Health inequalities among middle-aged and elderly people in China: analyses of cross-sectional surveys from the China Health and Retirement Longitudinal Study 2011–2016

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Research

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Abstract

Objectives: China has a history of striving to achieve health equity, including efforts to prevent and control infectious diseases. However, to date, there is no comprehensive assessment of inequalities in chronic diseases in China. Methods: Data for this study were obtained from the China Health and Retirement Longitudinal Study (CHARLS) conducted from 2011 to 2016. A total of 50,244 Chinese adults aged 45 years and older were included (16,128 in 2011, 16,646 in 2013, and 17,470 in 2015). Principal component analysis was used to construct the socioeconomic status indicator. We calculated concentration indices and corresponding CIs for 14 chronic diseases and comorbidities. We then estimated the Kendall rank correlation coefficient for inequalities and GDP per capita among provinces. Results: For 10 of the 14 chronic diseases, prevalence rates were higher for the poorest tertiles than for the richest tertiles. The concentration indices of dyslipidaemia, diabetes or high blood sugar, and cancer or malignant tumour were, respectively, 0.1256 (95% confidence interval, 0.1052–0.151), 0.098 (0.0704–0.1244), and 0.1305 (0.0528–0.215) in 2015–2016, which indicated pro-rich inequality. Health inequality for chronic lung diseases and eight other diseases grew markedly from 2011 to 2016. Overall, health inequality was lower for urban residents (−0.035 in 2011–2012, −0.036 in 2013–2014, and −0.05 in 2015–2016) than rural residents (−0.053, −0.064, and −0.08, respectively), and inequality was twice as high among women (−0.051, −0.05, and −0.072, respectively) than among men (−0.023, −0.02, and −0.032, respectively). Provinces that were ranked higher for GDP per capita were also ranked higher in the degree to which disease prevalence was higher in people with lower income (Kendall's $\tau=-0.2328$, $p=0.015$; Kendall's $\tau=-0.3545$, $p=0.0077$; Kendall's $\tau=-0.2646$, $p=0.0079$, respectively). Conclusions: Pro-poor health inequalities for many diseases in China are large and widening. Policies associated with health equity, including free public health services and community health programmes, are needed to achieve the Sustainable Development Goals.

Background

With rapid economic development, China faces the impending challenge of an ageing society. In 2017, the number of Chinese elderly people aged 60 years or older reached 241 million, or approximately 17% of the population [1]. With an ageing population, the prevalence and attributable mortality of chronic diseases among middle-aged and elderly Chinese adults are steadily increasing because of prolonged exposure to risk factors and impairments of the immune system [2], which together have a nonlinear effect on the health of middle-aged and elderly populations. The prevalence of chronic diseases among elderly Chinese adults was estimated at 74.45% in 2010 [3].

China's health care system has made great strides in recent years, with many improved performance indicators. There was a dramatic decline in the prevalence of 30 Class A and B notifiable diseases listed in the Law of the People's Republic of China on the Prevention and Treatment of Infectious Diseases, from 20% in 1949 to 0.2% in 2015. The average life expectancy in China has risen from 67.9 years in 1981 to 76.5 years in 2016. Health inequality is another performance indicator of the health care sector, defined as differences in health that are potentially avoidable, unjust, and (or) unfair [4]. Health inequalities that exist across different regions and communities of China have a great impact on economic and social development. Zhong estimated that the concentration indices of self-reported poor health and the prevalence of activities of daily living were −0.0102 and −0.0247, respectively, indicating a socioeconomic gradient among elderly Chinese residents [5]. In Shanghai, life expectancy in women was 83.54 years in 2015, whereas in poorer provinces such as Qinghai Province, it was 74.17 years—a difference of 9.37 years [6]. In addition, the health inequality index of rural residents is higher than that of urban residents in China [7]. The United Nations' Sustainable Development Goal 3 aims for a 30% reduction in premature mortality owing to noncommunicable diseases through prevention and treatment [8]. This aim will require substantial reductions among people with a high prevalence of chronic diseases caused by differences in socioeconomic status (SES). Hence, greater attention must be paid to reducing or eliminating health inequalities in China.

A number of recent studies have demonstrated that SES is the most decisive factor affecting health [9, 10]. Additional studies report that a coherent view of reproductive, newborn, maternal, and child health inequalities has been diminishing in most countries [11-16]. However, there has been no assessment of the extent of inequalities for chronic diseases in China, which is crucial for developing national health policies to reduce mortality and morbidity. Thus, we aimed to comprehensively estimate health inequalities through cross-sectional surveys by analysing differences in the prevalence of chronic diseases among middle-aged and elderly people in China with different SES levels. We will also investigate health system factors that might be correlated with health inequalities.

Methods

Data sources

In this study, we analysed data from the China Health and Retirement Longitudinal Study (CHARLS) 2011–2012 (wave 1), 2013–2014 (wave 2), and 2015–2016 (wave 3) [17, 18]. The CHARLS is a nationally representative large-scale survey targeting the population aged 45 years and above in China. The study, launched in 2011, aims to collect a set of high-quality microdata representing families and individuals aged ≥ 45 years to analyse population ageing in China and promote interdisciplinary research; this study covers 150 counties, 450 villages and approximately 10,000 households. Study participants are followed up every 2 years. Data collection in CHARLS has been described elsewhere [19]. We excluded observations with missing values, leaving respondents aged ≥ 45 years: n = 16,128 in wave 1, 16,646 in wave 2, and 17,470 in wave 3 (Table 1, Additional file 1: Fig. S1-S3).

All examinations were conducted after informed consent was obtained from participants. The Biomedical Ethics Committee of Peking University approved the survey (The approval number is IRB00001052-11015), and the conduct of the study adhered to the principles of the Declaration of Helsinki.

