Reducing the burden of Cardiovascular Disease in Indonesia

Evidence Review

The George Institute for Global Health

Pfizer

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Acronyms

ACS	Acute coronary syndrome
BPJS	Badan Penyelenggara Jaminan Sosial Kesehatan
CHD	Coronary Heart Disease
CVD	Cardiovascular disease
DALYS	Disability-adjusted life years
ESCAP	Economic and Social Commission for Asia and the Pacific
HDL-C	High-density lipoprotein cholesterol
IHD	Ischaemic heart disease
IMRSSP	Indonesian Mortality Registration System Strengthening Project
JKN	Jaminan Kesehatan Nasional
LDL-C	Low-density lipoprotein cholesterol
NCD	Non-communicable disease
PCI	Percutaneous coronary intervention
STEMI	ST-segment elevation myocardial infarction
UHC	Universal Health Coverage
WHO	World Health Organization
YLL	Years of life lost due to premature mortality

List of Figures

Executive Summary

1. Indonesia has a population of 260 million and over 10% of the population live in poverty.
2. Cardiovascular disease (CVD) is responsible for 37% of deaths in Indonesia. Stroke is the leading cause, followed by coronary heart disease, and diabetes.
3. There are considerably more years of life lost due to premature mortality from stroke, coronary heart disease, and diabetes in Indonesia when compared with neighbouring regions.
4. Modifiable risk factors (high blood pressure, high cholesterol, diabetes, obesity, and tobacco) are the main contributing factors to the burden of cardiovascular disease in Indonesia. The trend of increasing levels of risk factors over time indicates CVD health burden in Indonesia is likely to increase further.
5. Population health surveys found:
    - 65% of males smoke
    - Over a quarter of the population have high blood pressure
    - A third have high cholesterol and a third are overweight
    - 8% of females have diabetes
6. Universal healthcare coverage will provide a comprehensive level of cardiovascular disease care for all Indonesians however, healthcare personnel and services for CVD are currently inadequate. In 2015-16 there was an estimated 3.8 neurologists, 0.4 endocrinologists and 1.5 cardiologists per 1,000,000 and there were only 30 stroke units across Indonesia, with the majority of specialists and specialist services provided in Jakarta.
7. Primary care has insufficient capacity to diagnose, monitor or manage cardiovascular diseases including diabetes. Strengthening primary care to manage CVDs through existing established community health centre networks is a potential way of addressing this.
8. Medications for primary and secondary prevention of CVD are made available under the Jaminan Kesehatan Nasional (JKN) however, issues with coordination between levels of government and inadequate staffing have led to inequalities with regards to availability and access to medicines across Indonesia.
9. Some studies have identified poor awareness, treatment and control of cardiovascular risk factors. Addressing these gaps could reduce and prevent cardiovascular disease. Over half of participants with high blood pressure were unaware of their diagnosis and untreated and over half of patients with diabetes were untreated.
10. There is evidence to suggest that patients present late in their disease course. A large percentage of the population are estimated to have undiagnosed diabetes and a first presentation with established diabetes, with secondary complications, is common.
11. Studies revealed that patients with ST elevation myocardial infarction (STEMI) presented late to hospital and many (~60%) did not receive reperfusion therapies with high (~13%) in-hospital mortality among these patients.
12. Focussing on prevention and treatment of risk factors in primary care and implementing protocols for acute stroke and heart attack management could be some practical strategies to address the burden of CVDs. Improving data collection for health service utilisation and deaths will help monitor strategies for reducing the cardiovascular disease burden and assist in directing resources where they are most needed.

Basic statistics of Indonesia
Population density

Indonesia is the most populated nation in South-East Asia and home to 260 million people. Half (54%) of the population live in urban areas, with the area around West Java the most populated region of Indonesia with over 1,200 people per square kilometre (Figure 1),(1,2).

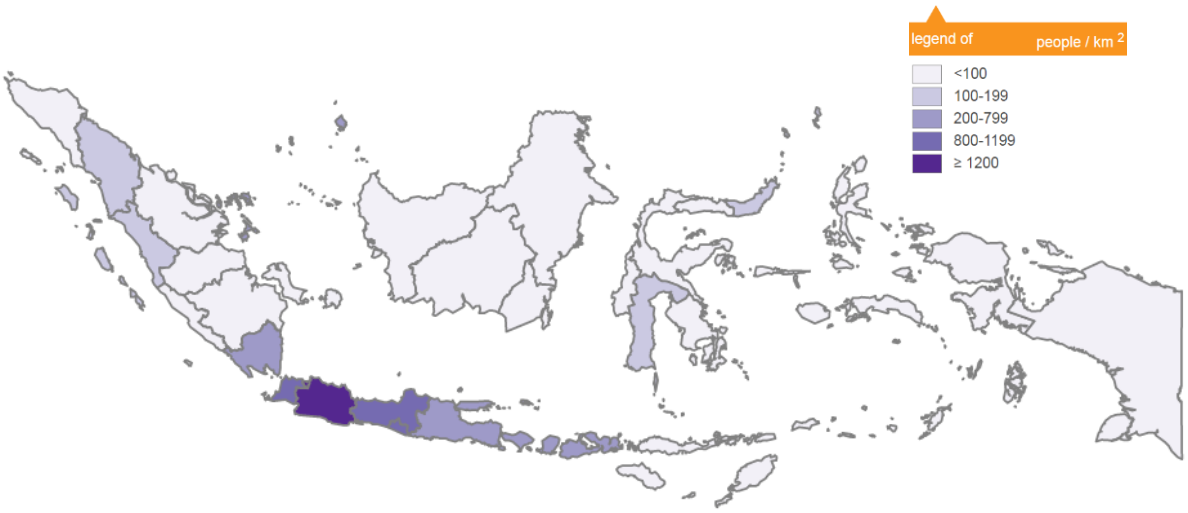

Figure 1 Population density in Indonesia 2010, people/km^2 Source: 2010 Population Census Data - Statistics Indonesia

Socioeconomic status

Although Indonesia's poverty levels are steadily declining (Figure 2),(3) in 2016 approximately 28 million people were still living in poverty and an additional 68 million were classified as near poor, using an international poverty line of $2USD a day.(4) Poverty is more prevalent in rural areas (14.1%) compared to urban areas (7.8%; Figure 2). The greatest poverty is observed on the islands of Java and Sumatra.

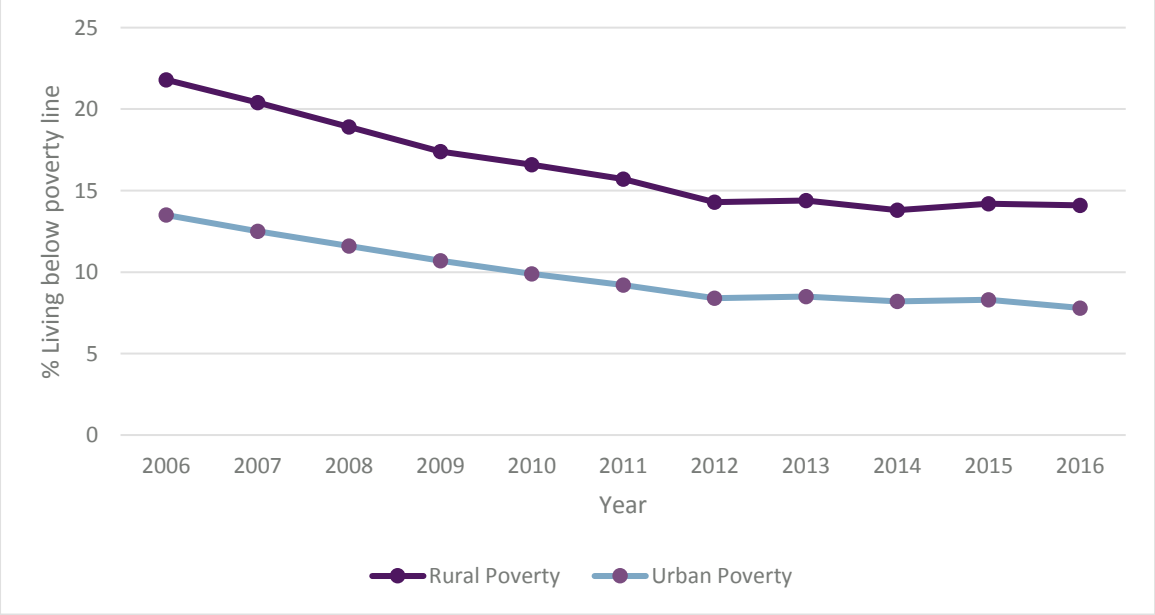

Figure 2 Change in prevalence of poverty in urban and rural regions of Indonesia 2006-2016

Life expectancy

In 2015, the average life expectancy for males was 67.2 years and for females 71.4 years. In addition, it was estimated that on average males would enjoy 60.7 (90.3%) of these years in good health and 6.5 of these years in poor health; for females this was 63.7 years (89.2%) and 7.7 years of poor health.(1)

Age distribution and future aging population

The Indonesian population is predominantly young (Figure 3). The 2010 census shows 28.9% of the population is younger than 15 years and 7.6% of the population was aged 60 years and over.(2) The Economic and Social Commission for Asia and the Pacific (ESCAP) estimates that 8.5% of the population are currently aged 60 years and older.(1) In the coming decades there will be a transition to approximately one-fifth of the population being aged over 60 years in 2050.(1)

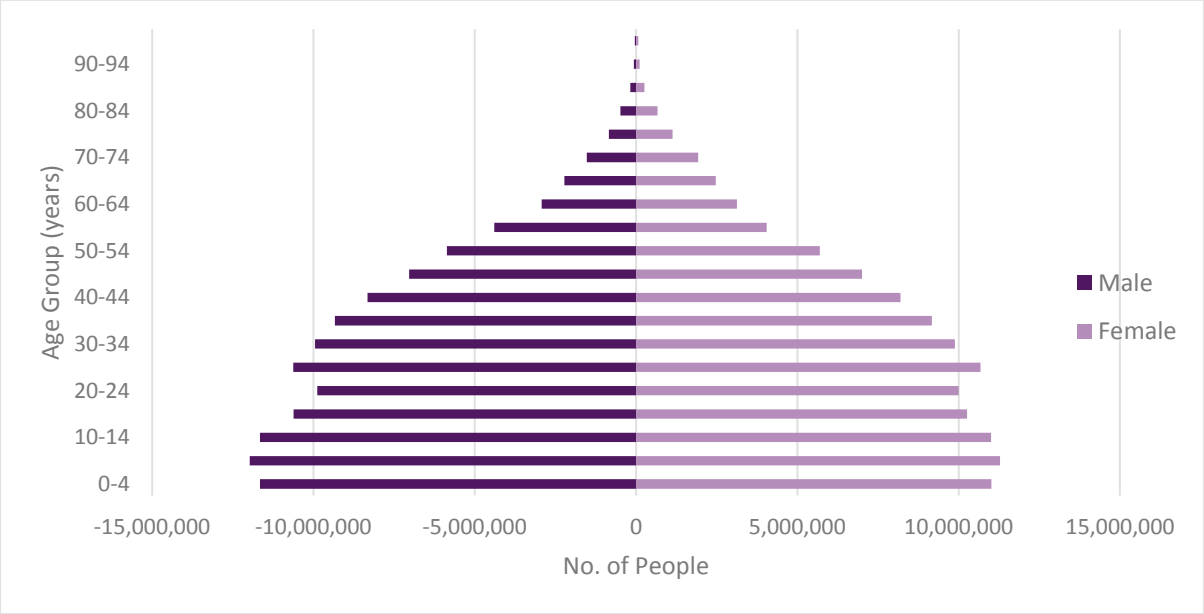

Figure 3 Population pyramid, Indonesia 2010. Source: 2010 Population Census Data - Statistics Indonesia

Data sources

The Riskedas survey was a nationally representative survey conducted in 2013 by the Indonesian government that included 722,330 participants aged ≥15 years from across Indonesia.(5,6) The survey collected information on presence of particular diseases, accidents, healthcare access and use, lifestyle (nutrition, physical activity, smoking, alcohol) and knowledge and attitudes towards health. Blood samples were collected from 40,250 participants for testing biochemical markers such as cholesterol and glucose. Households were selected for inclusion using a probabilistic method of sampling using the 2010 Census of Indonesia. This approach ensured a broadly representative sample of adults.

Death registration became compulsory in 2006. Deaths are registered within 30 days at the local administration office. Supporting documents are needed from the hospital or local health centre. Vital statistics are collected at district, province and national levels. Cause of death is not legally required to be reported, but the death record allows cause to be recorded as one of the following: general disease/sickness in elderly, plague, accident, crime, suicide, other (specified).(7) There have been more recent efforts made to improving the quality and completeness of mortality data, through the Indonesian Mortality Registration System Strengthening Project (IMRSSP).(7) This includes improvements in: 1) the comprehensiveness of data capture on death; and 2) recording the cause of death including the categorisation of types of causes of death. To improve information on cause of death, for example, medical certificates were acquired for approximately 20% of deaths that occurred in hospitals and the method of verbal autopsy utilised for determining cause of death in the community.(8)

Burden of CVD in Indonesia

Cardiovascular diseases account for 37% of deaths in Indonesia (Figure 4). The burden of disease for 2012 was approximately 18,000 disability-adjusted life years (DALYS), of which 17,500 were years of life lost due to premature mortality (YLL) and the remainder due to years of healthy life lost due to disability (YLD).(9)

