



1-14-2022

Long-Term Care Insurance Financing Using Home Equity Release: Evidence from an Online Experimental Survey

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Recommended Citation

Hanewald, Katja, Hazel Bateman, Hanming Fang, and Tin Long Ho. 2022. "Long-Term Care Insurance Financing Using Home Equity Release: Evidence from an Online Experimental Survey." *University of Pennsylvania Population Center Working Paper (PSC/PARC)*, 2022-81. https://repository.upenn.edu/psc_publications/81.

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Keywords

long-term care insurance, housing, reverse mortgages, home reversion, China

Disciplines

Demography, Population, and Ecology | Economics | Family, Life Course, and Society | Finance | Medicine and Health | Social and Behavioral Sciences | Sociology

Long-term care insurance financing using home equity release: Evidence from an online experimental survey*

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14 January 2022

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JEL classification: D14, G11, G21

* This research was supported by the Australian Research Council Centre of Excellence in Population Ageing Research (CEPAR) (project number CE17010005). The project described was initiated through the University of Pennsylvania QUARTET competition and is supported by the National Institute on Aging, P30 AG012836-24; the National Institutes of Health, the Eunice Shriver Kennedy National Institute of Child Health and Development Population Research Infrastructure Program R24 HD044964-15; the Boettner Center for Pensions and Retirement Security and/or LDI CHIBE. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or the University of Pennsylvania.

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1. Introduction

We explore new mechanisms to fund long-term care using housing wealth. Our research in this area is motivated by the following trends and policy challenges. In both developed and developing countries worldwide, there is a growing demand for long-term care services that exceed available funding. Health insurance programs often cover only basic long-term care costs (if at all) and few countries have public long-term care insurance programs, while private long-term care insurance markets are very small. As a result, individuals can face high out-of-pocket costs for long-term care. Simultaneously, many older individuals own their homes, with their housing wealth often forming the largest part of their household wealth and retirement savings. However, housing wealth is a lumpy and illiquid asset. Furthermore, individuals often have a strong emotional attachment to their home, and many prefer to ‘age in place,’ and remain and receive care in their own home as they age. This ‘ageing in place trend’ has been reinforced by the negative effects of the COVID-19 pandemic on older people in nursing homes.

These trends suggest potential for new public and/or private sector programs that allow individuals to access their housing wealth while still living in their homes. This paper uses survey methods to investigate the stated demand for new financial arrangements that allow individuals to access their housing wealth to purchase long-term care insurance. We compare the stated demand for long-term care insurance when individuals can (i) only use their savings, (ii) use their savings and a reverse mortgage loan, or (iii) use their savings and home reversion, to fund a single upfront premium for long-term care insurance. We focus on reverse mortgages and home reversion as the two most common types of home equity release arrangements internationally. With a reverse mortgage loan, a homeowner borrows against their home and is not required to make any interest and capital repayments until the home is sold. With home reversion, the homeowner sells part of their housing wealth, receives a payment upfront, and also receives a proportional share of the sale proceeds when they die or permanently move out. The long-term care insurance product we tested is a joint life product that pays a regular monthly income (rather than reimburses expenses) when either or both of a couple qualifies for long-term care. The income can be used for various purposes, including (but not limited to) paying formal caregivers, compensating friends or family members for informal care, and paying for formal residential care.

Our study is based on an online experimental survey that was completed by 1,200 participants aged 45–64 who live in 49 of China’s largest cities. We find that access to housing wealth increases the stated demand for long-term care insurance. When they could only use savings to

finance their long-term care insurance premiums, participants used an average of 5% of their total (hypothetical) wealth to purchase long-term care insurance. When they could use savings and a reverse mortgage, the survey participants used 15% of their total wealth to purchase long-term care insurance. With savings and home reversion, they used 12%. We also analyzed the impact of a broad range of covariates on the stated demand for long-term care insurance under the different funding mechanisms.

Our paper is the first to quantify the stated demand for combinations of long-term care insurance and home equity release products. Our results are consistent with theoretical studies which have used lifecycle models to show that the demand for long-term care insurance increases when home equity can be accessed to finance the insurance premium (e.g., Davidoff, 2010; Hanewald *et al.*, 2016; Shao *et al.*, 2019). We find a larger effect of home equity release on long-term care insurance demand than a recent theoretical study by Achou (2021). Using a lifecycle model of single retirees in the US context, Achou finds that housing liquidity has a limited impact on long-term care insurance demand. His model suggests that, even if housing were made to be fully liquid, long-term care insurance rates would hardly rise above 10%, from a 5% baseline in his sample. The larger effect we find in our survey data from China may be due to a range of factors, including different long-term care risks and out-of-pocket costs individuals face in China. We also note differences in product design: We designed an income product that can be used to pay for informal care, while Auchou (2021) considered expense reimbursement long-term care insurance in his theoretical analysis.

Our study also contributes to the growing body of empirical research exploring the demand for long-term care insurance. Lambregts and Schut (2020) provided a systematic literature review of the reasons for the low uptake of long-term care insurance and life annuities. They included 62 empirical studies that analyze long-term care insurance uptake in different high-income countries. Lambregts and Schut (2020) report that most studies find a positive association between education, income or wealth and long-term care insurance uptake, while home ownership is associated with lower uptake (e.g., Boyer *et al.*, 2017, Costa-Font and Rovira-Forns, 2008, Wu *et al.*, 2021). When housing assets cannot be used as a financial resource to fund long-term care insurance premiums, housing wealth may crowd out the demand for long-term care insurance as it may be retained for precautionary purposes (Boyer *et al.*, 2017; Costa-Font and Rovira-Forns, 2008). Our study is one of the first empirical studies to examine how access to housing assets via home equity release products impacts the demand for long-term care insurance.

Our results inform the design of new public and/or private sector programs that allow individuals to access their housing wealth while still living in their homes. Hanewald *et al.* (2020b) discussed how such combined products could be introduced into the US market. Mayhew *et al.* (2017) developed a pricing framework for selling a proportion of housing wealth to purchase long-term care insurance, while Mayhew *et al.* (2021) evaluated the benefit of different financing strategies to purchase long-term care insurance. These authors argued that both a single premium and a regular monthly premium for purchasing long-term care insurance would severely impact the daily expenses of retirees, particularly for those who are asset rich but cash poor. Instead, it could be beneficial to finance long-term care insurance through home equity release, either via a reverse mortgage or home reversion. A program like this could also be offered by the government; for example, the Australian Home Equity Access Scheme could be extended to cover long-term care costs (see Sun *et al.*, 2022, for a description of the Home Equity Access Scheme). By identifying an additional funding source for long-term care, our findings can also facilitate the development of long-term care services. The additional funding generated through access to housing wealth could attract more service providers to the market and may also increase the availability of informal carers who can be compensated according to the health of the care receiver through the design of the LTCI product.

Our results also inform current policy reforms in China, which aim to increase long-term care insurance coverage through government-funded schemes and the development of a private market for commercial long-term care products. In recent years, the Chinese government has focused on the development and enhancement of the long-term care funding system in various five-year plans. In 2016, long-term care insurance pilot programs were launched in 15 different cities and extended to 49 cities in 2020 (General Office of the State Council of PRC, 2020). Currently, the public long-term care insurance pilot program covers more than 130 million residents, with more than 1.3 million residents having received benefits from the scheme (Li *et al.*, 2021). The program focuses on providing basic services or funding for basic long-term care services and aims to reimburse 70% of the basic long-term care costs. The government plans to enhance the public long-term care scheme and develop the commercial long-term care insurance market to supplement the public scheme (General Office of the State Council PRC, 2020). Thus, there is potential to develop the long-term care insurance market in China.

The Chinese government has also shown interest in developing the home equity release market. Homeownership rates are high, and property prices have increased substantially (People's Bank of China, 2020). In 2014, a reverse mortgage program (known as the "House-for-Pension"

scheme) was introduced in several large cities. Although uptake of the pilot scheme was low, the findings of a recent experimental study suggest a potential demand for simpler and more flexible reverse mortgage products (Hanewald *et al.*, 2020a). Our results indicate that home equity release products could provide an additional source of funding for purchasing long-term care insurance.

The remainder of this paper is organized as follows. Section 2 provides the background information on public and private long-term care insurance, housing wealth, and reverse mortgage programs in China; Section 3 describes the survey design; Section 4 reports descriptive statistics; Section 5 presents the regression analysis of the survey data; finally, Section 6 concludes.

2. Background

2.1 Long-term care needs and insurance in China

China's population is rapidly aging, and there is a growing need for long-term care. In 2019, 12% of the population was aged 65 or above, and this proportion is projected to increase to 17% by 2030 and to 26% by 2050 (United Nations, 2020). Assuming current pension eligibility ages in China, we estimate that the chance of requiring long-term care for men aged 60 is 40% and for women aged 55 is 30% (see Section B.3.2 in the Online Appendix for detailed calculations).

Long-term care in China is traditionally provided by spouses and other family members. When Chinese retirees are disabled, they expect their partners and/or children—especially their daughters and daughters-in-law—to take care of them (Zimmer, 2005; Chappell and Kusch, 2007; Lin, 2014; Scheil-Adlung, 2015). However, the increasing demand for informal care is met by inadequate supply. There are fewer children available to be caregivers as a result of the change in China's population structure associated with the one-child policy, which was in effect from the late 1970s to 2015 (Rowland, 2009; Ku *et al.*, 2013; Zeng and Hesketh, 2016). The resulting "4-2-1" family structure—comprising four grandparents, two parents, and one child—places an increased level of responsibility for long-term care on that single child who has no siblings to share the responsibility. Moreover, the increased mobility of workers due to the changes in the labor market has weakened family connections, making it increasingly difficult for children to provide informal care for their elders (Arnsberger *et al.*, 2000; Ku *et al.*, 2013; Feng *et al.*, 2020). Less availability of informal care has led to a higher demand for formal care and unmet care needs.

To address this issue, China is developing its formal care facilities and services. Before the long-term care plan reform in 2016, most long-term care related services were provided in hospitals (Mi *et al.*, 2020). In 2016, the central government commenced a public long-term care pilot program in 15 cities, which was further extended to 49 cities in 2020. Since the plans and systems vary from city to city, we use Qingdao as an illustrative example. Qingdao is one of two focus cities for the development of the public long-term care pilot program. The current system provides two types of services: medical care and daily living care. For medical services, the public long-term care plan pays up to RMB 1600 per year for mobile clinic care, up to RMB 50 per day for home care services, up to RMB 65 per day for nursing home care, and up to RMB 170 per day for hospital care.¹ For daily care, the payment from the public plan is up to RMB 50 per day for daytime nursing home services and up to RMB 65 per day for short- and long-term nursing home services. These amounts only support relatively basic services. Individuals or their families have to cover comprehensive services out-of-pocket.

In the private insurance market, only critical illness insurance and retirement village investment products are currently offered by insurers.¹ The former typically provides a lump-sum benefit that does not provide an income stream to hedge long-term care risks, whereas the latter does not provide risk pooling. Since the government aims to further support the public long-term care scheme, it would be beneficial for it to develop the commercial long-term care insurance market to supplement the public scheme (General Office of the State Council PRC, 2020). The research reported in this paper examines the potential demand for long-term care insurance products that can top up the current government-funded long-term care scheme by using both out-of-pocket financial wealth and housing wealth.

2.2 Housing wealth and reverse mortgages in China

For most Chinese households, most of their wealth is in housing. In 2019, the homeownership rate of urban households was 96%, and they held 74% of their total household wealth in housing (People's Bank of China, 2020). Furthermore, in the past 20 years, house price growth in China has been substantial. According to the Bank for International Settlements (2021), the average annual growth rate for housing prices in China was 7.4% p.a. from 2011 to 2021.

¹ We use RMB to refer to the Chinese currency CNY. The CNY/USD exchange was 0.16 USD on 16 Dec 2021.

¹ China Life Insurance Company, People's Insurance Company of China, Cathay Life Insurance and Kuntun Health Insurance Company had offered monthly income benefit long-term care insurance products to the public, but due to various reasons such as low profitability and low demand, these companies now longer offer monthly income benefit long-term care insurance products.

In 2013, the Chinese government released a policy document to encourage the development of a reverse mortgage market.² The government strongly recommended that financial institutions develop new financial products (specifically reverse mortgages) to support retirement financing, especially the cost of long-term care services. While several insurers obtained a license to offer reverse mortgage products, only one—Happy Life Insurance—followed through with the introduction of the “House for Pension” scheme in July 2014. However, this product has been unpopular, and take-up has been extremely low. The product is relatively complex and inflexible since it provides fixed monthly payments for life that are partly structured as a deferred annuity (Hanewald *et al.*, 2020a). The product design remained unchanged between the launch in 2014 and mid-2021 when this research was conducted. However, research by Hanewald *et al.* (2020a) suggests that there could be a higher demand for an appropriately designed product that provides flexibility for older households to access liquidity from their housing assets to finance the purchase of long-term care insurance.

One potential concern for developing China’s home equity release market is property rights. In China, homeowners only own the buildings but not the land. Residential property owners need a grant contract to obtain 70-year land-use rights, which are transferrable when a property is sold. However, according to Article 22 of the Law of the People's Republic of China on the Management of Urban Real Estate, land users (e.g., homeowners) can apply for an extension one year before the end of the term and may receive a renewal contract for the granting of land use rights upon approval. Additionally, Article 149 states that the right to use the land for residential construction should be automatically renewed upon the expiration of the grant contract. Moreover, Article 359 of the new Civil Code (which came into effect on 1 January 2021) states that the land use rights for residential construction will be automatically renewed by the payment of fees under the provisions of the law and administrative regulations. Furthermore, Article 366 of the Civil Code establishes a new right: the right to live on a property. In summary, property rights and the establishment of the right to live should not hinder the development of the home equity release market in China.

3. Survey design

We designed an online experimental survey to investigate the potential demand for long-term care insurance financed from savings and/or housing assets by middle-aged urban homeowners

² Several Opinions of the State Council on Accelerating the Development of the Elderly Service Industry, which was issued September 2013.

in China. The experimental task elicited the demand for three alternative hypothetical long-term care insurance products. All three products provide a monthly income to the policyholder and their partner if at least one of the couple is disabled and qualifies for long-term care. The three products differ in the way the one-off premium (paid at the beginning of the contract) is financed: by cash from savings; by a combination of savings and borrowing against home equity via a reverse mortgage; by a combination of savings and selling part of one's home equity via home reversion.

3.1 Focus group testing

We developed a first draft of the survey based on related studies on the demand for long-term care insurance (Wu *et al.*, 2021) and reverse mortgages (e.g., Dillingh *et al.*, 2017; Fornero *et al.*, 2016; Davidoff *et al.*, 2019; Hanewald *et al.*, 2020a). We used focus groups to pre-test the survey design—particularly the wording and level of detail of long-term care insurance product descriptions and the format of the choice tasks. The focus group discussions were conducted by the market research company Horizon Dataway in Shanghai, China, on 20–21 December 2018. The recruitment of focus group participants was aligned with the screening criteria for the online survey: urban homeowners aged 45–64 with no difficulties in performing any activities of daily living (ADLs). We provided a script to the moderator from Horizon Dataway to lead the discussion in Mandarin Chinese. Two focus groups, each with six participants, undertook a facilitated discussion of the product information and draft choice tasks for 2 hours.

The video-recorded focus group discussions allowed us to considerably improve the presentation of the product information and the setup of the choice tasks. The focus group participants asked many detailed questions about the definition of long-term care and how the hypothetical products work. These questions and suggestions helped to refine the product descriptions presented in the online survey. For example, the participants asked whether non-permanent injuries would be covered, which party is responsible for appointing the doctor to determine the insured's health state, how the benefits are paid out, and whether the products provide a death benefit. The participants reported that numerical examples were critical for them to understand the products and provided some suggestions for the Chinese translation of the draft survey. We used this feedback to develop our final survey.