Measures

Health outcomes

In the CHARLS, each participant was interviewed using a standardized questionnaire and underwent a medical examination. Data included sociodemographic characteristics, biometrics, lifestyle and behavioural characteristics, cardiovascular disease risk factors, health history, and medications. Each new survey respondent was queried, “Have you been diagnosed with [chronic disease] by a doctor?” In follow-up interviews, participants were asked, “Our records from your last interview show that you have had/not had [chronic disease]; is this right?” and “Have you been diagnosed with [chronic disease] by a doctor [since your last interview in the last 2 years]?” Participants recorded yes or no responses to all questions. Those who answered affirmatively to any questions were required to provide medical or hospital records.

According to the CHARLS questionnaires, 14 chronic diseases were identified: hypertension, dyslipidaemia (i.e., elevated low-density lipoprotein, triglycerides, and total cholesterol or low high-density lipoprotein), diabetes (i.e., high blood sugar), cancer or malignant tumour (except minor skin cancers), chronic lung disease (e.g., chronic bronchitis or emphysema) excluding tumours or cancer, liver disease (except fatty liver, tumours, and cancer), heart disease (e.g., coronary heart disease, angina, congestive heart failure, other heart problems), stroke, kidney disease (except tumour or cancer), stomach and other digestive diseases (except tumour or cancer), emotional or psychiatric problems, memory-related disease, arthritis or rheumatism, and asthma.

Socioeconomic status (SES)

To measure inequalities in the prevalence of chronic disease among people with different standards of living, data on household assets and housing characteristics were used to construct a proxy index to measure living standards [20]. In this study, durable consumer goods (including an automobile, electric bicycle, motorcycle, refrigerator, washing machine, television, computer, stereo system, video camera, camera, air conditioner, mobile phone, furniture, musical instrument, valuable decorative items, jewellery, collectibles, precious metals, or artwork) and housing characteristics (including the type of structure of residence, one-story or multi-level building, toilet, electricity, running water, bathroom facilities, coal gas or natural gas, heating, source of cooking fuel, telephone, and internet connection) were combined into an index of SES to measure household living standards.

Principal component analysis (PCA) is a common approach [21] used to describe variation in a set of variables as linear combinations of the original variables, in which each continuous linear combination is derived to explain variation in the original data as much as possible while being uncorrelated with other linear combinations. Typically, the first principal component with the largest amount of information from the original variables was chosen to represent wealth status and be defined as the wealth index here [20]. In the case of PCA, the wealth index for individual is defined as follows: (see Equation 1 in the Supplemental Files)

where is the value of asset for household , is the sample mean, is the sample standard deviation, and are the weights associated with the first principal component (Additional file 1: Table S1).

Other variables

To compare the differences in chronic disease prevalence between different participant groups, demographic characteristics (including age, sex, urban or rural residence, living area) were obtained.

Concentration index

The concentration index has become one of the standard measures in the health economics literature on equality and inequality in health and health care. The concentration index is defined as twice the area between the concentration curve and the line of perfect equality (the 45-degree line), where individuals are ranked by socioeconomic level, general income, and the cumulative ranking of each individual plotted against the cumulative share of health outcomes or health care utilization [22]. Thus, in the case of no socioeconomic-related inequality, the concentration index is zero. When the outcome of interest is ill health, the convention is that the index takes a negative value when the curve lies above the line of equality, indicating that the prevalence of chronic disease is excessively concentrated among poor populations; the index takes a positive value when the curve lies below the line of equality. The concentration index can be expressed as follows: (see Equation 2 in the Supplemental Files)

where is the indicator of the health status of individual ; is the fractional rank of individual in the living standards distribution, with for the poorest and for the wealthiest individuals; and is the mean of the health outcome variables [22, 23]. The concentration index is bound between –1 and +1. When the concentration index is used to compare inequality across time, place, and subpopulations, calculating the concentration index for binary outcomes is potentially problematic because the possible range of the concentration index differs according to the mean of the outcome variable [24-27]. To resolve this issue, the concentration index is divided by (1 – mean of the outcome variable), referred to as the adjusted concentration index herein, following previous studies [25, 26].

Statistical analyses

We produced an initial estimation of socioeconomic inequalities in health by comparing the prevalence rates of 14 chronic diseases across wealth index tertiles. Rates were standardized for age and sex using logistic regression, including a random effect to account for clustering at the community level.

To measure socioeconomic inequalities in chronic disease prevalence among participants of CHARLS waves 1–3, we first calculated the concentration index for the prevalence of each chronic disease in each wave. After obtaining the total concentration index, we calculated concentration indices grouped by sex and urban or rural residence to compare the differences in chronic disease prevalence inequities among different populations. We used a SAS macro and the bootstrap method to estimate the concentration index and confidence interval [28]. We plotted values of the concentration index for each province against per capita gross domestic product (GDP) in the province. We used Kendall’s rank correlation coefficient (Kendall’s tau) to measure the strength and direction of the association between per capita gross GDP and concentration indices. All data preparation and data analysis were performed in SAS version 9 (SAS Institute Inc., Cary, NC, USA).

