Effectiveness of the strategic use of antiretroviral therapy in improving engagement of high-risk people to the HIV continuum of care in Indonesia

By

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Dedicated to marginalised and vulnerable people with HIV AIDS in resource limited settings particularly in Tanah Papua Indonesia who are sick and die without access to HIV testing and treatment

"A bruised reed he will not break, and dimly burning wick he will not quench…"

(Isaiah 42:3)

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ABBREVIATIONS

AEM	Asian epidemic modelling
AIDS	Acquired immunodeficiency syndrome
ART	Antiretroviral therapy
ARV	Antiretroviral
BCC	Behaviour communication change
CBHTC	Community based HIV testing and counselling
CDC	Communicable disease control
CD4	Cluster of differentiation 4
CHAI	Clinton Health Access Initiative
CHIPs	Community HIV-care providers
CIS	Combination intervention strategy
CST	Care support and treatment
DHO	District health office
eGFR	Estimated glomerular filtration rate
EIA	Enzyme immunoassay
EIC	Education information communication
EIDM	Evidence informed decision making
ELISA	Enzyme-linked immunosorbent assay

FBHTC	Facility-based HIV testing and counselling
FDC	Fixed-dose drug combination
FSW	Female sex worker
GF	Global fund
HB	Haemoglobin
HBHTC	Home-based HIV testing and counselling
HBV	Hepatitis B virus
HCC	HIV continuum of care
HPTN	HIV prevention trials network
HTC	HIV testing and counselling
ITS	Interrupted time series
IQR	Interquartile range
KAP	Key affected population
KT	Knowledge transfer
LKB	Layanan Komprehensif berkesinambungan
LMIC	Low and middle-income country
LTFU	Loss to follow-up
MBHTC	Mobile-based HIV testing and counselling
MeSH	Medical subject headings

MONEV	Monitoring evaluation
MOH	Ministry of Health
MSEM	Modified social ecological model
MSM	Men who have sex with men
NGO	Non-governmental organization
OI	Opportunistic infections
PEP	Post exposure prophylaxis
PICO	Population intervention comparison outcome
PITC	Provider initiated testing and counselling
PLHIV	People living with HIV
PMTCT	Prevention of mother to child transmission
POC	Point of care
PMU	Project management unit
PWID	People who inject drugs
RCT	Randomised controlled trial
RR	Reporting recording
SGOT	Serum glutamic oxaloacetic transaminase
SGPT	Serum glutamic pyruvic transaminase
SIHA	Sistem informasi HIV/AIDS

SOC	Standard of care
SMS	Short message service
SRH	Sexual reproductive health
STI	Sexual transmitted infection
SUFA	Strategic use of antiretroviral therapy
TasP	Treatment as prevention
TB	Tuberculosis
TDF	Tenofovir disoproxil fumarate
UNAIDS	Unites Nations AIDS
UNICEF	United Nations Children's Fund
VCT	Voluntary counselling and testing
WHO	World Health Organization
WPR	What is the problem represented to be?
ZDV	Zidovudine
3E	Triple Elimination

EXECUTIVE SUMMARY

Background: In 2013, the strategic use of the antiretroviral therapy (SUFA) initiative of expanding access to HIV testing and treatment was launched in Indonesia to improve the HIV treatment cascade, with the aim of achieving the UNAIDS 90-90-90 targets, and to contribute to the reduction of HIV transmission. To date, in Indonesia there has not been a comprehensive and systematic evaluation of the impact of the initiative, involving the treatment as prevention (TasP) strategy combined with HIV structural interventions on the multiple steps along the HIV continuum of care cascade. Evidence about the impact of the SUFA initiative is crucial for policy makers, as the scaling up of the 'treat all' strategy is underway at present.

Objectives: The objectives of this research was to assess the effect of the SUFA intervention in improving the quantity, and extent of the transition of high-risk people from the population to the clinical stages of the HIV continuum of care cascade. Specifically, this investigation aimed to determine: 1) the problems being represented by the SUFA policy and the likely effect of those representations on SUFA's outcomes; 2) the immediate impact of the SUFA intervention on HIV tests, HIV cases, enrolment in care, eligibility for antiretroviral (ARV), and treatment initiation; 3) the changes in the trends for HIV tests, HIV cases, enrolment in care, eligibility for ARV, and treatment initiation between pre-and post-SUFA implementation; 4) the differences in the rates of enrolment in care, eligibility for ARV, treatment initiation, loss to follow-up (LTFU) and death between SUFA and non-SUFA .

Methods: Two quantitative studies supplemented with a policy analysis were utilised to assess the impact of SUFA along the full HIV continuum of care cascade. The policy analysis took the approach of 'What is the problem represented to be?' utilizing six questions about how SUFA was problematized. These questions revealed the assumptions underpinning SUFA policy, the history of its development, the omitted

problems, and the possible effect and dissemination process of the SUFA policy. The second study was an interrupted time series (ITS) study using a multilevel negative binomial regression model that investigated the immediate and three-year impact of SUFA. Monthly data on HIV tests, HIV diagnosed cases, enrolment in care, eligibility for ARV, and treatment initiation from individuals aged ≥ 15 years from 13 cities were collected. The pre-SUFA data regarded as being non-exposed to the intervention were defined as data from 26th Dec 2010 to 25th Dec 2013 while the post-SUFA regarded as being exposed were defined as data from 26th Dec 2013 to 25th Dec 2016. The third study, a retrospective cohort study, estimated the hazard ratio for HIV enrolment in care, eligibility for ARV, treatment initiation, loss to follow up and overall crude mortality using a Cox proportional hazard regression model. The pre-intervention individuals aged ≥ 18 years old who were detected as HIV-positive between 26th Dec 2012 and 25th Dec 2013 in Medan and between 26th Dec 2013 and 25th Dec 2014 in Batam, were the non-exposed to the SUFA intervention. In the post intervention period, patients aged ≥ 18 years old who were detected as HIV-positive from 26th Dec 2013 to 25th Dec 2014 in Medan and from 26th Jun 2015 to 25thJuly 2016 in Batam were the exposed to the intervention. Participants were followed up for 12 months.

Results: The policy analysis found that the problem representation in SUFA's strategy indicated an assumption that the majority of high-risk people for HIV can be discovered in health facilities. The policy analysis also found that SUFA's strategy indicated the issue that the Indonesian HIV prevention strategy (prior to SUFA) was insufficient to control the growing HIV epidemic that concentrated in key affected population. As a result of the way SUFA was problematized, inequalities of access to HIV services among high-risk groups occurred and the deeper hidden population who had not yet been exposed to health facilities were inadvertently ignored. The ITS study showed that the rate of HIV tests immediately increased (IRR 1.41; CI 1.25, 1.59; $p<0.001$) once SUFA was introduced but that the rate of increase in HIV cases detected per HIV tests per

month was reduced (IRR 0.77; 95% CI 0.69, 0.86; p<0.001). The ITS also demonstrated that SUFA changed the trends in the rate of HIV tests, HIV detected, enrolment in care, eligibility for ARV and treatment initiation for the three years post implementation. The retrospective cohort study found increased rates of enrolment to care (HR 1.11; 95% CI 1.0, 1.22; p <0.05) and eligibility for ARV (HR 1.13; 95% CI 1.02,1.25; p<0.01) and reduced rates of LTFU (HR 0.73; 95% CI 0.55, 097; p<0.05) in patients who were initiated after one-year of SUFA implementation in Medan and Batam districts. The retrospective cohort study also found no differences between pre- and post- intervention in the median length of time transitioning from HIV detected cases to link to care, from link to care to found eligible for ARV, from eligible for ARV to treatment initiation. However, these time intervals for each of these transitioning events were already relatively short compared to other areas of the world.

Conclusion: Overall, the combination of TasP and the structural intervention of expanding access to HIV tests and treatment improved people's engagement along the continuum of care. However, the success of the intervention was impeded by the HIV testing strategy and the unsolved barriers in the treatment cascade, e.g. long waiting procedure, multiple visits, lack of transportation cost, stigma. Thus, for the current 'treat all' policy strategy to succeed in the scale up of the intervention across Indonesia, further development of testing and treatment strategies is crucial.

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed:

Date: 20 November 2019

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Chapter 1

Introduction

CHAPTER 1 INTRODUCTION

1.1 Global and Indonesian HIV epidemiological situation

Globally, achievements in the control of the HIV epidemic have been remarkable. However, substantial efforts are still necessary to expand and accelerate prevention programs as well as maintain various strategies to reduce morbidity and mortality and to eliminate stigma and discrimination (WHO Regional Office for South-East Asia 2016). UNAIDS reported that globally, 36.9 million people were living with HIV/AIDS, 21.7 million people were accessing antiretroviral therapy, 1.8 million new infections and 940 thousand AIDS-related deaths (UNAIDS 2018). Of these cases, 90% were found in low- and middle income countries (LMIC) (Bowman et al. 2017). Although significant progress in expanding HIV testing and ARV treatment, as well as other proven prevention measures, has raised the expectation that the epidemic will end by 2030 (Joint United Nations Programme on HIV/AIDS (UNAIDS) 2014b), efforts to achieve this have been uneven among countries. Indonesia is one of few countries in the Asia Pacific in which the number of newly infected cases of HIV per year continues to increase (Joint United Nations Programme on HIV/AIDS (UNAIDS) 2016). Of the five high HIV burdened South-East Asia countries, Indonesia alone is experiencing a growing trend of HIV cases (WHO Regional Office for South-East Asia 2016), and is experiencing one of the eight largest new infections in the world (Joint United Nations Programme on HIV/AIDS (UNAIDS) 2014c).

Indonesia's burden of HIV is particularly heavy due to complex and dynamic factors related to the size and characteristics of the population and geography (World Health Organization 2017). Figure 1.1 presents the HIV prevalence across Indonesia.

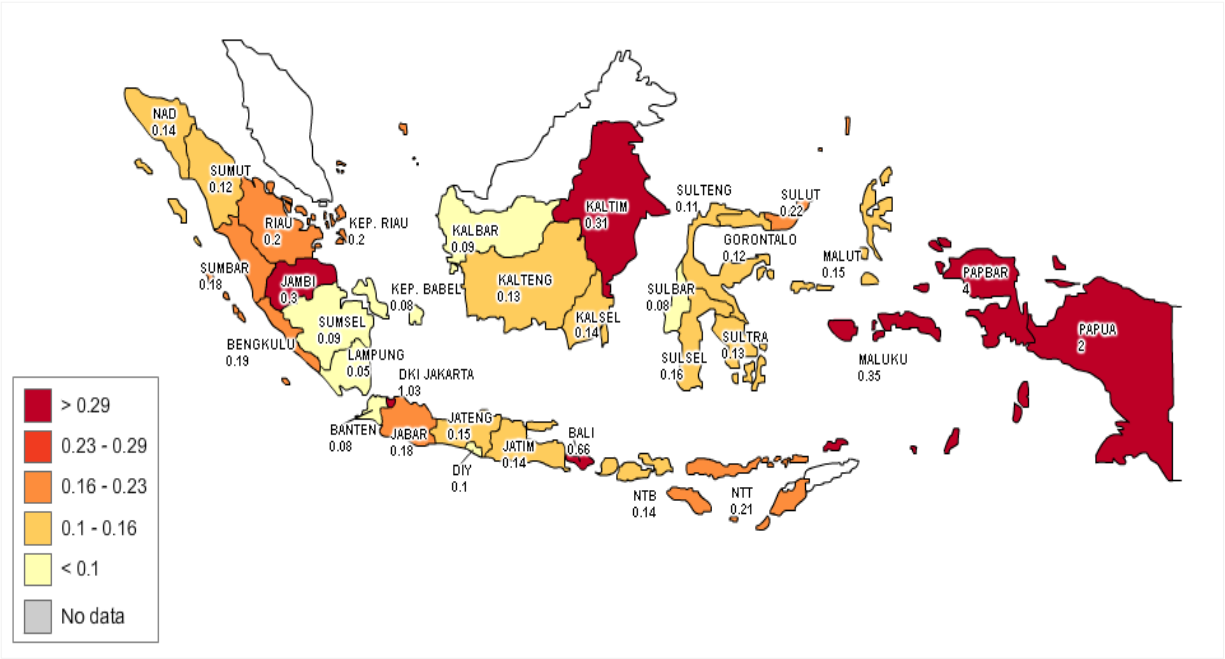


Figure 1.1. HIV prevalence estimates (%) in Indonesian provinces in 2012

National AIDS Commission & Ministry of Health (ID) 2013, Road map to reduce HIV-related morbidity and mortality and maximize the prevention benefits of scaling-up access to ARV: rapid scalling-up of HIV testing and treatment in high burden districts 2013-2015, National AIDS Commission, Ministry of Health, Jakarta.

As in other countries in Asia, the prevalence of HIV in Indonesia varies among key affected populations, is categorised as concentrated HIV epidemic ranging from 0.1% to 3.5%, with a nationwide average of 0.4% (World Health Organization 2017). According to the World Health Organization (WHO) a concentration of the HIV epidemic exists when 'HIV prevalence is consistently over 5% in at least one defined subpopulation but is less than 1% among pregnant women in urban areas' (World Health Organization 2016). The key affected populations (KAP) are female sex workers (FSW), men who have sex with men (MSM), transgender women (*waria* in Bahasa Indonesia) and people who inject drugs (PWID) (National AIDS Commission & Ministry of Health (ID) 2013). The KAP determines the HIV dynamic in the area, as they have specific high-risk behaviours which make them prone to HIV transmission (World Health Organization 2014a).

1.2 HIV/AIDS care and treatment program

1.2.1 Performance

The Indonesian HIV/AIDS management and control program has achieved substantial progress during the last three decades. To illustrate, in the period 2008-2013, across the country, the number of HIV counselling and testing services clinics increased six-fold, from 156 to 990. In the period 2010-2013, there was a three-fold increase in people screened for HIV, from around 300,600 to 1,080,000. During the period 2009-2014, the number of clinics providing antiretroviral therapy (ART) services increased significantly, from 159 to 470 (Ministry of Health (ID) 2015c). These clinics provide the ART drugs services to people living with HIV (PLHIV) at no cost (Culbert et al. 2016). However, these achievements have not succeeded in slowing the epidemic. Modelled projections through to 2025 indicate a rapid increase in PLHIV if the prevention strategies, particularly HIV testing and treatment, are not effectively expanded throughout the country (Ministry of Health (ID) 2015c; National AIDS Commission (ID) 2015).

As in many other countries, performance data for the HIV continuum of care reveal a significant number of PLHIV drop off at the transition to the next stage of the HIV continuum of care (HCC), indicating program challenges exist. The HIV HCC is a specified order of medical care that is followed by people infected with HIV/AIDS. The continuum covers HIV testing to viral load suppression, and describes the proportion of PLHIV who are engaged in each stage (AmfAR The Foundation for AIDS Research 2013; Freiberg et al. 2013; Hogg 2018). According to a report of Sub-directorate of HIV/ AIDS and STI of the Indonesian Ministry of Health (Luhukay 2019), the nationwide estimate of HIV cases as of March 2019 was around 640,443, which included 336,723 identified new cases, 111,228 treatment initiations and 260 viral load suppression cases, as shown in Figure 1.2.

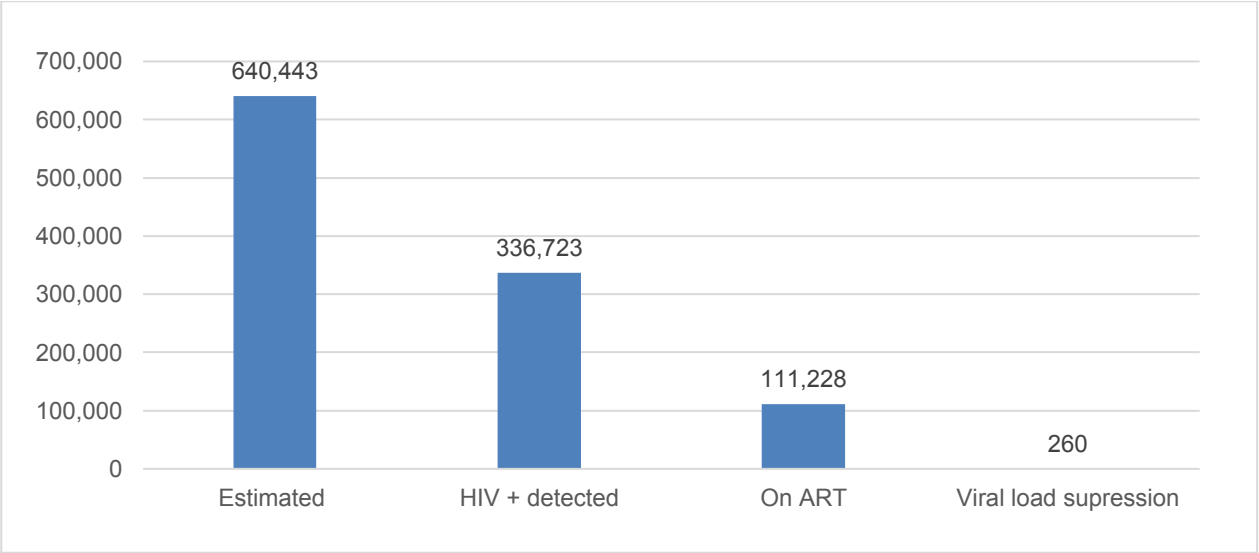


Figure 1.2. Participation in the Indonesian HIV cascade of HIV care up to March 2019

Luhukay, L 2019, *Cascade of HIV and ARV treatment in Indonesia: up to March 2019*, Subdirectorate HIV-AIDS and STI Ministry of Health Indonesia, Jakarta.

Indonesia's performance remains far below the UNAIDS current global target of 90-90-90 (90% of all PLHIV aware of their HIV status, 90% of all people diagnosed HIV receiving treatment, 90% of all people receiving ARV becoming virally suppressed) (Joint United Nations Programme on HIV/AIDS (UNAIDS) 2014a). The first 90% target in Indonesia reached only 42% of estimated PLHIV aware of their status (UNAIDS 2017), compared to United States of 80% (Cherutich, Bunnell & Mermin 2013), or to Sub-Saharan Africa countries of 60% (Suthar et al. 2013). Indonesia reached only 14% of the second 90% target of estimated PLHIV initiated into antiretroviral (ARV) (UNAIDS 2017), the lowest ART coverage in the Asia Pacific region (Joint United Nations Programme on HIV/AIDS (UNAIDS) 2013), and of those only 54% of PLHIV on ARV remained in care (Ministry of Health (ID) 2015c), which indicated that almost half of this population discontinued treatment for various reasons. The third 90% target in Indonesia was not reported by UNAIDS (2017) due to the unavailability of adequate data. Self-evidently, it is very important to aim for high participation/engagement proportion in each element of the cascade and to reduce risk behavior, facilitate viral suppression, reduce HIV transmission and, ultimately, reduce health care costs (Wong et al. 2018).

1.2.2 Barriers to HIV continuum of care

There are substantial barriers to the engagement of people along the treatment cascade in Indonesia. Socio-cultural, religious and political challenges (Mboi & Smith 2006), unreliable health services, and stigma (National AIDS Commission & Ministry of Health (ID) 2013) are among the many issues hampering HCC.

A scoping review by Lazuardi, Bell and Newman (2018) identified a number of the barriers to HIV diagnosis and linkage to care and treatment in Indonesia. Barriers to HIV diagnosis included clients' poor knowledge of HIV transmission, testing and treatment, service providers' poor knowledge about HIV transmission, poor relationships between clients and service providers due to a lack of privacy and confidentiality during counselling, fear of receiving a positive HIV test result, and fear of social stigmatization in the services. Barriers to linkage to care were identified as perceived or experienced breaches of confidentiality by health workers, as well as negative perceptions by the clients of health services e.g. new mothers' negative views about HIV in PMTCT service, and individuals' inability to be issued new identity documentation that reflects the gender they identify with (specifically for transgender women) (Lazuardi, Bell & Newman 2018). Barriers to treatment were payment requirements for standard blood and CD4 tests and assessment for opportunistic infections (OI) before receiving treatment and high administration costs, transportation costs, and fear of treatment side effects (Lazuardi, Bell & Newman 2018).

A qualitative study by Lumbantoruan et al. (2018) investigated barriers to prevention of mother to child transmission PMTCT. These barriers included doubts about ARV efficacy, particularly for asymptomatic women, unsupportive partners who actively prevent women from seeking treatment, and women's concerns about social stigma and discrimination.

Although regulations prohibit health care facilities from refusing treatment and care, stigma promoting behavior was found in the clinics. Stigmatization and discriminatory acts by providers included denial of service to PLHIV, treating PLHIV differently, disclosing PLHIV status to others in violation of confidentiality policy, and physical isolation of PLHIV (Merati, Supriyadi & Yuliana 2007).

1.3 HIV/AIDS care and treatment policy

1.3.1 Description of the 'strategic use of antiretrovirals' (SUFA) program

In the middle of 2013 the Ministry of Health Indonesia (MOH) launched a new strategy, the 'strategic use of antiretrovirals' (SUFA *temukan obati pertahankan* or *TOP* in Bahasa Indonesia), in response to the increase in HIV transmission and to contribute towards achieving the UNAIDS 90-90-90 target (Ministry of Health (ID) 2015b).

The SUFA was a policy intervention strategy designed to improve the uptake of people engaging within the HIV continuum of care, from HIV testing to viral load suppression. The strategy was expected to contribute to the reduction of HIV-related diseases and death and eventually also to slow a growing of HIV transmission. The main strategies were *to identify* high-risk people, *to treat* eligible PLHIV and t*o retain* them in care. *To identify* requires various interventions such as provider-initiated counselling and testing (PITC), voluntary counselling and testing (VCT), and mobile testing. *To treat* uses two criteria: ARV treatment eligibility when the HIV-infected person has CD4 (a type of white blood cell) count level at or less than 350 cells/mm3, and immediate ARV treatment initiation irrespective of the CD4 count level, which is applied in a specific population (FSW, MSM, transgender women, PWID, sero-discordant couples, pregnant women, and those with HIV/TB and HIV/HBV co-infections). *To retain in care* uses a once daily TDF based (Tenofovir Disoproxil Fumarat) fixed drugs combination (FDC) as a first line treatment.

The basic framework of the overall SUFA strategy was the integrated service delivery model (LKB or *Layanan Komprehensif Berkesinambungan* in Bahasa) which was purposed to build and expand the involvement of community support organizations in improving pre- and post-ART linkages (National AIDS Commission & Ministry of Health (ID) 2013). LKB refers to the HIV and STI management and service delivery covering a continuum of promotive, preventive, curative and rehabilitative steps, which is provided for clients at home, in communities or in health facilities, from uninfected status up to the terminal stage (Ministry of Health (ID) 2012). This model is appropriate for the Indonesian context as community involvement is always considered as an important asset in implementation of a program (LKB is further described in Chapter 3). The details of SUFA interventions are provided in the subsection 1.3.4 below.

1.3.2 The SUFA implementation phase

The SUFA was gradually implemented across Indonesia, beginning with 13 pilot regencies/cities, from late November 2013 to mid-January 2014 (Center for Public Communication Secretariat General Ministry of Health (ID) 2014). The program was then expanded to 75 regencies/cities from mid 2014 to early 2017 and eventually, expected to expand to 141 regencies/cities throughout the country (National AIDS Commission (ID) 2015). The introduction and implementation of the SUFA in regencies/cities involved a series of key activities and strategies (Ministry of Health (ID) 2015a). The implementation began with training in the standardized integrated service delivery model (LKB) for HIV program key stakeholders (local governments bodies, health providers and HIV community representatives in the regencies/cities).

Following the LKB training, two days of standardized SUFA launches and workshops were held at the national, provincial and regency/city levels with attendance of key HIV stakeholders at province and regency/city levels (see participant list in the Appendix A). The aims of the workshops were to build HIV networking groups and develop regency/city plans to accelerate the SUFA intervention strategy as well as to train

regencies/cities facilitators. It was expected that the local areas would have regular follow-up meetings to evaluate and respond as necessary regarding SUFA implementation.

The 13 pilot regencies/cities were chosen according to several criteria. These regencies/cities had already employed the LKB model, had a high HIV program burden (HIV prevalence, as shown by the number of key affected population reaching at least 200), had good support from their respective internal health service system infrastructures, and had the availability of non-government organisations. Further, the selected regencies/cities had support from the HIV community and had demonstrated a commitment to contribute to the program expenditure (National AIDS Commission & Ministry of Health (ID) 2013). In Indonesia, funding of the HIV program, particularly of the logistics, is a collaborative effort between central and local governments (Ministry of Health (ID) 2013a).

1.3.3 HIV policy interventions before the SUFA era

Before the SUFA era, HIV testing consisted of two main testing interventions: voluntary counselling and testing (VCT) and provider-initiated testing and counselling (PITC). VCT is defined as voluntary HIV testing and counselling initiated by an individual, while PITC is HIV testing and counselling initiated by health providers to patients in clinics. An additional HIV testing strategy in this era was the community outreach testing program ('mobile HIV testing') which was delivered outside clinics in communities where high-risk people live. Populations that were offered HIV testing and counselling were pregnant women, TB patients, KAP, STI patients and their partners, and HIV suspected patients (Ministry of Health (ID) 2011).

Before receiving treatment after being diagnosed positive for HIV, PLHIV were linked into HIV care and assessed for eligibility for ARV at the cut-off point of CD4 count level $\leq$ 350 cells/mm3, which was the eligibility criterion at the time. The CD4 count was also

used to monitor the health progress of patients after receiving ARV treatment. Before receiving treatment for the first time, patients were required to undergo serial blood testing. To ensure patients adhered to treatment they had to undergo several treatment counselling sessions with certified counsellors (frequency depending on the case). The first line drug used in this era was Zidovudine (ZDV) based with treatment consisting of triple independent drugs (Ministry of Health (ID) 2011). Table 1.1 presents detailed HIV care and treatment intervention before and after SUFA.

Table 1.1. Comparison of HIV intervention strategy in health facilities at Pre- and post-SUFA

Cascade stage	Intervention	Pre-SUFA*	Post-SUFA**	Post-SUFA new elements
HIV Test	Screening strategy	VCT	VCT	-
		PITC Population target: Pregnant women, TB patients, key affected population, STI patients and their partners, HIV suspected patients	PITC Population target: Pregnant women, TB patients, key affected population (every 6 months), STI patients, Hepatitis patients, prisoners, high risk men, PLHIV partners, HIV suspected patients	Additional Target population
		Mobile clinic	Mobile clinic	-
	Testing procedure	Rapid test using 3 reagents or ELISA	Rapid test using 3 reagents or EIA or Western blot	-
	Clinic system	Non-integrated	Integrated within other services in clinics	Integration system
		Not specified	Compulsory providing HIV screening in all health clinics	Larger scale and expansion of testing services
Enrolment and determination of eligibility for ARV	WHO clinical staging assessment	Applied	Applied	-
	Laboratory examination	CD4 count level (to initiate ART and control health progress), serum creatinine, SGPT/SGOT	CD4 count level (to control for health progress), serum creatinine or eGFR, SGPT, HB (if available)	Role of laboratory examination for treatment initiation from compulsory test before treatment to as necessary
	Cotrimoxazole	Purpose given as a proxy adherence for those who have CD4 count < 200 cell/mm3 or WHO staging 2,3,4	Given as indicated	-
	Treatment counselling	Frequency of treatment as indicated; Compulsory provided by certified counsellors	Frequency of treatment maximum 4 times; Provided by certified counsellors or by trained health providers	Task shifting allowed

Initiation	Treatment indication for:			
	PLHIV	CD4 count [2] ≤ 350 cells/mm3 or WHO clinical stadium[3] 3 or 4 whatever level of CD4 count	CD4 count [2] ≤ 350 cells/mm3 or WHO clinical stadium[3] 3 or 4 whatever level of CD4 count	-
	PLHIV from KAP	CD4 count [2] ≤ 350 cells/mm3 or WHO clinical stadium[3] 3 or 4 whatever level of CD4 count	Irrespective CD4 count level and WHO clinical staging	Criteria changes to universal treatment
	PLHIV from generalized epidemic	CD4 count [2] ≤ 350 cells or WHO clinical stadium[3] 3 or 4 whatever level of CD4 count	Irrespective CD4 count level and WHO clinical staging	Criteria changes to universal treatment
	Partner HIV positive of sero-discordant couple	CD4 count [2] ≤ 350 cells/mm3 or WHO clinical stadium[3] 3 or 4 whatever level of CD4 count	Irrespective CD4 count level and WHO clinical staging	Criteria changes to universal treatment
	Pregnant women	Irrespective CD4 count level and WHO clinical staging	Irrespective CD4 count level and WHO clinical staging	-
	TB/HIV	Irrespective CD4 count level	Irrespective CD4 count level and WHO clinical staging	-
	Hepatitis B	Irrespective CD4 count level	Irrespective CD4 count level and WHO clinical staging	-
Retention	First line ARV treatment	AZT or TDF based according to patients health conditions	TDF (fixed drug combination)	Changes of first line treatment regimen to TDF based Fixed drug combination once daily
		To treat to retain PLHIV in ARV were only in hospitals only	Decentralized the services to primary health centers	Decentralization

*Ministry of Health ID 2011, National guidelines on clinical management of HIV infection and antiretroviral treatment in adults (in Bahasa Indonesia)', *Jakarta: Kementerian Kesehatan Republik Indonesia Direktorat Jenderal Pengendalian Penyakit dan Penyehatan Lingkungan*, pp. 1-60.
** Ministry of Health ID 2014, *Regulation of Ministry of Health Republic of Indonesia number 87 year 2014 concerning ARV treatment guidelines (in Bahasa Indonesia)*, Jakarta.
** Ministry of Health ID 2014, *Regulation of Ministry of Health Republic of Indonesia number 74 year 2014 concerning guidelines for HIV counseling and testing (in Bahasa Indonesia)*, Jakarta.

1.3.4 HIV policy interventions after SUFA era

The HIV testing strategy in this era used a combination of community- and facility-based interventions, i.e. VCT, PITC and mobile testing, similar to the pre-SUFA era. However, the population types offered HIV testing were extended to prisoners and high-risk men. Six monthly retesting of KAP who were initially found to be HIV negative was also advised (Ministry of Health (ID) 2014d).

Treatment criteria were expanded to include the specific populations with the addition of the criterion 'irrespective of CD4 count'. In other words, PLHIV from these populations

were immediately eligible for ARV treatment without having to wait until their CD4 count level dropped to below or equal to 350 (Ministry of Health (ID) 2014e).

Other innovations were the decentralisation of ARV service to primary health centres, the integration of HIV testing services with other health services within clinics, and the simplification of the pre-ART procedure (such as CD4 count examination and blood test). The changes allowed task shifting for treatment counselling (delegation of tasks from highly specialised to less specialised health workers where necessary (World Health Organization 2007b)), and utilisation of the TDF based once daily fixed drug combination as the first line drug regimen (Ministry of Health (ID) 2014e).

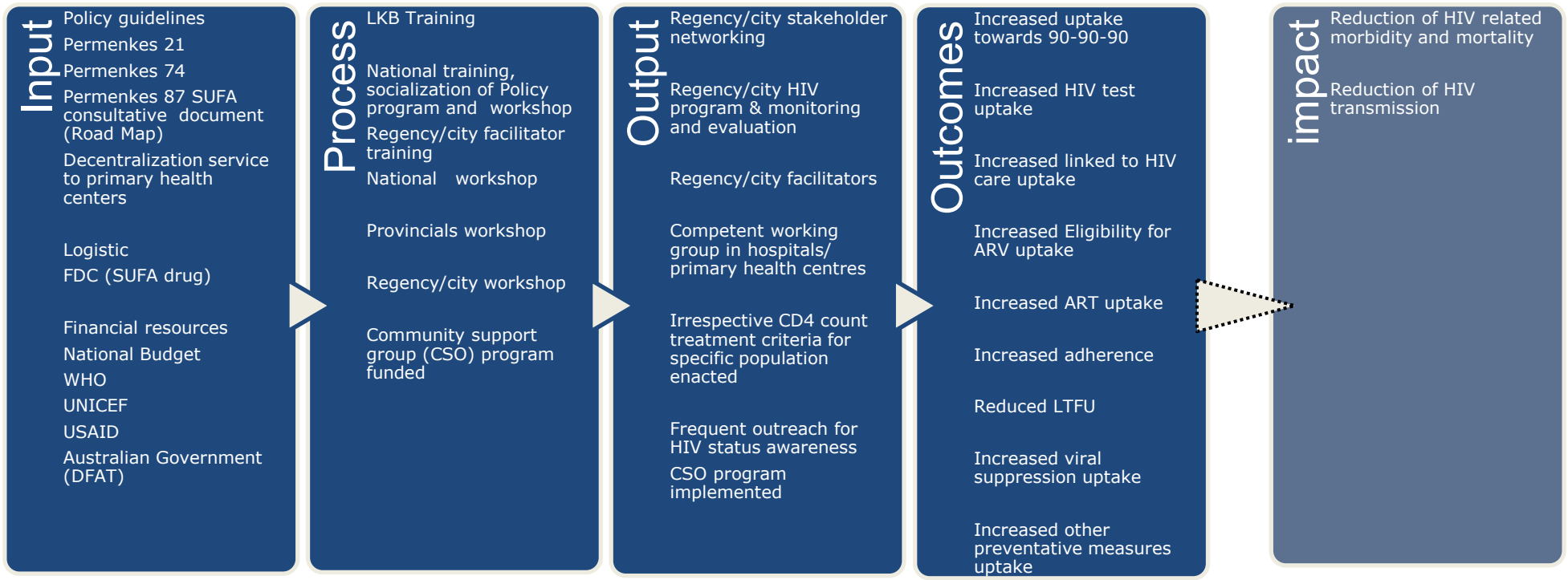
The structural intervention in the SUFA implementation era were serial training sessions, workshops and the establishment of HIV stakeholder networks at the national, provincial and regencies/cities levels, revision and enactment of new policy interventions in form of ministerial regulations and circular letters from Sub-Directorate HIV-AIDS and STI of the MOH. Through 2013 and 2014 one consultative paper titled 'Roadmap to reduce HIV-related morbidity and mortality and maximize the prevention benefits of scaling-up access to ARVs: rapid scaling-up of HIV testing and treatment in high burden districts 2013-2015' (National AIDS Commission & Ministry of Health (ID) 2013) and three ministerial regulations (Ministry of Health (ID) 2013d, 2014d, 2014e) defined the SUFA intervention strategy. These 2013/2014 documents together achieved a significant milestone in the policy for HIV-AIDS control and management (an outline of the policy is presented in Chapter 4) and defined potentially the most productive years in the history of development of HIV policy regulations in Indonesia.

The years since 2013 have been pivotal in the formation of the HIV stakeholder coalitions in Indonesia, consisting of inter-sectoral government bodies, international donor institutions, international and Indonesian local non-government organisations, PLHIV community groups and key population organisations. These years have been

marked by an increased awareness of the necessity to establish effective working collaborations in combating HIV, as recorded in a SUFA policy consultative paper (National AIDS Commission & Ministry of Health (ID) 2013). Effective working collaboration was also identified as one of the basic principles and strategies of HIV management in the Ministry of Health Regulation 21/2013 (Ministry of Health (ID) 2013d). It is also critical in addressing the complexity of the determinant factors of HIV-AIDS infection and transmission (O'Neill et al. 1997).

Figure 1.3 presents the SUFA strategy logic model, outlining the main SUFA initiatives from input, process, output, outcomes and impact. The SUFA intervention was expected to affect directly the immediate outcomes, which in turn were expected to contribute to the long-term goals of the HIV prevention intervention program i.e. reduction of HIV related morbidity and mortality as well as reduction of HIV transmission. This study measured the immediate outcomes only.

Figure 1.3. SUFA Strategy Logic Model



1.3.5 Rationale of the main SUFA interventions

The main SUFA intervention (provided irrespective of CD4 count to specific populations) is focussed on immediate ARV or treatment as HIV prevention (TasP), as formulated and recommended by World Health Organization (2013). Immediate treatment entails administering ARV to asymptomatic HIV-infected persons before their own health requires it for the purpose of reducing the viral load (Haire & Kaldor 2013).

Biological plausibility forms the core concept of TasP. The main action of ARV in the host body is preventing replication of the virus by suppressing concentration or viral load to below detectable level in the blood and other bodily fluids. There is incontrovertible evidence that viral load is the single key determinant for transmission of HIV infection (World Health Organization 2016). As the viral level reduces so does the probability of HIV transmission (Cu-Uvin et al. 2000; Vernazza et al. 2000).

The evidence of a landmark study, the HIV prevention trial (HPTN 052) (Cohen, MS et al. 2011), prompted the WHO to release the policy of immediate ARV treatment. Cohen et al.'s study (2011) demonstrated that HIV-positive partners who were given ARV could reduce HIV transmission by 96% to their HIV negative partners in heterosexual stable relationships. This evidence was extrapolated, on the basis of rigorous scientific argument, to other high-risk populations including FSW, MSM, transgender women and PWID, for immediate ART treatment regardless of CD4 cell count to decrease the HIV risk of transmission (World Health Organization 2012a). Many other experimental, observational and ecological studies support the theory that ARV treatment can reduce HIV transmission and endorse the use of ARV as a preventive tool for public health benefit (Das et al. 2010; Donnell et al. 2010; Fang et al. 2004; He et al. 2013; Jia et al. 2013; Montaner, JS et al. 2010; Montaner, JSG et al. 2014; Smith et al. 2015; Tang, ZZ et al. 2015; Vandormael et al. 2014; Wood et al. 2009). Like the Cohen study, Temprano Anrs Study Group et al. (2015) and Insight Start Study Group et al. (2015) provided evidence that after immediately treating PLHIV (CD4 count $\geq$ 500) with ARV,

death and severe illness related to AIDS were reduced up to 44%, which is the basis of the recent WHO recommendation on the treat all strategy (all PLHIV are eligible to ARV) (World Health Organization 2015).

TasP is supported by other global evidence that the cumulative percentage of HIV transmission by one person in the course of his/her life can be reduced by early treatment. For example, if one HIV infected person receives ARV when his CD4 count level is closer to 350, the cumulative percentage of probability of transmitting HIV is reduced by 50% in a lifetime compared to 0% when no treatment is given (The HIV modelling consortium treatment as prevention editorial writing group 2012). Several countries in sub Saharan Africa (Barnighausen, Eyal & Wikler 2014), and countries in Asia such as Indonesia (National AIDS Commission & Ministry of Health (ID) 2013), adopted the TasP strategy as part of their prevention strategy. Implementation has continued since, providing the opportunity for these countries to study the impact of this prevention intervention on their HIV epidemic.

The main rationale of the SUFA intervention was the revision of the treatment criteria from only including individuals with CD4 counts 350 or less to also including individuals in specific populations irrespective of their CD4 counts. This strategy aimed to double the number of PLHIV eligible for ARV treatment (most of the increase is expected from sero-discordant couples and MSM). It is expected that by increasing the proportion of PLHIV eligible for ARV treatment to 80%, the number of PLHIV who would receive ARV treatment would also increase significantly (National AIDS Commission & Ministry of Health (ID) 2013). Studies have reported reductions in transmission by up to 96% in HIV among those successfully on ART (see Cohen et al. 2011), although actual effectiveness in national programs is likely to be less. Figure 1.4 depicts the number of adults on ART with 80% coverage, by scenario (assuming 80% ART effectiveness).

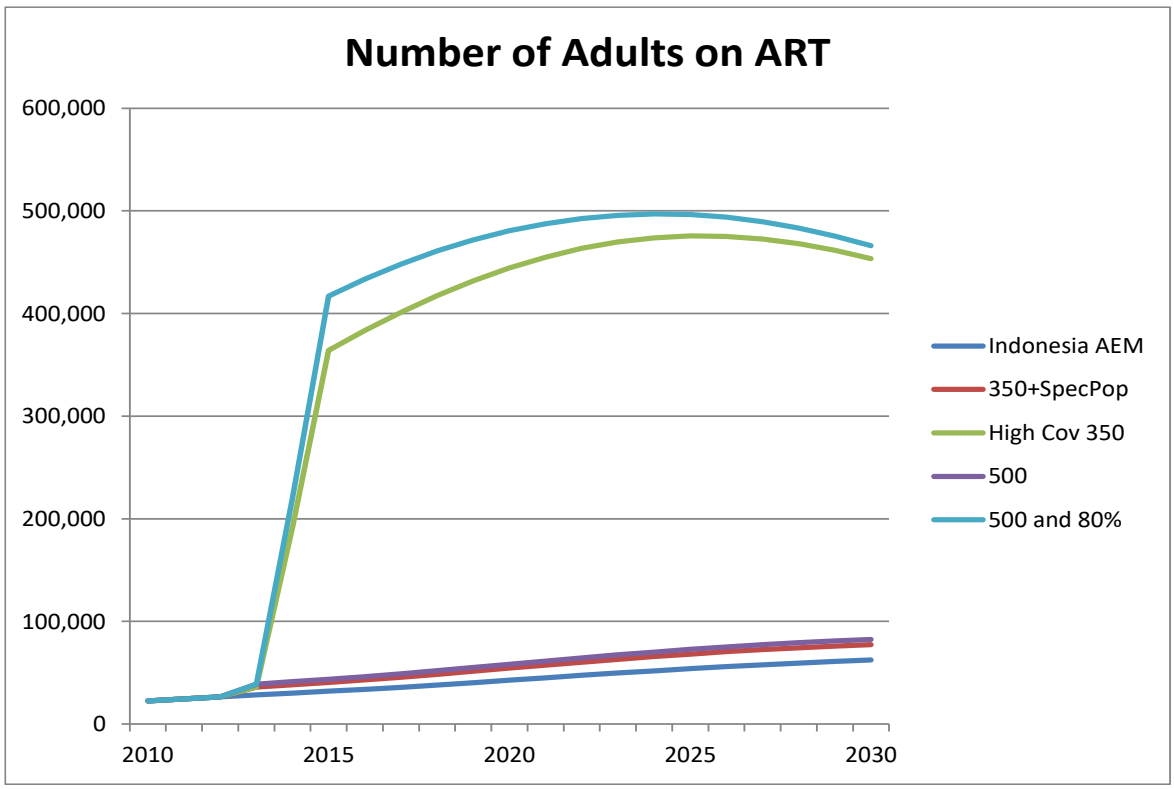


Figure 1.4. Number of adults on ART with 80% coverage, by scenario (assuming 80% ART effectiveness)

National AIDS Commission & Ministry of Health (ID) 2013, Road map to reduce HIV-related morbidity and mortality and maximize the prevention benefits of scaling-up access to ARV: rapid scalling-up of HIV testing and treatment in high burden districts 2013-2015, National AIDS Commission, Ministry of Health, Jakarta.

1.4 Statement of the problem

There are few peer reviewed studies of the effectiveness of accelerating HIV testing and ART treatment in improving the HIV continuum of care cascade in the general population in LMIC, particularly in Southeast Asia and, specifically, in Indonesia. Furthermore, there are few investigations in real world settings with evidence from a larger population and over more than two years observation, of multiple interventions that aimed to influence multiple stages in the HIV continuum at the same time from pre- to beyond ART stages in the TasP era. One study investigated the effectiveness of an intervention using cross sectional population data without directly testing the intervention effect (Wroe et al. 2018). To date there is only one peer reviewed paper, a longitudinal study, that described the achievement in HIV continuum of care cascade in Indonesia (Januraga et al. 2018). Most reports on the continuum of HIV care cascade in Indonesia used a cross sectional approach for the purpose of routine program monitoring and

evaluation, and were not peer reviewed. Furthermore, no study analysing SUFA policy was found in the literature.

To date, there is insufficient and incomprehensive evidence to confirm the effectiveness of the SUFA intervention in achieving its aims. A Ministry of Health evaluation of the cross sectional of the population in the HIV continuum of care from the 13 SUFA pilot sites from 2011 to 2014 (conducted in Nov 2014) showed an increase in the number of HIV tests, HIV detection, link to HIV care, treatment initiation (World Health Organization 2014b). These findings were supported and explained further by a later Ministry of health evaluation in April 2015, which found that HIV testing coverage in the 13 SUFA demonstrated sites were 3-4 times higher than the national data for the year 2013-2014 (Ministry of Health (ID) 2015a). This evaluation reported that although testing coverage had increased, positivity rate declined both in the 13 SUFA sites and nationally. The numbers enrolled into care, undergoing treatment and being retained in care grew, but these stage achievements did not differ between SUFA districts and nationwide (World Health Organization 2014b). These results may simply indicate improvement over time and that the SUFA program had not yet been fully implemented into the system (Fixsen et al. 2005) as of November 2014. Neither of these evaluations measured trends in the variables of interest, such as HIV testing, newly detected cases, enrolment to care, eligibility for ART, initiation of ART and retention in care using robust statistical analyses to evaluate the effectiveness of the intervention. Both evaluations consisted only of descriptive and cross-sectional aggregate data analyses.

SUFA was designed to combine the strengths of each of the various strategies; however, evidence is required to measure the effectiveness of the combined interventions, particularly at population and individual levels. Confirmation of the effectiveness of the SUFA intervention would provide a strong justification for applying the TasP strategy in the remaining regencies/cities (National AIDS Commission & Ministry of Health (ID)

2013). In light of a new test and treatment (treat all) policy strategy that is in the process of being scaled up across Indonesia (Ministry of Health (ID) 2018, 2019), rigorous evidence of SUFA effectiveness would also contribute fundamental evidence for the creation of a strong future strategy. Public health interventions must be rigorously evaluated to ensure that health funds are spent in effective and efficient ways (Sanson-Fisher et al. 2014).

The strong biomedical benefit of immediate ARV usage (TasP) in preventing onward transmission in the population is well known (Amico 2014) but it is only one piece of the puzzle (The HIV modelling consortium treatment as prevention editorial writing group 2012). The evidence for ARV effectiveness in reducing HIV transmission in trials (Cohen, MS et al. 2011), as well as in the real world ranges from highly effective to not effective at all (Wang et al. 2010). The results of HIV research in a particular population does not automatically demonstrate similar phenomena if applied in other settings, as differences are found among cultural, political, sexual and geographical contexts (Glasgow, Eckstein & ElZarrad 2013). The challenge lies in the translation of the evidence into practice, which is always difficult and complicated. In the real world, there are obvious gaps between theoretical knowledge of effectiveness and the real conditions in the health system practice.

Finally, under the optimistic SUFA scenario of 80% ART coverage (80% estimated PLHIV on ART) and assuming 80% SUFA program effectiveness (the ability of the SUFA program to reduce HIV transmission by 80%), mathematical modelling using GOALS software predicted a reduction of HIV transmission that would begin to be measurable across the Indonesian population in 2025 (National AIDS Commission & Ministry of Health (ID) 2013). However, this assumption might be contrary to the real-world experience. In its rigorous examination of the real world effectiveness of SUFA and the problems of the cascade in Indonesia, this study is expected to become a foundational

building block for the MOH's current policy of adopting and implementing the WHO recommendation of the test and treat or treat strategy for all PLHIV (Ministry of Health (ID) 2018). The adoption process has already been initiated by the release of a circular letter addressed to all provincial governments, hospitals and related stakeholders in Indonesia (Ministry of Health (ID) 2018), with endorsement in the latest version of national guidelines for HIV clinical management services (Ministry of Health (ID) 2019). Therefore, a scientifically systematic and comprehensive study of the SUFA implementation process in Indonesia and of the impact of the combination of expanded HIV testing and ARV treatment interventions targeting multiple stages on the HIV treatment cascade at the same time using population and individual level analysis is crucial.

1.5 Purpose of the study

The purpose of this study is to measure whether the combination of HIV stakeholder partnership, training of providers and communities, HIV testing strategy, treatment counselling, TasP for specific population, and simplified ARV drug regimen interventions were effective in changing people's movement in HCC between pre- and post-ART. Effectiveness is demonstrated by evidence that significant changes along the care continuum occurred in a comparison of pre- and post-SUFA intervention periods. Further, significant changes can also be demonstrated by providing a comparison with the 90-90-90 global target. This study also enables possible supports for SUFA's assumption that revision of eligibility treatment criteria significantly increases eligibility and then ART uptake. Thus, the study can potentially shed light on the SUFA program's contribution in reducing HIV transmission. The strengths, weaknesses and challenges in the Indonesian health system in delivering the HIV care and treatment program are evaluated and, by examining all factors involved together, this study can better estimate the extent of the program's achievement of the desired outcomes. Finally, the study's measurement of the immediate outcomes of the SUFA program and

interpretation of the program's effects on outcomes of interest enable recommendations for future Indonesia policies and practices (Saunders, Evans & Joshi 2005) particularly in light of test and treatment as well as treat all intervention era.

1.6 Motivation behind the study

The idea for the study was based on my past experience dealing at the national level with HIV policy development and implementation. As researchers, I believe we cannot avoid the influence of our experiences and background when reflecting on problems. I have observed that the use of research evidence in the formulation of HIV policies is still a challenge in Indonesia. Thus, it was necessary to conduct this study as a form of evaluation research in order to provide evidence that is useful for policy makers in Indonesia. The assessment of the effectiveness of SUFA has been an important issue for HIV stakeholders, particularly in discussions at the national level, since government and non-government organisations have been continuously involved from the design of SUFA to its implementation throughout the country. At the beginning of the study, I established a reference group, including some of the stakeholders, to advise on the operationalization of this research. I thereby built interaction between the researcher, the user, and the policy makers to increase the possibility of future uptake of this research (Nutley, Walter & Davies 2007). Since the government is in the process of upscaling the SUFA and recent test and treat all strategies across the whole of Indonesia (Ministry of Health (ID) 2018; National AIDS Commission & Ministry of Health (ID) 2013), evaluation of the SUFA progress is essential to develop improvements that can be made for better performance. Therefore, the motivation for this study has been to contribute to the improvement of these HIV prevention strategies, that aim at universal treatment recently implemented by the Indonesian government.

1.7 Dissertation structure

The study background, intervention description and rationale, problem statement, and purpose of the study have been outlined in Chapter 1. Chapter 2 presents a systematic review of the literature on structural interventions to change the characteristics of people's transition along the HIV clinical pathway conducted in general population in LMIC. This review provides further evidence underscoring the importance of this research. Research gaps and research questions are summarized at the end of chapter 2. Chapter 3 explains the conceptual basis, general method and theoretical framework applied in this research. Chapter 4 analyses the SUFA policy using the discourse analysis of the Bacchi approach to investigate how SUFA policy initiative represented the problems and what likely effect of this representation are in achieving their objectives. Chapters 5 and 6 present the comprehensive results of the interrupted time series and cohort studies respectively, which yielded the impact of SUFA against each stage in the HIV continuum of care cascade. Chapter 7 discusses the findings in general and its implication as well as how the systematic review, the policy analysis, and the original research reported in this thesis can provide the basis for suggestions for the future development of policy and intervention in the government's effort to achieve the UNAIDS target and combat the increase in HIV transmission. Chapter 7 also contains, reflections on methodology, the strengths, limitations, and challenges of the study, and possibility of knowledge translation. Finally, Chapter 8 provides a comprehensive conclusion, highlighting in particular, the impact of the SUFA intervention, the implications and the main recommendations of the study.

Chapter 2

Literature Review

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

To position the study within a broader knowledge setting and to identify any gaps in evidence, available international body of knowledge was explored. This chapter presents a review based on a systematic search of literature on the effectiveness of structural interventions, either singly or in combination, to map the characteristics of population movement along the HIV continuum of care cascade. The review summarises the impact of the interventions that targeted limited elements of the continuum of care cascade then continues to summarise the intervention that targeted full HIV continuum cascade steps. These reviews helped to shape the project's research questions, which are presented at the end of the chapter

2.2 Search and review process

2.2.1 Objectives

The objectives of the review were to emphasize knowledge gaps in the examination of the effect of structural and expanding access to HIV test and treatment interventions, transitioning people's movement along HIV continuum of care cascade. A further objective was to develop suggestions for the possible applicability of the knowledge found in other contexts. This review focussed on locating articles on general populations rather than on specific characteristic of populations. It also focused on eligibility criteria for ARV beginning from the era of CD4 count level of $\leq$ 350 cells/mm3 or newer, including aggregate and individual analyses.

2.2.2 Search process

To begin the process, the study developed a comprehensive search strategy by breaking down the review objectives into three concepts and structured then using PICO components. The concepts were: 1) Human immunodeficiency virus (HIV) in humans as a broad population of interest; 2) structural, test and treatment interventions (main

SUFA intervention); and 3) continuum of care. The structural factor was defined as physical, social, cultural, organisational, community, economic, legal, or policy aspects of the environment that facilitate or hamper efforts to prevent HIV infection. Structural intervention referred to programs or policies to avoid HIV acquisition that target structural factors by influencing the contexts or mechanisms which create the behaviour rather than directly targeting the behaviour itself (Gupta et al. 2008). These PICO terms were also formulated after finding the search terms of systematic reviews investigating HIV interventions (Hickey et al. 2017), consulting an experienced researcher in the HIV continuum of care (Haber et al. 2017), and consulting an expert medical librarian about obtaining sensitive key word terms to capture papers on treatment cascade.

Each of the term concepts were expanded using a combination of text words, synonyms and medical subject headings (MeSH) with regards to the sensitive search formula (Armstrong et al. 2007). Following this, the search strategy was piloted, tested and validated several times until it was proven as a reliable strategy. A reliable strategy was defined as the capacity to classify appropriate research papers published in high impact journals (Armstrong, Waters & Doyle 2008). Further, the pilot search was conducted in Medline with MeSH terms to find the papers, which gave search terms greater detail compared to other databases. Medline was used as the principal search terms for other databases. The search terms were then modified as necessary for use in the other databases. The study sought peer reviewed English language journals only due to resources limitation. Taking into consideration the nature of the collections in public health data bases, learning from systematic review researchers (Anglemyer et al. 2013) and consulting the librarian, the study searched papers in Ovid Medline, Ovid Emcare, Scopus, ProQuest, CINAHL, and the Cochrane database of systematic reviews (Wiley).

The final search terms in Scopus (as an example): (TITLE-ABS-KEY ((hiv* OR aids OR hiv-1 OR hiv-i OR "Human immunodeficiency virus*")) AND TITLE-ABS-KEY

((((continuum OR cascade) W/1 care) OR "clinical pathway*" OR "care pathway*" OR "treatment cascade" OR "treatment continuum" OR "longitudinal continuum" OR continuum* OR "longitudinal cascade" OR "care cascade" OR "treatment outcome")) AND TITLE (("structural intervention*" OR "health policy" OR "health system*" OR "health policies" OR "expan* treatment" OR "expan* test*" OR "scal* test*" OR "scal* treat*" OR prevent*))) AND AND NOT ALL (animal*) AND (LIMIT-TO (LANGUAGE, "English"))

The inclusion criteria used were that the study was a primary study of interventions assessing structural factors; aimed to change quantity and length of time of people's movement in the HIV continuum cascade; focused on the general population or non-specific key population, and included only adults; had a study design incorporating a comparison arm, comparison group or pre post data comparison; assessed eligibility for ART treatment using criteria of CD4 count level ≤350 μl or above or regardless CD4 count level; was conducted in LMIC; and was published between 2012 and 2018. While the following exclusion criteria were used: population of interest only children/youth, only KAP, only pregnant women, only TB-HIV, or only sero-discordant couple; conducted in high income country; not an intervention study; no comparison arm or groups; outcome measures not continuum care cascade stage.

Selected records from all databases were imported into an EndNote library and duplicate papers were removed. Irrelevant papers were then separated from potentially relevant papers by scanning first the titles and abstracts. If, in the title and abstracts scanning process, the decision for relevancy to the predetermined inclusion criteria could not be made, the full text was obtained to assess for eligibility. The full texts of all potentially relevant papers were obtained from the Flinders University library and its document delivery services. Finally, the full-text papers were examined and the included studies assessed based on the inclusion criteria described above (Anglemyer et al. 2013).

Topics of the irrelevant papers found were, for instance, adverse drugs reaction studies, ethics studies, individual clinical factors evaluation, virus genetic studies, assessing efficacy in other diseases, alternative therapy studies. Remaining duplicate articles identified during the scanning process were also removed. The criteria for duplicate papers were similarity of author's name, year published, objectives and results in the primary studies.

2.2.3 Search limitations

One potential limitation was the retrieval of papers from peer-reviewed journals only in the English language while other languages were discarded. Further, the search was also conducted in bibliographies of final articles, however only limited to some of the final papers because of time and resources constraints, practicality and manageability. Lastly, the two researchers assessed the quality of relevant papers at the risk of bias.

2.2.4 Study assessment

A quality assessment was conducted to examine the methodological quality of the included studies using the Joanna Briggs Institute Critical Appraisal tools checklist. The articles were assessed utilising questions that represent value of '1 to yes', '0 to no', '0 to not clear', 'not count to not applicable'. The articles that had a quality assessment point percentage of less than 70% was used to discard papers.

2.2.5 Data extraction

Two data extraction tables were developed by adjusting them to the review question and the synthesised themes (Akers, Aguiar-Ibáñez & Baba-Akbari 2009). The study adopted Hickey et al. (2017) method of describing interventions and extraction of intervention impact, and developed these to the specific needs of this review. The first table presented first author/ year of publication, location/ setting, study design, population, key limitation, and conclusion (Appendix B General Information). The second table included the study code, intervention and comparison, sample size, and

cascade impact per stage (Appendix C Intervention Effect along Cascade). The researcher conducted the data extraction and the review for correctness and completeness were conducted by at a different time.

