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ABSTRACT

Introduction Using nationally representative survey data from China and India, this study examined (1) the distribution and patterns of multimorbidity in relation to socioeconomic status and (2) association between multimorbidity and out-of-pocket expenditure (OOPE) for medicines by socioeconomic groups.

Methods Secondary data analysis of adult population aged 45 years and older from WHO Study on Global Ageing and Adult Health (SAGE) India 2015 (n=7397) and China Health and Retirement Longitudinal Study (CHARLS) 2015 (n=11 570). Log-linear, two-parts, zero-inflated and quantile regression models were performed to assess the association between multimorbidity and OOPE for medicines in both countries. Quantile regression was adopted to assess the observed relationship across OOPE distributions.

Results Based on 14 (11 self-reported) and 9 (8 self-reported) long-term conditions in the CHARLS and SAGE datasets, respectively, the prevalence of multimorbidity in the adult population aged 45 and older was found to be 63.4% in China and 42.2% in India. Of those with any long-term health condition, 38.6% in China and 20.9% in India had complex multimorbidity. Multimorbidity was significantly associated with higher OOPE for medicines in both countries ($p<0.05$); an additional physical long-term condition was associated with a 18.8% increase in OOPE for medicine in China ($p<0.05$) and a 20.9% increase in India ($p<0.05$). Liver disease was associated with highest increase in OOPE for medicines in China (61.6%) and stroke in India (131.6%). Diabetes had the second largest increase (China: 58.4%, India: 91.6%) in OOPE for medicines in both countries.

Conclusion Multimorbidity was associated with substantially higher OOPE for medicines in China and India compared with those without multimorbidity. Our findings provide supporting evidence of the need to improve financial protection for populations with an increased burden of chronic diseases in low-income and middle-income countries.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ In low-income and middle-income countries, out-of-pocket spending on medicines accounts for a significant portion of total healthcare costs for patients with chronic disease. However, there is a paucity of evidence on the links between multimorbidity and out-of-pocket expenditure (OOPE) on medicine in China and India.

WHAT THIS STUDY ADDS

⇒ In the adult population aged 45 and older in China and India, the prevalence of multimorbidity and complex multimorbidity was found to be 63.4% and 38.6% in China and 42.2% and 20.9% in India, respectively.

⇒ The prevalence of coexisting physical–mental health multimorbidity was 23.2% in China and 8.2% in India.

⇒ In China, each additional long-term condition was associated with an 18.8% increase in OOPE for medicine and a 20.9% increase in India.

⇒ Stroke was associated with the highest OOPE for medicines in India, while liver disease was associated with the highest OOPE in China. Diabetes, which is one of the most prevalent diseases in both China and India, has the second largest impact on OOPE for medicines in both countries.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ In China and India, a large proportion of adults suffer from multimorbidity and complex multimorbidity, which significantly raises OOPE on medicine. Our research suggests accelerating universal health coverage and implementing policy interventions to expand health insurance coverage and reduce prescription drug costs in low-income and middle-income countries. To more effectively prevent and manage chronic diseases, health systems must shift away from single-disease-focused models and towards new financing and service delivery models for multimorbidity.

INTRODUCTION

Multimorbidity, defined as the coexistence of two or more long-term conditions (LTCs) within an individual, is a growing yet unaddressed major public health challenge in low-income and middle-income countries (LMICs) undergoing rapid demographic and epidemiological transition.[1] Evidence from

high-income countries indicates that multimorbidity is becoming the norm rather than exception among the older adult population.[2] A recent study in China found that over 60% of the population aged 45 years and above is multimorbid.[3] Emerging evidence from high-income countries indicates that multimorbidity is a major contributor to health inequalities.[4 5] However, studies from LMICs have revealed mixed findings in terms of the socioeconomic patterning of multimorbidity.[6–8] The mixed findings might be due to the differences in the distribution of risk factors for LTCs across socioeconomic groups as well as underdiagnosis in those of lower socioeconomic status (SES).[9]

Reducing the financial burden of prescription medicines in patients with multimorbidity is a key priority for countries that aim to achieve universal health coverage (UHC).[10] Patients with multimorbidity have complex health needs that require more frequent visits to healthcare providers. Patients with multimorbidity are also at a higher risk of financial impoverishment caused by higher out-of-pocket expenditure (OOPE) on doctor visits and medication, and loss of income due to job losses or decline in productivity.[11–13] Our earlier study (2015) revealed that OOPE for medicines constitute a significant proportion of total healthcare expenditures for those with multimorbidity, in six major LMICs.[12] For example, in India, it constituted approximately 60% of outpatient service spending, and 50% of inpatient service spending. The high level of OOPE is concerning as cost is the major barrier to access to healthcare, especially for the poor that are more sensitive to costs for health services.[12]

Recent statistics indicate that, roughly 95% of the population is covered by at least one of the three social basic health insurance schemes.[14] These insurance schemes are the Urban Employee Basic Medical Insurance Scheme (UEBMI), the Urban Resident Basic Medical Insurance Scheme (URBMI) and the New Rural Cooperative Medical Scheme (NRCMS).[15 16] China has been focusing on implementing URBMI and NRCMS into the new Urban–Rural Resident Medical Insurance scheme since 2015.[17 18] Patients are required to pay user fees for their health services under the form of deductibles, copayments, reimbursement caps and patient cost sharing.[19] Studies have found that the level of cost sharing varies substantially based on the type of health services, insurance, province and patient characteristics.[20] These studies have shown that the percentage of cost sharing for outpatient care was significantly higher than for inpatient care.[21] The most recent Healthy China 2030[22] policy has set an ambitious target of reducing patient cost-sharing (the percentage of out-of-pocket spending in total health expenditure) from 60% in 2001 to 25% by 2030.[22]

According to the latest data, just around 37% of the Indian population has health insurance (including public and private).[19] Low levels of public health insurance coverage are mostly attributable to insufficient public health spending, particularly in low-income states.[23] Studies have shown that wealthy Indians are more likely to have private health insurance than their counterparts.[24] There is a focused public health insurance programme in India for the disadvantaged population.[13] Recent statistics estimate that OOPE accounts for around 62.5% of total health expenditures,[25] results in both impoverished and catastrophic health expenditures.[12] Data from national analysis suggested that medicines accounted for more than half of total OOPE for individuals with multimorbidity.[12]

Despite the critical importance of OOPE for medicines for LMICs to achieve UHC, to date, most research evaluating the impact of multimorbidity on OOPE for medicine has been conducted in high-income countries, with few comparative studies in LMICs (see Research in context).[4 13] To address this critical evidence gap, using nationally representative data in China and India, we have examined the patterning of multimorbidity and their effect on OOPE for medicines in both countries. Specifically we have investigated (1) the distribution and patterns of multimorbidity in relation to SES and (2) association between multimorbidity and OOPE on medicines by socioeconomic groups.

METHODS

Data sources

Secondary data analysis was conducted on nationally representative data from wave 2 of the WHO Study on Global Ageing and Adult Health (SAGE) India and wave 3 of the China Health and Retirement Longitudinal Study (CHARLS) both conducted in 2015. Wave 2 of SAGE India contained 9116 respondents. In brief, CHARLS is an ongoing nationally representative longitudinal survey where baseline measures were conducted in the year 2011 and subsequent rounds of data were collected every 2 years. CHARLS used a multistage stratified probability-proportionate-to size sampling and face to face computer assisted personal interviews were conducted in individuals aged 45 years or older.[26–28] SAGE is an longitudinal study that began in 2007 by the WHO. SAGE wave 2 is a follow-up to sage wave 1 conducted in 2007. SAGE used a multistage stratified cluster sampling design where face-to-face interviews were conducted on a larger sample of individuals aged 50 and older and on a smaller comparative sample of those aged 18–49 in six selected sates of Assam, Karnataka, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal.[29 30] More detailed description of study design, tools and protocols have been reported elsewhere.[31 32]

This study included respondents aged 45 years and older from the interviewed samples, with valid blood pressure readings from the survey nurse visit (n=7567) and excluded respondents with missing data on other outcome or independent variables, resulting in 7397 respondents . The wave 3 of CHARLS contained 20197 respondents. This study included respondents aged 45 years and older from the interviewed samples, with

valid blood pressure reading from the interviewer's visit (n=13354) and excluded respondents with missing data on other outcome or independent variables, resulting in 11 570 respondents . The sample flow chart of respondents for both countries is summarised in online supplemental appendix figures S1 and S2.

Variables

LTC multimorbidity

Our main variable of interest was the number of coexistent LTCs reported by each respondent. We counted the number of LTCs for each respondent and defined those with multimorbidity as the presence of two or more of these conditions.[1]

Furthermore, we used the International Classification of Diseases-10th revision to group LTCs into organ systems and counted the number of organ systems affected for each respondent. Those with complex multimorbidity were defined as 'three or more chronic conditions affecting at least three different body systems within one person' which has been used in previous research.[33 34]

In SAGE, nine LTCs were included: angina, arthritis, asthma, cataracts, diabetes, stroke, chronic lung disease, hypertension and depression.[34 35] The presence of LTCs was ascertained by either self-reporting or direct measurement.[35 36] For angina, arthritis, asthma, chronic lung disease, diabetes, cataracts, stroke and hypertension, respondents were defined as having an LTC, through self-reporting, if they have answered yes to the question, 'Have you ever been diagnosed with….?'[6 12 36] Furthermore, extra sets of symptomatic questions were provided to assess angina, arthritis, asthma and chronic lung disease.[36] Symptom-based assessment of angina was based from the WHO's Rose Angina Questionnaire.[37] Symptom-based assessment of arthritis, asthma and chronic lung disease was based from an algorithm created by the WHO SAGE study team in the Diagnostic Item Probability Study.[37] For hypertension, trained health investigators carried out measurement of systolic and diastolic levels of each respondent.[38] Three blood pressure readings were taken at 1 min intervals and the average was calculated.[36 38] In this analysis, we also categorised an individual as having hypertension if the average systolic levels were ≥140 mmHg and average diastolic levels were ≥90 mm Hg.[38] The presence of a mental health disorder is defined as having depression in WHO SAGE.[35] Diagnosis of depression was based on either self-reported diagnosis or from clinical-based assessment.[36] Self-reported diagnosis of depression occurs if respondents have answered yes to the question 'Have you ever been diagnosed with depression?'[12 36] Clinical-based assessment of depression was based from the algorithm-based World Mental health Survey version of the Composite International Diagnostic Interview (CIDI).[39]

For CHARLS, there were 14 LTCs. Twelve of which were physical (hypertension, diabetes, dyslipidaemia, heart disease, stroke, cancer, chronic lung disease, digestive disease, liver disease, kidney disease, memory disease and arthritis).[3] Two were mental LTCs: depression and psychological and emotional illness. Presence of a physical chronic condition was defined from a set of self-reported questions or confirmation through measurements such as blood pressure.[40] Respondents were hypertensive if systolic levels were ≥140 mm Hg or diastolic levels were ≥90 mm Hg or taking antihypertensive medication at the time of the survey.[41] Presence of mental LTCs was defined as having depressive symptoms or psychological and emotional illness. Psychological and emotional illness was assessed from self-reported questions and depression symptoms were assessed through a questionnaire based on a self-reported Centre for Epidemiologic Studies Depression 10 items score.[42] Respondents who scored more than 10 were found to have depression.[42]

Outcome variable

Our primary outcome of interest was OOPE for medicines. OOPE for medicines was assessed by examining outpatient OOPE for medicines on their last outpatient visit. In SAGE, individuals were asked about their OOPE for medicines by answering the question 'thinking about your last visit, how much did you or your household pay for…' for the following categories: Healthcare provider's fees, medicines, tests, transport and other fees in their local currency.[6] For respondents who responded in the previous question 'who paid for this most recent visit?' that their last hospitalisation was free and did not provide a value for OOPE for medicine, we assumed that OOPE for medicine will equate to zero.[6] In CHARLS, respondents wrote down OOPE spending on medicine by answering the question 'how much will you eventually pay out of pocket for the medications from this visit, including prescriptions you received?'[43] Those who did not pay anything will have an OOPE for medicines as zero.[43] As values for OOPE were highly skewed, we removed observations with the highest 0.5% of OOPE to lessen the skewing effects and influence of outlier on the analysis.[6] In both China and India, we used their local currency, Yuan (¥) and Rupee (₹), respectively, for OOPE for medicines.

Covariates

The following covariates were included in the analyses: age (45–54, 55–64, 65–74, 75+ years), sex (male/female), residence (urban/rural), marital status (currently married/not married), education (primary or less, secondary or high school, tertiary or higher), economic status defined as wealth quintiles with 1 being the lowest and 5 being the highest, caste (scheduled, none, other), health insurance status (yes/no), religion (Hinduism, Islam, other) and geographical regions defined as state names (Assam, Karnataka, Maharashtra, Rajasthan, Utter Pradesh, West Bengal). For CHARLS, the following covariates were included in the analyses: sex (male/female), age (45–54, 55-64, 65–74, 75+ years), marital status (currently married/not married), residence (urban/rural), education (primary or less, secondary, tertiary

or higher), social health insurance status (none/Urban Employee Basic Medical Insurance (UEBMI)/Urban Resident Medical Insurance (URBMI)/New Rural Cooperative Medical Scheme (NRCMS)/other), region (east/central/west) and economic status defined as wealth quintiles with 1 being the lowest and 5 being the highest.

Statistical analysis

We first summarised the prevalence for the following variables in both countries: (1) multimorbidity; (2) physical–mental multimorbidity and (3) complex multimorbidity at national level by SES subgroups. We examined multimorbidity patterns in each country, by showing the size of the bubble and its associated percentage of individuals with each dyad of disease.[44]

We estimated the relationships between multimorbidity and OOPE for medicine using log-linear models where a constant, equals to one, was added to the outcome variable prior to the log transformation to reduce skewness.[12] To interpret the coefficients estimated from the model, we converted the coefficients to a percentage change in outcome.[45]

We examined the potential differential effect of multimorbidity on OOPE for medicine across socioeconomic groups by including interaction terms between socioeconomic groups and number of LTCs in our regression models. Similarly, we examined the differential effect across health insurance status by including interaction terms between health insurance and number of LTCs in our regression models.

To examine the association between multimorbidity and OOPE for medicines across cost distribution, we performed quantile regression analyses. Quantile regression fits a line to minimise the sum of absolute residuals. The objective is to estimate the median (as well as the 25th, 75th and 90th percentile) of the outcome variable conditional on independent variables. The method is robust to outliers because it allows for studying the full distribution of the outcome variable and is suitable for modelling outcomes such as OOPE, which are often skewed or not normally distributed.[46–48]

In both countries, some patients reported zero OOPE for medicine (6.43% in China and 14.8% in India). Thus, we conducted sensitivity analyses that examined the relationships between multimorbidity and outcomes using two additional models that explicitly takes into account, the zero outcome. These were (1) two-part model and (2) zero-inflated negative binomial model. The two-part model consists of a logistic regression model that estimates OOPE for medicine being non-zero and a generalised linear model. The zero-inflated negative binomial model was fitted to observe the zero and count outcome variables.

All OOPE on medicines was estimates in inflation-adjusted 2020 US$. This was done by using Purchasing Power Parity Indices to convert costs from one country to another (in this case, the USA), and subsequently the overall US Consumer Price Index was used to convert historical costs to 2020 US$.[13] We also displayed money in China (yuan) and India (rupee) separately to enhance comprehension for local policy-makers.

We tested for multicollinearity for covariates adjusted for in our analysis with the variance inflation factor. The multicollinearity diagnostics (variance inflation factor) were all less than five, indicating that the assumption of reasonable independence among predictor variables was met.[12 49] We presented adjusted ORs (AOR) for results in logistic regression model, and regression coefficient for results in log-linear models. All data analyses were weighted to account for the complex, multistage design of the SAGE and CHARLS survey. We performed the statistical analyses using Stata V.16.1 (StataCorp).

Patient and public involvement

Patients and the public were not involved in any way in this analysis of previously collected data.

RESULTS

Sample characteristics

In China, the median age of respondents was 60 years old (IQR=52–67). The average number of LTCs per respondent was 2.42 (table 1) and 50.6% were female. 8.8% had no health insurance whereas 91.2% had health insurance. Of those with health insurance, 18.8% had UEBMI, 8.0% with URBMI, 61.6% had NRCMS with 2.7% having other types (online supplemental table S1). In India, the median age of respondents was 60 years (IQR=54–68). The average number of LTCs per respondent was 1.51. (table 2), 53.7% were female and only 10.1% had health insurance (online supplemental table S1).

Prevalence of multimorbidity

Tables 1 and 2 present the mean number of LTCs and the prevalence of multimorbidity, coexisting physical–mental multimorbidity and complex multimorbidity in China and India, respectively. Online supplemental tables S2 and S3 present the number of LTCs by the sample characteristics from China and India, respectively.

