**APPENDIX A: Detailed methods for our measure of hypertension-related primary care**

To develop this measure of hypertension-related primary care, we analyzed a sample that included all participants who completed questions about their hypertension medical history, had blood pressure measurements, and had a reported BMI of 15-150 kg/m$^2$; n=8207. We conducted a linear regression to predict hypertension control status in the baseline wave of CHARLS, controlling for observable individual characteristics including age, age squared, sex, sex interacted with age, health insurance scheme, log PCE, and *hukou* status; n=6589. We also included two indicator variables for education level using formal primary school education as the reference category. **Table S1** reports the results of this regression.

The residuals from this regression represent participants' probability of having hypertension diagnosed and under control (since by definition undiagnosed patients with hypertension have blood pressure readings out of control), conditional on individual demographics. This residual captures differences in county screening for hypertension and ability to keep individuals' blood pressure under control that are not attributable to a patient's age, education, or other observed factors. We use the residuals of this regression to construct our hypertension-related primary care score: the average of individuals' residuals in their county or district of residence, reflecting the likelihood of a resident of a county having hypertension under control, conditional on the demographic characteristics of local residents, which is important given immense regional variation in China. As a robustness check, the correlation of these county-average-residual scores compared to the raw percentage of hypertensives under control in each county is R=0.67. The median hypertension-related primary care score is -0.005. Compared to counties below the median, counties with above-median hypertension-related primary care scores averaged much higher hypertension diagnosis rates (72.2% compared to 56.8%) and hypertension control rates (50.0% compared to 33.0%). These scores provide a continuous measure of the quality of hypertension-related primary care in different counties after controlling for local resident characteristics.

**Table S1.** Constructing a measure of quality of county-level primary care in the baseline wave of CHARLS (2011) based on hypertension control rates

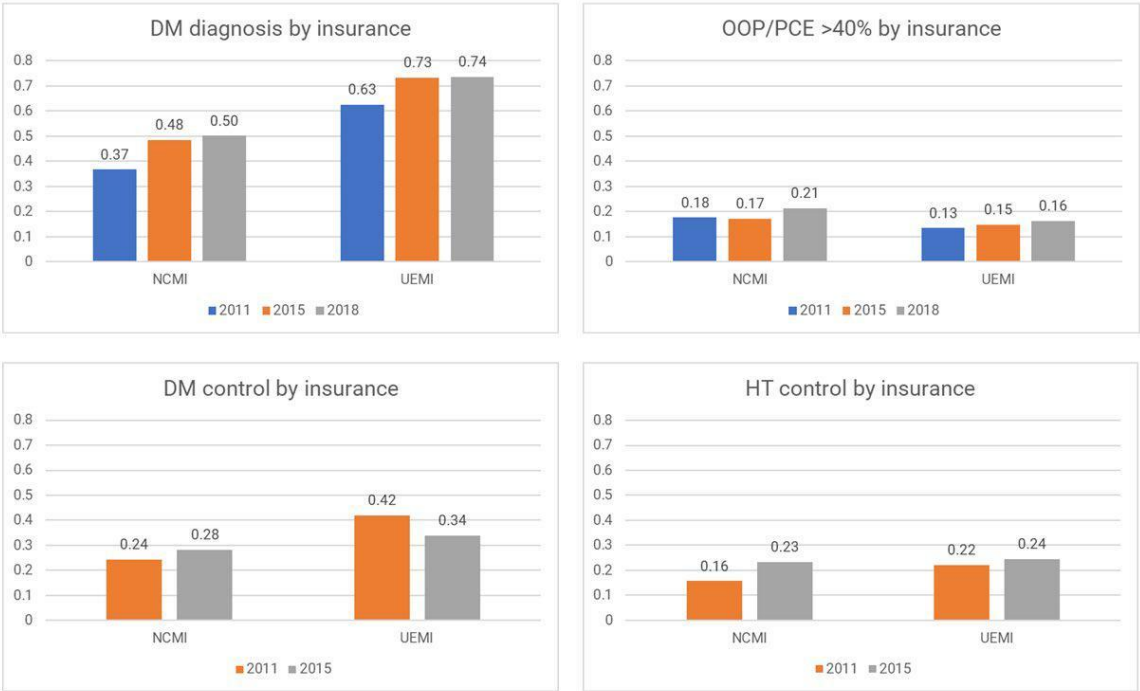
| | **Hypertension control (n=6589)** | |
|---|---|---|
| | Beta | P |
| **Age** | **0.027** | **<0.001** |
| **Age squared** | **0.000** | **<0.001** |
| **Female** | 0.058 | 0.266 |
| **Female * age** | -0.001 | 0.505 |
| **Insurance** | | |
| *NCMI* | | |
| URMI | 0.025 | 0.315 |
| UEMI | 0.025 | 0.266 |
| Other | -0.012 | 0.623 |
| **Education** | | |
| *Primary* | | |
| Below primary | -0.017 | 0.099 |
| Above primary | 0.000 | 0.969 |
| **Log PCE** | **0.016** | **0.001** |
| **Rural hukou** | -0.021 | 0.254 |

* Here, the sample size is smaller than the total number of participants with hypertension because not all participants had a complete set of covariates for inclusion in the regression.

