Health Outcomes and Socio-Economic Status Among the Elderly in China: Evidence from the CHARLS Pilot

John Strauss
University of Southern California

Xiaoyan Lei
Peking University

Albert Park
Oxford University

Yan Shen
Peking University

James P. Smith
RAND Corporation

Zhe Yang
Peking University

Yaohui Zhao
Peking University

October, 2009
Revised February, 2010

Comments from Richard Suzman and David Weir are greatly appreciated. Earlier versions were presented at the annual meetings of the Population Association of America, April 2009, Detroit, the World Congress of the International Association of Gerontology and Geriatrics, July 2009, Paris, and the 2nd International Conference on Health and Retirement in China, July 2009, Beijing. This research was supported by grants from the National Institute of Aging, the China National Natural Science Foundation and the World Bank, China.

1. Introduction

We are concerned in this chapter with measuring health outcomes among the elderly in Zhejiang and Gansu provinces and examine the relationships between different dimensions of health status and measures of socio-economic status (SES). China has undergone a health revolution over the past 50 years, with life expectancy having risen from 46 in the 1950s to just over 71 in 2000 (Wagstaff et al., 2009; World Health Organization, 2009). Driving this change, under 5 mortality fell dramatically from 225 per 1,000 live births in 1960 to 64 in 1980 to 22 in 2007 (Wagstaff et al., 2009; UNICEF, 2009). Most of this decline was due to an increasing control over infectious disease and under-nutrition. As a result, infectious diseases are being replaced by chronic diseases as the major source of ill-health and mortality (Hossein, 1997; Lopez et al., 2006).

As China has been passing through its health transition, it has also been undergoing a nutrition transition, which has both good and bad sides (Popkin et al., 1993, 1995a; Popkin, 1999, 2002). Among the principle dimensions of this transition has been a dramatic rise in body mass index among adults and a large change in diet towards more fatty foods (Popkin et al., 1995b). For instance Luo (2003), using the China Health and Nutrition Survey (CHNS), documents an increase in overweight for adults over 20 years from 1989 to 1997; for women from 11% to 21% and from 6% to 17% for men.[1] At the same time, Luo shows that the fraction of adults elderly who are undernourished (a BMI under 18.5) has fallen, particularly so for those over 60 years, from 19% to 13% for women and 20% to 12% for men, from 1991 to 1997.

Related to the health and nutrition transitions has been China's demographic transition. China elderly will increase from under 10% of the total population in 2000 to 30% in 2050. The

[1] Overweight is defined using World Health Organization standards of having a BMI 25 or above.

number of workers per pensioner has already fallen from over 12 in 1980 to 2 in 2005 (Kinsella and He, 2009). This sharp demographic transition is likely to place stress on China's health system, which has been focused on disease at younger ages and on infectious, not chronic diseases.

In this paper, we use CHARLS pilot data to examine health conditions among the elderly in Gansu and Zhejiang provinces, where the survey was fielded. We use a very rich set of health indicators that include both self-reported measures and biomarkers. We also examine correlations between these health outcomes and education and *per capita* expenditure (*pce*), our preferred measure of household income. While we cannot infer causality from these estimates, they tell us something important about the degree of health differentials by education and *pce*. In general education tends to be positively correlated with better health outcomes. Unmeasured community influences turn out to be highly important, though it is not clear what aspects of communities matter and why they matter. That is a high priority issue for future research. We also find a large degree of under-diagnosis of hypertension, a major health problems that afflicts the aged. This implies that the current health system is not well prepared to address the rapid aging of the Chinese population.

This paper is divided into four sections. The next section briefly describes the data in while our main empirical findings are presented in section 3. The final section highlights our main conclusions.

2. Data

We use the CHARLS pilot data, which is described in detail in Zhao et al. (2009). CHARLS was designed after the Health and Retirement Study in the US as a broad-purposed social science and health survey of the elderly in Zhejiang and Gansu provinces. The pilot survey was conducted in July-September 2008. The CHARLS pilot sample is representative of people aged 45 and over, and their spouses, living in households in Gansu and Zhejiang provinces.

The CHARLS pilot sample was drawn in four stages. In each province, all county-level units were stratified by whether they were urban districts (*qu*) or rural counties (*xian*), and by region within each classification. Both urban districts and rural counties can contain both urban and rural communities, but the concentration of urban and rural populations is quite different in the two. With a goal of sampling 16 county-level units per province, the number of counties to be sampled in each stratum was determined based on population size. Before the pilot survey, the Beijing CHARLS Office first obtained a list of county units and their populations in each of the provinces from official statistics. Counties were randomly selected within each stratum with probabilities proportionate to size as measured by population.

After the county units were chosen, the National Bureau of Statistics helped us to sample villages and communities within county units using recently updated village level population data. Our sample used administrative villages (*cun*) in rural areas and neighborhoods (*shequ*), which comprise one or more former resident committees (*juweihui*), in urban areas as primary sampling units (PSUs). We selected 3 PSUs within each county-level unit, using PPS (probabilities proportional to size) sampling. Note that rural counties contain both rural villages and urban neighborhoods and it is also possible for urban districts to contain rural administrative villages.

In each PSU, we selected a sample of dwellings from our frame, which was constructed based on maps prepared by advance teams with the support of local informants. For rural villages, in many cases the lead persons on the advance teams were able to use maps drafted for the agricultural census in 2006 as a starting point and then updated them in consultation with local leaders. For urban communities, existing building maps were frequently used as the basis for the frame. All buildings in each PSU were numbered, and dwellings within each building were listed and coded using standardized methods. The advanced team verified that all buildings in the PSU had been properly identified, and that dwelling units within multi-dwelling buildings had been correctly coded before choosing the sample of households.

Once the sampling frame for a PSU was completed and entered into the lead person's computer, they used CAPI (computer assisted personal interview laptops) to sample the households automatically. The number of households sampled was greater than the targeted sample size of 16 households per PSU in anticipation of non-response and sampled households' not having any members aged 45 or older. The number of households sampled was 36 in urban PSUs and 30 in rural PSUs. We interviewed all age-eligible sample households in each PSU who were willing to participate in the survey, ultimately interviewing 1,570 households containing 2,685 respondents aged 45 and over and their spouses.

In this paper we use data on all respondents 45 year of age and older,[2] some 2,238 respondents. As in the other chapters, tables and figures are weighted using individual sample weights.[3] All figures are nonparametric and drawn using LOWESS. Regressions are run unweighted. The sampling scheme is independent of our health variables (depending only on region and urban/rural area within the province) so weights are not needed to correct for any bias from the sampling. Of course refusals can cause bias. Given that a household participates,

[2] Spouses who are under 45 years old are dropped from this analysis.

[3] Here we use the sample weights allowing for household non-response using local community dummies to predict household nonresponse. We do not incorporate non-response for the biomarkers in the weights. The results using weights that do so using inverse probability weights (IPW) are similar in nature. Incorporating non-response with IPW requires an assumption of selection on observables, which is very strong and unlikely to be met. Using more standard selection methods is best using exclusion restrictions, which we do not plausibly have.

virtually all sampled respondents do as well for the main questionnaire (Zhao et al., 2009). For the biomarkers there is nonparticipation, but we do not feel that we have any plausible instruments to use methods such as inverse probability weighting or more standard selection methods.

In this chapter, the data collected in module C, on health outcomes, and on biomarkers are used extensively. Specifically our health measures include body mass index (BMI), hypertension and under-diagnosis of hypertension, activities of daily living (ADLs), instrumental activities of daily living (IALDs), the CES-D 10 index of depression, a measure of word recall, survival expectations to age 75 (for those aged 65 and under), a general health measure and an indicator of current smoking.[4]

3. Results

BMI

We first examine body mass index (BMI), which is measured as weight (in kg) divided by height squared (in meters). Extreme values of BMI may be related to hypertension, diabetes and in general to higher adult mortality (Waaler, 1984). Across countries, the BMI distribution is shifted to the right for countries with higher incomes. Figure 1, which is reproduced from Strauss and Thomas (2008), demonstrates this, showing nonparametric relationships between BMI and years of schooling, for men and women aged 25-70 from 6 countries, ranging in GDP from Bangladesh to the United States.[5] China as of 1991 is included among these six countries and is closest in its BMI distribution to Indonesia. Note that for men, except in the US, BMI

---

[4] Heights were measured using a lightweight SECA aluminum height board, the SECA 214 portable stadiometer. Weights were measured using a portable digital scale, the Beaver Tech HTS7270. Blood pressure was taken with a digital meter, the Omron HEM 712c meter.

[5] The sources are the Matlab Health and Socioeconomic Survey, 1996; the China Health and Nutrition Survey, 1991; the Indonesia Family Life Survey, 2000; the South African Demographic Health Survey, 1998; the Mexican Family Life Survey, 2002 and the NHANES3 (National Health and Nutrition Examination Survey III), 1988-1994.

rises with more education. For women the story is quite different. Again, US and excepting, at low levels of schooling for women, BMI rises with education, but at higher levels, it falls. Bangladesh is an exception, BMI rises with female schooling, probably because women are still so close to levels of undernutrition. In the other developing countries, including China, the U-shape relation is apparent. It may be that at higher levels of female schooling, women recognize the health benefits of reducing their BMI. Why not men is a key question for future research.

Figure 2 shows CDFs for BMI for both men and women separately from the CHARLS pilot data. Above 18.5, the CDF for women lies below that for men. This means that whatever cutoff for overweight that one might pick, the proportion of the population age 45 and over that is overweight is higher for women than men. This is a common result often found for other countries, as indicated in Figure 1.

Table 1 shows mean BMI by age and sex group, as well as the fraction undernourished and overweight in each group. Overall 33% of women are overweight compared to 22% of men. Nearly 40% of women aged 55-64 are overweight, although one has to be careful because with a cross-section it is not possible to distinguish age from birth cohort effects. BMI tends to fall with age, though again, this most likely represents birth cohort effects as well. These proportions that are overweight compare quite closely with the elderly in Indonesia (see Witoelar et al., 2009). Note too that underweight is still a problem, and particularly so for the very elderly, those 75 years and over, for whom approximately 20% are underweight.

Figure 3 displays a nonparametric regression plot of BMI against own education with the CHARLS data. The plot mimics that in Figure 1 closely. For men, BMI rises monotonically with levels of education, while women have an inverted-U shape pattern. The elderly in China fit this inverted-U pattern. If we examine the prevalence of underweight and own education the relationship is monotonically negative for women and U-shaped for men (Figure 4). Here is the question is why the U-shape for men? At the moment we do not have a good answer. For overweight, the relationship is very similar to that for mean BMI (Figure 5).

Table 2 presents selected regressions for men, with those for women contained in Table 3. These regressions all have the same format. We start in column 1 with dummies for age group and education levels, with 45-54 and no schooling being the omitted groups. In addition to life-cyle progression, these age dummies will also capture birth year cohort effects. With only a cross-section, we cannot distinguish the two.[6]

Education may proxy for many factors. Education may capture allocative efficiency effects, but also income effects until we add income in the second column. Allocative efficiency effects may represent better information by better educated women and their better understanding of what health inputs to choose to ensure good health (Schultz, 1984). Of course education will also be correlated with preferences towards health perhaps in part due to more forward looking behavior. Since past health (which would be endogenous) is correlated with current health (see Barker, 1994; or Gluckman and Hanson, 2005, for good overviews) and is an omitted variable in our analysis, it may be that past health “caused” in part education attainment, so that causation is going in both directions (Smith, 2009).. [7]

---

[6] Cohort effects would arise because younger birth cohorts have more schooling and also faced better health conditions when they were babies and in the fetus, compared to older cohorts. There is an accumulation of evidence now that better health conditions when young are associated with better health in old age (for instance Barker, 1994; Gluckman and Hanson, 2005; and Strauss and Thomas, 2008, for an economist’s perspective).

[7] We tried a specification with interactions between level of schooling dummies and age to help get at causality (see Witoelar, Strauss and Sikoki, 2009, for such an exercise for Indonesia), but except for IADLs, these were generally not significant.

In column 2 we add a linear spline in log *percapita* expenditure, with a knot point at the median.[8] *PCE* is preferred to income because income is measured with much more error than *pce* especially in developing countries where much of income is not monetized. (see Lee, 2009, for instance) In addition, *pce* is a superior measure of long-run resources because it is smoothed in the face of annual income shocks. Income, or pce, is surely caused by health as well as being caused by it (Smith, 1999; Strauss and Thomas, 1995, 1998, 2008). Because of this, ne has to be careful of over interpretation of the relationship as implying one way causation. In Column 3 we add a dummy for living in a rural area and in column 4 we add fully interacted province rural dummies.[9]

Finally, in column 5 we replace province-rural/urban dummies with community fixed effects.[10] The idea here is that each community has factors that will affect health outcomes, that are not captured by the provincial dummies interacted with rural or urban. These factors will include health care prices, inherent healthiness of the area, public health infrastructure and other factors. F-tests for all combinations of dummy variables are reported as well.

Throughout this chapter, we use ordinary least squares for continuous dependent variables and linear probability model (LP) for binary dependent variables. LP model estimates are consistent for estimating average partial effects of the regressors, which is our main interest. Robust standard errors of the regression coefficients are computed, that also allow for clustering

[8] A linear spline allows different slopes to the left and right of the knot point with the two lines being joined at the knot point. The first coefficient reported is the slope to the left of the knot point and the second coefficient is the change in the slope from the left hand portion.

[9] The rural definition we use in this paper is the State Bureau of Statistics (SBS) definition. Some of the SBS urban communities are in fact rural in nature and many of their populations are farmers with rural hukou.

[10] It is necessary for binary dependent variables that each community contains a mixture of 1s and 0s in order for the community dummy coefficient to be identified. Because of small cell sizes, for some communities, this required us to aggregate communities to a higher level so that this condition was met.

at the community level. By using robust standard errors for the linear probability regressions, we ensure that these standard error estimates are consistent (Wooldridge, 2002).

BMI declines for men over 65 years and women over 75, which could be an age or a birth cohort effect. Own education is not significantly correlated with BMI for men, though it is positively correlated for women. For women education coefficients display the inverted U pattern seen in the Figures. They are positive though not significant for can read and write, and rise in magnitude and become significant for completed primary, but then fall to near zero for junior high and above.

Log *pce* is strongly, positively related to BMI for men, with p-values less than .05 in all cases, and less than .001 except for when community fixed effects are added. For women, *pce* is only weakly related to BMI. Notice that for men and women, the coefficient on *pce* for low levels drops roughly in half once community fixed effects are added. This is a pattern that we will see consistently throughout these results in this chapter. Evidently something about the community is strongly correlated with household *pce*. Rural and province rural/urban dummies are significant for both men and women, as are the community dummies in the community fixed effect models.[11] [12]

Hypertension and its under-diagnosis

Respondents who had biomarker measurements were measured three times for blood pressure. We take the mean of systolic and diastolic measurements separately and then form a

[11] With community fixed effects, testing the joint significance of the community dummies is not straightforward. Because there are in our case few observations per cluster, we cannot cluster the standard errors after estimation using community fixed effects and use an F-test to test for the joint significance of clusters (Wooldridge, personal communication). To test the community dummies we reestimate the model with community dummies and just robust standard errors, without clustering, and do the F-test.

[12] It could be that the significance of the community dummy variables represents the impact of province and rural/urban location. This is not the case for our results. When we stratify the sample by the two provinces and run community fixed effects within each, the community dummies are still generally significant. Results are available upon request.

variable for being hypertensive if the mean systolic is 140 or greater or the mean diastolic is 90 or greater. These are the conventional cutoffs for hypertension diagnosis. Figure 6 shows that women are more prone to be hypertensive than are men at all ages, and that hypertension is strongly increasing with age for both genders. Table 4 presents the descriptive results of the percent who are hypertensive by gender and age. Overall half of women and 40% of men over 45 years measure to have hypertension, but among those over 75, almost 2/3 of men and over ¾ of women are hypertensive.