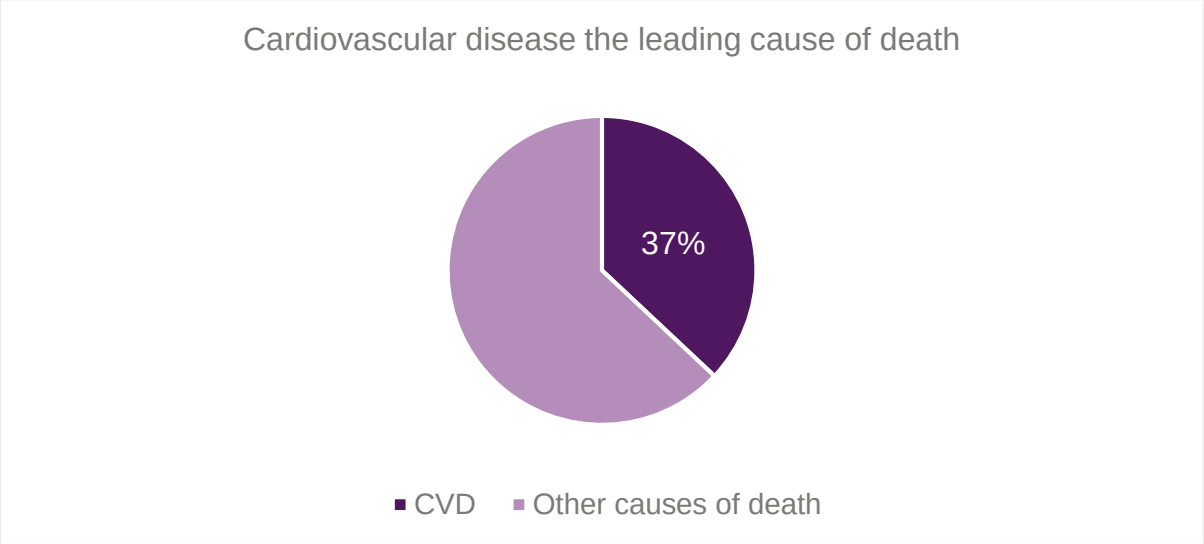

Figure 4 Proportion of deaths in Indonesia attributable to cardiovascular disease and other causes

Years of life lost due to premature mortality from cerebrovascular disease (stroke), coronary heart disease, and diabetes in Indonesia are considerably greater than those observed in many neighbouring regions (Figure 5).(10)

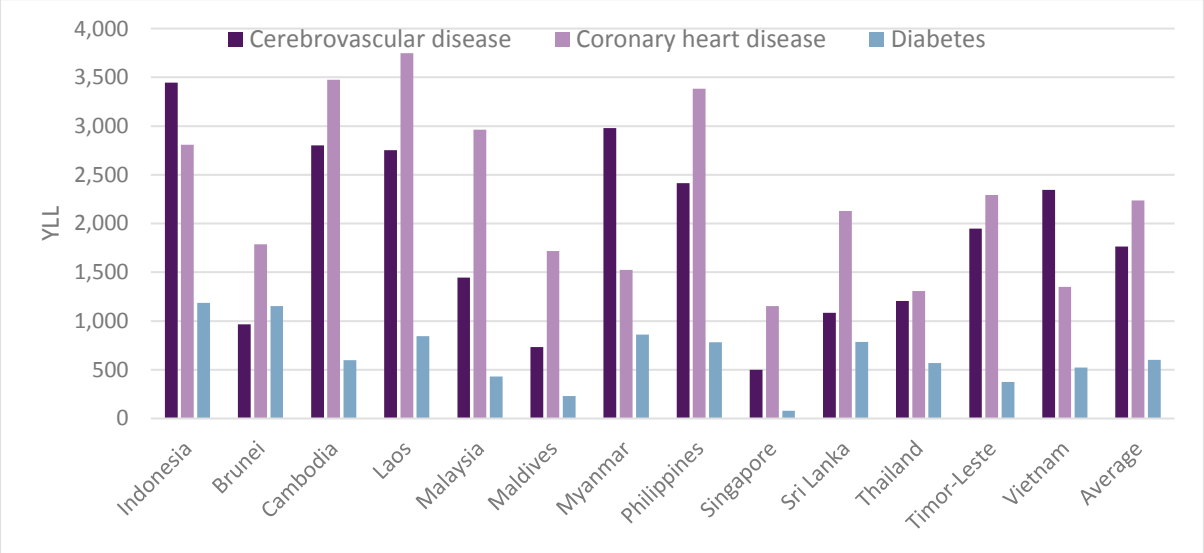

Figure 5 Years of life lost due to premature mortality in 2015, per 100,000, age-standardised

Stroke

Stroke is the leading cause of death in Indonesia.(9) Estimates of stroke mortality vary due to limited information collected via death registrations. We therefore rely on epidemiological modelling for national estimates. The World Health Organization (WHO) estimates stroke was the cause of death for 328,500 people in 2012; the leading cause of death (21% of deaths).(9) The true rates may be higher than WHO estimates – the modelled age-standardised death rates were 95 per 100,000 people for males and 94 per 100,000 for females however, 2007 data from the Indonesian Mortality Registration System Strengthening Project (IMRSSP) reported age-standardised death rates of 315 per 100,000 for males (Gorontalo: 226 per 100,000; Lampung: 254 per 100,000) and 312 per 100,000 for females (Gorontalo: 226 per 100,000; Lampung: 209 per 100,000) in Central Java.(8)

Non-fatal stroke prevalence is also high in Indonesia, affecting 1.2% of those included in the Riskedas 2013 survey.(5) DI Yogyakarta, Jawa Timur (East Java), Sulawesi Tengah (Central Sulawesi), Sulawesi Selatan (South Sulawesi), Sulawesi Barat (West Sulawesi) had more than 1.5% of the population reporting non-fatal stroke diagnosis or symptoms. Nusa Tenggara Barat, Nusa Tenggara Timur, Sulawesi Tengah, Sulawesi Selatan, Sulawesi Barat, Maluku, Maluku Utara, and Papua all showed less than half of those with suspected stroke had a doctor's diagnosis (Figure 6).(5)

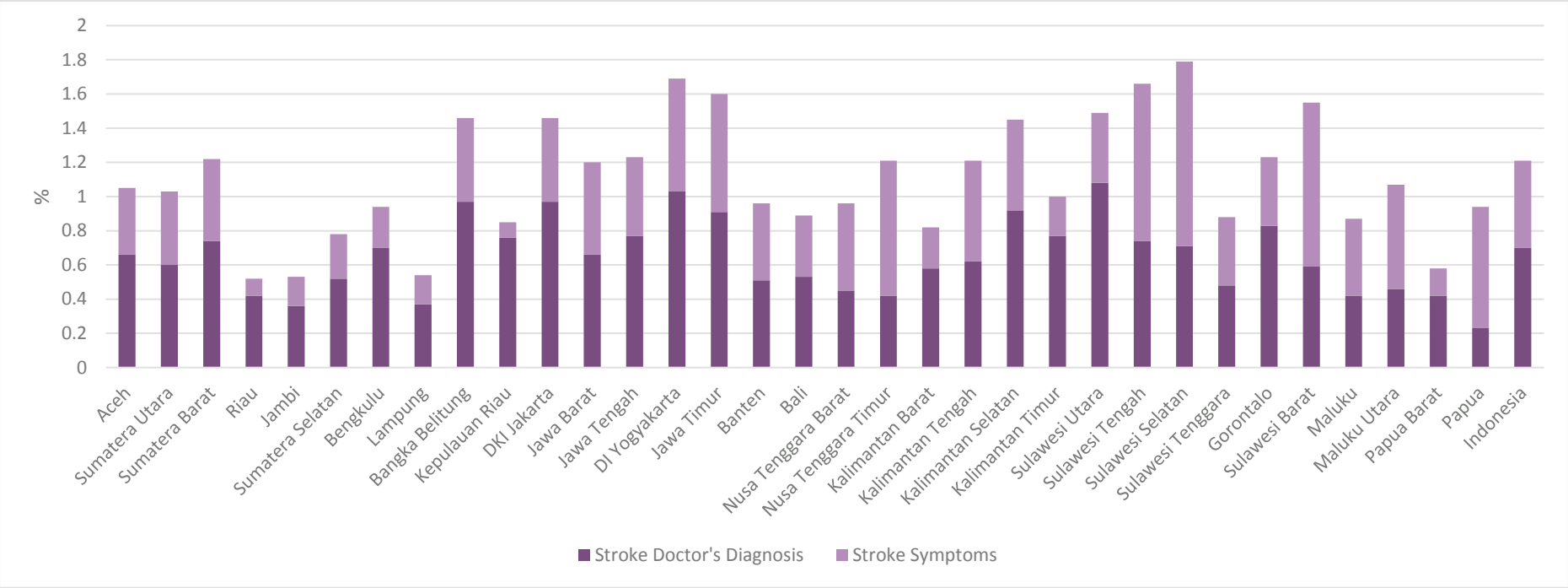

Figure 6 Proportion with suspected stroke diagnosed by a doctor or presence of stroke symptoms in Indonesian provinces and overall

A diagnosis of stroke increased with age, with over 4% having stroke diagnosed by a doctor in people aged 75 years and older. Non-fatal stroke was approximately equal between males and females, though a slightly higher proportion of males had a doctor's diagnosis. Stroke affected a slightly higher proportion of urban dwellers (1.3%) compared with rural residents (1.1%; Figure 7).(5)

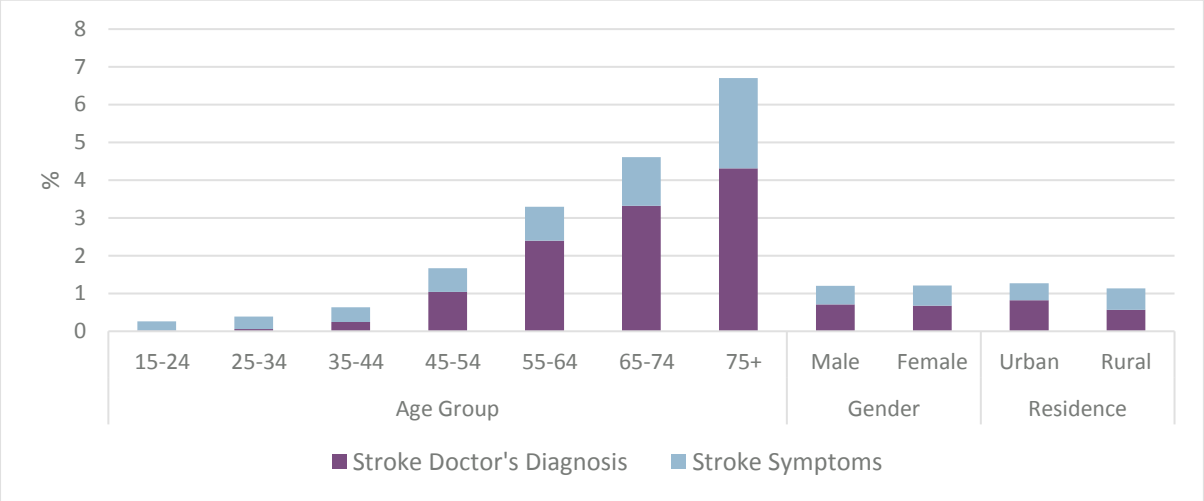

Figure 7 Proportion with suspected stroke diagnosed by a doctor or presence of stroke symptoms by age group, gender, and location of residence

Suspected non-fatal stroke was highest in those who had no education, of whom half had no formal diagnosis but experienced stroke symptoms. There appeared to be a downward trend in the proportion of people with suspected non-fatal stroke with increasing socioeconomic status (SES). Those in higher SES groups tend to have a higher proportion of doctor's diagnosis than those in lower SES groups (Figure 8).

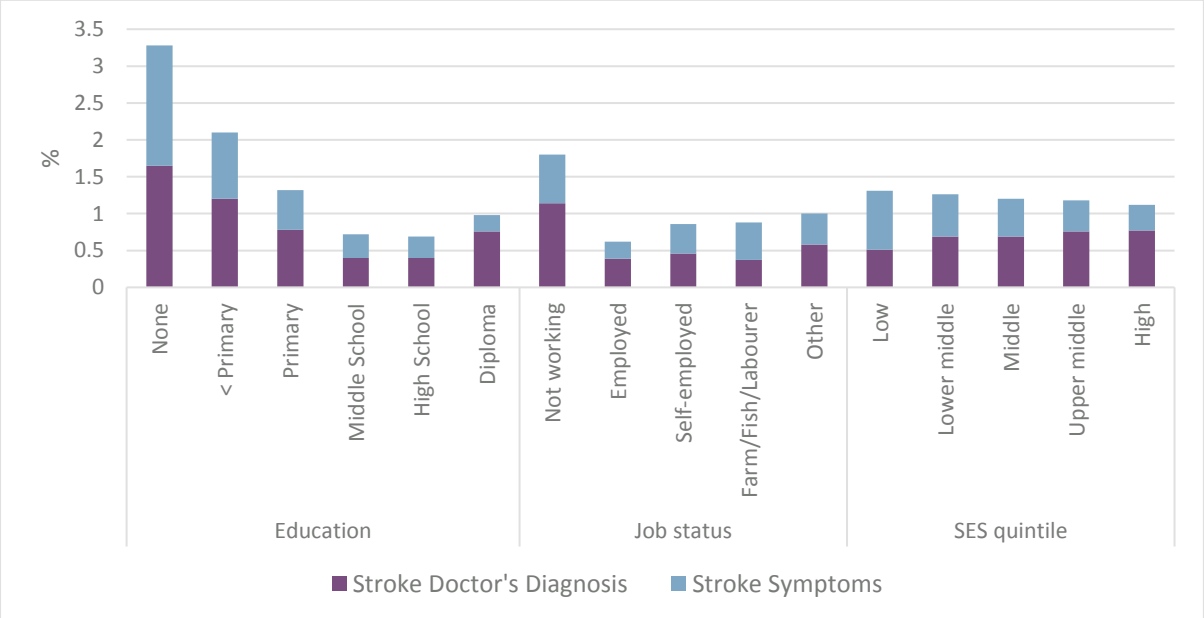

Figure 8 Proportion with suspected stroke diagnosed by a doctor or presence of stroke symptoms by education level, job status, and socioeconomic quintile

Coronary heart disease

Coronary heart disease (CHD) was the second leading cause of death in 2012 representing 9% of deaths (138,400 people).(9) Estimates from the Central Java sites of the IMRSSP places CHD (7% of deaths) third after stroke and diabetes in the urban municipality of Surakarta, and fifth (6% of deaths) in the more rural district of Pekalongan (after stroke, other heart diseases, chronic respiratory disease, and tuberculosis).(7) This suggests there is substantial variation in the frequency of ischaemic heart disease and other competing causes of death between urban and rural settings in Indonesia.

