Catastrophic health expenditure on acute coronary events in Asia: a prospective study

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Introduction

Acute coronary syndromes are caused by sudden, reduced blood flow to the heart muscle. These conditions are a major cause of mortality and morbidity in the Asia-Pacific region and account for around half of the global burden from these conditions, i.e. around seven million deaths and 129 million disability-adjusted life years (DALYs) annually from 1990 to 2010.1–3 Significantly, during this period associated mortality and morbidity accounted for nearly two-thirds of all DALYs and over half of deaths from acute coronary syndromes occurring in low- and middle-income countries.1 The management of acute coronary syndromes varies widely between countries in Asia. In this area, hospital admission can create significant financial hardships for participants as treatment costs in many settings are borne largely out-of-pocket.1,2,6–8

In India, for example, survey data indicate that household expenditure on health care is 16.5% higher in households where one or more adults has cardiovascular disease.9 In China, out-of-pocket costs for medications treating high blood pressure – a risk factor for acute coronary syndrome – limit the adherence to the treatment.10 In addition, out-of-pocket costs for health care act as a barrier to improvements in the treatment of acute coronary syndromes in hospitals.11

This economic burden on households due to out-of-pocket costs is commonly defined as catastrophic health expenditure when out-of-pocket expenditure over a year exceeds a certain threshold. This threshold has been defined in many ways: one of the most common definitions is out-of-pocket costs exceeding 30% of annual household income.12–15

There is a lack of evidence on the household economic burden associated with acute coronary syndromes in Asia. Studies that have considered the issue have been small-scale and localized16 or have studied cardiovascular disease in general14 rather than specific diseases.16 In China, India and the United Republic of Tanzania, more than 50% of people admitted with cardiovascular disease experienced catastrophic health expenditure.14 Among 210 people with acute coronary syndromes in Kerala, India, 84% (176/210) experienced catastrophic health expenditure based on a slightly different threshold of > 40% of disposable income (income minus expenditure on food).2

While health insurance potentially provides protection from the burden of out-of-pocket costs, the extent of such protection will vary across different health-care systems. Catastrophic health expenditure was reported to be more frequent in uninsured than insured participants with: stroke in China;17 cardiac arrest in India;18 and injury in Viet Nam.19 There is some contrary evidence that health insurance coverage is associated with catastrophic health expenditure in China and Viet Nam.20 This may be attributed to insurance-based

Objective To estimate out-of-pocket costs and the incidence of catastrophic health expenditure in people admitted to hospital with acute coronary syndromes in Asia.

Methods Participants were enrolled between June 2011 and May 2012 into this observational study in China, India, Malaysia, Republic of Korea, Singapore, Thailand and Viet Nam. Sites were required to enrol a minimum of 10 consecutive participants who had been hospitalized for an acute coronary syndrome. Catastrophic health expenditure was defined as out-of-pocket costs of initial hospitalization > 30% of annual baseline household income, and it was assessed six weeks after discharge. We assessed associations between health expenditure and age, sex, diagnosis of the index coronary event and health insurance status of the participant, using logistic regression models.

Findings Of 12 922 participants, 9370 (73%) had complete data on expenditure. The mean out-of-pocket cost was 3237 United States dollars. Catastrophic health expenditure was reported by 66% (1984/3007) of those without insurance versus 52% (3296/6366) of those with health insurance (P < 0.05). The occurrence of catastrophic expenditure ranged from 80% (1055/1327) in uninsured and 56% (3212/5692) of insured participants in China, to 0% (0/41) in Malaysia.

Conclusion Large variation exists across Asia in catastrophic health expenditure resulting from hospitalization for acute coronary syndromes. While insurance offers some protection, substantial numbers of people with health insurance still incur financial catastrophe.

Abstracts in العربية, 中文, Français, Русский, and Español at the end of each article.

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funding making treatment available to groups who may otherwise have not sought care but who, because of limited reimbursement, also incur high levels of out-of-pocket costs. Here we examine the out-of-pocket costs of hospitalization for acute coronary syndromes in China, Hong Kong Special Administrative Region (SAR) of China, India, Malaysia, the Republic of Korea, Singapore, Thailand and Viet Nam. We also assess the incidence of catastrophic health expenditure associated with such hospitalization and the influence of health insurance and other background characteristics on such outcomes.