In China, the overall prevalence of any type of multimorbidity was 63.4% which ranged from 47.2% (45–54 years) to 76.4% (75 years and above). The prevalence of coexisting physical–mental health multimorbidity was 23.2%. Among patients with any long-term health condition, 38.6% of those with complex multimorbidity (table 1). The most common LTC was dyslipidaemia (37.4%), followed by arthritis (35%) and hypertension (31.4%) (online supplemental figure S3) while that of depression was 23.5%. For patterns of multimorbidity, the most common dyad was asthma and chronic lung disease (75.6%) (figure 1A). The most common physical–mental multimorbidity dyad was depression and arthritis (63.2%) (figure 1). Hypertension, arthritis and depression have a higher prevalence among respondents with the highest economic status whereas diabetes,

Table 1 Prevalence of multimorbidity, coexisting physical–mental and complex multimorbidity in China, 2015

Variables	Mean no of morbidities (SD)	Prevalence of any type of multimorbidity % (95% CI)	Prevalence of coexisting physical–mental multimorbidity % (95% CI)	The prevalence of complex multimorbidity among those with chronic disease % (95% CI)
All individuals	2.42 (1.84)	63.4 (61.9 to 64.8)	23.2 (21.8 to 24.6)	38.6 (36.9 to 40.3)
Sex				
Male	2.32 (1.73)	62.4 (60.6 to 64.2)	18.3 (16.9 to 19.8)	35.1 (33.2 to 37.1)
Female	2.51 (1.93)	64.3 (62.1 to 66.4)	27.9 (26.1 to 29.8)	42.0 (39.9 to 44.1)
Age (years)				
45–54	1.76 (1.53)	47.2 (44.4 to 50.0)	17.3 (15.5 to 19.4)	23.7 (20.9 to 26.7)
55–64	2.52 (1.78)	67.8 (65.5 to 70.1)	24.7 (22.3 to 27.4)	39.9 (37.2 to 42.6)
65–74	2.99 (2.06)	74.8 (72.3 to 77.1)	29.0 (26.3 to 31.9)	50.5 (47.5 to 53.5)
75+	2.97 (1.78)	76.4 (72.1 to 80.2)	23.6 (20.2 to 27.3)	50.9 (45.8 to 56.0)
Education level				
Primary or less	2.48 (1.97)	64.0 (62.2 to 65.8)	26.6 (24.8 to 28.5)	42.9 (41.0 to 44.8)
Secondary	2.36 (1.74)	63.2 (59.2 to 67.0)	20.7 (17.1 to 24.8)	34.4 (31.8 to 37.0)
Tertiary or higher	2.22 (1.34)	61.0 (57.4 to 64.4)	11.3 (8.7 to 14.5)	26.1 (22.2 to 30.4)
Residence				
Urban	2.30 (1.57)	60.9 (58.5 to 63.3)	16.4 (14.8 to 18.2)	33.6 (31.1 to 36.2)
Rural	2.52 (2.06)	65.8 (64.1 to 67.4)	29.6 (27.9 to 31.3)	43.2 (41.4 to 45.0)
Marital status				
Currently married	2.34 (1.81)	62.0 (60.3 to 63.6)	21.7 (20.3 to 23.1)	36.8 (35.0 to 38.6)
Not married	2.79 (1.92)	70.7 (67.9 to 73.3)	30.6 (27.8 to 33.7)	47.1 (43.7 to 50.4)
Region				
East	2.22 (1.59)	60.9 (58.3 to 63.5)	18.6 (16.7 to 20.5)	32.9 (30.6 to 35.4)
Central	2.54 (2.00)	65.1 (63.1 to 67.1)	24.3 (22.0 to 26.7)	41.2 (38.6 to 43.9)
West	2.58 (1.98)	65.2 (62.2 to 68.1)	29.8 (27.0 to 32.7)	44.5 (41.5 to 47.6)
Health Insurance				
None	2.24 (1.62)	59.3 (54.4 to 64.0)	20.3 (17.0 to 24.1)	31.3 (26.8 to 36.3)
UEBMI	2.37 (1.46)	61.1 (56.3 to 65.7)	13.4 (10.8 to 16.4)	32.5 (27.9 to 37.5)
URBMI	2.42 (1.78)	60.8 (53.8 to 67.4)	18.4 (14.3 to 23.3)	40.3 (35.9 to 44.8)
NRCMS	2.45 (1.98)	64.8 (63.2 to 66.4)	27.6 (26.1 to 29.2)	41.4 (38.9 to 43.9)
Other	2.47 (1.43)	68.4 (61.2 to 74.7)	12.4 (8.4 to 18.1)	34.1 (25.7 to 43.5)
Economic status				
First quintile (lowest)	2.55 (1.90)	70.4 (67.3 to 73.4)	29.4 (26.5 to 32.5)	43.2 (39.3 to 47.1)
Second quintile	2.44 (1.94)	64.5 (61.6 to 67.2)	26.0 (23.6 to 28.6)	40.0 (37.3 to 42.7)
Third quintile	2.29 (1.80)	58.3 (52.5 to 63.8)	21.2 (18.2 to 24.4)	36.4 (32.4 to 40.7)
Fourth quintile	2.47 (1.79)	62.9 (59.9 to 65.8)	21.9 (19.5 to 24.5)	40.8 (37.3 to 44.3)
Fifth quintile (highest)	2.37 (1.75)	62.7 (57.5 to 67.6)	19.5 (16.5 to 22.9)	34.0 (30.2 to 38.1)
No of LTCs				
0	–	–	–	–
1	–	–	–	–
2	–	–	19.5 (17.5 to 21.8)	–
3	–	–	33.0 (30.0 to 36.1)	64.2 (60.7 to 67.5)
4+	–	–	54.9 (52.1 to 57.6)	97.3 (96.3 to 98.0)

All estimates are adjusted for sample weight. Multimorbidity defined as having at least two chronic conditions. Physical–mental multimorbidity defined as having both physical and mental chronic conditions. Complex multimorbidity defined as having at least three chronic conditions affecting at least three different body systems.
LTC, long-term conditions; NRCMS, New Rural Cooperative Medical Scheme; UEBMI, Urban Employee Basic Medical Insurance; URBMI, Urban Resident Basic Medical Insurance.

Table 2 Prevalence of multimorbidity, coexisting physical–mental and complex multimorbidity in India, 2015

Variable	Mean no of morbidities (SD)	Prevalence of any types of multimorbidity (%, 95% CI)	Prevalence of coexisting physical–mental multimorbidity (%, 95% CI)	The prevalence of complex multimorbidity among those with chronic disease (%, 95% CI)
All individuals	1.51 (1.38)	42.2 (40.1 to 44.5)	8.2 (7.2 to 9.3)	20.9 (19.4 to 22.5)
Sex				
Male	1.48 (1.43)	41.3 (38.7 to 43.9)	8.3 (7.1 to 9.8)	21.4 (19.3 to 23.6)
Female	1.53 (1.34)	43.1 (40.6 to 45.6)	8.1 (6.8 to 9.5)	20.6 (18.9 to 22.4)
Age (years)				
45–54	1.13 (1.18)	31.4 (28.7 to 34.4)	7.2 (5.8 to 8.9)	12.5 (10.5 to 14.7)
55–64	1.45 (1.36)	39.9 (37.4 to 42.4)	7.4 (6.2 to 8.9)	19.3 (17.3 to 21.5)
65–74	1.80 (1.45)	51.3 (46.8 to 55.7)	9.3 (7.6 to 11.4)	26.0 (22.5 to 29.9)
75+	2.00 (1.48)	57.3 (52.1 to 62.2)	10.7 (8.3 to 13.7)	30.6 (26.4 to 35.1)
Education level				
Primary or less	1.53 (1.40)	43.1 (40.8 to 45.3)	8.5 (7.3 to 9.9)	21.1 (19.3 to 23.0)
Secondary	1.45 (1.36)	39.3 (35.5 to 43.3)	7.5 (5.8 to 9.6)	21.8 (18.3 to 25.7)
Tertiary or higher	1.46 (1.25)	41.3 (33.5 to 49.6)	6.1 (4.0 to 9.1)	17.0 (12.6 to 22.5)
Residence				
Urban	1.50 (1.45)	41.9 (39.8 to 44.0)	8.8 (7.6 to 10.0)	20.4 (18.8 to 22.1)
Rural	1.54 (1.20)	43.2 (37.5 to 49.1)	6.7 (4.9 to 9.1)	22.2 (18.7 to 26.3)
Marital status				
Currently married	1.43 (1.36)	39.9 (37.7 to 42.2)	7.1 (6.1 to 8.3)	19.6 (17.8 to 21.5)
Not married	1.77 (1.41)	49.7 (46.1 to 53.3)	11.6 (9.8 to 13.7)	24.5 (21.9 to 27.2)
Caste				
Schedule	1.48 (1.36)	41.5 (39.4 to 43.7)	7.7 (6.6 to 9.0)	20.8 (18.9 to 22.8)
None	1.60 (1.57)	45.4 (40.0 to 50.9)	10.8 (8.1 to 14.3)	22.7 (18.7 to 27.2)
Other	1.54 (1.28)	42.7 (37.9 to 47.6)	8.1 (6.2 to 10.5)	20.0 (16.7 to 23.7)
Religion				
Hinduism	1.48 (1.35)	41.5 (39.2 to 43.8)	8.1 (7.1 to 9.4)	20.4 (18.8 to 22.2)
Islam	1.63 (1.49)	45.5 (40.8 to 50.3)	8.3 (5.9 to 11.4)	23.3 (19.7 to 27.3)
Other	1.82 (1.70)	50.8 (43.9 to 57.6)	8.5 (5.1 to 14.0)	24.9 (19.0 to 32.0)
Health insurance				
Yes	1.56 (1.44)	43.9 (39.5 to 48.3)	6.2 (4.7 to 8.3)	21.8 (18.3 to 25.8)
No	1.50 (1.37)	42.1 (39.8 to 44.4)	8.4 (7.3 to 9.6)	20.8 (19.2 to 22.5)
Economic status				
First quintile (lowest)	1.45 (1.31)	41.1 (36.8 to 45.6)	9.7 (7.5 to 12.4)	18.8 (15.4 to 22.7)
Second quintile	1.51 (1.39)	42.7 (39.2 to 46.3)	9.7 (7.7 to 12.1)	20.0 (17.0 to 23.4)
Third quintile	1.42 (1.36)	38.9 (35.1 to 42.8)	7.5 (5.9 to 9.4)	19.8 (17.0 to 23.0)
Fourth quintile	1.53 (1.36)	42.1 (38.4 to 45.8)	7.5 (5.5 to 10.0)	22.0 (19.1 to 25.3)
Fifth quintile (highest)	1.61 (1.47)	45.7 (42.2 to 49.3)	6.9 (5.3 to 8.9)	23.3 (20.4 to 26.6)
States				
Assam	1.54 (2.00)	42.3 (37.5 to 48.7)	5.5 (3.7 to 8.3)	22.4 (18.5 to 27.0)
Karnataka	1.61 (1.39)	45.4 (42.0 to 48.9)	9.9 (7.5 to 13.0)	24.5 (21.7 to 27.5)
Maharashtra	1.57 (1.30)	44.2 (39.7 to 48.8)	6.1 (4.6 to 8.0)	23.9 (20.5 to 27.7)
Rajasthan	1.60 (1.80)	45.8 (42.4 to 49.2)	9.7 (7.8 to 12.1)	21.4 (17.9 to 25.4)
Utter Pradesh	1.32 (1.07)	35.3 (30.9 to 39.8)	8.3 (6.1 to 11.3)	17.1 (14.2 to 20.6)
West Bengal	1.63 (1.42)	47.6 (44.5 to 50.8)	8.9 (7.2 to 11.0)	20.7 (18.3 to 23.3)
No of LTCs				
0	–	–	–	–
1	–	–	–	–

Continued

Table 2 Continued

Variable	Mean no of morbidities (SD)	Prevalence of any types of multimorbidity (%, 95% CI)	Prevalence of coexisting physical–mental multimorbidity (%, 95% CI)	The prevalence of complex multimorbidity among those with chronic disease (%, 95% CI)
2	–	–	12.2 (10.0 to 14.7)	–
3	–	–	19.3 (16.3 to 22.8)	53.6 (49.1 to 58.1)
4+	–	–	35.1 (31.0 to 39.5)	94.5 (92.2 to 96.1)

All estimates are adjusted for sample weight. Multimorbidity defined as having at least two chronic conditions. Physical–mental multimorbidity defined as having both physical and mental chronic conditions. Complex multimorbidity defined as having at least three chronic conditions affecting at least three different body systems.
LTC, long-term conditions.

dyslipidaemia and cancer have a higher prevalence in the lowest economic statu (figure 2B).

In India, the overall prevalence of any type of multimorbidity was 42.2%, that ranged from 31.4% (45–54 years) to 57.3% (75 years and above). The prevalence of physical–mental health comorbidity was 8.2% with percentage of these individuals ranging from 7.2% (45–54 years) to 10.7% (75 years and older). Among patients with any long-term health condition, 20.9% of those with complex multimorbidity (table 2). The most common LTC was hypertension (40.83%) and the prevalence of depression was 9.27% (online supplemental figure S4). The most common dyad was diabetes and hypertension (71.9%). The most common physical–mental multimorbidity dyad was depression and hypertension (48.1%) (figure 1B). Our results show hypertension and diabetes were more common in the respondents with the highest economic status whereas depression, asthma and chronic lung disease was more common in the lowest economic status (figure 2B).

Patterns of multimorbidity

Online supplemental table S4 presents the multimorbidity patterns in China. An increase in age was associated with a higher odds of multimorbidity. When compared with individuals aged between 45 and 54 years, those that are 55–64 years, had an AOR of 2.47 (95% CI 2.13 to 2.86, p<0.001); 65–74 years had an AOR of 3.49 (95% CI 2.95 to 4.13, p <0.0001) and those 75 years and above had an AOR of 3.82 (95% CI 2.94 to 4.97, p<0.0001). Males were associated with a lower odd of multimorbidity when compared with females (AOR 0.86; 95% CI 0.76 to 0.97; p=0.016). Marital status and SES showed no significant effect on the odds of multimorbidity.

Online supplemental table S5 shows the multimorbidity patterns in India. An increase in age was associated with a higher odds of multimorbidity. When compared with individuals aged 45–54 years, those aged 55–64 years had an AOR of 1.51 (95% CI 1.30 to 1.75, p <0.001); 65–74 years had an AOR of 2.06 (95% CI 1.68 to 2.52, p<0.0001) and those aged 75 years and above had an AOR of 2.58 (95% CI 2.07 to 3.21, p<0.0001). Males were associated with a lower odd of multimorbidity when compared with females (AOR 0.85; 95% CI 0.75 to 0.96; p =0.011). Online supplemental table S5 suggests significant heterogeneity in the prevalence of multimorbidity across states in India. For instance, when compared with living in Utter Pradesh, Karnataka had an AOR of 1.33 (95% CI 1.01 to 1.75; p=0.039), Maharashtra had an AOR of 1.35 (95% CI 1.00 to 1.81; p=0.047). Rajasthan had an AOR of 2.17 (95% CI 1.69 to 2.78, p<0.0001) and West Bengal had an AOR of 1.88 (95% CI 1.48 to 2.38; p<0.0001). On the other hand, those living in Assam showed no significant effect on the odds of multimorbidity. Rurality, residence, religion, marital status, caste, socioeconomic and health insurance status showed no significant effect on the odds of multimorbidity.

Associations between multimorbidity and OOPE for medicines

In China, online supplemental table S6 shows that a one-unit increase in the number of physical LTCs was associated with an 18.5% increase in OOPE for medicines (p<0.05). There was no association between the presence of mental health conditions and OOPE for medicines. In India, online supplemental table S7 shows that as the number of physical LTCs increased by one unit, OOPE for medicines increased by 20.9% (p<0.05). In both China and India, the coefficients for the interaction term between the number of physical LTCs and presence of a mental health condition was not statistically significant. This suggested that the amount of OOPE for medicines of physical and mental LTCs is similar the expected given the independent costs of each types of the LTCs.

Online supplemental table S8 shows that in China, liver disease was associated with highest increase in OOPE for medicine by 61.6% (p<0.05) compared with individuals with no disease. Online supplemental table S9 shows that in India, stroke was associated with the highest increase in OOPE for medicine of 131.6% (p<0.05). In both China and India, diabetes showed the second highest increase in OOPE for medicine with 58.4% (p<0.05) and 91.6% (p<0.05), respectively.

Association of multimorbidity and OOPE by economic groups and health insurance

Online supplemental tables S10 and S11 examines whether the associations between multimorbidity and

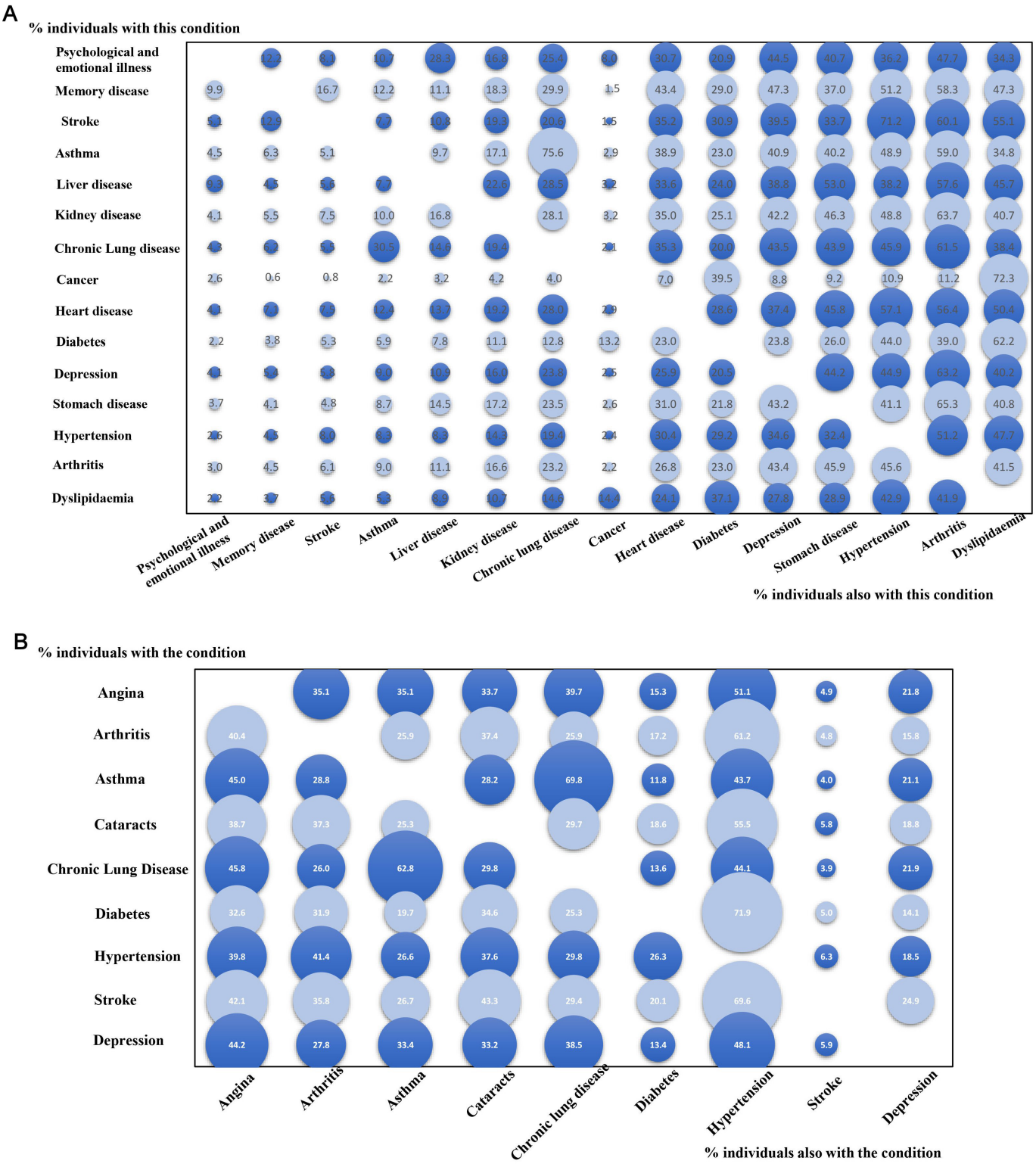

Figure 1 The prevalence of coexisting long-term conditions for each long-term condition for people with multimorbidity in China, 2015 (A); The prevalence of coexisting long-term conditions for each long-term condition for people with multimorbidity in India, 2015 (B). (A) Data source: China Health and Retirement Longitudinal Survey. (B) Data source WHO Study on Global Ageing and Adult Health survey, wave 2.