2.2.6 Data synthesis

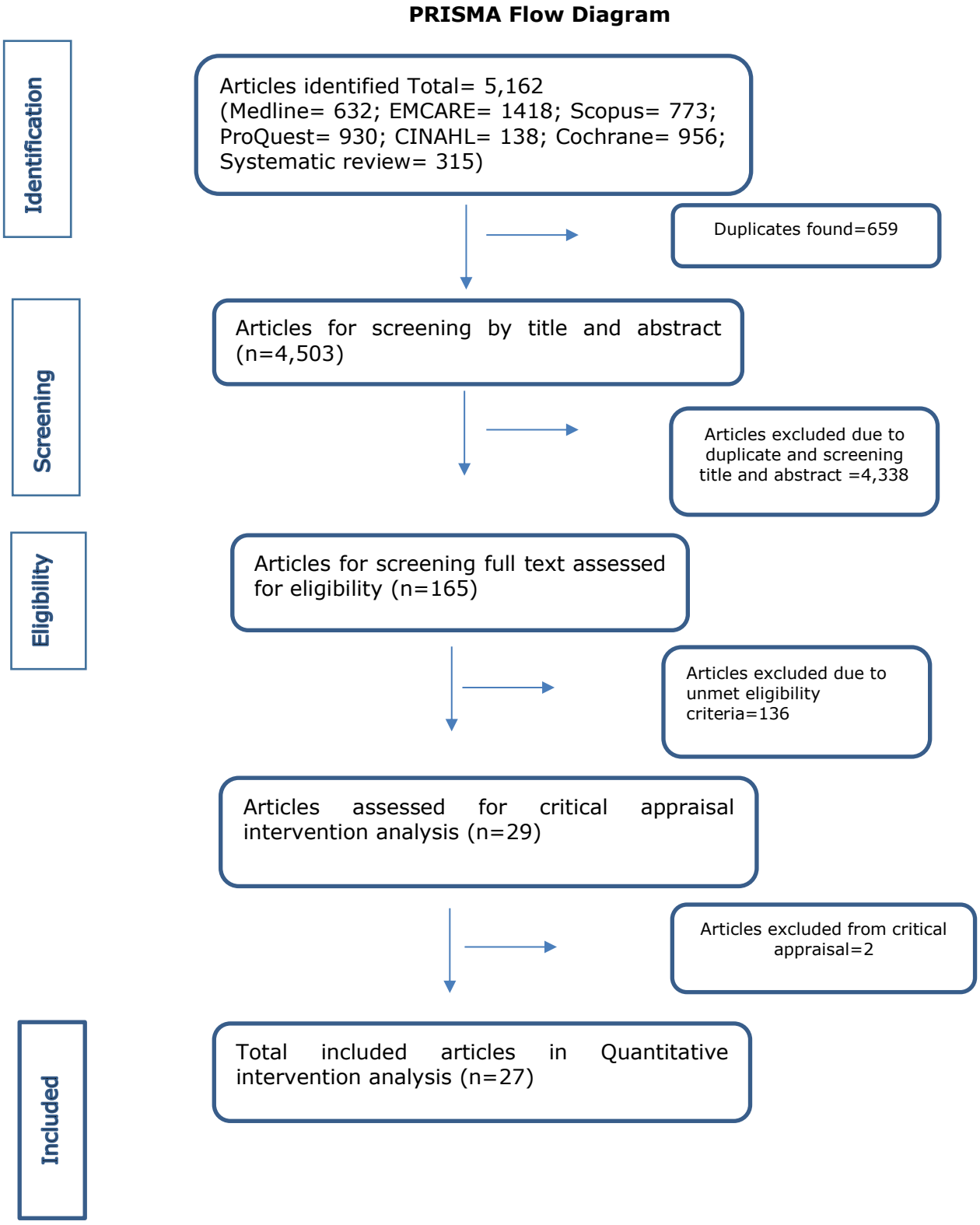
The study synthesized the evidence found in this review in a traditional way. The synthesis process was to arrange and describe the findings of all the included studies by comparing, contrasting and discussing in detail the relationship between the characteristic of single studies with their results and among the findings of different studies (Akers, Aguiar-Ibáñez & Baba-Akbari 2009)

2.3 Summary of findings

2.3.1 Overall summary

The initial search found 4,847 articles. After exploring 13 recent systematic reviews (Choko et al. 2018; Fox et al. 2016; Govindasamy et al. 2014; Hickey et al. 2017; Johnson, CC et al. 2017; Keane et al. 2017; Murray et al. 2017; Mutasa-Apollo et al. 2017; Penn et al. 2018; Ruzagira et al. 2017; Sabapathy et al. 2018; Sharma et al. 2015; Vojnov et al. 2016) 315 articles were added, resulting in a total of 5,162 papers reviewed. Figure 2.1 details the selection process of the include articles. Finally, for this review the study included twenty seven articles that matched the inclusion criteria and fulfilled at least the minimum level quality for this study (see Appendix D for the critical appraisal results of the 27 articles). A summary description of the included studies is presented in Appendix B and Appendix C.

Figure 2.1. Prisma results of systematic search and selection process for the inclusion studies



Twenty five of twenty seven studies were conducted in a generalized HIV epidemic context: South Africa (Barnabas et al. 2016; Bassett et al. 2016; Bassett et al. 2014; Clouse, K et al. 2014; Iwuji et al. 2016; Kompala et al. 2016; Kranzer et al. 2012; Rosen, S. et al. 2016), Uganda (Amanyire et al. 2016; Barnabas et al. 2016; Boeke et al. 2018; Chang et al. 2015; Siedner et al. 2015), Zambia (Floyd et al. 2018; Hayes et al. 2017; Hewett et al. 2016; Mody et al. 2018) Malawi (MacPherson et al. 2014; Wroe et al. 2018), Swaziland (McNairy et al. 2017; Parker et al. 2015), Lesotho (Labhardt et al. 2014; Labhardt et al. 2018), Mozambique (Elul et al. 2017), Kenya (Hickey et al. 2015) and Haiti (Koenig et al. 2017). Two articles focussed on a concentrated epidemic setting in GuangXi in China (Wu et al. 2017; Wu et al. 2015). The majority of the studies were RCTs (n=14). Of those, seven used the individual as the unit of randomization, while the rest used the cluster as the unit of randomization. Eleven articles used cohort designs, one article used a quasi-experimental design and one article was an observational cross-sectional study.

The articles reviewed were varied in regard to intervention types, the cascade stages that interventions targeted at, outcomes measures, outcomes definitions, and contexts, which posed substantial challenges in comparing and measuring the evidence. Few articles studied a combination of structural interventions aiming to directly target multiple steps of the full continuum of care. Moving along the full continuum of care was defined as entering the HIV clinical pathway, beginning with pre-ART steps and continuing beyond the ART treatment initiation step. The remaining studies focused on single or multiple interventions targeting the pre-ART stage only, the ART stage only, or were limited from the pre-ART to ART stage.

2.3.2 Evaluation of intervention impact

Due to the wide in variability of measures used by the researchers in reporting their findings, the most visible comparison of measurement effects on each step of the cascade were the rate/proportion of stages, transition time from one point to another

point and associated effect measures such as risk, hazard or odds ratios. The summaries of intervention impacts, presented below, were divided into two sections: single or multiple interventions affecting limited cascade steps or targeting the full continuum of care. Where the study used single or multiple interventions affecting limited cascade steps, the study summarised the effects of the interventions at the stages that the intervention aimed to change.

2.3.2.1 Single or multiple interventions targeting limited cascade steps

This section provides the review of twenty articles, with summaries of the intervention impacts on each stage beginning with the pre-ART stage HIV testing, HIV-positive, enrolment to care, eligibility for ARV and then continued with treatment initiation and post-ART retention in care, viral load suppression and ending with LTFU and death.

Interventions targeting HIV testing

Five studies assessed the effects of interventions directly targeting improved HIV testing and diagnosis. Of those, two used RCT and three used cohort study designs. The intervention type was a community-based HIV testing and counselling intervention (CBHTC), and enhanced counselling to encourage people utilising HIV test services in different clinics (add-on services). Variants of community-based testing were home-based HIV testing and counselling (HBHTC) and mobile-based HIV test and counselling (MBHTC). Overall, the studies demonstrated that CBHTC in addition to promoting the benefit from add-on services, increased demand and uptake of people aware of their HIV status.

Labhardt et al. (2014) investigated HBHTC versus MBHTC using standardized multi-disease test interventions to increase people's awareness of their HIV status. The results showed that both testing approaches achieved higher HIV testing uptake. However, differential uptakes across population characteristics were identified for each approach. HBHTC found more uptake in children (<12 years) than MBHTC (87.5% vs. 58.7%).

Further, HBHTC was found to attract more first time testers and male testers, while MBHTC found more HIV incident cases than HBHTC. These findings were similar to a study conducted in a hyper-endemic rural poor and universal testing setting in Swaziland (Parker et al. 2016). This study found a higher proportion of children and adolescents (<20 years) testing through HBHTC than MBHTC (57% vs. 17%). However, MBHTC reached a higher proportion of adult men than HBHTC (42% vs. 39%). Thus, to choose between both modalities depends on the purpose of the activities and which sub group population is the priority target.

Two HBHTC studies nested within a clustered randomised controlled trial (HPTN 071) were conducted in Zambia (Floyd et al. 2018; Hayes et al. 2017). The study investigated multiple interventions of HBHTC, health promotion, active referral and or retention in care by community HIV care providers, ART irrespective CD4 count, to improve HIV test and ART initiation, using a comparison of prior to and after community health provider visit (CHIPs). The first and second annual rounds of three-year results also found high uptake of HIV testing. At the first annual round, the rates of HIV testing among men was 80% relative to 18% prior to the intervention, while among women uptake was 85% relative to 26% before. At the end of the second annual round, 80% of HIV+ men and 90% of HIV+ women were aware of their status. These findings showed a very good acceptance of HBHCT.

Hewett et al. (2016) investigated whether persuasive efforts to encourage people to utilise add-on services to obtain comprehensive sexual reproductive health services, including HIV testing and counselling as well as HIV care and treatment improved HIV test. The study demonstrated that a persuasive strategy had the potential effect of increasing the patients' uptake of HTC. The odds of HIV testing increased 73% in enhanced referral combined with escorting patients to a referral centre rather than standard care at 6 weeks. However, over a longer period (six months), the intervention

showed no effect. Generalization of the intervention results was limited by the specific setting of SRH clinics system where each clinic had its own specialised function as opposed to providing integrated clinic services. Further, the types of providers who delivered the services, such as NGO-based services, might not be found in other context.

Interventions targeting HIV detection stage

One RCT investigated HBHTC and MBHTC, and four cohort studies evaluated CBHTC with incentive versus CBHTC without incentive, MBHTC versus clinic-based HTC, as well as VCT/PITC versus systematic HTC in improving HIV diagnosis stage. These studies yielded mixed results.

Kranzer et al. (2012) tailored MBHTC with active recruitment and provided incentives (70 South African Rand food voucher values approximately US$9.6) to increase the number of people diagnosed with HIV. The study showed that the actively recruited MBHTC enrolled twice as many newly diagnosed HIV infections than the voluntary MBHTC (10.9% vs. 5.0%). They also found more people with late diagnosis (CD4 count < 200) in the recruited tester than the voluntary tester (17.8% vs. 4.6%), although the interpretation of the finding is limited because it did not control for changes over time.

Labhardt et al. (2014) compared MBHTC and HBHTC and found the MBHTC approach was superior to HBHCT in finding new HIV diagnoses. Basset et al. (2014) investigated MBHTC vs. clinic-based HTC. The authors found that MBHTC identified cases that had lower HIV prevalence, were younger, more likely to be male and had a higher median CD4 count (earlier disease) than clinic-based HTC. HIV prevalence was 10% vs. 30%, median CD4 count was 416 (287-587) vs. 285 (136-482) in MBHTC and clinic-based respectively. However, MBHTC was successful in finding sub-populations that might not

otherwise access HIV care facilities. The Basset et al. (2014) study showed that the clinic-based HTC intervention was more effective in finding HIV cases than MBHTC.

Meanwhile, Clouse et al. (2014) tested VCT combined with targeted PITC and compared it to a systematic HTC. The study demonstrated that both VCT/PICT and a systematic HTC were able to identify high HIV prevalence effectively although there was little difference between the two strategies (VCT/PITC 50.5% vs. systematic HTC 49.5%).

Interventions targeting linkage to care stage and its impact

Six studies assessed the effects of single or multiple interventions in improving linkage to HIV care and yielded a variety of impacts from a very strong effect to no effect. The list of interventions tested included: immediate phlebotomy following CBHTC; same day ART; and improvement in health care quality. Three of the studies used cohort designs and three were RCTs.

In Parker et al.'s (2016) study, only 34% cases enrolled in HIV care at nearest facilities within six months after diagnosis via HBHTC or MBHTC. Similarly, Labhardt et al. (2014) found low linkage to care after one month from diagnosed positive either via HBHTC (25.6%) or MBHTC (25.3%). However, neither study used a specific linkage intervention targeting positive patients to enrol to HIV care in clinics.

Kompala et al. (2016) compared standard and adapted community-based approaches. The adapted approach included on site phlebotomy for CD4 count testing, while the standard approach required patients to visit their local primary care clinics health for their CD4 count testing. CD4 count test completion in the adapted group was higher than in the standard group (85.5% vs. 37.3%). Time from HIV test to CD4 completion was also shorter in the intervention group than in the standard group (median 8 days vs. 35 days). The study, however, did not account for changes over time. Basset et al. (2014) offered immediate phlebotomy for CD4 after detection of HIV in mobile settings

and then asked patients to attend a clinic for the results within 90 days, comparing this to standard clinic testing (immediate phlebotomy for CD4 count testing and attending a clinic for result). The authors found that mobile-based patients were less likely to link to the nearest HIV care facilities, with the proportions obtaining CD4 count results being 10% in the mobile based group and 72% in the clinic group. As reported by the authors, one possible reason for this lower proportion were mobile testers healthier than clinic testers thus they had less courage to seek for CD4 count testing. Possible underestimation of the linkages to care due to searching and retrieving the data only from appointed clinics cannot be ignored (Basset et al. 2014).

Another valuable intervention study about linking people from HBHTC to a health facility was conducted in Lesotho (Labhardt et al. 2018). The intervention offered same day provision ART to those identified as HIV positive providing a 30-day supply of ART for those who agreed to start ART within the next day. The study demonstrated that same-day ART provision during home-based testing was associated with increased linkage to health care facilities at three months (68.6% in the same day group versus 43.1% in the usual care group).

The above described studies (Basset et al. 2014; Kompala et al. 2016; Labhardt et al. 2014; Labhardt et al. 2018; Parker et al. 2015) researched interventions to improve case linkages from CBHTC to HIV care programs in health facilities. Boeke et al. (2018) researched whether improving the internal quality of health care services (such as increased human resources, and logistic and financial support) affected linkages to HIV care programs. After conducting a comprehensive health care quality improvement, expected to deliver best practice in following up patients, enhanced counselling adherence, home visits, and phone calls, there was no improvement in linkages. Linkage within one month was 52.9% at pre vs.54.9% at post intervention. The absence of

effect may be due to the quantity of intervention being insufficient to improve and change the whole system and health providers' practices and behaviours.

Interventions targeting eligibility stage and its impact

Only two cohort studies reported that their interventions studies influenced HIV positive cases being identified as eligible for ART. After positive cases were linked into care from either HBHTC or MBHTC, only 41% of those enrolled were found to be eligible for ARV. The median time from HIV testing to pre-ART enrolment was 12 days (IQR 6–29 days) (Parker et al. 2015). Clouse et al.'s (2014) study, did not find a different proportion of eligibility for ARV in groups of VCT/PITC (67.2%) vs. Systematic HTC (66.7%).

Interventions targeting ART initiation stage and impact

Twelve studies (7 RCT, 6 Cohort, 1 Quasi experimental) focused on improving people's transition from pre-ART to ART treatment stage. Four studies, which specifically investigated integrated and simplified pre-ART procedures (Clouse et al. 2014; Hewett et al. 2016; Kompala et al. 2016; Rosen et al. 2016), yielded mixed results from low to very strong effects. One study evaluated an intervention to improve treatment by subsidising transportation costs and using short message services reminders, with a promising result that the intervention increased the number of patients' visits and reduced time for patients being found eligible for treatment initiation (Siedner et al. 2015). Three studies which utilised CBHTC with and without following up PLHIV to place where they live in regard to linking them to care and then treating patients, showed mixed results as well (Floyd et al. 2018; Hayes et al. 2017; Parker et al. 2015). One study investigated a peer support intervention with no effect (Chang et al. 2015), while one study on 'strength-based case management' (health navigator system, SMS for appointment reminders) found no effect (Basset et.al, 2016). One study on health system care quality improvement (Amanyire et al. 2016) and one study on changing

the eligibility criterion for ART from ≤350 to ≤ 500 had promising results (Mody et al. 2018). However, interventions that are likely to benefit this stage are same day ART (Rosen et al. 2016), addressing barriers to transportation cost and forgetfulness (Siedner et al. 2015), CBHTC and home visit follow up, and universal treatment (Floyd et al. 2018; Hayes et al. 2017), health care provider quality improvement and changing eligibility criteria for ART to earlier stage (Amanyire et al. 2016; Mody et al. 2018).

Of all patients eligible for ART, only 38% were initiated to treatment (median time to ART was 118 days) (Kompala et al. 2016). Similarly, Clouse et al. (2012) found a low rate of treatment initiation both in VCT/PITC and systematic HTC (VCT/PITC 58.7% vs. systematic HTC 63.7%). Hewett et al.'s (2016) finding was similar, finding only marginal effects and inconsistent effect along their six-week and six-month measures.

Reducing the lengthy and burdensome process that required patients to attend multiple clinic visits prior to receive treatment was successful in improving the proportion and risk of people initiated in Johannesburg South Africa. The simplified pre-ART treatment process showed that the intervention was effective in increasing the proportion of people receiving ART within 90 days (97% vs. 72%; RR 1.36) in the rapid and standard arms respectively. However, the generalizability was uncertain due to the small number of sites and sample size (Rosen, S. et al. 2016).

Siedner et al. (2015) investigated the effect of a combination of text messages about abnormal CD4 count results, asking patients to visit clinic immediately and providing financial incentives to cover the transportation cost. The study resulted in a 2.3 times increased probability of treatment initiation relative to pre intervention, and decreased time to initiation from 47 days to 13 days. This intervention was valuable in tackling barriers of poor communication, forgetfulness, and transportation cost in pre-ART care. However, there is the uncertainty of sustainability, particularly in countries with limited resources, since the intervention required a significant investment of funds.

Parker et al.'s (2015) study also faced a challenge in treating the majority of their participants. Of the individuals eligible for antiretroviral therapy, only 52% started treatment within six months. The median time from HIV test to ART initiation was 34 days (IQR 20–60). Similarly, Hayes et al. (2017) reported that their community HIV-care providers' intervention resulted in only 42% initiating to ART within six months and 53% within 12 months. After the second year of the intervention, however, 80% of HIV+ participants were initiated to ART. The promising result also showed a reduction of median time to starting ART after referral to care from 9.5 months in the first year round to six months at the end of the second year round (Floyd et al. 2018).

In another home follow up visit intervention in Rakai Uganda, involving training PLHIV as peer supporters in Rakai Uganda, Chang et al. (2015) found no improvement in engagement in ART initiation. In the peers supported group, 31.9% of HIV positive patients started treatment versus 29.8% in standard care. As reported by the author, the lack of difference might be due to short follow up times (one year) as well as a high proportion of participants not eligible for ART.

An RCT study conducted in Durban South Africa (Basset et al. 2016) found no effect of health system navigator, short messaging service reminders to attend appointment and retrieve result intervention. The rate of eligible people on treatment for at least three months was low (navigator arm was 39% vs. usual care arm at 42%). The reason for the negative effect was possibly due to the main barriers to treatment not being specifically addressed by the intervention, although the intervention did indeed try to help overcome them e.g. stigma and discrimination. Implementing a US evidence-based intervention in other countries might need a more contextual intervention to achieve more tangible results. Further, the quantity of interventions might not have been sufficient as only 41% of participants in the intervention arm received five or more phone calls (Bassett et al. 2016).

Amanyire et al. (2016) found that enhanced training, efforts to change health care worker understanding about the consequences of delays in ART, revised counselling guidelines for counselling sessions, treatment support and POC were adequate to improve the number of people receiving treatment. The intervention group had 2.11 times the risk of ART initiation than standard care and the proportion treated in the intervention group was 80% vs. 38% of those in standard care. However, the Amanyire study was limited by using secondary data, and by possible contamination of intervention to non-intervention participants, and multiple assessments of outcomes due to the use of a stepped wedge design.

Lastly, Mody et al. (2018) conducted a regression discontinuity design with in a large population sample (23,036) in Zambia, investigating the effects before and after a change in treatment criteria from CD4 counts less or similar to 350 to CD4 to a count of less or similar to 500. This revision of treatment guidelines criteria was associated with a 13.6% absolute increase in ART initiation within three months of enrolment and no evidence of overcrowding health care facilities occurred. However, the generalizability of the findings was uncertain, for instance, if implemented in same day testing settings (Mody et al. 2018).

Interventions targeting retention stage and impact

Four studies assessed the effect of intervening in retention to ART care stages with mixed results. The rapid pre-ART procedure (i.e. rapid CD4 count and other blood test, screening TB symptom, adherence counselling) and dispensing ARV in the same day also resulted in better retention of participants relative to the standard arm (81% vs. 64%) at 10 months (Rosen et al. 2016). This finding was consistent with those of an unblinded RCT with almost double the population size of Rosen's study (762 participants), conducted in an urban clinic in Haiti (Koenig et al. 2017). This study found that same day testing and treating increased retention in care around 8% more than

standard care at 12 months. These findings suggest that giving ART as early as possible may be beneficial to patients and overcome important structural barriers to treatment access. As discussed by the authors, providing immediate treatment can create optimistic feelings, which is believed to contribute to good retention (Rosen et al. 2016).

Mody et al. (2018) also demonstrated a positive effect of retention in care as a result of increasing the CD4 treatment eligibility cut off to ≤ 500 by (4.1% increase in retention in care at six months). In contrast, improving the quality of the health care system, including training health providers and lay health workers, did not show any effect on time to initiation to treatment after a positive test, nor did it show any effect on treatment retention (Boeke et al. 2018).

Interventions targeting viral load suppression stage and impact

Three simplified procedures before treatment demonstrated that a higher proportion of people receiving treatment were virally suppressed compared to standard care. Rosen et al. (2016) found that 64% of same day treated patients were virally suppressed at ten months, versus 51% in standard care. Koenig et al. (2017) found that 53% of same day treated patients were virally suppressed at 12 months vs 44% in the standard arm. Labhardt et al. (2018) found that 50% the same day group and 34% of the usual care group were virally suppressed at 12 months.

Interventions targeting losses to follow up

Two studies examined the effect on LTFU after ART initiation with mixed results. Hickey et al. (2015) conducted a quasi-experimental study in Mfangano Island in Kenya, to test a micro-clinic group that consist of a patient support defined network (friends, family, others) in HIV care to prevent LTFU since ART initiation. They found LTFU in the intervention group was 11% vs. 20% in the control group. Social network support reduced treatment interruption and LTFU after treatment initiation. Since the

intervention was designed based on the patients' real social networks, the sustainability and amplification of the support may be enhanced. In a study on same day testing and treating (Rosen et al. 2016), treatment attrition at ten months was 16% in participants in the intervention group vs. 16% in the standard group. This suggests that more effort is needed to monitor and support home ART services, including during treatment, in order to reduce losses to follow up after treatment initiation.

Interventions targeting mortality

Basset et al.'s (2016) study showed that their combination of counselling via face-to-face and by long distance produced little effect on overall crude mortality in HIV positive patients (14% in navigator arm vs. 13% in usual care arm). Koenig et al.'s (2017) same day test and treat intervention was effective in reducing overall crude mortality (same day 2.9% vs. standard care 5.6%).

2.3.2.2 Multiple interventions targeting multiple steps in the continuum of care cascade

Eight studies evaluated single or multiple structural interventions to change people's movement along the full continuum of care. Most of these studies were either clustered randomised trial or individual randomised trials (Barnabas et al. 2016; Elul et al. 2017; Iwuji et al. 2016; MacPherson et al. 2014; McNAiry et al. 2017; Wu et al. 2017). One was a cohort study (Wu et al. 2015), and one an ecological study (Wroe et al. 2018). Three of the eight studies implemented their interventions beginning in the community setting, capturing people at high risk for HIV outside the clinic and linking them into HIV care. Community-based HIV test and counselling (HBHTC, MBHTC, home-based self-HIV testing) were applied to increase demand for HIV testing and raise awareness of HIV status (Barnabas et al. 2016; Iwuji et al. 2016; MacPherson et al. 2014). Various linkage interventions were then applied, such as lay counsellor follow up visits (Barnabas et al. 2016), home-based ART (MacPherson et al. 2014), and providing information about testing and treating (Iwuji et al. 2016). Treatment retention

interventions were also evaluated. Five of the eight studies implemented their interventions in health care facility settings and used integrated services, POC for CD4 test to link their positive patients into care, simplification pre-ART procedure, and SMS reminders to improve treatment and retention. The effect size varied within cascade steps in the studies as well as among studies with a similar intervention. However, a combination of CBHTC, POC and home ART service, TasP appeared to provide a promising combination of interventions.

Barnabas et al. (2016) tested a combination of CBHTC with lay counsellor home follow up visits, or a combination of CBHTC with clinic support to improve the full continuum of care cascade. Over all arms, they found high prevalence of HIV screening (98%) and HIV detection (15%). Their findings in engagement to HIV clinic were also encouraging. The risk of link to care among those visited by lay counsellors at home increased by 9% relative to standard care, but only 4% in the clinic support group respectively. The results, however, were not consistent throughout later stages. Barnabas et al. 2016, found that their intervention was only slightly effective in improving ART treatment and viral load suppression. Although the probability of ART treatment initiation increased by 23% in the lay counsellor and home follow up arm and by 11% in the clinic facilitation arm relative to the standard care arm, the interventions were not sufficient to make majority of population eligible for ARV initiating treatment. Only 41% of HIV positive people in lay counsellor home follow up and 37% of HIV positive people in clinic facilitation received treatment for the first time. The median time to ART initiation was 22 weeks. The authors suggested that the low proportion of people initiated to treatment was due to provider misperceptions that delaying treatment was fine, multiple visits required for ART, and patient perceptions that they were not sick. Viral suppression did not change among participants receiving ART after nine months of follow up (overall 83%). The likely reason for this, according to the authors, was the high proportion of eligible participants that were not initiated.

A larger CBHTC and TasP study in Kwazulu-Natal, South Africa, investigated a combination of home-based testing and counselling and immediate treatment in health facilities (Iwuji et al. 2016). They compared HIV positive people who were advised to receive ART immediately after diagnosis (irrespective of CD4 count or clinical staging) and HIV positive people who were advised to receive ART when their CD4 count ≤ 350, or clinical staging 3 or 4, or who were coinfected with multidrug resistant, or extensively drug resistant, TB. The Iwuji intervention was successful in screening the majority of their population, although there was no difference between the intervention and control groups after two years of implementation (76.7% and 78.4% respectively). Although two thirds of the HIV detected population were able to link to the HIV care facility, this occurred after 12 months (Iwuji et al. 2016). Barnabas et al. (2016) linked their patients to CD4 testing services in the same facility, while Iwuji et al. linked their HIV+ participants from community-based testing services to clinics. According to this researcher, the delay in linkage to care may be associated with earlier detection, as participants may be less motivated for treatment. In contrast to the Barnabas et al.'s study, the TasP intervention demonstrated that the proportion of HIV+ who initiated ART treatment was significantly higher in the intervention group (those who were treated irrespective of CD4 count) compared to the control group (87% versus 11%). Median time to initiation was 265 days (IQR 162-383 days). The result indicated high acceptability of universal treatment. Nevertheless, retention in care and viral load suppression with CD4 count ≤350 cells/mm3 were high in the two arms 86.2% vs.82.5; 85.2 vs. 84.9% in the intervention and control groups respectively. Although the intervention was able to achieve high ART uptake, the individual and public health benefits of TasP were likely to be reduced as their participants delayed enrolment to HIV clinics (Iwuji et al. 2016).

Another larger CBHTC intervention study (16,660 participants) conducted in Blantyre Malawi tested a combination of promotion of self-HIV testing and door-to-door home

visit services for ART initiation (MacPherson et al. 2014). This was compared with home-based self-HIV testing and referral to a health facility for ART initiation. Uptake of HIV self-testing was high in both groups (64.9% vs. 52.7%). Reporting as HIV positive was also higher in the home group than in the facility group (6% vs. 3.3%). Further, a significantly greater cumulative incidence of adults in the home group was initiated to ART than the facility group (2.2% versus 0.7%). Overall retention in care was 76.7%; however, there was higher probability of LTFU found in the intervention group (28.7%) than in the control group (23.8%). These findings demonstrate the importance of home-based ART services after self-HIV testing. This study overcame barriers to linkage to ART initiation, such as mistrust of the routine clinic-based service and frequent pressure of time related to extreme poverty (e.g. have to work), as the area from where the participants were drawn was about 40% poor (based on house hold wealth quantile), with a low education level (no school/primary). If implemented in a different context, there might be different results. The study found participants in the home group were more likely to disclose their positive results than the facility group, indicating readiness to pursue further care. Self-HIV testing was superior to facility-based testing in regard to patient convenience and confidentiality. The home test strategy also found higher CD4 counts at diagnosis, suggesting long term cost effectiveness due to prolonged life survival, and decreased early HIV management cost albeit with increased lifetime HIV management costs (MacPherson et al. 2014).

Facility-based HIV testing and counselling was investigated in a longitudinal study conducted by Wu et al. (2015). This study evaluated an intervention that aimed to streamline the pathway from screening for HIV to ART initiation and initiating using the irrespective of CD4 count level. They found that pooling most of the pre-ART stage in one hospital and expanding access to treatment demonstrated an increased proportion of completion in CD4 count testing (67% pre intervention 1, 60.5%, pre intervention 2 vs. 97.7% post intervention 1, 97% post intervention 2), and increased proportion of

treatment initiation (27% pre intervention 1, 48.7% pre intervention 2 vs. 91.2% post intervention 1, 89% post intervention 2). The increased proportion treated may be due to people with early disease (high CD4 count) becoming eligible and willing to be initiated at post intervention. They also observed a reduction of time from HIV confirmation to treatment initiation at 53 days in pre intervention 1, 43 days in pre intervention two vs. five days in post intervention 1, and five days in post intervention 2. The most promising finding in this study was mortality. They found a very strong impact on reduction of overall crude mortality. The proportions of overall crude mortality were 26.7% pre intervention 1, 26.5% pre intervention 2 vs. 9.8% post intervention 1, 10% post intervention 2. The risk of death in post intervention 1 and post intervention 2 was reduced by 61% and 62% respectively relative to pre intervention 2. Further, they found a slight decrease in the number of HIV positive post intervention (215 in pre intervention 1, 339 in pre intervention 2 vs. 215 in post intervention 1, 199 in post intervention 2). Nevertheless, low regional incidence, limited HIV testing program performance and reduced willingness of people to test may be the reasons for the lower number of HIV positive people found, as reported by the author (Wu et al. 2015).

A later study in the same region and by the same authors (Wu et al. 2017) evaluated another intervention aiming to streamline the extensive pathway from confirmatory testing procedures to treatment, and then treating patients according to the CD4 count level criteria $\leq$ 350 cells/mm3, and confirmed the findings of the earlier study (Wu et al. 2015). Using a more rigorous study design (a clustered-randomised trial), they were able to discover very strong effect size on testing completeness and time to treatment (Wu et al. 2017). The study, which aimed to reduce the multiple visits and time waiting for the test results, yielded increased testing completeness by 20 times within 30 days in intervention group (one4All). The study also increased ART initiation by 3.5 times within 90 days in one4All group. Median time to ART initiation from the day of screening HIV reactive was 52 days in the intervention with 167 days in the standard group. The

risk of death was reduced by 54% in the One4All group within 12 months. Stream lining the procedure at pre-ART addressed some of the important barriers in the cascade pathway (Wu et al. 2017). Further, both Wu et al. (2015) and Wu et al. (2017) studies may benefit other similar places which had problems of multiple visits, long waiting periods, late diagnosis and treatment, although an intervention procedure would have to be applied subject in their special context.

The other two facility-based interventions evaluated similar multi-components of a combination intervention strategy (CIS) targeting prominent barriers in the multiple steps of the HIV continuum of care. McNairy et al. (2017) applied the 'link4health' CIS strategy which involved testing CD4 count immediately after diagnosis using POC, accelerated eligibility assessment and treatment, mobile phone reminders for appointments, and providing health educational packages and non-cash financial incentives (prepaid mobile phone card valued at 8 US) compared to standard of care (SOC). The simplified procedure in the health care system, appointment reminder, daily life support for maintaining health, and non-cash incentive did not improve linkage to care or time between diagnosis and link to care CIS 94% vs. SOC 87%; the mean time between testing linkage was CIS 2.5 days vs. SOC 7.5 days. Although the linkage findings did not differ between CIS and SOC, more than 90% of the population was successfully linked to HIV care after CIS was applied (87% in SOC).

McNairy et al. (2017) found increased eligibility for ARV by 18%, reduction in the mean time between testing to eligibility assessment (CIS 0 days vs. SOC 6.5 days) and reduction in the mean time between testing and ART initiation (CIS 7 days vs. SOC 14 days). They also found increased retention in ART care by 48% within 12 months after testing. LTFU after ART reduced by 49% in CIS within 12 months. However, they found no differences in regard to treatment of people eligible (CIS 85% vs. SOC 88), viral load (CIS 88% vs. SOC 90%) after more than six months on ART, or in overall mortality

within 12 months after testing. The CIS link4health study demonstrated that a multiple combination of structural, biomedical and behavioural interventions through a simplification of procedure as well as through addressing structural barriers impacted to improving linkage and retention in care. Although the study did not differ in treating those eligible and in viral suppression, the proportion of both measures was already high in both arms, particularly the viral load.

Elul et al. (2017) tested a combination of POC CD4 testing at the time of diagnosis, accelerated assessment of eligibility and provision of ART, plus SMS and appointment reminders, in comparison with standard HIV care for the outcomes of improvement in linkage and retention in the continuum of care. Consistent with the findings of McNairy et al. (2017), Elul et al. demonstrated increased linkages to care by 23%, retention in HIV care by 32% within 12 months and eligibility for ART by 24%, after applying multicomponent structural, biomedical and behavioural interventions.

Elul et al (2017), however, found no difference between CIS vs. SOC in treatment initiation and overall death. Although the intervention showed a positive effect in regard on retention in care, the proportions of treatment initiation and retention in care were far lower than what is needed to end the epidemic. The study also investigated CIS compared to CIS plus using pre post design intervention. CIS plus supplemented the intervention with a noncash financial incentive of prepaid cellular air time card valued at 5 USD. The findings showed that all outcomes of interest did not differ between CIS and CIS plus. However, the study was limited by using secondary data, by the inability to isolate each intervention effect, and by the exclusion of many positive diagnoses. The CIS intervention demonstrated a promising impact for improving gaps in the HIV continuum, particularly the first step of timely linkage to care after diagnosis.

Finally, an ecological study by Wroe et al. (2018) utilized a combination intervention of a community-based HIV program, with socioeconomic and nutritional support and

partnership between MOH and NGOs. They compared the Neno district HIV program with 28 districts that provided HIV programs in Malawi. The study found no effect on HIV screening prevalence and detection rates. The study demonstrated that over a three-year period, the average proportion of HIV screening increased 4.23% in all districts; however, the increasing trend was not significant in the Neno District. The national detection rate among HIV test was 6.91%; but this was 1.35% lower in the Neno district. Further, the annual enrolment to care did not change nationally or in Neno. In the first study year, retention in care among the quarterly cohort in Neno was significantly higher than across all facilities within all districts (12.07%). This study showed that contextualized interventions based on patient needs might improve the cascade of care. In this study, the intervention was implemented closer to where the beneficiaries live. However, the data were at aggregate level, the analyses did not control for age and sex and did not measure temporal relationship between intervention impact and the outcomes.

2.4 Discussion

The review discovered twenty-seven studies that assessed effectiveness of single or combinations of structural interventions focusing on transitioning people at high risk for HIV from pre-ART to post-ART stages. The review yielded a variety of impacts from very strong effects to no effects. However, the effect size was inconsistent and varied along the cascade within the studies and among studies with similar intervention types and approaches. The most effective combination intervention is likely to be multifaceted and multilevel, targeting multiple barriers at the same time; however there was paucity of evidence of research on this type of intervention.

Community-based HIV testing (HBHTC, MBHTC, home-based self-HIV test) have shown effectiveness in targeting difficult to reach populations to become aware of their HIV status who might not otherwise access health facilities (Barnabas et al. 2016; Floyd et

al. 2018; Hayes et al. 2017; Iwuji et al. 2016; Labhardt et al. 2014; MacPherson et al. 2014; Parker et al. 2015). Which community-based strategy is most appropriate depends on the objectives of the activities and the target sub populations (Labhardt et al. 2014). Community-based HIV testing could also be used to target repeat testers (those who are at risk for HIV and need to be re-tested for HIV after a certain period) as the repeat population-based survey was also important in decreasing individual HIV acquisition risk (Iwuji et al. 2016). The inclusion of HIV testing in a multi-disease testing campaign (which aimed to reduce stigma) demonstrated high acceptance of HIV screening among the populations of interest (Labhardt et al. 2014). Further, persuading high-risk people to utilise add-on services and escort them to referral clinics to obtain a comprehensive health care services, including HIV testing and treatment program, was found to increase demand for HIV tests. Nevertheless, future research on whether escorting patients to a referral clinic might have a more tangible effect in linking patients to designated clinics is justified (Hewett et al. 2016).

A community-based HIV test strategy was used to supplement a clinic-based HTC intervention strategy, as clinic-based intervention was superior in finding HIV positive people to MBHTC (Basset et al. 2014). However, the challenge lay in linking HIV positive patients from community to health care facilities for a number of reasons (e.g. lack of transportation costs, unsuitable clinic operating hours, long waiting periods, fear of stigma, child care obligations, losing days for working). Studies which did not use a specific evidence-based linkage intervention to tackle those barriers failed to link the majority of their HIV positive patients to HIV care programs within the expected time (Iwuji et al. 2016; Labhardt et al. 2018; Parker et al. 2015). Some linkage strategies that proved to be valuable were POC for CD4 test (Amanyire et al. 2016; Elul et al. 2017; Larson et al. 2012; McNairy et al. 2017), home-based ART (Labhardt et al. 2018; MacPherson et al. 2014), SMS appointment reminders and financial incentives (Elul et al. 2017; McNairy et al. 2017). Linking patients from multiple centres to obtain a

comprehensive HIV testing and treatment program was also challenging in some parts of the world (Hewett et al. 2016; Wu et al. 2015; Wu et al. 2017). Integrating the service into a single-unit service or hospital could potentially address some of these barriers (Wu et al. 2015).

Multiple visits, long waiting periods and burdensome processes were major barriers to HIV care and treatment. Combined and compressed clinic procedures utilising standardized procedures and time frames from diagnosis to treatment increased treatment initiation and/or retention in care and viral load suppression uptake (Elul et al. 2017; Koenig et al. 2017; Labhardt et al. 2018; McNairy et al. 2017; Rosen et al. 2016; Wu et al. 2015; Wu et al. 2017). Certain populations characteristics were associated with people likely to gain greatest benefit from the streamlined approaches, such as people who wait to get treatment until they are sick, patients who do not return to clinic for even one visit, younger men, clinics with limited resources (primary health clinics vs hospitals) (Rosen et al. 2016). Further, the streamlined process interventions increased a sense of hope, optimism, and overall connectedness to the healthcare system (Koenig et al. 2017). Nevertheless, the proportion of attrition after initiation was worrisome, reflecting that some barriers might still exist. Continuing treatment at home could be an alternative (Rosen et al. 2016); however, none of the studies researched this.

One reason for multiple visits was a belief that to help patients adhere to the treatment, they had to visit clinics for multiple education and counselling sessions. However, this assumption was negated by the simplified pre-ART procedure of Rosen et al. (2016) and Koenig et al. (2017). The cost effectiveness study also showed that the intervention only required a little additional investment from the existing running system, which, it was believed, would promote the sustainable structural intervention (Wu, et al. 2015). Nevertheless, most of the studies were implemented in trial and unblinded settings,

generalised epidemics, large HIV programs and NGO-based that were relatively well resourced. Thus, testing the interventions in routine testing, concentrated epidemics and in limited resources conditions is suggested.

The TasP intervention was likely to have been a crucial strategy for increasing treatment initiation (Floyd et al. 2018; Hayes et al. 2017; Iwuji et al. 2016; Mody et al. 2018; Wu et al. 2015). No study was identified that researched the long-term effects of TasP. The longest follow up for identified studies on TasP were two years before and after (Floyd et al. 2018; Iwuji et al. 2016; Wu et al. 2015). These studies suggested the streamlined intervention was clearly beneficial, especially in the current context of TasP, in the optimisation of the benefit of ART in reducing the AIDS progression and death as well as HIV transmission in the community. One concern of TasP applied in a routine setting was the potential overcrowding of health care facilities from the sudden increase in the number of people eligible for ART treatment, particularly in respect to same day test and treat, as raised by Mody et al. (2018). This concern needs to be further investigated. Koenig et al. (2017) conducted a study in this specific setting (same day test and treat) but they did not report the occurrence of this problem. Nevertheless, the concern may be more pronounced in clinics or hospitals with low resources and in generalised epidemic settings.

To obtain the full benefit of ARV treatment for individuals' health as well as for HIV transmission in communities, high uptake of each step in the HIV continuum of care cascade, from earlier to later stages as well as prompt time engagement to each step has to be achieved and maintained. A substantial reduction in HIV transmission could be achieved if the HIV clinical pathway is made effective (Iwuji et al. 2016). CBHTC tailored with either lay counsellor home follow up visits or clinic facilitation was successful in increasing HIV screening uptake and linkages to HIV care but only modestly affected ART treatment initiation and viral suppression (Barnabas et al. 2016).

The Iwuji et al. (2016) intervention was able to show high uptake in HIV tests, a high proportion of linkages, a high proportion of people receiving ARV, and high proportions of retention and virally suppressed. However, delayed linkage of two thirds of Iwuji participants (enrolled after 12 months) could undermine the public health effectiveness of TasP. Even a short delay may be harmful for patients (Rosen et al. 2016). For example, if the intervention only targets HIV positive people in the community by designing a very good HIV testing strategy but does not include linking the detected cases to care, some percentage of this community is likely to be lost to follow up before going to the next stages in the pathway. Or if the strategy is only designed until linkage to care and then does not include adequate counselling sessions to improve patient skills in handling the drug ARV, patients could be lost to follow up before improving or achieving suppressed viral load. Such a strategy results in undermining the effect of early stages of the intervention. Thus, a combination of interventions targeting multiple stages at the same time is crucial.

Now, which is the most effective combination intervention? According to (Blankenship et al. 2006), the effective interventions are likely to be the interventions that successfully address the causes of risk and disease transmission, and to understand the causes comes from sound theory. The patient centred approach that overcame distances to facility, reduced multiple visits and lengthy wait times, improved patient skills and supported those in pre-ART – all of which were in the TasP intervention – demonstrated potential positive effects across some but not all cascade steps. Moreover, supplementing these interventions by addressing other structural factors (such as socio-economic support) also showed encouraging results, but improvement across a few steps was still inconsistent. Failure to address potential barriers beyond immediate individual patient factors (such as knowledge, attitude, behaviour), and failure to address structural factors in certain cascades might be among the reasons of inconsistent effects or no effects at all. Lack of intensity of intervention may also be one

of the barriers to effectiveness. However, real world conditions were far from the ideal represented in the trial settings. There may be a lack of knowledge of what barriers exist, and other complex factors beyond the capacity of the health system to influence, that prevent the players from being able to target multiple steps at the same time. Therefore, future research in a real world setting to evaluate the impact of interventions in a public heath setting would still be valuable.

2.5 Identifying gaps in the reviewed papers

Most of the reviewed studies (25 of 27) that investigated the effectiveness of structural interventions in expanding access to HIV tests and ART in the general population and strengthening the HIV cascade pathway were of HIV hyper endemic countries in the Sub-Saharan Africa region and Haiti. Two articles were about a concentrated epidemic setting in Asia but none from Southeast Asia. Most of the studies focused on the effectiveness of interventions targeting single or limited stages, but evidence using multiple interventions targeting multiple stages at the same time, from pre to post-ART stages, was scarce (eight papers, with two papers conducted in the TasP era). Each of the eight multiple combinations of structural interventions aimed to influence a minimum of four steps, but the stages most targeted for change were linkages to care and treatment initiation. None of the studies, however, had a consistent effect along the continuum. More powerful combinations of interventions, and larger populations with robust study designs are suggested. Only one study assessed the effect of the intervention using aggregate data; however it did not measure a temporal relationship between interventions and outcomes.

More evidence of the tangible effects of TasP is needed, particularly in real world settings and over longer periods of observation, to understand the magnitude and durability of the intervention. More evidence is required to test a simplified procedure prior to ART applied immediately, a test and treat strategy or same day test and treat, and to

discover the impact not only on the HIV continuum of care cascade but also on overall public health and general health service utilisation (e.g. clinic influx to providers and patient behaviour – long queues may change patient behaviour in routine settings). Further, studies evaluating the benefits of escorting patients to referral clinics and linking patients to designated clinics, with continuation of home treatment after facility initiation would also be valuable.

A systematic review published in 2014 also found a gap in evidence assessing a combination of interventions to influence people transitioning from pre to post-ART (Govindasamy et al. 2014). Further, a review conducted by Wu et al. (2015) highlighted the paucity of evidence of investigations of the impact of a combination of interventions across the full continuum of care cascade. Moreover, Wu et al. (2017) and Elul et al. (2017) claimed that they were among the first to publish research papers on this issue.

2.6 Research Questions

This thesis was designed to investigate the effect of the SUFA policy strategy 'expanding access to HIV testing and ARV treatment' in improving high-risk people's engagement in the HIV continuum of care in Indonesia. The study investigated the effect from the perspective of policy making and focussed the analysis on the main discourse used. The study was also designed to quantify the impact based on the SUFA logic model by finding the relationship between the SUFA designed approaches with the immediate outcomes using aggregate level and individual data. This review assisted in justifying research on the effectiveness of a combination of structural interventions, here named 'SUFA', aimed to influence people to transition along the full continuum of care cascade from pre-ART to beyond ART, using 1 to 3 years comparison before and after the implementation. Considering the significance and urgency to evaluate the SUFA intervention and the gaps found in the literature review, the specific research questions are as follows:

Discourse analysis

1. What is the problem represented to be in the SUFA policy strategy?

Aggregate level analyses

2. What are the relationships between SUFA intervention and HIV tests, HIV cases, enrolment in care, eligibility for ARV, and ART initiation immediately after implementation?
3. What are trend differences in HIV tests, HIV cases, enrolment in care, eligibility for ARV, and ART initiation in pre-and post SUFA implementation?

Individual level analyses

4. What are the differences in rates of enrolment to care, eligibility for ARV, ART initiation, LTFU and death between SUFA and non-SUFA?

Chapter 3

Conceptual Basis and General Method

CHAPTER 3 CONCEPTUAL BASIS AND GENERAL METHOD

3.1 Introduction

Having examined the global literature on SUFA in Chapter 2, this chapter describes the conceptual basis underpinning the project and outlines the methods used to investigate the effectiveness of SUFA in engaging people at risk to the HIV continuum of care in Indonesia. The detailed methods of the three studies (study 1, study 2 and study 3) in this research project are explained in Chapters 4, 5 and 6 respectively. This chapter is divided into six sections: Section 3.1 provides the methodological justification of why multiple quantitative studies complemented with policy analysis were undertaken in this project. Section 3.2 presents the theoretical framework underpinning the SUFA interventions as well as the framework used to investigate the effects. Section 3.3 describes the study setting, in particular the HIV care program services that had already been implemented when the data collection was carried out. Section 3.4 discusses reference group consultation, specifying the members, the reasons for their involvement and the detailed consultation process during the research period. Section 3.5 summarizes the ethical considerations, explains the importance of ethics, and the ethics permissions and permission letters that were obtained. The chapter ends with a summary in Section 3.6.

3.2 Methodological justification

The multiple quantitative studies design complemented with policy analysis was conceived as the most appropriate way to address the research questions and objectives of this study. The growing scientific knowledge of the weaknesses of various empirical methods has led many researchers to combine different methods in their approach to their research problems. Such combinations attract greater confidence in the findings

than a single approach, as the combined strength of two or more approaches produces more comprehensive results in an investigation (Heale & Forbes 2013).

This project applied two major designs: Study 2 involved a interrupted time series (ITS) that using aggregate level data, and Study 3 comprised a retrospective cohort study using individual level data. Both studies investigated a similar enquiry 'the effect of SUFA intervention in influencing the transition of high-risk people along the HIV continuum of care cascade. The two studies were complemented with Study 1 which was a discourse analysis of the SUFA policy using the Bacchi approach, 'What is the problem represented to be?' (Bacchi 2009).

The objective of analysing SUFA initiatives was to obtain an in depth understanding of what the policy is about, how the policy framed the problems, what the likely effects of this problematization were on its implementation. This understanding then guided the project in identifying the potential silences or competing issues in the policy design, thus enabling suggestions of alternatives policies. Having a deep understanding of SUFA policy benefited this project to meaningfully and reasonably interpret the findings of the two major studies (ITS and cohort). In particular, it helped the project in reflecting on the implications of the findings to Indonesia HIV program policies and practices. The ITS study was supplemented with the cohort studies to support the exploratory findings. Nevertheless, the cohort study, involved more comprehensive and detailed analyses, which improved the confidence in the findings. Further, the cohort study enabled conclusions to be drawn more confidently about how the SUFA intervention influenced the outcomes of interest. Further justifications of the Bacchi approach, ITS and retrospective cohort study are presented in Chapters 4, 5 and 6 respectively.

This study can be categorized as an evaluation research in which research questions are employed to measure whether the HIV prevention intervention works against the expected outcomes. A study which promotes the utilization of evidence into practice

has, over the last decade, come to be known as implementation science (Sánchez et al. 2016) and has been defined as a type of research that supports the adoption of clinical evidence into regular, real practice through structured, extensive, acceptable and continuous implementation (Sánchez et al. 2016). The intention is to enhance the utilization of the evidence to be effective, feasible and sustainable in the real world; thus one crucial aspect is to investigate the outcome results of effective interventions (Peters et al. 2014). In HIV intervention research, however, there has been a shift of attention to implementation research in a real world setting rather than a controlled setting (Cohen 2011). The way to discover the outcomes of interventions in the real world is by conducting an evaluation of the intervention against various variables of acceptability, adoption, suitability, practicability, fidelity, execution cost, proportion, and sustainability (Peters et al. 2014). Further, successful implementation science designs independent and dependent variables which are associated with the changes in a program, shown by choices of variables research (Fixsen et al. 2005).

Thus, the evidence of this project might be used as material for consideration by policy makers in judging the adequacy of current prevention strategies in achieving their purpose (Sarantakos 2005). However, as Armstrong et al. (2013) highlighted, a set of rules is needed for evidence-informed decision-making (EIDM) to be effective and efficient; therefore this research has to be conceptualized, conducted, and communicated in a language that can be understood and appreciated by the policy makers. Accordingly, this current study evaluated the pragmatic event observed in the field in which the event was conducted by the stakeholders and examined it against the goals of the Indonesian HIV AIDS program (Sarantakos 2005). In other words, the effectiveness of SUFA was compared with the available performance indicators in the Indonesian HIV continuum of care, such as HIV testing, HIV detected cases, enrolment to care, eligibility for ARV, treatment initiation, loss to follow-up, and death.

Furthermore, aggregate and individual data of the HIV program from the Ministry of Health was used to address the research questions.

3.3 Theoretical framework

The theoretical framework used in this research comprised a combination of a modified social ecological model (MSEM) (Baral et al. 2013) and the Indonesian model for the HIV continuum of care cascade (HCC). This theoretical framework helped clarify what the interventions are, stimulated insight into why these sets of interventions were chosen in the first place, guided operationalization of the research, and informed predictions of how the research would work (Meyer & Ward 2014). In addition, a five-layer framework (Nutley, Walter & Davies 2007) was used for the future knowledge transfer of the evidence of this research.

3.3.1 Modified Social Ecological Model (MSEM)

The role of social and structural drivers in HIV infection and transmission has been well recognised. Structural drivers are factors that contribute to social inequities such as social, economic, organisational, and political and power influence factors. These factors are indirect drivers in HIV transmission, and more directly mediate lower level risks, for example, individuals. A combination of preventative measures comprised of biomedical, behavioural and structural elements is the key to successfully combatting HIV transmission (Coates, Richter & Caceres 2008; Gupta et al. 2008). Further, the prevention interventions must be carried out in a form which addresses multiple layers of HIV risk transmission, including the structural drivers which are known to play important roles (Baral et al. 2013).

SUFA was designed as a combination of interventions to tackle multiple levels of drivers of HIV control and management in Indonesia. The MSEM models help us to tease out what SUFA is all about. The MSEM theory describes five layers of HIV infection risks:

individual, network, community, policy, and stage of epidemic, as presented in Figure 3.1 below:

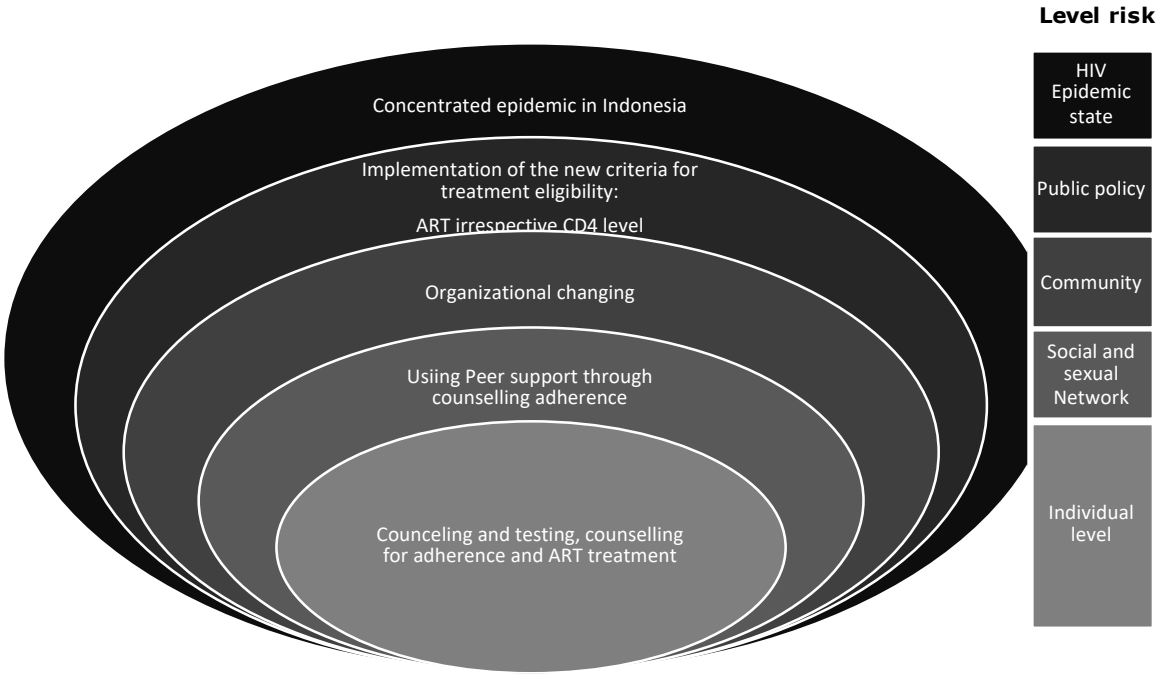


Figure 3.1. Modified social ecological model (adapted from Baral's MSEM model)

Individual level factors are biological and behavioural characteristics which make an individual susceptible to illness or infection. The interventions here were designed to influence individual behaviour, facilitating engagement in HIV care in optimal time and promoting retention in care, which were ultimately expected to result in good health outcomes. The SUFA interventions targeting these individual factors involved testing and counselling services, either via voluntary counselling and testing (VCT) or provider initiated testing and counselling (PITC), and aimed to raise awareness of HIV risk and HIV status; treatment counselling for adherence, which aimed to make patients adhere to treatment for their entire life through educating and counselling; and finally, addressing individual and service provider barriers to adherence to ARV (Ministry of Health (ID) 2014d).

Social and sexual network factors consist of relationships between people such as family, friends, neighbours, and peer groups, which directly influence individual health and health behaviour. Networks are formed by a group at higher risk of exposure to disease transmission from each individual member via sexual contact, shared use of injection, and/ or non-injection drug paraphernalia or increased physical contact. On the one hand social and sexual network levels of risk are, for example, HIV infection rate, sexual contact, shared use of injection or other factors that facilitate HIV transmission among members of the group. On the other hands, the network can create a supportive environment (such as providing social support, or reinforcing social norms and behaviour) to reduce HIV transmission and promote better health outcomes. The set of interventions identified at this level comprise a treatment supporter utilising partner/ friends, family, or peer to remind the HIV patient to adhere to care and treatment (Baral et al. 2013).

Community factors include network ties, and relationships between organizations, groups and peers, and between geographical, political and administrative regions. Wider social structural drivers affect interpersonal mechanisms and individual behaviours, forming social-cultural norms and values, social coherence and network structures. Community level factors such as perceptions of norms may increase (creating stigma) or reduce (promoting health) the risk level of HIV transmission within the community. For instance, normalising condom usage has demonstrated effectiveness in promoting the usage of condoms. In contrast, stigma, which usually operates at the community level, increases the probability of contracting HIV infection. Stigma limits and hinders the provision and uptake of HIV prevention, care and treatment services (Baral et al. 2013). The interventions found at this level consisted of a series of meetings, workshops and training sessions conducted at the national, provincial, and district levels involving various HIV program stakeholders at each level, as explained in Chapter 1.

Laws and policies in any form function to frame the risk for populations by promoting or reducing the ability of the community to deliver preventative measures. The heart of SUFA lies at this level, which involved changing the criteria of readiness for ARV. In addition to the bundle of regulations released at this time to support the scaling up of ARV, such as the Ministry of Health Regulations 87, 74, 21 that detail procedure of HIV test and treatment applied across Indonesia, particularly in health care facilities setting, budgets from a variety of donors were also utilised. A SUFA handbook was also released to guide providers in delivering SUFA in their area.

The stage of the epidemic in networks, community, or country will ultimately decide the size of the individual's risk of contracting the infection (Baral et al.2013). The risk of infection varies with differences of HIV prevalence among the areas. The Indonesian MOH designed the HIV program interventions according to the area epidemic level. HIV testing regulation and ARV treatment were customised for Papua and Papua Barat provinces as these provinces are categorised as burdened with a generalised HIV epidemic. For example, while concentrated epidemic level testing is offered only to certain patient criteria, in Papua testing is offered to all patients attending health care facilities regardless of the reason for their presentation. In concentrated epidemic level areas, ARV initiation can only be performed in hospitals, but in Papua ARV initiation can be delivered at primary health centres.

To understand whether these sets of interventions successfully achieve their purpose, the project utilised the HIV continuum of care cascade framework. This model was used to measure the achievement of the immediate objectives of SUFA (Chapter 1). The HCC model framed the research activity of this project, from designing the objectives of the study, data collection (particularly the data extraction tables and case record forms), and to presenting the arguments.

3.3.2 HIV continuum of care

The HIV continuum of care (HCC) is defined as a sequence of HIV care related steps from being diagnosed for positive HIV, to linkage and retention in pre-HIV care, to commencing ARV treatment until the achievement of sustainable virological suppression (Lourenço et al. 2015). This framework is used to quantify attrition along the continuum and has become the main approach used by program planners, policy makers, funding bodies to evaluate the performance of various HIV programs in achieving effective use of prevention methods (Alvarez-Uria et al. 2013; Koenig et al. 2017; Rosen, S. et al. 2016; Wu et al. 2015). In practice, however, various differences were found in the definitions of the steps and the populations of interest used as denominators (Schaefer et al. 2019).