Methods

Setting

The seven countries included in the study have a combined population of around 2.8 billion people (64% of the overall Asian population and 40% of the global population) and represent a mix of income categories and healthcare systems. China, Hong Kong SAR, Republic of Korea and Singapore have high incomes; China, Malaysia and Thailand are upper-middle income countries; while India and Viet Nam are lower-middle income countries. Table 1 provides basic demographic, economic and disease indicators for each of the seven countries included in this study.

Hong Kong SAR of China, Malaysia, the Republic of Korea, Singapore and Thailand have achieved universal health coverage, albeit through a varied combination of financing mechanisms. The health services are mainly provided by the public sector and health insurance generally plays a supplementary role in which participants access coverage mainly for private sector services or elective treatments. In China, India and Viet Nam, there are known to be gaps in financial protection and heavy reliance on out-of-pocket payments in access to health care.

EPICOR Asia study

The EPICOR Asia study is a prospective observational study of consecutively recruited participants surviving hospitalization for acute coronary syndromes, enrolled in 218 hospitals in seven countries in Asia between June 2011 and May 2012.

| Variable | China | China, Hong Kong SAR | India | Malaysia | Republic of Korea | Singapore | Thailand | Viet Nam |
|----------|-------|----------------------|-------|----------|-------------------|-----------|----------|----------|
| Population in 2013 (millions) | 1.357 | 1.252 | 1.570 | 0.61 | 0.10 | 0.81 | 0.75 | 0.92 |
| GNI/capita in 2013 (US$) | 6,560 (UMI) | 10,430 (UMI) | 15,700 (LMI) | 8,600 | 10,430 (LMI) | 5,700 (UMI) | 4,100 | 4,100 |
| Health expenditure per capita in 2012 (US$) | 610 | 410 | 860 | 790 | 939 | 850 | 850 | 850 |
| Health expenditure per capita in 2012 (US$) | 78.0 | 72.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 |
| Out-of-pocket expenditure as % of private health expenditure in 2012 | 78.0 | 72.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 |
| Life expectancy from birth in 2012, years | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| Age-standardized CVD mortality in 2000–2012 (per 100,000 population) | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| CVD: cardiovascular disease; GNI: gross national income; HI: high income; LMI: lower-middle income; UMI: upper-middle income; US$: United States dollars. | 700,000 Population. | 700,000 Population. | 700,000 Population. | 700,000 Population. | 700,000 Population. | 700,000 Population. | 700,000 Population. | 700,000 Population. |

Table 1. Health system indicators for seven countries in Asia

| Variable | China | China, Hong Kong SAR | India | Malaysia | Republic of Korea | Singapore | Thailand | Viet Nam |
|----------|-------|----------------------|-------|----------|-------------------|-----------|----------|----------|
| Population in 2013 (millions) | 1.357 | 1.252 | 1.570 | 0.61 | 0.10 | 0.81 | 0.75 | 0.92 |
| GNI/capita in 2013 (US$) | 6,560 (UMI) | 10,430 (UMI) | 15,700 (LMI) | 8,600 | 10,430 (LMI) | 5,700 (UMI) | 4,100 | 4,100 |
| Health expenditure per capita in 2012 (US$) | 610 | 410 | 860 | 790 | 939 | 850 | 850 | 850 |
| Health expenditure per capita in 2012 (US$) | 78.0 | 72.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 |
| Out-of-pocket expenditure as % of private health expenditure in 2012 | 78.0 | 72.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 |
| Life expectancy from birth in 2012, years | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| Age-standardized CVD mortality in 2000–2012 (per 100,000 population) | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| CVD: cardiovascular disease; GNI: gross national income; HI: high income; LMI: lower-middle income; UMI: upper-middle income; US$: United States dollars. | 700,000 Population. | 700,000 Population. | 700,000 Population. | 700,000 Population. | 700,000 Population. | 700,000 Population. | 700,000 Population. | 700,000 Population. |

Table 1. Health system indicators for seven countries in Asia
Participants were eligible for inclusion in the study if they were 18 years or older; hospitalized within 48 hours of symptom onset of the index event; with a discharge diagnosis of an acute coronary syndrome; provided written informed consent at discharge; and completed a contact order form agreeing to be contacted for regular follow-up interviews after discharge.

Participants were excluded if their acute coronary event was caused by, or was a complication of, surgery, trauma, gastrointestinal bleeding or post-percutaneous coronary intervention; hospitalization for other reasons; a condition or circumstance arose that in the opinion of the investigator could significantly limit follow-up; they were participating in a randomized interventional clinical trial; or they had concomitant serious/severe comorbidities, which at the discretion of the investigator might have limited short-term life expectancy.