Results

We found that among the 14 chronic diseases analysed, the prevalence of arthritis and rheumatism was the highest, with 32.5% (95% CI: 31.8%–33.2%), 35.9% (35.2%–36.6%), and 32.9% (32.2%–33.6%) in 2011–2012, 2013–2014, and 2015–2016, respectively (Additional file 1: Tables S2–S4). These were followed by hypertension (24.6%, 95% CI: 23.9%–25.3%; 28.2%, 95% CI: 27.6%–28.9%; and 29.7%, 95% CI: 29%–30.3%) and stomach or other digestive system diseases (21.8%, 95% CI: 21.1%–22.4%; 25.6%, 95% CI: 25%–26.3%; and 23.5%, 95% CI: 22.9%–24.1%) in the three waves, respectively. The prevalence rates were higher in the poorest wealth tertile than in the wealthiest tertile for the vast majority of diseases, except dyslipidaemia, diabetes or high blood sugar, cancer or malignant tumour, and liver diseases, which were either similar between the richest and poorest groups or higher among the wealthiest (Fig. 1). For chronic lung diseases, the prevalence was 1.4 times higher in the poorest than in the wealthiest tertile (10.7% vs. 7.6%) in 2015–2016; for arthritis or rheumatism, the prevalence was 1.37 times higher in the poorest than in the wealthiest tertile (32.9% vs. 24.1%). For emotional, nervous, or psychiatric problems, the prevalence was 2.6 times higher (2.1% vs. 0.8%) in the poorest than in the wealthiest tertile (Fig. 1, Additional file 1: Table S4).

The estimated concentration indices showed that socioeconomic inequalities for dyslipidaemia, diabetes or high blood sugar, and cancer or malignant tumour were 0.1256 (95% CI: 0.1052–0.151), 0.098 (0.0704–0.1244), and 0.1305 (0.0528–0.215) in 2015–2016, respectively, which were indicative of pro-wealthy inequality (Table 2). The health inequalities for chronic lung diseases, heart disease, kidney disease, stomach or other digestive disease, psychiatric problems, memory-related disease, arthritis or rheumatism, and asthma tended to be greater among people with low SES (Fig. 2). To a large extent, relative inequalities in these diseases grew markedly over the study period. The concentration indices for hypertension and stroke were, respectively, 0.0151 (−0.002–0.0307) and 0 (−0.064–0.0519) in 2011–2012 and −0.026 (−0.04 – −0.012) and −0.11 (−0.16– −0.065) in 2015–2016. These findings indicated a change in health equity from fair to unfair within a 5-year period (Table 2, Fig. 2). There was also significant pro-poor health inequality among comorbidities, with a concentration index −0.056 (−0.06– −0.047) in 2015–2016.

Notably, the concentration index of the number of comorbidities among women (−0.051, −0.05, −0.072) was more than twice that among men (−0.023, −0.02, −0.032) in waves 1, 2, and 3, respectively, and the gap was widening (Fig. 3, Additional file 1: Table S5). Additionally, regarding heart diseases, health equity was relatively fair among men, whereas health inequality was high among poor women. With pro-rich inequality, as seen in dyslipidaemia and diabetes or high blood sugar, the degree of inequality among women was smaller than that among men.

Regarding comorbidities, urban residents had smaller health inequalities (−0.035 in 2011–2012, −0.036 in 2013–2014, and −0.05 in 2015–2016); pro-poor health inequalities were larger among rural residents (−0.053 in 2011–2012, −0.064 in 2013–2014, and −0.08 in 2015–2016); and their confidence intervals did not overlap in 2015–2016. It is remarkable that compared with urban residents (−0.038, −0.05, −0.057), pro-poor inequalities among rural residents (−0.135, −0.17, −0.161) tripled with respect to heart disease in waves 1, 2, and 3, respectively. In addition, the estimated concentration index of liver diseases in rural residents was −0.097 (−0.144– −0.049) in 2015–2016, indicating pro-poor socioeconomic inequality in rural but not urban residents (Fig. 4, Additional file 1: Table S6).

Provinces ranking higher for GDP per capita also ranked higher in the degree to which health inequalities for dyslipidaemia, kidney disease, and asthma were pro-poor (Kendall's $\tau = -0.2328$, $p = 0.015$; Kendall's $\tau = -0.3545$, $p = 0.0077$; Kendall's $\tau = -0.2646$, $p = 0.0079$, respectively; Fig. 5). The variation in inequality among provinces explained by GDP per capita was 0.207 for dyslipidaemia, 0.2427 for kidney disease, and 0.2416 for asthma (Fig. 5, Additional file 1: Table S7).

Discussion

Our findings demonstrated obvious health disparities in several dimensions among middle-aged and elderly Chinese adults, calculated using the concentration index and corresponding CI of 14 chronic diseases based on data from the CHARLS. The results indicated that absolute inequalities among women and rural residents were nearly twice those of men and urban residents in most instances. Conversely, for diabetes and dyslipidaemia, the prevalence was found to be more pro-rich among men and urban residents than among women and rural residents. Health inequalities for dyslipidaemia, kidney disease, and asthma were associated with provincial per capita GDP.

According to the general trends in socioeconomic inequalities in the 14 chronic diseases investigated, 9 showed negative concentration indices throughout the 6-year study, indicating that people with lower SES tended to have more chronic diseases in most cases. This is consistent with a prior study demonstrating considerable socioeconomic inequalities in the prevalence of chronic diseases [29]. A study in Germany revealed that low SES groups seem to face a double burden of increased levels of health impairments and lower levels of health-related quality of life once health is impaired [30]. SES is closely linked to the utilization of health services; wealthier communities may have better health services, resulting in a lower prevalence of chronic diseases.

With regard to diabetes, dyslipidaemia and cancer, people with higher SES are more likely to develop these diseases. A survey of the diabetic population in India showed that people with higher SES are more susceptible to diabetes than those with lower SES [31]. The prevalence of diabetes in economically developed regions is significantly higher than that in underdeveloped regions in China. Urbanization has led to changes in people's lifestyles, which has significantly reduced physical activity, accelerated the pace of life and placed people in long-term patterns of stress. All of these factors are involved in diabetes. Among Korean men, socioeconomic status was positively associated with dyslipidaemia. Interestingly, the risk of obesity also increased with income in Korean men. Families with high SES tend to enjoy a diet high in protein and fat and excessive alcohol consumption; these families are also less physically active. In addition, the most important factor in cancer control is early diagnosis. People with low SES have little access to adequate and high-quality medical care, which may result in fewer patients being detected.