Tables 5 and 6 display the regressions predicting being hypertensive for men and women respectively. For men and women, only age and community dummies are significantly related to hypertension. There are no schooling or income effects. It is a bit surprising perhaps that hypertension is not related to SES in the CHARLS data. It turns out the same is true for the IFLS data for Indonesia. Both contrast to the US and England where studies have shown a negative correlation between education and hypertension (Banks et al, 2006).

Hypertension turns out to be a good example of the high degree of under-diagnosis of disease among the elderly in China. In addition to taking actual measurements of blood pressure, each respondent was asked if a doctor has diagnosed them with a series of chronic diseases or conditions, including hypertension. Table 7 contains these results. Hypertension is the most prevalent of the conditions that respondents report having been diagnosed. If a respondent answers yes, we ask a series of follow-up questions including whether they are currently taking medications. Respondents who are taking medications may not measure above the hypertensive diagnostic threshold if the medication is working well. To arrive at a complete list of people who are hypertensive, we add to those whom we measure as hypertensive, those who report being diagnosed by a doctor but whom we did not measure as being hypertensive. We then calculate the proportion of those who are hypertensive who report not being diagnosed.

Our results are shown in Table 8. Some 47% of men and 42% of women are estimated to be under-diagnosed by this method. This seems quite large, although estimates for Indonesia are much higher, 74% for men and 62% for women (Witoelar et al., 2009). One interpretation is that the health system in China, at least in Zhejiang and Gansu, are not set up to focus on chronic conditions of the elderly, perhaps because the emphasis is on infectious disease and on children and mothers. Additional research will be required to examine this issue more properly.

In addition to undiagnosed disease, another key health issue is good adherence to treatment when the disease is diagnosed (Goldman and Smith, 2002). Table 9 shows that 71% of men and 80% of women who have hypertension by our definition and have been diagnosed, are taking medications. Thus conditional on being diagnosed a preponderance of respondents are taking medications. However, those who are undiagnosed are not.

In Tables 10 and 11, using the sample of men and women who have measured or self-reported diagnosis of hypertension, we regress a dummy of being under-diagnosed on the same set of covariates used in the other regressions. For men, being over 55 makes it less likely to be under-diagnosed. Having junior high school or more education is negatively related to under-diagnosis and weakly significant (at the 10% level), although the education dummies jointly, are not significant. Log *pce* is not significant either. These results imply that personal attributes appear not be be the principal drivers of undiagnosed disease.

The community fixed effects and province-rural/urban dummies are, however, strongly jointly significant. For women, however, the education dummies are negatively related to under-diagnosis and are jointly significant in all specifications except when we add the community fixed effects. Again, as for men, community dummies are jointly significant at standard levels of statistical signficance. These strong community effects imply that is something about the community that is driving the degree of under-diagnosis, though in the case of women, having more education makes under-diagnosis of hypertension less likely. This is arguably an allocative efficiency effect of schooling on health probably due to better educated women going to the doctor more often, because they have the health knowledge to do so (see for instance, Schultz, 1984; Thomas et al., 1991), though we cannot test that exactly.

ADLs and IADLs

Table 12 contains the fraction of respondents who say they have some difficulties with activities of daily living (ADLs) or instrumental activities of daily living (IADLs).[13] Some 8.7% of men and 12% of women report having trouble with at least one ADL and 17.8% of men and 31.3% of women report having difficulty with at least one IADL. Not surprisingly, these proportions rise strongly with age. Figures 7 and 8 display non-parametrically by education level, the average number of ADLs and IADLs that men and women report having difficulties in performing. For both ADLs and IADLs, the mean number that respondents have difficulty with declines with higher schooling.

Regressions for the number of ADLs and IADLs that men and women report having difficulties in performing are reported in Tables 13-16. For both men and women, age group dummies are significant for both ADLs and IADLs. Respondents in Gansu, the poor rural province, report more .2 extra ADLs with which they have trouble.

[13] Our physical activities and ADL assessments include: walking for 100 meters; stooping, kneeling, crouching; extending arms above shoulder level; lifting weights like a heavy bag of groceries; picking up a small coin from a table; climbing several flights of stairs without help, to stand from sitting position without help, dressing without help; bathing or showering; cutting food and eating; going to the bathroom without help (including sitting down and getting up); controlling urination and defication; and getting into and out of bed. The IADL assessments are having difficulties with doing household chores; preparing hot meals; shopping for groceries; managing money; making phone calls (if they have a phone) and taking medications.

Once again, community dummies are jointly significant. Interestingly education and *pce* are not significant for either men or women for ADLs. For IADLs the results are quite different. Now education and pce are both significantly correlated, negatively with the number of IADLs.. In the case of men, a little bit of schooling (knowing how to read or write, but less than completing primary school) is enough to get this impact; more schooling than that does not add any more protection. For women, schooling levels above knowing how to read or write is a bit helpful, but not much. Once again the big jump is for knowing how to read and write. Log pce is negative and significant and is apparently linear in its relationship. However, once the community fixed effects are added, these coefficients fall in half and are no longer significant for men, and barely so for women.

Depression

As a measure of mental health, respondents were administered a self-reported depression scale from the short 10 question version of the CES-D Scale, one of the major international scales of depression used in general populations. Higher scores on the CES-D scale indicates a greater likelihood of having depression.[14] While some recent studies have failed to find a relationship between depression and education or income (see Das, Do, Friedman, McKenzie and Scott, 2007, for a review of several recent studies sponsored by the World Bank), most other studies have found negative correlations between education or income and CES-D scores (for example, Patel and Kleinman, 2003, and Lee and Smith, 2008). Of course at least for income, these studies may not show causality, which can run in both directions. However, Friedman and

[14] The answers for CES-D are on a four-scale metric, from rarely, to some days (1-2 days), to occasionally (3-4 days) to most of the time (5-7 days). We score these answers in the way suggested by the Stanford group that created the CES-D, using numbers from 0 for rarely to 3 for most of the time, for negative questions such as do you feel sad. For positive questions do you feel happy, the scoring is reversed from 0 for most of the time to 3 for rarely.

Thomas (2008) using a difference in difference approach with IFLS data find that the economic crisis fueled depression indicators in Indonesia, especially for the more vulnerable population.

Figure 9 displays a nonparametric regression between the CES-D score and age, for both men and women. As one can see, women have higher scores, indicating more depressive symptoms, but the male-female gap narrows at older ages.

Tables 17 and 18 contain regression results for men and women where the outcome is the CESD-10 score. Education dummies are jointly significant for women, but not for men. Having a junior high school level education is associated with a lower CES-D score by over 2.4-3 points for women, a considerable amount. Log *pce* is also associated with lower CES-D scores for both men and women, and the impact is concave, being reduced at higher levels of *pce*. However, the impact of *pce* goes away when the community fixed effects are added. The community fixed effects are strongly significant. The SES results are quite similar to the Indonesia results from IFLS of Witoelar et al. (2009) and suggest that in Gansu and Zhejiang, depressive symptoms are strongly correlated with schooling and less so with income,

Cognition- Word recall

Cognition has been found to be an important issue among the elderly (see McArdle, Fisher and Kadlec, 2007). We use immediate and delayed word recall as our cognitive measure, namely the episodic memory measure. In CHARLS, like HRS, respondents are read a list of ten simple nouns and they are immediately asked to repeat as many as they can, in any order. After answering the 10 CES-D questions, plus some additional cognition questions on subtraction, maybe ten minutes later, respondents are then asked again to repeat as many words as they can. We use the average number of correctly immediate and delayed recalled words as our memory measure (see McArdle, Smith and Willis, 2009).

Figure 10 displays the mean number of words recalled by men and women, by age. Word recall declines linearly with age. Some of this shape may also be caused by schooling being negatively correlated with age; regressions will thus be important to retrieve multivariate correlations. Men are better able to recall than women, which could be a function in part, of having more education. Indeed, in Figure 11, when we plot word recall against own education, women appear to recall better than men. For both genders, the gradient is strongly positive- that is the better educated recall more words. In this figure, holding constant education, men will tend to be older than women, which would reduce their recall. So it is very important to look at regressions to disentangle these effects.

Tables 19 and 20 contain regression results on word recall for men and women. The SES coefficients are positively correlated with word recall and strongly significant in almost all cases. Age dummies are significantly negatively correlated . Education at the junior high or above level for men is associated with a 1.5 higher number of words recalled, for women the marginal effect is quite similar. Log pce is also highly correlated with word recall, although the direction of causality is much less clear. It is also the case for women that this correlation disappears when community fixed effects are added. The community dummies are jointly significant for both men and women. These results are consistent with the results of McArdle et al., 2009, for the HRS data where word recall is highly correlated with educational attainment.

Survival expectations

In CHARLS, as in the HRS, we ask respondents about the chances that they will live to a particular age. Respondents answer on a 5 point scale, from 1 which means almost no chance, to 5 which means virtual certainty. The scales are pictorially presented to the respondents as being equally spaced. We do not ask probabilities directly since our pretest experience, and experience in other low-income countries indicated a real difficulty for respondents to understand probabilities. Experience with HRS and other aging surveys has shown that answers to this question are highly correlated with survival to subsequent waves (for example see Banks et al., 2009).

The future age about which each respondent is asked depends on their current age, older respondents are asked about survival to older ages. That raises an issue that answers across respondents asked about different ages may not correspond well. Here we take respondents under age 65, all of whom were asked about survival to age 75, so that this issue does not arise. We construct our variable as whether the respondent thinks it is not very likely, or almost impossible, to reach age 75; the two lowest scores. Table 21 shows the results for men and women, separately and Figure 12 displays the results by level of education. Roughly 20% of men and women consider their chances to reach age 75 to be not very likely or nearly impossible. When we look by education, we see that for illiterate men and women 30% believe their chances of survival to age 75 are very unlikely or near impossible, but that declines to 10% of women and 20% of men with junior high education and above. Interestingly, women with low levels of schooling do not appear to understand that their (unconditional) older age mortality is lower than for men, although women with junior high school or more education apparently do.

Regression results are displayed in Tables 22 and 23. For men, higher education is associated with a higher chance of survival, but the correlation is strongest for men with primary schooling, not junior high and above. Log *pce* is positively related to survival expectations, but only until we add the regional dummies or community fixed effects, in which case the coefficient magnitudes drop towards zero and their significance disappears. For women, there are stronger education correlations than for men, which are mitigated when regional or community fixed effects are added. In those specifications, it is only having junior high school or greater schooling that matters. Log *pce* also dissipates in its regression coefficient as regional or community fixed effects are added. Community dummies are jointly highly significant for both men and women.

General health

CHARLS followed the HRS example and asked respondents to assess their general health using two different scales: excellent, very good, good, fair, poor and very good, good, fair, poor, very poor. One was asked at the start of the health section, section CA, and one at the end of that section. Whether a respondent was asked one or the other first was determined randomly by CAPI. Here we use the excellent, very good, good, fair, poor scale. We look at whether respondents report poor health, as our variable of interest. Table 24 displays all the answers. About 19% of men and 27% of women report that they are in poor health. Note that the fraction of respondents reporting fair health is quite high, 40%. This is one reason why we do not combine fair and poor health as is done often in US studies. Apparently "fair" translates in Chinese to a word which is very commonly answered.

Figure 13 plots the proportion of respondents who answer poor, by age, for men and women. As is common, women are more likely to report being in poor health and the proportion reporting themselves to be in poor health rises with age. Figure 14 shows the bivariate relationship with education. As expected, better educated men and women report less being in poor health. The male-female differences narrow with the by education results because at each level of education, men are older than women.

Tables 25 and 26 show regression results for men and women. For men, education is not significantly related to reporting being in poor health, but log *pce* is, negatively. The *pce* relation is non-linear, with *pce* making most if its difference at higher levels of *pce*. Note, once again, that when province-rural/urban dummies are added, or when community fixed effects are used, that the pce coefficients move towards zero and are not significant.

For women, the *pce* results are qualitatively similar to the male results. Education dummies are now significant, being negatively correlated with reporting being in poor health. However, when the province or community dummies are added only the junior high or above retains its significant correlation, and the coefficients collapse with both province-urban/rural dummies and community fixed effects significant. Respondents living in Gansu province are much more likely to report being in poor health. Some of this Gansu effect could represent different subjective scales being used in Gansu than in Zhejiang. But it is more than a Gansu effect, because when the community fixed effect specification is run by province, the community dummies are jointly significant within the Gansu regression. That means that there is considerable heterogeneity within Gansu but across communities in the propensity to report being in bad health.

Smoking

There is one health input that we examine in this paper, smoking. As in other Asian countries, smoking is a male issue (for evidence in China see Lance et al., 2004 and Kenkel et al., 2009, which find that cigarette demand is price inelastic). Table 27 displays the percent of respondents who currently smoke by age and gender. For women, current smoking rates are only 2% while it is 52% for men.[15] In Figure 15 we plot non-parametrically both the proportions who ever smoked and who are currently smoking, by age, for men. There is a small downward trend in ever smoking by age, which must represent a birth cohort effect. However the vertical

[15] Here smoking is defined as smoking cigarettes or cigars. Current smoking prevalence for older men in CHARLS is quite close to rates of 55% reported from the China Health and Nutrition Survey (CHNS), for other provinces; see Kenkel et al.(2009). The CHNS rates are for all adult ages.

distance between ever and current smoking is growing by age, which indicates that there is quitting going on at older ages.

Table 28 shows regression results for current and ever smoking for men. For ever smoking, we use only the age (birth cohort) and education dummies. Since factors apparent when the respondent was young are the ones that would be most correlated with ever smoking, we drop income variables and community or province dummies based on current residence. The education coefficients are positively correlated with ever smoking, but they are not significant at standard levels. Older cohorts are less likely to have ever smoked. This could also represent a mortality selection effect, as it may be that older smokers died prior to the CHARLS pilot survey. There is no relation between current smoking and education, but *pce* does have a positive one with higher income men are more likely to be smokers. ,At low levels of economic development, smoking and income are often positively correlated, but this reverses at high levels of development. The province-rural/urban dummies make no difference, but the community dummies do. Once again there is variation between communities and within province that is important.

4. Conclusions

China has undergone a significant health and nutrition transition such that under-nutrition is very much less of a problem for the elderly than it had been in the past and over-nutrition has become much more of an issue. In Zhejiang and Gansu provinces, where the CHARLS pilot was fielded, health conditions of the elderly, such as having difficulties with ADLs and IADLs, having depressive symptoms, word recall cognition and general health are all correlated with education, especially for women and to some degree for men as well; with better education being associated with better health outcomes. On the other hand, BMI is positively correlated with income and with education for men, while for women education has an inverted-U relationship with BMI. The latter may be consistent with the hypothesis that women are more likely than men to understand the relationships between BMI and future health problems, but this will require more research. The correlations of health measures with income, as measured by *percapita* expenditure, are more mixed. On the one hand, *pce* is positively correlated with some health measures, such as BMI, IADLs, word recall and self-reported general health, but many times that correlation shrinks and becomes insignificant when community dummies are entered into the regressions.

One of the most important findings in this analysis is the apparent importance of regional and community factors. What exactly lies behind this is not yet clear and needs to be the subject of future research. From economic theory there are a number of factors that should be part of the story. Prices of health inputs is surely one such factor, as should be the availability and quality of health care services. Public health infrastructure should be another such factor, as should the inherent healthiness of a community due to factors like water, sanitation and air quality. Different and changing food or diet preferences are also no doubt related to these findings. Given the strength of the relationships, however, it may well be that there are other community influences that are important, perhaps including factors that related to social interaction and stress, that are particularly important in China. However at this point, all of these hypotheses represent speculation.

The other important finding in this research is the large-scale under-diagnosis of hypertension, which is correlated positively with education, at least for women and with community location for both men and women. This represents a major health system gap and one which is probably more serious for other, less prevalent, chronic conditions of the elderly. This problem is certainly not unique to China and seems to exist in other countries that are still in the midst of the health transition from infectious to chronic diseases. Health systems in such health transition countries apparently take time to re-orient their systems to diagnose and treat chronic diseases of the aging and aged. This is an important step that the Chinese health system will need to work out in the future.

