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Chronic disease risk factors in a transitional country

The case of rural Indonesia

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Abstract

Background: The epidemic of chronic diseases is largely neglected. Although a threatening burden of chronic diseases is emerging, developing public health efforts for their prevention and control is not yet a priority for trans-national and national health policy makers. Understanding the population burden of risk factors which predict chronic diseases is an important step in reducing the impact of the diseases themselves.

Objective: This thesis responds to the increasing burden of chronic diseases worldwide, and aims to illustrate the gap in chronic disease risk factor research in developing countries. The thesis describes and analyses the distribution of chronic disease risk factors in a rural setting in Indonesia. It also describes how smoking, one of the most common risk factors, is viewed by rural Javanese boys. Ultimately, therefore, this thesis aims to contribute to policy and programme recommendations for community interventions in a rural setting in Indonesia

Methods: The studies were conducted in Purworejo District, where a Demographic Surveillance System (DSS) has been running since 1994. The Purworejo DSS is part of the INDEPTH network (International Network of field sites for continuous Demographic Evaluation of Populations and Their Health in developing countries). Two representative cross-sectional studies (in 2001 and 2005) were conducted to assess the chronic disease risk factors (including smoking, elevated blood pressure, and overweight and obesity). The first cross-sectional study was followed up in 2002 and 2004. In each study, a total of 3 250 participants (approximately 250 individuals in each sex and age group among 15–74 year olds stratified into 10-year intervals) were randomly selected from the surveillance database from each enumeration area in the surveillance area. Instruments were adopted from the WHO STEPS survey and adapted to local setting. Since many Indonesians start to smoke at an earlier age, a qualitative study using a focus group discussion approach was conducted among school boys aged 13-17 years old to describe and explore beliefs, norms, and values about smoking in a rural setting in Java.

Result: Both the rural and urban populations in Purworejo face an unequal distribution of risk factors for chronic diseases. The burden among the most well-off group in the rural area has already reached a level similar to that found in the urban area. Most of the risk factors increased in all age, sex and socioeconomic groups during the period of 2001 to 2005. However, women and the poorest group experienced the greatest increase in risk factor prevalence. The qualitative study showed that cultural resistance against women smoking in Indonesia remains strong. Smoking is being viewed as a culturally internalised habit that signifies transition into maturity and adulthood for boys. Smoking is utilised as a means for socialisation and signifies better socioeconomic status. The use of tobacco in the construction of masculinity underlines the importance of gender specific interventions. National tobacco control policy should emphasise a smoking free society as the norm, especially among boys and men, and regulations regarding the banning of smoking should be enforced at all levels and areas of the community.

Within the demographic surveillance setting, it is possible to assess the population and health dynamics. Utilisation of a standardised methodology across sites in INDEPTH will produce comparable population-based data in developing countries. Such comparisons are important in global health. A comparison of smoking transition patterns between a Vietnamese DSS and an Indonesian DSS shows that Indonesian men started smoking regularly earlier and ceased less than Vietnamese men. Compared with Vietnam, which has already signed and ratified the Framework Convention on Tobacco Control, tobacco control activities in Indonesia are still deficient.

Conclusion: The thesis concludes that the rural population is not spared from the emerging burden of chronic disease risk factors. The patterning of risks across different socioeconomic groups provides a macro picture of the vicious cycle between poverty and chronic diseases. Understanding of risk factors in a local context through a qualitative study provides insight into cultural aspects relating to risk factor adoption, and will allow the fostering and tailoring of culturally appropriate interventions. Combining data from demographic surveillance sites with the WHO STEP approach to chronic disease risk factor Surveillance addresses basic epidemiological questions on chronic diseases. The use of such data is a powerful advocacy tool in public health decision-making for chronic disease prevention in developing countries. With substantial existing evidence on the effectiveness of chronic disease prevention and intervention programmes, it is vital that Indonesia to start planning intervention programmes to control the impending chronic disease epidemic, and most importantly, to translate all this evidence into public health action.

Keywords: chronic disease, risk factor, demographic surveillance system, smoking, elevated blood pressure, overweight and obesity, population-based intervention

Original papers

This thesis is based on the following papers:

- I. Ng N, Minh HV, Tesfaye F, Bonita R, Byass P, Stenlund H, Weinehall L, Wall S. Combining risk factors and demographic surveillance: Potentials of WHO STEPS and INDEPTH methodologies for assessing epidemiological transition. *Scand J Public Health* 2006;34:199-208.
- II. Ng N, Stenlund H, Bonita R, Hakimi M, Wall S, Weinehall L. Preventable risk factors for noncommunicable diseases in rural Indonesia: prevalence study using WHO STEPS approach. *Bull World Health Organ* 2006;84:305-13.
- III. Ng N, Weinehall L, Öhman A. 'If I don't smoke, I'm not a real man' – Indonesian teenage boys' views about smoking. (Submitted)
- IV. Minh HV, Ng N, Wall S, Stenlund H, Bonita R, Weinehall L, Hakimi M, Byass P. Smoking epidemics and socio-economic predictors of regular use and cessation: Findings from WHO STEPS risk factor surveys in Vietnam and Indonesia. (Accepted for publication in *Internet Journal of Epidemiology*)

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Abbreviations and acronyms

AIDS	Acquired Immunodeficiency Syndrome
BMI	Body Mass Index
CI	Confidence Interval
CVD	Cardiovascular Diseases
DALY	Disability-Adjusted Life Year
DSS	Demographic Surveillance System
FCTC	Framework Convention of Tobacco Control
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GPAQ	Global Physical Activity Questionnaire
GYTS	Global Youth Tobacco Survey
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
INDEPTH	An International Network of field sites for continuous Demographic Evaluation of Populations and Their Health in developing countries
MDG	Millennium Development Goals
MONICA	MONItoring of trend and determinants in CARDiovascular diseases
NCD	Non-Communicable Diseases
OR	Odds Ratio
PPS	Probability Proportional to Size
RR	Relative Risk
SARS	Severe Acute Respiratory Syndrome
STEPS	STEPwise approach to chronic disease risk factor Surveillance
UNICEF	United Nations Children's Fund
WHO	World Health Organization
WHR	Waist Hip Ratio

Glossary and definitions

Burden of disease	Sum of premature death and suffering due to ill-health in a population
Chronic diseases	Diseases which develop over a long period of time and require a long-term and systematic approach to treatment
Confidence interval	The computed interval with a given probability, e.g. 95%, that the true value of a variable such as a mean, proportion, or rate is contained within the interval
Content analysis	A research method that provides a systematic and objective means to make valid inferences from verbal, visual, or written data in order to describe and quantify specific phenomena
Cross-sectional study	A study that examines the relationship between disease (or other health-related characteristics) and other variables of interest as they exist in a defined population at one particular time
DALY	DALY measures the sum of life years lost due to premature mortality and years lived with disability adjusted for severity. One DALY is one lost year of healthy life. DALY is used as a measure of the burden of disease on a defined population and the effectiveness of interventions
Dependency ratio	Proportion of children and old people in a population in comparison to all others i.e. the proportion of non-economically to economically active; “children” are usually defined as ages under 15 and “old people” as ages 65 and over
Demographic Surveillance System	DSS is a set of field sites and computing operations which longitudinally relate demographic information to health outcomes within a clearly defined geographic area
Emerging design	A research design that allows the design to emerge rather than to construct it a priori. It presupposes multiple realities which makes it difficult to decide upon the design ahead of time
Epidemiology	The study of the distribution and determinants of health related states or events in specified populations, and the application of this study to the control of health problems

Epidemiological transition	A theory that focuses on the complex change in patterns of health and disease and on the interactions between these patterns and their demographic, economic and sociologic determinants and consequences
Focus group discussion	Small convenience sample of people brought together to discuss a topic or issue with the aim of ascertaining the range and intensity of their views, rather than arriving at a consensus.
Gender	The socially constructed roles, behaviours, activities, and attributes that a given society considers appropriate for men and women
Low birth weight	Birth weight less than 2 500 gram
Masculinity	Theory on male gender role which is both social and dynamic
Maternal mortality rate	Number of maternal deaths related to pregnancy and delivery per 100 000 live births
Neonatal mortality rate	Number of deaths among children under 1 year old per 1 000 live births
Odds	The probability that a particular event will occur divided by the probability that the event will not occur
Odds ratio	The odds of a particular exposure among persons with a specific disease divided by the corresponding odds of exposure among persons without the disease of interest
Population attributable risk	The proportion of disease in a population that results from a particular risk to health
Prevalence	The number of a given disease or other conditions in a given population at a designated time
Prevalence of risk	The proportion of the population who are exposed to a particular risk
Public health	The art and science of preventing disease, promoting health, and extending life through the organized efforts of society
Public health interventions	Interventions that are sought or directed towards entire populations or subgroups
Purposive sampling	Non-random, non-probability sampling procedures used in qualitative methodology. The study units are selected deliberately, with an expectation that they will be appropriate for the purpose of the study. As opposed to random samples, the purposive sample is not representative for its population in a statistical meaning

Qualitative method	A research method that is used to discover and describe important variables, particularly in terms of social dynamics and the subjective realities of those involved in a given situation. It is used to develop an understanding of the meaning and experience dimensions of humans' lives and social worlds
Relative risk	The likelihood of an adverse health outcome in people exposed to a particular risk, compared with people who are not exposed
Risk factor	A factor that raises the probability of an adverse outcome
Sex	The biological and psychological characteristics that define men and women
Surveillance	Health surveillance is defined as the ongoing systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know.
Triangulation	A means of addressing qualitative/quantitative differences, which include data, investigator, theoretical, methodological, unit of analysis and interdisciplinary triangulation
Trustworthiness	The extent to which results extracted from empirical data are valid and reliable
Under five mortality rate	Number of deaths among children between birth and age 5 per 1 000 live births

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Prologue

“One of the first duties of the physician is to educate the masses not to take medicine”.
Sir William Osler (1849-1919)

Becoming a cardiologist or a cardiac surgeon was my dream during my early years in medical school. Both of my grandparents died from heart diseases when I was a teenager, adding to my motivation to become “the man in the white coat”. My exposure to clinical sciences since my third year in medical school stimulated my curiosity further. In most courses, the lecturer started with the definition and epidemiology of diseases. ‘Epidemiology’ – this new word changed my perspective on health and diseases. “Why do some people get sick, while others remain healthy?”, “If people can remain healthy, then why should anyone be ill?” My curiosities later motivated me to apply for an assistant’s position in the Department of Public Health. I passed the selection process, and was recruited as the late Dr. Suharyanto Supardi’s assistant in 1996. He later became my supervisor, my tutor, and my respected friend.

Time flies – this is my 10th year in the department. Having had opportunities to teach within the department and carry out research in the Community Health and Nutrition Research Laboratory in the faculty, I feel passionately about chronic disease prevention. My teaching responsibilities include courses on chronic disease epidemiology and research methods, which mostly focuses on chronic disease risk factors, including obesity, elevated blood pressure, physical inactivity, unhealthy diet, and smoking.

Talking about smoking causes me to think back to April 1, 2005 when I was in Sweden preparing for my mid-term seminar. A short message popped up on my mobile phone and shocked me - Dr. Supardi had just passed away following ten months of treatment for cancer. He was only 52. I recalled visiting him in hospital on February 17, 2005 before I departed for Sweden. Having the chance to talk to him for almost an hour, I witnessed the pain he was experiencing, both from the disease and from the treatment. I never thought that it would be our last chat.

June 2004 – I was in a seminar in the Faculty, giving a presentation about the health consequences of smoking. A colleague sent me a shocking message – the specimen of Pak Supardi was positive for cancer cells, clinically lung cancer stage 4. I never thought that it would happen – he had been complaining of shortness of breath since January and had quit smoking since then. Being a heavy smoker, he used to have doubts - or rather, denial – about smoking: “Will it be of any use to quit since I have been smoking for almost my entire life?” I really wished he had asked this question many years earlier, and I believe that honestly he knew that the answer was ‘yes’.

These are not just tales about my grandparents, or my respected tutor, these are stories common throughout the world. We are living in a world of risk; we are being exposed to the risk factors of disease and are getting sick. These facts lead to questions such as “Why should we be sick if we can prevent the sickness?” These questions have guided my research for this thesis.

“I never think of the future - it comes soon enough.” – Albert Einstein (1879-1955)

The future chronic disease epidemic is coming soon. This thesis is not, and does not intend to be, a cure to such an epidemic. Rather, let this thesis, with its imperfections, be a motivating factor for us as individuals to aware of our right to have healthier lives in a healthier world. Let it also be, with its methodological limitations, a stimulant to research communities in the developing world that something needs to be done to fill in the gap of knowledge in this field. And stimulate it also to be, with its population-based evidence, a document of advocacy for health authorities. Finally, let it be a challenge for all who read it to translate this small piece of work into appropriate, effective action.

I dedicate this thesis to the late Dr. Supardi and those suffering from chronic diseases – because I believe, as he did and many of us do, we have the right to prevent disease, to promote our health and to live in a healthier world.

Chapter 1. Introduction

Epidemiological transition and burden of non-communicable diseases

The 20th century witnessed a great leap in public health, with the improvement of the world population's health status and the dramatic decrease in mortality rates. Life expectancy increased sharply during the second half of the twentieth century. Industrialisation and modernisation processes have been the major forces of this public health achievement. In modernised society, demographic factors interact with economic and social factors and lead to changes in the patterns of health and diseases as postulated by Omran's epidemiological transition theory in the early 1970s (1). The theory describes the shifting pattern of mortality from the predominant communicable diseases to the emerging non-communicable diseases (NCD). In his work, Omran defined three stages of epidemiological transition, i.e. 'the age of pestilence and famine', 'the age of receding pandemics', and 'the age of degenerative and man-made diseases' (1). Thirty years later, Omran proposed two more stages for the western model: the 'age of declining cardiovascular mortality, ageing, life styles modification, emerging and resurgent diseases' and the 'age of aspired quality of life, with paradoxical longevity and persistent inequities' (2).

While the epidemiological transition progressed slowly over a century in the developed world, it appears to be accelerating faster in some developing countries (2). Improvement in living standards, nutrition, levels of education, public health measures, and breakthroughs in medical science are amongst factors contributing to the health transition in developing countries (3). The health and epidemiological transitions in "non-western societies" occur with different acceleration, timing and magnitude of changes; thus it can be differentiated into rapid, intermediate and slow transition models. "Non-western societies" have experienced prolonged pestilence and famine (stage 1) as well as the stage of receding epidemics (stage 2). Omran later proposed a different third stage for non-western countries, 'the age of triple health burden', i.e. the unfinished old set of health problems, a rising new set of health problems, and the ill-prepared health systems to cope with the prevention and care of chronic diseases (2).

The theory itself has received criticism on its applicability in the "third-world" where valid and reliable morbidity and mortality data over a long time period is questionable (4). The validity of Omran's model has also been accused of failing to recognise and analyse the importance of political processes and health policy in understanding the epidemiological profile. Moreover, the

categorisation of economic development into different stages has gained major criticism as economic development is naturally a continuous and dynamic process (5). Carolina and Gustavo (2003) pointed out that the use of epidemiological profiles in understanding complex disease causation and predicting disease occurrence in the future should be complemented by scientific, epistemological, historical, economic and social knowledge (5). Despite these criticisms, the epidemiological transition model highlights the importance of good practice of demographic and health surveillance in order to understand population health dynamics.

Developing countries suffer nearly 90% of the global disease burden, but only 10% of global health research expenditure is being spent there (6, 7). The disparities of mortality rates between the poorest and richest populations clearly indicate a wide poverty gap in developing countries. Mortality burdens from communicable diseases, NCD and injury are higher among the world's poorest than the richest (8). Different measures have been implemented in the last decade to correct the 10/90 gap and to promote investments in health and health research in developing countries. Efforts have also been made to identify research priorities in these countries (6).

Non-communicable diseases have emerged as the main global health problem and account for major morbidity, mortality and disability burdens in both developed and developing countries. Estimates in 2002 showed that communicable diseases, NCD and injuries account for 41%, 47% and 12% of the worldwide Disability Adjusted Life Years (DALYs) respectively (9). The burden of NCD itself is projected to increase from 41% in 1990 to 60% by 2020. Neuropsychiatric disorders, which accounted for 11% of global DALYs in 1990, are the leading cause of NCD disability. Cardiovascular disease (CVD) burden, ranked second on the list of worldwide disease burdens, is projected to reach the level of the neuropsychiatric burden (15% of total DALYs) by 2020 (7, 10). By 1998, low and middle income countries also experienced a high level of CVD disability (10% of DALYs in low and middle income countries vs. 18% in high income countries) (11).

In spite of the increasing health burden of NCDs, their prevention and control have not yet become a priority in national health planning and policy in most developing countries. Resources and health budgets allocated for NCD are still scarce compared to those allocated to communicable disease control. In most developing countries, health systems are better designed to deal with acute diseases and short-term care. A system focussed on acute care will need to be reshaped to deal more effectively with the increase in chronic disease cases, an inevitable consequence of aging populations (12). In some developing countries, the epidemiological transition presents national health

systems with double burdens of persistent infectious diseases and rising chronic diseases (13).

The validity of the “non-communicable diseases” term is currently under debate. The causes of several NCDs, such as liver cancer and cervical cancer, are infectious in nature. In addition, some diseases categorised as NCD, such as cardiovascular diseases, stroke and diabetes, can also be considered as “communicable”. With globalisation, many of the determinants of NCD-related health-risk behaviours, such as behavioural, psycho-social, cultural, and socioeconomic factors, can easily be transmitted over borders and across population (14-20). The Global Burden of Disease Study’s classification of diseases into communicable, non-communicable and injuries are also being questioned for its appropriateness and usefulness in guiding national health priority setting and resource allocations. The cause-based classification provides less guidance than the effect-based classification. Setel et al. (2004) suggest a broad care needs classification based on the chronicity and mortality of diseases. Such classification provides 4-way effect-oriented care-needs categories: (1) acute care needs, with low- and high-mortality subgroups; and (2) long-term care with low- and high- mortality subgroups. This scheme provides health care policy makers and planners with more useful information relating to acuteness-chronicity disease burdens as well as disease patterns over time and between populations (21).

Over recent years, the conventional term of “chronic disease” has become more favoured and its use more widespread (18, 22). From this point on in the thesis, the term “chronic disease” will be used to describe a wide-range of diseases which all have a long natural history and are therefore preventable.

The epidemic of chronic diseases

Chronic diseases have emerged as a threat to population health as the epidemiological transition progresses. In 2005, an estimated 35 million people died from heart disease, stroke, cancer and other chronic diseases. Low- and middle-income countries accounted for 4/5 of total chronic disease deaths, and the absolute number of deaths in these countries outnumbered those of high-income countries. Moreover, the burden of chronic diseases is shared equally among men and women, and mostly in people under the age of 70 years, the biggest constituents of developing countries’ populations (23).

CVD has become a significant cause of chronic disease death. A total of 17 million CVD deaths were estimated in 2002. By 2030, this is estimated to have reached 24 million deaths, of which 80% will occur in low- and middle-income countries (24). The burden of death attributable to CVD in both China and India accounted for 54% of global CVD death in developing

countries in 1990. The burden in India is projected to exceed that of China by the year 2020 (25). In 2005, CVD was responsible for 3 million deaths in India and 3.3 million deaths in China, which is equal to 11% and 13% of DALYs lost in India and China, respectively (26, 27). Coronary heart disease and cerebrovascular disease are responsible for 43% and 33% of CVD mortality in the world, respectively (24). In other Asian regions, CVD is estimated to contribute 16% of total DALYs (10).

In the Asia Pacific region, there are geographical differences of cause-specific mortality patterns from the two leading causes of CVD death. Mortality due to coronary heart disease exceeded more than 150 deaths per 100 000 people in New Zealand, Australia and Singapore. In contrast, countries with fewer coronary heart disease deaths, such as those in East Asia and South-East Asia experience a higher cerebrovascular mortality rate (more than 100 deaths per 100 000 people) (28).

The global prevalence of type 2 diabetes is also increasing. The estimated prevalence among the populations over 20 years old in 2000 was 4.6% (developed vs. developing countries: 6.3% vs. 4.1%) and this figure is expected to reach 6.4% by 2030 (8.4% vs. 6.0%). The prevalence in developed countries is expected to increase by approximately 1.3 times, whilst the increase in developing countries is expected to be greater (1.5 to 1.7 times), particularly in countries with populations over 100 million, such as China, India, Indonesia, Bangladesh and Brazil. This projection means an abundant increase in the absolute number of diabetes patients in the near future. This will pose significant health and economic challenges to a country's health systems. The estimated direct cost of diabetes varies between countries, from 0.5% of total gross domestic product (GDP) in Tanzania to 3.8% in Brazil. At the microeconomic level, the indirect cost of diabetes can be higher than its direct cost (29).

Mortality related to cancer is also predicted to increase in the future. The worldwide DALY burden of cancer was 6.4% of total DALYs in 1990 (15% in developed countries vs. 4.2% in developing countries), and is estimated to reach 10% in 2020 (17% vs. 9%) (7, 10). The burden is expected to be double in China and to be triple in India, where the burdens were 11% and 4% of total DALYs in 2005, respectively (10, 26, 27). Lung cancer is among the cancers with highest incidence and mortality rate in men in 2002 (age-standardised incidence rate of 35.5 per 100 000 people and mortality rate of 31.2 per 100 000 people). Among females, the incidence of breast cancer in 2002 was 37.4 per 100,000 people with a death rate of 13.2 per 100 000 people (30).

A few major risk factors explain a large proportion of new cases of chronic diseases – tobacco use (31, 32), hypertension (33), imbalanced dietary intake

(34), physical inactivity (35), obesity (36) and alcohol consumption (37) – all of which have been shown to be strong predictors of chronic diseases, particularly CVD (38-40). The risk factors can contribute either individually or jointly to the disease burden and worldwide DALYs. The common risk factors can interact and jointly contribute to a large proportion of the disease burden. It has been estimated that among those over 30 years of age, 50% of CVD is related to elevated blood pressure, 31% to high cholesterol and 14% to tobacco use. These three risk factors can jointly contribute to 65% of the CVD burden (41).

Not only is the burden of chronic disease increasing, but the burden of risk factors is also increasing. The increased burden of chronic diseases and their risk factors will have health, social and economic consequences, and will have an impact on national development. Therefore, controlling the risk factors of today is important for preventing chronic diseases of tomorrow. Globally, however, health budgets allocated for chronic disease prevention and control are still insufficient. The belief that “interventions for chronic disease prevention and control are less cost-effective than those for acute infectious diseases” discourages health authorities from investing in chronic disease prevention (42). Research has shown that effective and inexpensive interventions to control risk factors of chronic diseases at the population level are readily available.

The myth that “chronic diseases are diseases of affluence” has caused health authorities, particularly in low- and middle-income countries, to be unaware of the impending burden of chronic diseases (42). In fact, developing countries suffer a greater burden of chronic disease morbidity and mortality than developed countries (22, 43). As cause-specific mortality is not equally distributed in the population, one might expect an unequal distribution of risk factors (8). Evans and Kantrowitz (2002) showed that poverty has important consequences on health because poverty leads to exposure of multiple environmental risk factors (44). For example, people with lower socioeconomic status have higher levels of CVD risk factors, and the association is more consistent among women than men (45). The association between socioeconomic factors and chronic diseases is well-established (46-48). Poverty and chronic diseases are a viscous cycle; a failure to control one of them will lead to the continuing growth of the other (22).

The Millennium Development Goals (MDGs), constituted in the United Nations Millennium Declaration in 2000, was pledged by all 191 member states of the United Nations to achieve health and to address the needs of the world's poorest. The goals range from eradicating extreme hunger and poverty, reducing child mortality and improving maternal health, to combating Human Immunodeficiency Virus (HIV)/ Acquired

Immunodeficiency Syndrome (AIDS), malaria and other diseases (49). By not including the reduction of the chronic disease burden in the MDGs, this global health action has marginalised chronic diseases; reducing the burden of chronic disease is not amongst the goals. The gap between chronic disease burden and global health response to the burden continues to grow which increases the threat of a neglected epidemic of chronic diseases, particularly among the world's poorest (22).