The analysis of different groups according to sex and living environment revealed that health inequalities were mostly pro-poor but with different intensities across groups. For example, the inequality index of the number of comorbidities among women was twice as high as that among men. Sex-based social norms and constraints regarding economic autonomy lead to an unbalanced distribution of health resources towards men [32]. Compared with men, women are less independent and less physically active. Much-needed health services for women have been neglected, ultimately leading to worse health conditions. If inequity is not addressed, health disparities will persist between men and women in China, with women remaining unable to receive adequate health services or achieve health equality with men.

With regard to living environment, our results indicated that pro-poor health inequalities among rural residents were larger than those among urban dwellers. It has been reported that urban-rural differences in health inequalities, influenced by SES, reflect the impact of the predominant dual urban-rural structure and household registration policy of China [33]. Furthermore, the health status and utilization of health services among elderly adults in urban areas are better than those among elderly adults in rural areas [5, 33]. Consistent with previous studies, differences in urban and rural health inequalities deepened during 2011–2016 [34, 35]. The phenomenon of “poverty owing to illness” is widespread in rural areas of China. Qi and Wang found that the health gradient differs between urban and rural areas and that rural residents in China are more dependent on SES than urban residents are [36]. The imbalance between urban and rural areas in terms of economic development, public health expenditure, and health care has led to obvious urban–rural differences in the health status of residents. Thus, greater efforts are needed to reduce these health inequalities as well as the gap between residents of rural and urban areas. Such efforts include adopting policies targeting the poor, particularly the rural poor. Moreover, inequalities in comorbidities are high among middle-aged and older rural Chinese populations. The management of multimorbidity therefore warrants greater attention from health policy-makers, health care providers, and educators of health professionals in China as well as in other low- and middle-income countries [37].

We found that greater socioeconomic health inequalities exist in provinces with high GDP per capita, especially for dyslipidaemia, kidney disease, and asthma. On the one hand, the prevalence of asthma and kidney disease is pro-poor at the country level, with the problem more markedly pro-poor in provinces with higher GDP. This finding is consistent with a previous report that suboptimal asthma care and poor asthma control are common, even in developed areas of China [38]. Higher GDP per capita and higher health expenditure per capita do not seem to have led to lower rates of kidney disease and asthma. On the other hand, the prevalence of dyslipidaemia in China indicates pro-rich inequality; however, the opposite is true among those provinces with the highest GDP. This is similar to the situation in which low-income people in developed countries have higher rates of dyslipidaemia and obesity [39]. The findings imply a major challenge to present and future case management for patients, particularly those in low-income groups who pay a large portion of health-care costs out-of-pocket. One potential policy response is to concentrate on raising the utilization of public health services by securing universal access without targeting any particular group. A comprehensive national medical service improvement programme is greatly needed.

With the increasing popularity of medical care data and the rapid development of big data analysis methods, the successful application of artificial intelligence (AI) in medical care has become possible. A recent review found emerging research showing the benefits of AI in the management of cancer, heart diseases, stroke, vision impairment, dementia, and depression, which are common chronic diseases in China. At present, in the field of chronic diseases, AI can mainly assist doctors in diagnosis and relieve the shortage of medical resources. If we can have corresponding smart devices that can be used in daily life to test patients, manage patients' health status and provide feedback to doctors, patients will have a reduced need to go to a hospital for care and treatment. Therefore, AI may benefit patients of lower socioeconomic status with less access to medical care by doctors and enhance the cost-effectiveness of chronic disease management.

There are at least three limitations of this study. First, the CHARLS samples were not selected to be nationally representative of all age groups, and people younger than 45 years old were not included in the study; therefore, our results do not fully reflect China's overall health inequalities. Whereas the sampled populations were similar to the national population older than 45 years old with respect to major demographic and socioeconomic characteristics, estimates of health inequities among middle-aged and elderly adults in China may be the most accurate. As mentioned earlier, a small percentage of our sample was excluded from the analysis owing to missing data. We did not impute missing wealth data, and these observations were excluded from our analyses, which assumes that missing wealth data are completely random in all counties. This assumption might bias our inequality estimates, although the direction of that bias is unclear. Second, the data used here were based on self-reported chronic conditions and are therefore subject to potential recall bias. However, we applied a recall correction for responses given during follow-up interviews, which could remediate the potential biases; in addition, the available data from other studies of chronic diseases provide some support for the accuracy of self-reported data. Third, quantitative analyses revealed but could not provide a causal explanation for socioeconomic inequalities. The next step requires multidisciplinary research (e.g., a decomposition of the concentration index) to clarify the observed variations.

Conclusion

Our study showed significant health inequalities in 2011–2016 among middle-aged and older adults in China in several dimensions. These results imply that enhanced awareness is urgently needed to reduce inequalities. Further studies are needed, as well as interventions to reduce health inequalities in China.

Abbreviations

SD: standard deviation; CI: confidence interval; SES: socioeconomic status

Declarations

Acknowledgment

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Authors' contributors

HPS designed the study; XQQ and JFZ managed statistical analysis and interpretation of the results; XQQ, HPS, LYH and ZC wrote the manuscript; all authors reviewed the manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request

Ethics approval and consent to participate

All examinations were conducted after obtaining informed consent from participants. The Biomedical Ethics Committee of Peking University approved the survey (The approval number is IRB00001052-11015), and the conduct of the study adhered to the principles of the Declaration of Helsinki.

Consent for publication

Not applicable

Competing interests

We declare no competing interests.