Doctor diagnosed CHD was reported by 0.5% of Riskesdas 2013 participants. The highest proportion with this diagnosis was in Sulawesi Tengah (0.8%) and several regions (Riau, Jambi, Lampung, Nusa Tenggara Barat, Maluku Utara, Papua) had very low levels of diagnosis (0.2%; Figure 9). The highest levels of symptoms were reported in Nusa Tenggara Timur with 4.1% followed by Sulawesi Tengah with 3%, compared with 1% for all of Indonesia.(5)

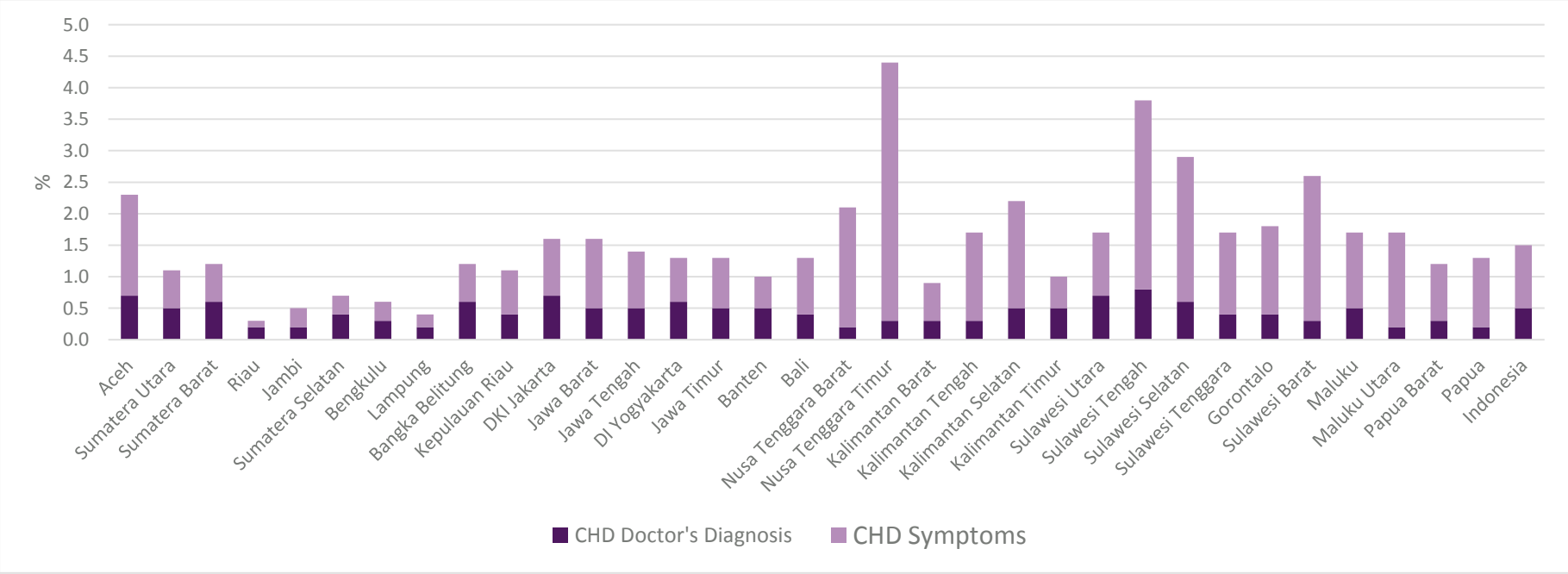

Figure 9 Suspected coronary heart disease diagnosed by doctor or presence of coronary disease symptoms in Indonesian provinces and overall

There was a trend of suspected CHD that increased with age, reaching a peak of 3.6% in survey respondents aged 65-74 years and then it decreased to 3.2% in those aged 75 years and older. A higher proportion of females than males had a diagnosis (0.5% vs. 0.4%) and symptoms (1.1% vs. 0.9%) of CHD. Rural participants had a higher proportion of CHD, leading to a higher level of suspected CHD overall. Urban participants had a higher proportion of CHD diagnosis provided by a doctor (Figure 10).

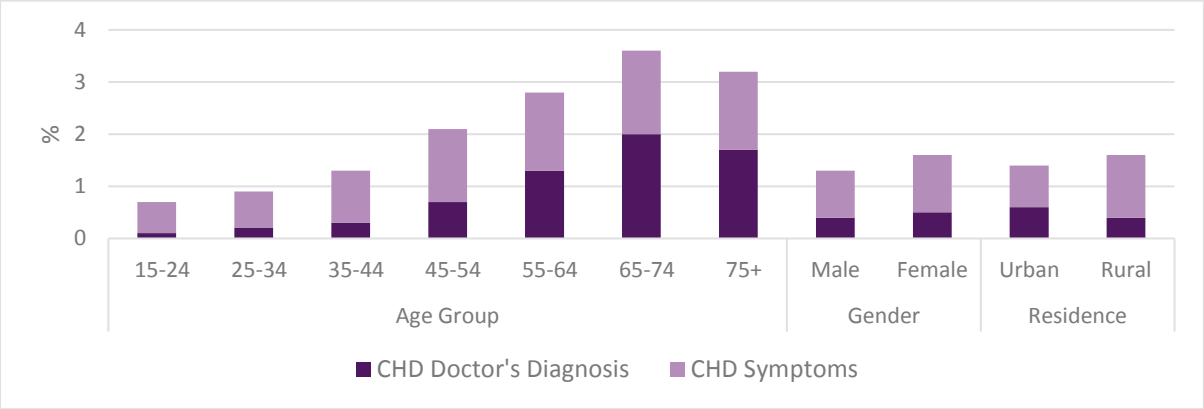

Figure 10 Suspected coronary heart disease diagnosed by doctor or presence of coronary disease symptoms by age, gender, and location of residence

There appeared to be a decreasing trend in suspected CHD with increasing levels of education. Patients with lower SES were more likely to have a diagnosis based on CHD symptoms (Figure 11) and this may impact on the accuracy of the overall rates of CHD. Farmers, fishermen and labourers had the highest levels of coronary disease symptoms (1.3%) and lowest level of diagnosis by doctor (0.3%). There was a downward trend in coronary disease symptoms and increasing trend in doctor's diagnosis of coronary disease with increasing socioeconomic status.

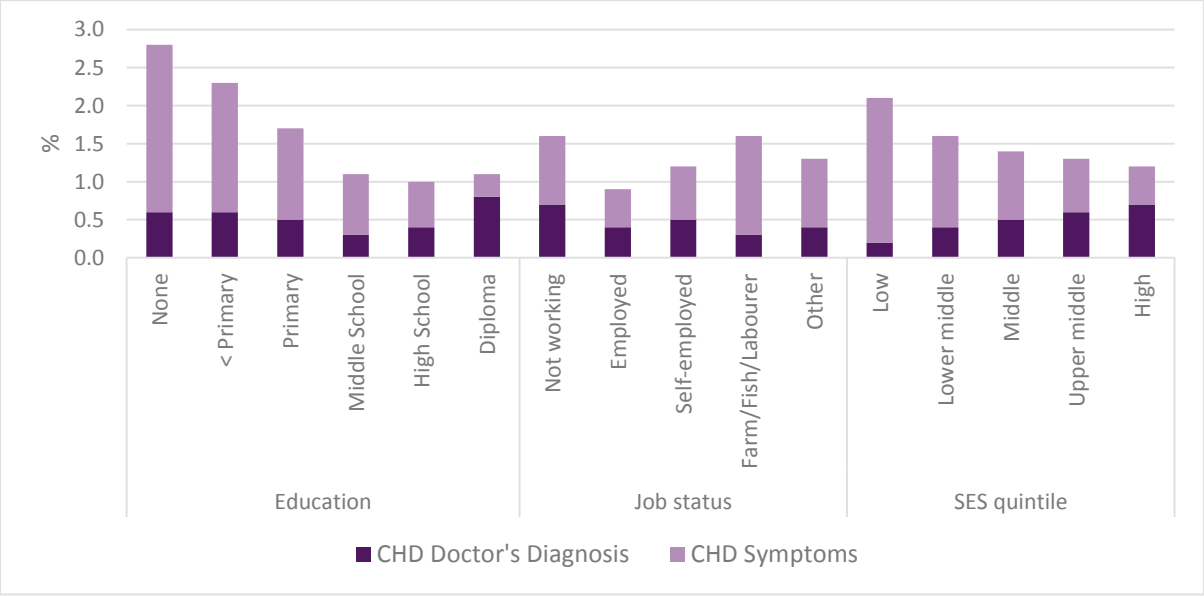

Figure 11 Suspected coronary heart disease diagnosed by doctor or presence of coronary disease symptoms by education, job status, and socioeconomic quintile

Diabetes

Diabetes mellitus was the third leading cause of death with 6% of deaths in 2012 (100,400 people).(9) The IMRSSP data from Central Java listed diabetes as the second leading cause of death in the urban municipality of Surakarta (8.5% of deaths) but it was not in the top ten causes for the rural district of Pekalongan.(7)

Overall in Indonesia, 1.5% reported a doctor's diagnosis of diabetes and 0.6% reported symptoms. In Nusa Tenggara Timur, Sulawesi Tengah, Sulawesi Selatan, Sulawesi Barat, Maluku, and Papua less than half of those with suspected diabetes had a doctor's diagnosis (Figure 12).(5)

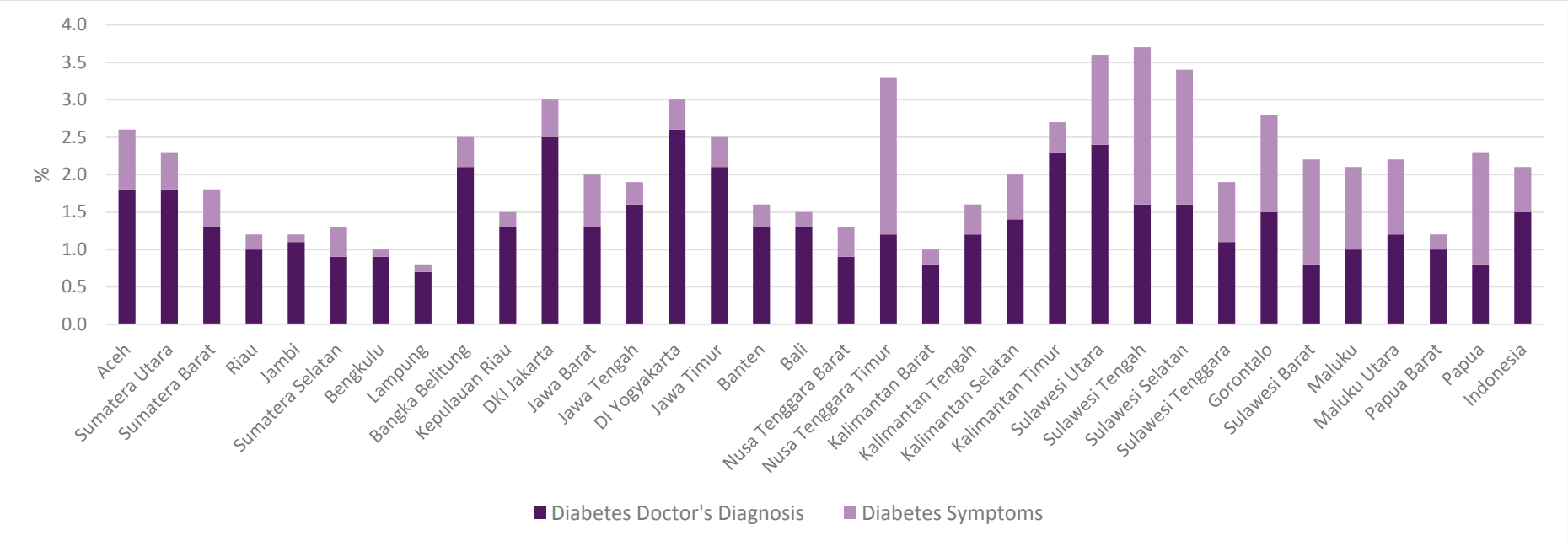

Figure 12 Proportion with diabetes diagnosed by a doctor and proportion reporting symptoms of diabetes in Indonesian provinces, and overall

There was a trend of suspected diabetes increasing with age. It peaked at 55-64 years, representing 5.5% of the respondents, then decreased to 3.5% in those aged 75 years and older (Figure 13). A higher proportion of females than males had a doctor's diagnosis of diabetes, though similar proportions reported symptoms. Urban dwellers had higher rates of diabetes than rural residents.(5)

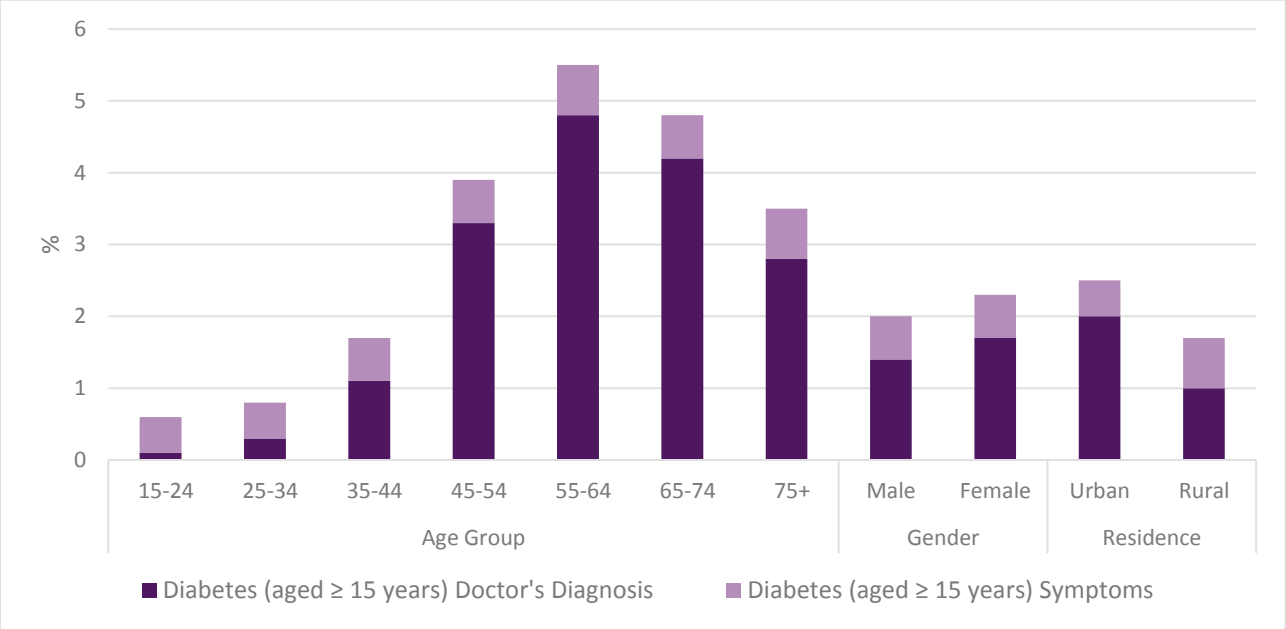

Figure 13 Proportion with diabetes diagnosed by a doctor and proportion reporting symptoms of diabetes by age, gender, and location of residence

Those with a diploma had the highest proportion of diagnosed diabetes (2.5%). Farmers, fishermen and labourers had the lowest levels of suspected diabetes and only half had a doctor's diagnosis (Figure 14).