Surveillance of chronic diseases and risk factors

Surveillance of chronic diseases has a long history that can be traced back as far as the Framingham Heart Study in 1948. This study has contributed to a huge body of knowledge on CVD risk factors from the so-called 'classical risk factors' such as cigarette smoking, high blood cholesterol level, and high blood pressure, to the emerging risk factors, such as homocysteine, lipoprotein A and apolipoprotein E, as well as to the study of chromosomes and genes (50).

The World Health Organization (WHO) MONICA (MONItoring of trend and determinants in CARDiovascular Diseases) Project was conducted to measure the trends and determinants in CVD mortality and cerebrovascular disease morbidity. The project also assessed the relationship between these trends and changes in some major risk factors, such as blood pressure, obesity, waist circumference, waist hip ratio (WHR), blood cholesterol level and smoking history. This multinational descriptive study showed differences in risk factor patterns across study populations, mainly in Europe. Only large centres which were able to follow the standardised MONICA study protocol were included in the study, and thus the results do not reflect other populations, ethnic sub-groups or developing regions (51).

In addition to CVD surveillance, community interventions for CVD prevention have been conducted in a number of different settings, such as North Karelia in Finland (38), Norsjö in Sweden (52), and several areas of the US, which include the Stanford Five City Project (53), the Minnesota Heart Health Program (54), the Pawtucket Heart Health Program (55), and Otsego-Schoharie (56). These intervention studies have already generated a huge body of knowledge on reducing CVD risk factors at the community level which can be used as the basis for further research and future intervention strategies.

Surveillance for chronic diseases such as CVD, stroke and cancer, requires tight control of the quality of the data and access to information about cause of death (57). To date, most of the surveillance of chronic diseases has been conducted only in developed countries because such surveillance is usually too technology-dependent and resource-demanding for sustainability in developing countries. The surveillance of chronic disease risk factors, which is

less technological and resource intensive, is more feasible in developing countries compared with disease surveillance (58). Apart from stroke studies based on a clinical definition, it is difficult to measure incidence of many chronic diseases. Therefore it is more appropriate to advocate for chronic disease risk factor surveillance in the developing country setting. From a public health point of view, the surveillance of risk factors is more justifiable for two reasons. Firstly, the risk factors of today predict the diseases of tomorrow, and secondly, most chronic disease environmentally determined risk factors are modifiable (58).

Surveillance of chronic disease risk factors based on standard protocols provides the baseline against which evaluation of intervention programmes can be measured. The WHO STEPwise approach to chronic disease risk factor Surveillance (STEPS) is an example of a standardised chronic diseases risk factor surveillance tool. The WHO STEPS is based on the view that small amounts of good quality data on a few modifiable chronic disease risk factors which may predict most future chronic diseases are more valuable than large amounts of poor quality data (59). The STEPS approach has been developed as a simple hierarchical system which allows sufficient flexibility whilst maintaining comparability of core items over time and between countries (60). The STEPS approach is constructed in such a way that add-on modules can be simply built into the information package to capture, on a population basis, emerging chronic disease risk factor patterns. STEPS uses different levels of risk-factor assessment, including collecting information using questionnaires (Step 1), taking physical measurements (Step 2), and taking blood samples for biochemical assessment (Step 3). Each step contains core, expanded and optional items that can be added as needed and as resources allow (60).

Demographic and health surveillance in developing countries

Population health has been inadequately measured in most developing countries. Lack of vital statistics, lack of representative data at the population level, poor data quality control, and lack of comparable data are among concerns when dealing with data from developing countries. Low priority is given to chronic disease surveillance in national health systems, including morbidity, mortality and risk factor surveillance. Surveillance is “the tool underpinning health promotion and disease prevention efforts and it is a fundamental, but often neglected, component of public health practice” (61). For developing countries, vital registration is often the starting point in fieldwork (62, 63).

Demographic Surveillance Systems (DSSs) have thus been established in different countries as platforms to monitor population dynamics (Figure 1). In

1998, the INDEPTH network (an International Network of field sites for continuous Demographic Evaluation of Populations and Their Health in developing countries) (www.indepth-network.org) was founded to facilitate linkage of existing demographic field sites through a focused network (64). To date, 37 DSSs in 19 different countries, scattered in Africa (26 sites), Asia (9 sites), Oceania (1 site) and Central America (1 site), are participating in the network.

An initial census defines and registers the target population. Regular subsequent rounds of data collection are carried out to register all new individuals, households and residential units, and to update key variables and attributes of existing subjects. This core system provides actual data of population dynamics and complementary data, covering health, social and economic indicators, are occasionally collected. Regular data collection maintains accurate denominators for estimation of age-, sex- and cause-specific death rates.



Figure 1. Countries in the INDEPTH Network

The INDEPTH network mostly covers countries in the southern hemisphere where data on chronic disease risk factors are still lacking. These countries are also experiencing different stages of demographic, economic and epidemiological transitions. Therefore the DSS creates an opportunity to study the chronic disease risk factor burdens in these countries, and further to provide insight into the epidemiological transition processes in countries with different levels of economic development. The well-established population in the DSS creates the possibility to monitor risk factor changes over time, and thus enables evaluation of the effectiveness of community interventions conducted within the DSS.

Framing Indonesia into the chronic diseases perspective

In Indonesia, chronic disease prevention and control is still at its initial stage. Reliable nationwide data on chronic disease are not available. Data on chronic disease are mostly compiled from routine hospital reports and small-scale population studies. An initial effort to collect population-based data on chronic disease risk factors incorporating WHO STEPS has been undertaken by the Indonesian Ministry of Health in the last five years and a pilot community-based intervention study has also been conducted (65). However, longitudinal community-based studies to describe and monitor chronic disease risk factor changes over time in Indonesia are needed. Designing a locally appropriate intervention on chronic disease risk factors requires knowledge on risk factor patterns and distribution across the population. It also requires understanding of why some risk factors or behaviours are taken up by the population and the cultural issues relating to this behaviour.

Objectives

Overall objective

The overall objective of the study is to describe and analyse the distribution of chronic disease risk factors and thereby to contribute to policy and programme recommendations for community interventions in a rural setting in Indonesia.

Specific objectives

1. To analyse the pattern of chronic disease risk factor distribution in a well-defined population in a rural Indonesian setting
2. To analyse the gender and socioeconomic patterning of risk factor distribution in a rural Indonesian setting
3. To explore beliefs, norms and values about smoking among boys in a rural Indonesian setting
4. To illustrate the importance of international comparisons in understanding the risk factor patterns in countries at different stages of epidemiological transition.

Chapter 2. Indonesia – a country in transition

Geography

Indonesia is located in South-East Asia, between the Indian and Pacific oceans and between the continents of Asia and Australasia. This largest archipelagic nation in the world has more than 17 000 islands, of which only about 1 000 are permanently inhabited. The five main islands are Java, Kalimantan, Irian Jaya, Sumatra, and Sulawesi (Figure 2). Most of the areas are coastal lowlands, although the large islands are mountainous and some are tectonically unstable. Indonesia's equatorial climate and its rain forest typically produce heavy rainfall. The current environmental issues in Indonesia are landslides due to deforestation, water pollution in urban and industrialised areas, and air pollution from forest fires. As the country lies on the meeting point of tectonic plates, natural disasters such as earthquakes and tsunamis have become a serious threat to the country and the population (66).



Figure 2. Indonesia – the largest archipelagic nation in the world

Source: <http://www.worldlanguage.com/CountryMaps/93.gif>

Rice, cassava (tapioca), rubber, cocoa, coffee, palm oil and copra are the main agricultural products in Indonesia (66). Tobacco was first cultivated commercially in Sumatra, and later it spread to Java, mainly in East and Central Java, and West Nusa Tenggara. Less than 1% of agricultural land is utilised for tobacco cultivation (Figure 3).



Figure 3. Indonesia rice field terrace (left) and the tobacco plantation (right)

Demography and economic indicators

Indonesia has the world's fourth largest population after China, India, and the United States, with an estimated 216 million people in 2004 (67). Sixty-nine percent of the population live in rural areas. Java Island is densely populated by more than 120 million people, or about 945 persons per square kilometre. About 350 recognised ethnolinguistic groups live in Indonesia, and the majority are Javanese (45% of the population) (66).

The age structure of Indonesia is typical of developing countries (29% under 15 years of age, 67% between 15 and 64 and 4% over 65 years). The annual population growth rate changed from 1.7% (between 1975 and 2003) to 1.1% (estimation between 2003 and 2015). In 2003 the birth rate was 21 births/1 000 people and the death rate was 6.3/1 000 people. Life expectancy is estimated at 68 years for women and 65 years for men. The total fertility rate was 2.4 children per woman during 2000-2005 (49).

The per capita GDP is approximately 970 US dollars with an annual growth of 5.1%. The inflation rate was 6.4% in 2003. Approximately 27% of the population live under the national poverty line. The nationwide 112 million people-strong labour force is mainly distributed in agriculture (45%), services (39%) and industry (16%) and, in 2004, the unemployment rate was 9.2% (49, 66). Tobacco plantation provides employment for only 0.5% of the total labour force, and tobacco manufacturing employs 5.6% (68). Tobacco manufacture supplies 8% of Indonesia's total manufacturing output (69).

Education is not yet seen by the government as a priority investment. During 2000-2002, only 9% of total government expenditure (1.2% of total GDP) was spent on education. In 2003, literacy rates were 88% among adults aged 15 and above and 98% among young adults aged 15 to 24 years. The net school enrolment rate ranges from 92% at primary level to 54% at secondary level (49).

Human Development Index (HDI), which is a summary of life expectancy, education and GDP indices, is used to measure average achievement of human development within a country. In 2005, Indonesia's HDI was 0.697 which ranks it 110th on the list of 177 countries worldwide, below Singapore (rank 25), Malaysia (61), Thailand (73), the Philippines (84), and Vietnam (108) (49). During the period of economic growth in the '80s, Indonesia's HDI increased by 20 units from 0.468 in 1975 to 0.663 in 1995. As one of the countries badly hit by the global economic crisis, Indonesia suffered slow development in the late 1990s. The HDI increased by only 3 units from 1995 to 2003, among the lowest in South-East Asia (49).

Health care and health indicators

Indonesia has a three-tiered system of community health centres (*Puskesmas, Pusat Kesehatan Masyarakat*) (Figure 4), with 3.7 health centres per 100 000 people, 0.6 hospitals per 100 000 people, and 60 hospital beds per 100 000 people. There are 11 physicians, 40 nurses, and 30 midwives per 100 000 people (70). Government health expenditures were about 3.2% of GDP in 2002, shared between the public sector (1.2%) and private sector (2.0%) (49). Only 20% of health expenditure is organised under a pre-paid scheme, and the remaining 80% is paid for out-of-pocket.



Figure 4. Public health centre in Indonesia (left) and physician-patient encounter

The economic crisis in 1997 led to a reduction in the Indonesian central government's spending on primary health care by 25% per capita. The crisis reduced household purchasing power and household expenditures for health. It later contributed to lower levels of health and nutritional status, and increased the susceptibility of the most vulnerable groups to infectious diseases (71). In response to the economic crisis, the Indonesian government launched the Social Safety Net for the Health Sector Scheme (JPS-BK, *Jaring Pengaman Sosial Bidang Kesehatan*) to counter the health impact of the economic crisis and to ensure health care among the poor. The decentralisation health policy

in 2001 delegated the responsibility for health care funding and quality control in the health sector from the central to district governments and private sectors. Health care decentralisation policy has led to commercialisation of the health sector and further neglect of preventive health and environmental improvement (72).

Indonesia is among the countries in South-East Asia with a high maternal mortality rate. In 2000, the maternal mortality rate was 230 deaths per 100 000 live births. The infant mortality rate decreased from 104 per 1 000 live births in 1970 to 31 in 2004, within the same period the under-5 mortality rate decreased from 172 per 1 000 live births to 41 (70). The neonatal mortality rate is 18 per 1 000 live births. During 1995-2003, about 68% births were attended by skilled health personnel, ranging from 21% among the poorest to 89% among the richest (49). Low birth weight babies (birth weight less than 2 500 grams) accounted for 6.9% of total births in 2001 (73).

Similar to some other countries that have undergone an epidemiological transition, Indonesia suffers a double burden of diseases – the persistent burden of infectious diseases and the increasing burden of chronic diseases. Public health expenditure has been heavily invested into preventing and controlling major infectious diseases such as tuberculosis, acute respiratory infection, malaria, dengue fever and diarrhoea. In contrast, the increasing prevalence of chronic disease morbidity and mortality has not yet prompted significant public health actions from the relevant authorities.

Tuberculosis remains a potential threat and Indonesia was among the top three countries with a high prevalence rate of tuberculosis in 2003. The estimated annual incidence was 285 cases per 100 000 people, with the prevalence of 675 cases per 100 000 people and 65 deaths per 100 000 people (74). HIV/AIDS is becoming a new, emerging health problem in Indonesia. In 2003 Indonesia ranked third among South-East Asian countries for prevalence rate of HIV/AIDS, after Myanmar and Thailand. The estimated prevalence rate was 0.1% among adults, 110 000 HIV/AIDS cases, and 2 400 deaths annually (75). Morbidity and mortality related to malaria remains high, particularly in Java, Bali and Papua. Malaria incidence doubled during the period 1997-2000, and reached the level of 30 cases per 1 000 people (73). The outbreaks of dengue haemorrhagic fever and the newly emerging avian influenza are currently adding to the burdens of the national health system.

As a country in transition, Indonesia is also experiencing changes of demographic structure and mortality patterns (76). While most national health resources have been focused on the infectious diseases mentioned above, chronic diseases have emerged as a major health problem. The National Household Health Surveys, conducted jointly by the National Institute of Health Research and Development, Ministry of Health Indonesia and Indonesia Central Statistical Bureau, have shown that the leading cause of mortality shifted from respiratory infection in 1992 to cardiovascular disease in 2001. The proportion of CVD-attributable deaths increased from 16% in 1992 to 26% in 2001, and deaths caused by respiratory infection decreased from 26% to 22%. During the same period, neoplasm deaths rose from 4% to 6% (73). In 2003, the estimated total number of deaths due to heart disease and stroke was only 344 000. In the same year, the disability caused by heart disease and stroke was 14 DALYs lost per 1 000 people and 8 DALYs lost per 1 000 people, respectively (24).

National strategy on health and chronic disease

In January 2006, the Ministry of Health introduced the new national health strategies and the health development programme. The current national health development strategy includes four main pillars: (1) promote community action and community empowerment for healthy life; (2) provide better community access to qualified health care; (3) intensify surveillance systems, monitoring and health information; and (4) strengthen health financing and assure financing for the poor (77).

The Indonesian Medium Term Health Development Programme from 2004-2009 aims to improve the health status of communities through available and accessible qualified health care. By 2009, the programme should have had an impact on four indicators: (1) increase of life expectancy from 66 years to 71 years; (2) decrease of infant mortality rate from 35 to 26 per 1 000 live births; (3) decrease of maternal mortality rate from 307 to 226 per 100 000 live births; and (4) decrease of under-five malnutrition from 26% to 20%.

The national strategy and policy on the prevention and control of chronic disease in Indonesia was formulated by the Indonesian Ministry of Health in 2004 (78). It was acknowledged that previous policies on chronic disease control had been fragmented and focused on curative efforts. Therefore a comprehensive prevention and promotion approach to chronic disease control was proposed. However, the Medium Term Programme clearly indicates the lack of focus on chronic diseases, and again, this also shows that the chronic disease control strategy formulated in 2003 has not been taken into consideration during health planning.

Chapter 3. Methodology

Study setting

The study was conducted in Purworejo District, Central Java Province, Indonesia (Figure 5). The district is located at longitude 109°-110° and latitude 7°, and it is about 60 km from Jogjakarta City. It covers an area of 1 035 km², spanning a diverse geographical area from the coast in the south to the mountains the north. The climate is tropical, with rain falling between October and March, followed by the dry season from April to September. Rainfall volume ranges from 10mm in the dry season to 310 mm in the rainy season. Temperature ranges from 19° to 28°C, and the air humidity is about 70-90%.



Figure 5. Maps of the study area in Purworejo District

Source: <http://www.indonesia-tourism.com/central-java/map.html>

The total population in Purworejo District in 2003 was 709 000 individuals, mostly Javanese. The population pyramid is typical of developing countries, with about 26% of the population under 15 years old. The dependency ratio is 0.6, and the proportion of elderly over 65 years in Purworejo is higher than that of Central Java Province, 11% vs. 6% (Table 1). In 2002, about 89% of the population lived in rural areas. The education attainment was 96% among children aged 7 to 12 years, 81% among 13 to 15 year olds, and 51% among 16 to 18 year olds. Overall, the illiteracy rate was about 11%, and about 37% of females and 28% of males have less than six years of formal education (79).

Table 1. Sociodemographic and health indicators in Purworejo District and Central Java Province in 2002

Indicators	Purworejo District ^a	Central Java Province ^b
Socio-demographic indicators		
Total area (km ²)	1 035	32 544
Total population	709 000	32 053 000
Number of households	194 000	7 964 000
Age structure (%)		
< 1 year	2.5	2.7
1-4 years old	4.5	5.3
5-14 years old	19	20
15-44 years old	43	48
45-64 years old	20	18
>64 years old	11	6
Illiteracy (%)	11	11
Male	6.4	6.5
Female	16	16
Health Indicators		
Maternal mortality rate (per 100 000 live births)	220	120
Infant mortality rate (per 1 000 live births)	14	8.3
Under-five mortality rate (per 1 000 live births)	2	2.3
Newborns with low birth weight (%)	2.6	2.0
Births attended by skilled attendant (%)	88	83
Infants with exclusive breast feeding (%)	37	18
Villages with Universal Child Immunisation (%)	81	81
Population with pre-paid health care (%)	18	22
Poor households (%)	22	NA
Poor households with health care access (%)	87	NA

^a Purworejo District Health Office, 2004

^b Central Java Province Health Office, 2003

Purworejo has one district hospital, five private hospitals, two maternity clinics, one lung clinic and twenty five primary health care centres (80). Health care services at public health care facilities are mostly paid for out-of-pocket (over 80%). About one fifth of the households in the district are classified as poor, and 87% of the poor households have been covered by the health care scheme provided free of charge by the government.

Malaria and diarrhoea are the two main health problems in the district. Several sub-districts in Purworejo are malaria endemic areas, particularly those in the Menoreh mountainous area. The Menoreh covers areas of Purworejo District in the west; Kulonprogo District of Jogjakarta Province in the east; and Magelang District of Central Java Province. Control of malaria in the

Menoreh area demands synergistic efforts from all the districts. Maternal and infant deaths remain a significant health problem in Purworejo District. Purworejo is amongst those districts with the highest maternal mortality rate in Central Java Province (79).

The district hospital-based data shows that chronic disease has become the leading burden of morbidity and mortality. Hypertension, cardiovascular disease, diabetes and neoplasm are among the main chronic diseases in the district (81). However, no reliable population-based data on the burden are available at the district level.

The Purworejo DSS was established in 1994 as a collaboration between the Faculty of Medicine Gadjah Mada University, Ministry of Health of Indonesia, Purworejo District Health Office, the World Bank and United Nation Children's Fund (UNICEF). The Purworejo District was selected as it has the typical characteristics of a rural district in Indonesia, and it is located at a reasonable distance from the university. The site was established with the objectives to identify the characteristics and determinants of health outcomes, to monitor and evaluate the effectiveness of activities designed to influence health outcomes, and to provide accurate and timely information to health care decision makers. Results from various studies have been disseminated to the district health authority, as well as to the Central Java Provincial Health Office. Chronic disease risk factor surveillance and causes of death studies are among the research works conducted within the surveillance area.

Multistage cluster sampling with Probability Proportional to Size (PPS) was used to select samples for the surveillance. The primary sampling unit is the enumeration area, which constitutes about 20% of the total of 793 enumeration areas according to the Purworejo agricultural census. The secondary sampling unit is the household, and about 110 households were selected in each enumeration area. All family members in selected households were included in the surveillance. Routine home visits at six months intervals have been conducted to collect and update data on vital statistics and population health (82). A total of 5 field supervisors and 40 trained surveyors are responsible for the regular surveillance. Periodic meetings between researchers, supervisors and surveyors are held to discuss problems arising during the data collection process. Following quality control checks by the supervisors, the data is sent to Jogjakarta's office to be entered into the database. Since 1994, the DSS has generated a wealthy database on 550 000 person-years. In 2004, the total population under surveillance was 55 000 belonging to 14 500 households living in 128 enumeration areas. The surveillance database has been used as a sampling frame for different studies conducted in the surveillance area, including the chronic disease risk factor study presented here.

Study design

This study utilised a combination of quantitative and qualitative methods (Figure 6). The quantitative study included selection of two cross-sectional samples, the baseline cross-section in 2001 and the second cross-section in 2005. The DSS provided sampling frames for both cross-sectional studies, as well as supporting infrastructures for field data collection. Taking advantage of conducting this study in a demographic surveillance setting, the cohort from 2001 was visited for follow-up in 2002 and 2004. Based on the priority-sequence model (83), the qualitative study was conducted following the main quantitative study (QUAN+qual). The qualitative study was conducted to complement the emerging results from the baseline cross-sectional study. In this case, the qualitative study was carried out to gain a more in-depth knowledge on smoking among boys.

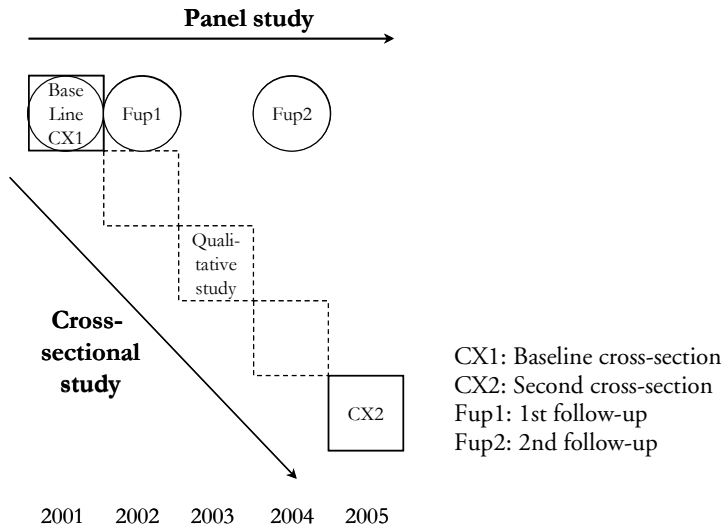


Figure 6. Different studies included in the thesis

Both cross-sectional studies were conducted among the adult population aged 15 to 74 years. The WHO STEPS core module is recommended for use on adults in the age group of 25–64 years (60). The age groups of 15–24 years and 65–74 years, which are the optional age groups in STEPS, were included in this study for two reasons. Firstly, the fact that smoking is now being taken up at a younger age justified the inclusion of the young age group. Secondly, adults aged 65–74 years were also included because cardiovascular disease has emerged as the leading cause of death in Indonesia, particularly among elderly people.

The WHO STEPS recommends the inclusion of approximately 250 individuals in each sex and age group of 10-year intervals in the final representative sample, to allow estimation of key variables with high precision (60). In both cross-sectional studies, an additional 5% of respondents (and 30% among the oldest group) were added to the sample to ensure the final required sample sizes in each sex and age group. For each study, a total of 3 250 individuals were randomly selected from the surveillance database, representing all enumeration areas. Exclusion criteria included severe chronic illness requiring bed rest, physical disability, mental disability and the presence of communication barriers.