Figure 3.2 outlines the Indonesian HCC models which have a distinctive form compared to other HCC models e.g. as reported by (Jose et al. 2018). The Indonesian HCC begin from the stage of diagnosis, enrolment to HIV care unit, assessment criteria for eligibility for ARV, received ARV treatment for the first time, to retained in care for life while maintaining undetectable level of viral load suppression. What makes the Indonesian HCC models unique is the linkage to pre-ART care, which has its own steps. These models are also designed to measure the uptake of different services from testing to eligibility in the HIV care unit. In the era of SUFA, determination of eligibility is still an important concept and has specific stages. It might be that in future this step will be eliminated since the determination of eligibility will no longer be necessary (‘test and treat’, in which all HIV positive people are eligible for ARV). Further, the fundamental principles of the Indonesian HCC model were integrated into the service delivery model (LKB) framework (Januraga et al. 2018), which became the basic framework of the overall SUFA initiatives. Table 3.1 provides the estimations of the cascade of the Indonesian HCC model.

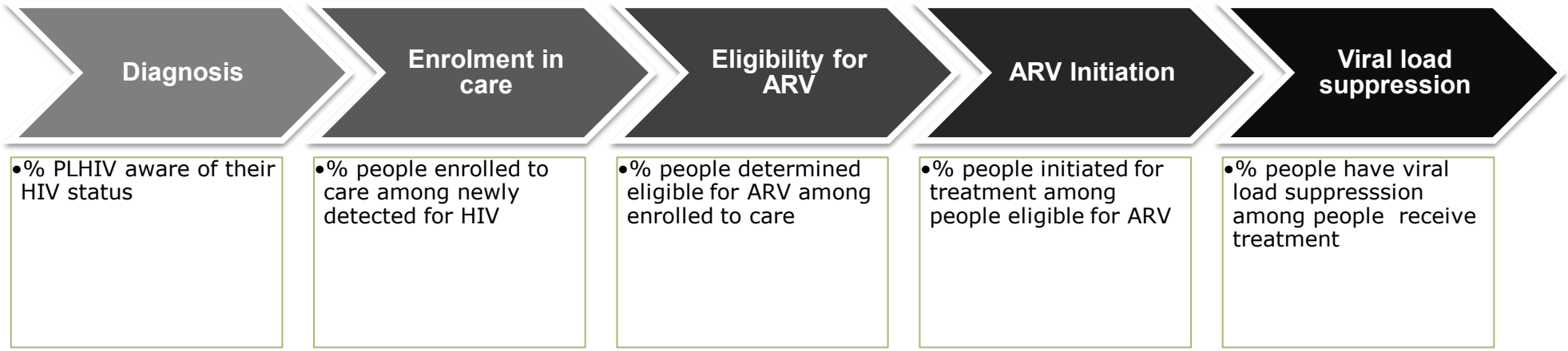


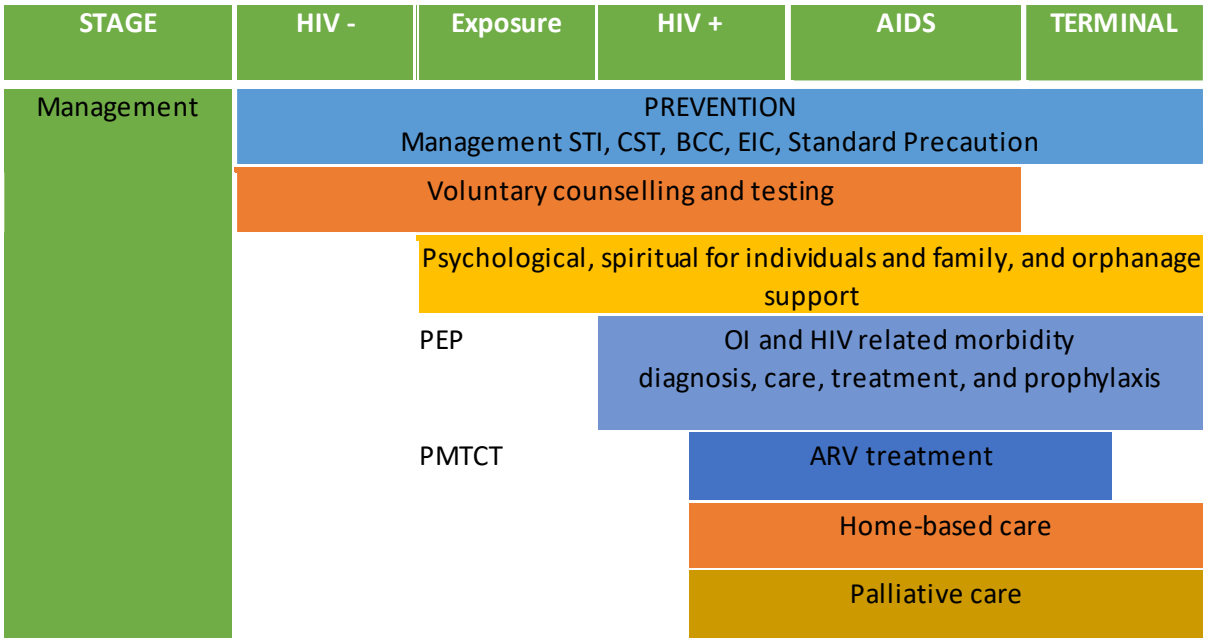
Figure 3.2. Indonesian HIV continuum of care cascade model and estimation of progress

Table 3.1. Estimation of the Indonesian HIV continuum of care cascade progress

Cascade	Indicator	Numerator	Denominator
Diagnosis	% PLHIV who are aware of their HIV status	Number of people newly diagnosed for HIV positive	Estimation of number of PLHIV/ number of HIV test performed
Enrolment to HIV care	% people newly detected for HIV who are enrolled to care	Number enrolled into care	Number of people newly diagnosed for HIV
Eligibility for ARV	% people enrolled to care who are determined eligible for ARV	Number eligible for ARV	Number enrolled in care
Treatment initiation	% people eligible for ARV who are initiated in treatment	Number of treatment initiations	Number eligible for ARV
Viral load suppression	% people receiving treatment who have viral load suppression	Number of ARV patients who have undetectable level of viral load	Number of patients who are initiated for treatment

3.3.2.1 Integrated service delivery model (LKB)

LKB refers to the HIV and STI management and service delivery covering a continuum of promotive, preventive, curative and rehabilitative steps which is provided for clients at home, in communities or in health facilities, from uninfected status up to the terminal stage (Ministry of Health (ID) 2012). Implementation of the LKB strategy in a district is the paramount element of the SUFA program. It is the backbone of the plan to accelerate HIV testing rates and ARV treatment coverage in a district. The successful integration of the strategy into the district HIV AIDS program network is the first step towards the effective implementation of the SUFA program (National AIDS Commission & Ministry of Health (ID) 2013). Figure 3.3 presents a diagram of the LKB concept.



STI=Sexual transmitted infection; CST= care support and treatment; BCC=Behaviour change communication; EIC= Education information communication; PEP=Post Exposure Prophylaxis; PMTCT=prevention mother to child transmission. Source from (Pulungsih 2013).

Figure 3.3. LKB concept diagram

As a framework of the HIV continuum of care (Januraga et al, 2018), LKB aims to increase quality of access, coverage, promotion, prevention and treatment of HIV and STI, as well as rehabilitation, through expanding services networking to primary health centres including services for key populations. A further aim is to increase knowledge of, and responsibility for, controlling the HIV epidemic and STI in Indonesia through strengthening coordination in delivering services among HIV and STI providers, the community and civil society. Six basic strategies to achieve the LKB aims include coordination and partnership with all levels of stakeholders, active community participation (including PLHIV and their families), integrated and decentralised services relevant to the local context, a package of comprehensive and continuum HIV services,

a networking and referral system, and sustainable access to services (Ministry of Health (ID) 2012).

The principle underlying the combination of HIV prevention interventions in SUFA is the concept of ART TasP, given that the current evidence world-wide has confirmed the compelling efficacy of immediately treating the PLHIV regardless of CD4 count in reducing HIV transmission in the population (National AIDS Commission and Ministry of Health ID 2013). As the nature of SUFA is a multilevel strategy targeting biomedical, behavioural and structural determinants, the evaluation of this combination is pivotal in discovering whether there is a synergy of interventions in controlling the disease (Padian, McCoy, Manian, et al. 2011). Thus, such an evaluation could provide a logical basis for judging SUFA's efficacy in achieving its goals.

3.3.3 Knowledge transfer (KT)

Increasingly, the transfer of research outcomes into policy and practice is required by policy makers (Davies, Nutley & Walter 2005). There are numerous terms and definitions to describe this concept, with knowledge translation (KT) the most favoured term of KT researchers (Armstrong et al. 2006). The Canadian Institute of Health Services Research defined KT as an interaction process between researchers and users through a complex action of 'exchange', 'synthesis', and 'utilization' of evidence (Armstrong et al. 2013). The Canadian Health Services Research Foundation described it as mutual problem-solving between researchers and policy makers that exists through interaction and exchange (Armstrong et al. 2011). In other words, KT involves an iterative process to enable evidence-informed decision making (EIDM) (Armstrong et al. 2011).

Recognition of both facilitators and barriers in the KT process is crucial to an understanding of how knowledge translation intervention might work. Lavis et al. (Johnson, NA & Lavis 2010) stated that competitor, value, relevance, and

appropriateness of research evidence are the common challenges in KT. This current project borrowed the Nutley Five Frameworks of KT intervention to explain how the SUFA research evidence might be transferred. The five mechanisms are: dissemination, interaction, social influence, facilitation, incentives and reinforcement (Nutley, Walter & Davies 2007).

Learning from this framework, at the beginning of this project a reference group was established consisting of officials from the MOH and their consultants, and HIV Indonesia experts which worked in the implementation of SUFA. The reference group advised the project on SUFA policy design and implementation and indicators used to measure SUFA effects, as well as updating the project on the current progress of Indonesian health policies and practices. A further objective of the establishment of the reference group was to develop a sense of ownership of this research among the members, thereby building interaction between the researcher and the users and engaging the group's networks for other aspects of knowledge translation such as dissemination, interaction and social influence, in order to increase the chance of the research becoming utilized in policy design (more detail about the reference group appears in Section 3.5).

3.4 Study setting

3.4.1 Health care facility types

Health care facilities responsible for primary health care in Indonesia are publicly operated, have limited services, available only to inpatients or in and outpatients. Secondary and tertiary level care, provided by public and private hospitals, is provided for referral cases from the lower level i.e. primary health level care. Further, hospitals are grouped into classes based on the complexity of facilities and services that they can provide, ranging from A, the highest, to D, the lowest (Ministry of Health (ID) 2016). One hospital is responsible for receiving referrals from its satellites in their operational areas. Satellites can consist of several lower level hospitals and primary health centres,

with the number of health care facilities in the satellite depending on the size of population in the area.

ARV treatment is free of charge to HIV patients in Indonesia (Ministry of Health (ID) 2004); however, laboratory tests such as CD4 cell count and viral load tests are paid for by the patient, except in Papua and west Papua provinces. The national health insurance does not cover the cost for these tests for outpatients. Only inpatients in the D/C minimum level category are entitled to receive these services (Ministry of Health (ID) 2014c).

3.4.2 HIV care and services at health care facility

Based on current regulations, HIV testing services must be provided in all health care facilities in the country (Ministry of Health (ID) 2014d). While HIV care treatment services (particularly treatment initiation) must be delivered in hospitals with a minimum class of C, certain patients (such as those in a stable condition after treatment initiation) can continue their treatment and care at primary health centres. Regulations specific to Papua and Papua Barat provinces allow ARV treatment to be initiated at primary health centres (Ministry of Health (ID) 2014e).

The referral mechanism is implemented to fulfil the need of patients to obtain comprehensive HIV care and treatment; for example, patients who are tested in a primary health centre that does not have a treatment care unit. In most cases, the referral system functions in the same operational area unless the services that are sought do not exist. The thirteen pilot SUFA and Batam regencies/cities (which were the locations for this project) have the capacity to provide comprehensive HIV care and treatment from testing to ARV care, including the examination of CD4 count levels. However, viral load test was not available in some locations at the time of this project.

The PITC and VCT types of testing approaches in the Indonesian HIV program are the main strategies to identify HIV positive clients in Indonesia. Occasionally/ several times

per year (depending on budget available) mobile clinic testing (community-based HIV testing and counselling) is also utilised (Ministry of Health (ID) 2014d). However, only PITC and VCT approaches were traced in HIV reporting and recording systems (Ministry of Health (ID) 2015e). Data on mobile clinic testing is combined in the VCT report. After people are diagnosed with HIV at testing sites, they are transferred to care support and treatment service units, either internal or external to the diagnosing clinic. The clinics usually receive referral patients only from their operation area (Ministry of Health (ID) 2014d). New HIV patients then enrol to receive standard HIV care as patients moving along HIV continuum of care cascade. 'Standard care', while following the prevailing care support and treatment policy, was different between the two periods, particularly in regards to ARV eligibility, as explained in Chapter 1.

Ineligible patients remain in pre-ART until routine examination of the clinical course of their disease and their CD4 count level indicates deteriorating progress (Ministry of Health (ID) 2014e). Prior to treatment, four treatment counselling sessions are compulsorily given to eligible patients (Ministry of Health (ID) 2014d). Thereafter, treatment is initiated and they remain in care, requiring high treatment compliance for life (Ministry of Health (ID) 2014e).

Patients who are ready to start treatment are encouraged to obtain support from their close relatives/ partner/ friends who are designated as 'treatment supporter' (Ministry of Health (ID) 2015d). When commencing treatment, patients receive fortnightly or monthly drug doses (depending on the drug type) and are asked to visit the clinic monthly for evaluation of treatment effects and resupply of antiviral drugs (see Chapter 1 for a first line ARV drugs in pre-and post-SUFA era). In every follow up visit, the doctors/ paramedics assess the adherence level of the patient. Adherence is assessed by counting the remainder of the drugs provided at the previous appointment and classified into one of three levels: high (missed doses $\leq$ 95% or $\leq$ 3 doses); moderate

(missed doses 80%-95% or 3-12 doses; poor (missed doses ≥ 80% or ≥ 12 doses) (Ministry of Health (ID) 2015d). Depending on the patient's health and particular treatment regimen, several laboratory tests at specific periods are also conducted as necessary. Six-monthly examination of immunology status, such as CD4 cells count level, is also recommended (Ministry of Health (ID) 2014e).

HIV testing centres and hospitals/primary health centres are required to record HIV test results and patient clinical data as per the MOH's standard record form: HIV testing and counselling record, summary of HIV and ART treatment history, pre-ART registry, and ART registry. The forms require information on patient characteristics, risk factors and detailed clinical data of each stage of the patient's HIV clinical pathway. Some of these data are collected at the first patient contact, and follow up patient information is collected at each subsequent monthly visit (Ministry of Health (ID) 2014e). Thus the country system only utilises a clinical-based system of recording, unlike other countries which report HIV tests sourced from population based records (Haber et al. 2017). This system makes gathering data easier than the different systems that link population-based data to clinical-based data. The difficulty lies in combining data from different sources of reporting from different clinics or from the same clinics.

For each month, hospitals/ clinics that provide HIV testing and CST services are required to report all HIV data as a result of work from the 26th of the previous month to the 25th of current month to the district health offices and MOH central office in Jakarta. For instance, the report on January is of results from 26 Dec-25 Jan. Each clinic assigns special staff, trained under a standardized RR training package, to be responsible for reporting and recording (RR). The staff collect data on HIV testing, HIV cases detected, enrolments to care, eligibility for ARV, and ARV initiation. They then enter the data into the reporting system and send electronic or paper based versions of the compiled data

to the upper administrative level and to the national office of the MOH sub-directorate of HIV/AIDS and STI in Jakarta (Ministry of Health (ID) 2015d)

3.5 Reference group consultation

The voluntary reference group for this project consists of HIV program experts and consultants from various HIV stakeholder organisations (see Table 3.2). The group's role is to function as consultative partners and as a future dissemination channel for influencing health policy and practice. Serial consultative sessions with the reference group were conducted from the development of the research idea until finalisation of writing up the thesis (two letters of acceptance to join the reference group appears in the Appendices E). The group was consulted about detailed HIV program policy, particularly on the SUFA program implementation from the design until the evaluation process as well as in the current test and treat era. In developing the data collection instrument, each of the variables used for the project was discussed with the reference group to enhance validity. The project also required access to the MOH's network to identify the appropriate people to communicate with when collecting data in the field. The consultation process on instrument development resulted in some revision of the research questions and the instrument, for instance, removal of the retention in care variable and the insertion of the eligible for ARV variable. The category of mobile clinics approach in the variable of testing approaches was also deleted in the individual questionnaire.

The reference group's support was also sought for sending documents and updating the researcher on recent developments regarding HIV policy program implementation in Indonesia as well as the latest regulations released by the Indonesian MOH during the project. The SUFA logic model to explain SUFA implementation process and the HIV program setting, as well as general discussion were sent to two members for validity

checking, and to one member for review and comment. The consultation process utilised emails, SKYPE calls, WhatsApp communication, and face-to-face meetings.

Table 3.2. List of reference group members and titles

No	Organization	Title
1.	Indonesian Ministry of Health	Head of Sub Directorate HIV AIDS and STI
2.	Indonesian Ministry of Health	Coordinator of MONEV and Surveillance
3.	Indonesian Ministry of Health	OIC for legal, PMTCT and 3 E
4.	Indonesian Ministry of Health	Consultant SUFA and LKB (currently as Coordinator PMU Global Fund Component AIDS)
5.	Independent consultant/ Former Senior Adviser in Clinton Health Access Initiative	HIV specialist
6.	Independent consultant / Former HIV reporting and recording staff at Clinton health Access initiative	SIHA specialist
7.	Department of Internal Medicine, Hasan Sadikin General Hospital, Bandung, Indonesia	Member of Indonesia HIV and STI expert panel/ Head of tropical diseases and infection

3.6 Ethical considerations and permissions

3.6.1 Ethical approval

Although the project used secondary data, ethical issues were still of concern. The major reason was because the medical records belonging to HIV patients in clinics were utilised as the main source for the retrospective cohort study. However, there was no direct contact with nor information presented to participants. All collected identification information was destroyed after analysis. Further, no identifying information will be presented or published. The Indonesian MOH regulation 269 of year 2008 (Ministry of Health (ID) 2008) provides the authority for the use of medical records for research purposes, when used for the benefit of the country, and also states that the use of de-identified medical data for research purposed does not require prior consent from patients. Based on this regulation, the project did not seek the consent of participants during the process of data collection. The regulation also states that the head of the clinics where medical records are kept has the authority to permit researchers to access patient medical records on written request. Therefore, the project provided a formal written letter from Flinders University to each study location, as explained below.

The project also maintained patient confidentiality during each process of data collection. The principal researcher was assisted by two trained data collectors who had health professional backgrounds and are bound by professional oath that patient information must be treated confidentially and cannot be revealed publicly (further details on data collectors are provided in Chapter 6). The primary researcher asked the two data collectors to sign a letter of patient confidentiality prior to commencing their involvement in data collection (see the letters in Appendices F). The primary researcher also worked with and consulted about the collected data only with the responsible officers, and conducted data collection in a room or space designated exclusively for our data collection purpose. Finally, the collected data were kept securely in one-drive data storage and a password-protected computer.

3.6.2 Formal approval

This study received formal approval from the ethics committees of Flinders University and the University of Padjajaran (the approval letter are attached in Appendixes G). Letters of support were requested from several government bodies at the central administrative level, the provincial level and the district/ municipality level in Indonesia. Permission to conduct the study in each of the clinics in each city was also sought. The permission was sought to: 1) conduct research in two provinces and two cities, 2) collect HIV data belonging to the MOH sub-directorate on HIV AIDS and STI, and 3) utilise the medical records of 20 hospitals and primary health centres. The list of the ethics committees, government institutions, hospitals and primary health centres that provided letters of support and formal approval for this study is provided in table 3.3 below:

Table 3.3. List of ethics committees, government institutions, hospitals and primary health centres

No	Ethics committee/ Institutions/ Hospitals/Primary health centers	Remark
1	The Social and Behavioural Research Ethics Committee, Flinders University in Adelaide, Australia	Approval Project number 7622, dated 20 April 2017
2	The Health Research Ethics Committee, Faculty of Medicine, University of Padjajaran (KEPK- FK UNPAD)	Approval number 708/UN6. C.10/PN/2017 dated 16 June 2017
3	Ministry of Home Affairs,	Letter of recommendation addressed to local home affairs in the two provinces informing them that the study will be conducted in their area for a period of six months
4	Sub-directorate HIV and STI, Indonesian Ministry of Health	Letter of permission addressed to Professor Paul Ward (principal supervisor) and letter of support for the research and collection of HIV program data addressed to Sumatra Utara Provincial Health Office (PHO) and Kepulauan Riau Provincial Health Office.
5	Sumatra Utara Provincial Health Office	Letter of support addressed to Kota Medan District Health Office
6	Tanjung Pinang Provincial Health Office	Letter of support addressed to Kota Batam District Health Office
7	Medan DHO	Letter of support addressed to 14 hospitals and primary health centres
8	Batam DHO	Letter of support addressed to six hospitals and primary health centres

3.7 Summary

This research utilised ITS and retrospective cohort designs to investigate the SUFA impact on influencing the transition of high-risk people along HIV continuum of care in Indonesia. The research also involved a discourse analysis of SUFA policy in addressing SUFA work and its outcomes. Utilising MSEM, Indonesia HCC and Nutley et al.'s framework, SUFA effectiveness was investigated, understood, predicted, measured and transferred. The study setting was based on the HIV care and treatment program operating when PLHIV engaged in the HCC. To support operationalisation of the project from the beginning until the end of the thesis write up, a network consisting of eight Indonesian HIV experts was formed and remained involved. Thirty institutions were visited and provided ethics approvals, recommendations and permission letters for conducting the SUFA effectiveness research.

Chapter 4

SUFA Policy Analysis

CHAPTER 4 SUFA POLICY ANALYSIS

4.1 Introduction

This chapter reports on Study 1, presenting an analysis of the SUFA policy, how SUFA works and the possible outcomes of the SUFA policy from different perspectives. The policy analysis centres on how SUFA policy problematized issues of HIV prevention program and on the influence of the Indonesian social, religious, cultural and political context on the development of the policy. Using the discourse analysis of 'What is the problem represented to be' approach (WPR), this study reveals the premises and assumptions underpinning the representation of the problem in the SUFA policy, suggests characteristics of the government that the analysis is dealing with and how people are governed. Section 4.2 outlines the aim and justification of the method selection; Section 4.3 describes the methods; Section 4.4 presents the results; and Section 4.5 presents the discussion. This chapter ends with a summary and some suggestions for improvement, for alternative solutions and future research (4.6).

4.2 Aim and justification of method choice

Although measuring the impact of the SUFA interventions by comparing them against the achievement program indicators could obtain robust evidence, it may be insufficient to tell the whole story. It is necessary to proceed further along an impasses and evidence-based approach (Carson & Edwards 2014). Social, cultural religious and political influences were closely tied to establishment of the SUFA initiative. To understand this complex territory, this study examines how SUFA policy represented the problems, what the assumptions underpinning the SUFA policy interventions were, what the dominant powers in the development of the initiatives were, the effects of this representation and how these effects were likely to have influenced how SUFA works. To answer these enquiries, a method called 'What is the problem represented to be' (WPR), which is different from conventional methods of analysis (Bacchi 2009), was

utilised. The WPR discourse analysis using a constructivism framework and will produce valuable new insight into the SUFA policy.

The Bacchi approach poses six critical questions to unpack the policy subject, as discussed below in the 'Methods' section. As the SUFA program covers the large area of 'to find, to treat and to retain', the analysis and discussion focused mainly on the first two components: 'to find' and 'to treat'.

The following section explains the Bacchi method, and the meanings and goals of the six questions. The six questions are then applied to unpack the SUFA policy by analysing the discursive context of the issues.

4.3 Methods

The Bacchi method focuses on the characterization of the problem that is represented in the policy. Rather than considering policy initiatives as unbiased views, focusing on an examination of the effect of the policy intervention and its relation to outcomes (the usual way of analysis using policy cycle) (Carson & Edwards 2014), Bacchi investigates policies through deeply understanding the meaning of the policies and of the meaning-making part of policy development. This approach is grounded in understanding the way policy makers view the problems, which then determines what they think is necessary to change. Thus, the analysis centres the investigation on how the government problematizes the situation and the effect of this problematization. This approach reveals the characteristics of the government, and the dominant powers, particularly in the social-cultural and political context (Bacchi 2009). This constructivist approach advanced our understanding of what the problem is represented to be; what the premises and conceptual logic behind the problematization in the SUFA policy strategy were; what and who influenced the government, and how the government was influenced, in regard to this problematization. The WPR also allows scrutiny of the possible silences or competing issues that might otherwise be overlooked (Bacchi 2009).

To the researcher's knowledge, four main policy documents related to production and enactment of the SUFA policy initiatives appeared through 2013 and 2014, all of which were investigated in this study. The first is a consultative policy paper titled, 'Road map to reduce HIV-related morbidity and mortality and maximize the prevention benefits of scaling-up access to ARVs' (National AIDS Commission &Ministry of Health (ID) 2013). This paper described SUFA strategy, rationale, target and goals and development process. The second is the Ministerial Regulation number 21/2103 on HIV-AIDS control (Ministry of Health (ID) 2013d). This policy paper contained the main regulation for HIV-AIDS control in Indonesia as well as comprehensive implementation strategies. Finally, the two Ministerial Regulations 87/2014 on ARV treatment guidelines (Ministry of Health (ID) 2014e), and Regulation 74/2014 on HIV counselling and testing (Ministry of Health (ID) 2014d) were also examined. These two policy papers provided technical guidelines containing specific strategies and detailed information.

The six critical questions and how each question addresses the policy subject are examined in detail below.

Question 1 (Q1): what is the problem represented to be in a specified policy?

The objective of Q1 is to identify implicit representation of issues in specific policies. To answer this opening question, common sense is applied, based on the argument that understanding the proposed activities will reveal what the problem is. An examination of the changes that arise as a result of the activities proposed by policy makers reveals the problem that those changes represent. Addressing the question is quite straightforward. It starts with understanding the suggested approaches in the policy, then working backwards to reveal the representation of the problem. For example, if counsellor training was proposed in a policy to improve HIV counsellor skill in delivering treatment counselling sessions to an HIV patient, the assumed problem would be the

lack of counsellor training, which infers counsellors' lack of skill and knowledge about delivering treatment counselling (Bacchi, 2009).

Question 2 (Q2): What pre-suppositions or assumptions underlie this representation of the problem?

The objective of Q2 is to recognize and examine the meaning that makes the problem representation logically understandable. The work begins with analysing the deep-seated pre-suppositions or assumptions that underpin an identified issue. The recommended form of analysis here uses the discourse of binaries, key concepts and categories. Binaries discourse locates the two debating concepts, of which one side is thought to be more important than the other. The binaries in our study refer to the dichotomization of public health issues, such as public versus private, decentralization versus centralization of services. The second discourse, 'key concepts', is relatively open ended, with the objective of locating the meaningful concepts in a particular identified problem representation for policy makers. 'Categories' refers to central concepts of how people are governed, and how people perceive themselves and others. The purpose here is to identify the categorizations applied and understand how they act to contribute to a specific meaning in the problem representation. For instance, after end of nineteenth century, the category 'homosexual' had a meaningful role, while before then it did not exist. The purpose of categorization focuses on organizing behaviours and people that exist in a certain space and time rather than simply labelling people who engage in same sex relations as homosexual (Bacchi 2009).

Question 3 (Q3): How has this representation of the problem come about?

The objective of Q3 is to review the development and decisions at the time the problem representation was formulated and to identify competing problem representations over time and space. The way to review the history of the problem representation is by

following its natural evolution: how it came to be shaped as it is. Further, the contingencies of the representation of the problem can be scrutinized by locating a specific point in time when the policy was decided, and journeying from this direction. This strategy can reveal the dominance of one side in the shaping of the problem representation and the weakness of the other side.

Question 4 (Q4): What is left unproblematic in this problem representation? Where are the silences that could lead to the problem being thought about differently?

This question is a critical element of the WPR approach. The objective of Q4 is to reflect and consider issues and concerns that remain unproblematized or have been silenced in the problem representation. The central argument is that the way issues are framed can limit understanding of the problem as represented in specific policies. The analyses conducted in the binaries and categorization method of Q2 can reveal what issues are misrepresented. For example: to suggest that government should be fair in allowing both cars and motor bike riders to use main streets in Jakarta leaves issues of traffic congestion and traffic accidents unresolved.

Question 5 (Q5): What effects are produced by this representation of the problem?

The objective here is to identify the impacts of the problem representations so they can be critically assessed. To critically assess the impacts, three effects need to be scrutinized: discursive, subjectification, and lived effects. Discursive effects refer to effects of discourse that constrain the process of thinking about the problem. Linking identified presuppositions and assumptions (Q2), the evolution of the problem representation (Q3), and silences in the discourse (Q4) all enable examination of the discursive effect. For example: to frame the issue as welfare justice and thus allow rickshaw (*becak* in Bahasa) usage to be restored in Jakarta closes off considerations of traffic congestion. 'Subjectification effects' refers to the impact of problem

representation on subject categorization or the target population in the policy. The specific effect to be discovered here is how subjectification impacts the way the subjects feel about themselves and others. 'Lived effects' refers to effects on life and death.

Question 6 (Q6): How/where is this representation of the problem produced, disseminated and defended? How could it be questioned, disrupted and replaced?

The objective of Q6 is to examine how the policy representation is disseminated and reaches the target audience and what possible challenges can harm the implementation of the policy. Media roles in circulating and supporting the particular policy representation are also relevant.

The following section applies the Bacchi framework to the SUFA initiative. The analysis focuses on how SUFA was framed and how this framing might be affecting its implementation and outcomes

4.4 Results

4.4.1 What is the problem represented to be? (Q1)

The objective of Q1 is to reveal what the problem in SUFA policy is represented to be. The process begins by scrutinizing the aims and strategies reported in the written documents and then moves backwards (Bacchi 2009).

The SUFA's goals are to reduce HIV morbidity and mortality and to improve prevention strategies in order to reduce HIV transmission. To achieve these goals, expanding HIV test and ARV treatment uptake and retaining ARV patients in care were suggested. Several HIV testing and treatment intervention regulations were released by the Minister of Health (e.g. Ministerial regulations 21/2013, 74/2014, 87/2014), which specified further SUFA interventions on how to achieve the aims (National AIDS Commission & Ministry of Health (ID) 2013). These regulations have legal binding force over the Indonesian people who are working in HIV-AIDS programs. Three main SUFA

interventions stipulated in the regulations, as explained in Chapter 1 Section 1.3.4, were:

- To test using a combination of CBHTC (mobile clinic) and facility -based HTC (VCT and PITC);
- To treat using SUFA treatment criteria that, in addition to giving treatment to PLHIV who have a CD4 count level ≤ 350 cells/mm3, treatment based on 'irrespective of CD4 count' or TasP or immediate treatment for particular at-risk groups of HIV-positive people is also provided.
- To retain in care using a once daily TDF based fixed drugs combination as a first line treatment.

Identification of the problem represented in this policy is straightforward. The combined HIV testing modality used PITC/VCT and mobile testing. However, the focus was on PITC/VCT, which are facilities-based HIV testing strategies, as stipulated clearly in two regulations, Regulation 21/2013 on HIV-AIDS control strategy, and Regulation 74/2013 on technical guidelines. However, mobile testing, which is a strategy to reach non-clinical populations, is only briefly mentioned in the Regulation 74/2014. Further, reporting and recording system in Indonesia does not recognize the mobile test modality. This might be because mobile testing activities only contribute minimally to the reporting and recording of HIV test data. Thus, the main testing strategy to identify PLHIV in Indonesia is the facility-based testing strategy (PITC or VCT). Because the HIV testing strategy utilizes the facilities-based strategy as the main modality, the problem as represented in this policy is that majority of PLHIV can be identified in health care facilities. In other words, location in identifying PLHIV is considered as sufficient in health facilities.

The second main strategy is the SUFA treatment criteria. The addition of the new prevention strategy signified that the current combination of The Indonesian HIV

prevention strategy (prior to TasP era) is inadequate to control HIV transmission. This was supported by mathematical modelling that HIV transmission was projected to continue to rise until 2030 unless there was significant investment in HIV testing and ARV treatment strategies (National AIDS Commission & Ministry of Health (ID) 2013). Data on regular condom use and ARV treatment provide evidence illustrating this inadequacy. Comparison data from the two periods of the Integrated Biological and Behavioural Survey (IBBS) in 2009/2013 among FSW, MSM, IDU and transgender people (at-risk subpopulations) showed a small rise in consistent condom use; however the uptake was still low (28-42%). Advanced HIV treatment among the key populations was extremely low (3-7%) and HIV prevalence among these groups increased over the two periods (Ministry of Health (ID) 2014b). Therefore, the problem as represented in this policy was the ineffectiveness and insufficiency of the other preventative measures to prevent the growing of HIV transmission that are concentrated particularly among KAP.

4.4.2 What presuppositions or assumptions underlie this representation of the problem? (Q2)

This section examined the conceptual logic underpinning the problematization of SUFA initiatives, how this problematization was elaborated from one discourse to another discourse, and how the framing of the problem representation is guided by the binaries, key concepts and categories (Bacchi 2009).

Treatment as Prevention (TasP)

The key concept of the SUFA policy is identified by extracting the central concept that underpins its main strategy for achieving its goals. The ultimate goal of SUFA is the reduction of HIV transmission, which is achieved through expansion of HIV testing and treatment criteria. Giving ARV as early as possible to high-risk people, known as 'Treatment as Prevention' (TasP), benefits not only individuals but also the community. TasP refers to the HIV prevention method that uses ARV to reduce the risk of HIV

acquisition. TasP's rationale, efficacy, and the global and Indonesian processes of adoption were explained in detail in Chapter 1 section 1.3.5. The SUFA TasP initiative was implemented with a revision of the eligibility criteria for ARV treatment to include specific populations irrespective of CD4 count level. The other stated rationale underpinning the SUFA initiative was that the number of people eligible for ARV could be doubled by applying the ARV initiation criteria of ≤ 350 CD4 count to PLHIV and irrespective of CD4 count level to PLHIV from the specific at-risk populations. Doubling the number of people eligible for ARV was expected to significantly increase the number of people on ARV treatment. The SUFA target was to increase treatment coverage to 80% of those eligible with the objective of achieving an 80% reduction in HIV transmission. The resulting decrease in HIV transmission is likely to be observable by 2025, according to mathematical modelling (National AIDS Commission & Ministry of Health (ID) 2013). A cost-effectiveness study has proposed that expanding ARV treatment programs would not only contribute to slowing the HIV epidemic but would also benefit the national economy in the long term (National AIDS Commission & Ministry of Health (ID) 2013). In the TasP era, the most commonly implemented initiation timing is 'immediate or irrespective' versus 'CD4 count threshold at ≤ 350 CD4'.

The binaries discourse of the SUFA policy is recognized by identifying the two debated public health issues underpinning main SUFA strategy. Examination of SUFA's second strategy revealed that the binary discourse was between the two criteria for eligibility for ARV: irrespective of CD4 count level (immediate treatment) or CD4 count level ≤ 350 cells/mm3.

Immediate treatment versus CD4 count ≤350 cells/mm3

Immediate treatment, early treatment or treatment irrespective of CD4 count are other terms used for treatment as prevention (TasP). In the SUFA context, immediate

treatment means initiating ARV for a specific population without considering the CD4 count level. The benefits of immediate treatment have been the subject of global debate during the SUFA launching era. It has been argued that providing ARV early could lead to poor adherence, which potentially leads to drug resistance (Haire & Kaldor 2013). There are also short and long-term side effects of taking ARV, (Haire & Kaldor 2013) as well as potential risk behaviour compensation (e.g. no longer using a condom due to perceptions of low transmission risk) (Crepaz et al. 2006). Applying the concept to the community could also potentially lead to the risk that people would think the test and treat framework was compulsory without clear communication of the optionality of involvement (Haire & Kaldor 2013).

Another argument was for 'delayed treatment', which involved initiating ARV when the CD4 count level drops to ≤350 cells/mm3 (the treatment criteria before TasP era). In other words, PLHIV were required to wait until their CD4 counts decreased below the critical threshold, which is usually marked by the emergence of major HIV-related diseases (Cohen, MS et al. 2012). This old criterion was still applied to other populations in the SUFA era with the focus on treating sick individuals rather than using ARV as a secondary prevention measure. Although pros and cons continued to be debated, the World Health Organization and the President's Emergency Plan for AIDS Relief (PEPFAR) recommended the immediate treatment approach for the sake of reducing HIV transmission (Cohen, MS et al. 2012; World Health Organization 2016). The debate over the pros and cons regarding timing for treatment initiation essentially ceased in 2015, when the WHO recommended the new test and treat approach (World Health Organization 2015 guideline) that all PLHIV should be eligible to receive treatment irrespective which KAP group they belong to and CD4 count level on global evidence (Cohen, MS et al. 2011; Insight Start Study Group et al. 2015; Temprano Anrs Study Group et al. 2015).

A further concern was the possibility of competing logistical needs between allocating ARV to people who are treated using the new criterion and to people who are treated using the old criterion. The government's task is to ensure that people living with HIV AIDS who are eligible for treatment receive the medication. However, this can become a difficulty given Indonesia has limited resources and has been struggling to fulfil the ART drug needs even for delayed treatment. The government's struggle is further evidenced by the 2016 data indicating only 14% uptake of treatment initiation (UNAIDS 2017).

The concept of categorization reveals how the government deals with the populations. The concept also informs how these populations perceive themselves and how other people judge and react to these populations (Bacchi 2009). The categorizations used in the main SUFA intervention and categorization concepts in the SUFA policy are revealed by this scrutiny. The TasP chose immediate treatment only for specific categories of the population, in particular KAP as identified in the policy (National AIDS Commission & Ministry of Health (ID) 2013).

Key affected populations (KAP) and their problems

FSW, MSM, PWID, and transgender people, are categorized as the key affected population, which is one of the specific population categorizations identified in the SUFA policy (National AIDS Commission & Ministry of Health (ID) 2013). Q5 focuses on the impact of this categorization. Here the analysis extends the implications of this categorization for policy makers and for the community. KAPs refers to groups who have specific higher risk behaviour that makes them vulnerable to acquiring HIV-AIDS regardless of epidemic level and local context (World Health Organization 2014a). KAP are important target groups in combating HIV transmission, and therefore are targeted as part of the main population in the SUFA policy. In other words, KAP are considered the main source of the problem. These KAPs are defined (FSW, MSM, PWID,

transgenders) according to their specific risk behaviour and in accordance within the global health sector strategy for HIV/AIDS 2011-2015. FSW refers to females who receive money or other goods in exchange for either regular or occasional sexual work. MSM refers to men who engage in sex and /or romantic relations with other men. PWID refers to people who inject psychoactive substances e.g. opioids, amphetamine-type stimulants, cocaine, hypno-sedatives and hallucinogens through intravenous, intramuscular, subcutaneous or other injectable for non-therapeutically purposes. Transgenders (transsexual, transgender or otherwise gender nonconforming) refers to people whose gender identity and expression do not conform with the common norms and beliefs about the gender they were labelled with at birth (World Health Organization 2014a).

The majority of Indonesian society does not accept and tends to have negative perceptions of people from these KAP (Fauk et al. 2017; Wolffers 1997). To illustrate, a Bahasa Indonesian term for FSW is *"wanita tuna susila"*, meaning a woman with no morals. Another derogatory word is *"pelacur",* meaning a woman with bad sexual behaviour (Basuki et al. 2002). The legal status of the industry in Indonesia further serves to marginalise sex workers, with 30 local laws that criminalize the sex industry (Praptoraharjo). Another example, being gay (MSM) is seen as a social deviance problem and as contaminating Indonesian culture (Fauk et al. 2017). Social sanctions also alienate FSW, MSM, PWID and transgender people, as their risk behaviour is perceived as breaking religious and social norms. All of these factors further serve to increase the extent of social and health inequalities in Indonesia. For example, key populations may not want to access health services because they perceived discrimination (Ministry of Health (ID) 2013b), which results in low access to care, low treatment compliance and high loss to follow-up. Therefore, the aim of the SUFA focus on these at-risk populations was twofold: to address social inequalities by increasing

health service access to this population and to reduce HIV transmission in the KAP (World Health Organization 2014a).

4.4.3 How has this representation of the 'problem' come about? (Q3)

The aim here is to detail the history of SUFA policy development and reflect on the competing issues over the time and across the context of HIV management. The analysis begins with an examination of the time when the SUFA policy was first decided, and of the processes and steps undertaken and the people involved in the development of the problem. The analysis exposes the contingency level of the problem being represented, what issues were debated and who dominated the decision making process (Bacchi 2009).

As previously discussed, the final adoption of the TasP into WHO policy recommendation was preceded by much global debate on the pros and cons. Based on the scientific rigor of the arguments, the WHO recommended expanding the use of ARV for prevention (TasP) in key populations (World Health Organization 2012a). The recommendation was later included in the consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection (World Health Organization 2013), which was then adopted into the Indonesia HIV program policy.

In addition to the WHO's external influence on Indonesia's HIV policy, an internal movement also contributed to the story of ARV use as a prevention strategy, although it seems no competing issues were raised. A joint rapid assessment team led by the MOH and the National AIDS Commission (NAC), together with UNAIDS, WHO and UNICEF, conducted a review of the evidence around the ARV prevention strategy (National AIDS Commission & Ministry of Health (ID) 2013). The review investigated the internal and external barriers and challenges in the health area, to inform the development of 'a new approach' to accelerate ARV rollout, especially among the key populations. The assessment team undertook interviews and discussion sessions with

PLHIV, key populations, service providers, and local and regional experts (National AIDS Commission & Ministry of Health (ID) 2013). Community interviewees identified a number of potential benefits and concerns about the proposed acceleration of the ARV as prevention strategy. The potential benefit identified was the utilization of community groups to promote, for example, the protective effect of ARV. Possible drawbacks included a fear of logistic stock-out, potential discrimination from health providers, fear of severe treatment side effects, and the potentially prohibitive cost of transportation to regular health checks. The fear of the logistics might be one of the valid issues to consider in the future, since Indonesia has limited resources, as explained under Q2. However, based on the interviews, literature reviews and field visits, the Commission finally recommended this new policy intervention (National AIDS Commission & Ministry of Health (ID) 2013).

4.4.4 What is left unproblematic in this problem representation? Where are the silences? Can the problem be thought about differently? (Q4)

The objective in this section is to identify the issues that failed to be examined because of the way the problem was represented in this policy. The key conceptual logic articulated in Q2 was used to find the issues that were closed off in the representation of the problem in the SUFA policy. The problem representation included TasP, immediate treatment criteria versus old treatment criteria, hospital based versus community-based testing strategy as well as categorization of KAP. Bacchi's Q4 argues that the problem could be framed in different ways (Bacchi 2009).

For example, employing ARV treatment as a prevention strategy to reduce HIV transmission rates tends to reduce the relative importance of other prevention strategies. Crucial strategies that remained under-examined were behaviour risk reduction, condom use, male circumcision, and management of STIs. Although the Ministerial Regulation number 21/2013 also lists those strategies as part of Indonesia HIV prevention strategies (Ministry of Health (ID) 2013d), it does not detail their

implementation. To illustrate, there was no implementation policy on alternative prevention strategies in the Jayawijaya district of Papua, which was one of SUFA pilot areas, although PITC and ARV treatment were stipulated in the standard operational procedure (SOP) in the hospitals and primary health centres (Author personal observation, 2014).

Applying the 'irrespective of CD4 cell count' criterion for ARV initiation only to specified populations may have omitted other high-risk populations, such as prisoners, sailors, truck drivers, manufacture workers, all of whom were among the high-risk groups identified in the 2013 IBBS report (Ministry of Health (ID) 2014b). These groups could ultimately receive treatment once diagnosed HIV positive via the untargeted treatment pathways and commence treatment under the general PLHIV ARV initiation criteria (≤ 350 CD4 count). In the longer waiting period associated with the general pathway, however, they could represent a continuing transmission risk as they continue to engage in high risk behaviours. Although the 2013 WHO guidelines on ARV recommended prisoners to be treated immediately (World Health Organization 2013), it is not clear why this high-risk group was not included in the SUFA policy. One likely consequence of the omission was the entrenchment of inequality in treatment standards among the high-risk groups. Although Indonesia has begun to adopt the test and treat or treat all strategy (i.e. all HIV positive are eligible for ARV treatment) (Ministry of Health (ID) 2018), full implementation of this test and treat strategy to all hospitals and primary health centres in Indonesia could potentially take several years. Indonesia will likely face the issue of competing logistics due to the limitation of drugs supply, which would exacerbate the difficulty of allocating ARV to certain high-risk groups. Therefore, the researcher believes that this issue is still relevant today.

The SUFA's strategy of expanding HIV testing is principally through the PITC and VCT, with success indicated by increased testing of patients presenting to clinics or hospitals.

As noted in Chapter 1, however, it is estimated that only 42% of HIV-infected people are aware of their HIV-positive status, which suggests the majority of PLHIV have not been tested and diagnosed (UNAIDS 2017). As the greatest disease burden is outside clinical settings, outreach programs remain a crucial requirement for improving the demand for the HIV test. The lack of attention to mobile testing or other community based testing stands in contrast to the focus on PITC and VCT, which are the main features of the standard operational procedures (SOP) in the field. This focus of targeting high-risk people in clinic/hospital settings inadvertently ignores high-risk people outside these settings.

It was assumed that changing the criteria for treatment initiation would increase the number of eligible people and, therefore, increase the proportion of people receiving ARV (National AIDS Commission & Ministry of Health (ID) 2013). However, the focus of the SUFA policy on this criterion (irrespective of CD4 for a particular population) may have decreased attention on socially determinant factors that act as barriers to treatment and care, such as stigma, and socio-economic and cultural factors. It was intended that PITC would reduce stigma and perceived discrimination from providers; however, this testing strategy is only adequate for addressing internal barriers in clinics and hospitals. The social, cultural and political obstacles outside the clinics and hospitals are substantial and these need to be addressed by specific HIV intervention modalities to facilitate eligible PLHIV to receive treatment.

4.4.5 What effects are produced by this representation of the problem? (Q5).

To determine the particular impact of the way SUFA represented the problem, the study examined three key effects: discursive, subjective and lived.

The discursive effect of TasP that the expansion of ARV to specific populations is the best strategy to reduce HIV transmission resulted in most of the focus and resources being directed at the implementation. As discussed, however, this representation

seemed to ignore other preventative strategies. ARV was scaled up by increasing HIV testing using PITC/ VCT and immediate treatment, with the result that testing and ARV acceleration mostly focuses on hospital and clinical settings. Thus, the impact of this representation of the problem may be the diminishment of opportunity for the 'hidden' population to access HIV testing and treatment. Further, targeting only specific risk populations with the new irrespective of CD4 count criterion for ARV initiation excluded other high-risk groups from the immediate treatment intervention. These inadvertently inequitable impacts have created inequality among the population that could severely impact the health of those excluded from treatment and, potentially, increase the prospect of rising HIV-transmission. Given the majority of the potentially eligible population reside beyond the reach of clinics and hospitals failure to address these issues could ultimately lead to the failure to achieve the SUFA's program goals.

The subjective effect of categorizing KAP can be understood by examining the target population as defined in this WPR. Categorizing at-risk populations into specific groups, including key populations, was intended to facilitate government objectives and encourage these distinct groups to behave in particular ways. However, the use of such categories could negatively impact these vulnerable groups. Being framed as the primary target risks and as a source of the problem could potentially negatively influence the way they perceive themselves as well as how others perceive them (e.g. stigmatization). This situation could seriously impact the extent of cooperation among potential clients and (potentially) health providers, again, with a negative impact on the success of the program (Bacchi 2009).

Finally, investigation of the daily effect of WPR, called the 'lived effect' of the SUFA policy is crucial. The critical point is whether the supply sides are ready to cope with the growing burden on the health system if there is an increase in the demand side (expansion of testing and treatment). The growth of human resources (both in quantity

and quality), testing kits and drug logistics, and the recording and reporting system are examples of the resulting increase in the requirements for logistics support. SUFA has a very high target program indicator of 80% in treatment coverage. Given the limited capacity of the Indonesia health system (Mboi & Smith 2006), it seems doubtful that the program can be effectively delivered and come close to reaching this target. Another issue is the impact of the introduction of the 'irrespective of CD4 cells count' treatment initiation strategy, which will increase the number of HIV-infected people with relatively high CD4 counts receiving treatment. This raises the possibility of the potential harm of treating HIV people in asymptomatic stages, i.e. 'healthy people'. These include the potential for treatment side effects, non-adherence, losses to follow-up, drug resistance, and the transmission of potentially drug resistant viruses.

4.4.6 How/Where is this representation of the problem produced, disseminated and defended? How could it be questioned, disrupted and replaced? (Q6).

The task here is to find the modes of disseminating the SUFA policy initiative until it reaches the policy's target population. The possible challenges that can impede the SUFA implementation process must also be explored.

Scientists had a dominant role in framing the representation of the problem in the SUFA policy, with current evidence supporting the principal strategy of employing ARV TasP. A deductive approach of the application of proven global knowledge to Indonesia was taken. Mathematical modelling and cost-effective analyses were applied to predict future impacts and define the benefits of implementing the policy. The significant contribution in shaping the SUFA concept from international organisations and PLHIV, especially those from the key populations, cannot be overlooked (National AIDS Commission & Ministry of Health (ID) 2013).

Various methods were employed to disseminate the SUFA program from the central office to the lowest administrative levels. In the early phase of SUFA implementation,

the MOH and the National AIDS Commission assigned district facilitators in 13 pilot districts to support the implementation process in these areas. The district facilitators supported the local coalitions, which consisted of various government officers, health service providers, PLHIV communities and key populations, in managing the interventions. Each organisation involved in the SUFA network was expected to disseminate the SUFA program within their structures (Kencana 2014). The media was also utilised, with several online newspapers supporting the delivery of SUFA program throughout the country. Some important Indonesian language publications (translated into English here) disseminated news and information about the program. For example, the MOH published 'SUFA, the new innovation in the effort of HIV-AIDS control in Indonesia', which focused on introducing SUFA nationwide (Central Office for Public Communication, Secretariat General to Ministry of Health (ID) 5th August 2014). Life & Style *ePaper Bisnis Indonesia* (25th Oct 2016) published 'Preventing the increase of HIV: the Ministry of Health undertakes prevention of STIs and SUFA' which highlighted key populations as the groups most susceptible to HIV transmission, thus identifying them as the main target (Rachmawati 2015). *Kompas* (4 Oct 2015) published 'The future of people living with HIV-AIDS' by Dr Samsurizal Djauzi a highly respected HIV clinician in Indonesia, promoting the nationwide implementation of SUFA (Djauzi 2015).

In contrast to the above efforts to promote the SUFA program, several adverse actions occurred in the country. The 2015 shutdown of a huge brothel complex area '*Gang Doly*' in Surabaya, the largest brothel in Southeast Asia, (Andriansyah 2014) was a politically motivated response to HIV. There was also a movement to criminalize lesbian, gay, bisexual and transgender (LGBT) activity through a new law to ban same sex relationships. The bill, as reported by CNN (Westcott 2018), was worded, 'committing an "obscene act" with someone of the same gender is punishable by a fine and up to 18 months in jail, if the act is public.'

These reactions have made the implementation of the HIV control program more difficult, particularly in regard to delivering the program to FSW, MSM and transgender people. Because people from these groups are not legally and socially recognized and accepted, they cannot reveal their identity as belonging to those groups, which keeps them hidden from, and out of reach of, the HIV care program. Their reluctance to discuss their sexual problems and their lack of information limit their access HIV related services, which in turn, keeps them engaging in unsafe sexual practices, thus increasing their risk of HIV infection (Fauk et al. 2017).

A number of obstacles concerning health providers have also affected the implementation of SUFA, such as refusal to treat, unfair treatment of PLHIV, disclosure of HIV patient status to others (Merati, Supriyadi & Yuliana 2007), and lack of counsellors. These barriers have slowed the implementation of the program in the field. Although Ministerial regulations have addressed some of these issues, (e.g. HIV counselling can be performed by trained health staff, not only counsellors, as stipulated in Regulation 74/2014), far greater effort is required to address fundamental issues that impact on program delivery, such as health providers' cultural perceptions.

On the positive side, the SUFA policy representation has shifted attention from the controversial intervention of 'condom promotion' to the medical arena. The treatment intervention seems to have facilitated the spread of the medical message to the community. For example, the PITC strategy offers HIV testing to patients with HIV symptoms rather than to patients who are thought to be at risk due to sexual behaviours. This strategy is likely to draw attention away from moral issues and onto treating sick people, which could be considered as more morally neutral (Bacchi 2009) and therefore positively contributing to acceleration of the program.

4.5 Discussion

The revision of the HIV-AIDS management policy through the development of SUFA program strategies was based on Indonesia's program situation and needs; however, the influence of the international community, particularly WHO was clearly apparent in shaping the initiatives. The support of international organisations and communities for Indonesia's HIV-AIDS management program has been paramount since the early phase of HIV/AIDS administration. There was a significant increase of funding from the national budget between 2007-2012, especially for HIV drugs (100% of drugs were funded from local budget in 2012). To date, however, most of the funding of non-drug related HIV program activities is still provided by international donors and local provincial/district governments (Center of Policy and Health Management Faculty of Medicine University of Gadjah Mada).

The benefit of alternative prevention strategies, such as condom use and male circumcision, are underplayed in the representation of the problem. Although it has been demonstrated that ARV is a powerful tool for preventing HIV transmission, it is doubtful that any single solution can be the panacea for curtailing the epidemic in the real world. It would seem more likely that the emphasis should be on a combination of prevention strategies that are tailored to the specific context of each country (Padian, McCoy, Karim, et al. 2011).

A critical element missing from the SUFA problem representation was the asymptomatic HIV-infected people who were not accessing health facilities. This problem seemed less important given the focus of finding PLHIV were framed in health care facilities. Unfortunately, the success of the TasP program depends on identifying and engaging with these asymptomatic people, as highlighted by Padian, McCoy, Manian, et al. (2011). The PITC intervention was expected to significantly increase the number of people tested in health care facilities (National AIDS Commission & Ministry of Health

(ID) 2013); however, it is likely that those seeking clinical care would already be exhibiting symptoms of HIV diseases, marked by the reduction of CD4 count, as the reason for seeking medical care. Even though these people would have received the ARV treatment, further transmissions have likely occurred, as evidence demonstrated that the diagnosis and commencement on ARV treatment of one HIV-infected person with a CD4 close to 200 cells/μl could reduce onward transmission by up to 25-30%. The prevention effect could be even larger (50% onward transmission could be prevented) if treatment is initiated at CD4 count level closer to 350 (The HIV modelling consortium treatment as prevention editorial writing group 2012). Thus, finding and treating the hidden populations earlier is a crucial strategy in controlling the HIV transmission. In the early phase of SUFA, it was necessary to target only people along the continuum of care (people in hospitals/primary health centre or in HIV care unit). However, to increase the demand outside the health care facilities, it is crucial in the next phases to design specific interventions targeting the hidden population (e.g. community-based HIV test and treatment models).

It is assumed that HIV transmission in Indonesia will be reduced by 2025 if the coverage of ARV treatment and program attains 80% or more (National AIDS Commission & Ministry of Health (ID) 2013) It is not clear if this target is achievable given the silences found due to the way SUFA policy problematized issues and possible barriers identified in this analysis. Evidence for the effectiveness of ARV in reducing HIV incidence by 96% suggested the 80% increase in program effectiveness is achievable; however, the relevant studies were conducted in experimental research environments (Cohen's study). Real world studies conducted in China (where the HIV treatment and care are fully subsidized) demonstrated lower results of between 26% and 66% (He et al. 2013; Smith et al. 2015; Wang et al. 2010). Based on this evidence, it is possible that ARV can reduce HIV transmission in the real world, but in a context like Indonesia, the extent of this reduction is uncertain. Clearly, further research is required to shed the light on

this, as well as to test the SUFA's assumptions after several years of implementation. This current project can be particularly useful for informing the way forward.

My policy analysis has some limitations. As an independent researcher I was not privy to the development stages of the policy. Only published papers were accessed via online documents and government websites; details on the processes of the development of SUFA policy were unavailable, which may have also limited the depth of the scope of analysis. However, my considerable knowledge of the implementation phase of SUFA, benefiting from past experience working in the area of HIV program policy design up to its implementation in the field, may have helped to minimize some of these gaps. Further research is required to achieve a more comprehensive understanding of Indonesia's HIV prevention policy program.

4.6 Summary

SUFA policy initiatives of expanding HIV testing, ARV treatment and retention in care were developed in response to the growing HIV epidemic in Indonesia. To understand how SUFA works and its outcomes, it was necessary to assess the SUFA policy initiative from various angles. Analysis using the discourse analysis of the WPR method helped to reveal the problems that were left out in the process of SUFA's design.

A discursive analysis of Indonesia's recent HIV policy initiatives, that is, what SUFA is represented to be, revealed the Indonesian government's view of the problem of the HIV prevention program and appropriate measures to avert the growing epidemic. SUFA represented the problem as low achievement in program indicators, with the majority of PLHIV already in health care facility settings, and inadequate preventative measures. On the basis of this representation, SUFA's design was shaped by the TasP strategy and global and local scientists and the community, with global evidence suggesting promising results from the use of TasP as the main strategy to tackle the epidemic. However, as a consequence of the way problem was framed in SUFA policy, outcomes

for SUFA could be impeded by social inequalities and health disparities among the high risk populations needing access to HIV testing and ARV treatment. Finally, significant enhancements to the policy would include the extension of the new ARV initiation criteria to all high-risk groups and the development of a robust strategy regarding HIV services accessibility to the hidden populations outside of clinical settings.

Chapter 5

Interrupted Time Series

CHAPTER 5 INTERRUPTED TIME SERIES

5.1 Introduction

The SUFA policy analysis, using 'What is the problem represented to be?' approach reported in the previous chapter, provided insight into the features of the outcomes of SUFA. To prove SUFA's effectiveness in achieving its objectives, however, further investigation is needed. Two quantitative studies, the interrupted time series (Study 2) and the retrospective cohort study (Study 3), were applied to address this enquiry. The overall aim was to discover the effect of the SUFA intervention in changing the HIV continuum of care cascade. This chapter discusses the interrupted time series study, which investigated the impact of SUFA at the population level, as expressed in two research questions:

Research Question 1. What are the relationships between the SUFA intervention and HIV tests, HIV cases, enrolment in care, eligibility for ARV, and ART initiation immediately after implementation?

