**CAS RESEARCH PAPER**

# UNDERSTANDING THE DEMAND FOR INCLUSIVE INSURANCE: A PILOT STUDY

*By Ida Ferrara, Ph.D., Edward Furman, Ph.D., Tsvetanka Karagyozova, Ph.D.*

CASUALTY ACTUARIAL SOCIETY

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# Executive Summary

The goal of this study is to pave the way for a more comprehensive assessment of the potential benefit of microinsurance (MI) to low-income households in any country, regardless of its level of development, by piloting and implementing a survey instrument to enhance our understanding of the drivers of risk- and insurance-related decisions pertaining to the purchase of health, life and property insurance. For our purposes, we take MI to refer to the provision of conventional insurance products with small limits and simple coverages to low-income individuals. Below are key messages from this pilot work on the drivers of the demand for MI based on a unique Canadian dataset, which will inform its future iterations in a broader analytical framework that will bring together demand and supply.

## Key Messages

- The risks that preoccupy most individuals are physical well-being and mental well-being, including the well-being of children and children's safety for those households with children.
- However, among all relevant risks, the most frequently listed top-ranked risk is losing employment or not being able to work for health reasons, followed by physical and mental well-being.
- Individuals tend to recognize the importance of insurance but to have no trust in insurers. This is more so among those who experience a risk event and who are also more likely to have an opinion.
- A key factor in the decision to buy insurance is the risk comfort index which combines the belief that the probability that a risk event occurs is low with the perception that the consequences of risk events are manageable. When the index increases (i.e., people are more comfortable with risk), the probability of buying insurance decreases.
- Among different types of risk events (health, life, property), the predicted probability of buying property insurance is always the highest (85%, with the second highest probability for life insurance estimated at 57%); the predicted probabilities of buying property insurance and life insurance are also the most responsive to a change in the risk comfort index, decreasing, on average, by 7.3 and 13.9 percentage points as the index increases by one unit.
- Among the most risk averse individuals, the predicted probability of buying health, disability, and flood insurance ranges between 30% and 40%, which is much lower than the 73% for life insurance and 92% for property insurance; we can take these differences as suggesting risk events (e.g., flood) which are more likely to benefit from MI opportunities.
- The risk comfort index also impacts the willingness to pay (WTP) decision, but other factors are at play in this decision, most importantly how people feel about insurance. Specifically, a benign view of insurance, which reflects an appreciation for and trust in insurance, tends to increase WTP, while a malign view of insurance, which reflects distrust in insurance, tends to decrease WTP.
- The positive effect of the benign view of insurance on WTP is consistently stronger than the negative effects of the malign view of insurance and of the risk comfort index; the three attitudes tend to be more impactful on the WTP for more comprehensive policies, whenever two policies are available (for injury, critical illness, and life), while the positive view and risk comfort indices tend to have larger effects on the WTP for property insurance.
- The main implication of the WTP analysis as to the benefit of MI options lies in the prospect that they promote a more positive view of insurance companies, appealing to concepts such as social business, a consumer-centered approach, and corporate social responsibility.
- For both the buying decision and the WTP decision, there is a clear and consistent indication that decisions across areas are related via the error terms: any unsystematic effect on the decision in one area is coupled with a qualitatively similar unsystematic effect on the decision in another area.

# 1. Introduction

While financial inclusion is not one of the United Nations' 2030 Sustainable Development Goals (SDGs), it is "positioned prominently as an enabler of other developmental goals," including poverty eradication and income inequality reduction.[1] Although poverty and income inequality may have very different faces in developed and developing nations, they are not a relic of the past in high-income countries. The Organisation for Economic Co-operation and Development (OECD, 2008) finds a trend of rising income inequality and poverty in its member states starting from the mid-1980s, with Canada highlighted as one of the countries that has experienced the most significant gains in inequality between the mid-1990s and mid-2000s. According to Murphy et al. (2012), low income is transitory; however, about 1 in 5 individuals in Canada experienced low income in at least one six-year interval over the 34-year period from 1976 to 2009, with the incidence of low income concentrated among single-parent households, recent immigrants, seniors, children, people with disabilities, and Aboriginal persons. In terms of spatial distribution, income inequality is more pronounced in large metropolitan areas (Bolton and Breau, 2012), with poverty geographically concentrated in some neighborhoods within urban centers (Hulchanski, 2007).

As an enabler of SDGs, financial inclusion is thus a goal relevant not only to low-income economies but also to high-income economies that have almost achieved universal access to basic financial services such as bank accounts. Notably, access to finance does not necessarily translate into use of finance. For example, only 3% of all Canadians are unbanked but 15%, about 5 million, are considered underbanked (ACORN Canada, 2016).

An aspect of financial inclusion, **microinsurance** (MI), a term we take to be equivalent to **inclusive insurance**, is hoped to follow in the steps of its closely related cousin, microfinance, in becoming the next "revolution," enabling the development agenda. The idea is that MI can help bridge the gap between market-based and social interventions to provide financial protection to low-income groups in developed countries. Equivalently, MI can create social and economic value while reinforcing a company's strategy and can thus play an important role in helping break the cycle of poverty by protecting low-income populations against different types of risks. This idea reflects a new business concept, referred to as "social business" and originally developed in the context of poor countries, which focuses on social goals in the presence of business spillovers as opposed to business goals in the presence of social spillovers. Social businesses share three characteristics: (1) they aim at alleviating social problems; (2) they are sustainable; and (3) they involve reinvestment of profits, if any, in the businesses.

Our goal is to assess the potential for the application of key aspects of the social business model in the insurance sector by considering MI holistically, both theoretically and empirically and through the lens of each market agent (i.e., the consumer, the producer, the

[1] UNCDF. Financial Inclusion and the SDGs. http://www.uncdf.org/financial-inclusion-and-the-sdgs.

regulator). The objective is to better understand people at the bottom of the pyramid in order for regulators to come up with frameworks to address challenges MI presents and for industries like insurance and finance to create new business models while improving the lives of poor people. As a concept that appeals to the social business model, MI entails approaching innovation with a focus on consumers as opposed to products. Unlike a low-cost business which services low-income individuals by producing low-quality versions of its products, a social business does not reduce cost by redesigning products or manufacturing processes but looks for integrated solutions to offset costs in one component with savings in other components, often partnering with non-profits and public agencies or working with distributors on a non-commercial basis.

In pursuing our goal, we posit that the focus on consumers to promote innovation and on integrated solutions to increase accessibility is crucial to realizing the full potential of MI. Correspondingly, a first step in promoting MI as a tool to reduce financial exclusion in the developed world necessitates a deeper understanding of the target groups (i.e., low- to mid-income individuals), the risks they face, the risk-coping mechanisms available to them, and the main obstacles and barriers (behavioral, cognitive, regulatory, and institutional) that limit their access to and use of financial services in general and insurance in particular. Such a deeper understanding is important not only to identify the type of consumer-tailored solution that might work but also to inform how to promote the behavioral change that a viable solution might require. A second step necessitates a deeper understanding of supply-side constraints and a formal analysis of opportunities that exist to address the perceived low profitability and high volatility of MI through risk interdependence and diversification possibilities (hence, integrated solutions). The focus of this pilot study is, however, on the first step.

As it stands, MI has witnessed an explosive growth over the last decades in developing countries but has yet to make its way into the developed world despite its relevance and potential. In 2006, MI covered 75 million low-income individuals in developing countries all over the world (Roth et al., 2007), while this number increased to 135 million in 2009 (Lloyd's, 2009) and to nearly 500 million in 2011 (Churchill and McCord, 2012). Nevertheless, the current outreach of MI is far below its estimated global market potential of 4 billion people that could generate premium income of $40 billion (Swiss Re, 2010). This modest reach of MI relative to its potential has created a puzzle in the academic literature: theory predicts higher take-up rates of MI than observed.

Our understanding of the avenues for enhancing the quality and reach of financial services and products in general and insurance in particular (hence, MI) is limited by the lack of reliable, representative micro data on financial exclusion on the demand side and of appropriate pricing models on the supply side. To the best of our knowledge, publicly available micro data on access to insurance services in Canada are not available. To get a glimpse of the use of private insurance products and the socio-demographic characteristics of the uninsured in Canada in preparation of this report, we had a look at data from the 2014 Canadian Community Health Survey (CCHS) of Statistics Canada, which includes an optional module on supplementary health insurance administered in Ontario and New Brunswick. We focused on health insurance not only because of data availability but because health risk is one of the most important risks faced by MI clients in developing

countries, in terms of both likelihood and financial impact (Janssens and Kramer, 2016; Biese et al., 2018). In Canada, a large private market for supplementary health services coexists with the publicly funded health care system. The private sector funds about 30% of health expenditure in Canada amounting to an estimated $73 billion in 2017, with a trend of shifting this burden over time to private health insurance (CIHI, 2017).[2]

Our analysis of the CCHS data indicates that prescription medication is the most popular supplementary health insurance cover (purchased by about 73% of the population in Ontario), dental insurance is a close second, and hospital charges insurance is the least popular (purchased by 50% of the population in Ontario). Even though the provincial government of Ontario funds supplementary benefits for certain vulnerable groups (e.g., low-income residents, seniors, and children), those who are uninsured tend to be low-income individuals (with income less than $40,000), widowed, divorced, separated, single, recent immigrants, visible minorities, and employed in the sales and services sectors. These simple statistics indicate that (1) a sizable portion of the population does not have supplementary health insurance and (2) the uninsured tend to come from the most vulnerable strata of the population.[3] This suggests that MI is a viable market niche in Canada.

Despite its importance as a policy tool, there is no generally agreed upon definition of MI among researchers, practitioners, and regulators alike. For our purposes, we adopt three major characteristics of MI as guiding principles in the way we think of MI in a developed country. Churchill (2007) defines MI as "the protection of low-income people against specific perils in exchange for regular premium payments proportionate to the likelihood and cost of the risk involved" (p. 402). Churchill's definition emphasizes the importance of the **target group** in defining MI, while the International Association of Insurance Supervisors (IAIS, 2007) emphasizes the importance of governing principles: "MI is … managed **based on insurance principles and funded by premiums**" (p. 10). Thus, both Churchill and IAIS agree that MI should operate based on market principles and, therefore, does not include government-run social security schemes, which are either not funded by premiums or the premiums collected are not commensurate with the underlying risk and/or benefits are not paid from the collected premiums in the insurance pool. In contrast, Biese et al. (2018) emphasize that MI is not simply a scaled-down version of conventional insurance products but rather "insurance **specifically designed to meet the needs of the poor**" (p. 1). The above three characteristics resonate with the social business dimension of MI and emphasize the need to understand the target group in order to take its specific characteristics into account when designing, delivering, and administering MI products (consumer-focused innovation), which is the focus of this pilot study, as well as the need to rely on market principles to develop affordable and sustainable MI products (integrated market solutions), an aspect to explore in future work.

[2] https://www.cihi.ca/sites/default/files/document/cihi-annual-report-2017-2018-en.pdf.

[3] The graphical descriptions of these results are in Appendix A.

# 2. Literature Review

Most relevant to this study is the empirical literature on the demand for insurance. Empirical research on insurance purchasing decisions is grounded in the pioneering work of Yaari (1964, 1965) who models the demand for life insurance within a dynamic, intertemporal framework of saving and consumption decisions with uncertain lifespan. Within this setup, the demand for life insurance is a function of wealth, income, price, interest rates, discount rates, and the (administrative) cost of life insurance policies. According to Outreville (2013), it is possible to generalize this theoretical model "to the consumption of all insurance products as part of a basket of securities available to the consumer" (p. 80).

The extensive empirical literature on factors underlying the demand for insurance includes both national and cross-country studies as well as studies of the two sectors of the market: life and non-life insurance. Outreville (2013) groups the determinants of the demand for (conventional) insurance into economic, demographic, social and cultural, and institutional factors. Among the economic factors, disposable income and permanent income have a positive effect on demand (Fortune, 1972; Outreville, 1985; Beck and Webb, 2003; Nakata and Sawada, 2007), while the price of insurance has a predictable negative impact (Babbel, 1985; Browne et al., 2000; Beck and Webb, 2003; Li et al., 2007). The impact of other economic factors such as income inequality is ambiguous (Beenstock et al., 1986; Nakata and Sawada, 2007; Feyen et al., 2011), possibly because the impact of income distribution on insurance demand is conditional on the economy's level of development. Demographic factors such as population size/density and urbanization as well as social and cultural factors such as education tend to increase the demand for insurance (Mantis and Farmer, 1968; Truett and Truett, 1990; Ward and Zurbruegg, 2002; Webb et al., 2002; Beck and Webb, 2003; Feyen et al., 2011; Millo and Carmeci, 2011; Lee and Chiu, 2012). Interestingly, the impact of risk aversion on insurance demand is ambiguous (Browne et al., 2000; Esho et al., 2004). Structural factors such as financial development have a positive impact on demand (Feyen et al., 2011; Millo and Carmeci, 2011), while a non-competitive market structure, market concentration, and political risk affect the demand adversely (Feyen et al., 2011; Park and Lamaire, 2012). Typically, the tendency is to employ a common set of factors to explain the (individual) demand for both life and non-life insurance, especially in cross-country studies, with some exceptions. For example, age and the age dependency ratio are common explanatory variables in national studies of the determinants of life insurance demand while they are absent in corresponding studies of non-life insurance demand. The corporate demand for insurance is less well understood, and studies in the field are largely grounded in the works of Mayers and Smith (1982, 1987, 1990) and Main (1982, 1983).

While there seems to be a shared understanding about the determinants of the demand for conventional insurance, until recently our understanding of these determinants for MI demand was limited to practitioners' field studies. There is no reason to believe that, theoretically, there should be a difference between the factors that affect the demand for conventional insurance and those that affect the demand for MI, but the impacts may be different in terms of direction and/or size (Eling et al., 2014). For example, income and wealth can affect the demand for traditional insurance and MI via different channels. In empirical studies of traditional insurance, wealth and income are typically used as proxies for the potential loss and, as such, are expected to have a positive effect on the demand for

insurance (Outreville, 2013). While, a priori, the effect of income/wealth on MI is also expected to be positive, empirical studies point out that income and wealth in developing countries act as a proxy for access to finance and liquidity constraints. On one hand, Gollier (2003) shows that wealth accumulation can serve as a self-insurance strategy in the presence of liquidity constraints and only those with binding liquidity constraints will purchase insurance, thus predicting a higher demand for MI among low-income groups. On the other hand, access to finance and liquidity constraints serve as a proxy for ability to pay and severely credit-constrained households would, therefore, not be able to afford MI.

Research on the demand for MI, within the context of developing countries, has shed light on factors affecting the demand neglected in research on conventional insurance markets such as trust in the insurance provider, peer effects, informal risk-sharing, and the quality of service (Eling et al., 2014). Several empirical studies with a focus on different developing countries and insurance types suggest that the lack of trust reduces the take up of MI (Zhang et al., 2006; Basaza et al., 2008; Giné et al., 2008; Dercon et al., 2012) which peer effects (e.g., the experience/recommendation of a trusted peer) could offset (Cole et al., 2013). In contrast, there is limited evidence of the impact of trust and peer effects based on the demand for traditional insurance. One possibility is that these factors have been neglected by researchers because of the stronger institutional foundation and the rule of law in developed economies. Financial literacy also appears to be a crucial determinant of the demand for MI, with higher financial literacy associated with higher demand (Giné et al., 2008; Cole et al., 2013). Although the impact of financial literacy on the demand for other financial services is well-documented, research on its impact based on data from developed countries is limited.

In the absence of formal insurance and a limited or non-existent public safety net, informal risk-sharing arrangements become vital in risk mitigation, and community-based insurance mechanisms have long been in existence in developing countries. Borrowing, intergenerational or interfamily transfers in the form of loans, cash or in kind can help a household weather a downturn in income. The question is whether such informal risk-sharing arrangements would complement or crowd-out commercial MI. So far, evidence is ambiguous. Whereas Jowett (2003) finds evidence in support of the crowding-out effect based on data from Vietnam, Mobarak and Rosenzweig (2012) find evidence to the contrary based on a randomized field experiment in India.

In summary, existing evidence suggests that, while a common set of factors drives the demand for both conventional insurance and MI, there are factors idiosyncratic to the MI market which have been neglected in studies of developed economies. These factors, including trust, peer effects, and informal risk-sharing mechanisms, as well as the extent to which they crowd out the demand for commercial insurance will be the focal point of our research project on the demand for MI in Canada based on the findings of this pilot study.

# 3. Demand for Inclusive Insurance in Canada: A Pilot Study

To the best of our knowledge, nationally representative micro data on access to insurance in Canada are not publicly available. Yet, we need data to be able to identify a potential niche for microinsurance in Canada, with the goal of extending the work to other countries as part of a larger project, by assessing gaps between the risks faced by low-income individuals and the risk-mitigation mechanisms available to them. To this end, we designed a survey instrument and, under financial support from York University, the Royal Bank of Canada, and the Casualty Actuarial Society, piloted it in Canada through Forum Research Inc., a market and consumer research firm.

To ensure the data would come from the relevant target audience, namely, low- to middle-income households, we relied on Canada's 2017 low-income measure (LIM) thresholds, adjusted by household size,[4] for the lower bound, and resorted to the upper income limit of the eighth decile for the individual upper bound,[5] extrapolating upper bound figures for varying household size (i.e., 2 through 10) according to the multiplier factor for the one-person household. Specifically, we computed the high-end threshold for an *x*-person household as the corresponding LIM threshold times the ratio of the high-end and LIM thresholds for the one-person household ($71,800 ÷ $23,513). Participation in the study then required the before-tax household income to fall within a certain range varying by household size as follows:

**Qualifying Household Income**

| Household size | Low-End Threshold | High-End Threshold |
|---|---|---|
| 1 person | 23,513 | 71,800 |
| 2 persons | 33,252 | 101,539 |
| 3 persons | 40,726 | 124,362 |
| 4 persons | 47,026 | 143,600 |
| 5 persons | 52,577 | 160,551 |
| 6 persons | 57,595 | 175,874 |
| 7 persons | 62,210 | 189,966 |
| 8 persons | 66,505 | 203,082 |
| 9 persons | 70,539 | 215,400 |
| 10 persons | 74,355 | 227,053 |

[4] Statistics Canada. Table 11-10-0232-01 Low-income measure (LIM) thresholds by income source and household size. DOI: https://doi.org/10.25318/1110023201-eng.

[5] Statistics Canada. Table 11-10-0193-01 Upper income limit, income share and average of adjusted market, total and after-tax income by income decile. DOI: https://doi.org/10.25318/1110019301-eng.