3.2 Survey structure

Figure 1 summarizes the structure of the final version of the survey. The survey commenced with screening questions followed by information about health states and long-term care, the

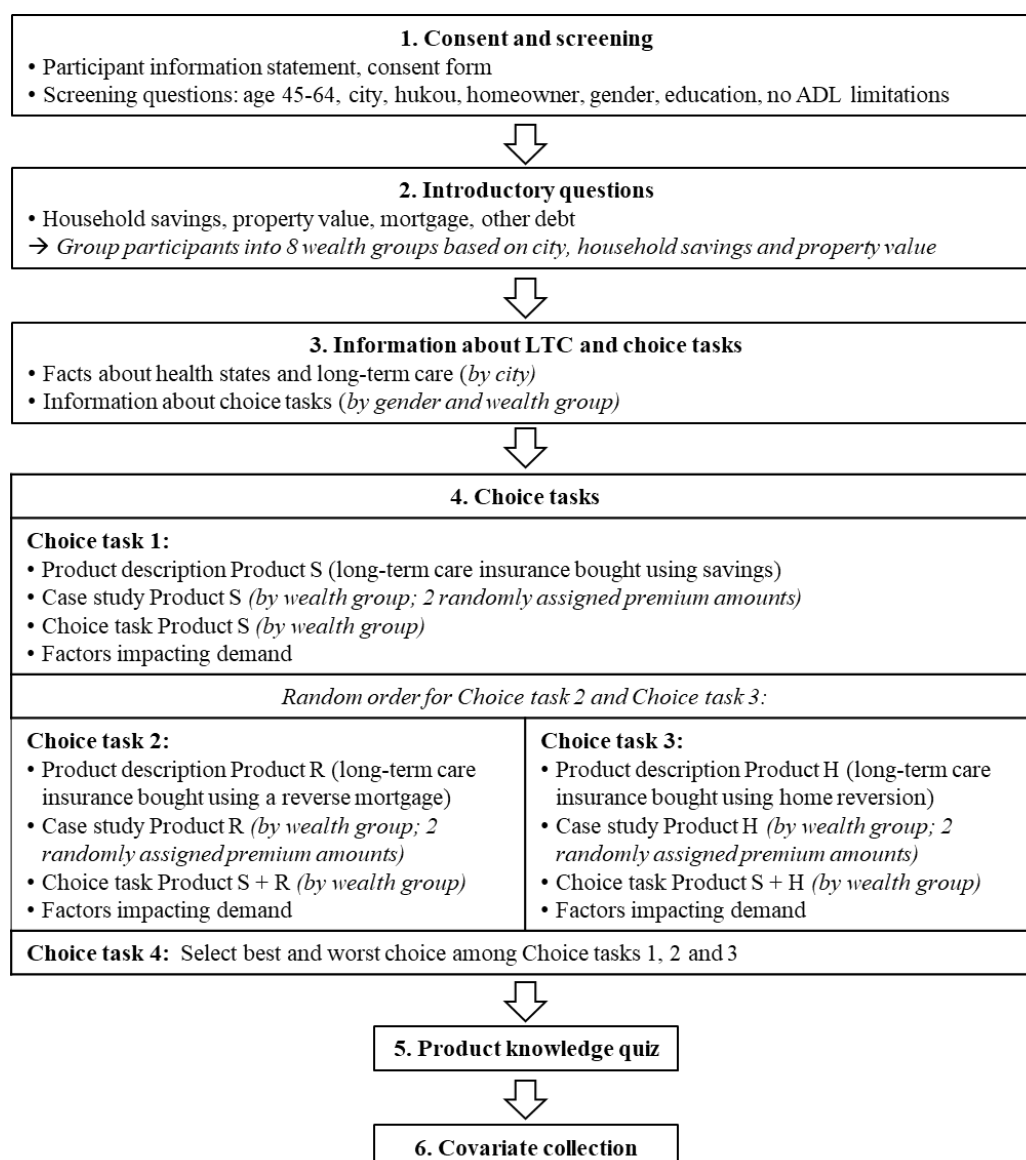
choice tasks, and finally, questions to collect covariate data. We will describe the survey components in detail in the following sections. The online survey was programmed in English and Chinese by the survey company dataSpring and administered in Chinese. Screenshots of the English version of the survey are available in Appendix A.³ As shown in the screenshots, we used bold font and red font to emphasize important information. We used blue font color to highlight technical terms, which were explained via pop-up windows. We also required the survey participants to remain on important survey screens for at least 20 seconds.

³ The live survey can be found at:

English: https://pro.wenjuan.com/s2/5d6e41097e634b90c7a7c319/?test_mode=1

Chinese: https://pro.wenjuan.com/s2/5da15ed57e634b50a6b3e6d1/?test_mode=1.

Figure 1: Overview of the survey design.



3.3 Sample

The Chinese version of the survey was fielded in November 2019 by the online survey firm dataSpring to a sample of 1,200 participants. dataSpring recruited the participants through email and an app from their database of over 1 million Chinese urban residents and from their network of panel suppliers to expand the reach of their database. The participation rate was approximately 5–10%. Participants who completed the survey were paid a fixed amount. Additionally, a bonus payment was based on the results of the product knowledge quiz. The median completion time for the survey was 19 minutes.

The survey targeted urban homeowners aged 45–64 years, who could be potential customers for the long-term care insurance products we tested. We included quotas to target 50% males and 50% females, broad coverage of education levels, and representative geographical coverage across four Tier 1 cities (Shanghai, Beijing, Shenzhen, and Guangzhou) and 45 Tier 2 cities in China.⁴ We required 50% of the participants to reside in Tier 1 cities and the other 50% to reside in Tier 2 cities. Tier 1 and 2 cities differ in population size, income level, business opportunity, and consumer behaviors. We also required the participants to have the urban “*hukou*” registration of the cities they reside in since this identifies participants who have a long-term relationship with the city. We identified homeowners by asking participants whether they (or their spouse) own at least one property (with an owner certificate). We excluded participants with difficulties performing ADLs since such conditions would make them immediately eligible for long-term care insurance benefits and would therefore disqualify them from purchasing any of the long-term care insurance products.

3.4 Wealth groups

Eligible participants began the survey with nine introductory questions to provide information that would help us allocate the participants into different wealth groups. Based on the self-reported answers regarding their (net of loans) savings, the current (net of mortgages) values of their properties, and the tier of the city they live in, participants were allocated into one of eight wealth groups (see Table 1). The participants were then assigned hypothetical home values and saving amounts close to their self-reported values.

Table 1: Wealth group allocation.

Self-reported home value in RMB	Self-reported savings in RMB	City Tier	Wealth group	Hypothetical home value (H) in RMB	Hypothetical savings (W) in RMB
≥ 3,000,000	≥ 500,000	1	1	5,000,000	750,000
≥ 3,000,000	< 500,000	1	2	5,000,000	250,000
< 3,000,000	≥ 500,000	1	3	1,500,000	750,000
< 3,000,000	< 500,000	1	4	1,500,000	250,000
≥ 1,000,000	≥ 150,000	2	5	1,500,000	750,000
≥ 1,000,000	< 150,000	2	6	1,500,000	250,000
< 1,000,000	≥ 150,000	2	7	800,000	250,000
< 1,000,000	< 150,000	2	8	800,000	75,000

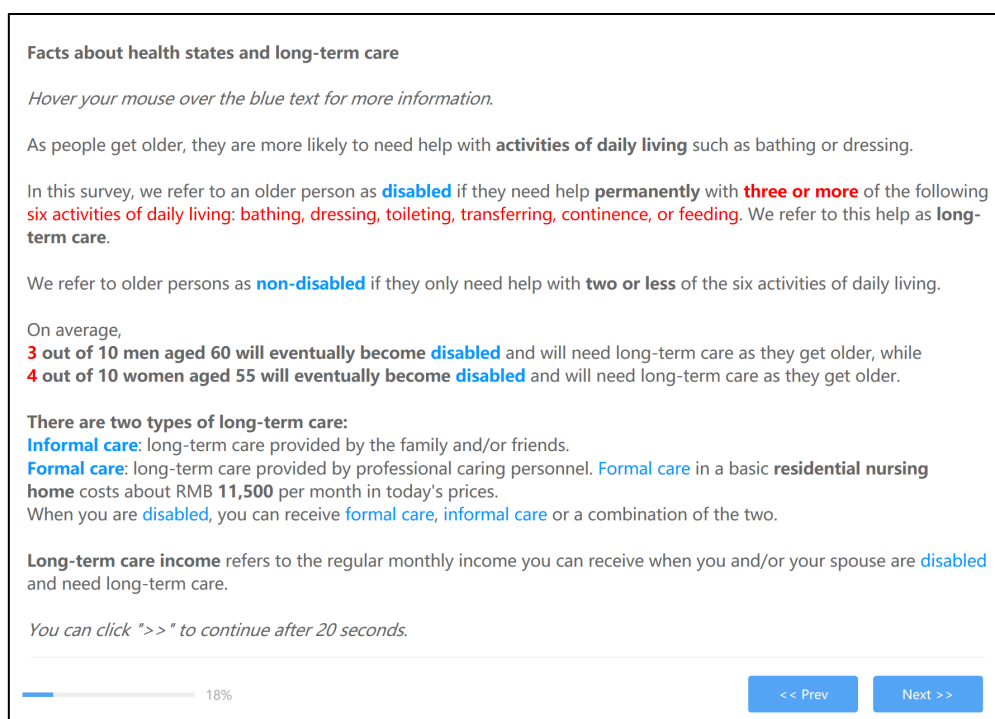
Notes: This table shows how we assigned participants into one of eight wealth groups based on their self-reported home values, savings, and the tier of the city they live in. The wealth groups have different hypothetical home values and saving amounts close to their self-reported values.

⁴ The Chinese city tier system is not an official list. We used the definition by the Chinese Business Network (2021) to determine the tiers of the cities. We grouped New Tier 1 cities and Tier 2 cities into one group and called them Tier 2 cities. The ranking system is updated on an annual basis, but the Tier 1 cities have remained unchanged for several years.

3.5 Information about long-term care and choice tasks

The participants then saw a screen titled “Facts about health states and long-term care”, which explained long-term care, health status, and other key technical terms used in the survey in easy-to-understand language (see Figure 2). We developed this description based on insights from the focus group testing and previous research (Wu *et al.*, 2021). We provided estimates for the chance of requiring long-term care for men aged 60 and women aged 55. These ages correspond to the pension eligibility ages for men and blue-collar women under China’s Basic Old-Age Insurance program, which covers urban employees and public servants (Deng *et al.*, 2020). Section B.3 in the Online Appendix describes how we calculated these rates using individual-level data from two household panel surveys in China: the Chinese Longitudinal Healthy Longevity Survey (CLHLS) and the China Health and Retirement Longitudinal Study (CHARLS).

Figure 2: Screenshot of “Facts about health states and long-term care” (translated).



The “Facts about health states and long-term care” screen also included information about residential nursing home costs. The participants saw different prices according to the tier of the city they reside in. Participants in Tier 1 cities saw the cost of RMB 11,500 per month, whereas those in Tier 2 cities saw the cost of RMB 9,500. We estimated these costs based on the average cost of residential long-term care in Tier 1 and Tier 2 cities according to “58 Daojia,” the

national service provider that publishes residential long-term care costs in different cities every month (see Section B.3.5 in the Online Appendix).

On the next two screens, we prepared participants for the choice tasks. We explained that they would be asked to make choices regarding three new financial products designed to fund long-term care. We informed the participants that each product would provide them with an income when they require long-term care. Participants were told that they would see product descriptions and a case study for each of the three long-term care income products before completing four choice tasks. We asked the participants to read the product descriptions carefully and that their understanding would affect the bonus amount they could earn from the survey (e.g., Hanewald *et al.*, 2020a used similar incentives).

We asked participants to ignore their financial circumstances in the choice tasks and imagine that they were aged 60 for males (55 for females), married to a spouse aged 55 (60 for females), about to retire, that they own their own home at a given value, that they have a given amount in a savings account, and that they have no other assets. We then showed the participants a hypothetical home value and savings amount close to their self-reported financial situation, as described in Section 3.4.

3.6 Choice tasks 1–3

As indicated in the overview of the survey design in Figure 1, participants then proceeded to Choice Tasks 1–3, each of which involved a different long-term care insurance product. Each choice task consisted of a product description, a case study of the product, and a choice task for the stated demand. All participants started with Choice Task 1, which was for Long-Term Care Income Product S (long-term care insurance bought using savings). They then completed either Choice Task 2, in which participants could use savings and a reverse mortgage loan (via Long-Term Care Income Products S and R, respectively) to purchase long-term care insurance, or choice task 3, in which participants could use savings and home reversion (via Long-Term Care Income Products S and H, respectively) to purchase long-term care insurance. We randomized the order of Choice Tasks 2 and 3 to avoid potential ordering effects. We used “S”, “R”, and “H” as the product names to avoid any (positive or negative) connection with existing financial products. We did not refer to the products as insurance. Instead, we called them “products” or “contracts.”

The remainder of this section describes other components of the choice tasks.

Product descriptions

Choice Tasks 1, 2, and 3 each began with the description of a new hypothetical product. The product descriptions consisted of a summary of the product and a detailed product description in a question-and-answer style presented in table format. Screenshots of all product descriptions can be found in Appendix A. We explain the underlying pricing in Section B.3 of the Online Appendix.

The product description for Long-Term Care Income Product S explained that the participants could buy this product with a single payment from their savings and would receive a regular monthly income if they and/or their spouse required long-term care. The detailed description (in table format) explained that Product S was offered by a state-owned bank, would require a single payment at the start of the contract, would provide a monthly income for life in the case of being disabled and requiring long-term care services, and outlined other features.

The product description for Long-Term Care Income Product R explained that the participants could buy this product by borrowing against their home. It also stated that the product would pay a regular monthly income if the participant and/or their spouse required long-term care. The description of the long-term care insurance component was similar to that of Product S. The description of the reverse mortgage component was informed by the mortgage product description developed by Hanewald *et al.* (2020a), which reported high rates of product understanding. We explained that Product R would not require payment at the start of the contract but would incur a loan that accumulates a fixed interest of 5.8%⁵. We also explained that no repayments would be required while the participant and/or their spouse live in their home. Instead, the product provider would sell the property at the highest possible market price after both partners had passed away or moved to a residential nursing home and would use the sale proceeds to repay the loan. The participants were also informed that if the sale proceeds were insufficient to cover the debt, they, their spouse, or their heirs would not be required to make any extra payment. That is, Product R included a non-negative equity guarantee, which is a common regulatory requirement for reverse mortgages.⁶

⁵ Happy Life Insurance Company launched the pilot reverse mortgage in China in 2014. At the time when the survey was conducted, the interest rate charged was 5.5% p.a. In addition, there are several types of fees charged each year (including lawyers' fee, policy fee and surveyor fee) and at the beginning of the contract. We estimated the equivalent interest charged for these fees is around 0.3% p.a. Therefore, we used $5.5\% + 0.3\% = 5.8\%$ p.a. as the interest rate charged in Product R.

⁶ Compared to Hanewald *et al.* (2020a), this product is less flexible as it is only used for financing the premium of long-term care income product. However, in terms of the no-negative equity guarantee, the right of renting out the property, and the arrangement of terminating the contract, Long-Term Care income Product R is similar to the

The product description for Long-Term Care Income Product H explained that the participants could buy this product by selling part of their home. The description of the long-term care insurance component was similar to those for Products S and R. The description of the home reversion component explained that Product H would not require payment at the start of the contract. Instead, the participant would sell a part of the home to the product provider. We also explained that the product provider would sell the property at the highest possible market price after both partners had passed away or moved to a residential nursing home and that the sale proceeds would be split between the product provider and the participant, their spouse (if in a nursing home), or their heirs.

We included several product features in Products R and H that the focus group participants identified as important. Both product descriptions clarified that the participant would have a guaranteed right to live in their home while they or their spouse are non-disabled. Furthermore, the participants would retain full legal rights to their homes and would be allowed to rent them out. We also included an option for them to terminate the contract early and—importantly—an option for their heirs to repay the debt (with Product R) or buy back the share of housing wealth (with Product H) to keep the property when the contract terminates. Focus groups discussions suggested that these options are important for the acceptance of home equity release products.

Case study

After each product description, the participants were shown a case study. The case study illustrated how each product works, using as an example a hypothetical couple in the same wealth group as the participants. The case study described how the purchase of the product would impact the couple's initial housing wealth and savings, the monthly long-term care income they received when they became disabled, and described the transactions at the end of the contract. For Products R and H, which involve the use of housing wealth, we described the outcomes for three possible scenarios at the time of the contract termination to illustrate the impact of house price growth and the option for their heirs to keep the property when the contract terminates. Figure 3 shows a screenshot of the case study for Long-Term Care Income

product described by Hanewald *et al.* (2020a). We reduced the complexity of the current existing reverse mortgage product launched by Happy Life Insurance by removing the deferred annuity component (both premium and benefit component) and different types of fees.

Product R. The case studies for Products S and H have a similar structure and are shown in Appendix A.

Figure 3: Partial screenshot of the case study for Long-term Care Income Product R (translated).

Case study for **Long-term Care Income Product R**

Hover your mouse over the blue text for more information.

Please read the following case study which illustrates how **Long-term Care Income Product R** works.

Mr. Wang is aged 60 and Mrs. Wang is aged 55 in 2019. They have an adult daughter. They live in their own apartment in Guangzhou which is worth RMB 5,000,000 and have RMB 750,000 in their savings account. They decide to buy **Long-term Care Income Product R** to cover their future long-term care needs.

- They choose to **borrow RMB 600,000 against their apartment** to buy long-term care income with **Long-term Care Income Product R**. The amount becomes a debt which accumulates interest at the fixed interest rate of 5.8% p.a
- If one or both are disabled, they will receive a **monthly income** according to the following table:

Both non-disabled/deceased	1 non-disabled/deceased , 1 disabled	Both disabled
RMB 0/month	RMB 10,542/month	RMB 21,085 /month

- They do **not have to repay anything** while at least one of them still lives at home.
- The couple **fully own their apartment**, including all growth in its value, if any.

