



Cohort Profile

Cohort Profile: LIFE course study in CARdiovascular disease Epidemiology (LIFECARE)

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Why was the cohort set up?

The global burden of cardiovascular diseases (CVDs) has been increasing steadily over the past two decades. Although the age-standardized CVD mortality rates have fallen, the number of deaths due to CVDs continues to rise, with 17.9 million deaths attributed to them in 2015.¹ A 12.5% increase in CVD deaths was seen between 2005 and 2015, with approximately 85% attributed to ischaemic heart disease (IHD) and stroke alone.¹ The World Health Organization (WHO) predicts this trend to continue, with cardiovascular disease mortality projected to increase by 6 million by 2030.^{2,3}

This CVD burden is not uniform throughout the world. While the number of deaths due to CVD-related causes did not change much in high-income countries between 1990

and 2013, they increased by 66% in low- and middle-income countries.⁴ Currently, about 80% of the CVD deaths occur in middle- and low-income countries.⁵

Such disparity in CVD burden is also observed in Asia, where countries like Japan, South Korea, Singapore and Thailand with better economies have lower cardiovascular mortality rates than Western populations, whereas other Asian countries have 2-5-fold higher rates.⁶ There are also differences in the patterns of mortality from CVD in Asia; west, central, south and south-eastern Asian countries have higher age-adjusted mortality rates of IHD as compared to stroke, whereas East Asia and Thailand have higher age-adjusted mortality rates of stroke.⁶ In Southeast Asia, especially, CVDs such as IHD and stroke have become the leading cause of premature deaths.⁷

The INTERHEART study clearly demonstrated that risk factors for CVD are the same across countries and geographical regions. However, the study only included a very small number of participants from Southeast Asia and Japan.⁸ The Asia Pacific Cohort Studies Collaboration has studied the associations of major risk factors with cardiovascular mortality by pooling data from multiple cohorts within the region, with results similar to the Framingham and INTERHEART studies.⁹ However, there are still unanswered questions around the relationships between duration and timing of exposure and CVD risk, and the effect of psychosocial factors, including socioeconomic status and psychological distress, on risk.

The LIFE course study in CARdiovascular disease Epidemiology (LIFECARE) was designed to fill this gap in knowledge regarding cardiovascular epidemiology in Southeast Asian countries. Specifically, it aimed to identify exposures such as psychosocial and lifestyle factors that affect the risk factors of CVD in Asia over time, as well as to determine the impact of CVD risk factors on health-related quality of life (HRQoL) and health care utilization. Additionally, this study has provided epidemiological data on prevalence of CVD risk factors in the cohort which can be used for comparison with other countries in the region. It has also established a biobank of specimens that could be used for future genetic or biomarker-related studies.

LIFECARE is a longitudinal study comprising four contributing 'subcohorts' from Indonesia, Malaysia, the Philippines and Thailand. These countries were chosen as each of them suffers from a high CVD burden, ranging from 29% of proportional mortality due to CVDs in Thailand, to 37% in Indonesia, for 2014,¹⁰ and they are among the most populous countries in Southeast Asia.¹¹

Who is in the cohort?

The LIFECARE cohort consists of participants from Indonesia, Malaysia, the Philippines and Thailand. Each of these countries followed a standardized protocol devised by the study advisory committee, comprising the overall principal investigator (PI), PIs from each study site and international experts for consultation. It was planned to recruit 18–50-year-old participants from urban and semi-urban areas, with two cycles of follow-up at 3–5 year intervals. So far, the baseline and first follow-up have been completed. At each cycle, interviewers administered questionnaires on sociodemographics, lifestyle factors, past history, health-related quality of life and health care utilization. CVD risk factors were assessed by physical examination and biochemical measurements. Details on the study protocol and the advisory committee have already been published elsewhere.¹²

Recruitment began in 2008 and the baseline data collection was completed in 2011, for all countries. It was planned to recruit approximately 3000 ostensibly healthy individuals from each country, with a target total of 12 000. A total of 12 033 people were recruited at phase 1. After excluding 1548 participants with age 51 years and above, and four participants younger than 18 years at the time of recruitment, the final number of participants in phase 1 was 10 481. Figure 1 details the recruitment and follow-up for each country.