The aim of the qualitative study was to describe and analyse beliefs, norms and values about smoking among teenage boys in a rural setting in Java. Qualitative data were gathered through FGDs. FGDs are considered to reflect norms, values and culture in groups and are therefore preferred when studying such topics (84, 85). When listening to each other in the group, participants can reflect on each other's opinions and express their own views on topics and ideas introduced by other participants or by the researchers.

Six FGDs with a total of 49 teenage boys were conducted in four schools in Purworejo District. The schools were selected purposively to represent rural villages and small urban settlements. Three FGDs were held with smokers and three with non-smokers. The groups were chosen purposively to get complete information from both smokers and non-smokers. The participants were between 13 and 17 years old and were selected by their school teachers. This study was conducted among this age group because boys within this age group are at high risk of initiating and adopting smoking behaviour.

Both the quantitative and qualitative studies were approved by the ethical review boards of the Faculty of Medicine of Gadjah Mada University, Indonesia, and the Medical Faculty, Umeå University, Sweden. For the cross-sectional studies, written consent was obtained from each respondent. For the qualitative study, consent was obtained from the school, which is responsible for granting consent for research on school students in this setting. Verbal consent was also given by the school students prior to data collection.

Measurements

The WHO Step 1 and Step 2 methods (Figure 7) were used to gather information on the prevalence of common chronic disease risk factors (60). Step 1 includes assessment of smoking behaviour, smokeless tobacco use, physical activity, alcohol consumption, and fruit and vegetable intake using a structured questionnaire. Step 2 includes physical measurements, i.e. weight, height, waist circumference, and hip circumference, as well as blood pressure measurements. Due to the limited resources available, Step 3, which includes blood sampling and blood sugar and cholesterol examination, was not conducted on the baseline cross-section but was later added into the new cross-section. The risk factors measured in the studies are shown in Table 2.

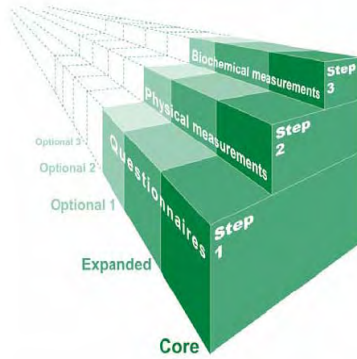


Figure 7. General concept of STEPWise approach

Table 2. Variables in WHO STEPS adopted in the studies

Measures	Step 1 (Self-report)	Step 2 (Physical examination)	Step 3 (Biochemical assessment)
Core	Socioeconomic and demographic variables including years of education, tobacco and alcohol use, physical inactivity, intake of fruit and vegetables	Measured weight, height, waist circumference, blood pressure	Data not collected
Expanded core	Ethnicity, educational attainment, occupation, income, use of smokeless tobacco, fat consumption, types of physical activity, history of high blood pressure, history of diabetes, treatment for diabetes, treatment for high blood pressure	Hip circumference, pulse rate	Data not collected
Optional	Data not collected	Data not collected	Data not collected

Adapted from Bonita et al, 2002 (58)

In the study, both the core and expanded items for Step 1 were assessed. Questionnaires on Step 1 were translated into Indonesian and then back-translated into English to ensure validity of the translation. A pilot study was conducted to test both the STEPS methodology and the logistical issues of STEPS implementation. House visits were conducted to obtain data from the respondents (Figure 8).



Figure 8. Fieldworkers carrying out Step 1 (left) and Step 2 (right)

The instrument on smoking behaviour assessed current and past use of any tobacco products, including cigarettes and smokeless tobacco, age at start of daily smoking, age at quitting daily smoking, and types and amount of tobacco used. Participants were classified as current daily smokers if they smoked ≥ 1 cigarette per day. The questions on smoking captured both daily smokers and non-daily smokers, and the smokers were further categorised into regular users and quitters/those who have given up smoking. Becoming regular user was defined as the change in smoking status from non-daily smoking to daily smoking (starting daily smoking). Cessation was defined as the change in smoking status from daily smoking to non-daily smoking (quitting daily smoking). The changes in smoking status were ascertained retrospectively using reported ages at the start of daily use and at the cessation of daily use of tobacco.

Alcohol consumption was defined as drinking any type of alcoholic beverage during certain periods in the past. The types and volume of alcohol consumed was also recorded. The patterns of vegetable and fruit consumption were assessed in terms of frequency (days per week of consumption) and portion size. Physical activity was measured using the Global Physical Activity Questionnaire (GPAQ). This instrument captures physical activities in three different domains: occupational; non-occupational; and transportation activities. In each domain, the instrument assessed the frequency and the duration of moderate and vigorous physical activities. Data on alcohol

consumption, fruit and vegetable intake, and physical activity are not included in this thesis. However, methodological issues relating to their measurement will be presented briefly in the discussion.

Weight and height were measured with participants barefoot and wearing lightweight clothing. Weight was measured to the nearest 10 grams using an electronic scale (Seca GmbH, Hamburg, Germany). Height was measured to the nearest 0.1 cm using a portable stadiometer (Figure 8). Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Participants were classified as being overweight or obese if they had a BMI ≥ 25 (86). Waist and hip circumferences were measured using non-elastic tape to the nearest 0.1 cm. Waist circumference was measured at the level of umbilicus at the end of expiration. Hip circumferences were measured at the level of greater trochanter. Both measurements have also been excluded from the current analysis.

Using a standardised protocol (87), blood pressure was measured twice with the right arm at heart level while the participant was seated. In 2001, only manual blood pressure measuring equipment was available for use. In the follow-up study of the same participants in 2002, blood pressure was measured using automated devices (Omron M4-I, Omron Healthcare Europe BV, Hoofddorp, the Netherlands). These measurements were used as proxies for blood pressure in 2001. For participants for whom there were no digital measurements in 2002 (i.e. those who could not be contacted in 2002), we estimated blood pressure by calculating the regression between the 2001 and 2002 values and predicting the digital measurement. The prediction was based on a regression equation that included a random component to reflect variation in blood pressure at specific levels, and was done separately for the different sex and age groups. Participants were defined as having elevated blood pressure if the systolic pressure was ≥ 140 mmHg and/or diastolic pressure was ≥ 90 mmHg or if they were taking antihypertensive medication (88).

With the exception of using the latest STEPS instrument (STEPS Version 2) (60), the data collection in 2005 followed the same protocol as that of 2001. The STEPS Version 2 is similar to Version 1, with some minor modifications on tobacco use and physical activity sections. Data for the quantitative studies were collected by trained, lay field workers. Ten field workers (five men and five women) were recruited and trained as surveyors. Training was conducted over 2 days, one day for explaining the study details and instruments, and the second day for practical work in the field. The field workers worked in pairs of men and women to facilitate anthropometry measurement of female respondents by female field workers. Two supervisors were responsible for the STEPS data quality control, including accuracy and completeness of data

obtained. All instruments were standardised and calibrated routinely. Weekly field meetings were held to enable researchers, supervisors, and surveyors to identify and discuss problems encountered during the STEPS data collection processes. Completed questionnaires were sent to the data entry manager.

In the qualitative study, a thematic discussion guide was developed to explore different aspects of smoking among teenage boys. Tobacco advertisements from magazines were shown to all groups to explore the participants' views on tobacco advertisements. All FGDs were conducted without the presence of any school authorities. The FGDs were conducted during school hours, and each group session lasted 1-1.5 hours (Figure 9). The FGDs were moderated by two anthropologists and the author of this thesis, who acted as assisting moderator. The last three FGDs were conducted after the preliminary analyses of the first three. Thus, the study design was emergent (89), which in this case means that additional topics derived from earlier FGDs were included in the thematic guide for the proceeding groups. In this way, we attempted to be flexible and sensitive to the issues and topics that emerged from the boys themselves during the FGDs. Tobacco smoking from a gender perspective and religious practices in relation to smoking were the two most important topics added as a result of this process.



Figure 9. Conducting focus group discussion (left) and debriefing (right)

Asset surveys were conducted in the surveillance area in 1999 and 2005, and data from 14 200 households and 13 900 households, respectively, was available for analysis. Household assets have been used to create a composite index as a proxy for socioeconomic status (90). Several indicators assessed in the survey included: housing conditions (Figure 10) (including ownership, floor, roof, and wall materials); housing facilities (source of drinking water, latrine, cooking materials); ownership of electronic equipment (electricity, television, radio/cassette player, refrigerator, telephone, sewing machine); and transportation means (car, motorbike, and bicycle). Information on household income and expenditure collected by the asset survey was incomplete and was therefore not included in the analysis.



Figure 10. Types of housing as one of the socioeconomic indicators

The composite index was derived from principal component analysis. The statistical procedure assigned a weight to each household asset. Each household was assigned a score for each asset owned and the score differed depending on the particular assets owned. The sum of the scores was calculated for each household, and households were ranked according to their total score. Except for urban households which were few in number, the rural households were further categorised into poorest (the lowest quintile of asset distribution), middle (three middle quintiles), and richest (the highest quintile). The three middle quintiles were grouped to provide better contrast between the two extremes of socioeconomic distribution. The results from the 1999 asset survey were used in the analysis of baseline cross-sectional and follow-up studies, while the results from 2005 were used in the second cross-sectional analysis.

Data management and analysis

Data entry for the quantitative studies was performed using data entry programmes prepared in Microsoft Foxpro®. Databases created for specific studies can be linked to the main surveillance dataset. Built-in data entry checks ensured that consistent and plausible data were being entered. Double entry was conducted for 10% of the total sample for data validation. Data entry and data cleaning were both performed in the Purworejo field office.

Sampling weights were calculated based on the age group and sex specific sampling distribution in the Purworejo population. The sampling weights and sampling design were incorporated into statistical analysis to derive design-adjusted estimates. Multinomial logistic regression with three levels of dependent variable (no risk factor, single risk factor, and multiple risk factors) was used to estimate the odds ratio (OR) of risk factors clustering for each socioeconomic group adjusted for age and stratified by sex. Cox regression was used to estimate the relative risk (RR) of having individual risk factors for each socioeconomic group adjusted by age and stratified by sex.

For specific analysis of the smoking data, Cox regression was used to estimate the contribution of each socioeconomic determinant to changes in smoking status (becoming a regular smoker or quitting smoking). The regular smoker model included all subjects in the cross sectional study, while the quitter model only included daily smokers. Kaplan-Meier survival analysis was used to estimate age at becoming a regular smoker and age at quitting smoking for different socioeconomic groups. The curve was also used to plot the difference between Indonesian and Vietnamese smokers.

Data were analysed using Stata software, version 8 (StataCorp, College Station, TX). Survey analysis procedures (such as `svytab`, `svyprop`, `svymean`, `svylogit`, `svymlogit`) were utilised to take into account the effect of study design. These survey functions enable inclusion of stratification identifier, primary sampling unit (clusters) and sampling weight. Thus, all estimates derived from the analysis (such as mean, percentage, standard error and regression coefficients) were adjusted to the study design.

A debriefing session was conducted soon after each FGD (Figure 9). All the recordings were transcribed and translated into English. A descriptive content analysis (91) was employed. We reviewed the verbatim interview transcripts and discussion notes several times, and thereby identified different meaning units. Table 3 shows an example of how the different meaning units were then condensed and developed into themes and sub-themes. In order to increase trustworthiness of the study, we used triangulation of researchers in terms of professional expertise (medical doctors and medical sociologist) and cultural understanding (89). The final negotiated outcome benefited from this triangulation in that we used our theoretical knowledge during the process of interpretation.

Table 3. One example of the data analysis process using content analysis

Meaning Unit	Condensed Meaning Unit	Sub-Themes	Themes
Boys are introduced to cigarettes during circumcision because they perceived as already being an adult	Smoking as a signal of maturity and adulthood	The meaning of smoking in culturally significant life transitions	<i>Smoking as a culturally internalised habit</i>
Only adult males are allowed to smoke because they are economically stable and their body is strong enough to smoke	Social norms of smoking		
A smoker has higher social status and has more friends	Smoking as a means of socialising	Smoking as a social signifier	
It is culturally inappropriate to refuse gifts, including cigarettes			
Smoking has been considered a common and acceptable behaviour for a long time	Smoking as an old habit	Smoking as a social habit, both traditional and modern	
Smoking as a reflection of modern life, wealth, good environment, adventurous personality and stability	Smoking portrays modernity		

Table 4. Overview of research questions and methodologies

Paper	Research questions	Study design and study subjects	Analysis and outcomes assessed
I.	What are the potentials of combining the WHO STEPS within the ongoing DSSs for assessing the changes in chronic diseases risk factor patterns?	Design paper	Synthesis of the potential of DSS and WHO STEPS Conceptual framework of the interface between demographic surveillance, risk factor surveillance and hypothesis-driven research
II.	What is the prevalence of tobacco use, being overweight or obese, and elevated blood pressure in Purworejo DSS? To what extent is the rural population burdened by these risk factors compared with their urban counterparts?	Cross-sectional study 3 250 adults aged 15-74 years old in Purworejo District, Indonesia	Measure of risk factor prevalence with 95% CI (Confidence Interval) Cox regression to estimate relative risk of having risk factors for each socioeconomic group Multinomial logistic regression to estimate odds ratio of risk factor clustering
III.	What are the beliefs, norms, and values about smoking among teenage boys in a rural setting in Purworejo District?	Qualitative study – FGD 6 FGD among 49 boys aged 13-17 years old	Content analysis to derive themes reflecting beliefs, norms and values relating to smoking in Javanese society
IV.	What are the smoking epidemic patterns in Vietnam and Indonesia? What are the associations between socioeconomic conditions and changes in smoking status in Vietnam and Indonesia?	Cross-sectional study 2 000 adults aged 25-64 years old in each of Bavi District, Vietnam and Purworejo District, Indonesia	Measure of smoking prevalence with 95% CI Kaplan-Meier survival analysis to compare age at smoking initiation and cessation between countries Cox regression to estimate the contribution of socioeconomic factors in changes of smoking status

Chapter 4. Results

Characteristics of subjects – the quantitative study

A total of 3 079 individuals (95%) and 2 999 individuals (92%) responded to the baseline study and the second cross-sectional study, respectively (Table 5). The baseline cross-section was visited for follow-up in 2002 and 2004. In 2002, 193 respondents were lost to follow-up (6% of the original baseline sample). In the second follow-up, three years after the baseline data collection, approximately 83% (2 547 individuals) of the baseline sample was recruited to participate. Reasons for non-participation included death, refusal, illness, out-migration, absence and failure to contact the individual after three attempts/visits. Individuals who refused to participate, even after repeated visit by the supervisors, were dropped from the study. Of the respondents recruited, a small number were not included in the analysis because of incomplete data on household socioeconomic groups or invalid blood pressure or anthropometrical measurements. The sex and socioeconomic distributions were similar in all studies, despite some drop-out in the follow-up studies (Table 5).

Table 5. Characteristics of subjects recruited at different studies

	Baseline cross-section (Year 2001)	1 st follow-up (Year 2002)	2 nd follow-up (Year 2004)	Second cross-section (Year 2005)
Total sample	3 250	3 079	2 886	3 250
Number of drop-out subjects	171	193	339	251
Death (%)	7	10	21	9
Migration and absence (%)	83	58	64	55
Refusal (%)	6	10	7	19
With exclusion criteria (%)	4	22	8	17
Sample recruited	3 079	2 886	2 547	2 999
Sample analysed	2 963	2 772	2 477	2 941
Sex				
Men (%)	49.9	49.1	49.1	48.7
Women (%)	50.1	50.9	50.9	51.3
Socioeconomic groups				
Urban dweller (%)	12.4	12.5	12.0	9.6
Rural richest (%)	12.7	12.9	12.0	14.7
Rural middle (%)	60.4	60.2	60.7	59.4
Rural poorest (%)	14.5	14.4	15.2	16.3

What is the trend of chronic disease risk factors in Purworejo?

The follow-up studies showed that all risk factors increased in both sexes (Table 6) and all socioeconomic groups (Figure 11) during the period of 2001 to 2004. The increase was particularly prominent for overweight and obesity prevalence in both men and women, except for urban women. Smoking prevalence in men increased among the rural poor and rural middle groups, while it was more or less constant among the rural rich and urban groups. The socioeconomic gap of elevated blood pressure persisted among men but became smaller among women (Figure 11).

The cross-sectional studies also showed that all risk factors increased in both sexes during the period of 2001 to 2005, except for smoking among women (Table 6). Overall, the prevalence of smoking among men increased from 53.9% (95%CI= 51.1-56.7%) in the baseline to 57.3% (95%CI= 54.4-60.2%) in 2005. The mean population blood pressure shifted to the right by 1 mmHg of systolic blood pressure and 1.6 mmHg of diastolic blood pressure. As a consequence, the prevalence of elevated blood pressure increased from 22.1% in 2001 to 26.7% in 2005. The increase was higher among women than men (6% vs. 3%). Mean BMI distribution also shifted to the right by 0.8 units, and the overweight and obesity trend increased faster among women than men (the annual percentage point increase in prevalence was 2.2% in women and 0.7% in men). Women had higher mean BMI and thus a higher prevalence of being overweight or obese compared with men (the baseline prevalence of overweight and obesity = 12% among women versus 4.8% among men) (Table 6). The baseline cross-sectional study pointed out that being overweight or obese increased the risk of elevated blood pressure significantly by 1.7 times (95%CI=1.3–2.2) among men and 1.6 times (95% CI=1.3-2.0) among women (data not shown).

The second cross-sectional study in 2005 indicated that the risk of having risk factors increased in all socioeconomic groups during the year 2001-2005 (Figure 12). The risk of smoking among rural men was higher than among urban men, and the rural poorest men had a 40% higher chance of becoming a smoker than urban men. The risk of elevated blood pressure and overweight and obesity among the rural poorest women approached those of urban women, and the increase in risk was greater among women categorised as rural richest compared to women in other socioeconomic groups. Among men, the risk of having risk factors also increased in all socioeconomic groups.

Table 6. Prevalence of risk factors in the cross-sectional and follow-up studies

Risk factors	Baseline cross-section (Year 2001)		1 st follow-up (Year 2002)		2 nd follow-up (Year 2004)		Second cross-section (Year 2005)	
		95% CI		95% CI		95% CI		95% CI
Smokers (%)	27.6	(26.1-29.2)	27.4	(25.6-29.1)	31.8	(29.9-33.8)	28.8	(27.3-30.4)
Men	53.9	(51.1-56.7)	55.1	(51.8-58.4)	63.0	(59.4-66.4)	57.3	(54.4-60.2)
Women	1.7	(1.1- 2.6)	0.5	(0.3- 1.1)	1.7	(1.1- 2.8)	1.7	(1.0- 2.8)
Systolic BP (mmHg)(mean)	124.9	(124.2-125.7)	125.1	(124.3-126.0)	125.8	(124.8-126.8)	125.9	(125.1-126.7)
Men	126.6	(125.6-127.6)	126.9	(125.8-128.1)	127.0	(125.8-128.2)	127.6	(126.7-128.6)
Women	123.4	(122.3-124.5)	123.4	(122.2-124.5)	124.6	(123.3-126.0)	124.2	(123.0-125.3)
Diastolic BP (mmHg)(mean)	75.9	(75.4-76.4)	76.1	(75.6-76.7)	78.0	(77.3-78.6)	77.5	(77.0-78.0)
Men	76.3	(75.7-77.0)	76.4	(75.6-77.1)	77.5	(76.7-78.4)	77.0	(76.4-77.7)
Women	75.5	(74.9-76.2)	75.9	(75.2-76.6)	78.4	(77.6-79.1)	77.9	(77.2-78.6)
Elevated BP (%)	22.1	(20.7-23.6)	22.1	(20.6-23.7)	23.5	(21.8-25.4)	26.7	(25.2-28.3)
Men	22.4	(20.3-24.7)	22.3	(19.9-24.8)	22.5	(20.0-25.1)	25.5	(23.4-27.8)
Women	21.9	(19.9-24.0)	22.0	(19.8-24.2)	24.6	(22.2-27.1)	27.9	(25.7-30.2)
BMI measurement)(mean)	20.6	(20.4-20.7)	20.9	(20.8-21.1)	21.2	(21.0-21.4)	21.4	(21.2-21.5)
Men	20.2	(20.1-20.4)	20.5	(20.4-20.7)	20.8	(20.5-21.0)	20.7	(20.5-20.9)
Women	20.9	(20.7-21.1)	21.3	(21.1-21.6)	21.6	(21.4-21.9)	22.0	(21.8-22.3)
Overweight and obesity (%)	8.5	(7.3- 9.8)	10.6	(9.2-12.3)	12.1	(10.6-13.8)	14.2	(12.7-15.9)
Men	4.8	(3.8- 6.1)	6.0	(4.7- 7.6)	8.2	(6.6-10.1)	7.5	(6.1- 9.3)
Women	12.0	(10.3-14.0)	15.1	(13.0-17.6)	16.1	(13.9-18.5)	20.8	(18.4-23.3)