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Tables

Table 1 Characteristics of survey respondents in China: 2011–2012, 2013–2014, 2015–2016

	N	Age (years)		Women			Urban		
		Mean (SD)	95% CI	n	%	95% CI	n	%	95% CI
-2012	16,128	59.4 (9.8)	59.2-59.6	8,236	51.1	50.3-51.8	6,472	40.1	39.4-40.9
-2014	16,646	59.9 (9.6)	59.8-60.1	8,537	51.3	50.5-52.0	6,548	39.3	38.6-40.1
-2016	17,470	59.9 (9.8)	59.8-60.2	8,926	51.1	50.4-51.8	7,088	40.6	39.8-41.3

Abbreviation: SD, standard deviation; CI, confidence interval.

Table 2 Concentration indices of 14 chronic diseases and comorbidities: 2011–2012, 2013–2014, 2015–2016

Disease	2011-2012 CI(95%CI)	2013-2013 CI(95%CI)	2015-2016 CI(95%CI)
Hypertension	0.0151 (-0.002,0.0307)	-0.008 (-0.022,0.0059)	-0.026 (-0.04,-0.012)
Dyslipidemia	0.1874 (0.1594,0.21)	0.1714 (0.1486,0.19)	0.1256 (0.1052,0.151)
Diabetes or high blood sugar	0.1362 (0.102,0.1753)	0.1303 (0.099,0.1598)	0.098 (0.0704,0.1244)
Cancer or malignant tumor	0.1163 (0.0228,0.2089)	0.0907 (0.0113,0.178)	0.1305 (0.0528,0.215)
Chronic lung diseases	-0.143 (-0.167,-0.116)	-0.123 (-0.146,-0.102)	-0.15 (-0.18,-0.13)
Liver disease	-0.044 (-0.089,0.001)	0.009 (-0.031,0.0532)	-0.017 (-0.059,0.0206)
Heart disease	-0.03 (-0.057,-0.007)	-0.059 (-0.081,-0.037)	-0.066 (-0.088,-0.043)
Stroke	0 (-0.064,0.0519)	-0.014 (-0.067,0.0341)	-0.11 (-0.16,-0.065)
Kidney disease	-0.075 (-0.106,-0.041)	-0.062 (-0.093,-0.029)	-0.084 (-0.116,-0.04)
Stomach or other digestive disease	-0.063 (-0.08,-0.047)	-0.067 (-0.081,-0.052)	-0.071 (-0.085,-0.056)
Emotional, nervous, or psychiatric problems	-0.188 (-0.258,-0.115)	-0.094 (-0.181,-0.013)	-0.232 (-0.302,-0.16)
Memory_related disease	-0.089 (-0.162,-0.016)	-0.1 (-0.175,-0.056)	-0.151 (-0.207,-0.088)
Arthritis or rheumatism	-0.101 (-0.11,-0.089)	-0.101 (-0.112,-0.09)	-0.122 (-0.133,-0.11)
Asthma	-0.16 (-0.206,-0.115)	-0.162 (-0.202,-0.12)	-0.2 (-0.24,-0.162)
Count of comorbidity	-0.037 (-0.046,-0.029)	-0.038 (-0.04,-0.02)	-0.056 (-0.06,-0.047)

Abbreviation: CI, confidence interval.

