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Abstract

In many low- and middle-income countries, social insurance provides basic pension benefits with limited cover for illness and care costs, while private insurance markets are underdeveloped. Using an online survey of retirement insurance choices in urban China, we explore the stated demand for longevity, critical illness and long-term care (LTC) insurance. Most preferred is critical illness and LTC insurance cover for 50% of the expected out-of-pocket costs, and a monthly annuity of around 20% of average urban disposable income. We find that access to critical illness and LTC insurance can release precautionary savings for the purchase of annuities. Better product knowledge, higher financial competence, stronger bequest motives, and lower risk tolerance are linked to *higher* demand for critical illness and LTC cover but *lower* demand for annuities. Our results inform the development of retirement insurance markets in countries with ageing populations and gaps in social and private insurance.

Keywords: long-term care insurance, critical illness insurance, annuities, financial competence, risk aversion, health care

JEL Codes: D03, D14, G11, J14, J32

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1. Introduction

Upon retirement, individuals require adequate financial resources to sustain their living standards, while also safeguarding themselves against financial, health, and disability-related uncertainties. In high income countries, retirement provision typically encompasses both public and private pensions, along with public and/or private insurance for health and long-term care (LTC). However, in low- and middle-income countries, retirees typically receive modest public pensions and basic health insurance, while private insurance markets are often underdeveloped. Even when universal health care is available, older adults in less developed countries are often exposed to catastrophic costs of illnesses such as cancer and heart disease (Macinko et al., 2020). Care traditionally provided by the family is threatened by higher migration (Lagakos, 2020) and increasing female labour force participation (World Bank, 2021), and the options to supplement the often-modest public benefits via private pensions remain scarce (Fang and Feng, 2020). Moreover, emerging evidence indicates that, in the absence of well-developed insurance markets to manage these retirement risks, older individuals attempt to self-insure by holding on to assets well into their later years, at the detriment of their standard of living in retirement (Alonso-Garcia et al., 2022). This prompts considerations about the potential viability of private pensions (annuities), to complement basic public pensions, and insurance to address critical illness and LTC risks. Although several studies have explored the stated demand for annuities (Beshears et al., 2014; Lee et al., 2019) and LTC insurance (Akaichi et al., 2020; Wu et al., 2022; Wang et al., 2017), critical illness insurance has received little attention.

We study the stated demand for longevity, critical illness, and LTC insurance and the extent to which access to critical illness and LTC insurance for health and LTC risk allow individuals to release precautionary savings for the purchase of longevity insurance (annuities). We design and administer an online survey to elicit the preferred allocation of financial wealth at retirement to one or more of, an annuity that pays survival-contingent income, critical illness insurance that pays an illness-contingent lump-sum payment, and LTC insurance that pays disability-contingent income. We also collect comprehensive information on personal characteristics and attitudes relevant to these decisions, including demographics, preferences, financial competence and personality traits, which allow us to explore heterogeneity in the preferred allocations.

We conduct the survey in urban China. China is ageing rapidly, and the old-age dependency ratio is predicted to reach around 50% by 2050 (United Nations, 2022). As for many low- and middle-income countries, urban retirees are covered by a public pension system (at varying degrees of adequacy), face uninsured critical illness costs, and have limited LTC cover.[5]

We find that most participants prefer portfolios of retirement insurance. The most preferred option is a portfolio comprising insurance cover for 50% of expected out-of-pocket costs for both critical illness and LTC, and an annuity paying around 20% of urban disposable income, with the remainder, on average about 42% of financial wealth at retirement, placed in a savings account. This is the first study to examine the stated demand for longevity insurance (annuities), critical illness insurance and LTC insurance in a portfolio allocation setting. Related stated preference studies mostly focus on one insurance type (e.g., Beshears et al., 2014; Bateman et al., 2018; Brown et al., 2019; Akaichi et al., 2020), rather than a portfolio, as suggested by Koijen et al. (2016). Our results suggest an unmet demand for insurance to cover out-of-pocket costs due to critical illness and LTC, and to supplement the public pension, and in doing so provides empirical evidence for comparison with the optimal insurance amounts predicted by Wan et al. (2024).

We also find that access to critical illness and/or LTC insurance can release precautionary savings for the purchase of longevity insurance, and that the amount depends on the extent of the critical illness and LTC cover. This is a reasonable finding because health risks and costs may reduce annuity demand in the absence of insurance (e.g., Reichling and Smetters, 2015; Peijnenburg et al., 2017), hence critical illness and LTC cover may increase annuity demand (as per Wu et al., 2022). On the other hand, the wealth available for annuity purchases decreases after purchasing such health cover, which could reduce annuity demand. We find that purchasing cover for 50% of the expected out-of-pocket costs for either critical illness, LTC, or both, compared with no cover (the status quo) can increase annuity demand by about 1.5% of average disposable income. Our findings suggest opportunities to supplement social insurance with private cover, and to develop new offerings, including bundled longevity, critical illness and LTC insurance.

An important strength of this study is that we observe the stated demand for annuities, critical illness and LTC insurance for the same participant, which allows us to compare the influence of

[5] See Online Appendix A for background on retirement insurance in China.

personal characteristics, attitudes and knowledge on the demand for these three retirement insurance products. We show that, as compared with the sample median, a better understanding of the retirement insurance products, higher financial capability and stronger bequest motives are associated with a *higher* demand for critical illness and LTC cover, but a *lower* demand for annuities, while a higher financial risk tolerance is linked to a *higher* annuity demand but a *lower* demand for critical illness and LTC cover. These findings highlight those factors such as product understanding (Bateman et al., 2018), financial literacy and numeracy skills (e.g., van Rooij et al., 2011; Lusardi and Mitchell, 2011), financial risk tolerance (Dohmen et al., 2011), and bequest motives (e.g., Lockwood 2018) can have opposing influences on the cover for critical illness and LTC and the demand for annuities. Consequently, our results indicate that, regardless of health status, preferences and financial competence could separate the markets for longevity and health-contingent insurance, which is a valuable insight for insurers.

Furthermore, we note that being financially risk-averse is associated with a higher demand for critical illness and LTC cover, but a lower demand for annuities, and that those more financially capable and with better product knowledge prefer portfolios with more health-related cover. Together these findings suggest that health-related risks may dominate concerns about longevity risk for individuals, extending Beshears et al. (2014) who found that individuals in the United States viewed annuities as risky investments rather than insurance. A higher intention to spend more in poor health states is linked to a lower demand for critical illness and LTC cover, but such state-dependent consumption preferences are not significantly associated with annuity demand. Moreover, based on socioeconomic and health-related factors, we find potential selection effects for longevity insurance but not for critical illness and LTC cover. Our findings provide new evidence on the importance of individual heterogeneity in retirement insurance decisions (e.g., Hurwitz and Sade, 2020), as well as valuable insights into the design of bundled longevity and health-contingent insurance products (e.g., Brown and Warshawsky, 2013) and behavioural aspects of decisions related to ageing and insurance (e.g., Bonsang and Costa-Font, 2020).

The remainder of this paper is organised as follows. Section 2 describes the online survey and choice tasks designed to elicit preferences for longevity, LTC and critical illness insurance. Section 3 presents descriptive statistics. Section 4 describes the modelling strategy and reports regression results. Section 5 concludes.

2. Survey design

We designed an online survey with embedded choice tasks to elicit preferences for three types of retirement insurance purchased with accumulated savings at retirement – longevity insurance (annuities), and health and disability-contingent insurance to cover critical illness and LTC costs. The key aims were to (i) explore the stated preferences for portfolios comprising an annuity, critical illness insurance, and/or LTC insurance, for individuals close to retirement in urban China, and (ii) investigate whether access to critical illness and/or LTC insurance can release precautionary savings for the purchase of annuities. Our secondary aim is to explore the influence of personal characteristics, attitudes and knowledge on demand for retirement insurance.

2.1 Sample selection and survey overview

The online survey was fielded in August and September 2020 by commercial panel provider dataSpring.[6] dataSpring recruited 1,000 participants from their database of over one million Chinese urban residents and their network of panel suppliers. Participants were recruited via email and through a mobile app. They received a flat payment of about CNY 20 (USD 2.94)[7] on completion, and a bonus payment of up to CNY 30 (USD 4.41) based on their performance in a quiz designed to evaluate their understanding of the longevity and health-contingent insurance introduced in the survey.

We selected participants aged 45-59 (females) and 55-69 (males),[8] resident in 52 major cities in China, with an urban hukou, who were not retired, and in good health.[9] We set quotas for gender, age, and city size to ensure the representativeness of our sample. We focused on urban residents because rural populations are covered by different public pensions which are far less generous, and there are significant differences in socioeconomics, health status, and social insurance

[6] See Online Appendix A for background on China's COVID-19 experience.
[7] 1 USD = 6.8 CNY on September 1, 2020.
[8] We included individuals beyond the pension eligibility age 50 for female blue-collar workers, 55 for female white-collar workers, and 60 for males covered by China's Basic Old Age Insurance (Fang and Feng, 2020) to match the proportion of urban residents continuing to work beyond the official retirement ages in the CHARLS data. We note that their insurance preferences could be correlated with their retirement decisions.
[9] The hukou registration system is a household registration system used in mainland China that identifies a person as a permanent resident of an area and determines the person's eligibility for different government benefits and programmes. Individuals can migrate from rural areas to urban areas and can enrol for the public insurance for urban employees. Our survey did not ask about migration history.

coverage compared with urban China. Moreover, a study of urban China has greater potential to provide generalisable findings for other countries. We screened participants on health status, including only individuals without a prior critical illness diagnosis or current limitations on activities of daily living (ADL), to ensure that they would be eligible for the hypothetical insurance products.

The survey structure is summarised in Table 1. Screenshots of the English version of the survey can be found in Online Appendix B.[10]

Table 1: Survey overview

Participant information statement and consent form **Sample selection questions**
Section 1: Introductory questions • Wealth and (expected) pension

Section 2: Presentation of retirement financial products
• For each of annuity, critical illness insurance, long-term care insurance, savings account
  – Explanation of risk in retirement and expected cost
  – Short description of relevant retirement financial product
• Quiz to test knowledge of retirement financial products introduced in survey

Section 3: Choice tasks - allocation of retirement savings to retirement financial products • Introduction • Stage 1: 9 portfolio allocation tasks • Stage 2: 12 best/worst choice sets • Rank additional attributes for annuity, critical illness insurance, and long-term care insurance
Section 4: Questions to collect data on personal characteristics and attitudes • Retirement planning • Health (including COVID-19) • Risk attitude and patience • Personality traits • Financial competence • Socio-demographics • COVID-19 questions • Survey clarity, feedback

2.2 Introductory questions: Wealth and pension groups

The introductory questions (Section 1) asked participants to report their household's savings, debt and property value, as well as their (actual or expected) public pension benefits per month. We

[10] An interactive version of the survey can be accessed at:
English version: https://pro.wenjuan.com/s2/5ed9e935f47c050001a75bb5/?test_mode=1,
Chinese version: https://pro.wenjuan.com/s2/5ef01abfcabdf500010c25a8/?test_mode=1.

used this information to assign the participants to four wealth groups (CNY 150,000; 300,000; 500,000; 1,000,000) and five (expected) pension income groups (CNY 500; 1,000; 2,000; 3,000; 3,500, per month) that were close to their actual circumstances and therefore addressed possible alienation from amounts presented in the choice tasks.[11]

2.3 Retirement financial products

In Section 2, participants were introduced to four financial products − three retirement insurance products and a savings account. We asked participants to focus on the hypothetical products described in the survey rather than products available in the market. Participants were reminded to read the product descriptions carefully and informed that their product understanding would affect the bonus payment they could earn from completing the survey. We avoided the terms "insurance" and "annuity" to address possible negative connotations.[12] Instead, we used the generic name Lifetime income product for the hypothetical longevity insurance (annuity), Critical illness cash product for critical illness insurance, and Long-term care income product for LTC insurance, and referred to all three products as retirement financial products. Each product description started with an explanation of the risk and the associated cost the product was designed to cover. The risk description included the gender-specific life expectancy and the chance of becoming critically ill or needing LTC, estimated based on official mortality and critical illness curves and CHARLS data (see Table 2). The pricing of the three retirement insurance products was based on the same curves and data (as explained in Online Appendix D). We used pop-up explanations with mouse-hovers for technical or unfamiliar terms.

All three hypothetical products could be bought with a single premium at retirement, and provide monthly income (annuities, LTC insurance) or a lump sum (critical illness insurance) rather than

[11] We chose the hypothetical wealth levels based on the distribution of total wealth of a matched China Health and Retirement Longitudinal Study (CHARLS) sample comprising non-retired urban individuals. The monthly pension levels were based on the average pension income published by sub-national Chinese governments in 2020 and by Fang and Feng (2020) and Zhu and Walker (2018).

[12] We pre-tested the product names for a better understanding of key insurance product attributes in a focus group study (see Online Appendix C)

expense reimbursement.[13] Participants were told that they could use the payments for any purpose, and that if the insured person died, the payments would stop, and no refund would be provided.

Table 2: Description of retirement risks, costs, and hypothetical insurance products in the survey (translated).

Longevity risk and cost: *"Most retirees cover living expenses with money from three sources: 1. Pension; 2. Personal savings and investments; 3. Transfers provided by their children or other family members. A typical {male/female} just retired at age* ***{60 for male/55 for female}*** *is expected to live until* ***{83/87}*** *but can live longer or shorter than that. If a retiree lives long, {he/she} may not have enough resources to cover the expenses."* **Lifetime income product:** *"A financial product that helps retirees cover regular living expenses. The product provides regular income payments every month,* ***as long as the policyholder is alive****. The product description explained that for every* ***10,000 RMB***[14] *paid now (a one-off payment), the policyholder receives a monthly income of {****35 for males, 30 for females****} RMB (inflation-adjusted) as long as the policyholder is alive."*
Critical illness risk and cost: *"The chance of getting* ***critically ill*** *(for example, having cancer, a stroke, or heart attack) varies from person to person, depending on their health and medical history. On average,* ***{5/5} out of 10*** *{male/female} retirees will be critically ill during their retirement. For persons infected with the novel coronavirus, the chance of getting critically ill is much higher.*[15] ***Public Health Insurance*** *provides basic critical illness coverage. On average, public health insurance will reimburse* ***half*** *of the medical expenditures for critical illness. Patients need to use their savings to access more advanced/expensive treatments or drugs which are not covered by Public health Insurance. The additional cost can range from* ***tens of thousands to hundreds of thousands RMB****."* **Critical illness cash product**: *"A financial product that helps retirees cover critical illness costs. The critical illness cash product provides a one-off payment if the insured person is* ***critically ill****, i.e., diagnosed with one of 25 critical conditions (e.g., cancer, stroke, or heart attack) and qualification for critical illness insurance payments if infected by COVID-19.*[16] *For every* ***10,000 RMB*** *paid now (one-*

[13] This design is standard for annuities (Reichling and Smetters, 2015), is emerging for long-term care income insurance (Wu et al., 2022) and is a reasonable assumption to cover for critical illness costs for the elderly (Swiss Re Institute, 2020).

[14] We used RMB in the survey to refer to the Chinese currency CNY.

[15] The survey was conducted immediately after the first COVID-19 wave in 2020. It was widely reported by the media that older people with co-morbidities were more vulnerable.

[16] As defined by the China Bank and Insurance Regulatory Commission (CBIRC, 2013).

*off payment), a cash payment of {**20,000 for males, 21,000 for females**} **RMB** (inflation-adjusted) will be provided if the policyholder is critically ill."*
Long-term care risk and cost: *"The chance of needing long-term care varies from person to person, depending on their health and medical history. However, on average, **{4/5} out of 10** {male/female} retirees will need some form of care during their retirement, mostly at older ages. People need **long-term care** if they need help completing at least three of the following six activities: bathing, dressing, toileting, getting into or out of bed, continence, and feeding.*[17] *Some people need long-term care for **several months**, while others need it for **many years**. **Public Health Insurance** does not provide long-term care insurance in most cities. Where there is no insurance, people pay for long-term care from their savings. The monthly cost of long-term care services can range from **2,000 to 6,000 RMB**."* **Long-term care income product**: *"A financial product that provides a monthly income during periods that **the insured person needs long-term care**. Government-appointed doctors will regularly assess their ability to undertake the six activities. For every **10,000 RMB** paid now (a one-off payment), a monthly income of {**450 for males, 350 for females**} **RMB** (inflation-adjusted) will be provided as long as long-term care is needed."*

Participants were also told that retirement savings not used to purchase insurance would be placed in a savings account and could be withdrawn to cover critical illness and LTC expenses. They were warned that the money in the savings account might not be enough if the person lived for a long time and/or the expenses were high, and informed that any remaining money in the savings account when the account holder died would be passed to their beneficiaries. We offered a savings account rather than risky assets because most Chinese retirees save in low return savings accounts rather than investing in equities. The average stock market participation rate in China is about 8% (and even lower among the elderly).[18]

Participants then moved to a screen presenting a summary of the key features of the three retirement insurance products and the savings account in a table format. They were asked to review

[17] The definition of the long-term care state is not consistent across China. For example, hospitals and long-term care facilities can use a range of metrics (e.g., ADLs and instrumental ADLs) to measure the need for care. The commercial insurance market usually uses three or more of the six ADLs or dementia, but this definition is not consistent across insurers.

[18] Less than 5% of individuals aged 50-69, still working and living in urban areas (our sub-population of interest) participate in the stock market (own calculations based on CHARLS, 2018).

this information and were informed that they would receive a discount of about 10% (15%) when they bought any two (three) products together.[19] We incorporate the discount mainly to avoid potential behavioural effects because our focus group study indicated that participants would expect discount for bundled products.[20] Next, participants completed a quiz evaluating their understanding of the three retirement insurance products (and the savings account) and were paid a bonus based on the number of correct answers.[21]

2.4 Choice Tasks

Participants then completed a series of choice tasks designed to elicit the preferred allocation of financial wealth at retirement across the three retirement insurance products (with the remainder placed in a savings account). Existing studies show that health insurance is complex, and it could be better to limit options or choices (Abaluck and Gruber, 2023; Biener and Zou, 2024). To simplify this complex allocation, we split the choice task into two stages. In the first stage, participants completed nine allocation tasks, each with a pre-set (and increasing) allocation to the critical illness cash product and the LTC income product (within-subjects design), with free choice between the lifetime income product and the savings account. In the second stage, participants completed twelve best/worst choice sets to elicit their preferences from the nine chosen allocations.

Stage 1: Allocation tasks

In line with China's institutional setting for retirement provision (see Online Appendix A), participants were asked to suppose they were aged 55 (females) or 60 (males),[22] had just retired with a given amount of savings, would receive an inflation-adjusted public pension, and be covered by public health insurance which would fund half of the cost of critical illness but none of the cost of LTC. They were allocated to "representative" financial wealth at retirement and pension groups using the information on wealth and expected pension collected at the beginning of the survey.

[19] The risks of critical illness insurance and LTC insurance could be mitigated by an annuity, but the risks of the health contingent insurance could not be mitigated by each other. However, price discounts are common with bundled products, and to simplify the survey we adopted the discount rules. The discounts applied in our study were based on the differences in mortality curves used for annuities and health insurance. See Online Appendix D.

[20] Bundled products are often associated with a price discount. To avoid additional complexity, our experiments do not attempt to separate the effect of pure product bundling and the price effect.

[21] The equivalent of USD 1.00 for at least 50% of answers correct and USD 2.00 for 100% correct.

[22] These ages correspond to the retirement eligibility ages for blue-collar females and males covered by China's Basic Old Age Insurance (Fang and Feng, 2020).

Participants then completed nine similar allocation tasks in which they were assigned a pre-set critical illness cash product and/or the LTC income product – of either 0%, 50% or 100% cover for critical illness medical expenditures not covered by public health insurance and LTC (see Table 3)[23] – and were asked to use a configurator to allocate their remaining retirement savings between the lifetime income product and a savings account (as illustrated in Figure 1).

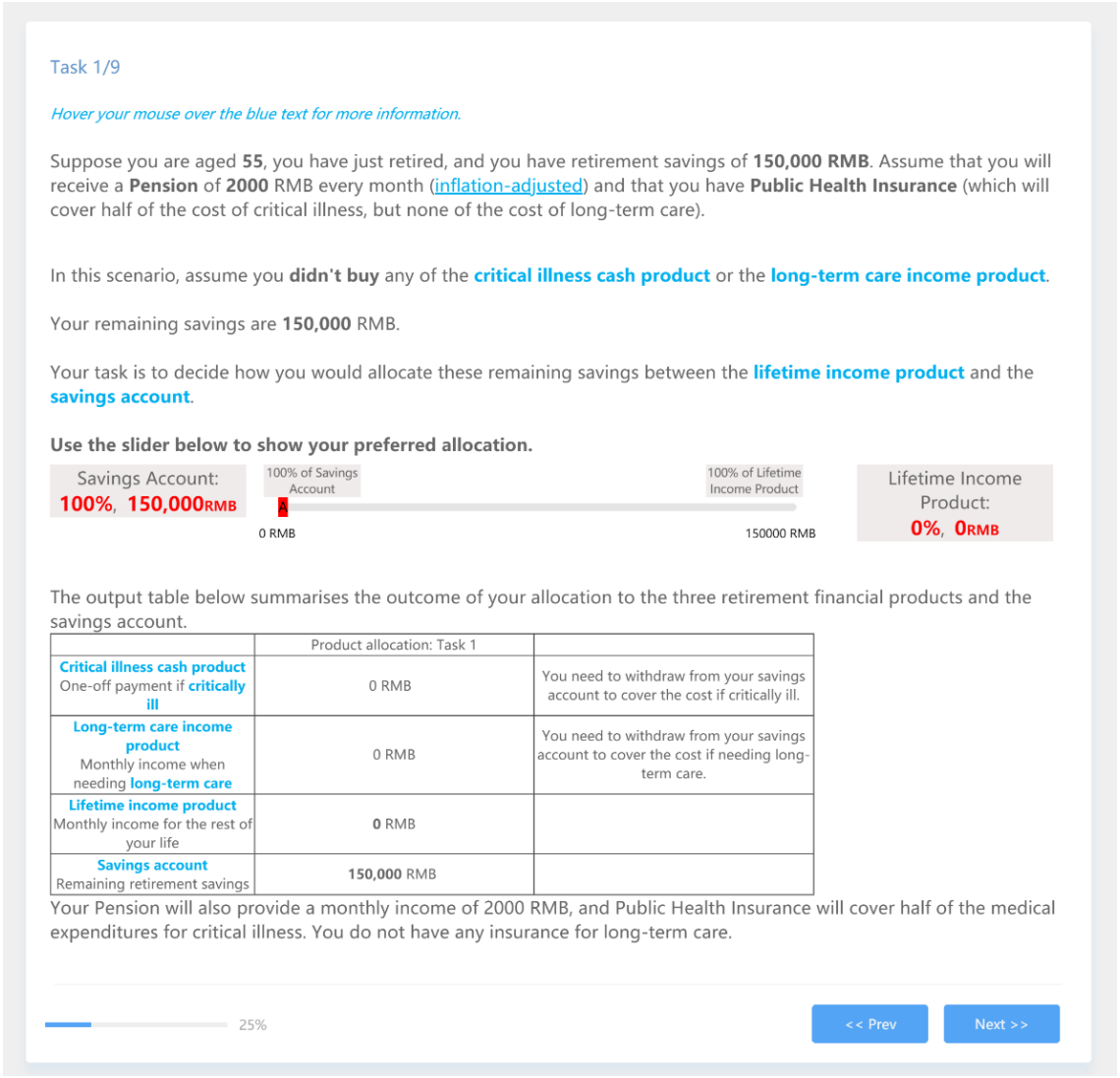
Table 3: Cover levels for critical illness and long-term care in the nine tasks

Task	1	2	3	4	5	6	7	8	9
Critical illness cover	0	50%	100%	0	0	50%	100%	50%	100%
Long-term care cover	0	0	0	50%	100%	50%	50%	100%	100%

The initial allocation was set at 100% in the savings account and 0% in the lifetime income product to reflect most individuals' actual portfolios. The participants were told to move the slider at least once but could move it back to 100% savings account if they did not want to purchase any lifetime income products. A table below the configurator simultaneously summarised the outcomes of their choice: the cover provided by critical illness insurance and LTC insurance, the monthly annuity income and remaining retirement savings placed in the savings account. There was a reminder below the table about their assumed public pension and the limited public cover for critical illness and LTC (see lower part of Figure 1). Before moving to the next task, participants were asked to confirm whether their choice was final, and if not, they were prompted to reallocate.

[23] All participants completed these tasks in the same order.

Figure 1: Illustrative portfolio allocation task for white-collar female (translated)

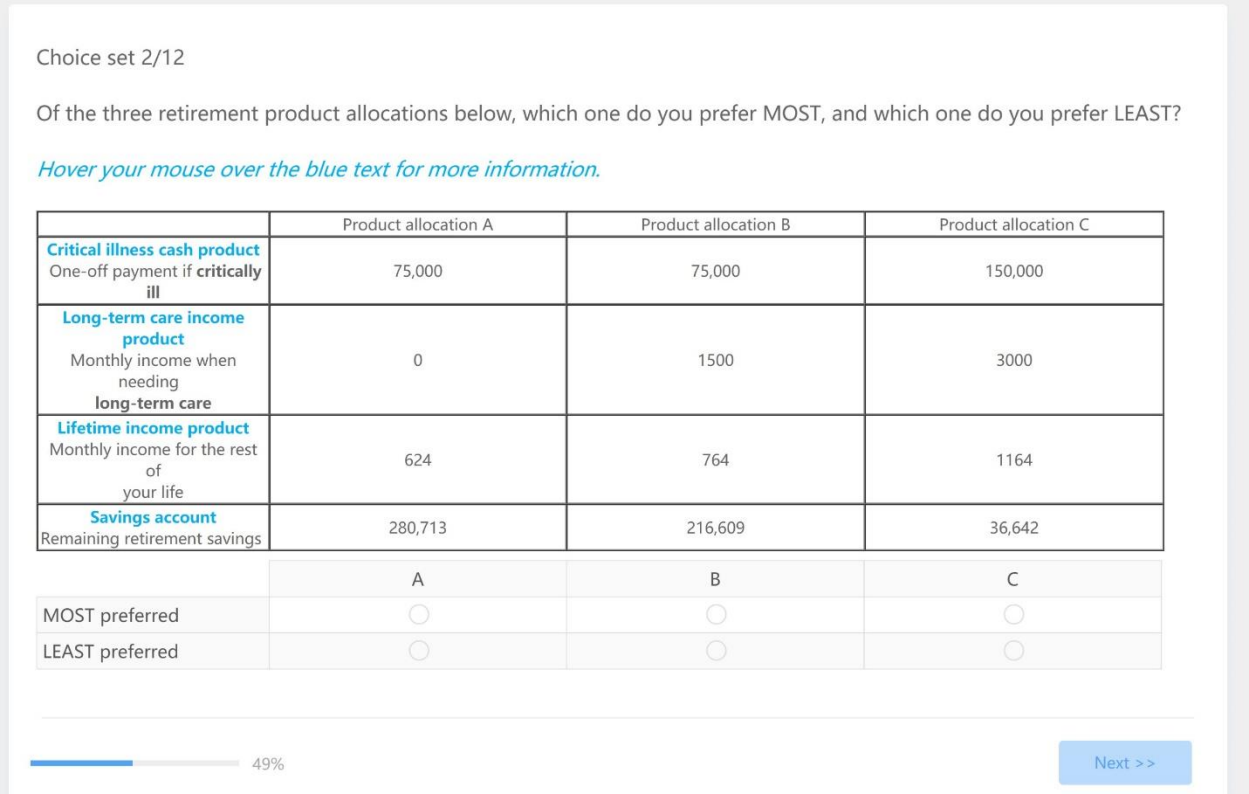


Stage 2: Best/worst choice sets

After completing nine allocation tasks, participants proceeded to the second stage of the choice task, which was designed to elicit the most preferred of their nine Stage 1 portfolio choices using Best-Worst (B-W) scaling (Louviere et al., 2015). The first screen presented a table summarising these nine portfolio choices for review. Participants then completed 12 randomly allocated choice sets, each comprising three of the nine chosen portfolios (assigned using a balanced incomplete block design). For each choice set, participants were asked to select their most and least preferred

portfolio allocation. We used the B-W scaling approach to reduce the difficulty of ranking nine portfolios directly. Figure 2 shows an example of one of the 12 choice sets.