Enrolment methods

The Indonesian subcohort was recruited from the all subdistricts in the Rappocini district of Makassar, which included urban and semi-urban areas. Volunteers for the study were invited through local community and religious organizations, and interested participants were then

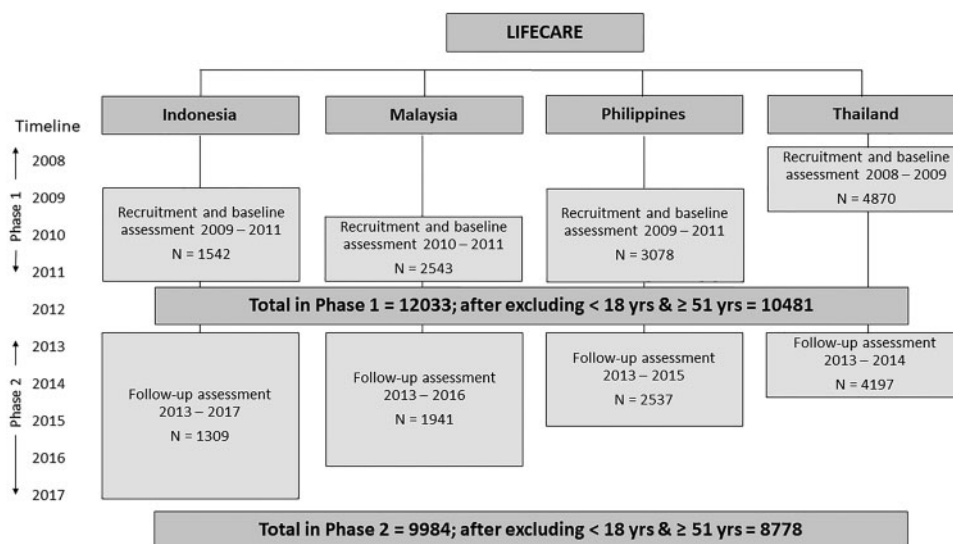


Figure 1. Flowchart showing details of recruitment and follow-up.

recruited into the study. Priority for inclusion into the subcohort was given to male over female, and younger over older participants, if there were multiple eligible participants in the same household. Trained interviewers accompanied by doctors conducted the interviews and measured height and weight, and trained nurses measured blood pressure and waist circumference. Ethics approval was obtained from the Review Board of Faculty of Medicine Hasanuddin, University of Makassar.

The Malaysian subcohort included participants from the urban and rural areas of Sarawak and Sabahan. Volunteers for the study were invited through schools and companies in the urban areas and through village heads in the rural areas. Interviews were conducted by trained research officers, doctors and nurses who were also responsible for taking physical measurements like height, weight, waist circumference and blood pressure. Ethics approval was obtained from the Medical Research & Ethics Committee, Ministry of Health, Malaysia.

The Philippines subcohort was recruited from eight randomly selected communities in four different urban and rural areas of Metro Manila, Philippines. Household lists were obtained from local officials of each community and households were randomly chosen, with one respondent per household recruited into the study. The interviews and physical examination were conducted by trained field interviewers and nurses. Ethics approval was obtained from the National Institute of Health and the Ethics Review Board of Cardinal Santos Medical Centre.

The Thai subcohort was recruited from the employees of the Electricity Generating Authority of Thailand (EGAT). The participants were randomly recruited from the employees working in the headquarters of EGAT in Bangkok metropolitan area, as well as three different sites in Western and Northern Thailand, from a wide range of socioeconomic backgrounds, as part of the second and third phases of the EGAT study.¹³ The interviews and physical examination were conducted by doctors, research officers and health assistants. Ethics approval was obtained from the Institutional Review Board at Mahidol University.

Written informed consent was given by all participants before recruitment, at all study sites.

Description of the cohort

LIFECARE is a young cohort with median age of 40 years at recruitment, and almost equal proportions of males and females. Among the subcohorts, only Thailand has a majority of males (72%), whereas the other three subcohorts are predominantly female with the highest proportion of females in the Indonesian subcohort. The baseline sociodemographic characteristics are summarized in [Table 1](#).