This contract will **terminate** when **both** Mr. and Mrs. Wang **pass away**.

Assume that Mr. Wang remains **non-disabled** and passes away in 2044. In the same year, Mrs. Wang becomes **disabled** and **permanently moves** into a residential nursing home. The **outstanding debt** amount in 2044 accumulated from the **initial loan** is RMB 2,456,000. Below are **three possible scenarios** in 2044:

- **Scenario A:** The product provider **sells the home at the highest possible market price** of RMB 10,000,000. The sale proceeds are used to **repay the debt**. Mrs. Wang **receives the remaining** RMB 7,544,000. She will receive a **long-term care income** of RMB 10,542/month **until she passes away**.
- **Scenario B:** The product provider **sells the home at the highest possible market price** of only RMB 1,000,000. All sale proceeds are used to **repay the debt**. Mrs. Wang will **receive nothing from the sale**, but she is **not required to make an extra payment**. The difference is a loss to the product provider. Mrs. Wang will receive a **long-term care income** of RMB 10,542/month **until she passes away**.
- **Scenario C:** Their daughter decides to **repay the debt herself and keep their property**. Mrs. Wang will receive a **long-term care income** of RMB 10,542/month **until she passes away**.

We randomly showed the participants in each treatment group one of two different amounts of long-term care insurance purchased in the numerical example to avoid that this amount influenced the demand for long-term care insurance in the later choice tasks. We adjusted the financial consequences in the case study accordingly.

Below the case study, we asked participants to rate their understanding of the product described on the same screen. The five possible answers ranged from *Completely clear* to *Completely confusing*. Participants could only proceed to the next screen after 20 seconds.

Choice task

After reading the case study, participants proceeded to the choice task. In each choice task, the participants were asked to assume that they have a given amount of savings and own a home worth a given amount, as described in Section 3.4. The amounts were the same in Choice Tasks

1, 2, and 3. Participants were asked to assume the hypothetical home values and saving amounts listed in Table 1 to perform the choice tasks, which were close to their reported wealth amounts.

In Choice task 1, the participants were informed that they could use the money in their savings account to purchase long-term care income with Long-term Care Income Product S. They were then asked to make the following decisions: (1) *Would you like to buy long-term care income with Long-term Care Income Product S? And if you do;* (2) *How much of your savings do you want to use to buy long-term care income?* The participants used a configurator to indicate their choice. The configurator ranged from 0 to the hypothetical amount of savings.

Figure 4 shows a screenshot of the choice task for Choice Task 2. The participants were informed that they could use both Long-term Care Income Product S and R to purchase long-term care income and were asked to make the following decisions: (1) *Would you like to buy long-term care income? And if you do,* (2) *How much of your savings do you want to use to buy long-term care income with Long-term Care Income Product S?* (3) *How much do you want to borrow against your home to purchase long-term care income with Long-term Care Income Product R?* As shown in the middle of Figure 4, the participants were prompted to use two configurators to indicate their choice: one configurator for Long-term Care Income Product S (range: 0 to the hypothetical savings amount) and one for Long-term Care Income Product R (range: 0 to 40% of the hypothetical amount of housing wealth). With this setting, we assumed a maximum initial loan to value of 40% for the reverse mortgage component in Product R.⁷

⁷ We chose a maximum initial loan to value of 40% based on research by Alai et al. (2014) on the cash flows and risk profiles of reverse mortgage from the provider's perspective.

Figure 4: Partial screenshot of Choice task 2 (translated).

Task 2 of 4: Long-term Care Income Product R

Hover your mouse over the blue text for more information.

In this choice task, assume, you have **RMB 750,000** in your savings account and your home is worth **RMB 5,000,000**. You can use the money in your savings account to purchase **long-term care income** with **Long-term Care Income Product S**. You can also borrow against your home to purchase long-term care income with **Long-term Care Income Product R**.


Use the two sliders below to indicate your choices. You can buy long-term care income with your savings (**Long-term Care Income Product S**) and/or borrow against your home (**Long-term Care Income Product R**). The outcomes of your choice are summarised in the table below.

The decisions you have to make are:

Would you like to buy long-term care income? And if you do

MRa. How much of your savings do you want to use to buy long-term care income with **Long-term Care Income Product S?**


You can position the slider anywhere on the line, but you need to move it at least once before you can continue. **If you DON'T want to buy **Long Term Care Product S** place the slider at RMB 0.**



Long-term Care Income Product S: RMB 0 RMB 750,000

MRb. How much do you want to borrow against your home to buy long-term care income with **Long-term Care Income Product R?**

You can position the slider anywhere on the line, but you need to move it at least once before you can continue. **If you DON'T want to buy **Long Term Care Product R** place the slider at RMB 0.**



Long-term Care Income Product R: RMB 0 RMB 2,000,000

	Outcome
Regular income when you and your spouse are non-disabled	RMB 0 per month
Regular income when one spouse is disabled, and the other spouse is non-disabled or deceased	RMB 0 per month This would cover 0.00% of the cost of formal care in a residential nursing home for one person or compensate your family/friends who take care of you.
Regular income when both spouses are disabled	RMB 0 per month This would cover 0.00% of the cost of formal care in a residential nursing home for you and your spouse or compensate your family/friends who take care of you.
Total payment for long-term care income	RMB 0
Payment for long-term care income from your savings account	RMB 0
Payment for long-term care income from Long-term Care Income Product R	RMB 0 loan with annual interest rate 5.80% p.a.
Remaining money in your savings account	RMB 0
Your remaining housing wealth	RMB 0
Your remaining total wealth	RMB 0
Additional features:	You receive the monthly income for as long as you/your spouse are disabled

Choice Task 3 involved Long-term Care Income Product S and Long-term Care Income Product H. The participants faced the following decisions: (1) *Would you like to buy long-term care income? And if you do,* (2) *How much of your savings do you want to use to buy long-term care income with Long-term Care Income Product S?* (3) *How much of your home do you want to sell to buy long-term care income with Long-term Care Income Product H?* Again the participants were prompted to use two configurators to indicate their choice: one configurator for Long-term Care Income Product S (range: 0 to the hypothetical savings amount) and one

for Long-term Care Income Product H (range: 0 to the maximum proportion of housing wealth that can be used to purchase long-term care insurance under home reversion.⁸).

The configurators in each choice task were initially set to 0. The participants read: *You can position the slider anywhere on the line, but you need to move it at least once before you can continue. If you DON'T want to buy Long-Term Care Product, place the configurator at RMB 0.* For each choice task, we showed an output table below the configurator(s) illustrating the financial consequences of the participant's choices, including the regular income in different disability states, the required payments, and the remaining wealth (see Figure 4, bottom). The table also reported the percentage of the cost of formal care or informal care that participants would be able to cover with the selected amount of long-term care income. The participants could review their choice and observe how their choice would impact their income and wealth in different scenarios. The numbers in dark blue changed when the participants moved the cursor on the configurator. Below the output table (not shown in the screenshot in Figure 4), participants were asked to select the main reason (from a list of seven possible reasons) for why they did not purchase more of the respective product.

⁸ See Section B.3.4 in the Online for the calculation of the home reversion values.

3.7 Choice task 4

Following the separate decisions in Choice Tasks 1, 2, and 3, the participants were then asked to choose their most and least preferred of the three product choices using a table that summarized the choices they made in Choice Tasks 1, 2, and 3 (see Figure 5).

Figure 5: Screenshot of Choice Task 4 (translated).

Task 4 of 4: Which of the following choices do you prefer?

Hover your mouse over the blue text for more information.

The following table summarises the three choices you have just made to buy long-term care income. We now ask you to choose which of the three choices would be BEST for you and which of the three choices would be WORST for you.

Product Properties	A Task 1 choice Long-term Care Income Product S	B Task 2 choice Long-term Care Income Product R	C Task 3 choice Long-term Care Income Product H
Regular income when you and your spouse are non-disabled	0 per month		
Regular income when one spouse is disabled and the other spouse is non-disabled or deceased	RMB 1,757 per month	RMB 4,393 per month	RMB 2,508 per month
Regular income when both spouses are disabled	RMB 3,514 per month	RMB 8,786 per month	RMB 5,016 per month
Total payment for long-term care income	Single payment of RMB 100,000 at the beginning of the contract	RMB 250,000	RMB 142,734
Payment for long-term care income from your savings account	RMB 100,000	RMB 50,000	RMB 40,000
Payment for long-term care income from Long-term Care Income Product R	Not applicable	RMB 200,000 loan with annual interest rate 5.8% p.a.	Not applicable
Value of home sold through Long-term Care Income Product H	Not applicable	Not applicable	RMB 350,000 is sold
Remaining money in your savings account	RMB 650,000	RMB 700,000	RMB 710,000
Your remaining housing wealth	RMB 5,000,000	RMB 5,000,000	RMB 4,650,000
Your remaining total wealth	RMB 5,650,000	RMB 5,700,000	RMB 5,360,000
Additional comments:	You receive the monthly income for as long as you/your spouse are disabled		
Which one of A, B or C would be BEST for you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which one of A, B or C would be WORST for you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

47%

<< Prev Next >>

3.8 Product quiz

After completing the choice tasks, the participants completed an incentivized product knowledge quiz comprising eight statements (as shown in Figure 6) that tested their understanding of Long-term Care Income Products S, R, and H. The participants were asked to select whether the statements applied to each of the three products.

Figure 6: Screenshot of the product knowledge quiz (translated).

Product knowledge

Hover your mouse over the blue text for more information.

Now we would like to review your knowledge of the three Long-term Care Income Products. Which of the following statement(s) apply to each of the products –[Long-term Care Income Product S](#), [R](#) and [H](#)? Please tick the boxes to indicate to which product or products a statement applies. Your bonus payment depends on the number of correct answers in this quiz. Scores are awarded for each correct answer.

	Long-term Care Income Product S	Long-term Care Income Product R	Long-term Care Income Product H
You can receive a monthly income as long as you are alive, even when you are non-disabled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You pay a lump sum but nothing else at the start of the contract to purchase this product.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You can use the income from the product to compensate your family/friends who take care of you	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At the end of the contract, if the house price is higher than the loan amount, you (or your heirs) can receive the difference between the house price and loan amount.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At the end of the contract, you (or your heirs) will receive a percentage from the sale of the residential property.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The interest rate charged in this contract is fixed during the term of the contract.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At the start of the contract, you will need to choose the percentage of your property to sell.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At the end of the contract, you/your spouse/your heirs will have a chance of receiving nothing when your property is sold.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

49%

<< Prev Next >>

3.9 Covariate collection

The final part of the survey asked questions to collect data for covariates, including demographics and information about children and grandchildren, health and subjective life expectancy, household income and wealth, financial literacy and numeracy, retirement plans, financial risk attitudes and personality traits, bequest plans, and expectations of house price growth and long-term care arrangements. Where possible, we used standard questions to ensure comparability with other surveys, including the CHARLS and CLHLS. We drew on Lusardi and Mitchell (2011) for the financial literacy questions, while the numeracy questions were from Lipkus *et al.* (2001). Personality traits were elicited using the Big Five personality questions (Borghans *et al.*, 2008; Agnew *et al.*, 2018). We also included an instructional manipulation check (IMC), which allowed us to identify inattention by repeating a question in the survey and asking the participants whether they had seen this question before (Oppenheimer *et al.*, 2009). Questions eliciting bequest preferences, subjective views on retirement plans, and house price expectations were adopted from related studies on life care annuities and reverse mortgages (Davidoff *et al.*, 2017; Wu *et al.*, 2021; Hanewald *et al.*, 2020a). We also measured

the time taken to complete the survey. To gauge the quality of the survey design, we asked participants to rate the clarity of the survey questions.

4. Descriptive statistics

4.1 Sample characteristics

Table 2 reports the average values for key demographic and socioeconomic variables for our sample and compares them with data from the nationally representative CHARLS. For this comparison, we used similar sample criteria to select a sample from the 2018 CHARLS survey wave. That is, we report statistics for all CHARLS participants aged 45–64 with an urban *hukou* (residence permit) who live in a household that owns at least one property. Notably, our study sample is younger and has more children than the CHARLS sample. Furthermore, the participants in our survey were more educated and wealthier than those who participated in the CHARLS. These differences are likely due to the following factors: (i) the interview method (since our survey was conducted through an online commercial web panel, whereas the CHARLS used face-to-face interviews); (ii) the sampling method (since the participants in our survey were recruited from 49 selected cities—four Tier 1 cities and 45 Tier 2 cities—whereas the CHARLS recruited participants from cities all over China).

Table 2: Participant characteristics: Comparison with CHARLS 2018 data.

	Our survey	CHARLS sample
Age (mean)	52.1	55.4
Male	50.0%	48.3%
Married	97.8%	91.5%
Number of children (mean)	1.3	1.1
Highest education attained		
Junior middle school and below	17.7%	71.3%
Senior middle school/college degree/diploma	49.2%	24.8%
Bachelor and above	33.1%	3.0%
Current work status		
Employed	84.1%	69.5%
Retired	14.4%	31.3%
Other	1.5%	0.2%
Urban <i>hukou</i>	100%	100%
Number of properties	1.3	1.5
HH savings (median)	RMB 150,001-250,000	[RMB 8,500]
HH house value (median)	RMB 1,600,000	[RMB 160,000]
HH debt excluding mortgage (median)	RMB 2,000 – RMB 9,999	[RMB 0]
N	1,200	3,867

Notes: HH denotes household. The CHARLS sample was obtained from the 2018 wave of the China Health and Retirement Longitudinal Study. [] indicates that variable definitions differ.

4.2 Product familiarity, understanding, and survey clarity

Most participants had heard about reverse mortgages and long-term care insurance before taking the survey. Overall, 58% indicated that they had heard about a “House for Pension” scheme (i.e., the reverse mortgage product offered in China, see Section 2.2), while 73% indicated that they had heard of long-term care insurance.

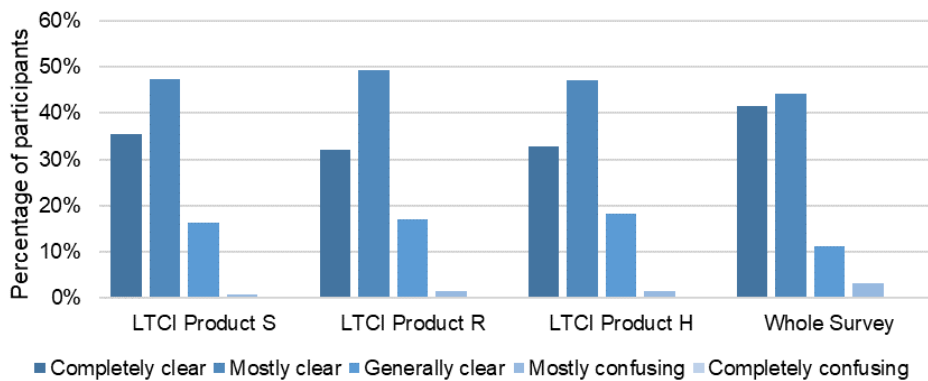
Long-term care insurance, reverse mortgages, and home reversion are complex financial products. In Section 3, we described several methods that we used in the survey design to help the participants better understand these products, including detailed product descriptions with case studies and pop-up windows with definitions for technical terms. Participants rated their product understanding following the product descriptions and numerical examples as relatively high.

Figure 7 reports the subjective product and survey understanding for the full sample and by product type. 36%, 32%, and 33% of the participants rated their product understanding as completely clear for Long-term Care Income Products S, R, and H, respectively. In addition, 48%, 49%, and 47% of participants rated their product understanding as mostly clear for Long-term Care Income Product S, R, and H, respectively. Only 1%, 2%, and 2% of participants rated their understanding as mostly confusing or completely confusing. Overall, 86% of participants reported that they found the questions in the survey completely or mostly clear.

We used 24 true-false questions to test the participants' objective understanding of the three long-term care income products. The data confirm that participants generally understood the products well, with 17% recording more than 80% correct answers in the quiz and 51% recording more than 75% correct answers.

Overall, these results suggest that the comprehensive product descriptions and numerical examples we developed based on previous research and focus group testing allowed participants to understand the complex financial products well.

Figure 7: Subjective product and survey understanding.