Figures

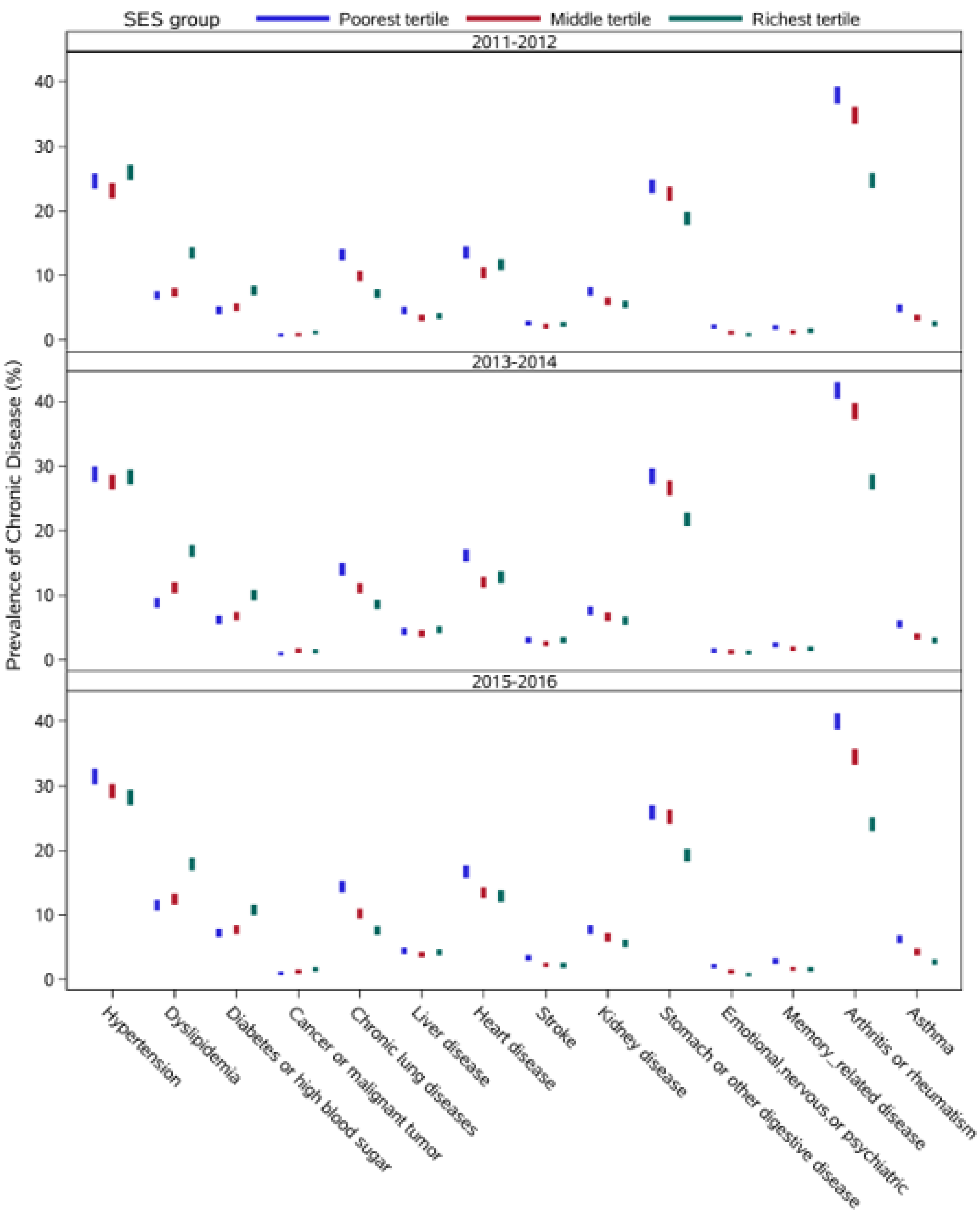

Figure 2

High–low plot showing 95% confidence intervals for the prevalence of 14 chronic diseases, by tertiles according to socioeconomic status (SES)

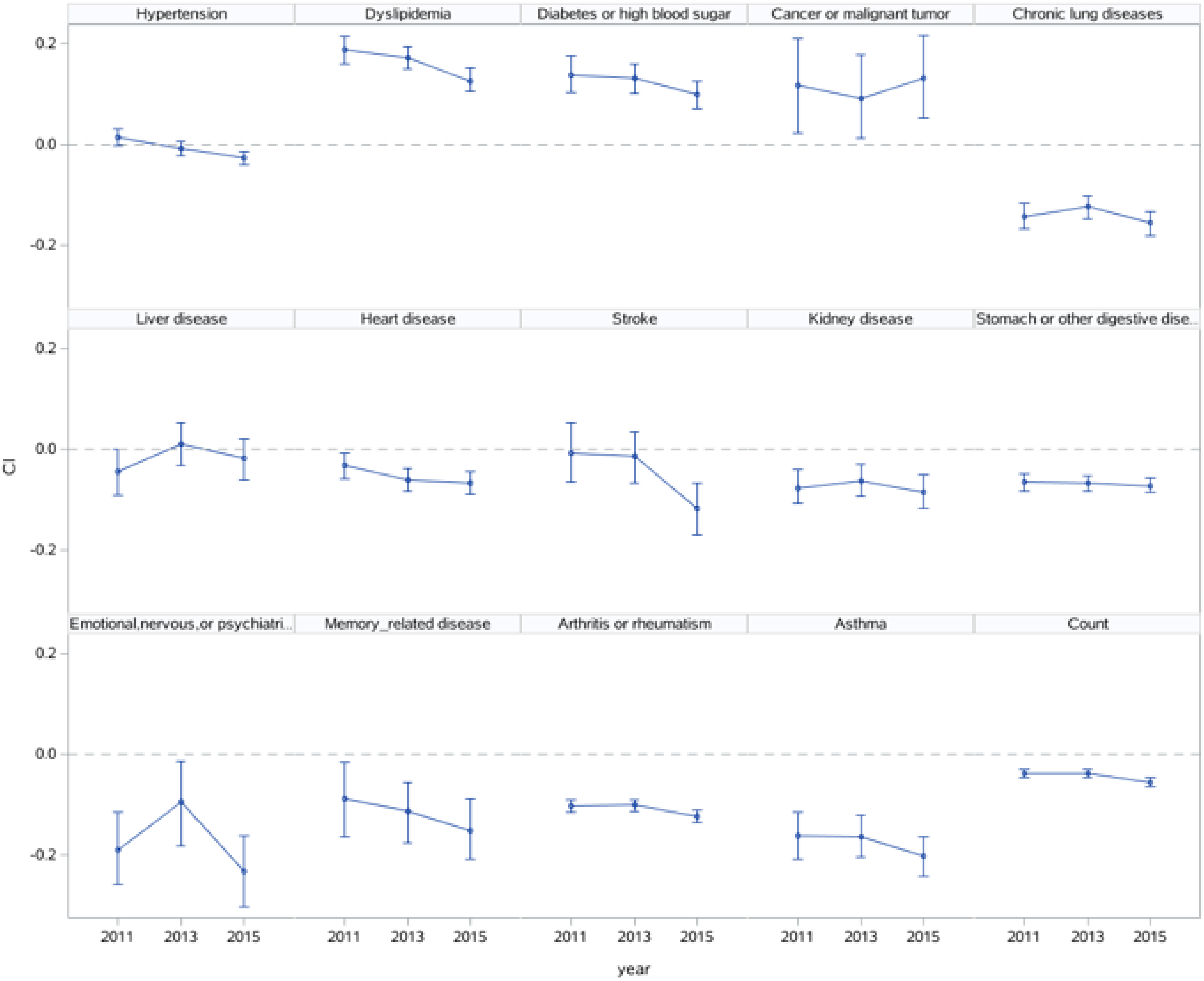

Figure 4

Trends of concentration indices for 14 chronic diseases and comorbidities, 2011–2016