OOPE for medicines vary by economic groups. As the coefficients for most of the interactions between LTCs and economic groups were not statistically significant, our results indicated that these associations were similar across economic groups (p>0.05).

Online supplemental tables S12 and S13 examines the hypothesis that whether the associations between multimorbidity and OOPE for medicines vary by respondents' health insurance coverage. Our results pointed out there were no significant differences in the effect of

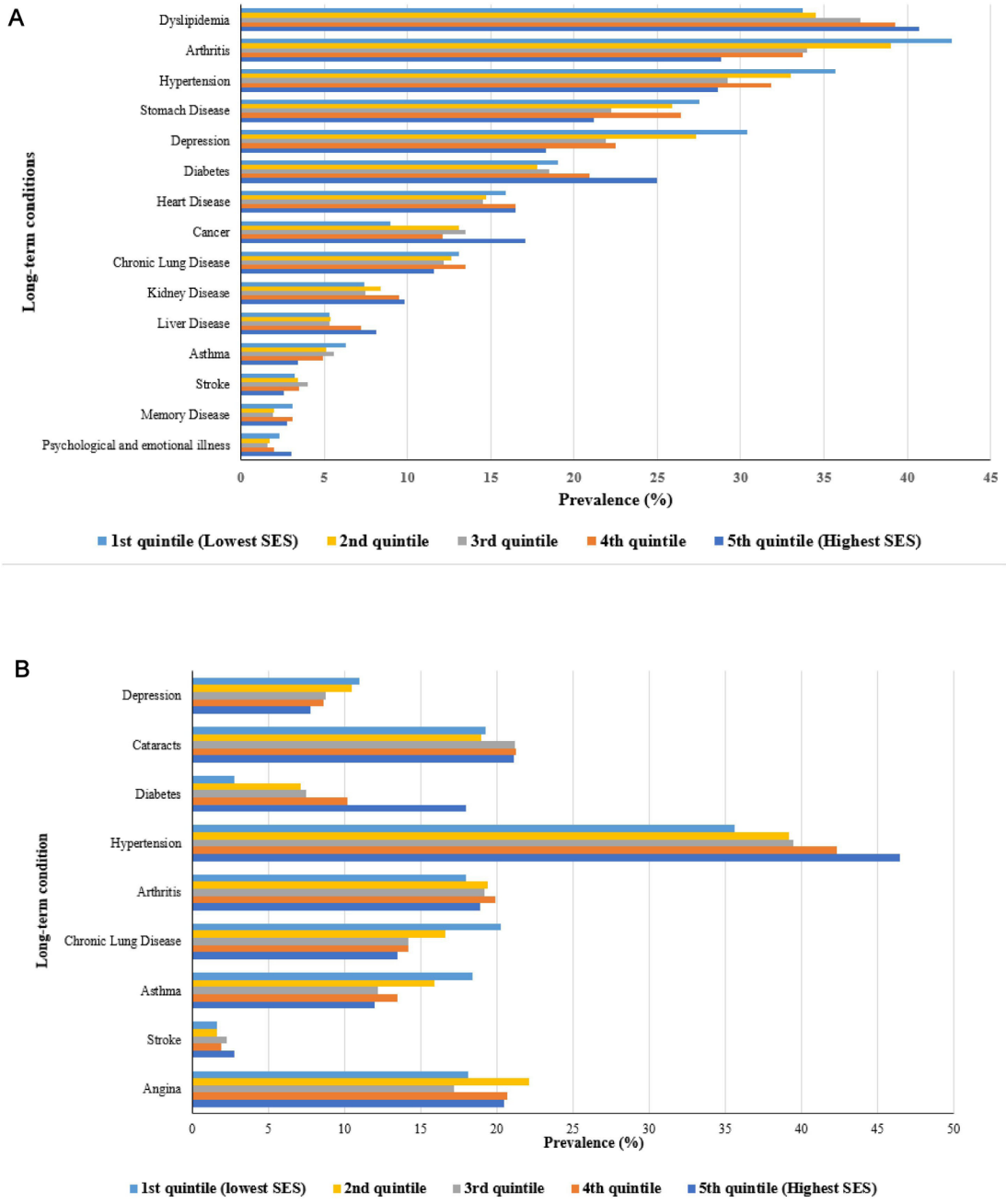

Figure 2 Prevalence of long-term conditions by socioeconomic status (SES) in China, 2015 (A); Prevalence of long-term conditions by SES in India, 2015 (B). (A) Data source: China Health and Retirement Longitudinal Survey. (B) Data source WHO Study on Global Ageing and Adult Health survey, wave 2.

multimorbidity across health insurance status in China, except for the association between physical LTCs and NRCMS (coefficient for the interaction terms between NRCMS and physical LTCs=−0.36; 95% CI −0.59 to −0.12) and the association between physical LTCs and UEBMI (coefficient for the interaction terms between UEBMI and physical LTCs= -0.34; 95% CI -0.61 to -0.07). Online supplemental table S13 shows that differential effect of multimorbidity on OOPE was similar across health insurance status in India and again there were no significant associations in all interaction terms between health insurance status and LTCs.

Associations between multimorbidity and OOPE for medicines across the cost distribution

Tables 3 and 4 present the effect of the number of physical LTCs on OOPE for medicines across the cost distribution in China and India, respectively. An increase in the number of long-term physical conditions was significantly associated with greater OOPE for medicines across every quantile in India whereas it was significantly associated up to the 75th percentile in China. As expected, the effect of physical LTCs was found to be greater in the top percentiles than those in the lower percentiles in the cost distribution in both China (25th percentile: 3.6; 50th

Table 3 Association between multimorbidity with OOPE for medicines (元 & US$) based on the generalised linear model and quantile regression model to examine cost distribution in China, 2015

Outpatient OOPE for medicine (coefficient, 95% CI)										
	Mean		25th percentile Absolute difference		50th percentile Absolute difference		75th percentile Absolute difference		90th percentile Absolute difference	
Variables	China	US$	China	US$	China	US$	China	US$	China	US$
No of physical LTCs	13.2 (–3.4 to 29.8)	3.6 (–0.91 to 8.1)	**3.6 (1.9 to 5.4)**	**1.0 (0.5 to 1.5)**	**8.4 (3.1 to 13.6)**	**2.3 (0.8–3.7)**	**22.5 (6.3 to 38.7)**	**6.1 (1.7–10.5)**	28.3 (–19.9 to 76.5)	7.7 (–5.4 to 20.7)
Mental health condition	–23.3 (–119.72.6)	–6.3 (–32.2 to 19.6)	3.0 (–6.4 to 12.4)	0.8 (–1.7 to 3.3)	–4.3 (–32.7 to 24.1)	–1.2 (–8.8 to 6.5)	–25.6 (–112.8 to 61.7)	–6.9 (–30.5 to 16.7)	–84.2 (–343.0 to 174.7)	–22.7 (–92.7 to 47.2)
No of physical LTCs × mental health condition	6.1 (–22.0 to 34.1)	1.63 (–5.95 to 9.21)	–1.2 (–3.9 to 1.4)	–0.3 (–1.0 to 0.4)	2.6 (–5.3 to 10.6)	0.7 (–1.4 to 2.9)	6.1 (–18.3 to 30.6)	1.7 (–4.9 to 8.3)	37.5 (–35.0 to 110.0)	10.1 (–9.5 to 29.7)
Economic status (ref. first quintile (lowest))										
Second quintile	1.0 (–61.7 to 63.8)	0.28 (–16.7 to 17.2)	0.6 (–7.1 to 8.3)	0.2 (–1.9 to 2.2)	10.5 (–12.8 to 33.8)	2.8 (–3.5 to 9.1)	23.7 (–47.9 to 95.3)	6.4 (–12.9 to 25.8)	78.3 (–134.2 to 290.9)	21.2 (–36.3 to 78.6)
Third quintile	5.8 (–63.1 to 74.7)	1.57 (–17.1 to 20.2)	5.3 (–2.5 to 13.1)	1.4 (–0.7 to 3.5)	6.6 (–17.0 to 30.3)	1.8 (–4.6 to 8.2)	14.2 (–58.5 to 87.0)	3.8 (–15.8 to 23.5)	–23.3 (–239.1 to 192.5)	–6.3 (–64.6 to 52.0)
Fourth quintile	64.2 (–3.1 to 131.5)	17.3 (–0.84–35.5)	7.4 (–0.4 to 15.2)	2.0 (–0.1 to 4.1)	**34.9 (11.2 to 58.5)**	**9.4 (3.0 to 15.8)**	**91.2 (18.5 to 163.8)**	**24.6 (5.0–44.3)**	167.5 (–48.1 to 383.1)	45.3 (–13.0 to 103.5)
Fifth quintile (highest)	**154.3 (68.0 to 240.6)**	**41.7 (18.4 to 65.0)**	7.4 (–0.3 to 15.1)	2.0 (–0.1 to 4.1)	**48.2 (24.9 to 71.5)**	**13.0 (6.7 to 19.3)**	**124.2 (52.5 to 195.9)**	**33.6 (14.2–52.9)**	**306.7 (94.0 to 519.3)**	**82.9 (25.4–140.3)**
Gender (ref. female)										
Male	5.0 (–52.2 to 62.3)	1.4 (–14.1 to 16.8)	–0.5 (–5.5 to 4.5)	–0.1 (–1.5 to 1.2)	0.0 (–15.2 to 15.2)	0.0 (–4.1 to 4.1)	0.8 (–46.0 to 47.5)	0.2 (–12.4 to 12.8)	0.8 (–137.9 to 139.6)	0.2 (–37.3 to 37.7)
Age group (ref. 45–54)										
55–64	35.6 (–35.5 to 106.7)	9.6 (–9.6–28.8)	2.2 (–3.7 to 8.1)	0.6 (–1.0 to 2.2)	6.9 (–11.0 to 24.7)	1.9 (–3.0 to 6.7)	9.5 (–45.4 to 64.5)	2.6 (–12.3 to 17.4)	50.8 (–112.2 to 213.9)	13.7 (–30.3 to 57.8)
65–74	5.2 (–68.6 to 79.0)	1.4 (–18.5–21.3)	0.6 (–6.1 to 7.2)	0.2 (–1.6 to 2.0)	2.4 (–17.8 to 22.5)	0.6 (–4.8 to 6.1)	–10.5 (–72.5 to 51.5)	–2.8 (–19.6 to 13.9)	33.3 (–150.6 to 217.2)	9.0 (–40.7 to 58.7)
75+	–14.8 (–104.0 to 74.3)	–4.0 (–28.1 to 20.1)	–4.6 (–14.9 to 5.6)	–1.2 (–4.0 to 1.5)	–11.7 (–42.8 to 19.4)	–3.2 (–11.6 to 5.2)	–26.0 (–121.5 to 69.4)	–7.0 (–32.8 to 18.8)	148.3 (–134.9 to 431.6)	40.1 (–36.4 to 116.6)
Residence (ref. urban)										
Rural	35.2 (–21.1 to 91.5)	9.5 (–5.7 to 24.7)	2.5 (–3.0 to 7.9)	0.7 (–0.8 to 2.1)	6.5 (–9.9 to 22.9)	1.8 (–2.7 to 6.2)	17.5 (–33.1 to 68.0)	4.7 (–8.9 to 18.4)	50.0 (–99.9 to 199.9)	13.5 (–27.0 to 54.0)
Marital status (ref. currently married)										
Not married	42.8 (–61.8 to 147.4)	11.6 (–16.7 to 39.8)	2.0 (–4.5 to 8.4)	0.5 (–1.2 to 2.3)	7.3 (–12.2 to 26.8)	2.0 (–3.3 to 7.2)	–2.5 (–62.4 to 57.3)	–0.7 (–16.9 to 15.5)	10.8 (–166.7 to 188.4)	2.9 (–45.1 to 50.9)
Education Status (ref. primary or less)										
Secondary	–21.8 (–77.7 to 34.0)	–5.9 (–21.0 to 9.2)	–2.2 (–8.5 to 4.2)	–0.6 (–2.3 to 1.1)	–1.4 (–20.7 to 17.9)	–0.4 (–5.6 to 4.8)	–13.0 (–72.3 to 46.3)	–3.5 (–19.5 to 12.5)	–33.3 (–209.3 to 142.7)	–9.0 (–56.6 to 38.5)

Continued

Table 3 Continued

Outpatient OOPE for medicine (coefficient, 95% CI)										
	Mean		25th percentile Absolute difference		50th percentile Absolute difference		75th percentile Absolute difference		90th percentile Absolute difference	
Variables	China	US$	China	US$	China	US$	China	US$	China	US$
Tertiary or higher	54.1 (−48.2 to 156.4)	14.6 (−13.0 to 42.3)	−0.1 (−5.5 to 4.5)	0.0 (−2.3 to 2.3)	3.3 (−22.3 to 28.9)	0.9 (−6.0 to 7.8)	−29.1 (−107.8 to 49.7)	−7.9 (−29.1 to 13.4)	211.7 (−22.0 to 445.3)	57.2 (−5.9 to 120.3)
Health insurance status (ref. no)										
UEBMI	−24.2 (−120.1 to 71.7)	−6.5 (−32.5 to 19.4)	−8.2 (−20.6 to 4.1)	−2.2 (−5.6 to 1.1)	−3.5 (−40.9 to 33.9)	−0.9 (−11.0 to 9.2)	−62.1 (−177.0 to 52.8)	−16.8 (−47.8 to 14.3)	−146.7 (−487.6 to 194.2)	−39.6 (−131.7 to 52.5)
URBMI	21.2 (−88.4 to 130.9)	5.7 (−23.9 to 35.4)	3.4 (−10.0 to 16.8)	0.9 (−2.7 to 4.5)	26.6 (−14.1 to 67.3)	7.2 (−3.8 to 18.2)	4.5 (−120.5 to 129.5)	1.2 (−32.5 to 35.0)	−230.0 (−600.8 to 140.8)	−62.1 (−162.3 to 38.0)
NRCMS	39.1 (−32.9 to 111.1)	10.6 (−8.9 to 30.0)	1.7 (−8.2 to 11.6)	0.5 (−2.2 to 3.1)	16.0 (−14.1 to 46.1)	4.3 (−3.8 to 12.4)	−39.2 (−131.6 to 53.1)	−10.6 (−35.6 to 14.3)	−268.3 (−542.3 to 5.7)	−72.5 (−146.5 to 1.5)
Other	−5.6 (−139.0 to 127.8)	−1.5 (−37.6 to 34.5)	−6.2 (−24.6 to 12.2)	−1.7 (−6.6 to 3.3)	42.8 (−13.1 to 98.7)	11.6 (−3.5 to 26.7)	−13.9 (−185.6 to 157.7)	−3.8 (−50.1 to 42.6)	−92.5 (−601.8 to 416.8)	−25.0 (−162.6 to 112.6)
Region (ref. east)										
Central	37.9 (−32.1 to 108.0)	10.2 (−8.7 to 29.2)	−2.6 (−8.2 to 3.0)	−0.7 (−2.2 to 0.8)	−3.5 (−20.5 to 13.5)	−0.9 (−5.5 to 3.6)	37.7 (−14.5 to 89.9)	10.2 (−3.9 to 24.3)	**192.5 (37.6 to 347.4)**	**52.0 (10.2 to 93.9)**
West	−45.9 (−110.0 to 18.1)	−12.4 (−29.7 to 4.9)	1.7 (−4.4 to 7.8)	0.5 (−1.2 to 2.1)	−12.4 (−30.9 to 6.0)	−3.4 (−8.3 to 1.6)	−50.6 (−107.2 to 6.1)	−13.7 (−29.0 to 1.7)	−90.0 (−258.2 to 78.2)	−24.3 (−69.8 to 21.1)

Mean values were derived from a generalised linear model.
All estimates adjusted for sample weight. Bolded values indicate p<0.05.
LTCs, long term conditions ; NRCMS, New Rural Cooperative Medical Scheme; OOPE, out-of-pocket expenditure; UEBMI, Urban Employee Basic Medical Insurance ; URBMI, Urban Resident Basic Medical Insurance.

Table 4 Association between multimorbidity with OOPE for medicines (₹ and US$) based on the generalised linear model and quantile regression model to examine cost distribution in India, 2015