The majority of the participants were married and employed, with a college/university education. The Thai subcohort was most educated of the four countries, with 74% having a college/university education, and had the highest proportion of people with postgraduate degrees. The reason for this difference could be that all the participants in the Thai subcohort were recruited from EGAT, 99.4% of whom were currently working and were more likely to have higher educational qualifications. The Indonesian subcohort had the highest proportion of unemployed people. Concurrently, it also had the lowest proportion of people with college and postgraduate degrees and the highest proportion of females. This is likely due to Indonesia not targeting companies and schools for recruitment, with more recruitment from people at home such as unemployed individuals and home-makers.

Only 20% of the total participants were smokers, with the highest smoking rates observed in the Philippines subcohort. Slightly more than half of the participants gave a history of alcohol intake in the past year. Indonesia did not ask about alcohol consumption at baseline because of cultural sensitivity. However, Indonesia had only 0.6 L per capita consumption of alcohol in 2010, so it is unlikely that the prevalence would be high.¹⁰

Unfortunately, we do not have information on the proportion of responders and non-responders. Therefore, any differences in their sociodemographic characteristics could not be established. On comparing the responders with the general population in their respective countries ([Supplementary Table 1](#), available as [Supplementary data at IJE online](#)), we found that all subcohorts had a higher proportion of respondents who were females and were married, as compared with the national level statistics at baseline. The employment rates of the Philippines and Indonesian subcohorts were much lower than their respective national employment rates. However, the literacy rates for each subcohort were quite similar to or higher than the national rates. The median age of all subcohorts was higher than their respective national median ages, as expected.

How often have they been followed up?

The initial cohort was recruited between 2009 and 2011 at all sites. The participants have been followed up once between 2013 and 2017, with an average of 4.6 years between assessments. A further round of follow-up is planned to start in 2020. The follow-up rates are calculated based on all participants who were enrolled. Loss to follow-up was highest in the Malaysian subcohort, with only 76% individuals from phase 1 participating in phase 2. The follow-up rates for Thailand, Indonesia and the Philippines were 86%, 85% and 82%, respectively. The overall follow-up rate was 84%