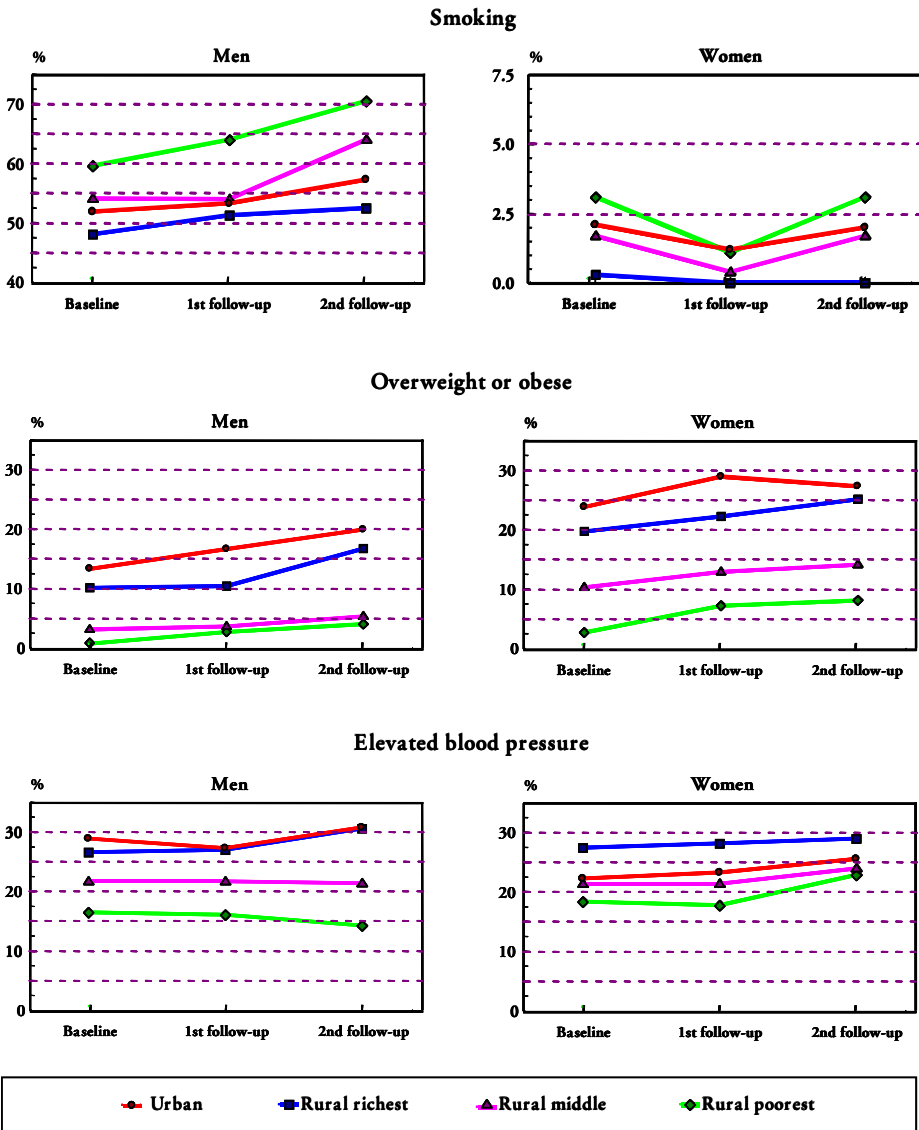


Figure 11. Trends of risk factors in the baseline and follow-up studies

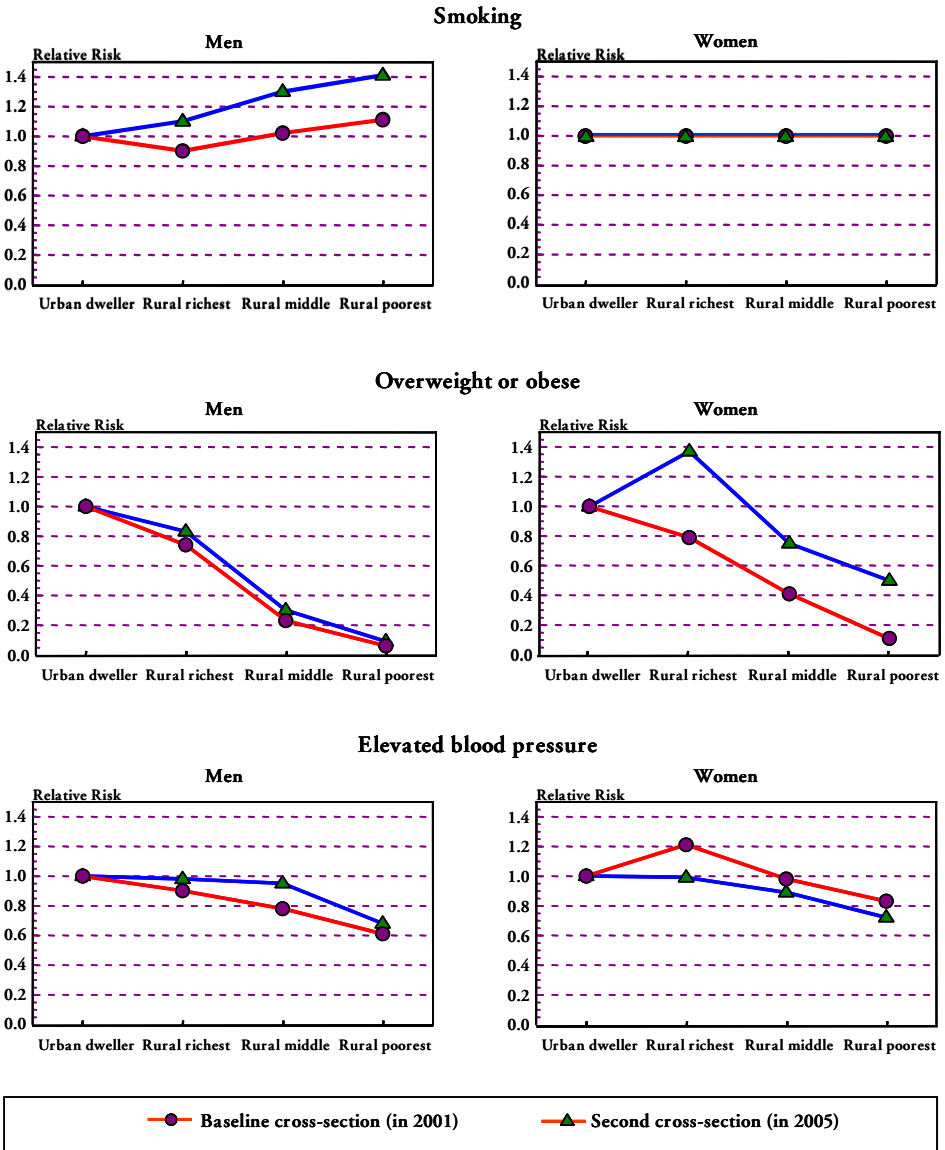


Figure 12. Relative risk for having risk factors in two cross-sectional studies

Risk factors tended to cluster among urban participants (16.6% of those in the urban area had two or more risk factors compared with 7.3% of those classified as being in the poorest quintile in the rural areas in the baseline cross-section). A similar pattern was observed in the second cross-sectional data. There was an increasing trend of risk factor clustering across socioeconomic groups in rural areas (Table 7). Even though not statistically significant, the risk of clustering of risk factors was higher among the richest quintile in rural areas than in the poorest quintile. The risk was only 35-40% lower among the richest rural population than in the urban population in 2001. However, the second cross-sectional study in 2005 indicated a higher risk of risk factors clustering among the richest quintile in the rural area than the urban population (Figure 13).

Table 7. Clustering of risk factors among study subjects

	Urban dweller		Rural richest		Rural middle		Rural poorest	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Baseline cross-section								
≥ 2 risk factors	16.6	(13.7-20.0)	12.7	(9.6-16.6)	9.6	(8.5-10.8)	7.3	(5.3- 9.8)
Men								
No risk factor	32.4	(24.9-40.9)	36.7	(29.4-44.7)	36.5	(33.0-40.1)	35.0	(28.4-42.2)
1 risk factor	44.7	(36.3-53.4)	44.0	(37.1-51.3)	48.5	(44.5-52.5)	53.0	(46.6-59.4)
≥ 2 risk factors	23.0	(18.2-28.6)	19.2	(14.3-25.3)	15.0	(13.1-17.2)	12.0	(8.6-16.5)
Women								
No risk factor	62.5	(56.5-68.2)	59.7	(52.7-66.3)	70.9	(67.8-73.9)	78.4	(72.8-83.0)
1 risk factor	27.3	(21.7-33.7)	33.3	(27.4-39.8)	25.0	(22.3-28.0)	19.2	(14.6-24.9)
≥ 2 risk factors	10.2	(7.1-14.4)	7.0	(4.2-11.6)	4.0	(2.9- 5.6)	2.4	(1.1- 5.3)
Second cross-section								
≥ 2 risk factors	18.4	(15.7-21.5)	15.7	(12.6-19.5)	12.7	(11.2-14.4)	8.8	(6.7-11.6)
Men								
No risk factor	32.8	(27.5-38.5)	30.1	(24.9-35.9)	28.2	(25.0-31.7)	28.5	(22.1-35.8)
1 risk factor	42.6	(37.1-48.2)	48.9	(42.5-55.4)	54.1	(50.5-57.6)	57.9	(50.8-64.7)
≥ 2 risk factors	24.7	(19.7-30.5)	21.0	(16.3-26.6)	17.7	(15.4-20.2)	13.6	(10.0-18.4)
Women								
No risk factor	53.2	(45.6-60.6)	50.3	(43.3-57.2)	59.6	(56.0-63.1)	61.8	(55.3-67.8)
1 risk factor	33.8	(24.9-44.0)	38.5	(32.1-45.2)	32.6	(29.3-36.1)	34.8	(29.2-40.8)
≥ 2 risk factors	13.0	(9.8-17.1)	11.3	(7.9-15.8)	7.8	(6.2- 9.8)	3.4	(1.5- 7.8)

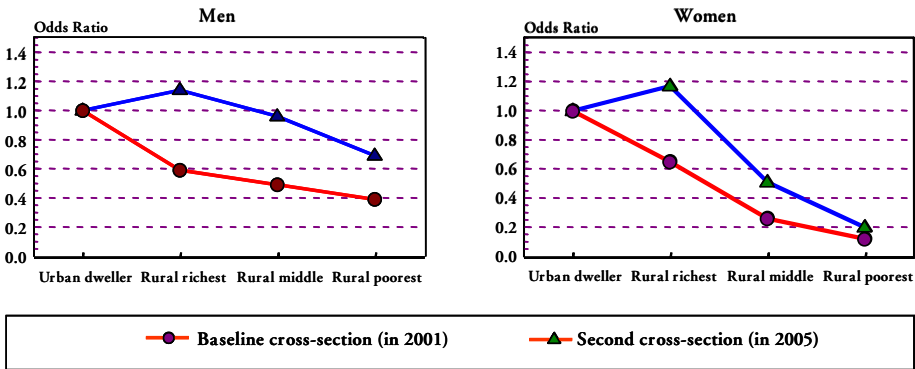


Figure 13. Odds ratio for risk factors clustering in different socio-economic groups

For the subsequent presentation of the results, which focuses on specific risk factors, only data from the baseline study will be used to describe the individual risk factors. Analysis will focus on the risk factor distributions between the different sexes and socioeconomic groups.

Who smoked and who didn't?

The gender differences of smoking were obvious in the study setting (Table 8). Almost 91% of women were non-smokers compared with only 15% of men. Almost one third of men aged 15-24 years had already smoked daily, and the prevalence peaked among those aged 55-64 years. Among men, smoking was prevalent in all socioeconomic groups. The prevalence was higher among the poorest quintile compared to the richest quintile in the rural area (59.7% (95% CI= 51.8-67.2%) versus 48.2% (40.3-56.2%)). Since the smoking prevalence among women was low, the following analysis will only consider men.

The study showed that about 25% of men in the study setting had smoked daily by the age of 15 and, by the age of 20, about 55% of them had taken up the habit (Figure 14). Twenty years after initiating daily smoking, only 10% of daily smokers had quit. The estimated mean duration from initiating to quitting daily smoking was 26 years among men.

Table 8. Smoking characteristics among the study population

Smoking characteristics	Men		Women	
	%	95% CI	%	95% CI
Type of smoker				
Current daily smoker	53.9	(51.1 - 56.7)	1.7	(1.1 - 2.6)
Ex-daily smoker	9.2	(7.9 - 10.7)	1.6	(1.1 - 2.3)
Smoker but never daily	21.7	(19.2 - 24.5)	5.8	(4.7 - 7.2)
Non smoker	15.2	(12.9 - 17.7)	90.9	(89.2 - 92.3)
Daily smoking prevalence				
15 to 24 years	31.2	(25.5 - 37.5)	-	-
25 to 34 years	54.9	(48.0 - 61.6)	0.4	(0.1 - 2.9)
35 to 44 years	62.6	(56.3 - 68.5)	0.8	(0.1 - 5.5)
45 to 54 years	66.4	(60.1 - 72.2)	1.6	(0.6 - 4.2)
55 to 64 years	71.6	(65.3 - 77.2)	5.0	(2.8 - 8.8)
65 to 74 years	67.4	(61.7 - 72.7)	4.3	(2.4 - 7.8)
Current daily smokers				
Urban dweller	52.0	(42.9 - 61.0)	2.1	(1.0 - 4.3)
Rural richest	48.2	(40.3 - 56.2)	0.3	(0 - 2.4)
Rural middle	54.2	(50.8 - 57.5)	1.7	(1.0 - 2.7)
Rural poorest	59.7	(51.8 - 67.2)	3.1	(1.4 - 6.7)

Figure 14 shows that men belonging to the poorest group in the rural area adopted daily smoking earlier than men belonging to other socioeconomic groups. The difference in likelihood of becoming a daily smoker was small between different socioeconomic groups. However, the difference in likelihood of quitting daily smoking between socioeconomic groups was large. Smokers in the richest rural population quit smoking earlier than the poorest rural population (proportion of daily smokers having quit within 30 years of initiating daily smoking: 30% of urban vs. 9.2% of rural).

Given that the STEPS was also applied in Filabavi DSS in Vietnam, it was possible to compare the findings on smoking between these two settings. The cross-site analysis showed that the prevalence of current daily smokers was greater in Purworejo DSS than in Filabavi DSS (63% among men and 1.6% among women in Purworejo versus 57% and 0.1% in Filabavi). In contrast, the proportion of quitters among daily smokers was higher in Filabavi than in Purworejo (18% vs. 10%, respectively). Men in Purworejo tended to start daily smoking earlier and to quit later than men in Filabavi (Figure 15). Twenty years after initiating daily smoking, 15% of male daily smoker in Filabavi and only 10% in Purworejo had quit. Within 35 years of initiating smoking the proportion of quitters in Filabavi was double that in Purworejo.

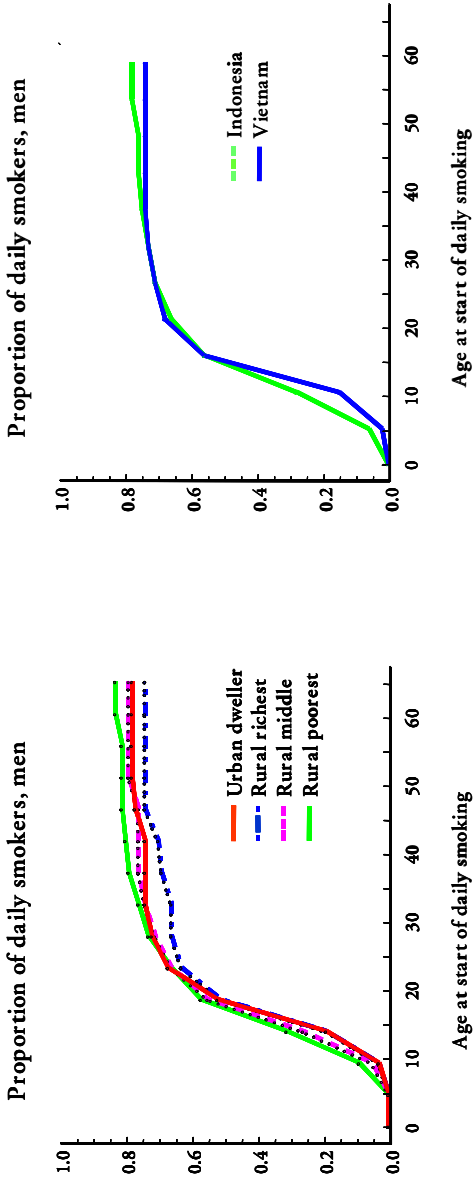


Figure 14. Proportion of daily smoker and quitters among men in Purworejo DSS

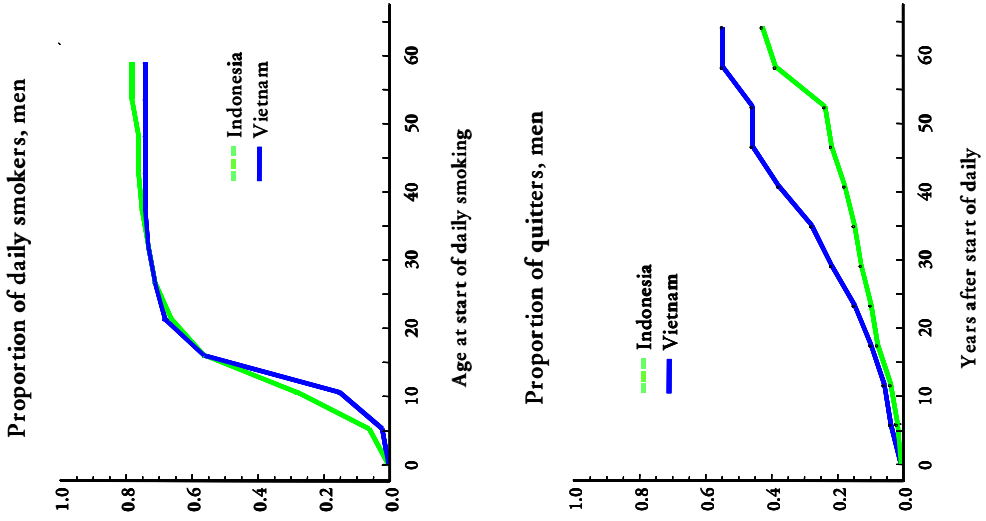


Figure 15. Proportion of daily smoker and quitters among men in Purworejo DSS and Filabavi DSS

Several similarities of smoking patterns between the two sites included more daily smokers among those with lower education and a higher proportion of quitters among the older age group. Birth cohort and education were identified as significant predictors of becoming a daily smoker in Purworejo. Men with lower education had a 1.5 times higher chance (95%CI=1.2-1.8) of adopting daily smoking than those with higher education. In Filabavi, income became the sole significant predictor of becoming a daily smoker. Men with low income were 1.4 times (95%CI=1.1-1.8) more likely to smoke daily than those with high income. When taking time into consideration, the younger birth cohort in both sites was more likely to quit smoking. Not being a farmer and having higher education increased the chances of quitting smoking by 40% and 60%, respectively in Purworejo. In Filabavi, smokers with high income had a greater chance of quitting than those with low income (Table 9).

Table 9. Significant predictors of starting and quitting daily smoking in Purworejo and Filabavi

Predictors of starting daily smoking		Predictors of quitting daily smoking	
Purworejo	Filabavi	Purworejo	Filabavi
Older birth cohort		Younger birth cohort	Younger birth cohort
	Low income		High income
Low education		High education	
		Not being a farmer	

Trends of blood pressure across socioeconomic groups

Both systolic and diastolic blood pressures were distributed in a similar pattern across different socioeconomic groups. The urban population had higher systolic and diastolic blood pressure than the rural population. As socioeconomic conditions improved, the distribution of blood pressure shifted to the right. The richest quintile in the rural area had higher blood pressure distribution compared to the urban population (Figure 16). When the arbitrary cut off points of 140 mmHg and 90 mmHg were used for systolic and diastolic blood pressure, the proportion of population over the cut-off points was higher in urban than in rural population.

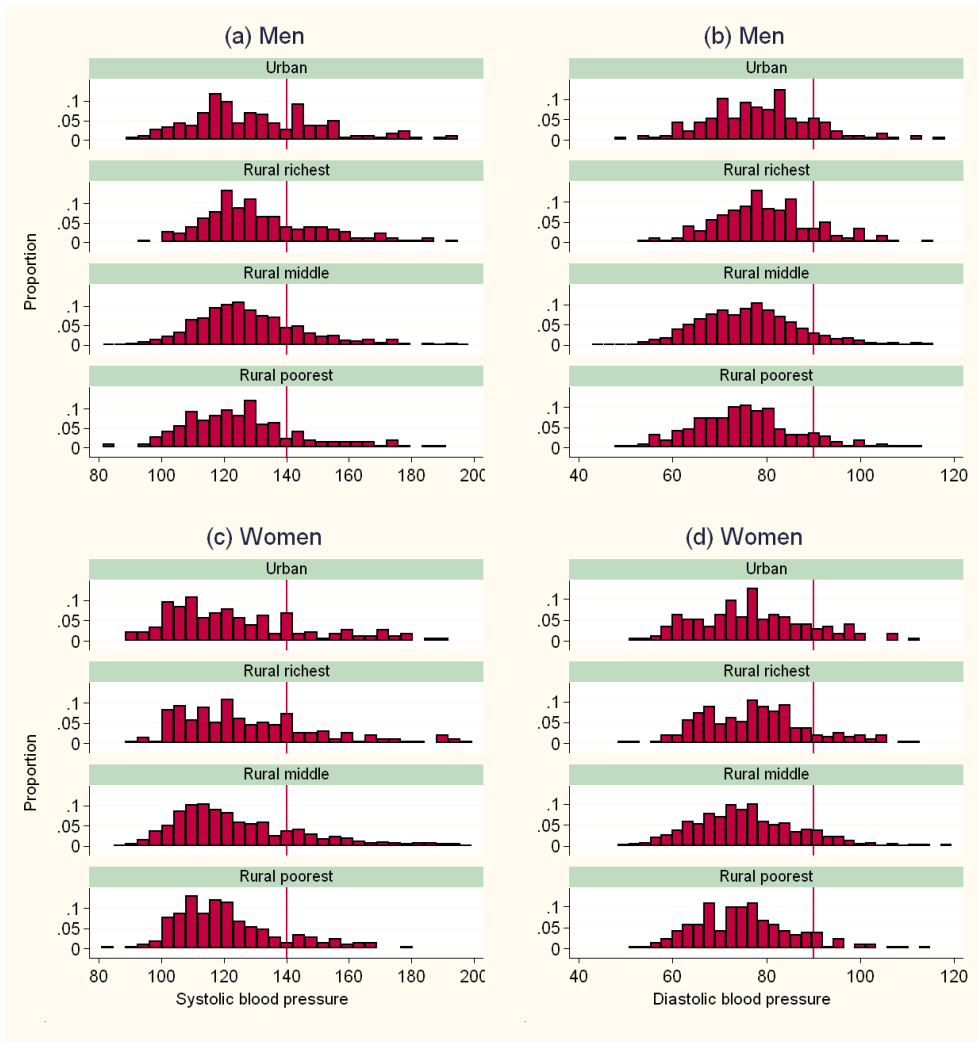


Figure 16. Systolic and diastolic blood pressure distribution for different socio-economic groups

There is a gradient of an increasing proportion of elevated blood pressure among different socioeconomic groups in rural areas (Table 10). The prevalence of elevated blood pressure was higher among the richest quintile in the rural area compared with the poorest quintile. The trends were similar for both sexes. The use of anti-hypertensive medication was more common among women than men, 22.6% of women took the medication compared with only 9.2% of men. It was observed that the use of medication was higher among the urban population, as compared with the rural population, even though the differences were not statistically significant in both sexes ($p > 0.05$).

Only 5% of men with elevated blood pressure who belong to the poorest quintile in the rural area used anti-hypertensive medication (Table 10). The group taking medication still had higher blood pressure distribution compared to those who did not take medication.

Table 10. Blood pressure patterns across different socioeconomic groups

Blood pressure (BP)	Urban dweller	Rural richest	Rural middle	Rural poorest
Men				
Systolic BP (mmHg)	127.2 (124.3-130.1)	129.2 (126.3-132.2)	126.5 (125.3-127.7)	124.5 (122.2-126.8)
Diastolic BP (mmHg)	77.8 (76.0-79.6)	78.9 (77.1-80.7)	75.8 (75.0-76.6)	75.1 (73.7-76.5)
Elevated BP (%)	28.9 (22.5-36.4)	26.6 (20.9-33.3)	21.7 (19.2-24.4)	16.5 (12.5-21.7)
With medication (%)	17.7 (8.6-32.9)	6.1 (2.4-14.6)	8.7 (5.5-13.4)	4.8 (1.5-14.0)
Women				
Systolic BP (mmHg)	121.1 (119.1-123.1)	125.7 (122.3-129)	123.8 (122.2-125.4)	120.8 (118.5-123.2)
Diastolic BP (mmHg)	75.8 (74.4-77.2)	76.7 (75.1-78.2)	75.2 (74.3-76.1)	75.2 (73.5-77.0)
Elevated BP (%)	22.2 (17.8-27.2)	27.4 (22.0-33.6)	21.3 (18.6-24.3)	18.3 (14.2-23.2)
With medication (%)	37.0 (24.0-52.2)	18.8 (10.5-31.2)	20.9 (16.0-26.9)	17.5 (8.1-33.8)

Note: Number in brackets indicated 95% CI

Obesity index and obesity patterning in different socioeconomic groups

Women had a higher BMI than men. The distribution of BMI among the urban population was more heterogeneous compared to the rural population. As socioeconomics improved, BMI distribution shifted to the right (Figure 17). The distribution of waist circumference, which is another commonly used indicator for obesity index, showed the same pattern as BMI. However, a smaller proportion of subjects were classified as abdominally obese when waist circumference was used as the obesity index.