Participants were followed-up via telephone interviews at six weeks and three months after the index event, and subsequently every three months until 24 months following hospital discharge. Only baseline and six-week data are reported here as the focus of the study is on the economic burden associated with hospitalization for a relevant acute episode of acute coronary syndromes. Baseline data were collected through interviews with participants on: (i) demography; (ii) index event type (ST elevation myocardial infarction, non-ST elevation myocardial infarction, or unstable angina); and (iii) health insurance status (government, private, employer-provided, or none). Further details of the data collection have been published previously.

The study was conducted in compliance with the principles of the Declaration of Helsinki, International Conference on Harmonisation Good Clinical Practice guidelines and applicable legislation on non-interventional studies in participating countries. The protocol, including the informed consent form, was approved in writing by the applicable ethics committee of the participating centres according to local regulations. A list of participating centres is available from the corresponding author.

Health insurance status was defined as a binary variable based on whether individuals nominated any one of the listed forms of health insurance or none. Treatment costs associated with hospitalization, amount reimbursed and out-of-pocket costs were assessed at the follow-up interviews at six weeks after discharge and converted into United States dollars (US$) based on exchange rates in March 2013. The primary outcome, catastrophic health expenditure, was assessed on the basis of whether a participant had incurred out-of-pocket treatment costs greater than 30% of annual baseline household income.

A multivariable logistic regression model was used to assess associations between catastrophic health expenditure and age, sex, the type of index event and health insurance status. The results are presented as odds ratios (OR) and corresponding 95% confidence intervals (CI).

Analyses were undertaken using SAS version 8.2 or later (SAS Institute, Cary, United States of America).

Results

Overall, 9370 out of 12 922 participants (73%) had complete economic data and were included in the analysis. Background characteristics of participants by health insurance status are shown in Table 2. The mean age of participants was 60 years and 77% (7209) were male. The majority of participants (7016) were from China (100 centres) where 61% (4266) had health insurance. There were 74 participants from Hong Kong SAR of China (three centres, 30% [22] insured), 1635 participants from India (41 centres, 56% [913] insured), 41 participants from Malaysia (two centres, 0% [0] insured), 169 from the Republic of Korea (11 centres, 12% [21] insured), 57 from Singapore (one centre, 18% [10] insured), 234 from Thailand (10 centres).

| Characteristic | Yes (n = 5279) | No (n = 4091) | Total (n = 9370) |
|----------------|----------------|---------------|-----------------|
| Age, average years (SD) | 60 (11) | 61 (12) | 60 (12) |
| Age group, no. (%) | | | |
| <55 years | 1660 (31) | 1251 (31) | 2911 (31) |
| 55–64 years | 1789 (34) | 1328 (33) | 3117 (33) |
| 65–74 years | 1311 (25) | 933 (23) | 2244 (24) |
| >75 years | 519 (10) | 579 (14) | 1098 (12) |
| Male, no. (%) | 4094 (77.6) | 3115 (76.1) | 7209 (76.9) |
| Country, no. (%) | | | |
| China | 4266 (60.8) | 2750 (39.2) | 7016 (100.0) |
| China, Hong Kong SAR | 22 (29.7) | 52 (70.3) | 74 (100.0) |
| India | 913 (55.8) | 722 (44.2) | 1635 (100.0) |
| Malaysia | 0 (0) | 41 (100.0) | 41 (100.0) |
| Republic of Korea | 21 (12.4) | 148 (87.6) | 169 (100.0) |
| Singapore | 10 (17.5) | 47 (82.5) | 57 (100.0) |
| Thailand | 15 (6.4) | 219 (93.6) | 234 (100.0) |
| Viet Nam | 32 (22.2) | 112 (77.8) | 144 (100.0) |
| Place of residence, no. (%) | | | |
| Rural | 2008 (38.0) | 1086 (26.5) | 3094 (33.0) |
| Urban | 3271 (62.0) | 3005 (73.5) | 6276 (67.0) |
| Final diagnosis of index admission, no. (%) | | | |
| STEMI | 2854 (54.1) | 1908 (46.6) | 4762 (50.8) |
| NSTEMI | 959 (18.2) | 873 (21.3) | 1832 (19.6) |
| UA | 1466 (27.8) | 1310 (32.0) | 2776 (29.6) |

NSTEMI: non-ST segment elevation myocardial infarction; STEMI: ST segment elevation myocardial infarction; SD: standard deviation; UA: unstable angina.