Figure 2: Choice set (example, translated)



Choice set 2/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	75,000	75,000	150,000
Long-term care income product Monthly income when needing **long-term care**	0	1500	3000
Lifetime income product Monthly income for the rest of your life	624	764	1164
Savings account Remaining retirement savings	280,713	216,609	36,642

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

49%

Next >>

Participants then rated how difficult it was for them to complete the tasks on a five-point scale and were asked to rank additional product characteristics for the three retirement insurance products. We listed four extra characteristics for each product. These attributes included income patterns and fixed contract lengths for the annuity, disease cover and instalment purchase for the critical illness insurance, lower ADL requirements for eligibility and lump sum benefits for the LTC insurance, a price discount and access to death benefits.

2.5 Covariate collection

The final section of the survey collected personal characteristics, attitudes and knowledge, including financial capability and understanding of insurance products (e.g., Bateman et al., 2018), financial literacy (Lusardi and Mitchell, 2011) and numeracy (Lipkus et al., 2001); preferences –

including risk attitude (Dohmen et al., 2011), time preference (Jacobs-Lawson and Hershey, 2005), state-dependent consumption attitudes and bequest motives (Wu et al., 2022); exposure to health-related risks (e.g., Wu et al., 2022); psychological traits (Agnew et al., 2016) and demographic and socioeconomic factors related to retirement financial planning (e.g., Agnew et al., 2016; Hanewald et al., 2020). The survey was conducted during the COVID-19 period, and to control for its impact, we also included questions about individuals' COVID-19-related experiences and expectations.[24]

Given the potential complexity of the choices we asked participants to make, we used focus groups to pre-test the product descriptions and choice tasks (see Online Appendix C), we included timers on key information screens, provided access to key definitions using a 'hover mouse' feature, and incentivised a quiz testing knowledge of products introduced in the survey (and informed participants of this beforehand).[25]

3. Descriptive statistics

3.1 Participants' characteristics

The analysis sample includes all 1,000 survey participants. A comparison with a comparable sample from the 2018 wave of the nationally representative China Health and Retirement Longitudinal Study (CHARLS) shows that overall, the analysis sample has a lower proportion of males (50% rather than 60.9%) and is wealthier and more educated than the CHARLS sample (see Appendix E) but is otherwise broadly comparable. The differences are likely because we set an equal quota for gender, restricted our sample to 52 major cities in China, and used an online sampling method, while CHARLS conducts in-person data collection and has smaller cities included to represent a wider coverage of the Chinese population.

Responses to the product knowledge quiz suggest that participants had a reasonably good understanding of the retirement financial products introduced in the survey: 72% correctly answered all three questions about the Lifetime income product, and 67% correctly answered the questions about the Critical illness cash product and LTC income product. However, only 39% of

[24] These include experience with the virus in their immediate social environment and its impact (WHO, 2020), insurance purchase and risk-taking behaviour, impact on financial circumstances, and expectations about the economy.

[25] An instructional manipulation check (IMC, Oppenheimer et al., 2009) was included to identify participants' inattention. The final question of the survey asked participants to rate the clarity of the questions in the survey.

participants answered all ten quiz questions correctly. The median completion time was 48 minutes, and 86% of participants passed the IMC.[26]

3.2 Preferred portfolios

We explained in Section 2.4 that in Stage 2 of the choice task, participants completed 12 choice sets in which they selected their most preferred - best (B) - and least preferred - worst (W) - from random subsets of three of their nine Stage 1 portfolios. In Table 3, we report the overall preferences for the nine portfolios using two measures: the average of the best-worst (B-W) scores and the standard deviation of the individual B-W scores (Flynn et al., 2007; Louviere et al., 2015).[27] A higher average score indicates that the overall preference for the portfolio is higher than for other portfolios. The standard deviation of the individual B-W score for each portfolio summarises the heterogeneity of the portfolio preferences.

Table 3 shows that survey participants preferred portfolios with 50% or 100% pre-selected cover for **Error! Reference source not found.**expected out-of-pocket critical illness and LTC costs. The average B-W scores were higher for these portfolios (Portfolios 6-9) than for portfolios with zero cover for critical illness or LTC costs (Portfolios 1-5). Portfolio 6 (with 50% **Error! Reference source not found.Error! Reference source not found.**pre-set cover for critical illness and LTC costs) was the most preferred, with a B-W score of 0.093. For this 50-50 critical illness and LTC cover, on average the portfolio included a monthly annuity of CNY 711, or around 20% of average urban disposable income, with about 42% of the retirement wealth placed in a savings account. Portfolio 1 (zero pre-set cover for critical illness and LTC costs, or '0-0 cover') was the least preferred, with a B-W score of -0.183.

Table 4 also reports the standard deviations of the individual B-W scores, which show considerable heterogeneity in preferences. The greatest variation is for Portfolio 1 (0-0 cover), followed by

[26] 72% of participants considered the survey questions completely or mostly clear, while 41% of participants considered the choice tasks "easy" or "very easy".

[27] The average B-W score for each portfolio was calculated by subtracting the number of times the portfolio was selected as 'least' preferred from the number of times the portfolio was selected as 'most' preferred across all choice tasks and survey participants, averaged by the number of times that each portfolio was presented to the participants (4,000 times). Our survey had a balanced design, such that each portfolio was presented to each participant the same number of times.

Portfolio 9 (100-100 cover). These preferences vary by wealth and pension income – see online Appendix F.

Table 4: Preference for retirement portfolios by best-worst (B-W) measures

Portfolio	CI-LTC cover	Monthly annuity (CNY)	Savings account	Ranking	# Best	# Worst	Average B-W score	Std. dev. of B-W scores
1	0-0	665	54%	9th	1,049	1,779	-0.183	0.550
2	50-0	665	48%	8th	1,209	1,586	-0.094	0.481
3	100-0	657	42%	7th	1,289	1,486	-0.049	0.423
4	0-50	718	47%	6th	1,278	1,441	-0.041	0.393
5	0-100	666	40%	5th	1,384	1,247	0.034	0.371
6	50-50	711	42%	1st	1,530	1,159	0.093	0.440
7	100-50	651	36%	4th	1,417	1,125	0.073	0.438
8	50-100	652	36%	2nd	1,443	1,101	0.086	0.456
9	100-100	590	30%	3rd	1,401	1,076	0.081	0.510

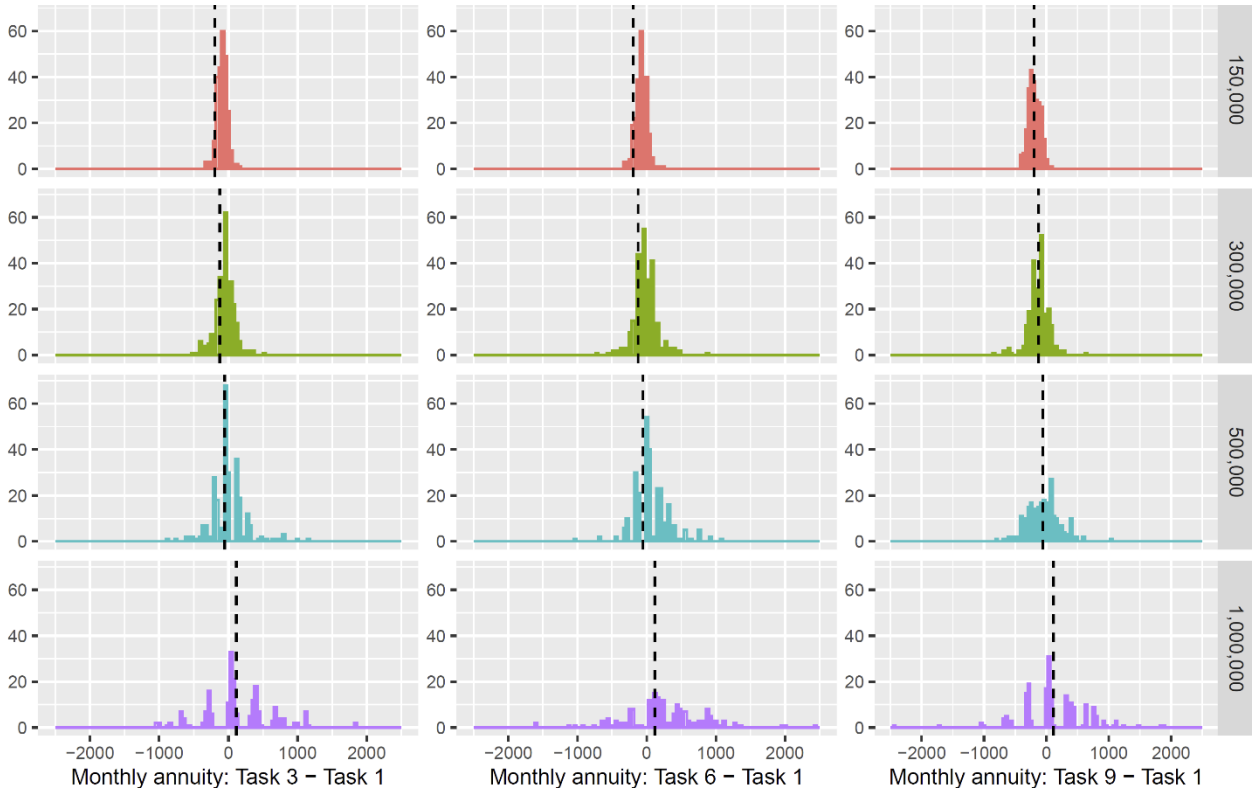
Notes: The CI-LTC cover column shows the cover (in percentage points) provided in a portfolio for expected out-of-pocket costs of critical illness (CI) and long-term care (LTC), respectively. The monthly annuity column reports the average selected annuity income by CI-LTC cover. The savings account column shows the average proportion of retirement wealth in a savings account by CI-LTC cover.

In a related paper, Wan et al. (2024) construct a life-cycle model to derive the optimal retirement portfolio, based on the same retirement insurance products considered here. Their model suggests that participants with the average (hypothetical) wealth and pension income in the survey should choose the 100-100 cover for critical illness and LTC, instead of the 50-50 cover that most participants preferred; the predicted annuity amount is nearly zero, which is much less than the stated average for participants with similar wealth and pension levels. A comparison of these results indicates that the survey participants may have either underestimated their health-related risks or preferred to use annuity income as a buffer for uncertain costs in retirement (e.g., Pang and Warshawsky, 2010).

3.3 Annuity amounts and release of precautionary savings

We are also interested in the extent to which access to critical illness and/or LTC insurance can release precautionary savings for the purchase of annuities. The design of the Stage 1 choice tasks allows us to analyse how access to cover for critical illness and LTC costs (0%, 50% or 100% of expected out-of-pocket costs) influence annuity demand. Figure 3 presents the differences between the annuity income chosen in Task 1 (critical illness cover 0% - LTC cover 0%) and three other tasks with positive critical illness and/or LTC cover. For illustrative purposes, we report comparisons of Task 1 with Task 3 (50-0 cover), Task 6 (50-50 cover), and Task 9 (100-100 cover) by wealth group. We average across pension groups and note that there was a discount of 10% when the participants purchased any two types of insurance and 15% when they purchased three. We also note that the amount of remaining retirement wealth available to allocate between an annuity and a savings account was lower in tasks with higher pre-set levels of critical illness and LTC cover.

Figure 3: Difference in monthly annuity between Task 1 and each of Tasks 3, 6, and 9 by initial retirement wealth



Notes: The four allocation tasks for annuities were from Stage 1, each with different pre-selected cover for expected out-of-pocket costs of critical illness and long-term care: Task 1 (critical illness cover: 0%, long-term care cover: 0%, or '0-0 cover'); Task 3 (100-0 cover); Task 6 (50-50 cover); Task 9 (100-100 cover). Participants chose their preferred allocation between an annuity and a savings account in each of the tasks. A positive difference shows that the selected annuity income is higher with the critical illness and LTC cover provided in the corresponding task than that in Task 1, and vice versa. The figure shows the histograms of the differences of monthly annuity amounts by initial retirement wealth (CNY 150,000, 300,000, 500,000, and 1 million), as indicated on the vertical axis. The dashed line shows the average value of the differences in each subfigure.

Firstly, the differences between annuity incomes in Figure 3 show that the treatment effect of including cover for critical illness and/or LTC depends on wealth and the level of cover. Secondly, the release of precautionary savings for annuity purchase varies considerably across participants. The dashed line in each subfigure represents the average treatment effect (ATE) of the pre-set critical illness and LTC cover in the corresponding task, which varies by wealth level. For those with high wealth (CNY 1 million), the ATE on annuity demand was positive for more critical illness and LTC cover. However, with lower wealth, the ATE was negative; more participants chose a lower annuity income as their available wealth decreased after purchasing more critical illness and LTC cover. In Section 4.2, we use regression analysis to test which pre-set levels of critical illness and LTC cover are effective in releasing precautionary savings for the purchase of annuities.

4. Regression results

Our overall aim is to elicit preferences for insurance to cover longevity, critical illness and LTC risks in retirement. As explained in Section 2, we designed a two-stage survey in which we first obtained stated preferences for longevity insurance given nine levels of cover for expected out-of-pocket critical illness and LTC costs. This stage gives nine portfolios for the three types of retirement insurance and a savings account. In the second stage, we used B-W analysis to identify the most preferred of the nine portfolios. We also collected data on relevant personal characteristics, attitudes, and knowledge. Variables are defined in Online Appendix G. In this section, we use regression analysis to explain the preferences for retirement insurance portfolios with different levels of critical illness and LTC cover (Section 4.1), and to study the subsequent demand for annuities (Section 4.2). We conducted the survey during the COVID-19 period so provide robustness analysis with respect to COVID-19 stress experience in Appendix H.

4.1 Choice of retirement portfolios with critical illness and LTC cover

The descriptive statistics for the B-W measures reported in Section 3.2 indicate that participants prefer portfolios with more critical illness and LTC cover, while substantial variations among portfolio preferences are also observed. The portfolios have different levels of annuity, depending on individual preferences. However, by design (to address potential task complexity) the portfolios have nine different levels of health cover.[28] We use a multinomial logit model (Model A) to explain the preferred choice of retirement insurance portfolios with alternative levels of critical illness and LTC cover by personal characteristics, attitudes, and knowledge.

In Model A, the random utility of the portfolio in task *t* in Stage 1 (hereafter, Portfolio *t*) for an individual *i* is:

$$U_{i,t} = \alpha_t + X_i\kappa_t + \epsilon_{i,t}, \quad (1)$$

where the error term $\epsilon_{i,t}$ is assumed to be independently and identically distributed (i.i.d.) and to follow a Gumbel distribution.[29] The dependent variable is the choice outcome indicating the most preferred choice made by individual *i* from each of the 12 B-W tasks (Stage 2; 12,000 observations), and the probability of an individual *i* choosing Portfolio *t*, among the portfolios in a given B-W task with *k* portfolios can be represented as:

$$\text{Prob}(\text{Choice}_i = \text{Portfolio}_t) = \frac{e^{\alpha_t + X_i\kappa_t}}{\sum_k e^{\alpha_t + X_i\kappa_t}}. \quad (2)$$

The vector of covariates $\mathbf{X}_i$ includes covariates that have been identified as relevant to retirement insurance decisions, such as personality traits, financial capability, retirement expectations, illness- and care-related experience, and demographic and socioeconomic variables. It also includes controls for COVID-19 impact and survey quality.[30] The vector $\kappa_\mathbf{t}$ is the portfolio-specific coefficient of the individual covariates, and α_t is the portfolio-specific intercept. All coefficients for Portfolio 1 (0-0 cover) are set to zero for the purpose of identification. We use robust standard

[28] Therefore, the portfolio choices in the B-W task more reflect preferences for health cover, rather than for longevity insurance (annuities).

[29] The standard approach for a multinomial logit model.

[30] These include measures of the influence of COVID-19 on emotion, personal finances, economic concerns, and risk-taking behaviour since the loosening of the COVID-19-induced lockdown, and two measures of survey quality – the IMC and survey clarity.

errors clustered at the individual level and consider effects with a *p*-value of less than 5% to be statistically significant. Our model estimate is based on choice data from the B-W tasks for the nine portfolios, each with fixed levels of cover for expected out-of-pocket costs for critical illness and LTC and stated annuity and savings account amounts. The Hausman-McFadden Test shows no violation of the independence of irrelevant alternatives assumption.[31] The regression results from this model are reported in Table 5 and discussed below. We choose to report relative risk instead of marginal effects for a more straightforward interpretation, because this shows the relative probability of choosing one portfolio with some critical illness and LTC cover over the reference Portfolio 1 (0-0 cover), the status quo.[32] Table H.1 in Appendix H shows that the majority of our results do not differ by participants' COVID-19 stress levels.[33]

Financial capability

The perceived complexity of insurance and a lack of understanding of specific insurance attributes are often associated with suboptimal insurance choices (e.g., Brown et al., 2019). The regression results in Table 5 show that understanding of retirement insurance and financial competence were mostly positively associated with demand for critical illness and LTC cover. Participants with a better understanding of the retirement insurance products than the sample median were 27% more likely to prefer a portfolio with 50-50 cover and 45% more likely to prefer 100-100 cover ($p < 0.05$ and $p < 0.01$, respectively) over 0-0 cover.[34] This finding is consistent with Bateman et al. (2018), who found that a better understanding is associated with higher preferences for retirement risk management products. Higher financial competence (based on responses to financial literacy and numeracy questions) was associated with a 54-151% higher preference for portfolios with more critical illness and LTC cover ($p < 0.01$, Table 5, Columns 3 to 9), while the portfolio with

[31] We apply the Hausman-McFadden test to several model specifications with different subsets of variables and all the p-values of the tests are larger than 0.05.

[32] Full results, including the standard errors, are available upon request.

[33] However, for those with differing results, first, they suggest that the effects are from participants with more COVID-19 stress, for example, product understanding, public sector employment, financial risk tolerance and bequest motives. Second, they show that a null overall effect could be caused by opposing effects by COVID-19 stress, for example, health related measures such as subjective life expectancy and ADL limitations.

[34] This is interpreted as the relative probability of choosing one portfolio with some critical illness and LTC cover over the reference Portfolio 1 (0-0 cover). For example, participants with better product understanding than the sample median are associated with a higher relative probability of choosing the portfolio with 50-50 cover over 0-0 cover by a factor of 1.27 (Table 5, Column 5). In the remaining text, participants are compared with their median values (and reference levels for categorical variables), while preferences for portfolios are relative to Portfolio 1 (0-0 cover), if not stated explicitly.

100-100 cover was most preferred. The results confirm the importance of financial literacy and numeracy skills for retirement planning (e.g., Bateman et al., 2018). Furthermore, a higher familiarity with financial products in China's market was linked to a 31-54% higher preference for portfolios with both critical illness and LTC insurance ($p < 0.05$, Table 5, Columns 6-9).

However, higher subjective financial literacy was linked to a 20% lower preference for 100-50 cover and 100-100 cover ($p < 0.05$, Table 5, Columns 7 and 9), which could suggest poor choices associated with over-confidence. Similarly, stock market participation was associated with a 27-32% lower preference for 50-50 cover and 50-100 cover ($p < 0.05$, Table 5, Columns 6 and 8). This contrasts with the finding that risky investment increased after the introduction of drug coverage in the US (Li et al., 2021).

Wealth and public pension income

We found that the demand for critical illness and LTC cover was positively associated with retirement wealth but negatively associated with (public) pension income. Participants in the highest wealth group (CNY 1,000,000) preferred portfolios with full cover for LTC and at least some cover for both critical illness and LTC, with the preference for these portfolios generally increasing with critical illness and LTC cover by a factor ranging from 1.72 to 3.94 ($p < 0.01$, Table 5, Columns 5 – 9). This result is consistent with stated-preference studies for (public) illness and LTC insurance in China (e.g., Ying et al., 2007, Wang et al., 2017). However, participants in the higher public pension group (of CNY 3,500 relative to CNY 2,000 or less) were about 30-40% less likely to prefer half and full LTC cover ($p < 0.05$, Table 5, Columns 4 and 5). A plausible explanation for this negative association could be that individuals can use high (pension) income to finance LTC, which tends to occur later in life (e.g., Pang and Warshawsky, 2010; Peijnenburg et al., 2017). Or perhaps individuals with high pension income did not see the need to purchase LTC insurance. Also, state-dependent preferences could rationalize a decrease in demand for LTC insurance with income (De Donder and Leroux, 2021).

Preferences

Financial risk tolerance, bequest motives and health state-dependent utility were significantly associated with the demand for critical illness and LTC cover. However, patience was not statistically significant.

Participants who reported a higher tolerance for financial risk were 14-24% less likely to take more critical illness and LTC cover ($p < 0.05$, Table 5, Columns 2, 4, 7 and 9). A stronger intended bequest motive was linked to a 15% higher preference for 50-100 cover and 100-50 cover ($p < 0.05$, Table 5, Columns 7 and 8). This suggests that individuals in China with higher-than-median intended bequest motives are likely to use insurance to cover their uncertain health-related expenditures rather than relying on precautionary savings.

A higher intention to spend more in poor health states was linked to a 5-16% lower preference for critical illness and LTC cover ($p < 0.01$, Table 5, Columns 4 to 9). This result is somewhat surprising, as we would expect individuals with a higher marginal utility of consumption in poor health state buy more critical illness and LTC cover. However, using a linear probability model based on the CHARLS data in China, Wang and Wang (2020) found that a higher marginal utility of consumption was associated with more chronic diseases, while a lower marginal utility of consumption was associated with more ADL limitations, which partly supports our results.

Selection effects

Private information may influence the demand for health and LTC insurance (e.g., Brown et al., 2012; Braun et al., 2019) and may be strong enough to prevent the existence of a large insurance segment (Hendren, 2013). However, we did not find strong selection effects for most demographic and socio-economic factors and health- and care-related variables considered in this study, on the demand for critical illness and LTC cover.

Age, education, living in Tier 1 cities, public sector employment and gender were not significantly associated with the demand for critical illness and LTC cover. These results differ from previous studies which found gender and education to be important in determining preferences for LTC insurance (Jakobsson et al., 2016; Akaichi et al., 2020; Wu et al., 2022; Lambregts and Schut, 2024). Nevertheless, the results are consistent in the Chinese context with Wang et al. (2017) for gender on stated LTC insurance demand and Hanewald et al. (2020) for employment and property value on reverse mortgages for retirement.

Similarly, we found no significant effects of body mass index (BMI), subjective life expectancy, critical illness or ADL limitations. These results are consistent with previous findings in China that chronic conditions do not affect the stated demand for LTC insurance (Wang et al., 2017) or

critical illness insurance (Ying et al., 2007). However, participants who previously provided active care had a 31-45% lower preference for critical illness and LTC cover ($p < 0.01$, Table 5, Columns 3 and 6 to 9). One plausible explanation could be that providing care is positively associated with the willingness to take risks, as shown by Browne et al. (2022) based on German data.[35]

Alternatives to formal insurance

We found that family status (e.g., marital status, had one or no child, had a daughter, or had at least one child who lived in the same house) in general did not influence the demand for critical illness and LTC cover. Similarly, the effect of housing wealth was not significant, except in the case of 100-100 cover, for which those with greater housing wealth showed a 27% higher preference ($p < 0.05$, Table 5, Column 9). This is an interesting finding, as families and home ownership are often seen as alternatives to formal insurance for illness and care (Van Houtven, et al., 2015; Hanewald et al., 2020).[36]

Table 5: Multinomial logit regression to investigate preferences for portfolios with differing critical illness and LTC cover

	Dependent variable: Preferred retirement portfolio (ref. 0-0 cover in Task 1)							
Portfolio	2	3	4	5	6	7	8	9
CI-LTC cover	50-0	100-0	0-50	0-100	50-50	100-50	50-100	100-100
Wealth and public pension income								
Wealth: 300,000 (ref. 150,000)	0.95	1.02	0.84	1.01	1.17	1.39**	1.28*	1.67***
Wealth: 500,000	1.01	1.16	1.04	1.26	1.35*	1.62***	1.86***	2.16***
Wealth: 1,000,000	1.13	1.38*	1.22	1.72***	2.18***	2.39***	2.72***	3.94***
Pension: 3,000 (ref. 2,000 or less [1])	0.97	1.07	0.91	0.96	0.83	1.00	1.02	0.98
Pension: 3,500	0.84	0.90	0.73**	0.67**	0.62***	0.81	0.79	0.73*
Understanding of retirement insurance products and financial capabilities								
Product understanding	0.82*	1.03	1.08	1.21*	1.27**	1.19	1.09	1.45***
Financial competence	1.19	1.25*	1.55***	1.54***	1.67***	2.01***	2.36***	2.51***
Financial product ownership	1.09	1.20	1.09	1.21	1.40***	1.31**	1.54***	1.49***
Subjective financial literacy	0.97	0.92	0.91	1.00	0.83*	-0.80 **	0.88	0.79**

[35] Table 6 in Section 4.2 showed that providing care was positively associated with annuity demand, which could be explained by that providing care is positively linked to the willingness to take risks (Browne et al., 2022) and that the willingness to take risks are positively linked to annuity demand (See discussion in Section 4.2).

[36] In our tasks, although the hypothetical wealth and public pension were chosen according to each participant's reported values, the hypothetical survey may still lack the power to detect such effects.