Table 1. Baseline sociodemographic characteristics of LIFECARE cohort

	Indonesia (<i>n</i> = 1520)	Malaysia (<i>n</i> = 2541)	Philippines (<i>n</i> = 3069)	Thailand (<i>n</i> = 3351)	Total (<i>n</i> = 10 481)
Age, years, median (IQR)	40.80 (11.75)	36.11 (13.13)	36.18 (14.10)	44.22 (9.16)	39.74 (13.61)
Gender, <i>n</i> (%)					
Males	375 (24.67)	1062 (41.80)	1326 (43.21)	2408 (71.86)	5171 (49.34)
Females	1145 (75.33)	1479 (58.20)	1743 (56.79)	943 (28.14)	5310 (50.66)
Race, <i>n</i> (%)	(<i>n</i> = 1287)	(<i>n</i> = 2044)	(<i>n</i> = 3069)	(<i>n</i> = 3010)	(<i>n</i> = 9410)
Chinese	13 (1.01)	764 (37.35)	0	94 (3.12)	871 (9.26)
Malay	0	1235 (60.45)	0	0	1235 (13.12)
Thais	0	0	0	2914 (96.81)	2914 (30.97)
Indonesians	1274 (98.99)	11 (0.54)	0	0	1285 (13.66)
Filipinos	0	0	3069 (100)	0	3069 (32.61)
Others	0	34 (1.66)	0	2 (0.07)	36 (0.38)
Education, <i>n</i> (%)	(<i>n</i> = 1516)	(<i>n</i> = 2541)	(<i>n</i> = 3069)	(<i>n</i> = 3340)	(<i>n</i> = 10 466)
None/<primary/don't know	100 (6.60)	23 (0.91)	226 (7.36)	8 (0.24)	357 (3.41)
Primary	156 (10.29)	147 (5.8)	395 (12.87)	0	698 (6.67)
Secondary	983 (64.84)	1418 (55.79)	1400 (45.62)	190 (5.69)	3991 (38.13)
College/university	251 (16.56)	827 (32.56)	1042 (33.95)	2486 (74.43)	4606 (44.01)
Postgraduate	26 (1.72)	126 (4.96)	6 (0.20)	656 (19.64)	814 (7.78)
Job status, <i>n</i> (%)	(<i>n</i> = 1517)	(<i>n</i> = 2541)	(<i>n</i> = 3069)	(<i>n</i> = 3341)	(<i>n</i> = 10 468)
Employed	569 (37.51)	2345 (92.29)	2067 (67.35)	3321 (99.40)	8302 (79.31)
Unemployed	945 (62.29)	190 (7.48)	997 (32.49)	6 (0.18)	2138 (20.42)
Retired	3 (0.2)	4 (0.16)	5 (0.16)	13 (0.39)	25 (0.24)
Disabled/dependent	0	2 (0.08)	0	1 (0.03)	3 (0.03)
Marital status, <i>n</i> (%)	(<i>n</i> = 1513)	(<i>n</i> = 2541)	(<i>n</i> = 3069)	(<i>n</i> = 3334)	(<i>n</i> = 10 457)
Single	239 (15.80)	723 (28.45)	581 (18.93)	819 (24.57)	2362 (22.59)
Married	1187 (78.45)	1742 (68.56)	2015 (65.66)	2350 (70.49)	7294 (69.75)
Separated/divorced/widowed	87 (5.75)	74 (2.91)	121 (3.94)	165 (4.95)	447 (4.27)
Live-in	0	2 (0.08)	352 (11.47)	0	354 (3.39)
Smokers, <i>n</i> (%)	(<i>n</i> = 1508)	(<i>n</i> = 2541)	(<i>n</i> = 3069)	(<i>n</i> = 3310)	(<i>n</i> = 10 427)
Yes	172 (11.41)	512 (20.15)	847 (27.6)	620 (18.73)	2151 (20.63)
Alcohol intake ^a , <i>n</i> (%)	(<i>n</i> = 0)	(<i>n</i> = 2541)	(<i>n</i> = 3069)	(<i>n</i> = 3277)	(<i>n</i> = 8887)
Yes	NA	927 (36.48)	1810 (58.98)	2015 (61.49)	4752 (53.47)

NA, not available.

^aIndonesia did not ask about alcohol intake because of cultural sensitivity.

with 8778 participants in phase 2. The main reason for loss to follow-up was inability to contact the participant due to change of address. Table 2 compares baseline demographic characteristics between those who were followed up and those lost to follow-up. As can be seen from the table, participants who were lost to follow-up were more likely to be males, smokers, with secondary level of education and single or separated/divorced.

What has been measured?

Interviewer-administered questionnaires were used to collect information on sociodemographic characteristics and cardiovascular risk factors. Questionnaires to assess anxiety, depression, health-related quality of life and health care utilization were also included. Questionnaires were standardized across the four countries. Forward and backward translations of questionnaires were conducted at

each site locally at both phases. Phase 2 translations were cross-checked by the LIFECARE team at the Saw Swee Hock School of Public Health (SSHSPH), National University of Singapore (NUS). Table 3 gives details of the information collected at each study site in both phases.

The 10-item Kessler Psychological Distress Scale (K10) questionnaire was used to measure the level and severity of depression and anxiety in phase 2. The Malay and Tagalog (Philippines) translations used have been accepted as the official translations.^{14,15} Health-related quality of life was assessed using the Short Form 36 Health Survey (SF-36) and EuroQol five-dimensions five-levels (EQ-5D) questionnaires. Validation studies were performed for the phase 1 Tagalog translation of SF-36 and the Thai translation of EQ-5D.^{16,17} Official translations of these two questionnaires were used in phase 2 for all countries.^{18,19} Health care utilization was assessed by asking about visits to outpatient clinics and health care expenditure in the preceding 6 months.