	Outpatient OOPE for medicine (coefficient, 95% CI)									
			25th percentile		50th percentile		75th percentile		90th percentile	
	Mean		Absolute difference		Absolute difference		Absolute difference		Absolute difference	
Variables	India	US$	India	US$	India	US$	India	US	India	US$
No of physical LTCs	**99.0 (45.3 to 152.6)**	**5.3 (2.5 to 8.1)**	**25.6 (16.1 to 35.1)**	**1.2 (0.7 to 1.8)**	**48.1 (34.8 to 61.4)**	**2.7 (1.9 to 3.4)**	**106.9 (73.3 to 140.5)**	**5.1 (3.2 to 7.1)**	**197.5 (84.7 to 310.3)**	**8.8 (2.4 to 15.1)**
Mental health condition	290.9 (–47.1 to 628.9)	17.0 (–5.0 to 39.1)	–8.93 (–71.2 to 53.3)	–0.1 (–4.5 to 4.2)	2.21 (–85.4 to 89.9)	0.04 (–5.9 to 5.9)	**201.2 (–19.8 to 422.2)**	**16.0 (0.5 to 31.4)**	628.6 (–113.5 to 1370.6)	43.9 (–6.9 to 94.7)
No of physical LTCs × mental health condition	–72.3 (–244.9 to 100.4)	–3.7 (–13.4 to 6.1)	3.21 (–22.6 to 29.0)	–0.1 (–1.6 to 1.5)	0.77 (–35.6 to 37.1)	0.2 (–1.9 to 2.3)	–79.6 (–171.3 to 12.0)	–4.7 (–10.1 to 0.7)	–147.3 (–455.0 to 160.5)	–9.9 (–27.7 to 7.8)
Economic status (ref. first quintile (lowest))										
Second quintile	131.3 (–25.3 to 287.8)	7.8 (–1.6 to 17.2)	8.96 (–30.0 to 47.9)	0.5 (–1.9–2.9)	25.9 (–28.9 to 80.7)	2.4 (–0.8 to 5.6)	101.5 (–36.7 to 239.8)	6.4 (–1.9 to 14.8)	152.7 (–311.5 to 616.9)	14.8 (–12.8 to 42.4)
Third quintile	69.2 (–69.0 to 207.4)	4.1 (–4.2 to 12.3)	14.1 (–23.9 to 52.1)	0.5 (–1.8 to 2.8)	35.7 (–17.8 to 89.2)	2.5 (–0.6 to 5.7)	100.8 (–34.1 to 235.7)	5.7 (–2.5 to 13.9)	97.9 (–355.0 to 550.9)	9.0 (–18.0 to 35.9)
Fourth quintile	88.6 (–54.5 to 231.6)	5.0 (–3.6 to 13.6)	19.9 (–18.3 to 58.0)	0.8 (–1.5–3.2)	**62.9 (9.16 to 116.6)**	**4.1 (1.0 to 7.3)**	**151.9 (16.5 to 287.3)**	9.3 (1.1 to 17.5)	157.1 (–297.5 to 611.8)	12.8 (–14.3 to 39.8)
Fifth quintile (highest)	194.0 (–34.1 to 422.0)	11.8 (–1.9 to 25.5)	**47.2 (5.80 to 88.7)**	**2.7 (0.1 to 5.2)**	**100.0 (41.7 to 158.3)**	**6.8 (3.4 to 10.3)**	**265.8 (118.7 to 412.9)**	17.5 (8.6 to 26.4)	444.9 (–49.0 to 938.8)	27.3 (–2.1 to 56.6)
Gender (ref. female)										
Male	–16.5 (–143.3 to 110.2)	–0.9 (–8.5 to 6.8)	–5.18 (–31.1 to 20.7)	–0.4 (–2.0 to 1.2)	–24.0 (–60.5 to 12.5)	–1.1 (–3.2 to 1.0)	–59.6 (–151.6 to 32.4)	–3.9 (–9.5 to 1.7)	–79.6 (–388.5 to 229.3)	–5.1 (–23.4 to 13.3)
Age group (ref. 45–54)										
55–64	–23.8 (–141.1 to 93.5)	–1.7 (–8.7 to 5.3)	–5.70 (–35.2 to 23.8)	–0.4 (–2.2 to 1.4)	1.82 (–39.7 to 43.3)	0.2 (–2.2 to 2.6)	8.46 (–96.2 to 113.1)	0.9 (–5.5 to 7.2)	124.2 (–227.2 to 475.5)	7.8 (–13.2 to 28.7)
65–74	19.1 (–113.8 to 152.1)	1.3 (–6.6 to 9.3)	–1.91 (–36.2 to 32.3)	–0.1 (–2.2 to 2.0)	0.72 (–47.5 to 48.9)	0.04 (–2.8 to 2.9)	82.3 (–39.3 to 203.9)	4.6 (–2.8 to 12.0)	176.8 (–231.4 to 584.9)	15.1 (–9.2 to 39.3)
75+	161.6 (–59.0 to 382.2)	9.6 (–3.5 to 22.7)	–9.55 (–53.9 to 34.8)	–0.1 (–2.8 to 2.7)	13.7 (–48.7 to 76.2)	0.8 (–2.8 to 4.5)	109.2 (–48.2 to 266.6)	6.8 (–2.7 to 16.4)	479.2 (–49.3 to 1007.8)	30.7 (–0.8 to 62.1)
Residence (ref. urban)										
Rural	–57.5 (–218.9 to 103.8)	–3.8 (–13.5 to 5.9)	16.0 (–14.8 to 46.8)	0.5 (–1.3 to 2.4)	5.57 (–37.8 to 49.0)	0.1 (–2.5 to 2.6)	–12.7 (–122.1 to 96.8)	–0.8 (–7.4 to 5.9)	–4.55 (–372.0 to 362.9)	–0.5 (–22.3 to 21.3)
Marital status (ref. currently married)										
Not married	**137.9 (12.1 to 263.7)**	**8.1 (0.7 to 15.5)**	15.4 (–13.9 to 44.7)	1.2 (–0.6 to 3.0)	28.3 (–12.9 to 69.5)	1.4 (–1.0 to 3.8)	**126.9 (23.0 to 230.9)**	**7.6 (1.3 to 14.0)**	346.1 (–2.96 to 695.2)	17.7 (–3.1 to 38.4)
Education status (ref. primary or less)										
Secondary	52.0 (–126.0 to 230.0)	3.5 (–7.1 to 14.1)	24.0 (–9.66 to 57.7)	1.2 (–0.9 to 3.2)	29.7 (–17.7 to 77.1)	2.1 (–0.7 to 4.9)	71.2 (–48.5 to 190.8)	5.5 (–1.8 to 12.7)	136.0 (–265.6 to 537.6)	9.4 (–13.5 to 33.3)
Tertiary or higher	141.5 (–197.0 to 480.0)	8.4 (–11.7 to 28.4)	12.9 (–42.8 to 68.7)	0.1 (–3.3 to 3.5)	–10.6 (–89.1 to 67.9)	–0.4 (–5.0 to 4.2)	–6.92 (–204.9 to 191.1)	2.1 (–10.0 to 14.1)	79.5 (–585.3 to 744.3)	1.1 (–38.4 to 40.6)
Caste (ref. scheduled)										

Continued

Table 4 Continued

	Outpatient OOPE for medicine (coefficient, 95% CI)									
			25th percentile		50th percentile		75th percentile		90th percentile	
	Mean		Absolute difference		Absolute difference		Absolute difference		Absolute difference	
Variables	India	US$	India	US$	India	US$	India	US	India	US$
None	–5.7 (–146.2 to 134.8)	–0.4 (–8.8 to 8.0)	14.8 (–20.9 to 50.5)	0.9 (–1.2 to 3.1)	20.3 (–29.9 to 70.6)	1.1 (–1.8 to 4.0)	47.3 (–79.4 to 174.0)	1.3 (–6.4 to 9.0)	27.8 (–398.7 to 453.2)	2.0 (–23.3 to 27.3)
Other	151.2 (–27.4 to 329.8)	9.0 (–1.7 to 19.6)	0.80 (–33.4 to 35.0)	0.05 (–2.0 to 2.1)	21.0 (–27.2 to 69.2)	1.1 (–1.7 to 3.9)	41.2 (–80.4 to 162.7)	0.8 (–6.6 to 8.2)	128.6 (–279.5 to 536.7)	12.5 (–11.7 to 36.8)
Religion (ref. hinduism)										
Islam	**162.6 (11.7 to 313.6)**	**9.6 (0.5 to 18.7)**	9.6 (–24.0 to 43.3)	0.3 (–1.8 to 2.3)	27.8 (–19.6 to 75.2)	1.4 (–1.4 to 4.2)	91.5 (–28.0 to 211.0)	6.2 (–1.1 to 13.4)	**487.8 (86.5 to 889.1)**	**31.7 (7.8 to 55.6)**
Other	12.8 (–319.3 to 344.8)	0.3 (–19.7 to 20.3)	–71.1 (–136.3 to –5.9)	–3.8 (–7.8 to 0.1)	**–136.9 (–228.6 to –45.1)**	**–8.1 (–13.5 to –2.8)**	–118.5 (–349.8 to 112.9)	–7.4 (–21.5 to 6.6)	–56.4 (–833.2 to 720.5)	–4.4 (–50.6 to 41.8)
Health insurance status (ref. No)										
Yes	94.7 (–66.4 to 255.8)	5.4 (–4.2 to 15.0)	1.70 (–31.6 to 35.0)	–0.03 (–2.1 to 2.0)	11.0 (–35.8 to 57.9)	0.4 (–2.3 to 3.1)	3.85 (–114.3 to 122.0)	–0.5 (–7.6 to 6.7)	42.1 (–354.8 to 438.9)	2.9 (–20.7 to 26.5)
State (ref. Utter Pradesh)										
Assam	**605.9 (201.6 to 1010.2)**	**37.5 (13.5 to 61.5)**	**318.0 (230.4 to 405.6)**	**20.1 (14.7 to 25.4)**	**550.1 (426.7 to 673.4)**	**33.2 (26.0 to 40.4)**	**720.4 (409.4 to 1031.4)**	**48.0 (29.1 to 66.8)**	**2137.3 (1093.1 to 3181.4)**	**131.6 (69.6 to 193.6)**
Karnataka	**375.6 (53.1 to 698.1)**	**23.6 (4.3 to 42.8)**	–8.34 (–59.4 to 42.7)	–0.02 (–3.1 to 3.1)	18.0 (–53.9 to 89.8)	1.8 (–2.4 to 6.0)	–40.0 (–221.2 to 141.2)	1.9 (–9.1 to 12.9)	**609.1 (0.72 to 1217.5)**	**41.0 (4.9 to 77.1)**
Maharashtra	–136.0 (–355.1 to 83.2)	–7.3 (–20.3 to 5.7)	18.0 (–32.9–68.8)	1.2 (–1.9 to 4.3)	28.9 (–42.7 to 100.5)	1.9 (–2.3 to 6.1)	10.8 (–169.7 to 191.3)	1.3 (–9.6 to 12.2)	–19.5 (–625.5 to 586.6)	1.2 (–34.8 to 37.2)
Rajasthan	53.9 (–98.8 to 206.6)	2.8 (–6.4 to 12.0)	–39.2 (–82.2 to 3.87)	–2.4 (–5.1 to 0.2)	51.9 (–8.70 to 112.5)	2.6 (–0.9 to 6.2)	–58.8 (–211.6 to 93.9)	–1.6 (–10.9 to 7.7)	–12.2 (–525.1 to 500.7)	–0.8 (–31.4 to 29.7)
West Bengal	**–146.3 (–278.0 to –14.5)**	**–8.2 (–16.0 to –0.4)**	16.1 (–27.1 to 59.4)	0.9 (–1.8 to 3.5)	38.3 (–22.6 to 99.2)	2.3 (–1.2 to 5.9)	–102.3 (–255.7 to 51.1)	–3.3 (–12.6 to 6.0)	–240.4 (–755.6 to 274.8)	–14.9 (–45.5 to 15.7)

Note: Mean values were derived from a generalised linear model.
Bolded values indicate p<0.05.
All estimates adjusted for sample weight.
LTCs, long-term conditions ; OOPE, out-of-pocket expenditure.

percentile: 8.4; 75th percentile: 22.5; 90th percentile: 28.3) and India (25th percentile: 25.6; 50th percentile: 48.1; 75th percentile: 106.9; 90th percentile 197.5).

Sensitivity analyses

To account for large zero in the OOPE outcome, we conducted two sensitivity analyses using a two-part model consisting of a logit model and a generalised linear model online supplemental tables 14 and 15 and the zero-inflated negative binomial regression online supplemental tables S16 and S17. The results from these two sensitivity analyses yielded very comparable with those in the main analysis, suggesting our findings are robust under different regression model specifications.

DISCUSSION

Our results found that the prevalence of multimorbidity in China and India was 63.4% and 42.2%, respectively, in adults aged 45 years or more. The prevalence increased with age. Among individuals with any long-term health condition, 38.6% and 20.9% of those had complex multimorbidity in China and India, respectively.

An increased number of LTCs was associated with increasing OOPE for medicines. In India, stroke was associated with highest OOPE for medicines and this was the case for liver disease in China. Diabetes, one of the largest disease burdens in both China and India, had the second largest increase in OOPE for medicines in both countries.[50] High OOPE associated with stroke and liver disease can be attributed to a variety of factors, including patients who may require multiple medications, high costs of these medications and insufficient coverage of medical costs in India and China.[51 52] As a result, more research is required to determine why different LTCs affect OOPE for medicine in different ways.

Our quantile regression models provide more detailed and comprehensive information on the associations between multimorbidity and OOPE for medicines across the cost distribution that previous studies have not shown.[53] The strong association between the severity of multimorbidity and OOPE for medicines is consistent with a recent systematic review which has highlighted that patients with an increasing number of LTCs will experience increasing OOPE for medicines. However, the systematic review included only one study from India and no studies from China.[36] Earlier studies on the prevalence of complex multimorbidity were primarily based in high-income countries,[33 34 54] and our study is the first large scale study to investigate the prevalence of complex multimorbidity in two middle-income countries with the largest populations in the world—China and India, based on nationally representative survey data. Our study found high prevalence of complex multimorbidity among the adult populations in both countries, indicating the need for further research around prevention and treatment of complex multimorbidity in these countries and LMICs in general.

Our findings provide new evidence to inform the development of targeted policies and interventions to tackle the growing financial burden of multimorbidity in LMICs. With rapidly ageing population, China and India are both facing a rapidly growing burden of multimorbidity. Efforts to reduce multimorbidity risk factors are integral to prevention strategies to reduce disease burden, avoidable mortality, OOPE and financial risk. Such efforts include greater investment in cost-effective public health interventions for risk factor reduction including reduced pollution, effective implementation of Framework Convention on Tobacco Control and the Global Strategy for Diet, Physical Activity and Health.[55 56] These interventions are effective in reducing common risk factors shared by cardiovascular diseases (CVDs), cancer, diabetes and chronic respiratory disease. These interventions should be targeted to those at greatest risk by conducting risk profiling at the population level and designing focused prevention and treatment strategies with appropriate strengthening of health services.[57 58] These targeted interventions should then be integrated into health policies at the national level in the context of centralised China or at the subnational level for India where the primary responsibilities for health is at the state level.[59]

WHO Package of essential noncommunicable, high-impact cost-effective interventions could be delivered at the primary care level.[60] However, healthcare delivery in both China and India are highly hospital-based and fragmented, with little coordination among healthcare providers across different tiers of the system.[61] In China and India, stronger primary healthcare, underpinned by multidisciplinary teams is critical for addressing health and economic burden of multimorbidity.[3 62] Health systems may need to adapt from single-disease responsive models to new financing and service delivery models to prevent and manage multimorbidity more effectively. Studies are needed to develop suitable care delivery models for multimorbidity and should include infectious diseases that are common on both countries, such as TB. Rigorous evaluation of these new healthcare delivery models is warranted to ensure effectiveness, efficiency and quality of care.

China has undertaken major reforms to increase population access to essential medicines over the last decades with notable increase in social health insurance coverage for prescription drugs.[63] Recent studies suggest that the current reimbursement rate is around 45% for medicines in an outpatient setting, however, the monthly reimbursements are capped at a relatively low rate.[64 65] Optimising a health insurance system plays an extremely important role in improved financial risk protection. At the end of 2015, China had officially announced the merger of the UEBMI and the NRCMS,[17] representing a commendable milestone towards UHC.[16] However, the current health insurance system still leaves much financial risk for households to bear, and a relatively high incidence (5.14%) of health impoverishment. In the implementation of this

integration, the most critical element was the further extension of funding pools and narrowing of disparities in covered services and medications between the Unified Resident Health Insurance and UEBMI.[15] This new phase in China's reform needs special attention devoted to disadvantaged groups, particularly the poor and households with members suffering multiple chronic diseases. Extending insurance coverage to include long-term care for chronically ill patients, essential medications, outpatient and rehabilitation services are a priority. The reform of the Public Medical Assistance System could also be deeply integrated with National Poverty Alleviation Projects, giving priority to a comprehensive benefits package with services and cost-sharing mechanisms for citizens with multimorbidity.

An earlier study in India has indicated that almost 50% of the population does not have regular access to essential medicines and the proportion of out-pocket-payments as a percentage of total health expenditures was at the high rate of 62.6% in 2015.[66] An important first step in improving access and affordability to essential medicines is to define an essential medicines list on the basis of effectiveness, quality and cost, followed by inclusion of this list in public health insurance benefits, supported by price regulation and efficient procurement and delivery of a single payer public health financing programme.[67]

As part of its commitment to Sustainable Development Goals, India recently launched major public health insurance expansion through the Rashtriya Swasthya Bima Yojana and Pradham Mantri Jan Arogaya Yojana.[68] The programme aimed to help lower financial barriers of low-income households to access to essential medicines and UHC. However, affordability of quality healthcare and essential medicine could pose a challenge for low-income and middle-income households. Individuals in India still incur high levels of OOPE for medicines. For instance, between 1998 and 2005, low-income groups in India spent around 27%–34% of their annual income on care for LTCs, where the largest proportion of the expenditure (65% of the OOPE) was for medicines.[69] Thus, expanding health insurance coverage to all individuals in India and ensuring the affordability of essential medicines is key to reducing OOPE.

The study has several limitations. First, the cross-sectional study limits the causal interpretation of our findings.[70] Further studies are warranted to investigate the long-term or dynamic effect of multimorbidity using panel or cohort study design. Second, similar to other studies based on survey datasets, our study is subject to well-known self-reported bias for chronic disease status. It is also worth mentioning that the measures in CHARLS and SAGE are not completely comparable because (1) the number of LTCs measured are not equal, (2) there are differences in the type of LTCs measured and (3) the clinical measurements for depression, CIDI and CESD are not exactly comparable. This could lead to underestimation of the prevalence of LTCs and prohibits us from comparing the outcome variable between China and India. Our study had a potential limitation in that our outcome variable was OOPE for the last visit. However, CHARLS and SAGE do not include data on patients' total OOPE in the previous year. A calculation to determine OOPE for medicines over the year was considered, but it was based on the assumption that OOPE would be the same for each visit. This is unlikely in this case because patients seek outpatient care for a variety of reasons. Some visits may necessitate patients purchasing medications, while others may not. As a result, patients may incur varying amounts of OOPE. Another limitation of the study is the inability to conduct analyses on individuals who used inpatient services. This is due to the small proportion of people using inpatient services in both India (6.84%) and China (6.5%) in the survey sample. Appropriately powered future studies are needed to ascertain how multimorbidity, different multimorbidity dyads and complex multimorbidity affect hospital inpatient admissions and OOPE for hospital care and medicines.

In conclusion, multimorbidity is associated with substantial increase in OOPE for prescription medicines in China and India. Our study calls for acceleration of UHC and policy interventions to extend coverage of health insurance and to reduce financial burden associated with prescription medicines in LMICs.