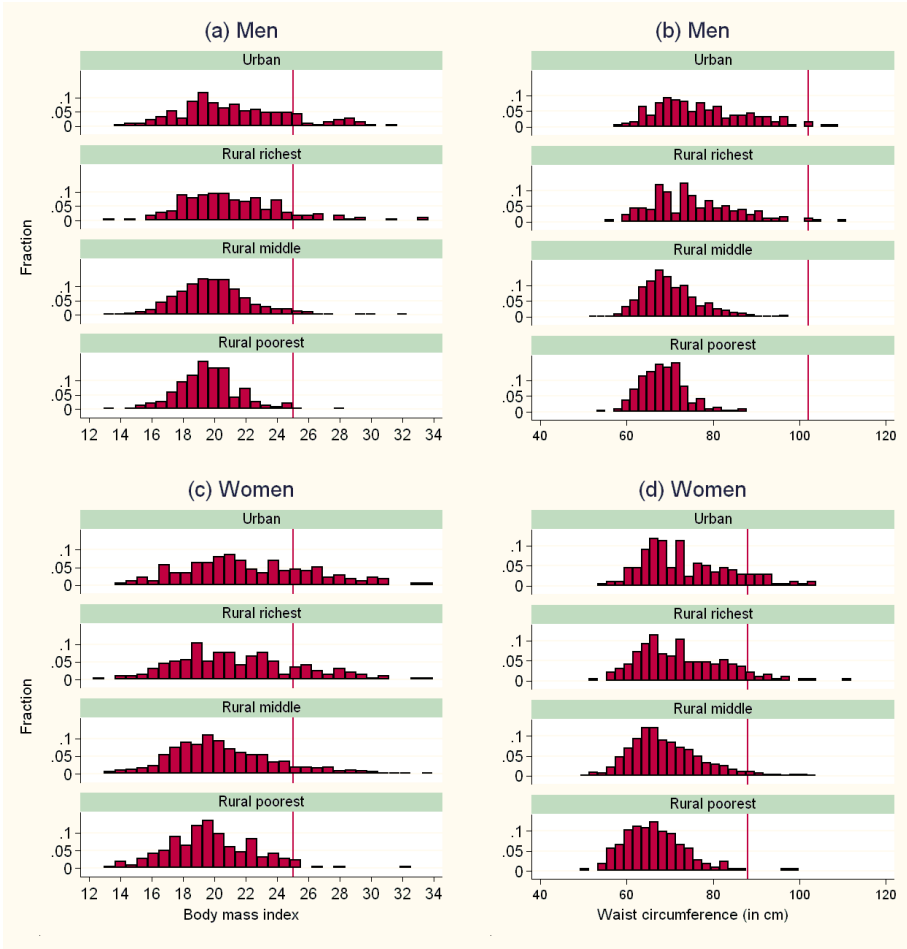


Figure 17. Obesity indices in different socioeconomic groups

The prevalence of being overweight or obese based on BMI was higher among women than men (Table 11). Overall, 2% of women were obese compared to only 0.4% of men, and the obesity was highest in the urban area and among the richest quintile in the rural area. Although men generally have greater waist circumferences compared to women, the proportion of abdominal obesity among men was lower than women due to the different cut-off points used for each sex. The socioeconomic gradients of obesity patterns were clear. The obesity prevalence was higher among those with higher socioeconomic status and among the urban population.

Table 11. Obesity indicators across sexes and socioeconomic groups

	Urban dweller	Rural richest	Rural middle	Rural poorest
Men				
BMI (mean)	21.0 (20.6-21.5)	21.1 (20.5-21.7)	20.0 (19.8-20.1)	19.8 (19.5-20.1)
Overweight and obesity (%)	13.3 (9.6-18.1)	10.1 (6.2-16.1)	3.1 (2.2-4.3)	0.7 (0.2-2.9)
Obesity (%)	0.5 (0.1-3.2)	2.1 (0.5-8.3)	0.1 (0-0.6)	0 (0 - 0)
Waist circumference (mean)	75.9 (74.3-77.5)	74.7 (72.9-76.4)	69.9 (69.4-70.4)	68.5 (67.8-69.2)
Abdominal obesity (%)	2.1 (0.9 - 4.8)	2.0 (0.6 - 6.6)	0 (0 - 0)	0 (0 - 0)
Women				
BMI (mean)	22.0 (21.6-22.5)	21.5 (20.9-22.1)	20.7 (20.4-20.9)	19.9 (19.6-20.3)
Overweight and obesity (%)	23.7 (19.6-28.4)	19.6 (14.5-26.1)	10.2 (8.3-12.5)	2.6 (1.2-5.8)
Obesity (%)	5.4 (3.3-8.8)	2.7 (1.2-6.0)	1.5 (0.9-2.6)	0.4 (0.1-2.8)
Waist circumference (mean)	72.6 (71.3-73.9)	71.7 (70.2-73.2)	68.9 (68.2-69.6)	66.7 (65.8-67.7)
Abdominal obesity (%)	11.4 (7.7 - 16.5)	6.7 (3.5 - 12.5)	3.2 (2.2 - 4.5)	0.7 (0.2 - 2.9)

Note: Number in brackets indicated 95% CI

Qualitative study on smoking

Four themes were derived from the descriptive content analysis: 1) smoking as a culturally internalised habit; 2) striving to become a man; 3) the way we smoke is not dangerous; and 4) the struggle against dependency. The themes reflected the norms and values on smoking that the boys face in society, the reasons for smoking, the way they perceived their smoking risks, and their beliefs on addiction and quitting. In the following description, the smokers in the FGDs are generally referred to as ‘the boys’.

Smoking as a culturally internalised habit

This theme reflects the norms and values about smoking and tobacco use that boys face in Javanese society. The boys emphasised that smoking is common everywhere among men and men’s smoking goes as far back in history as tobacco has been used. At home at least one of their family members smoked and in their social lives most of their friends were smokers. Whereas smokers stressed that “everybody smokes”, it seems that the non-smokers perceived fewer smokers around them.

“Since a long time ago (laughing)...since cigarettes were produced, man has smoked.”

“In a class of 40 boys, thirty nine smoke...(laughing). Only one person does not smoke.”

“If I do not smoke among my smoking friends, I will step aside. I feel inferior, because I’m the only one who does not smoke.”

Both the smokers and the non-smokers admitted that most of them had first tried smoking cigarettes when they were very young. Being in an environment where smoking is so common among men, it was difficult for them to avoid the temptation to smoke and sometimes they were even threatened if they refused to smoke. Even though schools are supposed to be smoke-free areas, the informants often saw their male teachers smoking in their offices, in the schoolyard and in classes. They were sometimes even asked by the teachers to buy cigarettes at a nearby shop. The boys considered it unfair that the teachers could smoke at school, while they were not allowed to do so.

“I saw that my teacher smokes in the office, that’s why I want cigarettes as well.”

“I received the cigarettes, my father gave them to me....”

“They said that if I do not want to smoke, they will throw me to the gutter”

The boys stressed that cigarettes are often introduced to them during the traditional religious ritual of circumcision (Figure 18), which in this society occurs at the age of 10-12 years. Cigarettes are believed to promote healing of the circumcision wound, a belief commonly shared by the parents and one that has been practiced for many generations. Circumcision, which is viewed as a sign of male maturity and adulthood, is celebrated in a village ceremony. During the ceremony, cigarettes are served to the guests, most of whom are teenage boys and friends of the boy being circumcised.

Although tobacco use is part of an old tradition in Indonesian society, the boys also regarded smoking as an aspect of modern culture. Their notion of modern life partly influenced their decision to dislike hand-rolled cigarettes, which they regarded as old-fashioned and used only by the older generation. They described the hand-rolled cigarettes as being cheap and of poor quality, having a strong, bad taste and causing headaches. Hand-rolled cigarettes were compared with coconut fibres and the boys believed that such cigarettes lead to an early death.



**Figure 18. A circumcision ceremony in a village in Java.
Cigarettes are served to the guests of the boy being circumcised**

Male villagers smoke during social gatherings and traditional puppet shows. The informants explained that in grieving ceremonies the villagers would come together and spend the night praying, condoling and sharing snacks, coffee and cigarettes. In addition, cigarettes were often used as a gift to friends, visitors or guests in traditional or religious ceremonies. The informants shared the same social norms as the wider community, that is, when you are offered a gift, it is impolite to refuse it.

The participants viewed smoking as a socialising factor and as a means of increasing their social status. For the boys, tobacco and smoking play important roles in making friends. Boys felt more confident, more mature and richer than their peers if they smoked a good, expensive and popular brand. Smoking is a reflection of solidarity and being in a group. When shown the tobacco advertisements, the boys who smoked described smoking as “truly friendly”, “helping each other” and “cheerful”. Smoking creates a sense of cohesiveness and being “gaul”, slang used by the boys to show that they were sociable and followed trends. They were proud of themselves if they could blow and play around with “smoke rings”.

Striving to become a man

The uses of tobacco during circumcision and smoking as a sign of male maturity have resulted in the development of a widespread view on smoking as normal male behaviour. Smoking enabled the boys to demonstrate their masculine identity, and smoking portrays the image of potency, wisdom and bravery (Figure 19). All the groups emphasised that their “masculine identity” was developed and reinforced in the company of their friends. Thus, they were able to create a male “togetherness”.



Figure 19. Indonesian cigarette advertisements associate smoking with potency, wisdom and bravery

The boys who smoked believed that they had to be brave enough to smoke otherwise they would be seen as having an effeminate manner. However, the non-smokers showed relatively high degrees of self-confidence with their non-smoking status. The non-smokers maintained their non-smoking status because they associated smoking with being badly behaved. They were also afraid of the health hazards and the addiction caused by tobacco. They revealed unpleasant memories from their first cigarette: “*it did not taste good, it tasted bitter*”; “*it made my tongue feel itchy*”; “*it made me sick, it was hard for me to breath*”; “*it is nglekii (hot on the eyes/causes eye irritation due to the smoke)*”; “*it made me cough*”; “*it caused me to feel faint*”; “*it made me want to vomit*”; “*it was uncomfortable*”; and “*it made me smell bad*”.

The informants perceived smoking among women and girls as unusual and as a sign that such women were impolite and ill mannered: “*Smoking is only common among hookers and bad girls*”.

The way we smoke is not dangerous

Even though both the smokers and the non-smokers believed that smoking causes health problems, the smokers perceived their way of smoking as harmless. They learned about the health hazards mainly from the health warnings on cigarette packages, as well as from magazines, newspapers, friends, family and neighbours. Teachers only talked generally about tobacco and smoking in biology and civics classes. Even though the smokers were aware of the health hazards of tobacco, they stated that they were not afraid of smoking. They claimed that smoking less than 1 or 2 packets of cigarettes or 12 to 24 cigarettes per day would not harm their health. They said: *“I think it’s okay if I smoke just one cigarette because it is too little... The level of nicotine is too low”*. The boys also viewed locally produced cigarettes with no health warnings as being less harmful.

“In this local tobacco product, there is no warning label that smoking causes cancer... (laughing). Even if there was such a warning, I am not afraid of smoking, because it is so common.”

“Smoking can cause breathlessness, heart disease, cancer, and damages to the foetus in pregnant women; but I don’t know exactly, because I just read it on the cigarette packages.”

“My parents told me that smoking could harm my heart and my heart will get cancer.”

The non-smokers stated that staying away from smoking would keep them healthy and physically fit because they would eliminate the risks of heart disease and addiction. They considered the smokers to have unpleasant breath, be prone to diseases, and to have poorer physical capabilities regarding running and working. The parents of the non-smokers forbade them to smoke because smoking could damage their health. According to the boys, the parents argued that the boys are still too young to smoke, and that their hearts are not yet strong enough.

Struggle against dependency

The smokers in the FGD perceived themselves as being addicted to tobacco. They felt that they were helpless regarding their smoking and could not quit despite their parents’ prohibition: *“I don’t care if my parents are angry with my smoking, because I am already addicted.”* When the boys were shown the tobacco advertisements with youths at parties, they described smokers as “smoking warriors” and “addicted heroes”, relating these notions to the lives of American cowboys. The non-smokers felt that those who smoked did so because they were addicted and smoking had become a habit to them.

Being addicted to tobacco was viewed as a process, and the boys expressed their perception of smoking addiction: “the first time it (smoking) felt bitter, the second time felt rather comfortable, the third time felt comfortable, and the fourth time I was addicted”. When they craved for cigarette, the smokers described feelings of “confusion”, “weakness”, “anger”, “craving”, “sleepiness”, and “dizziness”. The smokers emphasised that they had an intention to quit smoking, or at least to cut down on the number of cigarettes they smoked. Several reasons were given for wanting to stop smoking, including respecting their parents’ wishes, health aspects and career and economic reasons. Nevertheless, they all said that they found it difficult to quit.

Chapter 5. Discussion

Lack of reliable data on population vital statistics, morbidity and mortality has been the main concern in studying population dynamics in developing countries. Efforts to collect basic demographic and health data, such as those currently being made by the INDEPTH member sites, will provide valuable contributions in understanding population and health dynamics in the world's poorest communities. Most INDEPTH sites traditionally emphasise the health and mortality of women and children related to reproductive health, particularly from infectious diseases (64). However, given the progress of the epidemiological transition in most developing countries (92), a focus on adult health and aging is also warranted. Studies on risk factors of morbidity and mortality should be encouraged in these low resource settings as such studies can lead the way in prevention efforts. This thesis is among the few population-based studies on chronic disease risk factors conducted in resource-poor countries.

This thesis benefits from existing well-established demographic surveillance operations in the study area and shows how chronic disease risk factor surveillance has been built into demographic surveillance. Figure 20 illustrates the triangulation between DSSs, risk factor surveillance and hypothesis-driven research. The surveillance of risk factors and mortality assessment will enable DSS sites to monitor changes over time and thus characterise the epidemiological transition alongside demographic and economic transitions (92, 93). The availability of mortality data in DSSs enables the assessment of cause-specific mortality through the validation and implementation of methods for verbal autopsy (94). This is especially relevant in the estimation of the impact of chronic diseases.

The Purworejo DSS provides an accurate sampling frame, as well as well-trained research staff and a suitable infrastructure to support risk factor surveillance. Risk factor surveillance provides information on the distribution of risk factor levels within a population, and changes can be assessed through repeated cross-sectional studies. Implementation of risk factor surveillance based on STEPS allows DSSs to answer the basic epidemiological questions of 'who, where and when?' (62) such as: (1) how are risk factors distributed in the population?; (2) who within the population are more affected by the risk factor burden?; (3) are the poor more burdened by chronic disease risk factors compared to the rich?; and (4) how do risk factor patterns change over time?

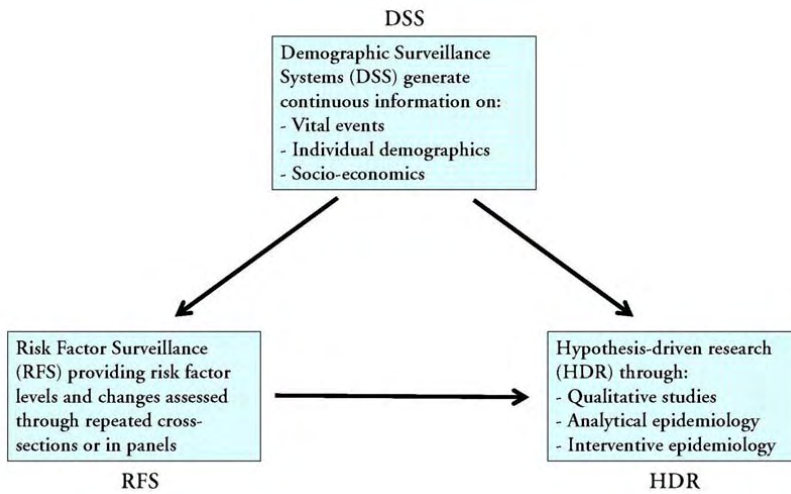


Figure 20. Conceptual framework of the interface between demographic surveillance systems (DSS), risk factor surveillance (RFS) and hypothesis-driven research (HDR)

This thesis provides evidence that the rural population is not spared from the burden of chronic disease risk factors. In the four-year study period (2001-2005), the burden of smoking, elevated blood pressure and overweight and obesity increased in Purworejo District. The risk factor burdens increased in both sexes and all socioeconomic groups. Moreover, the socioeconomic gradient of risk factor levels observed in rural area will potentially show the interrelationship of ongoing economic, nutritional and epidemiological transitions in this study setting. Findings that warrant particular attention include the young age at smoking initiation, the low cessation rate among men, the burden of elevated blood pressure on a quarter of the poorest rural population, the low proportion of people with elevated blood pressure receiving medication, particularly in the rural area, and the high proportion of women with high BMI. Furthermore, the risk factor surveillance provides evidence of risk factors clustering in the study setting.

Data from both demographic and risk factor surveillance may provide a lever for hypothesis driven research. Patterns observed over time may raise questions about the causes of risky behaviour, enable analyses of their consequences and suggest interventions. Different research designs may be used to address specific a priori hypotheses or research questions brought up from DSS or risk factor surveillance. While such analytical studies can enable the assessment of the levels of potential risk factors, qualitative approaches may enable more in-depth explorations of observed phenomena. In this thesis, the finding that

smoking has been culturally-embedded in the population was derived from a qualitative study based on the risk factor surveillance. Both risk factor surveillance and qualitative studies can provide a basis for designing appropriate and contextual population interventions, and the availability of a surveillance system will permit evaluations of these interventions.

With limited resources available, studying risk factors is a more feasible option than disease surveillance due to its simplicity and relevance to public health interventions. Risk factor surveillance enables a better understanding of the current situation and trends over a longer period. The risk factors of interest in the WHO STEPS are all potentially modifiable (58). They are associated with multiple disease outcomes, thus interventions on those common risk factors can be expected to result in a reduction of multiple diseases. Future integrated risk factor management, taking into consideration the unequal distribution of risk factors in different socioeconomic groups, can be based upon this knowledge.

Smoking, gendered traditions and the transition towards a modern society

The high prevalence of adult male smokers observed in this study is supported by results from different surveys in Indonesia. Smoking is prevalent among men in all socioeconomic groups, and is particularly high among the poorer population with less education (95, 96). The finding from the Global Youth Tobacco Survey (GYTS) confirms the young smoking initiation age identified in this study. About a quarter of students aged 13-15 years throughout the world has smoked their first cigarette before the age of 10 (96). The high prevalence of smoking among adult males should be treated as a potential threat to the nation's future public health.

The low prevalence of smoking among women in this study is also supported by the results from two national surveys in Indonesia. The National Household Health Survey in 2001 indicated a smoking prevalence among women aged over 15 years of 2.9% (95). The Indonesia Demographic and Health Survey in 2002 showed that smoking prevalence was 1.2% among girls aged 15 to 19 years, and 3% among women aged 35 to 49 years. Smoking prevalence was higher among rural women and those with less education (97).

The vicious cycle between poverty and smoking remains the most challenging aspect of tobacco control initiatives. The disadvantaged socioeconomic groups have the highest risk of adopting smoking behaviour due to their unawareness of the health hazards associated with smoking. Once they have taken up the habit, smokers in this group are less likely to cease than those in other, more advantaged socioeconomic groups. Ignorance, inaccuracy and underestimation of the risks of tobacco use by the general population, particularly those with

less education, have led to an increase in tobacco consumption (98, 99). Moreover, the cumulative risks of tobacco are potentially being misperceived and underestimated because of the long lag period between tobacco exposure and the occurrence of diseases attributed to smoking (100).

Indonesia is currently on the second stage of a tobacco epidemic. In this stage, tobacco use is widespread among men in different socioeconomic groups, smoking prevalence among women is low but rapidly increasing, and tobacco control activities are not well-developed (100). The tobacco-related diseases, such as cardiovascular diseases, hypertension and diabetes (101), have increased in the last decade in Indonesia and have become the main cause of death in this population (73). Attention should also be focussed on the high exposure of environmental tobacco smoke among women and children living in the same house as smokers (102). Passive smokers are also at high risk of experiencing tobacco-related diseases, such as acute stroke (103), coronary heart disease (104, 105), lung cancer (106) and diseases among children (101, 107). A further increase in smoking-related morbidity and mortality is to be expected in the coming decades in Indonesia if no preventive and control actions are taken.

The qualitative results from this study imply that tobacco smoking is deeply rooted in Javanese society and that smoking is strongly gendered, almost exclusively including men and teenage boys. Three major aspects of tobacco smoking will be discussed below, namely the interrelations between gender constructions and culture, psychological peer pressure and the role of the tobacco industry in the transition towards a modern society.

Smoking seems to be positioned in an intersection between gender and culture. Smoking is connected to old traditions of religious and cultural norms, beliefs and male practice. Boys are expected of to start smoking, while it is socially unacceptable for females to smoke. The introduction of cigarettes to boys aged 10-12 years that have recently undergone circumcision functions as a rite de passage towards adulthood. It is a symbolic act that also serves to introduce smoking as normative behaviour among adult males. This finding in Purworejo District provides insight into a question raised by Nichter (2003) on the different meanings that smoking assumes during life transitions in different cultures (108). In addition to the cultural meaning of smoking, smoking takes on a social meaning among youths, and therefore an understanding of the meanings to which smoking is being endorsed is very important in designing appropriate youth smoking prevention programmes (109).

The high smoking prevalence among men in Indonesia is similar to the prevalence in most Muslim countries (110). Whether smoking is mukrooh (discouraged) or haram (prohibited) for Muslim remains debatable worldwide.

Investment from Indonesia's largest Muslim associations in kretek manufacturing might lead to a potential conflict of interest in deciding whether smoking is considered religiously lawful (68). During recent years, more Muslim scholars from the Mediterranean countries have declared smoking as haram. Smoking is being considered as actions that result in harm, both for smokers and passive smokers. Even though religious rulings alone will not have much effect on the smoking rate, they have the potential to guide smoking cessation activities among Muslim smokers, especially during the month of Ramadan (during which smoking is prohibited) (110).

Smoking proved to be essential in the formation of a male identity among the teenage boys in this study. Smoking was used as a metaphor for masculinity, potency and bravery among the teenage boys. Courtenay (111) claims that men's unhealthy behaviours put them at a higher risk than women for diseases and injuries. In the social construction of masculinity, men are regarded as invulnerable to health risks, he argues. Therefore the use of tobacco as a masculine signifier puts men at greater risk of starting to smoke, and later, of suffering from tobacco and smoking related diseases. Courtenay hypothesises that 'denial of risk and other unhealthy behaviour are used by men in the negotiation of social status and to enact idealized forms of masculinity that enable them to assume positions of social power relative to women or less powerful, marginalised men' (111). Engendering health is also endangering health because the very construction of masculinity includes a risky behaviour expressing strength, invulnerability and bravery. Boys actively follow and adapt the social prescription that tobacco is an age-appropriate behaviour associated with masculinity. Smoking becomes a social signifier of maleness within a group of peers where the consumption and exchange of cigarettes is associated with group inclusion. Cigarettes are used to create social bonds among peers, to maintain the group's identity, and to avoid exclusion by their peers (112). Tobacco here functions as a gift. The gift system in the Javanese culture is old and takes on meaning in the sense that it is obligatory to offer and inappropriate to refuse a gift (113). While the boys that smoked believed that smoking enhanced their masculine image, the non-smokers did not view themselves as less masculine; instead they used other symbols to express their identity. How non-smokers deal with their male identity remains unknown and yet to be addressed in future research.

It is important to discuss psychological aspects of smoking among teenagers. Young adolescents are supposed to have more concrete thinking than adults, preventing them from thinking abstractly and hypothetically about the potential hazards of smoking (114). Concrete thinking allows adolescents to understand only linear concrete relationships between cause and effect (115). In this study, the boys related their smoking behaviour more to their immediate physical fitness than to their potential of developing threatening

diseases in the future. Even though boys in Purworejo believe that they “know” the hazardous effects of tobacco, the concepts of smoking as a hazards is not conceived well by them (114), or among smokers in general (99).

During the period of adolescence, young people establish independency and autonomy from their parents. They take the risks, experiment with smoking, and later demand their right to smoke (114). Culturally, smoking is acceptable for and a right of an adult male. Economically, parents view children’s smoking as a disadvantage to the family’s economy. Young adolescents’ financial dependency goes against the independence they try to establish during their psychological development. The clashes between these standards put the teenagers in a somewhat precarious situation during their psychosocial development to adulthood (114, 116). Such a situation, heightened by the social context that favours smoking, might lead youths into the rebellious act of smoking. While psychological factors influence more on the first few cigarettes among youths, the physical and biological effects of nicotine assume more importance on transforming an adolescent from experimental to a regular smokers (116, 117).