Table 2. Comparison of sociodemographic characteristics between those who were followed up and those lost to follow-up

	Followed up		Lost to follow-up		P-value ^a
	(n = 9984)		(n = 2049)		
Age, years, mean(SD)	40.91	(9.28)	39.51	(11.22)	<0.001
Gender, n (%)					0.001
Males	5167	(51.75)	1147	(55.98)	
Females	4817	(48.25)	902	(44.02)	
Smoking, n (%)	1910	(19.27)	553	(27.34)	<0.001
Alcohol consumption, n (%)	4598	(53.50)	967	(53.90)	0.758
Leisure-time physical activity, n (%)					0.014
None	5608	(56.36)	1088	(53.54)	
Little exercise	2597	(26.10)	561	(27.61)	
Moderate to vigorous exercise, 3–5 times/week	1380	(13.87)	283	(13.93)	
Moderate to vigorous exercise, daily for ≥30 min	366	(3.68)	100	(4.92)	
Job status, n (%)					0.385
Employed	8028	(80.51)	1626	(79.67)	
Unemployed	1944	(19.49)	415	(20.33)	
Education, n (%)					<0.001
None/<primary	302	(3.03)	68	(3.33)	
Primary	588	(5.90)	116	(5.68)	
Secondary	3549	(35.60)	896	(43.90)	
College/university	4716	(47.31)	863	(42.28)	
Postgraduate	813	(8.16)	98	(4.80)	
Marital status, n (%)					<0.001
Single	1994	(20.02)	496	(24.36)	
Married	7206	(72.35)	1357	(66.65)	
Separated/widowed/divorced	481	(4.83)	108	(5.30)	
Live-in	279	(2.80)	75	(3.68)	

SD, standard deviation.

^aT-tests were used to test the difference of age and chi square tests were used to test for differences in all other variables between the two groups.

The phase 2 questionnaire was more detailed, with all the countries using the same standardized questionnaire for data collection. Additional steps were taken to ensure data fidelity, including development of an online portal with double data entry. The questionnaire included more uniform measures of income, which were comparable across the countries. It also contained additional information such as detailed diet and lifestyle information. In addition, phase 2 biochemical measurements also included creatinine measurement for all countries as opposed to phase 1, where only the Philippines and Thailand measured creatinine levels.

In addition to questionnaires, anthropometric measurements as well as blood tests were conducted to assess cardiovascular risk biomarkers. Anthropometric measurements included height, weight, hip and waist circumference. Three readings each of systolic and diastolic blood pressure, ankle brachial pressure index (ABPI measurements) and electrocardiogram (ECG) recordings were taken by trained interviewers and nurses. Fasting blood samples were collected by trained nurses or phlebotomists, and transported to the respective laboratories via cooler boxes with ice packs to

maintain transport temperature at 2–8°C. The samples were analysed on the same day as their collection, except for those collected in some remote areas of the Philippines. In these cases, the samples were centrifuged within an hour of collection; plasma and buffy coat samples were transported in a cold box with a temperature of <−30°C and analysed/ stored within 3 days of collection. Each country used a local laboratory to analyse its samples for measuring fasting plasma glucose, total cholesterol, triglycerides (TG), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C). A calibration study was conducted by analysing a pool of common samples in each of the local laboratories and comparing the resulting measurements with the International Organization for Standardization (ISO) 15189 certified reference laboratory in Thailand. This helped to generate equations that were used to re-calibrate the biochemical measurements if they were significantly different from those obtained from the reference laboratory. The details of this re-calibration exercise will be published elsewhere. This was done to ensure comparability of these measurements across countries.

Table 3. Overview of the information collected in phases 1 and 2 of LIFECARE study in the participating countries