Additionally, as participants would be responding on behalf of their households, they had to be at least 18 years of age and actively involved in the financial decisions of their households. Once recruited via a computer-assisted telephone interview (CATI), respondents would receive a link via e-mail to continue the survey via a computer-assisted web interview (CAWI), answering questions on (*i*) risks and risk-management strategies, with specific focus on health, life, and property, (*ii*) insurance knowledge and use, (*iii*) financial practices, (*iv*) health information, and (*v*) socio-demographics.

Through a probability-based sampling to ensure that the data set would be representative of Canada along several socio-demographic dimensions, Forum Research successfully administered the survey within 2,183 households during the period from August to November 2019, collecting information on 549 variables, including willingness to pay for sample policy packages in each of the areas under consideration, namely, health, life, and property. The final data set, which we employ in the empirical estimation of the demand for insurance and statistical description of the health, life, and property risk experiences, consists of 2,143 observations. For the demand analysis, we weigh the data set to match the distribution of the Canadian population along three dimensions: age and gender jointly and region/province.[6] Given that the administration of the survey was conditional on household income by household size, adjusting the weights to mirror the distribution of income, or for that matter the distribution of education as a correlate of income, would have yielded distortions, and we thus dropped it from consideration.

Our goal is to exploit the full informational potential of this data set and assess the effects of a wide range of factors on insurance purchasing decisions, most notably attitudinal characteristics which may be particularly relevant in income-constrained environments. There are three types of decisions we can investigate: whether to buy (participation), how much to pay for a given coverage (intensity), and how much to pay to switch to greater coverage (incremental intensity). For the sake of this report, our focus is on the first two types of decisions, which we refer to as the selection/participation and intensity (or willingness to pay) decisions. For the former decision, our dependent variable is dichotomous, and we will thus employ a probit regression. For the latter decision, our dependent variable can either be pseudo continuous,[7] although censored at the left end or at both ends, or categorical, and we will then rely on the (censored) linear regression model as well as on the ordered probit specification. In both instances, as the dependent variable is available per cover, we will allow for error correlation between cover-specific equations and resort to conditional mixed process (CMP) modelling to estimate systems of equations that are seemingly unrelated. Finally, for the participation decision, our data admit separation between self-paid insurance and insurance through someone outside the household (e.g., employer), and the participation variable of interest then records whether

[6] The weighting strategy resulted in the elimination of 40 observations for which the male versus female classification was not available.

[7] The pseudo attribute stems from the combination of closed- and open-ended questions generating the data on willingness to pay, which is our measure of intensity. The resulting intensity variable can take on specific values, as provided in the closed-ended questions, or any value in a non-negative half-open interval with an upper bound that corresponds to the lowest specified value in the closed-ended options.

an observation falls in one of three categories: no insurance, self-paid insurance, and externally funded insurance; in this case, as the categories are unordered and the outcomes nominal, we will adopt the multi-nominal logit model to estimate the relative propensity of being in a given category.

## 3.1 A Look at the Socio-Demographic Composition of the Sample

In this sub-section, we describe the data along important dimensions, which reflect the thematic structure of the questionnaire. In terms of socio-demographic factors, the tables below provide frequencies describing our pool of respondents (Table 3.1A) and their households (Table 3.1B). Some noticeable points about the respondents are that most are employed, educated, and born in Canada. At the household level, most households have four or fewer members, have two adults, dwell in a detached house, own their property, and live in Ontario, Quebec, Alberta, or British Columbia.

**Table 3.1A. Socio-Demographics of Respondents**

| AGE | | EMPLOYMENT | | EDUCATION | | GENDER | | PLACE of BIRTH | |
|---|---|---|---|---|---|---|---|---|---|
| Value | % | Value | % | Value | % | Value | % | Value | % |
| 18 – 24 | 7.5 | full time | 49.6 | ≤ grade 8 | 0.3 | female | 50.0 | Canada | 83.4 |
| 25 – 29 | 9.7 | part time | 10.3 | some HS | 3.7 | male | 48.1 | other | 13.7 |
| 30 – 34 | 10.3 | retired | 24.2 | high school | 11.9 | non-binary | 0.4 | no answer | 2.9 |
| 35 – 39 | 8.6 | homemaker | 3.3 | trade school | 15.3 | no answer | 1.4 | | |
| 40 – 44 | 7.9 | unemployed | 2.0 | some college | 28.0 | | | | |
| 45 – 49 | 10.5 | on leave | 2.9 | UG degree | 28.3 | | | | |
| 50 – 54 | 11.6 | student | 3.9 | grad degree | 11.8 | | | | |
| 55 – 59 | 5.1 | other | 2.7 | no answer | 0.8 | | | | |
| 60 – 64 | 8.0 | no answer | 1.0 | | | | | | |
| ≥ 65 | 20.8 | | | | | | | | |

**Table 3.1B. Socio-Demographic and Contextual Characteristics of Households**

| PROVINCE | | HH SIZE | | NO. of ADULTS | | DWELLING | | OWNERSHIP | |
|---|---|---|---|---|---|---|---|---|---|
| Value | % | Value | % | Value | % | Value | % | Value | % |
| Alberta | 13.7 | 1 | 19.1 | 1 | 4.0 | detached | 59.6 | rent | 33.2 |
| BC | 17.1 | 2 | 38.3 | 2 | 72.9 | apartment | 22.2 | own | 66.8 |
| Manitoba | 4.0 | 3 | 18.3 | 3 | 14.9 | townhouse | 10.1 | | |
| NB | 2.0 | 4 | 15.9 | 4 | 6.5 | other | 8.2 | | |
| Newfoundland | 1.2 | 5 | 6.1 | 5 | 1.6 | | | | |
| Nova Scotia | 2.3 | 6 | 1.6 | 6 | 0.2 | | | | |
| Ontario | 33.4 | 7 | 0.5 | 7 | 0.1 | | | | |
| PEI | 0.4 | 8 | 0.2 | | | | | | |
| Quebec | 21.8 | 9 | 0.1 | | | | | | |
| Saskatchewan | 4.2 | | | | | | | | |

Given our focus on low- to middle-income households, which are more likely to face barriers that constrain their access to and use of financial services in general and insurance in particular, we depict some additional information about the income distribution of our sample in the figures that follow.

**Figure 3.1a. Income per Household Member**

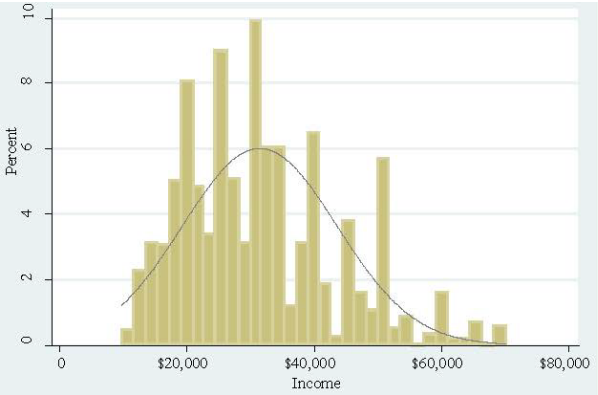
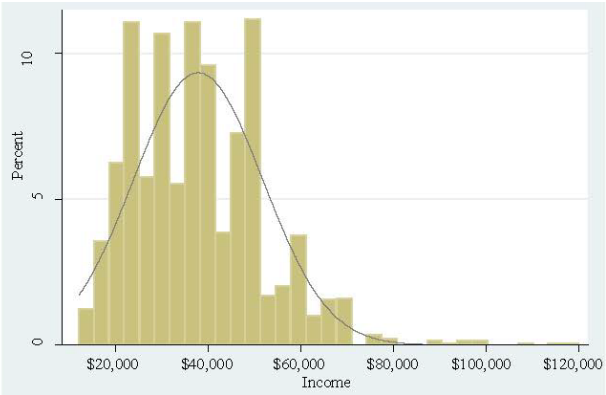



**Figure 3.1b. Income per Household Adult**




When we look at the distribution of income per member (Figure 3.1a) or per adult (Figure 3.1b), we notice that most households (about 95%) have a per capita income level of

$50,000 ($60,000 in the per adult case) or less, and the highest per capita income level is $70,000 ($120,000 in the per adult case, but in excess of $70,000 only in 26 cases).

**Figure 3.1c. Distribution of HH Income by HH Size**

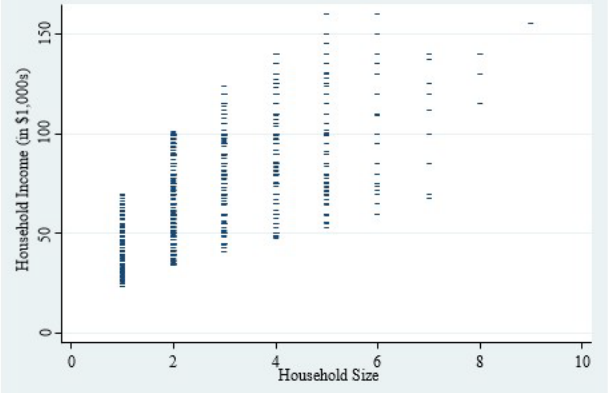
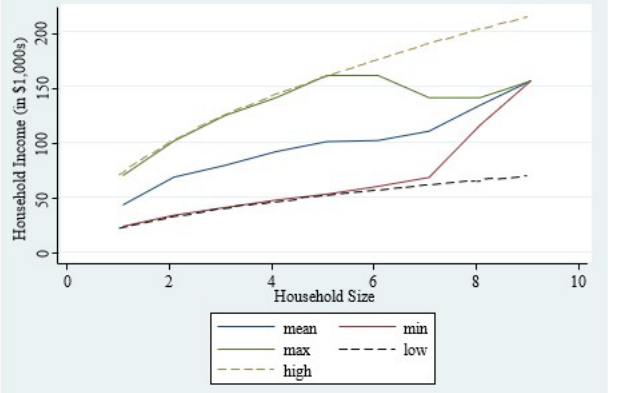



**Figure 3.1d. HH Income by HH Size**

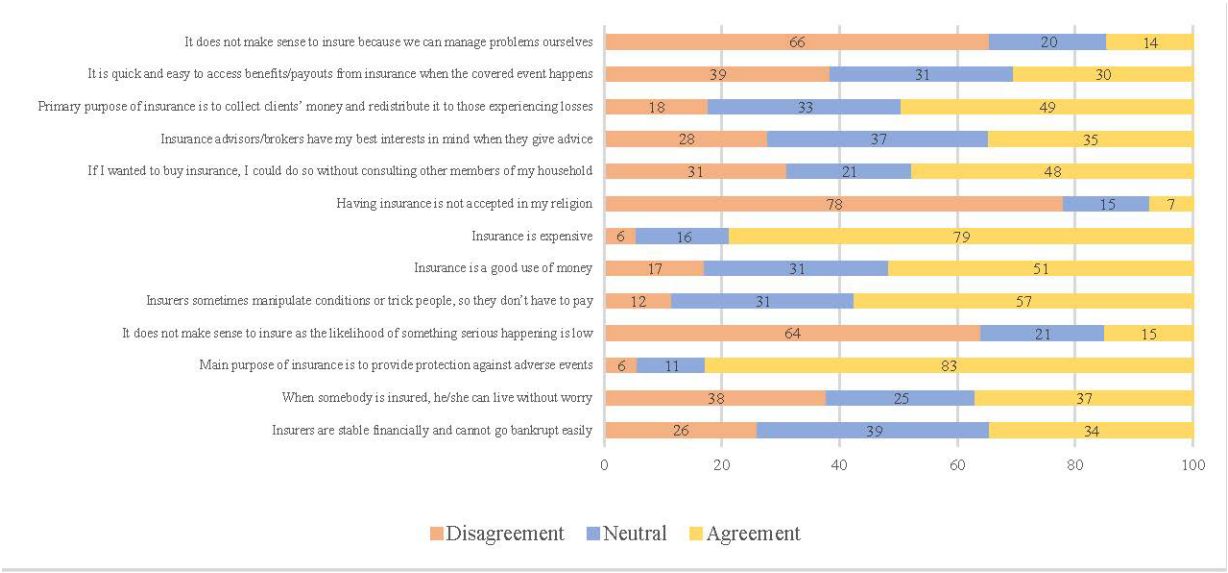



In Figures 3.1c and 3.1d, we have some additional visual information about the distribution of household income by household size. Specifically, Figure 3.1c gives the range and concentration while Figure 3.1d gives the mean, min, and max in addition to the low and high qualifying thresholds. Both sets of figures do not suggest a concentration of households at the middle-income levels, which would have hindered our ability to tease out key considerations in insurance-purchasing decisions within low-income households.

## 3.2 Perceptions and Attitudes

From the literature, there is evidence that there exist factors that are peculiar to the microinsurance market and are thus likely important in understanding and explaining the demand for inclusive insurance. Many of these factors relate to perceptions or beliefs about insurance and need which, in turn, shape attitudes. With this in mind, we have a section in the questionnaire that covers a comprehensive set of attitude-informing statements, as listed below in Figure 3.2a which depicts relative frequencies. For each of these statements, respondents must record their degree of agreement on a scale from 1 (corresponding to strongly disagree) to 5 (corresponding to strongly agree), with 3 assigned to the neither agree nor disagree category; they also have the option of selecting being uncertain, which most of them do not exercise. In fact, for seven of the fourteen statements, only 2% of the sample takes advantage of the "Don't Know" option; for the remaining statements, that option attracts from 4% to 11% of responses, with c7a, about the belief that insurers cannot go bankrupt easily, having the highest percentage and c7e, about the belief that insurers manipulate conditions to avoid paying, and c7l, about the belief that benefits when insured events occur are easily accessible, having the second highest at 7%. Hence, we adjust the values assigned to the various levels of disagreement/agreement so that the neutral (neither agree nor disagree) and uncertain answers receive a zero, disagreement has a negative value (minus 2 for strong and minus 1 for somewhat), and agreement has a positive value (2 for strong and 1 for somewhat).

**Figure 3.2a. Attitudinal Questions: Relative Frequencies for Extent of Agreement/Disagreement**




There is general agreement that insurance is expensive (79%) and that its main purpose is to provide protection against adverse events (83%). Correspondingly, most respondents disagree with the view that insurance is not useful either because they believe that the likelihood of a serious event is low (64%) or because they believe that they are able to manage their own problems (66%). Furthermore, more individuals agree than disagree about insurance being a good use of money (51% vs 17%) and about the primary purpose of insurance being to collect and redistribute money to those experiencing losses (49% vs 18%); however, there is also more agreement than disagreement about insurers manipulating conditions or tricking people to avoid paying (57% vs 12%). Religion does not appear to be an impediment to purchasing insurance, and there is a significant presence of neutrality or uncertainty (at least 20%) across all questions but the two with the largest support and the one about religion.

That, in most instances, between 20% and close to 40% of respondents are unable to tell whether they agree or disagree is suggestive of the potential benefit of informational strategies aimed at clarifying the role of insurance and building trust, particularly among those with health risk experiences;[8] in fact, in comparison to those without health risk experiences (878), individuals with at least one such experience (1,265) are consistently less likely to be neutral and consistently more likely to disagree. Interestingly, among the statements with the largest differences (8 to 11 percentage points) between the absence of a health risk experience and the presence of at least one health risk experience, we have: (1) the two about insurance not being useful, which individuals with health risk experiences are more likely to disagree with, (2) the one about quick and easy access to benefits when

[8] For the cross tabulations, we focus on health events because of the magnitude of the affected sub-sample. For the other two types of risk experiences (property loss/damage and loss of life), we have 261 and 155 cases (or 12% and 7% of the sample).

covered event occurs, which individuals with health risk experiences are as less likely to have no opinion about as they are more likely to disagree with, and (3) the one about redistribution of money being the primary purpose of insurance, which individuals with health risk experiences are less likely to have no option about but also more likely to both agree and disagree with. The first two points, combined, are revealing: while individuals are more likely to appreciate the value of insurance if they face a risk event, they are also more likely to have a negative experience in claiming and receiving benefits.

As the variables from the attitudinal statements are likely correlated and may conceptually measure similar things, we explore whether we can describe variability among them in terms of a lower number of unobserved latent variables. To this end, we employ factor analysis which involves modelling the observed variables as linear combinations of the potential unobserved variables called factors, plus error terms. Reducing the dimensionality of the data serves to facilitate our understanding of the data and interpretation of the empirical results. Hence, identifying a smaller set of independent latent variables that reflect attitudes about insurance and insurers is particularly useful in the empirical analysis of the demand for insurance.

Explicitly, the adopted approach entails applying factor analysis, via the principal factor method, to determine the number of factors (or independent latent variables) to retain, with each factor subsuming information from all attitudinal statements, as well as which variables (or attitudes) are more relevant in each factor. For the purpose of this exercise, we exclude two statements: on conceptual grounds, we exclude c7h about insurance being unacceptable in one's religion, which is the only statement about cultural restrictions on insurance purchasing decisions; on practical grounds, we exclude c7i about one's ability to buy insurance without consulting with other members of the household, which is the only statement that not all respondents get to consider.[9]

[9] As c7i is only appropriate for multi-member households, there are 409 survey participants from one-member households who do not consider the statement.

**Table 3.2A. Rotated Factor Loadings from Factor Analysis of Attitudes**

| Attitudinal Statement | | Factor 1 | Factor 2 | Factor 3 | Uniqueness |
|---|---|---|---|---|---|
| c7a | Insurers are stable financially and cannot go | 0.4304 | 0.1116 | 0.0683 | 0.7977 |
| c7b | When somebody is insured, he/she can live without | 0.5715 | 0.0652 | -0.0224 | 0.6687 |
| c7c | Main purpose of insurance is to provide protection against adverse events | 0.3818 | -0.2387 | 0.3318 | 0.6871 |
| c7d | It does not make sense to insure as the likelihood of something serious happening to my family or me is low | -0.0264 | 0.7538 | 0.0217 | 0.4306 |
| c7e | Insurers sometimes manipulate conditions or trick people, so they don't have to pay | -0.1995 | 0.2059 | 0.4653 | 0.7013 |
| c7f | Insurance is a good use of money | 0.5871 | -0.2472 | 0.0393 | 0.5927 |
| c7g | Insurance is expensive | -0.1323 | 0.0152 | 0.4823 | 0.7497 |
| c7j | Insurance advisors/brokers have my best interests in mind when they make recommendations or give advice | 0.6285 | -0.0672 | -0.0544 | 0.5975 |
| c7k | Primary purpose of insurance is to collect clients' money and redistribute it to those of them who experience financial losses | 0.2004 | 0.1363 | 0.2730 | 0.8668 |
| c7l | It is quick and easy to access benefits/payouts from insurance when the covered event happens | 0.6062 | 0.0581 | -0.1849 | 0.5949 |
| c7m | It does not make sense to insure because we can manage problems ourselves | -0.0246 | 0.7592 | 0.0288 | 0.4222 |

The results of the factor analysis, which we do not report, suggest that we retain only three factors based on the Kaiser criterion that recommends keeping factors with eigenvalues equal to or higher than one. What we show instead in Table 3.2A are: (*i*) the rotated factor loadings for the three factors – that is, the weights and correlations between each variable and the factor; (*ii*) uniqueness – that is, the variance that is 'unique' to the variable and not shared with other variables (e.g., 80% of the variance in c7a is not shared with other variables in the overall factor model). The magnitude of the load signifies the relevance of the corresponding variable in defining the factor's dimensionality. It thus follows, as the shading in the table clarifies, that factor 1 is mostly related to c7a, c7b, c7f, c7j, and c7l, factor 2 mostly reflects c7d and c7m, and factor 3 mostly encompasses c7e and c7g.