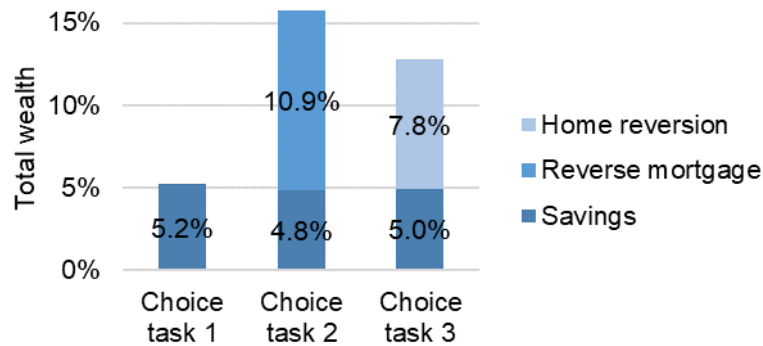


4.3 Demand for long-term care insurance

In Section 3.6, we explained that the survey contained three choice tasks in which participants indicated their demand for long-term care insurance with different financing methods: using savings (Product S) in Choice Task 1; using savings (Product S) and a reverse mortgage (Product R) in Choice Task 2; using savings (Product S) and home reversion (Product H) in Choice Task 3. The order of Choice Tasks 2 and 3 was random as described in Section 3.6.

Figure 8 shows that the demand for long-term care insurance varied among the different financing methods.

Figure 8: Average demand for long-term care insurance.



The demand for long-term care insurance was highest in Choice Task 2 (using Product S and Product R), where savings and a reverse mortgage could be used to buy long-term care insurance. On average, the participants stated that they would use 33% of their savings and 13% of their home value (i.e., 15% of their total wealth) to purchase long-term care insurance. The average purchase amount across all wealth groups was RMB 384,825 (USD 60,442), while the median was RMB 250,000 (USD 39,266).

The demand for long-term care insurance in Choice Task 3, in which participants could use their savings and home reversion (which involved the partial sale of their home) to purchase long-term care insurance, was also higher than in Choice Task 1. On average, participants stated that they would use 32% of their savings and 9% of their home value (i.e., 12% of their total wealth) to purchase long-term care insurance. The mean stated purchase price across all wealth groups was RMB 308,762 (USD 48,495), while the median was RMB 203,877 (USD 32,021).

Table 3 compares the change in wealth allocation when housing wealth was available to purchase long-term care insurance. We first compare the difference in demand for long-term care insurance between Tasks 1 and 2 and Tasks 1 and 3. We also compare the allocation of savings wealth to long-term care insurance between Tasks 1 and 2 and between Tasks 1 and 3. We used Welch's *t*-test for these four comparisons since we did not need to assume that the variance of the samples was equal.

Table 3: Welch’s *t*-test results for differences between tasks.

Test	Mean	Mean	D Mean	Test stat	df	<i>p</i> -value
Demand for long-term care insurance						
Task 1 vs. 2	5.2% (Task 1)	15.7% (Task 2)	10.5%	31.7	1645.3	< 2.2e-16***
Task 1 vs. 3	5.2% (Task 1)	12.8% (Task 3)	7.5%	27.1	1857.1	< 2.2e-16***
Savings allocated to long-term care insurance						
Task 1 vs. 2	36.0% (Task 1)	32.8% (Task 2)	-3.2%	-3.6	2391.7	1.8e-4 ***
Task 1 vs. 3	36.0% (Task 1)	33.7% (Task 3)	-2.3%	-2.6	2395.3	5.0e-3**

Notes: Test stat denotes the test statistic of Welch’s *t*-test. df denotes degrees of freedom. “D Mean” refers to the difference in mean between treatment groups. Task 1 refers to using savings to purchase the long-term care insurance offered. Task 2 refers to using savings and reverse mortgages to purchase the long-term care insurance offered. Task 3 refers to using savings and home reversion to purchase the long-term care insurance offered.

For all comparisons, we found that when housing wealth (accessed by either home reversion or a reverse mortgage) was available to purchase long-term care insurance, the demand for long-term care insurance increased significantly. Furthermore, the amount of savings allocated to long-term care insurance was significantly reduced when housing wealth was available for purchasing long-term care insurance.

4.4 Preferred long-term care income products

In Choice Task 4, the participants were shown a table that summarized their choices in Choice Tasks 1–3. The participants indicated which of the three choices would be “best” for them and which would be “worst” for them. Overall, 42% of the participants selected their Task 1 choice as best, while 38% nominated their Task 2 choice, and 20% nominated their Task 3 choice.

The fact that Choice Task 1 was the most preferred on average is somewhat surprising. In Choice Task 1, only savings could be used to purchase long-term care income, while in Choice Tasks 2 and 3, savings **and** housing assets via a reverse mortgage **or** home reversion could be used. Thus, Choice Task 1 is a subset of Choice Tasks 2 and 3. The participants likely preferred Choice Task 1 because it was easier.

5. Regression results

We used regression analysis to better understand the factors driving individuals’ preferences for long-term care insurance financing using home equity release. We regressed the demand for long-term care insurance in each task on different measures of product and survey understanding, the survey treatments, and covariates that have been identified as being associated with interest in long-term care insurance and reverse mortgages in previous research (e.g., Wu *et al.*, 2021; Brown *et al.*, 2012; Hanewald *et al.*, 2020a). The covariates included

economic and demographic factors, health variables, and measures of personality and expectations. We included two variables measuring whether the participants paid attention when completing the experimental survey: the IMC and the time taken to complete the experimental survey.

The variable definitions are listed in Section B.2 of the Online Appendix. Most covariates were coded as binary variables. We converted numerical and ordinal variables to binary indicators of whether the participants' responses were higher than the sample median.

Table 4 presents the regression results, where we analyzed the factors explaining long-term care insurance demand under the alternative funding mechanisms. We measured individuals' long-term care insurance demand as the percentage of total wealth (i.e., hypothetical home value plus savings) they used to purchase long-term care insurance. Since the dependent variable ranged between 0 and 1, we used beta regressions with a logit link function to estimate the relationships between the dependent variable and the independent variables (e.g., Ferrari and Cribari-Neto, 2004). This regression assumes that the underlying data has a beta distribution, which can be any shape depending on the combination of parameters under the beta law. We estimated separate regression models for Choice Tasks 1, 2, and 3: for the demand for long-term care insurance using savings only in Choice Task 1, using savings and housing assets accessed via a reverse mortgage in Choice Task 2, and using savings and housing assets accessed via home reversion in Choice Task 3. These results are reported in columns 1, 2, and 3 of Table 4.

In the following discussion, we discuss the association between demand for each of the three long-term care financing products and the covariates. We compare our results to those of related studies on the demand for long-term care insurance conducted in Australia (Wu *et al.*, 2021), Canada (Boyer *et al.*, 2017), France (Courbage and Roudaut, 2008), Hong Kong (He and Chou, 2018), Spain (Costa-Font and Rovira-Forns, 2008; Jiménez-Martín *et al.*, 2016), and the US (Brown and Finkelstein, 2008; Brown *et al.*, 2012; Chatterjee and Fan, 2017; Gottlieb and Mitchell, 2020; McGarry *et al.*, 2014; Schaber and Stum, 2007; Sloan and Norton, 1997; Van Houtven *et al.*, 2015). We note that these studies did not assess the demand for products that combine long-term care and home equity release (as in the present study).

Economic factors: As reported in Table 4, participants with higher self-reported household savings had a higher demand for long-term care insurance in all three tasks. Chatterjee and Fan (2017) and He and Chou (2018) also found that individuals with higher net non-housing wealth

have a higher demand for long-term care insurance. The coefficient for self-reported household savings was largest for Choice Task 1 (LTCI purchased with savings). Households with more debt would use the Product R and H more than Product S (as the coefficients are greater for those two products). It indicates that when individuals can access their housing wealth to purchase more long-term care insurance as they are not limited to their liquid wealth, which is needed to repay the loans. Furthermore, demand was higher for participants with a lower household income—while several previous studies found positive associations between income level and long-term care insurance demand (Schaber and Stum, 2007; Costa-Font and Rovira-Forns, 2008; Brown *et al.*, 2012; Jiménez-Martín *et al.*, 2016; Chatterjee and Fan, 2017). We note that the product offered in our survey is an income product, while other studies typically consider reimbursement products. In Choice Task 1, participants with a lower self-reported value for their primary property had a significantly higher demand for long-term care insurance. This finding aligns with Davidoff's (2009) argument that housing wealth is a substitute for long-term care insurance when housing wealth is illiquid.

Demographic factors: Similar to the results of McGarry *et al.* (2014) and Jiménez-Martín *et al.* (2016), there was no statistically significant link between long-term care insurance demand and age, retirement status, and gender. Married participants (including those in long-term relationships) had higher demand across all proposed products, which is in line with findings from Gottlieb and Mitchell (2020), but divergent from several other studies that found no link between marital status and long-term care insurance demand (Sloan and Norton, 1997; McGarry *et al.*, 2014; Jiménez-Martín *et al.*, 2016; Wu *et al.*, 2021). This might be because we asked individuals to assume that they were married in the hypothetical scenario in the choice task and the products offered were joint-life products. Thus, married participants could probably relate better to the task than single individuals. We also noted that 97.8% of the sample was married. When a home equity release was available to purchase long-term care insurance in Choice Tasks 2 (via a reverse mortgage) and 3 (via home reversion), participants with a daughter indicated a lower demand for long-term care insurance. One of the explanations is that these participants expected to rely on their daughters to provide long-term care. Notably, there was no link between long-term care insurance demand and the participants' number of children, which is congruent with the findings of McGarry *et al.* (2014), Van Houtven *et al.* (2015), and Wu *et al.* (2021). We also found that residents of Tier 2 cities had a higher demand for long-term care insurance.

Table 4: Explaining the demand for long-term care insurance.

	Demand for LTCI using Product S	Demand for LTCI using Product S + R	Demand for LTCI using Product S + H
<i>Economic factors</i>			
Household savings	0.619***	0.206***	0.216***
Household debt	0.227***	0.239***	0.272***
Household income	-0.086 ⁺	-0.129*	-0.129**
Social insurance	-0.038	-0.064	-0.276
Property value	-0.288***	-0.023	-0.081 ⁺
Mortgage amount	-0.028	-0.119	-0.147*
<i>Demographic factors</i>			
Age	0.013	0.002	0.016
Retired	0.056	0.104	0.073
Female	-0.018	-0.075	-0.071
Married	0.282 ⁺	0.423*	0.611***
1+ child	-0.045	0.198	-0.153
Daughter	-0.010	-0.093*	-0.114**
Child same HH	0.075	0.014	0.054
College above	0.043	-0.010	0.055
Tier 1 city	-0.131**	-0.144**	-0.161**
<i>Health</i>			
Health	-0.070	-0.014	-0.024
Life expectancy	-0.046	-0.094*	-0.098*
Smoker	0.023	-0.100 ⁺	-0.074
<i>Personality and expectations</i>			
Financial literacy and numeracy	0.032	-0.019	0.054
Awareness of financial products	-0.113*	-0.102 ⁺	-0.083
Awareness LTCI	0.067	0.124*	0.155**
Awareness RM	-0.023	-0.078	-0.061
House price expectations	0.034	0.142**	0.118*
Trust in banks	0.017	-0.002	0.016
Trust in insurer	0.039*	0.090***	0.084***
Thought of LTC	0.213***	0.264***	0.253***
Intended bequest	-0.203***	-0.273***	-0.280***
<i>Product and survey understanding</i>			
Subjective Product Understanding	0.245***	0.281***	0.292***
Product quiz	-0.016	-0.082 ⁺	-0.066
Survey clarity	0.024	0.015	0.039
Passed IMC	0.101	0.118	0.005
Survey time	-0.018	0.007	0.045
<i>Treatments</i>			
Version R	-0.089*	-0.099*	-0.120**
High premium in example	0.059	0.048	0.061
Intercept	-4.249***	-3.279***	-3.323***
N	1,200	1,200	1,200
R ²	0.183	0.151	0.183

Notes: This table presents the results of beta regressions of the percentage of total wealth allocated to long-term care insurance on independent variables. Variables are defined in Appendix B.2. ⁺, *, **, and *** denote statistical significance at the 10%, 5%, 1%, and 0.1% level, respectively.

Health: Similar to the results of Chatterjee and Fan (2017) and Gottlieb and Mitchell (2020), we found no significant link between subjective health and long-term care insurance demand. When home equity release was available for purchasing long-term care insurance in Choice Tasks 2 and 3, participants with a shorter subjective life expectancy indicated a higher demand for long-term care insurance. This finding differs from existing studies that found no relationship between subjective life expectancy and the demand for long-term care insurance (Sloan and Norton, 1997; Wu *et al.*, 2021). It is likely that participants with a shorter subjective life expectancy worried more about long-term care risks and thus chose to purchase more long-term care insurance.

Personality and expectations: Participants who were familiar with fewer financial products had a higher demand for long-term care insurance in Choice Task 1 (only using savings to purchase the long-term care insurance). This might be because they did not know about other financial products (e.g., critical illness insurance and life annuities, both of which exist in China) that could (partially) cover their long-term care expenditure. Participants who had heard of long-term care insurance before taking the survey had a higher demand for long-term care insurance in Choice Tasks 2 and 3 (when housing wealth could be used through reverse mortgages or home reversions). Additionally, participants who had higher house price growth expectations had a higher demand for long-term care insurance when housing wealth could be used. Moreover, participants who had thought about how to pay for long-term care expenses before participating in the survey allocated a significantly higher proportion of their total wealth to long-term care insurance in all tasks. This result aligns with the results of Courbage and Roudaut (2008), Brown *et al.* (2012), and Jiménez-Martín *et al.* (2016). Trust in insurers was a significant factor in all three choice tasks, especially when housing wealth was available to finance long-term care insurance. Furthermore, long-term care insurance demand was higher for participants who had thought about how to pay for long-term-care expenses before participating in the survey and for those who were less certain about leaving an inheritance. In contrast, studies in Western countries found that individuals with stronger bequest motives have higher long-term care insurance demand, most likely to protect remaining wealth against high nursing home costs (Brown *et al.*, 2012; Boyer *et al.*, 2017).

Product and survey understanding: Participants with higher subjective product understanding used a significantly higher percentage of total wealth to purchase long-term care insurance. The finding of a positive relationship between subjective understanding and demand

for the product aligns with previous studies such as Davidoff *et al.* (2017) and Hanewald *et al.* (2020a).

Treatments: Our survey included two random treatments: the order of Choice Tasks 2 and 3, and the amount of long-term care insurance used in the case study, as explained in Section 3.6. The results show that participants who completed Choice Task 2 first allocated less wealth to long-term care insurance in all tasks (participants were allowed to go back in the survey). There was no significant impact of the case study treatment on demand.

Summary: Section 4.3 showed that the demand for long-term care insurance was higher when housing wealth is available to finance long-term care insurance. This section reported plausible results for the effect of the independent variables on long-term care insurance demand in the different choice tasks. Our findings largely align with those of existing studies.

6. Conclusion

We conducted and analyzed an experimental online survey fielded to assess the potential demand for new public and/or private sector programs that allow individuals to access their housing wealth to purchase long-term care insurance, which pays an income when one or both of the couples are disabled. In our sample of 1,200 Chinese homeowners aged 45–64, we found that the stated demand for long-term care insurance in different hypothetical scenarios increased when individuals could use housing wealth in addition to savings to purchase long-term care insurance. The demand for long-term care insurance was higher when individuals could access housing wealth via reverse mortgage loans rather than via home reversion, which involves the partial sale of housing wealth.

We identified the stated demand for all three proposed long-term care insurance products. When they could only use savings, the participants used on average 5% of their hypothetical wealth to purchase long-term care insurance. The demand for long-term care insurance increased when the participants could access their (hypothetical) housing wealth. The participants allocated an average of 15% of their total wealth to long-term care insurance when a reverse mortgage was available and 12% of their total wealth to long-term care insurance when home reversion was available. Our results are in line with previous theoretical studies, which suggest that the demand for long-term care insurance increases when home equity can be used to finance the insurance premium (e.g., Davidoff, 2010; Hanewald *et al.*, 2016; Shao *et al.*, 2019; Achou, 2021). The increase in stated demand for our LTCI income product is

larger than the estimated effect for expense-reimbursement LTCI in a recent paper by Achou (2021).

We developed product designs associated with the descriptions and case studies that were well understood. Thus, these designs can be used to develop new public and/or private sector programs in China and other markets. For example, we included options for the homeowners' heirs to repay the reverse mortgage debt or buy back the home reversion share to keep the property upon contract termination.

Furthermore, we used regression results to identify factors driving the demand for long-term care insurance products in the different choice tasks in our study. Our findings confirm that economic circumstances, demographic factors, health, personality, expectations, and product understanding impact long-term care insurance demand. Importantly, we find - in line with previous studies (Davidoff *et al.*, 2017; Hanewald *et al.*, 2020a) - that a subjective product understanding is important in determining the stated demand for long-term care insurance.

We acknowledge that our survey sample of urban Chinese homeowners was more educated and wealthier than a comparison sample from the nationally representative CHARLS survey, as discussed in Section 4.1. The demand for long-term care insurance and the effect of home equity release on this demand may differ in the general population. Future research could aim to collect a broader sample and include individuals living in rural areas.