* In Malaysia, services provided through the public sector are heavily subsidized — responses regarding insurance status pertain to supplementary private cover.

Table 2. Baseline characteristics of participants, enrolled between June 2011 and May 2012, by health insurance status, in seven countries in Asia
6% [15] insured), and 144 from Viet Nam (seven centres, 22% [32] insured). In terms of final diagnosis of index event, 51% (4762) had ST elevation myocardial infarction, 20% (2776) had non-ST elevation myocardial infarction and 29% (1832) had unstable angina. Fig. 1 indicates the number of events in each category across all seven countries. Of the 4762 participants who suffered a myocardial infarction with ST elevation, the majority (2854) were insured, while for participants who suffered from myocardial infarction without an ST elevation or unstable angina, around half of participants were uninsured; 48% (873/1832) and 47% (1310/2776), respectively.

The total mean cost of hospitalization per participant was US$ 6478 for ST elevation myocardial infarction, US$ 5904 for non-ST elevation myocardial infarction and US$ 6026 for unstable angina. Average out-of-pocket costs of hospitalization were US$ 3421 for ST elevation myocardial infarction, US$ 3050 for non-ST elevation myocardial infarction and US$ 3052 for unstable angina. There was a broad range of out-of-pocket costs both by country and by index event type: for example, in Malaysia, mean out-of-pocket costs were US$ 69 for ST elevation myocardial infarction and US$ 72 for non-ST elevation myocardial infarction, while in China, mean out-of-pocket costs were US$ 4047 for ST elevation myocardial infarction, US$ 3743 for non-ST elevation myocardial infarction and US$ 3273 for unstable angina (Fig. 2). Catastrophic health expenditure was reported by 56% (5280/9373) of participants; of these, there was a significantly greater proportion in occurrence of this outcome amongst the uninsured (66%; 1984/3007) compared with insured (52%; 3296/6366; P < 0.05). The occurrence of catastrophic expenditure ranged from 80% (1055/1327) in uninsured and 56% (3212/5692) of insured participants in China, to 0% (0/41) in Malaysia (Fig. 3). In short, there was a broad range in the level of out-of-pocket costs and occurrence of catastrophic health expenditures experienced across the seven countries.

In the adjusted analysis, catastrophic health expenditure was significantly less likely for those with health insurance compared to those without insurance; OR: 0.563 (95% CI: 0.51–0.62). Catastrophic health expenditure was significantly more likely among older participants (Table 3).

Discussion

This study shows that the burden of out-of-pocket costs associated with treatment for acute coronary syndromes in Asia can be substantial, reflecting the limited financial protection available for hospitalization for these conditions. It further highlights large variation across countries in rates of catastrophic health expenditure resulting from hospitalization for acute coronary syndromes, and high rates of financial catastrophe incurred, particularly in China and India. With data from over 9000 respon-
Catastrophic health expenditure for participants, enrolled between June 2011 and May 2012, who suffered from acute coronary syndrome, in seven countries in Asia

Proportion of participants with catastrophic health expenditure (%)

| Country          | Uninsured | Insured |
|------------------|-----------|---------|
| China SAR        | **75**    | 42      |
| China, Hong Kong | 72        | 46      |
| India            | 62        | 41      |
| Malaysia         | 60        | 40      |
| Republic of Korea| 42        | 44      |
| Singapore        | 33        | 36      |
| Thailand         | 52        | 40      |
| Viet Nam         | 60        | 49      |

* P < 0.05

Note: Catastrophic health expenditure was defined as out-of-pocket treatment costs greater than 30% of annual baseline household income. In Malaysia, services provided through the public sector are heavily subsidized and responses regarding insurance status pertain to supplementary private cover.