Stock market participation	0.89	0.98	0.86	0.82	0.73**	0.77*	0.68***	0.81
Housing wealth	1.08	1.09	1.06	1.15	1.11	1.15	1.01	1.27**
Demographic and socioeconomic factors								
Age Group	1.02	0.98	1.03	1.09	0.98	0.96	0.98	0.93
Female	0.91	0.76	0.84	1.00	0.89	0.84	0.82	0.77
Tier 1	1.00	0.94	1.00	0.93	0.84	0.82	0.90	0.88
State employee	1.08	1.16	1.16	1.16	1.17	1.06	1.06	1.23*
College and above	1.13	1.21	1.17	1.26	1.22	1.15	0.98	1.04
High school	1.19	1.11	1.07	1.15	1.21	1.03	0.98	1.04
Personal traits and preferences								
Conscientiousness	1.17	1.21	1.30**	1.21*	1.54***	1.46***	1.54***	1.40***
Financial risk tolerance	0.86**	0.92	0.83***	0.90*	0.91	0.84*	0.79***	0.76***
Patience	1.05	0.97	1.06	0.94	0.92	0.95	1.00	1.04
Health state-dependent consumption	1.01	0.97	0.95**	0.95***	0.90***	0.90***	0.86***	0.84***
Health- and care-related experience								
Unhealthy BMI	1.27**	1.12	1.13	1.07	1.19	1.03	1.11	1.15
Subjective life expectancy	1.00	1.06	1.00	0.99	1.16	1.21*	1.07	1.05
People close: CI	0.97	0.90	1.06	0.86	0.87	0.80*	0.75**	0.93
People close: ADL limitations	0.81	0.91	0.78	0.86	0.90	0.86	0.95	0.68***
Provided care	0.92	0.68***	0.81	0.86	0.61***	0.58***	0.55***	0.69***
Retirement planning								
Spend more	0.86	0.93	0.87	0.81**	0.84*	0.76***	0.79**	0.79**
Long planning horizon	0.90	0.90	1.03	1.01	1.05	1.06	1.25*	1.27**
Inter-generational aspects								
0 or 1 child	0.73**	0.90	0.93	1.05	0.90	0.99	1.01	1.16
Daughter	0.77*	0.87	0.89	0.95	0.97	0.88	0.97	0.95
Child same household	1.09	1.03	1.13	1.07	1.28**	1.14	1.02	1.04
Bequest motives	1.01	1.06	0.97	0.99	1.05	1.13**	1.16***	1.09
Constant	2.05*	1.72	1.46	1.36	2.39**	1.62	1.95	1.00
Controls for COVID-19 impact	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls for survey quality	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,000							
McFadden R^2	0.52							
Likelihood ratio test	Chi-square = 27,589, p < 2.22e-16***							

Notes: The table reports the multinomial logit regression results of the preference for portfolios with annuities and critical illness (CI) and long-term care (LTC) cover from Task 1 to Task 9 in Stage 1 of the choice task. Variables are defined in Online Appendix G. The reference portfolio is the one elicited from Task 1 with 0-0 cover, providing zero out-of-pocket cover for CI and LTC costs. The reference category of public pension is a combination of three pension categories: CNY 2,000, CNY 1,000 and CNY 500. The

relative risk ratio is reported (raw logit-scale estimates omitted), representing the probability ratio of choosing a portfolio with specified CI and LTC cover over the reference portfolio. Clustered standard errors at individual level are used to account for the correlation between preferences across different choice tasks presented to the same individual. BMI: body mass index; ADL: activities of daily living; IMC: instructional manipulation check. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Other factors

Participants who were more conscientious were 23-54% more likely to choose greater critical illness and LTC cover ($p < 0.05$, Table 5, Columns 4, 6 to 9), while those who intended to spend more during retirement than before had a 19-24% lower demand for critical illness and LTC cover ($p < 0.05$, Table 5, Columns 5, 7 to 9). A long planning horizon was linked to a 30% higher preference for 100-100 cover ($p < 0.05$, Table 5, Column 9).

4.2 Factors influencing demand for longevity insurance (annuities)

Next, we explore which factors are associated with annuity demand, and in particular, the impact of access to critical illness and LTC insurance. Section 3.3 reports that the impact of critical illness and LTC cover differs substantially on releasing precautionary savings for annuity purchase. We use a linear mixed model (Model B) to explore factors associated with annuity demand. In Model B, we estimate the following equation:

$$\text{Annuity}_{i,t} = \alpha_0 + \sum_t \beta_t * \text{CI\_LTC\_Cover}_t + X_i\kappa + \lambda_i + \epsilon_{i,t}, \quad (3)$$

where the dependent variable $\text{Annuity}_{i,t}$ is the amount of monthly annuity income chosen by an individual *i* in a given choice task *t* in Stage 1. The error terms are assumed to be i.i.d. distributed and to follow a normal distribution. The CI_LTC_Cover_t variables are the dummy coded treatment variables for the nine portfolio allocation choice tasks in Stage 1 (each with a pre-set level of cover for critical illness and LTC costs; 9,000 observations). The reference category is the 0-0 cover from Task 1, as a control, which represents zero cover for critical illness and LTC. The CI_LTC Cover_t variables allow us to explore which critical illness and LTC cover options are effective in releasing precautionary savings for annuity purchase. β_t measures the average treatment effect of the critical illness and LTC cover in task *t* relative to the 0-0 cover. As in Model A, $\mathbf{X}_i$ is the individual covariate vector with κ measuring its impact. We include random intercept λ_i to account for

correlations at the individual level. Table H.2 in Appendix H shows that most of our results do not differ by participants' COVID-19 stress levels.

Does access to critical illness and LTC cover impact annuity demand?

Concern for uncertain health-related costs in retirement is a key factor affecting annuity demand. Previous studies have argued that low voluntary annuitisation in the United States could be explained by concern for medical expenditures (Peijnenburg et al., 2017), and a low or even negative annuity amount is optimal if considering stochastic mortality and correlated medical costs (Reichling and Smetters, 2015). On the other hand, consideration of uncertain health spending could also induce a shift to safer assets, including annuities (Pang and Warshawsky, 2010). However, none of these explanations has considered the influence of critical illness and LTC cover in a retirement portfolio.

We found that access to critical illness and LTC cover can increase annuity demand, but the size and direction of the effect depends on the extent of cover. Table 6, Panel I, reports the regression results from Model B for the critical illness and LTC cover treatment variables on the chosen monthly annuity amounts from all nine portfolio allocation tasks. We found a small average treatment effect. Compared with the reference 0-0 cover, 50-0 cover, 0-50 cover, and 50-50 cover increased the monthly annuity income by CNY 45-53 ($p < 0.01$). The effect size was about 1.5% of average disposable urban income. However, 100-100 cover decreased the monthly annuity by CNY 76 ($p < 0.01$). This outcome is likely because the remaining savings that a participant could use to purchase annuities decrease with full critical illness and LTC cover. The remaining critical illness and LTC cover options show no significant average treatment effects.[37]

Heterogeneity

Table 6, Panel II, presents the estimated associations between personal characteristics and annuity demand. First, we highlight that the same factor may have opposing influences for annuity and for critical illness and LTC cover (reported in Section 4.1). Then, we summarise the remaining results.

We found that product understanding and financial capability were negatively associated with annuity demand, which contrasts with their positive influences on critical illness and LTC cover.

[37] We only study the average effects of the health cover treatments and leave investigation of how the treatment effect varies by personal characteristics for future studies.

A lower demand for monthly annuities was linked to participants with a better understanding of retirement insurance and those with greater financial competence (CNY -53 and -51 per month, respectively, $p < 0.05$).[38] Our results differ from the positive influence of product understanding and numeracy on annuity demand found in previous studies (Banks and Oldfield, 2007; Bateman et al., 2018; Lee et al., 2019). Overall, our findings may suggest that those with more financial capability knew that they were reasonably well covered by public pensions, and/or that longevity risk was less of a concern compared with other risks and costs in retirement. Other plausible explanations are that individuals in China may be more aware of health risks and may underestimate longevity risk due to a fast growth in life expectancy and a traditional reliance on government and family.

Table 6: Factors influencing annuity demand

	Dependent variable: Monthly annuity
Panel I	
Critical illness and LTC cover treatments	
Cover: CI-LTC (ref. 0-0 cover)	
50-0 cover	44.8***
100-0 cover	-8.2
0-50 cover	52.8***
0-100 cover	0.9
50-50 cover	45.3***
100-50 cover	-14.4
50-100 cover	-13.1
100-100 cover	-75.5***
Panel II	
Wealth and public pension income	
Wealth: 300,000 (ref. 150,000)	217.4***
Wealth: 500,000	566.5***
Wealth: 1,000,000	1,366.9***
Pension: 3,000 (ref. 2,000 or less)	175.7***
Pension: 3,500	211.9***
Understanding of retirement insurance products and financial capabilities	
Product understanding	-52.7**
Financial competence	-51.0**
Financial product ownership	-20.8

[38] Table H.2 in Appendix H shows that the effects on annuity demand are from the participants having higher-than-median COVID-related stress.

Subjective financial literacy	-0.2
Stock market participation	-33.0
Housing wealth	-27.9
Demographic and socio-economic factors	
Age group	37.8**
Female	-73.2*
Tier 1	-33.9
State employee	-61.2**
College and above	68.9*
High school	69.1**
Personal traits and preferences	
Conscientiousness	71.7***
Financial risk tolerance	34.5***
Patience	16.6
Health state-dependent consumption	9.0*
Health- and care-related experience	
Unhealthy BMI	-63.3**
Subjective life expectancy	-6.6
People close: CI	-61.1**
People close: ADL limitations	18.7
Provided care	62.3**
Retirement planning	
Spend more	52.7**
Long planning horizon	-0.3
Inter-generational aspects	
0 or 1 child	24.8
Daughter	35.0
Child same house	74.4***
Bequest motives	-30.8**
Constant	27.5
Controls for COVID-19 impact	Yes
Controls for survey quality	Yes
Number of observations	9,000

Notes: The table reports the regression results of the selected monthly annuity on treatments, i.e., alternative insurance cover for out-of-pocket critical illness (CI) and long-term care (LTC) costs, and individual covariates. Variables are defined in Online Appendix G. The reference cover is zero cover for out-of-pocket CI and LTC costs. The reference category of public pension is based on a combination of the following three pension categories: CNY 2,000, CNY 1,000 and CNY 500. BMI: body mass index; ADL: activities of daily living; IMC: instructional manipulation check. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

Second, we found that the results for preferences, such as risk aversion and bequest motives, differed by annuity and critical illness and LTC cover. Importantly, financial risk tolerance was positively linked to annuity demand (CNY 34, $p < 0.05$), while more risk-tolerant participants showed lower demand for critical illness and LTC cover. Such contrasts suggest that critical illness and LTC cover may have a higher priority than longevity insurance in countries with less well-developed healthcare systems. Another potential explanation is that the insurance market in China usually frames annuity-like products as investments; therefore, individuals may be accustomed to considering annuities to be risky (e.g., Brown et al., 2008; Beshears et al., 2014). The result is supported by Bommier et al. (2020) − who found that individuals could be too risk averse to purchase annuities based on a life-cycle model with risk-sensitive preferences. The intuition behind this is that the risk of dying early outweighs the risk of living longer than expected. Our result is also supported by empirical findings for life insurance and LTC insurance in many European countries (Eling et al., 2021). A stronger bequest motive was linked to a lower monthly annuity (CNY -31, $p < 0.01$), which is consistent with the findings in Europe (Bello et al., 2024). This contrasts with the positive effect on the demand for critical illness and LTC cover, which suggests a preference to insure uncertain large health costs to secure their bequests.

Third, we found potential selection effects for annuity demand based on demographic and socio-economic factors, such as age, education, and public sector employment, and objective health measures, such as BMI and private information about illness and care.[39] This is in line with Bello et al. (2024) who showed evidence asymmetric information in annuity market in Switzerland. However, it is contrary to the findings in Section 4.1 where no substantial selection effect was found for the demand for critical illness and LTC cover. Note that the insurance products we consider are priced according to official mortality and morbidity curves, which account for adverse selection. The results could imply that there is potential advantageous selection for health-contingent insurance.[40]

[39] In the choice tasks, all insurance products were priced according to gender and age, and the prices were higher for females. Thus, the remaining savings associated with the pre-determined critical illness and LTC cover for female participants to purchase an annuity were also lower and could have systematically led to less annuitisation.

[40] We tested a different experimental design that tested product pricing based on health status. However, the design was too complicated for participants.

For the remaining factors, we found that wealth and income are positively associated with annuity demand, which is consistent with prior literature (e.g., Inkmann et al., 2011; Pashchenko, 2013). We also found positive associations for participants with at least one child living in the same household, conscientiousness, and intention to spend more in retirement. We also found no significant effect of subjective life expectancy on annuity demand, which contrasts with studies showing life span risk as an important factor in portfolio choice (Alonso-García et al., 2022).

5. Conclusion

In many low- and middle-income countries, social insurance provides only basic cover for risks in retirement. Private arrangements are underdeveloped, and the cost of self-insurance can be exorbitant. To address this gap, we study the demand for retirement insurance – specifically annuities, critical illness insurance and LTC insurance - in urban China. In an online study of stated choices, we ask survey participants to consider portfolios covering longevity risk (annuities) and health-related risks (critical illness insurance and LTC insurance). Our survey design allows us to explore the preferred portfolio of retirement insurance, and whether access to cover for health-related risks (critical illness and LTC) could release precautionary savings to purchase longevity insurance (annuities). We also explore the heterogeneity of preferences by personal characteristics, attitudes and knowledge.

We find that most participants prefer portfolios with more than one type of retirement insurance and choose to keep a substantial proportion of their retirement wealth in liquid savings accounts. The most preferred portfolio comprised insurance covering 50% of the expected out-of-pocket costs for both critical illness and LTC, and an annuity providing a monthly income of about 20% of the average disposable income in urban China to supplement the (public) pension, with about 42% of retirement wealth placed in a savings account. Our study extends Reichling and Smetters (2015) and Peijnenburg et al. (2017), who explained the annuity puzzle by health risks and associated costs, by showing that bundling critical illness and LTC insurance can release precautionary savings to enable the purchase of annuities. However, our analysis shows that the effect depends on the extent of the critical illness and LTC cover. Our results provide evidence to public and private insurers that access to cover for critical illness and LTC costs can increase annuity demand and therefore supplement often modest public pensions.

Our findings highlight that preferences for retirement insurance are closely linked to personal circumstances, and "one-size-fits-all" solutions to coverage gaps are not appropriate. We found considerable heterogeneity in the share of retirement wealth allocated to longevity and health-contingent insurance. In line with previous studies (e.g., Ying et al., 2007; Wang et al., 2017; Bateman et al., 2018; Alonso-García et al., 2022), wealth, general financial capability, understanding of retirement insurance products, and conscientiousness were found to be positively associated with preferences for retirement portfolios with greater critical illness and LTC cover, while higher financial risk tolerance and higher intention to spend more in retirement were linked to lower demand for critical illness and LTC cover. We also found a negative effect for income, suggesting self-insurance for health-related costs (e.g., Pang and Warshawsky, 2010; Ameriks et al., 2020), and a positive effect for bequest motives, which implies a preference for using health-contingent insurance to safeguard their bequests. Finally, in contrast to prior findings (Hendren 2013; Braun et al., 2019), we found little evidence of selection effects in health and LTC insurance markets.

Our findings also showed heterogeneity in the stated demand for annuities and contrasting effects of key personal characteristics and preferences as compared with the stated demand for critical illness and LTC cover. Firstly, irrespective of their health status, an individual's preferences and financial knowledge alone could separate the markets for longevity and health-contingent insurance. Financial risk tolerance was positively associated with demand for annuities, but negatively associated with critical illness and LTC cover. Bequest motives, general financial skills and understanding of the specific retirement financial products were negatively associated with annuity demand, but positively linked to demand for critical illness and LTC insurance. The above results suggest that individuals consider annuities to be risky and less attractive and possibly treat them as investments, whereas they likely perceive critical illness and LTC insurance as risk management tools. Such results support the finding that individuals may be too risk-averse to purchase annuities (Bommier et al., 2020), and suggest that in developing countries, individuals are more concerned about health-related risks than longevity risk. Secondly, we found potential selection effects for annuities based on objective health measures such as BMI, but these findings were not replicated for the health-contingent insurance we consider.

Overall, our results suggest that there is a large gap in demand for retirement insurance that needs to be addressed by policymakers and insurers in low- and middle-income countries. Adverse selection and preferences are potential barriers to the development of annuity markets. Retirees may view annuities as risky investment products but may view health-contingent insurance products as risk management tools. This may be due to concerns about health-related risks in less developed countries. Bundling critical illness and LTC insurance with annuities could increase demand for both health-related and longevity insurance. Further, regulators may consider adopting a consumption framing for annuities to make them feel less risky, and insurers should also pay attention to other behavioural factors contributing to the annuity puzzle to increase their appeal (Brown et al., 2008; Beshears et al., 2014; Benartzi et al., 2011).

Supplementary materials

The Appendix associated with this article can be found in the online supplementary files.

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Preferences for annuities, critical illness and long-term care insurance portfolios: Evidence from an online survey

Online Appendices September 2024

Contents

A. Background

China is ageing with unprecedented speed and magnitude (Peng, 2021). By the end of 2020, 18.7% of the Chinese population was aged 60 years or above (264 million), and this ratio is projected to increase to 50% by 2050 (United Nations, 2022). However, the tradition of elderly support by family members has been dissipated by rapid economic development (Pezzin et al., 2015; Peng & Wu, 2021), while China's social insurance system provides only basic pensions, and the private market for retirement insurance products is immature. The public pension replacement rate (for urban employees) fell from about 80% of a worker's pre-retirement wage in the 1990s to about 45% of the local average wage in 2019, while private pension coverage is low (Chen and Turner, 2021; Fang and Feng, 2020). China's public health insurance often excludes expensive imported drugs and medical treatments, and individuals must pay out-of-pocket if they desire to access advanced medical services (Liu et al., 2017). For example, the reimbursement rate under the public health insurance system for critical illness medical expenditure is approximately 50% (Zhu et al., 2016) and expenditure is often catastrophic for advanced treatments. Private health insurance often sets an age limit to purchase so that the old are excluded, and long-term contracts for them are even rarer. Public long-term care insurance is still in the pilot phase (with only 49 pilot programs introduced by August 2021), while private long-term care insurance generally pays lump sum benefits and is designed for investment purposes (Huang et al., 2019). Despite recently announced plans to promote the development of insurance for critical illness, long-term care, and retirement income (Xinhua, 2020), the Chinese market is still undeveloped.

This study was conducted in August-September 2020, well into the first year of the COVID-19 pandemic and several months after the end of the first COVID-19-induced lockdowns. The outbreak of the second wave in June and July 2020 had been controlled promptly by the time the survey was administered, and there was no sign of a third wave at that time. However, the health concerns were evidenced by the increased demand for life and health insurance following the initial outbreak of COVID-19 (Xu et al. 2020; Qian 2021).

Overall, there is an unmet need for old-age income support and cover for catastrophic medical expenditures and care-related costs in China, due to a decline in its traditional family support and limited benefits provided by social insurance. This gap has been amplified by COVID-19-induced concerns, especially for the old. The private retirement insurance market is undeveloped, and research on the demand for retirement insurance covering longevity, critical illness, and long-term care risks is urgently needed.

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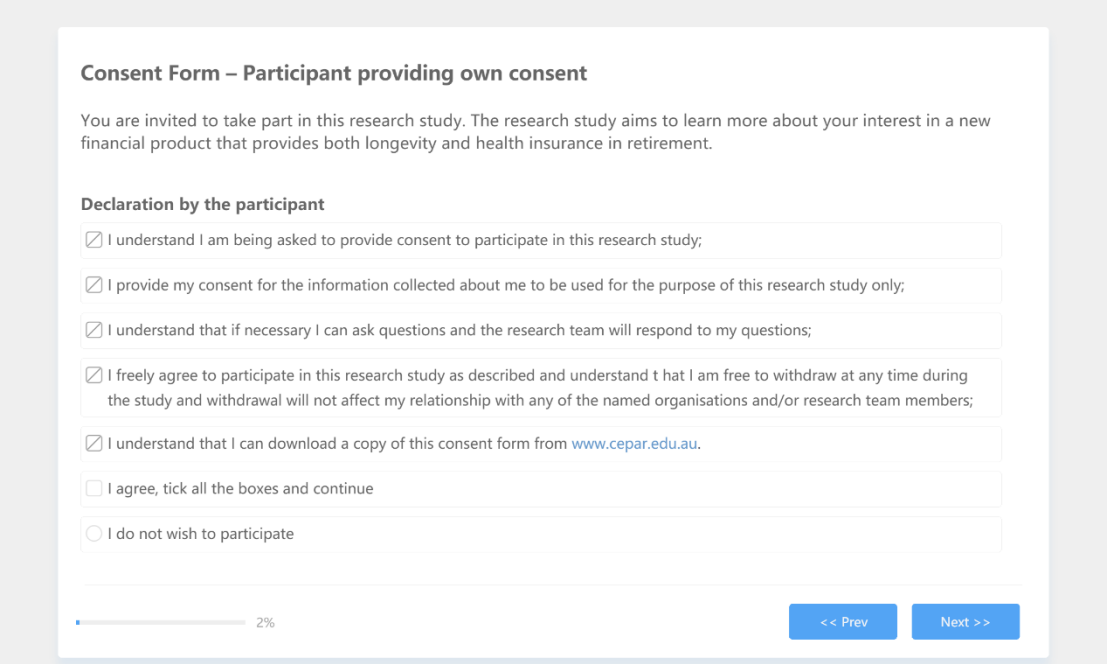
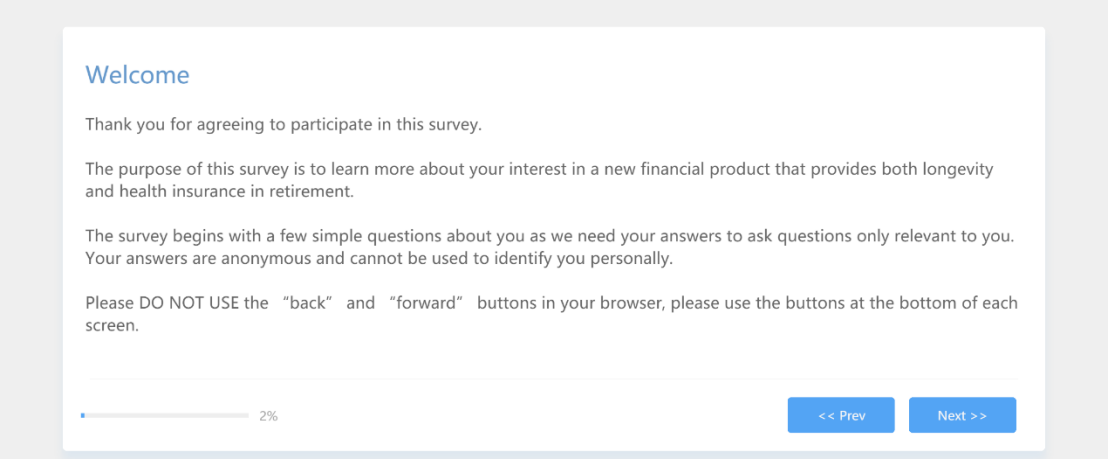
B. Survey screenshots

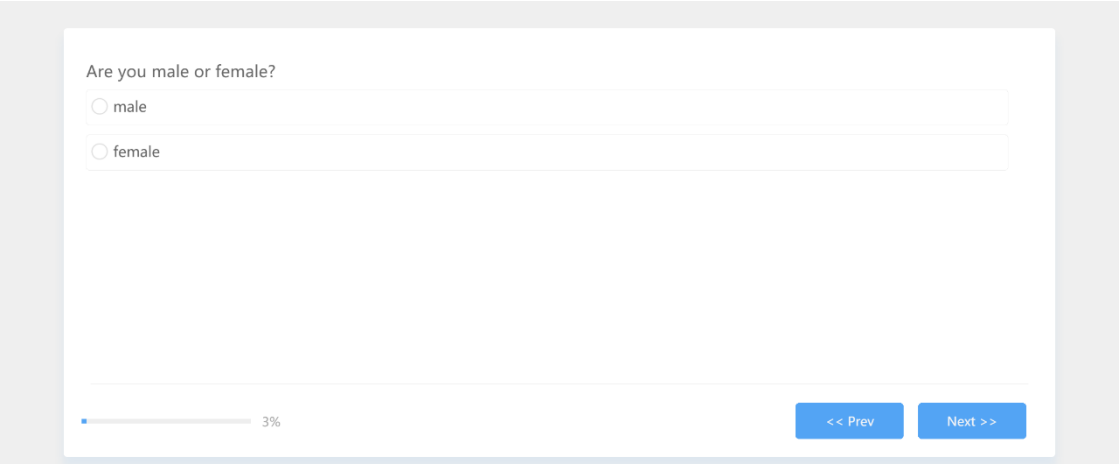
English version (translated)

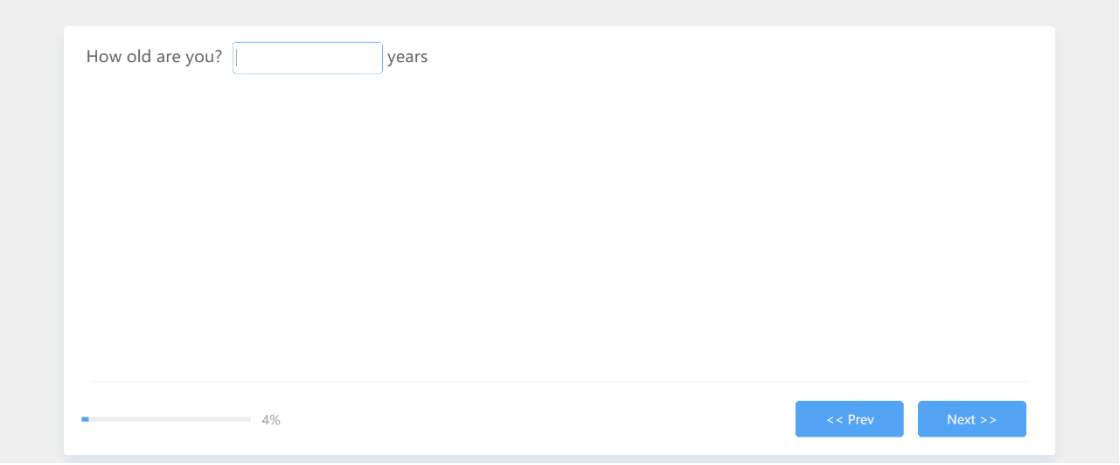
Participant information statement and consent form



Sample selection questions




Are you male or female?
male
female
3%
<< Prev
Next >>


How old are you?
years
4%
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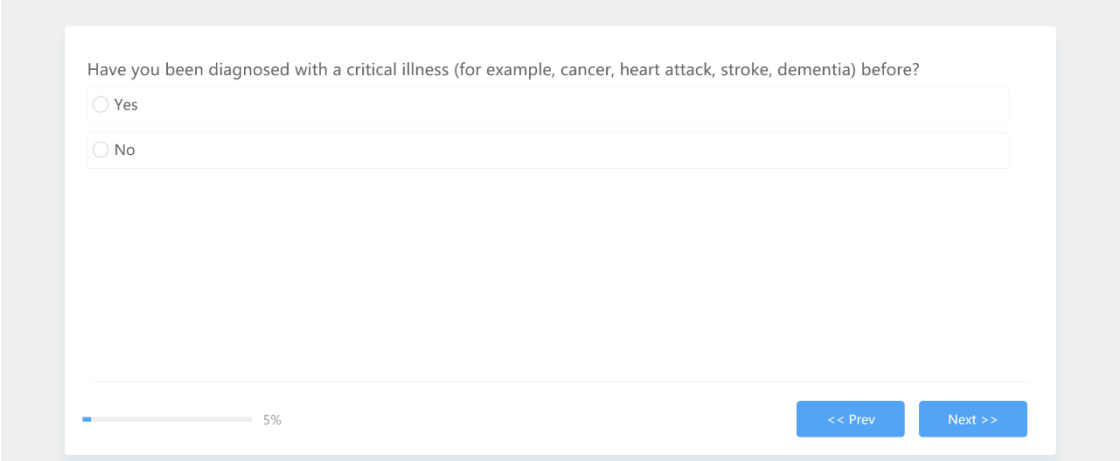
Next >>


Have you been diagnosed with a critical illness (for example, cancer, heart attack, stroke, dementia) before?
Yes
No
5%
<< Prev
Next >>

Do you need help with any of the following activities? Please tick all that apply.