References

Banks, James, Michael Marmot, Zoe Oldfield, and James P. Smith. 2006. "Disease and Disadvantage in the United States and in England," *Journal of the American Medical Association*, 295(17):2037-2045.

Banks, James, Alastair Muriel and James P. Smith, 2009. “Disease prevalence, incidence and determinants of mortality in the United States and England”, manuscript, Department of Economics, University College London.

Barker, David, 1994. *Mothers, babies and health in later life*, London: BMJ Publishing Group.

Börch-Supan, Axel, Agar Brugiavini, Hendrik Jürges, Arie Kapteyn, Johan Mackenbach, Johannes Siegrist, Guglielmo Webger, 2008. *First Results from the Survey of Health, Ageing and Retirement in Europe (2004-2007).* Mannheim Research Institute for the Economics of the Aging (MEA).

Das, Jishnu, Quy-Toan, Do, Jed Friedman, David McKenzie, and Kinnon Scott, 2007. “Mental health and poverty in developing countries”, *Social Science and Medicine*, 65(3):467-480.

Friedman, Jed and Duncan Thomas, 2008. “Psychological health, before, during and after an economic crisis: Results from Indonesia 1993-2000”, *World Bank Economic Review*, 23(1):57-76.

Goldman, Dana and James P. Smith. “Can Patient Self-Management Help Explain the SES Health Gradient?” *Proceedings of the National Academy of Sciences* 99(16):10929-10934, August 6, 2002

Gluckman, Peter and Mark Hanson, 2005. *The fetal matrix: Evolution, development and disease*, Cambridge

Hossain, Shaikh. 1997. “Tackling health transition in China”, Policy Research Working Paper No. 1813, Washington D.C.: World Bank.

Kenkel, Don, Dean Lillard and Feng Liu. 2009. “An analysis of life-course smoking behavior in China”, *Health Economics*, 18:S147-S156.

Kinsella, Kevin and Wan He, 2009. *An aging world: 2008*, US Census Bureau, International Population Reports, PS95/09-1, Washington D.C.: US Government Printing Office.

Lance, Peter, John Akin, William Dow and C Loh. 2004. “Is cigarette smoking in poorer nations sensitive to price?: Evidence from Russia and China”, *Journal of Health Economics*, 23:173-189.

Lee, Nayoung. 2009. "Measurement error and its impact on estimates of income and consumption dynamics", mimeo, Department of Economics, Chinese University of Hong Kong.

Lee, Jinkook and James P. Smith . 2008. "Explanations for Education Gradients in Depression—The Case of Korea," mimeo, RAND Corporation, Santa Monica, CA.

Lopez, Alan, Colin Mathers, Majid Ezzati, Dean Jamison and Christopher Murray. 2006. "Measuring the global burden of disease and risk factors, 1990-2001", in A. Lopez, C. Mathers, M. Ezzati, D. Jamison, and C. Murray (eds.), *Global Burden of Disease and Risk Factors*, Oxford: Oxford University Press.

Luo, Zhehui. 2003. "Socioeconomic determinants of body mass index of adults Chinese in 1990s", presented at the Northeast Consortium Development Conference (NEUDC), October 2003. mimeo, Department of Epidemiology, Michigan State University.

McArdle, John, Gwenith Fisher and Kelly Kadlec, 2007. "Latent variable analysis of age trends in tests of cognitive ability in the Health and Retirement Survey, 1992-2004", *Psychology and Aging*, 22(3):525-545.

McArdle, John, James P. Smith and Robert Willis, 2009. "Cognition and economic outcomes in the Health and Retirement Survey", manuscript, RAND Corporation, Santa Monica, CA.

Patel, V. and A. Kleinman, 2003. "Poverty and common mental disorders in developing countries", *Bulletin of the World Health Organization*, 81(8):609-615.

Popkin, Barry, Keyou Ge, Fengying Zhai, X Guo, H Ma and N Zohoori. 1993. "The nutrition transition in China: A cross-sectional analysis", *European Journal of Clinical Nutrition*, 47:333-346.

Popkin, Barry, 1994. "The nutrition transition in low-income countries: An emerging crisis", *Nutrition Reviews*, 52(9):285-298.

Popkin, Barry, Sahasporn Paeratakul, Fengying Zhai and Keyou Ge. 1995a. "A review of dietary and environmental correlates of obesity with emphasis on developing countries", *Obesity Research*, 3(S2):S145-S153.

Popkin, Barry, Sahasporn Paeratakul, Fengying Zhai and Keyou Ge. 1995b. "Dietary and environmental correlates of obesity in a population study of China", *Obesity Research*, 3(S2):S135-S143.

Popkin, Barry. 1999. "Urbanization, lifestyle changes and the nutrition transition", *World Development*, 27(11):1905-1916.

Popkin, Barry. 2002. "The shift in stages of the nutrition transition in the developing world differs from past experiences", *Public Health Nutrition*, 5(1A):205-214.

Smith, James P. 1999. "Healthy bodies and thick wallets: The dual relation between health and economic status", *Journal of Economic Perspectives*, 13(2):145-167.

Smith, James P. 2009 "The Impact of Childhood Health on Adult Labor Market Outcomes," *Review of Economics and Statistics* 91(3):478-489.

Schultz, T. Paul. 1984. "Studying the impact of household economic and community variables on child mortality", in W.H. Mosely, and L. Chen (eds.), *Child Survival: Strategies for Research*, *Population and Development Review*, 10(Supplement):215-236.

Strauss, John and Duncan Thomas, 1995. "Human resources: empirical modeling of household and family decisions", in J.R. Behrman and T.N. Srinivasan (eds.), *Handbook of Development Economics*, *Volume 3A*, Amsterdam: North Holland Press.

Strauss, John and Duncan Thomas. 1998. "Health, nutrition and economic development", *Journal of Economic Literature*, 36(3):766-817.

Strauss, John and Duncan Thomas. 2008. "Health over the life course", in T.P. Schultz and J. Strauss (eds.), *Handbook of Development Economics, Volume 4*, Amsterdam: North Holland Press.

Thomas, Duncan, John Strauss and Maria-Helena Henriques. 1991. "How does mother's education affect child height?", *Journal of Human Resources*, 26(2):183-211.

UNICEF. 2009. *China Statistics*, www.unicef.org/infobycountry/china_statistics.html.

Wagstaff, Adam, Winnie Yip, Magnus Lindelow and William Hsiao. 2009. "China's health system and its reform: A review of recent studies", 18:S7-S23.

Waaler, Hans. 1984. "Height, weight and mortality: The Norwegian experience", *Acta Medica Scaninavica*, 215(S679):1-56.

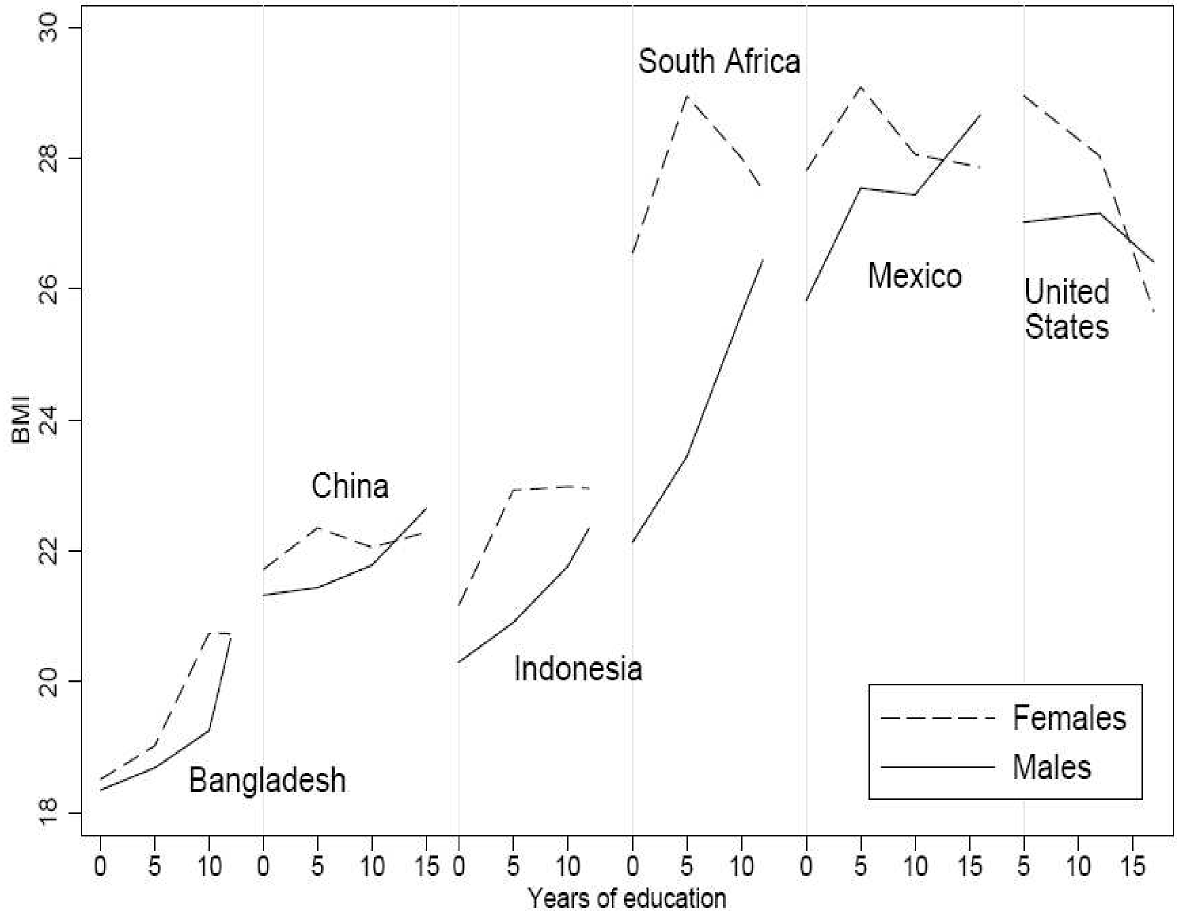
Witoelar, Firman, John Strauss and Bondan Sikoki 2009. "Socioeconomic success and health in later life: Evidence from the Indonesia Family Life Survey". mimeo, University of Southern California.

World Bank. 2009. *From Poor Areas to Poor People: China's Evolving Poverty Reduction Agenda*, Washington D.C.: World Bank.

World Health Organization. 2009. *China*, WHO Country Health Information Profiles.

Zhao, Yaohui, John Strauss, Albert Park and Yan Sun. 2009. "China Health and Retirement Longitudinal Study User's Guide", China Center for Economic Research, Peking University.

Figure 1
Relationship Between BMI and Education in Selected Countries



Reproduced from Strauss and Thomas (2008).

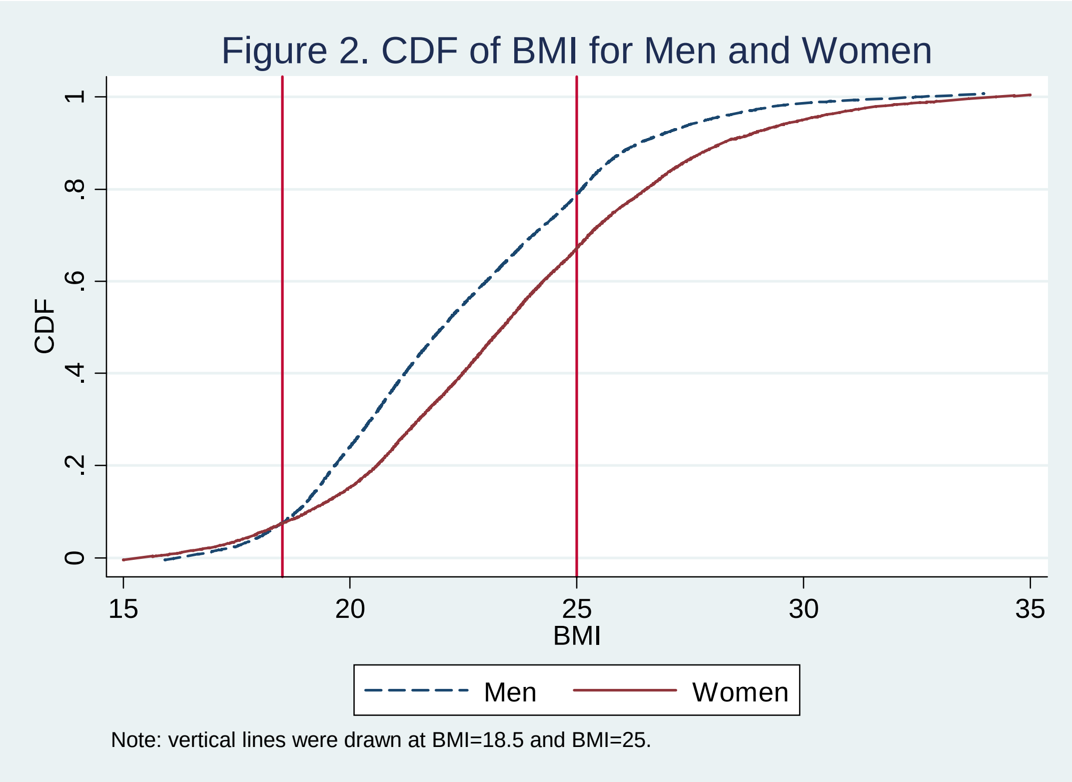


Figure 2. CDF of BMI for Men and Women
CDF
0
.2
.4
.6
.8
1
15
20
25
30
35
BMI
Men
Women
Note: vertical lines were drawn at BMI=18.5 and BMI=25.

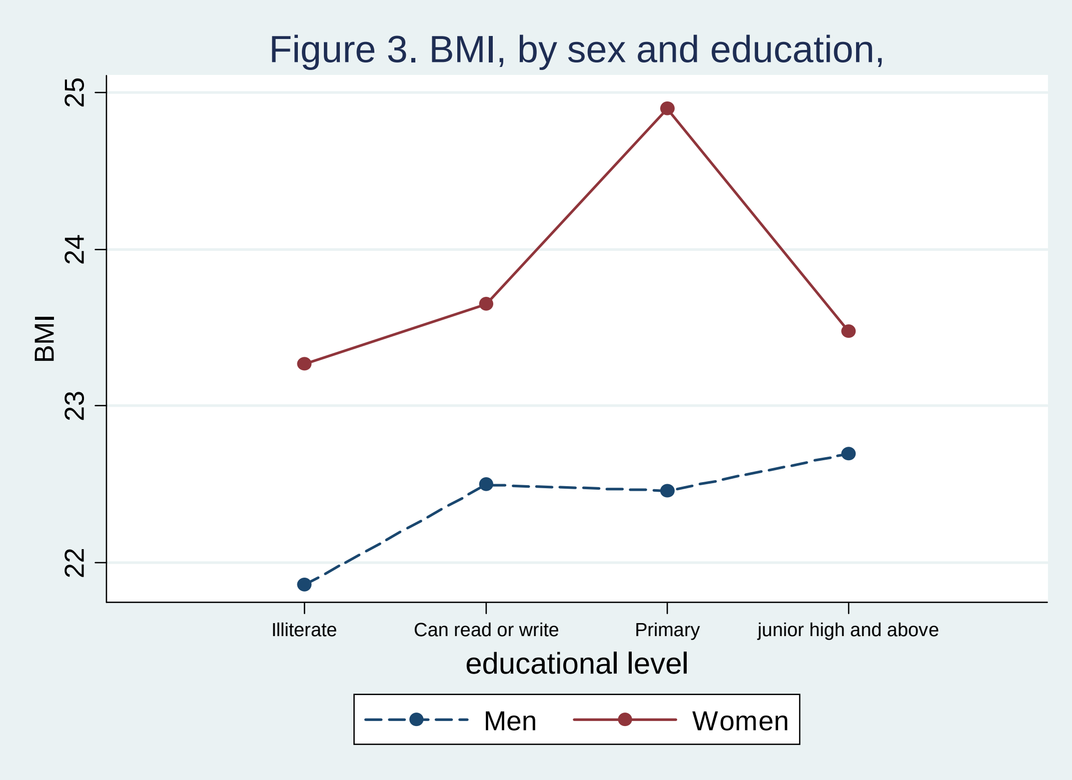


Figure 3. BMI, by sex and education,
BMI
25
24
23
22
Illiterate
Can read or write
Primary
junior high and above
educational level
Men
Women