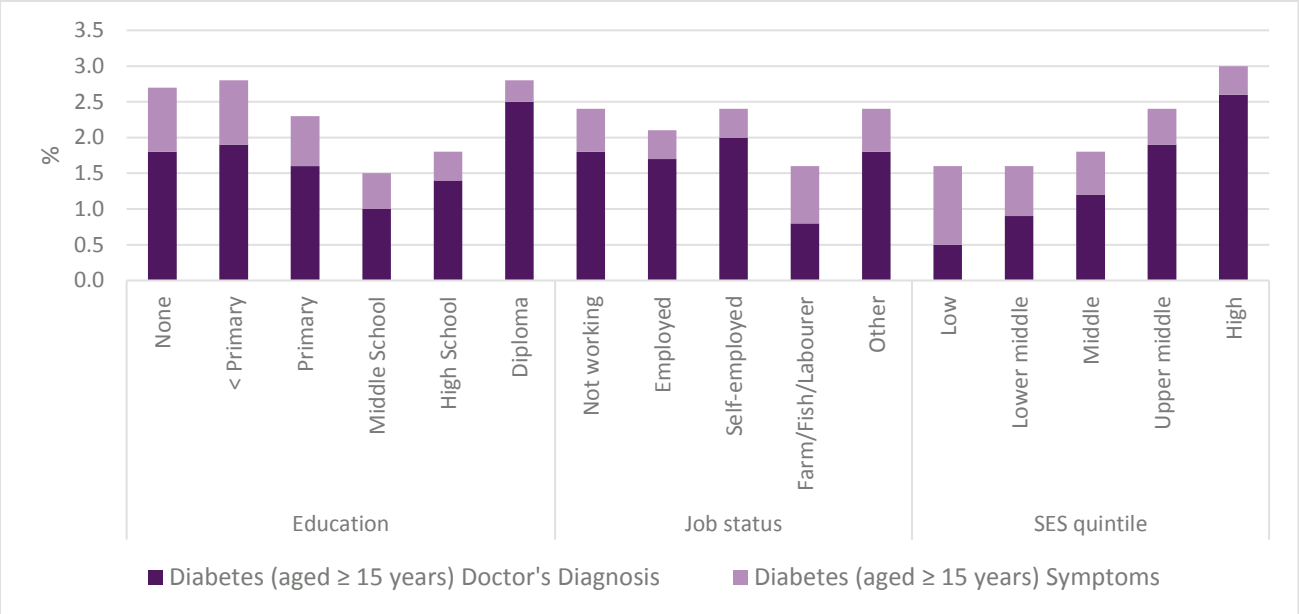

Figure 14 Proportion with diabetes diagnosed by a doctor and proportion reporting symptoms of diabetes by education level, job status, and socioeconomic quintile.

Prevalence of cardiovascular risk factors

A substantial burden of modifiable cardiovascular risk factors that contribute to the high cardiovascular disease burden in Indonesia has been demonstrated.(6) Sixty-five percent of males smoked tobacco, 30% had high cholesterol, 23% had high blood pressure, 20% were overweight and 6% had diabetes. In females, 2% smoked tobacco, 40% had high cholesterol, 29% had high blood pressure, 33% were overweight, and 8% had diabetes.(6)

High blood pressure

High blood pressure is a key determinant of stroke. Studies from Indonesia estimated population attributable risks for high blood pressure to be 37% for strokes in males, 39% for strokes in females, 20% for CHD in males and 25% for CHD in females.(6)

The Riskesdas study found over a quarter of Indonesians had high blood pressure, measuring above 140/90mmHg.(5) Bangka Belitung (30.9%) and Kalimantan Selatan (30.8%) had the highest proportions while Papua (16.8%) had the lowest levels of high blood pressure (Figure 15).

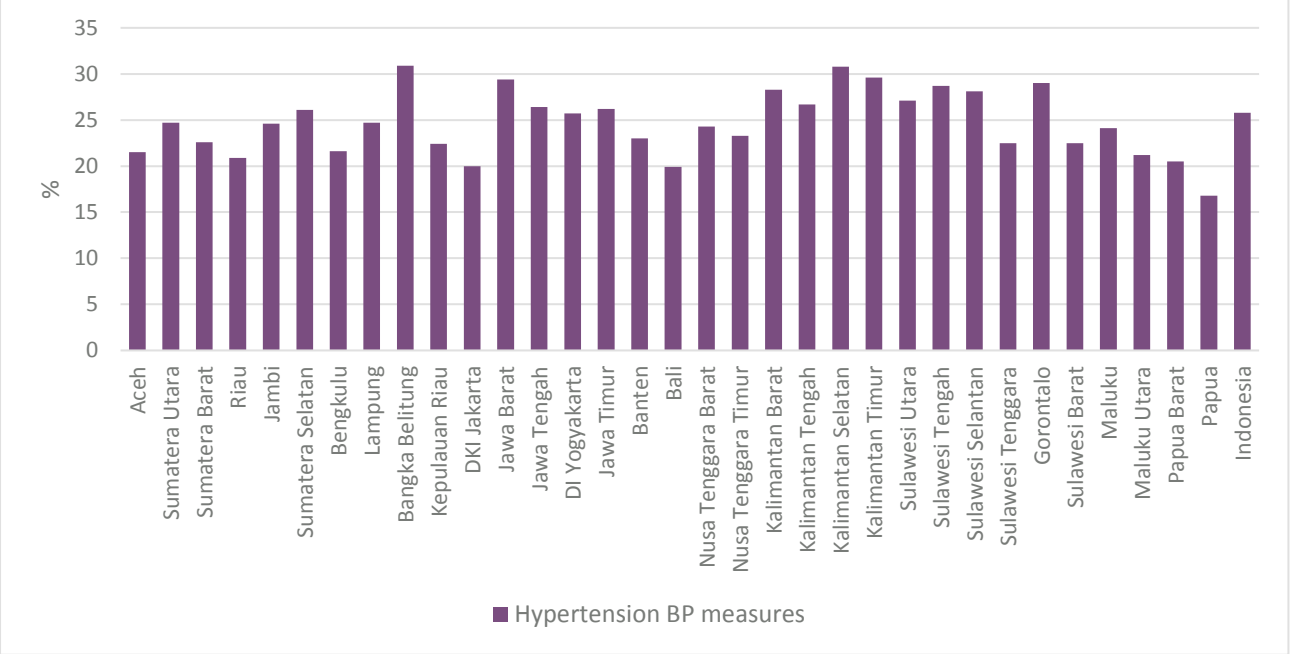

Figure 15 Proportion with measured high blood pressure in Indonesian provinces, and overall

The proportion with high blood pressure increased with age – increasing from 8.7% in 15-24 year-olds to 63.8% in those aged 75 years and older (Figure 16). More females had high blood pressure than males (28.8% vs. 22.8%). There was very little difference in the proportions based on location of residence.(5)

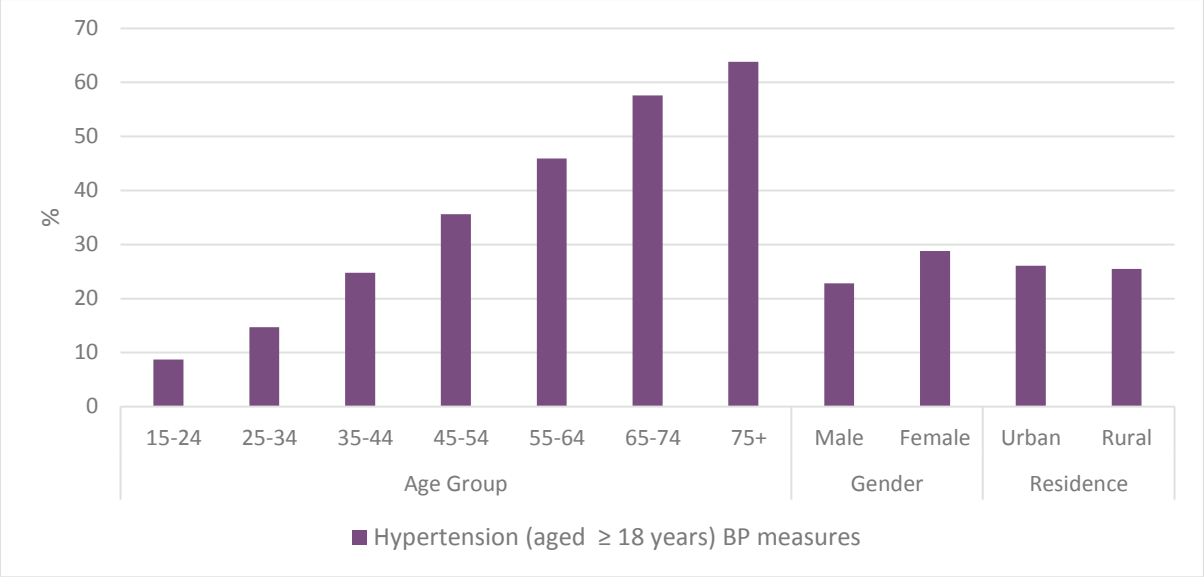

Figure 16 Proportion with measured high blood pressure by age, gender and location of residence

There was a downward trend in the proportion of people with high blood pressure as levels of education increased. High blood pressure affected 42% of people with no education. This decreased to 18.6% in those completing high school and increased to 22.1% in those with diploma (Figure 17). Proportions of those with high blood pressure by job status were highest in those not working and lowest in those employed. Proportions were approximately equal across socioeconomic quintiles. (5)

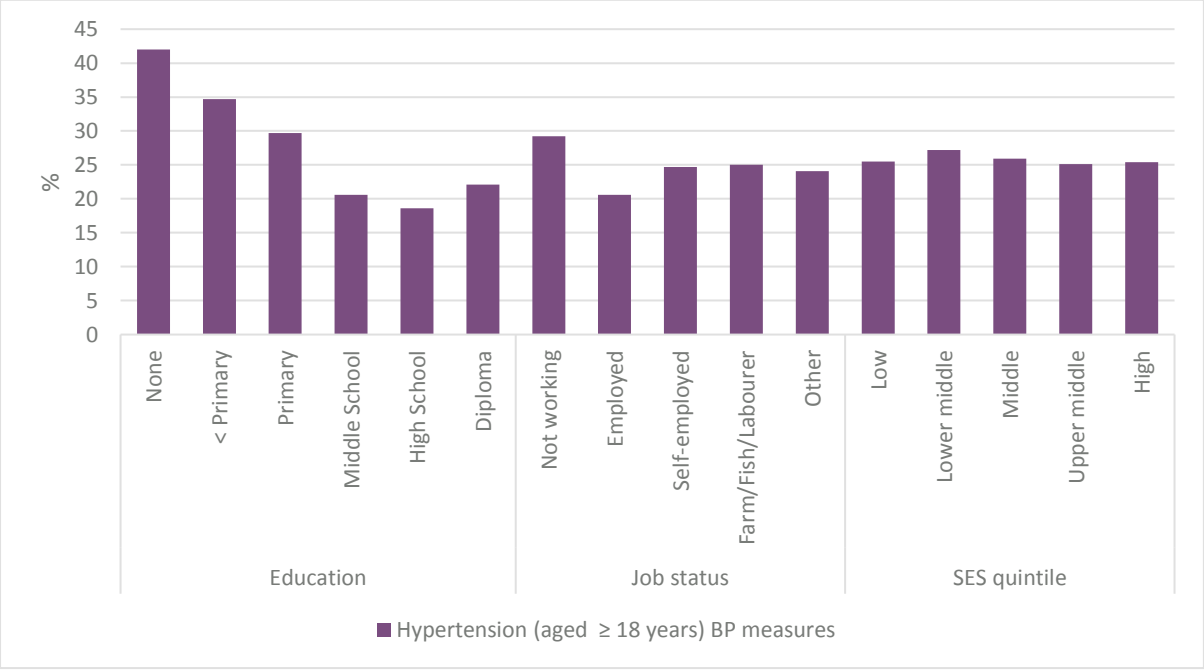

Figure 17 Proportion with measured high blood pressure by education level, job status, and socioeconomic quintile.

High cholesterol

Total cholesterol

For those Riskesdas participants who completed the biomedical measures, there was an increasing trend in borderline and high total cholesterol measures with age. This peaked at 50.7% in those aged 55-64 years (Figure 18).(5) A higher proportion of females than males had borderline and high cholesterol levels. There was an increasing trend in borderline and high total cholesterol levels with increasing socioeconomic status.

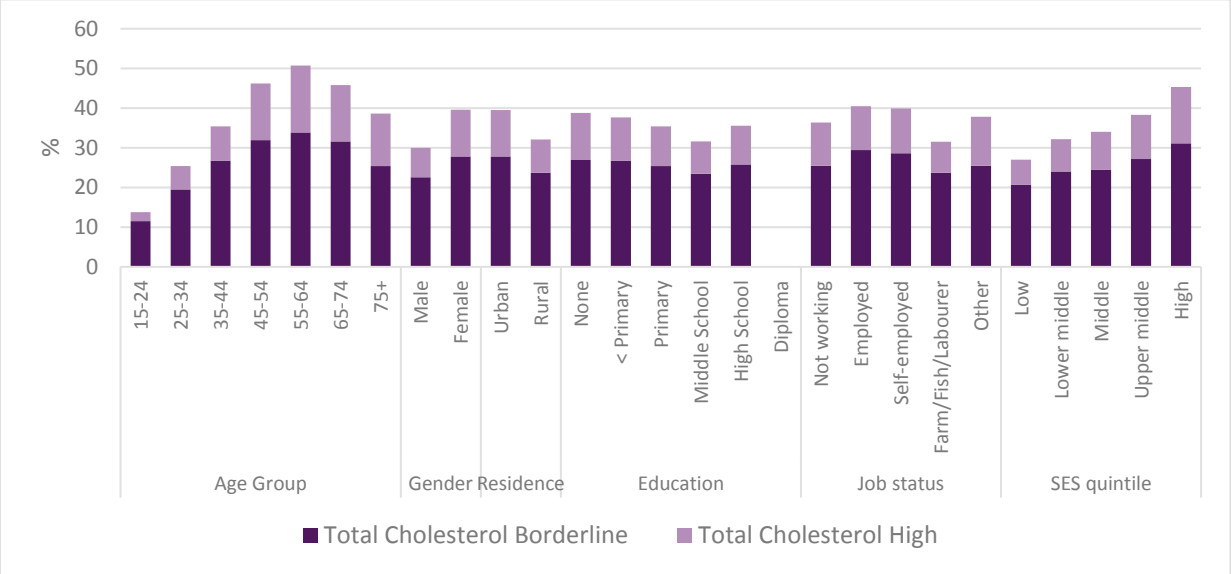

Figure 18 Proportion with abnormal total cholesterol by age, gender, residence, education, occupation, and socioeconomic status. Note: missing values for highest education level.