- [ ] Bathing
- [ ] Dressing
- [ ] Toileting
- [ ] Getting into or out of bed
- [ ] Continence
- [ ] Feeding
- [ ] None of them

5%

<< Prev Next >>

Which of the following best describes your current work status? Please choose one.

- ( ) Employed by someone else
- ( ) Self-employed
- ( ) Unemployed including structurally unemployed (Xia Gang)
- ( ) Retired
- ( ) Not working - Stay-at-home parent or caregiver
- ( ) Not working - Other reasons

6%

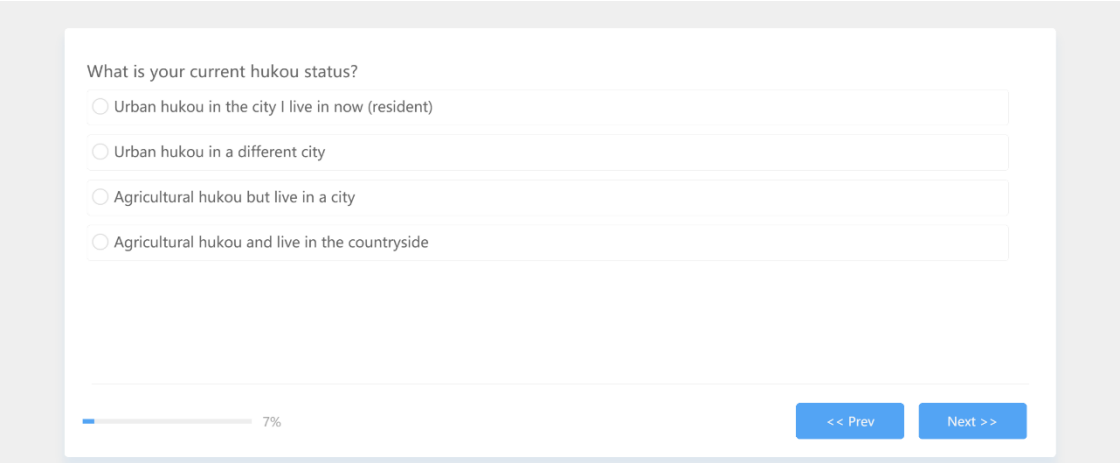
<< Prev Next >>

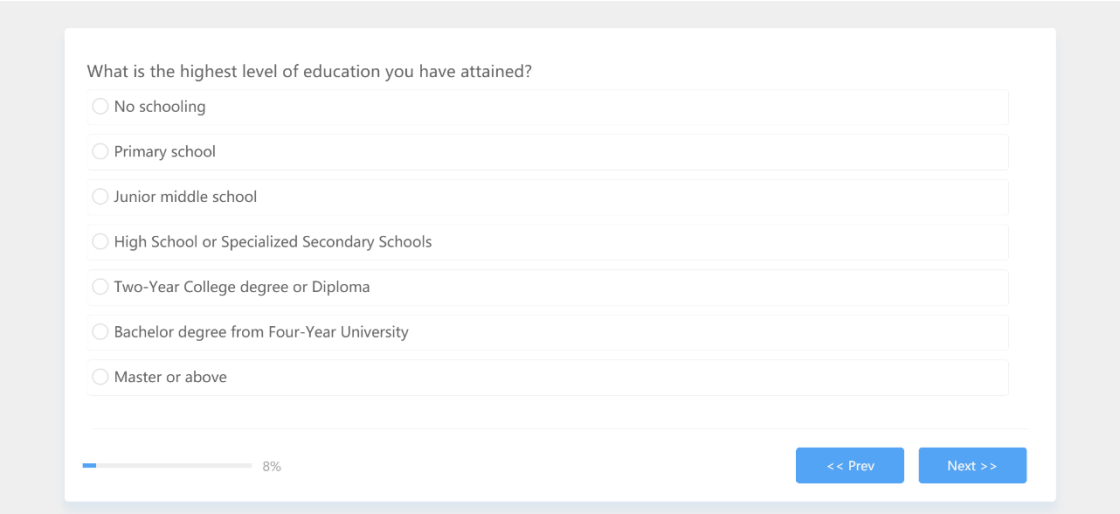
Which city do you live in?

Choose an option

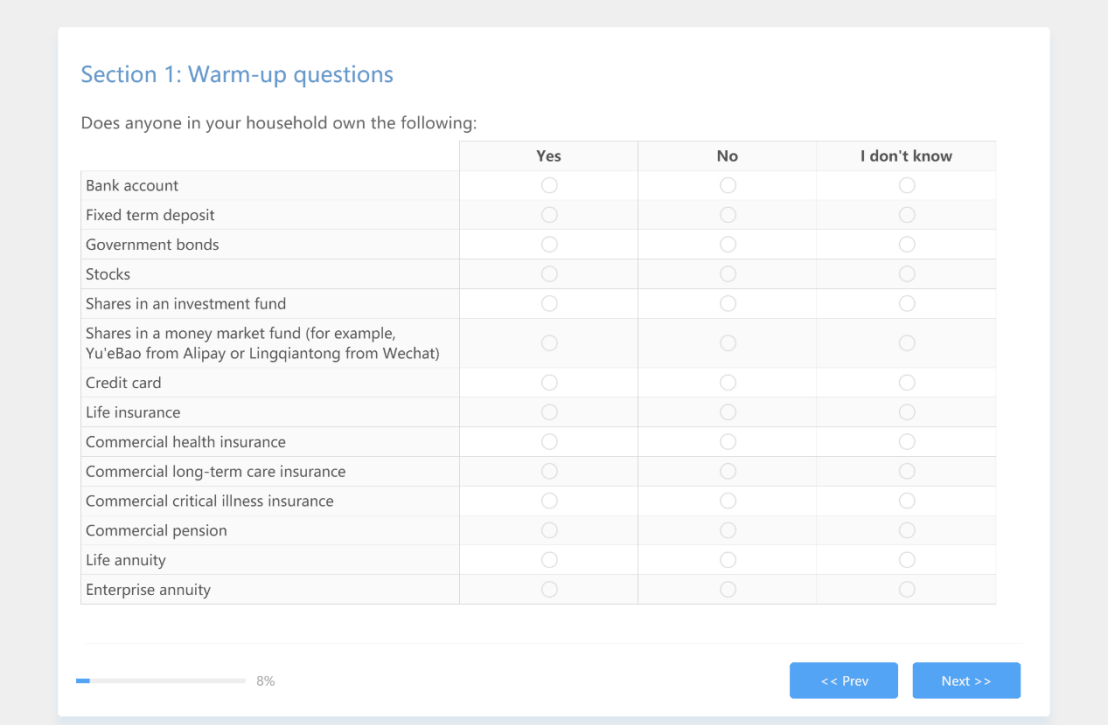
6%

<< Prev Next >>


What is your current hukou status?
Urban hukou in the city I live in now (resident)
Urban hukou in a different city
Agricultural hukou but live in a city
Agricultural hukou and live in the countryside
7%
<< Prev
Next >>


What is the highest level of education you have attained?
No schooling
Primary school
Junior middle school
High School or Specialized Secondary Schools
Two-Year College degree or Diploma
Bachelor degree from Four-Year University
Master or above
8%
<< Prev
Next >>

Section 1: Warm-up questions



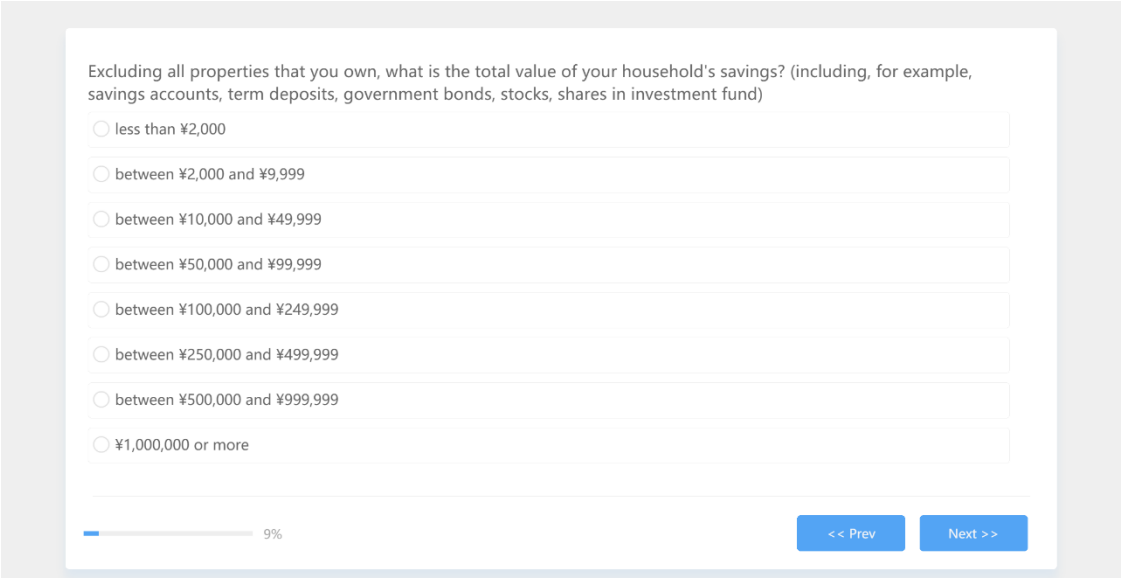
Section 1: Warm-up questions

Does anyone in your household own the following:

	Yes	No	I don't know
Bank account	○	○	○
Fixed term deposit	○	○	○
Government bonds	○	○	○
Stocks	○	○	○
Shares in an investment fund	○	○	○
Shares in a money market fund (for example, Yu'eBao from Alipay or Lingqiantong from Wechat)	○	○	○
Credit card	○	○	○
Life insurance	○	○	○
Commercial health insurance	○	○	○
Commercial long-term care insurance	○	○	○
Commercial critical illness insurance	○	○	○
Commercial pension	○	○	○
Life annuity	○	○	○
Enterprise annuity	○	○	○

8%

<< Prev | Next >>



Excluding all properties that you own, what is the total value of your household's savings? (including, for example, savings accounts, term deposits, government bonds, stocks, shares in investment fund)

- ○ less than ¥2,000
- ○ between ¥2,000 and ¥9,999
- ○ between ¥10,000 and ¥49,999
- ○ between ¥50,000 and ¥99,999
- ○ between ¥100,000 and ¥249,999
- ○ between ¥250,000 and ¥499,999
- ○ between ¥500,000 and ¥999,999
- ○ ¥1,000,000 or more

9%

<< Prev | Next >>

What is the total value of your household's **debt**? (including, for example, mortgages, bank loans, money borrowed from relatives, friends, or using credit cards)

- less than ¥2,000
- between ¥2,000 and ¥9,999
- between ¥10,000 and ¥49,999
- between ¥50,000 and ¥99,999
- between ¥100,000 and ¥249,999
- between ¥250,000 and ¥499,999
- between ¥500,000 and ¥999,999
- ¥1,000,000 or more

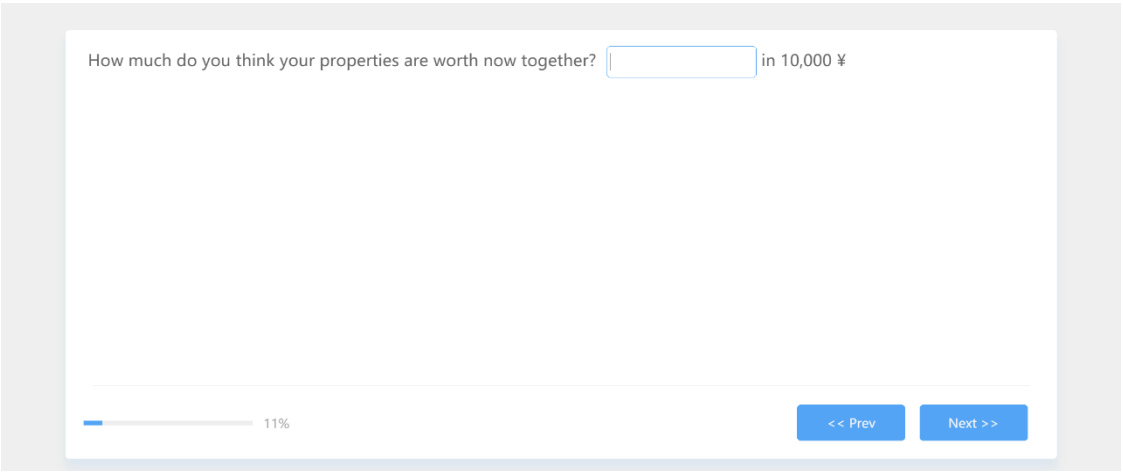
10%

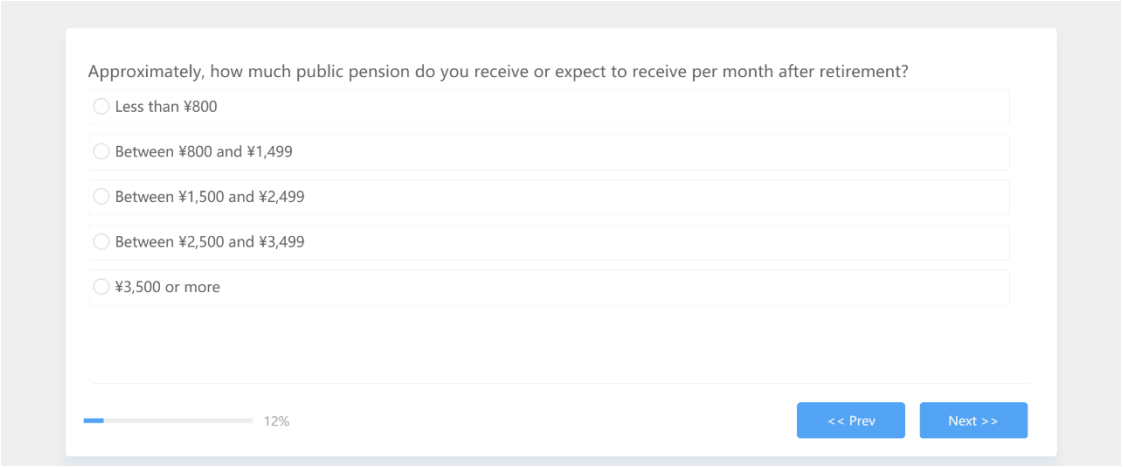
<< Prev | Next >>

How many properties do you/your spouse currently own in total? number

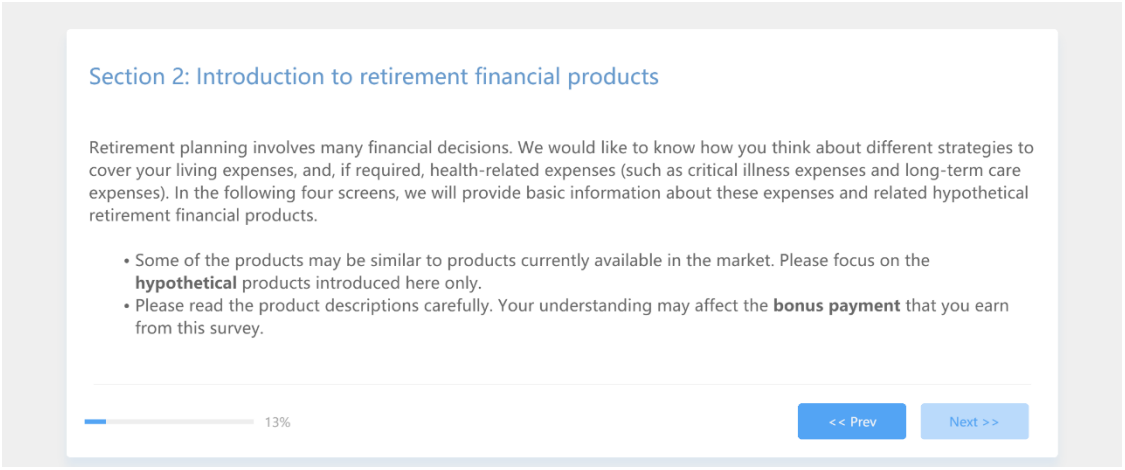
10%

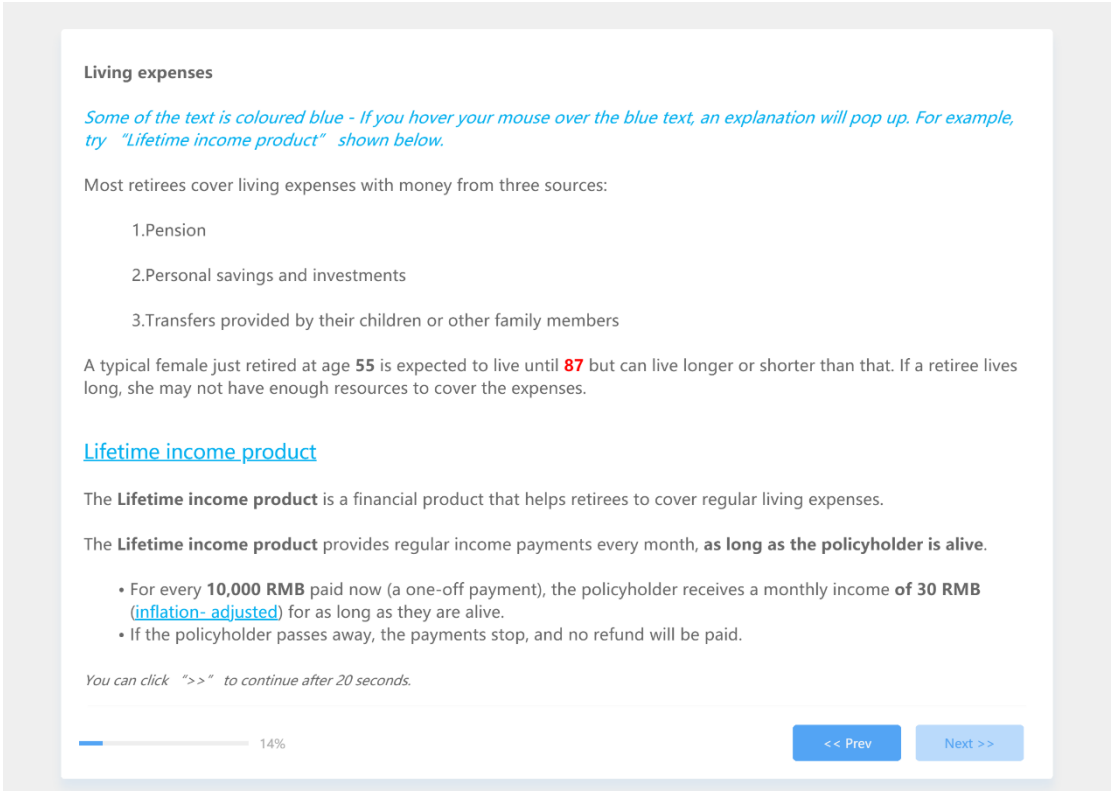
<< Prev | Next >>


How much do you think your properties are worth now together?
in 10,000 ¥
11%
<< Prev
Next >>


Approximately, how much public pension do you receive or expect to receive per month after retirement?
Less than ¥800
Between ¥800 and ¥1,499
Between ¥1,500 and ¥2,499
Between ¥2,500 and ¥3,499
¥3,500 or more
12%
<< Prev
Next >>

Section 2: Introduction to retirement financial products





Critical illness expenses

The chance of getting **critically ill** (for example, having cancer, a stroke, or heart attack) varies from person to person, depending on their health and medical history. On average, **5 out of 10** female retirees will be critically ill during their retirement. For persons infected with the novel coronavirus, the chance of getting critically ill is much higher.

Public Health Insurance provides basic critical illness coverage. On average, Public Health Insurance will reimburse **half** of the medical expenditures for critical illness. Patients need to use their savings to access more advanced/expensive treatments or drugs which are not covered by Public Health Insurance. The additional cost can range **from tens of thousands to hundreds of thousands RMB**.

Critical illness cash product

The **Critical illness cash product** is a financial product that helps retirees cover critical illness costs.

The **Critical illness cash product** provides a one-off cash payment if the policyholder is **critically ill.** The 25 critical illness conditions (e.g., cancer, stroke, heart attack) are defined by the government. Government-appointed doctors will assess the health condition.

- The policyholder can choose how they want to use the one-off cash payment from the product. For example, the payment can be used to pay for medical treatments or drugs not covered by Public Health Insurance or any other expenses.
- For every **10,000 RMB** paid now (one-off payment), a cash payment of **21,000RMB** (inflation-adjusted) will be provided if the policyholder is critically ill.
- The product offers only one payment at most. If no claim is made or if the policyholder passes away before a diagnosis, no refund will be paid.

The novel coronavirus disease itself is not specifically covered. However, if one of the 25 critical illness conditions is diagnosed after infection, the policyholder can receive the one-off payment from the product .

If you hover your mouse over the blue text an explanation will pop up.

You can click ">>" to continue after 20 seconds.

15%

<< Prev Next >>

Long-term care expenses

The chance of needing long-term care varies from person to person, depending on their health and medical history. However, on average, **5 out of 10** female retirees will need some form of care during their retirement, mostly at older ages.

People need **long-term care** if they need help completing at least three of the following six activities: bathing, dressing, toileting, getting into or out of bed, continence, and feeding. Some people need long-term care for **several months**, while others need it for **many years**.

Currently, **Public Health Insurance** does not provide long-term care insurance in most cities. Where there is no insurance, people pay for long-term care from their savings. The monthly cost of long-term care services can range **from 2,000 to 6,000 RMB**.

Long-term care income product

The **Long-term care income product** is a financial product that helps retirees cover long-term care costs.

The **Long-term care income product** provides regular income every month **as long as the policyholder needs long-term care**. Government-appointed doctors will regularly assess the ability to undertake the six activities.

- The policyholder can choose how they want to use the income from the product. For example, they can use the income to pay for professional care, compensate family members or friends for care provided, or any other expenses.
- For every **10,000 RMB** paid now (a one-off payment), a monthly income of **350 RMB (**inflation-adjusted**)** will be provided as long as long-term care is needed.
- If the policyholder no longer needs long-term care or passes away, the income stops, and no refund will be paid.
- If the policyholder never needs long-term care, no refund will be paid.

If you hover your mouse over the blue text an explanation will pop up.

You can click ">>" to continue after 20 seconds.

17%

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Savings account

Retirement savings can also be placed in a **savings account** and withdrawn to cover the living expenses, the critical illness, and long-term care expenses mentioned before.

- The money in the savings account may not be enough if the person lives long and/or the expenses are high.
- Any remaining money in the savings account when the account holder dies is passed to their beneficiaries.

17%

<< Prev | Next >>

The three retirement financial products and the savings account are summarised in the table below. Please review the key features for each of them, one row at a time.

	Regular income payments?	Payments only in case of health problems?	Payments for the rest of the policyholder's life?	If the policyholder passes away?
Lifetime income product*	Yes, monthly	No	Yes	Payments stop, no refund
Critical illness cash product*	No, one-off payment if diagnosed	Yes, if critically ill (for any of the 25 conditions)	No, one-off payment if diagnosed	No refund
Long-term care income product*	Yes, monthly income when needing long-term care	Yes, when needing long-term care (needing help with 3 or more activities: bathing, dressing, toileting, getting into or out of bed, continence, and feeding)	No, only when needing long-term care	Payments stop, no refund
Savings account	No, but you can withdraw money any time (provided there is still money in the account)	No, but you can withdraw money any time (provided there is still money in the account)	No, but you can withdraw money any time (provided there is still money in the account)	Beneficiaries inherit any remaining savings

*__PLEASE NOTE__ that all products are priced fairly, and you will receive a **discount** when you buy the lifetime income product, the critical illness cash product and the long-term care income product together. The discount is about **10%** when you buy any **two** products and about **15%** when you buy **three** products.

If you hover your mouse over the blue text an explanation will pop up.

You can click ">>" to continue after 20 seconds.

18%

<< Prev Next >>

Product knowledge quiz

We will now test your knowledge of the financial products we have described. Please answer the following questions about the three retirement financial products and the savings account. Your bonus for this survey depends on the number of correct answers you provide.

19%

<< Prev Next >>

For each statement below, indicate whether it is true or false?

		True/False	Correct Answer
Lifetime income product	A single payment is exchanged for regular income.	---Choose an option---	
	Income from this product is paid for the life of the policyholder, irrespective of the length of life.	---Choose an option---	
	The policyholder's estate receives a lump-sum payment when he/she passes away.	---Choose an option---	

You can click '>>' to continue after 10 seconds.

19%

<< Prev Next >>

For each statement below, indicate whether it is true or false?

		True/False	Correct Answer
Critical illness cash product	A single payment is exchanged for a cash payment that can help cover (or reduce) costs in the case of critical illness.	---Choose an option---	
	The payment provided by the product can only be used for medical treatments or drugs.	---Choose an option---	
	A refund will be paid if the policyholder stays healthy.	---Choose an option---	

You can click '>>' to continue after 10 seconds.

20%

<< Prev Next >>

For each statement below, indicate whether it is true or false?

		True/False	Correct Answer
Long-term care income product	The product will continue to provide an income if the policyholder no longer needs long-term care.	---Choose an option---	
	The product covers the cost of residential care only.	---Choose an option---	
	A single payment is exchanged for regular income that can help cover (or reduce) the cost of long-term care.	---Choose an option---	

You can click '>>' to continue after 10 seconds.

21%

<< Prev Next >>

For each statement below, indicate whether it is true or false?

		True/False	Correct Answer
Savings account	There will always be money in the savings account as long as the account holder is alive.	---Choose an option---	

You can click '>>' to continue after 10 seconds.