Research Question 2. What are time trend differences in HIV tests, HIV cases, enrolment in care, eligibility for ARV, and ART initiation in pre-and post-SUFA implementation?

The second quantitative study (retrospective cohort design), which investigated impact of SUFA at individual level, is presented in Chapter 6.

In this chapter the method is outlined first, comprising study design, study location, study participants, data source, collection and techniques, data variables, statistical and analyses. Following this, the results, discussion and strengths and limitations of the study are described. The chapter ends with a summary.

5.2 Method

5.2.1 Study design

The first quantitative study design was an interrupted time series (ITS). ITS is the observation of an ongoing sequence, which is repeatedly measured (usually in the same interval) over time (time series), interrupted by interventions at a specific point in time (Bernal, Cummins & Gasparrini 2017). ITS has gained popularity in evaluating the impact of public health interventions, particularly interventions which are introduced at a population level over a certain period of time, and assessing the effect of the intervention in population health outcomes (Bernal, Cummins & Gasparrini 2017). The design is suitable for effectiveness studies (Armstrong et al. 2007), evaluating policy change, assessing on-going programs, and repeatedly collected data (Biglan, Ary & Wagenaar 2000; Morgenstern 1982), which suits the characteristics of this study. ITS was considered the most rigorous analytical method for assessing the SUFA intervention at the population level given randomization could not be conducted, since the new intervention have been implemented, in 13 then 75 and gradually to other 141 sites (Chapter 1) mostly before the commencement of and during this study (Bernal, Cummins & Gasparrini 2017). Furthermore, policy makers assumed that SUFA would be effective and, therefore, SUFA was first implemented in chosen locations (13 pilot demonstration sites) which were purposely selected on that basis (Bonell et al. 2011). ITS was also considered for this study because it would answer three crucial interests in evaluating a public health intervention (observed change, temporal relationships between intervention and the changed outcomes, and the magnitude of the change as accepted by the key stakeholders) (Sanson-Fisher et al. 2014). The magnitude of the change refers to the findings in terms of the progress towards the UNAIDS 90-90-90 goal.

An ITS design was used to demonstrate the impact of the SUFA intervention at population level. The unit of analysis was absolute number (count data) per month i.e.

HIV tests, newly detected HIV cases, enrolment to care, eligibility to ARV, and treatment initiation. The data used were from the period 26 Dec 2010 to 25 Dec 2013 (before intervention) and from 26 Dec 2013 to 25 Dec 2016 (after intervention), sourced from 13 sites. The 13 sites data were treated as separate time series data, thus enabling the design of multiple baseline data, where the introduction of the SUFA occurred during a similar time period across the 13 different sites (Biglan, Ary & Wagenaar 2000). The intervention impacts were measured through changes in level and slope of the regression lines following the intervention. Level changes were observed immediately after implementation of SUFA and then the gradual changes of the gradient of the trend of outcomes until three years after implementation were observed. These changes were assessed by way of using three independent variables in each of the ITS models: SUFA, time, and interaction between intervention and time, to observe changes in the level and slope of the regression model as hypothesised (Bernal, Cummins & Gasparrini 2017).

A limitation of using the ITS design is that any changes found in HIV tests, diagnosed, enrolments in care, eligibility for ART and initiation of ART in a population level study might be caused by other factors as well, not simply due to the single effect of SUFA intervention (Biglan, Ary & Wagenaar 2000). To our knowledge, however, no other HIV policy program was introduced at the same time as SUFA in Indonesia, particularly in the 13 locations. However, the study could not conclude the phenomenon observed in the population might be observed as well at the individual level (ecological fallacy). Furthermore, the study could not account for different characteristics of the observed population at pre- and post-SUFA that might create bias in the ITS results. Therefore, the study supplemented this approach with a retrospective cohort design (Study 3, presented in Chapter 6), which comprised more comprehensive and detailed analyses to support the exploratory evidence in this study.

5.2.2 Study location

The study chose the 13 SUFA demonstration sites as the study locations for Study 2 because these sites were the first to implement SUFA in Indonesia. Further, the dates of SUFA implementation in these sites were similar, between mid of December 2013 to mid of January 2014 (National AIDS Commission & Ministry of Health (ID) 2013).

5.2.3 Data source, collection and techniques

The national office in the MOH Sub Directorate HIV AIDS and STI in Jakarta receives monthly reports of HIV test and treatment care report programs from the main health care facilities (ART sites) all over Indonesia. Health care facilities staff enter the compilation of individual data as their monthly reports directly into the HIV AIDS reporting recording (RR) online database system. The system can be accessed using a password assigned to authorised staff (Ministry of Health (ID) 2015d). Then staff at the national office can access and review the report using their passwords.

These aggregate electronic data were collected for analysis. Because only authorised staff can access the RR database, the study data were collected by two RR staff at the national office. The staff physically extracted data from the database guided by an Excel file of data extraction table (see Appendix H). The first staff member was responsible for collecting monthly data on: 1) HIV test performed, and 2) newly detected HIV cases from the database of the counselling and testing report program. The second staff member was responsible for withdrawing data from the HIV report program database, including: 3) enrolment to care, 4) readiness for ARV, and 5) ARV treatment initiated. The extracted data Excel files were sent via email to the researcher. In the process of data cleaning, when missing and inconsistent data were found, the two RR staff were consulted via email by the researcher. Following this, the clean data were exported to Stata (Release 15.1 StataCorp LLC, Texas) for further analyses.

The study collected population data of individuals aged 15 years and above which were recorded in the HIV/AIDS database. The data reported for HIV testing, HIV cases, enrolled in care, eligibility for ARV, treatment initiation from 26 Dec 2010 - 25 Dec 2016 in the 13 SUFA demonstration sites, were included in the study.

5.2.4 Data variables

5.2.4.1 Outcomes

There were five variable outcomes in Study 2: HIV tests performed, newly detected HIV cases, enrolment in care, eligibility for ARV and treatment initiation. The unit of the analysis of each of the outcomes was absolute numbers (count data) per month. The data arrived in a monthly format basis (collapsed using the period from date 26th of preceding month to date 25th of the month). Table 5.1 presents details on the research question, outcomes and estimations.

Table 5.1. Research questions, outcome variables and unit of the analysis

Research questions	Outcome variable	Unit of the analysis
1.What are the relationships between SUFA intervention and HIV tests, HIV cases, enrolment in care, eligibility for ARV, and ART initiation immediately after implementation of SUFA? 2.What are time trend differences in HIV tests, HIV cases, enrolment in care, eligibility for ARV, and ART initiation in pre-and post-SUFA implementation	HIV test	Absolute number of HIV tests per month
	New HIV cases	Absolute number of new HIV cases per month
	Enrolment in care	Absolute number of enrolment in care per month
	Eligibility for ARV	Absolute number of eligibility for ARV per month
	Treatment initiation	Absolute number of treatment initiations per month

5.2.4.2 Exposures definition

SUFA was implemented in the 13 sites from mid-December 2013 to January 2014. Therefore, people who were tested, detected for HIV, enrolled, eligible and initiated from 26 December 2010 to 25 December 2013 were considered to be unexposed and those tested from 26 December 2013 to 25 December 2016 were considered to be exposed to the intervention.

The independent variables for all research questions were Time, SUFA and SUFATime. 'Time'= the time elapsed since the beginning of the study from 26 December 2010 to 25 December 2016 (1 to 72 months); 'SUFA'= a dummy variable indicating pre-SUFA (coded 0) and post-SUFA (coded 1); 'SUFATime'= the interaction between SUFA intervention and time centred at the time of implementation (SUFA*(Time-36 months)) (Bernal, Cummins & Gasparrini 2017).

5.2.5 Statistical analysis

All analyses in Study 2 used Stata (Release 15.1, StataCorp LLC Texas 77845 USA) and SPSS (IBM Corp. Released 2018 IBM SPSS Statistic for Mac, version 25.0.0.1).

5.2.5.1 Descriptive statistics

The count data were summarised using median and range. To describe number and proportion of outcomes across 13 sites for each month (overall as well as stratified at pre- and post-SUFA), the study used total and median. The proportions of outcomes were calculated by comparing the amount of data observed in an outcome (numerator) with amount of data from the previous outcome stage (denominator) in each month x 100% ((n of an outcome / n of the preceding outcome stage) x 100%). Specific to the HIV test uptake, a 2012 estimated KAP population was used as denominator (Ministry of Health (ID) 2014a). The percentage incremental proportion from pre- to post-SUFA was calculated from the total amount of data on an outcome post-SUFA, subtracting the total amount of data on the outcome pre-SUFA, and this result was divided by the total amount of the data on an outcome pre-SUFA x 100% ((n Post-SUFA- n Pre-SUFA)/ n Pre-SUFA)) x 100%.

The study also measured the treatment uptake progress towards the second UNAIDS 90-90-90 indicator. The second 90 refers to the 90% proportion of people who received ARV over people who were detected for HIV. Since the main objective of the study was to measure the effect of the intervention over a specific period (2011-2016), the first

UNAIDS 90-90-90 uptake was not measured, as this would require cumulative data from beginning of the reported program. The third study also could not measure the third 90, because viral load had not been used as a standard laboratory examination for HIV patients during the study period, and was not available in some of study locations before 2016. The bar chart was also developed to graphically represent the progress along the continuum cascade from test to initiation stages using the changes of the gaps between stages from time to time during the study period (2011-2016).

5.2.5.2 Multivariate multilevel model (MLM)

To test for the intervention impact of each outcome, multilevel models (MLM) were used to account for the clustering of monthly counts within the sites. The models were also negative binomial to account for the high variability (over-dispersion) in the counts. MLM is a statistical technique used to estimate values of parameters in more than one level e.g. individual and site level (Luke 2004). MLM is increasingly used by epidemiological and public health researchers, particularly for the purpose of understanding people's health in their living context (Leyland & Groenewegen 2003). Using this model, the intercept (baseline count) is able to vary between the different sites (Leyland & Groenewegen 2003), providing a specific site-level estimate of the intervention for each site. In developing the regression model for count data, first, the possibility of using Poisson regression was checked (Bernal, Cummins & Gasparrini 2017) by plotting histograms of the outcome variables and also by estimating the mean and variance using the pre- and post-SUFA variables. The results showed that over dispersion was observed (variance far exceeding mean). A model for count data that accounts for over-dispersion (mean is lower than variance of outcome variable) is negative binomial regression. The likelihood ratio test in the binomial model also provided evidence of over-dispersion ($p<0.05$).

Absolute number model versus rate model

In order to consider the effect of SUFA, two separate models were fitted for two outcomes: absolute numbers and rates (for which the denominator was the population at risk). The incidence rate ratio (IRR) and 95% confidence intervals (95% CIs) of absolute number (model 1) and rate (model 2) were calculated.

Model 1 used the absolute number outcomes per month as the dependent variable, while SUFA intervention, Time and Time x SUFA intervention as the independent variables. Model 2 used the absolute number outcomes per month with the same independent variables but the outcomes (dependent variables) were adjusted for absolute number of population at risk per month. The population at risk in each outcome was the absolute number of outcomes from the preceding stage, except for the HIV test. The denominator for HIV tests was based on an estimate of key affected populations in each site. Then the regression predicted lines using scatter plot and line graphs were visualised for both models.

Interrupted time series multivariate multilevel model

The interrupted time series method describes trends in outcomes over time and changes of the trends after introduction of the intervention. Three covariates and a model 'constant' were used to explain the impact: SUFA intervention, Time pre-SUFA and Time post-SUFA. Thus, the models included four fixed effect parameters: 1) β_0, the regression model constant, which indicates the mean pre-SUFA intervention; 2) β_1, the pre-SUFA intervention slope across time; 3) β_2, the change in level at the start of the implementation intervention (SUFA) and 4) β_3, the change in slope between pre- and post-intervention (Time x SUFA intervention interaction). Following the estimation for each model, the post-SUFA slope (Time post-SUFA) was determined by adding together the estimates for β_1 and β_3. Each model also included the site (1-13) as a random

intercept. The parameters were identified following the tutorial from Bernal, Cummins and Gasparrini (2017). The choice of how many and what type of variables created for the regression equations, also based on previous knowledge (Bernal, Cummins & Gasparrini 2017), here was based on visualization of a predicted line of number of adults on ART after SUFA implementation, sourced from the SUFA policy document (Bernal, Cummins & Gasparrini 2017; National AIDS Commission & Ministry of Health (ID) 2013) (see the graph in Chapter 1 Figure 1.4).

Assessing necessity of using MLM

The data were investigated further to determine the necessity of using MLM. Line charts of mean number of outcomes per month against sites stratified by pre- and post-SUFA were plotted to visualise whether there were variations in mean number of outcomes within and among sites. There was considerable variability in outcome among sites, leading to the possibility of using MLM. The intra-class correlation coefficient (ICC) was also calculated (Luke 2004) to obtain the scientific basis for MLM. ICC is defined as the level of similarity between units in the same class (level). ICC was also calculated to see how similar the outcomes were among sites (Carrasco et al. 2014), represented by the number between 0 to 1. ICC 1 means all monthly data within sites have identical observation (that is 100% of total variability of the monthly data explained by sites). ICC 0 means monthly data do not have any similarity of common related observations within a site. If ICC is similar to 0, justification of using MLM is less pronounced (Merlo et al. 2005). ICC and its 95% CI were calculated using mixed linear model formula because the STATA v15.1 could not calculate the ICC for count data.

Model assumption

All assumptions of the MLM were checked to ensure that level 1 (within group) residuals are independent and normally distributed, and level 2 residuals are normally distributed

and independent across sites. Diagnostic testing for this was by plotting histograms to level 1 and 2 residuals. None of our models were found to violate the assumptions. The homoscedasticity assumption using a scatter plot of standardized residuals against fitted values was also checked. The plot showed constant variance or non-curvature in all of the models (Luke 2004).

5.3 Results

The presentation of findings below begins with a descriptive summary of the five outcomes totalled over all sites and separated across sites for six-years of data between the pre- and post-SUFA. The impact of SUFA is then described descriptively and inferentially about each of the five outcomes, stratified by pre- and post-SUFA.

5.3.1 Descriptive summary of overall data

The total number of observations for 13 sites in six years included in the analyses was 932 HIV tests per month, 930 newly identified HIV cases per month, 709 enrolled in care per month, 707 assessed eligible for ARV per month, and 707 patients initiated for treatment per month. Total missing numbers amounted to 24.3% (227 missing count data/936 total complete count data x 100%) (936 = 13 sites x 12 months x 6 years) in HIV tests, HIV cases detected, enrolment in care, eligibility for ARV and treatment initiation from 13 SUFA sites. Detailed missing data can be seen in the Appendix I. Total counts of each continuum step in all sites over the study period can be seen in Table 5.2.

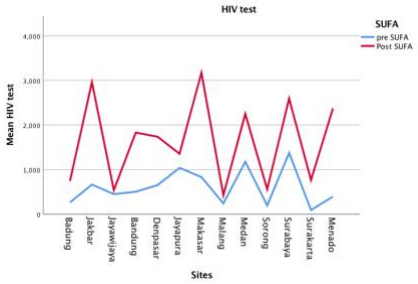
Table 5.2. Total counts and median per month for each stage of HIV continuum cascade in 13 sites over the six years (2011-2016)

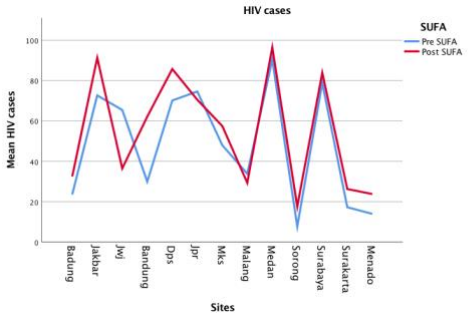
Outcomes	N	Median (IQR)
HIV test performed	1,050,621	787.5 (377.5-1672)
HIV positive cases	48,213	47 (25-76)
Enrolments in HIV care	40,238	52 (26-81)
Eligibility for ARV	33,654	43 (21-66)
Treatments initiated	24,530	30 (16-50)

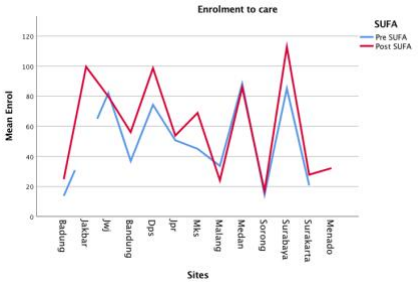
Table 5.2 shows that during the six-year study period a total of 1,050,621 HIV tests were performed (median=787.5 tests per month; IQR=377.5-1672) and there were 48,213 newly detected HIV cases (median=47 cases per month; IQR=25-76) across the 13 sites. There were 40,238 people linked to HIV care (median=52 enrolment per month; IQR=26-81) across the 13 sites. There were 33,654 people observed eligible for ARV (median = 43 eligibility per month; IQR=21-66) and 24,530 persons were initiated for ARV (median=30 initiation per month; IQR=16-50) across the 13 sites.

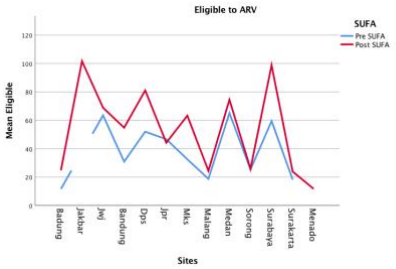
Figure 5.1 presents the line chart of HIV tests, HIV cases, enrolments in care, eligibility for ARV, and treatment initiations from 13 sites in pre- and post SUFA. The graph shows variations and changes in outcomes among sites and between pre- and post-SUFA. Overall, the mean number of HIV tests per month in each site increased from pre- to post-SUFA. In contrast, the mean numbers of HIV cases identified and enrolled in care per month were relatively stable; however the mean number of those deemed eligible for ARV and initiated to treatment per month improved moderately between pre- and post-SUFA. The considerable variability from site to site in pre- and post-SUFA on HIV cascade steps outcomes led us to consider using the multilevel modelling approach (Luke 2004).

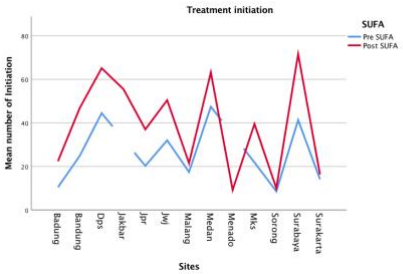
Figure 5.1. The mean number of HIV test, HIV cases, enrolments in care, eligible for ARV, treatment initiations per month among 13 sites in pre- (2011-2013) and post- SUFA (2014-2016).





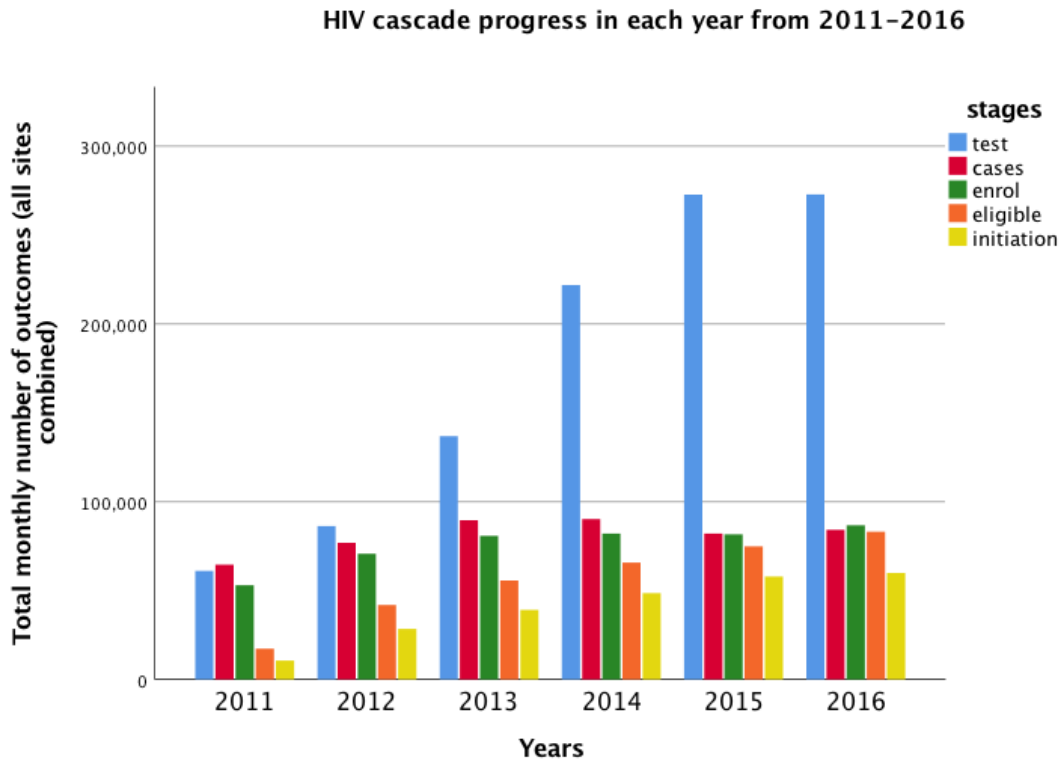






The study analysed the yearly HIV cascade progress during the study period. Figure 5.2 shows the yearly cascade progress, demonstrated by changes in the number of outcomes and in the distance between one stage and the next stage. Improvements of the cascade gaps were observed between HIV cases and HIV enrolments as well as between HIV enrolments and eligibility for ARV after one year of the introduction of SUFA. The space between identifying HIV cases and the enrolment stages, and also the enrolment and determination of eligibility stages became narrower, whereas the gap between eligibility for ARV and treatment initiation stages was unchanged during the same period.

Figure 5.2. The annual cascade progress from 2011 to 2016



Note: Data in cases, enrol, eligible and initiation were multiplied by 10

The progress towards the second target of the UNAIDS 90-90-90 (proportion of treatment initiation among HIV detected positive people) showed that the median proportion per month in post-SUFA were 69.06 % (IQR 51.4-88.3), while in pre- SUFA were 50% (IQR 34.88 - 69.44%), which represented an increase of 19% from pre- to post-SUFA.

5.3.2 Impact of SUFA on HIV test performed

5.3.2.1 Descriptive statistics

Table 5.3 presents the total HIV tests outcomes of all sites stratified by pre- and post-SUFA. In the pre-SUFA period, the median number of HIV tests performed in all sites per month was 448 while in post-SUFA, it was 1546. The number of people being screened increased as much as 171% from pre- (283,281) to post-SUFA (767,340) (incremental). Median proportion HIV population screening increased from 1.0% to 3.0% per month.

Table 5.3. HIV tests outcomes: Pre-SUFA (2011-2013) and post-SUFA (2014-2016) in 13 sites combined

Outcome	**Pre-SUFA (2011-2013)** **Total all sites**				**Post-SUFA (2014-2016)** **Total all sites**				**Incremental ****
	n	**Median (IQR)**	**Median proportion * (IQR)**	**Population at risk**	**n**	**median (IQR)**	**Median proportion (IQR)**	**Population at risk**	**%**
HIV tests	283,281	448 (200-910)	1 (.04-2)	59,628	767,340	1546 (676.5-2394.5)	3 (1.6-8.3)	59,628	171

* Median Proportion = (number of HIV tests per month/number of population at risk in all sites) x 100%; population at risk in all site (see appendix) **Incremental number =((n Post-SUFA-n Pre-SUFA)/ n Pre-SUFA)) x 100%

5.3.2.2 Multivariate multilevel model

Table 5.4, and Figures 5.3 and 5.4 show the impact of SUFA on HIV tests performed using the result of multilevel regression models 1 and 2.

The SUFA intervention was associated with changes in the absolute number of HIV tests per month, as well as, after adjustment with estimation of KAP population, changes immediately and after three years implementation. In Table 5.4, in both absolute

number (model 1) and rate (model 2), the multilevel model showed a significant immediate impact of HIV testing performed per month following the introduction of the SUFA (IRR 1.41; 95% CI 1.25, 1.59; <0.001). The HIV tests trend was also found continuing to increase after 3 years SUFA implementation, however, slightly more slowly (IRR 1.008; 95% CIs 1.004, 1.013; p<0.001) than the HIV test trend in pre-SUFA (IRR 1.04; 95% CIs 1.03, 1.04; p <0.001). The HIV tests trend in pre-SUFA was different to post-SUFA (IRR 0.97; 95% CIs 0.97, 0.98; p<0.001 for time x SUFA interaction for both models).

As shown in Table 5.4, based on ICC, about 56% of the total variation in the absolute number of HIV tests within and between sites was attributable to site differences. After adjustment with the estimation of population at risk in each site (rate), the contribution of site level factor in determining total variation in proportion of HIV tests was reduced to 43%.

Table 5.4. Impact of SUFA on HIV tests: multilevel regression model assuming population as stable throughout the two periods (model 1) and multilevel regression model adjusted for KAP (model 2)

Outcome	**Covariate**		**Model 1** **IRR (95 % CI) (p-value)**	**Model 2** **IRR (95 % CI) (p-value)**
HIV tests	SUFA		1.41 (1.25, 1.59) (<0.001)	1.41 (1.25, 1.59) (<0.001)
	Time	Pre-SUFA	1.04 (1.03, 1.04) (<0.001)	1.04 (1.03, 1.04) (<0.001)
		Post-SUFA	1.008 (1.004, 1.013) (<0.001)	1.008 (1.004, 1.012) (<0.001)
	ICC		0.56	0.43

Figure 5.3. Number of HIV tests trend per month, pre- (2011-2013) and post-SUFA (2014-2016) in 13 sites and predicted number without adjustment for KAP estimation (model 1)

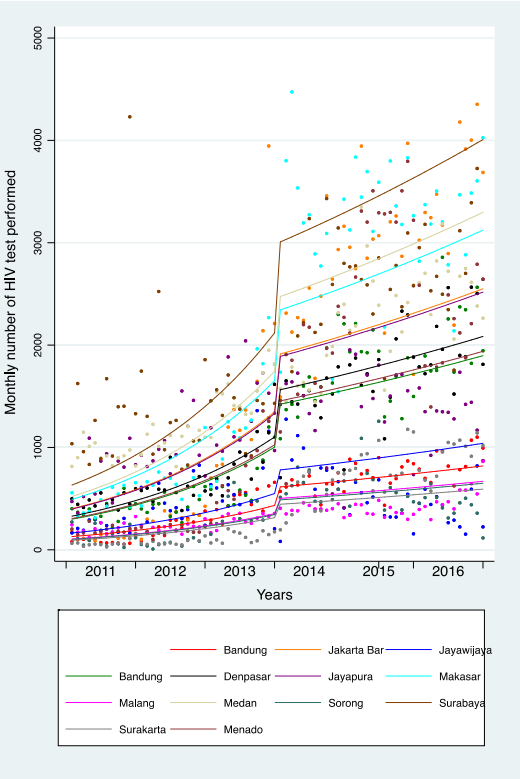
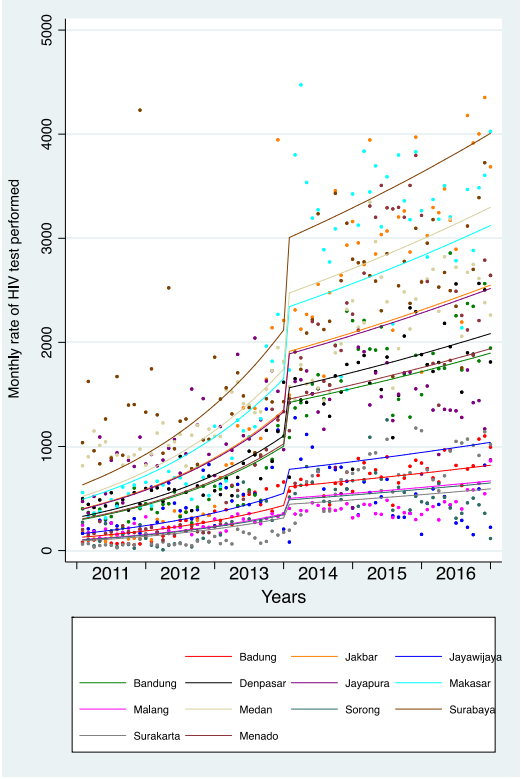


Figure 5.4 Number of HIV tests trend per month, pre (2011-2013) and post-SUFA (2014-2016) in 13 sites and predicted number with adjustment for KAP estimation (model 2)



5.3.3 Impact of SUFA on newly diagnosed HIV

5.3.3.1 Descriptive statistics

Table 5.5 shows that the total of all sites' median numbers of newly detected HIV cases per month was 44 prior to intervention vs. 50 after the intervention. The incremental percentage of newly identified HIV cases was 14% from pre-SUFA (22,514) to post-SUFA (25,699). Between pre- and post-SUFA, the overall median proportion of HIV detection decreased from 8.6% to 3.8 % per month.

Table 5.5. HIV cases outcome: Pre-SUFA (2011-2013) and post-SUFA (2014-2016) in 13 sites combined

Outcome	Pre-SUFA (2011-2013) Total all sites			Post-SUFA (2014-2016) Total all sites			Incremental
	n	Median (IQR)	Median proportion (IQR)	n	Median (IQR)	Median proportion (IQR)	%**
HIV cases	22,514	44 (22-70)	8.6 (6.25-13.7)	25,699	50 (27-79.5)	3.8 (2.6-5.2)	14

Median proportion = (number of HIV cases per month / number of HIV tests per month in all sites) x 100%; **Incremental =((n Post-SUFA - n Pre-SUFA)/ n Pre-SUFA)) x 100%

5.3.3.2 Multivariate multilevel model

Table 5.6 and Figures 5.5 and 5.6 show the impact of SUFA on the absolute number and the rate of HIV cases as the result of multilevel regression of models 1 and 2.

The SUFA intervention was not associated with the absolute number of newly diagnosed HIV cases but was associated with number adjusted with HIV test performed per month immediate after SUFA was implemented. The model detected that immediate change of the absolute number of new HIV cases per month did not differ following SUFA introduction. However, after adjusting the model with the number of HIV tests performed per month, a significant immediate decline of 23% was observed in the HIV cases per month (IRR 0.77, 95% CIs 0.69, 0.86).

Both MLM models also detected that the trends in HIV cases were significantly different between pre- and post-SUFA periods (IRR 0.98; 95% CIs 0.98, 0.99; $p<0.001$ for time X SUFA interaction for model1), (IRR 1.01; 95%CI 1.01, 1.02; $p<0.001$ for time X SUFA interaction for model 2). Model 1 detected a slightly increasing trend in pre-SUFA (IRR 1.013; 95%CIs 1.01,1.02; $p<0.001$), whereas the trend in post-SUFA was towards a decline (IRR 0.996; 95% CIs 0.993, 0.999; $p<0.05$). Meanwhile model 2 detected that the trend prior to the intervention declined (IRR 0.97; 95% CIs 0.97,0.98; $p<0.001$) at a slightly greater rate than the trend after SUFA (IRR 0.987; 95% CIs 0.984, 0.991; $p<0.001$).

Table 5.6 shows that, based on ICC, the total variation within and between sites of the absolute number of HIV cases, at 69% was attributable to between sites. After adjustment with HIV testing, the approximately 63% total variation in rate of HIV cases was attributable to site level differences.

Table 5.6. Impact of SUFA on HIV cases: multilevel regression model assuming population as stable throughout the two periods (model 1) and multilevel regression model adjusted for HIV tests (model 2)

Outcome	Covariate		Model 1 IRR (95 % CI) (p-value)	Model 2 IRR (95 % CI) (p-value)
HIV cases	SUFA		1.04 (0.947, 1.133) (0.445)	0.77 (0.69, 0.86) (<0.001)
	Time	Pre-SUFA	1.013 (1.01, 1.02) (<0.001)	0.97 (0.97, 0.98) (<0.001)
		Post-SUFA	0.996 (0.993, 0.999)(<0.05)	0.987 (0.984, 0.991) (<0.001;)
	ICC		0.69	0.63

Figure 5.5 Number of HIV cases trends per month, pre- (2011-2013) and post-SUFA (2014-2016) in 13 sites and predicted number without adjustment for HIV tests per month (model 1)

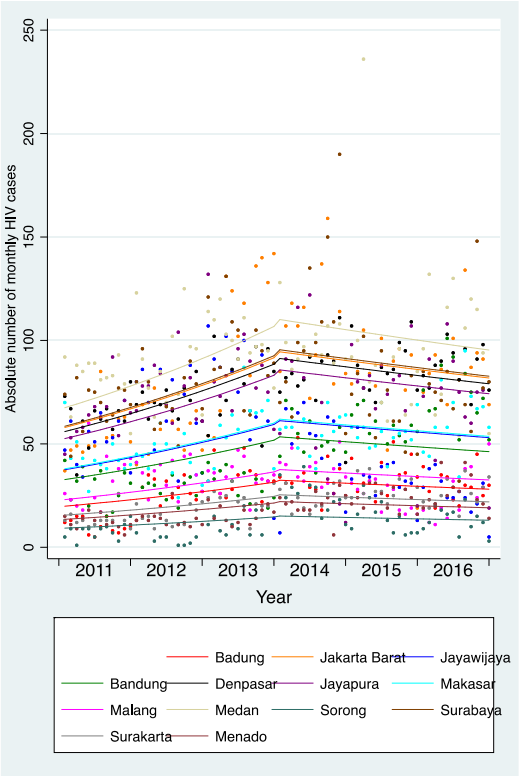
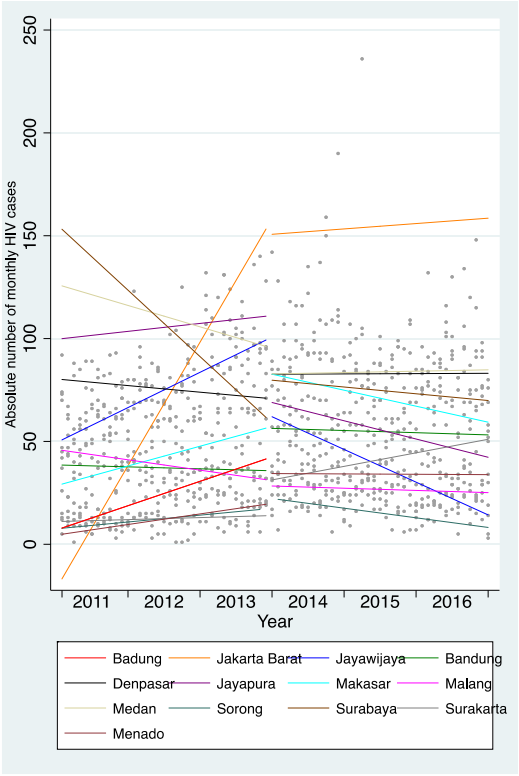


Figure 5.6 Number of HIV cases trends per month, pre- (2011-2013) and post- SUFA (2014-2016) in 13 sites and predicted number with adjustment for HIV tests per month (model 2)



5.3.4 Impact of SUFA on enrolment in care

5.3.4.1 Descriptive statistics

Table 5.7 shows that, prior to the intervention, the total (all sites) median number of enrolments in care per month was 47, while after the intervention the median number of enrolments in care per month was 57. The number of enrolments in care increased as much as 70% from pre- (14,816) to post SUFA (25,422). Although the median proportion of enrolments in care was unchanged from pre- to post-SUFA, the proportion was almost universal in both pre- (98.9%) and post-SUFA (98.6%).

The upper limit IQR of median proportion enrolment in care exceeded 100% in pre- and post-SUFA. This was obtained as a result of the amount of the numerator (number of enrolments in care) being larger than the amount of the denominator (number of HIV cases). This could occur because data were taken cross sectionally each month and each cascade stage in a month could be sourced from different individuals (e.g. some individuals who were detected for HIV in a month could be enrolled in a different month of diagnosis). Thus, number of enrolments in a month could be different with the number of individuals who were detected for HIV cases from the same month.

Table 5.7. Enrolment to care outcome: Pre-SUFA (2011-2013) and post-SUFA (2014-2016) in 13 sites combined

Outcome	**Pre-SUFA (2011-2013)** **Total all sites**			**Post-SUFA (2014-2016)** **Total all sites**			**Incremental**
	n	**Median (IQR)**	**Median proportion (IQR)**	**n**	**Median (IQR)**	**Median proportion (IQR)**	**%****
Enrolment in care	14,816	47 (24-72)	98.9 (75-116)	25,422	57 (27-86)	98.6 (78.3-121)	70

Median proportion = (number of enrolment to care per month / number of newly HIV diagnosed per month) x 100%; **Incremental % =((n Post-SUFA - n Pre-SUFA)/ n Pre-SUFA)) x 100%

5.3.4.2 Multivariate multilevel model

Table 5.8 and Figures 5.7 and 5.8 show the impact of SUFA on enrolment in care as a result of multilevel regression models 1 and 2.

The SUFA intervention was not associated with the absolute number and the rate of enrolments in care right after SUFA was introduced. The MLM detected that the immediate change of absolute number and rate of enrolments in care per month did not differ following the introduction of SUFA.

The SUFA intervention was associated with absolute number and rate of enrolment in care three years after implementation of SUFA. The trend of enrolments in care per month in pre- and post SUFA differed in both (IRR 0.98; 95%CIs 0.97, 0.99 ; p<0.001 for Time X SUFA interaction for model1) (IRR 0.98; 95%CI 0.98, 0.99; p<0.001 for Time X SUFA interaction for model2). The MLM detected an increased trend in the absolute number of enrolments in care per month in the pre-SUFA period (IRR 1.016; 95% CI 1.01, 1.022; p<0.001), while a trend towards a decline in the post SUFA period was not significant (IRR 0.996; 95% CI 0.992, 1.0; p= 0.063). The MLM also detected an increased trend of rate of enrolment in care per month at pre-SUFA (IRR 1.01 95% CI 1.0, 1.02; p<0.05), while there was trend towards decline in post SUFA (IRR 0.994 95% CI 0.989, 0.998; p<0.05).

Based on the ICC, the total variation within and between sites of absolute number of enrolment in care of 56% was attributable to variation between sites. After adjustment with HIV cases, the influence of site level differences in determining total variation in rate of enrolment to care reduced to 40%.

Table 5.8. Impact of SUFA on enrolment to care: multilevel regression model assuming population as stable throughout the two periods (model 1) and multilevel regression model adjusted for HIV cases (model 2)

Outcome	**Covariate**		**Model 1** **IRR (95 % CI) (p-value)**	**Model 2** **IRR (95 % CI) (p-value)**
Enrolments in care	SUFA		1.06 (0.929, 1.206) (0.391)	1.12 (0.971, 1.289) (0.119)
	Time	Pre-SUFA	1.016 (1.01, 1.022) (<0.001)	1.01 (1.0, 1.02) (<0.05)
		Post-SUFA	0.996 (0.992, 1.00) (0.063)	0.994 (0.989, 0.998) (<0.05)
	ICC		0.56	0.40

Figure 5.7 Number of enrolments in care trend per month, pre- (2011-2013) and post-SUFA (2014-2016) in 13 sites and predicted number without adjustment for HIV cases detected per month

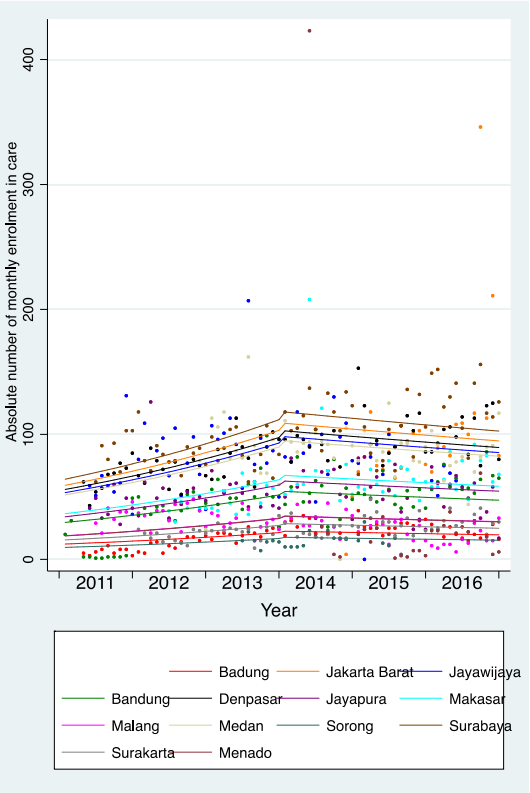
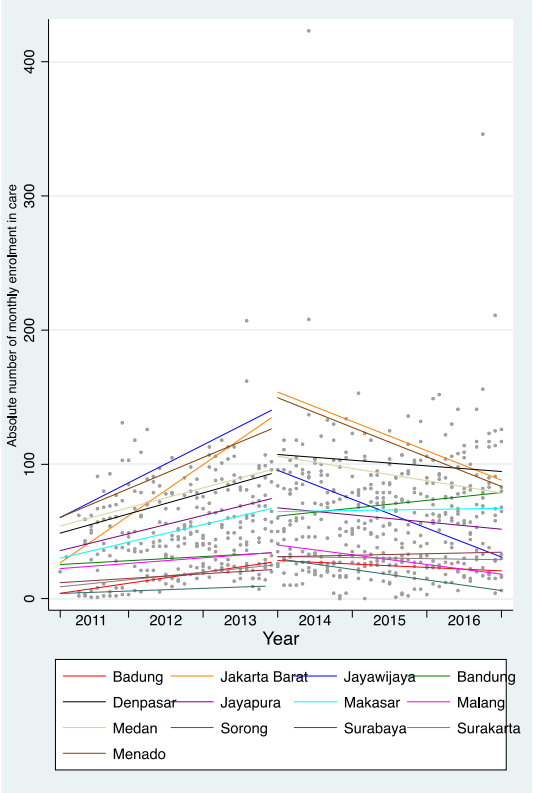


Figure 5.8 Number of enrolments in care trend per month, pre- (2011-2013) and post-SUFA (2014-2016) in 13 sites and predicted number with adjustment for HIV cases detected per month



5.3.5 Impact of SUFA on eligibility for ARV

5.3.5.1 Descriptive statistics

As shown in Table 5.9, prior to the intervention the total median number of persons eligible for ARV per month was 37 across all sites, while after the intervention the median number of eligible for ARV per month was 52. Across all sites, the total of the number of eligible for ARV increased as much as 98% ((22,380-11,274)/11,274) x 100% from pre- (11,274) to post-SUFA (22,380). Median proportion of eligible for ARV per month increased from 76.9% in pre-SUFA to 90.3% in post-SUFA.

Table 5.9. Eligible to ARV outcomes: Pre-SUFA (2011-2013) and post-SUFA (2014-2016) in 13 sites combined

Outcome	Pre-SUFA (2011-2013) Total all sites			Post-SUFA (2014-2016) Total all sites			Incremental**
	n	Median (IQR)	Median Proportion * (IQR)	n	Median (IQR)	Median Proportion * (IQR)	%
Eligible for ARV	11,274	37 (19-53)	76.9 (66.1-89.8)	22,380	52 (24-74)	90.3 (77-100)	98

*Proportion Median = (number of eligible for ARV per month / number of enrolment to care per month) x 100%; **Incremental=((n Post-SUFA - n Pre-SUFA)/ n Pre-SUFA) x 100%

5.3.5.2 Multivariate multilevel model

Table 5.10 and Figures 5.9 and 5.10 show the impact of SUFA on eligibility for ARV as result of multilevel models 1 and 2.

The SUFA intervention was not associated with the absolute number and rate of eligibility for ARV right after SUFA introduced. The MLM detected that the absolute number and rate of eligibility for ARV per month did not differ immediately following SUFA introduction.

The SUFA intervention was associated with absolute number of eligible for ARV but not associated with rate of eligible for ARV three years after SUFA implementation. The model identified that the trend of the absolute number of eligible for ARV per month was different between the two periods (IRR 0.99; 95% CI 0.98, 0.99; p <0.001 for time X SUFA interaction). In post SUFA, the trend of the number of eligible for ARV per month increased (IRR 1.005 95% CI 1.061, 1.009; p<0.05), however at a slower growth than in pre-SUFA (IRR 1.02; 95% CI 1.013, 1.024; p<0.001). The model also detected that the trend of the rate of eligibility for ARV per month in pre-SUFA increased (IRR 1.003; 95% CI 0.999, 1.008; p=0.112) slightly more slowly than the trend in post-SUFA (IRR 1.005 95% CI 1.002, 1.008; p<0.05) although there was no difference between the two trends (p=0.499 for time x SUFA interaction).

Based on ICC, the total variation within and between sites absolute number of eligible for ARV of 61% was attributable to site level factors. After adjustment with enrolments in care, an influence of site level differences in determining total variability in rate of eligibility for ARV was reduced by almost half (34%).

Table 5.10. Impact of SUFA on eligibility for ARV: multilevel regression model assuming population as stable throughout the two periods (model 1) and multilevel regression model adjusted for enrolment to care (model 2)

Outcome	**Covariate**		**Model 1** **IRR (95 % CI) (p-value)**	**Model 2** **IRR (95 % CI) (p-value)**
Eligible for ARV	SUFA		1.03 (0.908; 1.165) (0.661)	1.02 (0.928; 1.109) (0.750)
	Time	Pre-SUFA	1.02 (1.013, 1.024) (<0.001)	1.003 (0.999, 1.008) (0.112)
		Post-SUFA	1.005 (1.061, 1.009) (<0.05)	1.005 (1.002, 1.008) (<0.05)
	ICC		0.61	0.34

Figure 5.9 Number of eligible for ARV trend per month, pre- (2011-2013) and post SUFA (2014-2016) in 13 sites and predicted number without adjustment for enrolment to care per month (model 1)

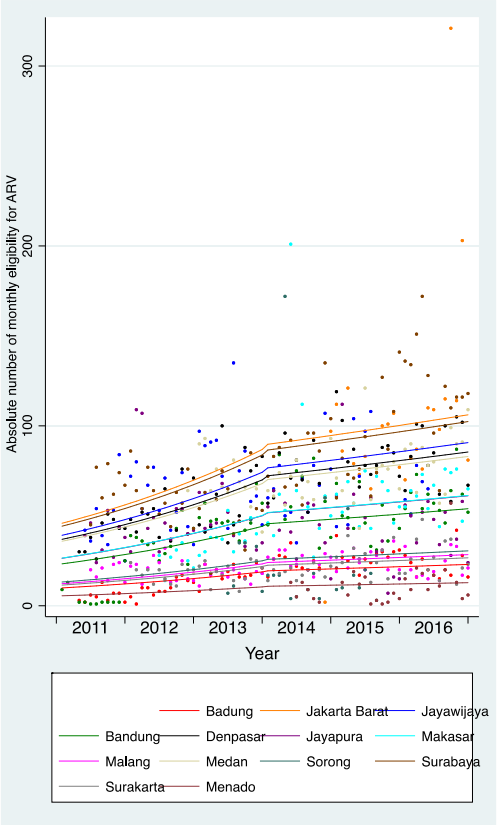
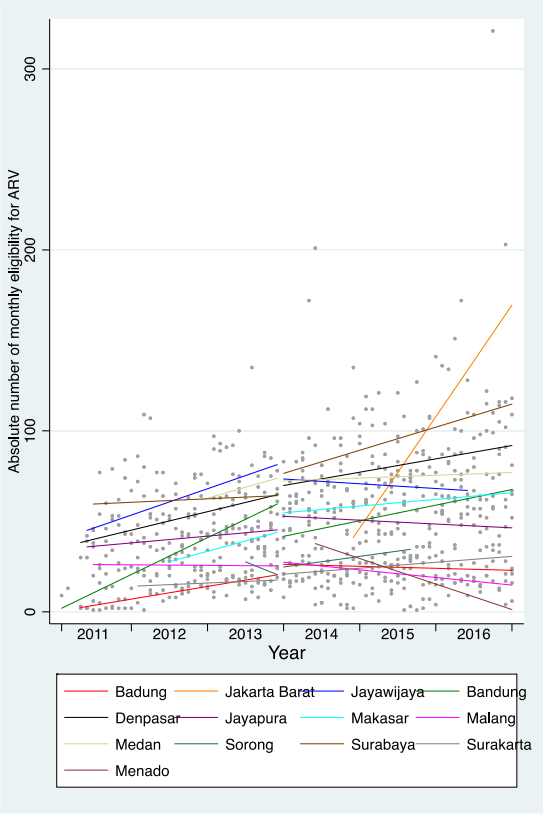


Figure 5.10 Number of eligible for ARV trend per month, pre- (2011-2013) and post SUFA (2014-2016) in 13 sites predicted number with adjustment for enrolment to care per month (model 2)



5.3.6 Impact of SUFA on treatment initiation

5.3.6.1 Descriptive statistics

Table 5.11 shows that in all sites combined, the median number of treatment initiations per month was 23 prior to the intervention implementation, while the median number of treatment initiations per month was 38.5 after the intervention implementation. The number of treatment initiations increased as much as 120% (((16,632-7,658)/7,658) x 100%) from pre- to post-SUFA. Median proportion of treatment initiation per month increased from 75.8% in pre-SUFA to 81.2% in post SUFA.

Table 5.11. Treatment initiation outcome: Pre-SUFA (2011-2013) and post-SUFA (2014-2016) in 13 sites combined

Outcome	Pre-SUFA (2011-2013) Total all sites			Post SUFA (2014-2016) Total all sites			Incremental **
	n	Median (IQR)	Median Proportion (IQR)	n	Median (IQR)	Median Proportion (IQR)	%
Treatment Initiation	7,658	23 (14-39)	75.8 (54.7-92)	16,632	38.5 (19.5-56.5)	81.2 (64.2-93.4)	120

* Median Proportion = (number of treatment initiation per month / number of eligible for ARV per month) x 100%; **Incremental=((n Post-SUFA - n Pre-SUFA)/ n Pre-SUFA) x 100%

5.3.6.2 Multivariate multilevel model

Table 5.12 and Figures 5.11 and 5.12 show the impact of SUFA on treatment initiations as a result of multilevel models 1 and 2.

The MLM detected that the absolute number and rate of treatment initiations per month were not associated immediately after implementation of SUFA. The model detected that immediate change of absolute number and rate of treatment initiation per month did not differ following SUFA introduction.

After three years implementation, the SUFA was associated with both absolute number and rate of treatment initiation. The MLM identified that the absolute number of treatment initiation trends were different between the two periods (IRR 0.98; 95% CI 0.98-0.99; p<0.001 for Time X SUFA interaction). Post SUFA trends absolute number of treatment initiations (IRR=1.005; 95% CI 1.001, 1.008; p<0.001) increased, however at slower rate than pre-SUFA (IRR=1.02; 95% CI 1.019,1.029; p<0.001). The MLM also identified that the pre- SUFA trend of rate of treatment initiations was different to post-SUFA (IRR 0.99; 95% CI 0.99-1.00; p <0.05 for time x SUFA interaction). The pre-SUFA trend in rate of treatment initiations slightly increased (IRR 1.005; 95% CI 1.00, 1.01; p<0.05) whereas the post-SUFA trends were towards a very slow decline (IRR 0.998; 95% CI 0.995, 1.002; p=0.323).

Based on ICC, the total variation within and between sites of the absolute number of treatment initiations 70% was attributable to site level factor. After adjustment with eligibility for ARV, the influence of site level differences in determining total variation rate of treatment initiation was reduced to 53%.

Table 5.12. Impact of SUFA on treatment initiation: multilevel regression model assuming population as stable throughout the two periods (model 1) and multilevel regression model adjusted for eligibility for ARV (model 2)

Outcome	Covariate		Model 1 IRR (95 % CI) (p-value)	Model 2 IRR (95 % CI) (p-value)
Treatment initiation	SUFA		1.07 (0.956, 1.198) (0.241)	1.088 (0.987, 1.198) (0.089)
	Time	Pre-SUFA	1.02 (1.019, 1.029) (<0.001)	1.005 (1.00, 1.01) (<0.05)
		Post-SUFA	1.005 (1.001, 1.008) (<0.05)	0.998 (0.995, 1.002) (0.323)
	ICC		0.70	0.53

Figure 5.11 Number of treatment initiation trends per month, pre- (2011-2013) and post-SUFA (2014-2016) in 13 sites and predicted number without adjustment for eligible per month (model 1)

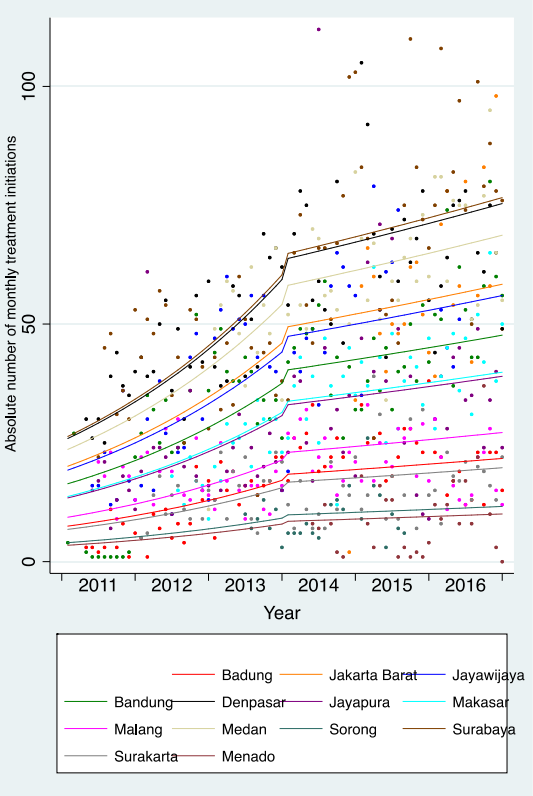
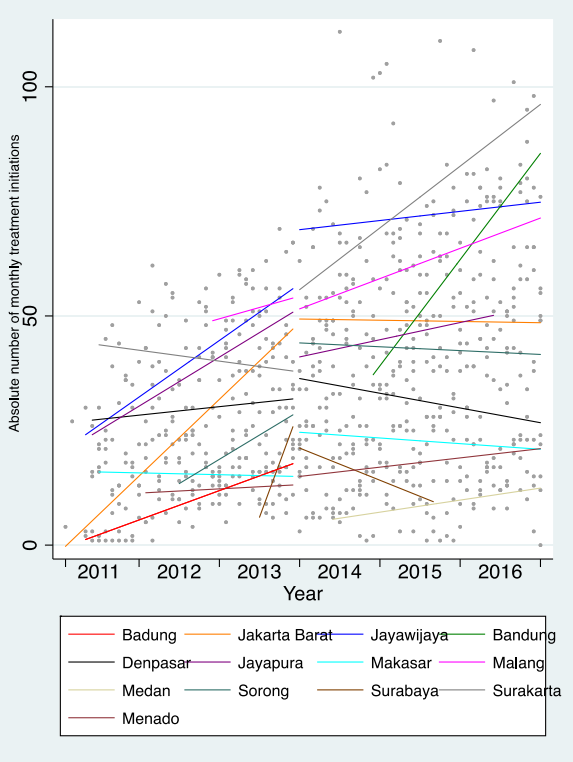


Figure 5.12 Number of treatment initiation trends per month, pre- (2011-2013) and post-SUFA (2014-2016) in 13 sites and predicted number with adjustment for eligible per month (model 2)



5.4 Discussion

5.4.1 Impact of SUFA on HIV tests performed

The results of the study suggest that there was a significant immediate impact of the SUFA intervention on HIV tests performed, as well as a significant medium impact after three years of SUFA acceleration in thirteen sites. There was an immediate increase of 41% in HIV testing performed per month, both in absolute number of HIV tests and number of HIV tests per estimated KAP per month (since the estimated KAP remained the same), following the introduction of the SUFA intervention. The sudden jump of testing indicated a successful adoption of the intervention to accelerate testing completeness at the beginning of implementation by providers. An observed immediate increase in HIV tests may be due to the fact that HIV testing is the first aim of the intervention, and functions as a gateway to identify those at high risk of HIV as well as to determine numbers likely to progress to the next stages in the HIV clinical pathway; thus, all initial resources and attention might be directed to improve this stage.

This study demonstrated that a significantly different trend between pre- and post-SUFA of HIV testing in both models showed that SUFA was associated with HIV tests. These significant increases in the trend of HIV testing per month over time from pre- to post-SUFA indicated a continuation of effectiveness of the intervention, although slightly slower than pre-intervention. This may be related to a better adoption of the initiatives over time (Abimpaye et al. 2018) by providers who carried out the HIV testing service program for the high-risk community as beneficiaries of the HIV testing services. A study from North Carolina found a similar monthly trend in HIV tests after the adoption of routine op-out HIV testing (PITC) and case detection. After the intervention was implemented, HIV tests increased (34 tests per month or 0.46 tests per 100,000 persons per month); however the increase was slightly flatter than prior to the intervention (55 tests per month or 0.81 tests per 100 000 persons per month) (Klein et al. 2014). The findings of this current study support those of the monitoring and

evaluation of SUFA reported by the MOH consultant using population data and descriptive analysis in the early phase of SUFA implementation. It was reported that upward trends in HIV testing and counselling was observed in the thirteen districts where almost no growing trend was seen in national data from year 2013-2014 (Ministry of Health (ID) 2015a).

The success of SUFA in expanding the HIV tests using a combination of mobile clinic HTC, VCT and PITC approaches showed that the additional population targeted in the SUFA era (Chapter 1, section 1.4.4, Table 1.1) might have contributed to improving the testing uptake. The study did not collect data on the characteristics of the population tested, such as whether the populations included pregnant mothers, TB patients, or KAP or which testing modalities tested which population type. This would have helped to assess whether the testing reached target subpopulations. For example, a cluster randomised trial study in the hyperendemic country, Lesotho, found that HBHTC identified a higher proportion of children and adolescents (<20 years) while MBHTC reached a higher proportion of adult men (Labhardt et al. 2014).

However, another MOH report that monitored and evaluated SUFA utilising descriptive analysis showed that imbalanced population targeting might have occurred. The report indicated that, although HIV testing and counselling increased significantly from 2010-2014, this was likely due to an increase of testing of pregnant mothers rather than of KAP particularly between 2013-2014 in the thirteen sites (World Health Organization 2014b).