HDL-Cholesterol

High HDL cholesterol levels appeared to increase with age (Figure 19). High HDL cholesterol increased and low HDL cholesterol decreased with increasing socioeconomic status. A much higher proportion of females (24.1%) than males (8.4%) have high HDL cholesterol levels and a much higher proportion of males have low HDL cholesterol levels (34.8%) than females (15.3%).(5)

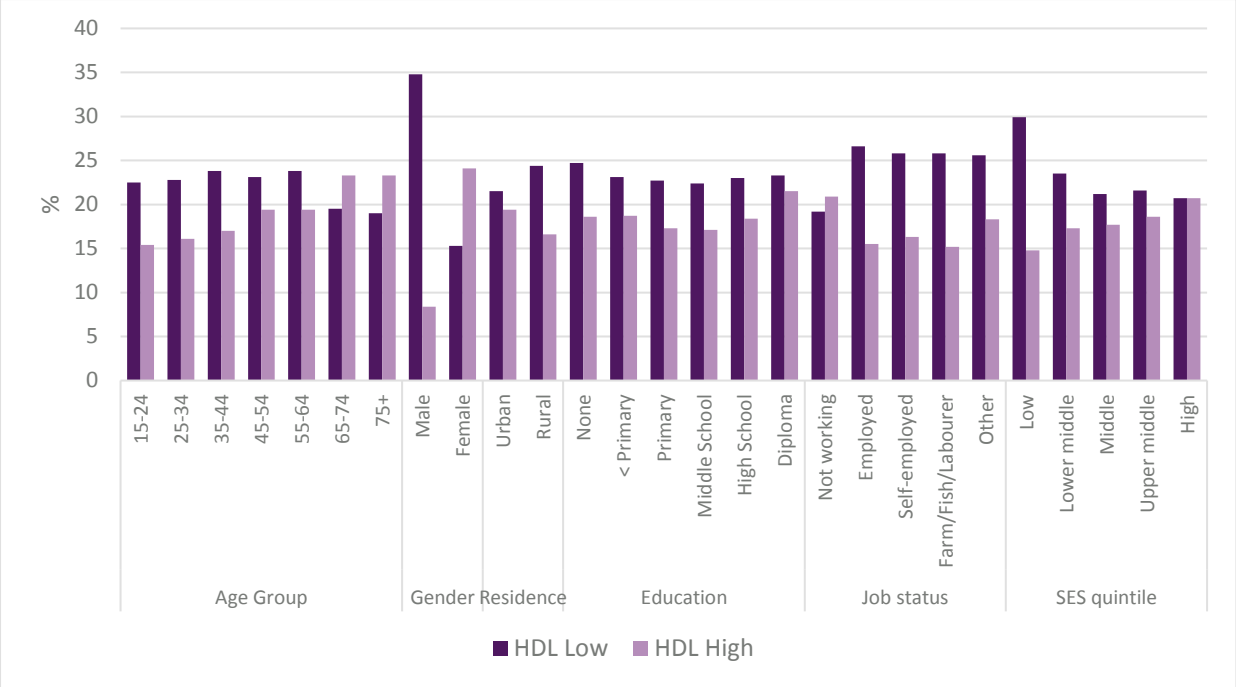

Figure 19 Proportion with low and high HDL cholesterol by age, gender, residence, education, occupation, and socioeconomic status.

LDL Cholesterol

Those aged 55-64 years had the highest proportion with borderline high, high, and very high LDL cholesterol levels (Figure 20). Females had a higher proportion with borderline high LDL cholesterol. Urban dwellers had a higher proportion with high LDL cholesterol. (5)

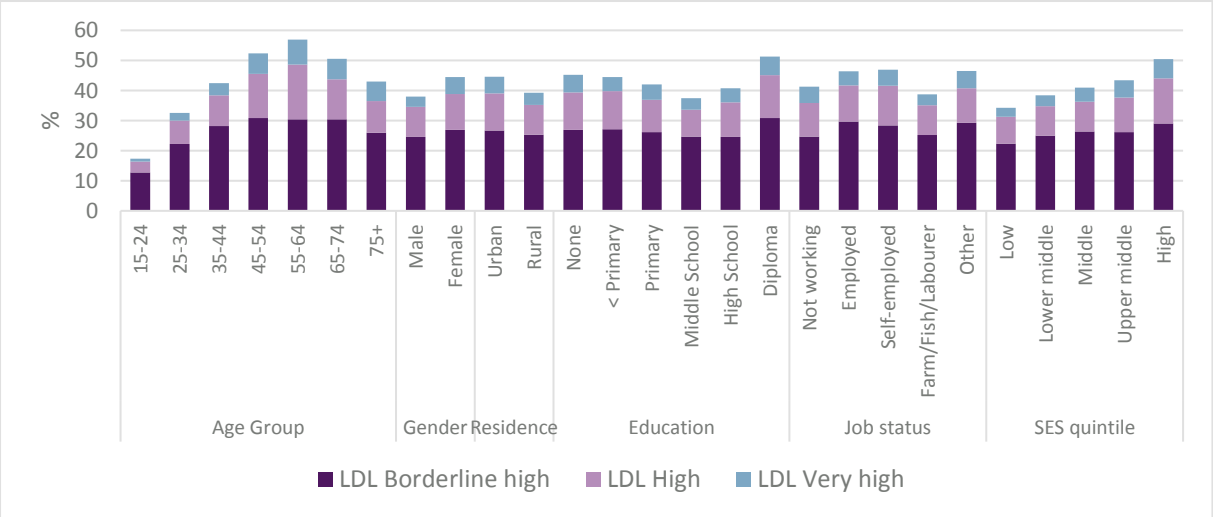

Figure 20 Proportion with borderline high, high, and very high LDL cholesterol by age, gender, residence, education, occupation, and socioeconomic status

Triglycerides

Males and adults aged 55-64 years had the highest proportion of abnormal triglyceride levels (Figure 21). Urban dwellers had a higher proportion with high triglycerides, though the proportion with borderline high levels was approximately equal with rural residents. The proportion of people with high triglyceride levels increased with socioeconomic status.

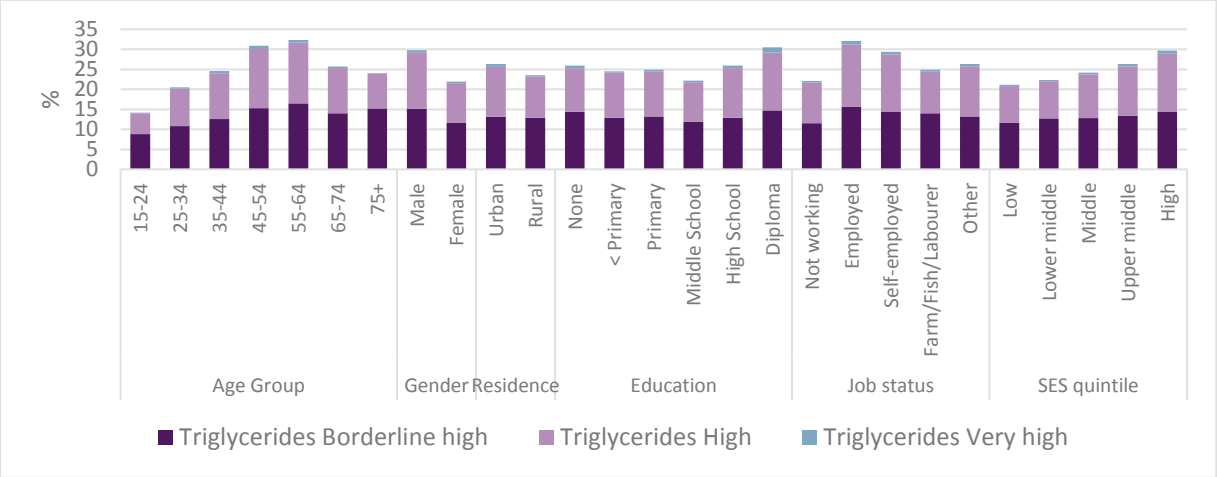

Figure 21 Proportion with borderline high, high, and very high triglycerides by age, gender, residence, education, occupation, and socioeconomic status

Overweight

Riskesdas data for Indonesia overall suggest that 8.7% are underweight, 13.3% are overweight, and 15.4% are obese (Figure 22).(5) The province of Sulawesi Utara has the highest levels of obesity with 24% and Nusa Tenggara Timur has the lowest obesity levels with 6.2%. Approximately 26.6% of Indonesians have central obesity (waist circumference >90cm in males and >80cm in females). Central obesity rates range from 15.2% in Nusa Tenggara Timur up to 39.7% in DKI Jakarta.

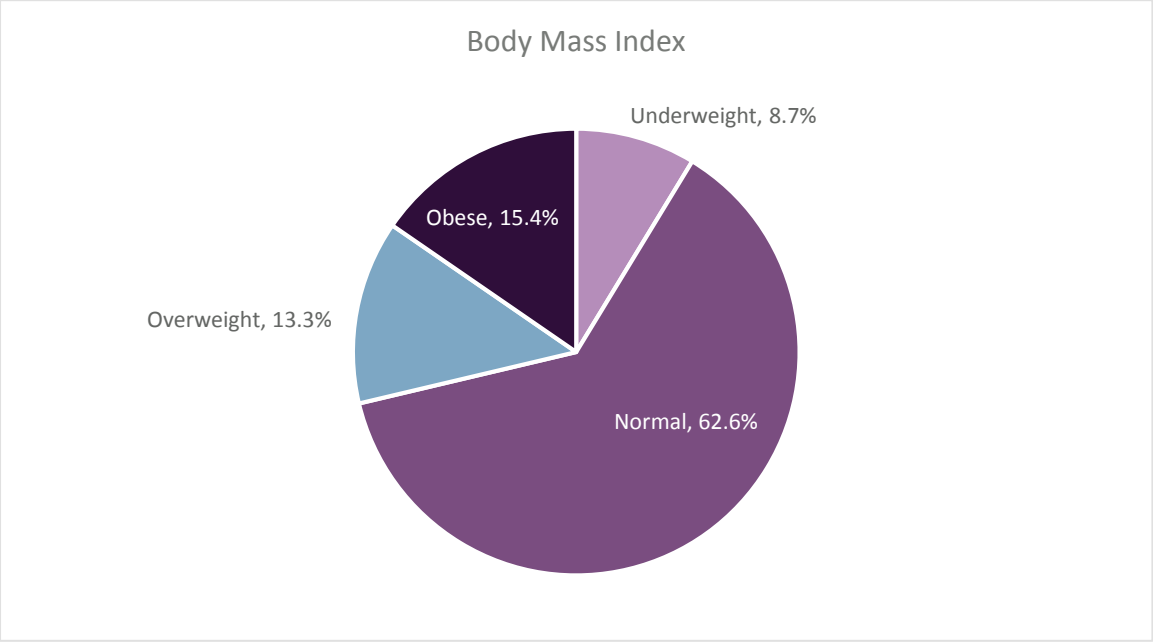

Figure 22 Proportion of Indonesians underweight, normal, overweight, and obese, 2015

Determined from blood sugar values and presence of symptoms

Diabetes was determined here by blood sugar values and presence of excessive huger, excessive thirst, frequent urination, and weight loss.(5)

The proportion of people with diabetes increased with age, from 1.1% in 15-24 years to 13.2% in both 65-74 years and 75 years and older (Figure 23).(5) A higher proportion of females than males had diabetes according to this definition (7.7% vs. 5.6%). (5)

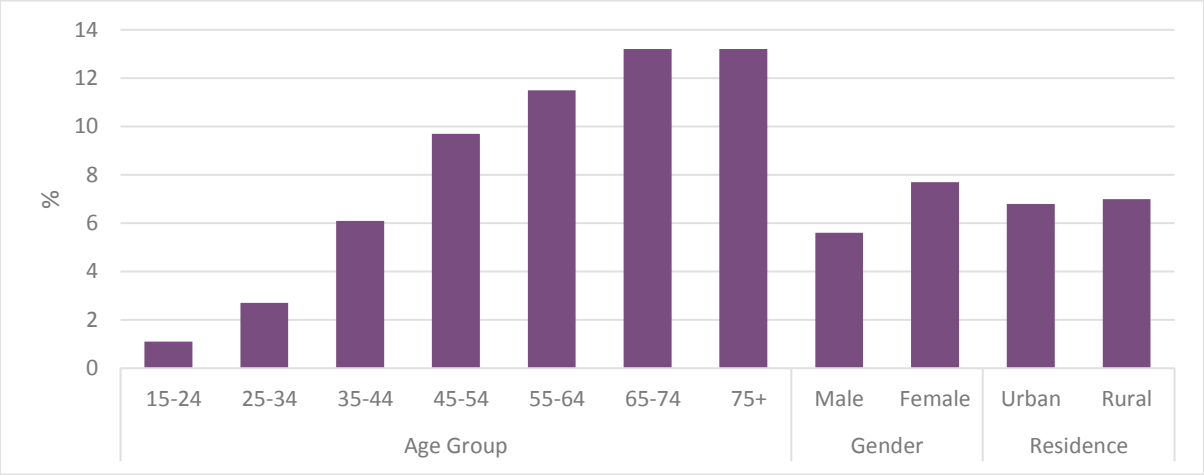

Figure 23 Proportion with diabetes by age, gender, and location of residence

Those with no education had the highest proportion with diabetes (10.4%), and those who completed high school had the lowest proportion with diabetes (5.2%; Figure 24).(5)

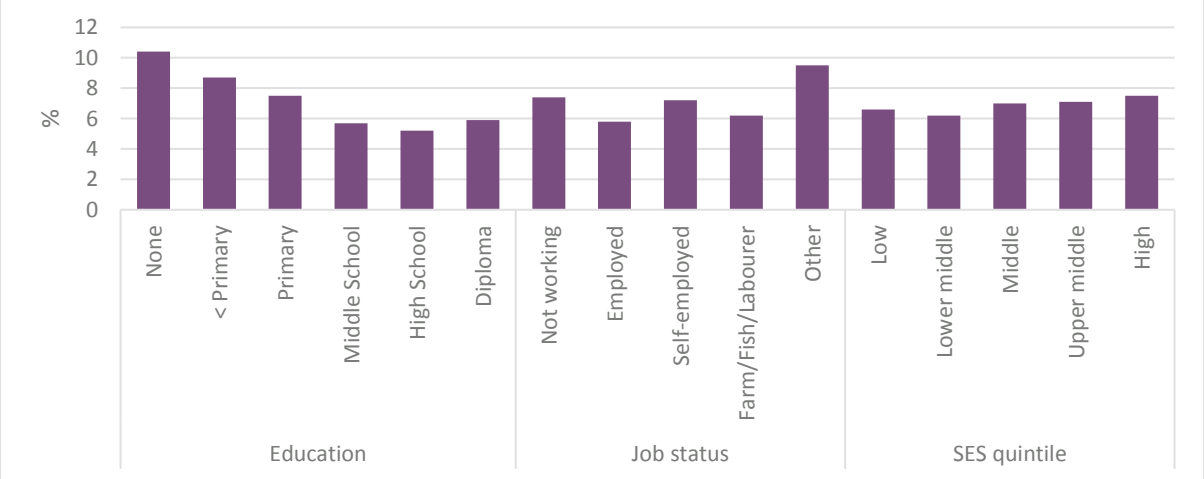

Figure 24 Proportion with diabetes by education level, job status, and socioeconomic status

Abnormal fasting glucose

The prevalence of abnormal fasting glucose was 36.6% in Indonesia overall.(5) The proportion increased from 26.2% in 15-24 year-olds up to 45.4% in 55-64 year-olds (Figure 25).