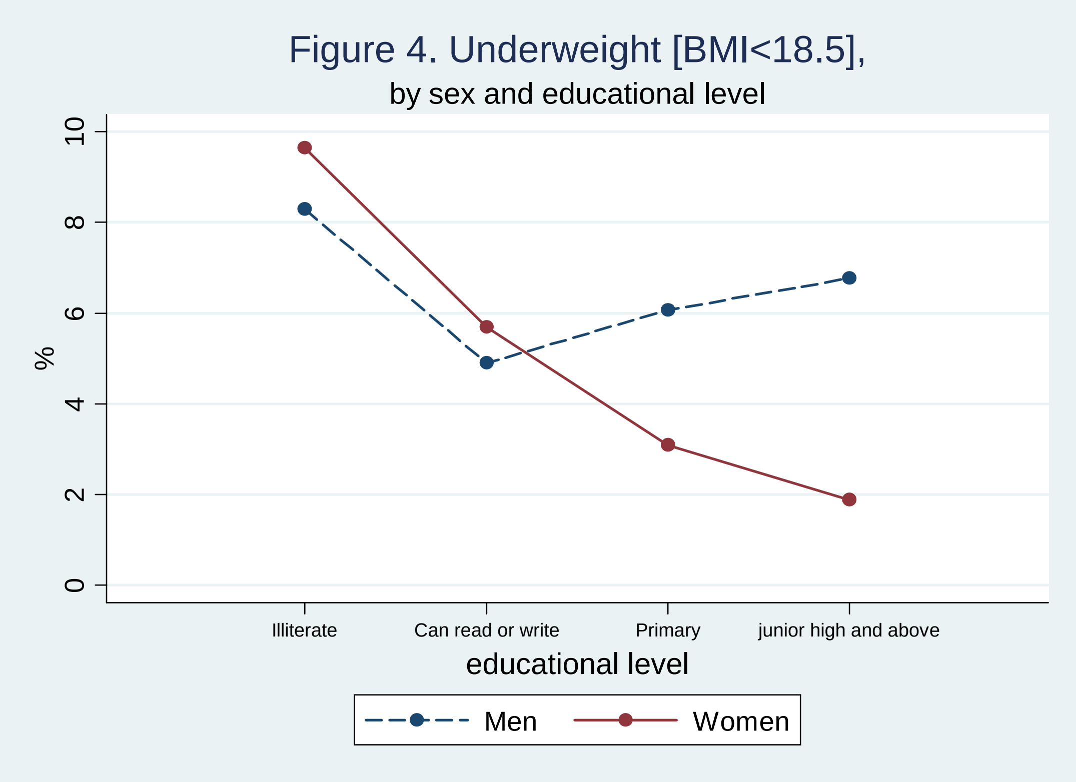


Figure 4. Underweight [BMI<18.5],
by sex and educational level
%
0
2
4
6
8
10
Illiterate
Can read or write
Primary
junior high and above
educational level
Men
Women

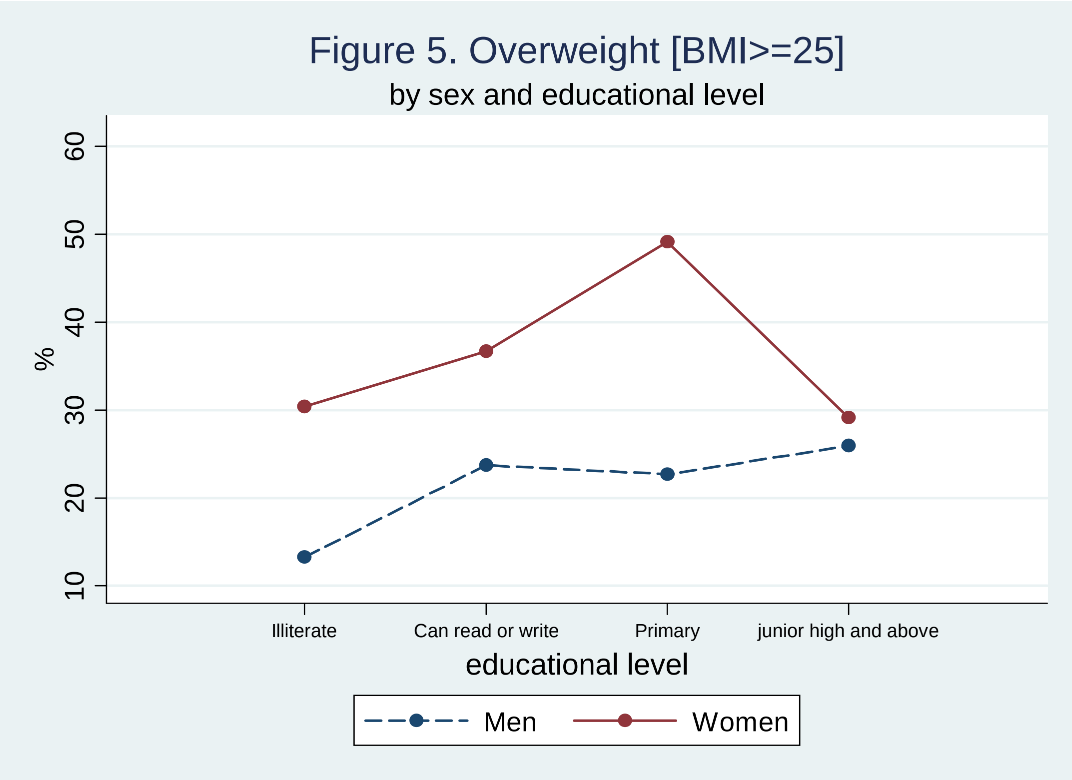


Figure 5. Overweight [BMI>=25]
by sex and educational level
%
10
20
30
40
50
60
Illiterate
Can read or write
Primary
junior high and above
educational level
Men
Women

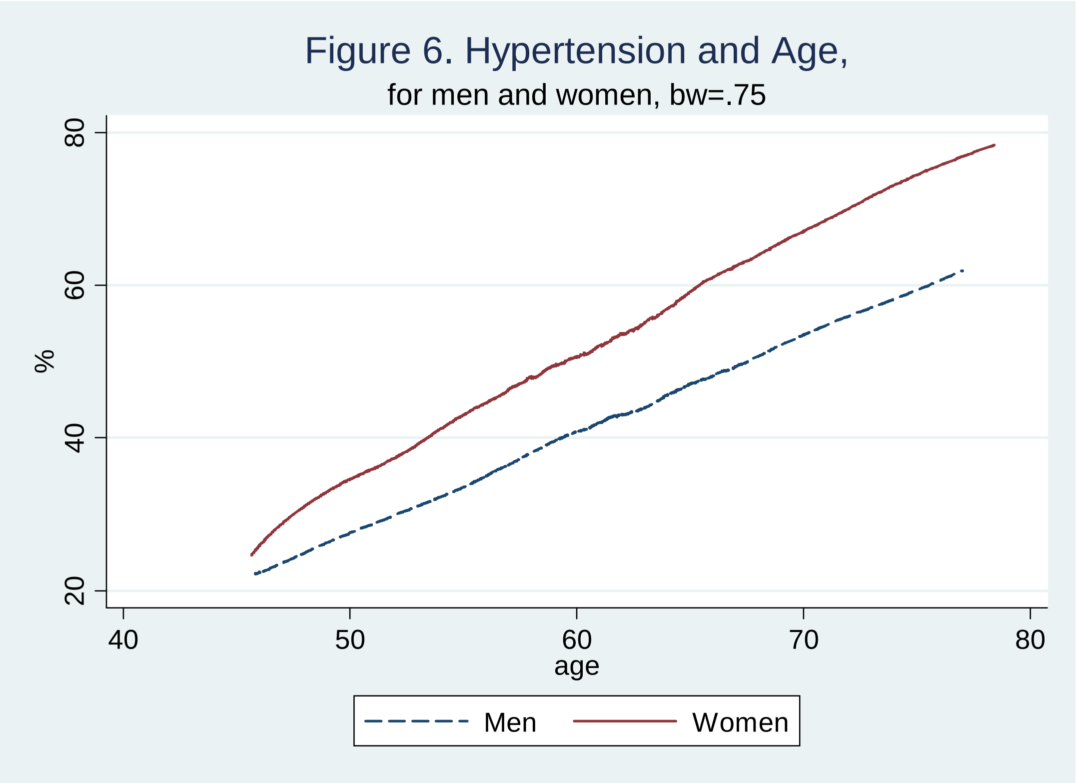


Figure 6. Hypertension and Age,
for men and women, bw=.75
%
20
40
60
80
40
50
60
70
80
age
Men
Women

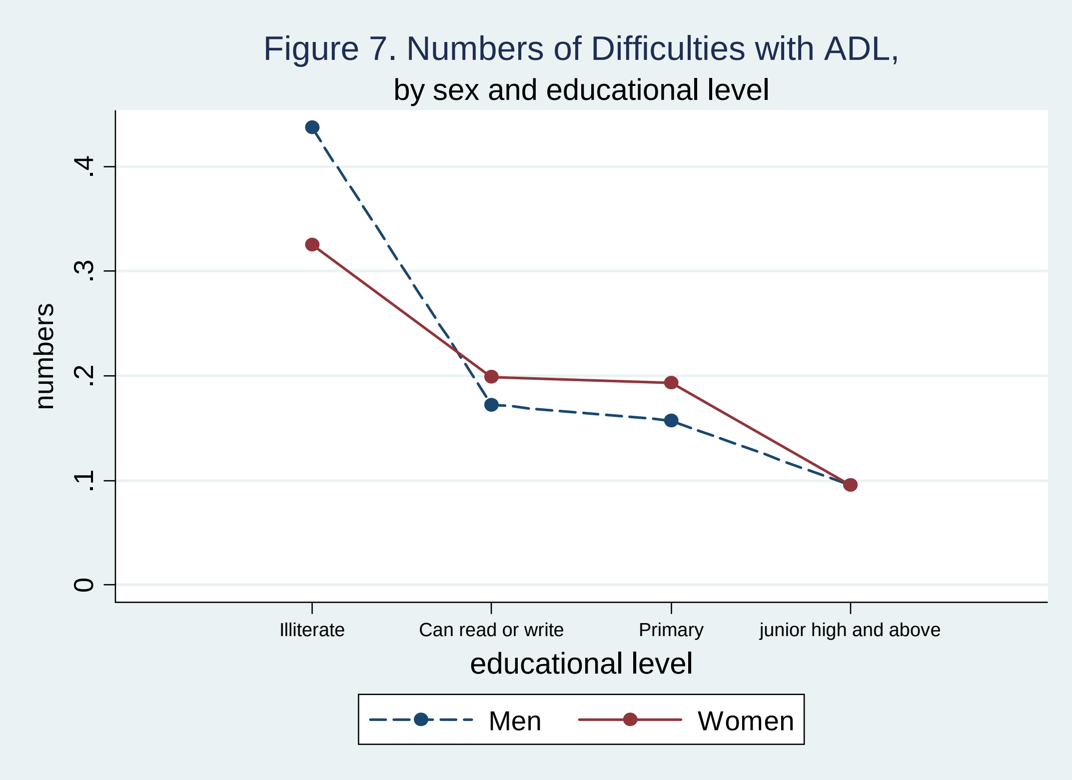


Figure 7. Numbers of Difficulties with ADL,
by sex and educational level
numbers
0
.1
.2
.3
.4
Illiterate
Can read or write
Primary
junior high and above
educational level
Men
Women

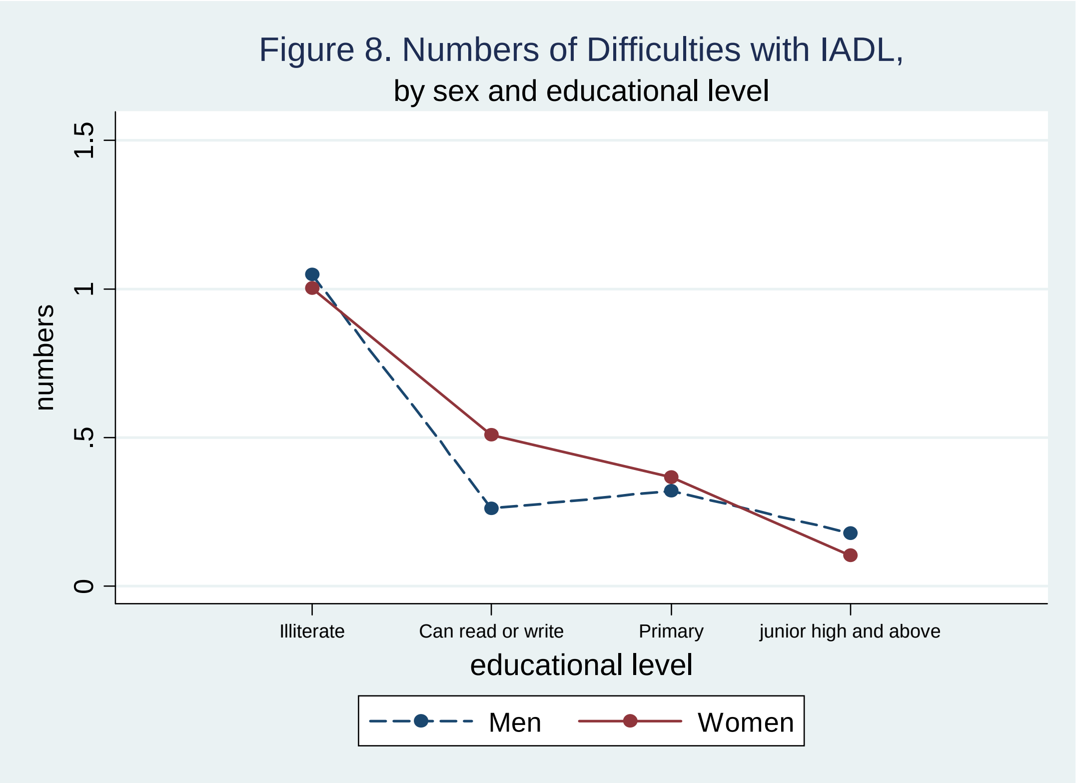


Figure 8. Numbers of Difficulties with IADL,
by sex and educational level
numbers
0
.5
1
1.5
Illiterate
Can read or write
Primary
junior high and above
educational level
Men
Women