21%

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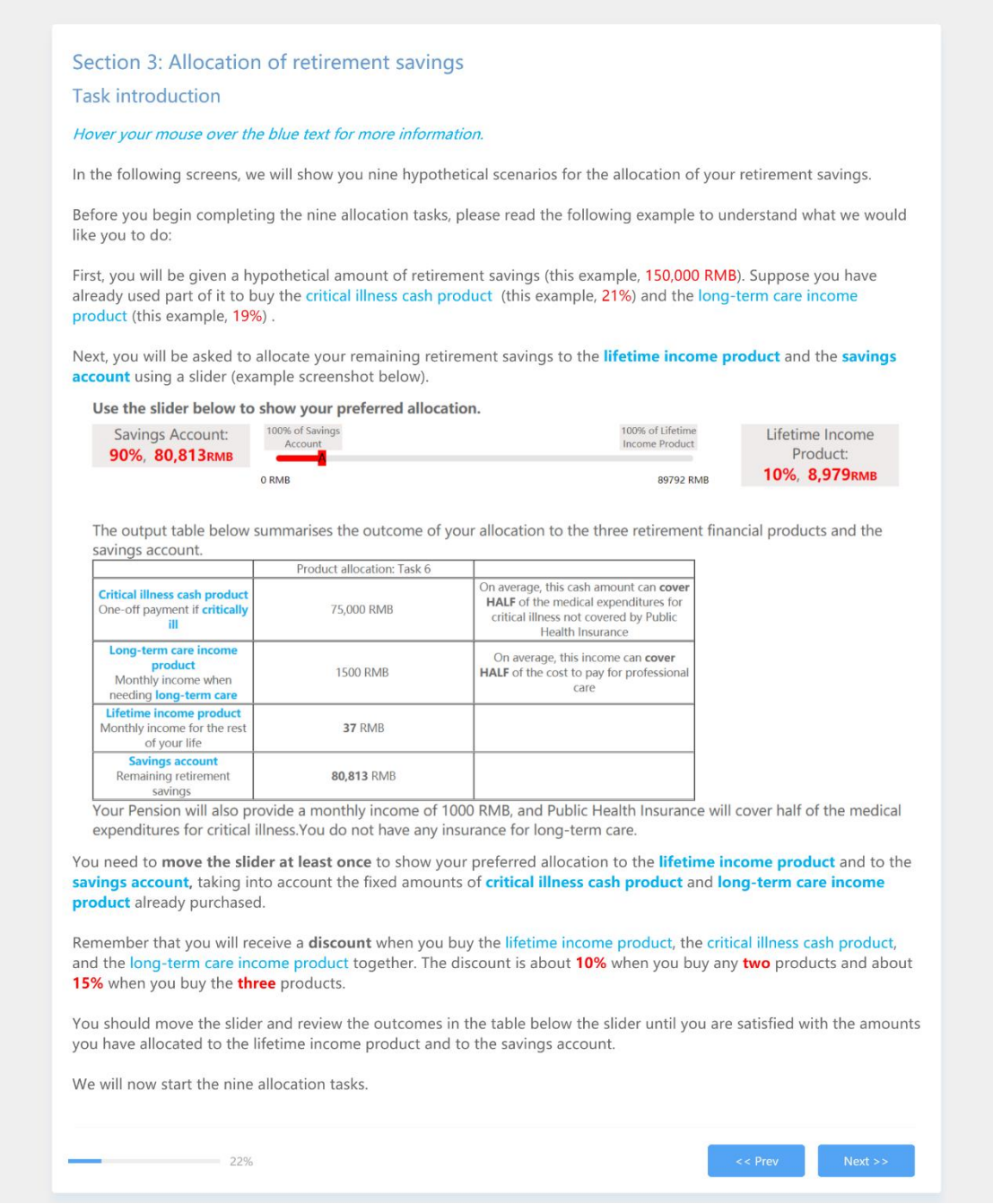
Section 3: Allocation of retirement savings



Section 3: Allocation of retirement savings

Task introduction

Hover your mouse over the blue text for more information.

In the following screens, we will show you nine hypothetical scenarios for the allocation of your retirement savings.

Before you begin completing the nine allocation tasks, please read the following example to understand what we would like you to do:

First, you will be given a hypothetical amount of retirement savings (this example, 150,000 RMB). Suppose you have already used part of it to buy the critical illness cash product (this example, 21%) and the long-term care income product (this example, 19%) .

Next, you will be asked to allocate your remaining retirement savings to the **lifetime income product** and the **savings account** using a slider (example screenshot below).

Use the slider below to show your preferred allocation.

Savings Account: 90%, 80,813RMB

100% of Savings Account

100% of Lifetime Income Product

0 RMB

89792 RMB

Lifetime Income Product: 10%, 8,979RMB

The output table below summarises the outcome of your allocation to the three retirement financial products and the savings account.

	Product allocation: Task 6	
Critical illness cash product One-off payment if **critically ill**	75,000 RMB	On average, this cash amount can **cover HALF** of the medical expenditures for critical illness not covered by Public Health Insurance
Long-term care income product Monthly income when needing **long-term care**	1500 RMB	On average, this income can **cover HALF** of the cost to pay for professional care
Lifetime income product Monthly income for the rest of your life	**37** RMB	
Savings account Remaining retirement savings	**80,813** RMB	

Your Pension will also provide a monthly income of 1000 RMB, and Public Health Insurance will cover half of the medical expenditures for critical illness.You do not have any insurance for long-term care.

You need to **move the slider at least once** to show your preferred allocation to the **lifetime income product** and to the **savings account**, taking into account the fixed amounts of **critical illness cash product** and **long-term care income product** already purchased.

Remember that you will receive a **discount** when you buy the lifetime income product, the critical illness cash product, and the long-term care income product together. The discount is about **10%** when you buy any **two** products and about **15%** when you buy the **three** products.

You should move the slider and review the outcomes in the table below the slider until you are satisfied with the amounts you have allocated to the lifetime income product and to the savings account.

We will now start the nine allocation tasks.

22%

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Next >>

Task 1/9

Hover your mouse over the blue text for more information.

Suppose you are aged **55**, you have just retired, and you have retirement savings of **150,000 RMB**. Assume that you will receive a **Pension** of **2000** RMB every month (inflation-adjusted) and that you have **Public Health Insurance** (which will cover half of the cost of critical illness, but none of the cost of long-term care).

In this scenario, assume you **didn't buy** any of the **critical illness cash product** or the **long-term care income product**.

Your remaining savings are **150,000** RMB.

Your task is to decide how you would allocate these remaining savings between the **lifetime income product** and the **savings account**.

Use the slider below to show your preferred allocation.

Savings Account:
100%, 150,000RMB

100% of Savings Account

100% of Lifetime Income Product

0 RMB

150000 RMB

Lifetime Income Product:
0%, 0RMB

The output table below summarises the outcome of your allocation to the three retirement financial products and the savings account.

	Product allocation: Task 1	
Critical illness cash product One-off payment if **critically ill**	0 RMB	You need to withdraw from your savings account to cover the cost if critically ill.
Long-term care income product Monthly income when needing **long-term care**	0 RMB	You need to withdraw from your savings account to cover the cost if needing long-term care.
Lifetime income product Monthly income for the rest of your life	**0** RMB	
Savings account Remaining retirement savings	**150,000** RMB	

Your Pension will also provide a monthly income of 2000 RMB, and Public Health Insurance will cover half of the medical expenditures for critical illness. You do not have any insurance for long-term care.

25%

<< Prev

Next >>

Task 2/9

Hover your mouse over the blue text for more information.

In this scenario, assume you have already used **24% of the 150,000 RMB** retirement savings to buy the **critical illness cash product**, but you **didn't buy** any of the **long-term care income product**.

Your remaining savings are **114,286** RMB.

Your task is to decide how you would allocate these remaining savings between the **lifetime income product** and the **savings account**.

Use the slider below to show your preferred allocation.

Savings Account: **100%**, **114,286RMB**

100% of Savings Account

100% of Lifetime Income Product

0 RMB

114286 RMB

Lifetime Income Product: **0%**, **0RMB**

The output table below summarises the outcome of your allocation to the three retirement financial products and the savings account.

	Product allocation: Task 2	
Critical illness cash product One-off payment if **critically ill**	75,000 RMB	On average, this cash amount can **cover HALF** of the medical expenditures for critical illness not covered by Public Health Insurance
Long-term care income product Monthly income when needing **long-term care**	0 RMB	You need to withdraw from your savings account to cover the cost if needing long-term care.
Lifetime income product Monthly income for the rest of your life	**0** RMB	
Savings account Remaining retirement savings	**114,286** RMB	

Your Pension will also provide a monthly income of 2000 RMB, and Public Health Insurance will cover half of the medical expenditures for critical illness. You do not have any insurance for long-term care.

28%

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Task 3/9

Hover your mouse over the blue text for more information.

In this scenario, assume you have already used **48% of the 150,000 RMB** retirement savings to buy the **critical illness cash product**, but you **didn't buy** any of the **long-term care income product**.

Your remaining savings are **78,571** RMB.

Your task is to decide how you would allocate these remaining savings between the **lifetime income product** and the **savings account**.

Use the slider below to show your preferred allocation.

Savings Account: **100%**, **78,571RMB**

100% of Savings Account

100% of Lifetime Income Product

0 RMB

78571 RMB

Lifetime Income Product: **0%**, **0RMB**

The output table below summarises the outcome of your allocation to the three retirement financial products and the savings account.

	Product allocation: Task 3	
Critical illness cash product One-off payment if **critically ill**	150,000 RMB	On average, this cash amount can **cover ALL** the medical expenditures for critical illness not covered by Public Health Insurance
Long-term care income product Monthly income when needing **long-term care**	0 RMB	You need to withdraw from your savings account to cover the cost if needing long-term care.
Lifetime income product Monthly income for the rest of your life	**0** RMB	
Savings account Remaining retirement savings	**78,571** RMB	

Your Pension will also provide a monthly income of 2000 RMB, and Public Health Insurance will cover half of the medical expenditures for critical illness. You do not have any insurance for long-term care.

30%

<< Prev

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Task 4/9

Hover your mouse over the blue text for more information.

In this scenario, assume you **didn't buy** any of the **critical illness cash product**, but you used **29% of the 150,000 RMB** retirement savings to buy the **long-term care income product**.

Your remaining savings are **107,143** RMB.

Your task is to decide how you would allocate these remaining savings between the **lifetime income product** and the **savings account**.

Use the slider below to show your preferred allocation.

Savings Account:
100%, 107,143RMB

100% of Savings Account

100% of Lifetime Income Product

0 RMB

107143 RMB

Lifetime Income Product:
0%, 0RMB

The output table below summarises the outcome of your allocation to the three retirement financial products and the savings account.

	Product allocation: Task 4	
Critical illness cash product One-off payment if **critically ill**	0 RMB	You need to withdraw from your savings account to cover the cost if critically ill.
Long-term care income product Monthly income when needing **long-term care**	1500 RMB	On average, this income can **cover HALF** of the cost to pay for professional care
Lifetime income product Monthly income for the rest of your life	**0** RMB	
Savings account Remaining retirement savings	**107,143** RMB	

Your Pension will also provide a monthly income of 2000 RMB, and Public Health Insurance will cover half of the medical expenditures for critical illness. You do not have any insurance for long-term care.

33%

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Task 5/9

Hover your mouse over the blue text for more information.

In this scenario, assume you have **didn't buy** any of the **critical illness cash product**, but you used **57% of the 150,000 RMB retirement savings** to buy the **long-term care income product**.

Your remaining savings are **64,286** RMB.

Your task is to decide how you would allocate these remaining savings between the **lifetime income product** and the **savings account**.

Use the slider below to show your preferred allocation.

Savings Account:
100%, 64,286RMB

100% of Savings Account

100% of Lifetime Income Product

0 RMB

64286 RMB

Lifetime Income Product:
0%, 0RMB

The output table below summarises the outcome of your allocation to the three retirement financial products and the savings account.

	Product allocation: Task 5	
Critical illness cash product One-off payment if **critically ill**	0 RMB	You need to withdraw from your savings account to cover the cost if critically ill.
Long-term care income product Monthly income when needing **long-term care**	3000 RMB	On average, this income can **cover ALL** the cost to pay for professional care
Lifetime income product Monthly income for the rest of your life	**0** RMB	
Savings account Remaining retirement savings	**64,286** RMB	

Your Pension will also provide a monthly income of 2000 RMB, and Public Health Insurance will cover half of the medical expenditures for critical illness.You do not have any insurance for long-term care.

36%

<< Prev Next >>

Task 6/9

Hover your mouse over the blue text for more information.

In this scenario, assume you have already used **21% of the 150,000 RMB** retirement savings to buy the **critical illness cash product and 26%** to buy the **long-term care income product**.

Your remaining savings are **79,286** RMB.

Your task is to decide how you would allocate these remaining savings between the **lifetime income product** and the **savings account**.

Use the slider below to show your preferred allocation.

Savings Account:
100%, 79,286RMB

100% of Savings Account

100% of Lifetime Income Product

0 RMB

79286 RMB

Lifetime Income Product:
0%, 0RMB

The output table below summarises the outcome of your allocation to the three retirement financial products and the savings account.

	Product allocation: Task 6	
Critical illness cash product One-off payment if **critically ill**	75,000 RMB	On average, this cash amount can **cover HALF** of the medical expenditures for critical illness not covered by Public Health Insurance
Long-term care income product Monthly income when needing **long-term care**	1500 RMB	On average, this income can **cover HALF** of the cost to pay for professional care
Lifetime income product Monthly income for the rest of your life	**0** RMB	
Savings account Remaining retirement savings	**79,286** RMB	

Your Pension will also provide a monthly income of 2000 RMB, and Public Health Insurance will cover half of the medical expenditures for critical illness.You do not have any insurance for long-term care.

38%

<< Prev

Next >>

Task 7/9

Hover your mouse over the blue text for more information.

In this scenario, assume you have already used **43% of the 150,000 RMB** retirement savings to buy the **critical illness cash product and 26%** to buy the **long-term care income product**.

Your remaining savings are **47,143** RMB.

Your task is to decide how you would allocate these remaining savings between the **lifetime income product** and the **savings account**.

Use the slider below to show your preferred allocation.

Savings Account:
100%, 47,143RMB

100% of Savings Account

100% of Lifetime Income Product

0 RMB

47143 RMB

Lifetime Income Product:
0%, 0RMB

The output table below summarises the outcome of your allocation to the three retirement financial products and the savings account.

	Product allocation: Task 7	
Critical illness cash product One-off payment if **critically ill**	150,000 RMB	On average, this cash amount can **cover ALL** the medical expenditures for critical illness not covered by Public Health Insurance
Long-term care income product Monthly income when needing **long-term care**	1500 RMB	On average, this income can **cover HALF** of the cost to pay for professional care
Lifetime income product Monthly income for the rest of your life	**0** RMB	
Savings account Remaining retirement savings	**47,143** RMB	

Your Pension will also provide a monthly income of 2000 RMB, and Public Health Insurance will cover half of the medical expenditures for critical illness.You do not have any insurance for long-term care.

41%

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Task 8/9

Hover your mouse over the blue text for more information.

In this scenario, assume you have already used **21% of the 150,000 RMB** retirement savings to buy the **critical illness cash product** **and 51%** to buy the **long-term care income product**.

Your remaining savings are **40,714** RMB.

Your task is to decide how you would allocate these remaining savings between the **lifetime income product** and the **savings account**.

Use the slider below to show your preferred allocation.

Savings Account:
100%, 40,714RMB

100% of Savings Account

100% of Lifetime Income Product

0 RMB

40714 RMB

Lifetime Income Product:
0%, 0RMB

The output table below summarises the outcome of your allocation to the three retirement financial products and the savings account.

	Product allocation: Task 8	
Critical illness cash product One-off payment if **critically ill**	75,000 RMB	On average, this cash amount can **cover HALF** of the medical expenditures for critical illness not covered by Public Health Insurance
Long-term care income product Monthly income when needing **long-term care**	3000 RMB	On average, this income can **cover ALL** the cost to pay for professional care
Lifetime income product Monthly income for the rest of your life	**0** RMB	
Savings account Remaining retirement savings	**40,714** RMB	

Your Pension will also provide a monthly income of 2000 RMB, and Public Health Insurance will cover half of the medical expenditures for critical illness.You do not have any insurance for long-term care.

44%

<< Prev

Next >>

Task 9/9

Hover your mouse over the blue text for more information.

In this scenario, assume you have already used **43% of the 150,000 RMB** retirement savings to buy the **critical illness cash product** **and 51%** to buy the **long-term care income product**.

Your remaining savings are **8,571** RMB.

Your task is to decide how you would allocate these remaining savings between the **lifetime income product** and the **savings account**.

Use the slider below to show your preferred allocation.

Savings Account:
100%, 8,571RMB

100% of Savings Account

100% of Lifetime Income Product

0 RMB

8571 RMB

Lifetime Income Product:
0%, 0RMB

The output table below summarises the outcome of your allocation to the three retirement financial products and the savings account.

	Product allocation: Task 9	
Critical illness cash product One-off payment if **critically ill**	150,000 RMB	On average, this cash amount can **cover ALL** the medical expenditures for critical illness not covered by Public Health Insurance
Long-term care income product Monthly income when needing **long-term care**	3000 RMB	On average, this income can **cover ALL** the cost to pay for professional care
Lifetime income product Monthly income for the rest of your life	**0** RMB	
Savings account Remaining retirement savings	**8,571** RMB	

Your Pension will also provide a monthly income of 2000 RMB, and Public Health Insurance will cover half of the medical expenditures for critical illness.You do not have any insurance for long-term care.

46%

<< Prev Next >>

Final task: Preferred portfolio

Hover your mouse over the blue text for more information.

You have just completed nine tasks for how you would allocate your retirement savings of 150,000 RMB between three retirement financial products and a savings account. In the table below, we show you, for each of the nine choices you have made, the payment you would receive from each product, as well as any money remaining in your savings account.

Summary of the nine choices you have just made

Product allocation	Task1	Task2	Task3	Task4	Task5	Task6	Task7	Task8	Task9
Critical illness cash product One-off payment if **critically ill**	0	75,000	150,000	0	0	75,000	150,000	75,000	150,000
Long-term care income product Monthly income when needing **long-term care**	0	0	0	1500	3000	1500	1500	3000	3000
Lifetime income product Monthly income for the rest of your life	90	157	143	223	146	235	93	83	35
Savings account Remaining retirement savings	120,000	70,713	42,859	44,571	29,141	16,646	26,427	23,391	6,571

We would now like to know how you compare the nine retirement product allocations in this table. Therefore, we will show you 12 different combinations of three of the retirement product allocations. For each combination of retirement products, please indicate which product allocation you prefer MOST and which product allocation you prefer LEAST.

47%

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Choice set 1/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	0	0	75,000
Long-term care income product Monthly income when needing **long-term care**	1500	3000	3000
Lifetime income product Monthly income for the rest of your life	223	146	83
Savings account Remaining retirement savings	44,571	29,141	23,391
	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

48%

<< Prev Next >>

Choice set 2/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	150,000	0	75,000
Long-term care income product Monthly income when needing **long-term care**	0	3000	1500
Lifetime income product Monthly income for the rest of your life	143	146	235
Savings account Remaining retirement savings	42,859	29,141	16,646

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

49%

<< Prev Next >>

Choice set 3/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	75,000	150,000	0
Long-term care income product Monthly income when needing **long-term care**	0	0	1500
Lifetime income product Monthly income for the rest of your life	157	143	223
Savings account Remaining retirement savings	70,713	42,859	44,571

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

50%

<< Prev Next >>

Choice set 4/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	75,000	150,000	75,000
Long-term care income product Monthly income when needing **long-term care**	0	1500	3000
Lifetime income product Monthly income for the rest of your life	157	93	83
Savings account Remaining retirement savings	70,713	26,427	23,391

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

50%

<< Prev Next >>

Choice set 5/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	0	0	150,000
Long-term care income product Monthly income when needing **long-term care**	0	1500	3000
Lifetime income product Monthly income for the rest of your life	90	223	35
Savings account Remaining retirement savings	120,000	44,571	6,571

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

51%

<< Prev Next >>

Choice set 6/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	0	150,000	150,000
Long-term care income product Monthly income when needing **long-term care**	3000	1500	3000
Lifetime income product Monthly income for the rest of your life	146	93	35
Savings account Remaining retirement savings	29,141	26,427	6,571

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

52%

<< Prev Next >>

Choice set 7/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	0	75,000	150,000
Long-term care income product Monthly income when needing **long-term care**	1500	1500	1500
Lifetime income product Monthly income for the rest of your life	223	235	93
Savings account Remaining retirement savings	44,571	16,646	26,427

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

52%

<< Prev Next >>

Choice set 8/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	0	150,000	150,000
Long-term care income product Monthly income when needing **long-term care**	0	0	1500
Lifetime income product Monthly income for the rest of your life	90	143	93
Savings account Remaining retirement savings	120,000	42,859	26,427

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

53%

<< Prev Next >>

Choice set 9/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	75,000	75,000	150,000
Long-term care income product Monthly income when needing **long-term care**	0	1500	3000
Lifetime income product Monthly income for the rest of your life	157	235	35
Savings account Remaining retirement savings	70,713	16,646	6,571

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

54%

<< Prev Next >>

Choice set 10/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	0	75,000	75,000
Long-term care income product Monthly income when needing **long-term care**	0	1500	3000
Lifetime income product Monthly income for the rest of your life	90	235	83
Savings account Remaining retirement savings	120,000	16,646	23,391

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

54%

<< Prev Next >>

Choice set 11/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	150,000	75,000	150,000
Long-term care income product Monthly income when needing **long-term care**	0	3000	3000
Lifetime income product Monthly income for the rest of your life	143	83	35
Savings account Remaining retirement savings	42,859	23,391	6,571

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

55%

<< Prev Next >>

Choice set 12/12

Of the three retirement product allocations below, which one do you prefer MOST, and which one do you prefer LEAST?

Hover your mouse over the blue text for more information.

	Product allocation A	Product allocation B	Product allocation C
Critical illness cash product One-off payment if **critically ill**	0	75,000	0
Long-term care income product Monthly income when needing **long-term care**	0	0	3000
Lifetime income product Monthly income for the rest of your life	90	157	146
Savings account Remaining retirement savings	120,000	70,713	29,141

	A	B	C
MOST preferred	○	○	○
LEAST preferred	○	○	○

56%

<< Prev Next >>

How easy was it for you to complete the tasks on the previous screens?