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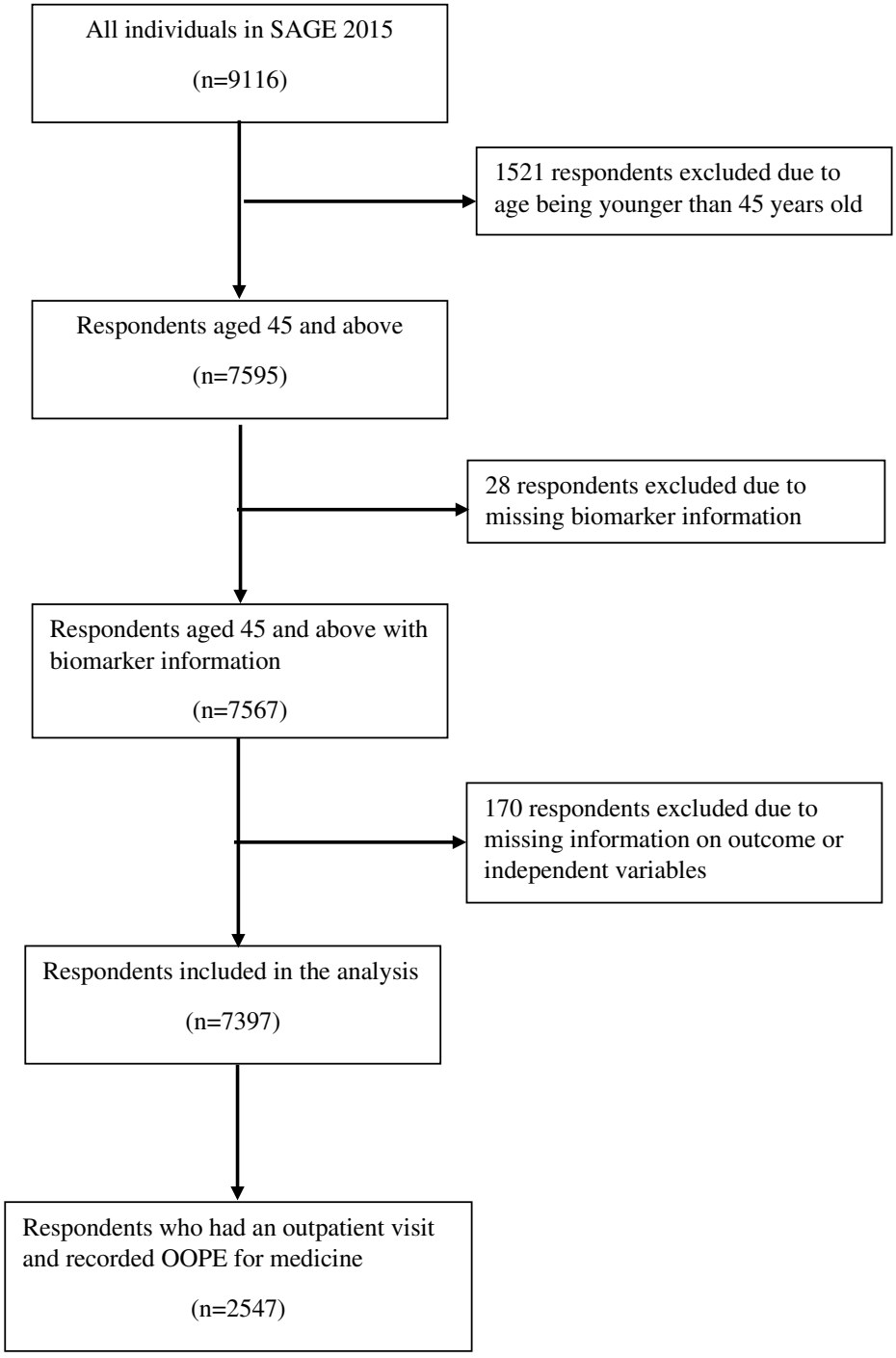
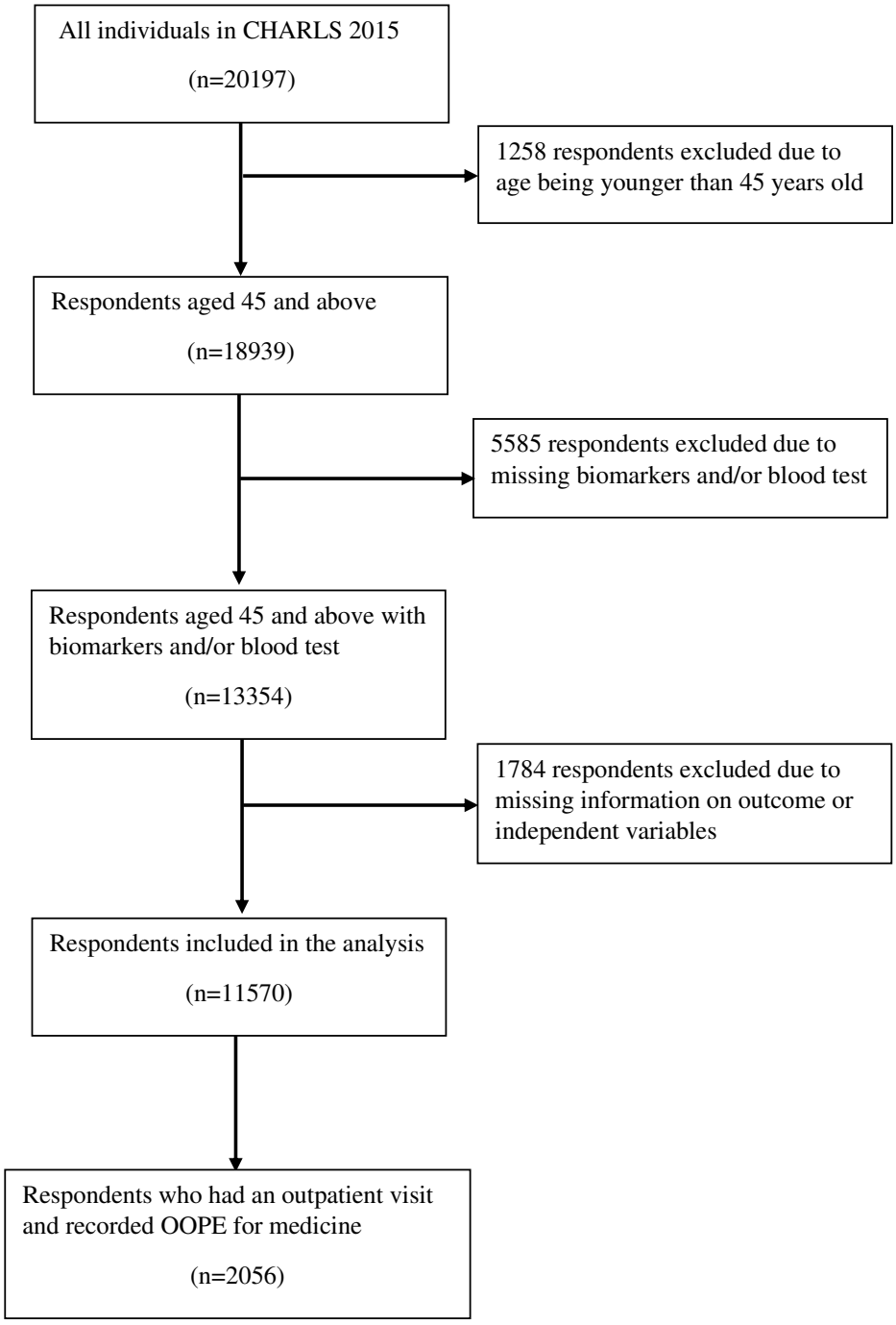
SUPPLEMENTARY APPENDIX

Figure S1: Sample flowchart for India, 2015.



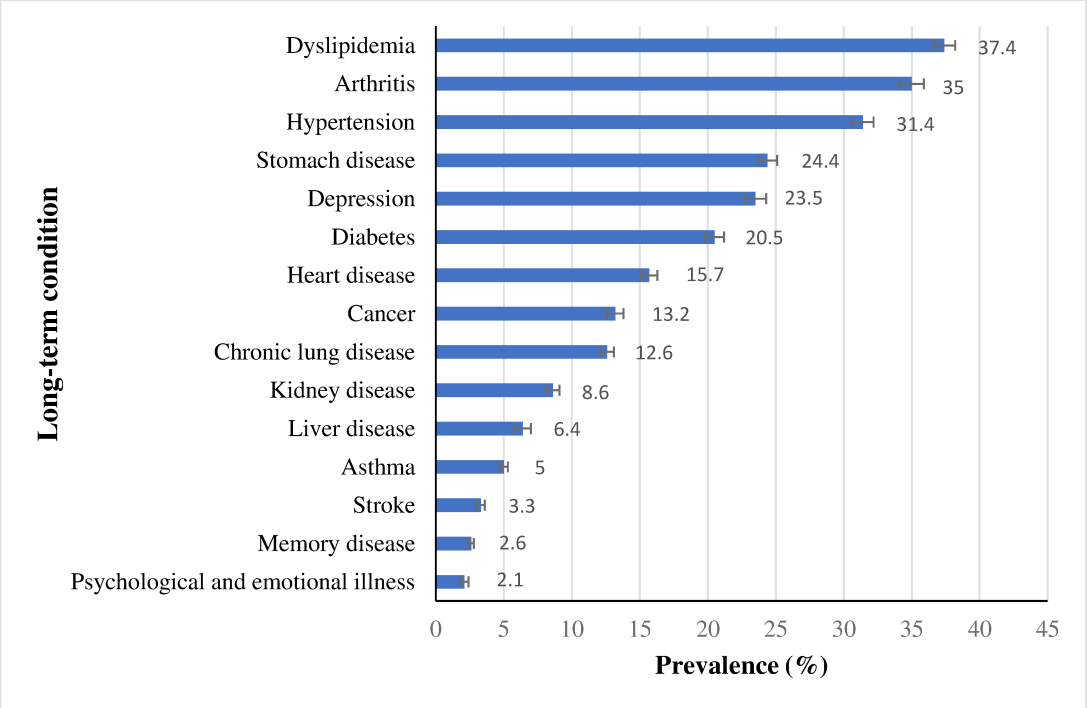
Note: OOPE: Out-of-pocket expenditure

Figure S2: Sample flowchart for China, 2015.



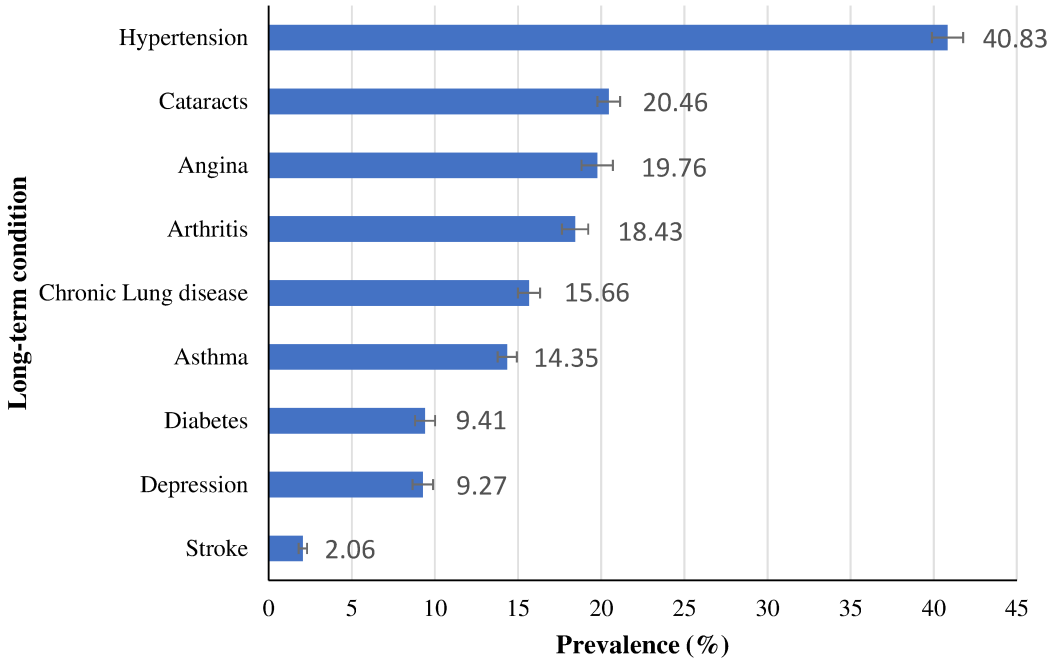
Note: OOPE: Out-of-pocket expenditure

Figure S3. Prevalence of long-term conditions in China, 2015.



Note: All percentages were adjusted for sample weight. Values next to the bar indicates the prevalence of that LTC in China.

Figure S4. Prevalence of long-term conditions in India, 2015.



Note: All percentages were adjusted for sample weight. Values next to the bar indicates the prevalence of that LTC in India.

Table S1. Sample characteristics in China and India, 2015

Variables	China		India	
	N	%	N	%
All individuals	11570	100	7397	100
Sex				
Male	5482	49.4	3426	46.3
Female	6088	50.6	3971	53.7
Age (Years)				
45-54	3583	32.9	1910	26.6
55-64	4195	35.7	2921	38.5
65-74	2815	22.4	1779	24.3
75+	977	9.1	787	10.6
Education level				
Primary or less	8061	64.4	5677	74.7
Secondary	2347	21.3	1310	18.6
Tertiary or higher	1162	14.3	410	6.7
Residence				
Urban	4304	48.8	5834	72.0
Rural	7266	51.2	1563	28.0
Number of LTCs				
0	1327	11.9	1873	26.9
1	2701	24.7	2259	30.9
2	2595	23.0	1605	21.0
3	1925	16.0	925	11.7
4+	3022	24.3	735	9.6
Marital Status				
Currently married	9622	83.5	5576	76.0
Not married	1948	16.5	1821	24.0
Caste				
Schedule	-	-	5230	71.0
None	-	-	1217	14.2
Other	-	-	950	14.8
Religion				
Hinduism	-	-	6203	84.9
Islam	-	-	902	12.0

Other	-	-	292	3.0
Health Insurance				
Yes	-		810	10.1
No	971	8.8	6587	89.9
UEBMI	1305	18.8	-	-
URBMI	775	8.0	-	-
NRCMS	8289	61.6	-	-
Other	230	2.7	-	-
Economic status				
1st quintile (Lowest)	2314	16.4	1415	20.1
2nd quintile	2314	18.0	1374	18.1
3rd quintile	2315	20.8	1383	18.4
4th quintile	2314	21.2	1516	20.7
5th quintile (Highest)	2313	23.6	1709	22.8
States				
Assam	-	-	765	5.2
Karnataka	-	-	916	11.4
Maharashtra	-	-	1216	20.8
Rajasthan	-	-	1512	12.3
Utter Pradesh	-	-	1566	31.9
West Bengal	-	-	1422	18.5
Region				
East	4338	41.6	-	-
Central	4443	35.5	-	-
West	2789	22.9	-	-

Note: LTCs: Long Term Conditions; UEBMI: Urban Employee Basic Medical Insurance ;URMBI: Urban Resident basic Medical Insurance; NRCMS: New Rural Cooperative Medical Scheme. Samples were weighted.

Table S2. The distribution of long-term conditions by socioeconomic groups in China, 2015

Variables	Multimorbidity Status				
	0 LTC	1 LTC	2 LTC	3 LTC	4+ LTC
	N (%)	N (%)	N (%)	N (%)	N (%)
All individuals	1327 (11.9)	2701 (24.7)	2595 (23.0)	1925 (16.0)	3022 (24.4)
Sex					
Male	659 (11.7)	1343 (25.9)	1294 (24.8)	932 (16.3)	1254 (21.4)
Female	668 (12.1)	1358 (23.6)	1301 (21.3)	993 (15.7)	1768 (27.3)
Age (Years)					
45-54	687 (19.0)	1138 (33.8)	778 (23.7)	459 (11.5)	521 (12.0)
55-64	389 (9.6)	868 (22.6)	1004 (24.4)	769 (17.9)	1165 (25.6)
65-74	187 (7.3)	519 (17.9)	596 (20.6)	520 (18.1)	993 (36.1)
75+	64 (9.3)	176 (17.3)	217 (21.1)	177 (19.8)	343 (35.5)
Education level					
Primary or less	934 (13.0)	1795 (23.0)	1750 (21.5)	1327 (16.1)	2255 (26.4)
Secondary	261 (10.8)	589 (26.1)	570 (25.1)	399 (15.7)	528 (22.4)
Tertiary or higher	132 (8.6)	317 (30.4)	275 (26.6)	199 (16.2)	239 (18.2)
Residence					
Urban	521 (12.8)	1074 (26.3)	953 (23.7)	711 (15.1)	1045 (22.1)
Rural	806 (11.0)	1627 (23.3)	1642 (22.4)	1214 (16.8)	1977 (26.6)
Marital status					
Currently married	1169 (12.7)	2290 (25.4)	2171 (23.3)	1596 (16.0)	2396 (22.6)
Not married	158 (7.8)	411 (21.5)	424 (21.5)	329 (15.9)	626 (33.3)
Region					
East	537 (12.5)	1121 (26.6)	1036 (25.4)	723 (15.6)	921 (19.9)
Central	493 (11.7)	982 (23.2)	971 (21.5)	733 (16.7)	1264 (27.0)
West	297 (11.0)	598 (23.8)	588 (21.0)	469 (15.7)	837 (28.6)
Health insurance					
No	100 (9.5)	265 (31.2)	216 (23.4)	167 (15.9)	223 (20.0)
UEBMI	160 (13.0)	331 (25.9)	286 (22.8)	213 (15.5)	315 (22.7)
URBMI	95 (15.0)	169 (24.2)	183 (20.8)	114 912.4)	214 (27.6)

NRCMS	948 (11.6)	1884 923.6)	1860 (23.2)	1394 (16.7)	2203 (25.0)
Other	24 (8.3)	52 (23.3)	50 (26.7)	37 (15.6)	67 (26.1)
Economic status					
1st quintile (lowest)	221 (9.2)	480 (20.4)	534 (25.5)	456 (19.3)	623 (25.7)
2nd quintile	244 (12.2)	552 (23.4)	533 923.6)	383 (15.4)	602 (25.5)
3rd quintile	287 (12.6)	560 (29.1)	524 (21.4)	349 (14.0)	595 (22.9)
4th quintile	270 (11.6)	553 (25.5)	472 (19.6)	369 (17.3)	650 (26.0)
5th quintile (highest)	305 (13.1)	556 (24.3)	532 (25.4)	368 (14.8)	552 (22.5)

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; CI: Confidence Interval; UEBMI: Urban Employee Basic Medical Insurance ;URMBI: Urban Resident basic Medical Insurance; NRCMS: New Rural Cooperative Medical Scheme.

Table S3. The distribution of long-term conditions by socioeconomic groups in India, 2015.