The remaining variables (c7c and c7k) not only have the lowest loads (below 0.4 in one case and below 0.3 in the other case), but the variation between the two largest loads across the three factors is small in comparison with the corresponding variation for the other variables (less than 0.08 versus more than 0.25, which is the next lowest variation and is associated with c7e). Put differently, it is not immediate that c7c is relevant in defining factor 1, even if its load is highest for factor 1, and that c7k is relevant in defining factor 3, even if its load is highest for factor 3; this seems to align with the conceptually different nature or implication

of these two variables in relation to the ones that are most relevant in delineating factors 1 and 3, as we argue shortly.

In examining the key dimensions that define the three factors, we can easily deduce that factor 1, comprised of statements a, b, f, j, and l, reflects a benign view of insurance, one that combines value and trust, while factor 3, comprised of statements e and g, represents a malign view of insurance, one that questions the trustworthiness of insurers; factor 2 captures, instead, a positive predisposition towards risk both in terms of its likelihood and in terms of its management. Accordingly, we label factors 1 through 3 as positive attitude towards insurance, positive attitude towards risk or risk comfort, and negative attitude towards insurance, respectively. To the list of factors, we add a factor or index that brings together statements c and k and that focuses on the purposes of insurance; we argue that this index represents a measure of a neutral attitude towards insurance.

For the sake of the empirical analysis, we derive the four factors manually as arithmetic averages of their components (hence, as indices), rather than employing the factor scores based on the estimated regression coefficients of the eleven attitudinal statements. Although more simplistic, this approach has the advantage of a cleaner interpretation of the factors given that we attach each dimension to only one factor, namely, the factor for which the dimension has the greatest explanatory power. Furthermore, the estimated coefficients of each factor's components are sufficiently close to justify the equal weighting of the arithmetic averaging.[10]

## 3.3 Risks

One of the sections of the questionnaire deals with relevant risks as well as risk experiences and risk management strategies over the five-year period preceding the survey. The list of risks, which respondents consider and, if applicable, rank, includes fourteen items, with three pertinent only to households with children. A glance at the Pearson correlation coefficients of the fourteen risks, as reported in Table 3.3A, reveals strong association (i.e., coefficient in excess of 0.5, highlighted in yellow) between the risks involving children (R4 and R10; R4 and R11), healthy food (R6 and R7), and crime (R5 and R12). We also have moderate association (i.e., coefficient between 0.3 and 0.5, highlighted in green) between the risks about physical and mental well-being (R3 and R9), children's safety and mental well-being (R10 and R11), ability to buy food, availability of healthy food, and nutritious eating (R6 and R13; R7 and R13), and ability to buy food and medications (R13 and R14). The significance of these associations lies in their signalling consistency in respondents' reporting, particularly in view of the randomized nature of the order of appearance of the fourteen risk statements. In the last column labelled with the percentage sign (%), the table also gives the proportion of respondents checking off the applicability box, with the risks relevant to at least 20% of households highlighted.

[10] The estimated coefficients are: 0.15 (c7a), 0.22 (c7b), 0.24 (c7f), 0.26 (c7j), and 0.25 (c7l) for factor 1; 0.41 (c7d) and 0.43 (c7m) for factor 2; 0.31 (c7e) and 0.31 (c7g) for factor 3.

### Table 3.3A. Pairwise Correlation Matrix of Risks

| | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | R11 | R12 | R13 | R14 | %* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R1: Losing job due to layoff or shutdown of company | 1.00 | | | | | | | | | | | | | | 20 |
| R2: Losing housing | 0.18 | 1.00 | | | | | | | | | | | | | 8 |
| R3: Physical well-being | 0.08 | 0.15 | 1.00 | | | | | | | | | | | | 44 |
| R4: Children's physical well-being | 0.05 | 0.08 | 0.16 | 1.00 | | | | | | | | | | | 28# |
| R5: Personal safety from crime | 0.09 | 0.17 | 0.23 | 0.11 | 1.00 | | | | | | | | | | 15 |
| R6: Eating nutritious food | 0.06 | 0.09 | 0.30 | 0.18 | 0.18 | 1.00 | | | | | | | | | 27 |
| R7: Having access to healthy foods | 0.07 | 0.14 | 0.29 | 0.16 | 0.18 | 0.51 | 1.00 | | | | | | | | 18 |
| R8: Income loss due to not working for health reasons | 0.25 | 0.24 | 0.22 | 0.07 | 0.12 | 0.14 | 0.14 | 1.00 | | | | | | | 23 |
| R9: Mental well-being | 0.13 | 0.16 | 0.32 | 0.18 | 0.15 | 0.30 | 0.28 | 0.22 | 1.00 | | | | | | 36 |
| R10: Children's mental well-being | 0.06 | 0.08 | 0.11 | 0.51 | 0.12 | 0.13 | 0.18 | 0.07 | 0.23 | 1.00 | | | | | 27# |
| R11: Children's safety | 0.06 | 0.09 | 0.14 | 0.61 | 0.17 | 0.16 | 0.17 | 0.06 | 0.15 | 0.45 | 1.00 | | | | 27# |
| R12: Family safety from crime | 0.12 | 0.16 | 0.23 | 0.22 | 0.53 | 0.16 | 0.22 | 0.12 | 0.12 | 0.17 | 0.25 | 1.00 | | | 15 |
| R13: Having enough money for food | 0.16 | 0.26 | 0.21 | 0.14 | 0.11 | 0.34 | 0.40 | 0.26 | 0.30 | 0.14 | 0.14 | 0.12 | 1.00 | | 21 |
| R14: Not being able to pay for medications | 0.17 | 0.28 | 0.20 | 0.08 | 0.16 | 0.19 | 0.19 | 0.29 | 0.22 | 0.06 | 0.05 | 0.12 | 0.34 | 1.00 | 14 |
| Top Risk (%)[a] | 50 | 21 | 38 | 22 | 17 | 16 | 10 | 36 | 33 | 27 | 26 | 22 | 28 | 18 | |
| Top Risk (%)[b] | 10 | 2 | 16 | 6 | 2 | 4 | 2 | 8 | 12 | 7 | 7 | 3 | 6 | 2 | |

* Percentage of respondents for whom risk is relevant. # Only respondents from households with children (689) consider risk. [a] Percentages computed in relation to those households for which risks matter. [b] Percentages computed in relation to the relevant sample (689 for R1, R10, and R11; 2143 for any other risk).

Interestingly, the risks that preoccupy the largest percentage of households are about physical and mental well-being. Other key risks pertain to children's well-being, losing employment or being unable to work for health reasons, being able to buy food, and eating nutritious food. The last two rows provide information about the top ranked risk and confirm the importance of job stability and physical and mental well-being. Specifically, taking the entire sample into account (689 respondents from households with children for R1, R10, and R11 and 2143 respondents for the remaining risks), we note that the three risks registered as the most applicable for at least 10% of the relevant sample are R1 (being laid off or company shutting down), R3 (physical well-being), and R9 (mental well-being). The same picture emerges, with the addition of R8 (income loss due to not working for health reasons) to the list of most important risks, when we compute the percentages out of only those households for which the risks matter.

## 4. Risk Events

In the questionnaire, we ask respondents to consider three types of risk events: health related, life related, and property related. For each type of event, we then inquire about the most financially burdensome experience over the previous *X* number of years, with *X* varying across different types of risk events (three years for health risks and five years for life and property risks). The line of inquiry is common across the three types, encompassing questions about the cost of the event, the ensuing loss of family income, the strategies implemented to cope with the event, including the strategy that covers the largest proportion of the cost of the event, and the overall adequacy of financial support. For the health risk events, however, we include some additional questions about all of the experiences within the household over the preceding three years, with details on the type (whether injury leading to permanent or temporary disability or chronic versus non-chronic illness), whether there is recollection of a request for medical assistance and, if so, type of assistance requested (family doctor, walk-in clinic, emergency/hospital, pharmacy, and/or alternative medicine assistance), reasons for not seeking medical assistance, and hardship experienced. Finally, for chronic illnesses, we collect information on type from a list that includes cardiovascular diseases, chronic respiratory diseases, mental illnesses, diabetes, musculoskeletal disorders, and neurological conditions, consistent with the nomenclature of the Canadian Chronic Disease Surveillance System (CCDSS), a collaborative network of provincial and territorial surveillance systems, under the support of the Public Health Agency of Canada, responsible for enhancing the scope of data on chronic diseases in Canada and for assisting in the planning of health resources and the development of health policies and programs.[11]

[11] https://www.canada.ca/en/public-health/services/publications/canadian-chronic-disease-surveillance-system-factsheet.html.

## 4.1 Health Risk Events

Of the 2,143 respondents, 1,265 recall experiencing at least one health risk event over the pre-survey three-year period (roughly 2nd half of 2016 to 2nd half of 2019). However, overall, we have details on 2,226 experiences, as 645 households find themselves coping with multiple events (two in 395 cases, three in 184 cases, and four in 66 cases). The distribution of these experiences across the four types reveals a large proportion, just shy of 40% (828), pertaining to chronic illnesses and over 25% resulting from temporary disabilities (569) or non-chronic illnesses (584); the remaining cases (245 or 11%) represent permanent disabilities. Of the 828 households reporting on chronic illnesses, we have 302 households with multiple illnesses (up to seven), although most list between two (208) and three (69) illnesses. While we do not have information about each experience of chronic illness within the same household, we know that there are 1,258 chronic illnesses referred to in the study across the given category options, with a non-negligible representation for each category, from 49 cases of neurological condition to 238 cases of mental illness.[12] In Table 4.1A, we summarize the 2,226 health risk experiences along two dimensions, namely, medical assistance and hardship.

**Table 4.1A. Health Risk Events by Medical Assistance and Hardship**

| Health Risk | Medical Assistance | | | | | | | Hardship | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | No | Yes[a] | | | | | | No[b] | Little | Moderate | Great |
| | | Family Doctor | Walk-in Clinic | Hospital | Pharmacy | Alternative | Other | | | | |
| Permanent Disability (245) | 2.5 | 72.8 | 16.3 | 57.3 | 19.2 | 9.2 | 10.0 | 17.6 | 31.4 | 26.9 | 24.1 |
| Temporary Disability (569) | 2.3 | 61.3 | 21.6 | 58.8 | 18.9 | 9.0 | 9.9 | 20.0 | 38.8 | 26.4 | 14.8 |
| Chronic Illness (828) | 0.7 | 88.8 | 13.7 | 36.4 | 27.9 | 8.6 | 13.5 | 33.6 | 28.5 | 23.2 | 14.7 |
| Non-Chronic Illness (584) | 6.5 | 70.9 | 26.4 | 40.1 | 17.0 | 6.0 | 9.2 | 35.1 | 36.5 | 21.2 | 7.2 |

Note: figures are percentages. [a] Percentage for each option computed out of those who sought medical assistance; percentages across options do not add up to 100 as choice was not restricted to one option. [b] Category includes the "Hard to say" responses as their incidence was very low (9, 6, 15, and 12 across the four health risks, respectively).

A few messages that emerge from Table 4.1A and apply across the different types of health risk events are worthy of mention: (1) most individuals seek medical assistance when

[12] The number of cases for the other CCDSS categories is: 138 for respiratory disease, 188 for musculoskeletal disorder, 191 for diabetes, 215 for cardiovascular disease. Additionally, there are 239 records for chronic illnesses outside of the given categories, among which the most common are, in no particular order, cancer, back pain, fibromyalgia, high cholesterol, high blood pressure, and kidney disease.

confronting a health issue; (2) seeing the family doctor and going to the hospital are the two most common types of medical assistance individuals resort to; (3) most individuals tend to rely on more than one source of assistance; (4) most individuals do experience some (little or moderate) hardship as a result of a health issue, but great hardship is more likely than no hardship with injuries leading to a permanent disability, while no hardship is more likely than great hardship with injuries leading to a temporary disability and with chronic and non-chronic illnesses.

The next table gives a snapshot of the most significant health event, from a financial perspective, for each of the 2,143 households in the sample during the three-year period under consideration. Probably the most compelling piece of information that we can extract from Table 4.1B is that people do incur health-related costs even in a country such as Canada that enjoys a universal healthcare system. Unsurprisingly, doctors' services represent the one cost item that public or private insurance covers regularly, but health events tend to necessitate more than just doctors' services, and these additional requirements, most notably transportation to and from a medical facility, can involve out-of-pocket disbursements. Indeed, save doctors' services, all cost items entail personal funding for at least 25%, and up to 70% in the case of transportation, of the surveyed households experiencing a costly health event during the specified time window. Correspondingly, the dollar figures, which reflect approximations of costs incurred before insurance reimbursements, show that, across all cost items but doctors' services, between 57% and 93% of the surveyed households that are able to supply cost details in dollar terms record non-zero amounts, although predominantly in the lowest-cost category with a $500 upper bound; for doctors' services, most answers fall either in the zero- (about 61%) or lowest-cost category (about 26%). Aside from doctors' services, supplies and transportation exhibit a substantial representation in the zero-cost category (43% and 31%).

**Table 4.1B. Health Risk Events: A Glance at their Costs**

| | | Tests | Medicine | Supplies | Transportation | Doctors' Services | Other |
|---|---|---|---|---|---|---|---|
| Cost & Coverage | | | | | | | |
| | | | | | | | |
| No cost | | 12.5 | 13.1 | 29.8 | 27.5 | 30.0 | 36.4[a] |
| | | | | | | | |
| Yes[b] | Government Insurance | 21.2 | 23.0 | 12.6 | 5.7 | 56.9 | 15.1 |
| | Private Insurance | 39.7 | 42.2 | 21.0 | 8.6 | 16.7 | 13.3 |
| | Own Pocket | 32.7 | 28.4 | 38.2 | 69.9 | 14.5 | 26.7 |
| | Don't Know/Remember | 6.4 | 6.5 | 28.2 | 15.8 | 12.0 | 44.9 |
| | Size of Sub-Sample | 1,876 | 1,862 | 1,505 | 1,553 | 1,501 | 1,295 |
| X = CDN Dollars[c] | X = 0 | 10.9 | 12.5 | 43.3 | 30.6 | 60.5 | 7.1 |
| | 0 < X ≤ 500 | 42.3 | 57.1 | 40.9 | 60.2 | 25.7 | 41.3 |
| | 500 < X ≤ 1,000 | 16.6 | 12.2 | 6.6 | 4.8 | 6.5 | 17.5 |
| | 1,000 < X ≤ 2,000 | 13.2 | 8.2 | 3.7 | 2.3 | 3.6 | 15.9 |
| | 2,000 < X ≤ 4,000 | 8.1 | 4.1 | 2.6 | 1.4 | 0.5 | 7.1 |
| | X > 4,000 | 8.9 | 6.0 | 2.9 | 0.8 | 3.2 | 11.1 |
| | Size of Sub-Sample | 742 | 864 | 653 | 794 | 588 | 126 |

Note: figures are percentages. [a] Percentage computed out of 2,037. [b] Percentages computed out of those who did not choose the "No cost" option. [c] Percentages computed out of those who provided a cost approximation.

The last table in the health risk sub-section (Table 4.1C), which follows, gives some additional details on the financial burden of the most significant health event during the

specified timeframe and on the strategies implemented to cope with it. In addition to direct costs (e.g., tests and supplies), an illness or an injury can financially impact households through the loss of income of either the ill or injured person, the household member caring for the ill or injured person, or even both. Of the 2,143 households in the sample, 658 households record income loss for at least one household member, and 224 households report it for both the person in need of care and the caregiver; the loss of income of the ill or injured person is, however, a more likely occurrence among the single-loss instances (343 vs 91). Furthermore, when we consider both the direct and indirect (i.e., income loss) costs, there is no clear indication of a tendency to coexist: the relevant figures in the table suggest, in fact, that direct costs are more likely to prevail both when income loss is present (20% vs 2%) and when it is absent (28% vs 4%), and income loss is a less likely manifestation both in the presence of direct costs (28% vs 20%) and in their absence (4% vs 2%).

**Table 4.1C. Health Risk Events: Income Loss and Coping Strategies**

| | | Ill/Injured Person | Other Member | Within Household | Non-Income Costs | | | Coping Strategies | | Cost Recovery | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Yes | No | NA* | Yes | No | Yes | No | DNK* |
| | | | | | | | | | | | | |
| Income Loss | Yes | 26.5 | 14.7 | 30.7 | 20.3 | 1.6 | 8.8 | 93.8 | 6.2 | 74.2 | 22. | 3.8 |
| | No | 59.6 | 73.8 | 53.8 | 27.7 | 4.3 | 21.8 | | | | | |
| | NA* | 13.9 | 11.5 | 15.4 | 5.4 | 0.5 | 9.6 | | | | | |
| | | | | | | | | | | | | |
| Observations | | 2,143 | 2,143 | 2,143 | 2,143 | | | 658 | | 658 | | |

Note: figures are percentages. * NA = Don't Know or Don't Remember; DNK = Don't Know.

As to the management of the income loss, most of the affected households (94%) avail themselves of several strategies, relying often on multiple channels; as a matter of fact, 74% of the households that adopt coping schemes signal at least two strategies, but the mix typically (in 70% of the cases) comprises between two and six actions. Among the various options, the most widely implemented include reducing expenditures (62%), using savings (44%), and borrowing from at least one of four sources (43%),[13] but no option registers a negligible uptake; the two options with the lowest incidence, namely, additional job/work and donations/gifts, still attract 14% of the relevant pool. Interestingly, although curbing non-essential spending has a greater appeal than curtailing essential (food) spending, the latter occurs more frequently, often in conjunction with the former, than the other possible actions outside of the top three above mentioned (35% vs 26% which is the

[13] Respondents consider separately four borrowing alternatives, that is, credit card, bank, friend or family member (without interest), and payday loan or loan from an informal source. The most appealing sources of borrowing are a credit card and a friend or a family member not living in the same household.

next highest rate of adoption and relates to the selling of household goods and business equipment). Aside from being the most prevailing loss-handling activities, reducing expenditures, using savings, and borrowing represent the financial strategies that most regularly cover the largest proportion of the loss (22%, 25%, and 18%, respectively). Whether or not households adopt loss-coping strategies, most (74%) confirm the ability to pull together resources from different sources to adequately manage the loss; predictably, however, and notwithstanding the small size of the pool of non-adopters (41 households), the success rate is lower among adopters (73% vs 93%).