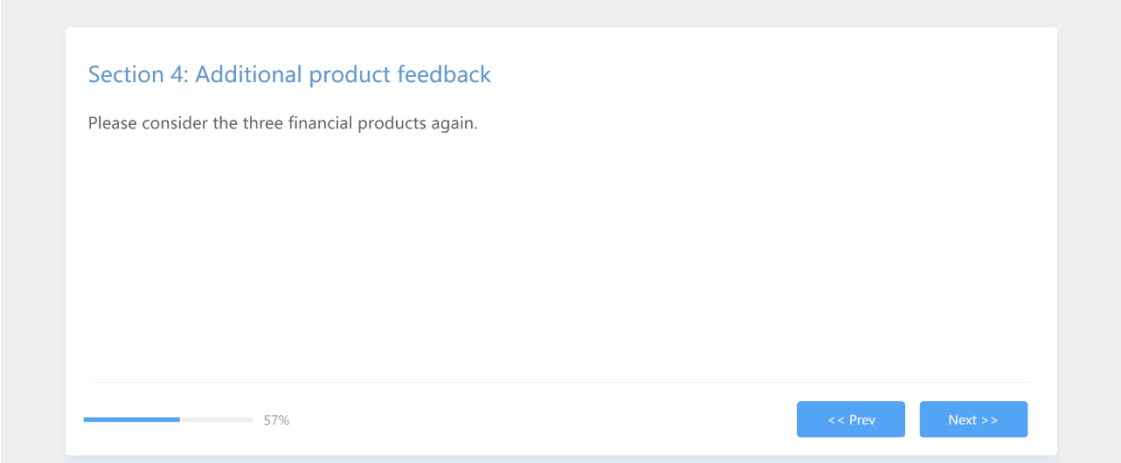
Very easy **Very hard**

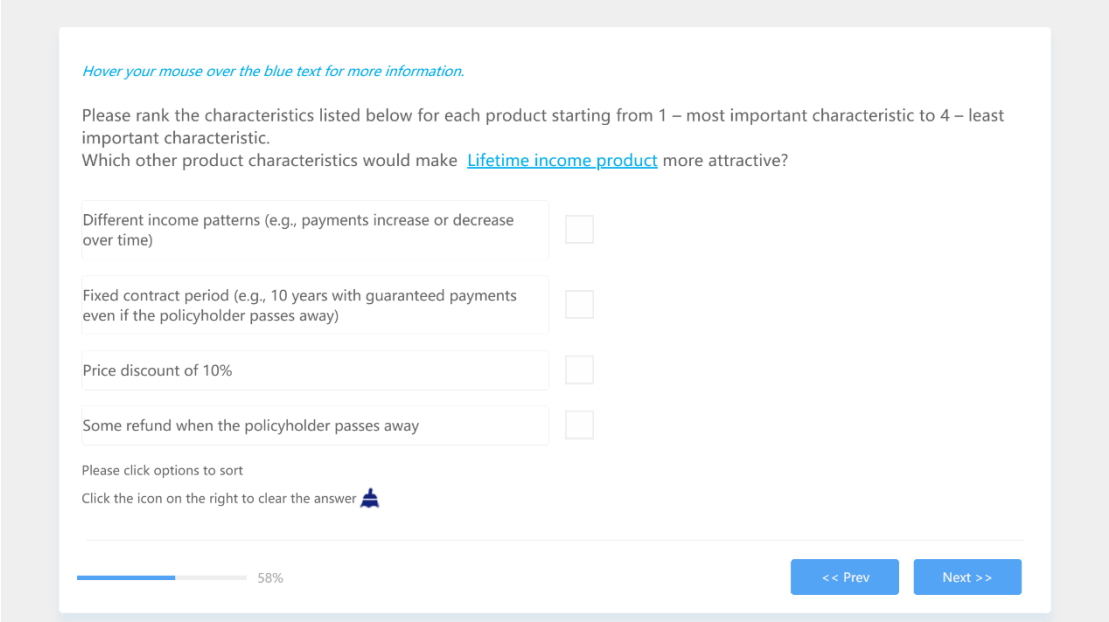
1 2 3 4 5

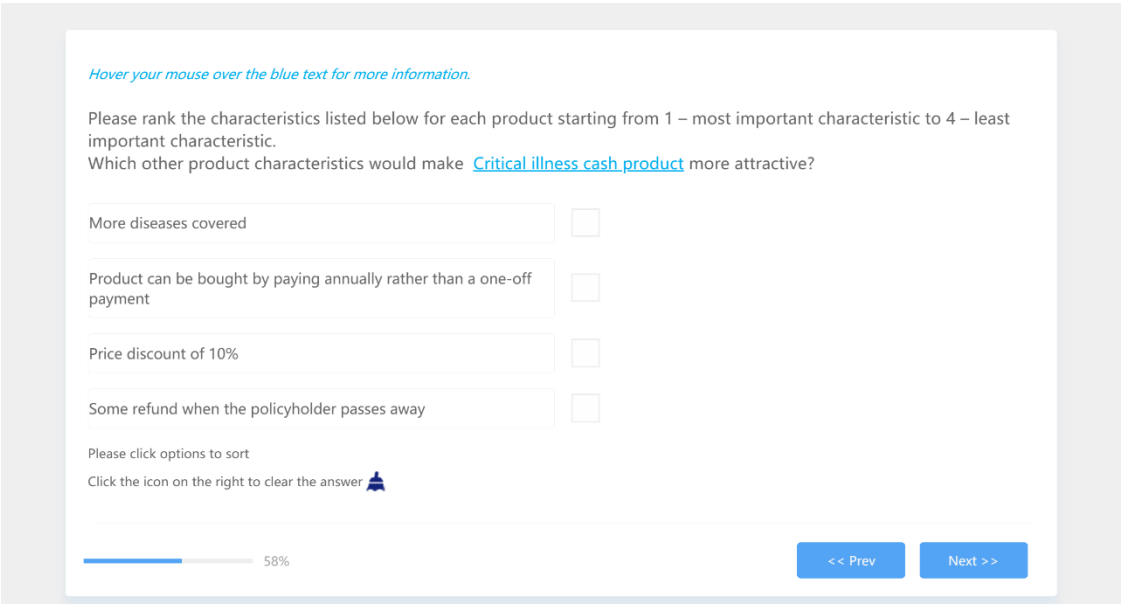
56%

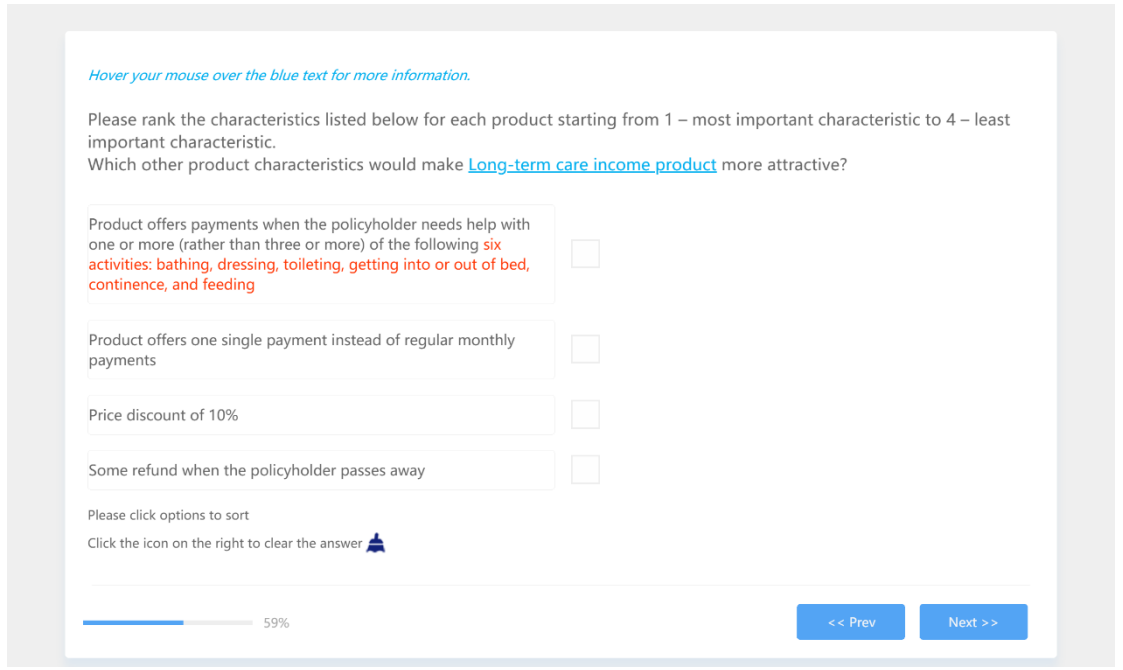
<< Prev Next >>

Section 4: Additional product feedback

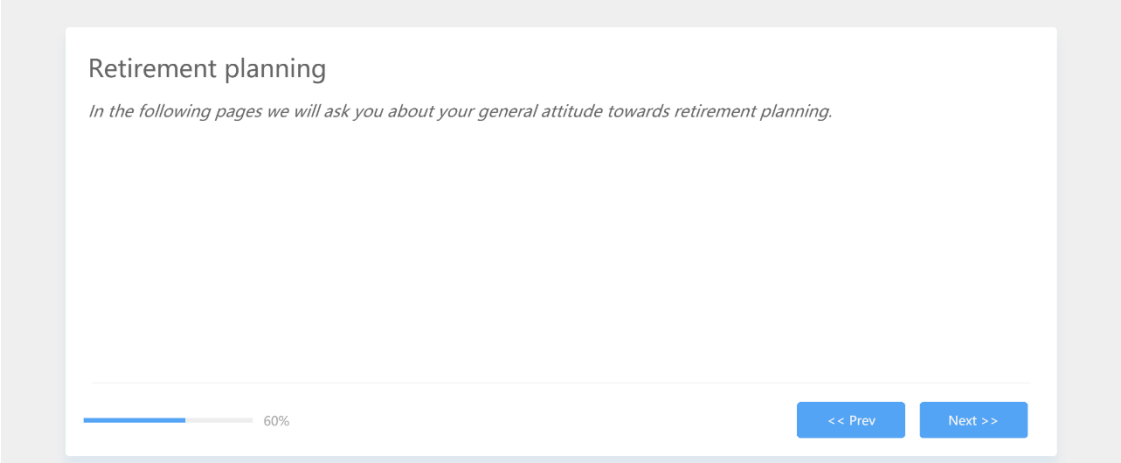


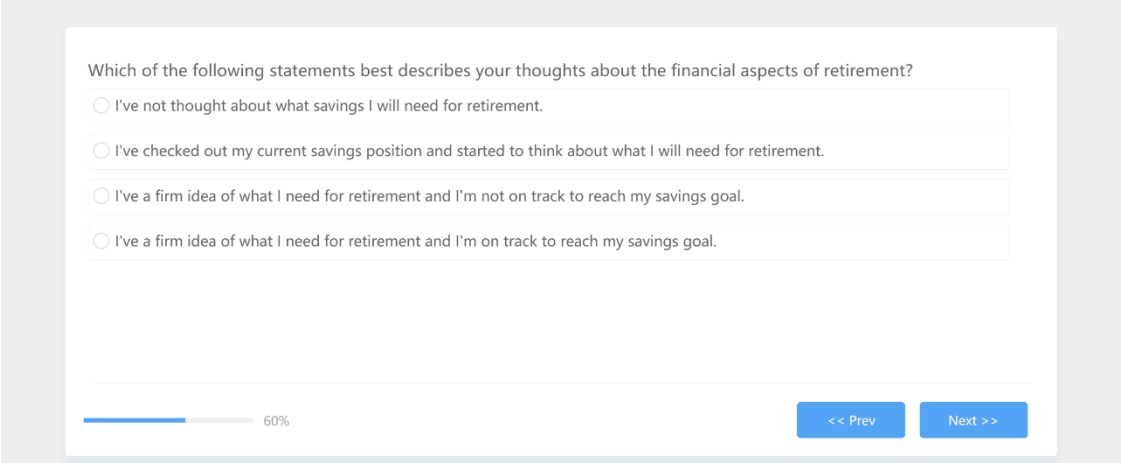


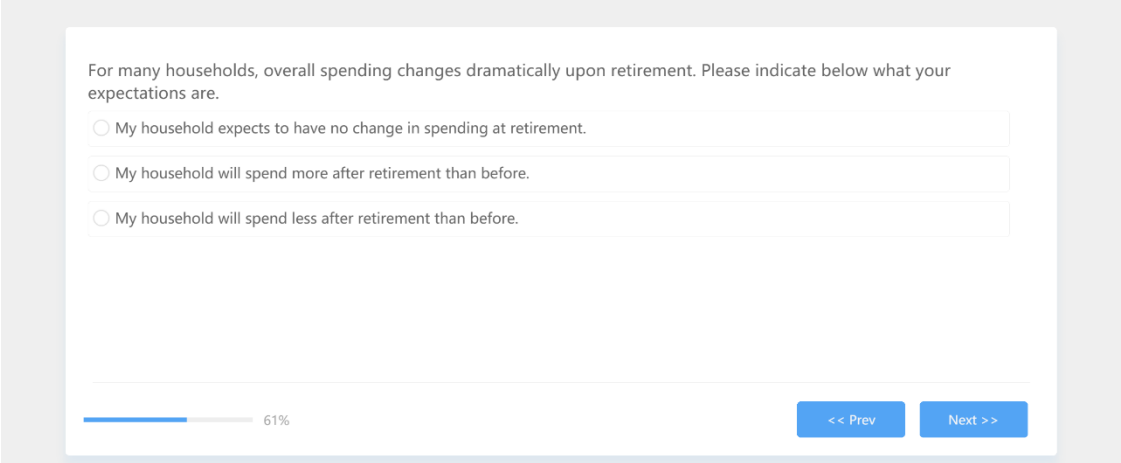

Hover your mouse over the blue text for more information.
Please rank the characteristics listed below for each product starting from 1 – most important characteristic to 4 – least important characteristic.
Which other product characteristics would make Critical illness cash product more attractive?
More diseases covered
Product can be bought by paying annually rather than a one-off payment
Price discount of 10%
Some refund when the policyholder passes away
Please click options to sort
Click the icon on the right to clear the answer
58%
<< Prev
Next >>


Hover your mouse over the blue text for more information.
Please rank the characteristics listed below for each product starting from 1 – most important characteristic to 4 – least important characteristic.
Which other product characteristics would make Long-term care income product more attractive?
Product offers payments when the policyholder needs help with one or more (rather than three or more) of the following six activities: bathing, dressing, toileting, getting into or out of bed, continence, and feeding
Product offers one single payment instead of regular monthly payments
Price discount of 10%
Some refund when the policyholder passes away
Please click options to sort
Click the icon on the right to clear the answer
59%
<< Prev
Next >>

Covariate collection







People use different time-horizons when they decide how much of their income to spend, and how much to save. Which of the time-horizons mentioned below is in your household most important with regards to planning expenditures and savings?

- ○ The next couple of months
- ○ The next year
- ○ Then next couple of years
- ○ The next 5 to 10 years
- ○ More than 10 years from now

62%

<< Prev | Next >>

People's general spending behaviour may be different when they are not healthy. How do you see yourself: Are you generally like person A or person B?

- •Person A: Spend as much as possible while being in good health and spend little while being in bad health.
- •Person B: Spend as much as possible while being in bad health and spend little while being in good health.

Please tick one box on the scale where 0 means 'Person A' and 10 means 'Person B'.

Person A										Person B
0	1	2	3	4	5	6	7	8	9	10

62%

<< Prev | Next >>

How many children do you have that are still alive? *Please count all natural children, fostered, adopted and stepchildren.*

_____ children

63%

<< Prev | Next >>

Where do your children live?

- [ ] Same household as me
- [ ] Same city as me
- [ ] Different city but same province as me
- [ ] Different province
- [ ] Different country

64%

<< Prev | Next >>

How many sons do you have? _____ sons

64%

<< Prev | Next >>

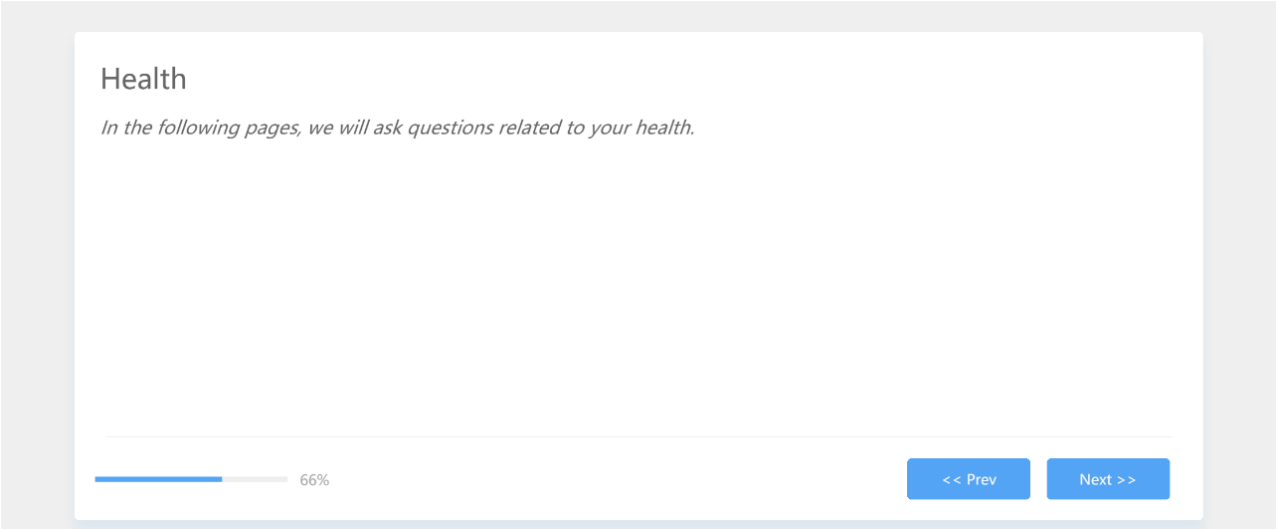
To what extent the following statement apply to you?

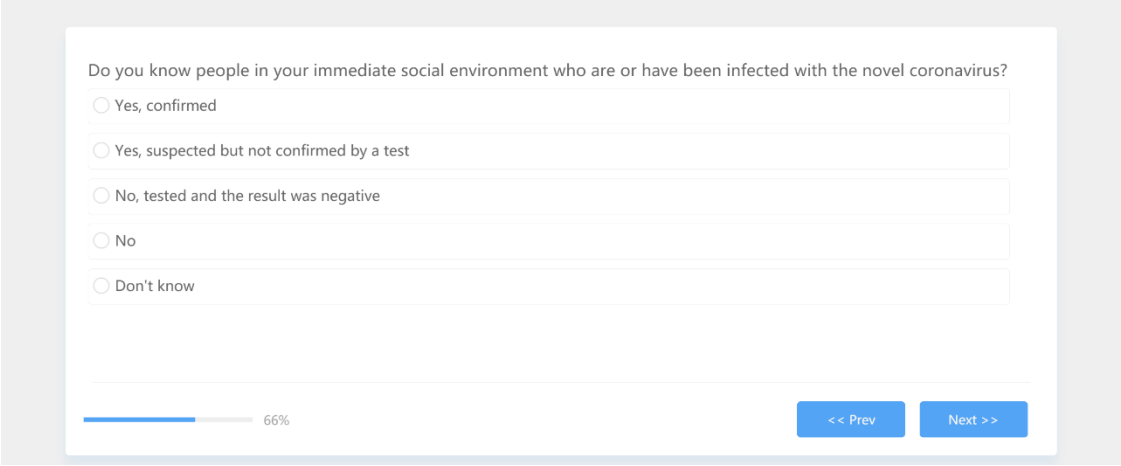
Please tick on box on the scale where 0 means 'certainly not' and 10 means 'certainly yes'.

	Certainly not										Certainly yes
I would like to leave an inheritance.	0	1	2	3	4	5	6	7	8	9	10

65%

<< Prev | Next >>


Health
In the following pages, we will ask questions related to your health.
66%
<< Prev
Next >>


Do you know people in your immediate social environment who are or have been infected with the novel coronavirus?
Yes, confirmed
Yes, suspected but not confirmed by a test
No, tested and the result was negative
No
Don't know
66%
<< Prev
Next >>

How does the novel coronavirus make you feel? For each statement below, please indicate how the novel coronavirus makes you feel on a scale from 1 to 7. The novel coronavirus is:

	1	2	3	4	5	6	7	
Something that makes me not worry about my health								Something that makes me worry about my health
Something I can combat with my own action								Something that makes me feel helpless
Not stressful								Stressful
Something that does not affect my mood								Something that is making me depressed

69%

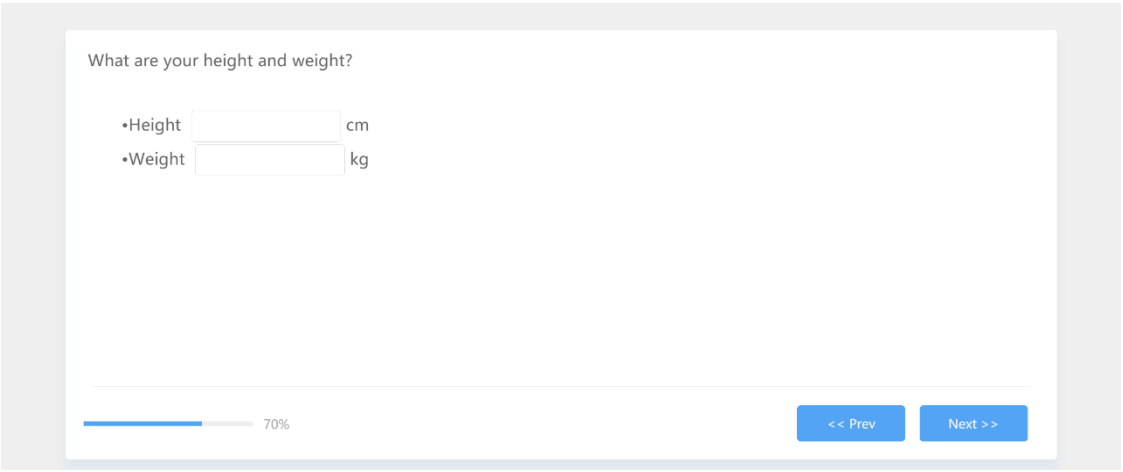
<< Prev Next >>

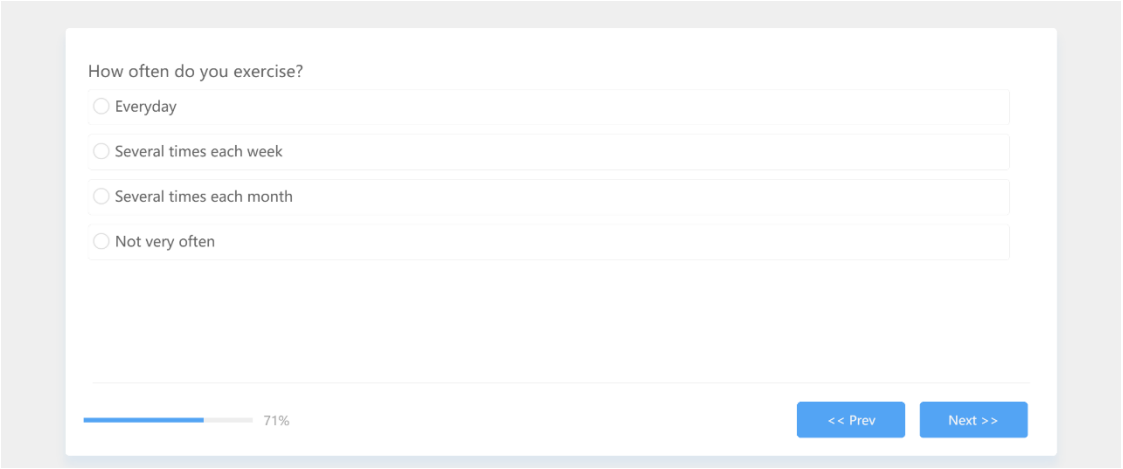
Chinese women at your age on average are expected to live to age 87 . To what age do you think you will live?

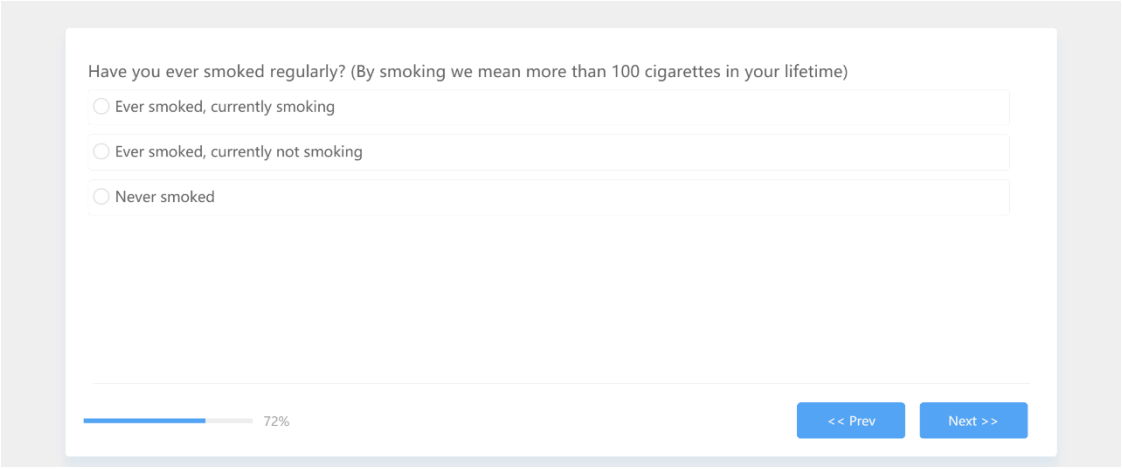
years

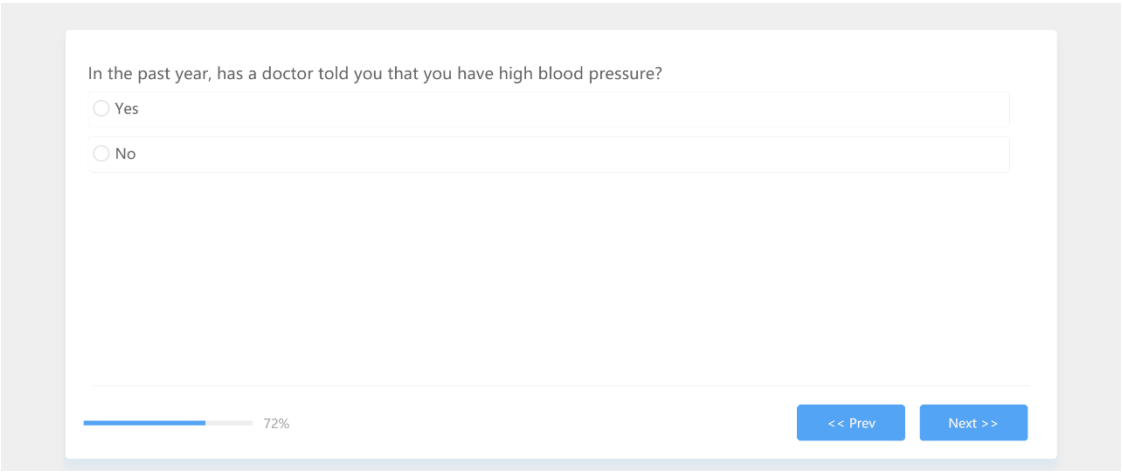
70%

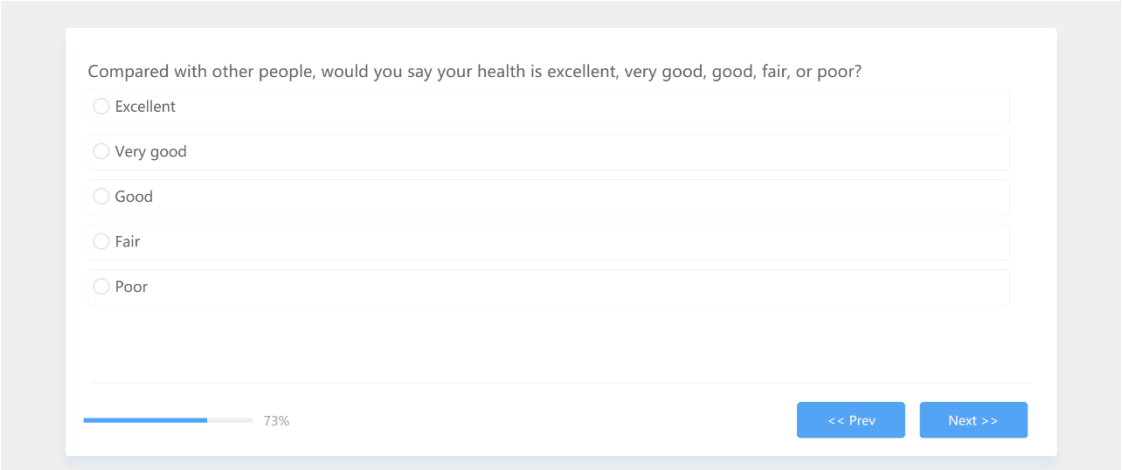
<< Prev Next >>

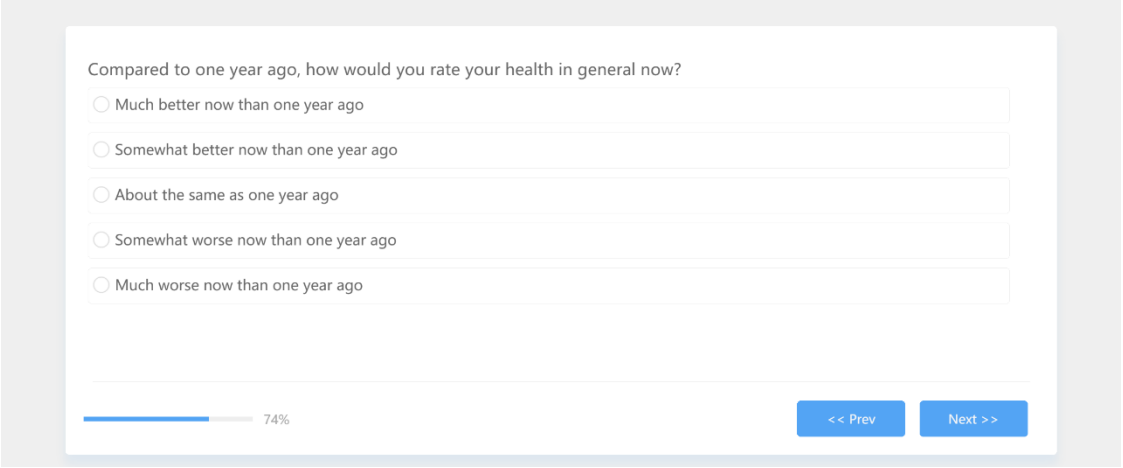

What are your height and weight?
•Height
cm
•Weight
kg
70%
<< Prev
Next >>


How often do you exercise?
Everyday
Several times each week
Several times each month
Not very often
71%
<< Prev
Next >>


Have you ever smoked regularly? (By smoking we mean more than 100 cigarettes in your lifetime)
Ever smoked, currently smoking
Ever smoked, currently not smoking
Never smoked
72%
<< Prev
Next >>


In the past year, has a doctor told you that you have high blood pressure?
Yes
No
72%
<< Prev
Next >>


Compared with other people, would you say your health is excellent, very good, good, fair, or poor?
Excellent
Very good
Good
Fair
Poor
73%
<< Prev
Next >>


Compared to one year ago, how would you rate your health in general now?
Much better now than one year ago
Somewhat better now than one year ago
About the same as one year ago
Somewhat worse now than one year ago
Much worse now than one year ago
74%
<< Prev
Next >>

Excluding all properties that you own, what is the total value of your household's savings? (including, for example, savings accounts, term deposits, government bonds, stocks, shares in investment fund)

- less than ¥2,000
- between ¥2,000 and ¥9,999
- between ¥10,000 and ¥49,999
- between ¥50,000 and ¥99,999
- between ¥100,000 and ¥249,999
- between ¥250,000 and ¥499,999
- between ¥500,000 and ¥999,999
- ¥1,000,000 or more

74%

<< Prev Next >>

Have you seen the previous question before?