Infrastructure and human resources associated with the SUFA intervention are considered to be the main contributors to the rapid expansion of access to counselling and testing. These included the substantial number of campaigns promoting HIV tests, outreach programs, the establishment of new HIV testing service clinics, a significant increase in staff numbers within and outside hospitals and clinics including lay workers

who had the capacity to provide PITC and VCT. Additional contributing activities were promotion of SUFA to professional organisations such as the Indonesian Midwives Association, as well as expanding and strengthening networking among clinics and hospitals, lay workers, community based organisation, key affected populations and subdistrict task forces (Kencana 2014; Ministry of Health (ID) 2015a). Nevertheless, some barriers to development from facilities-based to testing elsewhere (the major approach used in SUFA) were long travel distance, long waiting times, inconvenient time of tests services, staff behaviour, lack of confidentiality, and patient related factors (health seeking behaviours, negative attitude towards HIV testing, and fear of stigma/discrimination) (Johnson, CC et al. 2017; Shamu et al. 2018).

5.4.2 Impact of SUFA on detected HIV cases

The expansion of HIV testing and treatment to high-risk populations, the SUFA intervention was associated with a 23% significant immediate decrease in the population of HIV cases detected per HIV tests per month following the launch of SUFA. The increase of HIV tests from the previous step is likely to have an immediate impact in reducing HIV cases detected per HIV tests per month. An 11% reduction in the HIV positivity rate after introduction of the routine opt-out testing and case detection intervention was also observed in an ITS study conducted in North Carolina (Klein et al. 2014). This current study also found a slight, gradual but consistent declining trend in the number of HIV cases detected and the number of HIV cases detected per HIV tests per month after investigating the trend for three years post-SUFA implementation. This finding was also similar to the SUFA monitoring and evaluation report conducted by the MOH consultant using a descriptive approach that, as HIV testing increased, the prevalence of HIV cases detected declined in 13 SUFA sites and nationally (World Health Organization 2014b).

Three factors were responsible in determining the number of people diagnosed per year: regional HIV prevalence, performance of HIV testing programs, and individual readiness

to be diagnosed (Wu et al. 2015), which may explain the slight reduction in cases per month in post-SUFA. The decrease of HIV prevalence in the SUFA areas may be one factor to be considered. The MSEM model suggested that apart from other multilevel factors, HIV prevalence ultimately determines the number of HIV cases that can be found in an area (Baral et al. 2013). However, the researcher considered that this was less likely the cause. The projection of HIV incidence in Indonesia predicted steady growth until 2025, according to the Asian Epidemic Modelling (AEM), particularly among MSM and women from the general population (Ministry of Health (ID) 2015c).

The second most likely reason for the decline in HIV cases per month was the performance of the HIV program in the SUFA areas. The SUFA providers might have disproportionally targeted certain population groups and have shifted priority from high risk to low risk groups, resulting in fewer cases found. A specific policy to expand HIV tests to pregnant women was implemented years before the implementation of SUFA (Ministry of Health (ID) 2013e) and this testing policy was incorporated into the SUFA intervention (Chapter 1 section 1.4.4 table 1.1). Compared to key affected populations, offering tests to pregnant women was assumed by the researcher to be more prioritised in the SUFA implementation era. Furthermore, pregnant women were easier to reach relative to KAPs as they were already accessing care in clinics. In contrast, KAPs required more effort to reach, involving sizeable human, time, logistics and money input. This may have caused providers to shift their focus to pregnant mothers, despite this group being considered the lower risk group. HIV prevalence among pregnant women was estimated 0.49% in 2016 (Ministry of Health (ID) 2013e) compared to HIV prevalence among KAP ranges between 9.4% to 39.5% in 2013 (Ministry of Health (ID) 2015c). Clinics were set HIV test targets to aim for each month according to population type, for example 45% for HTC clients, 17-21% for KAPS, 5-19% for pregnant women, 0.4-7% TB patients, 9-35% for STI patients (Ministry of Health (ID) 2015a). However, these targets were not always reached. In practice, poor communication between

logistics persons in provincial/district health offices and HTC providers resulting into HTC providers delivered testing programs without well program plans thus insufficient supplies occurred (author's observation). This assumption is supported by the monitoring and evaluation report to the MOH about the scaling up of HIV tests between 2010 and 2014 in 13 SUFA sites. The expansion of testing in key populations was less substantial, compared to pregnant women, particularly in 2014 (World Health Organization 2014b). Another MOH report also suggested that the problem of competing logistical issues in the 13 sites might explain this phenomenon. The MOH report also suggested strengthening community outreach to reach more KAP (Ministry of Health (ID) 2015a).

5.4.3 Impact of SUFA on enrolment to care

The SUFA intervention did not affect enrolments in care immediately after implementation. However, the intervention was associated with increased enrolments in care in absolute number as well as rate per month three years after implementation, although the trends were declining. Further, the findings in the median proportion of enrolments in care indicated that almost all newly detected cases were universally linked into care in both periods.

On consideration of the first model, two reasons may indicate the very slight drop in trend. The reducing trend from month to month in the absolute number of newly diagnosed HIV cases contributed to a similar trend in the enrolments in care. Additionally, there might have been a small proportion of newly diagnosed HIV cases that were not linked into care over time in post-SUFA. Unsolved barriers linking to care might be the reason for this problem. The expansion of testing centres to within and outside hospitals/clinics in the post SUFA era might create somewhat immature referral systems and tracking mechanisms. Clinics that only have HIV testing services without offering HIV care and treatment are permitted by Indonesian regulation as long as they refer the patients to centres with more comprehensive care and treatment capabilities

(Ministry of Health (ID) 2014d). Referral systems were also required when patients tested positive with HIV through outreach programs conducted by clinics. Patients were usually linked to care via a letter of referral, making the patients responsible for delivering the letter to the designated clinics. Unfortunately, some patients did not present to those clinics. This process may have inadvertently created a barrier to care access due to the separation of testing from care and treatment services. The lack of adequate referral systems and tracking mechanisms are likely to have impacted negatively on linkage uptake (Hewett et al. 2016).

Regarding the second model, the flatter trend in post-SUFA might indicate that data on newly detected cases and enrolments in care in pre-SUFA were already saturated; thus, no real improvement from there in proportion of enrolments in care could be expected. Data on median proportion of enrolments in care in pre-SUFA (98.9%) were quite similar with pos-SUFA (98.6%), which may explain the assumption that almost all newly HIV detected cases were successfully linked to care. Either pre- or post-SUFA may have used effective linkage interventions that were able to enrol the majority of their population to HIV care. The testing strategy of 'facility based HTC (VCT or PITC)' in both periods (Chapter 1 section 1.4.4 table 1.1) may explain these promising findings. Since the HIV testings were conducted in health care facilities, particularly in facility settings which had comprehensive HIV care and treatment, enrolment in care was facilitated (World Health Organization 2007a). The HCC cohort study findings conducted in four locations in Indonesia supported this argument, that being tested and treated in the same health care facilities was an important predictor for enrolling into HIV care (Januraga et al. 2018).

5.4.4 Impact of SUFA on eligibility for ARV

Study 2 found that the SUFA did not immediately affect eligibility for ARV but after three years SUFA was associated with the absolute number of those eligible for ARV per month, although the increasing trends were slightly flatter than pre-SUFA. The study

findings also showed that, more than 90% of people enrolled in care were eligible for ARV, which was increased compared to pre-SUFA (76.9%).

Two possible reasons contributed to the increased trends. The absolute number of enrolments per month increased as well as the absolute number of people assessed as eligible due to the expanded eligibility criteria. This interpretation was supported by data on median enrolment and eligible for ARV. However, the slower increase in the absolute number eligible for ARV per month post-SUFA compared to pre-SUFA may be because the proportion of those eligible per month in pre-SUFA had achieved a saturation point; thus, although in post-SUFA the trends were growing it was difficult to grow much more. SUFA could show its potential to maintain a constant increase of eligibility for ARV, but the increase might be not as high as expected. As for HIV identification, there was a potential problem of the proportion of finding more HIV cases in clinical settings rather than through outreach. This led to identifying more HIV cases at later stages of infection with their CD4 counts already low (Menzies et al. 2009; Topp et al. 2012). Thus, the proportion of HIV patients who were enrolled and then had their eligibility determined according to the new SUFA treatment criteria was not as great as planned. Identifying a greater proportion of people early in their infection would have made the SUFA eligibility criteria more useful in determining earlier their eligibility for ARV then earlier in initiating treatment in this group. This is an important condition for the success of the SUFA intervention, as postulated in a SUFA consultative paper. Expansion of the treatment criteria could double the number of people eligible for ARV, which could significantly increase the people receiving treatment as well (Chapter 4 section 4.4.2) (National AIDS Commission & Ministry of Health (ID) 2013).

After accounting for the number of enrolments in care per month in both pre- and post SUFA, the increasing trends from one month to the next month did not differ between the two periods. There was an increase in the eligibility for ARV but possibly there were not as great as expected due to identifying mostly people with counts that would have

met the old criteria as well as the new criteria. More time might be needed to see the impact on eligibility for ARV more clearly.

5.4.5 Impact of SUFA on treatment initiation

The SUFA intervention did not immediately affect treatment initiation but the impact over the longer term demonstrated more promise. After three years post-SUFA, the trend in the absolute numbers of treatment initiations and absolute numbers of treatment initiations per eligibility for ARV per month differed, although both models visualized towards flatter trends in post-SUFA than in pre-SUFA.

The continued increasing trends in post-SUFA (model 1) was due to the increased number of people eligible for ARV per month as well as the increased number of people who were initiated for ARV. The findings in median numbers of treatment initiation per month supported further that there was a substantial change in the absolute number of people receiving treatment for the first time from 23 in pre-SUFA to 38.5 in post-SUFA. A South African study of the expansion of HAART used ITS to assess the effect of strengthening the health system with quality improvement including the decentralization of care to primary health center, increasing staff involvement and teamwork (Webster et al. 2012). Utilizing data to set and evaluate the progress, the study also found a significant improvement in the mean numbers of treatment initiations per month from 179 to 511 over a three-year period (Webster et al. 2012). Further, TasP was found to be a promising intervention that increased treatment initiations by cohort and CRCT studies in SSA and China (Floyd et al. 2018; Hayes et al. 2017; Iwuji et al. 2016; Mody et al. 2018; Wu et al. 2015).

After adjustment with the population eligible for ARV per month (model 2), the flattened trend in rate of treatment initiations per month may indicate a problem of 'late adoption' of the innovation in the field, although the intervention still showed potential to maintain high rates of treatment initiation. The success and speed of adoption by a community

of a new innovation depend on a variety of factors, including the characteristics of the potential adopters, the rate of adoption, the nature of the social system, the characteristics of the innovation and the characteristics of the change agents (Nutbeam, Harris & Wise 2010). In society, some individuals react more quickly to more modern ideas while others tend to be suspicious of change and slow to react. The 'late adopter' assumption was suggested by a Medan district facilitator (Kencana 2014), who found that the SUFA criteria (irrespective CD4 count) were not yet applied to key affected populations. The local NGOs were able to find the cases from the KAP group but when the patients moved to treatment stage, they did not receive ARV drugs and instead were told to wait until their CD4 dropped below the 350 level (Kencana 2014)

Nevertheless, data on the median proportion of treatment initiation showed a very slight increase in proportion from 77.8% and 81.2% and there were still about 20% of people eligible who did not get treatment in both periods. Even after applying the SUFA intervention, particularly the simplification of the treatment procedure from a compulsory CD4 count and blood test examination to control for health progress and, if indicated and available, frequency of treatment adherence counselling from subjective frequency to four times (Chapter 1 section 1.4.4 table 1.1), there were only slight increases in proportion of treatment initiations. This indicates that much work still needs to be done to improve this condition. There are a number of reasons why eligible people were not initiated into treatment in Indonesia. A scoping review conducted recently found that economic problems related with CD4 tests and blood examination or administration and transportation costs, and fear of treatment side effects (Lazuardi, Bell & Newman 2018) were some of the reasons for not getting treatment. Further, a qualitative study conducted in Papua Indonesia found several barriers to PMTCT receiving treatment: women's doubts on ARV efficacy, particularly for asymptomatic women, and unsupportive partners who actively prevented women from seeking treatment (Lumbantoruan et al. 2018). Psychosocial factors (such as stigma,

discrimination and preference for traditional medicines), structural factors (such as poverty and distance to clinic), and clinic system characteristics (such as rigid policies and long wait times) were among the reasons given for not initiating treatment in sub-Saharan Africa (Layer et al. 2014)

5.4.6 Strength and limitations of the study

There were several strengths of the study including the use of interrupted time series multilevel modelling study to assess the effectiveness of multilevel interventions on the comprehensive HIV continuum of care cascade, from population to clinical stages. Another major strength of the study was the large scope size of the data set and the breadth of the period time analysed, utilizing six years of monthly HCC data belonging to thirteen sites that represented other sites across Indonesia. The study used the appropriate MLM technique that accounted for potential confounder due to clustering.

However, the findings should be interpreted in the light of the study limitations. In the HIV testing stage, the project was not able to differentiate whether data were sourced from new clients or re-testers or pregnant mother or KAP. This study was not adjusted for age and gender groups in our MLM model. Data were analysed using monthly count without information age and gender, however we assumed age and sex stay the same before and after the intervention. The other limitation of the study was due to the characteristics of the secondary data, which meant missing data could not be avoided. However, the uncertainty of the data was minimised by consulting with the staff in charge. The missing data in this study occurred due purely to reporting and recording issues in the field. For example, staff from field offices delayed sending, or even failed to send monthly reports to the central office (reported by the central office staff). This happened for a number of reasons: lack and high turnover of RR staff, postponement of entering data into the forms, or satellite RR staff failing to complete the report (Ministry of Health (ID) 2015a). For these reasons, the pattern of the missing data was assumed to be random (missing data independent of both the exposure (SUFA) and

outcomes), and less likely to introduce biased estimates (Newsom, Jones & Hofer 2012). Also the study is based on aggregate data and therefore the associations cannot adjust for individual confounders and there is the possibility of an ecological association. For example the effects observed may be a result of the different time periods with differing demographics in those tested.

Whilst the point estimates for the time trends from pre to post-SUFA were statistically significant, there was also a reasonably level of uncertainty in these estimates which was reflected in the width of the 95% CI's. Specifically, in the enrolment to care and eligibility for ARV, the change in the rate of enrolments and eligibility might be as low as 1% per-month (the lower limit of 95% CIs). Determining whether changes as small as these could still be considered meaningful after three years post SUFA, further study such as an economic evaluation of the costs and savings from SUFA would be needed.

5.5 5.6. Summary

The interrupted time series study found that the SUFA policy initiatives implemented in thirteen regencies and cities across Indonesia were associated with increased HIV tests performed and a reduced number of HIV detections per HIV tests performed immediately after implementation of the intervention. The study also found that the SUFA influenced the trends in HIV tests, HIV detections, enrolments in care, eligibility for ARV and treatment initiations three years after implementation of SUFA.

Although the overall results were encouraging, discovering HIV cases in these thirteen sites remained a challenge. Disproportional targeting of low risk populations (such as pregnant mothers rather than KAP) likely resulted in the decreasing positivity rate after implementation of the intervention. Nevertheless, eligibility for ARV per month demonstrated promise that almost all HIV people enrolled were eligible for ARV. The focus of a future program is likely to find more cases beyond health facilities and to initiate all eligible people into treatment, as the post-SUFA improvement was only slight.

Chapter 6

Retrospective Cohort Study

CHAPTER 6 RETROSPECTIVE COHORT STUDY

6.1 Introduction

The previous chapter reported the investigation of the impact of SUFA along the HIV continuum of care cascade immediately after implementation and three years later in thirteen demonstration sites using population level data. This chapter examines the SUFA impact in greater detail in relation to the number of PLHIV and the length of time for them to transition from one step to the next step in the HIV HCC one year before and after the implementation of SUFA. To address this specific enquiry, one research question was posed:

What are the differences in the rates of enrolment in care, eligibility for ARV, treatment initiation, loss to follow-up (LTFU) and death between pre-SUFA and post-SUFA?

This chapter is comprised of six sections, Section 1 provides the introduction, and section 2 details the methods including the study design, locations, population, data source, data collection techniques, data variables and measurements, data analysis and instrument test. Section 3 reports on the study results, while section 4 provides a discussion of the results. The chapter ends with a review in section 5 of the study's strength and limitations and section 6, the summary.

6.2 Methods

6.2.1 Study design

The retrospective cohort design (Study 3) reported in this chapter was used to support evidence in the Study 2, by an investigation of whether the associations observed in Study 2 at the population level also occurred at the individual level. The individual cohort study was able to produce stronger level of evidence on the temporal sequence that the SUFA effect preceded the outcomes of interest (Woodward 2005). It also more

comprehensively accounted for demographic and clinical characteristics of the participants that generally stayed the same across time i.e. pre- and post-SUFA. Thus, the project was able to produce more robust and convincing evidence. However, this study was conducted in only two sites, Medan and Batam, unlike the ITS study which was conducted in thirteen cities, and results may therefore be less generalisable.

A retrospective cohort design was the most appropriate given the retrospective nature of the data on our outcomes of interest. Retrospective cohort studies are conducted in the present time and retrospectively compare exposures and health outcomes (Song & Chung 2010). Retrospective designs use existing data and are associated with relatively lower cost and shorter study periods than prospective approaches. However, as researchers rely on available data, the quality of existing records is a potential limitation of the design (Song & Chung 2010). Nevertheless, the retrospective cohort design was considered an appropriate approach given the limitation of time and resources available to this study.

Similar to study 2, this research study assessed whether the SUFA intervention increased the number of people participating in enrolment in care, eligibility for ARV and treatment initiation, as well as whether the SUFA reduced the number of people lost from ARV treatment and the number of overall crude deaths. The study also investigated whether SUFA shortened the time of movement from detection for HIV to enrolment in care, from enrolment in care to eligible for ARV, and from eligible for ARV to treatment initiation. Further, the study assessed the SUFA's effect by comparing the outcomes of exposure and non-exposure to the interventions.

Two matched sites, Medan and Batam cities, were selected as the study locations. Medan and Batam were matched using non-random sampling based on similarity of HIV programs and regional characteristics. They were also matched based on the one-year time overlap between the period of pre- and post-SUFA; then the project expanded the

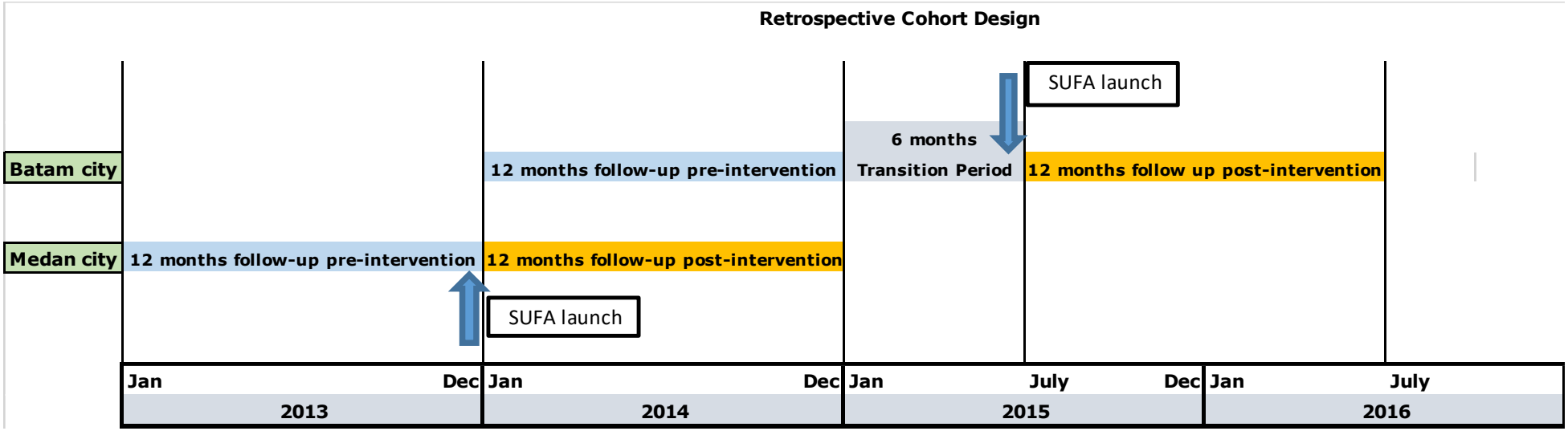
time criterion into one year pre- or post SUFA in each city with the purpose of increasing the size of population studied and of adjusting for different sites and periods. Only those two locations were chosen because of limitations in study time and resources available.

In pre-SUFA Medan (26 Dec 2012-25 Dec 2013) and in Batam (26 Dec 2013-25 Dec 2014), adults aged ≥ 18 years who were first detected with HIV were considered as non-exposed to the SUFA intervention. In post-SUFA Medan (26 Dec 2013-25 Dec 2014) and Batam (26 Jun 2015-25 Jun 2016) adults aged ≥ 18 years who were first detected with HIV were considered as exposed to the SUFA intervention. The study followed up HIV patients sourced from all hospitals and primary health centres that had reported HIV cases in the two cities (fourteen hospitals and primary health centres in Medan and six in Batam) Figure 6.1 illustrates the retrospective cohort design.

The study included all hospitals and primary health centres in the two cities that had HIV cases detected within the period of interest, as confirmed by District Health Offices. However, there were important differences in the provision of care provided by primary health centres and hospitals, e.g. differences in regard to the availability of ARV drugs, laboratory equipment and supply, as well as the number and ability of trained staff. For this reason, if health care facilities did not have comprehensive HIV care and treatment services available, patients were transferred by primary health centre staff, or on their own initiative, to other health care facilities which had the required HIV care and support treatment services. The study followed up patients from the date of HIV detection until their last observation time, regardless of their stage on the HIV continuum of care and the number of clinics they attended. In other words, if they received services in more than one clinic, these patients' data were combined as their whole follow up history. Thus, the researcher is confident that the data represented all of the reported HIV detected cases at the two locations in the years of interest. The other strength of our study is that the we followed up a large population, which enabled us to stratify the

study's outcomes using participants' characteristics, district and time in demonstrating that the study outcomes were consistently observed in all groups (Klein et al. 2014). The main factor that differed over time was the introduction and implementation of SUFA policy intervention. Thus, the study's results could be used to explain the SUFA intervention effect. However, generalization of findings to other regencies/cities in Indonesia may be limited as many of regencies/cities vary in regional and epidemiological characteristics.

Figure 6.1 Retrospective study design of Pre and Post-SUFA intervention located in Medan and Batam cities. Two Pre-SUFA data and two Post-SUFA data period were designed. Each of data period in each city were followed up for 12 months. Pre intervention in Medan was obtained from 26 Dec 2012–25 Dec 2013 and post 26 Dec 2013-25 Dec 2014 while pre intervention in Batam was obtained from 26 Dec 2013-25 Dec 2014 and post 26 June 2015 - 25 June 2016.



6.2.2 Study location

Two comparable locations (Medan and Batam) were chosen as the study focus. To select the sites, the project non-randomly sampled using similarities in regional characteristics and overlapped time periods between pre- and post-SUFA to reduce unexplained factors in the two locations. The characteristics used for matching the sites were the KAP proportion found in the areas (FSW, MSM, PWID), the availability of HIV treatment services, particularly the access to CD4 count machines (variable of measurement) (Menard 2002), comparable demography (Woodward 2005), including socio-cultural and religious factors, geography and availability of organisations working in HIV, and comparability on the Human Development Index (Song & Chung 2010). Further, the overlapped time period between pre- and post-SUFA meant a period of time coincided between before the SUFA intervention was implemented in one city and after the SUFA intervention was implemented in another city.

Two lists of regencies/cities were prepared for matching in our attempt to find the comparable locations. The first list consisted of thirteen SUFA pilot sites. Of these sites, five regencies/cities were excluded: Denpasar, Badung in Bali province; Jayapura, Jayawijaya in Papua Province, and Sorong in Papua Barat province, due to unique features that made them difficult for comparison with other places in Indonesia. Bali has a specific social cultural religious context, while Papua and West Papua provinces also have specific social cultural economic, educational, environmental, health, political circumstances and HIV epidemic characteristics (Campbell 2014; Central Inteligence Agency 2019). Finally, eight districts were included in the first list for sampling.

As explained in the previous section, SUFA acceleration was conducted gradually throughout Indonesia; thus, for the second list of cities the researcher was able to choose regencies/cities in which the SUFA intervention was introduced at a later time than the SUFA pilot sites. Initially the plan was to study three years of overlapped time between pre- and post SUFA. However, the researcher could not find locations that had

two or three-years' time overlap that were comparable to the eight districts in the first list, in regard to number of HIV cases detected per year. Finally, one year of overlapped time between pre- and post SUFA at two locations was decided and the time criterion was changed to one year of non-overlap of pre- or post-SUFA in each of locations to increase size of the study population. The researcher considered that measuring SUFA impact after one year was a sufficient timeframe. Mody et al. (2018) demonstrated the effectiveness in about one year of an intervention that expanded treatment eligibility on the HIV continuum of care. The second list comprised 26 cities in which the acceleration of SUFA was conducted between January and September 2015. Thus, we were able to find a one-year time period coinciding between the pre- and post SUFA. We managed to reduce the cities to 10 of the 26 cities, as 16 were different in terms of government administrative type (e.g. region size, population density, sociocultural characteristics, education, health and economic structure) (The President of the Republic of Indonesia 1999; Turner 2003). Finally, based on the two matching criteria (Hutchinson & Chong 2016; Statistics Central Bureau 2010; Statistics of Kepulauan Riau Province 2017; Suryadinata, Arifin & Ananta 2003) as explained above, Medan and Batam were selected as the best pair from the lists (see a detailed explanation of the matching procedure of the two locations in the Appendix J).

The researcher visited all health care facilities that had HIV care and treatment service units, as confirmed by District Health Offices (DHO) in the two cities at the time of study. There were five hospitals and nine primary health centres in Medan, and three hospitals and three primary health centres in Batam. Table 6.1 presents locations of data collection in Medan and Batam.

Table 6.1. Location of data collection in Medan and Batam

Hospitals/Primary Health Centre In Medan	Hospitals/ Primary Health Centre In Batam
1. General Hospital of [redacted]	1. Hospital of [redacted]
2. General Hospital of [redacted]	2. Local General Hospital of [redacted]
3. General Hospital of [redacted]	3. Hospital of [redacted]
4. Hospital of [redacted]	4. Primary health centre of [redacted]
5. Hospital of [redacted]	5. Primary health centre of [redacted]
6. Primary health centre [redacted]	6. Primary health centre of [redacted]
7.Primary health centre [redacted]	
8. Primary health centre [redacted]	
9.Primary health centre [redacted]	
10. Primary health centre [redacted]	
11. Primary health centre [redacted]	
12. Primary health centre [redacted]	
13. Primary health centre [redacted]	
14. Primary health centre [redacted]	

6.2.3 Study population

All adults aged ≥ 18 years who were diagnosed with HIV in the hospitals/health centres pre-SUFA between 26 Dec 2012 and 25 Dec 2013 in Medan, and between 26 Dec 2013 and 25 Dec 2014 in Batam were included. Post-SUFA data from 26 Dec 2013 to 25 Dec 2014 in Medan, and from 26 June 2015 to 25 June 2016 in Batam were included. There was a six-month gap in Batam between pre- and post-SUFA but not in Medan. This could not be avoided because SUFA was launched in Batam six months later than the original plan. SUFA was launched in Medan on 10-11 Dec 2013 but on 4-5 June 2015 in Batam. The six-month gap, it was believed, would not make a significant difference in the HIV program dynamic in Batam, as no new policy about HIV was implemented during that period and it could still be considered the pre- implementation era.

Ongoing residence in Medan and Batam was an important inclusion criterion to ensure that all participants were likely to have been exposed or not exposed to the intervention during the periods of interest. People from outside of Medan or Batam could access HIV testing and CST service units in any hospital in Medan and Batam because there was no regulation to restrict non-residents' access to HIV care in the two municipalities.

Therefore, non-residents were excluded, by identifying them from the records using their name, date of birth and home address.

As patients moved from being detected with HIV to other stages in the HIV continuum of care, not all of the population were included in the sub analysis of the stages. A requirement for the next stages was that subjects must have entered the previous stage in the cascade (Haber et al. 2017). For example, to analyse the enrolment in care outcome, all participants were included, while to analyse eligibility for ART, only participants who were already enrolled were included. To analyse treatment initiation, participants who were eligible were included, while to analyse LTFU, participants who were receiving treatment initiation were included. Specific for the sub analysis of crude death, all participants were included because the study's interest was crude death in any stage.

6.2.4 Data source

Data were accessed from medical records of HIV patients sourced from the HIV clinic and medical records units in hospitals or primary health centres, written in the national standardized HIV report forms. The various source of data collection format were the HIV testing registry, counsellor books, a summary of HIV and ARV care, the register of pre-ART and ART, and other HIV registry records, either in paper or electronic format (see Table 6.2.)

Table 6.2. List of data source and type of data collected

No	Data Source	Type of Data Collected
1.	Medical record with or without a summary of HIV and ARV care form	**Patient characteristics** (date of birth, sex, education level, employment status); **test HIV information** (date of test, risk transmission); **enrolment and eligibility information** (date of assessment of WHO clinical staging and result, date of baseline CD4 cells count test and result, date of eligible); **treatment initiation information** (date of treatment initiation, WHO clinical staging, ARV regimen received for the first time, treatment indication); **clinical follow up history** (date of visited every month and status, ARV drug regiment received)
2.	Register of Pre-ART	**HIV test information** (date of test, risk transmission, test entry point); **enrolment and eligibility information** (date of assessment of WHO clinical staging and result, date of baseline CD4 cells count test and result, date of eligible); **Medical record number**
3.	Register of ART	**Enrolment and eligibility information** (date of assessment of WHO clinical staging and result, date of baseline CD4 cells count test and result, date of eligible); **treatment initiation information** (date of treatment initiation, WHO clinical staging, ARV regimen received for the first time, treatment indication); **clinical follow up history** (date of visited every month and status, ARV drug regimen received for the first time)
4.	Register of HIV testing	**Patient characteristics** (date of birth, sex, education level, employment status); **test HIV information** (date of test, risk transmission, test entry point); **enrolment and eligibility information** (date of assessment of WHO clinical staging and result, date of baseline CD4 cells count test and result, date of eligible)
5.	HIV Counsellor books	**Patient characteristics** (date of birth, sex, education level, employment status); **test HIV information** (date of test, risk transmission, test entry point)
6.	Medical record without data source 1.	**Patient characteristics** (date of birth, sex, education level, employment status); **test HIV information** (date of test, risk transmission, test entry point); **enrolment and eligibility information** (date of assessment of WHO clinical staging and result, date of baseline CD4 cells count test and result, date of eligible); **treatment initiation information** (date of treatment initiation, WHO clinical staging, ARV regimen received for the first time, treatment indication); **clinical follow up history** (date of visited every month and status, ARV drug regimen received for the first time)
7	Others HIV record documents	**Patient characteristics** (date of birth, sex, education level, employment status); **test HIV information** (date of test, risk transmission, test entry point); **enrolment and eligibility information** (date of assessment of WHO clinical staging and result, date of baseline CD4 cells count test and result, date of eligible)

6.2.5 Data collection technique

Data were collected using a case record form (see a case record form and a guidance on how to fill the form in Appendix K), which was developed based on the standardized summary of HIV and ART history forms. All data variables collected were routine data collected by Reporting and Recording (RR) staff in the clinics (Ministry of Health (ID) 2015d). The sequence of information in the summary of HIV and ART history form

followed the order of the HIV continuum of care cascade from the steps of HIV testing, HIV detected, enrolment in care, eligibility for ART, treatment initiation, to monthly retention in care. Thus, the routine information collected was able to capture the HIV continuum of care progress of individual patients.

The number of cases collected in each of the hospitals and primary health centres for this project was taken from the HIV clinics' monthly reports received by DHO if available. The reports were used as proxy benchmarks of the total HIV detected cases to be collected in each of the clinics. This number provided an estimate of total cases to be searched in each health service. In the hospitals, the data collection commenced in the HIV clinics unit of the hospital. Through this unit support, the study was able to develop a list of HIV patient medical record numbers. The lists were then used by the medical record unit to find each patient's medical records.

Registers of HIV pre-ART (electronic and paper-based versions) were used as a main source to identify HIV cases in the clinics that fulfilled our study criteria and to produce lists of numbers of medical records to be searched. If the hospitals did not have this register, a clinical database of HIV positive was used. If the hospitals did not have either of these records, any other available record showing monthly total HIV cases recorded by the HIV clinic were used. If they did not have these records either, their submitted monthly HIV reports to the district health office were used to estimate the total number of HIV cases. The researcher found that the facilities had various methods of recording HIV patient data. However, because only routinely collected data was required, the researcher was able to collect data in one or other form. Some HIV registers had missing HIV patient record numbers. The researcher manually searched for these record numbers in the general patient database of the hospitals. For this, the researcher applied criteria of a three-exact identity data points: name, home address and date of birth to determine our case record numbers.

Once the list of medical record numbers was produced, it was given to the hospital's medical record unit. The staff in the medical records unit then searched and collected the medical records of the study participants and provided them to the researcher. However, not all the medical records could be found by medical staff. This was mainly due to different record storage methods for patients who were lost to follow up and assumed deceased. The records of such patients were kept in separate rooms and stored without consecutive numbers. Where participants did not have medical records, the information was taken from other available sources produced by the HIV clinic unit.

The medical records were examined by two data collectors (background midwives) and the primary researcher in Medan, and by one data collector and the primary researcher in Batam. The primary researcher trained the two data collectors before commencing the real data collection until they were able to independently withdraw data from sources without error. Nevertheless, at the beginning of seven days, each of the variables collected in case record forms that were filled out by the data collectors was thoroughly reviewed by the primary researcher. The data collectors were then allowed to conduct the real data collection independently following normal procedure, as explained here. Each form in the medical record was scanned prior to data extraction to map out where the data were written. If the medical records incorporated a summary form of HIV and ART care, the data were directly extracted from this form. If the medical records did not contain the standard form, the data were collated from other records, such as a daily record of patient care by a physician, a patient record by a counsellor, and a laboratory test report in the medical records. Data abstracted by data collectors and the primary researcher were entered into a hardcopy of the case record form. After abstraction, each case record form was validated by the primary researcher for important variables such as date of testing, date of birth, date of enrolment, date of assessed eligible, date of treatment initiation, date of follow up and last date of follow up, baseline clinical stadium, and baseline CD4 count, using the same medical record.

If there were differences in data between initial extraction and validation, the validation data were used as the final version of data.

Although the medical records were used as the main source of data, other patient records were also scrutinised to complete any missing data in the case record form. The three-exact identity technique was administered to other patient records to search the medical record number in the database, to identify which individual's data to extract. This method was applied to obtain corresponding information with the case record form, which involved linking information belonging to the same patient from several sources. After comparing information, if the data differed across the various records (medical records and other registers), or if the data appeared invalid or unclear, the officer who was responsible for the records was consulted and the data was verified accordingly.

The data collection techniques in the primary health centres were far simpler than those required in hospitals, as the primary health centres in the period of data search did not have comprehensive HIV treatment services, particularly in regard to follow up services. Most HIV patients simply entered the diagnosed stage and were then referred to hospitals within their operation area to continue their treatment. Therefore, data were only sourced from HIV testing and diagnosed registers.

Tracing and linking participant information were not limited to the hospitals/primary health centres, where cases were first identified as study participants. The researcher compared the total participant lists to hospitals /primary health centres in each of the municipalities. This technique was applied to make sure that each individual was included in the study only once. If participants were lost to follow up in one clinic, the researcher traced the rest of their information in other hospitals/primary health centres. Thus, a participant's data were a combination of information from the various clinics that they visited for HIV care. If there was a different date on data documented by

different clinics for the same variables, the researcher relied on the earliest data as the patient's first link to any kind of HIV services at any facilities in the study areas.

Cleaning of data was conducted through a variety of processes, starting from when data were initially collected in the clinics until analysis. Although the researcher attempted to solve any ambiguities in data at the clinic level, due to limited time and working space, some of the data abstraction and cleaning occurred outside the clinics. Initially, the researcher planned to withdraw anonymous/de-identified data, assuming that each HIV patient would have had an ID number; however, this was not always the case. To compare patients among clinics, the researcher was obliged to collect patient names and addresses. Comparison of participants among clinics was important to ascertain that one individual was represented in the participants group only once. Once data linkage was completed, all identifying information was destroyed prior to analysis.

The researcher continued data checking before analysis using logical order, comparison among available sources of data (medical records, /pre-ART and ART registers/ counsellor books, case records form), and table frequency. The dataset was scrutinised to identify any incomplete, incorrect, inconsistent, or duplicated data and was then refilled, modified, removed or revalidated as appropriate. The duplication checking of participants was conducted for data from all clinics. The researcher found that several participants were treated in two to four different clinics; thus, these individuals had several repeated clinical data sourced from multiple clinics. These data were combined as explained above. The data were then entered to an Excel spreadsheet as a row per case record form. Individual patient data were entered once and then about 90% of individual entered data were checked for data accuracy to case record forms.

6.2.6 Data variables and measurement

6.2.6.1 Variables

Table 6.3. summarizes outcomes, definitions and estimations.

Outcome 1

Enrolment in care was defined as newly identified HIV positive people transitioning from their diagnosis date to the earliest date observed enrolling in one of these services: 1) assessment for WHO clinical staging, 2) laboratory testing for baseline CD4 count, 3) receiving cotrimoxazole prophylaxis. The time to event of enrolment was determined as number of days from date of diagnosis to date of enrolment in care. Censoring occurred of patients who were HIV positive and who did not enter enrolment before the end of the study period, people that were transferred to other health facilities outside of the study locations, and patients who died. The date of censoring was the date of the last day observed or the date of transfer to other clinics outside the locations or the date of death.

Outcome 2

Readiness for ARV was defined as participants transitioning from date of enrolment in care to date of identification as eligible for ART treatment. Readiness for ARV in the pre-SUFA intervention group was assessed using pre-SUFA eligibility criteria (see Chapter 1 section 1.3.3), while readiness for ARV in post-SUFA was assessed using SUFA criteria (see Chapter 1 section 1.3.4). Date of eligibility for ARV was either 1) date of examination of CD4 cells count, or 2) date of assessment of WHO clinical staging (also when risk transmission criteria were used to determine eligibility). Time to the event of readiness for ART was number of days from enrolment in care to eligibility for ART. Censoring occurred of patients who were enrolled in care but then did not enter the eligible point due not visiting or not being assessed for eligibility until the end of the study period, being transferred to other health facilities outside of the locations before

eligibility assessment, or due to death. Date of censored was the date of last observed or the date of transfer to other clinics outside the study locations or the date of death. Time of survival was number of days from enrolment in care to censoring.

Outcome 3

ARV treatment initiation was defined as patients who were eligible for ARV transitioning to the treatment initiation point. The date of treatment initiation was the date that ARV was given for the first time to patients in the clinics. Time to the event of treatment initiation was the number of days from date of eligibility for ART to date of treatment initiation. Censoring occurred of patients who were identified as eligible for treatment but then did not ever start treatment due to not visiting until the end of the study period or being transferred to other health facilities outside of the locations, or death prior to starting treatment. The date censored was the date of the last visit observed or the date of the end of study period or the date of transfer to other clinics outside the study locations or the date of death. Time of survival was the number of days from being identified as eligible for ARV to censoring.

Outcome 4

LTFU was defined as patients who did not visit clinics for more than two months after the date of last provision of ARV drugs and were not known to have been referred, who stopped, or who died. Date of LTFU was 30 days after date of last drug refill. Censorship occurred of patients who started treatment but were transferred to other health facilities outside of the study locations, or who died, or who visited for less than 3 months or did not continue in care until end of study period. The date censored was the date of last observed or the date of transfer to other clinics or the date of death.

Outcome 5

Overall crude death was the identification of HIV positive participants who were documented as dead after having been detected for HIV in any stage along the continuum. The date of death was the date documented as dead. People who were censored were observed alive until end of study. The date censored was the date of the last visit observed.

Table 6.3. Outcomes, event definitions and dates used in estimating follow-up time

Variable	Definition	Date of follow-up
Newly HIV detected	Patient detected positive HIV for the first time	Date of HIV tested positive found in the clinics' records
Enrolment in care	Patient links to care support and treatment unit	Date of first documented for WHO clinical staging assessment or CD4 cells count examination, or receiving cotrimoxazole prophylaxis
Eligibility for ART	Patient entitled for ART	Date of first identified as eligible for ART treatment at the time of observation.
Initiation of ART	Patient initiated for ART	Date of starting ARV treatment for the first time
LTFU post ARV	Patient non-attendance for at least 2 months since last refilled drug finished	Date of 30 days after last time observed visit for drug refilling
Crude Dead	Patient observed dead	Date of observed dead

Exposure

The exposure variable of interest for all five outcomes was pre- versus post-SUFA. Other covariates in the five analyses were age, sex, education attainment, employment status, risk transmission mode, district and time. Education was assessed as low (no school/ primary school) and high (high school/ higher education). Employment was coded as worked and not worked. Transmission risks were categorised as vaginal, anal, and other (injecting drug use, blood transfusion, perinatal, bisexual, occupational exposure). Districts were categorised as Medan or Batam, while time was categorised as 2013, 2014, 2015/16.

6.2.7 Data analysis

The Excel spreadsheet of data was exported to Stata (Release 15.1 StataCorp LLC, Texas). Stata was used to conduct most of the analyses and SPSS (IBM Corp. Released 2018 IBM SPSS Statistic for Mac, version 25.0.0.1) was used in some of the analyses.

Before commencing the main analysis, descriptive analysis was conducted to learn the natural characteristics of the data, consistency and missing values. Categorical variables were summarised using proportion while continuous variables were summarised using median, range, histogram/QQ plot as appropriate. The differences in characteristics of participants were compared using Chi-Square test or Mann-Whitney.

Cox regression survival analysis was used to measure the effect of SUFA in enrolment, readiness, treatment initiation, LTFU and overall crude death (five sub-analyses) at the individual level due to time from exposure to SUFA to the events of most interest in the study. Survival time of the five events was defined in the previous section and summarised in Table 6.3. Due to technical issues in STATA with number of day similar to zero, one day was added to each number of days of all events, thus the real number of days in results section is the number of days minus one day. The number of days of each event (median, interquartile range (IQR)), the total number of the events, and events rates were calculated, stratified by pre- and post-SUFA intervention.

The cumulative incidence of the events were visualised using the Kaplan Meir curve. The Kaplan Meir curve also was used to visualise the survival functions shape. The incidence rate of the events was calculated as the number of cases yielded (enrolment in care/eligibility for ART/ initiated of ART/ LTFU/crude death) among people observed whilst at risk. The numerator for the rate was the number of cases occurring within the whole follow up time period, while the denominator was the sum of the follow up time of the whole population at risk (person-days of observation). The non-parametric test

for equality Log-rank test was performed to compare the survival experience of pre and post-SUFA groups for the 5 events.

To test the association of the SUFA intervention with each of the cascade stages, multivariate Cox proportional hazard regression models were used. A purposeful covariates selection method was used in building our multivariate Cox model due to important assumptions in this analysis (Hosmer, Lemeshow & May 2008). Four Cox models were built for each outcome. The first Cox model was to calculate the crude (unadjusted) hazard ratio of the main covariate (intervention group). The second model was to calculate the intervention group's adjusted hazard ratio with covariates of age, and sex. To control for possible confounding due to different locations and years, the project additionally adjusted the third model with district and time covariates. The model was also adjusted for with other possible known confounders such as education attainment, employment and risk transmission (model 4). Based on the assumption of MCAR (Missing complete at random) or MAR (missing at random), model four was imputed. The missing data occurred due to the RR staff responsible for the record ignoring those variables when they interviewed patients at the time of administrative processing or forgetting to ask patients or patients' family. In model 4, the variables imputed were covariates that had more than 1% missing values and were included in the model. To do imputation, the variables included were those included in model 4 as well as additional covariates that were not included in model 4, which might also help explained the missing values. In Stata, the chained equations command to impute 30 datasets was used (Royston 2008). To impute sex and employment status covariates in multivariate model of enrolment in care, education attainment and transmission risk covariates (which were not included in model 4 with missing data) were included in imputation process. To impute education attainment in multivariate model of eligibility for ARV, sex, employment status, and transmission risk were included in imputation process. To impute employment status in multivariate model of treatment initiation,

sex, education attainment, and transmission risk were included in the imputation process. To impute education attainment in multivariate model of loss to follow up, sex, employment status, and transmission risk were included in the imputation process. To impute sex, transmission risk covariates in model of death, only covariates in final model 4 were used. Using additional covariates to those in the Cox regression models sometimes resulted in perfect prediction of the missing values. Since this meant that there was no variability in the predicted missing values, the creation of multiply imputed datasets was not possible. In these cases, we used multiple imputation using only the covariates in the Cox regression model 4.

Including patient clinical characteristics into the models was avoided since all the clinical characteristics such as HIV test approach, CD4 count level, and treatment indications could be considered to lie on the causal pathway between the SUFA intervention and the outcomes of interest. Nevertheless, the project primary aim was in assessing the overall effect of the intervention.

In addition, possible interaction between the intervention group and district in the model to check potential crossed factors of whether the effect of either depended on the other was examined. The proportional hazard assumption was assessed using proportional hazard test (PHTest), globally and for individual covariates. Covariates which were not proportional were solved by including time dependent covariates into the model (Hosmer, Lemeshow & May 2008).

6.2.8 Instrument test

Of seven reference group members, three members reviewed the data extraction table and case records form for readability, clarity and comprehensiveness (Bolarinwa 2015). These consultative processes resulted in some changes in variables. This took place in early June 2017. The project removed the variable of 'retention in care' in the data extraction table of Study 2, due to the unsuitability of analysing retention using cross

sectional data. The project also deleted the 2nd line ARV drug category of ARV drug combination types in the case record form for Study 3, given our focus was on the 1st line of treatment only. Pilot tests were conducted on the case record forms in late June 2017 in a hospital in Bandung and in a hospital in Medan. Conducting a pilot test prior to formal data collection was an important step in reassessing study components: study objectives, study participants, inclusion and exclusion criteria, the structure of the case record form, correctness of data collected (different variables written in the record), and availability of data in a variety of sources (Jansen et al. 2005). Fifteen records of HIV patients were used to validate the questionnaire in Bandung. After conducting the pilot test, some changes in the case record form were: a new data category was added in the follow up variable and the sequence of some variables was changed.

6.3 Results

This section presents the results of the analyses, beginning with a description of the overall cohort population in the form of the population's demographic and clinical characteristics and a flow diagram of data collection, stratified by pre and post-SUFA intervention. Explanations follow of the univariate and multivariate analyses of the impact of the intervention on each of the cascade stages using subset population outcomes, which are organised according to HIV continuum of care sequence.

6.3.1 Description of the overall cohort population

The study analysed data obtained for 2,292 people with HIV infection, from the day they were tested for HIV, diagnosed with HIV, linked to HIV care, found eligible for ARV, received HIV treatment, and loss to follow up (LTFU). Additionally, patients were followed from the day they were identified as HIV positive until they died (where relevant). Of these individuals, 52.7% were from the post-SUFA intervention group and 47.3% were from pre-SUFA group. Approximately half (51.3%) of the patients were from Medan and 48.7% were from Batam. Around one quarter of the patient data

(24.1%) related to the calendar year 2013, one quarter (25.4%) to a 12-month period over 2015-16 and around one half (50.5%) to the calendar year 2014. The cohort outcome of enrolment in care and death used the whole cohort while the outcomes of eligible for ARV, treatment initiation, and LTFU used 75.96%, 69.72%, 48.51% of the cohort respectively (see section 6.2.3 study population). Figure 6.1 provides the flow diagram of data collection from the newly positive cases reported in the locations and years of the participant cohort).

Figure 6.2 Flow diagram of data collection for cohort population, stratified pre-and post-SUFA

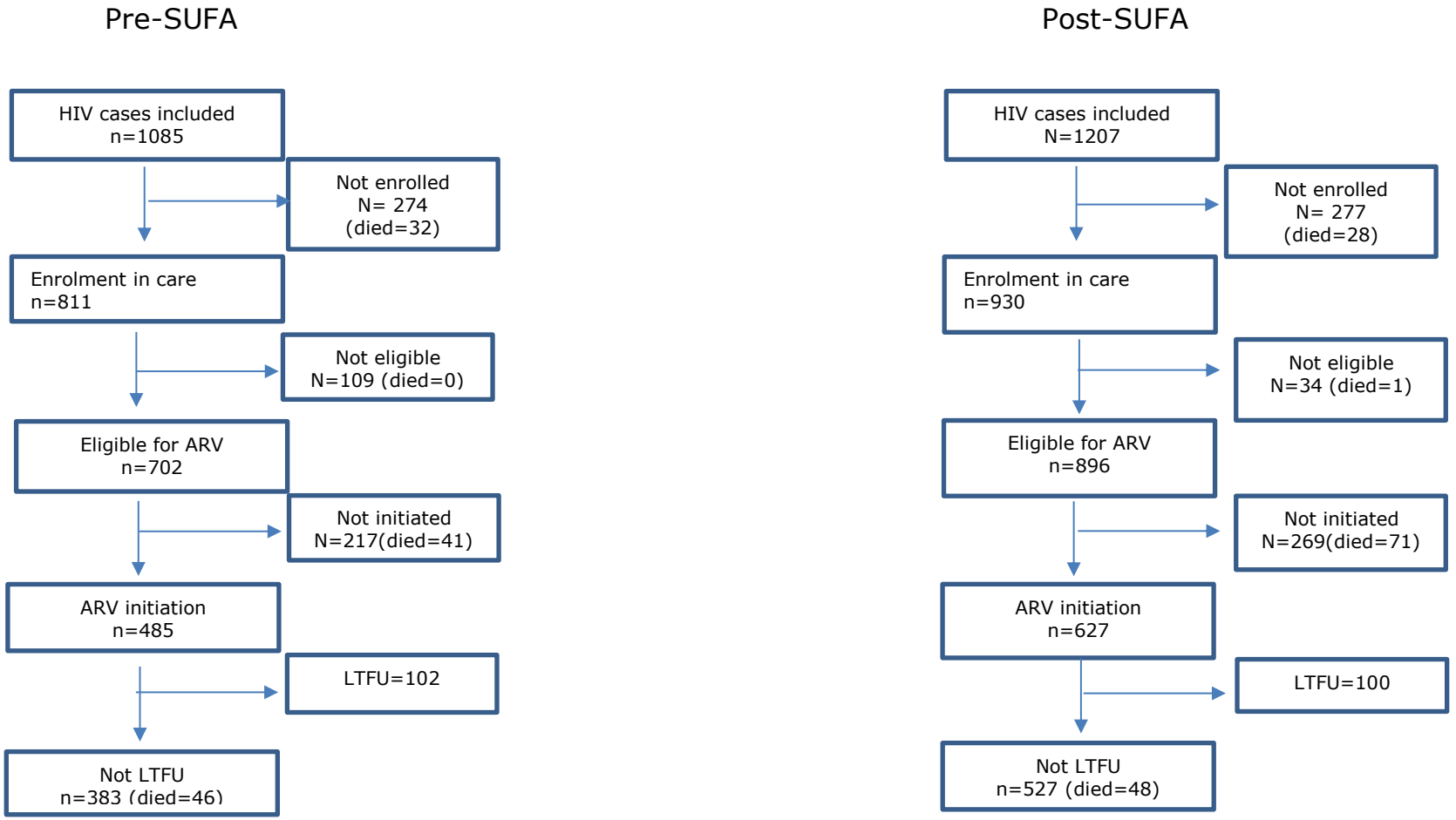


Table 6.4. shows the demographic and clinical characteristics of the overall cohort population and the subpopulation of enrolment in care, crude death, eligibility for ARV, treatment initiation, LTFU, stratified by pre- and post-SUFA intervention groups. In the sub populations 'enrolment in care' and 'crude death', of 1085 HIV positive individuals in the pre-SUFA era, the median age was 32 years, 64.8% were male, 68.4% had completed at least high school education, 59.6% were in paid employment. Heterosexual was reported as the main mode of HIV transmission (68.6%). About half of the participants were from Medan (50.9%) and from year 2014 (49.1%). Of 1207 individuals in post- SUFA, the median age was 32 years, 68.1% were male, 67.9% had completed at least high school education, 67.7% were in paid employment, 51.7% were from Medan and 48.3% were from Year 2014. Heterosexual activity was reported as the main mode of HIV transmission (64.1%). The Chi-square test result showed population demographic and clinical characteristics of those eligible for ARV, treatment initiation and LTFU were not substantially different to the population of enrolment in care and death. However, employment, transmission risk and time differed significantly between pre- and post-SUFA interventions ($p < 0.001$).

Table 6.4. Demographic and clinical characteristics of overall cohort population and sub-population of Enrolment in care, Eligibility for ARV, Treatment initiation, LTFU, Death stratified by Pre- and Post-SUFA intervention group

Characteristics		Sub-pop 1 (Enroll)		Sub-pop 2 (Eligible)		Sub-pop 3 (Initiation)		Sub-pop 4 (LTFU)		Sub-pop 5 (Death)						
		Pre-SUFA n(%); median (IQR) N=1085	Post-SUFA n(%); median (IQR) N=1207	Pre-SUFA n(%); median N=811	Post-SUFA n(%); median (IQR N=930	Pre-SUFA n(%); median (IQR) N=702	Post-SUFA n(%);median (IQR N=896	Pre-SUFA n(%);median (IQR) N=485	Post-SUFA n(%);median (IQR N=627	Pre-SUFA n(%); median (IQR) N=1085	Post-SUFA n(%); median (IQR N=1207	P1*	P2*	P3*	P4*	P5*
Enrolment	Enrolled in	811 (74.6)	930 (77)	---	---											
	Not enrolled	274 (25.3)	277 (23)	---	---											
Eligibility	Eligible			702 (86.6)	896(96.3)											
	Not eligible			109 (13.4)	34(3.7)											
Initiation	Initiation					485 (69.1)	627(70)									
	Not initiation					217 (30.9)	269 (30)									
LTFU	LTFU							102 (21)	100(16)							
	Not LTFU							383 (79)	527(84.1)							
Death	Dead									92 (8.5)	101 (8.4)					
	Not dead									993(91.5)	1.106(91.6)					
Age		32(28-38)	32(27-38)	32 (28-38)	33(27-39)	32 (28-38)	33(27-39)	32 (28-38)	33(28-39)	32(28-38)	32(27-38)	0.760	0.351	0.702	0.872	0.760
Gender	Male	703(64.8)	822(68.1)	545(67.2)	657(70.7)	471(67.1)	640(71.4)	322(66.4)	448(71.6)	703(64.8)	822(68.1)	0.078	0.184	0.110	0.122	0.078
	Female	363(33.5)	374(31)	266(32.8)	272(29.3)	231(32.9)	255(28.5)	163(33.6)	178(28.4)	363(33.5)	374(31)					
	Missing	19 (1.8)	11(0.9)	0	0.1	0	0.1	0	0.1	19 (1.8)	11(0.9)					
Education attainment	Lower[a]	115 (10.6)	128(10.6)	86(10.6)	93(10)	81(11.5)	85(9.5)	54(11.1)	51(8.1)	115 (10.6)	128(10.6)	0.952	0.844	**<0.05**	0.230	0.952
	Higher[b]	742(68.4)	819(67.9)	594(73.2)	679(73)	536(76.4)	660(73.7)	372(76.7)	494(78.8)	742(68.4)	819(67.9)					
	Missing	228 (21)	260 (21.5)	131(16.2)	158 (17)	85(12.10	151 (16.9)	59 (12.2)	82 (13.1)	228 (21)	260 (21.5)					
Employment	Not worked	304(28)	267(22.12)	249(30.7)	231(24.8)	230 (32.8)	219(24.4))	163(33.6)	148(23.6)	304(28)	267(22.12)	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
	Worked	647(59.6)	817(67.7))	504(62.2)	664(71.4)	440(62.7)	645(72)	304(62.7)	462(73.7)	647(59.6)	817(67.7))					
	Missing	134 (12.4)	123 (10.2)	58 (7.2)	35 (3.8)	32 (4.6)	32 (3.6)	18 (3.7)	17(2.7)	134 (12.4)	123 (10.2)					
Risk transmission	Vaginal	744(68.6)	774(64.1)	565(69.7)	610(65.6)	509(72.5)	582(65)	352(72.6)	423(67.5)	744(68.6)	774(64.1)	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
	Anal	139(12.8)	249(20.6)	100(12.3)	185(19.9)	65(9.3)	181(20.2)	49(10.1	127(20.3)	139(12.8)	249(20.6)					
	Others[c]	89(8.2)	92(7.6)	77(9.5)	68(7.3)	60(8.6)	66(7.4)	39(8)	48(7.7)	89(8.2)	92(7.6)					
	Missing			69(8.5)	67(7.2)	68 (9.7)	67 (7.5)	45 (9.3)	29 (4.6)							
Test approach	PITC	663(61.1)	725(60.2)	---	---	---		---	---	663(61.1)	725(60.2)	0.389				0.389
	VCT	285(26.3)	306(25.4)	---	---			---	---	285(26.3)	306(25.4)					
	Missing	137 (12.6)	176(14.6)	---	---			---	---	137 (12.6)	176(14.6)					
Baseline Clinical	I	---	---	92(11.3)	80(8.6)	32(4.6)	68(6.6)	28(5.8)	50(8)	92(8.5)	80(6.6)	---	**<0.05**	**<0.05**	0.433	**<0.05**
	II	---	---	106 (13.1)	126 (13.6)	84(12)	116(13)	73 (15.1)	96 (15.3)	106 (9.8)	126 (10.4)					

	III	---	---	360 (44.4)	457(49.1)	360(51.3)	457(51)	254 (52.6)	338(53.9)	360 (33.2)	457(37.9)					
	IV	---	---	128 (15.8)	165(17.7)	128(18.2)	165(18.4)	86(17.7)	94(15)	128 (11.8)	165(13.7)					
	Missing			125 (15.4)	102 (11)	98 (14)	90 (10)	44 (9.1)	49 (7.8)	399 (36.8)	379 (31.4)					
Baseline CD4	Median	---	---	120(32-265)	115(31-276)	112(31-269)	98(29-223)	97(30-210)	120(35-275)	120(32-265)	115(31-276)			0.073	**<0.05**	0.855
	< 350			493 (60.8)	601(64.6)	493(70.2)	599 (66.9)	385 (79.4)	474 (75.6)	493(45.4)	601(49.8)		0.234	**<0.05**	0.078	0.102
	>350			88(10.9)	96 (10.3)	41 (5.8)	84(9.4)	33 (6.8)	67 (10.7)	88(8.1)	96(8)					
	Missing			230 (28.4)	233 (25.1)	168 (23.9)	213(23.8)	67(13.8)	86 (13.7)	504(46.5)	510 (43.3)					
Treatment Indication	Baseline Clinical	---		---	---	---	---	468(96.5)	559(89.2)	468(43.1)	559(46.3)			**<0.001**	**<0.001**	**<0.001**
	SUFA criteria							16(3.3)	60(9.6)	16(<2)	60(5)					
	Missing							1(<1)	2(<2)	601(55.4)	588(48.7)					
ARV drug initiation	ZDV (300) + 3TC (150) + NVP (200					---		259(53.4)	113(18)	259(23.9)	113(9.4)				**<0.001**	**<0.001**
	ZDV (300) + 3TC (150) + EFV (600)							85(17.5)	32(5.1)	85(7.8)	32(2.7)					
	TDF (300) + 3TC (150) + NVP (200)							34(7)	34(5.4)	34(3.1)	34(2.8)					
	TDF (300) +3TC (150) +EFV (600)							90(18.6)	101(16.1)	90(8.3)	101(8.4)					
	TDF (300) +3TC (300) +EFV (600)							7(<2)	334(53.3)	7(<1)	334(27.7)					
	Others							3(<1)	3(<1)	3(<1)	3(<1)					
	Missing							7(<2)	10(<2)	607(55.9)	590(48.9)					
District	Medan	552 (50.9)	624(51.7)	442(54.5)	500 (53.8)	369(52.6)	479(53.5)	265(54.6)	347(55.3)	552 (50.9)	624(51.7)	0.694	0.758	0.722	0.815	0.694
	Batam	533 (49.1)	583(48.3)	369 (45.5)	430 (46.2)	333(47.4)	417(46.5)	220(45.4)	280(44.7)	533 (49.1)	583(48.3)					
Time	2013	552(50.9)	0	442 (54.5)	0	369 (52.6)	0	265(54.6)	0	552(50.9)	0	**<0.001**	**<0.001**	**<0.001**	**<0.001**	**<0.001**
	2014	533 (49.1)	624(51.7)	369 (45.5)	500 (53.8)	333 (47.4)	479 (53.5)	220(45.4)	347(55.3)	533 (49.1)	624(51.7)					
	2015/16	0	583(48.3)	0	430 (46.24)	0	417 (46.5)	0	280(44.7)	0	583(48.3)					

[a]no school/primary school; [b] high school/higher education; [c]PWID/ bisexual/perinatal/blood transfusion/occupational
*Pearson chi-square test or Mann-Whitney test

6.3.2 Impact of SUFA on enrolment in care

6.3.2.1 Proportion of enrolment in care

The study followed up 2,292 individuals from the day they were tested for, and diagnosed with HIV until they were linked to HIV care. The proportion enrolled to care among newly detected HIV patients was 74.8% (811/1085) in pre-SUFA, while the proportion enrolled in care was 77.1% (930/1207) in post-SUFA. The PITC was reported as the main testing approach used (about 60%) compared to VCT in the two groups as shown in Table 6.4.