Indonesia is currently undergoing a transition towards a more modern society. The tobacco companies build on the process of modernisation and convey modern views of women and men. This adds to the picture of risk taking. A mixture of adventurous lifestyles, good looks and modern culture is the main content of contemporary tobacco commercials in Indonesia. In modern society, cigarettes are being marketed as a ‘torch for freedom’ for women, a symbol of social desirability, emancipation, independence, and success (118, 119). The tobacco advertisement in Figure 20 explores two dynamic aspects of modernity as described by Giddens (120), which are time-space separation, or distanciation, and reflexivity. The tobacco industries in Indonesia try to shape the image of smoking as both an inherited traditional value and practice and a means toward modernity (121, 122). While portraying a young girl talking on the mobile phone, the advertisement tries to introduce cigarette as a means of socialisation, a means to establish relationship with those who are physically absent. “Yesterday is gone – start all over again today”, the slogan reflects the time and space distanciation of Giddens’s modernity theory, in which history shapes the modern world and the present (120). The advertisement also encourages young women to reflect on themselves as females in a society where female smoking has been repressed by social norms.

Exposure to tobacco advertisements was identified as one reason why boys in Purworejo start smoking. Indonesians are highly exposed to the extensive tobacco promotions, such as advertisements on billboards and television, as well as at points of sale and kiosks, which are wallpapered with cigarette logos. Some tobacco advertisements, which reflect the images of freedom, openness

and individuality, even specifically target youngsters. The teenage boys were very receptive to the tobacco advertisements, which can be seen a success for tobacco company advertisements aimed at sensitising the population and making them more receptive to a smoking culture (121). Factors such as repeated exposure to advertisements, youth's preferences and receptiveness towards tobacco advertisements have been shown to be significantly associated with smoking among youths (123-125). Therefore regulation on tobacco promotion material should be strengthened, and punishment on violation should be given to tobacco industries (68).

Despite the tobacco advertisements' (disastrous) success in creating positive images of tobacco among the participants, the health warnings on tobacco advertisements have undoubtedly been the single most important source of health education regarding tobacco hazards. This is particularly important when appropriate health education from other sources is still lacking. However, providing information solely on health risks and negative impacts of tobacco might not be effective for tobacco control in many settings (126), especially in a country such as Indonesia where tobacco has been a social need and smoking is used as a cultural signifier of masculinity.

Elevated blood pressure: risk factors and control

The results from this thesis show that elevated blood pressure has become a major public health problem for both men and women in all socioeconomic groups, particularly elderly women living in rural areas. The age-adjusted prevalence of hypertension was less than that in more developed countries (such as Australia, Japan and New Zealand), but it was similar to findings from other developing countries such as China, India, the Islamic Republic of Iran and the Gambia (127-129). Elevated blood pressure is one of the major risk factors for a global burden of chronic disease and contributes to the rise of chronic diseases in both developed and developing countries (12).

This thesis suggests a positive association between elevated blood pressure and better socioeconomic conditions, after controlling for age, obesity and smoking status. The positive association observed in this study is supported by findings from other developing countries (45, 130). However, it is in contrast with the negative association observed in developed countries (131). Even though the prevalence of elevated blood pressure in the rural area was lower than that of the urban population, the richest quintile in the rural area also had a higher risk of elevated blood pressure compared with the poorest quintile in the rural area.

Elevated blood pressure increases the risk of coronary heart disease, and this association appears to be consistent across different ethnic groups (39). The existence of elevated blood pressure tends to cluster with other risk factors of

chronic disease such as high blood cholesterol, diabetes, smoking and obesity. Clustering of risk factors increases the risk of cardiovascular disease with a clear dose-response relationship pattern (132, 133).

In this setting, obesity is an independent risk factor for elevated blood pressure in both men and women. This result is confirmed by findings from other countries (134). Being overweight or obese increases the risk of having elevated blood pressure by 60% in women and 70% in men in the study setting. Obesity may induce hypertension through different mechanisms of sympathetic activation, which will further lead to vasoconstriction and sodium retention (135). On the other hand, babies born with low birth weight also have higher risk of early onset hypertension in adulthood (136, 137). Colhoun et al. (1998) found that a higher prevalence of obesity and higher salt and alcohol intake among wealthier socioeconomic groups might explain the direct association between socioeconomic status and high blood pressure (131). However, alcohol may not be the explanation in Indonesia because of the low prevalence of alcohol use.

Dietary habits may play an important role in the development of hypertension among people in the Asia Pacific region. A number of studies have been conducted in Japan and China to reveal dietary factors and their relation to hypertension. Asian cuisine, which usually has a high salt content, might increase blood pressure (138). To counter the shift of dietary intake towards unhealthy foods, promotion of healthy dietary habits should be included in an integrated approach to tackling chronic disease risk factors. Foods such as nuts, soy, lentils and tempe (fermented soybeans) are widely available in the Asia Pacific region. These foods contain high levels of unsaturated fatty acids, fibre, anti oxidant vitamin E, vitamin B12, isoflavone and folate, and have a low glycemic index, thus are considered as candidate foods for cardiovascular protection in this region (139).

Since the most common causes of death in the study population are vascular diseases, the management of the three major cardiovascular risk factors (smoking, hypertension and raised cholesterol levels) should be initiated at the primary-care level (13). Secondary prevention strategies should include interventions tailored to increase people's awareness of elevated blood pressure and to ensure that medicines are taken correctly. However, it is unlikely that a strategy aimed solely at increasing levels of awareness and compliance in treatment will bring about a measurable improvement in the population blood pressure distribution (140-142). Therefore in the prevention of chronic diseases, a broader community-oriented prevention strategy, for example encouraging a reduction in salt consumption, should be a priority in interventions aimed at reducing blood pressure in the population as a whole (13, 143, 144) .

Obesity: an emerging epidemic

The findings from this study are supported by results from different countries, which conclude that there is a significantly more rapid obesity transition in developing countries than developed countries. Overweight and obesity has become a major health problem, affecting about 1 billion people in the world. The World Health Report 2002 listed overweight and obesity among the top-five leading risk factors of disease in developed countries and developing countries with low mortality (41). Urbanisation (145, 146), improvements in socioeconomic status (147), better food availability, the adoption of eating habits similar to those in developed countries (e.g. an increasing proportion of nutrition obtained through the consumption of fats and proteins) and moves towards a more sedentary lifestyle (148) contribute to the increased prevalence of obesity in developing countries.

This thesis documents a rapid increase of overweight and obesity between 2001 and 2005 among rural women, particularly those belong to the richest group (Figure 21). Women are at higher risk (2.5 times) of becoming overweight or obese compared to men, both in urban and in rural areas. The difference of obesity prevalence between men and women observed in this study is confirmed by studies in other developing countries such as Ghana (the risk of overweight and obesity was six times greater among women than men), Morocco (four times), and South Africa (three times) (149).

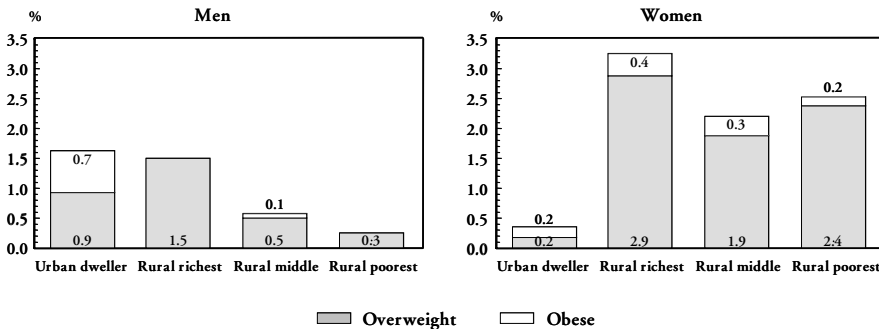


Figure 21. The annual percentage increase in obesity prevalence during 2001 and 2005

Higher BMI observed in women compared to men might also be associated with their non-smoking status. The risk factor study showed a higher prevalence of overweight and obesity among non-smokers, and the risk of being overweight or obese was 25% lower among smokers than non-smokers (data not shown). Another possible hypothesis for this difference is the pattern of vegetable and fruit intake among smokers and non-smokers. A study in

Canada showed that fruit and vegetable consumption is associated with smoking behaviour. Smokers consumed less vegetables and fruit, and obtained most of their daily calories from fat (150). However, in this study, no differences in fruit and vegetable intake were observed between smokers and non-smokers (data not shown).

A further possible explanation to the biological differences in overweight and obesity prevalence is the thrifty genotypes theory. The hypothesis states that populations that have survived famine or starvation have a higher risk of becoming obese and suffering from diabetes (151). The subjects included in this study, particularly those aged 35-74 years, had experienced political and economic depression during their early life, during which food was scarce and malnutrition was the main health problem in society, particularly among women. In some cultures and social contexts, boy preference and resource allocation at the household level which favours males may be associated with the higher rate of obesity among women who had experienced a relative scarcity of food compared to the boys. However, in Indonesia, boy preferences and gender-biased allocation of household resources might not be a realistic explanation for women's obesity (152).

Being overweight or obese is not only a biological issue, but also a culture and gender issue. In Indonesia, thinness is associated with poverty, and being obese is viewed as having better economic power. It is also a common view that women aged over 40 years (called as 'ibu-ibu, or 'lady' in Indonesian) naturally have a larger body constitution. This social issue of obesity is also observed in other parts of the world. A study in Africa showed that Gambians are more obesity tolerant than African Americans and white Americans. Middle-aged women are more satisfied with their body image and obesity status than the other age groups of women and men. In Africa, thinness is associated with disease such as HIV/AIDS, and this stigma leads to the wide acceptance and preference of obesity (153).

In this study setting, the prevalence of overweight and obesity among women in the richest quintile in the rural area is 8 times higher than those of women in the poorest rural quintile. The urban population also has high prevalence of overweight and obesity. Improvement of socioeconomic status might lead to changes in dietary patterns, better affordability of modern transportation, and engagement of more sedentary daily activities. All these can later contribute to an increase in overweight and obesity. With the improvement of transportation systems that reach the peripheral areas in Java, increased varieties of food are being marketed to the remote villages. The traditional market, which opens every five days according to the Javanese calendar, provides villagers with better access to different types of food, including meat.

In general, the pattern of food consumption has changed during the last decade in Indonesia. Global expansion of food industries to the developing market goes hand-in-hand with modernisation, and has led to changing patterns of food consumption in most developing countries. Coinciding with household economic improvements, consumption of traditional food has shifted towards a more unhealthy diet which is dominated by high calories and fat. The ratio of energy contribution from carbohydrate, protein and fat in Indonesia has changed over the past 16 years with an increase in the consumption of fat and protein (the ratio of carbohydrate:protein:fat was 81:8:11 in 1983 and 59:19:23 in 1999)(154).

The growing investment of global food industries in the city areas of Indonesia does not only influence the food habits of urban populations, but also the rural and marginalised populations. The middle- and small-scale, household food industries soon imitate the production of fast food as offered by the larger industries. Small fast-food restaurants serving deep-fried chicken and potato snacks at lower prices compared to those offered by the branded international food chains are now easily accessible by middle and lower socioeconomic groups. Even foods considered as cardioprotective, for example tofu and Tempe (soy bean) (139), have been prepared and marketed as 'Kentucky Tofu and Kentucky Tempe'. While large-scale food industries are strictly regulated by the government, the small-scale food industries, which are more widespread and accessible, receive less regulation and therefore have greater freedom in marketing unhealthy foods to a larger population.

An increase in sedentary activities during leisure time, such as sitting and watching television, may potentially contribute to the increased trend of overweight and obesity observed in Purworejo DSS. Televisions are no longer considered an exclusive good in the study setting. The socioeconomic survey in Purworejo DSS in 2005 showed that 87% of the urban population owned a television, and this figure corresponded to 98%, 70%, and 19% among the richest, middle and poorest quintiles of the rural population, respectively. The second cross sectional study conducted in 2005 shows a significant association between ownership of a television within a household with the prevalence of overweight and obesity. In households with televisions, 9.6% of men and 23.3% of women were overweight or obese, compared to 3.4% and 15.0% in households without televisions (data not shown). The numerous reality shows and soap operas shown on television may contribute to increase in the number of hours spent sitting during leisure time, particularly among housewives.

Obesity are risk factors to many chronic diseases such as diabetes, cardiovascular disease and cancers, which are now becoming more prevalent (12, 29). In Indonesia, the diabetes prevalence is estimated to increase from 6.7% in 2000 to 10.6% in 2030 (29). In addition to the individual health

burden, diabetes creates further economic burdens at the household level as well as at the national macro- and micro-economic level. The indirect impact of diabetes on society is sometime more costly than the disease itself. Diabetes may lead to poverty, particularly in poor countries when healthcare expenses are paid for out-of-pocket. Resources allocated for controlling the disease and its consequences may account for a significant proportion of household income (29). It is therefore important to start planning initiatives to tackle obesity whilst taking into account the lessons learnt from tobacco control (155).

Designing interventions – lessons learnt and ways forward

The results from this study which show an increased burden of most chronic disease risk factors in this transitional country underline the urgent need for programmes aimed at preventing and controlling chronic diseases. There are at least two reasons that justify implementing prevention programmes for chronic diseases. Firstly, the health system in Indonesia has been heavily strained by the persistent burden of infectious diseases such as malaria, tuberculosis and dengue fever, as well as the emerging burden of Avian influenza, SARS (Severe Acute Respiratory Syndrome), and HIV/AIDS. The additional burden from chronic diseases therefore should be prevented. Secondly, it would be a great mistake not to protect the coming generation from the known and well-established risk factors for chronic diseases. Several community-interventions for chronic disease prevention have been proven more cost-effective than any secondary and tertiary prevention approaches.

Indonesia's national policy and strategy on chronic disease prevention and control, which focuses on risk factor surveillance, health promotion and reformation of health services, was implemented by the Indonesian Ministry of Health in 2004. The integration of the WHO STEPS into the National Household Health Survey is an important milestone that will enable the country to estimate the population's risk factor burden and to provide the much needed community-based evidence. In the current era of decentralisation, such evidence is vital for district health authorities that have the responsibility of selecting priority health programmes. This evidence will later guide adaptation of policy and help to identify implementation steps for chronic disease prevention and control (22). The characteristics and the pattern of risk factors observed in this study signify the importance well tailored, integrative and comprehensive interventions for chronic disease prevention and control in Indonesia. These basic principles of integrative and comprehensive interventions will be elaborated further in the following text.

Interventions should be integrative to address all risk factors together. The existence of multiple risk factors in this study increases an individual's risk of developing chronic diseases, and this finding is supported by researches

conducted in other countries (156, 157). Understanding the absolute risk of developing a chronic disease is more important than the level of single risk factors, which does not reflect the absolute risk of the diseases related to those factors (141, 142, 158, 159). A non-hypertensive individual with diabetes, for example, will benefit more from blood-pressure lowering treatment than a hypertensive individual without complication (141). Therefore, it is important for national health authorities in low income countries to manage chronic disease risk factors in a comprehensive manner (160).

Interventions should be based on comprehensive community and individual approaches. Taking smoking as an example, with a high prevalence of daily smokers among adult men, community-based smoking prevention programmes among youths should be complemented by individual smoking cessation programmes among adults to be effective in reducing the impending burden of chronic diseases related to tobacco. If smoking cessation programmes are not initiated, it is likely that Indonesia will progress towards the third stage of the smoking epidemic, which is characterised by the peaking of morbidity and mortality due to tobacco-related diseases (100). Similarly, clinical treatment of hypertensive patients will fail to yield optimal results in reducing the burden of cardiovascular and cerebrovascular diseases at the community level. It might be even more effective to shift the whole population's blood pressure distribution towards a lower distribution (159, 161). Lessons from developed countries have shown that individual approaches alone, such as medication for hypertension, may not fully account for changes in blood pressure trends at the population level (140). Such evidence provides important support for community interventions, and it should be made clear to health authorities that wider community interventions are more feasible in resource-poor settings (161). This is especially important for countries with health systems that are not prepared to deal with an epidemic of chronic diseases.

In addition being integrative and comprehensive, chronic disease risk factor interventions should start as early as possible. Research has shown the importance of hazardous exposure across the life course on later life health outcomes. In the last decades, the foetal origins of adult disease (137) and life course epidemiology (162) have been developed intensively to understand the causation of chronic diseases. The former postulates that poor nutrition during a critical period in early life results in foetal programming of future propensity to adult disease (137). The latter studies long-term effects of physical and social exposures during gestation, childhood, adolescence, young adulthood, and later adult life on chronic disease. Biological, behavioural, and psychosocial pathways that operate across an individual's life course, as well as across generations, that influence the development of chronic diseases are explored (163).

Smoking prevention should start in the early stage of smoking adoption among youths, as this behaviour is likely to continue into adult life (115). Tobacco control advocates should learn lessons from the tobacco companies, as evidence shows that the tobacco industry understands adolescent development better than any other industry (164). Preventing tobacco sales to minors is one effective intervention that can control smoking among teenagers (165). Addressing the tobacco burden through tobacco control policies (166-169) is likely to be among the effective means of controlling the emerging burden of chronic diseases (170).

Genetic susceptibility may put various ethnic groups at different risks of developing chronic diseases, even if the level of risk factors does not vary between groups. The Asian populations are at a higher risk of developing cardiovascular disease and other co-morbidities than Caucasian populations, even at the 'normal' level of body mass index and waist circumference (171, 172). Molecular epidemiology studies have shown that people with apolipoprotein E genotypes, especially $\epsilon 4$ allele, are at higher risk of developing coronary heart disease, and this genetic factor interacts with environmental factors, such as smoking, to modify the risk of getting coronary heart disease (173, 174).

In addition to genetic factors, social disadvantages and susceptibility put poor people at higher risk of experiencing the impact of chronic diseases and their risk factors. The burden of chronic diseases is more prominent in developing countries and among poor populations than in the developed countries (22). This thesis shows that chronic disease risk factors do not effect only to affluent groups. The vicious cycle of poverty and chronic diseases or their risk factors shown in this study calls for designing interventions that can reach poor and marginalised populations.

Several community intervention programmes on CVD in developed countries have reduced the level of CVD risk factors (56, 175-178) and mortality (38) following long-term interventions. Even though the three community intervention programmes in the US (the Stanford Five City Project, the Pawtucket Heart Health Programme, and the Minnesota Heart Health Programme) showed only modest effects of interventions, all of which lacked statistical significance, they have all provided insight and valuable lessons in conducting community interventions (179). In spite of numerous lessons from developed countries, community-based interventions targeting specific populations in developing countries are still lacking. Nevertheless, some countries developing countries, including some in South East Asia have already taken the initiative to start pilot studies on community-based interventions. In Indonesia, this pilot study was conducted in a suburban area in West Java for a period of eight months. Active participation by different

key people and organisations, such as village leaders, welfare organisations, community leaders, health personnel and the private sector, as well as a community interest and participation in the programme have been major supportive factors for this intervention. The barriers identified include the lack of a focal point or person responsible for chronic diseases in the local government, lack of infrastructure and facilities to promote healthy lifestyles, and the fact that chronic disease is still being neglected by the health sector (65).

This thesis does not intend to downplay the importance of public health approaches at the individual level, especially for those with established risk factors and/or chronic disease. Interventions aimed at changing the lifestyle of individuals with established conditions are justified as evidence shows that such changes decrease the risk of mortality from chronic diseases (101, 144, 181). This thesis again emphasises the importance of individual smoking cessation programmes to achieve a significant decrease in the tobacco-related mortality among Indonesian men. Smoking cessation is the single most important means of decreasing the potential burden of chronic disease in the near future. Even though there is very little evidence of effectiveness of smoking cessation counselling in Indonesia, it is reasonable to initiate such counselling to help Indonesian smokers to quit. Smoking cessation programmes should be a priority in Indonesian health planning. Health professionals such as doctors and nurses should lead smoking cessation initiatives. In every clinical encounter, patients should be asked about their smoking behaviour and should be advised to quit smoking (182, 183). This approach is currently being piloted in two referral lung clinics in Jogjakarta.

Setting an arbitrary cut-off point for risk factors such as for blood pressure, body mass index and blood cholesterol to identify individuals at risk (88, 184) has limited potential in controlling risk factors and improving the health of the population. Critical assessments of how to define individuals at risk have put the potential use of such thresholds under debate (159). Over time, the risk factor levels for identification of individuals at risk are being reconsidered by the experts. Once considered as being normal, the blood pressure of 120-139/80-89 is now categorised in the new guidelines for diagnosis and treatment of hypertension as a pre-hypertension risk level for which lifestyle modification is recommended (185). Once again, this will result in an increased demand on the resources needed by health care systems to deal with the increasing number of individuals at risk.

The last part of this section will discuss the prerequisite factors for successful chronic disease interventions. These factors are the main pillars of modern public health practice, namely community participation, intersectoral approaches, interdisciplinary approaches and sustained political will (186).

Community participation plays an important role in the success and sustainability of any intervention programme (186). Tackling the chronic disease risk factor burden is not only an individual's responsibility, but also the responsibility of the government and society as a whole. The following example from Singapore shows how community participation has been recognised as an important determinant of chronic disease prevention. In 1992, the National Health Lifestyle Programme was launched by the Singapore government as an intervention strategy to reduce the risk factors of chronic diseases. This population-based programme targeted primary prevention by focusing on four main lifestyles – smoking, physical inactivity, dietary patterns and stress. The programme reduced the smoking prevalence among adults aged 18-69 years from 18.4% in 1992 to 15.0% in 1998, thanks to the strict implementation of an anti-smoking policy. The programme also increased the proportion of Singaporean adults performing regular exercise from 13.6% in 1992 to 16.9% in 1998. The prevalence of high blood cholesterol and hypertension, however, increased from 19% to 23.5% and 15.9% to 19.6%, respectively. The Singapore Government responded to these results by increasing community participation in the national strategies. New initiatives were later designed, including the CHERISH (Championing Efforts Resulting in Improved Health) award for the school which proactively promotes the physical and mental health of students, the HEALTH award given to commendable workplace health promotion programmes, the workplace health promotion grant, and the annual mass workout campaign - the Great Singapore Walkout, as well as the Ask for Healthier Food Programme in collaboration with food sellers which encourages the consumption of more vegetables and fewer products containing fat and oil (187, 188).

The North Karelia project in Finland serves as an example of how involvement of different sectors, such as food industries, the agricultural sector, health professionals and the mass-media can contribute to the success of intervention programmes in reducing CVD burdens (38, 176). The example from Singapore also shows how other sectors such as schools, workplaces and food industries have been involved to achieve optimal results from interventions. Mass media also plays an important role in helping the health sector direct health messages in an appropriate and effective way. The tobacco industry has been very aggressive with their marketing strategies targeting the potential market of youths and women. In order to counter this, youth smoking prevention programmes should be tailored appropriately with palatable messages for youths, to help them to make informed decisions about smoking (189). Providing information on the skills necessary to recognise and resist negative influences, whether from peers, family or culture, is essential in preventing tobacco use, especially in situations where these influences play a significant role in encouraging smoking (126).

An interdisciplinary approach should be used in designing interventions because different socio-cultural contexts at micro, meso and macro levels can influence the outcome (190). Understanding the local and cultural context of risk factors, such as smoking and dietary habits, provides guidance in tailoring culturally appropriate interventions for developing countries (108, 190). Several studies in Indonesia identified peer pressure as the main determinant of smoking behaviour among adolescents and young adults, and suggested that interventions should focus on peer groups and schools (191-193). However, a study in Jogjakarta city failed to show the effectiveness of a smoking inoculation programme in school students aged 13 to 15 years (192). The degree of understanding of the cultural context of smoking in Indonesia potentially determines the success or failure of such interventions.