- Yes
- No

75%

<< Prev Next >>

In the last five years, which of the following events happened to you and/or people close to you? Choose all that apply.

	Me	People close to me	None
The person provided active care for elderly members or relatives	☐	☐	○
Medically-trained people provided care at the person's home	☐	☐	○
The person was diagnosed with a critical illness (for example, cancer, heart attack, stroke, dementia)	☑	☐	○
The person could not complete **one** or **two** of the following six activities: Bathing, dressing, toileting, getting into or out of bed, continence, and feeding	☐	☐	○
The person could not complete **three** or more of the following six activities: Bathing, dressing, toileting, getting into or out of bed, continence, and feeding	☑	☐	○

76%

<< Prev Next >>

Risk attitude and patience

In the following pages, we will ask you about your risk attitude and level of patience.

77%

<< Prev Next >>

How do you see yourself: Are you generally a person who is fully prepared to take risks in financial matters or do you try to avoid taking risks in financial matters?

Please tick on box on the scale where 0 means 'not prepared to take risks' and 10 means 'fully prepared to take risks'.

Not prepared to take risks										Fully prepared to take risks
0	1	2	3	4	5	6	7	8	9	10

77%

<< Prev Next >>

How do you see yourself: Are you generally an impatient person, or someone who always shows great patience?

Please tick on box on the scale where 0 means 'very impatient' and 10 means 'very patient'.

Very impatient										Very patient
0	1	2	3	4	5	6	7	8	9	10

78%

<< Prev Next >>

How do you rate your overall knowledge of financial matters?

- Very good
- Good
- Moderate
- Poor
- Very poor

79%

<< Prev Next >>

In the following pages we ask you about your general financial competence. Please answer the questions without a calculator.

79%

<< Prev Next >>

Suppose you had ¥100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow?

- More than ¥102
- Exactly ¥102
- Less than ¥102
- Do not know

80%

<< Prev Next >>

Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?

- More than today
- Exactly the same
- Less than today
- Do not know

81%

<< Prev Next >>

Please evaluate whether this statement is true or false. "Buying shares in a single company usually provides a safer return than buying units in a managed share fund."

- True
- False
- Do not know

81%

<< Prev Next >>

Imagine that we rolled a fair, six-sided die 1000 times. Out of 1000 rolls, how many times do you think the die would come up even? Please enter a number between 0 to 1000 in the box.

times

82%

<< Prev Next >>

In a lottery, the chance of winning a 500 RMB prize is 1%. What is your best guess of how many people would win the prize if 1000 people each buy a single ticket in the lottery? Please enter a number between 0 to 1000 in the box.

people

83%

<< Prev Next >>

In a raffle, the chance of winning a car is 1 in 1000. What percent of tickets in the raffle win a car? Please enter a percentage in the box.

%

83%

<< Prev Next >>

Psychological personality traits

In these questions, we ask you to describe your own personality traits. Please indicate how well each of the following describes you.

	Not at all	a little	Somewhat	a lot
Organized	○	○	○	○
Responsible	○	○	○	○
Hardworking	○	○	○	○
Careless	○	○	○	○
Thorough	○	○	○	○

84%

<< Prev Next >>

Socio-economic information

In the following pages, we will collect some personal information about you.

85%

<< Prev Next >>

What is your marital status?

- Never married
- Married (including living in a long-term partnership)
- Divorced
- Separated
- Widowed

85%

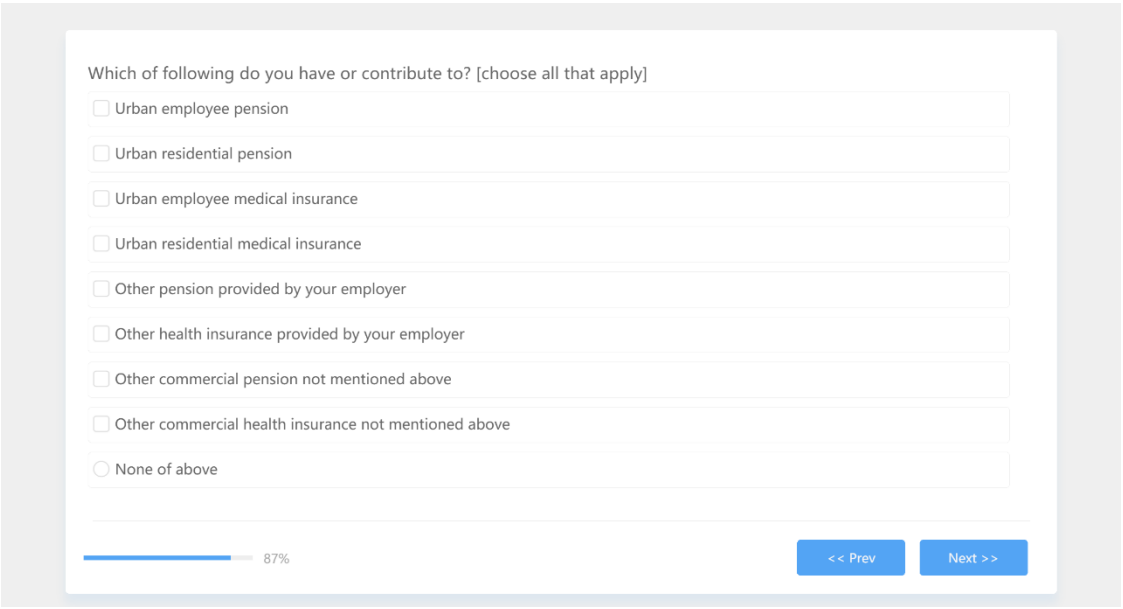
<< Prev Next >>

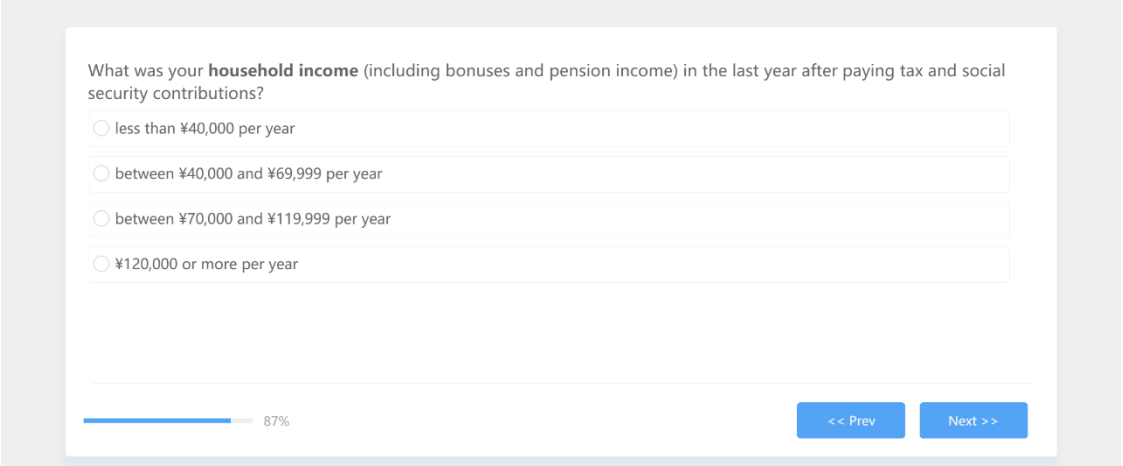
Who do you work for? If you are not currently working, please answer according to your most recent previous job.

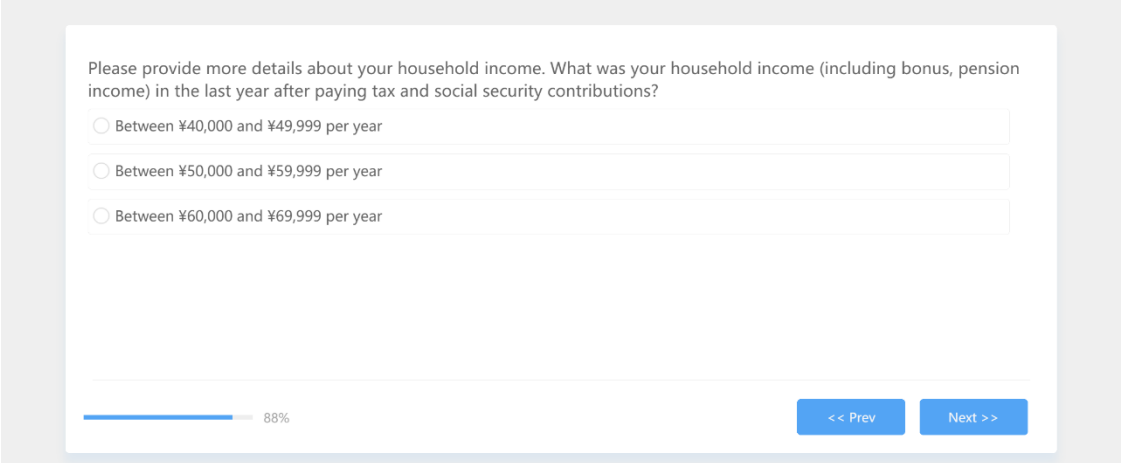
- Government
- Public institution
- Non-government organisation
- State-owned enterprise
- Private company including foreign firm
- Individual firm and freelancer
- Farmer
- Never worked
- Other

86%

<< Prev Next >>


Which of following do you have or contribute to? [choose all that apply]
Urban employee pension
Urban residential pension
Urban employee medical insurance
Urban residential medical insurance
Other pension provided by your employer
Other health insurance provided by your employer
Other commercial pension not mentioned above
Other commercial health insurance not mentioned above
None of above
87%
<< Prev
Next >>


What was your household income (including bonuses and pension income) in the last year after paying tax and social security contributions?
less than ¥40,000 per year
between ¥40,000 and ¥69,999 per year
between ¥70,000 and ¥119,999 per year
¥120,000 or more per year
87%
<< Prev
Next >>


Please provide more details about your household income. What was your household income (including bonus, pension income) in the last year after paying tax and social security contributions?
Between ¥40,000 and ¥49,999 per year
Between ¥50,000 and ¥59,999 per year
Between ¥60,000 and ¥69,999 per year
88%
<< Prev
Next >>

Novel coronavirus related questions

The novel coronavirus has a broad impact. We would like to know:
How have your income changed following the spread of the novel coronavirus? My income has:

- ○ Increased a lot
- ○ Increased a little
- ○ More or less the same
- ○ Decreased a little
- ○ Decreased a lot

89%

<< Prev | Next >>

The novel coronavirus has a broad impact. We would like to know:
How has your savings changed following the spread of the novel coronavirus? My savings have:

- ○ Increased a lot
- ○ Increased a little
- ○ More or less the same
- ○ Decreased a little
- ○ Decreased a lot

89%

<< Prev | Next >>

Have you bought any insurance since the spread of the novel coronavirus?

- ☐ Novel coronavirus insurance
- ☐ Critical illness insurance
- ☐ Long-term care insurance
- ☐ Commercial medical insurance
- ☐ Other health-related insurance
- ☐ Annuity or commercial pension
- ☐ Other insurance
- ○ None

90%

<< Prev | Next >>

What is the main reason you buy the insurance product(s)?

- Risks of COVID-19
- Awareness of health risks in general
- Price
- Recommendations from others
- People around me bought it
- Other reason

91%

<< Prev | Next >>

The novel coronavirus has widespread economic effects. At the moment, how much do you worry about: (For each statement below, please indicate how the novel coronavirus makes you feel on a scale from 1 to 7.)

	Don't worry at all						Worry a lot
Losing your main source of income	1	2	3	4	5	6	7
Small companies closing down	1	2	3	4	5	6	7
An economic recession in China	1	2	3	4	5	6	7

91%

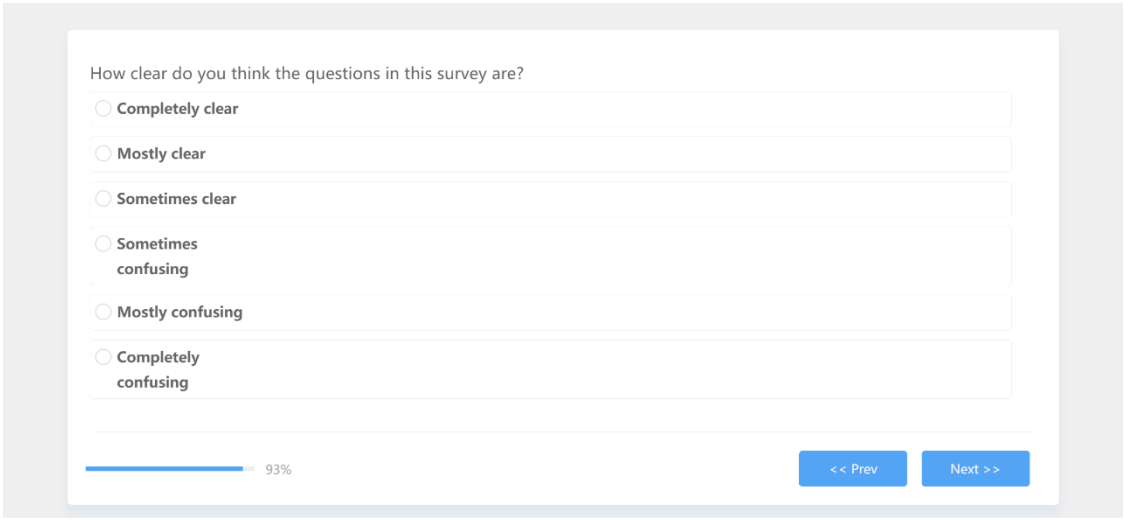
<< Prev | Next >>

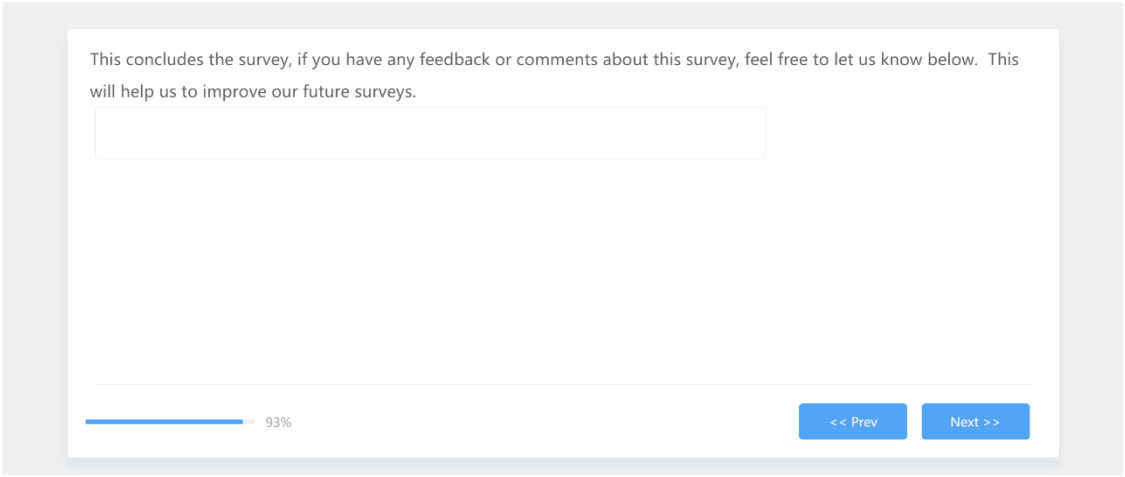
Since the lockdown measures have been loosened, have you done the following?

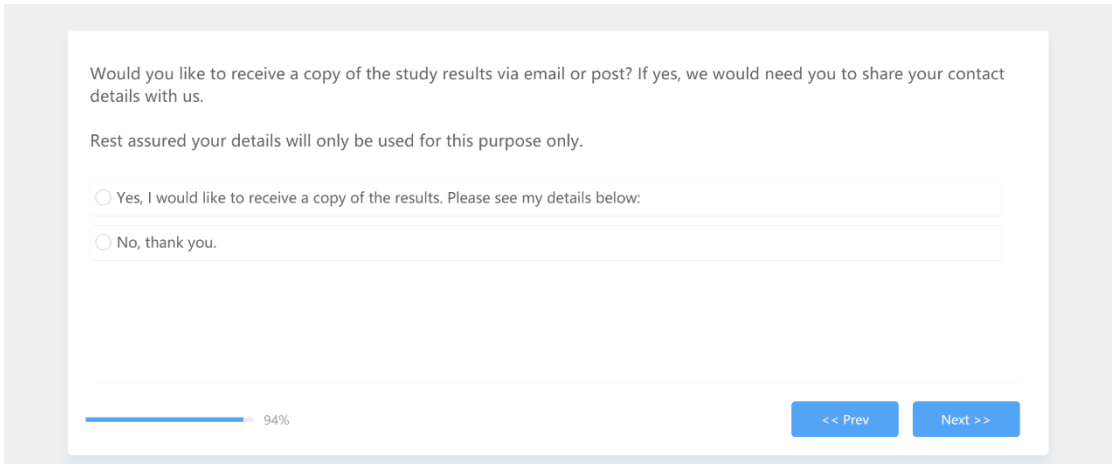
	Always avoided	Often avoided	Sometimes avoided	Never avoided	Does not apply
Avoided seeing relatives outside your home					
Avoided having meals in a restaurant with a friend					
Avoided direct contact with doors or elevator buttons					
Avoided crowded locations like shopping malls					
Avoided travelling					

92%

<< Prev | Next >>


How clear do you think the questions in this survey are?
Completely clear
Mostly clear
Sometimes clear
Sometimes confusing
Mostly confusing
Completely confusing
93%
<< Prev
Next >>


This concludes the survey, if you have any feedback or comments about this survey, feel free to let us know below. This will help us to improve our future surveys.
93%
<< Prev
Next >>


Would you like to receive a copy of the study results via email or post? If yes, we would need you to share your contact details with us.
Rest assured your details will only be used for this purpose only.
Yes, I would like to receive a copy of the results. Please see my details below:
No, thank you.
94%
<< Prev
Next >>

C. Focus group testing

We used focus groups to pre-test the survey design. The focus group discussions were conducted by the market research company Horizon Dataway in Beijing, China, on 16-17 January 2019. Two focus groups, each with six participants, were asked to discuss key survey elements, including the product descriptions of the retirement financial products and the portfolio allocation choice task. The participants were recruited according to the sample selection criteria for our main survey (see Section 2.1). The two-hour discussions in both groups were led by a moderator from Horizon Dataway using a script we provided. The focus group participants asked detailed questions about the financial products and showed a good understanding of the portfolio allocation task. The discussions helped us improve the product descriptions and determine the most relevant product attributes for the attribute-ranking task.

D. Pricing of insurance products

In the survey, the life annuity, critical illness insurance, and long-term care insurance were priced for individuals at the hypothetical retirement age of 55 (for females) or 60 (for males) assuming a one-off payment. We priced the three products in an actuarially fair way based on gender and age. We assumed a constant 3.5% nominal interest rate[1] and a constant 2% inflation rate[2] for each year in the future. In addition, we assumed a 15% loading for all products. This loading assumption is slightly higher than in practice in China as Wan et al. (2017) find that the money's worth ratio for commercial pensions is at least 90% in China. However, the 15% loading is potentially lower for critical illness and long-term care insurance as the administrative cost for critical illness insurance in China is between 15% to 20%, and there is an additional 10% to 30% surcharge on the pure premium (Zhang et al., 2021). We assume the 15% loading for administration such that the results are more transparent for the government and insurers.

We used the official mortality and incidence rates required by the China Banking and Insurance Regulatory Commission (CBIRC) for annuities and critical illness insurance products. For the life annuity, we used the mortality curves for the pension business for males and females starting at age 60 and 55, respectively. For the critical illness insurance, we used the incidence rate curves for 25 diseases for males and females starting at age 60 and 55, respectively. For the mortality profiles needed to price critical illness insurance, we use the industry mortality curves for the health insurance business.[3] The insured period is lifetime for all three products. However, for critical illness insurance, the contract ends if the payment is made, and for long-term care insurance, the payments will only be made when the insured cannot perform three or more ADLs.[4] For simplicity and a cleaner interpretation, we assumed that all the mortality and illness incidences curves are unchanged in the future.[5]

[1] This is a standard assumption for pricing under China's insurance regulation.

[2] This is approximately an average of the national CPI values during the period 2010-2019.

[3] Chinese insurance companies can also use the mortality curves for the pension business to achieve a more conservative price.

[4] Instead of a lifetime cover of the critical illness insurance, we have also tested the price with a shorter cover, that is, age 60-80 for males, and age 55-85 for females. The differences compared with a lifetime cover are not substantial as the cumulative survival chances at later ages are small enough to mitigate a higher chance of incidence.

[5] The incidence curve for critical illness insurance is subject to update in 2020 according to CBRIC. However, the final update had not been released by the time the survey was conducted. The curves for mortality and critical illness can be found at the following websites (in Chinese):

For long-term care insurance, official pricing curves are not available in China. Therefore, we estimated the health transition rates based on data from the CHARLS survey. We used data from the 2011, 2013, and 2015 waves of CHARLS, which were all the available waves at the time when the survey was designed. A two-year transition at each age for both genders was observable from 2011 to 2013 and from 2013 to 2015. As the sample size was limited at certain ages, we pooled the two-year transition data and estimated the one-year transition at each age for each gender, assuming the transition rates were stable from 2011 to 2015. We only used data for respondents in the initial years (2011 or 2013) that were at least 35 years old.[6] We excluded observations with missing ADL status or death information.

We modelled the health transitions in a Markov framework. We defined four health states: Healthy, Fair (one or two ADLs), Disabled (three or more ADLs, long-term care insurance payable), and Dead. We allowed for recovery from states Fair or Disabled, while Dead is an absorbing state.

To estimate health transition probabilities, we used a multinomial logit model based on a comparison of different models.[7] We estimated separate models for females and males. The dependent variable was each respondent's health state observed in the follow-up wave (2013 or 2015), and the explanatory variables were the respondent's age and health state in the initial wave (2011 or 2013).[8]

Based on the fitted multinomial logit model, we predicted the two-year transition rates for females (males) starting from age 55 (60) and further converted them to the one-year transition probability matrix for pricing. Both females and males were assumed dead at age 105.

https://www.cbirc.gov.cn/cn/view/pages/ItemDetail.html?docId=372677&itemId=925&generaltype=0 (mortality), https://www.cbirc.gov.cn/cn/view/pages/ItemDetail.html?docId=359804&itemId=928&generaltype=0 (illness).

[6] We include ages younger than 55 to avoid potential large bias at the boundaries of the age domain when non-parametric smoothing models are used. We have conducted sensitivity tests using a subset with ages between 45-84, and a subset with a ten-year age group starting from 35-45. The impact on product pricing was not substantial.

[7] We considered a probit model, which had been used to estimate the transition probabilities in a similar context in the US by Yogo (2016) and Koijen et al. (2016). We also have tested ordered logit, probit, complementary log–log models, and the multinomial logit model has the best performance in terms of AIC and deviance residuals. We also have tested non-parametric smoothing models for each of the possible transitions and we do not find substantial differences in terms of price.

[8] We do not distinguish between the urban and rural populations for pricing, as the insurance price is the same for them in China.

As in the case of the life annuity and the critical illness insurance, we assumed that the estimated transition rates for long-term care were stable in the future. The price of the long-term care insurance was determined following the pricing practice in China described by Hu et al. (2016).

We mentioned in the survey that the participants would receive a discount when they buy the lifetime income product, the critical illness cash product and the long-term care income product together. The discount was given as "about 10% when you buy any two products" and "about 15% when you buy three products". We used price discounts because the impact of adverse selection in separate longevity and health insurance markets can be reduced by better risk pooling due to bundled insurance products, hence reducing the insurance price. To estimate the price discounts, we calculated the pricing difference of the annuities with respect to the three industry mortality curves (one for pension with low mortality rates, one for health insurance with high mortality rates, and one for savings products with median mortality rates). We found that the average pricing difference by using the high mortality curve and the median mortality curve, and by using the low mortality curve and the median mortality curve, was about 10%. We, therefore, assumed that bundling longevity and health insurance could yield an approximately 10% discount, and we further assumed a 15% discount if all three products were bought together.

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Wan, Q., Cheng, D., and Niu, L. (2017). The pension system in China: an empirical study of the money's worth ratio of annuities. *Aestimatio*, (15):20.

Wang, J.-B., Gu, M.-J., Shen, P., Huang, Q.-C., Bao, C.-Z., Ye, Z.-H., Wang, Y.-Q., Mayila, M., Ye, D., Gu, S.-T., Lin, H.-B., & Chen, K. (2016). Body Mass Index and Mortality: A 10-Year Prospective Study in China. *Scientific Reports*, 6(1), 31609.

Yogo, M. (2016). Portfolio choice in retirement: Health risk and the demand for annuities, housing, and risky assets. *Journal of Monetary Economics*, 80:17–34.

Zhang, Y., Guan, Y., Hu, D., Vanneste, J., and Zhu, D. (2021). The Basic vs. Ability-to-Pay Approach: Evidence From China's Critical Illness Insurance on Whether Different Measurements of Catastrophic Health Expenditure Matter. *Frontiers in Public Health*, 9:646810.

E. Comparison of participant characteristics with CHARLS 2018 Variables

	Survey (Ages 45-69, not retired, 52 major cities)	CHARLS (Ages 45-69, not retired, urban Hukou)
Age (mean)	54.4	56.0
Male	50.0%	60.9%
Married	99.0%	93.0%
Household income (median)	CNY 100,000 to 109,999 per year	[CNY 63,580]
Household debt (median)	CNY 2,000 to 9,999	[0]
Highest education attained		
No schooling	6.9%	13.4%
Primary school	6.2%	22.6%
Junior middle school	24.8%	24.0%
High school	37.4%	19.6%
College degree or diploma	13.4%	15.9%
Bachelor's degree	11.1%	4.1%
Master's degree or above	0.2%	0.3%
Current work status Employed by someone else	64.6%	58.8%
Self-employed	31.9%	41.2%
Unemployed	3.5%	0.0%
Urban hukou	94.3%	100.0%
Number of children (mean)	1.6	1.8
Number of observations	1,000	1,446

Notes: CHARLS refers to the 2018 wave of the China Health and Retirement Longitudinal Study (based on the Harmonized CHARLS dataset provided by the Program on Global Aging, Health & Policy, University of Southern California (see https://g2aging.org).). Online Appendix E.1 describes how we coded the variables collected in the survey, while Online Appendix E.2 reports detailed summary statistics.