Overall, our study documented a positive stated demand for new financial arrangements that allow older homeowners to use their housing wealth to fund long-term care insurance. The arrangement was described as a 'financial product' offered by a 'state-owned bank', but the arrangement could also be offered as a government program similar to the Home Equity Access Scheme offered by the Australian government.

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Long-term care insurance financing using home equity release: Evidence from an online experimental survey

- Online Appendix -

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14 January 2022

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Appendix A: Survey screenshots (translated)

1. Consent and screening



ARC CENTRE OF EXCELLENCE IN POPULATION AGEING RESEARCH



UNSW SYDNEY

ONLINE PARTICIPANT INFORMATION STATEMENT
Long-term care financing using home equity release
Professor Hazel Bateman

Participant Information Statement

1. What is the research study about?
 You are invited to take part in this research study. The research study aims to analyse a new method to finance long-term care cost using housing wealth. You have been invited because you meet the sample criteria, and your contact details were obtained from the research company dataSpring.

2. Who is conducting this research?
 The study is being carried out by the following researchers:

Roles in this research	Name	University
Chief investigator	Professor Hazel Bateman	University of New South Wales (Australia)
Partner investigators	Professor Hanming Fang Dr Katja Hanewald	University of Pennsylvania (USA) University of New South Wales (Australia)
Student investigator	Mr Tin Long Ho	University of New South Wales (Australia)

Research Funder: This research is being funded by the University of Pennsylvania.

3. Inclusion/Exclusion Criteria
 Before you decide to participate in this research project, we need to ensure that it is ok for you to take part. The research study is looking recruit people who meet the following criteria:

- Aged 45-64
- No difficulties in performing any of the activities of daily living
 - Bathing
 - Dressing
 - Toileting
 - Transferring
 - Continence
 - Feeding
- Own at least 1 residential property in a major city in China
- Have the urban "hukou" of the city that you live in

4. Do I have to take part in this research study?
 Participation in any research study is voluntary. If you do not want to take part, you do not have to.

If you decide you want to take part in the research study, you will be asked to:

- Read the information carefully;
- Complete the online questionnaire.

5. What does participation in this research require, and are there any risks involved?

If you decide to take part in the research study, we will ask you to complete an online questionnaire. The questionnaire will ask you to undertake several hypothetical tasks concerning products to finance long-term care and to answer some general questions. It should take approximately 25 minutes to complete.

You will be given a certain amount of incentives for your participation in the online survey. You may also be paid bonus incentives depending on the number of correct answers given in a quiz in the survey.

If you experience discomfort or feelings of distress while participating in the research and you require support, you can stop participating at any time.

6. What are the possible benefits to participation?
 We hope to use information we get from this research study to benefit others who are making financial plans for their retirement.

7. What will happen to information about me?
 Submission of the online questionnaire is an indication of your consent. By clicking the 'I agree to participate' button you are providing your permission for the research team to collect and use information about you for the research study. Your data will be kept for a period of 5 years after the publication of the research results. We will store information about you in a non-identifiable format on a server at the University of New South Wales. Your questionnaire responses will only be used for academic research purposes. The information collected for this research project may be made available to other research projects in non-identified form only.

8. How and when will I find out what the results of the research study are?
 The research team intend to publish and report the results of the research study in a variety of ways. All information published will be done in a way that will not identify you.

If you would like to receive a copy of the results you can let the research team know by adding your email or postal address within the consent form. We will only use these details to send you the results of the research. The results will also be made available via the website of CEPAR:
<http://www.cepar.edu.au/publications/working-papers>.

9. What if I want to withdraw from the research study?
 If you do consent to participate, you may withdraw at any time. You can do this by closing the questionnaire. If you withdraw from the research, we will destroy any information that has already been collected. Once you have submitted the questionnaire however, we will not be able to withdraw your responses as the questionnaire is anonymous.

10. What should I do if I have further questions about my involvement in the research study?
 The person you may need to contact will depend on the nature of your query. If you require further information regarding this study or if you have any problems which may be related to your involvement in the study, you can contact the following member/s of the research team:

Research Team Contact	
Name	Dr. Katja Hanewald
Position	Senior Research Fellow, CEPAR, University of New South Wales
Telephone	+61 2 9385 6124
Email	k.hanewald@unsw.edu.au

What if I have a complaint or any concerns about the research study?
 If you have a complaint regarding any aspect of the study or the way it is being conducted, please contact the UNSW Human Ethics Coordinator:

Complaints Contact	
Position	Human Research Ethics Coordinator
Telephone	+61 2 9385 6222
Email	humanethics@unsw.edu.au
HC Reference Number	HC190103

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Consent Form – Participant providing own consent

You are invited to take part in this research study. The research study aims to analyse a new method to finance long-term care cost using housing wealth.

To participate in the survey, you MUST answer these questions as we need your answers to be able to ask you only relevant questions. Your answers to these questions are confidential, and cannot be used to identify you personally.

Declaration by the participant

- I understand I am being asked to provide consent to participate in this research study;
- I have read the Participant Information Sheet or it has been provided to me in a language that I understand;
- I provide my consent for the information collected about me to be used for the purpose of this research study only;
- I understand that if necessary I can ask questions and the research team will respond to my questions;
- I freely agree to participate in this research study as described and understand that I am free to withdraw at any time during the study and withdrawal will not affect my relationship with any of the named organisations and/or research team members;
- I understand that I can download a copy of this consent form from www.cepar.edu.au.
- I agree, tick all box and continue
- I do not wish to participate

2%

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Next >>

What was your age at your last birthday?

years old

3%

<< Prev

Next >>

Which city do you live in?

Choose an option

4%

[<< Prev](#) [Next >>](#)

Do you have urban hukou of the city you live in?

Yes

No

5%

[<< Prev](#) [Next >>](#)

Do you or your spouse own at least one property? (Exclude any properties without an owner certificate)

Yes

No

6%

[<< Prev](#) [Next >>](#)

What is your gender?

Male

Female

7%

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What is the highest level of education you have attained?

No schooling

Primary School

Junior middle school

High school (高中) or Specialised secondary school (中專)

Two-Year College degree or Diploma (大专)

Bachelor degree from Four-Year University (大学本科)

Master or above

8%

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Do you have any difficulties in performing any of these activities? (Please select all the boxes that are applicable)

Bathing

Dressing

Toileting

Transferring

Continence

Feeding

None of the above

8%

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2. *Introductory questions*


Introductory slide

Thank you for agreeing to participate in this survey about financing long-term care.

Please take as much time as you need to answer the questions. All your answers to the questions are strictly anonymous – that is, no one involved in this study can identify you personally, no one will contact you after the survey and no sales solicitation is involved. Your answers will be used only for academic research.

Please answer each question as honestly as possible. The aim of the survey is to provide a reliable and accurate picture of how people like you feel about the new financial products described in the survey. Please do not use any other sources of information to answer the questions because our research focuses on how you (and others like you) would answer them. Please answer all of the survey questions.

Please DO NOT USE the “back” and “forward” buttons in your browser. Instead, please use the buttons at the bottom of each screen. If you would like to pause the survey to return to it later, simply close the window and click on the original link in the invitation when you are ready to resume. It will return you to the last point of entry in the survey.

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Introductory questions

In answering these questions, please exclude any properties for which you do not have an owner certificate (房产证).

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

RMB 0-50,000

RMB 50,001-500,000

RMB 500,001 or more

 10%

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Next >>

Please provide more details about your household savings. Excluding all properties that you own, what is the total value of your household savings (including, for example, saving accounts, term deposits, government bonds, stocks, shares in investment funds)?

RMB 500,001-1,000,000

RMB 1,000,001-1,500,000

RMB 1,500,001-2,000,000

RMB 2,000,001 or more

 11%

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Next >>

You indicated at the start of the survey that you own a property. For this property (if you own more than one, please focus on the one with the highest current market value). In which year did you receive/purchase it?

12%

<< Prev

Next >>

How much did the property cost when you received/purchased it?

For example, if the value you want to tell us is RMB 1,000,000, please enter 100

 (in RMB 10,000)

13%

<< Prev

Next >>

How much do you think this property is worth now?

For example, if the value you want to tell us is RMB 1,000,000, please enter 100

 (in RMB 10,000)

13%


<< Prev

Next >>

Do you still have a mortgage on this property?

Yes

No


 14%

[<< Prev](#) [Next >>](#)

What is the outstanding mortgage loan balance?

For example, if the value you want to tell us is RMB 1,000,000, please enter 100

(in RMB 10,000)


 15%

[<< Prev](#) [Next >>](#)

Do you still have outstanding debt owed to family and friends for the purchase of this property?

Yes

No

 16%

[<< Prev](#) [Next >>](#)

What is the outstanding loan amount from family and friends?

For example, if the value you want to tell us is RMB 1,000,000, please enter 100

(in RMB 10,000)

 17%

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Next >>

How many properties do you or your spouse own in total, including the one you just told us about?

 18%

<< Prev

Next >>

3. Information about LTC and choice tasks

Facts about health states and long-term care

Hover your mouse over the blue text for more information.

As people get older, they are more likely to need help with **activities of daily living** such as bathing or dressing.

In this survey, we refer to an older person as **disabled** if they need help **permanently** with **three or more** of the following **six activities of daily living: bathing, dressing, toileting, transferring, continence, or feeding**. We refer to this help as **long-term care**.

We refer to older persons as **non-disabled** if they only need help with **two or less** of the six activities of daily living.

On average,

3 out of 10 men aged 60 will eventually become disabled and will need long-term care as they get older, while **4 out of 10 women aged 55 will eventually become disabled** and will need long-term care as they get older.

There are two types of long-term care:


Informal care: long-term care provided by the family and/or friends.

Formal care: long-term care provided by professional caring personnel. **Formal care** in a basic **residential nursing home** costs about RMB **11,500** per month in today's prices.

When you are **disabled**, you can receive **formal care**, **informal care** or a combination of the two.

Long-term care income refers to the regular monthly income you can receive when you and/or your spouse are **disabled** and need long-term care.

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

 18%

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Next >>

New Long-term Care Income Products

In this survey we will ask you to make some choices about three new financial products designed to fund **long-term care**. Each of these products will provide you with an income when you require **long-term care**.

For each of the three **long-term care income** products we will describe the product and show you a case study. We will then ask you to complete a choice task. Finally we will ask you to choose your most preferred and least preferred of the three choices. In total you will complete four (4) choice tasks.

Please read the product descriptions carefully because your understanding will affect the bonus amount that you can earn from the survey.

 20%

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Next >>

Long-term care income choice tasks

In each of the choice tasks you will be asked you to choose how much long-term care income you would like to buy. Ignoring your own financial circumstances, we want you to imagine that:

- you are aged 60,
- you are married and your spouse is aged 55,
- you are about to retire,
- you own your own home in the city you live in, which is currently worth **RMB 5,000,000**
- you have **RMB 750,000** in your savings account,
- you have no other assets.

 21%

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4. Choice tasks

Choice task 1

Long-term Care Income Product S

Hover your mouse over the blue text for more information.

We would like to introduce you to Long-term Care Income Product S.

You buy Long-term Care Income Product S with a single payment from your **savings account**. When you and/or your spouse need **long-term care** you receive a regular monthly income.

Please read the product description carefully as your product understanding will be tested in a quiz.

The first column lists the product properties. The second column explains these properties for Long-term Care Income Product S.

Product Properties	Long-term Care Income Product S
Who offers this product?	A state-owned bank.
How much do you need to pay at the start of the contract?	The amount of the single payment you make at the start of the contract depends on the size of the monthly income you/your spouse want to receive when you/your spouse need long-term care.
How much long-term care income can you buy at most?	Depends on: Your age , your spouse's age , your gender ; and the amount you wish to pay at the start of the contract.
When can you purchase this product?	When you and your spouse are aged 55-65 and non-disabled .
What are your benefits?	You/your spouse receive a monthly income when you/your spouse are disabled , for as long as you/your spouse are alive .
How do you receive the income?	The product provider transfers the income into your savings account each month.
Do you receive any income when you and your spouse are non-disabled ?	No.
What happens when one spouse is disabled , and the other spouse is non-disabled ?	The disabled spouse can choose to move to a residential nursing home or to stay at home . You can use the monthly income for any purpose , including but not limited to pay for formal care or to compensate family members/friends for informal care .
What happens when both spouses are disabled , or one spouse is disabled , and the other spouse is deceased?	You/your spouse will need to move to a residential nursing home . You can use the monthly income for any purpose , including but not limited to pay for formal care or to compensate family members/friends for informal care at the residential nursing home.
Who will determine your health status?	You choose a doctor from a list of doctors appointed by the government . The doctor determines whether you/your spouse are non-disabled or disabled . Once you/your spouse are disabled , you/your spouse will be entitled to receive the monthly income benefits for as long as you/your spouse are alive .
Do you have to make a claim to receive the monthly income when you need long-term care?	No. The doctor will inform the product provider to transfer the monthly income to you.
When do you pay the product provider?	You make a single payment at the start of the contract.
When does the contract terminate?	When you and your spouse pass away .
Can you terminate the contract earlier?	Yes, but you will not receive the regular income if you later need long-term care.

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

23%

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Case study for Long-term Care Income Product S

Hover your mouse over the blue text for more information.

Please read the following case study which illustrates how Long-term Care Income Product S works.

Mr. Wang is aged 60 and Mrs. Wang is aged 55 in 2019. They live in their own apartment in Beijing which is worth RMB 5,000,000 and have RMB 750,000 in their savings account. They decide to buy Long-term Care Income Product S to cover their future long-term care needs.

- They choose to use RMB 200,000 from their savings account to buy long-term care income with Long-term Care Income Product S.
- If one or both are disabled, they will receive a monthly income according to the following table:

Both non-disabled/deceased	1 non-disabled/deceased, 1 disabled	Both disabled
RMB 0/month	RMB 3,514/month	RMB 7,028 /month

- The couple fully own their apartment, including all growth in its value, if any.

This contract will terminate when both Mr. and Mrs. Wang pass away.

Assume that Mr. Wang remains non-disabled and passes away in 2044. In the same year, Mrs. Wang becomes disabled and permanently moves into a residential nursing home. She will receive a long-term care income of RMB 3,514/month until she passes away. When she passes away, their daughter inherits the apartment.

How do you rate your understanding of Long-term Care Income Product S?

Completely clear

Mostly clear

Generally clear

Mostly confusing

Completely confusing

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

 25%

<< Prev

Next >>

Task 1 of 4: Long-term Care Income Product S

Hover your mouse over the blue text for more information.

In this choice task, assume you have **RMB 750,000** in your savings account and your home is worth **RMB 5,000,000**. You can use the money in your savings account to purchase **long-term care income** with **Long-term Care Income Product S**.

The decision you have to make is:

Would you like to buy long-term care income with Long-term Care Income Product S? And if you do

How much of your savings do you want to use to buy long-term care income ?

Use the slider below to indicate your choice. The outcomes of your choice are summarised in the table below.

You can position the slider anywhere on the line, but you need to move it at least once before you can continue. **If you DON'T want to buy Long Term Care Product S place the slider at RMB 0.**



	Outcome
Regular income when you and your spouse are non-disabled	RMB 0 per month
Regular income when one spouse is disabled , and the other spouse is non-disabled or deceased	RMB 0 per month This would cover 0% of the cost of formal care in a residential nursing home for one person or compensate your family/friends who take care of you.
Regular income when both spouses are disabled	RMB 0 per month This would cover 0% of the cost of formal care in a residential nursing home for you and your spouse or compensate your family/friends who take care of you.
Total payment for long-term care income	Single payment of RMB 0 at the start of the contract
Payment for long-term care income from your savings account	Single payment of RMB 0 at the start of the contract
Remaining money in your savings account	RMB 0
Your remaining housing wealth	RMB 5,000,000
Your remaining total wealth	RMB 0
Additional features:	You receive the monthly income for as long as you/your spouse are disabled

Why did you not purchase more long-term care income with **Long-term Care Income Product S**? Please only choose the main reason.

- I think I can manage long-term care risk.
- My children/grandchildren will care for me when I am old.
- I think the product is too complex.
- I do not think the product is a good deal.
- I do not trust the product provider.

27%

<< Prev Next >>

Choice task 2

Long-term Care Income Product R

Hover your mouse over the blue text for more information.

We would like to introduce you to [Long-term Care Income Product R](#).

You buy Long-term Care Income Product R by **borrowing against your home**. When you and/or your spouse need [long-term care](#), you receive a regular monthly income.

Please read the product description carefully as your product understanding will be tested in a quiz.

The first column lists the product properties. The second column explains these properties for [Long-term Care Income Product R](#).