Information collected		Indonesia	Malaysia	Thailand	Philippines
Sociodemographics	Date of birth, gender, marital status	●	●	●	●
	Education	●	●	●	●
	Employment status	●	●	●	●
	Ownership of goods	●	●	●	●
	Other questions regarding SES	●	●	●	●
	Ethnicity	●	●	●	○
	No. of jobs	●	●	●	○
	Occupation	●	●	●	○
	Annual personal income	○	○	○	○
	Annual household income	○	○	○	○
	Parents' education	◇	◇	◇	
	Monthly household income		◇	◇	◇
	Women's health	Menopausal status	●	●	●
Pregnancy and lactation status		●	●	○	○
Past medical history	Major chronic diseases	●	●	●	●
Family history	Major chronic diseases	●	●	●	●
Lifestyle factors	Physical activity	●	●	●	●
	Smoking	●	●	●	●
	Diet	○	●	○	●
	Alcohol consumption	○	●	●	●
	Sedentary behaviour and screen time	○	○	○	○
Psychological stress	Financial stress	●	●	●	●
	Autonomy	●	●	●	●
	Major life events	●	●	●	●
	Stress at home, past year	●	●	●	○
	Stress at work, past year	●	●	●	○
HRQoL	K10	○	○	○	○
	EQ-5D VAS	●	●	●	●
	EQ-5D	○	○	●	○
	SF-36	○	○	○	●
Health care utilization		●	●	●	●
Physical examination	Weight	●	●	●	●
	Height	●	●	●	●
	Waist	●	●	●	●
	Hip	●	●	●	●
	Systolic blood pressure	●	●	●	●
	Diastolic blood pressure	●	●	●	●
	Heart rate	●	●	●	●
	Electrocardiogram (ECG)	●	●	●	●
	ABPI	○	●	●	●
Biochemical tests	Fasting plasma glucose	●	●	●	●
	Fasting lipid profile	●	●	●	●
	Creatinine	○	○	●	●

● Both phases; ○ only phase 2; ◇ only phase 1.
SES, socioeconomic status.

Frozen serum/plasma samples were also stored at each study site for future biochemical and genetic studies. Table 4 shows the types and numbers of samples stored at each country. The separated plasma/serum was stored in cryovial tubes, and buffy coat in nalgene vials. These were put in cryoboxes and stored in -80°C freezers.

For phase 1, each country entered data into a spreadsheet and subsequently sent a duplicate copy of the de-identified data to the centralized LIFECARE database at SSHSPH, NUS, which also acts as the study coordination centre. For phase 2, all countries except Thailand entered the data directly into an online portal using an electronic

Table 4. Type and number of stored samples from each country

	Type of stored sample	Phase 1(<i>n</i>)	Phase 2(<i>n</i>)
Indonesia	Serum	3502	1396
	Plasma	3502	1396
Malaysia	Serum	559	1896
	Plasma	2540	1920
	Buffy coat	2540	0
Philippines	Plasma	3072	2417
	Buffy coat	3072	2417
Thailand	Serum	4847	4183
	Buffy coat	4840	4183

case report form, for all participants. Thailand continued to use Microsoft Excel for entering and managing the data, as LIFECARE was incorporated into the EGAT study as mentioned earlier, and they managed the data according to its protocol.

What has it found? Key findings and publications

So far, the LIFECARE data has produced 12 publications, and more are in progress. Data from the Philippines subcohort has been analysed in four studies examining the socio-demographic, socioecological, health and stress profile, cardiovascular risk profile and dietary preferences.^{20–23} Ecological correlations with data from the municipality/city health offices showed that respiratory diseases were the most prevalent and cardiovascular diseases were the biggest contributors to mortality in the participating provinces. Data directly obtained from participants showed that the majority of participants experienced moderate levels of financial stress, with loss of job being the most common cause of stress. Cardiovascular risk factors were more common in males living in urban areas and having higher socioeconomic status. An analysis of dietary habits showed that people with diabetes and metabolic syndrome (MetS) had healthier diets. Another study conducted on the prevalence of MetS using both International Diabetes Federation (IDF) and National Cholesterol Education Program (mNCEP) III criteria concurred with the findings of the study on cardiovascular risk factors, providing evidence that MetS was more common in higher socioeconomic groups and urban areas in the Philippines, as opposed to developed countries which have an inverse relationship between socioeconomic status and MetS.^{24–26}

A parallel study conducted on the Indonesian subcohort using the American Heart Association/National Heart, Lung, and Blood Institute (AHA/NLBI) criteria found that MetS was prevalent among young adults (<39 years of

age), with more than half of this population being obese.^{25,27} An examination of the prevalence of individual components of MetS in the same population showed that obesity had the highest prevalence, followed by low HDL-C, especially among females. Males had higher prevalence of increased fasting plasma glucose (FPG) and triglycerides (TGs) as compared with females. Blood pressure was higher among those with a university education.²⁸ A study on prevalence of diabetes in phase 1 participants from Indonesia showed higher prevalence of diabetes with increasing age, in males and in those with a lower education level. Low HDL-C levels were also related to the prevalence of diabetes in this subcohort.²⁹