Table 3. Factors associated with catastrophic health-care expenditure after an acute coronary syndrome event, for participants enrolled between June 2011 and May 2012, in seven countries in Asia

| Factor                              | OR (95% CI) |
|-------------------------------------|-------------|
| Age group, years                    |             |
| 55–64 vs ≤ 55                       | 1.07 (0.97–1.19) |
| 65–74 vs ≤ 55                       | 1.15 (1.02–1.28) |
| ≥ 75 vs ≤ 55                        | 0.76 (0.66–0.88) |
| Final diagnosis of index admission  |             |
| NSTEMI vs STEMI                     | 0.74 (0.66–0.82) |
| UA vs STEMI                         | 0.78 (0.71–0.86) |
| Gender                              |             |
| Female vs male                      | 1.01 (0.91–1.12) |
| Health insurance                    |             |
| Yes vs no                           | 0.56 (0.51–0.62) |

CI: confidence interval; NSTEMI: non-ST segment elevation myocardial infarction; OR: odds ratio; STEMI: ST segment elevation myocardial infarction; UA: unstable angina.

Given substantial differences in the types of health-care systems involved in this study, health insurance has different roles across the various settings. In health-care systems such as those used in Malaysia, the Republic of Korea, Singapore and Thailand, where there is universal health coverage, health insurance is largely supplementary cover. This may explain why, in the Republic of Korea for instance, there were higher rates of catastrophic health expenditure in insured compared to uninsured participants. Here, participants who are insured may be opting for care through the private system, for reasons such as the avoidance of waiting lists for non-urgent procedures, choice of provider and superior hotel services. They may incur private insurance co-payments and treatment costs not covered under their policies. In contrast, uninsured participants may have been receiving free or heavily subsidized services through the public system.

Financial catastrophe appears to increase with age up to 75 years, whereupon participants experience a lower risk. The greater complexity of illness with increasing age may increase costs associated with an event. The fact that this association is reversed in participants from the highest age groups may be due to higher mortality and an emphasis on more conservative treatment and palliation in this group.

There are three main limitations of the study. First, being clinic-based, the...
study assessed only the costs incurred by those participants who were able to afford treatment. The study therefore lacks an account of this aspect of financial burden where individuals are excluded from treatment due to cost. Second, only 73% of the participants were able to complete income and cost data. In some countries, participants were recruited from a few centres only. This limitation mirrors well-recognized difficulties in eliciting economic data and limits the generalizability of the findings. Third, the relatively small numbers of participants from countries other than China and India limited the ability to conduct adjusted analyses for individual countries. The study should not be viewed as a series of multi-country analysis. The fact that there were smaller numbers of participants enrolled in smaller countries does not detract from the generalizability of the findings since financial catastrophe – a standardized outcome indicator – was used.

Ensuring that treatment for acute coronary syndromes is provided and financially affordable in future years will be a major challenge. In particular, this will entail the funding of financial protection programmes that adequately offset the high costs of conditions such as acute coronary syndromes in low-resource settings. While these findings relate to the acute phase of hospitalization, the need to provide affordable, long-term treatment and rehabilitation presents further significant challenges.

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Катастрофические расходы на здравоохранение при остром коронарном синдроме в Азии: проспективное исследование

Цель Подсчитать выплаты из собственных средств пациентов и долю катастрофических расходов на здравоохранение среди людей, госпитализированных с острым коронарным синдромом, в Азии.

Методы Участники были включены в проспективное исследование в период с июня 2011 по май 2012 г. во Вьетнаме, Индии, Малайзии, Республике Корея, Сингапуре и Таиланде. Для исследования определялось не менее 10 последовательных участников в странах с острым коронарным синдромом, за исключением специализированных центров. Катастрофические расходы на здравоохранение составляли выплаты из собственных средств пациентов при первоначальной госпитализации, превышающие 30% базового уровня годового дохода семьи. При этом оценка проводилась через 6 недель после выписки из стационара. Была проведена оценка взаимосвязи между показателями качества здравоохранения и внутрибольничной инфекции.

Результаты Из 12 922 участников 9 370 (73%) предоставили полные данные о расходах. Средний размер выплат из собственных средств пациентов составил 3 237 долларов США. О катастрофических расходах на здравоохранение сообщили 66% (1 984 из 3 007) пациентов из тех, у кого медицинская страховка отсутствовала, против 52% (3 296 из 6 366) пациентов, имеющих медицинскую страховку (P < 0,05). Частотность катастрофических расходов варьировалась от 80% (1 055 из 1 327) среди незастрахованных и 56% (3 212 из 5 692) застрахованных участников в Индии до 0% (0 из 41) в Малайзии.