## 4.2 Loss of Life Risk Events

Of the 2,143 respondents, 155 list a loss of life experience within their households during the five years prior to the survey (roughly 2nd half of 2014 to 2nd half of 2019) as a result of an illness, age, or an accident (in 57%, 40%, and 3% of the cases, respectively). Notwithstanding the small size of the relevant sub-sample, we provide specifics on the distributions of some of the dimensions common across the three risk areas under investigation (e.g., expenses, income loss, and coping strategies by degree of hardship) in Table 4.2A but refrain from describing them by cause of death, focusing instead on the overall picture and avoiding cross tabulations.

While losing a family member may carry a significant financial burden, which adds to the emotional affliction, the experiences with the loss of life in our sample suggest that most of the affected households are able to absorb the expenses (81%); nevertheless, there are quite a few households that cannot manage. Between direct costs (for items such as medical care or treatment associated with the cause of the death, documentation, burial plot, coffin or urn, funeral venue, interment, and religious service/leader) and indirect costs (loss of income of deceased and/or of household member), the financial impact of a death is an unavoidable reality for most households (85%), but the former costs tend to be more applicable (81% vs 43%), whereas the latter costs are inherently more substantial. Although all expense items appear to be important, the most recurring ones are documentation (e.g., death certificate) and coffin or urn.

In terms of coping strategies, Table 4.2A is not exhaustive but contains the ones with the highest attraction rate. Peculiarly, relying on cash or savings, borrowing from various sources, and reducing expenditures are the same strategies that households favor when dealing with health events; correspondingly, additional job/work and donations/gifts are the strategies with the lowest uptake (13% and 14%). When we break down borrowing by source and spending by type of good (i.e., essential or non-essential), we similarly detect that using credit cards and spending less on non-essential goods are the most frequent responses to death-related events.

**Table 4.2A. Loss of Life Risk Events: Hardship, Cost, Income Loss, and Coping Strategies**

| | | | | | |
|---|---|---|---|---|---|
| Hardship | No* | Little | Moderate | Great | |
| | 29.7 | 29.0 | 23.9 | 17.4 | |
| Cost (X = $ CDN) | X = 0 | 0 < X ≤ 4,000 | 4,000 < X ≤ 8,000 | 8,000 < X ≤ 12,000 | X > 12,000 |
| | 19.4 | 36.1 | 18.7 | 11.0 | 14.8 |
| Income Loss (Y = $ CDN) | Y = 0 | 0 < Y ≤ 8,000 | 8,000 < Y ≤ 16,000 | 16,000 < Y ≤ 24,000 | Y > 24,000 |
| | 57.4 | 19.4 | 7.1 | 4.5 | 11.6 |
| Coping Strategies | Cash or Savings | Borrowing | Insurance | Selling Items | Reducing Expenses |
| | 31.0 | 30.3 | 18.1 | 23.9 | 34.2 |

Note: figures are percentages. * Category includes the "Hard to say" responses as their incidence was very low (6).

## 4.3 Property Risk Events

Although the experience of damage to, or loss/theft of, personal or business property during the five years prior to the survey affects more households than the experience of loss of life, the number is still rather small (261 vs 155 out of 2,143). We are thus somewhat constrained in our ability to make strong assertions about property risk events generally, but especially by type (i.e., whether damage, loss, or theft and whether personal or business property); nonetheless, as in the previous sub-section, we can summarize the marginal distributions of key variables.

**Table 4.3A. Property Risk Events by Type and Cause**

| Year | | Type | | | Cause[a] | | | |
|---|---|---|---|---|---|---|---|---|
| | | HH[b] | BUS[b] | Both | Flood | Fire | Erosion | Other |
| 2014: 6.4<br>2015: 11.0<br>2016: 16.3<br>2017: 22.0<br>2018: 27.3 | Damage (137/261) | 94.2 | 2.9 | 2.9 | 37.2 | 10.2 | 5.8 | 50.4 |
| | Loss (27/261) | 70.4 | 14.8 | 14.8 | 33.3 | 40.7 | 14.8 | 22.2 |
| | Theft (97/261) | 94.9 | 4.1 | 1.0 | | | | |

Note: figures are percentages. [a] Percentages across options do not add up to 100 as choice was not restricted to one option.
[b] HH = household; BUS = business.

A first observation when we delve into the data about property events, as summed up in Table 4.3A, is that most cases involve either damage (53%) or theft (37%) and are asymmetrically distributed over time with greater concentration in the second half of the 2014 to 2019 period. A second observation is that, consistently across the three event type categories, but notably among damages and thefts, personal property is most likely to be at risk. A third observation is that floods are responsible for at least one-third of damages and losses, but fires also prevail as a major cause of the latter, granted that the number of losses is trivial; the "Other" category for causes is a main one for damages, and weather-associated phenomena, wind in particular, represent a recurring theme in respondents' descriptions. With damages and losses combined, the "Other" category dominates, accounting for 46% of the cases, while floods remain at 37% and fires drop to 15%.

The second set of comments, based on the frequencies in Table 4.3B, concerns financial considerations and coping strategies and resonates in presentation with our discussions in the previous sub-sections. To begin, we should note that, of the five types of property damage/loss households consider, we only reflect on the two that are clearly about personal property as the remaining three (e.g., about business equipment and inventory) can only claim a handful of responses (12 with only 2 indications of experience).

**Table 4.3B. Property Risk Events: Cost, Income Loss, and Coping Strategies**

| | | Damage or Loss | | | Coping Strategies | |
|---|---|---|---|---|---|---|
| | | Structure of house | Furniture or other household belongings | Both | | |
| Cost Incurred | | 32.4 (out of 253)[a] | 47.6 (out of 248)[a] | 18.4 (out of 261) | | |
| | | | | | Cash or Savings: | 28.7 |
| Replaced or Fixed (out of 261) | No | 40.6 | 41.0 | | Borrowing: | 26.8 |
| | Partial | 25.7 | 32.6 | | Insurance: | 20.3 |
| | Complete | 33.7 | 26.4 | | Selling Items: | 13.8 |
| | | | | | Reducing Expenses: | 28.0 |
| Cost of Repair (X = $ CDN) | X = 0 | 23.5 | 28.1 | 0.0 | | |
| | 0 < X ≤ 1,000 | 34.2 | 39.0 | 27.0 | ***Borrowing*** | |
| | 1,000 < X ≤ 5,000 | 18.8 | 19.9 | 29.7 | Credit Card: | 11.9 |
| | 5,000 < X ≤ 10,000 | 11.4 | 7.5 | 5.5 | Friend: | 8.1 |
| | 10,000 < X ≤ 20,000 | 3.4 | 3.4 | 18.9 | Bank Loan: | 10.3 |
| | X > 20,000 | 8.7 | 2.1 | 18.9 | Payday Loan: | 5.8 |
| | Observations | 149 | 146 | 37 | | |
| | | | | | ***Reducing Expenses*** | |
| Income Loss (out of 261) | Yes | 21.8 | | | Food: | 10.0 |
| | No | 73.2 | | | Non-Essential: | 22.2 |
| | Hard to say | 5.0 | | | | |

Note: figures are percentages. [a] Size of sub-sample falls short of 261 (i.e., the number of damage/loss/theft experiences) because of a few missing observations from the "Don't Know/Remember" option.

In comparison with the observations about health and life risk events, we find that households are less likely to suffer a loss of income when dealing with property damage or loss, but the ranking of their coping strategies by likelihood of adoption remains the same, with digging into savings as the most attractive option, followed by curtailing expenditures (especially of non-essential goods), borrowing (through credit cards and bank loans, in particular), and going through private insurance.

Whereas 261 households in a sample of 2,143 confirm at least one experience of personal property damage or loss during the period under consideration, the majority does not incur

the associated cost, at least for each of the two types of events included in Table 4.3B. Whether sustained or not, however, the cost of completely fixing the damage or replacing the loss, based on the available estimates from slightly over 55% of the 261 households, is mostly non-zero but concentrated in the lower-amount categories (within $5,000).[14]

Yet, a closer look at the data via cross tabulations as presented below in Table 4.3C reveals what may appear to be an inconsistency in reporting but is likely the result of different interpretations of the question about incurring the cost. Indeed, both positive and negative answers to the question combine with both positive and negative answers to the question about replacing/fixing the lost/damaged item, when (*a*) one would expect no need for replacement or repair, and thus no cost estimate, in the absence of loss/damage if the question about cost incurrence is ultimately about event occurrence, or (*b*) one would expect to always see replacement/repair in the presence of cost incurrence, and thus never a zero cost estimate, if the question about cost incurrence is truly about the cost of the event as opposed to the experience of the event. However, as Table 4.3C suggests, 6% and 8% of the respondents fall in the categories that join the presence of cost incurrence and the absence of replacement/repair, which is a violation of (*b*); concurrently, 32% and 19% of respondents fall in the categories that join the absence of cost incurrence and the presence of replacement/repair, which is a violation of (*a*). Given the larger magnitude of the latter set of categories, respondents are less likely to view the question about incurring cost as a question about experiencing damage/loss, but there are, nonetheless, instances which seem to justify the experience interpretation.

**Table 4.3C. Property Risk Events by Cost**

| | | Cost Incurred | | | | | |
|---|---|---|---|---|---|---|---|
| | | Damage: Structure of house | | | Damage/Loss: Furniture or other belongings | | |
| | | Yes | No | NA* | Yes | No | NA* |
| | | | | | | | |
| Repaired/Fixed (out of 261) | Yes | 25.3 | 32.2 | 1.9 | 36.8 | 18.8 | 3.5 |
| | No | 6.1 | 33.3 | 1.2 | 8.4 | 31.0 | 1.5 |
| | | | | | | | |
| Cost of Repair (X = $ CDN) (out of 149 and 146) | X = 0 | 0.7 | 22.8 | 0.0 | 5.5 | 22.6 | 0.0 |
| | X > 0 | 36.2 | 39.6 | 0.7 | 50.7 | 20.5 | 0.7 |

Note: figures are percentages. * NA = Don't Know or Don't Remember.

[14] For households that incur costs for both types of events, the higher-amount categories (in excess of $10,000) also exhibit substantial concentration, which may simply reflect the heavier burden, but the applicable pool is too small to warrant any inference attempt.

That the cost interpretation is more plausible also follows from a comparison of the joint frequency of presence of cost incurrence and zero cost estimate (1% and 6%), which supports the experience flavor, with the joint frequency of absence of cost incurrence and positive cost estimate (40% and 21%), which supports the cost flavor.

# 5. An Empirical Exploration of Insurance Purchasing Decisions

For the insurance purchasing decisions, there are several survey questions we employ to construct our measures of participation and intensity decisions. The former comes from the section on knowledge and use of insurance, which consists mostly of questions about past experiences with different types of insurance, sources of funding for insurance policies if present (i.e., internal versus external), and whether these policies are still in adoption at the time of the survey. These questions enable us to create two variables for each type of insurance: (1) a dichotomous variable which records whether a household has self-funded coverage; (2) a non-ordered categorical variable which records if a household has no coverage, self-funded coverage, or externally funded coverage. The variable in (1) is for the examination of the decision of whether to buy insurance based on probit and CMP estimations, while the variable in (2) is for a more general empirical analysis in which we compare the event of self-funded insurance to both the event of no insurance and the event of externally funded insurance via a multi-nominal logic specification.

We describe the data which inform the participation decision in Table 5A and Table 5B below. Although we have details on past and current experiences with ten types of insurance, consistency between the participation study and the intensity or WTP study dictates that the focus of the former be on non-government health insurance, disability or accident insurance, life insurance, property insurance, and flood insurance. Nonetheless, a few general comments about the complete set are in order. First, there is a significant segment of the population that has or perceives to have no insurance; the most noticeable gaps are for credit life, long-term care, flood, disability or accident, travel, and non-government health insurance policies. Second, most of those with previously held policies continue to be policyholders, although continuity is more common among those with externally funded policies. Third, self-funding is more likely to apply for vehicle, property, flood, life, and credit life insurance coverages. Fourth, there seem to be some misperceptions about government health insurance according to two peculiarities: (1) about 24% of the sample believes to have no access to this type of insurance; (2) about 31% of the sample believes to have access to this type of insurance but to be responsible for its funding. Interestingly, but correspondingly, this is the type of insurance that registers an unusually high percentage of respondents who are unsure about the funding source (11% versus 1.4%, which is the second highest percentage in the set and is associated with flood insurance). These features suggest some confusion over the adopted terminology (i.e., government health insurance) which may not resonate with more familiar descriptors such as publicly funded health insurance or public health insurance or with the commonly used

provincial acronyms (e.g., OHIP for the Ontario Health Insurance Plan, AHCIP for the Alberta Heath Care Insurance Plan, and MSP for British Columbia's Medical Services Plan).

**Table 5A. Types of Insurance**

| Type of Insurance (out of 2,143) | Has Had | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Yes | | | | | | | No | Unsure |
| | Someone outside household paid | | | Policyholder paid | | | Unsure | | |
| | Still | No longer | Unsure | Still | No | Unsure | | | |
| Non-government health | 19.5 | 1.4 | 0.1 | 21.3 | 2.1 | 0.3 | 1.1 | 45.4 | 8.8 |
| Government health | 22.2 | 0.8 | 0.1 | 30.7 | 2.3 | 0.6 | 11.1 | 24.2 | 8.0 |
| Travel | 11.1 | 1.0 | 0.2 | 19.2 | 12.8 | 0.6 | 0.9 | 48.0 | 6.2 |
| Disability or accident | 14.9 | 2.7 | 0.2 | 17.3 | 3.3 | 0.4 | 0.9 | 50.6 | 9.7 |
| Life | 11.2 | 1.3 | 0.4 | 42.0 | 3.4 | 0.6 | 1.3 | 33.1 | 6.7 |
| Credit life | 1.5 | 0.8 | 0.1 | 13.2 | 3.5 | 0.4 | 1.0 | 68.8 | 10.7 |
| Property | 1.9 | 0.3 | 0.1 | 68.2 | 2.3 | 0.7 | 1.1 | 20.1 | 5.3 |
| Flood | 1.3 | 0.3 | 0.0 | 24.3 | 2.6 | 1.5 | 1.4 | 55.5 | 13.1 |
| Vehicle | 2.1 | 0.3 | 0.1 | 76.5 | 1.7 | 0.5 | 0.5 | 14.0 | 4.3 |
| Long-term care | 7.1 | 1.4 | 0.2 | 8.1 | 2.1 | 0.6 | 1.0 | 68.0 | 11.5 |

Note: figures are percentages.

**Table 5B. Types of Insurance: Internally versus Externally Funded**

| | NG Health | Gov Health | Travel | Disability | Life | Credit | Property | Flood | Vehicle | LT care |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| Cat 1* | 52.7 | 31.4 | 61.3 | 61.1 | 38.4 | 82.4 | 22.3 | 68.4 | 15.2 | 81.7 |
| Cat 2* | 22.6 | 28.8 | 14.1 | 18.0 | 13.0 | 1.8 | 2.1 | 1.6 | 2.2 | 8.5 |
| Cat 3* | 24.7 | 39.8 | 24.6 | 20.9 | 48.6 | 15.8 | 75.6 | 30.0 | 82.6 | 9.8 |
| | | | | | | | | | | |
| Obs | 1,847 | 1,652 | 1,677 | 1,775 | 1,849 | 1,790 | 1,933 | 1,737 | 1,984 | 1,782 |

Note: figures are percentages. * Cat 1 = no insurance; Cat 2 = insurance through someone else; Cat 3 = insurance through policyholder.

For the intensity decision, we work with the willingness to pay questions from several policy applications included in the questionnaire. Specifically, each of the three risk-specific sections of the questionnaire (i.e., health, life, and property) begins with one or two insurance policy scenarios, with parameters that are often contingent on age and that mimic those of existing policies. For each situation, we adopt the same practice of suggesting a premium, which may be age-dependent, and asking whether it is acceptable; if it is not, we decrease the premium by *X* dollars, where *X* is $2, $3, or $4, and ask again about acceptability, repeating the exercise once more if the answer to the second question is negative. After collecting three negative answers to specified, but sequentially lower, premiums, we ask survey participants an open-ended question about their willingness to pay (WTP). The combination of the age dependency of the premiums and the mix of closed- and open-ended questions to elicit WTP presents some challenges in defining a measure of WTP that is consistent among respondents and that we can use in our empirical analysis of the demand for insurance.

In measuring intensity, there are two variables we generate: (1) a seemingly continuous variable that gives one of the specified premiums, if selected, or the amount from the open-ended question; (2) an ordered categorical variable that purely reflects and preserves the ranking of the values, as we discuss below in more detail. Our reliance on the variable in (1) is restricted to instances in which we have no age dependency (injury and property policies); when the premiums from the closed-ended questions are contingent on age (illness and life policies), we cannot attach meaning to absolute value comparisons between different age groups but must resort to describing intergroup analogies or differences in terms of relative intragroup value positions (e.g., highest value category in one age group versus second highest value category in another age group).

In creating the categorical measure of intensity, we assign WTP an integer from 0 to 5, with 3 to 5 corresponding to the specified premiums in ascending order, 0 denoting no WTP, and 1 and 2 encompassing positive amounts from the open-ended WTP questions; more specifically, category 1 includes values in the bottom half of the range between 0 and the lowest specified premium, while category 2 includes values in the top half. Although the categorical assignment is our strategy to deal with the age dependency of the premiums for

the critical illness and life policies, we implement it across the full spectrum of policies for completeness. In Table 5C, we give a glimpse of the diversity of the WTP data and summarize our approach to measuring intensity.