Variables	Multimorbidity status				
	0 LTC	1 LTC	2 LTC	3 LTC	4+ LTC
	N (%)	N (%)	N (%)	N (%)	N (%)
All individuals	1873 (26.9)	2259 (30.9)	1605 (21.0)	925 (11.6)	735 (9.6)
Sex					
Male	969 (29.8)	988 (28.9)	714 (20.2)	412 (10.8)	343 (10.3)
Female	904 (24.4)	1271 (32.5)	891 (21.8)	513 (12.4)	392 (9.0)
Age (Years)					
45-54	678 (37.9)	613 (30.7)	354 (18.8)	175 (8.3)	90 (4.4)
55-64	756 (27.3)	953 (32.9)	602 (19.9)	346 (11.8)	264 (8.3)
65-74	329 (19.4)	485 (29.4)	440 (23.7)	278 (14.1)	247 (13.5)
75+	110 (15.3)	208 (27.5)	209 (24.7)	126 (14.0)	134 (18.5)
Education level					
Primary or less	1408 (26.4)	1739 (30.5)	1229 (21.2)	711 (12.1)	590 (9.7)
Secondary	354 (28.7)	393 (32.0)	285 (19.3)	171 (10.5)	107 (9.5)
Tertiary or higher	111 (27.5)	127 (31.2)	91 (23.7)	43 (9.1)	38 (8.5)
Residence					
Urban	1520 (27.4)	1795 (30.7)	1255 (20.8)	694 (11.6)	570 (9.5)
Rural	353 (25.6)	464 (31.3)	350 (21.6)	231 (11.7)	165 (9.8)
Marital Status					
Currently married	1564 (29.8)	1693 (30.3)	1179 (20.5)	643 (10.6)	497 (8.8)
Not married	309 (17.6)	566 (32.7)	426 (22.8)	282 (14.8)	238 (12.2)
Caste					
Schedule	1362 (27.6)	1592 (30.9)	1119 (20.5)	658 (11.8)	499 (9.2)
None	301 (26.1)	361 (28.5)	277 (23.2)	146 (10.7)	132 (11.4)
Other	210 (24.3)	306 (33.1)	209 (21.2)	121 (11.7)	104 (9.8)
Religion					
Hinduism	1598 (27.2)	1904 (31.3)	1349 (21.1)	765 (11.2)	587 (9.1)
Islam	222 (26.9)	256 (27.6)	185 (19.6)	126 (14.1)	113 (11.8)
Other	53 (18.2)	99 (31.0)	71 (23.7)	34 (12.4)	35 (14.7)

Health Insurance					
Yes	196 (25.6)	245 (30.5)	172 (20.2)	120 (14.2)	77 (9.5)
No	1677 (27.1)	2014 (30.9)	1433 (21.1)	805 (11.3)	658 (9.6)
Economic status					
1st quintile (Lowest)	374 (27.7)	436 (31.2)	316 (21.8)	160 (10.8)	129 (8.5)
2nd quintile	369 (27.1)	414 (30.2)	283 (20.9)	168 (11.9)	140 (9.9)
3rd quintile	371 (28.7)	439 (32.5)	278 (19.8)	160 (10.6)	135 (8.6)
4th quintile	363 (25.7)	478 (32.2)	324 (19.3)	209 (13.7)	142 (9.1)
5th quintile (Highest)	396 (25.7)	492 (28.6)	404 (23.0)	228 (11.1)	189 (11.6)
States					
Assam	192 (25.1)	243 (31.9)	171 (22.2)	94 (12.2)	65 (8.6)
Karnataka	199 (21.8)	298 (32.8)	200 (21.6)	130 (13.6)	89 (10.2)
Maharashtra	304 (27.3)	336 (28.5)	262 (21.3)	170 (12.0)	144 (10.9)
Rajasthan	366 (24.5)	457 (29.7)	342 (22.2)	193 (13.0)	154 (10.5)
Utter Pradesh	482 (31.4)	513 (33.3)	291 (18.3)	154 (9.3)	126 (7.7)
West Bengal	330 (23.9)	412 (28.5)	339 (24.0)	184 (12.8)	157 (10.8)

Note: All percentages are adjusted for sample weight. LTC: Long-term condition.

Table S4: Patterns of multimorbidity in China, 2015

	Multimorbidity Unadjusted Odds Ratio (95% CI)*	**Multimorbidity Adjusted Odds Ratio (95% CI)***
Gender (Ref: Female)		
Male	0.92 (0.82-1.04)	**0.86 (0.76-0.97)**
Age group (Ref: 45-54)		
55-64	**2.36 (2.03-2.74)**	**2.47 (2.13-2.86)**
65-74	**3.31 (2.81-3.90)**	**3.49 (2.95-4.13)**
75+	**3.61 (2.86-4.57)**	**3.82 (2.94-4.97)**
Residence (Ref: Urban)		
Rural	**1.23 (1.09-1.40)**	**1.14 (1.00-1.30)**
Region (Ref: East)		
Central	**1.20 (1.04-1.38)**	**1.21 (1.04-1.41)**
West	**1.20 (1.02-1.43)**	**1.23 (1.03-1.46)**
Marital Status (Ref: Married)		
Not Married	**1.48 (1.28-1.72)**	1.14 (0.97-1.33)
Education Status (Ref: Primary or less)		
Secondary	0.96 (0.79-1.17)	**1.30 (1.04-1.61)**
Tertiary or higher	0.88 (0.74-1.04)	**1.24 (1.03-1.49)**
Health Insurance status (ref: No)		
UEBMI	1.08 (0.80-1.45)	1.01 (0.74-1.36)
URBMI	1.06 (0.75-1.50)	1.22 (0.89-1.67)
NRCMS	**1.27 (1.03-1.55)**	**1.31 (1.06-1.61)**
Other	**1.48 (1.02-2.17)**	1.30 (0.85-1.99)
Socioeconomic status (ref: 1st quintile (lowest))		
2nd quintile	**0.76 (0.64-0.91)**	0.90 (0.73-1.11)
3rd quintile	**0.59 (0.42-0.82)**	0.74 (0.52-1.07)
4th quintile	**0.71 (0.59-0.86)**	0.89 (0.71-1.11)
5th quintile (Highest)	**0.71 (0.59-0.85)**	0.92 (0.78-1.09)

*Bolded indicates p<0.05

Note: All estimates adjusted for sample weight. CI: Confidence Interval; UEBMI: Urban Employee Basic Medical Insurance ;URMBI: Urban Resident basic Medical Insurance; NRCMS: New Rural Cooperative Medical Scheme. Coefficients are statistically significant if p<0.05.

Table S5: Patterns of multimorbidity in India, 2015

	Multimorbidity Unadjusted Odds Ratio (95% CI)*	**Multimorbidity Adjusted Odds Ratio (95% CI)***
Socioeconomic status (Ref: 1st quintile (lowest))		
2nd quintile	1.10 (0.86-1.42)	1.07 (0.85-1.36)
3rd quintile	0.94 (0.75-1.18)	0.91 (0.74-1.12)
4th quintile	1.13 (0.89-1.42)	1.13 (0.89-1.44)
5th quintile (highest)	1.28 (0.98-1.68)	1.32 (0.98-1.77)
Gender (Ref: Female)		
Male	**0.89 (0.80-0.98)**	**0.85 (0.75-0.96)**
Age (Ref: 45-54)		
55-64	**1.44 (1.26-1.65)**	**1.51 (1.30-1.75)**
65-74	**1.91 (1.56-2.35)**	**2.06 (1.68-2.52)**
75+	**2.45 (1.99-3.02)**	**2.58 (2.07-3.21)**
Residence (ref. Urban)		
Rural	1.07 (0.81-1.40)	1.15 (0.90-1.47)
Marital status (ref. married)		
Not married	**0.77 (0.68-0.86)**	0.97 (0.85-1.11)
Education status (ref. Primary or less)		
Secondary	**0.80 (0.69-0.93)**	**0.85 (0.73-0.98)**
Tertiary or higher	0.92 (0.67-1.27)	0.94 (0.69-1.29)
Caste (ref. Scheduled)		
None	1.18 (0.96-1.44)	1.10 (0.88-1.37)
Other	1.06 (0.87-1.29)	1.12 (0.92-1.37)
Religion (ref. Hinduism)		
Islam	1.21 (0.97-1.50)	1.24 (0.98-1.56)
Other	**1.40 (1.03-1.90)**	1.34 (0.98-1.83)
Health Insurance status (ref. No)		
Yes	1.08 (0.88-1.32)	0.98 (0.81-1.18)
State (ref. Utter Pradesh)		
Assam	1.32 (0.98-1.78)	1.33 (0.98-1.81)
Karnataka	1.25 (0.97-1.62)	**1.33 (1.01-1.75)**
Maharashtra	1.29 (0.94-1.75)	**1.35 (1.00-1.81)**
Rajasthan	**2.16 (1.69-2.78)**	**2.17 (1.69-2.78)**
West Bengal	**1.72 (1.37-2.18)**	**1.88 (1.48-2.38)**

*Bolded indicates p<0.05

Note: All estimates adjusted for sample weight. CI: Confidence Interval. Coefficients are statistically significant if p<0.05.

Table S6. Association of multimorbidity with OOPE for medicines (元 & $USD) in China, 2015

Variable	**Outpatient OOPE for medicine**			
	China (Coefficient, 95% CI)	**p-value**	**$USD** (Coefficient, 95% CI)	**p-value**
Number of physical LTCs	0.17 (0.09-0.26)	<0.0001	0.14 (0.07-0.21)	<0.0001
Mental health condition	0.16 (-0.34-0.66)	0.531	0.13 (-0.27-0.53)	0.530
Number of physical LTCs * Mental health condition	-0.06 (-0.19-0.08)	0.409	-0.04 (-0.15-0.07)	0.461
Gender (ref. Female)				
Male	-0.11 (-0.40-0.18)	0.462	-0.08 (-0.31-0.14)	0.478
Age group (ref. 45-54)				
55-64	-0.05 (-0.36-0.25)	0.721	-0.04 (-0.28-0.20)	0.761
65-74	-0.15 (-0.52-0.22)	0.436	-0.12 (-0.41-0.17)	0.422
75+	-0.42 (-0.98-0.15)	0.147	-0.34 (-0.78-0.11)	0.136
Residence (ref. Urban)				
Rural	0.08 (-0.21-0.37)	0.591	0.05 (-0.19-0.28)	0.712
Region (ref. East)				
Central	0.04 (-0.32-0.39)	0.846	0.05 (-0.23-0.33)	0.736
West	-0.10 (-0.44-0.24)	0.559	-0.12 (-0.39-0.15)	0.382
Marital Status (ref. Currently married)				
Not married	0.02 (-0.31-0.36)	0.885	0.03 (-0.24-0.30)	0.828
Education Status (ref. Primary or less)				
Secondary	0.09 (-0.30-0.47)	0.662	0.06 (-0.24-0.36)	0.695
Tertiary or higher	0.43 (0.01-0.86)	0.045	0.33 (0.00-	0.053

			0.66)	
Health Insurance (ref. No)				
UEBMI	-0.33 (-1.04-0.37)	0.354	-0.25 (-0.79-0.29)	0.360
URBMI	0.47 (-0.26-1.19)	0.206	0.39 (-0.18-0.95)	0.178
NRCMS	0.63 (0.08-1.18)	0.024	0.47 (0.05-0.90)	0.030
Other	-0.19 (-1.23-0.85)	0.717	-0.09 (-0.89-0.71)	0.825
Economic status (ref. 1st quintile (Lowest))				
2nd quintile	-0.03 (-0.39-0.33)	0.862	0.01 (-0.28-0.31)	0.941
3rd quintile	0.07 (-0.28-0.42)	0.699	0.05 (-0.23-0.34)	0.708
4th quintile	0.28 (-0.06-0.62)	0.103	0.27 (0.00-0.55)	0.053
5th quintile (Highest)	0.66 (0.26-1.06)	0.001	0.62 (0.30-0.95)	<0.0001

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval; UEBMI: Urban Employee Basic Medical Insurance ;URMBI: Urban Resident basic Medical Insurance; NRCMS: New Rural Cooperative Medical Scheme. Coefficients are statistically significant if P<0.05.

Table S7. Association of multimorbidity with OOPE for medicines (₹ & $USD) in India, 2015

Variable	Outpatient OOPE for medicine			
	India (coefficient, 95% CI)	**p-value**	**$USD** (coefficient, 95% CI)	**p-value**
Number of physical LTCs	0.19 (0.09-0.30)	<0.0001	0.14 (0.08-0.21)	<0.0001
Mental health condition	0.20 (-0.33-0.72)	0.465	0.30 (-0.09-0.70)	0.132
Number of physical LTCs * Mental health condition	-0.01 (-0.21-0.18)	0.894	-0.07 (-0.21-0.07)	0.327
Gender (ref. Female)				
Male	-0.12 (-0.31-0.07)	0.207	-0.08 (-0.20-0.04)	0.175
Age group (ref. 45-54)				
55-64	-0.10 (-0.33-0.12)	0.374	-0.07 (-0.22-0.08)	0.371
65-74	0.09 (-0.21-0.38)	0.558	0.05 (-0.15-0.25)	0.646
75+	0.20 (-0.19-0.60)	0.332	0.15 (-0.15-0.44)	0.336
Residence (ref. Urban)				
Rural	-0.22 (-0.50-0.05)	0.107	-0.18 (-0.38-0.01)	0.069
Marital Status (ref. Currently married)				
Not married	0.35 (0.13-0.58)	0.002	0.24 (0.10-0.37)	0.001
Education Status (ref. Primary or less)				
Secondary	0.07 (-0.20-0.33)	0.622	0.11 (-0.07-0.29)	0.219
Tertiary or higher	0.19 (-0.32-0.71)	0.459	0.22 (-0.16-0.60)	0.253
Caste (ref. Scheduled)				
None	0.16 (-0.16-0.48)	0.313	0.10 (-0.11-0.32)	0.333

Other	0.14 (-0.18-0.46)	0.390	0.15 (-0.07-0.37)	0.192
Religion (ref. Hinduism)				
Islam	-0.01 (-0.42-0.39)	0.944	0.07 (-0.18-0.32)	0.600
Other	-1.13 (-1.96 to -0.30)	0.008	-0.58 (-1.09 to -0.08)	0.024
Health Insurance status (ref. No)				
Yes	-0.01 (-0.31-0.29)	0.951	0.02 (-0.18-0.22)	0.833
State (ref. Utter Pradesh)				
Assam	1.03 (0.42-1.63)	0.001	0.96 (0.51-1.40)	<0.0001
Karnataka	-0.12 (-0.58-0.34)	0.606	0.08 (-0.25-0.41)	0.648
Maharashtra	-0.13 (-0.50-0.23)	0.465	-0.09 (-0.36-0.18)	0.501
Rajasthan	-0.64 (-1.02 to -0.25)	0.001	-0.23 (-0.48-0.02)	0.068
West Bengal	-0.19 (-0.50-0.12)	0.218	-0.09 (-0.31-0.13)	0.412
Economic status (ref. 1st quintile (lowest))				
2nd quintile	0.07 (-0.25-0.40)	0.664	0.08 (-0.14-0.31)	0.460
3rd quintile	0.17 (-0.18-0.52)	0.342	0.12 (-0.10-0.35)	0.283
4th quintile	0.25 (-0.20-0.70)	0.276	0.16 (-0.15-0.46)	0.312
5th quintile (highest)	0.26 (-0.20-0.71)	0.265	0.22 (-0.11-0.55)	0.194

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval. Coefficients are statistically significant if P<0.05.

Table S8. Association with OOPE for medicines (元 & $USD) and long-term condition type in China, 2015

Variable	**Outpatient OOPE for medicine**			
	China (coefficient, 95% CI)	**p-value**	**$USD** (coefficient, 95% CI)	**p-value**
Hypertension	0.07 (-0.23-0.37)	0.634	0.04 (-0.19-0.28)	0.712
Diabetes	0.46 (0.09-0.84)	0.016	0.39 (0.09-0.69)	0.010
Dyslipidaemia	-0.07 (-0.36-0.22)	0.646	-0.06 (-0.29-0.19)	0.631
Chronic Lung Disease	0.30 (0.01-0.59)	0.046	0.24 (0.01-0.48)	0.043
Liver Disease	0.48 (0.08-0.89)	0.018	0.40 (0.08-0.73)	0.016
Heart Disease	0.29 (-0.07-0.64)	0.117	0.26 (-0.02-0.54)	0.069
Kidney Disease	0.13 (-0.28-0.54)	0.537	0.11 (-0.21-0.43)	0.492
Stomach Disease	0.01 (-0.24-0.26)	0.925	0.01 (-0.20-0.21)	0.943
Arthritis	0.13 (-0.11-0.37)	0.291	0.09 (-0.11-0.28)	0.387
Stroke	0.40 (-0.18-0.98)	0.173	0.36 (-0.10-0.83)	0.128
Cancer	0.38 (-0.01-0.77)	0.058	0.31 (0.00-0.61)	0.050
Asthma	0.07 (-0.34-0.48)	0.730	0.06 (-0.28-0.39)	0.744
Memory disease	-0.43 (-1.15-0.29)	0.237	-0.33 (-0.90-0.24)	0.253
Psychological and emotional illness	0.47 (-0.15-1.09)	0.137	0.42 (-0.07-0.90)	0.095
Depression	-0.09 (-0.35-0.17)	0.510	-0.06 (-0.27-0.15)	0.586

Gender (ref. Female)				
Male	-0.16 (-0.46-0.14)	0.288	-0.13 (-0.36-0.11)	0.283
Age group (ref. 45-54)				
55-64	-0.03 (-0.33-0.28)	0.864	-0.01 (-0.25-0.23)	0.916
65-74	-0.08 (-0.45-0.28)	0.652	-0.06 (-0.35-0.22)	0.656
75+	-0.37 (-0.91-0.16)	0.173	-0.30 (-0.71-0.12)	0.160
Residence (ref. Urban)				
Rural	0.12 (-0.14-0.39)	0.361	0.09 (-0.13-0.30)	0.440
Region (ref. East)				
Central	0.03 (-0.29-0.36)	0.850	0.05 (-0.21-0.30)	0.723
West	-0.11 (-0.43-0.21)	0.502	-0.12 (-0.38-0.13)	0.339
Marital Status (ref. Currently married)				
Not married	0.002 (-0.33-0.33)	0.992	0.01 (-0.26-0.28)	0.933
Education Status (ref. Primary or less)				
Secondary	0.08 (-0.28-0.44)	0.673	0.05 (-0.23-0.33)	0.719
Tertiary or higher	0.45 (0.04-0.86)	0.030	0.35 (0.03-0.67)	0.033
Health Insurance status (ref. No)				
UEBMI	-0.34 (-1.01-0.32)	0.313	-0.26 (-0.77-0.24)	0.308
URBMI	0.41 (-0.28-1.09)	0.246	0.33 (-0.20-0.87)	0.216
NRCMS	0.65 (0.14-1.16)	0.013	0.49 (0.09-0.89)	0.016
Other	-0.18 (-1.21-0.85)	0.738	-0.08 (-0.87-0.71)	0.844
Economic status (ref. 1st quintile (Lowest))				
2nd quintile	-0.05 (-0.40-0.31)	0.795	0.00 (-0.29-0.29)	0.986

3rd quintile	0.04 (-0.30-0.39)	0.800	0.03 (-0.25-0.31)	0.820
4th quintile	0.23 (-0.10-0.57)	0.172	0.23 (-0.04-0.51)	0.099
5th quintile (Highest)	0.59 (0.22-0.96)	0.002	0.56 (0.26-0.86)	<0.0001

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval; UEBMI: Urban Employee Basic Medical Insurance ;URMBI: Urban Resident basic Medical Insurance; NRCMS: New Rural Cooperative Medical Scheme. Coefficients are statistically significant if P<0.05.