Вывод Существует большая разница между странами Азии в отношении катастрофических расходов на здравоохранение, вызванных госпитализацией при остром коронарном синдроме. Несмотря на то что страхование предоставляет определенную защиту, значительное количество людей, имеющих медицинскую страховку, теряют финансовый крах в вопросах здравоохранения.
a un 52% (3 296/6 366) de los que contaban con seguro (P < 0,05). La aparición de gastos catastróficos variaba de un 80% (1 055/1 327) de participantes sin seguro y un 56% (3 212/5 692) de participantes asegurados en China a un 0% (0/41) en Malasia.

**Conclusión** Existe una gran variación en Asia en lo referente al gasto sanitario catastrófico derivado de la hospitalización por síndromes coronarios agudos. Aunque los seguros ofrecen cierta protección, existe un gran número de personas con seguro sanitario que aún incurriran en catástrofe financiera.

**References**

1. Davadanan M. Pathways to catastrophic health expenditure for acute coronary syndrome in Kerala. “Good health at low cost”? BMC Public Health. 2012;12(1):306. doi: http://dx.doi.org/10.1186/1471-2458-12-306 PMID: 22537240

2. Davadanan M, Thankappan KR, Sarma PS, Hankirshnan S. Catastrophic health expenditure & coping strategies associated with acute coronary syndrome in Kerala, India. Indian J Med Res. 2012 Oct;136(4):585–92. PMID: 23168698

3. Ohira T, Iso H. Cardiovascular disease epidemiology in Asia: an overview. Circ J. 2013;77(7):1646–52. doi: http://dx.doi.org/10.1253/circj.CJ-13-0702 PMID: 23802394

4. Huo Y, Thompson P, Buddhani W, Ge J, Harding S, Ramanathan L, et al. Challenges and solutions in medically managed ACS in the Asia-Pacific region: expert recommendations from the Asia-Pacific ACS Medical Management Working Group. Int J Cardiol. 2015 Mar 15;183:63–75. doi: http://dx.doi.org/10.1016/j.ijcard.2014.11.195 PMID: 25662044

5. Vedanthan R, Seligman B, Fuster V. Global perspective on acute coronary syndrome: a burden on the young and poor. Circ Res. 2014 Jun 6;114(12):1959–75. doi: http://dx.doi.org/10.1161/CIRCRESAHA.114.302782 PMID: 24902978

6. Prabhakaran D, Yussuf S, Mehta S, Pogue J, Avezum A, Budaj A, et al. Two-year outcomes in patients admitted with non-ST elevation acute coronary syndrome: results of the OASIS registry 1 and 2. Indian Heart J. 2005 May-Jun;57(3):217–25. PMID: 16196178

7. Van Minh H, Xuan Tran B. Assessing the household financial burden associated with the non-communicable diseases in a rural district of Vietnam. Glob Health Action. 2012;5(0):1–7. doi: http://dx.doi.org/10.3402/gha.v5i0.18892 PMID: 22732250

8. Bhogni U, Thiriveni B, Devadasan R, Munegowda C, Devadasan N, Kolsteren P, et al. Out-of-pocket healthcare payments on chronic conditions impoverish urban poor in Bangalore, India. BMC Public Health. 2012;12(1):990. doi: http://dx.doi.org/10.1186/1471-2458-12-990 PMID: 23158475

9. Karan A, Engelmau G, Mahal A. The household-level economic burden of heart disease in India. Trop Med Int Health. 2014 May 19;19(5):581–91. doi: http://dx.doi.org/10.1111/tmi.12281 PMID: 24612174

10. Yu B, Zhang X, Wang G. Full coverage for hypertension drugs in rural China to a 0% (0/41) in Malaysia.

11. Meng Q, Xu K. Progress and challenges of the rural cooperative medical scheme in China. Bull World Health Organ. 2014 Jun 19;92(6):447–51. doi: http://dx.doi.org/10.2471/BLT.13.131532 PMID: 24940019

12. World Bank Open Data. Washington: World Bank. 2015. Available from: http://data.worldbank.org/ [cited 2016 Jan 27].

13. Deaths due to cardiovascular diseases. Global Health Observatory. Geneva: World Health Organization, 2015. Available from: http://gamaspserver.who.int/go/interactive_charts/cnrd/mortality/cvd/asia.html [cited 2016 Jan 27].