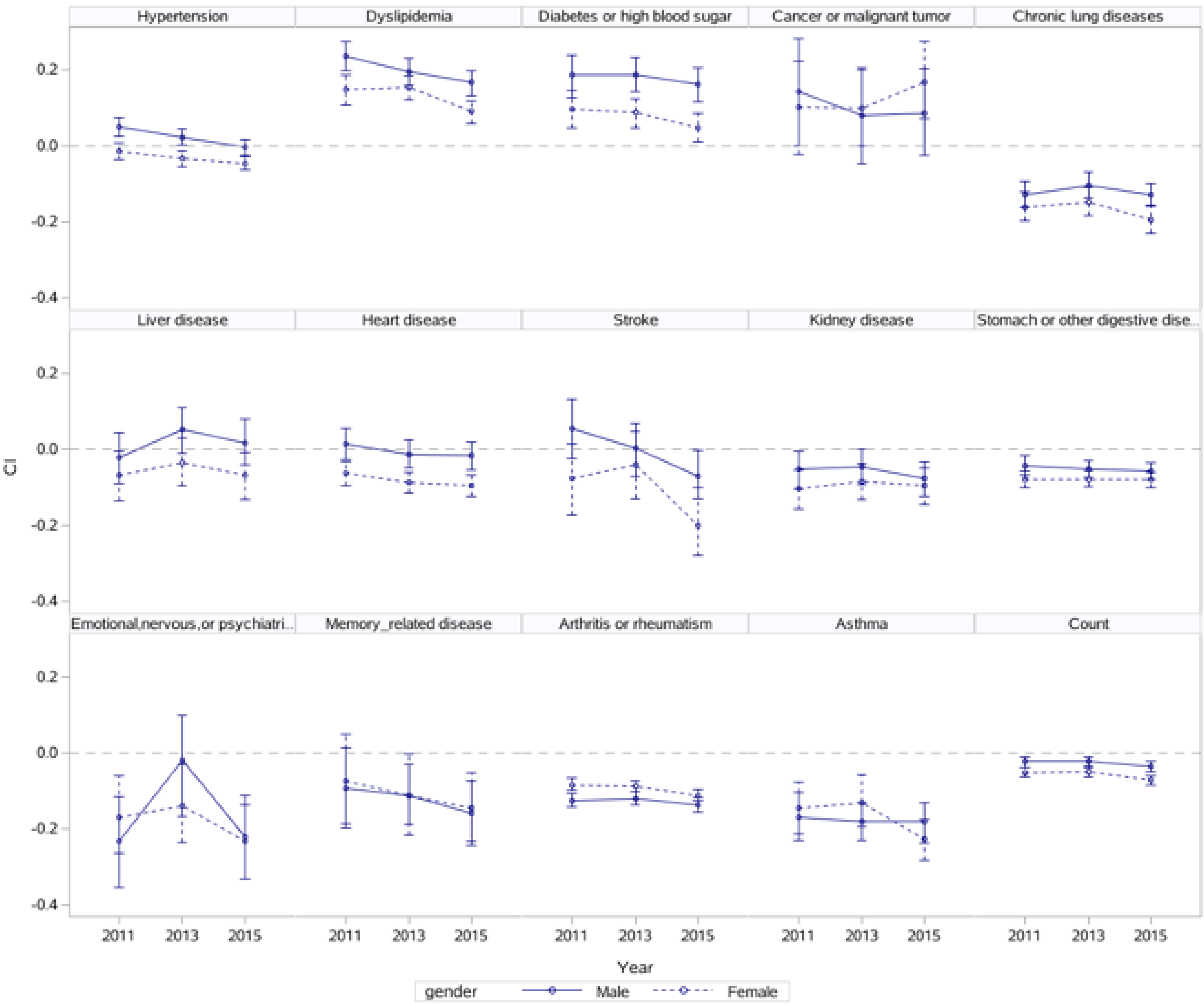

Figure 6

Trends of concentration indices for 14 chronic diseases and comorbidities by subpopulations according to sex, 2011–2016