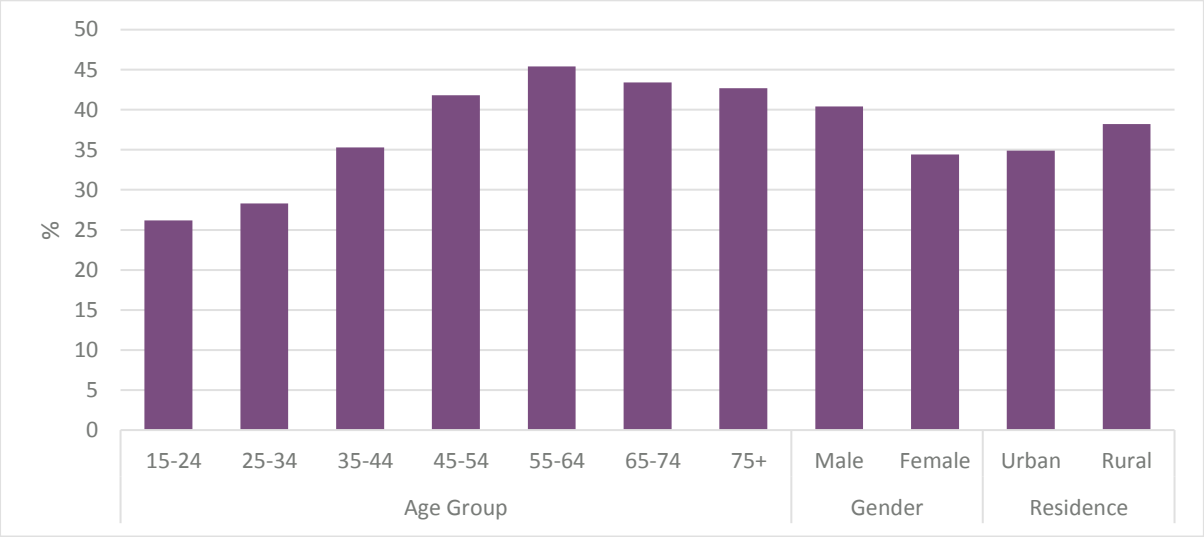

Figure 25 Proportion of abnormal fasting glucose levels in the population aged ≥ 15 years by age, gender, and location of residence

Those with no education had the highest proportion with abnormal fasting glucose (46.7%). Those who completed middle-school had the lowest proportion with abnormal fasting glucose (31.8%), increasing up to 35.6% in those with diploma (Figure 26).

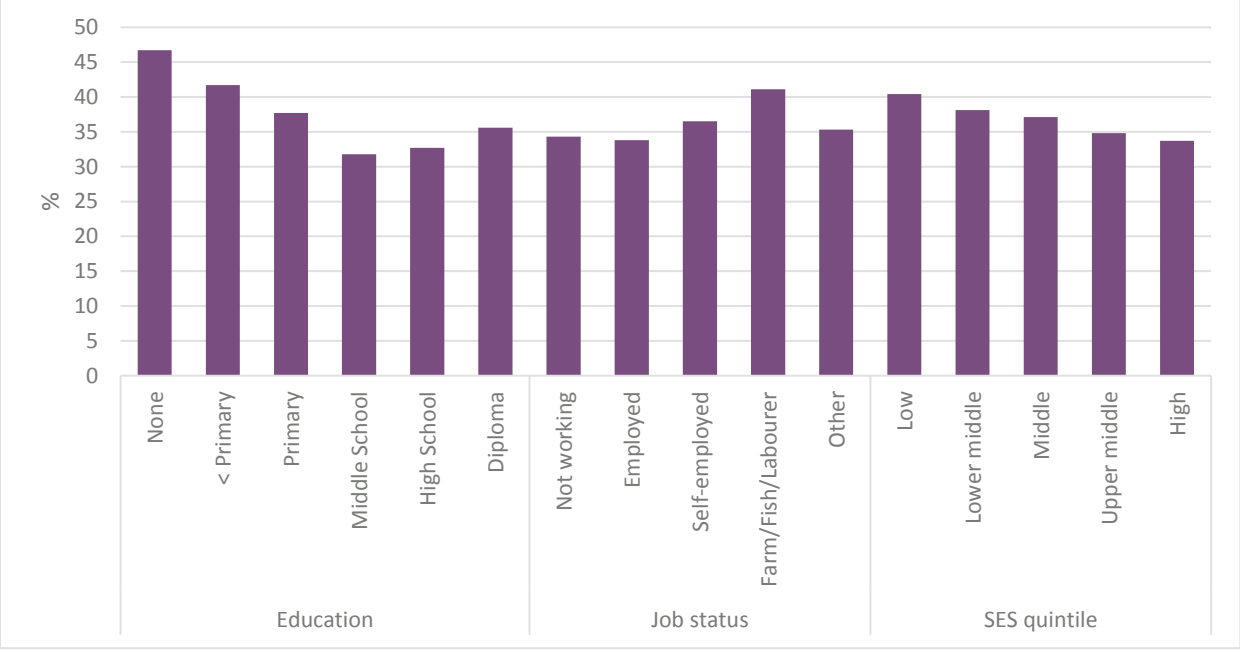

Figure 26 Proportion of abnormal fasting glucose levels in the population aged ≥ 15 years by education level, occupation, and socioeconomic quintile

Tobacco

Smoking is the leading risk factor for coronary heart disease in males attributable to 25% of events.(6)

Overall in Indonesia 24.3% were reported as daily smokers, with 5% occasional smokers and 4% ex-smokers (Figure 27).(5) The proportion of daily smokers was highest in Kepulauan Riau (27.2%) followed by Bengkulu and Jawa Barat (both 27.1%). Papua (16.3%) and Bali (18%) had the lowest levels of daily smokers. Daily smoking was highest in 30-34-year-old age group (33.4%). Smoking was much more prevalent in males than females (47.5% vs. 1.1%). Twenty-nine percent of high school leavers were daily smokers. Daily smoking was slightly lower in those with a diploma (18.9%). There was a downwards trend in daily smoking with increasing socioeconomic status from 27.3% in the lowest to 19.5% in the highest.

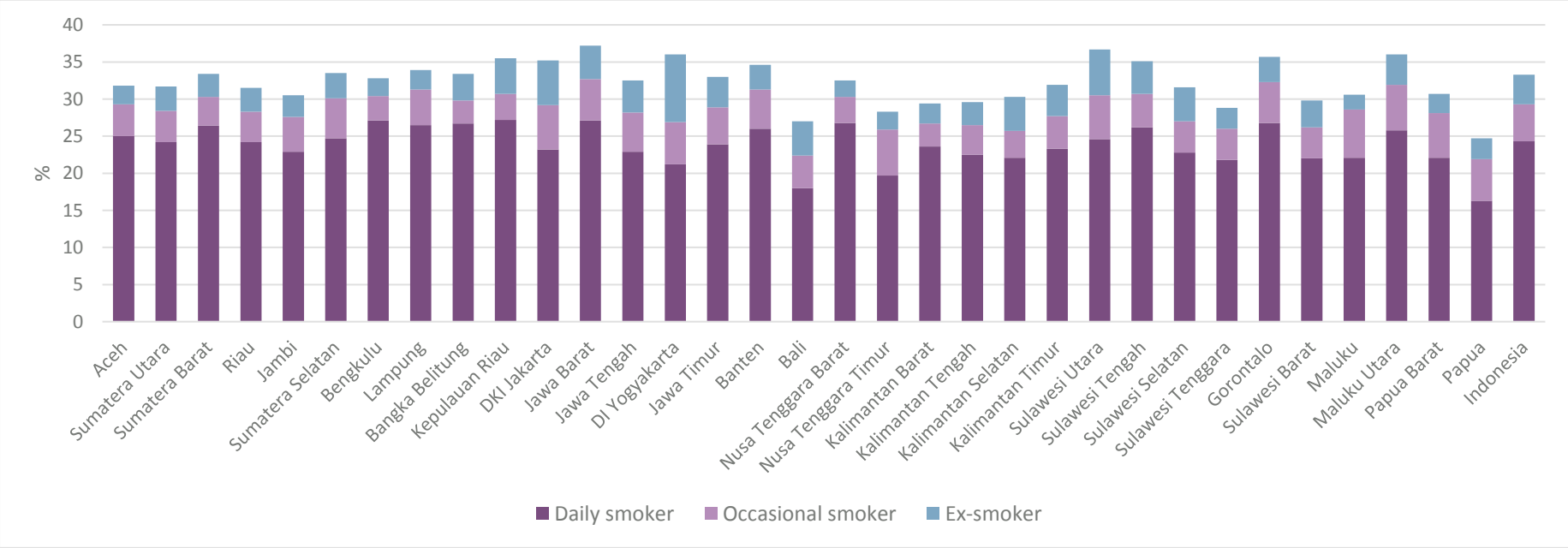

Figure 27 Proportion of daily, occasional, and ex-smokers by Indonesian province, and overall

Awareness, treatment and control of risk factors

Awareness, treatment and control of risk factors are important in reducing the burden of cardiovascular disease. This requires access to health services with facilities that enable diagnosis and access to medicines. Access to counselling for lifestyle change and facilities for disease monitoring are also needed. Future national health surveys may consider reporting awareness, treatment and control if asking about diagnosis and medicines and conducting these measurements.

High blood pressure

Awareness and control of high blood pressure is highly dependent on access to primary health services with a calibrated sphygmomanometer (device for measuring blood pressure) and access to affordable blood pressure lowering medicines.

A small study among individuals aged 45+ years in Bintan Island, Riau Archipelago provides some indication of local awareness and control rates in 2015 (Figure 28). Approximately half of those with high blood pressure were unaware and untreated. Over a third of those with high blood pressure were receiving some treatment, but only 15% with high blood pressure were adequately treated.

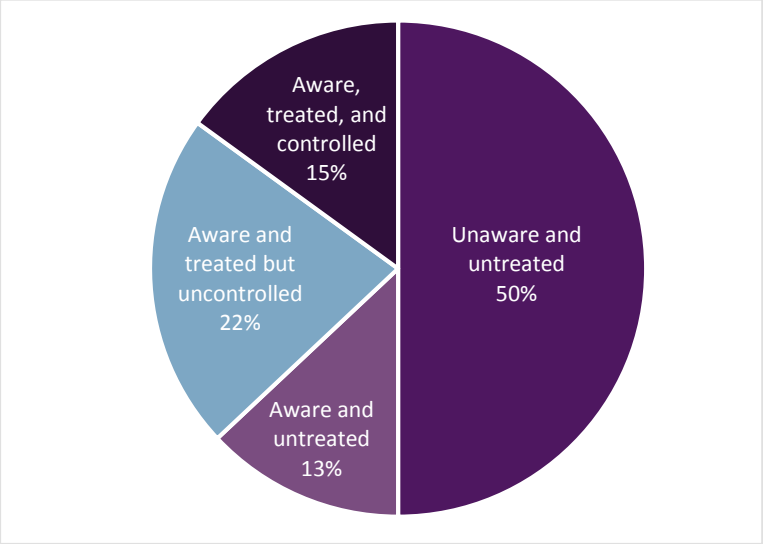

Figure 28 Awareness, treatment and control of high blood pressure on Bintan Island 2015, age 45+ years

Given the high prevalence of measured hypertension (see Figure 15 in the previous section), the proportion of participants reporting a diagnosis by a doctor, other health worker, or self-medication gives some indication of the level of awareness. Overall, 9.5% of Indonesians reported a diagnosis of hypertension (mostly doctor's diagnosis), ranging from 3.3% in Papua to 15.2% in Sulawesi Utara (Figure 29).(5)