	Long-term Care Income Product R
Who offers this product?	A state-owned bank.
Product properties when you are alive	
How much do you need to pay at the start of the contract?	No payments required.
Is your home used as a collateral?	Yes.
Can you continue to live in your home?	Yes. You and your spouse have a guaranteed right to live in your home while at least one of you is non-disabled .
Do you retain the full legal right of your home?	Yes. For example, you can rent out your home.
How much long-term care income can you buy at most?	Depends on: Your age , your spouse's age , your gender , the amount you wish to pay at the start of the contract and the value of your home at the start of the contract
How is the home value assessed?	The value of your home is assessed by an independent, authorized appraiser .
When can you purchase this product?	When you and your spouse are aged 55-65 and non-disabled .
What are your benefits?	You/your spouse receive a monthly income when you/your spouse are disabled , for as long as you/your spouse are alive .
How do you receive the income?	The product provider transfers the income into your savings account each month.
Do you receive any income when you and your spouse are non-disabled ?	No.
What happens when one spouse is disabled, and the other spouse is non-disabled ?	The disabled spouse can choose to move to a residential nursing home or to stay at home . You can use the monthly income for any purpose , including but not limited to pay for formal care or to compensate family members/friends for informal care.
What happens when both spouses are disabled , or one spouse is disabled , and the other spouse is deceased?	You/your spouse will need to move to a residential nursing home . You can use the monthly income for any purpose , including but not limited to pay for formal care or to compensate family members/friends for informal care at the residential nursing home.
Who will determine your health status?	You choose a doctor from a list of doctors appointed by the government . The doctor determines whether you/your spouse are non-disabled or disabled . Once you/your spouse are disabled , you/your spouse will be entitled to receive the monthly income benefits for as long as you/your spouse are alive .
Do you have to make a claim to receive the monthly income when you need long-term care ?	No. The doctor will inform the product provider to transfer the monthly income to you.
Will this product incur any loan?	Yes, but no repayments are required while you/your spouse live in your home .
What is the debt amount?	The cost of the long-term care income becomes a debt which accumulates interest .
What is the interest rate on the loan?	5.80% p.a. Set by the government. Fixed at the start of the contract.
Can you terminate the contract earlier?	Yes, you can.
What do you need to do to terminate the contract earlier?	Repay the loan
Product properties when both of you are deceased/move to a residential nursing home	
What happens after you and your spouse have both passed away or moved into a residential nursing home?	The product provider will sell your property at the highest possible market price .
What happens to the sale proceeds?	The sale proceeds are used to repay the loan. If the sale proceeds exceed the loan amount, you/your spouse/your heirs can retain the difference. If the sale proceeds are insufficient to cover the debt, you/your spouse/your heirs are not required to make an extra payment.
Can your heirs remain in the property when you and your spouse pass away?	Yes. Your heirs have the option to repay the debt and keep your home .
When does the contract terminate?	When you and your spouse are deceased.

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

29%

<< Prev Next >>

Case study for Long-term Care Income Product R

Hover your mouse over the blue text for more information.

Please read the following case study which illustrates how Long-term Care Income Product R works.

Mr. Wang is aged 60 and Mrs. Wang is aged 55 in 2019. They have an adult daughter. They live in their own apartment in Beijing which is worth RMB 5,000,000 and have RMB 750,000 in their savings account. They decide to buy Long-term Care Income Product R to cover their future long-term care needs.

- They choose to **borrow RMB 600,000 against their apartment** to buy long-term care income with Long-term Care Income Product R. The amount becomes a debt which accumulates interest at the fixed interest rate of 5.8% p.a
- If one or both are disabled, they will receive a **monthly income** according to the following table:

Both non-disabled/deceased	1 non-disabled/deceased, 1 disabled	Both disabled
RMB 0/month	RMB 10,542/month	RMB 21,085 /month

- They do **not have to repay anything** while **at least one of them still lives at home**.
- The couple **fully own their apartment**, including all growth in its value, if any.

This contract will **terminate** when **both** Mr. and Mrs. Wang **pass away**.

Assume that Mr. Wang remains **non-disabled** and **passes away in 2044**. In the **same** year, Mrs. Wang becomes **disabled** and **permanently moves** into a **residential nursing home**. The **outstanding debt** amount in **2044** accumulated from the **initial loan** is **RMB 2,456,000**. Below are **three possible scenarios** in 2044:

- **Scenario A:** The product provider **sells the home at the highest possible market price** of **RMB 10,000,000**. The sale proceeds are used to **repay** the debt. Mrs. Wang **receives the remaining RMB 7,544,000**. She will receive a **long-term care income** of **RMB 10,542/month until she passes away**.
- **Scenario B:** The product provider **sells the home at the highest possible market price** of only **RMB 1,000,000**. All sale proceeds **are used to repay** the debt. Mrs. Wang will **receive nothing from the sale**, but she is **not required to make an extra payment**. The difference is a loss to the product provider. Mrs. Wang will receive a **long-term care income** of **RMB 10,542/month until she passes away**.
- **Scenario C:** Their daughter decides to **repay the debt herself** and **keep** their property. Mrs. Wang will receive a **long-term care income** of **RMB 10,542/month until she passes away**.

How do you rate your understanding of Long-term Care Income Product R?

Completely clear

Mostly clear

Generally clear

Mostly confusing

Completely confusing

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

33%

<< Prev

Next >>

Task 2 of 4: Long-term Care Income Product R

Hover your mouse over the blue text for more information.

In this choice task, assume, you have **RMB 750,000** in your savings account and your home is worth **RMB 5,000,000**. You can use the money in your savings account to purchase long-term care income with Long-term Care Income Product S. You can also borrow against your home to purchase long-term care income with Long-term Care Income Product R.

Use the two sliders below to indicate your choices. You can buy long-term care income with your savings (Long-term Care Income Product S) and/or borrow against your home (Long-term Care Income Product R). The outcomes of your choice are summarised in the table below.

The decisions you have to make are:

Would you like to buy long-term care income? And if you do

MRa. How much of your savings do you want to use to buy long-term care income with Long-term Care Income Product S?

You can position the slider anywhere on the line, but you need to move it at least once before you can continue. If you DON'T want to buy Long Term Care Product S place the slider at RMB 0.



MRb. How much do you want to borrow against your home to buy long-term care income with Long-term Care Income Product R?

You can position the slider anywhere on the line, but you need to move it at least once before you can continue. If you DON'T want to buy Long Term Care Product R place the slider at RMB 0.



	Outcome
Regular income when you and your spouse are non-disabled	RMB 0 per month
Regular income when one spouse is disabled, and the other spouse is non-disabled or deceased	RMB 0 per month This would cover 0.00% of the cost of formal care in a residential nursing home for one person or compensate your family/friends who take care of you.
Regular income when both spouses are disabled	RMB 0 per month This would cover 0.00% of the cost of formal care in a residential nursing home for you and your spouse or compensate your family/friends who take care of you.
Total payment for long-term care income	RMB 0
Payment for long-term care income from your savings account	RMB 0
Payment for long-term care income from Long-term Care Income Product R	RMB 0 loan with annual interest rate 5.80% p.a.
Remaining money in your savings account	RMB 0
Your remaining housing wealth	RMB 0
Your remaining total wealth	RMB 0
Additional features:	You receive the monthly income for as long as you/your spouse are disabled

Why did you not purchase more of Long-term Care Income Product R to pay for the long-term care income? Please only choose the main reason.

- I think I can manage long-term care risk.
- My children/grandchildren will care for me when I am old.
- I think the product is too complex.
- I do not think the product is a good deal.
- I do not trust the product provider.
- I do not want to have a (higher) loan.
- I am worried that I would be evicted from my property.

36%

<< Prev

Next >>

Choice task 3

Long-term Care Income Product H

Hover your mouse over the blue text for more information.

We would like to introduce you to [Long-term Care Income Product H](#).

You buy Long-term Care Income Product H by selling part of your home. When you and/or your spouse need [long-term care](#), you receive a regular monthly income.

Please read the product description carefully as your product understanding will be tested in a quiz.

The first column lists the product properties. The second column explains these properties for [Long-term Care Income Product H](#).

	Long-term Care Income Product H
Who offers this product?	A state-owned bank.
Product properties when you are alive	
How much do you need to pay at the start of the contract?	No payments required.
Is your home used as a collateral?	No, a part of your home is sold to the product provider.
Can you continue to live in your home?	Yes. You and your spouse have a guaranteed right to live in your home while at least one of you is non-disabled.
Do you retain the full legal right of your home?	No, but you can still rent out your home.
How much long-term care income can you buy at most?	Depends on: Your age , your spouse's age , your gender , the amount you wish to pay at the start of the contract and the value of your home at the start of the contract
How is the home value assessed?	The value of your home is assessed by an independent, authorized appraiser .
When can you purchase this product?	When you and your spouse are aged 55-65 and non-disabled .
What are your benefits?	You/your spouse receive a monthly income when you/your spouse are disabled , for as long as you/your spouse are alive .
How do you receive the income?	The product provider transfers the income into your savings account each month.
Do you receive any income when you and your spouse are non-disabled?	No.
What happens when one spouse is disabled, and the other spouse is non-disabled?	The disabled spouse can choose to move to a residential nursing home or to stay at home . You can use the monthly income for any purpose , including but not limited to pay for formal care or to compensate family members/friends for informal care.
What happens when both spouses are disabled, or one spouse is disabled, and the other spouse is deceased?	You/your spouse will need to move to a residential nursing home . You can use the monthly income for any purpose , including but not limited to pay for formal care or to compensate family members/friends for informal care at the residential nursing home.
Who will determine your health status?	You choose a doctor from a list of doctors appointed by the government . The doctor determines whether you/your spouse are non-disabled or disabled . Once you/your spouse are disabled , you/your spouse will be entitled to receive the monthly income benefits for as long as you/your spouse are alive .
Do you have to make a claim to receive the monthly income when you need long-term care?	No. The doctor will inform the product provider to transfer the monthly income to you.
Can you terminate the contract earlier?	Yes, you can.
What do you need to do to terminate the contract earlier?	Buy back the proportion you sold to the product provider
Product properties when both of you are deceased/move to a residential nursing home	
What happens after you and your spouse have both passed away or moved into a residential nursing home?	The product provider will sell your property at the highest possible market price .
What happens to the sale proceeds?	The sale proceeds are split into two parts. The product provider keeps the sale proceeds of the proportion you sold. You/your spouse/your heirs receive the sale proceeds from the proportion you own .
Can your heirs remain in the property when you and your spouse pass away?	Yes. Your heirs have the option to buy back the proportion you sold and keep your home .
When does the contract terminate?	When you and your spouse are deceased.

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

37%

<< Prev Next >>

Case study for Long-term Care Income Product H

Hover your mouse over the blue text for more information.

Please read the following case study which illustrates how [Long-term Care Income Product H](#) works.

Mr. Wang is aged 60 and Mrs. Wang is aged 55 in 2019. They have an adult daughter. They live in their own apartment in Beijing which is worth RMB 5,000,000 and have RMB 750,000 in their savings account. They decide to buy [Long-term Care Income Product H](#) to cover their future [long-term care](#) needs.

- They choose to **sell** RMB 2,044,000 **of their apartment** to buy long-term care income with Long-term Care Income Product H.
- If one or both are disabled, they will receive a **monthly income** according to the following table:

Both non-disabled/deceased	1 non-disabled/deceased, 1 disabled	Both disabled
RMB 0/month	RMB 10,542/month	RMB 21,085/month

- They do **not have to pay anything** while **at least one of them** still lives at home.
- They still **own a part** of the apartment.

This contract will **terminate** when **both** Mr. and Mrs. Wang **pass away**.

Assume that Mr. Wang remains **non-disabled** and **passes away in 2044**. In the **same** year, Mrs. Wang becomes **disabled** and **permanently moves** into a **residential nursing home**. Below are **three** possible **scenarios** in 2044:

- **Scenario A:** The product provider **sells the home at the highest possible market price** of RMB 10,000,000. Mrs. Wang receives RMB 5,912,000 from the sale proceeds. She will receive a [long-term care income](#) of RMB 10,542/month **until she passes away**.
- **Scenario B:** The product provider **sells the home at the highest possible market price** of only RMB 1,000,000. Mrs. Wang receives RMB 591,000 from the sale proceeds. Mrs. Wang will receive a [long-term care income](#) of RMB 10,542/month **until she passes away**.
- **Scenario C:** Their daughter decides to **buy back** and **keep** their property. Mrs. Wang will receive a [long-term care income](#) of RMB 10,542/month **until she passes away**.

How do you rate your understanding of [Long-term Care Income Product H](#)?

Completely clear

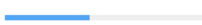
Mostly clear

Generally clear

Mostly confusing

Completely confusing

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

 43%

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Next >>

Task 3 of 4: Long-term Care Income Product H

Hover your mouse over the blue text for more information.

In this choice task, assume, you have **RMB 750,000** in your savings account and your home is worth **RMB 5,000,000**. You can use the money in your savings account to purchase long-term care income with **Long-term Care Income Product S**. You can also borrow against your home to purchase long-term care income with **Long-term Care Income Product H**.

Use the two sliders below to indicate your choices. You can buy long-term care income with your savings (**Long-term Care Income Product S**) and/or borrow against your home (**Long-term Care Income Product H**). The outcomes of your choice are summarised in the table below.

The decisions you have to make are:

Would you like to buy long-term care income? And if you do

MHa. How much of your savings do you want to use to buy long-term care income with Long-term Care Income Product S?

You can position the slider anywhere on the line, but you need to move it at least once before you can continue. **If you DON'T want to buy Long Term Care Product S place the slider at RMB 0.**



MHb. How much of your home do you want to sell to buy long-term care income with Long-term Care Income Product H?

You can position the slider anywhere on the line, but you need to move it at least once before you can continue. **If you DON'T want to buy Long Term Care Product H place the slider at RMB 0.**



	Outcome
Regular income when you and your spouse are non-disabled	RMB 0 per month
Regular income when one spouse is disabled , and the other spouse is non-disabled or deceased	RMB 0 per month This would cover 0.00% of the cost of formal care in a residential nursing home for one person or compensate your family/friends who take care of you.
Regular income when both spouses are disabled	RMB 0 per month This would cover 0.00% of the cost of formal care in a residential nursing home for you and your spouse or compensate your family/friends who take care of you.
Total payment for long-term care income	RMB 0
Payment for long-term care income from your savings account	RMB 0
Payment for long-term care income from Long-term Care Income Product H	RMB 0 is sold
Remaining money in your savings account	RMB 0
Your remaining housing wealth	RMB 0
Your remaining total wealth	RMB 0
Additional features:	You receive the monthly income for as long as you/your spouse are disabled

Why did you not purchase more of **Long-term Care Income Product H** to pay for the long-term care income? Please only choose the main reason.

- I think I can manage long-term care risk.
- My children/grandchildren will care for me when I am old.
- I think the product is too complex.
- I do not think the product is a good deal.
- I do not trust the product provider.
- I do not want to sell (more) part of the property.
- I am worried that I would be evicted from my property.

47%

<< Prev

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Choice task 4

Task 4 of 4: Which of the following choices do you prefer?

Hover your mouse over the blue text for more information.

The following table summarises the three choices you have just made to buy long-term care income. We now ask you to choose which of the three choices would be BEST for you and which of the three choices would be WORST for you.

Product Properties	A Task 1 choice Long-term Care Income Product S	B Task 2 choice Long-term Care Income Product R	C Task 3 choice Long-term Care Income Product H
Regular income when you and your spouse are non-disabled	0 per month		
Regular income when one spouse is disabled and the other spouse is non-disabled or deceased	RMB 1,757 per month	RMB 4,393 per month	RMB 2,508 per month
Regular income when both spouses are disabled	RMB 3,514 per month	RMB 8,786 per month	RMB 5,016 per month
Total payment for long-term care income	Single payment of RMB 100,000 at the beginning of the contract	RMB 250,000	RMB 142,734
Payment for long-term care income from your savings account	RMB 100,000	RMB 50,000	RMB 40,000
Payment for long-term care income from Long-term Care Income Product R	Not applicable	RMB 200,000 loan with annual interest rate 5.8% p.a.	Not applicable
Value of home sold through Long-term Care Income Product H	Not applicable	Not applicable	RMB 350,000 is sold
Remaining money in your savings account	RMB 650,000	RMB 700,000	RMB 710,000
Your remaining housing wealth	RMB 5,000,000	RMB 5,000,000	RMB 4,650,000
Your remaining total wealth	RMB 5,650,000	RMB 5,700,000	RMB 5,360,000
Additional comments:	You receive the monthly income for as long as you/your spouse are disabled		
Which one of A, B or C would be BEST for you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Which one of A, B or C would be WORST for you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

47%

<< Prev

Next >>

5. Product quiz

Product knowledge

Hover your mouse over the blue text for more information.

Now we would like to review your knowledge of the three Long-term Care Income Products. Which of the following statement(s) apply to each of the products –[Long-term Care Income Product S](#), [R](#) and [H](#)? Please tick the boxes to indicate to which product or products a statement applies. Your bonus payment depends on the number of correct answers in this quiz. Scores are awarded for each correct answer.