6.3.2.2 Univariate analysis of time to enrolment in care

The 2,292 patients included in time to enrolment contributed to a total of 11,124 person-days observation time from diagnosis. The incidence was 1.8 enrolments in care per 10 person-days in post-SUFA (1.8 enrolment cases were expected for 10 HIV positive people observed in 1 day). The rate was 1.4 enrolments in care per 10 person-days in pre-SUFA (1.4 enrolments cases were expected for 10 people observed in 1 day). The median time from HIV detection to enrolment in care was 1 day (IQR 0-5 d), similar in the two groups. Enrolment in care differed between pre- and post-SUFA (p=0.0407). Figure 6.2 shows Kaplan-Meier curve of enrolment in care by pre- and post-SUFA.

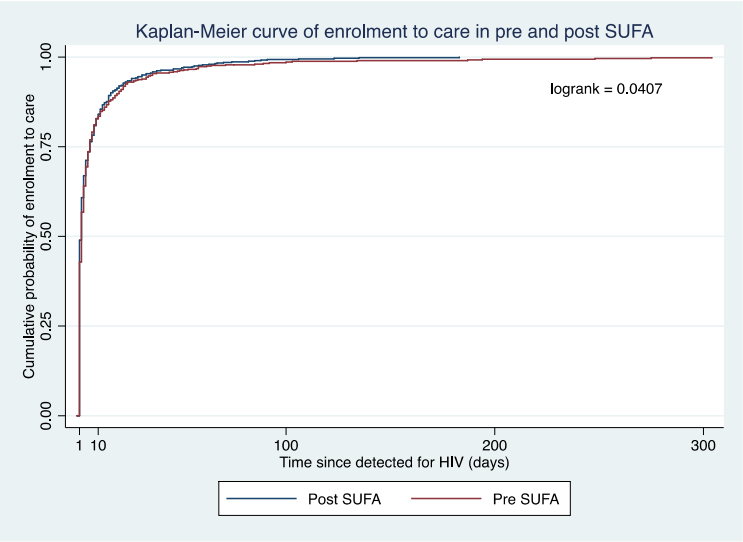


Figure 6.3 Kaplan Meir curve of enrolment in care among people who were detected for HIV, by pre- and post-SUFA intervention groups

6.3.2.3 Cox proportional hazards model

The SUFA intervention was strongly associated with enrolment in care. The Cox model results for enrolment in care among HIV positive people during pre-SUFA and post-SUFA interventions are presented in Table 6.5. In univariate analysis, the only factor related with enrolled in care was residence in Batam (HR 0.88, 95%CI 0.8,0.97, p<0.05). The rate of HIV people being enrolled in care in the post-SUFA intervention was higher than the pre-SUFA intervention group but the difference was not significant in univariate analysis, after adjustment with age and gender (model 2) and after adjustment with age, sex, district and time (model 3). However, after adjustment with age, sex, district and time, employment status, the rate of enrolment in care increased by 10% in the post-SUFA intervention group (HR 1.10 95% CI 1.0, 1.22 p <0.05). After multiple imputation, the result remained statistically significant (HR 1.11 95% CI 1.0, 1.22 p <0.05) indicating that missing data did not induce any bias in the estimated effect for the SUFA intervention.

Table 6.5. The result of univariate and multivariate Cox model[1] for enrolment in care among HIV positive people during pre -SUFA and post-SUFA interventions

Covariates	Category	Number of enrolment	Observed person/days	Enrolment rate (events/10 person-days)	HR 1 (95%CI)	aHR 2 (95%CI)	aHR 3 (95%CI)	aHR 4 (95%CI)	
								Incomplete cases analysis	Multiple imputation
Intervention group	Pre-SUFA	811	1085	1.4	Ref	Ref	Ref	Ref	Ref
	Post-SUFA	930	1207	1.8	1.08 (0.99, 1.19)	1.08 (0.98 1.18)	1.08 (0.98, 1.19)	**1.10*** (1.0,1.22)	**1.11*** (1.0,1.22)
Age (y)		1741	2292	1.6	1.0 (0.998, 1.01)	1.0 (0.998, 1.01)	1.0 (0.997, 1.01)	1.0 (0.997, 1.01)	1.0 (0.996,1.01)
Sex	Male	1202	1525	1.7	Ref	Ref	Ref	Ref	Ref
	Female	538	737	1.4	0.95 (0.86, 1.05)	0.95 (0.86, 1.06)	0.98 (0.88, 1.08)	0.93 (0.83, 1.05)	0.93 (0.83, 1.04)
District	Medan	942	1176	1.8	Ref		Ref	Ref	Ref
	Batam	799	1116	1.4	**0.88*** (0.8, 0.97)		[a]**0.88*** (0.8, 0.97) [b]0.998 (0.99, 1.0)	[a]**0.88*** (0.8, 0.98) [b]1.00 (0.81, 1.03)	**0.88*** (0.8, 0.97)
Time	2013	442	552	1.6	Ref		Ref	Ref	Ref
	2014	869	1157	1.5	0.92 (0.82, 1.04)		0.93 (0.85, 1.02)	0.98 (0.89, 1.08)	0.98 (0.89, 1.08)
	2015/16	430	583	1.6	0.96 (0.84, 1.09)		Omitted	Omitted	Omitted
Employment status	Not worked	480	571	1.8	Ref			Ref	Ref
	Worked	1168	1464	1.6	0.94 (0.84, 1.04)			0.91 (0.81, 1.03)	0.91 (081, 1.02)

*=Statistically significant at p value <0.05

[1]=univariate model (HR); =model adjusted for age and sex (aHR2); =model adjusted for age, sex, district, time (aHR3); =model adjusted for age, sex, district, time, employment status (aHR4); =model adjusted to covariates in model 4 and using 30 imputed dataset

[a]=main , [b]=TVC res

6.3.3 Impact of SUFA intervention to eligibility for ARV

6.3.3.1 Proportion of eligibility for ARV

The study followed up 1,741 patients enrolled in care (of the 2,292 identified as HIV positive) until they were determined to be eligible for ARV.

The proportion of those eligible for ARV was 86.6% (702/811) in pre-SUFA while the proportion of eligibility for ARV was 96.3% (896/930) in post-SUFA as shown in Table 6.4. Table 6.6. shows that almost all participants in both groups were deemed eligible due to their CD4 count dropping below ≤ 350 or because they were already in the WHO clinical staging of 3 or 4.

Table 6.6. Proportion of eligibility according to old and new criteria among all eligible for ARV participant, by pre and post-SUFA intervention group.

Characteristics		**Pre SUFA n(%)** N=702	**Post-SUFA n(%)** N=896
Eligibility criteria	≤ 350 CD4/Clinical staging 3 or 4	673 (95.9)	811 (90.5)
	Irrespective CD4 and others	29 (4.13)	85 (9.5)

6.3.3.2 Univariate analyses of time to be deemed as eligible for ARV

Among 1,741 patients enrolled to care, there was a total of 3,275 person-days observation time. The rate of eligibility for ARV in the post SUFA group was higher than in the pre-SUFA group (6.4 eligible for ARV cases per 10 person-days in SUFA vs. 3.8 eligible for ARV cases per 10 person-days in non SUFA). The median survival time was 0 d (IQR 0-0) in pre- and post-SUFA. The log-rank test results showed that the survival experience of being observe as eligible in pre- and post-SUFA was statistically significantly different ($p<0.001$). The Kaplan-Meir curve of eligibility for ARV in pre and post SUFA is presented in Figure 6.3.

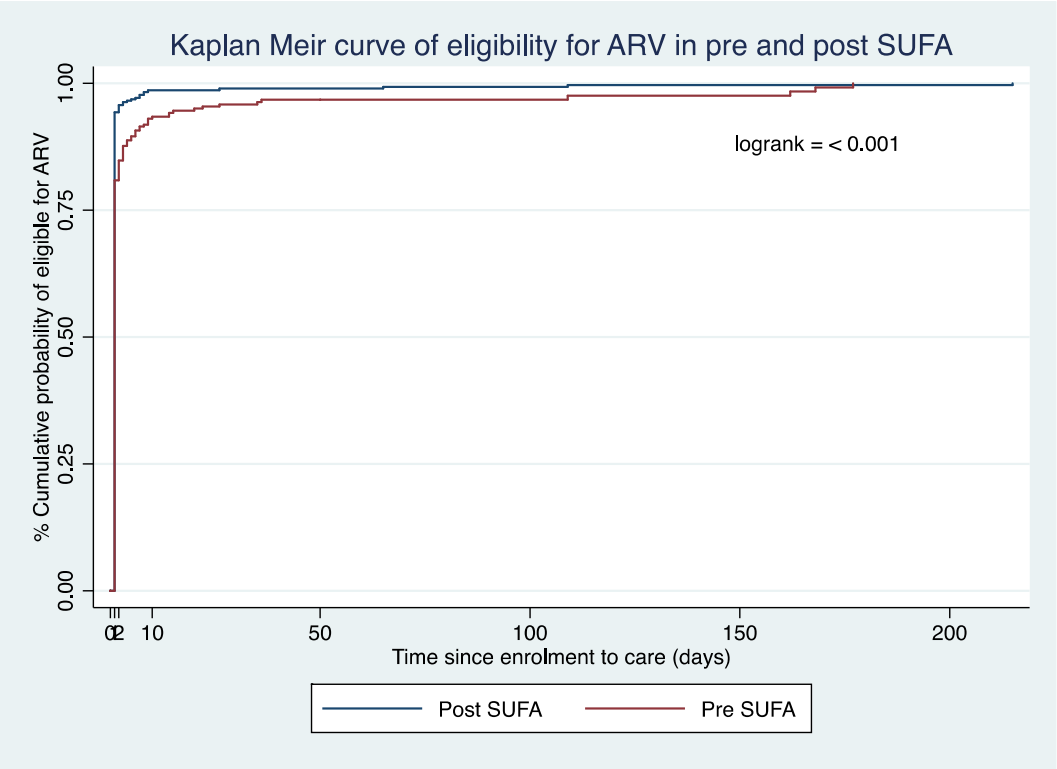


Figure 6.4 Kaplan Meir curve of eligibility for ARV among people who enrolled in care stratified by pre and post-SUFA

6.3.3.3 Cox proportional hazards model for eligibility for ARV

Table 6.7. describes the result of four Cox models of eligibility for ARV among patients who were enrolled. The SUFA intervention was strongly associated with eligibility for ARV in univariate and multivariate analyses. In univariate analysis, being in the SUFA group was strongly associated with eligibility for ARV (HR 1.16 95% CI 1.05, 1.28, p <0.01). The only additional factor related with eligibility for ARV was seen in year 2015/2016 (HR1.19; 95%CI 1.032, 1.37, p < 0.01). In the multivariate analyses, being in the SUFA group was consistently associated with eligibility for ARV throughout adjustment with age, sex (model 2), with age, sex, district, time (model 3), although not in model 4 with adjustment with age, sex, district, time, education attainment. However, in the sensitivity analysis with the use of multiple imputation the probability of seen eligible for ARV increased by 13% in the post-SUFA group (HR 1.13, 95%CI 1.02,1.25, p<0.01).

Table 6.7. The result of univariate and multivariate Cox model[1] for eligibility for ARV among people enrolled in care during pre-SUFA and post-SUFA interventions

Covariates		**Number of eligibility**	**Observed person/days**	**Eligible rate (Event/10 person-days)**	**HR1 (95%CI)**	**aHR2 (95%CI)**	**aHR3 (95%CI)**	**aHR4 (95%CI)**	
								Incomplete cases analysis	**Multiple imputation**
Intervention group	Pre-SUFA	702	811	3.81	Ref		Ref	Ref	Ref
	Post-SUFA	896	930	6.41	**1.16*** (1.05, 1.28)	**1.16*** (1.05, 1.28)	**1.16*** (1.05, 1.28)	1.11 (0.997, 1.24)	**1.13*** (1.02,1.25)
Age (y)		1598	1741	4.9	1.01 (0.999, 1.01)	1.01 (0.999, 1.01)	1.01 (0.999, 1.01)	1.0 (0.99, 1.01)	1.0 (0.998, 1.01)
Sex	Male	1,111	1202	5.7	Ref	Ref	Ref	Ref	Ref
	Female	486	538	3.7	0.95 (0.86, 1.06)	0.96 (0.86, 1.07)	0.96 (0.86, 1.07)	0.95 (0.84, 1.06)	0.96 (0.86, 1.07)
District	Medan	848	942	5.5	Ref		Ref	Ref	Ref
	Batam	750	799	4.3	1.02 (0.93, 1.13)		1.03 (0.93, 1.14)	1.00 (0.9, 1.12)	1.01 (0.91, 1.12)
Time	2013	369	442	4.3	Ref		Ref	Ref	Ref
	2014	812	869	4.8	1.11 (0.984, 1.26)		1.03 (0.93, 1.14)	0.97 (0.87, 1.08)	0.99 (0.90, 1.1)
	2015/16*	417	430	5.8	**1.19*** (1.032, 1.37)		Omitted due to collinearity	Omitted due to collinearity	Omitted due to collinearity
Education attainment	Low	166	179	3.2	Ref			Ref	Ref
	High	1196	1273	4.9	1.04 (0.886, 1.23)			1.05 (0.88, 1.24)	1.04 (0.87, 1,23)

*Statistically Significant at p value <0.01

[1]=univariate model (HR1); =model adjusted for age and sex (aHR2); =model adjusted for age, sex, district, time (aHR3); =model adjusted for age, sex, district, time, education attainment (aHR4); =model adjusted to covariates in model 4 and using 30 imputed dataset

6.3.4 Impact of SUFA intervention to treatment initiation stage

6.3.4.1 Proportion of treatment initiation

The study followed up 1,598 participants who were eligible for ARV (from 1,741 enrolled in care) until they received ARV treatment for the first time. The proportion of treatment initiation in pre-SUFA was 69.09% (485/702) while in post-SUFA was 69.98% (627/896) as shown in Table 6.4.

Table 6.8. presents the proportion of treatment indication according to clinical condition/CD4 count or irrespective CD4 count or missing among participants who received treatment, stratified by the intervention groups. In pre-SUFA, 96.5% of patients, receiving treatment was due to their advanced clinical condition. In the post-SUFA period, however, there was only 89.2% receiving treatment based on disease progression.

Table 6.8. Proportion of treatment indication according to clinical condition/CD4 count or irrespective CD4 count or missing among all participants who got treatment, stratified by pre-and post-SUFA

Characteristics		**Pre-SUFA n(%); median (IQR)** Total N=485	**Post-SUFA n(%); median (IQR** Total N=627
Treatment Indication	CD4 or clinical condition	468 (96.5)	559(89.2)
	SUFA population	16 (3.3)	60(9.6)
	Missing	1(<1)	8(<2)

6.3.4.2 Univariate analyses time to treatment initiation

The total number of patients included in the time to treatment initiation was 1,598, which contributed to a total of 19,511 person-days observation time. The incidence of treatment initiation in pre-SUFA was 6.2 treatment initiations per 100 person-days while in the post-SUFA groups it was 5.5 per 100 person-days. Compared to pre-SUFA, the median time until receiving ARV for the first time was one day longer in post-SUFA (pre-SUFA 9 days (1-19) vs. post-SUFA 10 days (2-20 d), however this difference was not

significant (p=0.165). Figure 6.4 shows the hazard function of ARV initiation among population eligible, stratified in pre-SUFA and post-SUFA.

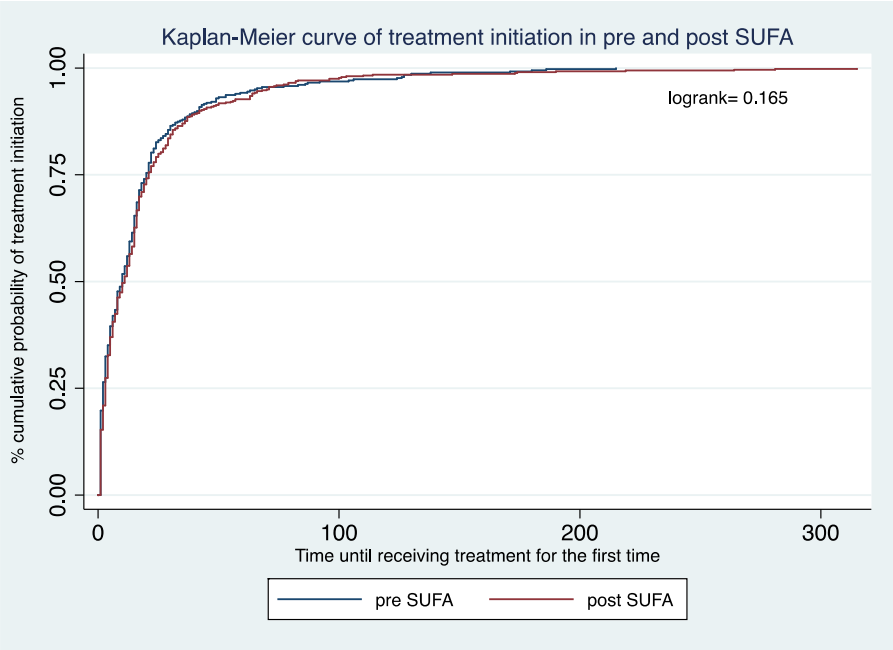


Figure 6.5 Kaplan Meir plot of treatment initiation among people observed eligible for ARV, stratified by pre-and post-SUFA intervention group.

6.3.4.3 Cox proportional hazards model of time to receive treatment initiation

The SUFA intervention was not associated with treatment initiation. Table 6.9. presents the results of the four Cox models of treatment initiation during the pre- and post-SUFA interventions. In the univariate analysis, factors related with treatment initiation were being resident in Batam (HR 0.86, 95%CI 0.76, 0.96, p<0.05), being treated in 2015/16 (0.81, 95%CI 0.68, 0.96, p<0.05), and being engaged in a paid job (HR 1.15 95%, 95%CI 1.01, 1.31, p<0.05). In the multivariate Cox proportional hazard model, after adjustment for age and gender (model 2), adjustment for age, gender, district, time (model 3), adjustment for age, gender, district, time, employment (model 4), as well as adjustment with covariates of model 4 using 30 imputed data set, the SUFA intervention was not associated with treatment initiation.

Table 6.9. Results of Cox model[1] for treatment initiation of people eligible for ARV during pre-SUFA and post-SUFA interventions

Covariates		Number of initiation	Observed person-days	Initiation rate (event/10-days)	HR1 (95%CI)	aHR2 (95%CI	aHR3 (95%CI)	aHR4 (95%CI	
								Incomplete data analysis	Multiple imputation
Intervention group	Pre-SUFA	485	702	5.9	Ref	Ref	Ref	Ref	Ref
	Post-SUFA	627	896	5.5	0.94 (0.83, 1.05)	0.94 (0.83, 1.05)	0.94 (0.83, 1.05)	0.92 (0.81, 1.04)	0.91 (0.81, 1.03)
Age (y)		1112	1741	5.7	1.0 (1, 1.01)	1.0 (1, 1.01)	1.0 (1, 1.01)	1.0 (1, 1.01)	1.0 (1, 1,01)
Sex	Male	770	1111	6	Ref	Ref	Ref	Ref	Ref
	Female	341	486	5.2	0.95 (0.84, 1.08)	[a]1 (0.89, 1.16) [b]1 (0.99, 1.0)	[a]0.9 (0.87, 1.18) [b]1 (0.99, 1.002)	[a]1.08 (0.92, 1.27) [b]0.997 (0.99, 1.)	1.03 (0.89, 1.19)
District	Medan	612	848	6.4	Ref		Ref	Ref	Ref
	Batam	500	750	5	**0.86*** (0.76, 0.96)		**0.88*** (0.78, 0.99)	0.89 (0.79, 1.01)	**0.88*** (0.78, 0.997)
Time	2013	265	369	6	Ref		Ref	Ref	Ref
	2014	567	812	6.3	.99 (.85, 1.14)		1.09 (0.97, 1.23)	1.01 (0.96, 1.23)	1.09 (0.96, 1.23)
	2015/16	280	417	4.6	**0.81*** (0.68, 0.96)		Omitted due to collinearity	Omitted due to collinearity	Omitted due to collinearity
Employment status	Not worked	311	449	4.8	Ref			Ref	Ref
	Worked	766	1085	6.1	**1.15*** (1.01, 1.31)			**1.17*** (1.01, 1.36)	**1.17*** (1.01, 1.35)

*Statistically significant at p value <0.05; [a]main HR, [b] after include TVC

[1]=univariate model (HR1); =model adjusted for age and sex (aHR2); =model adjusted for age, sex, district, time (aHR3); =model adjusted for age, sex, district, time, employment status (aHR4);=model adjusted to covariates in model 4 and using 30 imputed dataset

6.3.5 Impact of SUFA intervention on loss to follow up

6.3.5.1 Proportion of LTFU

The study followed up 1,112 participants who were initiated for ARV (among the 1,598 who were eligible for ARV) until they were lost to follow up, or the end of their follow up time. The proportion of LTFU among those who were initiated for ARV was 21% (102/ 485) in pre-SUFA. The proportion of LTFU among those who were initiated for ARV was 16% (100/627) in post-SUFA. Additionally, in regard to the drug regimen given by the physician, the majority of participants (53.4%) twice daily received a free triple combination of ZDV (300) + 3TC (150) + NVP (200) in the pre-SUFA group, while the majority of participants (53.3%) took once daily a fixed drug combination of TDF (300) +3TC (300)+EFV (600) or named SUFA drug in the post-SUFA group ($p<0.001$) as shown in Table 6.4.

6.3.5.2 Univariate analyses of time until loss to follow up

The total number of patients included in the time until LTFU was 1,112, which contributed to a total of 119,120 person-days observation time. The rate was 0.21 LTFU cases per 100 persons who received initiation for treatment in a day in the pre-SUFA group, while the rate was 0.14 cases per 100 person-days in the post-SUFA group. Figure 6.5 shows the Kaplan-Meir curve probability of LTFU among people who received treatment for the first time stratified by pre- and post-SUFA groups. There was a sudden drop at 30 days which is explained by the fact that patients could not be classified as LTFU in the first 30-days. The hazard function of LTFU among initiation for treatment over the follow up time differed between pre- and post-SUFA intervention groups ($p<0.05$).

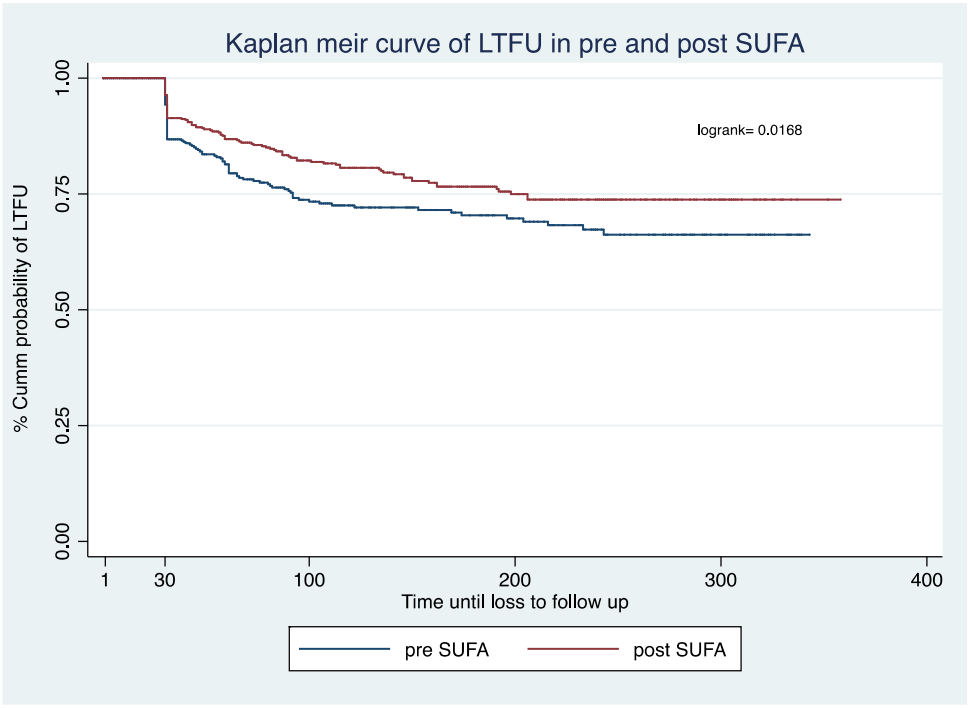


Figure 6.6 Kaplan-Meir plot of LTFU among people who were initiated for treatment, stratified by pre- and post-SUFA group.

6.3.5.3 Cox proportional hazards model of time to LTFU

Table 6.10 shows the findings of univariate and multivariate Cox model of LTFU among people who were initiated into treatment. The SUFA intervention was strongly associated with LTFU post receiving treatment initiation in univariate as well as in multivariate analyses. In the univariate analysis, being resident in Batam was associated with LTFU (HR1.37, 95%CI 1.04, 1.81, p<0.05). Being in the post SUFA group was also associated with LTFU (HR 0.72, 95%CI 0.55, 0.95, p<0.05). In the multivariate Cox proportional hazard model, after adjusting for age and gender (model 2) and age, gender, district, time (model 3), the probability of hazard in the post-SUFA group reduced by 29% compared to pre-SUFA group (aHR2&3 0.71, 95%CI 0.54, 0.94, p<0.05). After adjustment with age, gender, district, time, education attainment in the 30 imputed datasets, the SUFA intervention consistently demonstrated strong associations with the reduction of LTFU (aHR4 0.73, 95%CI 0.55, 0.97, p<0.05).

Table 6.10. The results of univariate and multivariate Cox model[1] for LTFU among people who received treatment for the first time during pre- and post-SUFA interventions

Covariates		Number LTFU	Observed Person/days	LTFU rate (event/1000 person-days)	HR1 (95%CI)	aHR2 (95%CI)	aHR3 (95%CI)	aHR4 (95%CI)	
								Incomplete cases analysis	**Multiple imputation**
Intervention group	Pre SUFA	102	485	2	Ref	Ref	Ref	Ref	Ref
	Post SUFA	100	627	1.4	**0.72*** (0.55, 0.95)	**0.71*** (0.54, 0.94)	**0.71*** (0.54, 0.94)	0.78 (0.57, 1.05)	**0.73*** (0.55, 0.97)
Age (y)		202	1112	1.7	1.01 (0.99, 1.023)	1.01 (0.99, 1.02)	1.01 (0.99, 1.02)	1.01 (0.99, 1.03)	1.01 (0.99, 1.03)
Sex	Male	146	770	1.8	Ref	Ref	Ref	Ref	Ref
	Female	56	341	1.5	0.89 (0.65,1.21)	0.86 (0.63, 1.18)	0.82 (0.61, 1.14)	0.90 (0.64, 1.25)	0.80 (0.58, 1.10)
District	Medan	104	612	1.5	Ref	Ref	Ref	Ref	Ref
	Batam	98	500	2	**1.37*** (1.04, 1.81)		**1.41*** (1.07, 1.87)	**1.48*** (1.08, 2.03)	**1.36 *** (1.02, 1.82)
Time	2013	55	265	1.9	Ref		Ref	Ref	Ref
	2014	96	567	1.5	0.815 (0.59, 1.14)		0.88 (0.67, 1.16)	0.98 (0.72, 1.32)	0.89 (0.67, 1.17)
	2015/16	51	280	1.9	0.99 (0.68,1.45)		Omitted	Omitted	Omitted
Education attainment	Low	21	105	2	Ref			Ref	Ref
	High	150	866	1.5	0.69 (0.44,1.09)			0.85 (0.52, 1,37)	0.85 (0.52, 1.37)

*Significant at p value <0.05

[1]=univariate model (HR1); =model adjusted for age and sex (aHR2); =model adjusted for age, sex, district, time (aHR3); =model adjusted for age, sex, district, time, education attainment (aHR4);=model adjusted to covariates in model 4 and using 30 imputed datasets

6.3.6 Impact of SUFA intervention on overall crude mortality

6.3.6.1 Proportion of crude mortality

A total 2,292 people were followed up from the day they were tested for, and diagnosed with, HIV until they died or to the end of the study.

In pre-SUFA, the number of deaths among newly identified HIV cases was 92, including 45 deaths after treatment initiation, and the overall proportion of death was 8.5% (92 died/1085 newly detected cases). In post-SUFA, the number of deaths was 101, including 35 deaths after initiation, and the overall rate of death was 8.4% (101/ 1207) as shown in Table 6.4. The proportion of death after initiation of treatment in post-SUFA (34.7%) was less than in pre-SUFA (48.9%). In the analysis of subpopulation of death, the project found that incidence of death was substantially higher in the pre-ART stage than post ART, similar in both groups as shown in Table 6.11.

Table 6.11. Proportion of death before and after receiving treatment among newly diagnosed for HIV, stratified by pre- and post-SUFA

Characteristics		**Pre-SUFA n(%)** Total N=119	**Post-SUFA n(%)** Total N=148
Crude death	Before treatment	47 (51.1)	66 (65.4)
	After treatment	45 (48.9)	35 (34.7)

6.3.6.2 Univariate analyses of time until death

The total number of patients included in the time until death was 2,292, which contributed to a total of 133,555 person-days observation time. The rates of death in the pre-SUFA and post-SUFA groups were similar. There were 1.7 deaths per 1000 person-days in pre-SUFA while 1.3 deaths per 1000 person-days in post-SUFA. The hazard function for death among newly diagnosed HIV cases over the follow up time did not differ between pre- and post SUFA intervention groups (p=0.866) (Figure.6.6.).

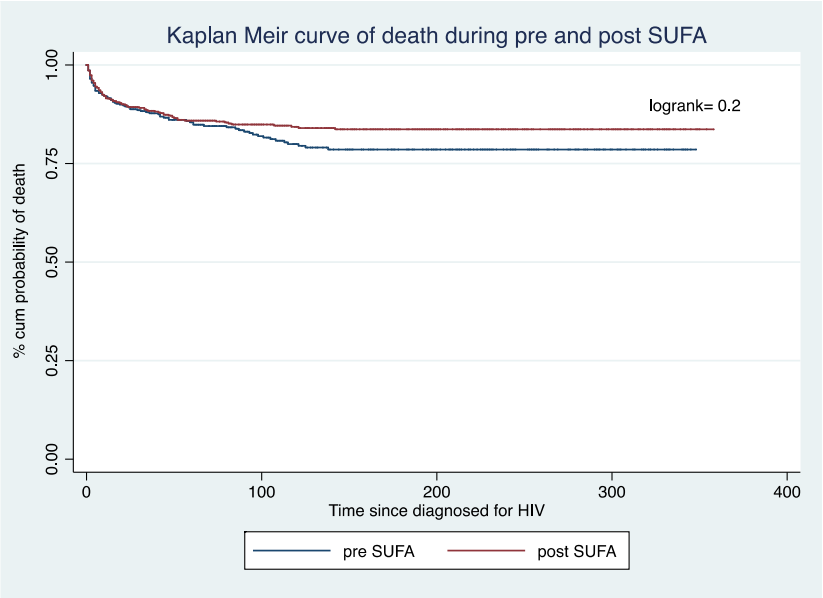


Figure 6.7 Kaplan Meir curve of death among HIV positive people in pre-and post-SUFA group

6.3.6.3 Cox proportional hazards model of overall crude mortality

Table 6.12 describes factors associated with mortality among newly detected HV cases stratified by intervention group. The SUFA intervention was not associated with overall crude mortality. In the univariate analyses, factors related with death were every 1-year increase in age (HR 1.03, 95% CI 1.01, 1.04; $p < 0.05$), having HIV transmitted via the anal route (HR 0.41, 95%CI 0.23, 0.70, $p<0.05$) and via bisexual/perinatal/ occupational exposure (HR 0.31,95% CI 0.13, 0.74, $p<0.05$). Being in the group of post SUFA was not associated with mortality.

In the multivariate Cox proportional hazard model, after adjusting for age and gender (model 2), adjusting for age, gender, municipalities and years (model 3), adjusting for age, gender, municipalities, years, transmission risk (model 4) as well as after using 30 imputed data similarly adjusting for factors in model 4, being in the post-SUFA group was not associated with death.

Table 6.12. The result of univariate and multivariate Cox model[1] for death among people who were diagnosed for HIV during pre- and post-SUFA interventions

Covariates		Number death	Observed Person/days	Death rate (event/1000 person-days)	HR1 (95%CI)	aHR2 (95%CI)	aHR3 (95%CI)	aHR4 (95%CI)	
								Incomplete cases analysis	**Multiple imputation**
Intervention group	Pre-SUFA	92	1085	1.7	Ref	Ref	Ref	Ref	Ref
	Post SUFA	101	1207	1.3	0.83 (0.63, 1.10)	0.83 (0.63, 1.11)	0.83 (0.62, 1.10)	0.75 (0.55, 1.03)	0.85 (0.64, 1.14)
Age (y)		193	2292	1.5	**1.03*** (1.01, 1.04)	**1.03*** (1.01, 1.04)	**1.03*** (1.01, 1.04)	**1.03*** (1.01, 1.04)	**1.02* (1.0,1.04)**
Sex	Female	65	737	1.6	Ref	Ref	Ref	Ref	Ref
	Male	128	1525	1.4	0.88 (0.65, 1.19)	0.87 (0.64, 1.17)	0.88 (0.65, 1.18)	0.92 (0.66, 1.28)	0.95 (0.69 1.31)
Municipalities	Medan	106	1176	1.4	Ref	Ref	Ref	Ref	Ref
	Batam	87	1116	1.6	1.02 (0.77, 1.36)		1.06 (0.79, 1.41)	[a]1.21 (0.81, 1.81) [b]**0.99*** (0.99, 1)	1.02 (0.77, 1.37)
Years	2013	48	552	1.5	Ref		Ref	Ref	Ref
	2014	102	1157	1.5	0.97 (0.69, 1.37)		1.10 (0.83, 1.5)	1.04 (0.77, 1.42)	1.09 (0.82, 1.45)
	2015/16	43	583	1.3	0.85 (0.56,1.28)		Omitted because of collinearity	Omitted because of collinearity	Omitted because of collinearity
Transmission Risk	Vaginal	147	1518	1.6	Ref			Ref	Ref
	Anal	14	388	0.7	**0.41*** (0.23, 0.70)			**0.52*** (0.29, 0.93)	**0.48*** (0.27, 0.88)
	Others	5	181	0.5	**0.31*** (0.13, 0.74)			**0.32*** (0.13, 0.77)	**0.32*** (0.13, 0.8)

*Significant at p value <0.05; a. main aHR3 incomplete case analysis result; b. after including time dependent covariate

[1]=univariate model (HR1); =model adjusted for age and sex (aHR2); =model adjusted for age, sex, district, time (aHR3); =model adjusted for age, sex, district, time, transmission risk (aHR4);=model adjusted to covariates in model 4 and using 30 imputed datasets

6.4 Discussion

6.4.1 Impact of SUFA on enrolment in care

After one year of implementation, the SUFA intervention was effective in linking 11% more people into the WHO clinical staging assessment, or blood test for CD4 count levels or receiving cotrimoxazole prophylaxis. The proportion of enrolment in care found in this study was 77% in post-SUFA, which is slightly better than the median (ranges) proportion of HIV testing to linking to care found in a systematic review 58% (35-88%) (Rosen, Sydney & Fox 2011). Further, among those linking into care, the current study was able to maintain the short time from diagnosis to engagement in care (1 day).

Integration of services, or 'one stop shopping', is likely the key facilitator in linking more patients after implementation. It addresses some of the structural and physical barriers i.e. lack of transportation cost, different locations of services, and also addresses multiple clinical and social needs at the same time (Mizuno et al. 2019). The PITC was the dominant testing approach that was used prior to and after the SUFA intervention, compared to VCT. The PITC has some advantages: because it is offered by clinical providers, it normalises testing procedures and therefore reduces stigma. It reduces time to test completion (Dalal et al. 2011) and it is conducted in health care clinics that facilitate patient access to HIV care, treatment and support services according to a systematic review meta-analysis and the WHO (Sharma et al. 2015; World Health Organization 2007a). When conducted in hospitals that have a comprehensive HIV care and treatment, it also facilitates linking and reduces time from test to engagement in care. The study argued that the PITC in post-SUFA might be slightly better in linking patients to services than in pre-SUFA. Furthermore, an integrated clinic system had already begun to function in the SUFA era (Chapter 1 section 1.3.4 Table 1.1). In contrast to PITC (facility based), capturing high risk populations in the community (e.g.

MBHTC) was likely to face further difficulties due to testing conducted outside health care facilities (Ayieko et al. 2018).

A recent systematic review demonstrated the positive effect of service co-location particularly for linking patients to services and ART treatment (Mizuno et al. 2019). A recent prospective cohort study of the HIV cascade among KAP in four Indonesian locations (Bali, Yogyakarta, Jakarta, Bandung), found that having HIV care and treatment services in the same clinic likely facilitated the linking to the next cascade (Januraga et al. 2018). Further, in a study conducted in GuangXi China, a simplified procedure of testing and treatment and pooling HIV care services in one centre after completion of screening demonstrated a large increase in the proportion of HIV cases linked into care, from a pre-simplified procedure 1 (67%) to a post simplified procedure 1 (97.7%) and pre-simplified procedure 2 (60.5%) to a post simplified procedure 2 (97%) (Wu et al. 2015). Integration reduces loss of opportunity to utilise HIV services and lag time between cascades.

The risk of enrolment in care in the current study was in line with a six armed randomised controlled trial conducted in Kwazulu-Natal South Africa (Barnabas et al. 2016). That study found that the risk of enrolment in care increased by 4% and 9% compared to the standard arm after utilising community-based HIV counselling and testing (CBHCT) and lay counsellor support or CBHTC and clinic support intervention. Point of care (POC) intervention also demonstrated a promising effect to link PLHIV from MBHTC into further HIV care programs in clinics. The risk of enrolment in care increased by 25% in POC group within 8 weeks after HIV testing (Larson et al. 2012). According to Vojnov et al. (2016) POC decreased time and increased retention along the continuum of care cascade, particularly from testing to the treatment stage. The presence of a qualified health care provider to take a blood sample for CD4 count at the

testing point resulted in 85% treatment linkage compared to 37% if the providers were absent (Kompala et al. 2016). In contrast, CBHCT without a specific linking intervention resulted in a low proportion of linkage into HIV care: about 25% (after 1 month diagnosed) (Labhardt et al. 2014), 34% (after six months diagnosed) (Parker et al. 2015), 63.6% linkage (within 12 months) (Iwuji et al. 2016). Sharma et al. (2015) systematic review and meta-analysis found that higher rates (comparable to facility-based) of linkages after community-based testing could be achieved if community-based testing was tailored with a facilitated linkage intervention.

The integration of services also might impact on time to enrolment. In this study the median time to engage was 1 day (IQR 0-5) in both groups. SUFA did not make a difference in regard to the length of time. Nonetheless, this finding does indicate that the very short time to engagement in care was maintained under SUFA. This finding was comparable to those of Wu et al. (2015), who found that the median time to link into care was one day and zero days after the simplified procedure. Similarly McNairy et al. (2017), found that the mean time to link to care was 2.5 days after intervention. In other parts of the world, the long period between being diagnosed for HIV and enrolment in care was still a huge concern, with 34% of their PLHIV linkage to care after six months (Parker et al. 2015), and with 47.5% of their HIV linkages occurring within six months of referral (Iwuji et al. 2016).

Considering that universal access to HIV treatment is available in Indonesia, efforts clearly need to be invested in improving linkages to services. In the current study, more than 20% people failed to engage in any kind of HIV service for a number of reasons, which the project was unable to explore. However, a recent scoping review found factors related to low uptake of engagement to HIV care in Indonesia were: lack of HIV knowledge, fear of stigma, and poor linkages between services (Lazuardi, Bell &

Newman 2018). Further, Patten et al. (2013) found that patients' choosing to obtain HIV testing away from their usual place of residence for confidentiality concerns as another reason for patient attrition after diagnosis.

6.4.2 Impact of SUFA on eligibility for ARV

The expansion of eligibility criteria under SUFA from restricting treatment to people with CD4 count ≤ 350 to including at risk population groups regardless of their CD4 count level, demonstrated a strong impact in improving the number of people eligible for ARV after one year of implementation with a 13% increase in eligible for ARV over baseline. The finding is comparable to studies investigating a multicomponent intervention (POC, accelerated eligibility assessment and treatment, applied mobile phone reminders for appointments, provided health educational packages, and non-cash financial incentives). These studies found increases in eligibility for ARV of 18% (McNairy et al. 2017) and 24% (Elul et al. 2017) after implementing the intervention. This is despite both studies using a CD4 count ≤350 cells/mm3 eligibility criterion for ARV.

After applying the SUFA eligibility criteria, almost all the participants who were linked into care (96.3%) were observed to be eligible for treatment with ARV. Elul et al. (2017) and McNairy et al. (2017) found similar high proportions of eligible for ARV treatment after applying the multicomponent intervention (75% vs. 76% respectively). In current study the use of SUFA eligibility criteria (eligible irrespective of CD4 count if part of a SUFA population), in post-SUFA period showed a 9.5% increase in the number of eligible people. In the cascade, the stages are interrelated; the number of people transitioning to the next step depends on the number of people in the preceding stages. The increased number of people enrolled in care from the previous stage as well as the expansion of ART eligibility criteria increased the number of eligible people, which may explain the findings.

The current findings showed that the SUFA intervention has made a significant improvement in the eligibility for treatment, although the result was not as high as predicted. It was postulated that the expanded criteria could double the number of eligible people as discussed in Chapter 1 (particularly given expected contributions from sero-discordant couples and MSM) (National AIDS Commission & Ministry of Health (ID) 2013). The reason that this expectation was unmet may be because a substantial number of asymptomatic HIV infected individuals who would have benefitted from the new criteria, have not yet been identified. The majority of participants were diagnosed when already in more advanced stages of HIV infection (median baseline CD4 count was 115 cells/mm3; proportion of CD4 counts ≤350 was 64.6%; proportion of clinical stage 3 and 4 was 66.8% in post-SUFA). This indicated challenges in reaching high-risk individuals earlier, for a number of reasons. In Indonesia, conducting outreach to find high-risk populations outside healthcare facilities usually depends on other actors to find cases and not all healthcare facilities have links to KAP groups (author observation).

The HIV testing model facilitates to the speedy discovery of people diagnosed with HIV either at early or delayed stages (Topp et al. 2012), which then leads to the determination of the potential number of people linked to care, eligible for ARV and so forth. The hospital-based testing strategy finds more delayed diagnoses (Menzies et al. 2009; Sharma et al. 2015; Topp et al. 2012); however, community-based testing strategy finds more cases with higher CD4 count (Menzies et al. 2009; Sharma et al. 2015). SUFA's main testing strategy, which was based on hospital and clinical settings (PITC), led to finding a greater number of patients in the more advanced stages of HIV progression (WHO clinical stages 3 or 4 and median CD4 count < 350 cells μl). The contribution of SUFA to finding early cases was small (median CD4 count was ≤ 200 in post-SUFA). This indicates a more effective testing strategy is needed to capture people outside of healthcare facilities.

Studies in Swaziland (Parker 2016) and (Kompala 2016) found lower rates of eligibility (33.1%, 41%, respectively) compared to the current study. The differences between the current study and these two studies were likely due to the testing strategies and eligibility criteria used. Both the Parker and the Kompala studies detected their cases via community-based testing strategies and applied the eligibility for treatment criteria of CD4 count level ≤ 350 or WHO stages 3 or 4. In other words, they found cases with higher CD4 (early diagnosis) but not eligible for treatment at that time, while this study found more delayed diagnosis and thus more people were eligible.

The short length of time from enrolment in care to a determination of eligibility showed that most participants were found eligible once enrolled. SUFA led to the shortest time for an eligibility determination that the program could achieve: 0 days (median time 0 d (IQR 0-0)). McNairy et al. (2017) also found exactly the same mean time length from testing to eligibility assessment (0 days) as the current study, while Parker et al. (2015) found 12-days interval between testing and eligibility.

6.4.3 Impact of SUFA on treatment initiation

After one-year of implementation of the immediate treatment policy to those eligible, the SUFA did not improve the number of people initiating treatment. The number of people on ART was projected to grow substantially, based on mathematical modelling using the assumption of 80% eligibility by the SUFA criteria (National AIDS Commission & Ministry of Health (ID) 2013). Although the numbers eligible exceeded expectations, the project findings demonstrated that numbers initiating treatment did not improve.

Studies in Swaziland (McNairy et al. 2017), Kwazulu Natal and Uganda (Barnabas et al. 2016), Durban south Africa (Bassett et al. 2013) and Zambia (Hewett et al. 2016), found similar challenges. After applying multiple interventions that targeted several stages in the cascade (such as home-based testing, lay counsellor support, accelerated eligibility assessment and treatment, stigma reduction, POC, counselling, reminder of

forgetfulness, patient skill improvement, enhanced referral and escorting, provided health educational packages, non-cash financial incentives), treatment uptake did not improve, remaining at a relatively low uptake of 37% (Barnabas et al. 2016), and 22% (Bassett et al. 2013).

There are several potential factors related to the non-improvement of treatment uptake, including the providers' late adoption of the innovation (Barnabas et al. 2016; Kencana 2014) (see Chapter 5 section 5.4.6 on late adopters reported by the Medan District facilitator). Another potential reason was the lack of a meaningful increase in the number of asymptomatic individuals found in this current study. The significantly higher treatment initiation rate in the Iwuji study with an active community outreach component demonstrated that the majority of enrolled participants having CD4 counts > 350 cells/mm3 accepted universal treatment while our study found only a small number of participants with CD4 count level > 350 cells/mm3 after the intervention, with no significant increase in initiations post-SUFA. A pre- and post-intervention study in China also found high uptake of treatment initiation after simplifying the pre-ART procedure and applying TasP. Their results after the revision of eligibility criteria showed a higher number of eligible patients for ART and high willingness to be initiated (Wu et al. 2015). A qualitative study in Kenya investigating sero-discordant couples' responses to early initiation of ART found that majority were interested in being initiated early for the sake of health benefits and preventing transmission to their partner (Curran et al. 2014).

Another possible reason for the non-improvement of treatment uptake in this study was that most eligible participants in advanced disease stages usually had TB symptoms and required further assessment (Koenig et al. 2017). If TB diagnosis was established, patients had to be treated for TB for eight weeks before continuing to ART (Ministry of

Health (ID) 2014e, 2019), which might delay treatment or increase loss to care. The longer the initiation interval the fewer retained in care (Koenig et al. 2017).

Another potential reason was that the multiple steps and long procedure prior to treatment initiation were not significantly improved after one year implementation of SUFA. Januraga et al. (2018) highlighted the existence of similar challenges. Complex blood testing algorithms and the requirement for multiple counselling sessions were two policies that were simplified after SUFA in the new ARV guidelines, as discussed earlier (Ministry of Health (ID) 2014e). A simplified blood test algorithm based on clinical condition and the use of CD4 count for monitoring and not a requirement for initiation may not have been followed. The second supposed simplification was the stipulation of four compulsory adherence to treatment counselling sessions, rather than the previous ad hoc frequency of sessions (Ministry of Health (ID) 2014d). Prior to initiation to ARV, patients must undertake adequate and appropriate treatment counselling, after which their possible adherence level is assessed and predicted based on information collected from the counselling session. However, this procedure potentially leads to subjectivity in interpretation of the patient's knowledge and adherence level, thus potentially delaying the treatment. Further, a large CRCT study in Uganda found that there was a belief that delayed initiation for ART was not harmful, therefore long waiting and multiple visits to health facilities for eligible people were common. Despite a clear evidence base, standard counselling rules required three adherence counselling sessions before ART and the need for a treatment supporter (Amanyire et al. 2016). This situation may also occur in Indonesia; however further investigation is needed for verification.

In this study, the proportion of ART eligible patients starting treatment was slightly lower than that estimated by Januraga et al. (2018), with 86.2% initiating. The median time from a determination of eligible to treatment in our study was 10 days (2-20 days),

while Januraga et al. (2018) estimated a median time from study registration to treatment of seven days (3-17 days). The difference was possibly due to Januraga et al. having more simplified and uniform procedures to initiate treatment (more controlled), free care (some items that in a normal setting were paid in Januraga et al.'s study were donor funded), and differences in provider capacity to deliver HIV care and treatment services. Locations providing treatment in Januraga et al.'s study had recognised experience in HIV/AIDS research in KAP and had highly qualified teams (Januraga et al. 2018), while this research generally represented the real world conditions of HIV clinics in Indonesia with likely less experienced staff. This could be considered a strength of this project, as it demonstrated the magnitude and durability of TasP in the real world situation as well as the challenges that exist in the effort to scale up the ARV (Cohen, MS 2011).

About 30% of those eligible and 48% of all HIV cases did not initiate treatment, and the study did not explore the reasons (see Chapter 5 section 5.4.6. for possible reasons for not getting treatment initiation). A patient who is not treated misses the benefits of ARV as does the overall population as this patient is still able to transmit the virus over their lifetime (Iwuji et al. 2016). Early initiation could reduce HIV transmission by 96% in trial studies (Cohen, MS et al. 2011). Further research in real world conditions showed that early initiation can reduce new HIV infections by 18% and AIDS related deaths by 9% (Maddali et al. 2015). The key to optimisation of the ARV benefit in Indonesia is to get all PLHIV initiated (under the current treat all strategy) as early as possible.

6.4.4 Impact of SUFA on loss to follow up (LTFU)

The SUFA intervention was effective in decreasing the LTFU by 27% after treatment initiation. The proportion of LTFU decreased from 21% in pre to 16% post-SUFA, comparable to Koenig et al. (2017) finding that simplification of multiple steps prior to

patients receiving treatment by applying a same day testing and treatment intervention resulted in a reduction of LTFU from 22.5% to 17.3%

In the treatment cascade stage, one of the main SUFA interventions used to facilitate compliance with treatment was use a fixed triple combination of HAART given once-daily and is safe and well-tolerated (Delaugerre et al. 2015; Ministry of Health (ID) 2011). Although the majority of people in the intervention group used the SUFA drug, it was unlikely the reason for the reduction of LTFU in the current project. In the sub-analysis of the drug regimen used among people who were LTFU, the majority of LTFU in the intervention group were people who also used the SUFA drug regimen. In contrast, the majority of LTFU in the pre-SUFA group were people who twice used the dose-free combination of ZDV (300) + 3TC (150) + NVP (200). This finding indicated that the lower frequency of taking medicine and a simpler formulation of drug regimens might not be related to a reduction in LFTU incidence after initiation the treatment. Amico (2014), in contrast, found that treatment regimen and substance use were associated with retention to treatment.

Instead, the current study proposed that the main factors contributing to treatment retention are readiness to start long life treatment and multiple adherence counselling sessions (Koenig 2017). Compulsory serial counselling, including pre- and post-HIV test and four treatment counselling adherence sessions, was required before treatments were given to HIV eligible patients in Indonesia. Additional requirements in the post-SUFA era were for patients to have a treatment supporter reminder to take drugs routinely, as well for patients to provide a written statement of readiness to take life-long treatment (Ministry of Health (ID) 2013d, 2014d). Koenig (2017) found the level of their participants' readiness to begin life-long treatment was very high at 99%. This was not measured in this study; however, most of the patients in this study showed

that they have overcome certain barriers (e.g. perceived stigmatisation from providers, lack of laboratory and transportation cost) by linking to care and continuing to treatment stage, which indicated a readiness to begin the treatment. Before SUFA, only certified counsellors were able to counsel clients or patients prior to testing and treatment. This created a barrier to expanding treatment services, as the number of counsellors in the country was very limited. After SUFA, this requirement was moderated by allowing trained health staff to deliver the service (task shifting), which, in the opinion of the researcher, is one of the program's strengths.

Three systematic reviews on interventions improving retention in care found the delegation of task to lay workers, adherence support via counselling, and education were effective (Murray et al. 2017; Vrazo et al. 2018; Vreeman & Scanlon 2013). Another systematic review assessing intervention impact on retention in ART found reduction in clinical visits and ARVs pick up, although this was suggested for stable, virally suppressed patients, tolerant of their drug regimen and with very high level of adherence, was effective (Mutasa-Apollo et al. 2017).

6.4.5 Impact of SUFA on crude death along continuum of care

Structural interventions which expanded access to HIV testing and ART treatment did not impact crude mortality along the continuum of care after one year of implementation. Globally, wide scale-up of ARV has reduced the mortality related to HIV (Joint United Nations Programme on HIV/AIDS (UNAIDS) 2014c). Global evidence demonstrated that treating HIV infected people before their CD4 counts lowered could decrease clinical disease progression and mortality by up to 44% (Cohen, M et al. 2015; Insight Start Study Group et al. 2015; National Institute of Allergy and Infectious Diseases 2015; Temprano Anrs Study Group et al. 2015). The target of the SUFA intervention was to capture healthier people, and link them to care and immediate treatment, with the expectation that these efforts would contribute to reducing overall

population morbidity and mortality from HIV (National AIDS Commission & Ministry of Health (ID) 2013). However, the current project showed that delayed diagnosis (defined as CD4 counts <350), which was found to occur in similar proportions pre- and post-SUFA, could partly explain the apparent lack of effect of SUFA on mortality.

In both pre- and post-SUFA, the project found the majority of participants experienced delayed diagnoses and treatment. The high proportion of participants in both groups who had baseline CD4 counts ≤ 350 cells/mm3 or who had baseline WHO stages 3 and 4 clinically provided clear evidence that the majority were late stage infections. There was only a small percentage (9.5% in post-SUFA) of eligible who were without clinical signs of HIV progression. The SUFA intervention may not have contributed measurably to finding healthier people after one year of intervention. Early diagnosis is still a crucial challenge in Indonesia, as found by Januraga et al. (2018) and elsewhere (Lima et al. 2015; May et al. 2011; Tang, H et al. 2014; Wu et al. 2015).

A study in China (Wu et al. 2015) found that overall crude mortality reduced from 26% to 10% pre- to post intervention due to the application of a simplified HIV testing and treatment procedure. Identifying a greater number of people in lower CD4 count could be one of the reasons for the dissimilarity in the findings between the current project and the Chinese study. In the current study, the median CD4 count was 120 and 115 in pre- and post-intervention respectively, while the patients in the China study had relatively higher CD4 counts of 243, 219 and 220, 178 in the pre-1, pre-2 and post 1, post 2 interventions respectively. Similarly, in a Haitian study by Koenig, where only patients with WHO stage 1 and 2 and CD4 count < 500 (early diseases) were enrolled, a reduction of overall mortality after applying the intervention was demonstrated. Early treatment results in decreased HIV transmission (Cohen, MS et al. 2011) and decreased mortality and opportunistic infection prophylaxis (Halperin et al. 2017). In this study,

ART contribution to mortality is likely minimal. As there was almost no change in speed of PLHIV receiving treatment, in cumulative incidence and given late entry into treatment, there was negligible effect on mortality.

Poor linkages between service providers might also have contributed on the findings, as this has been identified as related to low engagement and poor performance along HIV cascade in Indonesia (Lazuardi, Bell & Newman 2018). In a Chinese study (Wu et al. 2015) successful streamlining of the testing and treatment procedures by pooling all care appointments previously provided by multiple centres, into a single hospital visit after initial screening improved engagement and initiation rates. This contrasts with the situation in Indonesia where multiple visits are required in the context of poor referral systems amongst centres.

Inadequate intensity of patients' interaction with health provider (Bassett et al. 2016), patients' socioeconomic constraints, insufficient access to the health care system (Lima et al. 2015), no history of testing, advanced WHO clinical staging, immunologic failure, bedridden functional status (Gesesew et al. 2018), low CD4 count (Gesesew et al. 2018; Tachbele & Ameni 2016) have all been found to contribute to overall crude mortality. However, whether these factors were also the factors influencing the study's findings needs to be further explored.