**Table 5C. Willingness to Pay: A Summary**

| Insurance Policy | | Age Group | Categories | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 5 | 4 | 3 | 2 | 1 | 0 |
| Injury (if age ≤ 50) | $1,000/month | | 17 | 15 | 13 | [6.5, 13) | (0, 6.5) | 0 |
| | $2,000/month | | 27 | 24 | 21 | [10.5, 21) | (0, 10.5) | 0 |
| Critical Illness (if age ≤ 54) | $10,000 lump sum | 18 – 24 | 6 | 4 | 2 | [1, 2) | (0, 1) | 0 |
| | | 25 – 34 | 8 | 6 | 4 | [2, 4) | (0, 2) | 0 |
| | | 35 – 44 | 10 | 8 | 6 | [3, 6) | (0, 3) | 0 |
| | | 45 – 54 | 18 | 16 | 14 | [7, 14) | (0, 7) | 0 |
| | $50,000 lump sum | 18 – 24 | 18 | 14 | 10 | [5, 10) | (0, 5) | 0 |
| | | 25 – 34 | 22 | 18 | 14 | [7, 14) | (0, 7) | 0 |
| | | 35 – 44 | 37 | 33 | 29 | [14.5, 29) | (0, 14.5) | 0 |
| | | 45 – 54 | 79 | 75 | 71 | [35.5, 71) | (0, 35.5) | 0 |
| Life (if age ≤ 64) | $10,000 lump sum | 18 – 34 | 8 | 6 | 4 | [2, 4) | (0, 2) | 0 |
| | | 35 – 44 | 9 | 7 | 5 | [2.5, 5) | (0, 2.5) | 0 |
| | | 45 – 54 | 10 | 8 | 6 | [3, 6) | (0, 3) | 0 |
| | | 55 – 64 | 16 | 14 | 12 | [6, 12) | (0, 6) | 0 |
| | $50,000 lump sum | 18 – 34 | 15 | 11 | 7 | [3.5, 7) | (0, 3.5) | 0 |
| | | 35 – 44 | 18 | 14 | 10 | [5, 10) | (0, 5) | 0 |
| | | 45 – 54 | 30 | 26 | 22 | [11, 22) | (0, 11) | 0 |
| | | 55 – 64 | 58 | 54 | 50 | [25, 50) | (0, 25) | 0 |
| Property* | $1,000 deductible | | 22 | 19 | 16 | [8, 16) | (0, 8) | 0 |

Note: figures denote WTP in dollars. * Policy stipulates: (*i*) up to $16,000 for belongings; (*ii*) up to $5,000 if house is unlivable and move is required; (*iii*) up to $500,00 in unintentional damage to third party.

We then adopt two empirical specifications for the intensity decision or WTP: the tobit model with censoring at both ends (zero and the maximum specified premium) for the pseudo-continuous measures of intensity and the ordered probit model for the categorical

measures of intensity. In addition to estimating WTP by risk or policy, or the per policy participation decision for that matter, we allow decisions across risk areas or policies to be correlated via the error terms. Specifically, we adopt the conditional mixed process (CMP) framework (Roodman, 2011), which utilizes the maximum likelihood estimation procedure to deal with multi-equation systems in either a seemingly unrelated regression (SUR) setup with dependent variables arising from processes that are independent except for correlated terms, as the case at hand, or a simultaneous equation setup with endogenous variables that influence one another.

For the purpose of our empirical questions, the significance of correlated error terms across participation or WTP equations stems from the conjecture that insurance decisions across areas (e.g., health, life, and property) are the result of the same constrained optimization problem. Although we can express the decision to buy insurance or the decision over WTP for each option in reduced form and thus only as a function of exogenous variables, any unsystematic or unobservable factor affecting the insurance decision in a particular area through the corresponding error term may have implications for insurance decisions in other areas.

The most salient features of the STATA CMP tool are that the data-generating processes within the multi-equation system can be mixed, we can use different samples for different models within the system via the inclusion of the Heckman selection model, and we can implement switching regressions to allow for the modelling of variables to depend on the data. Within an environment, such as ours, that involves correlated error terms but otherwise independent data-generating processes, CMP is a more appealing estimator than the SUR estimator because of its flexibility. While the SUR setup permits only continuous dependent variables, the CMP framework admits a broader range of dependent variables, including dichotomous, categorical, censored, and interval regressors, and can support variation in data-generating process and number of observations across equations.

## 5.1 A Look at Key Regressors

For both the participation and intensity studies, we rely on the same set of regressors, which we can group into one of four categories comprising socio-demographic factors about the respondent, contextual factors about the household, attitudes, and experiences, respectively. The experience regressors are indicators about occurrences of different risk events (health, life, and property-related) and are thus variables we selectively assign to the areas under investigation (e.g., we exclude the experience with a property risk event in the health insurance participation and WTP equations). The attitude regressors are especially relevant to our empirical analyses as the existing literature is silent about their impact, particularly in income-constrained environments. We list the variables by category in Table 5.1A.

Although most variables in Table 5.1A are self-explanatory, a few clarifications are in order. To begin, the categories of the education variable represent incremental educational levels, with 1 corresponding to elementary school (grade 8 or lower) and 7 to graduate degree. Likewise, the categories of the tenure variable reflect incremental time periods, with 1 denoting a period of less than 1 year and 5 a period of 10 years or more. For health status,

satisfaction with life, and satisfaction with public health services which we only include in the health-related equations, moving through categories in ascending order (i.e., 1 through 5) is equivalent to amelioration, from poor to excellent, from very dissatisfied to very satisfied, and from not satisfactory at all to fully satisfied, respectively.

**Table 5.1A. Independent Variables by Type**

| Variable | STATA label | Variable | STATA label |
|---|---|---|---|
| ***Socio-Demographic* about *Individual*** | | ***Contextual* about *Household*** | |
| Age (in years) | age | Household income (in dollars) | hh_income |
| Gender (indicator: 1 for female) | gender | Household size (integer) | hh_size |
| Education (categories: 1 to 7) | education | Ownership of residence (indicator) | own |
| Employed (indicator: 1 for full or part time) | employed | House (indicator) | house |
| Religious (indicator) | religion | Tenure in community (categories: 1 to 5) | tenure |
| Born in Canada (indicator) | can_born | | |
| Health status (categories: 1 to 5) | health_status | | |
| ***Experience*** | | ***Attitudes*** | |
| Health risk event | | Positive view of insurance (index) | positive_att |
| Permanent disability from accident (indicator) | health_event1 | Negative view of insurance (index) | negative_att |
| Temporary disability from accident (indicator) | health_event2 | Neutral view of insurance (index) | neutral_att |
| Chronic illness (indicator) | health_event3 | Risk comfort (index) | risk_comfort_att |
| Non-chronic illness (indicator) | health_event4 | Cultural restriction (index) | cult_restrict_att |
| Loss of life risk event (indicator) | death_event | Satisfaction with life (categories: 1 to 5) | life_satisf |
| Property risk event (indicator) | property_event | Satisfaction with public health services (categories: 1 to 5) | serv_satisf |

The last set of comments pertain to the attitudinal indices, namely, positive view, negative view, neutral view, risk comfort, and cultural restriction, all of which range from minus 2 to plus 2, from strongly disagree to strongly agree. As noted in an earlier section, the first four variables combine, through arithmetic averaging, several statements which we identify via factor analysis. The statements subsumed in the positive view attitude speak of both an appreciation of the insurance sector's value in the provision of risk management services and a belief in insurers' trustworthiness. The statements that underlie the negative view attitude reflect, instead, the presence of distrust in the insurance sector as manifested in its questionable commitment to insureds' interests. The statements included in the neutral view attitude relate solely and passively to the functions of insurance. Finally, the statements that inform the risk comfort attitude measure a positive predisposition towards risk which amounts to an undermining of the value of the insurance sector. The cultural

restriction attitude consists of only one statement that captures the importance of a religious impediment to buying insurance. All in all, our priors suggest a non-negative effect of the positive view variable and non-positive effects of the negative view attitude, the risk comfort attitude, and the cultural restriction.

## 5.2 Methodologies

There are several estimation methodologies we employ in our empirical investigation of the factors that affect the insurance purchasing decisions.[15] We briefly detail the technical aspects of each of them in this sub-section. We begin with an overview of the ordinal regression model of which the ordered probit and ordered logit are the most widely used versions with survey data; this model includes the binary case which we apply to the study of the participation decision. As part of the binary and ordered choice analysis, we present the CMP framework which allows us to simultaneously estimate purchasing decisions across risks, be they about participation or about intensity, on the premise that any shock that affects a decision in a particular area is likely to affect the decision in a different area. We then consider the multi-nominal regression model which we employ when considering the question of self-funded insurance when no insurance and externally funded insurance are available options. Finally, we review the tobit regression model which we adopt to examine the intensity decisions with the pseudo continuous dependent variables taking on values that are both left- and right-censored.

### 5.2.1 Ordinal Regression Model

The derivation of the ordinal regression model commonly follows from a latent-variable model which relates a latent or unobserved variable $y^*$ ranging from $-\infty$ to $\infty$ to the observed independent variables according to the structural equation $y_i^* = \boldsymbol{x}_i^T \boldsymbol{\beta} + \varepsilon_i$, where $\boldsymbol{x}$ is the vector of independent variables, $\boldsymbol{\beta}$ is the vector of coefficients estimated by maximum likelihood, $\varepsilon$ is a random term,[16] and $i$ denotes the observation. The idea of a latent $y^*$ is that the underlying propensity generates the observed state; although the propensity itself is not observable, a change in what we observe is attributable to a change in $y^*$. The probability of an event occurring is thus given by the cumulative density function (cdf) of $\varepsilon$ evaluated at given values of the independent variables. A simple measurement equation can then link the observed $y$ with the latent $y^*$. In the binary case, which will come in handy when we consider the question of whether to buy insurance,

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0, \end{cases}$$

[15] For more details, see Cameron and Trivedi (2010), Greene (2000), and Long and Freese (2006).

[16] The error term could be distributed normally (probit specification) or logistically (logit specification). The two distributions differ only in spread with the latter having thicker tails: $\text{var}(\varepsilon) = \pi^2\sigma^2/3$ with the logistic cdf and $\text{var}(\varepsilon) = \sigma^2$ with the normal cdf. The two distributions can give different results if the sample is unbalanced (that is, most of the outcomes are similar with only few differences).

so that we observe positive values of $y^*$ as $y = 1$ and negative values of $y^*$ as $y = 0$, and the probability of the event occurring is equal to $\Pr(y_i = 1 \mid \boldsymbol{x}_i) = \Phi(\boldsymbol{x}_i^T \boldsymbol{\beta})$, where $\Phi$ denotes the normal cdf. The likelihood of each observation is then

$$\mathcal{L}(\boldsymbol{\beta}; y_i, \boldsymbol{x}_i) = \left[\Phi(\boldsymbol{x}_i^T \boldsymbol{\beta})\right]^{y_i} \left[1 - \Phi(\boldsymbol{x}_i^T \boldsymbol{\beta})\right]^{1-y_i};$$

as observations are independent and identically distributed, the likelihood of the entire sample is

$$\mathcal{L}(\boldsymbol{\beta}; \boldsymbol{y}, \boldsymbol{x}) = \prod_i \left[\Phi(\boldsymbol{x}_i^T \boldsymbol{\beta})\right]^{y_i} \left[1 - \Phi(\boldsymbol{x}_i^T \boldsymbol{\beta})\right]^{1-y_i} \left[\Phi(\boldsymbol{x}_i^T \boldsymbol{\beta})\right]^{y_i} \left[1 - \Phi(\boldsymbol{x}_i^T \boldsymbol{\beta})\right]^{1-y_i},$$

which gives the following log likelihood function:

$$\ln \mathcal{L}(\boldsymbol{\beta}; \boldsymbol{y}, \boldsymbol{x}) = \sum_i \left\{ y_i \ln \Phi(\boldsymbol{x}_i^T \boldsymbol{\beta}) + (1 - y_i) \ln\left[1 - \Phi(\boldsymbol{x}_i^T \boldsymbol{\beta})\right] \right\}.$$

The estimated coefficients of the model (i.e., $\boldsymbol{\beta}$) then maximize the above log likelihood function.

In the ordinal case,

$$y_i = g(y_i^*) = \begin{cases} 0 & \text{if } y_i^* \leq 0 \\ 1 & \text{if } 0 < y_i^* \leq \mu_1 \\ 2 & \text{if } \mu_1 < y_i^* \leq \mu_2 \\ \vdots & \quad \vdots \\ J & \text{if } y_i^* > \mu_{J-1}, \end{cases}$$

where $J$ is the number of categories and $\mu_j$ is the cutpoint for $j = 1, \ldots, J-1$, such that $0 < \mu_1 < \mu_2 < \cdots < \mu_{J-1}$, and the probabilities of household $i$ falling into the $J$ categories are

$$\begin{aligned} \Pr(y_i = 0 | \boldsymbol{x}_i) &= \Phi(-\boldsymbol{x}_i^T \boldsymbol{\beta}) \\ \Pr(y_i = 1 | \boldsymbol{x}_i) &= \Phi(\mu_1 - \boldsymbol{x}_i^T \boldsymbol{\beta}) - \Phi(-\boldsymbol{x}_i^T \boldsymbol{\beta}) \\ \Pr(y_i = 2 | \boldsymbol{x}_i) &= \Phi(\mu_2 - \boldsymbol{x}_i^T \boldsymbol{\beta}) - \Phi(\mu_1 - \boldsymbol{x}_i^T \boldsymbol{\beta}) \\ &\vdots \\ \Pr(y_i = J | \boldsymbol{x}_i) &= 1 - \Phi(\mu_{J-1} - \boldsymbol{x}_i^T \boldsymbol{\beta}), \end{aligned}$$

that is, the areas under the normal cdf between pairs of cut points. The estimated coefficients then maximize the following log likelihood function:

$$\ln \mathcal{L}(\boldsymbol{\beta}; \boldsymbol{y}, \boldsymbol{x}) = \sum_i \sum_{j=0}^{J} \gamma_{ij} \ln\left[\Phi(\mu_j - \boldsymbol{x}_i^T \boldsymbol{\beta}) - \Phi(\mu_{j-1} - \boldsymbol{x}_i^T \boldsymbol{\beta})\right],$$

where $\gamma_{ij} = 1$ if $y_i = j$ and zero otherwise, $\mu_0 = 0$, $\mu_{-1} = -\infty$, and $\mu_J = +\infty$.

With $m$ ordinal choice variables corresponding to the WTP variables of the various insurance policies covered in the survey, we have a system of $m$ equations that seem unrelated (and thus a SUR system) in the sense that no endogenous (left-hand side) variables appear as explanatory (right-hand side) variables of other equations, but their errors can be correlated, thus sharing a multidimensional distribution. While estimating the parameters of the system equation by equation guarantees consistency, simultaneous

estimation accounts for the full covariance structure of the errors and generally results in greater efficiency.

For each household $i$, we can write the multivariate ordered probit model to represent the SUR system as $y_{ik}^* = \boldsymbol{x}_{ik}^T \boldsymbol{\beta}_k + \varepsilon_{ik}$, for $k = 1, \ldots, m$, where $k$ denotes the equation. Stacking all observations, we can express the *k*th equation as $\boldsymbol{y}_k^* = \boldsymbol{X}_k \boldsymbol{\beta}_k + \boldsymbol{\varepsilon}_k$, with $\boldsymbol{y}_k = g_k(\boldsymbol{y}_k^*)$, where the sets of regressors ($\boldsymbol{X}_1$ through $\boldsymbol{X}_m$) can be distinct or overlap, fully or partially, and the cut points and number of categories ($\mu_{jk}$ and $J_k$, for $j = 1, \ldots, J_k - 1$ and $k = 1, \ldots, m$) can differ across equations. Finally, stacking the $m$ equations, we have

$$\begin{bmatrix} \boldsymbol{y}_1^* \\ \boldsymbol{y}_2^* \\ \vdots \\ \boldsymbol{y}_m^* \end{bmatrix} = \begin{bmatrix} \boldsymbol{X}_1 & 0 & \cdots & 0 \\ 0 & \boldsymbol{X}_2 & \cdots & \vdots \\ \vdots & \vdots & \ddots & 0 \\ 0 & \cdots & 0 & \boldsymbol{X}_m \end{bmatrix} \begin{bmatrix} \boldsymbol{\beta}_1 \\ \boldsymbol{\beta}_2 \\ \vdots \\ \boldsymbol{\beta}_m \end{bmatrix} + \begin{bmatrix} \boldsymbol{\varepsilon}_1 \\ \boldsymbol{\varepsilon}_2 \\ \vdots \\ \boldsymbol{\varepsilon}_m \end{bmatrix}$$

or, in compact form, $\boldsymbol{y}^* = \boldsymbol{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}$, with $\boldsymbol{y} = \boldsymbol{g}(\boldsymbol{y}^*) = \{g_1(\boldsymbol{y}^*), \ldots, g_m(\boldsymbol{y}^*)\}^T$.

The error terms have zero mean and are independent across individuals and homoscedastic, but, for a given observation, they are correlated across equations, that is, $\boldsymbol{\varepsilon}|\boldsymbol{X} \sim \text{i. i. d. } N(\boldsymbol{0}, \boldsymbol{\Sigma})$, where

$$\boldsymbol{\Sigma} = \begin{bmatrix} \sigma_{11} & \sigma_{12} & \cdots & \sigma_{1m} \\ \sigma_{21} & \sigma_{22} & & \sigma_{2m} \\ \vdots & & \ddots & \vdots \\ \sigma_{m1} & \sigma_{m2} & \cdots & \sigma_{mm} \end{bmatrix}.$$

In estimating the $\boldsymbol{\beta}_k$ vectors, we maximize the log likelihood function using the cumulative distribution function of the joint normal distribution.

### 5.2.2 Multi-Nominal Logit Model

If the dependent variable is a nominal outcome ($y$) with at least three unordered alternatives (e.g., no insurance, self-funded insurance, and externally funded insurance), the regressors ($\boldsymbol{x}$) affecting $y$ are case-specific (i.e., they do not vary across alternatives as for the question at hand), and the assumption of independence of "irrelevant" alternatives (IIA) holds,[17] we can model the choice of *h* alternatives as a set of $h - 1$ independent binary choices, in which we select one alternative to be the base category and compare each of the other $h - 1$ alternatives against it. Formally, with error terms that follow the logistic distribution, we can write the probability of alternative *j* as

$$\Pr(y = j|\boldsymbol{x}_i) = \frac{e^{\boldsymbol{x}_i^T \boldsymbol{\beta}_j}}{\sum_h e^{\boldsymbol{x}_i^T \boldsymbol{\beta}_h}}.$$

As the probabilities of the *h* alternatives must sum to unity, there are only $h - 1$ separately specifiable probabilities, and thus only $h - 1$ separately identifiable vectors of coefficients. A

[17] By the IIA assumption, the odds of preferring one option over another do not depend on the presence or absence of other "irrelevant" alternatives.

convenient normalization to address this detail is to set one of the vectors to zero (i.e., $\boldsymbol{\beta}_b = 0$, where $b$ stands for base category). Hence, we have

$$\Pr(y = j|\boldsymbol{x}_i) = \frac{e^{\boldsymbol{x}_i^T \boldsymbol{\beta}_j}}{1 + \sum_{h \neq b} e^{\boldsymbol{x}_i^T \boldsymbol{\beta}_h}} \quad \text{for } j \neq b$$

and

$$\Pr(y = b|\boldsymbol{x}_i) = \frac{1}{1 + \sum_{h \neq b} e^{\boldsymbol{x}_i^T \boldsymbol{\beta}_h}},$$

and can compute the odds ratios as

$$\frac{\Pr(y = j|\boldsymbol{x}_i)}{\Pr(y = b|\boldsymbol{x}_i)} = e^{\boldsymbol{x}_i^T \boldsymbol{\beta}_j}$$

and the log-odds ratios as

$$\ln\left[\frac{\Pr(y = j|\boldsymbol{x}_i)}{\Pr(y = b|\boldsymbol{x}_i)}\right] = \boldsymbol{x}_i^T \boldsymbol{\beta}_j,$$

with the $\boldsymbol{\beta}_j$ vector, which is estimated by maximum likelihood, giving the marginal effects of the independent variables on the log-odds of choosing $j$ relative to $b$.