	Long-term Care Income Product S	Long-term Care Income Product R	Long-term Care Income Product H
You can receive a monthly income as long as you are alive, even when you are non-disabled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You pay a lump sum but nothing else at the start of the contract to purchase this product.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
You can use the income from the product to compensate your family/friends who take care of you	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At the end of the contract, if the house price is higher than the loan amount, you (or your heirs) can receive the difference between the house price and loan amount.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At the end of the contract, you (or your heirs) will receive a percentage from the sale of the residential property.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The interest rate charged in this contract is fixed during the term of the contract.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At the start of the contract, you will need to choose the percentage of your property to sell.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
At the end of the contract, you/your spouse/your heirs will have a chance of receiving nothing when your property is sold.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

 49%

<< Prev

Next >>

You have 24 correct answers out of 24.

 51%

<< Prev

Next >>

6. Covariates questions

You have now completed the choice tasks. Next we will ask you three sets of standard survey questions on:

1. Demographics and health
2. Financial competence and retirement planning
3. Preferences and expectations

 52%

<< Prev

Next >>

1. Demographics and health

The next set of questions will cover employment, marital status, children, income and debt

Which of the following best describes your current employment situation?

- Employed by someone else
- Self-employed
- Unemployed including structurally unemployed (Xia Gang)
- Retired
- Not in the labour force - stay-at-home parent or caregiver
- Not in the labour force - other reasons

 53%

<< Prev

Next >>

1.Demographics and health

Who are you working for? If you are retired or not in the labour force, please answer according to your most recent previous job.

- Government (政府机构)
- Public institution (事业单位)
- Non-government organisation (非政府组织, 社团, 协会, 学会, 等等)
- State-owned enterprise (国有企业)
- Private company including foreign firm (私营企业, 包括外资企业)
- Individual firm and freelancer (个体户)
- Farmer (农户)
- Never worked
- Other

 55%

<< Prev

Next >>

1.Demographics and health

What is your marital status?

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

 56%

<< Prev

Next >>

1.Demographics and health

What is your spouse's age? Answer: years

 57%

<< Prev

Next >>

1. Demographics and health

How many children do you have that are still alive? Answer: children

 58%


<< Prev

Next >>

1. Demographics and health

Please provide the following information on your child(ren)

	Gender	Age	Residence of child	Personal income (annual) of the child
1st child	Male ▼	<input type="text" value="31"/>	Live in the same household ▼	More than 120,000 ▼




 59%

<< Prev

Next >>

1. Demographics and health

How many grandchildren do you have that are still alive? Answer: grandchildren

 60%

<< Prev

Next >>

1.Demographics and health

Please provide the following information on your grandchild(ren)

	Gender	Age	Residence of grandchild	Personal income (annual) of the grandchild
1st grandchild	Female ▼	1	Live in the same household ▼	Less than RMB 40,000 ▼

61%

<< Prev Next >>

1.Demographics and health

Do you/your spouse have social health insurance?

	Yes	No
Myself:	<input type="radio"/>	<input type="radio"/>
Spouse:	<input type="radio"/>	<input type="radio"/>

63%

<< Prev Next >>

1.Demographics and health

Excluding all mortgages, what is the total value of your household debt? (including for example money borrowed from relatives, friends, or using credit cards, and bank loans other than mortgages)

- RMB 0-2,000
- RMB 2,000-9,999
- RMB 10,000-49,999
- RMB 50,000-99,999
- RMB 100,000-249,999
- RMB 250,000-499,999
- RMB 500,000-999,999
- RMB 1,000,000 or more

64%

<< Prev Next >>

1.Demographics and health

What was your household income (including bonuses and pension income) in the last year after paying tax and social security contributions?

- RMB 0-39,999 per year
- RMB 40,000-69,999 per year
- RMB 70,000-119,999 per year
- RMB 120,000 or more per year

 65%

<< Prev

Next >>

1.Demographics and health

Please provide more details about your household income. What was your household income (including bonuses and pension income) in the last year after paying tax and social security contributions?

- RMB 120,000-149,999 per year
- RMB 150,000-199,999 per year
- RMB 200,000-299,999 per year
- RMB 300,000 or more per year

 66%

<< Prev

Next >>

1.Demographics and health

Do you smoke now?

- Ever smoked, currently smoking
- Ever smoked, currently not smoking
- Never smoked

 67%

<< Prev

Next >>

1.Demographics and health

Compared to the population, what do you think are the chances you will ever need **formal care** at home?

- Higher probability of needing formal care at home than the average for people of your age and gender
- Lower probability of needing formal care at home than the average for people of your age and gender

 68%

[<< Prev](#) [Next >>](#)

1.Demographics and health

Compared to the population, what do you think are the chances you will ever need **formal care** in a residential nursing home?

- Higher probability of needing formal care in a residential nursing home than the average for people of your age and gender
- Lower probability of needing formal care in a residential nursing home than the average for people of your age and gender

 69%

[<< Prev](#) [Next >>](#)

1.Demographics and health

Would you say your/your spouse's health is excellent, very good, good, fair, or poor?

	Excellent	Very good	Good	Fair	Poor
Myself:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spouse:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 70%

[<< Prev](#) [Next >>](#)

1.Demographics and health

Compared to one year ago, how would you rate your health in general now?

- Much better now
- Somewhat better now
- About the same
- Somewhat worse now
- Much worse now

 72%

<< Prev

Next >>

1.Demographics and health

What is the highest level of education you have attained?

- No schooling
- Primary School
- Junior middle school
- High school (高中) or Specialised secondary schools (中專)
- Two-Year College degree or Diploma (大专)
- Bachelor degree from Four-Year University (大学本科)
- Master or above

Have you seen this question before?

- Yes
- No

 74%

<< Prev

Next >>

1.Demographics and health

To what age do you think you are going to live? Answer: years

 75%

<< Prev

Next >>

1.Demographics and health

To what age do you think your spouse is going to live? Answer: years

 76%

<< Prev

Next >>

2. Financial Competence and Planning

This set of questions covers financial literacy, numeracy, knowledge of financial products and retirement planning

Financial literacy

Suppose you had RMB 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 RMB 102
- Exactly RMB 102
- Less than RMB 102
- Do not know

Imagine the interest rate in your savings account is 1% per year and inflation is 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

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

- True
- False
- Do not know

 80%

<< Prev

Next >>

2. Financial Competence and Planning

Numeracy

Imagine that we rolled a fair, six-sided die 1,000 times. Out of 1,000 rolls, how many times do you think the die would come up even (2, 4, or 6)?

Please enter a number between 0 and 1,000 in the box.

Answer: times

In a lottery, the chances of winning a RMB 500 prize is 1%. What is your best guess about how many people would win the prize if 1,000 people each buy a single ticket to the lottery?

Please enter a number between 0 and 1,000 in the box.

Answer: people

In a raffle, the chance of winning a car is 1 in 1,000. What percent of tickets in the raffle win a car?

Please enter a percentage in the box.

Answer: percentage

 83%

<< Prev

Next >>

2. Financial Competence and Planning

Financial product knowledge

Before participating in this survey, had you heard of any of the following financial products?

	Yes	No
Bank accounts	<input type="radio"/>	<input type="radio"/>
Fixed term deposit	<input type="radio"/>	<input type="radio"/>
Government bonds	<input type="radio"/>	<input type="radio"/>
Shares (Stocks)	<input type="radio"/>	<input type="radio"/>
Shares in an investment fund (基金)	<input type="radio"/>	<input type="radio"/>
Credit card	<input type="radio"/>	<input type="radio"/>
Money market fund (e.g., Yu'eBao)	<input type="radio"/>	<input type="radio"/>
Commercial health insurance	<input type="radio"/>	<input type="radio"/>
Life insurance	<input type="radio"/>	<input type="radio"/>
Long-term care insurance	<input type="radio"/>	<input type="radio"/>
Critical illness insurance	<input type="radio"/>	<input type="radio"/>
Commercial pension	<input type="radio"/>	<input type="radio"/>
Life annuity	<input type="radio"/>	<input type="radio"/>
Enterprise annuity	<input type="radio"/>	<input type="radio"/>
"House for Pension" (Reverse mortgage in China)	<input type="radio"/>	<input type="radio"/>

 84%

<< Prev

Next >>

2. Financial Competence and Planning

Retirement planning

At what age do you plan to retire? (Or at what age did you retire if you are already retired)

Answer: years old

 85%

<< Prev

Next >>

2. Financial Competence and Planning

Which of the following statements best describes your thoughts about the financial aspects of retirement?

I've not thought about what savings I will need for retirement.

I've checked out my current savings position and started to think about what I will need for retirement.

I've a firm idea of what I need for retirement and I'm not on track to reach my savings goal.

I've a firm idea of what I need for retirement and I'm on track to reach my savings goal.

 86%

<< Prev

Next >>

2. Financial Competence and Planning

For many households, overall spending changes dramatically upon retirement. Please indicate below what your experience has been (if you are retired), or what your expectations are (if not retired)

My household had (or expects to have) no change in spending at retirement

My household has spent (or will spend) more after retirement than before

My household has spent (or will spend) less after retirement than before

 88%

<< Prev

Next >>

2. Financial Competence and Planning

Have you given a thought about how you will pay for long-term-care expenses before you participated in this survey?

Yes

No

 89%

<< Prev

Next >>

2. Financial Competence and Planning

To what extent do the following statements apply to you? Please tick one box on the scale where 0 means 'certainly not' and 10 means 'certainly yes'.

	certainly not											certainly yes
I have/expect to have enough retirement income.	0	1	2	3	4	5	6	7	8	9	10	
I have enough savings.	0	1	2	3	4	5	6	7	8	9	10	
I would like to leave an inheritance.	0	1	2	3	4	5	6	7	8	9	10	

 90%

<< Prev

Next >>

3. Preferences and expectations

The final set of questions covers risk preferences, patience, expectations about needing long-term care and house price expectations

Risk preferences

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 one 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		

 91%

<< Prev

Next >>

3.Preferences and expectations

Long-term care expectations and preferences

In the future when you are getting older, you may need someone to care for you and help you with your activities of daily living. In the following table, please tick all answers that apply to you.

	Spouse	Children and/or grandchildren	Caregiver living in home	Caregiver visiting home	Nursing home
Who is the most likely to provide care for you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Who do you prefer to provide care for you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 95%

<< Prev

Next >>

3.Preferences and expectations

House price expectations

Over the last five years, do you think the value of your home:

- Increased a lot (greater than 20%)
- Increased moderately (between 5% and 20%)
- Remained rather stable (between 5% and -5%)
- Decreased moderately (between -5% and -20%)
- Decreased a lot (greater than -20%)

 97%

<< Prev

Next >>

3.Preferences and expectations

In the next 5 years do you think the value of your home:

- Increased a lot (greater than 20%)
- Increased moderately (between 5% and 20%)
- Remained rather stable (between 5% and -5%)
- Decreased moderately (between -5% and -20%)
- Decreased a lot (greater than -20%)

 98%

<< Prev

Next >>

Survey feedback

How clear do you think the questions in this survey are?

- Completely clear
- Mostly clear
- Sometimes clear
- Sometimes confusing
- Mostly confusing
- Completely confusing



Appendix B

B.1 The pilot reverse mortgage product in China

Happy Life Insurance issued an income stream type RM. This contract has an embedded ‘no negative equity guarantee’, similar to the US home equity conversion mortgage (HECM). The ‘no negative equity guarantee’ property ensures that households do not have to pay anything out-of-pocket (except the housing asset) to terminate the contract. If the loan account balance is lower than the house price, the remaining proceeds will be delivered to the heirs of the household. Therefore, a household can enjoy the upside risk of the house price and the provider will bear the downside risk of the house price. It is important to note that when a household enters the contract, a loan account is set up. The loan amount will be settled when the household sells the property or passes away. The general income stream type reverse mortgage will deliver an amount of \$x per month, and this amount will be added to the loan account. In addition, an interest rate of r% p.a. is charged each month on the loan account balance.

The product issued by Happy Life Insurance is further split into two streams: ‘with death benefit’ and ‘without death benefit’. For simplicity, further detail regarding the ‘without death benefit’ stream is presented. This product splits the retirement period of the household into two periods; the first N years is termed the ‘deferred annuity premium paying period’ and the second period the ‘no premium required period’. In the first N years, apart from being charged \$x per month for the benefit received, the household is charged another amount, \$y, annually, and this amount is also added to the loan account at the start of each year. This amount is treated as the premium for the deferred annuity. After N years, i.e. upon entering the second period of the contract, the households are neither charged x per month nor y per year, but they are still eligible to the benefit of \$x per month. This is because the amount \$y per year in the first N years covers the rest of the benefit, which is \$x per month for the rest of the individual’s life. This part can be treated as a deferred annuity. The interest rate charged each year on the loan account is fixed at the start of the contract, which is 5.5% p.a (the current conventional mortgage rate in China is around 5%). compounded monthly. Only individuals aged 60 to 85 are eligible to enter the contract.

The other stream of the product includes a death benefit. For this stream of the product, the deferred annuity component of the contract carries a ‘Cash Value’ such that when the contract is complete, the heirs of the household are eligible to receive the ‘Cash Value’ as a bequest. Therefore, the deferred annuity annual premium will be higher than the product without death

benefit. In addition to the annual administrative fee and the one-off notary fee, a transaction fee and lawyer fee will be charged to the loan account. Table 5.5 illustrates the benefit received and the deferred annuity premium (in terms of RMB) paid by a male with starting age of 60 to 85 per RMB 1,000,000 housing assets.

Figure B.1: Illustrative example of the Happy Life Insurance reverse mortgage for a male aged 60

Age	60	86
Events	Start of contract	End of period <i>N</i>
Amount add to loan each year	$12x + y$	0
Income per month	x	x

Table B.1: Illustrative example of the Happy Life Insurance reverse mortgage for a male aged 60-85 to enter the contract comparing 'with death benefit' and 'without death benefit'.

Age	Without death benefit		With death benefit		Deferred annuity premium paying period
	Deferred annuity annual premium	Benefit per month	Deferred annuity annual premium	Benefit per month	
60	2,544	2,514	7,107	2,124	26
61	2,850	2,624	7,830	2,199	25
62	2,587	2,646	7,616	2,217	25
63	2,911	2,766	8,409	2,296	24
64	3,285	2,894	9,302	2,380	23
65	3,719	3,031	10,312	2,468	22
66	4,226	3,177	11,457	2,560	21
67	4,822	3,334	12,761	2,656	20
68	4,384	3,372	12,412	2,686	20
69	5,034	3,546	13,891	2,790	19
70	5,810	3,734	15,595	2,898	18
71	6,740	3,938	17,572	3,013	17
72	6,128	3,990	17,088	3,054	17
73	7,173	4,219	19,348	3,180	16
74	8,453	4,470	22,006	3,312	15
75	10,036	4,744	25,159	3,453	14
76	9,145	4,821	24,472	3,512	14
77	10,992	5,135	28,174	3,668	13
78	13,343	5,484	32,660	3,834	12
79	12,168	5,584	31,754	3,911	12
80	15,009	5,989	37,155	4,098	11
81	13,651	6,105	36,064	4,191	11
82	16,204	6,216	40,298	4,158	10
83	14,707	6,344	39,042	4,266	10
84	18,672	6,795	46,245	4,441	9
85	24,667	7,463	56,710	4,727	8

B.2 Variable definitions

Variable	Definition
<i>Long-term care insurance demand</i>	
Wealth allocated to long-term care insurance	A numerical variable that ranges between 0 and 1, the percentage of total wealth allocated to the long-term care insurance premium
Preferred scenario Product S/ Products S and R/ Products S and H	Indicator variable that equals one if the participant prefers the scenario in which only Product S is available/Products S and R are available/Product S and H are available and zero otherwise.
<i>Economic factors</i>	
Household savings	Indicator variable that equals one if the participant reports household savings excluding all properties (including saving accounts, term deposits, government bonds, stocks, shares in investment fund) above the sample median, and zero otherwise.
Household debt	Indicator variable that equals one if the participant reports household debt excluding all mortgages (including for example money borrowed from relatives, friends, or using credit cards, and bank loans other than mortgages above the sample median, and zero otherwise.
Household income	Indicator variable that equals one if the participant reports a household income (including bonuses and pension income) in the last year after paying tax and social security contribution above the sample median, and zero otherwise.
Social insurance	Indicator variable that equals one if the participant has social insurance, and zero otherwise
Property value	Indicator variable that equals one if the participant reports a property value (in RMB 1,000,000) above the sample median, and zero otherwise.
Mortgage amount	Indicator variable that equals one if the participant has a mortgage amount greater than the sample median, and zero otherwise.
<i>Demographic factors</i>	
Age	A polychotomous variable that equals one if the participant is 45-49 years and rising by one in five-year steps.
Retired	Indicator variable that equals one if the participant is retired, and zero otherwise.
Female	Indicator variable that equals one if the participant is female, and zero for male.
Married	Indicator variable that equals one if the participant is married (including living in a long-term partnership), and zero otherwise.
1+ child	Indicator variable that equals one if the participant has at least one child, and zero otherwise.
Daughter	Indicator variable that equals one if the participant has at least one daughter, and zero otherwise.
Child same household	Indicator variable that equals one if the participant has a child living in the same household, and zero otherwise.
College above	Indicator variable that equals one if the highest level of education attained by the participant is a college degree or above, and zero otherwise.
Tier 1 city	Indicator variable that equals one if the participant lives in a Tier I city, and zero otherwise.
<i>Health</i>	