6.5 Strengths and limitations

This study is one of the first to measure a multicomponent intervention on multiple steps from pre- to post ART. It is the first cohort study to examine the effect of multilevel interventions along the full HIV continuum of care in Southeast Asia. The study design was robust, as it used two matched cities accounting for different years before and after the implementation of the intervention, investigating a large population. The study used all the HIV cases that were reported in the two areas so the findings can be generalised

to represent the HIV program achievement within the two cities. The data collection was based on standardised medical record review as opposed to the subjectivity of self-reporting (Bassett et al. 2016). The study also assessed the real-world situation rather than a trial setting, by using HIV data from available clinics that showed the real district performance in handling the HIV program. Thus, the current study could demonstrate the real magnitude and durability of the intervention tested. Further, the study collected standardised variables data that were used by HIV program, which allowed comparison of data among the different clinics (Januraga et al. 2018).

However, the findings should be interpreted carefully, as the study has some limitations. The method of choosing the two locations using non-probability sampling may limit the generalizability of this finding to other districts in Indonesia. This is also explained by the variety of region's characteristics such as social, cultural, economic, epidemiological as well as health system capacity and available resources. Some districts e.g. in Jakarta and East Java region which have more HIV cases as well as a stronger health system capacity, might experience larger effects on the care cascade than those estimated for the two cities studied. On the other hand, in the Papua region which has more HIV cases but a weaker health system capacity and resources, the effects of SUFA may be smaller

Further, the study used clinically defined and routinely collected secondary data that in some cases were incomplete and may not always have been accurately entered. Some variables had more that 20% missing data. However, the possibly incorrect data were assumed minimum as the staff responsible to fill out the data had received extensive training and were certified. They also used standardised forms to record the data, which improves data accuracy. For missing data, the researcher consulted the officer in charge or looked for other records to complete the patient's care history. In addition, conclusions obtained from multiply imputed analyses were mostly similar to those obtained from in complete-case analysis only. Although Eligible for treatment at LTFU

were statistically significant for the MI models but the in complete case models (model 4 without MI) for these outcomes were not. The HR's for the 2 models were very similar and the only reached statistical significance for the MI models due to the greater power with the additional data available.

The study was unable to confirm the end result of LTFU i.e. transfer to other clinic or death or other reasons; thus, the LTFU might be overestimated and mortality might be underestimated. However, since the focus of this study was to assess the effect of SUFA (HR) on enrolment in care, eligibility for ARV, treatment initiation, LTFU and overall crude mortality and was not the cumulative incidence, a standard Cox regression modelling approach was justified without performing a competing risk analysis.

The study did not collect data on adherence and viral load. Adherence data were not collected because of the varieties of definitions used by RR staff in the clinics, with some definitions found to be inaccurate compared to the national standard definition. Viral load was not collected because only one hospital (Adam Malik Hospital in Medan) had viral load data for some of their patients.

Lastly, although the changes in the point estimates could be considered meaningful as well as statistically significant changes, there was a relatively high degree of uncertainty in some of the results, in particular for enrolment to care and eligibility for ARV. Based on the 95% CI's, the true changes may have been decreases of <1% and 2% respectively. The factors that might contribute to the uncertainty include a limited number of events and relatively small sample size. Thus, for future study either a larger number of events (longer time period) or a larger sample size (more sites) would be required to obtain a better level of precision in the true effect of SUFA on these two outcomes. Such small effects might not have represented a positive outcome in view of the significant effort and resources invested as well as money in regards to the scaling up of testing and treatment. Nevertheless, the size of this study's point estimates are

supported by those of other studies suggesting that the true effects were meaningful and economically effective.

6.6 Summary

This chapter reported on Study 3's comprehensive and detailed investigation of the effect of SUFA in improving the number of people and length of time of their transition along HCC after one year, before and after implementation of the SUFA intervention in the cities of Medan and Batam. By utilising four Cox proportional hazard models, the univariate and multivariate analyses, adjusted with demographic characteristics as well as sites and time, the study was able to demonstrate that the combination of TasP and structural intervention significantly affected the number of PLHIV enrolled in care and the number of people determined as eligible for ARV. The study was also able to show that the number of people receiving treatment being LTFU was meaningfully reduced after SUFA was implemented. Although the study did not find significant changes in the length of people's engagement in enrolment, eligibility and treatment initiation between pre- and post-SUFA, the intervals are considered to be sufficiently short relative to elsewhere in the world, particularly from diagnosis to enrolment, and enrolment to eligibility. However, after its implementation, SUFA did not affect the number of people eligible to receive treatment for the first time and the overall crude mortality, which indicated that program challenges still exist and need further exploration.

Chapter 7

General Discussion

CHAPTER 7 GENERAL DISCUSSION

7.1 SUFA's impact along the full HIV continuum of care cascade

The results of the interrupted time series-ITS (Study 2) show that SUFA policy interventions implemented in the thirteen pilot demonstration sites immediately increased HIV testing by 41% as compared to HIV policy program prior to the TasP era. This increase is likely also to have affected the number of HIV cases detected per HIV tests performed per month, which was immediately reduced by 23%. The results also demonstrate that the interventions changed the trends in the rate of HIV testing, enrolment in care, eligibility for ARV and treatment initiation in the three years post implementation. Conducted in the same areas as this study three years before and one year after SUFA implementation, a MOH monitoring and evaluation report on investigation of the SUFA's impact using descriptive analysis of population data also found an increase in number of people engaging in HIV test, HIV detection, enrolment in HIV care, treatment initiation (World Health Organization 2014b). However, the MOH study could not demonstrate whether the SUFA intervention or other factors contributed to the changes. This present ITS's findings are valuable given the lack of research measuring the real world effect of TasP combined with HIV structural interventions on the full HIV continuum of care cascade. This study is the first to use multiple sites, six years of population data and an ITS approach in a limited resources country, specifically a Southeast Asian country.

The retrospective cohort study (Study 3) demonstrates that among PLHIV, enrolment in care was increased by 11%, seen eligible for ARV by 13%, and loss to follow up was reduced by 27% after one-year of SUFA implementation in Medan and Batam districts. These outcomes were the results of the revision of treatment criteria to TasP, combined with HIV stakeholder networking, health providers and community training, community-

and facility-based HIV testing and counselling, and a change to once daily fixed drug combination interventions. The findings of this project are also crucial considering a comprehensive and systematic evaluation of the SUFA intervention after its implementation has never been conducted before. From these findings, therefore, suggestions can be made to improve the current Indonesian HIV 'test and treat all' policy intervention.

The retrospective cohort study also found that median time between diagnosed for HIV positive and enrolment in care was 1 day (IQR 0-5), enrolment in care and being found eligible for ARV was 0 days (IQR 0-0), and between day of being determined eligible for treatment initiation was 10 days (IQR 2-20). Thus, the project's median time from being identified as HIV positive until receiving ARV initiation was eleven days (median enrolment 1 day, eligible 0 days, initiation 10 days). A prospective cohort study in four different areas in Indonesia found comparable (although slightly shorter) results, with a median time from study registration to ART treatment was of seven days (Januraga et al. 2018). The findings of this project and Januraga et al.'s study may indicate that the Indonesian health system might have been able to reduce time from diagnosis to receiving treatment, at a time when other areas of the world still experience huge challenges in shortening this time. The median times from diagnosis to ART treatment were 34 days (Parker et al. 2015), 118 days (Kompala et al. 2016), 6 months (Fyod), 22 weeks (Barnabas et al. 2016), and 265 days (Iwuji et al. 2016). However, these studies may have faced significant barriers in linking their PLHIV detected from CBHTC to facilities to continue HIV care and treatment, while in this project the majority of PLHIV were detected in health care facilities. As highlighted by Ayieko et al. (2018), it may be more difficult to link PLHIV identified outside clinics into care than when PLHIV are found in facilities that provide comprehensive HIV care services.

The SUFA policy analysis found that, overall, the achievements of HIV cascade program indicator were low; therefore, a new combination intervention strategy was needed. Because PITC and VCT (facility based) was the HIV testing strategy chosen for SUFA, the problem represented by this strategy was that it was sufficient to locate identification of high-risk people in health facilities. Further, SUFA's adoption of the strategy of TasP application to a specific population indicated that the previous intervention strategy was inadequate to control the growing epidemic that was particularly concentrated in this group. Therefore, they needed to be identified and receive ART as soon as possible. Consequently, the way the HIV program problems were framed could hamper the objectives of the SUFA intervention by social inequalities and health disparities among the high risk populations needing access to HIV testing and ARV treatment.

This study's systematic literature review found eight studies that examined multiple combinations of structural interventions aimed to change directly people's movement along the full continuum of care. Each study examined a minimum of four steps influenced by the particular intervention, with the stage most targeted for change being linkage to HIV care and treatment initiation. A combination of patient-centred approaches, including, simplification of the pre-ART to ART procedures, improvement of patient skill and support, TasP showed promise (Wu et al. 2015). The studies investigating the most comprehensive intervention found that combined point of care (POC) immediately after diagnosis accelerated the eligibility assessment and treatment procedure, while mobile phone reminders for appointments, health educational packages, and non-cash financial incentives also demonstrated promising results (Elul et al. 2017; McNairy et al. 2017). However, none of the studies discovered a consistent effect of those interventions along the HCC, which was also true of the SUFA intervention. The natural, interrelated characteristics of the HCC stages likely challenged the intervention's impact and contributed to the equivocal findings.

Inadequacy of structural, behavioural and medical interventions, which should address multiple ecological level barriers and target multiple steps at the same time, is a particular challenge for LMIC (Hayes 2017) and may be another reason for this effect. In the real world setting, complex issues that prevented the providers from targeting multiple steps at the same time, such as lack of knowledge about barriers and facilitators, incapacity to influence, low political will, lack of suitable planning, and insufficient funding may be among the other reasons for inconsistent improvement along the HCC stages.

7.2 Implications for Indonesian HIV policy intervention program and practice

This study has identified the program milestone that was achieved by the SUFA interventions, providing important information to support appropriate revision in order to improve the HIV intervention program strategies. This study has shed light on the performance of the Indonesian health system in adopting the SUFA policy strategy that utilized TasP. The strengths, weaknesses and challenges faced by the Indonesian health system have also been revealed. In general, the study demonstrated that expanding access to test and treatment improved engagement of PLHIV in the continuum of care cascade, indicating that, as adopted by the health system, the SUFA intervention worked well. The project also postulated that the effort to achieve the ultimate goals of 'to reduce morbidity, mortality and HIV transmission' can be threatened if substantial changes in the HIV testing and treatment are not made. Further, although the study did not specifically measure the achievement of SUFA towards the 90-90-90 goal the findings showed that a lot of work is still needed if Indonesia wants to achieve the UNAIDS 90-90-90 goal by 2020, and the UNAIDS 95-95-95 goal by 2030 (Joint United Nations Programme on HIV/AIDS (UNAIDS) 2014b).

The post-SUFA implementation ITS and cohort studies demonstrated that the SUFA intervention was effective in increasing the number of people engaged in most of the

steps of the HIV continuum of care cascade. The yearly progress of HCC during the six year period in the ITS study (see Chapter 5, Figure 5.2) showed a narrowing in the gaps from one stage to another after the implementation of SUFA. However, a significant drop out of PLHIV from each stage to the next stage was still observed, particularly from the determination of eligibility stage to the ART initiation stage, indicating a programmatic challenge in achieving the 90-90-90 goal. The cohort study also showed that post-SUFA about a quarter of patients who had been diagnosed, linked into care and found eligible for ARV were lost to follow up before beginning ART, similar to losses reported elsewhere (Clouse, EK et al. 2013; Plazy et al. 2014). Drop outs prior to receiving ART are usually due to long waiting and multiple visits (Koenig et al. 2017; Rosen, S. et al. 2016; Wu et al. 2015). These groups tend to return to care at a later time; however, this is frequently after their health condition has worsened from when they were first detected as HIV positive. Some of these patients may enter care in a very sick condition or may even die before receiving treatment. If they finally receive ART, they will have poorer prognosis than if they had started ART earlier (Rosen et al. 2016) as life expectancy is strongly related to CD4 count when receiving treatment. For example, patients who receive treatment when their CD4 has already dropped below 200 cells/mm^3 were predicted to have a life expectancy at age 20 of about 10 years, which is less than patients who received treatment according to the criterion of CD4 count level $\leq$ 350 cells/mm3 (May et al. 2011).

Apart from the negative effect of delayed treatment on individuals, failure to be treated also negatively affects the community. Untreated people can potentially continue to spread the virus to the community throughout their entire lives if they do not use ART. It has been estimated that if one infected person starts treatment when their CD4 count level is closer to 350 cells/mm3, the probability of this person transmitting the virus throughout their life is reduced by 50%. However, if an infected person starts ART with a CD4 count closer to 200 cells/mm3, there is only a 25-30% reduction of transmission

through this person (The HIV modelling consortium treatment as prevention editorial writing group 2012). Therefore, to engage PLHIV in treatment as soon as possible is essential to achieving the greatest benefit of the test and treat policy (WHO 2015). Nevertheless, a systematic review conducted in Sub Saharan countries, demonstrated that provision of community support and POC, decentralization of ART service, and provision of free ART can reduce LTFU in all stages (Keane et al. 2017).

Results showed that the SUFA intervention did not affect the mortality rate amongst the study population. SUFA may well have affected the mortality rate amongst people with HIV in Indonesia, since it managed to test more people, detect more cases, enrol more patients in care, and treat more overall. However, many of the PLHIV not yet identified are likely to die from HIV-related illness. Although the SUFA made some contribution to capturing more of these people, future research using population level data is needed to explore this problem further.

7.2.1 Challenges towards the first 90-90-90 milestone

The findings from the ITS and cohort studies, as well as from the SUFA policy analysis underscore the difficulty of finding PLHIV with asymptomatic conditions with the current HIV testing strategy that limit the search for HIV cases to clinical settings. The cohort study findings also suggest that the applied testing strategy identified a greater proportion of PLHIV in the delayed stage of disease. The reported data on the estimated proportion of PLHIV that are aware of their HIV status in the country was 42% (UNAIDS 2017), and the study results suggest that this situation may still be the case as of March 2019 was 52% (Luhukay 2019). This means that many PLHIV, particularly in the asymptomatic stage, were uncaptured by the SUFA testing strategy, and might remain unsupported outside of the health care facilities. The negative perceptions against KAP of most of the Indonesian community (Fauk et al. 2017; Wolffers 1997) may have significantly contributed to these difficulties as the policy analysis (Chapter 4) found.

Criminalisation of the sex industry (Praptoraharjo), beliefs that KAP breaking social and religious norm, poison Indonesia culture (Fauk et al. 2017), not to mention the latest political movement for the criminalisation of LGBT people and same sex relationship (Westcott 2018) are some of the negative factors that might hinder capture of KAP for diagnosis and treatment. Thus, fundamental revision of the testing strategy, addressing all barriers to diagnosis, including fear of stigmatisation (a common reason in Indonesia for refusal to be tested) (Lazuardi, Bell & Newman 2018), is crucial to the success of the current test and treat strategy.

7.2.2 Challenges towards the second 90-90-90 milestone

The 'test and treat' as well as 'treat all' strategies have been launched. Through these policies, all PLHIV are eligible for ARV treatment, irrespective of their CD4 count level. Once detected with HIV, immediate treatment is available using the universal treatment criteria (Ministry of Health (ID) 2018, 2019). The SUFA revision of the strategy of treatment eligibility criteria to test and treat and treat all could potentially make an even greater difference in improving HCC and reducing HIV transmission in the future, as demonstrated by a cost effectiveness study in India (Maddali et al. 2015).

The adoption of the test and treat policy was inevitable, as the intervention is currently the most powerful HIV prevention strategy available in the world (World Health Organization 2012b). The concern is how to appropriately implement this policy considering the findings of this project. Study 1 (policy analysis), Study 2 (ITS) and Study 3 (retrospective studies) all indicated the implementation of the new SUFA treatment criteria was not optimal. To obtain the maximum benefit of the strategy to treat all, the key is to substantially increase the number of PLHIV with asymptomatic conditions (i.e. with higher CD4 count). The policy analysis found the problem was that generally only high-risk people can be found in health care facility settings, and they were likely already in a symptomatic condition. The retrospective cohort study found

that 96.3% (only 9.5% of 96.3% eligible were added through the new SUFA criteria) of HIV positive cases who were linked into care were eligible for ARV in post-SUFA. Put differently, nearly all the identified cases would have been eligible under the old policy, so the new SUFA criteria made little difference during the study period. Similarly, the ITS study suggested that almost all PLHIV entered into care were already eligible, given the median proportion of eligibility for ARV was more than 90% after three years of SUFA implementation. If these figures have not improved since the study, the revision of the eligibility criteria for ARV from applying irrespective of CD4 count only to specific populations to the treat all policy may add only about 4% more people to receive ART (universally eligible 100% - 96.3%). In other words, a substantial improvement would be obtained if, in addition to people in delayed stages, a greater proportion of people at earlier stages of disease entered the next steps in the cascade, and more people, not eligible under SUFA, became eligible under the treat for all strategy.

If the test and treat policy is implemented without substantial improvement in the performance of the cascade, there may still be no improvement in intervention effectiveness, rendering the tremendous effort ineffectual. When a new policy is implemented, a substantial effort and investment has to be made by the country to allow the strategies to achieve their goals. For example, the national investment in drug supply must forecast and procure drugs in advance to respond to the possible increase of people eligible for ARV treatment. Again, this effort will become ineffectual if the health system cannot access increased supplies of drug stock due to the absence of substantial change in the demand side at field levels, which can threaten the goals of the new intervention.

Further, the cohort study found about 30% of eligible people did not receive treatment. While the reasons for this were not explored in the project, it is possible that economic issues such as cost of laboratory tests, administrative and transportation costs, lengthy,

and burdensome and multiple clinic visits prior to treatment initiation stages (Koenig et al. 2017; Lazuardi, Bell & Newman 2018; Rosen, S. et al. 2016; Wu et al. 2015) contributed to this failure. Stigmatization by providers may be another problem. A regulation ruled, 'every health service is prohibited from refusing treatment and care for PLHIV' (Ministry of Health (ID) 2013d). Factors related to stigmatization and discrimination by health service providers, which the study did not explore, were likely also a serious concern in Indonesia. A qualitative research conducted in Indonesia found that several stigmatizing and discriminatory acts by providers, such as denial to serve PLHIV, treating PLHIV differently, disclosure of PLHIV status to others in violation of confidentiality, and physical isolation of PLHIV (Merati, Supriyadi & Yuliana 2007). Again, the community social, cultural, and religious perceptions of KAP further add to these problems in Indonesia. The main SUFA intervention testing strategies, including PITC, changing the eligibility criteria and giving treatment as prevention, were designed to alleviate health and social disparities in the provider (Lima et al. 2015) as discussed in the policy analysis. Whether these issues remain a concern in Indonesia needs to be further explored. Clearly, the recent WHO recommendation on universal treatment will have reduced effects if PLHIV are unsuccessful in receiving treatment (Rosen, S. et al. 2016).

To increase the treatment uptake, multiple and burdensome visits have to be tackled first, as these are among the main reasons for drop out prior to receiving treatment (Rosen, S. et al. 2016). Multiple visits prior to treatment in Indonesia may not take as much time as in other contexts, e.g. six visits required until ART initiation (Rosen, S. et al. 2016; Wu et al. 2015). In Indonesia, the number of visits a patient is required to make depends on the patient's condition with respect to opportunistic infections (OI) (Ministry of Health (ID) 2014e), prediction of adherence (Ministry of Health (ID) 2014d), and whether the patient has to be referred to other health care facilities to obtain comprehensive HIV care and treatment. These conditions sometimes lead to subjective

interpretation of the appropriate time to start the treatment. A study in China found a multiple visits issue in completion of HIV testing and CD4 count results (Wu et al. 2015; Wu et al. 2017), while in Indonesia, as shown in this project, the most challenging step to simplification of the prior to ART steps was the step from eligibility for ARV to ART treatment (median time was ten days while median time from positive to determination as eligible was zero days). Same day test and treat intervention is effective in tackling this problem (Koenig et al. 2017). Through the circular letter and ministerial regulation, Indonesia allow the same day test and treat; however, many procedures and barriers in the pre-ART practice will need to be modified and simplified or simply eliminated if there is no evidence base to support them.

Another important aspect to consider is the capacity of the Indonesian health system to cope with an influx of PLHIV becoming eligible in the current policy (Mody, 2018). Before the new test and treat policy becomes formally regulated, it would be important to further investigate its potential public health impacts, such as clinic congestion and people's behaviour in a real world setting (Mody et al. 2018). This is particularly important if the same day test and treat is also to be implemented. Unfortunately, the study was unable to address this issue, since the additional SUFA criteria only slightly added to the health system burden. The cohort study found only 9.5% more people in being eligible for treatment following SUFA, and there was also no difference in the rate of treatment initiation. These finding translate into only a relatively small additional burden of work with respect to treatment at the clinic level. Further, the results of the cohort study suggested that the initial concerns (from the policy analysis) about potential harm as a result of treating healthy people in the asymptomatic stage, e.g. treatment side-effects, non-adherence, and drug resistance is unlikely to be a serious issue.

Although there was an attempt at addressing the lack of standardized time length of procedure in the new test and treat policy (Ministry of Health (ID) 2019), but the policy still lacks standardization of time to initiation. It should be made clear that ARV can be provided on the same day unless the patient has a contraindication for immediate treatment. The test and treat policy has yet to be tested and scaled up and will need time and political will to achieve full implementation across Indonesia. Several studies in Haiti, Africa, China (Koenig et al. 2017; Labhardt et al. 2018; Rosen, S. et al. 2016; Wu et al. 2017; Wu et al. 2015) found that same day testing and treatment as well as simplification of procedure demonstrated promising results for improving coverage of treatment. However, this current study has highlighted the lack of clear and detailed guidelines on how to execute immediate treatment; for example there was no standard time length proposed from being found eligible to starting treatment, or how to reduce four treatment counselling sessions without undermining the quality of counselling.

7.2.3 Challenges towards the third 90-90-90 milestone

As this study of pre-ART to ART stages demonstrated, significant challenges exist in achieving the first and second 90 goals, and even more so for the third 90 goal. Although the SUFA intervention could show effectiveness in reducing LTFU by 27% after treatment initiation, drop out before receiving treatment limited the success in achieving the third 90. Further, even in studies that showed their interventions were effective for reducing viral load stages, the results still demonstrated further challenges exist. For example, in the hyperendemic setting of South Africa, an RCT found that 64% of people receiving treatment were retained and became virally suppressed at ten months (Rosen et al. 2016). In an RCT of the low generalized epidemic setting in Haiti, of the 79.8% of PLHIV retained to ARV, only 53% received treatment, were retained and became virally suppressed at 12 months (Koenig et al. 2017).

7.3 Methodological reflection

The strengths and limitations of each study were discussed in each chapter. Here, the overall strengths, limitations, practical issues, challenges, strategies and approaches in making the project manageable are presented. The project utilised two separate approaches to assess whether SUFA achieved its objectives and therefore was able to obtain a more comprehensive understanding of the effect of SUFA through verification of the arguments of the two independent measurements (Heale & Forbes 2013). In addition to the two different techniques, the project analysed the SUFA policy from a qualitative perspective. This analysis deepened understanding of the policy interventions and enabled extrapolations of the likely consequences of the interventions for the outcomes of SUFA. Considering the implications of the findings from the ITS and cohort studies, several policy changes can be recommended to improve HIV policies, interventions and strategies. The role of the policy analysis was also to identify possible changes of policy. Therefore, with the three studies, the project was able to produce appropriate and tangible recommendations, adapted to the current Indonesian HIV policy interventions. Moreover, the project used routine HIV program data belonging to MOH, sourced from the various SUFA areas, and was conducted with the support of HIV stakeholders (via the reference group). This will enhance knowledge transfer to the relevant policy makers (details of the knowledge transfer are discussed in the next section).

The study had several strengths, such as using a pragmatic approach that is in line with implementation science research (McNairy 2017). It assessed interventions that were implemented by real HIV stakeholders, assessing the outcomes using indicators to evaluate and monitor the HIV care program in Indonesia. Further, it utilised routinely collected data sourced from HIV/AIDS system information either in health facilities or reported to MOH. Thus, the evidence demonstrated the real world magnitude and durability of the intervention, which enhances the likelihood of knowledge transfer to

the policy makers. This study is also distinctive because it assessed a package of combination interventions aimed to influence the multiple steps from pre- to beyond ART in HCC in a limited resource setting, specifically in Southeast Asia. Studies 2 and 3 further strengthened the conclusions, since the effects observed in both studies were overall similar, which means generalization of the findings can be done with more confidence across the whole of Indonesia (one study had more sites but less detail, the other study had more detail but fewer sites).

Effective interventions are likely to be interventions that successfully address the causes of risk and disease transmission and utilization of theory is crucial to understanding the causes of risk and disease transmission (Blankenship et al. 2006). The SUFA combined intervention was developed based on the theoretical perspective that HIV prevention interventions have to be carried out in the form of multilevel and multifaceted strategies that address structural, biomedical and behavioural drivers. The development of the main SUFA intervention was influenced by the powerful, global evidence of the beneficial effect of ART as treatment and prevention. However, despite demonstrating the overall effectiveness of the SUFA in improving the engagement of high risk people in the HIV continuum of care cascade, in the cohort study, a successful effect of SUFA was not always demonstrated, for instance in treatment initiation. Failing to address risk factors at each of layer of Baral's model may result in ineffective intervention. The study did not investigate the reasons for the failure of SUFA in showing an effect. Some barriers to treatment found in Indonesia were identified in other studies, such as social economic factors and stigma at the community risk level, and the lengthy and multiple visits procedure at the law and policy risk level in the MSEM model (Baral et al. 2013).

The study's stage-specific limitations have been described in Chapters 5 and 6. Here the study limitations are identified more broadly. Given that the SUFA intervention consisted of combined multiple level interventions, this study targeted the multiple

stages of the HCC and measured the effect on individuals. In other words, the study considered the intervention as a package. Thus, it was impossible to measure the corresponding contribution of each individual component of the interventions to detect effects at each stage (Amanyire et al. 2016; Elul et al. 2017; McNairy et al. 2017; Wu et al. 2015). However, the study was able to make a rational assumption for each stage of the intervention about what contributed to its success, as discussed in Chapters 5 and 6. For example, the intervention that is likely to contribute to enrolment in care was the SUFA testing strategy, in which PLHIV who were tested in facilities that were facilitated to linking into care. Future investigation on how many people are tested and enrolled at the same facility is needed to shed light on this proposition. The study did not measure the exact process evaluation in each of the study locations; however, standardized serial activities and key strategies to inaugurate the SUFA, such as LKB training, and two-day workshops at various levels, including all relevant participants (see Chapter 1 section 1.3.5) were implemented in all SUFA sites and were considered as adequate processes in delivering the interventions.

In the MLM analysis, the study did not measure the effect of SUFA in each site. Rather, the study designated a site as a single unit analysis to adjust for contextual factor differences. The MLM also enabled visualisation of the comparison of SUFA effects across the 13 sites. The contextual factors such as geographical, demographic, socioeconomic, cultural and religious factors might be important in determining the variations of data in each of the 13 sites; however, stratification analysis using sites was not feasible, as there were a large number of sites and a small amount of monthly data for several sites, apart from my main interest in assessing the overall effect of SUFA. Nonetheless, the moderate correlation (ICC result see Chapter 5) indicated that the data varied more between sites rather than within individual sites (justifying the choice of MLM).

The growth of the monthly median and proportion of people living with HIV (PLHIV) who commenced treatment after three years implementation seemed promising in the ITS study. The study did not observe these effects in the cohort study after one year of SUFA implementation which may be because of its shorter observation time. Further, the intervention was able to demonstrate a meaningful reduction (8%) of treatment initiation in post-SUFA but this was non-significant in the cohort analysis. However, if there had been more subjects, there may have been sufficient power to observe the difference between pre- and post-SUFA. Additionally, the two studies were not directly comparable because the ITS study looked for two different effects while the cohort study looked for the overall mean including immediate and a single hazard ratio.

As the study used secondary data that were collected for a different purpose, it was not possible to adjust for all potential confounders. However, the data were sourced from the standardised reporting and recording forms of HIV and ART treatment that were collected for routine program monitoring and evaluation. Thus, among the variables collected the most important confounders were likely known and needed for the program.

The researcher believes that the cohort data captured almost all the diagnosed people in the two cities. However, some people might have been missed due to testing conducted in locations other than the health facilities investigated in this study, with the data not reported to DHO. Since hospitals were the only health care facilities providing ART, that was where the data were collected. Most of these people would have finally sought treatment or might have been retested for HIV in one of the health care facilities where the study was located.

In Indonesia, using HIV program data that belong to the MOH for research purposes is challenging because the data are considered top level, confidential medical information. There was a long waiting period and an exhaustive application process until permission

was obtained. The process was particularly protracted because my research involved several districts and administrative levels. Thus, permission had to be obtained from the MOH at the central office, the provincial health offices, district health offices and, finally, at the hospitals or clinics where the data were located. In addition, a lot of time was spent waiting for each of the 28 required letters of permission. Since the data were considered exclusive, researchers outside the loop of the Ministry's HIV program partners usually had difficulty accessing these data. As I had worked with CHAI, had been part of the national SUFA's facilitator team and had established networks, I obtained the benefit to research this topic at the right time and was able to access the data. Further, my past working experience involved expanding access to HIV test and ART in isolated areas in Papua and Papua Barat. I then worked at the national level for three years dealing with HIV policy planning and implementation, which gave me a thorough understanding of the issues and challenges of the HIV care service and treatment program. My experience helped me to design this project regarding what aspects to consider, what data to use and how to collect the data, and with whom and how to communicate. My experience also helped me to understand the project's findings and implications and how to disseminate the knowledge attained.

My medical background and solid experience in a variety of public health arenas, in handling program management and implementation, and policy development and implementation at various administrative levels from lowest up to the central office have all greatly contributed to making this research manageable. My experience working in a variety of local institutions and international organizations, including WHO and partnerships with the Government of Indonesia, helped me to understand the 'rules of the game' in liaising with key people to benefit my data collection process and establish my reference group.

Apart from the exhaustive procedure of obtaining permission from 28 institutions, the main challenge I faced when conducting the data collection was collecting from 20 hospitals and clinics with different medical data-base recording systems. This would have been almost impossible to complete by a single researcher in the time given, particularly since 95% of the data sources used hard copy instead of electronic data. However, through the support of the two trained data collectors, health care facilities' staff, supervisors, and my own perseverance, I was able to collect all of the data within eight months. A further challenge was combining data forms from different sources. Although the standardised HIV and ART history forms could be found in the some of the medical records, most of the hospitals improvised or developed their own recording forms or did not have any forms at all. In most case, I had to look for the data page by page, often in large medical records. Furthermore, four hospitals had some medical records missing from the active medical record rack. In such cases, finding these medical records was even more challenging, as they were stored as inactive medical records without sequence. Nonetheless, we explored all possible stores and medical records to find our participants. Despite these efforts, the possibility of missing some participants could not be avoided. Another challenge was to combine an individual's data from different records within hospitals and between hospitals to obtain a comprehensive HIV care and treatment history, which made the data collection process take longer than expected. To collect the required number of variables (I collected data for 146 variables for each patient although not all formed part of the current analyses) and to combine these records demanded a significant length of time and effort.

7.4 Recommendations for HIV intervention program policies and practice and future research

Several key findings of this project have the potential for improving HIV program policy and practice, particularly for countries striving to achieve the UNAIDS 90-90-90 and the ultimate goals of reduction of HIV morbidity and mortality as well as HIV transmission.

The findings also underpin several suggestions for future public health research along the HIV continuum of care cascade in Indonesia and other countries facing similar challenges. A combination of structural interventions and TasP was effective overall in improving the engagement of people along the HCC. Scaling up these interventions across Indonesia is warranted but further development is needed to achieve the goals, based on the evidence from the current project.

The key to the successful achievement of the first 90 of the 90-90-90 goal is to capture hidden at-risk populations outside clinic settings. The current Indonesian HIV testing strategy, a combination of PITC, VCT and mobile clinics, tends to capture people in health care facilities and some readily accessible key populations. These approaches are inadequate to find the more deeply hidden populations at risk. The small number of people meeting SUFA new eligibility criteria demonstrates that expansion of testing to capture PLHIV in earlier disease stages has not yet occurred in any meaningful way. Thus, these findings highlight the importance of conducting more powerful community-based testing strategies. The evidence from this project makes it eminently clear that a fundamental revision of Indonesia's HIV testing strategy from its current design to a more powerful combination of facilities-based and community-based testing with special attention to capturing asymptomatic key populations is a crucial. Health providers need to develop various testing strategies working with community-based organizations outside health facilities to establish routine HIV testing services in the places where the high-risk people reside or gather. Approaches should include mobile clinics, self-HIV testing, and home-based testing (particularly for Papua). However, to prevent loss to follow up as a consequence of conducting HIV testing outside the health care facilities, wherever possible interventions with same-day test and treat procedures need to be designed to link new HIV positive people to HIV health care services.

Further implementation science research is suggested for Indonesia to design the most appropriate combination of facility-and community-based HIV testing while rapidly bringing programs to scale. Testing and referral need to be tailored to the specific context of HIV transmission risk for KAP. The KAP community needs must be addressed so that rapid ART enrolment and retention can occur. This implementation research should include generation of evidence on how best to deliver HIV testing in an efficient and effective manner given the limited resources – human and financial – available in the country. In this way, the waste of money due to mistargeting that may have occurred in the post-SUFA era can be prevented. This kind of research can utilise for example areas where KAP reside and their health care service providers where they seek help.

To achieve the second 90 goal, much work must still be done as, is revealed by the findings of this study. SUFA's lack of success in treatment initiation, as seen in the cohort analysis, warrants further exploration, as the study did not investigate the reasons. Thus, further research exploring the factors responsible for the lack of success in treatment initiation is warranted to appropriately address the problems.

Same day test and treat is now being implemented but lacks clear guidelines of standardization time from testing to initiation. Therefore, the policy must clearly require the use of the same day test and treat as the main approach unless there are contraindications. Research must be conducted to assess procedures that hamper the treatment process, and on the evidence, a standardized procedure must be developed in order to avoid subjective interpretation and to maintain a high quality of patient care and treatment. Research is also needed to explore local barriers, often at multiple levels, as well as enabling factors and risks, so that an appropriate framework can be designed. Investigations are warranted of the possible impact of the same day test and treat policy on health services and their ability to cope with sudden increases in demand for HIV

testing and treatment. This is particularly important given that the HIV program across Indonesia varies in regard to context, resources, infrastructure and capacity. Based on such investigations appropriate policy decisions can be made and actions taken for each region according to the regional context and capacity. Appropriate support to poorly serviced regions can be delivered in order to achieve goals.

To achieve the third 90 goal is even more challenging for Indonesia. Although LTFU rates as a proxy indicator of retention in ART care were reduced after one year of SUFA implementation, this might not be sufficient to achieve the third 90. The moderate proportion of PLHIV eligible for ART that were not treated is a further challenge to the third 90. For a number of reasons this study did not collect CD4 count after treatment initiation or look at viral suppression. Future studies are justified to gather this data to directly measure progress towards this target.

Finally, the test and treat strategy must be implemented carefully to prevent a waste of effort and money. The HIV program strategy should focus on finding a substantial number of undiagnosed PLHIV, particularly those in asymptomatic stages, while at the same time investing in efforts to link them into care, treat them immediately and retain them in ART with a high level of life-long adherence. Apart from the effectiveness of SUFA in improving the overall engagement of high-risk people in HCC, the high dropout rates in each of the cascade steps indicate that a more powerful and effective combination of structural, biomedical and behavioural interventions is needed to address barriers in each layer of Baral's model. As evidenced in this study and the literature review, a combination of patient-centred approaches (friendly and listening services), including supplementation of FBHTC with CBHTC, simplification of the pre-ART to ART procedure, improvement of patient skills and support, TasP, and socio-economic support, and a supportive and favourable community promise more success. Essential above all are high levels of political will, suitable planning, willingness to

embrace change, non -prejudice against KAPs, non-patronizing attitudes and sufficient funding.

'Knowing and understanding your cascade' is the first step in enabling authorities to improve program impacts. Robust and standardized monitoring and evaluation at each step of the cascade must be in place at each ART site. All PLHIV, regardless of stage or CD4 level, are now eligible for treatment and the deletion of the eligibility stage from SIHA (Sistem Informasi HIV/AIDS, HIV/AIDS Information System) is necessary to speed up the process of ART initiation.

7.5 Knowledge transfer (KT)

The SUFA policy, released in 2013 by the MOH, was a strategy designed to control the increase of HIV transmission in Indonesia. Mathematical modelling projected that a trend of reduction in HIV transmission would be observed in 2025 if SUFA worked effectively (National AIDS Commission & Ministry of Health (ID) 2013). Considering the high target, program evaluation was crucial in developing a better intervention strategy in the Indonesian HIV program (the rationale of the SUFA study). Further, the absence of an analytical evaluation study after the SUFA implementation revealed the research gap that motivated me to conduct this project (WHO 2016). There are a number of reasons why my research project has high feasibility of knowledge transfer.

Firstly, requirement for EIDM has increased, particularly in the HIV and Sexual Transmitted Infection (STI) Department at the MOH. In 2013, the MOH renewed the function and role of the HIV task force to support the MOH's role in developing the HIV policy (MInistry of Health (ID) 2013c). In the policy-making process, the task force was expected to produce expert policy advice supported by authoritative evidence from around the world (Ministry of Health (ID) 2014f). Although actualization has been impeded by several issues, including a capacity to achieve influential outcomes (author's observation as an insider), as also reviewed by Armstrong et al. (2013) as a

common barrier to KT, it is apparent that the policy makers had an awareness of using EIDM. Thus, I considered this factor as a positive indicator of KT (Davies, Nutley & Walter 2005).

The second reason is that the research concept of this project was framed based on the recent development of Indonesia's HIV policy program. Since 2013, the focus of the country's HIV program has shaped the SUFA strategy and now the test and treat policy, with the purpose of making a great impact on averting an epidemic. Therefore, my investigation of the effectiveness of SUFA is extremely timely, at the precise time that the government's attention and resources are concentrated on making this strategy work. In other words, my study is valuable for policy makers, relevant to their agenda and appropriate within the program evaluation timelines (National AIDS Commission & Ministry of Health (ID) 2013). These criteria are claimed by Lavis as enabling factors promoting KT (Johnson, NA & Lavis 2010).

Thirdly, the research used the HIV services program data belonging to MOH. The study utilized the language of the MOH program and was conducted in partnership with them. Therefore, the MOH is likely to recognize the importance of the study. To conceptualize, conduct and communicate research in this way is deemed crucial in stimulating the EIDM transfer effectively and efficiently (Armstrong et al. 2013).

Finally, the reason why this research will have a significant chance of contributing to HIV policy is the availability of the SUFA's stakeholder coalition, which could be employed to support the dissemination and social influence process of the evidence, following Nutley's framework (Nutley, Walter & Davies 2007). The coalition is comprised of various sectors, government bodies and international and local institutions working in HIV-AIDS, and was formed to tackle the social determinants of health (O'Neill et al. 1997). Moreover, the coalition, particularly at the district level, is operational and directly deals with HIV services delivery. Thus, the use of this network is likely to

accelerate the adoption into practice process of the evidence. Furthermore, I have represented my past work institution in this coalition at the national level, so I know the common understandings, whom to contact, and how to exert a positive influence on the promotion of KT (Petticrew et al. 2004).

Nevertheless, there are some potential barriers to transferring evidence into policy and practice. The turnover of key personnel in the sub-directorate of HIV-AIDS and STI in the MOH could impact the KT process (Armstrong et al. 2013). From my past experience, however, building excellent communication processes and good relationships with the institutions and key staff from the very beginning achieves recognition of the study by the institution. Thus, whoever is running the program at the time, can be expected to treat the study objectively because they are bound by institution principles and responsibilities. The other potential barrier is the lack of incentive and reinforcement mechanisms, as I observed following Nutley's framework (Nutley, Walter & Davies 2007) (see Chapter 3 section 3.3.3), which are mechanisms controlled by policy makers. In my opinion, the lack of incentive and reinforcement mechanisms can be issues in the future that have to be addressed by policy makers and government to improve knowledge translation into practice.

Finally, developing strong communication and partnerships between researchers and policy makers is of great importance (Nutley, Walter & Davies 2007). When initially planning my project, I commenced email communication with the Head of the Sub-Directorate of HIV-AIDS and the chief officers managing MOH HIV data at the MOH (2015) to inform them about my purpose and to seek permission to research on SUFA. I also sent a formal letter asking preliminary permission to access the secondary data and to use the MOH's policy papers and reports. Thus the exchange effort began from the earliest phase of the research (Nutley, Walter & Davies 2007). Further, I convened a reference group (see Chapter 3 section 3.3.3) consisting of members of the SUFA

coalition, HIV experts (ex-CHAI staff), HIV experts from the HIV task force, and MOH staff and consultants to advise me on the operationalization of the research, update me on the progress of the HIV program in the country as well as provide me with necessary documents to support the research. The partnerships with the suitable HIV policy key players have developed in generating part of the KT process according to Davies, Nutley and West (2002).

Several strategies for dissemination of my findings are planned. I will produce and distribute a brief summary report to provincial and district health offices and the hospitals in which the cohort study was conducted and to MOH. I will write several articles about the key findings of the project. I will also hold serial meetings at the national level via the reference group and key members of HIV task force, and make presentations at conferences and seminars.

Chapter 8

Conclusion

CHAPTER 8 CONCLUSION

The scaling up of HIV testing and treatment intervention, launched in Indonesia mid-2013, demonstrated promising effects in influencing people's transition along the HIV continuum of care. The findings of this study provide new evidence of the real world effect of TasP combined with a combination of structural HIV interventions on the full HIV continuum of care in LMIC, particularly Southeast Asia. Therefore, the scale up across the whole of Indonesia of the SUFA policies currently in the form of a test and treat ('treat all') policy, with improvement in testing and treatment strategies is justified.

The effect of the SUFA intervention was compromised by the choice of testing strategies and multiple unaddressed barriers in the multiple steps along the cascade. As the HCC steps are interrelated, the population size and characteristics of the high-risk people engaged at one step would likely determine the effect of the intervention in the next step in the cascade. As shown by the findings of this study, there was imbalance between CBHTC and FBHTC results in the capture of certain populations, while leaving asymptomatic people unreachable.

Because the majority of people were identified with HIV late in their disease progression and then experienced delay in receiving treatment, the effect of treatment might be diminished. The number of people who received treatment on the basis of the TasP criteria was small, indicating that the TasP effect in the larger community was likely minimal as well. This finding explains why the expectation of a substantial increase in eligibility for ARV and treatment initiation arising from the revision of the treatment criteria was not fulfilled. This issue can also obstruct the achievement of the long-term goals of HIV prevention program in Indonesia.

Thus, in designing an appropriate and powerful HIV testing strategy, it is crucial to focus on reaching the so far unreachable populations utilizing various modalities while addressing multiple barriers in the multiple steps in HCC. Further, patient-centred approaches that meet patient needs matched with same day test and treat strategy will also be a key. The same day test and treat is a worthwhile intervention, but to optimise the effect, a standardised guideline and clear policy on moving from test to initiating treatment on the same day must be in place before the intervention is adopted as a common practise.

This study has demonstrated that evaluations of public policy are crucial for informed decision making. Whilst SUFA can be described as an overall step forward, considerable work lies ahead if the 90-90-90 goal and a significant reduction of HIV transmission in 2030 can be seen as realistic targets for Indonesia.

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APPENDICES

Appendix A. SUFA Workshop Participants

Participants in the SUFA launching events and workshops at district level.

Groups	Detailed Participants Organizations
Provincial level	• Provincial AIDS commission, • Provincial BAPPEDA, • PHO health service or family health, • PHO health promotion, • PHO communicable disease, • regional office, • human rights and justice office
District level	• Head of districts or municipalities, • head of DHO, • DHO communicable disease control, • DHO family health, • DHO health promotion, • head of hospitals and HIV services working team, • head of primary health centre and • HIV service working team,
District level sectors	• District AIDS commission, • District BAPPEDA, • Social department, • education department • Transportation department, • Cultural and tourism department, • manpower department, • prison office, • BNK, • BPMD
People with HIV community representatives	• FSW, • MSM, • Transgender women, • IDU, • Warga Peduli AIDS, • local NGOS working in HIV

Appendix B. Table 1. General information of Intervention studies

No	Author	Country/Setting	Study Design	Population	Key Limitation	Conclusion
1	Barnabas, RV et al. 2016	Kwazulu natal south Africa Sheema district South Uganda	RCT	> 16 years, HIV Positive, ART naive	Recalling method to include participants	All community based intervention affected HIV test, linkage to care but only minorlly affected treatment initiation
2	Basset, I et al. 2016	Durban, South Africa, High prevalence	RCT	Adult≥ 18 years old, unaware HIV status	lower Intervention intensity than planned	Health system navigator to address patients barriers and chalenges to utilise care did not affect linkage to care, ART treatment and death
3	Hewett, PC. et al, 2016	Lusaka and Chipata district of Zambia, high prevalence	RCT	Adult≥ 18 years old	Unable to assess individual intervention component to impact, unintegrated services may limit generazaility if adopting in different setting	Active referral strategies and integration services improved linkage to care
4	Iwuji CC. et.al, 2016	Kwazulu Natal, South Africa/ high prevalence, rural	Cluster randomized control trial	≥ 16 years of age	small percentage of uncontactable eligible participants to be included in trial	Home based testing and immediate treatment yielded to high testing prevalence, slower linkage to care, high treatment, good viral suppression and retention.
5	Kompala, T. et al. 2016	Msinga sub district, Kwazulu Natal, South Africa, Extremely high prevalence; centralized laboratories for CD4 count level outside primary health care; high rate of poverty.	Retrospective cohort study	Adult≥ 18 years old	unadjusted for time different	CBVCT supplemented with onsite CD4 plebothomy may decrease attrition at pre ART stage and support for timely enrolling in care
6	MacPherson, P. et al, 2014	Blantyre Malawi	Clustered RCT/	adults	Using all adults residents as denominator, inr egards of privacy self testing participants were not following up as cohort	self-HIV testing and optional home ART initiation increased proportion adults receiving treatment initiation
7	Parker, 2015	Swaziland, hyperendemic, rural and poor	Cohort	All population age who were unaware of their HIV status	Imbalance people characteristics between home based and mobile based HTC, unavailability eligibility assessment at the spot	HBHTC and MBHTC were feasible to reach substantial number of people and increase possibility of people knowing their HIV status. However, this intervention was not effective to link people to HIV care.
8	Rosen et al. 2016	Johannesburg/ high prevalence, primary health clinic and hospital	Unblinded RCT	Adult 18 years non pregnant who tested for HIV or HIV positive who provided a blood sample for a CD4 count or who received the results of eligible for treatment initiation	Small number of sites and sample size, uncertainty generalizability to real world settings	A single visit ART initiation increased uptake of eligible people initiated ART by 36% and viral suppression by 26%. The intervention was ineefective to improve attrition rate for those initiated. Nevertheless, adoption of the intervention into public sector AFrica is suggested.

9	Koenig, SP. et al. 2017	Haiti, low HIV generalised epidemic, free of charge, NGO based program, urban based clinic	RCT	≥ 18 years old, HIV positive, CD4 count ≤ 500, WHO clinical staging 1 or 2	Uncertainty of generazability due to conducetd in one clinical urban, NGOs based provider. Provider behaviour changes were possible due to unblinded study	Among patients with early diagnosis, same day HIV test and treament improved retention in care with virally suppressed
10	Wu, Z. et al. 2015	Guangxi Zuang, Zhongshan and Pubei county, China, free of ART drug	pre-post study	Adult 18 years newly diagnosed HIV positive and received confirmation test	Due to the intervention considered as a package, relative contribution of each of componentto the outcomes cannot be measured	The simplified HIV tests and treatment intervention improved linkage to care and reduced mortality by 62%. The adoption of the intervention and irrespective CD4 count is supported.
11	Wu, Z. et al. 2017	Guangxi Zuang, China	Clustered randomized trial	Adult 18 years had to reactive screening result of HIV tests	Few hospitals used with high between cluster variation, multiple intervention considered as a package thus individual component contribution cannot be assessed, uncertainty generazaility to other countries as the intervention designed specificaly for China setting	Patient center approach utilising a simplified HIV testing and treatment improved HIV testing completeness by 20 times and ART treatment initiation by 3.5 times
12	Wroe et al. 2018	Malawi, high prevalence, poor, rural, free HIV care	Cross sectional	enrolment in HIV program between 1 Jan 2013- 30 Dec 2015	Unadjusted for district-level demographic characteristic	Involving community health workers, strengthening health system and addressing social determinant of health facilitated progress toward 90-90-90
13	Boeke, CE. etal, 2018	Central Uganda	Cohort	Adult HIV positive	Not control for change over time, secondary data, possible overestimation of LTFU	Intensive follow up and enhanced adherence counselling can improve retention to ART.
14	Amanyire, G. et al 2016	Southwestern Uganda	Stepped wedge, clustered-randomized controlled trial	Adult 18 years who were eligible for ART	Using secondary data, stepped wedge design weakness which is susceptible to trend over time	training health care worker, POC and revision of guideline counselling adherence to non mandatory multiple counselling session and treatment supporter was able to change belief of health care worker and resulted in improve ART initiation.
15	Hayes R 2017	Zambia	Cohort	Adult aged 18-44 years	Uncertainty on generazability to entire community due to only using participant in CHIP, utilsing self reporting for HIV status and linkage to care	Community HIV care providers (CHIP) facilitated HIV testing but effected minorly on linkage to care and ART intiation in th first year round
16	Floyd, S 2018	Zambia	Cohort	≥ 15 years old	High percentage of male have not contacted	The CHIP second year round was able to reduce time to get initiation after linkage to facilities.

17	Labhardt, ND et al 2018	Lesotho	RCT	≥ 18 years old HIV positive, ARV Naïve	uncertainty of generazabiity due to only including participants from home based HIV tests, high prevalence	A same day ART during home based test improved enrolment to health care facilities at 3 months and viral load suppression at 12 months
18	Mody, A 2018	Zambia	Regression discontinuity design/ Cohort design	ART naïve > 15 years	uncertainty of generazability due to settings of clinic with multiple visits procedure, high prevalence and rural context	Revision of treatment criteria from 350 to 500 cells/mm3 increased ART initiation, retention in care without evidence of spillover effect
19	Labhardt, ND. etal, 2014	Rural Lesotho	Clustered Randomized trial	People with unknown HIV status	Limited number of cluster included in the study, low positivity rate found that limited the effect of intervention	Home based and mobile based can reach high proportion of testing however, tailoring the intervention to those positive with linkages activities is a must
20	Basset et al. 2014	Durban, South Africa	Cohort	Adults ≥ 15 years of age presenting for HIV tests at mobile HIV tests unit	possiblle of underestimation of linkage to care due to retrieving data was only from designated clinic	Mobile testing found younger, hidden, earlier disease population but less likely to test for CD4 and linkage to clinic. Enhanced linkage intervention such as POC CD4, longer clinic hours, community based treatment, incentives may be beneficial.
21	Kranzer, K.etal, 2012	Cape Town, South Africa	Cohort	Adults ≥ 15 years of age	Not control for confounding and changes over time	Active recruitment and incentive may increase diagnosis and linkage to HIV care.
22	Clouse K, 2014	Johannesburg, South Africa	Cohort	Adult 18 years newly diagnosed HIV positive	Not control for changes over time, ony from one clinic	Changing HTC strategy from VCT/PITC to systematic HTC did not affect HIV diagnosis and finding more people at earlier disease stage
23	Elul, B et al.	Maputo and Inhambane Mozambique	clustered randomized trial	Adult ≥18 years newly diagnosed HIV positive	Using secondary data, not able to isolate each intervention effect, exclusion of many positive diagnosis	A combination of POC, accelerated ART initiation, sms health message and reminder, noncash financial incentive improved timely linkage to care after diagnosis
24	McNairy, ML et al. 2017	Swaziland	clustered randomized trial	≥ 18 years old newly HIV diagnosed	not able to measure relative contribution of each intervention component to oucomes	The combination of POC, accelerated ART initiation, SMS reminder, health education package, finacial incentive intervention impacted positively linkage to care and retention in care.
25	Chang, LW. etal, 2015	Rakai, Uganda	Randomized control trial	≥ 18 years old newly HIV diagnosed	Self reported outcome	Peer support on care engagement and preventive care utilization among pre ART demonstrated no effect on ART initiation
26	Siedner, MJ. et al, 2015	Mbarara, Uganda	Cohort	HIV positive and undergoing CD4 count test	Not control for changes over time	A multiple combination of SMS to communicate laboratory result, provide transportation reimbursement reduced significantly time to initiation
27	Hickey, MD 2015	Mfangano Island, Kenya	Quasi experimental	Adult HIV positive on ART	Not measure VL and mortality	Social network support reduced treatment interruption and LTFU after treatment initiation. Because the intervention was designed based on patients' real social network, the sustainability and amplification of the support may be promising

Appendix C. Table 2. Intervention effect along HIV continuum of care cascade

Study code	Intervention	comparison	sample size	Effect on HCC cascade								
				Test	Positive	Enrol	Eligible	Treatment	Retention	Viral supression	Death	LTFU
1			1325			overal 93%		overall Median time to ART initiation was 22 weeks		Overall 83 % (no differences among arms) in 9 mo		
	Community based HTC, Lay counsellor clinic facilitation, Poc	CD4 referral				Clinic facilitation 98% vs. referral arm 89% (RR 1.09 , 1.05- 1.13)		Clinic facilitation 37% vs. referral arm (RR 1.11, 0.92, 1.34)				
	Community based HTC, Lay counsellor home visit, Poc	CD4 referral				Lay counsellor follow up 93.3% vs.refferal arm (1.04, 1.0-1.09)		Lay counsellor Fu 41% vs. referral arm 34% (RR 1.23, 1.02-1.47)				
	Community based HTC, standard care, Poc	CD4 referral										
2	Health navigator	routine care	1,899					Navigator 39 % vs usual care 42 % completed in 9 mo (RR 0.93, 0.8-1.08)			Navigator 14% of HIV + vs. usual care 13% (RR 1.06; 0.84 - 1.34)	
3	enhanced	standard care	3963	Enhanced refferal vs. standard care (aOR 1.36; 0.95-1.95)				Enhanced refferal vs. standard care (aOR 1.26; 0.92-1.72)				
	enhanced and escorting	standard care		Enhanced refferal & escort vs. standard care (aOR 1.28; 0.89-1.85)				Enhanced refferal vs. standard care (aOR 1.30; 0.95-1.77)				
4	Home Based testing, immediate treatment	Standard care	12,894	Intervention 76.7% vs. Control 78.4% (p =0.676)		Intervention 62.6 % vs. control 63.6 % after 12 mo (p=0.912)		Median time to initiation 265 days (162-383)	Intervention 86.2 % vs. control 82.5 at 12 mo	Intervention 85.2 % vs. control 84.9%		
								CD4 ≤350 cells/mm3: intervention 91% vs.control 92.8% (p=0.719)				
								CD4>350 cells/mm3: intervention 87.3% vs.control 10.6% (p<0.001)				

5	CBVCT with Plebothomy	CBVCT	7,213			CBHTC plus 85.% vs. CBVCT 37% (< 0.001); median time from screening to CD4 test 8 days (4-19) CBVCT plus vs. 35 days CBVCT (15-131)		Overall ART initiation 38%; median time to ART 118 days (47-254)				
6	Home self-HIV test and treat	Home self HIV test and facility treat	16,660	64.9% vs. 52.7% (RR 1.23; 95% 0.96-1.58; p=0.10)	6% vs. 3.3 %; (RR 1.86; 95%CI 1.16-2.97; p=0.006)			2.2%vs. 0.7% (RR2.94; 95% CI 2.10-4.12; P<0.001)	overall 76.7% at 6 mo			28.7% vs. 23.8 % (aRR 1.18; 95% CI 0.62-2.25; p=0.57)
7	Home based test	Mobile based test	9,060	HBHTC 57% vs. MHTC 17% of Children and adolescent tested (<0.001)	Across all ages: HBHTC 3.5 % vs. MHTC 4.7% (<0.05)	Overall 34 % lingkage within 6 months	Overall 41% eligible; median time test to pre ART 12 d (IQR 6-29)	52% of eligible; median time from test to ART 34 d (IQR 20-60)				
				In HBHTC 39% vs. in MHTC 42% of adult men tested (<0.05)								
8	A single ART visit	Standard care (clinic setting)	377					intervention 97% vs. in standard care 72% within 90 d (RR 1.36; 1.24-1.49)	Intervention 81% vs.standard care 64% (RR 1.27 ;1.12–1.44) at 10 mo	Intervention 64% vs. standard 51`% (RR 1.26; 1.05-1.5)		intervention 16% vs. standard 16 % (HR 1.06; 0.61-1.84)
9	Same day test and ART initiation	Standard care (clinic setting)	762						Same day 79.8% vs. standard arm 71.9% (p<0.05) retained at 12 mo	Same day arm 53% vs standard arm 43.8 % (aRR 1.24; 1.06, 1.41; p <0.05)	same day 2.9% vs. standard care 5.6% (aRR 0.43; 0.19, 0.94; p <0.05)	
10	Streamline pathway from HIV tests to treatment	Standard care	1,034		pre1. 215, pre 2. 339; post 1. 215, post 2. 199	pre1= 67%, pre2=60.5% vs. post1=97.7, post2=97% (p<0.001); median time from HIV confirmatory to CD4 test pre1= 28 d(11-145), pre2=14 d(6-42), post 1=1d (0-4), post2=0d (0-1) (p<0.001)		pre1=27%, pre2=48.7% vs post1=91.2, post2=89% (p<0.001); median time from HIV confirmatory to treatment initiation pre1=53d(27-141); pre2=43d (15-113), post1=5d(2-12), post2=5d(2-13)			pre1=26.7 %, pre2=26.5 % vs post1=9.8%, post2=10% (p<0.001); post1=aHR 0.385 (0.239-0.620); post2=aHR 0.380(0.233-0.618) compared to pre 2.	
11	Streamline pathway	Standard care		Intervention 76% vs. standard care 26% (OR 19.94, 3.86-103.4; p<0.001): median time 12 days (8-24) vs. 58 days (28-207)				Intervention 54 % vs 25%; (OR 3.49 ; 1.37-8.86; p<0.05) within 90 d; median time to initiate ARV in intervention 52 days(16-407) vs. standard care 167 days(57-446)		Intervention 43% vs. standard 28% (OR 1.59, 0.92-2.73, p=0.094 at 12 mo	Intervention 28% vs. 47% (HR= 0.44, 0.19-1.01, p=0.053)	