F. Preference for retirement portfolios by wealth and (public) pension

Portfolio	1	2	3	4	5	6	7	8	9
Health cover	0-0	50-0	100-0	50-0	100-0	50-50	100-50	50-100	100-100
By wealth									
150,000	298	362	341	370	361	375	312	314	267
300,000	321	353	370	347	377	445	416	398	393
500,000	261	288	340	334	365	392	381	412	395
1,000,000	169	206	238	227	281	318	308	319	346
By pension									
2,000[1]	177	209	214	228	247	293	242	245	233
3,000	511	601	644	648	706	767	704	728	703
3,500	361	399	431	402	431	470	471	470	465

Notes: The health cover shows the cover (in percentage points) provided in a portfolio for out-of-pocket costs of critical illness and long-term care, respectively.

[1] The category is a combination of three pension categories: CNY 2,000, CNY 1,000 and CNY 500.

G. Variables

G.1 Variable definitions

<table>
<tr><th>Variable</th><th>Description</th></tr>
<tr><td>Monthly annuity</td><td>A numerical variable equals the monthly annuity income chosen by a participant.</td></tr>
<tr><td>0-0 cover / 50-0 cover / 100-0 cover / …</td><td>An indicator variable that is one for different levels of pre-selected cover for the critical illness cash product and the long-term care income product and zero otherwise (reference category: 0-0 cover in Task 1).
<table>
<tr><th>Variable name</th><th>Task</th><th>Critical illness cover</th><th>Long-term care cover</th></tr>
<tr><td>0-0 cover</td><td>Task 1</td><td>0</td><td>0</td></tr>
<tr><td>50-0 cover</td><td>Task 2</td><td>50%</td><td>0</td></tr>
<tr><td>100-0 cover</td><td>Task 3</td><td>100%</td><td>0</td></tr>
<tr><td>0-50 cover</td><td>Task 4</td><td>0</td><td>50%</td></tr>
<tr><td>0-100 cover</td><td>Task 5</td><td>0</td><td>100%</td></tr>
<tr><td>50-50 cover</td><td>Task 6</td><td>50%</td><td>50%</td></tr>
<tr><td>100-50 cover</td><td>Task 7</td><td>100%</td><td>50%</td></tr>
<tr><td>50-100 cover</td><td>Task 8</td><td>50%</td><td>100%</td></tr>
<tr><td>100-100 cover</td><td>Task 9</td><td>100%</td><td>100%</td></tr>
</table></td></tr>
<tr><td colspan="2">Wealth and public pension income</td></tr>
<tr><td>Wealth: 1,000,000 / 500,000 / 300, 000</td><td>An indicator variable that equals one if the participant was allocated to retirement savings group CNY 1,000,000, 500,000 or 300,000, respectively, and zero otherwise (reference category: 150,000).</td></tr>
<tr><td>Pension: 3,500 / 3,000</td><td>An indicator variable that equals one if the participant was allocated to pension group CNY 3,500 or 3,000, respectively, and zero otherwise (reference category: CNY 2,000 or below combined with CNY 1,000 and CNY 500).</td></tr>
<tr><td colspan="2">Understanding of retirement insurance products and financial capabilities</td></tr>
<tr><td>Product understanding</td><td>An indicator variable that equals one if the participant’s number of correct answers in the product knowledge quiz is above the sample median and zero otherwise.</td></tr>
<tr><td>Financial competence</td><td>An indicator variable that equals one if the participant’s number of corrected answers for three numeracy questions and three financial literacy questions is above the sample median and zero otherwise. Questions test fractions, percentages, probabilities, simple interest, inflation, and diversification.</td></tr>
<tr><td>Financial product ownership</td><td>An indicator variable that equals one if the reported number of 14 financial products that the participant’s household owns is larger than the sample median, and zero otherwise.</td></tr>
<tr><td>Subjective financial literacy</td><td>An indicator variable that equals one if the participant’s self-rated knowledge of financial matters on a five-point scale (0 = Very good ... 5 = Very poor) is better than the sample median, and zero otherwise.</td></tr>
<tr><td>Stock market participation</td><td>An indicator variable that equals one if the participant reports that anyone in their household owns stocks, and zero otherwise.</td></tr>
<tr><td>Housing wealth</td><td>An indicator variable that equals one if the participant’s reported value of all properties owned by the participant and their spouse is larger than the sample median, and zero otherwise.</td></tr>
<tr><td colspan="2">Demographic and economic factors</td></tr>
<tr><td>Age group</td><td>A polychotomous variable that equals one if the participant’s age is 45-49 and rises by one in five-year steps.</td></tr>
</table>

Female	An indicator variable that equals one if the participant is female and zero otherwise.
Tier 1	An indicator variable that equals one if the participant lives in a Tier 1 city and zero otherwise. Tier 1 cities include Beijing, Shanghai, Shenzhen, Guangzhou.
State employee	An indicator variable that equals one if the participant is currently employed by the government, a public institution, or a state-owned enterprise, and zero otherwise.
College and above	An indicator variable that equals one if the participant's highest level of education attained is college, diploma or above, and zero otherwise.
High school	An indicator variable that equals one if the participant's highest level of education attained is high school, and zero otherwise.
Personal traits and preferences	
Conscientiousness	An indicator variable that equals one if the participant's conscientiousness score is above the sample median, and zero otherwise. Participants rated themselves as organised, responsible, hardworking, careless (reverse coded), and thorough on a four-point scale.
Financial risk tolerance	A numerical variable that equals the participant's self-rated willingness to take risk in financial matters on an eleven-point scale (0 = Not prepared to take risks ... 10 = Fully prepared to take risks). The variable has been standardised.
Patience	A numerical variable that equals to the participant's self-rated patience on an eleven-point scale (0 = Very impatient ... 10 = Very patient). The variable has been standardised.
Health state-dependent consumption	A numerical variable that equals the participant's self-rated consumption behaviour in different health states on an eleven-point scale (0 = Person A: Spend as much as possible while being in good health and spend little while being in bad health ... 10 = Person B: Spend as much as possible while being in bad health and spend little while being in good health). The variable has been standardised.
Health- and care-related experience	
Unhealthy BMI	An indicator variable that equals one if the participant's body mass index (BMI) based on self-reported weight and height is unhealthy (<18.5 kg/m^2 or ≥ 25 kg/m^2) according to the Chinese BMI reference (Wang et al., 2016), and zero otherwise.
Subjective life expectancy	An indicator variable that equals one if the participant's subjective life expectancy is higher than the expected life expectancy given in the question conditional on the participant's age and gender, and zero otherwise.
People close: CI	An indicator variable that equals one if people close to the participant have been diagnosed with a critical illness (CI) and zero otherwise.
People close: ADL limitations	An indicator variable that equals one if people close to the participant could not complete at least one of the six activities of daily living (ADL), and zero otherwise.
Provided care	An indicator variable that equals one if the participant has provided active care for elderly family members or relatives, and zero otherwise.
Retirement planning	
Spend more	An indicator variable that equals one if the participant reports that their household will spend more after retirement than before, and zero otherwise.
Long planning horizon	An indicator variable that equals one if the participant indicated that the most important time horizon for their household with regards to planning expenditures and savings is "The next 5 to 10 years" or "More than 10 years from now", and zero otherwise.

Intergenerational aspects	
0 or 1 child	An indicator variable that equals one if the participant has no child or one child, and zero otherwise.
Daughter	An indicator variable that equals one if the participant has a daughter and zero otherwise.
Child same house	An indicator variable that equals one if the participant has a child living in the same household and zero otherwise.
Bequest motives	A numerical variable that equals the participant's self-rated intention to leave an inheritance on an eleven-point scale (0 = Certainly not ... 10 = Certainly yes). The variable has been standardised.
Impact of COVID-19	
COVID-19: stress	An indicator variable that equals one if the participant's COVID-19-induced stress is worse than the sample median, and zero otherwise. Participants rated on a seven-point scale whether COVID-19 is (i) something that makes them worry about their health, (ii) something that makes them feel helpless, (iii) stressful, and (iv) something that is making them depressed.
COVID-19: finance	An indicator variable that equals one if the participant's savings and income have decreased more than the sample median following the spread of COVID-19, and zero otherwise. Participants answered how their income and savings have changed on a five-point scale.
COVID-19: COVID-19 insurance / CI insurance / other health insurance	An indicator variable that equals one if the participant purchased COVID-19 insurance, critical illness (CI) insurance (without COVID-19 insurance), and other health insurance (medical insurance or long-term care insurance, without COVID-19 insurance or CI insurance), respectively, since the spread of COVID-19 and zero otherwise (reference category: no health insurance purchased).
COVID-19 worry: own income	A numerical variable that reflects the participant's self-rated worry about losing their main source of income on a seven-point scale (1 = Don't worry at all ... 7 = Worry a lot). The variable has been standardised.
COVID-19 worry: small companies	A numerical variable that reflects the participant's self-rated worry that small companies will close down on a seven-point scale (1 = Don't worry at all ... 7 = Worry a lot). The variable has been standardised.
COVID-19 worry: recession	A numerical variable that reflects the participant's self-rated worry that there will be an economic recession in China on a seven-point scale (1 = Don't worry at all ... 7 = Worry a lot). The variable has been standardised.
COVID-19: risky behaviour	An indicator variable that equals one if the participant has shown more risky behaviour related to COVID-19 than the sample median, and zero otherwise. Participants reported to what extent they had avoided the following five activities since the loosening of the COVID-19-induced lockdown measures in 2020: seeing relatives outside their home, having meals in a restaurant with a friend, direct contact with doors or elevators buttons, crowded locations like shopping malls, and travelling – all on a four-point scale (1 = Always avoided ... 4 = Never avoided). There was a 'Does not apply' option was provided.
Survey measures	
IMC passed	An indicator variable that equals one if the participant passed the instructional manipulation check (provided a consistent answer for the household income question, and reported that they had seen the question before), and zero otherwise.

Survey clarity	An indicator variable that equals one if the participant's rating of the survey's clarity on a six-point scale (1 = completely clear ... 6 = completely confusing) was above the sample median, and zero otherwise.

References

Wang, J.-B., Gu, M.-J., Shen, P., Huang, Q.-C., Bao, C.-Z., Ye, Z.-H., Wang, Y.-Q., Mayila, M., Ye, D., Gu, S.-T., Lin, H.-B., & Chen, K. (2016). Body Mass Index and Mortality: A 10-Year Prospective Study in China. *Scientific Reports*, 6(1), 31609.

G.2 Summary statistics

Variable	Min	Pctl(25)	Median	Pctl(75)	Max	Mean	Std. Dev.
Wealth and public pension income							
Wealth: (ref: 150,000)							
Wealth: 300,000	0	0	0	1	1	0.29	0.45
Wealth: 500,000	0	0	0	1	1	0.26	0.44
Wealth: 1,000,000	0	0	0	0	1	0.20	0.40
Pension (ref: 2,000 and below)							
Pension: 3,000	0	0	0.5	1	1	0.50	0.50
Pension: 3,500	0	0	0	1	1	0.33	0.47
Understanding of retirement insurance products and financial capabilities							
Product understanding	0	0	0	1	1	0.39	0.49
Financial competence	0	0	0	1	1	0.41	0.49
Financial product ownership	0	0	0	1	1	0.31	0.46
Subjective financial literacy	0	0	0	1	1	0.40	0.49
Stock market participation	0	0	0	1	1	0.23	0.42
Housing wealth	0	0	0	1	1	0.50	0.50
Demographic and socioeconomic factors							
Age group	1.00	1.75	3.00	3.00	5.00	2.58	1.16
Female	0	0	0.5	1	1	0.50	0.50
Tier 1	0	0	0	0	1	0.20	0.40
State employee	0	0	0	1	1	0.27	0.45
College and above	0	0	0	0	1	0.25	0.43
High school	0	0	0	1	1	0.37	0.48
Personal traits and preferences							
Conscientiousness	0	0	0	1	1	0.39	0.49
Financial risk tolerance	-4.11	-0.71	0.43	0.43	1.56	0	1
Patience	-4.58	-0.32	0.28	0.89	1.50	0	1
Health state-dependent consumption	-2.49	-0.86	0.37	0.78	1.60	0	1
Health- and care-related experience							
Unhealthy BMI	0	0	0	0	1	0.23	0.42
Subjective life expectancy	0	0	0	1	1	0.46	0.50
People close: CI	0	0	0	0	1	0.24	0.43
People close: ADL limitations	0	0	0	0	1	0.23	0.42
Provided care	0	0	0	0	1	0.18	0.38
Retirement planning							
Spend more	0	0	0	1	1	0.35	0.48
Long planning horizon	0	0	0	1	1	0.26	0.44
Intergenerational aspects							
0 or 1 child	0	0	0	1	1	0.46	0.50
Daughter	0	0	1	1	1	0.57	0.50
Child same household	0	0	0	0	1	0.25	0.43
Bequest motives	-3.77	-0.25	0.25	0.75	1.26	0	1
Impact of COVID-19							
COVID-19: stress	0	0	0	1	1	0.47	0.50

COVID-19: finance	0	0	0	1	1	0.46	0.50
COVID-19: COVID-19 insurance	0	0	0	0	1	0.20	0.40
COVID-19: CI insurance	0	0	0	1	1	0.31	0.46
COVID-19: other health insurance	0	0	0	0	1	0.11	0.31
COVID-19 worry: small companies	-1.81	-0.59	0.02	0.63	1.85	0	1
COVID-19 worry: recession	-2.24	-0.91	-0.24	1.09	1.76	0	1
COVID-19 worry: own income	-1.60	-0.98	-0.37	0.86	2.09	0	1
COVID-19: risky behaviour	0	0	0	1	1	0.48	0.50
Survey measures							
IMC passed	0	1	1	1	1	0.86	0.35
Survey clarity	0	0	1	1	1	0.72	0.45

Notes: BMI: body mass index; ADL: activities of daily living; CI: critical illness; IMC: instructional manipulation check.

H. Robust analysis with respect to COVID-19 stress

This section tests whether the results in Section 4 are sensitive to COVID-19 impact. We divided the sample based on their COVID-19 stress level such that one group experienced more-than-average COVID-19 related stress. We extend Model A and Model B in Section 4 by including the interaction terms between each variable under interest and the binary variable COVID-19 stress. A statistically significant interaction suggests that the result of the variable differs by COVID-19 impact. Panel II of Table H.1 reports the interactions for Model A, and Panel III of Table H.2 reports the interactions for Model B.

Table H.1 Preferences for critical illness and long-term care cover

	Dependent variable: Preferred retirement portfolio (ref. 0-0 cover in Task 1)							
Portfolio	2	3	4	5	6	7	8	9
CI-LTC cover	50-0	100-0	0-50	0-100	50-50	100-50	50-100	100-100
Panel I								
Wealth and public pension income								
Wealth: 300,000 (ref. 150,000)	0.86	1.13	0.92	0.89	1.19	1.31	1.40 *	2.04 ***
Wealth: 500,000	0.69	1.20	0.93	1.04	1.09	1.41	1.50 *	1.73 **
Wealth: 1,000,000	0.73	1.15	0.93	0.92	1.13	1.38	1.40	2.22 ***
Pension: 3,000 (ref. 2,000 or less [1])	0.92	1.14	0.82	0.91	0.81	0.81	1.07	1.09
Pension: 3,500	0.83	0.83	0.60 **	0.64 **	0.56 **	0.63 **	0.78	0.77
Understanding of retirement insurance products and financial capabilities								
Product understanding	0.81	0.99	1.02	1.13	1.19	1.08	0.84	1.04
Financial competence	1.30	1.12	1.33 *	1.52 ***	1.66 ***	1.78 ***	2.36 ***	2.24 ***
Financial product ownership	1.30	1.32	1.03	1.29	1.46 **	1.31	1.46 **	1.50 **
Subjective financial literacy	0.99	1.06	1.04	0.88	0.94	0.88	0.89	0.75 *
Stock market participation	0.88	1.18	1.12	0.93	0.86	1.10	0.72	0.88
Housing wealth	1.08	1.12	1.06	1.11	1.01	1.01	0.89	0.99
Demographic and socioeconomic factors								
Age Group	1.14	1.01	0.98	1.14	1.00	0.91	0.84	0.89
Female	0.92	0.74	0.63 *	0.92	0.84	0.73	0.63 *	0.78
Tier 1	1.12	1.11	1.13	0.99	1.00	0.91	1.06	1.02
State employee	0.84	0.91	0.89	0.92	0.89	0.71 **	0.77	0.80
College and above	1.33	1.38	1.44	1.32	1.30	0.99	0.95	1.13
High school	1.07	1.22	1.05	1.00	1.09	0.83	0.80	0.96
Personal traits and preferences								
Conscientiousness	1.44 *	1.46 **	1.63 ***	1.68 ***	2.23 ***	2.02 ***	2.50 ***	2.25 ***
Financial risk tolerance	0.83 **	0.92	0.96	0.96	1.04	1.02	1.00	0.97
Patience	1.05	0.95	0.98	0.89	0.84 **	0.89	0.92	0.91
Health state-dependent consumption	1.07	1.01	0.94	0.89 *	0.80 ***	0.79 ***	0.73 ***	0.63 ***
Health- and care-related experience								
Unhealthy BMI	0.97	1.03	1.02	1.03	1.20	0.98	1.01	1.17

Subjective life expectancy	1.03	1.07	0.97	1.31 *	1.42 **	1.42 **	1.32 *	1.50 ***
People close: CI	0.97	0.80	1.10	0.82	0.87	0.89	0.79	1.07
People close: ADL limitations	0.78	0.69 *	0.54 ***	0.59 ***	0.70 *	0.49 ***	0.58 ***	0.40 ***
Provided care	1.10	0.95	1.24	1.36	0.94	0.95	0.87	1.19
Retirement planning								
Spend more	1.00	1.10	1.08	1.02	1.16	0.94	1.15	1.16
Long planning horizon	0.91	0.97	1.23	1.09	1.26	1.38 *	1.48 **	1.23
Inter-generational aspects								
0 or 1 child	0.84	0.99	0.99	1.24	1.01	1.07	1.24	1.42 *
Daughter	0.93	1.04	1.01	1.06	1.01	0.85	1.13	0.97
Child same household	1.06	0.89	0.92	1.17	1.05	1.07	0.96	0.92
Bequest motives	0.93	0.95	0.90	0.88*	0.86 *	0.93	0.98	0.93
Panel II (interaction terms with COVID-19 stress)								
Wealth and public pension income								
Wealth: 300,000 (ref. 150,000)	1.44	0.80	0.92	1.41	1.12	1.25	0.76	0.58 *
Wealth: 500,000	2.78 **	0.95	1.39	1.56	1.74 *	1.52	1.50	1.30
Wealth: 1,000,000	3.33 ***	1.61	2.13	4.27 ***	4.63 ***	4.04 ***	4.06 ***	3.21 ***
Pension: 3,000 (ref. 2,000 or less [1])	1.08	0.76	1.17	1.11	1.04	1.47	0.93	1.00
Pension: 3,500	0.92	1.09	1.48	1.15	1.35	1.75 *	1.25	1.41
Understanding of retirement insurance products and financial capabilities								
Product understanding	0.99	1.18	1.24	1.25	1.27	1.35	1.89 ***	2.21 ***
Financial competence	0.92	1.50 *	1.48 *	1.12	1.13	1.45	1.06	1.39
Financial product ownership	0.69	0.77	1.12	0.86	0.86	0.91	0.98	0.83
Subjective financial literacy	0.88	0.72	0.74	1.10	0.69	0.74	0.90	0.95
Stock market participation	0.94	0.66	0.56 **	0.76	0.74	0.52 **	0.86	0.89
Housing wealth	1.06	0.95	0.93	1.10	1.18	1.20	1.26	1.65 **
Demographic and socioeconomic factors								
Age Group	0.80	0.92	1.08	0.85	0.92	1.03	1.25	1.06
Female	0.94	0.93	1.70	1.01	1.00	1.04	1.36	0.79
Tier 1	0.85	0.74	0.85	0.94	0.72	0.88	0.70	0.70
State employee	1.90 **	1.70 **	1.76 **	1.73 **	1.76 **	2.35 ***	1.93 **	2.32 ***
College and above	0.71	0.68	0.58	0.81	0.76	1.10	0.95	0.87
High school	1.34	0.79	1.11	1.31	1.30	1.59	1.46	1.17
Personal traits and preferences								
Conscientiousness	0.70	0.66 *	0.61 **	0.57 **	0.48 ***	0.53 **	0.38 ***	0.37 ***
Financial risk tolerance	1.08	1.03	0.74 **	0.87	0.73 **	0.65 ***	0.60 ***	0.56 ***
Patience	1.00	1.00	1.22	1.12	1.22	1.18	1.15	1.29 *
Health state-dependent consumption	0.87	0.85	0.92	1.00	0.95	1.02	0.93	1.13
Health- and care-related experience								
Unhealthy BMI	1.78 **	1.32	1.26	1.17	1.03	1.23	1.33	1.13
Subjective life expectancy	0.93	0.96	1.10	0.56 **	0.65 *	0.69 *	0.64 *	0.46 ***
People close: CI	0.99	1.43	1.00	1.21	1.14	1.00	1.03	1.02
People close: ADL limitations	1.11	1.64 *	1.83 **	1.85 **	1.36	2.40 ***	2.08 **	2.00 **

Provided care	0.70	0.54 **	0.47 **	0.47 **	0.47 ***	0.44 ***	0.46 ***	0.41 ***
Retirement planning								
Spend more	0.72	0.66 *	0.63 **	0.63 **	0.48 ***	0.60 **	0.46 ***	0.44 ***
Long planning horizon	0.91	0.86	0.73	0.88	0.71	0.67	0.73	1.21
Inter-generational aspects								
0 or 1 child	0.74	0.78	0.81	0.70	0.75	0.77	0.68	0.66
Daughter	0.63	0.67	0.69	0.76	0.87	0.95	0.72	0.93
Child same household	1.06	1.30	1.53 *	0.78	1.52	1.10	1.14	1.27
Bequest motives	1.21	1.27	1.18	1.30 **	1.55 ***	1.52 ***	1.51 ***	1.55 ***
Constant	1.44	1.23	1.73	0.98	1.45	2.12	1.87	0.71
Controls for COVID-19 impact	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls for survey quality	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,000							
McFadden R^2	0.53							
Likelihood ratio test	Chi-square = 28,051, p < 2.22e-16***							

Notes: The table reports the multinomial logit regression results of the preference for portfolios with annuities and critical illness (CI) and long-term care (LTC) cover from Task 1 to Task 9 in Stage 1 of the choice task. Panel II reports the results for the interaction terms between each variable under interest and the binary variable COVID-19 stress. A significant interaction suggests the result differs by COVID-19 stress levels. Variables are defined in Online Appendix G. The reference portfolio is the one elicited from Task 1 with 0-0 cover, providing zero out-of-pocket cover for CI and LTC costs. The reference category of public pension is a combination of three pension categories: CNY 2,000, CNY 1,000 and CNY 500. The relative risk ratio is reported (raw logit-scale estimates omitted), representing the probability ratio of choosing a portfolio with specified CI and LTC cover over the reference portfolio. Clustered standard errors at individual level are used to account for the correlation between preferences across different choice tasks presented to the same individual. BMI: body mass index; ADL: activities of daily living; IMC: instructional manipulation check. *p < 0.1; **p < 0.05; ***p < 0.01.

Table H.2 Factors influencing annuity demand

	Dependent variable: Monthly annuity
Panel I	
Critical illness and LTC cover treatments	
Cover: CI-LTC (ref. 0-0 cover)	
50-0 cover	44.5***
100-0 cover	-7.3
0-50 cover	46.9***
0-100 cover	-6.8
50-50 cover	41.6***
100-50 cover	-0.1
50-100 cover	-18.6
100-100 cover	-83.7***
Panel II	
Wealth and public pension income	
Wealth: 300,000 (ref. 150,000)	237.5***
Wealth: 500,000	587.4***
Wealth: 1,000,000	1,439.0***
Pension: 3,000 (ref. 2,000 or less)	113.4**
Pension: 3,500	104.3**
Understanding of retirement insurance products and financial capabilities	
Product understanding	34.3
Financial competence	-0.6
Financial product ownership	47.4
Subjective financial literacy	-3.2
Stock market participation	-36.0
Housing wealth	12.7
Demographic and socio-economic factors	
Age group	26.5
Female	-33.2
Tier 1	-37.7
State employee	-2.0
College and above	68.2
High school	31.9
Personal traits and preferences	
Conscientiousness	30.3
Financial risk tolerance	15.5
Patience	3.7
Health state-dependent consumption	2.3
Health- and care-related experience	
Unhealthy BMI	-2.1
Subjective life expectancy	-29.7
People close: CI	-95.0**

People close: ADL limitations	0.4
Provided care	94.3**
Retirement planning	
Spend more	9.7
Long planning horizon	-36.0
Inter-generational aspects	
0 or 1 child	-19.3
Daughter	2.6
Child same house	75.8**
Bequest motives	-15.1
Panel III (interaction terms with COVID-19 stress)	
Critical illness and LTC cover treatments	
Cover: CI-LTC (ref. 0-0 cover)	
50-0 cover	0.7
100-0 cover	-1.8
0-50 cover	12.7
0-100 cover	16.5
50-50 cover	7.7
100-50 cover	-30.5
50-100 cover	11.7
100-100 cover	17.5
Wealth and public pension income	
Wealth: 300,000 (ref. 150,000)	-42.5
Wealth: 500,000	-53.7
Wealth: 1,000,000	-162.3*
Pension: 3,000 (ref. 2,000 or less)	95.5
Pension: 3,500	190.1***
Understanding of retirement insurance products and financial capabilities	
Product understanding	-160.5***
Financial competence	-125.1**
Financial product ownership	-115.8**
Subjective financial literacy	14.6
Stock market participation	11.1
Housing wealth	-89.4*
Demographic and socio-economic factors	
Age group	30.1
Female	-72.9
Tier 1	-6.1
State employee	-91.7*
College and above	22.7
High school	72.1
Personal traits and preferences	
Conscientiousness	58.6

Financial risk tolerance	28.8
Patience	36.1
Health state-dependent consumption	24.2
Health- and care-related experience	
Unhealthy BMI	-109.3**
Subjective life expectancy	74.0
People close: CI	28.3
People close: ADL limitations	73.0
Provided care	-81.1
Retirement planning	
Spend more	81.4*
Long planning horizon	78.1
Inter-generational aspects	
0 or 1 child	112.3*
Daughter	121.4**
Child same house	-4.0
Bequest motives	-33.6
Constant	64.1
Controls for COVID-19 impact	Yes
Controls for survey quality	Yes
Number of observations	9,000

Notes: The table reports the regression results of the selected monthly annuity on treatments, i.e., alternative insurance cover for out-of-pocket critical illness (CI) and long-term care (LTC) costs, and individual covariates. Panel III reports the results for the interaction terms between each variable under interest and the binary variable COVID-19 stress. A significant interaction suggests the result differs by COVID-19 stress levels. Variables are defined in Online Appendix G. The reference cover is zero cover for out-of-pocket CI and LTC costs. The reference category of public pension is based on a combination of the following three pension categories: CNY 2,000, CNY 1,000 and CNY 500. BMI: body mass index; ADL: activities of daily living; IMC: instructional manipulation check. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.