Health	Indicator variable that equals one if the participant's self-rated health status on a five-point scale (1 = excellent ... 5 = poor, coded reversely) is above the sample median, and zero otherwise.
Subjective life expectancy	Indicator variable that equals one if the participant's subjective life expectancy is above the sample median, and zero otherwise.
Smoker	Indicator variable that equals one if the participant is a current smoker, and zero otherwise
<i>Personality and expectations</i>	
Financial literacy and numeracy	Indicator variable that equals one if the participant's financial literacy and numeracy score based on six questions are each above the sample median, and zero otherwise.
Awareness of financial products	Indicator variable that equals one if the number of the thirteen listed financial products that the participant had heard of is above the sample median, and zero otherwise.
Awareness of long-term care insurance	Indicator variable that equals one if the participant had heard of long-term care insurance before participating in the survey, and zero otherwise.
Awareness of RM	Indicator variable that equals one if the participant had heard of reverse mortgages before participating in the survey, and zero otherwise.
House price expectation	Indicator variable that equals one if the participant expects the value of the property to increase a lot (more than 20%) or increase moderately (5%-20%), and zero otherwise.
Trust in banks	Indicator variable that equals one if the participant's rating of the statement "Banks can generally be trusted" on an eleven-point scale (0 = Totally disagree... 10 = Totally agree) is above the sample median, and zero otherwise.
Trust in insurer	Indicator variable that equals one if the participant's rating of the statement "Insurance companies can generally be trusted." on an eleven-point scale (0 = Totally disagree... 10 = Totally agree) is above the sample median, and zero otherwise.
Thought of long-term care	Indicator variable that equals one if the participant has thought about how to pay for long-term care expenses before participating in the survey, and zero otherwise
Intended bequest	Indicator variable that equals one if the participant's rating of the statement "I would like to leave an inheritance." on an eleven-point scale (1 = Certainly not ... 10 = Certainly yes) is above the sample median, and zero otherwise.
<i>Product and survey understanding</i>	
Subjective product understanding	Indicator variable that equals one if the participant's self-rated product understanding in Tasks 1, 2, and 3 are all above the sample median, and zero otherwise.
Product quiz	Indicator variable that equals one if the participant's number of correct answers to the product quiz questions is above the sample median, and zero otherwise
Survey clarity	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, coded reversely) is above the sample median, and zero otherwise.
Passed IMC	Indicator variable that equals one if the participant answered the instructional manipulation check correctly, and zero otherwise.
Survey time	Indicator variable that equals one if the time taken by the participant to complete the survey was above the sample median, and zero otherwise.
<i>Treatments</i>	
Product R first	Indicator variable that equals one if the participant saw Product R before Product H, and zero otherwise.
High premium in example	Indicator variable that equals one if the participant saw the example with higher premiums

B.3 Pricing of the long-term care insurance products

B.3.1 CLHLS and CHARLS data

We use data from the Chinese Longitudinal Healthy Longevity Survey (CLHLS) and the China Health and Retirement Longitudinal Study (CHARLS) to estimate the health transition model. CLHLS and CHARLS contain detailed information on health status, socioeconomic characteristics, family structure, and other demographic covariates of the elderly in different areas of China.

CLHLS is conducted by the Center for Healthy Aging and Family Studies at the National School of Development at Peking University. The baseline survey of CLHLS was conducted in 1998 and covered 22 provinces in China. The data were collected from face-to-face home-based interviews and physical capacity tests. The CLHLS targets the elderly aged 80 or above in the sample cities and rural areas. Follow-up surveys were conducted in 2000, 2002, 2005, 2008, 2011, 2014, and 2018, and these surveys contain replacements for deceased elderly. From 2002, CLHLS has been expanded to target a broader group of the population, including elderly aged 65 or above, and collects a large set of health, disability, demographic, family, socioeconomic, and behavioral risk factors.

CHARLS is conducted by the China Center for Economic Research at Peking University. The baseline survey of CHARLS was conducted in 2011 and 2012 and covered 28 provinces in China. The target population of these surveys is elderly aged 45 or above in the sample cities and rural areas. Follow-up surveys were conducted in 2013, 2015, and 2018.

We designed the experimental survey for this chapter in 2018-2019 and used CLHLS and CHARLS data for 2000-2015. Our sample includes individuals who are aged above 45 living in the urban area. The total sample size of the CLHLS and CHARLS is 28,354, but a lot of observations are in older ages. As the data was not collected regularly, we use the age of each individual at the beginning and the end of the period to determine the transition period. We estimate the model using one-year age groups for the age range 65-99. We group all the individuals aged 100 or above in the “100+” group and those aged below 65 will be grouped in a five-year interval, i.e., 45-49, 50-54, 55-59, and 60-64. We estimate separate models for males and females.

We use ADL limitations as the measure of health states. Six ADL items were evaluated in both CLHLS and CHARLS: bathing, dressing, eating, using the toilet, continence, and transferring in and out of bed. Individuals reported their ability to perform these activities using three

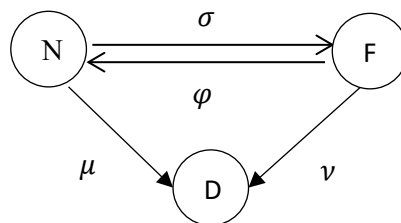
categories: do not need help, need partial help, and need full assistance. We classify an individual as being able to perform an ADL only if they do not need help. We define an individual as disabled if he/she has difficulties performing at least 3 of the ADLs. This definition is one of the triggers of benefit payments for many existing private critical illness insurance policies in China, such as the policies issued by Ping An Insurance and China Pacific Insurance.

We calculate the central exposed to risk for both healthy and disabled health states using the exact interview date, birth date, and death date. If these dates are missing, we use the 15th of the reported month. We assume that the transitions of health states happened in the mid-point between two survey waves.

B.3.2 Generalized linear model (GLM)

Following previous actuarial research (Renshaw and Haberman, 1995; Fong *et al.*, 2015; Hanewald *et al.*, 2019), we consider a Markov process as the basis for modeling long-term care status transitions and apply generalized linear models to estimate the transition probabilities. We consider a three-state Markov process as shown in Figure 5.10. The three health states are “N” (nondisabled), “F” (functionally disabled), and “D” (dead, absorbing state).

Figure B.2: Three-State Markov Process.



We consider four health transitions:

- $\sigma: N \rightarrow F$, the intensity for a healthy individual to become functionally disabled
- $\varphi: F \rightarrow N$, the intensity for a functionally disabled individual to recover
- $\mu: N \rightarrow D$, the mortality intensity for a healthy individual
- $\nu: F \rightarrow D$, the mortality intensity for a functionally disabled individual

The transition probabilities are assumed to follow a time-homogenous Markov process, which is time-independent, and where the transition probabilities only depend on the current state but not the history. So, we have the following equation:

$$P_{i,j}(x, t) = \Pr(S(x + t) = j | S(x) = i). \quad (5.1)$$

Under the GLM approach, there are three components to be specified: the probability distribution, the linear predictor, and the link function.

Probability distribution: The transition intensities of each one-year age group are assumed to be constant in a given time interval (between two survey waves), and the number of transitions is assumed to follow a Poisson distribution. In the following, we use the mortality intensities of a healthy individual at age x as an example to show the relationships of linear predictor and link function with the intensities. Let $n_x^{h,d}$ be the number of transitions from state H to D at age x :

$$n_x^{h,d} \sim \text{Poisson}(e_x^H \mu_x),$$

where e_x^H represents the central exposed to risk of the health state H at age x .

Linear predictor: Following Fong *et al.* (2015), we model the health transitions as polynomial functions of age. Therefore, the linear predictor is given by:

$$\eta_x = \beta_0 + \sum_{i=1}^n \beta_i x^i, \quad (5.2)$$

where x represents the age, and β_i are the coefficients to be estimated.

Link function: We use the log link function $g(\cdot)$ as in Fong *et al.* (2015) and Hanewald *et al.* (2019). Following the example above, we have the following link function:

$$g(\mu_x) = \ln(\mu_x) = \eta_x. \quad (5.3)$$

Model estimation

We use maximum likelihood estimation to estimate the parameters of the GLMs. Let Φ be the set of parameters. The log-likelihood function is given by (using the mortality intensities of a healthy individual as an example):

$$l(\Omega) = \sum_x [n_x \ln(e_x^H \mu_x(\Phi)) - e_x^H \mu_x(\Phi)] \quad (5.4)$$

We use the Bayesian information criterion (BIC) to choose the functional form in Equation (2). We select the model with the smallest BIC value as the preferred model under the proposed GLM. Table 5.7 shows the BIC of the four nested models, while Table 5.8 shows the coefficients of the selected model.

Table B.2: BIC for different nested models.

	Model	β_0	$\beta_0 + \beta_1x$	$\beta_0 + \beta_2x^2$	$\beta_0 + \beta_1x + \beta_2x^2$
σ	Male	1,036.37	441.51	435.69	438.06
	Female	1,500.77	568.46	577.09	569.48
μ	Male	3,835.29	546.23	644.36	545.94
	Female	4,577.01	531.58	727.17	469.29
γ	Male	314.21	296.92	301.7	296.47
	Female	460.75	384.82	388.77	389.2
ν	Male	618.98	399.12	409.57	401.4
	Female	613.21	368.96	374.31	373.34

Table B.3: Coefficients of different nested models.

	Model	β_0	$\beta_0 + \beta_1x$	$\beta_0 + \beta_2x^2$	$\beta_0 + \beta_1x + \beta_2x^2$
σ	Male	-5.219***	--	9.414***	-5.219***
	Female	-6.231***	6.944***	--	-6.231***
μ	Male	-6.555***	1.182***	3.440*	-6.555***
	Female	-9.165***	22.599***	15.165***	-9.165***
γ	Male	-1.191***	-6.826**	7.124*	-1.191***
	Female	-1.135***	3.362***	--	-1.135***
ν	Male	-3.824***	5.557***	--	-3.824***
	Female	-3.843***	5.220***	--	-3.843***

After estimating the GLMs, we calculate the health state transition matrix. The following matrix is an example for a male aged x :

$$T_{male}(x, x + 1) = \begin{bmatrix} p_{N,N}^{male}(x, x + 1) & p_{N,F}^{male}(x, x + 1) & p_{N,D}^{male}(x, x + 1) \\ p_{F,N}^{male}(x, x + 1) & p_{F,F}^{male}(x, x + 1) & p_{F,D}^{male}(x, x + 1) \\ 0 & 0 & 1 \end{bmatrix}, \quad (5.5)$$

where $p_{y,z}^{male}(x, x + 1)$ is the transition probability that the individual transitions from health state y to health state z between age x and age $x + 1$.

Calculation of the long-term care insurance premium

In the experimental task, all individuals are assumed to be healthy and age 60 for males or 55 for females. To calculate the transition probabilities to age $60 + a$ of a healthy male aged 60, we use the following matrix multiplication:

$$\begin{aligned} & [p_{h,h}^{male}(60, 60 + a) \quad p_{h,f}^{male}(60, 60 + a) \quad p_{h,d}^{male}(60, 60 + a)] \\ & = [1 \quad 0 \quad 0] \times \prod_{i=1}^a T_{male}(60 + i - 1, 60 + i). \end{aligned} \quad (5.6)$$

Each entry of the resulting array is the probability of the transition from healthy to the corresponding health state at age $60 + a$ of a healthy male aged 60. Assuming a limiting age

of 100, we can use the above formula to obtain the transition probabilities to age 61 up to 100 by varying a from 1 to 40.

The long-term care insurance premium is given by the total expected present value of the benefit, which is the income when the individual becomes disabled. The formula for males is

$$E[\text{LTCI}^{\text{male}}] = \sum_{t=1}^{40} E[\text{benefit}_t^{\text{male}}] \times DF_t, \quad (5.7)$$

where DF_t is the discount factor for the cash flow in t years' time. The long-term care insurance premium for females is calculated using the same methodology.

The long-term care insurance premium for a couple is given by:

$$E[\text{LTCI}^{\text{total}}] = E[\text{LTCI}^{\text{male}}] + E[\text{LTCI}^{\text{female}}]. \quad (5.8)$$

We assume a profit loading of 20% so that the final long-term care insurance premium is 1.2 times the expected present value.

B.3.3 Reverse mortgage

The initial loan of the reverse mortgage component is the price of long-term care insurance. We allow for a maximum loan-to-value ratio at the start of the contract of 40%. In the reverse mortgage pilot program in China, the interest rate charged is 5.5% p.a. plus annual management and policy fees. To simplify the fee structure, we assume no additional fees but instead assume a higher interest rate to capture the fees. We estimate that for an initial loan of RMB 1 million, for a male aged 60 entered into the pilot reverse mortgage agreement, with a life expectancy of 30 years, the management fee is around 0.3% p.a. Therefore, we use an interest rate of 5.8% p.a. for the reverse mortgage loan.

B.3.4 Home reversion plan

Assuming a similar product design as in Alai *et al.* (2014), the home reversion contract involves selling a proportion κ of home equity to the contract provider to finance the long-term care insurance premium. A lease-for-life is embedded in the contract, which reflects the rent on the proportion of the home sold. Therefore, the sale proceeds consist of two components, the lease-for-life agreement and the amount that can be used to finance the long-term care insurance premium, so the following relationship holds:

$$\kappa H_0 = LL + \text{amount can be used for LTC insurance}, \quad (5.9)$$

where H_0 is the current house price, and LL is the value of the lease-for-life agreement.

Let the rental yield be the constant RY . In each period, the value of the lease-for-life agreement would increase if they remain in the property. Assume the house price growth rate is g each year. Then, the EPV of the lease-for-life agreement is:

$$LL = \kappa H_0 \times \sum_{t=1}^{\omega-55} D_t \times RY \times (1+g)^t \times \Pr(\text{stay in the home}_t), \quad (5.10)$$

where ω is the limiting age, which is 100. $\Pr(\text{stay in the home}_t)$ is the probability that the couple will stay in the property for t years, which we calculate as:

$$\begin{aligned} \Pr(\text{stay in the home}_t) &= 1 - \Pr(\text{moving out}_t) \\ &= 1 - p_{h,f}^{male}(60,60+t) \times (p_{h,f}^{female}(55,55+t) + p_{h,d}^{female}(55,55+t)) \\ &\quad - p_{h,d}^{male}(60,60+t) \times (p_{h,f}^{female}(55,55+t) + p_{h,d}^{female}(55,55+t)). \end{aligned} \quad (5.11)$$

First, we compute the probability of the couple moving out of the property. The couple will need to move out of the property only when both are functionally disabled, one of them is dead and the other one is functionally disabled, or both are dead. As the sum of the probabilities of staying in the property and moving out of the property equals one, by rearranging the equation, the probability of staying in the property can be obtained. Therefore, to pay RMB 1 of long-term care insurance premium, the proportion of the property to sell is:

$$\kappa = \frac{1}{H_0 \times (1 - \sum_{t=1}^{\omega} D_t \times RY \times (1+g)^t \times \Pr(\text{stay in the home}_t))}. \quad (5.12)$$

B.3.5 Data sources

Variable	Value	Note	Source
House price growth (p.a.)	5.00%	Annual house price growth in over 70 cities in China was 4.2% p.a. during 2005-2018. We round up to 5% p.a.	Residential Property Prices for China https://fred.stlouisfed.org/series/QCNN628BIS Retrieved on 20 January 2019.
Long-term care cost inflation (p.a.)	5.00%	The main cost of long-term care is the residential cost (Kalseth and Halvorsen, 2020). Therefore, we assume it has the same growth as the house price growth.	
Rental yield (p.a.)	1.80%	The rental yield of the major cities in China is around 1.8% in 2018.	Gross rental yields https://www.globalpropertyguide.com/Asia/china/Rental-Yields Retrieved on 20 January 2019.
Long-term care cost in 2018 (Tier 1 cities)/month	RMB 11,500 (USD 1,710)	Tier 1 cities are Beijing, Shanghai, Guangzhou, and Shenzhen, and other cities included in this study are Tier 2 cities.	Cost of residential nursing home per month https://www.daojia.com/jiage/bj/yanglaoyuan/
Long-term care cost in 2018 (Tier 2 cities)/month	RMB 9,500 (USD 1,410)	The cost is calculated from the average of each Tier.	Retrieved on 12 th January 2019.
Discount rate (p.a.)	3.50%	Current inter-bank rates	https://tradingeconomics.com/china/interbank-rate

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