Sustained political will is a prerequisite for policy implementation. As a milestone health treaty, the Framework Convention of Tobacco Control (FCTC) is a comprehensive and effective strategy for tobacco control utilising different measures to reduce tobacco supply and demand (169). However, the FCTC, which unavoidably is also a political document, has been responded to in different ways by different governments. Indonesia is among the top five tobacco consuming countries in the world and is lagging behind Vietnam in terms of FCTC signature and ratification. Introduced in 1999 after the country's political reformation, the first tobacco control regulation in Indonesia was amended in 2000 and 2003. The momentum for tobacco control reached its anti-climax when the latest amendment in 2003 omitted all sanctions to violations in manufacturing, advertising and retailing tobacco products. (68). Stronger political will from the Vietnamese government might explain the differences in quitting rate observed between Vietnam and Indonesia in this thesis. The lack of political will is worsened by different myths surrounding the economics of tobacco, and has become one of the main barriers to tobacco control activities in the developing world (194). Implementing the FCTC, as well as the Global Strategy of Diet, Physical Activity and Health, can bring chronic disease prevention and control to the global health agenda.

Finally, national capacity for chronic disease control, including tobacco control, should be built by integrating evidence, infrastructure and networking and leadership (195). Both the FCTC and the Global Strategy integrate interventions at different levels of health systems, which create the potential for intersectoral and interdisciplinary approaches to tackling risk factors (22). Networking across sectors and countries has emerged as an essential requirement. With modernisation and globalisation, chronic disease has become a global responsibility. The Oxford Health Alliance, for example, is one of the multi-country broad-based preventive efforts to tackle the epidemic of chronic diseases in the near future. The alliance aims at raising awareness

and changing behaviours, policies and perspectives with regard to chronic disease at every level of society (196). By using the STEPwise approach for prevention (22) and mobilising global action against chronic disease, the goal of averting 36 million chronic disease deaths by 2015 may be achieved (23, 42).

Methodological considerations

Recall bias has been the main problem in measuring risk factors using questionnaires in the population. Questions such as age at start of smoking and age at quitting smoking may yield a biased result. Even though physical activity, vegetable and fruit consumptions, and alcohol intake, which are included in the WHO STEPS, are not presented in this study, it is worthwhile presenting the methodological limitations of measuring them. To limit the potential recall bias when assessing risk factors, the WHO STEPS questionnaire uses the ‘typical day’ rather than the other more commonly used time periods such as “in the last week or month or year”, yet some problems persist. Assessing the physical activity level in a setting where occupational activities are seasonal and multiple poses a big challenge to the validity of this assessment. In the agricultural setting of Indonesia, physical activities related to work depend on the timing of the interview – whether it is during the harvest or non-harvest period. Assessing time spent on leisure time by asking about sports activities done is not reasonable in a setting where recreational sport is uncommon. Measuring alcohol consumption behaviour in a religious Islamic setting is also difficult. To increase the validity of questionnaire-based assessments of fruit and vegetable intake, help cards showing different types of locally consumed fruits and vegetables should be provided to the respondents.

The limitations of the physical measurements should also be acknowledged. The difficulties in complying with the standard study protocol on some occasions, specifically in resource-poor settings will potentially influence the measurement results. Measurement of blood pressure in the field, for example, could not always be performed in a standard way. However, efforts have been made to minimise potential measurement biases by providing good training and conducting regular meetings with the surveyors.

The validity of the widely used cut-off points for BMI of 25 and 30 to differentiate populations at risk among Asian populations has been questioned. By using two obesity indices, i.e. BMI and waist circumference, to define risk of abdominal obesity, a large discrepancy of overweight and obesity level in the study population was observed. However, despite the limitations of the risk categorisation, it should be acknowledged that the current prevalences of overweight and obesity using the general cut off points, is at alarming levels. Regardless of the cut-off points used, moving the whole

population distribution of BMI to the left is more important than targeting only the high risk tail of the distribution.

The post-hoc comparison of risk factors in the urban and rural areas yields mostly non-significant results. Despite the lack of statistical power in finding any significant differences, the fact that the rural area has been burdened by risk factors should be treated with alarm and should indicate the need for interventions in this area as well. In future studies, the statistical power might be increased by selecting similar sample sizes in the urban and rural areas.

Working with teenage boys in a qualitative study has its own challenges, especially in the social setting where the teenage boys were not particularly used to participating in groups where they are asked to discuss and reveal their views and opinions and to share their experiences with adults. The discussions were not as lively as expected despite the moderator's efforts. The fact that the groups only met once might have hindered a more relaxed atmosphere. However, the boys seemed comfortable and relaxed enough to provide information about their beliefs and norms regarding tobacco smoking. The results are considered to contribute to a better understanding of young Indonesian boys' thoughts and beliefs about tobacco smoking. None of the researchers knew the informants prior to the study and no personal interests or biases were at hand. The analysis was done by oscillating between bracketing the researchers' prior understanding and using it overtly (197). Emphasis should be made that the interpretations about masculinity and smoking behaviour are analytical and theoretical, not statistical. Findings of this study could also be applicable in other social contexts. However, the conclusions are not being drawn based on any statistical inference to a target population, but on a theoretical understanding of health and ill-health behaviour and human social interaction (89).

The importance of conducting qualitative studies on smoking among females, despite their low smoking prevalence, is acknowledged in this thesis. The decision to include only boys in the study setting was based on the finding from the baseline cross-sectional study that smoking was almost non-existent in young females. However, in the second cross-sectional study, the prevalence of smoking increased among women, and during the last five years, there has been an increasing effort of tobacco companies to target women. It is therefore very important to include women's view on smoking in developing gender sensitive smoking prevention programmes. It is important to know the role of females in smoking prevention and cessation.

Implications for future studies and policy

This thesis illustrates the integration of chronic disease risk factor surveillance into ongoing demographic surveillance operations. It attempts to document the feasibility, potential and usefulness of conducting risk factor surveillance in resource-poor settings where reliable health statistics are lacking. Together with Filabavi DSS in Vietnam and Butajira DSS in Ethiopia, Purworejo DSS is one of the first DSSs to integrate chronic diseases and routine demographic surveillance (198). Such initiatives are currently also being adapted by the other INDEPTH sites in Asia by conducting risk factor surveillance using the WHO STEPS approach in a total of 16 000 study subjects.

The results from this thesis enrich the knowledge and understanding of the distribution of risk factors across different socioeconomic groups in Indonesia. By discussing Indonesia as a whole, this thesis makes an attempt to generalise the findings from this study setting to a national context. The risk factor patterns observed in this thesis on a representative sample of 3 000 people at district level is supported by the findings from the Indonesia National Household Health Survey which was conducted in 2003 and covered 13 000 people nationwide (95).

Despite the efforts made by the Ministry of Health of Indonesia to collect national representative data, the national study of chronic disease risk factors are still awaiting detailed analysis. The analysis of the national data stratified on different socioeconomic groups will provide district governments with evidence on and insight into the importance of controlling risk factors. In the current era of decentralisation, it is important that health authorities at the district level appreciate the impending burden of chronic disease. District health authorities should also have the capacity to conduct chronic disease risk factor surveillance in their respective districts. The evidence from Purworejo can serve as an example of such efforts.

This study provides a basis for further intervention studies on chronic disease risk factor control in Indonesia. Based on the understanding of the risk factor burden across the population, a comprehensive and integrative community approach should be developed in Indonesia. Interventions should involve different sectors related to chronic disease, such as industries, education, agriculture, etc. An effective community participation programmes should be identified to ensure the sustainability of any intervention programmes initiated at community level. It is also important to integrate chronic disease prevention and control programmes into the current health systems and health care services in order to achieve synergism between different programmes on infectious and chronic diseases.

At the health care delivery level, it is important to encourage health care providers to quit smoking and to maintain their non-smoking status. In the Indonesian society, health care professionals, especially doctors, are important role models for healthy living. It is therefore difficult to encourage the community not to smoke if the health care professionals themselves are still smoking. Doctors need to address patients' smoking, i.e. to ask patients about their smoking behaviour and to advise quitting to all smoking patients, in every clinical encounter. Studies on how to involve health care professionals in delivering messages on healthy behaviour should also be a priority.

This thesis shows that smoking is culturally embedded in this population. In addition to using smoking as an individual signifier, smoking has also been used in different social contexts; it has been used as a gift to guests, as well as a means for socialisation in the community. These cultural aspects should be taken into account in any smoking prevention programmes. The challenge now is to explore ways of demoralising smoking in Indonesian society. Efforts need to be increased to identify barriers to quitting at the population and cultural level such as: 1) how to detach smoking from the construction of masculinity; 2) what refusal skills need to be taught to teenagers to empower them to refuse cigarettes in a culturally appropriate way; 3) how to separate adolescent girls' notions of successful modern life from smoking. Questions such as how to empower women to be active advocates for tobacco control in a setting with a strong paternalistic culture deserve well-designed qualitative investigations.

Conclusion

This study demonstrates the importance of understanding the population burden of chronic disease risk factors in developing countries, where epidemiological data on which to base policy decisions are still lacking. The epidemiological transition is ongoing in the rural population, and it poses a bigger threat to the poorest population due to their unawareness of the problem.

- The thesis concludes that the rural population is not spared from the emerging burden of chronic disease risk factors. The patterning of risks across different socioeconomic groups provides a macro picture of the vicious cycle between poverty and chronic diseases.
- Understanding of risk factors in a local context provides insight into cultural aspects relating to risk factor adoption, and will allow the fostering and tailoring of culturally appropriate interventions.
- Combining data from demographic surveillance sites with the WHO STEPS approach to risk factor surveillance of major risk factors addresses basic epidemiological questions on chronic diseases. The use of such data is a powerful advocacy tool in public health decision-making for chronic disease prevention in developing countries.
- With substantial existing evidence on the effectiveness of chronic disease prevention and intervention programmes, it is vital that Indonesia starts planning intervention programmes to control the impending chronic disease epidemic, and most importantly, to translate all this evidence into public health action.

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Faktor risiko penyakit kronis di negara dalam transisi – Studi di daerah pedesaan Indonesia

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ABSTRAK

Pendahuluan: Epidemik penyakit kronis merupakan epidemik yang terabaikan. Walaupun ancaman beban penyakit kronis sudah muncul, pengambil kebijakan kesehatan di tingkat internasional maupun nasional masih belum memberikan perhatian dan prioritas yang besar untuk mengembangkan usaha kesehatan masyarakat dalam pencegahan dan pengendalian penyakit kronis. Pemahaman terhadap beban faktor risiko dalam populasi, yang dapat digunakan untuk memprediksi kejadian penyakit kronis, merupakan langkah penting untuk mengurangi dampak akibat penyakit kronis tersebut.

Tujuan: Tesis ini memberikan tanggapan pada peningkatan beban penyakit kronis di dunia, dan bertujuan menjembatani gap dalam penelitian faktor risiko penyakit kronis di negara berkembang. Tesis ini menggambarkan dan menganalisis distribusi faktor risiko penyakit kronis di daerah pedesaan di Indonesia. Tesis ini juga menggambarkan bagaimana pandangan remaja di daerah pedesaan Jawa tentang merokok. Pada akhirnya, tesis ini bertujuan untuk memberikan kontribusi dan rekomendasi dalam pengembangan kebijakan dan program kesehatan untuk intervensi komunitas di Indonesia

Metode: Penelitian ini dilakukan di Kabupaten Purworejo yang memiliki sistem surveilans demografi sejak tahun 1994. Sistem surveilans di Purworejo merupakan bagian dari jaringan NETWORK. Dua studi *cross-sectional* pada 3 250 orang sampel yang representatif dilakukan masing-masing pada tahun 2001 dan 2005. Studi ini dilakukan untuk menilai prevalensi faktor risiko penyakit kronis yang meliputi merokok, peningkatan tekanan darah dan kelebihan berat badan dan obesitas. Sampel pada studi *cross-sectional* pertama diikuti pada tahun 2002 dan 2004. Instrumen pada penelitian ini diadopsi dari instrumen WHO STEPS. Studi kualitatif dengan diskusi kelompok terarah juga dilakukan pada remaja laki-laki berusia 13-17 tahun untuk mengeksplorasi keyakinan, norma dan nilai-nilai tentang merokok di daerah pedesaan di Jawa.

Hasil: Penduduk di daerah perkotaan maupun pedesaan di Kabupaten Purworejo memiliki distribusi faktor risiko penyakit kronis yang tidak sama. Beban pada kelompok dengan sosial ekonomi yang tinggi di daerah pedesaan sudah mencapai tingkat beban penduduk di perkotaan. Semua faktor risiko meningkat pada semua kelompok umur, baik pada laki-laki maupun perempuan, dan pada semua kelompok sosial ekonomi. Namun wanita dan kelompok dengan sosial ekonomi yang rendah memiliki peningkatan prevalensi yang paling tinggi. Studi kualitatif menunjukkan bahwa resistensi kultural terhadap wanita yang merokok di Indonesia

masih tinggi. Merokok dipandang sebagai kebiasaan kultural yang telah terintegrasi dalam kehidupan masyarakat Indonesia, dan merupakan petanda transisi kehidupan bagi anak-anak untuk memasuki kehidupan sebagai orang dewasa. Rokok juga digunakan sebagai media untuk sosialisasi dan sebagai penanda status sosial ekonomi. Penggunaan rokok dalam pembentukan maskulinitas menunjukkan perlunya intervensi yang sensitif terhadap isu gender. Kebijakan nasional untuk pengendalian rokok perlu menekankan pada usaha untuk mewujudkan norma bebas rokok terutama pada anak-anak dan laki-laki dewasa. Peraturan dan larangan merokok harus ditegakkan pada semua tingkatan masyarakat. Adanya sistem surveilens demografi memungkinkan usaha untuk menilai dinamika kesehatan populasi. Penggunaan metodologi yang terstandarisasi di sistem surveilens yang terintegrasi dalam INDEPTH akan menghasilkan data berbasis masyarakat yang cukup baik untuk dibandingkan di negara berkembang. Perbandingan data transisi merokok di Indonesia dan Vietnam menunjukkan bahwa laki-laki di Indonesia mulai merokok pada usia yang lebih awal dan jumlah perokok yang berhenti merokok lebih sedikit daripada di Vietnam. Dibandingkan dengan Vietnam yang telah meratifikasi *Framework Convention of Tobacco Control*, kegiatan pengendalian rokok di Indonesia masih sangat kurang.

Kesimpulan: Tesis ini menyimpulkan bahwa penduduk pedesaan di Indonesia tidak terbebas dari beban faktor risiko penyakit kronis yang sudah muncul. Pola distribusi faktor risiko pada kelompok sosial ekonomi yang berbeda memberikan gambaran tentang lingkaran setan antara kemiskinan dan penyakit kronis. Pemahaman faktor risiko pada konteks lokal melalui studi kualitatif memberikan gambaran tentang aspek kultural yang mempengaruhi proses adopsi faktor risiko di masyarakat. Pemahaman ini memungkinkan pengembangan intervensi yang tepat sesuai dengan budaya masing-masing. Penggabungan sistem surveilens demografi dan sistem surveilens faktor risiko memberikan jawaban terhadap pertanyaan epidemiologi dasar tentang penyakit kronis, yang dapat digunakan untuk bahan advokasi dalam pembuatan kebijakan publik di bidang kesehatan untuk pencegahan dan penanggulangan penyakit kronis. Dengan bukti-bukti efektivitas program pencegahan dan penanggulangan penyakit kronis, Indonesia harus mulai merencanakan program intervensi, serta menerjemahkan bukti-bukti tersebut menjadi suatu tindakan kesehatan masyarakat

Kata kunci: penyakit kronis, faktor risiko, sistem surveilens demografi, merokok, peningkatan tekanan darah, kelebihan berat badan dan obesitas, intervensi berbasis populasi

Pendahuluan

Pada abad ke-20 terjadi perkembangan pesat dalam kesehatan masyarakat, yang ditandai dengan meningkatnya derajat kesehatan masyarakat dan penurunan tingkat kematian. Faktor demografi berinteraksi dengan faktor sosial dan faktor ekonomi, dan menyebabkan terjadinya perubahan pola penyakit, sesuai yang disebutkan oleh Omran dalam teori transisi epidemiologi (1). Teori transisi epidemiologi menggambarkan perubahan pola kematian dalam masyarakat dari dominasi penyakit menular menjadi penyakit tidak menular. Industrialisasi, modernisasi, peningkatan standar kehidupan, status nutrisi, tingkat pendidikan, dan perkembangan dalam dunia kedokteran merupakan faktor yang mendorong terjadinya transisi kesehatan (2). Transisi kesehatan dan transisi epidemiologi di negara berkembang terjadi dalam laju yang berbeda-beda. Kemampuan teori transisi epidemiologi ini untuk dapat dipergunakan di negara-negara berkembang diragukan, karena tidak tersedianya data kesehatan dan kematian yang valid dalam

periode waktu yang cukup lama. Validitas teori ini dipertanyakan karena hanya mempertimbangkan aspek ekonomi dan mengabaikan aspek politik yang juga berperan penting dalam memahami profil epidemiologi (3). Sebanyak 90% beban penyakit di dunia terjadi di negara-negara berkembang, namun hanya sekitar 10% dana penelitian kesehatan global yang digunakan di negara-negara miskin dan negara berkembang (4). Beban kematian akibat penyakit menular, penyakit tidak menular dan kecelakaan lebih besar di negara-negara miskin daripada negara-negara kaya. Penyakit tidak menular telah menjadi masalah kesehatan global. Pada tahun 2002, beban kesakitan, kematian dan disabilitas akibat penyakit tidak menular diperkirakan sebesar 47% dari keseluruhan beban penyakit di dunia. Penyakit jantung menempati urutan kedua sebagai penyebab kesakitan dan kematian setelah penyakit neuropsikiatri (5). Walaupun beban penyakit tidak menular telah meningkat, usaha pencegahan dan pengendalian penyakit tidak menular di skala internasional maupun skala nasional masih kurang memadai. Di sebagian besar negara berkembang, sistem kesehatan difokuskan untuk menangani penyakit akut yang biasanya memerlukan perawatan jangka pendek saja. Dalam tesis ini, istilah penyakit kronis akan digunakan untuk merujuk pada semua penyakit yang memiliki perjalanan alamiah penyakit yang panjang, dan oleh karena itu dapat dicegah (6).

Penyakit kronis seperti penyakit jantung, stroke, diabetes, dan kanker telah menjadi beban kesakitan dan kematian utama di negara maju maupun negara-negara berkembang. Di China dan India, dua negara dengan jumlah populasi yang besar, beban kematian akibat penyakit jantung mencapai 6,3 juta kematian pada tahun 2005 (7-8). Beberapa faktor risiko, seperti merokok, hipertensi, diet tidak seimbang, aktifitas fisik yang kurang, obesitas serta konsumsi alkohol dapat menjelaskan sebagian besar kasus-kasus penyakit kronis. Beban faktor risiko ini juga meningkat seiring dengan peningkatan kasus penyakit kronis, oleh karena itu pengendalian beban faktor risiko juga sangat penting dalam pengendalian penyakit kronis. Sebagian pemegang kebijakan kesehatan memiliki pandangan yang keliru bahwa pencegahan dan pengendalian penyakit kronis memerlukan biaya yang besar, dan tidak efektif dibandingkan dengan pengendalian penyakit menular. Di samping itu, penyakit kronis sering dipandang sebagai penyakit yang mengenai orang-orang kaya (6). Oleh karena itu, sebagian besar pemerintah di negara-negara berkembang kurang memberikan perhatian pada pencegahan dan pengendaliannya. Di samping itu, dalam *Millenium Development Goals* yang dideklarasikan oleh *United Nations* pada tahun 2000 dan telah disetujui oleh 191 negara-negara di dunia, pengendalian penyakit kronis tidak merupakan salah satu agenda kesehatan masyarakat (9).

Kebijakan kesehatan di negara-negara berkembang sering tidak diambil berdasarkan adanya bukti yang cukup dari tingkat populasi. Kurangnya data kesehatan yang valid dan reliabel pada tingkat populasi sering menjadi kendala utama dalam sistem kesehatan nasional. Sistem kesehatan nasional di negara-negara berkembang sering memberikan prioritas yang rendah terhadap kepentingan surveilens, walaupun surveilens penyakit, surveilens kematian dan surveilens faktor risiko memiliki nilai strategis dalam sistem kesehatan nasional. INDEPTH merupakan jaringan internasional yang beranggotakan negara-negara yang memiliki sistem surveilens demografi, dengan anggota tersebar di 37 sistem surveilens demografi di 19 negara (10). Sistem demografi surveilens memiliki potensi yang cukup besar dalam memberikan kontribusi untuk mempelajari perkembangan kesehatan dalam masyarakat. Dalam suatu sistem

demografi surveilens, dilakukan pengumpulan data yang rutin yang mencakup indikator demografi, sosial ekonomi dan kesehatan. Sistem ini juga memiliki potensi yang cukup besar untuk melakukan surveilens faktor risiko penyakit kronis dalam daerah surveilens. Penerapan pendekatan STEPS dalam surveilens faktor risiko terutama di negara-negara berkembang yang memiliki sumber daya kesehatan yang rendah menjadi suatu peluang yang perlu dicermati. STEPS merupakan suatu pendekatan surveilens faktor risiko yang dikembangkan oleh WHO, dan tersusun atas modul-modul sederhana (baik bagian utama, pendukung maupun tambahan), yang dapat ditambahkan sesuai dengan kemampuan dan kebutuhan negara-negara yang melakukannya (11). Di Indonesia, walaupun surveilens faktor risiko penyakit kronis dengan pendekatan STEPS telah diadopsi dalam Survei Kesehatan Rumah Tangga, harus diakui bahwa kebijakan kesehatan di bidang penyakit kronis masih tersegmentasi dan terfragmentasi sehingga belum memberikan suatu sinergi yang optimal dalam pengendalian penyakit kronis secara keseluruhan.

Tujuan penelitian

Penelitian ini bertujuan untuk memberikan gambaran dan analisis distribusi faktor risiko penyakit kronis di daerah pedesaan di Indonesia, dan oleh karena itu diharapkan melalui penelitian ini dapat memberikan kontribusi dan rekomendasi terhadap pengembangan kebijakan pencegahan dan pengendalian penyakit kronis di Indonesia. Tujuan khusus dari penelitian ini adalah:

1. Menganalisis pola distribusi faktor risiko penyakit kronis dalam populasi yang tercakup dalam sistem surveilens demografi di daerah pedesaan Indonesia
2. Menganalisis distribusi faktor pada kelompok sosialekonomi yang berbeda di daerah pedesaan Indonesia
3. Mengekplorasi keyakinan, norma dan nilai tentang merokok pada remaja di daerah pedesaan Indonesia
4. Memberikan gambaran akan pentingnya perbandingan internasional dalam memahami pola faktor risiko di negara-negara dalam fase transisi epidemiologi yang berbeda.

Metodologi penelitian

Penelitian ini dilakukan di Kabupaten Purworejo di Propinsi Jawa Tengah, yang memiliki jumlah penduduk sebanyak 709.000 jiwa pada tahun 2003. Di Kabupaten Purworejo, sejak tahun 1994 telah dibangun sistem surveilens demografi yang mencakup 15.000 rumah tangga (atau sebanyak 55.000 jiwa). Dalam sistem surveilens tersebut, dikumpulkan data-data demografi yang mencakup kelahiran, kematian, migrasi, fertilitas, serta data-data kesehatan. Kabupaten Purworejo dipilih sebagai daerah surveilens karena mencerminkan kondisi daerah pedesaan di Indonesia. Penelitian sejenis juga dilakukan di sistem surveilens demografi Filabavi di Vietnam, dan dalam tesis ini, data merokok dari kedua tempat tersebut dibandingkan.

Dalam penelitian ini dilakukan pengumpulan data melalui dua studi *cross-sectional* yang dilakukan pada tahun 2001 dan 2005. Kunjungan ulang pada tahun 2002 dan 2004 dilakukan pada sampel penelitian yang diteliti pada tahun 2001. Pada tahun 2003, dilakukan juga penelitian kualitatif dengan metode diskusi kelompok terarah untuk mendapatkan gambaran lebih mendalam tentang perilaku merokok pada remaja.