Table S9. Association with OOPE for medicines (₹ & $USD) and long-term condition type in India, 2015

Variable	Outpatient OOPE for medicine			
	India (coefficient, 95% CI)	**p-value**	**$USD** (coefficient, 95% CI)	**p-value**
Angina	0.25 (0.01-0.50)	0.039	0.23 (0.06-0.39)	0.006
Stroke	0.84 (0.41-1.25)	<0.0001	0.63 (0.31-0.95)	<0.0001
Diabetes	0.65 (0.32-0.97)	<0.0001	0.52 (0.30-0.74)	<0.0001
Hypertension	0.12 (-0.15-0.38)	0.386	0.08 (-0.10-0.26)	0.363
Asthma	0.24 (-0.16-0.64)	0.241	0.14 (-0.12-0.40)	0.287
Arthritis	0.01 (-0.24-0.26)	0.934	0.07 (-0.09-0.24)	0.387
Cataracts	0.04 (-0.18-0.27)	0.709	0.04 (-0.11-0.19)	0.572
Chronic Lung Disease	0.09 (-0.36-0.54)	0.682	0.08 (-0.21-0.36)	0.599
Depression	0.14 (-0.17-0.46)	0.366	0.14 (-0.07-0.35)	0.191
Gender (ref. Female)				
Male	-0.16 (-0.34-0.03)	0.094	-0.10 (-0.22-0.01)	0.078
Age group (ref. 45-54)				
55-64	-0.11 (-0.33-0.12)	0.339	-0.07 (-0.22-0.07)	0.318
65-74	0.11 (-0.18-0.40)	0.467	0.04 (-0.15-0.24)	0.654
75+	0.24 (-0.17-0.65)	0.250	0.17 (-0.13-0.48)	0.271
Residence (ref. Urban)				

Rural	-0.21 (-0.48-0.06)	0.132	-0.16 (-0.36-0.04)	0.107
Marital Status (ref. Currently married)				
Not married	0.34 (0.12-0.57)	0.003	0.23 (0.09-0.37)	0.002
Education Status (ref. Primary or less)				
Secondary	0.05 (-0.22-0.31)	0.734	0.08 (-0.10-0.26)	0.380
Tertiary or higher	0.16 (-0.32-0.64)	0.524	0.19 (-0.17-0.54)	0.298
Caste (ref. Scheduled)				
None	0.16 (-0.16-0.47)	0.328	0.11 (-0.10-0.31)	0.315
Other	0.13 (-0.18-0.45)	0.404	0.15 (-0.07-0.37)	0.193
Religion (ref. Hinduism)				
Islam	-0.04 (-0.42-0.35)	0.853	0.04 (-0.20-0.28)	0.730
Other	-1.13 (-1.97 to -0.30)	0.008	-0.57 (-1.07 to -0.07)	0.027
Health Insurance status (ref. No)				
Yes	0.01 (-0.28-0.31)	0.922	0.04 (-0.15-0.23)	0.679
State (ref. Utter Pradesh)				
Assam	1.03 (0.43-1.63)	0.001	0.90 (0.47-1.34)	<0.0001
Karnataka	-0.17 (-0.63-0.28)	0.456	-0.01 (-0.34-0.33)	0.969
Maharashtra	-0.15 (-0.51-0.21)	0.399	-0.14 (-0.41-0.13)	0.296
Rajasthan	-0.67 (-1.05 to -0.29)	0.001	-0.25 (-0.50-0.00)	0.049
West Bengal	-0.24 (-0.55-0.07)	0.123	-0.14 (-0.36-0.08)	0.201
Economic status (ref. 1st quintile (lowest))				

2nd quintile	0.06 (-0.26-0.38)	0.712	0.07 (-0.15-0.29)	0.539
3rd quintile	0.14 (-0.20-0.49)	0.410	0.10 (-0.12-0.33)	0.369
4th quintile	0.23 (-0.21-0.67)	0.299	0.14 (-0.15-0.43)	0.345
5th quintile (highest)	0.19 (-0.25-0.63)	0.395	0.15 (-0.17-0.47)	0.349

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval. Coefficients are statistically significant if P<0.05.

Table S10: Association with OOPE for medicines (元 & $USD) by economic status in China, 2015

Variables	**Outpatient OOPE for medicine**			
	China (coefficient, 95% CI)	**p-value**	**$USD** (coefficient, 95% CI)	**p-value**
Number of physical LTCs	0.11 (-0.01-0.23)	0.081	0.08 (-0.02-0.19)	0.100
Number of physical LTCs*Economic status (ref. 1st quintile (lowest))				
2nd quintile	0.10 (-0.08-0.28)	0.277	0.08 (-0.07-0.23)	0.301
3rd quintile	0.01 (-0.16-0.17)	0.932	0.00 (-0.13-0.14)	0.950
4th quintile	0.10 (-0.09-0.29)	0.293	0.08 (-0.07-0.24)	0.292
5th quintile (highest)	0.02 (-0.15-0.18)	0.847	0.03 (-0.11-0.16)	0.723
Mental health condition	-0.37 (-0.83-0.10)	0.123	-0.24 (-0.62-0.13)	0.204
Mental health condition*Economic status (ref. 1st quintile (lowest))				
2nd quintile	0.45 (-0.23-1.14)	0.195	0.31 (-0.24-0.86)	0.274
3rd quintile	0.53 (-0.15-1.21)	0.129	0.39 (-0.16-0.93)	0.163
4th quintile	0.76 (0.06-1.46)	0.033	0.57 (0.01-1.14)	0.046
5th quintile (highest)	0.14 (-0.54-0.82)	0.687	0.07 (-0.49-0.63)	0.797
Economic status (ref. 1st quintile (lowest)				
2nd quintile	-0.49 (-1.12-0.14)	0.124	-0.33 (-0.84-0.18)	0.204
3rd quintile	-0.18 (-0.76-0.40)	0.551	-0.12 (-0.60-0.35)	0.611

4th quintile	-0.28 (-0.92-0.37)	0.401	-0.16 (-0.70-0.37)	0.548
5th quintile (highest)	0.52 (-0.10-1.13)	0.099	0.49 (-0.01-1.00)	0.056
Gender (ref. Female)				
Male	-0.08 (-0.38-0.21)	0.580	-0.06 (-0.29-0.17)	0.595
Age group (ref. 45-54)				
55-64	-0.06 (-0.35-0.24)	0.709	-0.04 (-0.28-0.20)	0.735
65-74	-0.16 (-0.52-0.21)	0.393	-0.13 (-0.42-0.16)	0.377
75+	-0.45 (-1.01-0.12)	0.120	-0.36 (-0.80-0.08)	0.110
Residence (ref. Urban)				
Rural	0.07 (-0.22-0.37)	0.627	0.04 (-0.20-0.28)	0.752
Region (ref. East)				
Central	0.02 (-0.34-0.39)	0.896	0.04 (-0.24-0.33)	0.778
West	-0.11 (-0.46-0.24)	0.533	-0.13 (-0.41-0.15)	0.367
Marital Status (ref. Currently married)				
Not Married	0.04 (-0.29-0.38)	0.798	0.05 (-0.22-0.31)	0.741
Education Status (ref. Primary or less)				
Secondary	0.09 (-0.29-0.48)	0.634	0.07 (-0.24-0.37)	0.670
Tertiary or higher	0.41 (-0.01-0.84)	0.058	0.31 (-0.02-0.64)	0.068
Health Insurance status (ref. No)				
UEBMI	-0.31 (-1.01-0.39)	0.387	-0.23 (-0.77-0.30)	0.395
URBMI	0.51 (-0.20-1.23)	0.161	0.42 (-0.14-0.98)	0.140

NRCMS	0.64 (0.10-1.18)	0.021	0.48 (0.06-0.90)	0.026
Other	-0.20 (-1.26-0.85)	0.704	-0.10 (-0.90-0.71)	0.814

Note: All estimates are adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval; UEBMI: Urban Employee Basic Medical Insurance ;URMBI: Urban Resident basic Medical Insurance; NRCMS: New Rural Cooperative Medical Scheme. Coefficients are statistically significant if P<0.05

Table S11: Association with OOPE for medicines (₹ & $USD) by economic status in India, 2015.

Variables	Outpatient OOPE for medicine			
	India (coefficient, 95% CI)	**p-value**	**$USD** (coefficient, 95% CI)	**p-value**
Number of physical LTCs	0.19 (0.09-0.29)	<0.0001	0.14 (0.08-0.20)	<0.0001
Number of physical LTCs*Economic status (ref. 1st quintile (lowest))				
2nd quintile	0.01 (-0.28-0.30)	0.964	-0.02 (-0.23-0.19)	0.848
3rd quintile	-0.17 (-0.77-0.43)	0.577	-0.13 (-0.45-0.20)	0.445
4th quintile	0.04 (-0.27-0.35)	0.804	-0.01 (-0.27-0.25)	0.941
5th quintile (highest)	0.08 (-0.25-0.40)	0.645	-0.04 (-0.33-0.24)	0.768
Mental health condition	-0.35 (-1.11-0.41)	0.369	-0.16 (-0.63-0.31)	0.501
Mental health condition*Economic status (ref. 1st quintile (lowest))				
2nd quintile	0.78 (-0.29-1.85)	0.152	0.42 (-0.36-1.21)	0.286
3rd quintile	0.70 (-0.88-2.28)	0.384	0.57 (-0.45-1.60)	0.272
4th quintile	1.20 (-0.06-2.45)	0.061	0.89 (0.00-1.78)	0.050
5th quintile (highest)	-0.02 (-1.34-1.29)	0.972	0.08 (-1.01-1.16)	0.891
Economic Status (ref. 1st quintile (lowest))				
2nd quintile	-0.04 (-0.39-0.32)	0.836	0.03 (-0.22-0.28)	0.815
3rd quintile	0.11 (-0.26-0.48)	0.565	0.08 (-0.16-0.32)	0.511
4th quintile	0.11 (-0.38-0.59)	0.680	0.05 (-0.27-0.38)	0.740

5th quintile (highest)	0.24 (-0.23-0.72)	0.315	0.23 (-0.12-0.58)	0.202
Gender (ref. Female)				
Male	-0.13 (-0.31-0.06)	0.194	-0.09 (-0.20-0.03)	0.148
Age group (ref. 45-54)				
55-64	-0.10 (-0.32-0.12)	0.382	-0.07 (-0.21-0.08)	0.378
65-74	0.09 (-0.21-0.38)	0.555	0.05 (-0.15-0.25)	0.601
75+	0.17 (-0.22-0.56)	0.401	0.13 (-0.16-0.41)	0.391
Residence (ref. Urban)				
Rural	-0.18 (-0.44-0.07)	0.160	-0.16 (-0.34-0.03)	0.094
Marital Status (ref. Currently married)				
Not married	0.35 (0.12-0.57)	0.002	0.24 (0.10-0.38)	0.001
Education Status (ref. Primary or less)				
Secondary	0.05 (-0.20-0.31)	0.675	0.10 (-0.07-0.27)	0.252
Tertiary or higher	0.19 (-0.32-0.70)	0.462	0.22 (-0.15-0.59)	0.251
Caste (ref. Scheduled)				
None	0.20 (-0.13-0.52)	0.230	0.13 (-0.08-0.35)	0.229
Other	0.13 (-0.18-0.44)	0.409	0.14 (-0.08-0.35)	0.207
Religion (ref. Hinduism)				
Islam	-0.02 (-0.43-0.38)	0.912	0.06 (-0.19-0.31)	0.640
Other	-1.16 (-1.98 to -0.35)	0.005	-0.60 (-1.09 to -0.11)	0.017
Health Insurance status (ref. No)				
Yes	-0.01 (-0.30-0.29)	0.960	0.02 (-0.18-0.21)	0.852

State (ref. Utter Pradesh)				
Assam	0.97 (0.36-1.58)	0.002	0.92 (0.46-1.38)	<0.0001
Karnataka	-0.14 (-0.57-0.30)	0.541	0.07 (-0.25-0.38)	0.667
Maharashtra	-0.11 (-0.48-0.26)	0.548	-0.08 (-0.34-0.19)	0.576
Rajasthan	-0.63 (-1.01 to -0.26)	0.001	-0.23 (-0.48-0.02)	0.069
West Bengal	-0.16 (-0.47-0.16)	0.323	-0.06 (-28-0.15)	0.560

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval. Coefficients are statistically significant if P<0.05.

Table S12: Association with OOPE for medicines (元 & $USD) by health insurance in China, 2015

Variable	**Outpatient OOPE for medicine** (coefficient, 95% CI)	**p-value**		
	China	**p-value**	**$USD**	**p-value**
Number of physical LTCs	0.46 (0.23-0.69)	<0.0001	0.37 (0.19-0.56)	<0.0001
Mental health condition	-0.13 (-1.24-0.98)	0.816	-0.17 (-1.02-0.69)	0.705
Number of physical LTCs* Health Insurance (ref. No)				
Number of physical LTCs * UEBMI	-0.34 (-0.61 to -0.07)	0.013	-0.28 (-0.49 to -0.07)	0.009
Number of physical LTCs * URBMI	-0.12 (-0.47-0.22)	0.477	-0.10 (-0.37-0.17)	0.479
Number of physical LTCs * NRCMS	-0.36 (-0.59 to -0.12)	0.003	-0.29 (-0.48 to -0.11)	0.002
Number of physical LTCs * Other health insurance	0.19 (-0.35-0.73)	0.486	0.13 (-0.31-0.57)	0.561
Mental health condition* Health insurance (ref. No)				
Mental health condition * UEBMI	-0.18 (-1.56-1.20)	0.800	-0.02 (-1.08-1.05)	0.972
Mental health condition * URBMI	-0.12 (-1.55-1.31)	0.871	0.02 (-1.10-1.14)	0.969
Mental health condition * NRCMS	0.17 (-0.98-1.32)	0.766	0.21 (-0.68-1.10)	0.642
Mental health condition * Other	1.31 (-0.79-3.41)	0.221	1.01 (-0.65-2.68)	0.232

health insurance				
Gender (ref. Female)				
Male	-0.10 (-0.39-0.19)	0.484	-0.08 (-0.31-0.15)	0.492
Age group (ref. 45-54)				
55-64	-0.06 (-0.37-0.24)	0.692	-0.04 (-0.29-0.20)	0.722
65-74	-0.10 (-0.46-0.26)	0.583	-0.08 (-0.37-0.20)	0.560
75+	-0.39 (-0.93-0.14)	0.146	-0.32 (-0.74-0.10)	0.136
Residence (ref. Urban)				
Rural	0.06 (-0.22-0.34)	0.685	0.03 (-0.20-0.26)	0.811
Region (ref. East)				
Central	0.05 (-0.30-0.40)	0.778	0.06 (-0.21-0.33)	0.665
West	-0.10 (-0.42-0.22)	0.540	-0.12 (-0.38-0.14)	0.353
Marital Status (ref. Currently married)				
Not Married	0.02 (-0.30-0.34)	0.907	0.03 (-0.24-0.29)	0.851
Education Status (ref. Primary or less)				
Secondary	0.11 (-0.27-0.50)	0.559	0.08 (-0.22-0.38)	0.598
Tertiary or higher	0.43 (0.00-0.86)	0.049	0.32 (-0.01-0.66)	0.060
Health Insurance (ref. No)				
UEBMI	0.45 (-0.57-1.48)	0.907	0.37 (-0.40-1.14)	0.349
URBMI	0.65 (-0.57-1.86)	0.383	0.49 (-0.45-1.42)	0.306
NRCMS	1.41 (0.60-2.22)	0.001	1.09 (0.47-1.70)	0.001
Other	-1.01 (-2.93-0.89)	0.296	-0.69 (-2.13-0.74)	0.343

Economic status (ref. 1st quintile (Lowest))				
2nd quintile	-0.05 (-0.41-0.30)	0.769	0.00 (-0.29-0.29)	0.982
3rd quintile	0.06 (-0.29-0.41)	0.722	0.05 (-0.23-0.34)	0.723
4th quintile	0.28 (-0.05-0.61)	0.100	0.28 (0.00-0.54)	0.048
5th quintile (Highest)	0.64 (0.26-1.01)	0.001	0.60 (0.29-0.91)	<0.0001

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval; UEBMI: Urban Employee Basic Medical Insurance ;URMBI: Urban Resident basic Medical Insurance; NRCMS: New Rural Cooperative Medical Scheme. Coefficients are statistically significant if P<0.05.

Table S13: Association with OOPE for medicines (₹ & USD) by health insurance status in India, 2015.

Variable	Outpatient OOPE for medicine			
	India	**p-value**	**$USD**	**p-value**
	(coefficient, 95% CI)		(coefficient, 95% CI)	
Number of physical LTCs	0.20 (0.10-0.29)	<0.0001	0.14 (0.08-0.20)	<0.0001
Mental health condition	0.15 (-0.19-0.49)	0.385	0.11 (-0.12-0.35)	0.342
Number of physical LTCs* Health Insurance status (ref. No)				
Yes	-0.67 (-1.50-0.16)	0.113	-0.31 (-0.79-0.17)	0.210
Mental health condition* Health Insurance status (ref. No)				
Yes	1.27 (-0.25-2.80)	0.101	0.84 (-0.33-2.01)	0.157
Gender (ref. Female)				
Male	-0.12 (-0.31-0.07)	0.218	-0.08 (-0.20-0.03)	0.157
Age group (ref. 45-54)				
55-64	-0.10 (-0.33-0.12)	0.375	-0.06 (-0.21-0.08)	0.395
65-74	0.09 (-0.21-0.38)	0.562	0.05 (-0.15-0.25)	0.631
75+	0.19 (-0.21-0.59)	0.360	0.14 (-0.15-0.44)	0.335
Residence (ref. Urban)				
Rural	-0.22 (-0.49-0.05)	0.109	-0.18 (-0.38-0.01)	0.066
Marital Status (ref. Currently married)				
Not married	0.36 (0.13-0.58)	0.002	0.24 (0.10-0.38)	0.001
Education Status (ref. Primary or less)				
Secondary	0.07 (-0.19-0.33)	0.603	0.11 (-0.07-	0.224

			0.29)	
Tertiary or higher	0.21 (-0.30-0.73)	0.413	0.23 (-0.15-0.61)	0.240
Caste (ref. Scheduled)				
None	0.16 (-0.16-0.48)	0.328	0.10 (-0.11-0.31)	0.340
Other	0.14 (-0.18-0.46)	0.390	0.15 (-0.08-0.37)	0.199
Religion (ref. Hinduism)				
Islam	-0.01 (-0.41-0.39)	0.949	0.08 (-0.18-0.32)	0.578
Other	-1.14 (-1.96 to -0.31)	0.007	-0.58 (-1.08 to -0.09)	0.022
Health Insurance status (ref. No)				
Yes	-0.02 (-0.33-0.30)	0.905	0.00 (-0.21-0.21)	0.974
State (ref. Utter Pradesh)				
Assam	1.03 (0.43-1.63)	0.001	0.96 (0.52-1.41)	<0.0001
Karnataka	-0.12 (-0.57-0.34)	0.611	0.08 (-0.25-0.41)	0.621
Maharashtra	-0.13 (-0.49-0.23)	0.466	-0.09 (-0.35-0.18)	0.530
Rajasthan	-0.63 (-1.01 to -0.25)	0.001	-0.23 (-0.48-0.02)	0.071
West Bengal	-0.19 (-0.49-0.12)	0.223	-0.08 (-0.30-0.14)	0.459
Economic Status (ref. 1st quintile (lowest))				
2nd quintile	0.06 (-0.26-0.39)	0.697	0.08 (-0.14-0.30)	0.487
3rd quintile	0.18 (-0.17-0.53)	0.322	0.13 (-0.10-0.35)	0.276
4th quintile	0.25 (-0.20-0.70)	0.277	0.15 (-0.15-0.45)	0.320
5th quintile (highest)	0.25 (-0.20-0.71)	0.270	0.21 (-0.12-0.54)	0.204

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure;

CI: Confidence Interval. Coefficients are statistically significant if P<0.05.