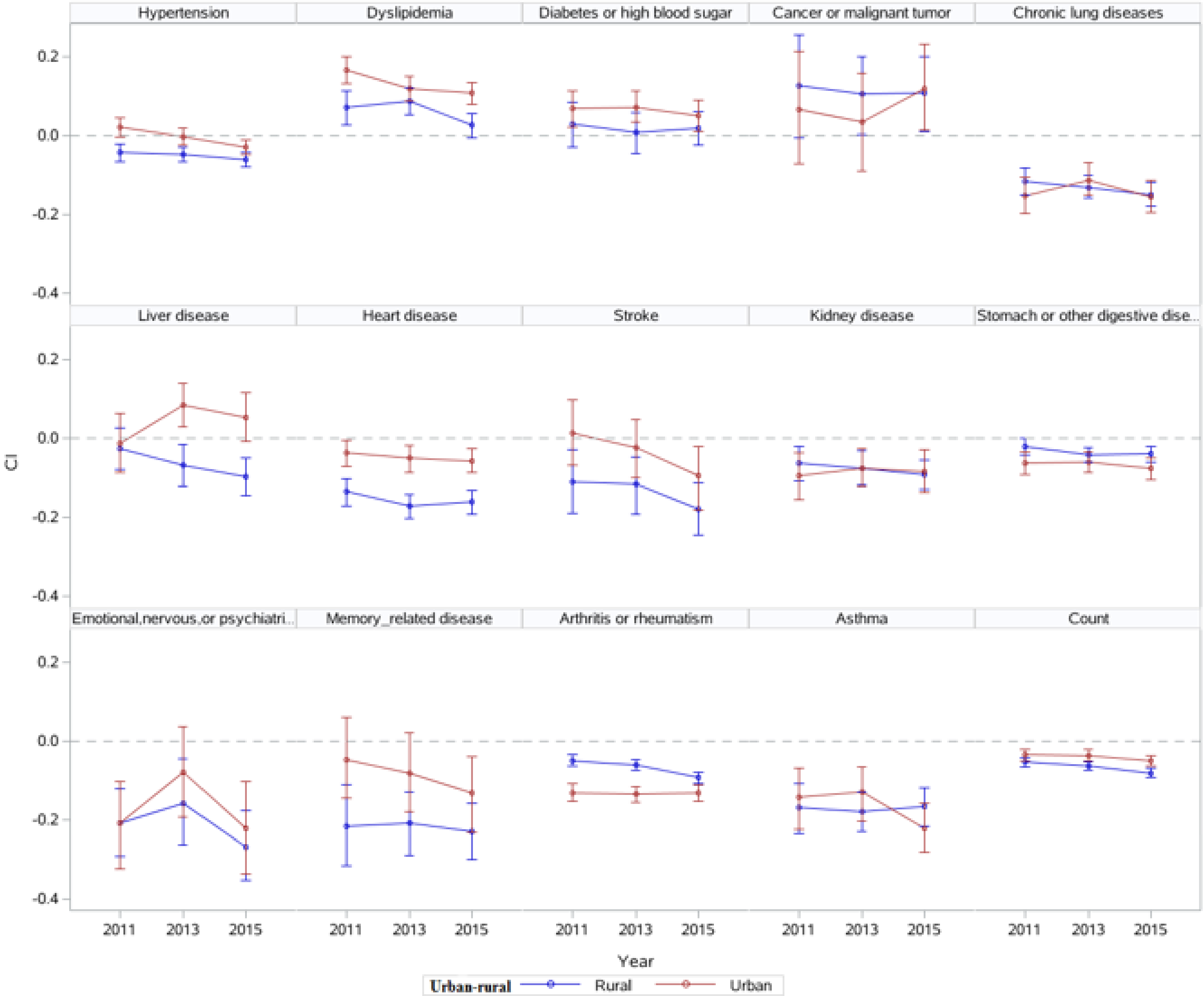

Figure 8

Trends of concentration indices for 14 chronic diseases and comorbidities by subpopulations according to rural or urban residence, 2011–2016

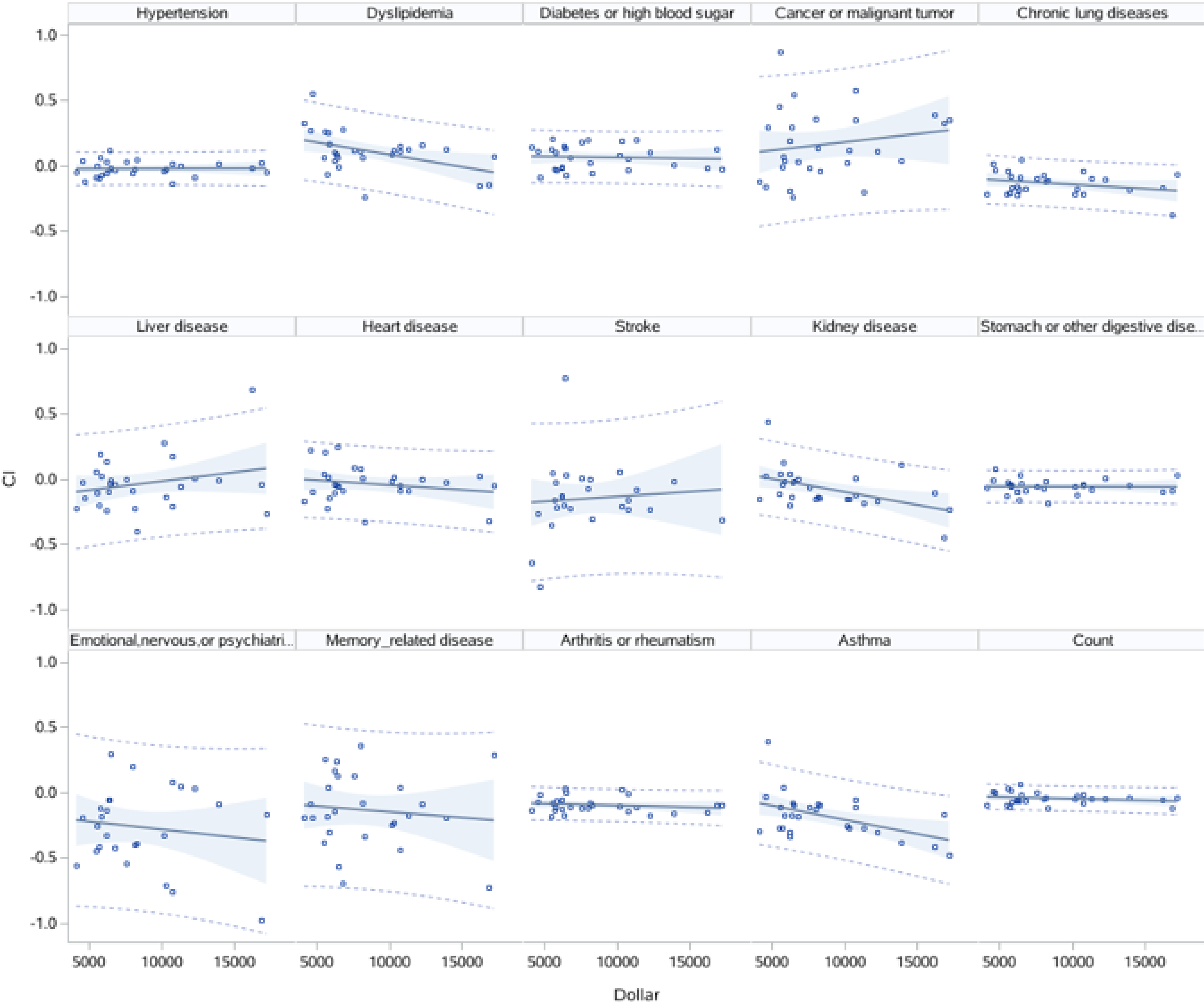

Figure 10

Scatter plots of concentration indices for inequality in 14 chronic diseases and comorbidities against GDP per capita, 2015–2016

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Equation1.jpg
- Equation2.jpg
- Additionalfile1.docx
- Additionalfile1.docx
- Equation2.jpg

- Equation1.jpg