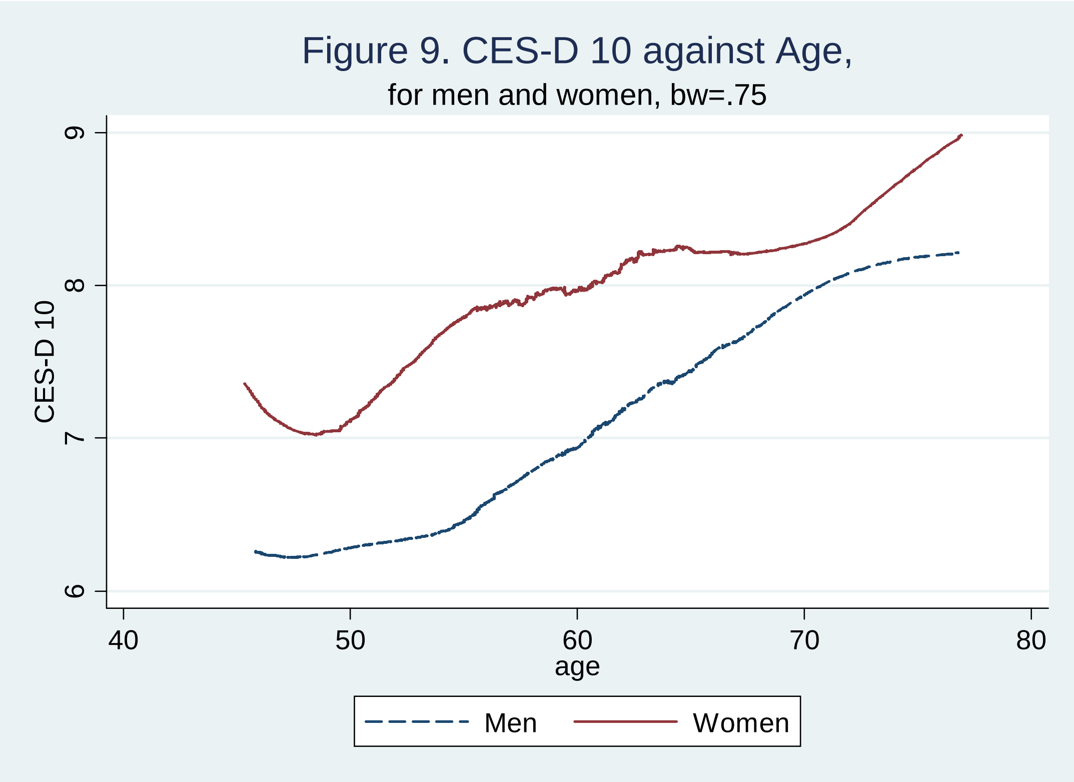
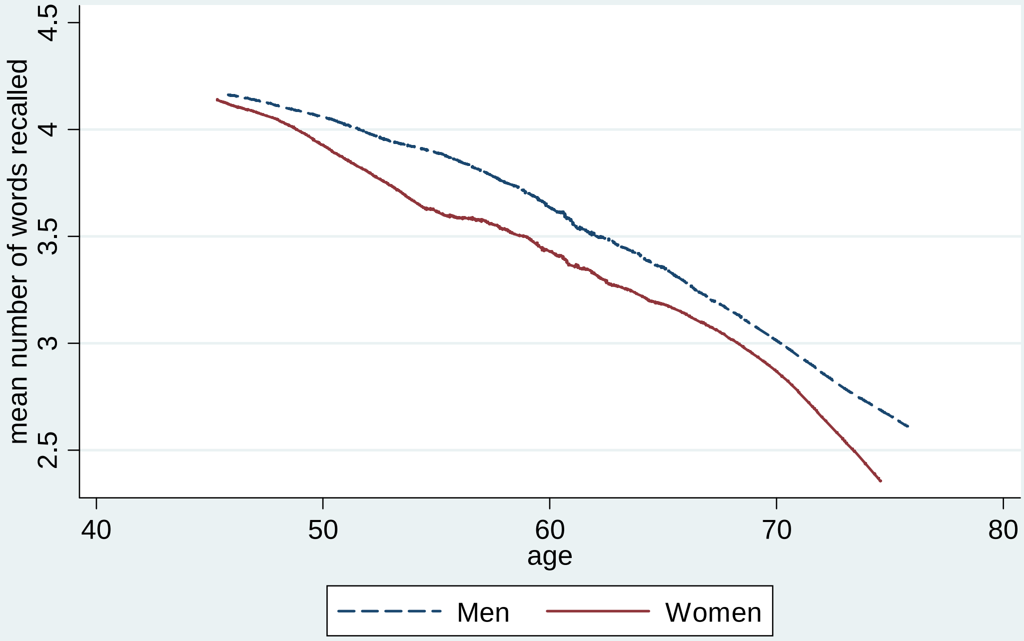


Figure 9. CES-D 10 against Age,
for men and women, bw=.75
CES-D 10
6
7
8
9
40
50
60
70
80
age
Men
Women

Figure 10. Number of Words Recalled against Age,
for men and women, bw=.75



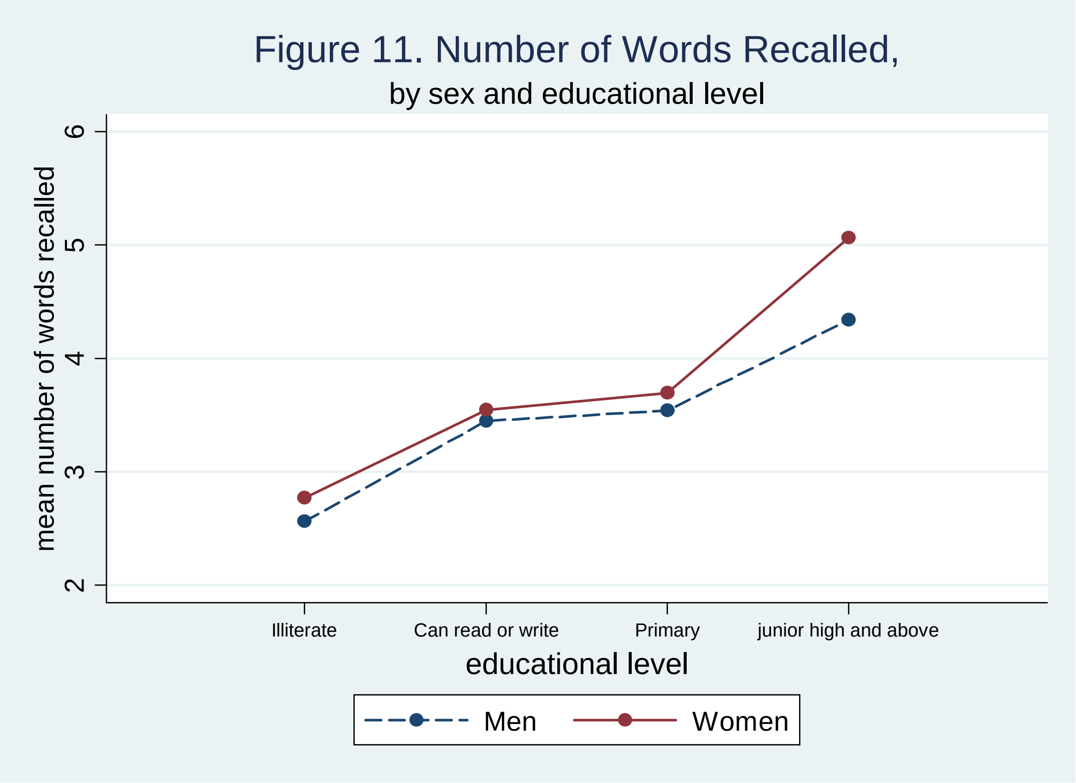


Figure 11. Number of Words Recalled,
by sex and educational level
mean number of words recalled
2
3
4
5
6
Illiterate
Can read or write
Primary
junior high and above
educational level
Men
Women

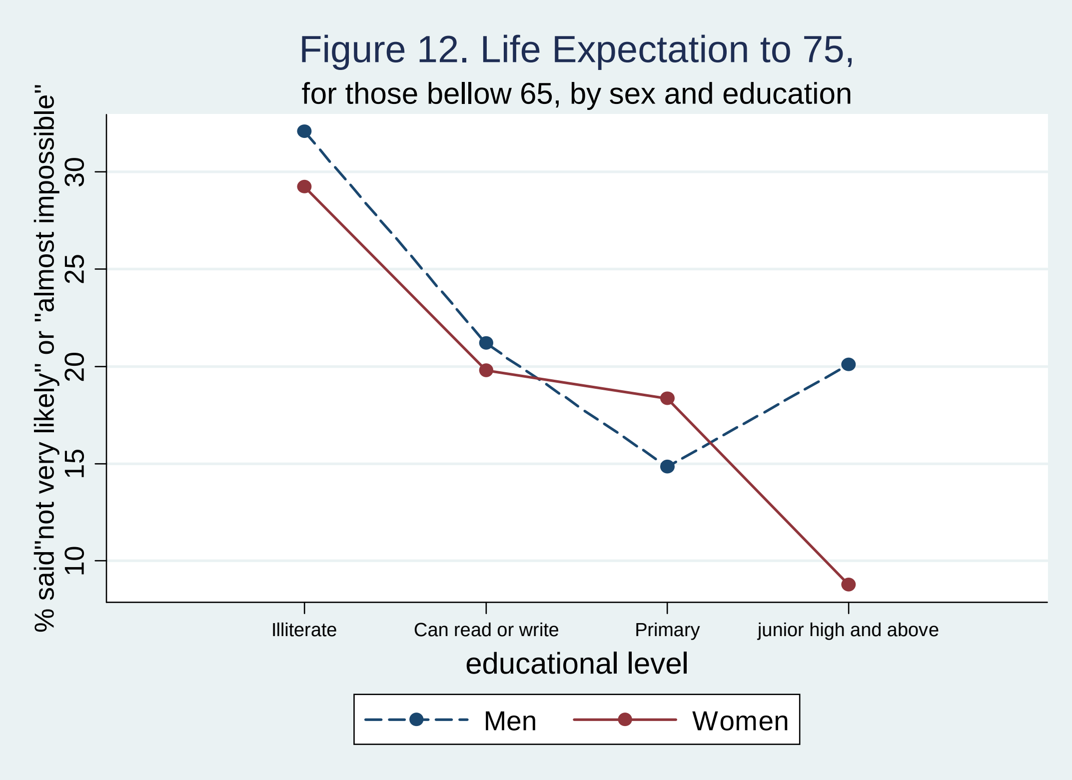


Figure 12. Life Expectation to 75,
for those bellow 65, by sex and education
% said"not very likely" or "almost impossible"
10
15
20
25
30
Illiterate
Can read or write
Primary
junior high and above
educational level
Men
Women

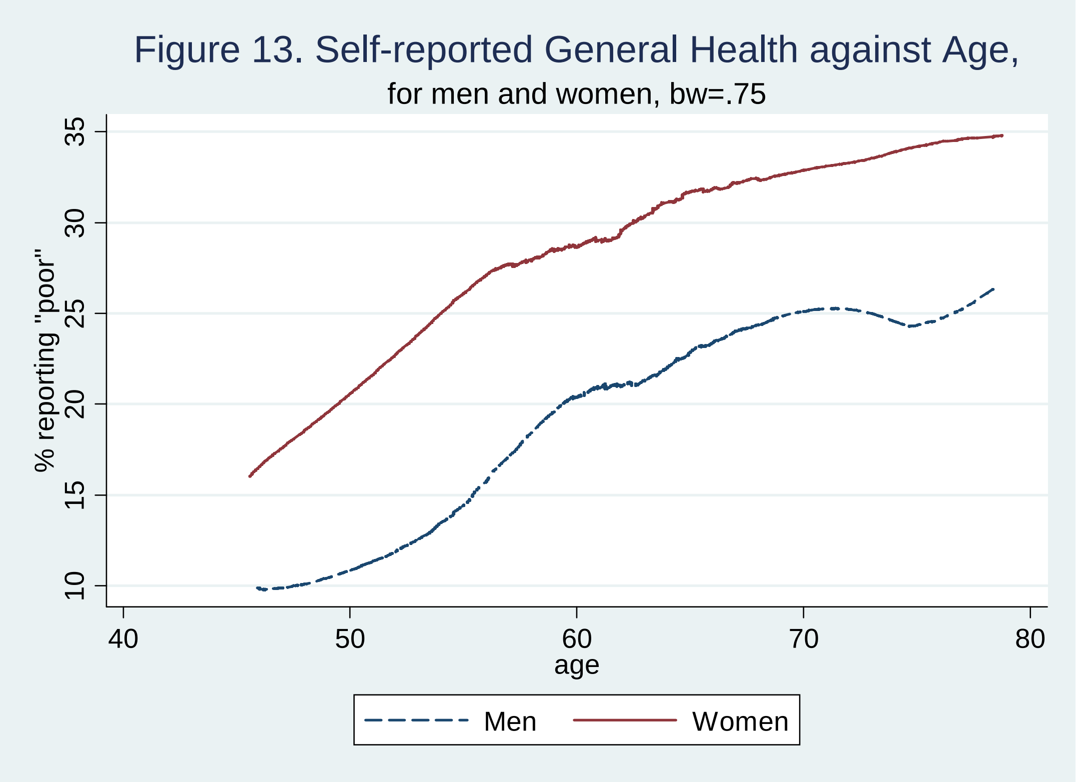


Figure 13. Self-reported General Health against Age,
for men and women, bw=.75
% reporting "poor"
10
15
20
25
30
35
40
50
60
70
80
age
Men
Women

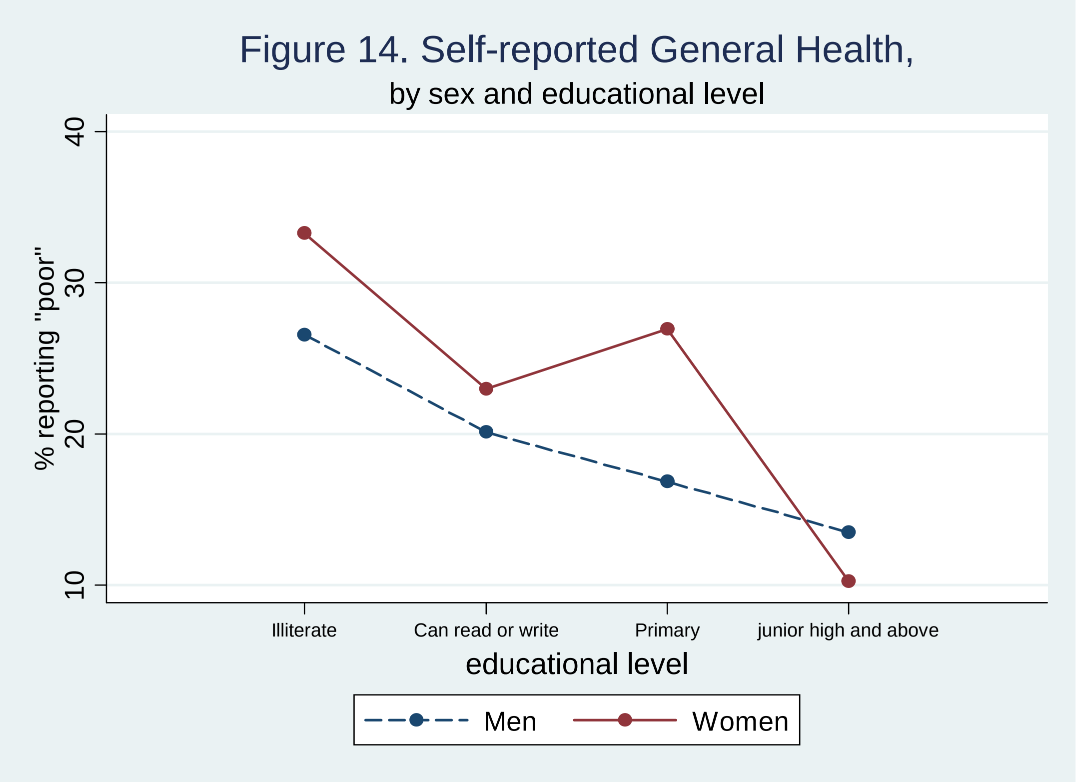


Figure 14. Self-reported General Health,
by sex and educational level
% reporting "poor"
10
20
30
40
Illiterate
Can read or write
Primary
junior high and above
educational level
Men
Women