14. Herberholz C, Supakankunti S. Contracting private hospitals: experiences from Southeast and East Asia. Health Policy. 2015 Mar;119(3):274–86. doi: http://dx.doi.org/10.1016/j.healthpol.2014.12.017 PMID: 25576007

15. Álvarez-Hernández E, Peláez-Ballestas I, Boonen A, Vázquez-Mellado J, Hernández-Garduño A, Rivera FC, et al. Catastrophic health expenses and impoverishment of households of patients with rheumatoid arthritis. Reumatol Clin. 2012 Jul-Aug;8(4):168–73. doi: http://dx.doi.org/10.1016/j.reuma.2012.05.002 PMID: 22704914

16. Tchangarosenthien V, Pitayarangsart S, Patcharanarumol W, Prakongsa P, Sumalee H, Tosanguan J, et al. Promoting universal financial protection: how the Thai universal coverage scheme was designed to ensure equity. Health Res Policy Syst. 2013;11(1):25. doi: http://dx.doi.org/10.1186/1478-4505-11-25 PMID: 23919275

17. Nguyen H, Ivers R, Jan S, Martinkus A, Pham C. Catastrophic household costs due to injury in Vietnam. Injury. 2013 May;44(5):684–90. doi: http://dx.doi.org/10.1016/j.injury.2012.05.006 PMID: 22658420

18. Sun Q, Liu X, Meng Q, Tang S, Yu B, Tolhurst R. Evaluating the financial protection of patients with chronic disease by health insurance in rural China. Int J Equity Health. 2009;8(1):42. doi: http://dx.doi.org/10.1186/1475-4762-8-42 PMID: 20003198

19. Meng Q, Xu K. Progress and challenges of the rural cooperative medical scheme in China. Bull World Health Organ. 2014 Jun 19;92(6):447–51. doi: http://dx.doi.org/10.2471/BLT.13.131532 PMID: 24940019

20. World Bank Open Data. Washington: World Bank. 2015. Available from: http://data.worldbank.org/ [cited 2016 Jan 27].

21. Deaths due to cardiovascular diseases. Global Health Observatory. Geneva: World Health Organization, 2015. Available from: http://gamaspserver.who.int/go/interactive_charts/cnrd/mortality/cvd/asia.html [cited 2016 Jan 27].

22. Herberholz C, Supakankunti S. Contracting private hospitals: experiences from Southeast and East Asia. Health Policy. 2015 Mar;119(3):274–86. doi: http://dx.doi.org/10.1016/j.healthpol.2014.12.017 PMID: 25576007

23. Guarro RL, Curran UZ, Suphanchaimat R, Pocock NS. Universal health coverage in ‘One ASEAN’: are migrants included? Glob Health Action. 2015;8(0):25749. doi: http://dx.doi.org/10.3402/gha.v8.a25749 PMID: 25626624

24. Mahal A, Karan A, Fan YV, Engelmau G. The economic burden of cancers on Indian households. PLoS One. 2013;8(8):e71853. doi: http://dx.doi.org/10.1371/journal.pone.0071853 PMID: 23951258

25. Tchangarosenthien V, Patcharanarumol W, P, Iploum SD, Muku AG, Akkhavan K, et al. Health-financing reforms in southeast Asia: challenges in achieving universal coverage. Lancet. 2011 Mar 5;377(9768):863–73. doi: http://dx.doi.org/10.1016/S0140-6736(10)60189-9 PMID: 21269682

26. Huo Y, Lee SW, Sawhney P, Kim HS, Kritsanyakophong R, Nhan VT, et al. Rationale, Design, and Baseline Characteristics of the EPCOR Asia Study (Long-Term follow-up of antithrombotic management patterns In Acute Coronary Syndrome patients in Asia). Clin Cardiol. 2015 Sep;38(9):511–9. doi: http://dx.doi.org/10.1002/clc.22431 PMID: 26026158

27. Jaspers L, Colpani V, Chaker L, van der Lee SJ, Muka T, Akkhavan K, et al. Health-financing reforms in southeast Asia: challenges in achieving universal coverage. Lancet. 2011 Mar 5;377(9768):863–73. doi: http://dx.doi.org/10.1016/S0140-6736(10)60189-9 PMID: 21269682

28. Ling RE, Liu F, Lu XQ, Wang W. Emerging issues in public health: a perspective on China’s healthcare system. Public Health. 2011 Jan;125(1):9–14. doi: http://dx.doi.org/10.1016/j.puhe.2010.10.009 PMID: 21168175

29. Turrell G. Income non-reporting: implications for health inequalities research. J Epidemiol Community Health. 2000 Mar;54(3):207–14. doi: http://dx.doi.org/10.1136/jech.54.3.207 PMID: 10746115