### 5.2.3 Tobit Model

In some instances, the dependent variable of a linear regression is censored, that is, observed only over some interval of its support; equivalently, with censored variables, their values in a certain range are reported as, or transformed to, a single value. Household expenditures on various commodity groups are a typical example of left-censored data in that we observe a significant proportion of households with zero expenditures and the rest with a positive level of expenditures. Likewise, our pseudo-continuous WTP data are censored at both ends; the right censoring is particularly imposing for the three policies with age-independent premiums, namely, injury with $1,000 per month, injury with $2,000 per month, and property, with 50%, 43% and 44% of respondents in support of the largest specified premium, respectively.

With censored data, we can analyze the distribution of the sample data, a mixture of discrete and continuous distributions, by defining a new variable ($y$), which we observe, as a transformation of the original variable ($y^*$), which we do not observe; with censoring at both ends, we can write the observation rule as

$$y_i = \begin{cases} l & \text{if } y_i^* \leq l \\ y_i^* & \text{if } l < y_i^* < u \\ u & \text{if } y_i^* \geq u, \end{cases}$$

where $l$ and $u$ are the lower and upper bounds of the interval over which we observe the dependent variable,[18] and $y_i^* = \boldsymbol{x}_i^T\boldsymbol{\beta} + \varepsilon_i$, with $\varepsilon_i \sim N(0, \sigma^2)$. The density function has thus three components that correspond to left-censored, uncensored, and right-censored observations; letting $d_l$ and $d_u$ denote the left- and right-censoring indicators (i.e., $d_l = 1$ if observation is left-censored and $d_u = 1$ if observation is right-censored), we in fact have

$$f(y_i) = \left\{\frac{1}{\sqrt{2\pi\sigma^2}}\exp\left[-\frac{1}{2}\left(\frac{y_i - \boldsymbol{x}_i^T\boldsymbol{\beta}}{\sigma}\right)^2\right]\right\}^{1-d_l-d_u}\left[1-\Phi\left(\frac{\boldsymbol{x}_i^T\boldsymbol{\beta}-l}{\sigma^2}\right)\right]^{d_l}\left[1-\Phi\left(\frac{u-\boldsymbol{x}_i^T\boldsymbol{\beta}}{\sigma^2}\right)\right]^{d_u},$$

with the last two terms reflecting the contributions to the likelihood of the censored observations. Maximum likelihood estimation of the coefficients of the model (i.e., $\boldsymbol{\beta}$ and $\sigma$) then requires maximization of the log likelihood function which, based on the assumption that observations are independent and identically distributed according to the above density function, is

$$\begin{aligned}\ln \mathcal{L}(\boldsymbol{\beta}; \boldsymbol{y}, \boldsymbol{x}) = &\sum_{y_i = y_i^*}\left\{-\frac{1}{2}\left[\ln 2\pi + \ln\sigma^2 + \left(\frac{y_i - \boldsymbol{x}_i^T\boldsymbol{\beta}}{\sigma}\right)^2\right]\right\} \\ &+ \sum_{y_i = l}\ln\left[1-\Phi\left(\frac{\boldsymbol{x}_i^T\boldsymbol{\beta}-l}{\sigma^2}\right)\right] + \sum_{y_i = u}\ln\left[1-\Phi\left(\frac{u-\boldsymbol{x}_i^T\boldsymbol{\beta}}{\sigma^2}\right)\right].\end{aligned}$$

## 5.3 To Buy or Not to Buy

For the participation decision, we consider the binary choice of whether to buy insurance in five areas: (non-government) health, disability or accident, life, property, and flood. We estimate the decisions separately as well as jointly to allow for unobservables affecting the decision in one area to also affect the decision in another area. We report both sets of estimates, side by side, in Table 5.3A below. For the individual probit regressions, we include a variant of the Wald statistic as a measure of goodness of fit (see Archer and Lemeshow, 2006) which accounts for the survey design of the data and is equal to

$$\hat{F} = \frac{(d - G + 2)}{(G-1)}\sum_{g=1}^{G}\frac{\bar{r}_g^2}{\hat{V}(\bar{r}_g)},$$

where $\bar{r}_g = \bar{y}_g - \bar{\pi}_g$, or the difference between the mean value of the dependent variable in group $g$ and the mean predicted probability in the same group, $\hat{V}(\bar{r}_g)$ is the estimated variance of $\bar{r}_g$, $d$ is the number of the design degrees of freedom (i.e., number of observations minus number of strata), $G$ is the number of groups we divide the data into upon sorting from the smallest predicted probability to the largest, and $g$ denotes group, with $g = 1, \cdots, G$. Letting $n_g$ represent the number of cases in group $g$, we have that the $n_1$ smallest values of the predicted probabilities are in the first group, the next $n_2$ smallest values of the predicted probabilities are in the second group, and so on.

[18] For our purposes, $l = 0$ and $u$ corresponds to the largest specified premium (17 for the injury policy with $1,000 per month; 27 for the injury policy with $2,000 per month; 22 for the property policy).

Under the null hypothesis that $\bar{\boldsymbol{r}} = \mathbf{0}$ (i.e., $\bar{r}_1 = \bar{r}_2 = \cdots = \bar{r}_G = 0$), $\hat{F} \sim F(G-1, d-G+2)$. A rejection of the null hypothesis implies that we do not have a good fit; correspondingly, for a good fit, we need to be unable to reject the null hypothesis, which is the case for each of the five probit regressions considered in this sub-section. With $G = 5$, so that each group has 20% of the observations, the $p$ value associated with the estimated $F$ statistic is high (in excess of 10%) in each of the five instances, and, therefore, we cannot reject the null hypothesis that the mean residuals of the five groups are simultaneously equal to zero; in other words, we have a good fit across the five binary models.

There are two results from the regression analysis of the participation decision we wish to highlight. The first is that there is strong positive correlation between the error terms of any two of the five equations, suggesting that any unsystematic effect on the participation decision in one area (e.g., life insurance) is coupled with a qualitatively similar unsystematic effect on the participation decision in another area (e.g., property insurance). The coefficients of correlation in Table 5.3A (i.e., $\hat{\rho}_{ij} = \hat{\rho}_{ji}$, for $i, j = 1 \ldots 5$ with $i \neq j$) are, in fact, all positive and statistically significant at the 1% level.[19] The second striking feature of the results is that the positive risk attitude appears to be the most relevant explanatory variable in the participation decision. Not only is this regressor the most consistent across the five areas, affecting the decision of whether to buy insurance in all of them, but its estimated effect in each area is always negative, as per our conjecture, and statistically significant at the 1% level, which means that we can reject the hypothesis that the effect is zero with a very low probability of erring.

There is, however, no evidence that having a positive or negative view of the insurance sector makes a difference in the participation decision: the estimated coefficient of negative_att is always not statistically significant, while the estimated coefficient of positive_att is only statistically significant in the decision to buy non-government health insurance. Although selectively (only for disability or accident insurance and property insurance), cultural restrictions appear to be more relevant in the decision, reducing, as we would anticipate, participation.

In terms of the remaining factors, experiences with risk events do not always matter but, when they do as the case for health insurance and flood insurance, tend to increase participation. Age has no effect on the decision to buy health insurance but is associated with a lower probability of buying disability or accident insurance and a higher probability of buying life, property, and flood coverage policies. Household income has mostly a positive effect, while household size reduces participation for health coverage and flood coverage while increasing it for life insurance. Those who own their dwellings

[19] The highest correlation coefficient is between property insurance and flood insurance. To note is that, in Canada, flood insurance is offered as an optional add-on to property insurance policies (e.g., a homeowners or renters insurance policy); the decision to buy these two products does not consist of two independent buying choices.

are more likely to buy property and flood insurance policies, but those who live in houses as opposed to apartments tend to be more interested in protection against flood damages but less interested in protection against other property damages. Whereas the statistically significant negative impact of living in a house on the decision to buy property insurance is inconsistent with our priors, it is reasonable to expect individuals who live in houses to prioritize flood insurance over property insurance when the latter is a broader concept that includes, as presented in the questionnaire, durables and business assets, neither of which are specific to whether the residential dwelling is a house or an apartment.

Aside from the estimated coefficient of the positive risk attitude regressor, the only other result that applies to all participation decisions and is statistically significant at the lowest level and qualitatively identical across the five equations is about the constant term which gives the predicted *z*-score, and thus the predicted probability of buying insurance, when all predictors are evaluated at zero. In some instances, such as the one at hand, setting all predictors to zero is meaningless: a value of zero may be acceptable for gender or any of the attitudinal indices but has no import for education or household size. Given that the

**Table 5.3A. Participation Decisions: Probit Estimation**

| Regressors | Non-Government Health (equation 1) | | Disability or Accident (equation 2) | | Life (equation 3) | | Property (equation 4) | | Flood (equation 5) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Probit | CMP | Probit | CMP | Probit | CMP | Probit | CMP | Probit | CMP |
| | | | | | | | | | | |
| age | 0.0020 | 0.0025 | -0.0089*** | -0.0078*** | 0.0081*** | 0.0083*** | 0.0200*** | 0.0185*** | 0.0055** | 0.0049* |
| gender | 0.1344* | 0.1588** | 0.1833** | 0.1874** | 0.1438** | 0.1544** | 0.1619** | 0.1441* | 0.0805 | 0.0752 |
| education | 0.0485* | 0.0416 | -0.0150 | -0.0225 | -0.0036 | -0.0031 | 0.0004 | -0.0107 | -0.0751*** | -0.0689*** |
| employed | -0.2094** | -0.1715** | 0.2786*** | 0.2717*** | 0.1442* | 0.1634** | -0.1743* | -0.2036** | -0.0952 | -0.0940 |
| religion | 0.0074 | -0.0008 | 0.0381 | 0.0707 | 0.1371* | 0.1464** | 0.0636 | 0.0421 | 0.0170 | 0.0438 |
| can_born | 0.1395 | 0.1320 | -0.0506 | -0.0338 | 0.0254 | 0.0191 | 0.0597 | 0.0608 | -0.1323 | -0.1504 |
| hh_income | 0.0000*** | 0.0000*** | 0.0000 | 0.0000** | 0.0000 | 0.0000 | 0.0000*** | 0.0000*** | 0.0000*** | 0.0000*** |
| hh_size | -0.1094*** | -0.1187*** | 0.0290 | 0.0234 | 0.1659*** | 0.1662*** | -0.0299 | -0.0195 | -0.0885** | -0.1054*** |
| own | 0.0196 | 0.0160 | 0.1528 | 0.1073 | 0.1551 | 0.1620* | 1.0989*** | 1.0894*** | 0.5240*** | 0.5116*** |
| house | 0.0954 | 0.0946 | -0.0453 | -0.0367 | -0.0207 | -0.0180 | -0.2508** | -0.2459** | 0.1787* | 0.1994** |
| tenure | -0.0103 | -0.0116 | 0.0100 | -0.0188 | 0.0178 | 0.0090 | 0.0119 | 0.0078 | 0.0227 | 0.0265 |
| health_status | 0.0562 | 0.0687 | 0.0428 | 0.0337 | 0.0139 | 0.0086 | 0.0031 | -0.0129 | -0.0277 | -0.0160 |
| life_satisf | 0.0224 | 0.0263 | 0.0008 | 0.0036 | 0.0412 | 0.0346 | 0.1465*** | 0.1401*** | -0.0330 | -0.0454 |
| serv_satisf | -0.0285 | -0.0308 | -0.0500 | -0.0513 | -0.0382 | -0.0191 | | | | |
| positive_att | 0.1321** | 0.1371** | 0.0764 | 0.0830 | 0.0847 | 0.0811 | -0.0911 | -0.0893 | 0.0813 | 0.0936* |
| negative_att | -0.0137 | -0.0111 | 0.0150 | 0.0167 | 0.0448 | 0.0475 | 0.0582 | 0.0642 | 0.0235 | 0.0085 |

| Regressors | Non-Government Health (equation 1) | | Disability or Accident (equation 2) | | Life (equation 3) | | Property (equation 4) | | Flood (equation 5) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Probit | CMP | Probit | CMP | Probit | CMP | Probit | CMP | Probit | CMP |
| | | | | | | | | | | |
| neutral_att | -0.0293 | -0.0371 | -0.0168 | -0.0222 | -0.0390 | -0.0358 | 0.0565 | 0.0589 | -0.0205 | -0.0305 |
| risk_comfort_att | -0.1608*** | -0.1653*** | -0.1941*** | -0.1891*** | -0.4049*** | -0.4118*** | -0.3544*** | -0.3524*** | -0.1871*** | -0.1904*** |
| cult_restrict_att | -0.0417 | -0.0526 | -0.0961** | -0.0999** | 0.0017 | 0.0101 | -0.1584*** | -0.1475*** | -0.0370 | -0.0316 |
| health_event1 | | | 0.1973 | 0.1408 | | | | | | |
| health_event2 | | | 0.0764 | 0.0566 | | | | | | |
| health_event3 | 0.2380*** | 0.2296*** | | | | | | | | |
| health_event4 | 0.1552* | 0.1519* | | | | | | | | |
| death_event | | | | | 0.0842 | 0.0609 | | | | |
| property_event | | | | | | | 0.1901 | 0.1717 | 0.3918*** | 0.4027*** |
| constant | -1.6427*** | -1.6718*** | -1.1275*** | -1.0218*** | -1.7028*** | -1.7183*** | -2.1883*** | -1.9234*** | -1.2857*** | -1.2334*** |
| Observations | 1,403 | 2,036 | 1,425 | 2,036 | 1,576 | 2,036 | 1.871 | 2,036 | 1,693 | 2,036 |
| Goodness of Fit | 0.30 | | 0.68 | | 1.29 | | 1.83 (0.12)[a] | | 0.71 (0.58)[a] | |
| | | $\hat{\rho}_{12}$ | 0.4521*** | | | $\hat{\rho}_{24}$ | 0.3454*** | | | |
| | | $\hat{\rho}_{13}$ | 0.4278*** | | | $\hat{\rho}_{25}$ | 0.3540*** | | | |
| | | $\hat{\rho}_{14}$ | 0.2332*** | | | $\hat{\rho}_{34}$ | 0.4066*** | | | |
| | | $\hat{\rho}_{15}$ | 0.2134*** | | | $\hat{\rho}_{35}$ | 0.1992*** | | | |
| | | $\hat{\rho}_{23}$ | 0.4806*** | | | $\hat{\rho}_{45}$ | 0.5883*** | | | |

Notes: all estimates are from maximum likelihood; $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$; $\hat{\rho}_{ij}$ denotes correlation coefficient between equation *i*'s errors and equation *j*'s errors; [a] $p$-value in brackets.

error term may encapsulate effects of factors that are relevant in the participation decision but are not included in the analysis for several reasons (e.g., lack of data, incomplete theory), we can think of the constant as the average impact of the excluded regressors, in which case the result suggests the presence of missing factors that tend to reduce the probability of buying insurance.

Based on the estimates from the individual probit regressions, we can compute the predicted participation probabilities for specific groups. Furthermore, as the results in Table 5.3A do not give marginal effects but the effects on the *z*-scores, we can also obtain estimates of the average marginal effects of key predictors. We summarize these additional results in Table 5.3B. Setting all covariates at their mean values, we find that the probability of buying is lowest for disability insurance (at 24%) and highest for property insurance (at 85%); health insurance and flood insurance also claim a low probability of participation, whereas life insurance attracts, on average, 57% of the potential (given income and age restrictions) pool of buyers.

**Table 5.3B. Participation Decisions: Predicted Probabilities and Marginal Effects**

| | | | Health | Disability | Life | Property | Flood |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Predicted probability of buying at mean values of all covariates | | | 0.3097*** | 0.2363*** | 0.5660*** | 0.8485*** | 0.2786*** |
| Predicted probability of buying at various values of the private view attitude index and at mean values for the remaining regressors | risk_comfort_att | -2 | 0.3795*** | 0.3112*** | 0.7296*** | 0.9234*** | 0.3541*** |
| | | -1 | 0.3200*** | 0.2461*** | 0.5819*** | 0.8585*** | 0.2873*** |
| | | 0 | 0.2648*** | 0.1892*** | 0.4214*** | 0.7640*** | 0.2271*** |
| | | 1 | 0.2150*** | 0.1412*** | 0.2732*** | 0.6424*** | 0.1748*** |
| | | 2 | 0.1710*** | 0.1022*** | 0.1567*** | 0.5042*** | 0.1308*** |
| Average marginal effect | own | | 0.0065 | 0.0454 | 0.0532 | 0.2272*** | 0.1627*** |
| | risk_comfort_att | | -0.0536*** | -0.0577*** | -0.1388*** | -0.0733*** | -0.0581*** |
| | health_event3 | | 0.0793*** | NA | NA | NA | NA |
| | health_event4 | | 0.0517* | NA | NA | NA | NA |
| | property_risk | | NA | NA | NA | 0.0393 | 0.1217*** |

Note: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

For individuals with a positive risk attitude, that is, those who question the usefulness of insurance on account of their perception that the likelihood of serious events is low and/or of their belief that they can manage problems, the probability of participating is low across all areas but property. If we compare the predicted probabilities at the two extreme values of the risk comfort index which correspond to strong disagreement or absence of the attitude (-2) and strong agreement or presence of the attitude (2), the difference between the two predictions represents a drop of 55%, 67%, 79%, 45%, and 63% in the probability of buying coverage for health, disability, life, property, and flood protection, respectively.