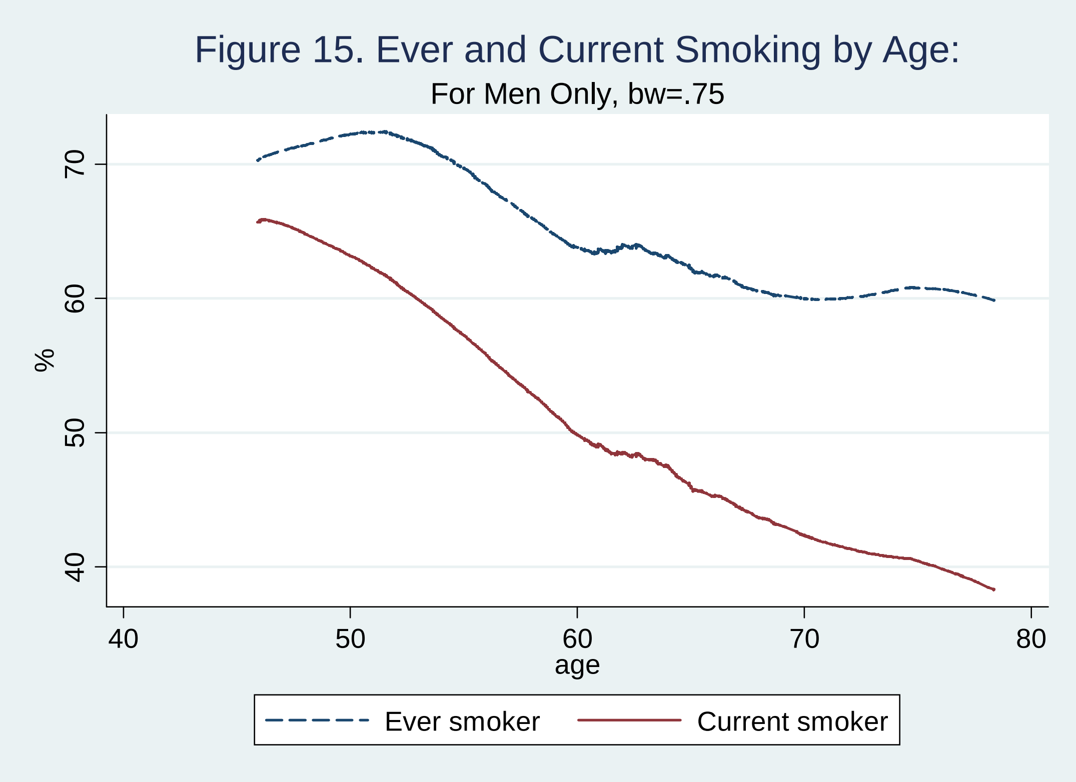


Figure 15. Ever and Current Smoking by Age:
For Men Only, bw=.75
%
40
50
60
70
40
50
60
70
80
age
Ever smoker
Current smoker

Table 1. BMI, by age and sex

	Men				Women			
	BMI Mean	% BMI <18.5	% BMI >=25.0	*N*	BMI Mean	% BMI <18.5	% BMI >=25.0	*N*
45-54	22.8	5.4	26.4	*334*	23.7	4.7	35.3	*371*
	(0.2)	(1.7)	(3.7)		(0.2)	(1.3)	(2.9)	
55-64	22.8	3.4	23.9	*317*	23.9	5.0	39.2	*305*
	(0.2)	(1.2)	(3.0)		(0.2)	(1.3)	(3.2)	
65-74	21.5	9.3	14.4	*203*	23.3	10.7	29.2	*169*
	(0.3)	(2.3)	(3.3)		(0.3)	(2.6)	(4.0)	
75+	21.2	17.2	10.3	*66*	21.8	21.6	12.8	*74*
	(0.4)	(5.1)	(3.7)		(0.5)	(6.1)	(4.3)	
Total (45+)	22.4	6.5	21.7	*920*	23.6	7.3	33.6	*919*
	(0.2)	(1.0)	(2.2)		(0.1)	(0.9)	(1.9)	

Standard errors in parentheses.

Table 2. Regression for BMI: Men

	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.083	0.163	0.172	0.147	0.102
	(0.221)	(0.215)	(0.211)	(0.207)	(0.216)
Aged 65-74	-0.940***	-0.760***	-0.787***	-0.885***	-1.073***
	(0.281)	(0.281)	(0.276)	(0.279)	(0.317)
Aged 75 and over	-1.122**	-0.827*	-0.858*	-0.909*	-1.190**
	(0.478)	(0.486)	(0.480)	(0.480)	(0.507)
Can read and write	0.356	0.294	0.279	0.236	0.294
	(0.278)	(0.272)	(0.270)	(0.274)	(0.318)
Finished primary	0.361	0.240	0.213	0.159	0.236
	(0.292)	(0.278)	(0.274)	(0.267)	(0.306)
Junior high and above	0.641**	0.427	0.366	0.236	-0.024
	(0.280)	(0.273)	(0.267)	(0.270)	(0.308)
logPCE (< median)		0.491***	0.447***	0.410***	0.267**
		(0.115)	(0.111)	(0.122)	(0.122)
logPCE (> median, marginal)		0.214	0.060	0.143	0.052
		(0.293)	(0.294)	(0.283)	(0.326)
Rural			-0.706**		
			(0.275)		
Rural Zhejiang				-0.139	
				(0.299)	
Urban Gansu				1.034***	
				(0.350)	
Rural Gansu				-0.603	
				(0.395)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	5.77***	3.94**	4.50***	5.33***	6.45***
(p-value)	(0.001)	(0.011)	(0.005)	(0.002)	(0.001)
F-test for all education dummies	1.72	0.83	0.66	0.33	0.59
(p-value)	(0.169)	(0.479)	(0.576)	(0.801)	(0.622)
F-test for all logPCE splines		22.79***	16.41***	11.68***	3.94**
(p-value)		(0.000)	(0.000)	(0.000)	(0.023)
F-test for all location dummies				6.33***	3.85***
(p-value)				(0.001)	(0.000)
Observations	917	917	917	917	917

Robust standard errors in parentheses, all clustered at community level.
* p<.1 ** p<.05 *** p<.01.
logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 3. Regression for BMI: Women

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	-0.127	-0.076	-0.066	-0.089	-0.257
	(0.281)	(0.281)	(0.279)	(0.272)	(0.308)
Aged 65-74	-0.415	-0.374	-0.384	-0.468	-0.597
	(0.369)	(0.363)	(0.362)	(0.357)	(0.405)
Aged 75 and over	-1.844***	-1.733***	-1.783***	-1.790***	-2.004***
	(0.495)	(0.501)	(0.492)	(0.499)	(0.610)
Can read and write	0.434	0.340	0.271	0.324	0.012
	(0.305)	(0.292)	(0.294)	(0.301)	(0.316)
Finished primary	1.374***	1.251***	1.170***	1.159**	0.956**
	(0.437)	(0.442)	(0.441)	(0.450)	(0.452)
Junior high and above	0.303	0.130	0.034	-0.147	-0.561
	(0.393)	(0.392)	(0.401)	(0.375)	(0.416)
logPCE (< median)		0.150	0.138	0.145	0.061
		(0.120)	(0.119)	(0.121)	(0.120)
logPCE (> median, marginal)		0.232	0.178	0.254	0.313
		(0.333)	(0.329)	(0.332)	(0.346)
Rural			-0.352		
			(0.304)		
Rural Zhejiang				0.187	
				(0.336)	
Urban Gansu				1.144**	
				(0.438)	
Rural Gansu				-0.090	
				(0.428)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	4.95***	4.41***	4.96***	4.91***	3.85**
(p-value)	(0.003)	(0.006)	(0.003)	(0.003)	(0.012)
F-test for all education dummies	3.37**	2.66*	2.31*	2.35*	2.42*
(p-value)	(0.022)	(0.053)	(0.081)	(0.077)	(0.071)
F-test for all logPCE splines		2.43*	1.85	2.49*	1.11
(p-value)		(0.094)	(0.163)	(0.089)	(0.333)
F-test for all location dummies				2.89**	2.14***
(p-value)				(0.040)	(0.000)
Observations	918	918	918	918	918

Robust standard errors in parentheses, all clustered at community level.
* p<.1 ** p<.05 *** p<.01.
logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 4. Percentage of hypertension, by age and sex

	Men		Women	
	%	*N*	%	*N*
45-54	28.3 (3.3)	*334*	34.3 (3.4)	*374*
55-64	38.6 (3.0)	*318*	50.5 (3.4)	*306*
65-74	53.9 (4.0)	*205*	67.4 (3.6)	*173*
75+	64.2 (7.0)	*73*	78.4 (4.9)	*77*
Total (45+)	40.2 (2.2)	*930*	49.5 (2.0)	*930*

Standard errors in parentheses.

Table 5. Regression for hypertension: Men

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.088**	0.089**	0.089**	0.089**	0.096**
	(0.036)	(0.035)	(0.036)	(0.036)	(0.039)
Aged 65-74	0.259***	0.260***	0.260***	0.257***	0.251***
	(0.045)	(0.046)	(0.046)	(0.047)	(0.050)
Aged 75 and over	0.357***	0.355***	0.354***	0.355***	0.347***
	(0.054)	(0.055)	(0.055)	(0.055)	(0.065)
Can read and write	0.022	0.021	0.021	0.022	-0.001
	(0.051)	(0.051)	(0.051)	(0.051)	(0.057)
Finished primary	0.007	0.005	0.004	0.003	-0.013
	(0.049)	(0.049)	(0.049)	(0.048)	(0.054)
Junior high and above	0.048	0.043	0.042	0.036	0.018
	(0.043)	(0.043)	(0.043)	(0.045)	(0.050)
logPCE (< median)		-0.018	-0.019	-0.018	-0.015
		(0.035)	(0.035)	(0.035)	(0.029)
logPCE (> median, marginal)		0.059	0.056	0.059	0.047
		(0.063)	(0.063)	(0.063)	(0.059)
Rural			-0.016		
			(0.038)		
Rural Zhejiang				-0.003	
				(0.046)	
Urban Gansu				0.043	
				(0.067)	
Rural Gansu				-0.002	
				(0.046)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	19.58***	18.10***	17.77***	18.17***	13.39***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all education dummies	0.50	0.42	0.40	0.31	0.14
(p-value)	(0.681)	(0.737)	(0.752)	(0.820)	(0.938)
F-test for all logPCE splines		0.59	0.44	0.54	0.32
(p-value)		(0.556)	(0.643)	(0.584)	(0.724)
F-test for all location dummies				0.17	1.59***
(p-value)				(0.917)	(0.001)
Observations	927	927	927	927	927

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 6. Regression for hypertension: Women

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.148***	0.151***	0.151***	0.150***	0.141***
	(0.040)	(0.040)	(0.040)	(0.040)	(0.044)
Aged 65-74	0.320***	0.322***	0.322***	0.317***	0.309***
	(0.039)	(0.039)	(0.040)	(0.040)	(0.045)
Aged 75 and over	0.414***	0.416***	0.416***	0.415***	0.410***
	(0.052)	(0.050)	(0.051)	(0.052)	(0.062)
Can read and write	0.034	0.028	0.027	0.029	0.054
	(0.043)	(0.044)	(0.045)	(0.047)	(0.050)
Finished primary	0.017	0.009	0.009	0.007	0.023
	(0.050)	(0.050)	(0.051)	(0.051)	(0.064)
Junior high and above	-0.039	-0.053	-0.053	-0.062	-0.071
	(0.057)	(0.057)	(0.056)	(0.056)	(0.060)
logPCE (< median)		-0.003	-0.003	-0.003	-0.001
		(0.018)	(0.018)	(0.018)	(0.022)
logPCE (> median, marginal)		0.047	0.046	0.050	0.051
		(0.046)	(0.046)	(0.046)	(0.054)
Rural			-0.001		
			(0.036)		
Rural Zhejiang				0.028	
				(0.046)	
Urban Gansu				0.057	
				(0.055)	
Rural Gansu				0.009	
				(0.050)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	33.19***	34.02***	33.22***	31.54***	22.58***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all education dummies	0.49	0.52	0.52	0.64	1.27
(p-value)	(0.688)	(0.672)	(0.669)	(0.588)	(0.289)
F-test for all logPCE splines		0.66	0.66	0.76	0.67
(p-value)		(0.517)	(0.520)	(0.468)	(0.512)
F-test for all location dummies				0.42	1.33**
(p-value)				(0.741)	(0.028)
Observations	928	928	928	928	928

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 7. Percentage with reported diagnosed disease, by age and sex

		Hypertension		High cholesterol		Diabetes		Cancer		Lung disease		Heart disease	
		Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
45-54	%	13.1	19.3	8.9	5.3	3.0	2.9	0.0	2.0	6.4	7.3	3.1	8.3
		(2.6)	(2.4)	(2.0)	(1.3)	(1.7)	(1.0)	(0.0)	(0.8)	(1.2)	(1.3)	(0.8)	(1.4)
	N	*443*	*492*	*441*	*489*	*447*	*492*	*447*	*493*	*447*	*493*	*447*	*492*
55-64	%	23.7	32.4	5.1	12.9	5.6	5.3	0.0	1.7	11.5	10.6	7.2	15.5
		(2.7)	(3.0)	(1.2)	(2.4)	(1.5)	(1.3)	(0.0)	(0.7)	(1.7)	(1.7)	(1.5)	(2.2)
	N	*422*	*406*	*421*	*404*	*424*	*405*	*423*	*405*	*424*	*406*	*424*	*406*
65-74	%	31.9	32.4	7.6	7.7	9.1	6.3	0.2	1.2	15.8	10.7	12.7	13.1
		(3.2)	(3.7)	(2.0)	(2.3)	(2.3)	(1.9)	(0.2)	(1.0)	(2.4)	(2.1)	(2.2)	(2.4)
	N	*277*	*230*	*274*	*229*	*277*	*229*	*278*	*229*	*278*	*229*	*278*	*229*
75+	%	31.5	42.4	4.7	0.3	4.1	7.4	1.0	0.6	21.3	20.5	8.4	17.3
		(5.2)	(6.1)	(2.1)	(0.3)	(1.8)	(3.2)	(1.0)	(0.6)	(4.7)	(4.8)	(2.7)	(4.2)
	N	*119*	*113*	*119*	*111*	*118*	*113*	*119*	*113*	*119*	*113*	*119*	*113*
Total (45+)	%	22.4	28.3	6.9	7.8	5.2	4.7	0.2	1.6	11.6	10.3	7.0	12.5
		(1.7)	(1.8)	(1.0)	(1.2)	(0.9)	(0.9)	(0.1)	(0.4)	(1.0)	(1.1)	(0.8)	(1.3)
	N	*1261*	*1241*	*1255*	*1233*	*1266*	*1239*	*1267*	*1240*	*1268*	*1241*	*1268*	*1240*

Standard errors in parentheses.

Table 8. Under-diagnosis of hypertension, by age and sex

	Men		Women	
	%	*N*	%	*N*
45-54	47.7 (7.9)	*92*	41.9 (5.4)	*136*
55-64	48.3 (5.9)	*124*	34.9 (4.9)	*163*
65-74	44.1 (6.1)	*107*	51.2 (5.0)	*121*
75+	45.7 (9.9)	*45*	41.6 (7.7)	*59*
Total (45+)	46.6 (3.8)	*368*	41.7 (2.9)	*479*

Standard errors in parentheses

Table 9. Percentage taking medication or treatment for hypertension

	Men		Women	
	%	*N*	%	*N*
45-54	63.4 (11.7)	*37*	70.4 (7.9)	*67*
55-64	83.2 (5.3)	*50*	81.5 (4.2)	*91*
65-74	71.2 (7.4)	*59*	83.7 (5.8)	*61*
75+	62.6 (10.3)	*25*	85.5 (5.5)	*35*
Total (45+)	71.3 (3.6)	*171*	79.5 (3.1)	*254*

Standard errors in parentheses.

Sample is those measured and diagnosed with hypertension.