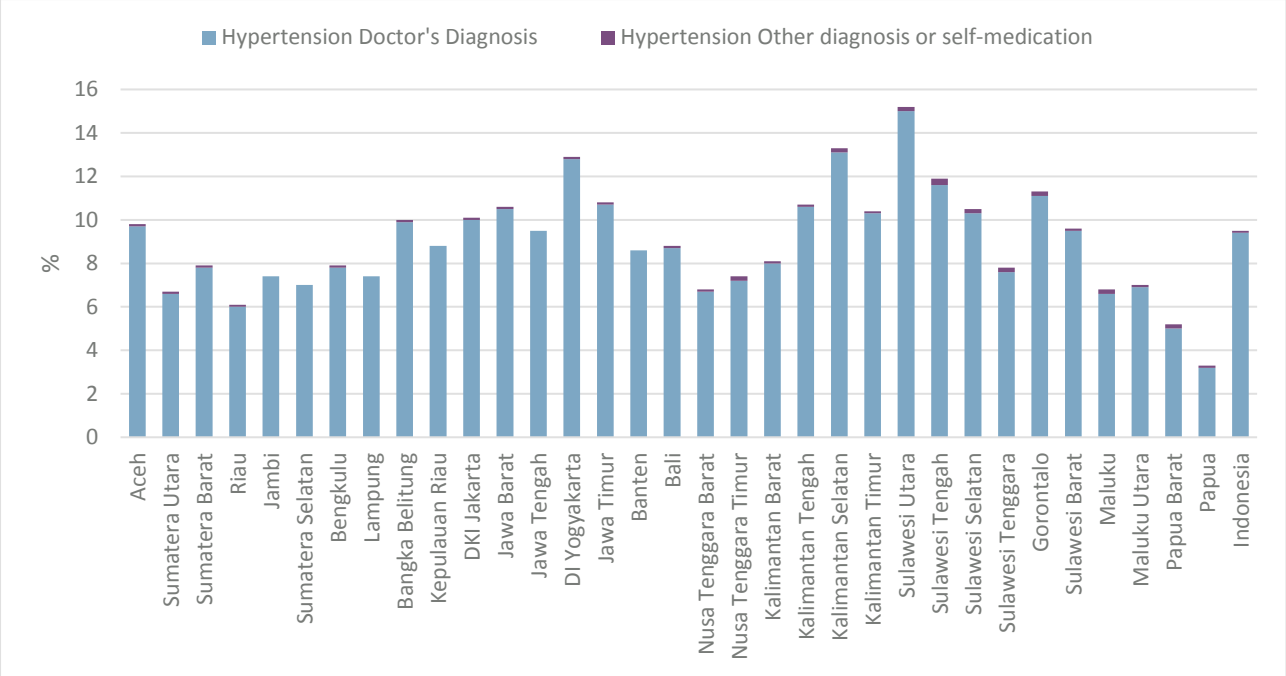

Figure 29 Proportion with hypertension diagnosed by a doctor and proportion with diagnosis by other health worker or self-medicating in Indonesian provinces, and overall

Reported diagnosis of hypertension increased with age, was higher in females and higher in urban residents (Figure 30).(5)

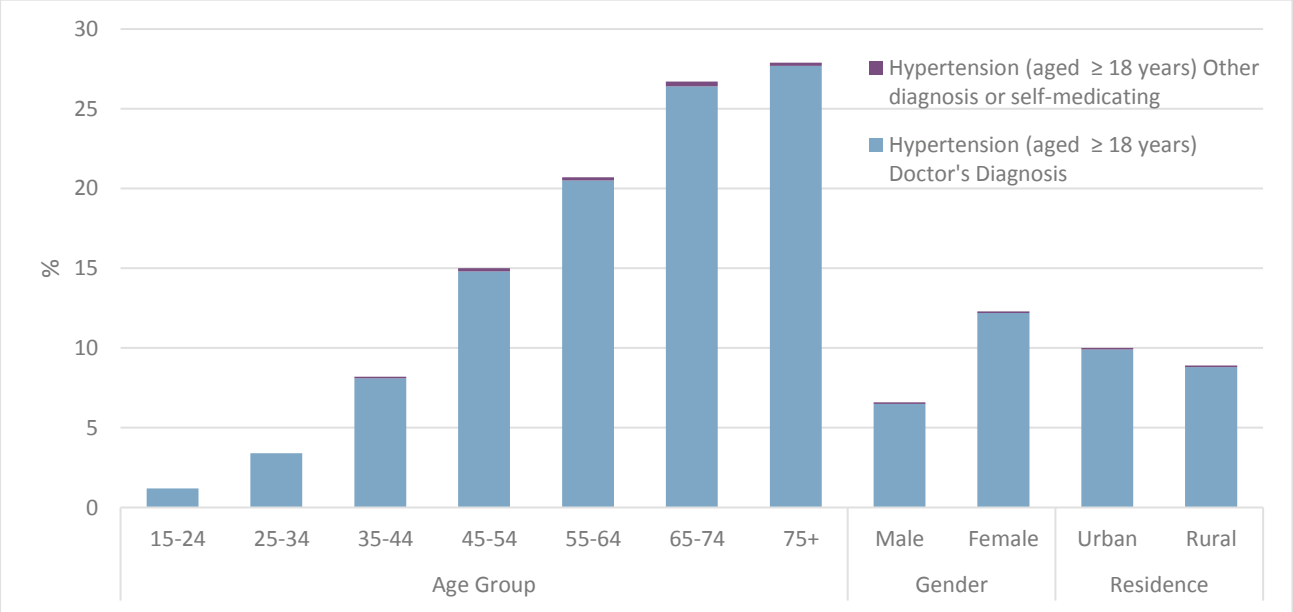

Figure 30 Proportion with hypertension diagnosed by a doctor and proportion with diagnosis by other health worker or self-medicating by age, gender and location of residence

Reported diagnosis of hypertension was highest in those with no education (17.6%) and lowest in those who completed high school (5.8%; Figure 31). The proportion reporting diagnosed hypertension was relatively stable across the socioeconomic quintiles.(5)

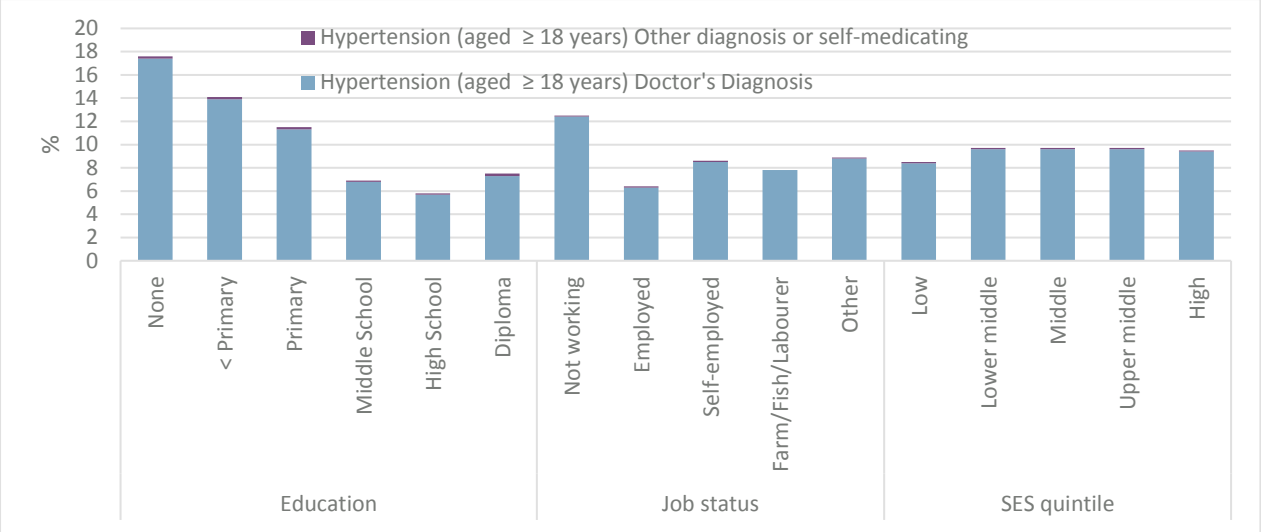

Figure 31 Proportion with hypertension diagnosed by a doctor and proportion with diagnosis by other health worker or self-medicating by education, job status, and socioeconomic status

Diabetes

Awareness, treatment, and control of diabetes requires access to glucose monitoring and access to treatment such as insulin or oral hypoglycaemic agents.

The estimated proportions of adults with diabetes (aware, treated and controlled) are shown in Figure 32.(11) This suggests there may be a substantial gap between availability of diagnosis and availability of treatment. Half of those diagnosed are not treated and only a small proportion are regularly treated.

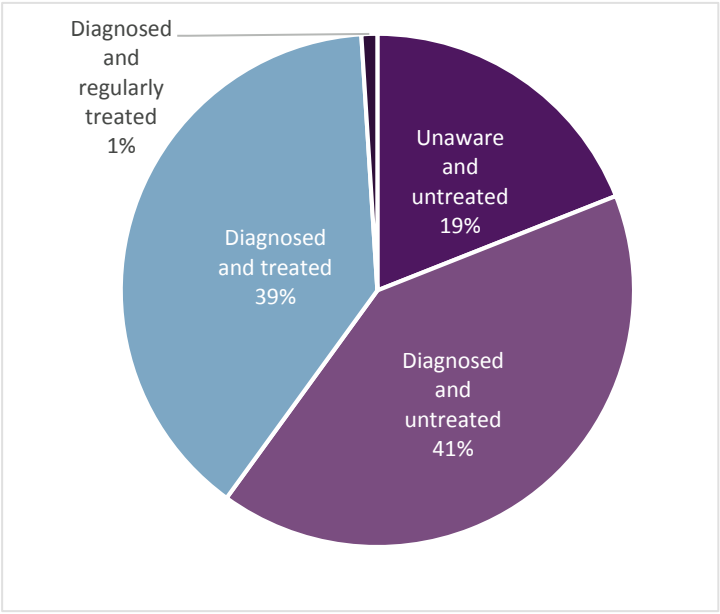

Figure 32 Proportion with diabetes aware, treated and controlled (as reported by Malini 2015)

Health Services
Universal healthcare coverage

Indonesian healthcare has traditionally been fragmented with low levels of healthcare coverage. There is substantial variation in access to existing healthcare services with certain population groups accessing different levels of care depending on the type of health insurance they are eligible for. In brief, private health insurance was available for those who could afford it, a state-provided insurance system (Jamkesmas and Jamkesda) for the poor and near poor, a civil servant health insurance scheme (Askes) and the social security scheme (Jamostek) for private employees.

From the 1st January 2014, all social insurance programs (Jamkesmas, Jamkesda, Askes, and Jamostek) were merged into a single-payer universal healthcare coverage (UHC) model, known as Jaminan Kesehatan Nasional (JKN) and implemented by Badan Penyelenggara Jaminan Sosial Kesehatan (BPJS). Universal healthcare coverage is expected to be achieved by 2019 through several phases of implementation, providing health insurance to the entire country's population of 250 million people. Under JKN, all Indonesian citizens will be able to access a comprehensive level of care, from outpatient and inpatient care at the primary level up to tertiary hospital settings. The main objective of JKN was to address growing disparities in health care and create a sustainable, accessible and equitable health system that provides comprehensive, high-quality care to all Indonesians.(12) The first year of the social health insurance implementation saw an increase of approximately 20 million members to JKN, with a total of 133.4 million members nationwide. Whilst there are obvious merits to universal healthcare coverage however, there are issues with the JKN which has specific implications for CVD in Indonesia.

Undersupply of healthcare services

Currently, the provision of healthcare personnel and services for CVD is inadequate, chronically undersupplied and unevenly distributed in Indonesia. Between 2015 and 2016, there were an estimated 939 registered practicing neurologists, 104 endocrinologists and 365 cardiologists whom were mainly based in Jakarta and other large cities.(13–15) That is approximately 3.8 neurologists, 0.4 endocrinologists and 1.5 cardiologists per 1,000,000 inhabitants of Indonesia, substantially lower than Australia's recorded registered 23.8 neurologists, 27.5 endocrinologists and 55.2 cardiologists per 1,000,000 persons in 2016 (Figure 33).(16)

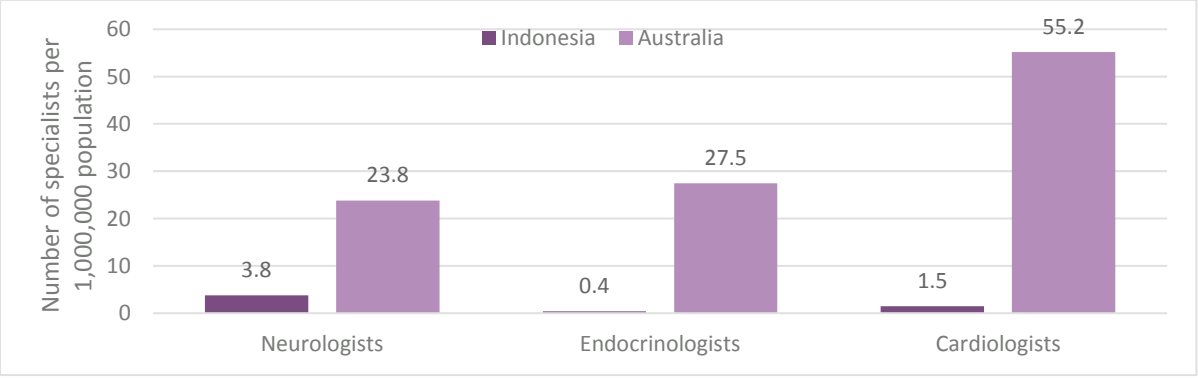

Figure 33 Number of neurologists, endocrinologists and cardiologists per 1,000,000 population in Indonesia and Australia based on estimates in 2015 and 2016.

Thirty stroke units provide neurology, neurosurgery and neuroimaging services to urban areas only,(17) whilst diabetes clinics provide mainly secondary and tertiary care due to shortages in expertise and diagnostic equipment at the primary care level.(18) Figure 34 depicts unequal distribution of healthcare services favouring densely populated provinces in the archipelago, suggesting lower quality, quantity and access to care for those in rural areas.