12	Neno district intervention of Involving community health workers, strengthening health system and addressing social determinant	other districts without intervention	aggregate data	14.7% vs 12.6%	5.56% vs.6.91%			11.7% vs 10.5% (among estimated HIV +)	96.2% vs.83.9%			
13	Training health care workers including lay workes , proactive patient follow-up, enhance counselling adherence	before intervention	1,900			pre 52.9% vs.54.9% post (aOR 1.09 , 0.78, 1.53, p=0.63)			pre 71.7 % vs. post 75.7%, (aOR 1.25, 0.94-1.67, p. 0.12)			
14	Opinion leader led-training, Heath worker training, guidelines revision from multiple session to non mandatory multiple session at pre ART, POC	standard care	12024					Intervention 80% vs. control 38% (RR 2.11, 2.03-2.20)				
15	Home based voluntary HIV testing, health promotion, active referral and or retention in care by community HIV care providers, ART irrespetive CD4 count	Before	121,130	men After 80% vs. Before 18%; women After 85% vs. Before 26%				After (end period) 72%) vs. Before 48%				
16	Home based voluntary HIV testing, health promotion, active referral and or retention in care by community HIV care providers, ART irrespetive CD4 count	Before	120,272	80% of HIV + women aware; 90% of HIV + women aware				65% of HIV+ men; 75% of HIV+ women; median time to start ART since referral to care was 6 mo				

17	Home based test and offering same day ART	Home based test and initiation at usual procedure at health facilities	278			same day 68.6% vs. usual care 43.1% at 3 mo				Same day 50.4% vs. Usual care 34.3% at 12 mo		Same day ART 8.8% vs. Usual care 7.3% at 12 mo
18	Treatment criteria ≤ 500 CD4 count	Treatment criteria ≤ 350 CD4 count	23,036					13.6% increase in the proportion initiating ART	a 4.1% increase in retention in care at 6 months			
19	Home based HTC	Mobile based HTC		HB found more children (<12 Yr) than mobile (87.5% vs. 58.7%; aOR 4.91; 95% CI 2.41-10.0). Also They found that home based found more first time tester and male.	While Mobile found higher prevalence of HIV detected than home.	They found very low linkages after positive test 1 mo after testing 25.6% HB vs. 25.3% MB						
20	Community based mobile HTC, immediate PoC, retrieving CD4 result in clinic	Clinic based HTC, immediate PoC, retrieving CD4 result in clinic	6957		Mobile 10% vs clinic 36%	Mobile 10% vs. clinic 72%; OR 0.05; 0.03-0.07						
21	Mobile test setting , promoting mobil services inlcuding multisisease test, active recruitment, incentive voucher 9.6$	Mobile test setting, promoting mobile services including multidisease test	2066		Intervention 10.9% vs. routine 5.0%							
22	VCT+Targeted PITC	Systematic HTC	2266		VCT/PITC 50.5% vs. systematic HTC 49.5%		VCT/PITC 67.2% vs. Syst HTC 66.7% (p=0.8)	VCT/PITC 58.7% vs.	VCT/PITC 36.5% vs. Syst HTC 39.4% (After 12 mo diagnosis)			Overall VCT/PITC 50.5% vs. 49.6% syst
23	Poc , accelerated ART initiation, SMS health messages and appointment reminders, additional noncash financial incentive	Standard of care	2,004			CIS 89% vs. SOC 16% (9.13, 1.65-50.40) within 1 day; CIS 91% vs. SOC 46% (2.43, 0.7-8.41) within 1 week; CIS 96% vs. SOC 77% (1.23 , 1.03-1.48) within 12 mo;	CIS 75% vs. SOC 60% (1.24 , 1.07-1.43) within 12 mo after diagnosis	CIS 65% vs. SOC 54% (1.20 , 1.00-1.43) within 12 mo after diagnosis	CIS 62% vs. SOC 53%(1.18, 1-1.39) within 6 mo; CIS 58% vs. SOC 44% (RR 1.32; 1.12-1.54) within 12 mo after diagnosis;		CIS 6% vs. SOC 7% (0.87 , 0.4-1.91) within 12 mo after diagnosis	

24	Poc , accelerated ART initiation, sms reminder, health package, non-cash financial incentive	Standard of care (a long waiting period for blood test result and treatment initiation)	2,197			CIS 94% vs. SOC 87% (RR 1.08, 0.97-1.21, p=1.08); mean time testing to linkage: CIS 2.5 days vs. SOC 7.5 days (p=0.189)	CIS 76% vs. SOC 65% (RR 1.18, 1.01-1.37, p=0.038); mean time testing to eligibility asessement: CIS 0 days vs. SOC 6.5 days (p<0.001)	CIS 85% vs. SOC 88% (of those eligible) (RR 1.16, 0.96-1.4, p=0.12); median time testing to ART initiation: CIS 7 days (3-21) vs. SOC 14 days (7-31) (p<0.001)	CIS 66% vs. SOC 45% (RR 1.48, 1.18-1.86, p=0.002) within 12 mo after testing	CIS 88% vs. SOC 90% (RR 0.97, 0.88-1.07, p=0.55) on ART more than 6 mo	Overall death CIS 3% vs. SOC4% (RR 0.80, 0.46-1.35, p=0.41) within 12 mo after testing	After ART: CIS 7% vs. SOC16% (RR 0.51, 0.31-0.85, p=0.013)within 12 mo after testing
25	Peer support consisting of structured home visits to promote clinic attendance and preventative care	Standard care	442					Peer supports 31.9% vs. standard care 29.8% (aHR 1.04, 0.74-1.47, p=0.8)				
26	A combination of SMS to communicate CD4 abnormal result, provide financial incentive 6$ for transportation cost	No SMS and financial incentive	183					Risk of initiation increased 2.27 times in post intervention compared to pre (aHR 2.27 , 1.38-3.72); median time from assessment CD4 eligibility to treatment: intervention 13 days (5-22) vs. pre 47 days (11-77) p<0.001				
27	Micro clinic of a patient support defined network (friends, family, others)	usual care	426									Intervention 11% vs. control 20% (aHR 0.48, 0.25 - 0.92)

Appendix D. Critical appraisal checklist for 27 articles

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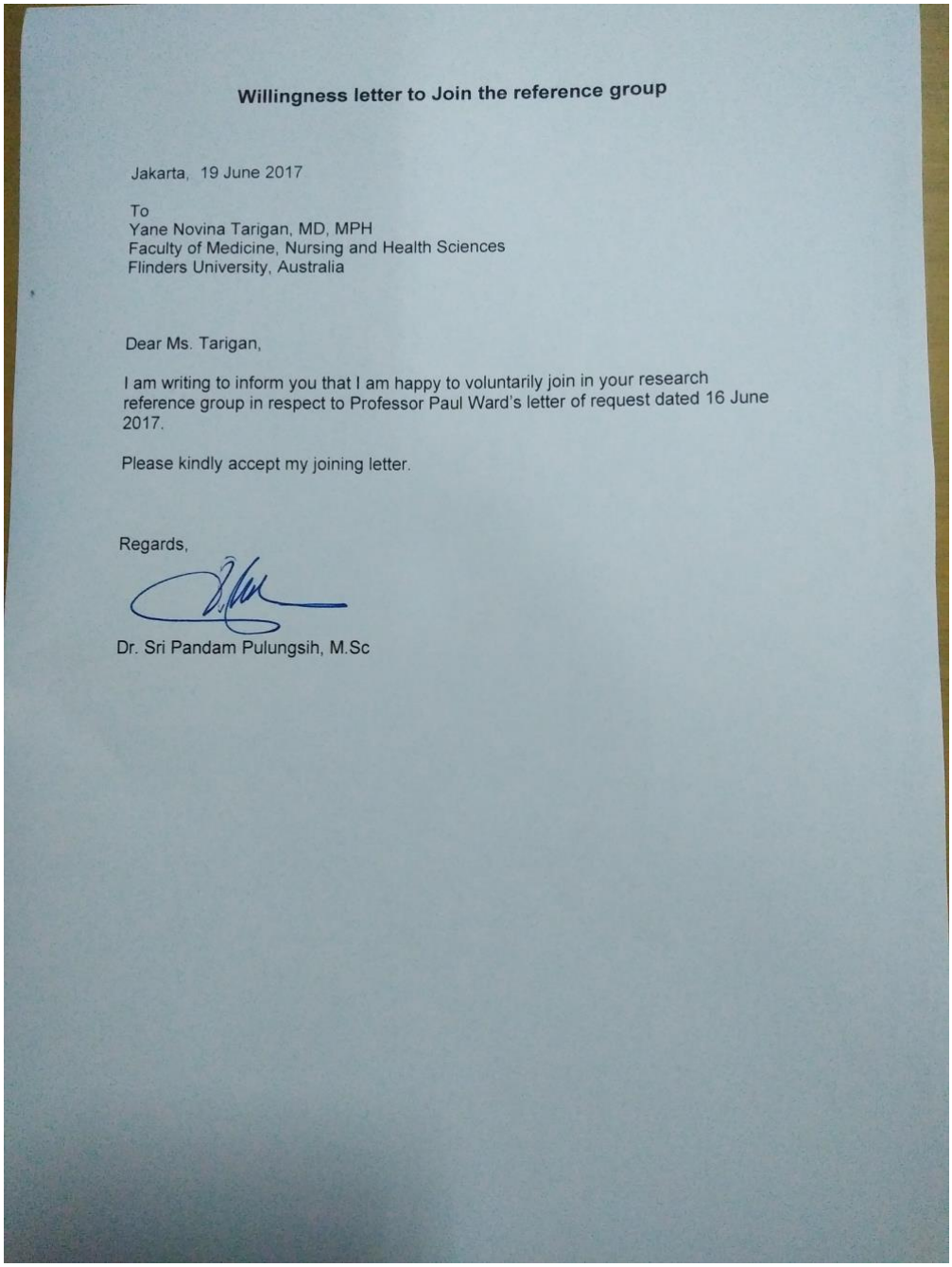
Appendix E. Acceptance letter of two member of reference group

Dr Sri Pandam Pulungsih (Consultant SUFA and LKB, Coordinator PMU Global Fund Component AIDS)



Willingness letter to Join the reference group

Jakarta, 19 June 2017

To
Yane Novina Tarigan, MD, MPH
Faculty of Medicine, Nursing and Health Sciences
Flinders University, Australia

Dear Ms. Tarigan,

I am writing to inform you that I am happy to voluntarily join in your research reference group in respect to Professor Paul Ward's letter of request dated 16 June 2017.

Please kindly accept my joining letter.

Regards,

Dr. Sri Pandam Pulungsih, M.Sc

19 June 2017

Yane Novina Tarigan, MD, MPH
Faculty of Medicine, Nursing and Health Sciences
Flinders University, Australia

Dear Dr. Tarigan,

I am writing to inform you that I am happy to join your research reference group as mentioned in Professor Paul Ward's letter of request dated 16 June 2017.

Please accept me as reference group member.

Warm regards,

Dr F. Stephen Wignall MD
HIV/STI Medical Consultant
Ubud, Bali
HP: +6281118605327
Email: Suwitno@mac.com

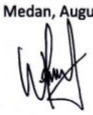
Appendix F. Letter of not to disclose patients information

The Statement letter of not to disclose patients information

I, the undersigned below:
Name :Wini Sry Rezeki Br Hombing
Date : Medan, 21 Nov 1995
Address : Munte

Declare not to disclose any information regarding patients who are the participants of 2017 SUFA research for any purpose other than the interests of the research. If I do this, I am willing to be prosecuted legally according tothe law that is applicable in Indonesia.

Medan, August 23, 2017



Best regards,

The Statement letter of not to disclose patients information

I, the undersigned below:
Name : Dewi Ratna sari Hutasoit
Date : Aceh , 27 Des 1995
Address : Sidikalang

Declare not to disclose any information regarding patients who are the participants of 2017 SUFA research for any purpose other than the interests of the research. If I do this, I am willing to be prosecuted legally according tothe law that is applicable in Indonesia.

Medan, August 23, 2017

Best regards,

Appendix G. Ethics approval

1. Social and Behavioural Research Ethics Committee (SBREC)

From: Human Research Ethics
To: "tari0017@flinders.edu.au"; "Paul Ward"; Emma Miller; "rudiw98@gmail.com"
Subject: 7622 SBREC approval notice (20 April 2017)
Date: Thursday, 20 April 2017 10:33:00 AM
Importance: High

Dear Yane Novina,

Your ethics application was considered by the Chair of the Social and Behavioural Research Ethics Committee (SBREC) at Flinders University and was granted approval. Your ethics approval notice can be found below.

APPROVAL NOTICE

Project No.:	**7622**
Project Title:	Effectiveness of the strategic use of antiretroviral therapy program in improving the engagement to HIV continuum of care in Indonesia
Principal Researcher:	Ms Yane Novina Tarigan
Email:	tari0017@flinders.edu.au
Approval Date:	20 April 2017
Ethics Approval Expiry Date:	**8 February 2020**

The above proposed project has been **approved** on the basis of the information contained in the application and its attachments with the addition of the following comments.

Additional comments:

1. Permissions (item D8)

   Please provide copies of correspondence granting permission to conduct the research from the individuals and/or organisations outlined (ie, Sub-Directorate HIV and STI, Indonesian Ministry of Health; Provincial/District health offices SUFA and Non-SUFA; Hospitals/Health facilities SUFA and Non-SUFA). Please ensure that all correspondence clearly outlines the specifics of what permission is being granted. If the documentation cannot be provided at the time of response to conditional approval please confirm that it will be provided to the Sub-Committee on receipt. Please note that data collection cannot commence until all relevant permissions have been granted.

2. Other Ethics Committees (item G1)

   Please provide copies of the ethics approval notifications granted from the ethics committees outlined in the application (ie, Health Research Ethics Committee padjajaran University, Faculty of Medicine or Komisi Etik Penelitian Kesehatan Fakultas Kedokteran Universitas Padjajaran (KEPH-FK UNPAD). If the approval notice(s) cannot be provided at the time of response to conditional approval please confirm that you will provide the ethics approval notification(s) *on receipt*. Please note that data collection cannot commence until all relevant ethics approvals have

been granted.

RESPONSIBILITIES OF RESEARCHERS AND SUPERVISORS

1. Participant Documentation

Please note that it is the responsibility of researchers and supervisors, in the case of student projects, to ensure that:

- all participant documents are checked for spelling, grammatical, numbering and formatting errors. The Committee does not accept any responsibility for the above mentioned errors.
- the Flinders University logo is included on all participant documentation (e.g., letters of Introduction, information Sheets, consent forms, debriefing information and questionnaires – with the exception of purchased research tools) and the current Flinders University letterhead is included in the header of all letters of introduction. The Flinders University international logo/letterhead should be used and documentation should contain international dialling codes for all telephone and fax numbers listed for all research to be conducted overseas.
- the SBREC contact details, listed below, are included in the footer of all letters of introduction and information sheets.

This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee (Project Number 'INSERT PROJECT No. here following approval'). For more information regarding ethical approval of the project the Executive Officer of the Committee can be contacted by telephone on 8201 3116, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au.

2. Annual Progress / Final Reports

In order to comply with the monitoring requirements of the *National Statement on Ethical Conduct in Human Research (March 2007)* an annual progress report must be submitted each year on the **20 April** (approval anniversary date) for the duration of the ethics approval using the report template available from the Managing Your Ethics Approval SBREC web page. *Please retain this notice for reference when completing annual progress or final reports.*

If the project is completed *before* ethics approval has expired please ensure a final report is submitted immediately. If ethics approval for your project expires please submit either (1) a final report; or (2) an extension of time request and an annual report.

Student Projects

The SBREC recommends that current ethics approval is maintained until a student's thesis has been submitted, reviewed and approved. This is to protect the student in the event that reviewers recommend some changes that may include the collection of additional participant data.

Your first report is due on **20 April 2018** or on completion of the project, whichever is the earliest.

3. Modifications to Project

Modifications to the project must not proceed until approval has been obtained from the Ethics Committee. Such proposed changes / modifications include:

- change of project title;
- change to research team (e.g., additions, removals, principal researcher or supervisor change);
- changes to research objectives;
- changes to research protocol;

- changes to participant recruitment methods;
- changes / additions to source(s) of participants;
- changes of procedures used to seek informed consent;
- changes to reimbursements provided to participants;
- changes / additions to information and/or documentation to be provided to potential participants;
- changes to research tools (e.g., questionnaire, interview questions, focus group questions);
- extensions of time.

To notify the Committee of any proposed modifications to the project please submit a Modification Request Form available from the Managing Your Ethics Approval SBREC web page. Download the form from the website every time a new modification request is submitted to ensure that the most recent form is used. Please note that extension of time requests should be submitted prior to the Ethics Approval Expiry Date listed on this notice.

Change of Contact Details

Please ensure that you notify the Committee if either your mailing or email address changes to ensure that correspondence relating to this project can be sent to you. A modification request is not required to change your contact details.

4. Adverse Events and/or Complaints

Researchers should advise the Executive Officer of the Ethics Committee on 08 8201-3116 or human.researchethics@flinders.edu.au immediately if:

- any complaints regarding the research are received;
- a serious or unexpected adverse event occurs that effects participants;
- an unforseen event occurs that may affect the ethical acceptability of the project.

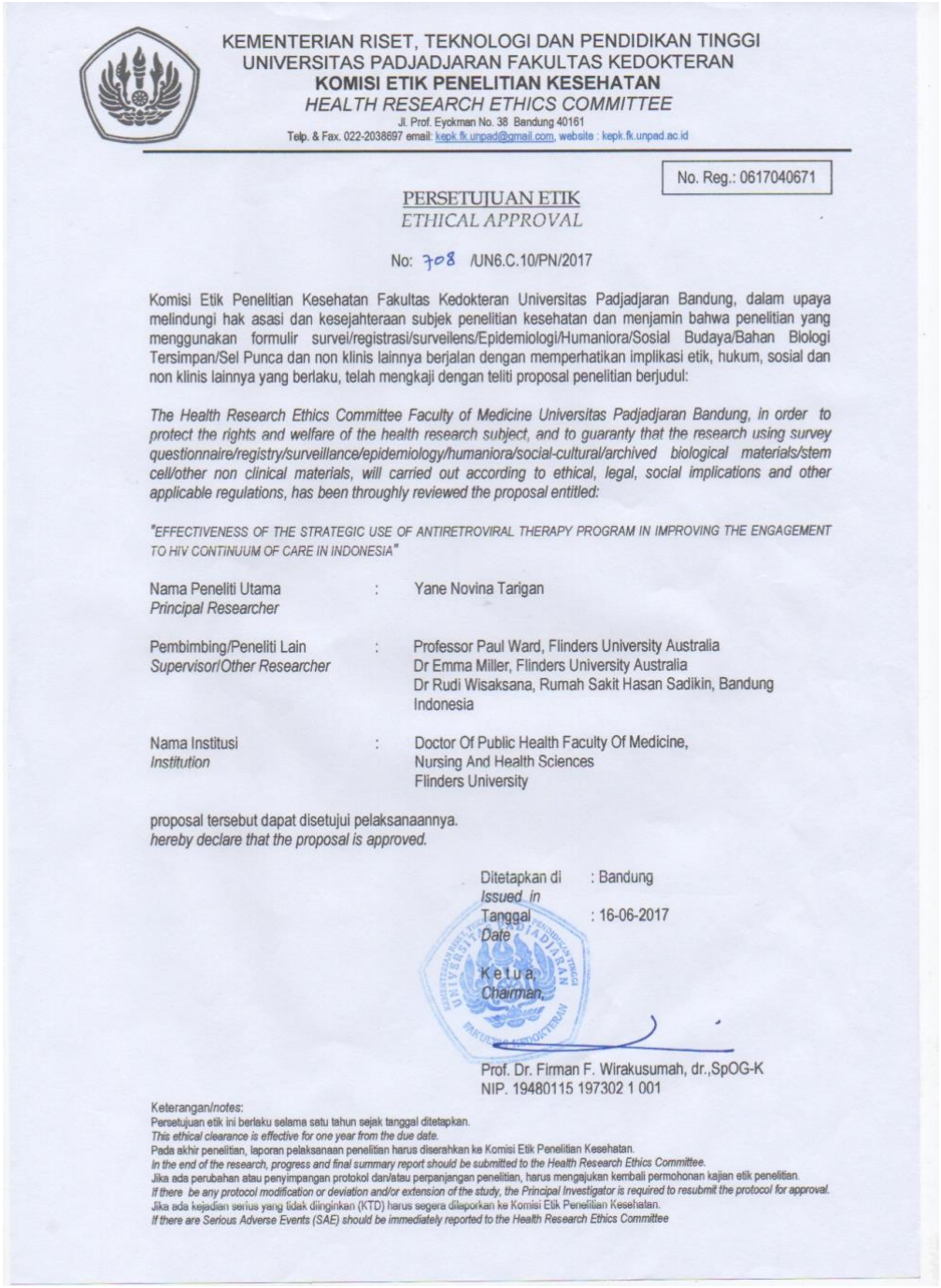
Kind regards
Rae

Mrs Andrea Fiegert and Ms Rae Tyler
Ethics Officers and Executive Officer, Social and Behavioural Research Ethics Committee
Andrea - Telephone: +61 8 8201-3116 | Monday, Tuesday and Wednesday
Rae – Telephone: +61 8 8201-7938 | ⅓ day Wednesday, Thursday and Friday

Email: human.researchethics@flinders.edu.au
Web: Social and Behavioural Research Ethics Committee (SBREC)

Manager, Research Ethics and Integrity – Dr Peter Wigley
Telephone: +61 8 8201-5466 | email: peter.wigley@flinders.edu.au
Research Services Office |Union Building Basement
Flinders University
Sturt Road, Bedford Park | South Australia | 5042
GPO Box 2100 | Adelaide SA 5001

2. Ethics approval from Health research ethics committee Faculty of Medicine, University of Padjajaran.



KEMENTERIAN RISET, TEKNOLOGI DAN PENDIDIKAN TINGGI
UNIVERSITAS PADJADJARAN FAKULTAS KEDOKTERAN
KOMISI ETIK PENELITIAN KESEHATAN
HEALTH RESEARCH ETHICS COMMITTEE
Jl. Prof. Eyckman No. 38 Bandung 40161
Telp. & Fax. 022-2038697 email: kepk.fk.unpad@gmail.com, website : kepk.fk.unpad.ac.id

No. Reg.: 0617040671

PERSETUJUAN ETIK
ETHICAL APPROVAL

No: 708 /UN6.C.10/PN/2017

Komisi Etik Penelitian Kesehatan Fakultas Kedokteran Universitas Padjadjaran Bandung, dalam upaya melindungi hak asasi dan kesejahteraan subjek penelitian kesehatan dan menjamin bahwa penelitian yang menggunakan formulir survei/registrasi/surveilens/Epidemiologi/Humaniora/Sosial Budaya/Bahan Biologi Tersimpan/Sel Punca dan non klinis lainnya berjalan dengan memperhatikan implikasi etik, hukum, sosial dan non klinis lainnya yang berlaku, telah mengkaji dengan teliti proposal penelitian berjudul:

The Health Research Ethics Committee Faculty of Medicine Universitas Padjadjaran Bandung, in order to protect the rights and welfare of the health research subject, and to guaranty that the research using survey questionnaire/registry/surveillance/epidemiology/humaniora/social-cultural/archived biological materials/stem cell/other non clinical materials, will carried out according to ethical, legal, social implications and other applicable regulations, has been throughly reviewed the proposal entitled:

"EFFECTIVENESS OF THE STRATEGIC USE OF ANTIRETROVIRAL THERAPY PROGRAM IN IMPROVING THE ENGAGEMENT TO HIV CONTINUUM OF CARE IN INDONESIA"

Nama Peneliti Utama *Principal Researcher*	:	Yane Novina Tarigan
Pembimbing/Peneliti Lain *Supervisor/Other Researcher*	:	Professor Paul Ward, Flinders University Australia Dr Emma Miller, Flinders University Australia Dr Rudi Wisaksana, Rumah Sakit Hasan Sadikin, Bandung Indonesia
Nama Institusi *Institution*	:	Doctor Of Public Health Faculty Of Medicine, Nursing And Health Sciences Flinders University

proposal tersebut dapat disetujui pelaksanaannya.
hereby declare that the proposal is approved.

Ditetapkan di : Bandung
Issued in
Tanggal : 16-06-2017
Date

Ketua,
Chairman,

Prof. Dr. Firman F. Wirakusumah, dr.,SpOG-K
NIP. 19480115 197302 1 001

Keterangan/*notes*:
Persetujuan etik ini berlaku selama satu tahun sejak tanggal ditetapkan.
This ethical clearance is effective for one year from the due date.
Pada akhir penelitian, laporan pelaksanaan penelitian harus diserahkan ke Komisi Etik Penelitian Kesehatan.
In the end of the research, progress and final summary report should be submitted to the Health Research Ethics Committee.
Jika ada perubahan atau penyimpangan protokol dan/atau perpanjangan penelitian, harus mengajukan kembali permohonan kajian etik penelitian.
If there be any protocol modification or deviation and/or extension of the study, the Principal Investigator is required to resubmit the protocol for approval.
Jika ada kejadian serius yang tidak diinginkan (KTD) harus segera dilaporkan ke Komisi Etik Penelitian Kesehatan.
If there are Serious Adverse Events (SAE) should be immediately reported to the Health Research Ethics Committee

3. Letter of support to conduct research and use SIHA data from MOH

KEMENTERIAN KESEHATAN REPUBLIK INDONESIA
DIREKTORAT JENDERAL
PENCEGAHAN DAN PENGENDALIAN PENYAKIT
Jalan percetakan Negara No. 29 Kotak Pos 223 Jakarta 10560
Telepon (021) 4247608 (*Hunting*) Faksimile (021) 4207807

GERMAS

Nomor : PM.02.02/3/1271.3 /2017 04 Juli 2017
Lampiran :
Hal : Dukungan Pengambilan Data SIHA

Yth. 1. Kepala Dinas Kesehatan Provinsi Sumatera Utara
2. Kepala Dinas Kesehatan Provinsi Kepulauan Riau
di
Tempat

Menindaklanjuti surat permohonan akses data SIHA dan laporan kebijakan nasional HIV SUFA di tingkat Nasional dan Lokal untuk kebutuhan penelitian doktoral an. dr Yane Novina Tarigan, MPH dari Universitas Flinders di Australia, kami mohon bantuan Saudara untuk dapat mendukung penelitian tersebut yang akan dilaksanakan di layanan HIV di kota Medan dan kota Batam. Untuk lebih jelasnya, kami lampirkan proposal penelitian yang bersangkutan.

Atas perhatian dan kerjasama Saudara kami ucapkan terima kasih.

Direktur P2PML,

KEMENTERIAN KESEHATAN REPUBLIK INDONESIA
DIREKTORAT JENDERAL PENCEGAHAN DAN PENGENDALIAN PENYAKIT

dr. Wiendra Waworuntu, M.Kes
NIP 19620301997032001

Tembusan :
Direktur Jenderal P2P

4. Letter of recommendation to conduct research in two provinces of Sumatra Utara and Kepulauan Riau from Ministry of Home Affairs

KEMENTERIAN DALAM NEGERI
REPUBLIK INDONESIA
DIREKTORAT JENDERAL POLITIK DAN PEMERINTAHAN UMUM
Jl. Medan Merdeka Utara No. 7 Tlp. 3450038 Ps. 2285 Jakarta 10110

REKOMENDASI PENELITIAN
Nomor :440.dd/2039 /Polpum

a. Dasar : 1. Peraturan Menteri Dalam Negeri Nomor 41 Tahun 2010 tentang Organisasi dan Tata Kerja Kementerian Dalam Negeri (Berita Negara Republik Indonesia Tahun 2010 Nomor 316), sebagaimana telah diubah dengan Peraturan Menteri Dalam Negeri Nomor 14 Tahun 2011 tentang Perubahan Atas Peraturan Menteri Dalam Negeri Nomor 41 Tahun 2010 tentang Organisasi dan Tata Kerja Kementerian Dalam Negeri (Berita Negara Republik Indonesia Tahun 2011 Nomor 168);

2. Peraturan Menteri Dalam Negeri Nomor 7 Tahun 2014 tentang Perubahan Atas Peraturan Menteri Dalam Negeri Nomor 64 Tahun 2011 tentang Pedoman Penerbitan Rekomendasi Penelitian.

b. Menimbang : Surat dari Flinders University, Adelaide Australia, Tanggal 2 Juni 2017, Perihal Permohonan Ijin Penelitian.

MEMBERITAHUKAN BAHWA :

a. Nama /Obyek : Yane Novina Tarigan

b. Jabatan/Alamat Identitas : Peneliti Utama / Jl. Janur elok II Qc 6 No.1 Kelapa Gading, Jakarta Utara, No.Hp. 0811627289/ No.KTP 9102014611720001.

c. Untuk : 1) Melakukan Penelitian, dengan proposal berjudul ***"Effectiveness Of Strategic Use Of Art In Improving The Engagement To HIV Continuum Of Care In Indonesia".***
2) Lokasi penelitian : Provinsi Sumatera Utara, Kepulauan Riau
3) Waktu/lama penelitian : Juni s.d. Oktober 2017;
4) Anggota tim peneliti : Prof Paul Ward, Dr Emma Hillen, Dr Rudi Wicaksana
5) Bidang penelitian : Kesehatan;
6) Status penelitian : Baru.

d. Melaporkan hasil penelitian kepada Menteri Dalam Negeri c.q. Dirjen Polpum, paling lambat 6 bulan setelah selesai penelitian.

Demikian rekomendasi ini dibuat untuk digunakan seperlunya.

Jakarta, 6 Juni 2017
a.n. DIREKTUR JENDERAL
POLITIK DAN PEMERINTAHAN UMUM
SEKRETARIS DITJEN,

DIDI SUDIANA SE., MM
Pembina Utama Madya (IV/d)
NIP. 19610109 201306 1001

Tembusan:
1. Kaban Kesbangpol Prov. Sumatera Utara
2. Kaban Kesbangpol Prov. Kepulauan Riau

Appendix H. Data extraction table of ITS study

1. HIV test

Aggregate data:	
City :	
Period: 26 Des 2010-25 Dec 2016	
Source: SIHA KT (PITC+VCT)	

No	Month	Absolute number of HIV test performed
1	26 Des-25 Jan 11	
2	26 Jan-25 Feb '11	
3	26 Feb-25 Mar'11	
4	26 Mar-25 Apr'11	
5	26 Apr-25 Mei 11	
6	26 Mei-25 Jun 11	
7	26 Jun-25Juli 11	
8	26 Jul-25 Aug 11	
9	26 Aug-25 Sept 11	
10	26 Sept-25 Okt 11	
11	26 Okt-25 Nop 11	
12	26 Nop-25 Des 11	
13	26 Des-25 Jan 12	
14	26 Jan-25 Feb 12	
15	26 Feb-25 Mar 12	
16	26 Mar-25 Apr 12	
17	26 Apr-25 Mei 12	
18	26 Mei-25 Jun 12	
19	26 Jun-25 Juli 12	
20	26 Jul-25 Aug 12	
21	26 Aug-25 Sept 12	
22	26 Sept-25 Okt 12	
23	26 Okt-25 Nop 12	
24	26 Nop-25 Des 12	
25	26 Des-25 Jan 13	
26	26 Jan-25 Feb 13	
27	26 Feb-25 Mar 13	
28	26 Mar-25 Apr 13	
29	26 Apr-25 Mei 13	
30	26 Mei-25 Jun 13	
31	26 Jun-25 Juli 13	
32	26 Jul-25 Aug 13	
33	26 Aug-25 Sept 13	
34	26 Sept-25 Okt 13	
35	26 Okt-25 Nop 13	
36	26 Nop-25 Des 13	
37	26 Des-25 Jan 14	
38	26 Jan-25 Feb 14	
39	26 Feb-25 Mar 14	
40	26 Mar-25 Apr 14	
41	26 Apr-25 Mei 14	
42	26 Mei-25 Jun 14	
43	26 Jun-25 Juli 14	
44	26 Jul-25 Aug 14	
45	26 Aug-25 Sept 14	
46	26 Sept-25 Okt 14	
47	26 Okt-25 Nop 14	
48	26 Nop-25 Des 14	
49	26 Des-25 Jan 15	
50	26 Jan-25 Feb 15	
51	26 Feb-25 Mar 15	
52	26 Mar-25 Apr 15	
53	26 Apr-25 Mei 15	
54	26 Mei-25 Jun 15	
55	26 Jun-25 Juli 15	
56	26 Jul-25 Aug 15	
57	26 Aug-25 Sept 15	
58	26 Sept-25 Okt 15	
59	26 Okt-25 Nop 15	
60	26 Nop-25 Des 15	
61	26 Des-25 Jan 15	
62	26 Jan-25 Feb 16	
63	26 Feb-25 Mar 16	
64	26 Mar-25 Apr 16	
65	26 Apr-25 Mei 16	
66	26 Mei-25 Jun 16	
67	26 Jun-25 Juli 16	
68	26 Jul-25 Aug 16	
69	26 Aug-25 Sept 16	
70	26 Sept-25 Okt 16	
71	26 Okt-25 Nop 16	
72	26 Nop-25 Des 16	

2.HIV cases

Aggregate data:	
City :	
Period: 26 Des 2010-25 Dec 2016	
Source: SIHA HTC (PITC+VCT)	

No	Month	Absolute number of HIV cases
1	26 Des-25 Jan 11	
2	26 Jan-25 Feb '11	
3	26 Feb-25 Mar'11	
4	26 Mar-25 Apr'11	
5	26 Apr-25 Mei 11	
6	26 Mei-25 Jun 11	
7	26 Jun-25Juli 11	
8	26 Jul-25 Aug 11	
9	26 Aug-25 Sept 11	
10	26 Sept-25 Okt 11	
11	26 Okt-25 Nop 11	
12	26 Nop-25 Des 11	
13	26 Des-25 Jan 12	
14	26 Jan-25 Feb 12	
15	26 Feb-25 Mar 12	
16	26 Mar-25 Apr 12	
17	26 Apr-25 Mei 12	
18	26 Mei-25 Jun 12	
19	26 Jun-25 Juli 12	
20	26 Jul-25 Aug 12	
21	26 Aug-25 Sept 12	
22	26 Sept-25 Okt 12	
23	26 Okt-25 Nop 12	
24	26 Nop-25 Des 12	
25	26 Des-25 Jan 13	
26	26 Jan-25 Feb 13	
27	26 Feb-25 Mar 13	
28	26 Mar-25 Apr 13	
29	26 Apr-25 Mei 13	
30	26 Mei-25 Jun 13	
31	26 Jun-25 Juli 13	
32	26 Jul-25 Aug 13	
33	26 Aug-25 Sept 13	
34	26 Sept-25 Okt 13	
35	26 Okt-25 Nop 13	
36	26 Nop-25 Des 13	
37	26 Des-25 Jan 14	
38	26 Jan-25 Feb 14	
39	26 Feb-25 Mar 14	
40	26 Mar-25 Apr 14	
41	26 Apr-25 Mei 14	
42	26 Mei-25 Jun 14	
43	26 Jun-25 Juli 14	
44	26 Jul-25 Aug 14	
45	26 Aug-25 Sept 14	
46	26 Sept-25 Okt 14	
47	26 Okt-25 Nop 14	
48	26 Nop-25 Des 14	
49	26 Des-25 Jan 15	
50	26 Jan-25 Feb 15	
51	26 Feb-25 Mar 15	
52	26 Mar-25 Apr 15	
53	26 Apr-25 Mei 15	
54	26 Mei-25 Jun 15	
55	26 Jun-25 Juli 15	
56	26 Jul-25 Aug 15	
57	26 Aug-25 Sept 15	
58	26 Sept-25 Okt 15	
59	26 Okt-25 Nop 15	
60	26 Nop-25 Des 15	
61	26 Des-25 Jan 15	
62	26 Jan-25 Feb 16	
63	26 Feb-25 Mar 16	
64	26 Mar-25 Apr 16	
65	26 Apr-25 Mei 16	
66	26 Mei-25 Jun 16	
67	26 Jun-25 Juli 16	
68	26 Jul-25 Aug 16	
69	26 Aug-25 Sept 16	
70	26 Sept-25 Okt 16	
71	26 Okt-25 Nop 16	
72	26 Nop-25 Des 16	

3.Enrolment in care

Aggregate data:	
City :	
Period: 26 Des 2010-25 Dec 2016	
Source: LBPHA (1.2 & 1.6)	

No	Month	Absolute number of enrolment to care
1	26 Des-25 Jan 11	
2	26 Jan-25 Feb '11	
3	26 Feb-25 Mar'11	
4	26 Mar-25 Apr'11	
5	26 Apr-25 Mei 11	
6	26 Mei-25 Jun 11	
7	26 Jun-25Juli 11	
8	26 Jul-25 Aug 11	
9	26 Aug-25 Sept 11	
10	26 Sept-25 Okt 11	
11	26 Okt-25 Nop 11	
12	26 Nop-25 Des 11	
13	26 Des-25 Jan 12	
14	26 Jan-25 Feb 12	
15	26 Feb-25 Mar 12	
16	26 Mar-25 Apr 12	
17	26 Apr-25 Mei 12	
18	26 Mei-25 Jun 12	
19	26 Jun-25 Juli 12	
20	26 Jul-25 Aug 12	
21	26 Aug-25 Sept 12	
22	26 Sept-25 Okt 12	
23	26 Okt-25 Nop 12	
24	26 Nop-25 Des 12	
25	26 Des-25 Jan 13	
26	26 Jan-25 Feb 13	
27	26 Feb-25 Mar 13	
28	26 Mar-25 Apr 13	
29	26 Apr-25 Mei 13	
30	26 Mei-25 Jun 13	
31	26 Jun-25 Juli 13	
32	26 Jul-25 Aug 13	
33	26 Aug-25 Sept 13	
34	26 Sept-25 Okt 13	
35	26 Okt-25 Nop 13	
36	26 Nop-25 Des 13	
37	26 Des-25 Jan 14	
38	26 Jan-25 Feb 14	
39	26 Feb-25 Mar 14	
40	26 Mar-25 Apr 14	
41	26 Apr-25 Mei 14	
42	26 Mei-25 Jun 14	
43	26 Jun-25 Juli 14	
44	26 Jul-25 Aug 14	
45	26 Aug-25 Sept 14	
46	26 Sept-25 Okt 14	
47	26 Okt-25 Nop 14	
48	26 Nop-25 Des 14	
49	26 Des-25 Jan 15	
50	26 Jan-25 Feb 15	
51	26 Feb-25 Mar 15	
52	26 Mar-25 Apr 15	
53	26 Apr-25 Mei 15	
54	26 Mei-25 Jun 15	
55	26 Jun-25 Juli 15	
56	26 Jul-25 Aug 15	
57	26 Aug-25 Sept 15	
58	26 Sept-25 Okt 15	
59	26 Okt-25 Nop 15	
60	26 Nop-25 Des 15	
61	26 Des-25 Jan 15	
62	26 Jan-25 Feb 16	
63	26 Feb-25 Mar 16	
64	26 Mar-25 Apr 16	
65	26 Apr-25 Mei 16	
66	26 Mei-25 Jun 16	
67	26 Jun-25 Juli 16	
68	26 Jul-25 Aug 16	
69	26 Aug-25 Sept 16	
70	26 Sept-25 Okt 16	
71	26 Okt-25 Nop 16	
72	26 Nop-25 Des 16	

4.Eligibility for ARV

Aggregate data:	
City :	
Period: 26 Des 2010-25 Dec 2016	
Source: LBPHA (2.2 & 2.7)	

No	Month	Absolute number of eligibility for ARV
1	26 Des-25 Jan 11	
2	26 Jan-25 Feb '11	
3	26 Feb-25 Mar'11	
4	26 Mar-25 Apr'11	
5	26 Apr-25 Mei 11	
6	26 Mei-25 Jun 11	
7	26 Jun-25Juli 11	
8	26 Jul-25 Aug 11	
9	26 Aug-25 Sept 11	
10	26 Sept-25 Okt 11	
11	26 Okt-25 Nop 11	
12	26 Nop-25 Des 11	
13	26 Des-25 Jan 12	
14	26 Jan-25 Feb 12	
15	26 Feb-25 Mar 12	
16	26 Mar-25 Apr 12	
17	26 Apr-25 Mei 12	
18	26 Mei-25 Jun 12	
19	26 Jun-25 Juli 12	
20	26 Jul-25 Aug 12	
21	26 Aug-25 Sept 12	
22	26 Sept-25 Okt 12	
23	26 Okt-25 Nop 12	
24	26 Nop-25 Des 12	
25	26 Des-25 Jan 13	
26	26 Jan-25 Feb 13	
27	26 Feb-25 Mar 13	
28	26 Mar-25 Apr 13	
29	26 Apr-25 Mei 13	
30	26 Mei-25 Jun 13	
31	26 Jun-25 Juli 13	
32	26 Jul-25 Aug 13	
33	26 Aug-25 Sept 13	
34	26 Sept-25 Okt 13	
35	26 Okt-25 Nop 13	
36	26 Nop-25 Des 13	
37	26 Des-25 Jan 14	
38	26 Jan-25 Feb 14	
39	26 Feb-25 Mar 14	
40	26 Mar-25 Apr 14	
41	26 Apr-25 Mei 14	
42	26 Mei-25 Jun 14	
43	26 Jun-25 Juli 14	
44	26 Jul-25 Aug 14	
45	26 Aug-25 Sept 14	
46	26 Sept-25 Okt 14	
47	26 Okt-25 Nop 14	
48	26 Nop-25 Des 14	
49	26 Des-25 Jan 15	
50	26 Jan-25 Feb 15	
51	26 Feb-25 Mar 15	
52	26 Mar-25 Apr 15	
53	26 Apr-25 Mei 15	
54	26 Mei-25 Jun 15	
55	26 Jun-25 Juli 15	
56	26 Jul-25 Aug 15	
57	26 Aug-25 Sept 15	
58	26 Sept-25 Okt 15	
59	26 Okt-25 Nop 15	
60	26 Nop-25 Des 15	
61	26 Des-25 Jan 15	
62	26 Jan-25 Feb 16	
63	26 Feb-25 Mar 16	
64	26 Mar-25 Apr 16	
65	26 Apr-25 Mei 16	
66	26 Mei-25 Jun 16	
67	26 Jun-25 Juli 16	
68	26 Jul-25 Aug 16	
69	26 Aug-25 Sept 16	
70	26 Sept-25 Okt 16	
71	26 Okt-25 Nop 16	
72	26 Nop-25 Des 16	

5.Treatment initiations

Aggregate data:	
City :	
Period: 26 Des 2010-25 Dec 2016	
Source: LBPHA (3.2 & 3.6)	

No	Month	Absolute number of Treatment initiations
1	26 Des-25 Jan 11	
2	26 Jan-25 Feb '11	
3	26 Feb-25 Mar'11	
4	26 Mar-25 Apr'11	
5	26 Apr-25 Mei 11	
6	26 Mei-25 Jun 11	
7	26 Jun-25Juli 11	
8	26 Jul-25 Aug 11	
9	26 Aug-25 Sept 11	
10	26 Sept-25 Okt 11	
11	26 Okt-25 Nop 11	
12	26 Nop-25 Des 11	
13	26 Des-25 Jan 12	
14	26 Jan-25 Feb 12	
15	26 Feb-25 Mar 12	
16	26 Mar-25 Apr 12	
17	26 Apr-25 Mei 12	
18	26 Mei-25 Jun 12	
19	26 Jun-25 Juli 12	
20	26 Jul-25 Aug 12	
21	26 Aug-25 Sept 12	
22	26 Sept-25 Okt 12	
23	26 Okt-25 Nop 12	
24	26 Nop-25 Des 12	
25	26 Des-25 Jan 13	
26	26 Jan-25 Feb 13	
27	26 Feb-25 Mar 13	
28	26 Mar-25 Apr 13	
29	26 Apr-25 Mei 13	
30	26 Mei-25 Jun 13	
31	26 Jun-25 Juli 13	
32	26 Jul-25 Aug 13	
33	26 Aug-25 Sept 13	
34	26 Sept-25 Okt 13	
35	26 Okt-25 Nop 13	
36	26 Nop-25 Des 13	
37	26 Des-25 Jan 14	
38	26 Jan-25 Feb 14	
39	26 Feb-25 Mar 14	
40	26 Mar-25 Apr 14	
41	26 Apr-25 Mei 14	
42	26 Mei-25 Jun 14	
43	26 Jun-25 Juli 14	
44	26 Jul-25 Aug 14	
45	26 Aug-25 Sept 14	
46	26 Sept-25 Okt 14	
47	26 Okt-25 Nop 14	
48	26 Nop-25 Des 14	
49	26 Des-25 Jan 15	
50	26 Jan-25 Feb 15	
51	26 Feb-25 Mar 15	
52	26 Mar-25 Apr 15	
53	26 Apr-25 Mei 15	
54	26 Mei-25 Jun 15	
55	26 Jun-25 Juli 15	
56	26 Jul-25 Aug 15	
57	26 Aug-25 Sept 15	
58	26 Sept-25 Okt 15	
59	26 Okt-25 Nop 15	
60	26 Nop-25 Des 15	
61	26 Des-25 Jan 15	
62	26 Jan-25 Feb 16	
63	26 Feb-25 Mar 16	
64	26 Mar-25 Apr 16	
65	26 Apr-25 Mei 16	
66	26 Mei-25 Jun 16	
67	26 Jun-25 Juli 16	
68	26 Jul-25 Aug 16	
69	26 Aug-25 Sept 16	
70	26 Sept-25 Okt 16	
71	26 Okt-25 Nop 16	
72	26 Nop-25 Des 16	

Appendix I. Missing aggregate data of enrolment in care, eligibility for ARV and treatment initiations in 13 sites

No	Sites	2011	2012	2013	2014	2015	2016
1	Badung	Jan-March			Nov-Dec		
2	JakBar	Jan-Dec	Jan-Dec	Jan-Dec	Jan-Oct		
3	Bandung	March					
4	Denpasar	Jan-March			Nov-Dec		
5	Makssar	Jan-Dec	Jan-May				
6	Malang	Jan-May					
7	Medan	Jan-Dec	Jan-Oct				
8	Surabaya	Jan-May					
9	Surakarta	Jan-Dec					
10	Menado	Jan-Dec	Jan-Dec	Jan-Dec	Jan-Apr, Nov-Dec		
11	Jayawijaya	Jan-Apr				Aug-Dec	Jun-Dec
12	Jayapura	Jan-Apr					
13	Sorong	Jan-Dec	Jan-Dec	Jan-May	Jul, Dec	Sept-Dec	Jan-Dec

Appendix J. Procedure choosing two locations

Step by Step procedure of choosing two matched districts

The choice of districts based on number of KAP > 200, availability of health facilities (CD4 count machine), availability of NGO and HIV AIDS networking, peer group for specific KAP, training CST and IMAI for health care facilities

Step 1. Determination of list districts with one year time different of SUFA exposure

SUFA Phase 1 accelerated Dec 2013-Jan 2014	SUFA Phase 3, accelerated Mar-Sep 2015
1. City Medan	1.Regency Tangerang
2. City Bandung	2.City Jambi
3. City Jakarta Barat	3.Regency Bogor
4. City Surabaya	4.Regency Ciamis
5. City Surakarta	5.Regency Garut
6.City Malang	6.Regency Karawang
7. City Denpasar	7.Regency Kuningan
8. Regency Badung	8.Regency Majalengka
9.City Makassar	9.Regency Subang
10.City Manado	10.Regency Sumedang
11.Regency Sorong	11.Regency Banyumas
12.City Jayapura	12.Regency Batang
13.Regency Jayawijaya	13.Regency Cilacap
	14.Regency Kendal
	15.Regency Jombang
	16.Regency Kediri
	17.Regency Sidoarjo
	18.City Pontianak
	19.City Singkawang
	20.City Batam
	21.City Tanjungpinang
	22.City Bandar Lampung
	23.City Mataram
	24.City Pare-Pare
	25.City Padang
	26.City Palembang

Of phase 1 column 8 City were put in the final list due to 5 districts (City Denpasar, Regency Badung, Regency Sorong, City Jayapura, Regency Jayawijaya) were excluded for they have a unique population and HIV epidemic characteristics. Meanwhile of phase 3 column, 10 City were put in the final list because 16 of them have a different government administrative type with 8 City in the list of SUFA phase one (City versus Regency).

Step 2. Matching similarity characteristic.
First characteristic:

1. 15 biggest City based on number of population

Name of City	Amount	SUFA Phase	
1. City Surabaya	2,765,908	1	
2. City Medan	2,109,339	1	
3. City Bandung	2,393,633	1	
4.City Jakarta Timur	2,687,027	2	
5. City Jakarta Barat	2,278,825	1	
6. City Jakarta Selatan	2,057,080	2	
7.City Depok	1,736,565	2	
8. City Bekasi	2,336,489	2	
9.City Jakarta Utara	1,645,312	2	
10.City Semarang	1,553,778	2	
11.City Palembang	1,452,840	3	
12.City Tanggerang	1,383,706	After phase 3	
13. City Makassar	1,339,374	1	
14. City Tanggerang Selatan	1,383,706	After phase 3	
15. City Batam	949,775	3	
16. City Pakan Baru	903,902	2	

We left with possible pairs:

Phase 1	Phase 2
1. City Surabaya	1. City Palembang
2. City Medan	2. City Batam
3. City Bandung	
4. City Jakarta Barat	
5.City Makassar	

3. Social cultural and religion pattern:

City	Ethnics	Religion
Medan	Batak (34.39%), Javanese (33.03%), Chinese (10.65%), Minangkabau (8.6%), Malay (6.59%), Acehnese (2.70%) (Suryadinata, Arifin & Ananta 2003)	Moslem (67.8%), Christian (22.06%), Buddhism (8.81%) (Statistics Central Bureau 2010)
Batam	Javanese (26.78%), Malay (22.61%), Batak (19.97%), Minangkabau (14.93%), Chinese (11.28%) (Hutchinson & Chong 2016)	Moslem (71,20%), Christian (21.72%), Buddhism (6.78%) (Statistics of Kepulauan Riau Province 2017)

2. Human Development index:
City Medan= 79.34 while City Batam= 79.79
Most of districts in list of phase one SUFA are

HIV Epidemic Level: all the18 districts were concentrated level of epidemic.
2. Proportion Estimation of Key affected population (KAP):

Districts	MSM	Direct and indirect FSW	Transgender Women	PWID
1. City Medan	8,495 (73.4%)	1,989 (17.2%)	664 (5.7%)	428 (3.7%)
2. City Batam	3,451 (82%)	403 (9.5%)	215 (5.1%)	137 (3.2%)

Both of location have type of HIV risk transmission dominated by homosexual and heterosexual.

Hutchinson, FE & Chong, T 2016, *The SIJORI cross-border region: Transnational politics, economics, and culture*, ISEAS-Yusof Ishak Institute.

Statistics Central Bureau 2010, *Population by region and religion Medan Municipality*, Statistics Central Bureau,,, viewed 2016, <https://sp2010.bps.go.id/index.php/site/tabel?tid=321&wid=1275000000>.

Statistics of Kepulauan Riau Province 2017, *Kepulauan Riau Province in figures 2017*, Statistics Indonesia, viewed 2016, <https://kepri.bps.go.id/publication/2017/08/11/8d778cc5c7e221a58020a580/provinsi-kepulauan-riau-dalam-angka-2017.html>.

Suryadinata, L, Arifin, EN & Ananta, A 2003, *Indonesia's population: Ethnicity and religion in a changing political landscape*, Institute of Southeast Asian Studies.

Appendix K. Individual study questionnaire and guidance to fill

Questionnaire

Case record form
Individual study

S.N (symbolic number)	____ (automatically delivered)
Date of data entry	_____
Date of data collection	_____
Study ID number	_____
Name of data collector	_____
Name of data vinificator	_____
Patient record number	_____
Sex	_ (1. Male; 2. Female)
Date of birth	_____
Treatment supporter	_ (1. Yes; 2. No)
Test strategy	_ (1. PITC; 2.VCT; 3. PMTCT)
Date of diagnosis	_____
Education Level	_ (1. No school; 2. Primary; 3. High school; 4. Higher)
Employment status	_ (1. No job; 2. Work)
Transmission risk	_
Pre-ART assessment visit	_ (1. Visit; 2. LTFU; 3. Dead)
Date of WHO clinical assessment	_____
WHO clinical stadium	_ (1. I; 2.II; 3. III; 4. IV)
Baseline CD4 count	____
Pre-ART eligible visit	_ (1. Visit; 2. LTFU; 3. Dead)
Date of eligible ART	_____
Clinical stadium once eligible	_ (1. I; 2.II; 3. III; 4. IV)
CD4 count when eligible	____
Pre-art initiation visit	_ (1. Visit; 2. LTFU; 3. Dead)
Freq counselling before initiation	_ (1. None; 2. 1-2; 3. 3 or more)
Date of initiation	_____
Stadium when initiated	__ (1. I; 2.II; 3. III; 4. IV)
CD4 count when initiated	____
Drug combination type	__
Initiation indication	_
F1 month	_
F1 date visited	_____
Drug combination type	_(same as above)
F1 Opportunistic infection	__
F1 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F1 timely visit	_ (1. Yes; 2. No)
F2 month	_
F2 date visited	_____
F2Drug combination type	_(same as above)
F2 Opportunistic infection	__ (same as above)
F2 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F2 timely visit	_ (1. Yes; 2. No)

1

F3 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F3 date visited	_____
F3Drug combination type	_(same as above)
F3 Opportunistic infection	__ (same as above)
F3 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F3 timely visit	_ (1. Yes; 2. No)
F4 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F4 date visited	_____
F4 Drug combination type	_ (same as above)
F4 Opportunistic infection	__ (same as above)
F4 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F4 timely visit	_ (1. Yes; 2. No)
F5 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F5 date visited	_____
F5 Drug combination type	_(same as above)
F5 Opportunistic infection	__ same as above)
F5 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F5 timely visit	_ (1. Yes; 2. No)
F6 month	_ (1. FU; 2. LTFU; 3. Dead)
F6 date visited	_____
F6 Drug combination type	_(same as above)
F6 Opportunistic infection	__ (same as above)
F6 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F6 timely visit	_ (1. Yes; 2. No)
F6 CD4 count	____
F7month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F7 date visited	_____
F7 Drug combination type	_(same as above)
F7 Opportunistic infection	__ (same as above)
F7 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F7 timely visit	_ (1. Yes; 2. No)
F7 CD4 count	____
F8 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F8 date visited	_____
F8 Drug combination type	_(same as above)

F8 Opportunistic infection	__ (same as above)
F8 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F8 timely visit	_ (1. Yes; 2. No)
F8 CD4 count	____
F9 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F9 date visited	_____
F9 Drug combination type	_(same as above)
F9 Opportunistic infection	__ (same as above)
F9 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F9 timely visit	_ (1. Yes; 2. No)
F9 CD4 count	____
F10 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F10 date visited	_____
Drug combination type	_(same as above)
F10 Opportunistic infection	__ same as above)
F10adherence level	_ (1. High; 2. Moderate; 3. Poor)
F10 timely visit	_ (1. Yes; 2. No)
F10 CD4 count	____
F11 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F11 date visited	_____
F11 Drug combination type	_(same as above)
F11 Opportunistic infection	__ (same as above)
F11 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F11 timely visit	_ (1. Yes; 2. No)
F11 CD4 count	____
Stages LTFU	##

1. Pre-art assessment visit
2. Pre art eligible visit
3. Pre art Initiation visit
4. F1
5. F2
6. F3
7. F4
8. F5
9. F6
10. F7
11. F8
12. F9
13. F10
14. F11

Individual study
Questionnaire Guideline

Effectiveness of strategic use of antiretroviral program in improving the engagement to HIV continuum of care in Indonesia

S.N (symbolic number)	#### (automatically delivered)
Date of data entry	######
Date of data collection	######
Study ID number	#######
	Pasien number (4 digit) kk(1 digit) yr (2 digit)
Name of data collector	##########
Name of data verificator	##########
Patient record number	########
	According to patient medical record number
Sex	# (1. Male; 2. Female)
Date of birth	######
Medicine companion	# (1. Yes; 2. No)
Test strategy	# (1. PITC; 2.VCT;)
Date of diagnosis	######
Education Level	# (1. No school; 2. Primary; 3. High school; 4. Higher)
Employment status	# (0. No job; 1. Work)
Transmission risk	# (1. Vaginal; 2. Anal; 3. Injecting drug; 4. Blood transfusion; 5. Perinatal; 6. Others
Pre-ART assessment visit	# (1. Visit; 2. LTFU; 3. Dead) (If not yet eligible but visited on next month, jump to F1)
Date of WHO clinical assessment	######
WHO clinical stadium	# (1. I; 2.II; 3. III; 4. IV)
Baseline CD4 count	####
Pre-ART eligible visit	# (1. Visit; 2. LTFU; 3. Dead) If eligible and visited at next month but not yet initiated, jump to F1
Date of eligible ART	######
Clinical stadium once eligible	# (1. I; 2.II; 3. III; 4. IV)
CD4 count when eligible	####
Initiation visit	# (1. Visit; 2. LTFU; 3. Dead)
	Initiation day visit
Freq tc before initiation	# (1. None; 2. 1-2; 3. 3 or more)
Date of initiation	######
Stadium when initiated	## (1. I; 2.II; 3. III; 4. IV)
CD4 count when initiated	####
Drug combination type	##

1. ZDV(300) +3 TC(150)+NVP(200);
2. ZDV(300)+3TC(150)+EFV(600)
3. TDF(300)+3TC(150)+NVP(200)
4. TDF(300)+3TC(150)+EFV(600)
5. TDF(300)+3TC(300)+EFV(600)
6. TDF(300)+FTC(200)+NVP(200)

F3 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F3 date visited	_____
F3Drug combination type	_(same as above)
F3 Opportunistic infection	__ (same as above)
F3 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F3 timely visit	_ (1. Yes; 2. No)
F4 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F4 date visited	_____
F4 Drug combination type	_ (same as above)
F4 Opportunistic infection	__ (same as above)
F4 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F4 timely visit	_ (1. Yes; 2. No)
F5 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F5 date visited	_____
F5 Drug combination type	_(same as above)
F5 Opportunistic infection	__ same as above)
F5 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F5 timely visit	_ (1. Yes; 2. No)
F6 month	_ (1. FU; 2. LTFU; 3. Dead)
F6 date visited	_____
F6 Drug combination type	_(same as above)
F6 Opportunistic infection	__ (same as above)
F6 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F6 timely visit	_ (1. Yes; 2. No)
F6 CD4 count	____
F7month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F7 date visited	_____
F7 Drug combination type	_(same as above)
F7 Opportunistic infection	__ (same as above)
F7 adherence level	_ (1. High; 2. Moderate; 3. Poor)
F7 timely visit	_ (1. Yes; 2. No)
F7 CD4 count	____
F8 month	_ (1. Retained in pre-ART, 2. Fu art; 3. LTFU; 4. Transfer out; 5. Stop; 6.Dead)
F8 date visited	_____
F8 Drug combination type	_(same as above)