Table 10. Regression for the under-diagnosis of hypertension: Men

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	-0.119*	-0.120*	-0.127**	-0.120*	-0.165**
	(0.064)	(0.062)	(0.061)	(0.061)	(0.081)
Aged 65-74	-0.181**	-0.185**	-0.187**	-0.171**	-0.201**
	(0.076)	(0.073)	(0.072)	(0.071)	(0.093)
Aged 75 and over	-0.198*	-0.208**	-0.206**	-0.181*	-0.146
	(0.101)	(0.101)	(0.100)	(0.101)	(0.129)
Can read and write	-0.110	-0.110	-0.114	-0.089	-0.073
	(0.076)	(0.075)	(0.074)	(0.074)	(0.090)
Finished primary	-0.053	-0.050	-0.052	-0.040	0.003
	(0.065)	(0.066)	(0.065)	(0.065)	(0.075)
Junior high and above	-0.168**	-0.160*	-0.149*	-0.155*	-0.178*
	(0.083)	(0.083)	(0.081)	(0.086)	(0.093)
logPCE (< median)		-0.052*	-0.050	-0.029	-0.025
		(0.029)	(0.030)	(0.035)	(0.049)
logPCE (> median, marginal)		0.043	0.083	0.085	0.114
		(0.079)	(0.081)	(0.082)	(0.089)
Rural			0.127**		
			(0.052)		
Rural Zhejiang				0.071	
				(0.073)	
Urban Gansu				0.061	
				(0.078)	
Rural Gansu				0.224***	
				(0.069)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	2.40*	2.73**	2.88**	2.49*	1.98
(p-value)	(0.074)	(0.049)	(0.040)	(0.066)	(0.123)
F-test for all education dummies	1.44	1.37	1.30	1.18	1.60
(p-value)	(0.238)	(0.259)	(0.278)	(0.322)	(0.194)
F-test for all logPCE splines		1.96	1.35	0.56	0.89
(p-value)		(0.147)	(0.264)	(0.571)	(0.416)
F-test for all location dummies				3.82**	1.46**
(p-value)				(0.013)	(0.024)
Observations	366	366	366	366	366

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 11. Regression for the under-diagnosis of hypertension: Women

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	-0.103*	-0.109*	-0.108*	-0.103*	-0.063
	(0.058)	(0.059)	(0.059)	(0.058)	(0.071)
Aged 65-74	-0.050	-0.054	-0.048	-0.038	-0.021
	(0.054)	(0.055)	(0.056)	(0.055)	(0.061)
Aged 75 and over	-0.121	-0.127	-0.112	-0.091	-0.054
	(0.083)	(0.085)	(0.083)	(0.084)	(0.097)
Can read and write	-0.161***	-0.153***	-0.139**	-0.114**	-0.084
	(0.055)	(0.056)	(0.055)	(0.056)	(0.065)
Finished primary	-0.266***	-0.255***	-0.246***	-0.221***	-0.156
	(0.075)	(0.074)	(0.071)	(0.072)	(0.100)
Junior high and above	-0.201**	-0.189**	-0.156*	-0.153	-0.064
	(0.085)	(0.090)	(0.090)	(0.093)	(0.114)
logPCE (< median)		-0.017	-0.011	-0.005	0.009
		(0.024)	(0.024)	(0.025)	(0.033)
logPCE (> median, marginal)		0.002	0.011	0.016	0.009
		(0.063)	(0.061)	(0.062)	(0.079)
Rural			0.093**		
			(0.045)		
Rural Zhejiang				0.023	
				(0.058)	
Urban Gansu				-0.005	
				(0.056)	
Rural Gansu				0.165***	
				(0.062)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	1.27	1.33	1.23	1.08	0.28
(p-value)	(0.291)	(0.270)	(0.302)	(0.361)	(0.836)
F-test for all education dummies	6.16***	5.40***	5.27***	4.05***	1.08
(p-value)	(0.001)	(0.002)	(0.002)	(0.010)	(0.361)
F-test for all logPCE splines		0.38	0.10	0.03	0.12
(p-value)		(0.687)	(0.905)	(0.968)	(0.887)
F-test for all location dummies				2.80**	1.41**
(p-value)				(0.045)	(0.026)
Observations	477	477	477	477	477

Robust standard errors in parentheses, all clustered at community level.
* p<.1 ** p<.05 *** p<.01.
logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 12. Percent Individuals having difficulty with ADLs and IADLs: By Age and Sex

		ADLs		IADLs	
		Men	Women	Men	Women
45-54	%	**1.9**	**5.7**	**6.6**	**19.8**
		(0.7)	(1.3)	(1.4)	(2.7)
	N	*442*	*489*	*435*	*474*
55-64	%	**8.3**	**12.5**	**18.5**	**29.5**
		(1.7)	(2.0)	(2.6)	(3.6)
	N	*420*	*402*	*401*	*370*
65-74	%	**10.0**	**18.0**	**24.1**	**45.1**
		(2.0)	(3.3)	(3.6)	(4.5)
	N	*277*	*227*	*242*	*196*
75+	%	**30.3**	**24.1**	**47.0**	**67.5**
		(5.7)	(4.8)	(6.4)	(7.5)
	N	*118*	*112*	*96*	*83*
Total (45+)	%	**8.7**	**12.0**	**17.8**	**31.3**
		(1.2)	(1.3)	(1.7)	(2.7)
	N	*1257*	*1230*	*1174*	*1123*

Standard errors in parentheses.

Table 13. Regression for the number of difficulties in ADLs: Men

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.158***	0.152***	0.152***	0.149***	0.178***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.049)
Aged 65-74	0.202***	0.188***	0.189***	0.177***	0.212***
	(0.057)	(0.059)	(0.058)	(0.055)	(0.061)
Aged 75 and over	0.850***	0.831***	0.834***	0.861***	0.924***
	(0.164)	(0.167)	(0.167)	(0.163)	(0.172)
Can read and write	-0.093	-0.084	-0.084	-0.044	-0.013
	(0.064)	(0.066)	(0.066)	(0.065)	(0.066)
Finished primary	-0.078	-0.066	-0.065	-0.060	-0.039
	(0.070)	(0.072)	(0.072)	(0.072)	(0.073)
Junior high and above	-0.073	-0.055	-0.052	-0.097	-0.098
	(0.070)	(0.073)	(0.074)	(0.078)	(0.092)
logPCE (< median)		-0.068	-0.067	-0.042	-0.052
		(0.046)	(0.046)	(0.048)	(0.050)
logPCE (> median, marginal)		0.068	0.072	0.087	0.101
		(0.080)	(0.077)	(0.079)	(0.083)
Rural			0.023		
			(0.051)		
Rural Zhejiang				0.023	
				(0.064)	
Urban Gansu				0.284***	
				(0.087)	
Rural Gansu				0.215***	
				(0.067)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	17.03***	14.69***	14.85***	15.67***	13.60***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all education dummies	0.70	0.58	0.60	0.55	0.61
(p-value)	(0.551)	(0.628)	(0.617)	(0.648)	(0.612)
F-test for all logPCE splines		1.23	1.13	0.60	0.76
(p-value)		(0.297)	(0.328)	(0.549)	(0.472)
F-test for all location dummies				5.28***	1.26*
(p-value)				(0.002)	(0.052)
Observations	1250	1250	1250	1250	1250

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 14. Regression for the number of difficulties in ADLs: Women

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.078*	0.074*	0.075*	0.064	0.050
	(0.040)	(0.041)	(0.040)	(0.041)	(0.048)
Aged 65-74	0.265***	0.263**	0.267***	0.268***	0.269***
	(0.101)	(0.101)	(0.101)	(0.101)	(0.101)
Aged 75 and over	0.685***	0.687***	0.701***	0.748***	0.786***
	(0.139)	(0.142)	(0.140)	(0.135)	(0.148)
Can read and write	-0.143**	-0.137**	-0.123*	-0.044	-0.015
	(0.066)	(0.065)	(0.066)	(0.066)	(0.067)
Finished primary	-0.116*	-0.107*	-0.086	-0.037	-0.027
	(0.059)	(0.058)	(0.060)	(0.058)	(0.068)
Junior high and above	-0.127**	-0.106*	-0.084	-0.100	-0.037
	(0.061)	(0.064)	(0.066)	(0.066)	(0.085)
logPCE (< median)		0.016	0.020	0.046	0.043
		(0.035)	(0.035)	(0.033)	(0.036)
logPCE (> median, marginal)		-0.078	-0.067	-0.041	-0.042
		(0.067)	(0.067)	(0.064)	(0.073)
Rural			0.074		
			(0.062)		
Rural Zhejiang				-0.054	
				(0.062)	
Urban Gansu				0.187**	
				(0.079)	
Rural Gansu				0.356***	
				(0.075)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	10.49***	9.84***	10.60***	12.24***	10.80***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all education dummies	2.24*	1.98	1.36	0.76	0.08
(p-value)	(0.088)	(0.122)	(0.260)	(0.519)	(0.972)
F-test for all logPCE splines		0.85	0.53	1.11	0.78
(p-value)		(0.431)	(0.593)	(0.334)	(0.462)
F-test for all location dummies				15.05***	1.76***
(p-value)				(0.000)	(0.000)
Observations	1225	1225	1225	1225	1225

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 15. Regression for the number of difficulties in IADLs: Men

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.244***	0.226***	0.228***	0.227***	0.290***
	(0.058)	(0.056)	(0.058)	(0.057)	(0.081)
Aged 65-74	0.362***	0.323***	0.335***	0.342***	0.385***
	(0.086)	(0.082)	(0.082)	(0.075)	(0.086)
Aged 75 and over	1.533***	1.506***	1.534***	1.601***	1.681***
	(0.244)	(0.245)	(0.243)	(0.236)	(0.255)
Can read and write	-0.522***	-0.504***	-0.507***	-0.388***	-0.354***
	(0.101)	(0.101)	(0.100)	(0.095)	(0.099)
Finished primary	-0.450***	-0.423***	-0.417***	-0.385***	-0.384***
	(0.104)	(0.104)	(0.102)	(0.097)	(0.104)
Junior high and above	-0.483***	-0.423***	-0.400***	-0.488***	-0.460***
	(0.100)	(0.098)	(0.097)	(0.097)	(0.101)
logPCE (< median)		-0.146***	-0.133**	-0.055	-0.062
		(0.054)	(0.053)	(0.050)	(0.049)
logPCE (> median, marginal)		0.019	0.063	0.084	0.095
		(0.092)	(0.087)	(0.089)	(0.094)
Rural			0.224***		
			(0.080)		
Rural Zhejiang				0.059	
				(0.075)	
Urban Gansu				0.465***	
				(0.114)	
Rural Gansu				0.706***	
				(0.088)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	16.35***	15.57***	15.70***	17.61***	15.73***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all education dummies	9.52***	8.64***	8.83***	8.71***	7.63***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all logPCE splines		6.73***	4.32**	0.63	0.84
(p-value)		(0.002)	(0.016)	(0.535)	(0.437)
F-test for all location dummies				23.81***	1.86***
(p-value)				(0.000)	(0.000)
Observations	1167	1167	1167	1167	1167

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 16. Regression for the number of difficulties in IADLs: Women

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.241***	0.186***	0.191***	0.141**	0.135*
	(0.071)	(0.066)	(0.064)	(0.062)	(0.074)
Aged 65-74	0.649***	0.600***	0.622***	0.596***	0.621***
	(0.130)	(0.123)	(0.121)	(0.107)	(0.110)
Aged 75 and over	1.430***	1.261***	1.332***	1.467***	1.412***
	(0.251)	(0.254)	(0.245)	(0.236)	(0.242)
Can read and write	-0.524***	-0.454***	-0.385***	-0.144	-0.112
	(0.121)	(0.115)	(0.114)	(0.109)	(0.114)
Finished primary	-0.619***	-0.506***	-0.405***	-0.270***	-0.232**
	(0.122)	(0.112)	(0.109)	(0.081)	(0.109)
Junior high and above	-0.702***	-0.525***	-0.414***	-0.511***	-0.406***
	(0.116)	(0.112)	(0.109)	(0.101)	(0.128)
logPCE (< median)		-0.208***	-0.194***	-0.111*	-0.119*
		(0.069)	(0.067)	(0.057)	(0.065)
logPCE (> median, marginal)		-0.063	-0.004	0.112	0.129
		(0.130)	(0.132)	(0.104)	(0.119)
Rural			0.380***		
			(0.141)		
Rural Zhejiang				0.052	
				(0.074)	
Urban Gansu				0.786***	
				(0.138)	
Rural Gansu				1.393***	
				(0.101)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	15.16***	12.86***	14.75***	18.62***	18.76***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all education dummies	13.59***	9.95***	6.93***	9.41***	3.54**
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.018)
F-test for all logPCE splines		15.31***	10.20***	1.98	1.70
(p-value)		(0.000)	(0.000)	(0.144)	(0.188)
F-test for all location dummies				73.84***	3.90***
(p-value)				(0.000)	(0.000)
Observations	1118	1118	1118	1118	1118

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 17. Regression for CES-D 10: Men

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.385	0.219	0.235	0.220	0.208
	(0.525)	(0.500)	(0.488)	(0.461)	(0.470)
Aged 65-74	1.006*	0.629	0.725	0.801	1.092*
	(0.589)	(0.566)	(0.544)	(0.529)	(0.574)
Aged 75 and over	1.155	0.722	0.921	1.571	1.771
	(1.004)	(0.968)	(0.970)	(0.996)	(1.091)
Can read and write	-0.868	-0.669	-0.681	-0.116	-0.105
	(0.639)	(0.610)	(0.597)	(0.611)	(0.664)
Finished primary	-0.984*	-0.633	-0.632	-0.464	-0.465
	(0.590)	(0.579)	(0.572)	(0.581)	(0.658)
Junior high and above	-1.304*	-0.732	-0.634	-1.106*	-1.015
	(0.662)	(0.626)	(0.618)	(0.613)	(0.720)
logPCE (< median)		-1.097**	-1.009**	-0.555	-0.582**
		(0.425)	(0.410)	(0.335)	(0.291)
logPCE (> median, marginal)		0.002	0.178	0.284	0.490
		(0.681)	(0.664)	(0.575)	(0.573)
Rural			1.068**		
			(0.439)		
Rural Zhejiang				0.206	
				(0.323)	
Urban Gansu				2.583***	
				(0.657)	
Rural Gansu				3.516***	
				(0.507)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	1.08	0.48	0.71	1.22	1.72
(p-value)	(0.362)	(0.700)	(0.548)	(0.308)	(0.167)
F-test for all education dummies	1.32	0.52	0.50	1.74	1.02
(p-value)	(0.274)	(0.670)	(0.684)	(0.163)	(0.389)
F-test for all logPCE splines		13.01***	8.70***	2.21	2.30
(p-value)		(0.000)	(0.000)	(0.115)	(0.105)
F-test for all location dummies				19.68***	2.15***
(p-value)				(0.000)	(0.000)
Observations	962	962	962	962	962

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 18. Regression for CES-D 10: Women

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.674	0.478	0.484	0.403	0.739
	(0.510)	(0.491)	(0.482)	(0.440)	(0.482)
Aged 65-74	0.370	0.201	0.275	0.505	0.738
	(0.607)	(0.607)	(0.611)	(0.573)	(0.628)
Aged 75 and over	-0.054	-0.509	-0.270	1.024	1.133
	(0.861)	(0.831)	(0.852)	(0.781)	(0.868)
Can read and write	-2.643***	-2.401***	-2.203***	-1.112**	-0.682
	(0.585)	(0.556)	(0.552)	(0.472)	(0.493)
Finished primary	-1.915***	-1.482**	-1.215**	-0.367	-0.144
	(0.601)	(0.565)	(0.544)	(0.548)	(0.661)
Junior high and above	-3.584***	-3.070***	-2.717***	-3.115***	-2.370***
	(0.591)	(0.583)	(0.603)	(0.597)	(0.703)
logPCE (< median)		-1.146***	-1.048***	-0.605*	-0.597
		(0.394)	(0.387)	(0.341)	(0.439)
logPCE (> median, marginal)		0.745	0.859	1.027	0.778
		(0.750)	(0.726)	(0.636)	(0.716)
Rural			1.257*		
			(0.684)		
Rural Zhejiang				0.133	
				(0.499)	
Urban Gansu				4.436***	
				(0.810)	
Rural Gansu				5.616***	
				(0.629)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	0.65	0.54	0.43	0.76	1.13
(p-value)	(0.588)	(0.656)	(0.729)	(0.517)	(0.341)
F-test for all education dummies	13.18***	10.47***	7.99***	9.84***	4.23***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.008)
F-test for all logPCE splines		5.48***	4.45**	1.69	0.92
(p-value)		(0.006)	(0.014)	(0.191)	(0.400)
F-test for all location dummies				36.90***	4.04***
(p-value)				(0.000)	(0.000)
Observations	882	882	882	882	882

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 19. Regression for number of words recalled: Men