A study on HRQoL using phase 1 data from the Thailand subcohort found that among the chronic diseases, diabetes was most strongly associated with poor mental health, followed by hypertension. Exercise had a positive effect on mental and physical health and even helped to counter the negative impact of chronic conditions.³⁰ A paper on the EGAT cohort profile, including the LIFECARE subcohort, has also been published detailing the characteristics and findings of the cohort.¹³

Three validation studies have been published, one for the Tagalog-translated version of the SF-36 questionnaire in the Philippines subcohort, one for the Thai-translated version of EQ-5D questionnaire in the Thai subcohort and another one for the Malay-translated K6 and K10 questionnaires in the Malaysian subcohort.^{15–17}

What are the main strengths and weaknesses?

The main strengths of this study are its focus on understudied populations in Southeast Asia, the multicentre, prospective cohort design, use of a unified protocol to examine study populations at all four sites and the extensive data collected on psychological factors, health care utilization and health-related quality of life. The recruitment of a relatively young population allows for the investigation of the onset of cardiovascular risk factors, their trajectories over time and disease endpoints when these occur; and enables the identification of key modifiable factors during this process. Another strength lies in the high follow-up rates achieved in the first round. The biological samples stored at all sites are also an asset, allowing the examination of trends over time for various CVD biomarkers, as well as the measurement of biomarkers discovered at a later time, in these populations.

However, the study also has some limitations. The study populations in each subcohort are restricted to certain geographical areas due to logistic constraints, and might not be representative of their respective countries. Another limitation

is that the participants have been recruited from different source populations; for example, the Thai subcohort is an occupational cohort, whereas the other subcohorts are population cohorts. Only one round of follow-up has been completed, and so only small proportions of the cohort have developed risk factors and/or disease as yet. Subsequent follow-ups are planned to allow capture of cardiovascular risk factors and disease. This in turn will help to determine the long-term effects of different sociodemographic factors on cardiovascular diseases risk, as well as incidence of CVD.

Can I get hold of the data? Where can I find out more?

LIFECARE data is available at the Saw Swee Hock School of Public Health (SSHSPH), National University of Singapore, which is the coordination centre of the study. Queries regarding the data and potential collaborations can be sent to [SSHSPHDataRequest@nus.edu.sg]. To access the data, a formal application must be submitted with a detailed research proposal consisting of the proposed title, authors, research questions, brief scientific background of approximately 200 words, study design, study population with details on eligible populations and exclusions, outcome and exposure variables, covariables and proposed statistical analysis. The LIFECARE committee will scrutinize the application and decide its outcome.

Future prospects

The LIFECARE cohort has contributed some much-needed information about four under-studied Southeast Asian countries. There is potential now for testing a range of hypotheses, using the comprehensive data collected at two phases. Future follow-ups will further enhance the value of this cohort by identifying trends as well as patterns of cardiovascular risk, and will empirically establish key modifiable risk factors that are relevant in these populations, as targets for intervention. Furthermore, the data on health care utilization can help formulate effective health policies in the respective countries.

Supplementary Data

Supplementary data are available at *IJE* online.

LIFECARE cohort profile in a nutshell

- LIFECARE is the first cohort of its kind from Southeast Asia, and is helping to fill the gap in knowledge regarding cardiovascular disease (CVD) epidemiology in the region.

- It consists of ostensibly healthy participants between 18 and 50 years of age, from four high CVD-prevalence countries, namely Indonesia, Malaysia, Thailand and the Philippines.
- Baseline data was collected between 2009 and 2011. A total of 12 033 participants were recruited, of whom 10 481 were eligible for participation in the study.
- The first follow-up was conducted between 2013 and 2017, with an overall retention rate of 84%.
- Data on sociodemographics, family history, lifestyle factors, stress, health-related quality of life, health care utilization, physical examination, fasting plasma glucose and lipid profile have been collected.
- Collaborations are welcome and data access can be requested by a formal application.

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