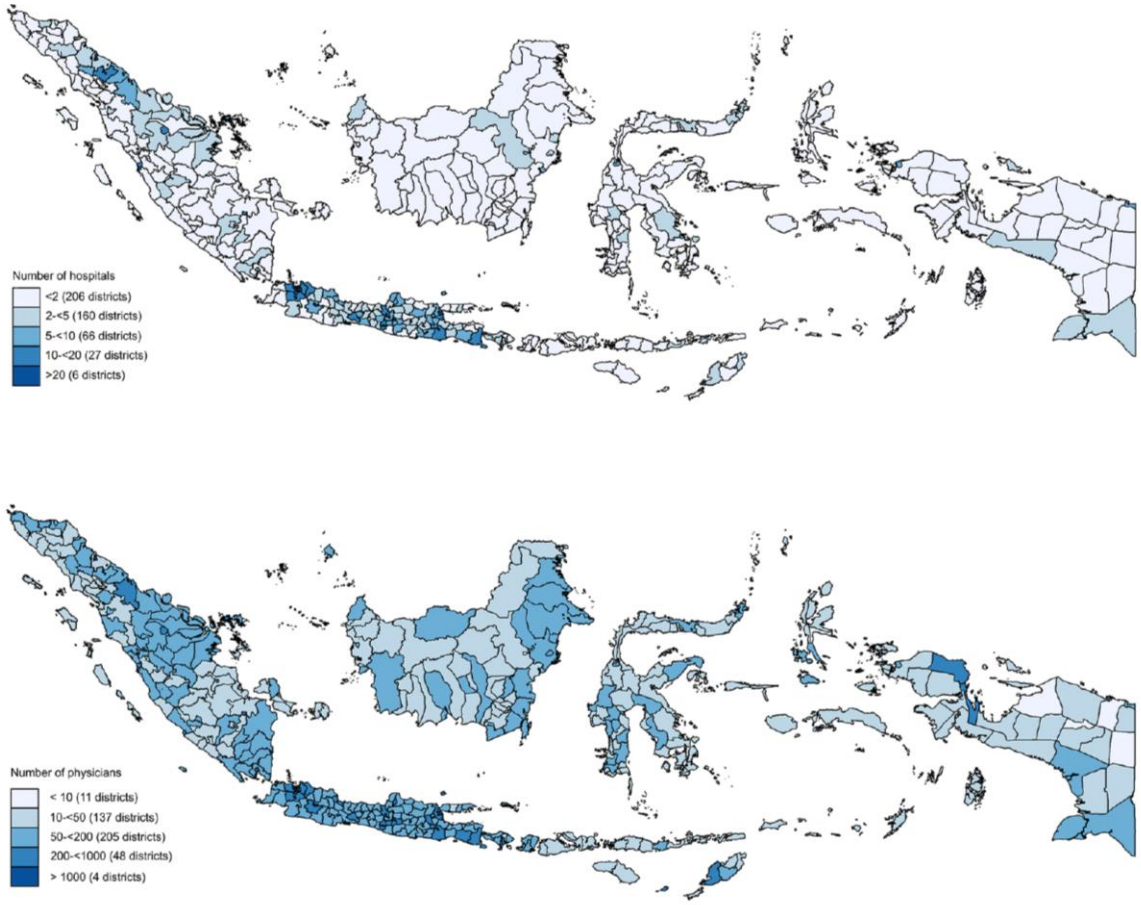

Figure 34 Number of hospitals and physicians across Indonesia in each district
Source: doi: 10.1371/journal.pone.0105831.q001

The lack of specialised cardiovascular disease health services for large areas of Indonesia indicate large challenges in the ability of the health system to implement effective CVD care and treatments. Surveys from Indonesia also underscore the presence of large gaps in care with respect to CVD. Results from the 2008 Indonesian Family Life Survey suggests nearly 70% of respondents with moderate to high CVD risk failed to receive CVD care.(19) The expected increase in utilisation of CVD prevention and management services as a result of expanding insurance coverage (not to mention increasing prevalence) will place an enormous strain on Indonesia's already overburdened CVD healthcare services, as well as increase financial costs to the government. Whilst guidelines in Indonesia for CVD management exist, implementation of these guidelines cannot be undertaken without investing in appropriate technologies and services related to CVD across its' whole continuum of care.

Barriers to healthcare access

Several factors contribute to the barriers in accessing healthcare for CVD. Individuals will experience longer waiting times and potentially limited access due to the undersupply of CVD healthcare service as mentioned above. Accessing healthcare services in a timely manner is problematic, with over 18% of Indonesians taking over an hour to reach a public hospital using various modes of transport.(20) In urban areas, large levels of traffic congestion provide a considerable barrier to accessing healthcare in a timely manner.

Challenges in urban areas: The Jakarta Acute Coronary Syndrome (ACS) Registry collected data from 2,103 patients between 2008 and 2009 and estimated the time from onset of myocardial infarction to hospital admission exceeded 12 hours in approximately 80% of recorded cases.(21) Similarly, a large scale hospital-based stroke study involving 2,065 patients with acute stroke in urban and rural areas between 1996 and 1997 in Indonesia revealed 22% of patients cited transportation problems as the reason for delayed hospital admission of stroke.(22)

Challenges in rural areas: A different set of issues exist for those who live in rural and remote areas. Public health centres provide health services to rural communities (health policy mandates stipulate one health centre per 30,000 inhabitants) which is staffed by at least one general practitioner, several nurses and midwives and ensures access is possible for all Indonesians.(23) Healthcare services are subsidised under the JKN, however individuals require out-of-pocket payments for transport services in order to receive healthcare. This prevents a number of poor and near poor Indonesians that live in rural and remote areas from accessing healthcare services. Distances to health facilities can be in excess of 30kms in West Papua, Papua and Maluku, well above the average distance of 5km and travel time to public health centres is worse for people living in the provinces of Papua, East Nusa Tenggara and West Kalimantan.(20) These factors that limit access are compounded by public health centres not having adequate services for CVD. Approximately 80% of public health centres provide services for CVD, whilst 54% and 47% of public health centres have the ability to test blood glucose levels and urine tests, respectively.(20)

Access to medicines: Medications for primary and secondary prevention of CVD are made available under the JKN. Official National Health Account figures suggest that pharmaceutical expenditures account for 33% of total health sector spending, although another study has suggested that proportion is as high as 44%.[Dunlop 2013 *unpublished*, cited in (20)] Issues with poor coordination between district, provincial and central levels, as well as inadequate staffing, means inequalities exist with regards to availability and access to medicines across Indonesia.(24) This has resulted in some provinces receiving an oversupply with a subsequent wastage of medicines and an undersupply in others. Another issue pertains to the beliefs held by community centre pharmacists and doctors, i.e. that they have limited roles in CVD secondary prevention, with limited engagement of individuals in terms of medication adherence and recommendations.(25) Coupled with a lack of trained pharmacists practising at a community level, there are difficulties in achieving continuity of care for Indonesians. Yet it is believed that the JKN will have positive effects in terms of CVD management, as a study found that those covered by a health insurance scheme were more likely to visit their doctor and collect medicines regularly.(25) Furthermore, the recent development of the National Formulary of Drugs (2013) and the List of Essential Medications (2014) will enable future

streamlining and relative affordability of medications for CVD prevention, at both a primary and secondary level.

Case Studies

Three case studies are presented in this report which describes the current situation and management of the following diseases in Indonesia:

- Case Study A: Acute coronary syndromes (ACS)
- Case Study B: Stroke
- Case Study C: Type 2 Diabetes Mellitus (T2DM)

Case Study A: Acute coronary syndromes (ACS)

Settings: The Jakarta ACS (JAC) Registry contained data on 2,103 ACS patients admitted at the National Cardiovascular Center Harapan Kita between 2008 and 2009 in Jakarta, Indonesia.

Objective: To describe the management and rates of reperfusion of ACS patients in a single large hospital in Indonesia.

Findings: The JAC Registry included 654 reported cases of ST elevation myocardial infarction (STEMI), of which 52% were referred from another hospital.(21) Delayed hospital presentation was common, with over 80% of patients presenting to hospital 12 hours after the onset of symptoms. In total, 29% of STEMI patients underwent percutaneous coronary intervention (PCI) and 12% received fibrinolysis with 59% of all STEMI patients not receiving any form of reperfusion therapy. In-hospital mortality was 13% among STEMI patients who did not receive reperfusion therapy, compared with 6% among patients that received fibrinolysis and 5% among patients who underwent primary PCI.

Interpretation: International guidelines advocate invasive procedures in the majority of ACS patients; however, a high proportion of ACS patients in the Asia-Pacific (APAC) region receive solely medical management. It is of note that in Indonesia, medication for ACS, such as antiplatelets (Aspirin, Clopidogrel, Cilostazol), Glycoprotein IIb/IIIa inhibitors (Eptifibatide), anticoagulants (Heparin, Enoxaparin, Fondaparinux), and fibrinolytic agents (Streptokinase, Alteplase) are funded/reimbursed.

The current study demonstrates very low rates of reperfusion therapy among STEMI patients at an urban centre of Indonesia. A number of factors could contribute to the poor rates of reperfusion therapy, including a the unique geographical, socioeconomic, and population-specific barriers.

The Asia Pacific ACS Medical Management Working Group identified the following challenges in the provision of optimal care for these patients: 1) accessibility/systems of care, 2) risk stratification, 3) education, 4) optimisation of pharmacotherapy, and 5) cost/affordability. They also identified that establishing cardiac networks and individual hospital models/clinical pathways could improve the situation and detailed other potential solutions in a published report.(27) ACS Guidelines were developed and published by The Indonesian Heart Association in 2014.

Conclusion/recommendations: This study identified poor rates of reperfusion among patients presenting to an urban centre with STEMI. Improving rapid access to hospitals and implementing algorithms and protocols in the pre-hospital and in-hospital setting could help improve the overall standard of care.

Case Study B: Stroke

Study 1

Settings/study design: Prospective observational study in 11 hospitals across Indonesia with 1,807 patients using standardised Stroke Case Report Form from 2012-2013.

Objective: To describe the prevalence and characteristics of stroke patients in Indonesia.

Findings: Ischemic stroke accounted for the majority of cases (67.1%), whilst haemorrhagic stroke accounted for the other 32.9%. Hypertension was the most common risk factor for both haemorrhagic (71.2%) and ischemic stroke (63.4%), followed by diabetes and dyslipidemia. In-hospital mortality rates were much higher in haemorrhagic stroke (18.3% within 48 hours of hospitalisation and 20.3% after 48 hours of hospitalisation) compared to ischemic stroke (3.5% within 48 hours of hospitalisation and 8.3% after 48 hours of hospitalisation).

Similar results were found by Suwanwela and colleagues in 2016, estimating the proportion of ischemic and haemorrhagic stroke in Indonesia to be 75% and 25%, respectively.(13) The study estimated the prevalence of three common risk factors among the general population and for stroke patients in Indonesia: hypertension (73.9%), diabetes (17.3%) and smoking (20.4%).

In a large prospective hospital-based study conducted in 1998 among 2,065 acute stroke patients from 28 hospitals across Indonesia, the mean age of the stroke patients was 58.8 years. A large proportion of stroke patients were younger, with 12.9% aged 45 years and younger and 51% were between 45 and 65 years old.(22) The prevalence of stroke was higher in males (54%) compared to females (46%). The mean period of time between stroke event and admission was 48.5 hours and most patients arrived at hospital more than 6 hours after the onset of stroke. The reasons for delayed admission were lack of recognition of stroke symptoms and long distance transportation. Recurrent stroke was found in nearly 20% of patients. Ischemic strokes accounted for 42.9% of patients, whilst 18.5% and 1.4% of patients experienced haemorrhagic and subarachnoid strokes, respectively. Due to the unavailability of computed tomography (CT) scans in certain hospitals, 39.1% of stroke were undetermined.

Conclusion/recommendations: Results show high prevalence of stroke of both haemorrhagic and ischaemic types and data indicating that patients presented late and had high rates of early mortality.

Study 2

Settings/study design: Literature review

Objective: To describe the healthcare systems for stroke management in Indonesia.

Findings: Kusuma et al. reports in 2009 that most of the neurologists and neurosurgeons in Indonesia practice in the major cities.(17) Stroke units are in large private and government hospitals and generally unavailable in rural areas, with small hospitals staffed by junior neurologists and no imaging facilities. Commonly used medications such as aspirin, statins and first-generation ACE inhibitors are available. Traditional medicine is widely practiced for the management of stroke. Some rehabilitation services are available in large cities but few in rural and other regions.(17)

Conclusion/recommendations: Health services and staff to manage stroke are sparse in Indonesia. Available data also indicate poor access to rehabilitation services.(17,22)

Case Study C: Type 2 Diabetes Mellitus

Settings/study design: Country profile

Objective: To describe the healthcare systems for Type 2 Diabetes Mellitus (T2DM) management in Indonesia.

Findings: People with diabetes in Indonesia typically present late and often already suffering the complications of advanced diabetes such as kidney failure or visual problems. Mortality after hospitalisation is high.(29) The National survey data in 2007 estimated the prevalence of diabetes was 5.7%, of which more than 70% of cases were undiagnosed.(18) The IDF notes in its latest scorecard on Indonesia, "The low level of diabetes-related health expenditures has prevented a very small proportion (1%) of diabetes-related deaths. Increased funding for cost-effective diabetes prevention and treatment is needed."(29)

Community screening: In recent years, the creation of thousands of community-based units known as 'Posbindu' to screen people for diabetes and other non-communicable diseases has helped to identify many cases. The front line of public health care in Indonesia is the 'Puskesmas' - community health centres, which are present in nearly every small village. While many of these units are poor and run-down, the government has been considering strengthening these centres and making diabetes care a focus.

Primary health care services have been found to be ill-equipped to manage T2DM.(11) Among 272 Primary Health Care Centres (PHC), laboratory facilities existed in 82%, most do not have equipment to diagnose complications such as ophthalmoscopes (72%), electrocardiogram (92%) and radiology tools (96%). Oral hypoglycaemic agents were available in 94% of the PHCs. Sulphonylurea (glybenclamide) was available in all while biguanide in 29%. Most PHC (97%) did not provide insulin. Only 6% had facilities to manage diabetic foot conditions, and only 21% were able to conduct diabetes education.

Medicines: Two first-line treatments for T2DM, metformin and sulfonylureas, are available in most centres. The Government provides free insulin for children, but access to insulin is reportedly poor and often unavailable in primary care facilities. For diagnosing diabetes, only simple blood glucose measurement was available but not blood testing for HbA1c.(29)

A study by Soewondo et.al reported that most treatments for diabetes and its complications were unavailable or unaffordable.(18) The average cost of insulin was approximately US$75 per month, which represents a significant barrier to treatment. In 2014, the average wage in Indonesia was estimated to be about $130 US per month according to the International Labour Organisation and many Indonesians earn less, with millions working as subsistence farmers.

Dialysis: Patients with diabetes and renal failure requiring dialysis generally have to pay for dialysis – usually a cost totalling thousands of US$ per month in out-of-pocket expenses. Dialysis is therefore clearly not affordable for many patients. Additionally, religious concerns among a predominantly Muslim population mean very few kidneys are available for transplant.(29) Hypertension and microalbuminuria among diabetes patients were frequent

and poorly treated.(11) A previous study of 207 patients with T2DM reported that 44.7% had macroalbuminuria and 33% had microalbuminuria. Of the 92% receiving treatment for hypertension, only 6% had blood pressure below target (130/85mmHg) levels.(30)

National Guidelines for diabetes are available in Indonesia and were last updated in 2011(18) however, no national programs for diabetes education are in place.(11) Malini and colleagues concluded that structured education programmes (e.g. X-PERT, DESMOND and DAFNE) that have been shown to be effective in a range of western settings, could be adapted for use in Indonesia.(11)

Conclusion/recommendations: Patients present late with diabetes complications and once with diabetes complications, they do poorly. Primary care has insufficient capacity to diagnose, monitor and manage complications of diabetes. Education and support for diabetes awareness and diabetes patients is lacking.

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