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	-0.145	-0.106	-0.116	-0.115	-0.201
	(0.149)	(0.147)	(0.144)	(0.145)	(0.164)
Aged 65-74	-0.615***	-0.557***	-0.596***	-0.567***	-0.654***
	(0.134)	(0.131)	(0.125)	(0.126)	(0.133)
Aged 75 and over	-1.300***	-1.241***	-1.308***	-1.284***	-1.288***
	(0.257)	(0.251)	(0.250)	(0.245)	(0.247)
Can read and write	0.632***	0.580***	0.590***	0.615***	0.675***
	(0.162)	(0.162)	(0.159)	(0.166)	(0.178)
Finished primary	0.834***	0.765***	0.776***	0.793***	0.875***
	(0.147)	(0.149)	(0.146)	(0.147)	(0.170)
Junior high and above	1.520***	1.406***	1.377***	1.405***	1.402***
	(0.159)	(0.157)	(0.154)	(0.154)	(0.171)
logPCE (< median)		0.285***	0.249***	0.266***	0.277***
		(0.088)	(0.088)	(0.078)	(0.086)
logPCE (> median, marginal)		-0.088	-0.142	-0.158	-0.256
		(0.165)	(0.168)	(0.169)	(0.188)
Rural			-0.390***		
			(0.137)		
Rural Zhejiang				-0.538***	
				(0.195)	
Urban Gansu				-0.195	
				(0.197)	
Rural Gansu				-0.380**	
				(0.181)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	13.17***	12.30***	14.51***	14.02***	15.38***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all education dummies	29.85***	26.42***	26.04***	27.46***	23.06***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all logPCE splines		10.16***	6.00***	7.94***	6.11***
(p-value)		(0.000)	(0.004)	(0.001)	(0.003)
F-test for all location dummies				2.80**	2.73***
(p-value)				(0.044)	(0.000)
Observations	852	852	852	852	852

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 20. Regression for number of words recalled: Women

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	-0.290**	-0.208*	-0.211*	-0.211*	-0.259*
	(0.114)	(0.111)	(0.111)	(0.111)	(0.132)
Aged 65-74	-0.616***	-0.593***	-0.624***	-0.671***	-0.683***
	(0.178)	(0.173)	(0.177)	(0.175)	(0.219)
Aged 75 and over	-1.438***	-1.399***	-1.492***	-1.572***	-1.726***
	(0.274)	(0.285)	(0.295)	(0.279)	(0.351)
Can read and write	0.681***	0.590***	0.530***	0.451***	0.348*
	(0.172)	(0.161)	(0.162)	(0.158)	(0.189)
Finished primary	0.946***	0.823***	0.741***	0.659***	0.628***
	(0.173)	(0.169)	(0.160)	(0.159)	(0.198)
Junior high and above	1.931***	1.738***	1.639***	1.614***	1.476***
	(0.172)	(0.171)	(0.172)	(0.169)	(0.223)
logPCE (< median)		0.214**	0.186*	0.121	0.022
		(0.099)	(0.096)	(0.093)	(0.122)
logPCE (> median, marginal)		0.146	0.111	0.148	0.183
		(0.203)	(0.202)	(0.194)	(0.223)
Rural			-0.369***		
			(0.130)		
Rural Zhejiang				-0.073	
				(0.165)	
Urban Gansu				-0.048	
				(0.168)	
Rural Gansu				-0.720***	
				(0.184)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	11.14***	9.78***	10.45***	12.67***	9.48***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all education dummies	42.37***	35.00***	30.75***	30.48***	14.79***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all logPCE splines		10.34***	7.46***	4.52**	1.22
(p-value)		(0.000)	(0.001)	(0.013)	(0.301)
F-test for all location dummies				6.75***	3.02***
(p-value)				(0.000)	(0.000)
Observations	765	765	765	765	765

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 21. Life expectation to 75, for men and women under 65

	Almost impossible	Not very likely	Maybe	Very likely	Almost certain	*N*
Men	5.5	15.3	30.8	20.8	27.6	*713*
	(1.0)	(2.0)	(2.2)	(1.9)	(2.7)	
Women	5.6	16.2	32.7	21.8	23.7	*759*
	(1.1)	(2.0)	(2.1)	(2.0)	(2.2)	

Standard errors in parentheses.

Table 22. Regression for "not very likely" or "almost impossible" to reach 75: Men under 65

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.014	-0.001	0.002	0.004	0.015
	(0.036)	(0.034)	(0.034)	(0.029)	(0.031)
Can read and write	-0.121**	-0.098*	-0.099*	-0.056	-0.052
	(0.053)	(0.054)	(0.053)	(0.048)	(0.051)
Finished primary	-0.174***	-0.143***	-0.142***	-0.140***	-0.124**
	(0.053)	(0.053)	(0.052)	(0.049)	(0.053)
Junior high and above	-0.097	-0.045	-0.039	-0.086	-0.066
	(0.059)	(0.059)	(0.058)	(0.053)	(0.061)
logPCE (< median)		-0.169***	-0.154***	-0.071	-0.065
		(0.047)	(0.048)	(0.049)	(0.052)
logPCE (> median, marginal)		0.119*	0.122*	0.078	0.070
		(0.064)	(0.064)	(0.065)	(0.068)
Rural			0.078*		
			(0.044)		
Rural Zhejiang				-0.019	
				(0.041)	
Urban Gansu				0.173***	
				(0.059)	
Rural Gansu				0.292***	
				(0.048)	
Community FE	NO	NO	NO	NO	YES
F-test for all education dummies	3.84**	3.33**	3.54**	2.95**	1.95
(p-value)	(0.012)	(0.023)	(0.018)	(0.037)	(0.127)
F-test for all logPCE splines		9.44***	6.58***	1.04	0.79
(p-value)		(0.000)	(0.002)	(0.358)	(0.459)
F-test for all location dummies				15.29***	2.67***
(p-value)				(0.000)	(0.000)
Observations	709	709	709	709	709

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 23. Regression for "not very likely" or "almost impossible" to reach 75: Women under 65

	All				
	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.073**	0.054	0.054*	0.050	0.052
	(0.033)	(0.033)	(0.032)	(0.030)	(0.031)
Can read and write	-0.137***	-0.111**	-0.089*	-0.027	-0.036
	(0.051)	(0.050)	(0.048)	(0.047)	(0.048)
Finished primary	-0.156***	-0.113**	-0.092*	-0.039	-0.078
	(0.050)	(0.049)	(0.048)	(0.045)	(0.050)
Junior high and above	-0.187***	-0.133***	-0.099**	-0.100**	-0.154***
	(0.045)	(0.045)	(0.045)	(0.043)	(0.051)
logPCE (< median)		-0.102***	-0.093***	-0.043**	-0.045**
		(0.019)	(0.019)	(0.020)	(0.020)
logPCE (> median, marginal)		0.043	0.056	0.036	0.019
		(0.044)	(0.041)	(0.038)	(0.041)
Rural			0.116**		
			(0.048)		
Rural Zhejiang				0.013	
				(0.037)	
Urban Gansu				0.154**	
				(0.060)	
Rural Gansu				0.353***	
				(0.057)	
Community FE	NO	NO	NO	NO	YES
F-test for all education dummies	6.60***	3.57**	2.20*	1.81	3.24**
(p-value)	(0.000)	(0.017)	(0.093)	(0.151)	(0.026)
F-test for all logPCE splines		20.95***	15.19***	2.56*	3.51**
(p-value)		(0.000)	(0.000)	(0.083)	(0.034)
F-test for all location dummies				15.23***	3.25***
(p-value)				(0.000)	(0.000)
Observations	757	757	757	757	757

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.

Table 24. Self-reported general health, by age and sex

	Men						Women					
	Excel-lent	Very good	Good	Fair	Poor	*N*	Excel-lent	Very good	Good	Fair	Poor	*N*
45-54	4.7 (1.8)	19.8 (2.4)	21.2 (2.6)	44.0 (3.3)	10.4 (1.8)	*397*	5.3 (2.1)	12.1 (2.3)	22.8 (2.6)	39.5 (3.0)	20.2 (2.5)	*462*
55-64	3.7 (1.2)	10.1 (1.6)	26.3 (3.1)	39.2 (3.2)	20.7 (2.7)	*373*	0.9 (0.5)	10.7 (1.8)	17.2 (2.4)	39.9 (3.2)	31.3 (3.7)	*365*
65-74	3.1 (1.4)	9.6 (2.2)	21.3 (3.2)	40.8 (4.5)	25.2 (2.9)	*251*	0.8 (0.8)	8.0 (2.1)	13.8 (2.7)	45.5 (4.2)	31.9 (3.6)	*203*
75+	2.1 (1.6)	14.7 (4.3)	21.7 (5.6)	31.8 (6.4)	29.7 (5.4)	*93*	3.4 (2.1)	11.3 (5.4)	19.0 (4.6)	34.3 (6.3)	31.9 (5.5)	*94*
Total (45+)	3.8 (0.8)	13.9 (1.1)	22.9 (1.7)	40.7 (2.0)	18.7 (1.5)	*1114*	2.9 (0.8)	10.8 (1.3)	19.0 (1.7)	40.2 (2.0)	27.0 (2.2)	*1124*

Standard errors in parentheses.

Table 25. Regression for reported poor general health: Men

	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.116***	0.109***	0.110***	0.110***	0.119***
	(0.029)	(0.029)	(0.030)	(0.029)	(0.031)
Aged 65-74	0.153***	0.139***	0.145***	0.146***	0.161***
	(0.033)	(0.034)	(0.034)	(0.034)	(0.038)
Aged 75 and over	0.175***	0.164***	0.173***	0.200***	0.202***
	(0.056)	(0.056)	(0.056)	(0.058)	(0.061)
Can read and write	-0.044	-0.034	-0.033	-0.007	0.007
	(0.033)	(0.033)	(0.032)	(0.033)	(0.036)
Finished primary	-0.084**	-0.067**	-0.065*	-0.059*	-0.038
	(0.034)	(0.034)	(0.034)	(0.035)	(0.038)
Junior high and above	-0.070**	-0.042	-0.034	-0.056	-0.032
	(0.034)	(0.034)	(0.035)	(0.037)	(0.043)
logPCE (< median)		-0.025	-0.019	0.001	0.012
		(0.028)	(0.029)	(0.029)	(0.031)
logPCE (> median, marginal)		-0.047	-0.032	-0.026	-0.044
		(0.047)	(0.046)	(0.046)	(0.048)
Rural			0.078***		
			(0.027)		
Rural Zhejiang				0.045	
				(0.030)	
Urban Gansu				0.124***	
				(0.043)	
Rural Gansu				0.193***	
				(0.031)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	10.37***	8.45***	8.96***	9.48***	8.84***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all education dummies	2.35*	1.34	1.22	1.66	0.77
(p-value)	(0.077)	(0.267)	(0.308)	(0.180)	(0.513)
F-test for all logPCE splines		6.19***	3.35**	0.53	0.70
(p-value)		(0.003)	(0.040)	(0.591)	(0.499)
F-test for all location dummies				13.55***	1.50***
(p-value)				(0.000)	(0.004)
Observations	1108	1108	1108	1108	1108

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the m

Table 26. Regression for reported poor general health: Women

	(1)	(2)	(3)	(4)	(5)
Aged 55-64	0.075**	0.064**	0.065**	0.059*	0.070**
	(0.032)	(0.031)	(0.031)	(0.031)	(0.034)
Aged 65-74	0.033	0.023	0.028	0.033	0.038
	(0.038)	(0.038)	(0.037)	(0.035)	(0.039)
Aged 75 and over	0.061	0.033	0.051	0.081	0.081
	(0.049)	(0.049)	(0.049)	(0.050)	(0.052)
Can read and write	-0.132***	-0.117***	-0.099***	-0.054	-0.018
	(0.035)	(0.035)	(0.034)	(0.033)	(0.035)
Finished primary	-0.100**	-0.077*	-0.050	-0.018	-0.005
	(0.040)	(0.040)	(0.038)	(0.038)	(0.043)
Junior high and above	-0.221***	-0.192***	-0.159***	-0.163***	-0.163***
	(0.037)	(0.040)	(0.040)	(0.041)	(0.048)
logPCE (< median)		-0.054***	-0.049***	-0.033**	-0.037**
		(0.017)	(0.016)	(0.016)	(0.016)
logPCE (> median, marginal)		0.030	0.044	0.055	0.078*
		(0.042)	(0.042)	(0.041)	(0.040)
Rural			0.104***		
			(0.038)		
Rural Zhejiang				0.033	
				(0.050)	
Urban Gansu				0.111**	
				(0.045)	
Rural Gansu				0.268***	
				(0.040)	
Community FE	NO	NO	NO	NO	YES
F-test for all age dummies	2.00	1.39	1.54	1.67	1.88
(p-value)	(0.120)	(0.252)	(0.209)	(0.179)	(0.138)
F-test for all education dummies	12.42***	8.49***	5.87***	5.61***	4.13***
(p-value)	(0.000)	(0.000)	(0.001)	(0.001)	(0.009)
F-test for all logPCE splines		6.13***	4.61**	2.24	3.17**
(p-value)		(0.003)	(0.012)	(0.113)	(0.046)
F-test for all location dummies				18.02***	2.31***
(p-value)				(0.000)	(0.000)
Observations	1120	1120	1120	1120	1120

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the

Table 27. Percentage of current smoker, by age and sex

	Men		Women	
	%	*N*	%	*N*
45-54	63.0 (3.3)	*398*	0.9 (0.4)	*462*
55-64	51.3 (3.3)	*375*	3.5 (1.4)	*366*
65-74	41.4 (4.0)	*251*	3.1 (1.4)	*204*
75+	34.1 (6.1)	*93*	1.0 (0.7)	*95*
Total (45+)	51.8 (2.1)	*1117*	2.2 (0.5)	*1127*

Standard errors in parentheses.

Table 28. Regression for smoking: Men

	Ever smoking	current smoking				
		(1)	(2)	(3)	(4)	(5)
Aged 55-64	-0.050	-0.094**	-0.089**	-0.088**	-0.088**	-0.077**
	(0.033)	(0.036)	(0.037)	(0.037)	(0.037)	(0.038)
Aged 65-74	-0.129***	-0.218***	-0.206***	-0.203***	-0.204***	-0.206***
	(0.045)	(0.046)	(0.046)	(0.046)	(0.046)	(0.050)
Aged 75 and over	-0.146**	-0.309***	-0.296***	-0.291***	-0.298***	-0.270***
	(0.059)	(0.056)	(0.057)	(0.056)	(0.055)	(0.058)
Can read and write	0.077*	0.004	-0.005	-0.004	-0.011	-0.003
	(0.045)	(0.043)	(0.044)	(0.044)	(0.045)	(0.048)
Finished primary	0.075*	0.021	0.008	0.009	0.007	0.019
	(0.040)	(0.046)	(0.046)	(0.046)	(0.046)	(0.051)
Junior high and above	0.068	0.030	0.011	0.014	0.019	0.017
	(0.045)	(0.046)	(0.047)	(0.048)	(0.047)	(0.050)
logPCE (< median)			0.045**	0.048**	0.043**	0.044**
			(0.019)	(0.018)	(0.018)	(0.019)
logPCE (> median, marginal)			-0.020	-0.013	-0.014	0.007
			(0.043)	(0.044)	(0.045)	(0.049)
Rural				0.037		
				(0.041)		
Rural Zhejiang					0.046	
					(0.055)	
Urban Gansu					-0.022	
					(0.054)	
Rural Gansu					0.012	
					(0.053)	
Community FE	NO	NO	NO	NO	NO	YES
F-test for all age dummies	3.45**	12.69***	11.12***	11.02***	11.55***	9.83***
(p-value)	(0.020)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
F-test for all education dummies	1.40	0.16	0.04	0.06	0.12	0.09
(p-value)	(0.248)	(0.921)	(0.988)	(0.980)	(0.945)	(0.964)
F-test for all logPCE splines			3.48**	4.28**	3.49**	4.48**
(p-value)			(0.035)	(0.017)	(0.034)	(0.014)
F-test for all location dummies					0.47	1.72***
(p-value)					(0.701)	(0.000)
Observations	1111	1111	1111	1111	1111	1111

Robust standard errors in parentheses, all clustered at community level.

* p<.1 ** p<.05 *** p<.01.

logPCE (>median, marginal) represents the change in the slope from the interval for logPCE below the median.