**APPENDIX B: Changes in diabetes diagnosis, catastrophic health care spending, diabetes control, and hypertension control among participants with diabetes in the baseline wave of CHARLS.**

**Figure S1** presents the mean proportions of diabetes diagnosis, catastrophic health care spending, diabetes control, and hypertension control among participants with diabetes in the baseline wave of CHARLS, separated by NCMI and UEMI insurance coverage. We find that regardless of insurance coverage, diabetes diagnosis rates increase over time despite inconsistent changes in diabetes control rates. We define out-of-pocket health care spending of greater than 40% of household per capita expenditures as catastrophic health spending, which does not change by many percentage points over time.

**Figure S1.** Diabetes diagnosis, catastrophic health spending, diabetes control, and hypertension control among the study cohort over time.



## APPENDIX C: Adding baseline diabetes control to models assessing factors associated with inpatient hospital stays among participants with diabetes

**Table S2.** Factors associated with inpatient hospital stays among participants with diabetes in the third wave (2015) and fourth wave (2018) of CHARLS after including baseline diabetes control as an additional predictor.

| | **Hospital stay in 2017 (n=1023)*** | | | **Hospital stay in 2018 (n=941)*** | | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | | OR | 95% CI | |
| **Primary care** | 0.04 | 0.00 | 1.06 | 8.08 | 0.29 | 222.61 |
| **Insurance** | | | | | | |
| *NCMI* | | | | | | |
| URMI | 1.57 | 0.75 | 3.26 | 1.64 | 0.78 | 3.45 |
| UEMI | 1.29 | 0.71 | 2.33 | 1.12 | 0.61 | 2.05 |
| Other | 1.20 | 0.46 | 3.15 | 1.23 | 0.48 | 3.16 |
| **Diabetes diagnosis** | **2.20** | **1.35** | **3.61** | **2.48** | **1.55** | **3.97** |
| **Diabetes control** | 0.69 | 0.42 | 1.15 | 0.62 | 0.38 | 1.01 |
| **Age** | | | | | | |
| *45-59* | | | | | | |
| 60-69 | 1.07 | 0.72 | 1.58 | 1.38 | 0.96 | 1.99 |
| 70-79 | **1.92** | **1.15** | **3.19** | 1.36 | 0.79 | 2.34 |
| 80+ | 1.66 | 0.62 | 4.47 | 1.87 | 0.58 | 6.00 |
| **Female** | 0.84 | 0.55 | 1.29 | 0.85 | 0.56 | 1.28 |
| **Education** | | | | | | |
| *Illiterate* | | | | | | |
| Literate | 1.58 | 0.97 | 2.58 | 1.04 | 0.64 | 1.70 |
| Primary | 0.84 | 0.50 | 1.42 | 0.89 | 0.54 | 1.47 |
| All else | 1.04 | 0.61 | 1.77 | 0.92 | 0.56 | 1.52 |
| **Log PCE** | | | | | | |
| *1st tercile* | | | | | | |
| 2nd tercile | 1.12 | 0.72 | 1.74 | 0.81 | 0.53 | 1.23 |
| 3rd tercile | 0.98 | 0.61 | 1.57 | 0.79 | 0.51 | 1.24 |
| **BMI** | | | | | | |
| *<23* | | | | | | |
| <25 | 1.30 | 0.82 | 2.06 | 1.13 | 0.71 | 1.78 |
| <30 | 0.96 | 0.62 | 1.49 | 1.08 | 0.71 | 1.66 |
| >=30 | 1.08 | 0.54 | 2.14 | 1.04 | 0.52 | 2.05 |
| **Current smoker** | 0.74 | 0.47 | 1.17 | 0.81 | 0.52 | 1.26 |
| **Hypertension** | **1.59** | **1.10** | **2.31** | 1.30 | 0.91 | 1.87 |
| **Heart problems** | 1.50 | 0.97 | 2.32 | **1.58** | **1.03** | **2.44** |
| **Stroke** | 1.10 | 0.51 | 2.39 | 1.13 | 0.52 | 2.49 |
| **Dyslipidemia** | 0.97 | 0.63 | 1.51 | 1.10 | 0.72 | 1.70 |
| **Liver disease** | 1.34 | 0.60 | 2.97 | 1.01 | 0.46 | 2.21 |
| **Kidney disease** | 1.39 | 0.76 | 2.54 | 1.13 | 0.59 | 2.19 |

* Here, the sample size is smaller than the total number of participants with diabetes because not all participants had a complete set of covariates for inclusion in the regression.