In line with the above discussion, the estimated average marginal effect of the risk comfort index suggests that the predicted probability decreases, on average, by between 5.4 and

13.9 percentage points when the index increases by one unit, and the strongest impact is on the decision of buying life insurance. When statistically significant, the experience of a risky event increases the probability of participation by at least 5 percentage points, but the largest impact is on the probability of buying flood insurance in the presence of a property damage/loss experience in the past five years (by 12.2 percentage points) and the probability of buying life insurance in the presence of a chronic illness experience in the past three years (by 7.9 percentage points). Of all covariates for which we provide estimates of the average marginal effects in Table 5.3B, the indicator for owning the place of residence has, however, the most noticeable effect, increasing the probability of buying property insurance and flood insurance by 22.7 and 16.3 percentage points.

A related participation question we consider in this sub-section compares the decision of externally funded insurance to both the decision of no insurance and the decision of internally funded insurance in each of the five areas under consideration via a multi-nominal logit model. A quick glance at the results in the next table (Table 5.3C), which provides changes in the relative risk ratios (or odd ratios), so that a value less than 1 implies a decrease and, correspondingly, a value greater than 1 implies an increase, reveals that a positive risk attitude tends to increase the likelihood of no insurance relative to externally funded insurance, with one notable exception, and to decrease the likelihood of self-funded insurance relative to externally funded insurance. Looking at the life coverage figures for illustrative purposes, we have that a unit increase in the risk comfort index increases the probability of no insurance and decreases the probability of self-funded life insurance relative to externally funded insurance by 31% and 33%.

Among other results, risk experiences are consistently associated not only with a lower probability of no insurance, which is in accordance with our priors, but also with a lower probability of privately funded insurance relative to externally funded insurance, which is not necessarily counterintuitive but is difficult to interpret without more information about pre- and post-event access to externally funded insurance. For health, disability, and life, being employed reduces the likelihood of no insurance as well as the likelihood of self-funded insurance, both in alignment with our expectations but with some obvious differences: being employed increases the expected benefit of insurance which affects both instances, so that we would expect more investment in insurance, including self-funded insurance; however, being employed offers opportunities to join employee insurance plans at likely lower premiums, which would increase the benefit of externally funded insurance over self-funded insurance, an increase that seems to dominate in our data set. One last result worthy of mention is the effect of a positive insurance attitude which does not matter in the comparison between no insurance and externally funded insurance, in harmony with the absence of impact on the participation decision in the probit estimation, but does increase the likelihood of privately funded insurance relative to externally funded insurance for health, disability, and life by over 30%.

**Table 5.3C. Multi-Nominal Logit Model: No Insurance, Externally Funded Insurance, and Internally Funded Insurance**

| Regressors | No Insurance relative to Externally Funded Insurance | | | | | Privately Funded Insurance relative to Externally Funded Insurance | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (1) | (2) | (3) | (4) | (5) |
| | Health | Disability | Life | Property | Flood | Health | Disability | Life | Property | Flood |
| | | | | | | | | | | |
| age | 1.0001 | 1.0099* | 0.9841*** | 0.9963 | 1.0251 | 1.0047 | 0.9924 | 0.9984 | 1.0334** | 1.0346* |
| gender | 0.9629 | 0.8090 | 0.7035** | 0.9073 | 1.2188 | 1.1635 | 1.0985 | 0.8572 | 1.2280 | 1.4028 |
| education | 0.9460 | 0.9507 | 0.9526 | 1.0196 | 0.9190 | 1.0300 | 0.9313 | 0.9610 | 1.0231 | 0.8106 |
| employed | 0.7268** | 0.3004*** | 0.3890*** | 1.2196 | 0.5507 | 0.5265*** | 0.4918*** | 0.5011*** | 0.9191 | 0.4611 |
| religion | 1.1206 | 0.8603 | 1.0100 | 0.5887 | 1.0199 | 1.1494 | 0.9504 | 1.2776 | 0.6499 | 1.0457 |
| can_born | 0.9092 | 1.1511 | 1.2463 | 0.3879* | 0.6734 | 1.1881 | 1.0959 | 1.2937 | 0.4210* | 0.5352 |
| hh_income | 1.0000*** | 1.0000*** | 1.0000** | 1.0000 | 1.0000 | 1.0000 | 1.0000*** | 1.0000 | 1.0000 | 1.0000** |
| hh_size | 1.0096 | 1.0983 | 0.7723*** | 0.7177** | 0.8033 | 0.8543** | 1.1605* | 1.0309 | 0.6912*** | 0.7007* |
| own | 1.3527* | 1.0816 | 1.0701 | 0.6211 | 1.7966 | 1.3627 | 1.3804 | 1.3288 | 4.0204*** | 4.3938** |
| house | 0.9015 | 1.2919 | 1.5767** | 3.2528** | 2.6250 | 1.0397 | 1.2135 | 1.5543** | 2.1732 | 3.5385* |
| tenure | 0.9940 | 0.9913 | 0.9662 | 1.2877** | 1.2621 | 0.9707 | 1.0196 | 0.9873 | 1.3023** | 1.3077 |
| health_status | 0.9013 | 0.9866 | 1.0408 | 1.5054* | 0.8542 | 0.9813 | 1.0589 | 1.0524 | 1.5425* | 0.8130 |
| life_satisf | 0.9361 | 0.9710 | 0.8276* | 0.3066*** | 0.9951 | 0.9962 | 0.9801 | 0.8954 | 0.3915*** | 0.9401 |
| serv_satisf | 0.9633 | 1.0092 | 1.0940 | | | 0.9046 | 0.9313 | 1.0353 | | |
| positve_att | 1.0904 | 1.1409 | 1.1490 | 0.9607 | 0.5193** | 1.3652*** | 1.3281** | 1.3134** | 0.8298 | 0.5985 |
| negative_att | 0.9132 | 0.9687 | 0.8331 | 0.9961 | 1.5015 | 0.9005 | 1.0218 | 0.9100 | 1.1194 | 1.5709 |
| neutral_att | 0.8561* | 0.8492* | 0.8347 | 1.4989 | 1.6660 | 0.8138** | 0.8156* | 0.7827** | 1.6833** | 1.6148 |
| risk_comfort_at | 1.1963*** | 1.3223*** | 1.3066*** | 1.1443 | 0.6260** | 0.9097 | 0.9300 | 0.6669*** | 0.6223** | 0.4556*** |
| cult_restrict_att | 1.2695*** | 1.2330** | 1.1344 | 0.8135 | 0.7916 | 1.1835* | 1.0270 | 1.1257 | 0.6154*** | 0.7432 |
| health_event1 | | 0.8227 | | | | | 1.2013 | | | |
| health_event2 | | 1.0429 | | | | | 1.1454 | | | |
| health_event3 | 0.8072 | | | | | 1.2141 | | | | |
| health_event4 | 0.6454*** | | | | | 0.8266 | | | | |
| death_event | | | 0.4558*** | | | | | 0.5601** | | |
| property_event | | | | 0.1221*** | 0.1921*** | | | | 0.1883*** | 0.3680** |
| constant | 65.2553*** | 47.4442*** | 125.5679*** | 559.9208*** | 12.5749 | 3.9248* | 6.2379** | 6.3721*** | 11.0093 | 1.4621 |
| | | | | | | | | | | |
| Observations | 1,813 | 1,742 | 1,816 | 1,912 | 1,720 | 1,813 | 1,742 | 1,816 | 1,912 | 1,720 |

Notes: coefficients give relative risk ratios; $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

## 5.4 Willingness to Pay

In this sub-section, we complete our empirical analysis of the data by examining the WTP information across seven policies covering four areas (injury, critical illness, life, and property) within an ordered probit model that relies on WTP categories and within a tobit model that relies on WTP amounts. For the ordered probit estimation, we adopt the same strategy as for the binary probit estimation to run the model for each of the seven policies individually as well as for all policies jointly to be able to comment, at a minimum, on whether decisions across areas are related via random shocks. The results, which we report in Table 5.4A that follows, clearly suggest the presence of statistically significant positive correlation between the error terms of any two equations, and this implies that a disturbance that affects the willingness to pay in a specific area impacts the willingness to pay in any other area in a qualitatively similar fashion.

The most striking feature of the estimation results in Table 5.4A, with focus on the individual ordered probit regressions, is the consistency of the effects of the positive and negative insurance attitudes on WTP, both in terms of direction and statistical significance: those with a positive view of the insurance sector are consistently willing to pay more, while those with a negative view are consistently willing to pay less. This contrasts starkly with the finding in the previous sub-section that holding any view of the insurance sector, be it positive or negative, has no bearing on the decision of whether to buy insurance. For the participation decision, the one regressor that catches the eye for its consistently negative and statistically significant effect is the positive risk attitude, which also matters in the WTP decision but less persistently as it is not statistically significant, and thus statistically not different from zero, for the low-coverage injury and life policies, at the 10% level of significance, and for the low-coverage critical illness policy, at the 5% level of significance.

The combined results from the participation and WTP decisions offer an interesting story, one worthwhile exploring further in future iterations of the questionnaire: while risk aversion/loving is an important factor in the decision of whether to buy insurance but also affects the demand for insurance through its impact on WTP, the evidence points to a more pervasive presence in the participation decision; conversely, insurance aversion/loving, as jointly reflected in the positive and negative view indices, is inconsequential in the decision to buy insurance but does shape the demand for insurance. A caveat is, however, in order: the WTP categories include a category for zero WTP which we can view as equivalent to no participation, and, therefore, it is reasonable to argue that the finding about the importance of insurance aversion/loving in the WTP analysis also holds for the participation decision (or the decision of a positive WTP versus a zero WTP). Notwithstanding the caveat, the data informing the participation decision in sub-section 5.3 are about the presence of privately funded insurance, and thus truly about the decision of buying insurance, whereas the data informing the participation decision in the current sub-section are about the willingness to pay for a specific policy, and a zero WTP is necessary but not sufficient to suggest no interest in buying insurance.

Additional regressors of distinctive relevance in the WTP decision include age and experience, with the former associated with lower WTP and the latter with larger WTP, as

we would anticipate. The positive effect of gender and negative effect of education from the participation analysis survive in the WTP analysis but less visibly in the former case and more visibly in the latter case; income, on the other hand, is always not statistically significant in the ordered probit regressions but mostly statistically significant in the binary probit regressions. The fact that more educated people are not only less likely to buy insurance but also less willing to pay is intriguing, and we may have room within the existing dataset to explore the reasons by examining the data more meticulously to ascertain, for example, if more education means greater risk tolerance. In the areas of life and property, WTP is increasing in household size, possibly on account of larger expected benefits, but is, peculiarly, particularly for property insurance, lower among homeowners. Life satisfaction only matters for injury policies, raising WTP as per anticipation, but Canada-born report lower WTP, although only for the high-coverage policies at least for critical illness and life.

Exploring the results in quantitative terms, and with specific emphasis on key regressors, we report the estimated probability of a WTP that corresponds to the high premium (category 5), the low premium (category 3), or to any level below the low premium (categories 0, 1, and 2) in Table 5.4B for each policy and at different values (-2 -1, 0, 1, and 2) of the three key attitudes (positive insurance view, negative insurance view, and risk comfort), setting the values of the remaining regressors at their mean levels. As the table clearly illustrates, at the 1% level of significance, the more positive people are about the insurance sector, the more likely they are to be willing to pay more for any type of coverage: across all areas, the predicated probability of being in the low WTP categories (< 3) decreases while the predicted probability of being in the high WTP category (5) increases as the value of the positive view index shifts from -2 to 2. The opposite holds when the negative view index or the risk comfort index increases, implying that, the more negative people are about the value of insurance companies or the more comfortable about risk they are, the less likely they are to be willing to pay more for any type of coverage.

### Table 5.4A. Willingness to Pay Decisions: Ordered Probit Estimation

| Regressors | Injury | | | | Critical Illness | | | | Life | | | | Property | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Policy 1 | | Policy 2 | | Policy 1 | | Policy 2 | | Policy 1 | | Policy 2 | | | |
| | Probit | CMP | Probit | CMP | Probit | CMP | Probit | CMP | Probit | CMP | Probit | CMP | Probit | CMP |
| age | -0.008* | -0.009 | -0.009** | -0.011 | -0.035*** | -0.039 | -0.056*** | -0.059* | -0.016*** | -0.012 | -0.031*** | -0.027 | -0.006*** | -0.006 |
| gender | 0.196*** | 0.103 | 0.186*** | 0.098 | 0.206*** | 0.199 | 0.097 | 0.062 | 0.136** | 0.123 | 0.093 | 0.073 | -0.014 | -0.024 |
| education | -0.095*** | -0.071 | -0.079*** | -0.054 | -0.085*** | -0.060 | -0.039 | -0.011 | -0.076*** | -0.053 | -0.055** | -0.032 | -0.020 | -0.016 |
| employed | -0.022 | 0.054 | 0.012 | 0.069 | 0.078 | 0.131 | 0.017 | 0.071 | 0.219*** | 0.183 | 0.203*** | 0.153 | 0.054 | 0.047 |
| religion | -0.022 | 0.015 | -0.020 | 0.020 | -0.078 | -0.040 | -0.070 | -0.033 | 0.057 | 0.039 | -0.032 | -0.023 | -0.064 | -0.057 |
| can_born | -0.245*** | -0.280 | -0.243*** | -0.253 | -0.113 | -0.131 | -0.182** | -0.209 | -0.112 | -0.100 | -0.194** | -0.180 | -0.142** | -0.146 |
| hh_income | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| hh_size | 0.029 | 0.060 | 0.055* | 0.072 | 0.057* | 0.077 | 0.042 | 0.057 | 0.088*** | 0.095 | 0.110*** | 0.113 | 0.056** | 0.060 |
| own | -0.121 | -0.160 | -0.105 | -0.155 | -0.077 | -0.125 | -0.085 | -0.136 | -0.179** | -0.185 | -0.244*** | -0.234 | -0.269*** | -0.255 |
| house | 0.034 | 0.020 | -0.071 | -0.068 | 0.046 | 0.028 | 0.073 | 0.065 | 0.154** | 0.120 | 0.203*** | 0.162 | -0.001 | -0.009 |
| tenure | -0.028 | -0.032 | -0.036 | -0.031 | -0.008 | 0.000 | -0.013 | -0.006 | -0.040 | -0.040 | -0.025 | -0.021 | -0.012 | -0.009 |
| health_status | -0.006 | -0.010 | -0.044 | -0.044 | 0.043 | 0.014 | 0.053 | 0.023 | -0.051 | -0.050 | -0.061* | -0.056 | -0.009 | -0.009 |
| life_satisf | 0.103** | 0.037 | 0.075* | 0.020 | 0.044 | -0.006 | -0.016 | -0.050 | 0.002 | -0.022 | 0.025 | -0.005 | 0.006 | 0.000 |
| serv_satisf | 0.046 | 0.029 | 0.021 | 0.011 | 0.010 | 0.020 | -0.034 | -0.020 | 0.006 | 0.017 | -0.021 | -0.003 | | |
| positive_att | 0.220*** | 0.261** | 0.183*** | 0.214* | 0.304*** | 0.314*** | 0.230*** | 0.238** | 0.313*** | 0.329*** | 0.272*** | 0.295** | 0.260*** | 0.266*** |
| negative_att | -0.188*** | -0.123 | -0.165*** | -0.094 | -0.138*** | -0.105 | -0.194*** | -0.149 | -0.071* | -0.068 | -0.094** | -0.085 | -0.084** | -0.087 |
| neutral_att | 0.044 | 0.018 | 0.057 | 0.030 | 0.002 | -0.026 | 0.021 | -0.005 | -0.030 | -0.047 | -0.015 | -0.042 | 0.023 | 0.021 |
| risk_comfort_att | -0.059 | -0.045 | -0.123*** | -0.113*** | -0.070* | -0.076** | -0.109*** | -0.127*** | -0.043 | -0.048 | -0.092*** | -0.087*** | -0.161*** | -0.154*** |
| cult_restrict_att | 0.033 | 0.019 | 0.004 | -0.007 | 0.073*** | 0.041 | 0.025 | 0.021 | 0.068** | 0.055 | -0.013 | -0.010 | 0.007 | 0.007 |
| health_event1 | 0.670*** | 0.401*** | 0.589*** | 0.313** | | | | | | | | | | |
| health_event2 | 0.327*** | 0.146* | 0.283*** | 0.123* | | | | | | | | | | |
| health_event3 | | | | | 0.060 | -0.085 | 0.093 | -0.069 | | | | | | |
| health_event4 | | | | | 0.298*** | 0.126** | 0.244*** | 0.105** | | | | | | |
| death_event | | | | | | | | | 0.337*** | -0.023 | 0.442*** | -0.006 | | |
| property_event | | | | | | | | | | | | | 0.371*** | 0.237** |
| Observations | 1,159 | 2,108 | 1,159 | 2,108 | 1,365 | 2,108 | 1,365 | 2,108 | 1,644 | 2,108 | 1,644 | 2,108 | 2,108 | 2,108 |
| | | $\hat{\rho}_{12}$ | 1.550*** | | | $\hat{\rho}_{24}$ | 0.871*** | | | $\hat{\rho}_{37}$ | 0.603*** | | | |
| | | $\hat{\rho}_{13}$ | 0.798*** | | | $\hat{\rho}_{25}$ | 0.604*** | | | $\hat{\rho}_{45}$ | 0.701*** | | | |
| | | $\hat{\rho}_{14}$ | 0.757*** | | | $\hat{\rho}_{26}$ | 0.767*** | | | $\hat{\rho}_{46}$ | 0.939*** | | | |
| | | $\hat{\rho}_{15}$ | 0.622*** | | | $\hat{\rho}_{27}$ | 0.633*** | | | $\hat{\rho}_{47}$ | 0.615*** | | | |
| | | $\hat{\rho}_{16}$ | 0.730*** | | | $\hat{\rho}_{34}$ | 1.015*** | | | $\hat{\rho}_{56}$ | 1.322*** | | | |
| | | $\hat{\rho}_{17}$ | 0.661*** | | | $\hat{\rho}_{35}$ | 0.858*** | | | $\hat{\rho}_{57}$ | 0.670*** | | | |
| | | $\hat{\rho}_{23}$ | 0.730*** | | | $\hat{\rho}_{36}$ | 0.864*** | | | $\hat{\rho}_{67}$ | 0.712*** | | | |

Notes: all estimates are from maximum likelihood; $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$; $\hat{\rho}_{ij}$ denotes correlation coefficient between equation *i*'s errors and equation *j*'s errors.