Dalam penelitian *cross-sectional*, pengumpulan data dilakukan oleh 10 orang surveyor (5 orang laki-laki dan 5 orang perempuan), di bawah pengawasan dua orang supervisor. Kuesioner penelitian diadaptasi dari kuesioner surveilans faktor risiko penyakit kronis yang dikembangkan oleh WHO (WHO-STEPS). Data faktor risiko penyakit kronis yang dikumpulkan meliputi perilaku merokok, kebiasaan minum alkohol, pola makan sayur dan buah, serta pengukuran antropometris berat badan, tinggi badan, lingkar perut, lingkar pinggang, dan pengukuran tekanan darah. Dalam tesis ini, hanya variabel merokok, obesitas dan tekanan darah yang akan dianalisis. Subjek penelitian dikategorikan sebagai perokok bila memiliki kebiasaan merokok lebih dari satu batang per hari. Untuk seorang perokok, juga dikumpulkan data umur pada saat mulai merokok setiap hari dan umur saat berhenti merokok setiap hari. Status obesitas ditentukan berdasarkan Indeks Massa Tubuh (IMT) yang dihitung dari berat badan dan tinggi badan, dan subjek dikategorikan memiliki berat badan berlebih bila IMT lebih dari 25 dan sebagai obesitas bila IMT lebih dari 30. Subjek dikatakan memiliki tekanan darah tinggi bila pengukuran tekanan darah sistolik melebihi 140mmHg dan tekanan darah diastolik lebih dari 90mmHg atau subjek menggunakan obat-obatan untuk mengendalikan tekanan darahnya. Dalam penelitian ini, data demografi dan data sosial ekonomi didapatkan dari database surveilans di Kabupaten Purworejo. Kemampuan untuk menggabungkan data dasar dan data surveilans faktor risiko merupakan salah satu keunggulan yang dimiliki oleh sistem surveilans demografi seperti di Kabupaten Purworejo ini. Data dianalisis dengan menggunakan paket analisis STATA yang mampu menganalisis data survey dengan mempertimbangkan efek disain studi. Dalam hal ini, stratifikasi pengambilan sampel dan bobot sampling ikut dipertimbangkan dalam analisis. Analisis logistik regresi multinomial dilakukan untuk mencari determinan terjadinya pengelompokan faktor risiko. Variabel tergantung dalam analisis ini adalah pengelompokan faktor risiko yang dikategorikan menjadi tidak memiliki faktor risiko, memiliki satu faktor risiko serta memiliki 2 atau lebih faktor risiko. Analisis regresi Cox dilakukan untuk menentukan determinan untuk masing-masing faktor risiko, dengan melakukan penyesuaian terhadap umur serta stratifikasi jenis kelamin. Analisis regresi Cox juga dilakukan untuk mengestimasi kontribusi faktor sosial ekonomi terhadap perubahan status merokok menjadi seorang perokok, ataupun berhenti merokok. Analisis Kaplan Meier dilakukan untuk mengestimasi umur terjadinya perubahan status merokok tersebut antara kelompok sosial ekonomi yang berbeda, maupun antara Indonesia dan Vietnam.

Untuk mengumpulkan data kualitatif tentang keyakinan, norma dan nilai-nilai merokok yang dimiliki oleh remaja di daerah pedesaan Kabupaten Purworejo, dilakukan enam kelompok diskusi terarah pada anak-anak SMP berusia 13-17 tahun. Panduan diskusi dibuat untuk mengeksplorasi beberapa aspek merokok pada remaja. Setiap diskusi dilakukan tanpa kehadiran dari pihak sekolah, dan berlangsung antara 1 sampai 1,5 jam. Moderator memandu jalannya diskusi, dan dibantu oleh asisten moderator. Tiga diskusi kelompok terakhir dilakukan setelah tiga diskusi kelompok sebelumnya dianalisis dan diinterpretasi. Dalam ketiga diskusi kelompok terakhir, tema diskusi tentang perspektif jender dalam merokok serta makna merokok dari aspek religius dan budaya, yang merupakan temuan awal dari ketiga diskusi sebelumnya, digali lebih lanjut. Materi diskusi direkam dengan persetujuan peserta diskusi, rekaman diskusi ditranskripsi dan kemudian dianalisis dengan menggunakan teknis *content analysis*. Analisis dilakukan dengan mengidentifikasi kesatuan arti (*meaning unit*), yang kemudian dikondensasi dan dikembangkan menjadi sub-tema dan tema.

Ringkasan pertanyaan penelitian dan metodologi penelitian

Tulisan	Pertanyaan penelitian	Rancangan dan subjek penelitian	Analisis dan outcome yang dinilai
I.	<p>Bagaimana potensi menggabungkan sistem surveilens demografi dengan surveilens faktor risiko dengan pendekatan WHO STEPS untuk menilai pola faktor risiko penyakit kronis?</p>	<p>Tulisan konseptual (disain)</p>	<p>Sintesis potensi sistem surveilens demografi dan surveilens faktor risiko dengan pendekatan WHO STEPS</p> <p>Kerangka konseptual untuk memadukan surveilens demografi, surveilens faktor risiko dan penelitian yang dikembangkan dari hipotesis</p>
II.	<p>Seberapa besar prevalensi merokok, peningkatan tekanan darah dan kelebihan berat badan/obesitas di daerah Purworejo?</p> <p>Seberapa jauh penduduk pedesaan terbebani oleh faktor risiko tersebut dibandingkan dengan penduduk perkotaan?</p>	<p>Studi <i>cross-sectional</i></p> <p>3 250 orang dewasa berusia 15-74 tahun di Kabupaten Purworejo, Indonesia</p>	<p>Pengukuran prevalensi faktor risiko disertai dengan penentuan interval keyakinan 95%</p> <p>Regresi Cox untuk mengestimasi risiko relative untuk memiliki faktor risiko pada tiap kelompok sosial ekonomi</p> <p>Regresi logistik multinomial untuk menentukan determinan terjadinya pengelompokan faktor risiko</p>
III.	<p>Apa keyakinan, norma dan nilai tentang merokok yang dimiliki oleh remaja di daerah pedesaan Purworejo?</p>	<p>Studi kualitatif dengan 6 kelompok diskusi terarah pada 49 remaja putra berusia 13-17 tahun</p>	<p><i>Content analysis</i> untuk menentukan tema-tema yang berkaitan tentang keyakinan, norma dan nilai tentang merokok pada remaja di Indonesia</p>
IV.	<p>Bagaimana pola epidemik merokok di Vietnam dan Indonesia?</p> <p>Apakah terdapat hubungan antara status sosial ekonomi dengan perubahan status merokok (menjadi seorang perokok ataupun berhenti merokok) di Indonesia dan Vietnam?</p>	<p>Studi <i>cross-sectional</i></p> <p>2 000 orang dewasa berusia 15-74 tahun, masing-masing di Kabupaten Purworejo, Indonesia dan Kabupaten Bavi, Vietnam</p>	<p>Pengukuran prevalensi merokok disertai dengan penentuan interval keyakinan 95%</p> <p>Analisis regresi Cox untuk mengestimasi kontribusi faktor sosial ekonomi terhadap perubahan status merokok</p> <p>Analisis Kaplan Meier untuk mengestimasi umur terjadinya perubahan status merokok</p>

Hasil Penelitian dan Diskusi

Sebanyak 3.079 orang (95%) dan 2.999 orang (92%) berpartisipasi dalam studi *cross-sectional* pada tahun 2001 dan 2005. Sebanyak 193 orang tidak dapat diikuti dalam studi follow-up pada tahun 2002, dan sejumlah 339 orang lainnya pada tahun 2004, karena meninggal, menolak, sakit, migrasi keluar maupun tidak dapat dijumpai pada kunjungan rumah. Status sosial ekonomi untuk studi *cross-sectional* tahun 2001 ditentukan dari hasil survei sosial ekonomi pada tahun 1999, dan untuk studi *cross-sectional* tahun 2005 digunakan hasil survei sosial ekonomi pada tahun 2005.

Hasil penelitian ini menunjukkan bahwa semua faktor risiko meningkat baik pada laki-laki maupun perempuan pada semua kelompok sosial ekonomi selama periode 2001 dan 2005. Peningkatan tersebut terutama pada prevalensi kelebihan berat badan ataupun obesitas, terutama pada responden perempuan di daerah perkotaan. Prevalensi merokok meningkat pada responden yang tinggal di daerah pedesaan dengan status sosial ekonomi rendah dan menengah. Prevalensi merokok pada laki-laki meningkat dari 53,9% (95% CI=51,1-56,7%) pada tahun 2001 menjadi 57,3% (95% CI=54,4-60,2%). Rata-rata distribusi tekanan darah bergeser ke kanan sebanyak 1 satuan mmHg (untuk tekanan darah sistolik) dan 1,6 satuan mmHg (untuk tekanan darah diastolik), dan pergeseran distribusi ini meningkatkan prevalensi tekanan darah tinggi dari 22,7% menjadi 26,7%. Indeks massa tubuh juga bergeser ke kanan sebanyak 0,8 satuan, sehingga prevalensi kelebihan berat badan ataupun obesitas meningkat dengan laju sebesar 2,2% pada perempuan dan 0,8% pada laki-laki. Wanita memiliki indeks massa tubuh yang lebih tinggi daripada laki-laki dan prevalensi kelebihan berat badan ataupun obesitas pada perempuan sebesar 12% dibandingkan 4,8% pada laki-laki. Penelitian ini juga menunjukkan bahwa risiko untuk kelebihan berat badan ataupun obesitas meningkatkan risiko tekanan darah tinggi sebanyak 1,7 kali (95% CI=1,3-2,2) pada laki-laki dan 1,6 kali (95% CI=1,3-2,0) pada wanita. Risiko untuk tekanan darah tinggi serta kelebihan berat badan ataupun obesitas meningkat pada semua kelompok sosial ekonomi, terutama pada perempuan dengan sosial ekonomi rendah, bahkan risiko wanita pada kelompok sosial ekonomi tinggi di daerah pedesaan memiliki risiko yang lebih tinggi dibandingkan dengan wanita di daerah perkotaan. Risiko untuk merokok lebih tinggi pada laki-laki di daerah pedesaan dibandingkan dengan laki-laki di daerah perkotaan, dan responden dengan sosial ekonomi yang rendah memiliki risiko 40% lebih tinggi untuk merokok dibandingkan dengan laki-laki di perkotaan.

Faktor risiko mengelompok terutama pada responden di perkotaan (16,6% responden di daerah perkotaan memiliki dua faktor risiko atau lebih dibandingkan dengan 7,3% responden di daerah pedesaan dengan sosial ekonomi rendah). Dengan peningkatan sosial ekonomi didapatkan juga adanya peningkatan prevalensi pengelompokan faktor risiko. Walaupun secara statistik tidak bermakna, risiko pengelompokan faktor risiko lebih tinggi pada kelompok sosial ekonomi tinggi di daerah pedesaan dibandingkan dengan kelompok sosial ekonomi rendah, dan risiko pengelompokan pada kelompok sosial ekonomi tinggi hanya 30-40% lebih rendah dibandingkan dengan penduduk perkotaan.

Terdapat perbedaan prevalensi merokok yang jelas antara laki-laki dan perempuan pada penelitian ini. Sebanyak 1/3 laki-laki telah merokok pada usia 15-24 tahun dan prevalensi merokok mencapai titik tertinggi pada kelompok usia 55-64 tahun. Prevalensi merokok paling tinggi pada laki-laki dengan status sosial ekonomi rendah (59,7%) dibandingkan dengan status sosial ekonomi tinggi (48,2%). Sebanyak 25% laki-laki di daerah penelitian ini telah merokok pada usia 15 tahun, dan

pada usia 20 tahun sebanyak 55% responden laki-laki telah merokok setiap hari. Laki-laki di Purworejo cenderung merokok pada usia lebih muda dan berhenti merokok pada usia lebih tua dibandingkan dengan laki-laki di Filabavi. Dua puluh tahun setelah mulai merokok setiap hari, hanya 10% perokok laki-laki di Purworejo berhenti merokok, dibandingkan dengan 15% di Filabavi. Di kedua tempat penelitian, faktor pendidikan yang rendah merupakan faktor penentu untuk menjadi perokok, dan kelompok usia tua merupakan kelompok yang lebih banyak berhenti merokok. Laki-laki dengan pendidikan rendah memiliki risiko sebanyak 1,5 kali untuk menjadi perokok dibandingkan dengan laki-laki berpendidikan tinggi di Purworejo. Di Filabavi, kelompok dengan pendapatan rendah memiliki risiko 1,4 kali lebih tinggi untuk menjadi perokok dibandingkan dengan laki-laki berpendapatan tinggi. Faktor yang mempengaruhi perokok untuk berhenti merokok adalah pendidikan tinggi dan memiliki pekerjaan selain bertani (di Purworejo), dan memiliki pendapatan tinggi (di Filabavi).

Tekanan darah sistolik dan diastolik terdistribusi dengan pola yang sama pada semua kelompok sosial ekonomi. Penduduk perkotaan memiliki tekanan darah yang lebih tinggi daripada penduduk pedesaan, dan kelompok sosial ekonomi tinggi di daerah pedesaan juga memiliki tekanan darah yang lebih tinggi daripada kelompok sosial ekonomi rendah. Prevalensi tekanan darah tinggi mencapai 28,9% pada laki-laki dan 22,2% pada perempuan di daerah perkotaan, dan sebesar 16,5% pada laki-laki dan 18,3% pada perempuan kelompok sosial ekonomi rendah di daerah pedesaan.

Distribusi indeks massa tubuh juga mengikuti distribusi tekanan darah, dan meningkat seiring dengan peningkatan status sosial ekonomi. Prevalensi kelebihan berat badan ataupun obesitas pada perempuan lebih tinggi daripada laki-laki. Sebanyak 23,7% perempuan di daerah perkotaan memiliki kelebihan berat badan ataupun obesitas dibandingkan dengan 13,3% laki-laki. Pada kelompok sosial ekonomi rendah di daerah pedesaan, prevalensi kelebihan berat badan ataupun obesitas sebesar 0,7% pada laki-laki dan 2,6% pada wanita.

Studi kualitatif pada remaja laki-laki mendapatkan empat tema yang menggambarkan keyakinan, norma sosial dan nilai-nilai tentang merokok, yang meliputi tema: (1) merokok merupakan kebiasaan kultural yang telah terintegrasi dalam kehidupan, (2) usaha untuk menjadi laki-laki, (3) cara kami merokok tidak berbahaya, dan (4) usaha menghadapi ketergantungan.

Merokok dipandang sebagai kebiasaan bagi laki-laki yang sudah berlangsung sejak tembakau dan rokok ditemukan. Responden remaja mengatakan bahwa hampir setiap orang merokok. Mereka mengakui bahwa mereka mencoba rokok pertamanya sejak usia yang sangat muda. Tinggal di lingkungan perokok merupakan faktor pemicu bagi mereka untuk merokok. Di rumah, di lingkungan sekitar rumah, bahkan di sekolah mereka selalu melihat laki-laki merokok, bahkan kadang mereka mendapatkan ancaman untuk merokok dari teman-teman mereka. Responden mengatakan bahwa mereka mendapatkan rokok pertama mereka pada saat mereka menjalankan upacara sunatan. Rokok juga dipercayai membantu penyembuhan luka sunatan, dan terutama digunakan sebagai petanda remaja memasuki kedewasaan dan maturitas sebagai laki-laki dan maskulinitas. Walaupun rokok merupakan tradisi lama di masyarakat Indonesia, merokok sering juga dikonosasikan sebagai budaya modern. Remaja tidak menyukai rokok lintingan yang sering dikonosasikan sebagai budaya lama dan hanya digunakan oleh generasi tua. Rokok lintingan diasosiasikan sebagai rokok murahan dan berkualitas rendah, memiliki rasa yang tidak enak, menyebabkan sakit kepala dan dapat menyebabkan kematian lebih awal. Merokok sering digunakan

sebagai faktor sosialisasi dan sebagai alat untuk meningkatkan status sosial ekonomi. Bagi remaja, rokok memiliki peranan yang sangat penting dalam hubungan sosial dengan teman. Remaja memiliki keyakinan yang lebih tinggi, dan mereka merasa lebih matang dan lebih kaya bila mereka merokok. Merokok merupakan refleksi solidaritas dalam satu kelompok. Merokok memiliki fungsi untuk pergaulan dan bila merokok remaja merasa 'gaul'.

Penggunaan rokok selama upacara sunatan memberikan penanda bahwa rokok digunakan sebagai petanda kematangan pada remaja menjadi seorang laki-laki dewasa. Rokok digunakan oleh remaja untuk menunjukkan identitas mereka sebagai laki-laki, dan memberikan cerminan potensi, kebijakan, dan keberanian. Remaja laki-laki mengatakan bahwa mereka harus berani merokok, bila tidak mereka akan dikatakan sebagai 'banci'. Tetapi bagi remaja yang tidak merokok, mereka memiliki keyakinan dan rasa percaya diri yang tinggi dengan status mereka yang tidak merokok. Bagi remaja yang tidak merokok, rokok dapat menyebabkan ketergantungan dan penyakit, dan rokok sering diasosiasikan sebagai perilaku orang yang tidak baik. Remaja mengatakan bahwa perempuan yang merokok adalah gambaran perilaku yang tidak biasa dan tidak baik, dan hanya dilakukan oleh wanita yang berkelakuan tidak baik.

Remaja merasa perilaku merokok mereka tidak berbahaya bagi kesehatan mereka, walaupun mereka mengetahui bahaya merokok. Pengetahuan mereka tentang bahaya merokok terutama didapatkan dari informasi di bungkus rokok dan dari iklan rokok. Di sekolah mereka jarang mendapatkan informasi tentang bahaya rokok dari guru. Mereka mengatakan bahwa merokok kurang dari satu atau dua bungkus rokok tidak akan berbahaya bagi kesehatan mereka, dan mereka merasa rokok produksi lokal yang tidak mencantumkan peringatan kesehatan adalah tidak berbahaya bagi kesehatan. Remaja yang tidak merokok menghindari rokok karena mereka ingin lebih sehat tanpa rokok, dan menghindari risiko penyakit jantung dan ketergantungan. Orang tua sering melarang anak-anaknya untuk merokok karena 'mereka masih terlalu muda untuk merokok, dan jantung anak-anak masih belum kuat untuk merokok'.

Remaja perokok merasa bahwa mereka sudah tergantung pada rokok, dan mereka tidak dapat mengendalikan keinginan mereka untuk merokok walaupun orang tua mereka melarang mereka untuk merokok. Waktu ditunjukkan iklan rokok yang menggambarkan tentang kehidupan 'cowboy' di Amerika, remaja mengatakan perokok adalah 'pahlawan yang kecanduan'. Ketergantungan terhadap rokok digambarkan sebagai suatu proses. Remaja mengatakan 'rokok pertama agak pahit, rokok kedua terasa lebih enak, rokok ketiga terasa enak, dan rokok keempat sudah membuat saya tergantung pada rokok'. Mereka menggambarkan ketergantungan mereka sebagai 'pusing', 'bingung', 'lemah', 'marah', dan 'ngantuk'. Remaja mengatakan bahwa mereka memiliki keinginan untuk berhenti merokok, namun sangat sulit bagi mereka untuk berhasil.

Tidak adanya data epidemiologis yang valid dan reliabel di negara berkembang merupakan kendala utama untuk mempelajari dinamika dan kesehatan populasi di negara berkembang. Di dalam jaringan INDEPTH, usaha sistem surveilens demografi untuk mengumpulkan data demografi, kesehatan dan kematian secara rutin memberikan kontribusi yang cukup besar dalam penyediaan data epidemiologis yang dapat dipercayai. Penelitian dalam tesis ini dibangun dengan berdasarkan infrastruktur yang sudah ada di sistem surveilens demografi di Kabupaten Purworejo, dan tesis ini menunjukkan bagaimana surveilens faktor risiko dapat diintegrasikan pada sistem surveilens demografi (12). Surveilens faktor risiko dalam sistem surveilens demografi memungkinkan peneliti

memantau perkembangan faktor risiko pada periode waktu yang berbeda-beda sehingga dapat digunakan untuk mempelajari transisi epidemiologi seiring dengan transisi demografi dan transisi ekonomi.

Hasil penelitian dalam tesis ini memberikan tambahan pengetahuan dan pemahaman tentang distribusi faktor risiko penyakit kronis pada kelompok sosial ekonomi yang berbeda-beda di Indonesia. Hasil penelitian yang dilakukan di Kabupaten Purworejo ini memberikan gambaran distribusi faktor risiko yang sama dengan hasil Survei Kesehatan Rumah Tangga yang dilakukan pada skala nasional yang mencakup sebanyak 13.000 orang di beberapa propinsi di Indonesia. Pada era desentralisasi ini, pihak Dinas Kesehatan Kabupaten memiliki peranan yang sangat strategis untuk melakukan surveilans faktor risiko penyakit kronis. Pelaksanaan surveilans ini juga sangat penting untuk memberikan data baseline yang dapat digunakan untuk memantau dan keberhasilan intervensi untuk menangani masalah ini. Berdasarkan hasil penelitian ini, suatu intervensi dengan pendekatan komunitas yang terintegrasi harus dikembangkan di Indonesia. Intervensi harus melibatkan semua sektor yang terlibat dalam penanganan penyakit kronis, baik profesional kesehatan, industri, pendidikan, pertanian dan lain-lain. Partisipasi komunitas sangat penting untuk menjamin sustainability program intervensi yang dilakukan. Dan sangat penting untuk mengintegrasikan program pencegahan dan pengendalian penyakit kronis ini dalam sistem kesehatan nasional dan sistem pelayanan kesehatan yang sudah ada untuk mencapai sinergisme yang lebih baik dalam pengendalian penyakit menular dan penyakit kronis.

Hasil penelitian kualitatif ini menunjukkan perlunya mempertimbangkan aspek kultural dalam perencanaan program intervensi berbasis komunitas. Tantangan utama dalam pengendalian merokok adalah bagaimana membuat perilaku merokok sebagai perilaku yang tidak 'biasa' dalam masyarakat. Hambatan-hambatan kultural dalam usaha pengendalian merokok perlu diidentifikasi, seperti: (1) bagaimana menghilangkan konotasi maskulinitas dari perilaku merokok, (2) strategi penolakan apa yang perlu dimiliki oleh remaja untuk menolak tawaran merokok yang sesuai dengan budaya Indonesia, dan (3) bagaimana menghindarkan remaja perempuan dari rokok tanpa menghilangkan konotasi modernitas dari diri mereka. Tantangan utama adalah bagaimana memberdayakan perempuan dalam usaha pengendalian rokok di Indonesia yang mengandung budaya paternalitas.

Kesimpulan

Tesis ini menyimpulkan bahwa penduduk pedesaan di Indonesia tidak terbebas dari beban faktor risiko penyakit kronis yang sudah muncul. Pola distribusi faktor risiko pada kelompok sosial ekonomi yang berbeda memberikan gambaran tentang lingkaran setan antara kemiskinan dan penyakit kronis. Pemahaman faktor risiko pada konteks lokal melalui studi kualitatif memberikan gambaran tentang aspek kultural yang mempengaruhi proses adopsi faktor risiko di masyarakat. Pemahaman ini memungkinkan pengembangan intervensi yang tepat sesuai dengan budaya masing-masing. Penggabungan sistem surveilans demografi dan sistem surveilans faktor risiko memberikan jawaban terhadap pertanyaan epidemiologi dasar tentang penyakit kronis, yang dapat digunakan untuk bahan advokasi dalam pembuatan kebijakan publik di bidang kesehatan untuk pencegahan dan penanggulangan penyakit kronis. Dengan bukti-bukti efektivitas program pencegahan dan penanggulangan penyakit kronis, Indonesia harus mulai merencanakan program intervensi, serta menerjemahkan bukti-bukti tersebut menjadi suatu tindakan kesehatan masyarakat

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