**APPENDIX D: Detailed methods for spending measures and comparisons across primary care quartiles and insurance scheme**

The CHARLS dataset contains self-reported medical spending across several categories. To create a proxy for total medical spending that accounts for relatively rare events such as hospitalizations, we created a measure of predicted total spending using a generalized linear model regression. We used outpatient medical spending over the last month and inpatient medical spending over the last year to calculate annualized self-reported total medical spending (total = outpatient*12 + inpatient) and then regressed this against age, age squared, sex, in addition to self-reported histories of hypertension, diabetes, heart problems, stroke, dyslipidemia, liver disease, and kidney disease. We assumed a log link and gamma distribution. We completed a similar regression for predicted out-of-pocket medical spending.

We also created three measures assessing the out-of-pocket burden of medical spending: (1) predicted out-of-pocket spending as a portion of predicted total spending; (2) actual out-of-pocket spending as a portion of actual total spending; (3) actual out-of-pocket spending as a portion of household PCE. All spending measures were annualized and adjusted for inflation using the 2010 CPI.

**Table S3** presents a comparison of health care spending characteristics between participants in the lowest and highest primary care quartiles. Participants in the highest primary care quartile demonstrated significantly higher predicted total health care spending in 2011, 2015, and 2018. Notably, the two groups did not significantly differ in the amount of out-of-pocket spending as a portion of household income as proxied by PCE, which is commonly used as a rough metric for catastrophic health spending.

**Table S4** presents a comparison of health care spending characteristics between participants with NCMI and UEMI health insurance. Participants with UEMI insurance coverage demonstrated significantly higher predicted total health care spending in 2011, 2015, and 2018. They also consistently demonstrated significantly lower predicted and actual out-of-pocket spending as a portion of total health care spending, consistent with more generous insurance coverage.

Notably, participants with UEMI insurance coverage reported significantly lower out-of-pocket spending as a portion of household income as proxied by PCE in 2011. This difference is not significant in 2015 or 2018.

**Table S3.** Health care spending characteristics for participants in the lowest and highest quartiles of hypertension-related primary care.

| | Year | n | Average | Lowest quartile | Highest quartile | p |
|---|---|---|---|---|---|---|
| **Total predicted spending, RMB** | 2011 | **630** | **4010.03** | **2362.08** | **4306.63** | **<0.001** |
| | 2015 | **510** | **9426.00** | **7889.24** | **10869.27** | **<0.001** |
| | 2018 | **498** | **9970.00** | **8555.88** | **11203.37** | **<0.001** |
| **OOP[a]/total spending, %** | 2011 | 191 | 0.84 | 0.86 | 0.83 | 0.45 |
| | 2015 | 183 | 0.79 | 0.82 | 0.76 | 0.50 |
| | 2018 | 165 | 0.66 | 0.66 | 0.66 | 0.98 |
| **Predicted OOP/total spending, %** | 2011 | **630** | **0.70** | **0.71** | **0.69** | **0.00** |
| | 2015 | **510** | **0.65** | **0.64** | **0.66** | **0.02** |
| | 2018 | **498** | **0.59** | **0.59** | **0.58** | **0.03** |
| **OOP/PCE[b] proportion, %** | 2011 | 531 | 0.47 | 0.39 | 0.53 | 0.52 |
| | 2015 | 369 | 0.44 | 0.42 | 0.46 | 0.79 |
| | 2018 | 395 | 1.05 | 0.51 | 1.47 | 0.41 |

[a] Out-of-pocket
[b] Per capita expenditures

**Table S4.** Health care spending characteristics for participants with NCMI and UEMI insurance coverage.

| | Year | n | Average | NCMI | UEMI | p |
|---|---|---|---|---|---|---|
| **Total predicted spending, RMB** | 2011 | **1091** | **4172.30** | **3891.92** | **6263.15** | **<0.001** |
| | 2015 | **886** | **9670.88** | **9169.21** | **13751.53** | **<0.001** |
| | 2018 | **889** | **10143.82** | **9823.62** | **12820.04** | **<0.001** |
| **OOP[a]/total spending, %** | 2011 | **344** | **0.83** | **0.86** | **0.56** | **<0.001** |
| | 2015 | **297** | **0.80** | **0.84** | **0.52** | **<0.001** |
| | 2018 | **301** | **0.66** | **0.69** | **0.48** | **<0.001** |
| **Predicted OOP/total spending, %** | 2011 | **1091** | **0.70** | **0.70** | **0.67** | **<0.001** |
| | 2015 | **886** | **0.65** | **0.65** | **0.60** | **<0.001** |
| | 2018 | **889** | **0.59** | **0.59** | **0.57** | **0.03** |
| **OOP/PCE[b] proportion, %** | 2011 | **954** | **0.42** | **0.45** | **0.20** | **0.01** |
| | 2015 | 646 | 0.46 | 0.47 | 0.36 | 0.53 |
| | 2018 | 718 | 1.03 | 1.12 | 0.29 | 0.08 |

[a] Out-of-pocket
[b] Per capita expenditures