Table S14. Two-part model in China, 2015

Variables	Logit model			Generalised linear model					
	China & $USD			China			$USD		
	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value
Number of physical LTC	0.15	0.01-0.29	0.030	10.1	-11.3-31.4	0.356	2.71	-3.1-8.5	0.356
Mental health condition	0.06	-0.55-0.67	0.857	-23.4	-137.9-91.1	0.688	-6.33	-37.3-24.6	0.688
Number of physical LTC*mental health condition	-0.06	-0.25-0.13	0.537	8.2	-25.2-41.5	0.631	2.21	-6.8-11.2	0.631
Gender (ref. Female)									
Male	-0.12	-0.49-0.26	0.533	11.4	-56.7-79.6	0.742	3.08	-15.3-24.5	0.742
Age (ref. 45-54)									
55-64	-0.07	-0.46-0.32	0.729	51.5	-34.2-137.3	0.238	13.9	-9.2-37.1	0.238
65-74	-0.17	-0.66-0.33	0.507	16.5	-74.1-107.2	0.720	4.47	-20.0-29.0	0.720
75+	-0.37	-1.04-0.31	0.288	13.3	-99.3-125.9	0.817	3.59	-26.8-34.0	0.817

Residence (ref. Urban)									
Rural	0.23	-0.12-0.59	0.199	34.6	-33.5-102.7	0.318	9.35	-9.5-27.8	0.318
Education status (ref. Primary or less)									
Secondary	0.11	-0.37-0.58	0.652	-29.0	-98.7-40.7	0.414	-7.84	-26.7-11.0	0.414
Tertiary or higher	0.54	-0.03-1.10	0.062	43.0	-85.0-171.0	0.510	11.6	-23.0-46.2	0.510
Marital status (ref. Married)									
Not married	-0.04	-0.45-0.37	0.835	53.2	-75.6-182.0	0.417	14.4	-20.4-49.2	0.417
Insurance status (ref. No)									
UEBMI	-0.33	-1.07-0.42	0.389	3.40	-128.6-135.4	0.960	0.92	-34.7-36.6	0.960
URBMI	0.30	-0.48-1.08	0.449	7.66	-136.1-151.4	0.917	2.07	-36.8-40.9	0.917
NRCMS	0.81	0.23-1.38	0.006	16.6	-74.4-107.7	0.719	4.50	-20.1-29.1	0.719

Other	-0.45	-1.40-0.51	0.358	17.5	-164.3-199.2	0.850	4.71	-44.4-53.8	0.850
Socioeconomic status (ref. 1st quintile (lowest))									
2nd quintile	-0.28	-0.72-0.15	0.198	8.80	-63.1-80.7	0.810	2.38	-17.0-21.8	0.810
3rd quintile	0.06	-0.42-0.54	0.808	4.80	-74.1-83.7	0.905	1.30	-20.0-22.6	0.905
4th quintile	-0.02	-0.48-0.43	0.920	76.5	-2.7-155.7	0.058	20.7	-0.72-42.1	0.058
5th quintile (highest)	0.04	-0.48-0.56	0.886	188.3	83.7-292.9	<0.0001	50.9	22.6-79.1	<0.0001
Region (ref. East)									
Central	-0.10	-0.55-0.36	0.674	51.2	-38.2-140.7	0.261	13.8	-10.3-38.0	0.261
West	0.14	-0.30-0.58	0.540	-58.5	-135.6-18.7	0.137	-15.8	-36.6-5.1	0.137

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval; UEBMI: Urban Employee Basic Medical Insurance ;URMBI: Urban Resident basic Medical Insurance; NRCMS: New Rural Cooperative Medical Scheme. Coefficients are statistically significant if P<0.05.

Table S15. Two-part model in India, 2015.

Variables	Logit model			Generalised linear model					
	India & $USD			India			$USD		
	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value	Coefficient	95% CI	p-value
Number of physical LTC	0.06	-0.07-0.19	0.392	89.3	42.7-135.8	<0.0001	5.30	2.54-8.07	<0.0001
Mental health condition	-0.27	-1.03-0.50	0.495	286.4	-84.4-657.4	0.130	17.0	-5.02-39.1	0.130
Number of physical LTC*mental health condition	0.11	-0.17-0.38	0.445	-61.8	-225.6-102.1	0.459	-3.67	-13.4-6.07	0.459
Gender (ref. Female)									
Male	-0.12	-0.48-0.25	0.529	-14.5	-142.7-113.7	0.824	-0.86	-8.48-6.76	0.824
Age (ref. 45-54)									
55-64	-0.09	-0.42-0.24	0.589	-28.5	-145.9-88.9	0.633	-1.70	-8.67-5.28	0.633
65-74	0.25	-0.19-0.68	0.262	22.1	-111.6-155.8	0.745	1.31	-6.63-9.26	0.745
75+	0.27	-0.26-0.81	0.309	160.8	-59.5-381.2	0.152	9.56	-3.54-22.7	0.152

Residence (ref. Urban)									
Rural	-0.16	-0.58-0.27	0.462	-57.5	-218.9-103.8	0.483	-3.78	-13.5-5.89	0.442
Education status (ref. Primary or less)									
Secondary	-0.15	-0.53-0.23	0.447	58.6	-119.7-237.0	0.518	3.48	-7.11-14.1	0.518
Tertiary or higher	-0.13	-0.83-0.58	0.726	141.2	-196.3-478.6	0.411	8.39	-11.7-28.4	0.411
Caste (ref. Scheduled)									
None	0.20	-0.26-0.67	0.390	-6.9	-148.1-134.3	0.924	-0.41	-8.80-7.98	0..924
Other	-0.09	-0.55-0.37	0.701	150.8	-28.0-329.6	0.098	8.96	-1.66-19.6	0.098
Marital status (ref. Married)									
Not married	0.37	-0.03-0.78	0.073	136.4	12.1-260.7	0.032	8.11	0.72-15.5	0.032
Insurance status (ref. No)									
Yes	-0.11	-0.51-0.28	0.569	90.5	-71.5-252.5	0.273	5.38	-4.25-15.0	0.273

Socioeconomic status (ref. 1st quintile (lowest))									
2nd quintile	-0.03	-0.44-0.38	0.898	131.2	-26.7-289.0	0.103	7.79	-1.59-17.2	0.103
3rd quintile	0.14	-0.33-0.62	0.547	68.5	-69.8-206.9	0.331	4.07	-4.15-12.3	0.331
4th quintile	0.34	-0.26-0.94	0.261	84.4	-60.9-229.7	0.254	5.01	-3.62-13.6	0.254
5th quintile (highest)	0.13	-0.37-0.63	0.611	198.5	-32.7-429.7	0.092	11.8	-1.94-25.5	0.092
State (ref. Utter Pradesh)									
Assam	0.43	-0.75-1.60	0.475	631.6	227.9-1035.2	0.002	37.5	13.5-61.5	0.002
Karnataka	-0.76	-1.37 to -0.14	0.016	375.6	53.1-698.1	0.016	23.6	4.35-42.8	0.016
Maharashtra	-0.16	-0.87-0.54	0.651	-122.7	-340.9-95.5	0.269	-7.29	-20.3-5.68	0.269
Rajasthan	-1.47	-2.00 to -0.94	<0.0001	47.3	-107.4-202.0	0.548	2.81	-6.38-12.0	0.548
West Bengal	-0.52	-1.10-0.06	0.079	-137.8	-268.9 to -6.6	0.040	-8.19	-16.0 to -0.39	0.040

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval. Coefficients are statistically significant if P<0.05

Table S16. Zero-inflated model in China, 2015

Variable	China			USD		
	Coefficient	**95% CI**	**p-value**	**Coefficient**	**95% CI**	**p-value**
COUNT COMPONENT						
Number of physical LTC	0.01	-0.05-0.08	0.701	0.02	-0.05-0.09	0.496
Mental health condition	-0.08	-0.49-0.33	0.701	-0.08	-0.50-0.33	0.689
Number of physical LTC* mental health condition	0.04	-0.06-0.14	0.415	0.04	-0.06-0.15	0.401
Gender (ref. Female)						
Male	-0.02	-0.20-0.16	0.842	0.01	-0.18-0.20	0.917
Age (ref. 45-54)						
55-64	0.20	-0.02-0.43	0.069	0.23	0.00-0.45	0.046
65-74	0.23	-0.03-0.50	0.081	0.22	-0.04-0.48	0.100
75+	0.29	-0.10-0.69	0.145	0.31	-0.09-0.72	0.132
Residence (ref. Urban)						
Rural	-0.01	-0.24-0.21	0.915	-0.04	-0.26-0.19	0.740
Education status (ref. Primary or less)						
Secondary	0.05	-0.20-0.31	0.680	0.05	-0.21-0.31	0.710
Tertiary or higher	0.27	-0.08-0.61	0.128	0.32	-0.04-0.67	0.080
Marital status (ref. Currently married)						
Not married	0.05	-0.21-0.30	0.729	0.06	-0.20-0.32	0.627
Insurance status (ref. No)						

UEMI	-0.14	-0.60-0.31	0.534	-0.19	-0.65-0.28	0.435
URMI	-0.08	-0.61-0.45	0.759	-0.13	-0.67-0.40	0.623
NRCMS	-0.20	-0.55-0.15	0.266	-0.22	-0.57-0.13	0.225
Other	-0.29	-0.83-0.25	0.290	-0.33	-0.88-0.22	0.240
Economic status (ref. 1st quintile (lowest))						
2nd quintile	0.07	-0.23-0.36	0.657	0.08	-0.22-0.37	0.616
3rd quintile	0.03	-0.28-0.35	0.843	0.07	-0.25-0.38	0.680
4th quintile	0.47	0.16-0.78	0.003	0.49	0.18-0.80	0.002
5th quintile (highest)	0.66	0.36-0.96	<0.0001	0.65	0.34-0.95	<0.0001
Region (ref. East)						
Central	0.29	0.08-0.50	0.006	0.25	0.04-0.47	0.021
West	-0.16	-0.41-0.09	0.199	-0.12	-0.37-0.13	0.347
ZERO COMPONENT						
Number of physical LTC	-0.25	-0.38 to -0.12	<0.0001	-0.67	-1.74-0.39	0.217
Mental health condition	-0.23	-0.81-0.35	0.433	-0.57	-2.79-1.65	0.614
Number of physical LTC* mental health condition	0.11	-0.08-0.29	0.250	0.35	-0.66-1.36	0.498
Gender (ref. Female)						
Male	-0.03	-0.35-0.29	0.870	0.59	-0.42-1.60	0.252
Age (ref. 45-54)						
55-64	0.09	-0.30-0.48	0.643	0.94	-0.70-2.59	0.260

65-74	0.28	-0.14-0.69	0.191	1.07	-0.48-2.63	0.176
75+	0.59	-0.02-1.19	0.057	2.23	0.15-4.31	0.036
Residence (ref. Urban)						
Rural	-0.26	-0.59-0.08	0.131	-1.93	-3.9-0.01	0.052
Education status (ref. Primary or less)						
Secondary	0.11	-0.29-0.51	0.599	0.53	-0.85-1.90	0.454
Tertiary or higher	-0.17	-0.69-0.35	0.519	0.12	-1.13-1.38	0.849
Marital status (ref. Currently married)						
Not married	-0.13	-0.56-0.31	0.562	0.18	-1.47-1.84	0.831
Insurance status (ref. No)						
UEBMI	0.53	-0.14-1.20	0.120	-0.20	-1.44-1.05	0.758
URBMI	-0.24	-1.03-0.55	0.554	-1.54	-4.45-1.37	0.299
NRCMS	-0.52	-1.07-0.04	0.071	-3.39	-7.00-0.21	0.065
Other	0.13	-0.85-1.11	0.795	-0.94	-2.91-1.02	0.345
Economic status (ref. 1st quintile (lowest))						
2nd quintile	0.19	-0.34-0.72	0.490	15.5	8.8-22.2	<0.0001
3rd quintile	-0.28	-0.88-0.31	0.345	14.2	7.4-21.0	<0.0001
4th quintile	0.10	-0.45-0.64	0.725	15.5	8.6-22.3	<0.0001
5th quintile (highest)	0.19	-0.32-0.71	0.466	15.0	8.5-21.4	<0.0001
Region (ref. East)						
Central	0.30	-0.04-0.65	0.087	0.22	-1.02-1.47	0.729
West	-0.27	-0.70-0.16	0.219	0.20	-1.09-1.49	0.762

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval; UEBMI: Urban Employee Basic Medical Insurance ;URMBI: Urban Resident basic Medical Insurance; NRCMS: New Rural Cooperative Medical Scheme. Coefficients are statistically significant if P<0.05.

Table S17. Zero-inflated model in India, 2015.

Variable	India			$USD		
	Coefficient	**95% CI**	**p-value**	**Coefficient**	**95% CI**	**p-value**
COUNT COMPONENT						
Number of physical LTC	0.16	0.22-0.21	<0.0001	0.15	0.09-0.20	<0.0001
Mental health condition	0.53	0.16-0.90	0.005	0.62	0.16-1.08	0.009
Number of physical LTC* mental health condition	-0.13	-0.28-0.01	0.070	-0.15	-0.30-0.00	0.056
Gender (ref. Female)						
Male	-0.05	-0.19-0.10	0.521	-0.04	-0.20-0.11	0.612
Age (ref. 45-54)						
55-64	0.03	-0.14-0.20	0.713	0.03	-0.15-0.20	0.783
65-74	0.03	-0.16-0.23	0.733	0.04	-0.17-0.25	0.701
75+	0.10	-0.14-0.35	0.521	0.12	-0.13-0.37	0.331
Residence (ref. Urban)						
Rural	-0.03	-0.20-0.13	0.688	-0.05	-0.23-0.13	0.589
Education status (ref. Primary or less)						
Secondary	0.11	-0.07-0.29	0.217	0.13	-0.05-0.32	0.164
Tertiary or higher	0.01	-0.26-0.28	0.926	0.01	-0.27-0.29	0.945
Caste (ref. Scheduled)						
None	-0.03	-0.21-0.14	0.713	-0.05	-0.23-0.14	0.613
Other	0.18	-0.01-0.37	0.058	0.18	-0.02-0.38	0.072
Marital status (ref. Currently married)						

Not married	0.19	0.04-0.35	0.015	0.19	0.02-0.35	0.024
Insurance status (ref. No)						
Yes	0.14	-0.05-0.32	0.150	0.14	-0.06-0.34	0.164
Economic status (ref. 1st quintile (lowest))						
2nd quintile	0.24	0.01-0.46	0.044	0.27	0.03-0.51	0.029
3rd quintile	0.20	-0.02-0.42	0.077	0.23	0.00-0.46	0.050
4th quintile	0.29	0.07-0.51	0.011	0.33	0.10-0.57	0.005
5th quintile (highest)	0.43	0.19-0.66	<0.0001	0.47	0.23-0.71	<0.0001
State (ref. Utter Pradesh)						
Assam	0.87	0.50-1.23	<0.0001	0.91	0.54-1.28	<0.0001
Karnataka	0.24	-0.07-0.55	0.124	0.24	-0.09-0.57	0.154
Maharashtra	0.16	-0.16-0.48	0.322	0.14	-0.19-0.47	0.400
Rajasthan	0.12	-0.13-0.38	0.339	0.09	-0.18-0.36	0.506
West Bengal	-0.26	-0.51 to -0.01	0.043	-0.29	-0.56 to -0.02	0.033
ZERO COMPONENT						
Number of physical LTC	-0.10	-0.20-0.00	0.055	-0.07	-0.23-0.08	0.356
Mental health condition	0.51	-0.04-1.05	0.068	0.77	-0.16-1.69	0.106
Number of physical LTC* mental health condition	-0.22	-0.48-0.03	0.089	-0.25	-0.60-0.10	0.166
Gender (ref. Female)						
Male	0.07	-0.19-0.33	0.597	0.09	-0.32-0.49	0.680
Age (ref. 45-54)						

55-64	0.10	-0.19-0.38	0.515	0.17	-0.29-0.63	0.459
65-74	-0.20	-0.55-0.16	0.272	-0.43	-1.11-0.25	0.218
75+	-0.18	-0.63-0.27	0.440	-0.10	-0.80-0.61	0.791
Residence (ref. Urban)						
Rural	-0.25	-0.57-0.06	0.114	-0.42	-0.96-0.11	0.123
Education status (ref. Primary or less)						
Secondary	0.06	-0.28-0.41	0.713	0.19	-0.38-0.75	0.518
Tertiary or higher	0.24	-0.31-0.79	0.391	0.44	-0.46-1.34	0.341
Caste (ref. Scheduled)						
None	-0.25	-0.63-0.12	0.185	-0.53	-1.16-0.11	0.106
Other	0.10	-0.26-0.46	0.587	0.23	-0.51-0.97	0.547
Marital status (ref. Currently married)						
Not married	-0.23	-0.53-0.06	0.122	-0.22	-0.70-0.26	0.373
Insurance status (ref. No)						
Yes	0.08	-0.27-0.42	0.666	0.09	-0.55-0.73	0.779
Economic status (ref. 1st quintile (lowest))						
2nd quintile	0.00	-0.38-0.39	0.980	0.24	-0.40-0.87	0.471
3rd quintile	-0.15	-0.53-0.24	0.450	0.05	-0.61-0.72	0.876
4th quintile	-0.42	-0.82 to -0.02	0.038	-0.38	-1.08-0.33	0.296
5th quintile (highest)	-0.23	-0.64-0.18	0.270	-0.09	-0.78-0.59	0.787
State (ref. Utter Pradesh)						
Assam	-0.26	-1.56-1.05	0.701	0.39	-2.88-3.66	0.815

Karnataka	0.95	0.31-1.60	0.004	1.73	-0.90-4.37	0.197
Maharashtra	0.47	-0.21-1.15	0.176	0.85	-1.76-3.45	0.523
Rajasthan	1.67	1.11-2.23	<0.0001	2.79	0.31-5.27	0.027
West Bengal	0.63	0.03-1.23	0.040	1.00	-1.72-3.73	0.471

Note: All estimates adjusted for sample weight. LTC: Long-term conditions; OOPE: Out-of-pocket expenditure; CI: Confidence Interval. Coefficients are statistically significant if P<0.05.