**Table 5.4B. Willingness to Pay Decisions: Predicted Probabilities**

| Positive View | | -2 | | | -1 | | | 0 | | | 1 | | | 2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WTP Category | | < 3 | 3 | 5 | < 3 | 3 | 5 | < 3 | 3 | 5 | < 3 | 3 | 5 | < 3 | 3 | 5 |
| Injury | Policy 1 | 57 | 4 | 33 | 49 | 4 | 41 | 40 | 4 | 50 | 32 | 4 | 59 | 24 | 4 | 67 |
| | Policy 2 | 54 | 11 | 29 | 47 | 11 | 35 | 40 | 11 | 42 | 33 | 11 | 50 | 27 | 10 | 57 |
| Critical Illness | Policy 1 | 43 | 14 | 32 | 32 | 13 | 44 | 22 | 12 | 56 | 14 | 9 | 67 | 8 | 7 | 77 |
| | Policy 2 | 66 | 9 | 19 | 57 | 10 | 26 | 48 | 11 | 34 | 39 | 11 | 42 | 30 | 10 | 52 |
| Life | Policy 1 | 52 | 16 | 24 | 39 | 17 | 34 | 28 | 16 | 46 | 19 | 13 | 59 | 11 | 10 | 70 |
| | Policy 2 | 55 | 17 | 21 | 44 | 18 | 29 | 34 | 18 | 39 | 24 | 16 | 50 | 17 | 14 | 61 |
| Property | | 57 | 11 | 25 | 47 | 12 | 34 | 37 | 12 | 43 | 27 | 11 | 54 | 19 | 9 | 64 |

| Negative View | | -2 | | | -1 | | | 0 | | | 1 | | | 2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WTP Category | | < 3 | 3 | 5 | < 3 | 3 | 5 | < 3 | 3 | 5 | < 3 | 3 | 5 | < 3 | 3 | 5 |
| Injury | Policy 1 | 21 | 3 | 72 | 26 | 4 | 65 | 33 | 4 | 58 | 40 | 4 | 50 | 47 | 4 | 43 |
| | Policy 2 | 23 | 10 | 62 | 28 | 10 | 55 | 34 | 11 | 49 | 40 | 11 | 42 | 46 | 11 | 36 |
| Critical Illness | Policy 1 | 12 | 8 | 71 | 14 | 9 | 66 | 18 | 10 | 61 | 22 | 11 | 56 | 26 | 12 | 50 |
| | Policy 2 | 26 | 9 | 56 | 33 | 10 | 49 | 40 | 11 | 41 | 48 | 11 | 34 | 56 | 10 | 27 |
| Life | Policy 1 | 21 | 14 | 56 | 23 | 14 | 53 | 25 | 15 | 50 | 27 | 15 | 47 | 30 | 16 | 44 |
| | Policy 2 | 24 | 16 | 51 | 27 | 17 | 47 | 30 | 17 | 43 | 33 | 18 | 40 | 37 | 18 | 36 |
| Property | | 27 | 11 | 54 | 30 | 11 | 51 | 33 | 11 | 47 | 36 | 12 | 44 | 39 | 12 | 41 |

| Risk Comfort | | -2 | | | -1 | | | 0 | | | 1 | | | 2 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WTP Category | | < 3 | 3 | 5 | < 3 | 3 | 5 | < 3 | 3 | 5 | < 3 | 3 | 5 | < 3 | 3 | 5 |
| Injury | Policy 1 | 36 | 4 | 54 | 39 | 4 | 52 | 41 | 4 | 49 | 43 | 4 | 47 | 46 | 4 | 45 |
| | Policy 2 | 33 | 11 | 50 | 37 | 11 | 45 | 42 | 11 | 40 | 47 | 11 | 35 | 52 | 11 | 31 |
| Critical Illness | Policy 1 | 19 | 11 | 60 | 21 | 11 | 57 | 23 | 12 | 55 | 25 | 12 | 52 | 27 | 13 | 49 |
| | Policy 2 | 41 | 11 | 40 | 46 | 11 | 36 | 50 | 11 | 32 | 54 | 10 | 28 | 59 | 10 | 24 |
| Life | Policy 1 | 25 | 15 | 49 | 27 | 15 | 48 | 28 | 16 | 46 | 30 | 16 | 44 | 31 | 16 | 43 |
| | Policy 2 | 29 | 17 | 45 | 32 | 18 | 41 | 35 | 18 | 38 | 39 | 18 | 34 | 43 | 18 | 31 |
| Property | | 29 | 11 | 52 | 34 | 11 | 46 | 41 | 12 | 39 | 47 | 12 | 33 | 53 | 12 | 28 |

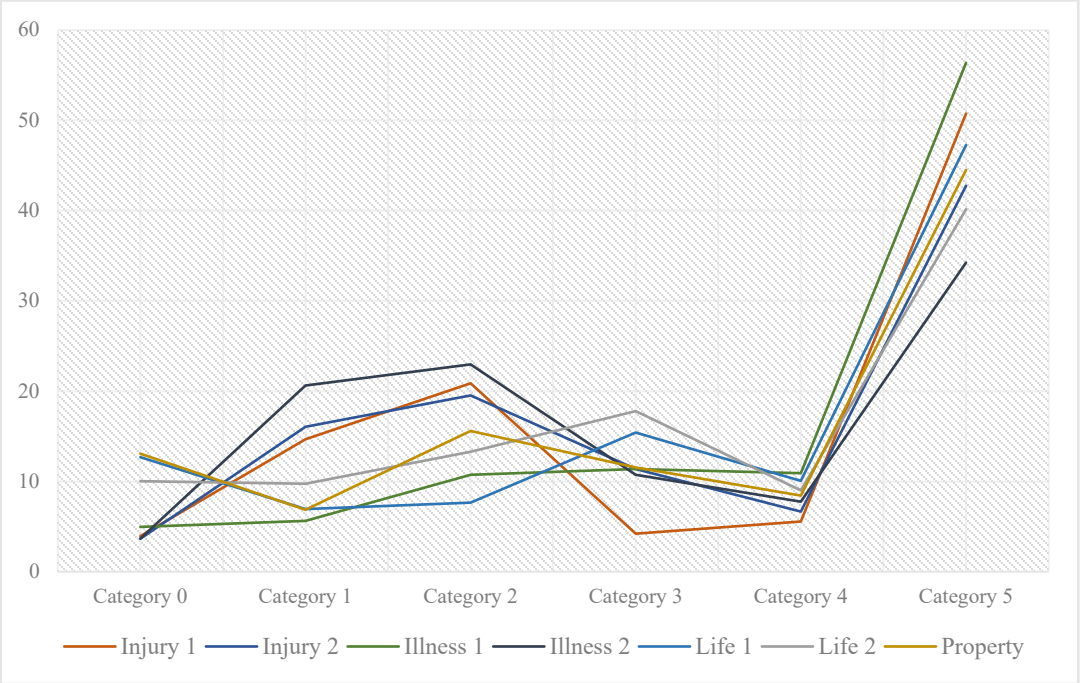
Note: all predicted probabilities are significant at the 1% level.

A comparison of the percentages across the three indices also reveals that the changes in predicted probabilities are of noticeably larger magnitude when the positive view index varies, underscoring the relevance of this index in the intensity decisions: the predicted probabilities of being in the low (< 3) and high WTP (5) categories jump, in fact, by an average of 37, less than 19, and less than 14 percentage points when the increase from -2 to 2 applies to the positive view, negative view, and risk comfort indices, respectively, with the average increase in the probability of being in the high WTP category being equal to or larger than the average decrease in the probability of being in the low WTP categories.

In Figure 5.4a that follows, we plot the predicted probabilities at the mean values of all variables, including the three indices above considered. A few inferences emerge from the

graph: (1) being in the high WTP category always enjoys the highest predicted probability;[20] (2) for areas with two policies differing in coverage (injury, illness, and life), the predicted probability of being in the high WTP category is always higher for the low-coverage policy; (3) the predicted probability of being in the zero-WTP category is higher for life insurance and property insurance. As tempting as it may be to comment on how the predicted probabilities across areas compare at the non-zero categories, we refrain from drawing any conclusion on account of the different ranges or different values the categories represent.

**Figure 5.4a. Predicted Probabilities of WTP Categories at Mean Values**




In the last table of this sub-section, Table 5.4C below, we provide a subset of the results of the tobit specification estimation, which utilizes the actual WTP values. The subset includes only regressors with estimated coefficients that are statistically significant in at least one instance. As the qualitative effects of the relevant regressors on WTP conform to the findings based on the ordered probit analysis of the WTP categories, we do not dwell on them; however, as the tobit-estimated coefficients represent marginal effects, we briefly interpret them for key variables.[21] It immediately follows from a cursory glance at the table that having a positive view of the insurance sector has a stronger impact on WTP than having a negative view: not only is the estimated effect of the former always present and

[20] This result may be attributable, at least in part, to the survey design which begins with a closed-ended question about the acceptability of a certain premium corresponding to the WTP value in category 5. It would be interesting to explore the impact of beginning with an open-ended question.

[21] As the premiums (WTP values) specified in the closed-ended questions, which we employ in the tobit analysis, are age-dependent for the illness and life policies, we exclude age in the tobit estimation of WTP in these areas and we only allow for censoring from below (or left-censoring) as the upper bound of the range is also age-dependent.

statistically significant at the 1% level, while the effect of the latter is absent in the regression results for the life policies, but, when both regressors are relevant, the effect of a one-unit increase in the former is also larger than the effect of a one-unit decrease in the latter.

Considering each index individually, we see that a unit increase in the positive view index is expected to raise WTP by between $1.1 (for the low-coverage critical illness policy) to $4.3 (for the property policy), but the expected increase is always larger for the high-coverage policies when two coverages are available ($2.5 versus $2.3, $3.5 versus $1.1, and $2.8 versus $1.2 for injury, critical illness, and life policies, respectively). A unit increase in the negative insurance attitude is instead expected to lower WTP, other things being equal, by between $0.3 (for the low-coverage critical illness policy) to $2.3 (for the high-coverage life policy), but the expected change is again always larger for the high-coverage policies ($2.3 versus $2.0 and $2.0 versus $0.3 for injury and critical illness). A larger effect on the WTP for the high-coverage policy also results from a unit change in the risk comfort index; in fact, the marginal impact on the WTP for the low-coverage policy is low, between 25 and 50 cents and statistically not different from zero in one case, while the marginal impact on the WTP for the high-coverage policy lies between $1.2 and $1.8. Like the positive attitude index, the risk comfort index is, however, most relevant in the property regression, with a unit decrease in the index (hence, a marginal increase in risk aversion) increasing the WTP for property insurance by $2.6.

**Table 5.4C. Willingness to Pay Decisions: Tobit Estimation**

| Regressors | Injury | | Critical Illness | | Life | | Property |
|---|---|---|---|---|---|---|---|
| | Policy 1 | Policy 2 | Policy 1 | Policy 2 | Policy 1 | Policy 2 | |
| | | | | | | | |
| age | -0.0731 | -0.1177** | NA | NA | NA | NA | -0.0946*** |
| gender | 1.9703*** | 2.3603** | 0.2814 | -1.1366 | 0.4250* | -0.0462 | -0.2111 |
| education | -0.9680*** | -1.0551*** | -0.3647*** | -0.6313 | -0.3295*** | -0.7956*** | -0.3109 |
| employed | -0.2141 | 0.2445 | 1.0186*** | 2.7275** | 0.3539 | 0.6556 | 1.0770 |
| religion | 0.0317 | -0.0106 | 0.5302* | 1.8544* | 0.5343** | 1.9400*** | -0.9297 |
| can_born | -2.5078*** | -3.1316** | -0.9817*** | -3.6688** | -0.6818** | -3.7219*** | -2.4824** |
| hh_size | 0.2752 | 0.6544 | 0.0229 | -0.0238 | 0.1362 | -0.0283 | 0.8990** |
| own | -1.3389 | -1.4859 | 0.3418 | 0.1326 | -0.4219 | -0.8203 | -4.3617*** |
| house | 0.2357 | -0.8320 | 0.0365 | 0.0928 | 0.5546* | 1.9878** | -0.1155 |
| tenure | -0.3197 | -0.5135 | 0.2730*** | 1.0434*** | 0.0009 | 0.6983*** | -0.2193 |
| health_status | -0.0911 | -0.4970 | -0.4061** | -1.0784 | -0.3569*** | -1.3355*** | -0.1490 |
| life_satisf | 0.9972** | 0.8445 | 0.1617 | -0.5825 | 0.0790 | 0.3037 | 0.0517 |
| serv_satisf | 0.4186 | 0.2147 | -0.2314 | -1.3105** | -0.0072 | -0.3806 | |
| positive_att | 2.2672*** | 2.5097*** | 1.1445*** | 3.5421*** | 1.1704*** | 2.8234*** | 4.2571*** |
| negative_att | -1.9617*** | -2.2691*** | -0.3389* | -2.0124*** | -0.2151 | -0.4293 | -1.4398*** |
| neutral_att | 0.4008 | 0.7266 | 0.2698 | 1.2551* | 0.0028 | 0.0684 | 0.3601 |
| risk_comfort_att | -0.6031 | -1.6256*** | -0.4849*** | -1.7401*** | -0.2486* | -1.2099*** | -2.5943*** |
| health_event1 | 6.7535*** | 7.8427*** | | | | | |
| health_event2 | 3.4309*** | 3.5450*** | | | | | |
| health_event3 | | | 0.4025 | 2.3300* | | | |
| death_event | | | | | 1.0580*** | 4.3294*** | |
| property_event | | | | | | | 5.9329*** |
| _cons | 22.2893*** | 33.5573*** | 9.8907*** | 29.6075*** | 8.2391*** | 18.6909*** | 29.2970*** |
| | | | | | | | |
| Observations | 1,159 | 1,159 | 1,365 | 1,365 | 1,644 | 1,644 | 2,108 |
| | | | | | | | |
| Censored Obs<br>L = left; R = right | L: 66<br>R: 585 | L: 59<br>R: 504 | L: 106 | L: 98 | L: 248 | L: 223 | L: 309<br>R: 937 |

Notes: table excludes regressors that are not statistically significant across the seven policies; $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Another regressor that has a particularly strong impact is the indicator for the experience of an event. In fact, those from households that have suffered an accident leading to temporary or permanent disability in the previous three years are willing to pay for injury insurance an additional $3.4 or $6.8 for low coverage and $3.5 or $7.8 for high coverage, on average, with the lower amount associated with a temporary disability outcome and, correspondingly, the higher amount associated with a permanent disability outcome; those who have experienced the loss of a family member in the previous five years are willing to pay for life insurance an additional $1.1 for low coverage and $4.3 for high coverage, on average. The experience of damage to or loss of property during the previous five years has, however, the largest effect, increasing the WTP for property insurance by $5.9, always on average. The experience of a chronic illness in the recent past is, in contrast, less relevant, impacting only the WTP for the high-coverage critical illness insurance but at the 10% level of significance.

When age is included, it decreases WTP for the high-coverage policy, although the effect is minimal (12 cents); being a Canadian by birth has, on the other hand, a sizable negative impact, especially for the high-coverage policy if available, at the 5% or 1% level of significance. The fact that those born in Canada are willing to pay less for insurance (between $2.5 and $3.1 less for injury coverage, between $1 and $3.7 less for critical illness coverage, between $0.7 and $3.7 less for life coverage, and $2.5 less for property coverage) is certainly a peculiar result that may suggest greater familiarity and comfort with the infrastructures in place when a risky event occurs or may capture cultural differences.

## 6. Conclusions

In this pilot study, we pave the way for exploring how MI, which we take to be equivalent to inclusive insurance, or insurance for the poor, can play a role in improving the lives of vulnerable groups of the population in any country, independently of its level of development. More concretely, for our purposes, we define MI as the provision of conventional insurance products with small limit and simple coverages to low-income individuals based on: (1) a more nuanced understanding of the target audience (low-income households) to inform the design, delivery, and administration of insurance products (consumer-focused innovation); (2) the application of market principles to develop affordable and sustainable insurance products (integrated market solutions).

Specifically, our focus in the study is on piloting and implementing a survey instrument to assess the demand side and support research to enhance our understanding, both qualitatively and quantitatively, of the drivers of risk- and insurance-related decisions within low-income households. Not only is this understanding vital to better meet the needs of the target audience, but it is also critical to identify risk factors and risk interdependencies specific to low-income groups in order to incorporate in pricing undertakings within broader product-line diversification and hedging frameworks. The survey, administered in Canada through Forum Research during the period from August to November 2019, encompasses the participation of 2,183 individuals from households with a per capita income in the low- to mid-income range. Between probability-based sampling and data weighing according to age, gender, and region/province, coupled with a non-negligible sample size, there is sufficient assurance that our sample is representative and that we can draw some meaningful insights from the statistical analysis of the data, notwithstanding concerns about the online nature of the survey, following recruitment of participants via telephone, and about possible divergences between stated preferences, which surveys can gather information about, and revealed preferences (or actual behavior).

The questionnaire itself is very comprehensive, giving rise to over 500 variables, some of which, however, are not particularly inferential as they are specific to experiences of risk events which only apply to a handful of participants (155 in relation to a life loss and 261 in relation to a property loss). The section on attitudes is, on the other hand, revealing, and we hope to be able to expand on it in a future iteration of the survey based on the lessons from the pilot survey informing this report. Particularly, simple frequencies indicate that individuals tend to understand the protective purpose of insurance and avoid downplaying it out of the belief that the probability of a serious event is low or that they can manage their

own problems. There seems to be an appreciation for the value of insurance coupled, unfortunately, with a perception that insurers manipulate conditions or trick people to get out of paying; interestingly, this pattern is more prevalent among individuals with at least one experience of a risk event who are also less likely to be neutral or have no opinion.

In the empirical analyses of the decision to buy insurance and of the WTP, for which we coalesce attitudes that speak to the same construct into indices measuring a benign view of insurance, a malign view of insurance, and risk comfort, we find that how individuals view insurance does not matter for the decision of whether to buy, but how comfortable they are with risk does correlate with the probability of buying insurance; specifically, the more positive individuals feel about risk, as reflected in the combo of negligible expectation of risk events and confidence in the ability to manage them, the less likely they are to buy insurance. While risk comfort continues to be a relevant factor in the WTP decision, with greater comfort associated with lower WTP, positive and negative attitudes towards insurance are also important, consistently increasing and decreasing WTP across all risk areas (health, life, and property). Although qualitatively similar, predicted probabilities and estimated marginal effects do differ in magnitude across risk areas, and we summarize below a few notable similarities and differences.

In the participation decision, the predicted probability of buying at mean values of all regressors is substantially higher for property insurance (85% compared to 57% for life insurance and 31% or less for health, disability, and flood insurance). If we allow risk aversion to vary, we notice that the predicted probability of buying property insurance jumps to over 92% among the most risk averse individuals and drops to 50% among the least risk averse individuals; corresponding estimates for life insurance are 73% and 16%, but the greatest room for improvement in terms of buying insurance applies to health, disability, and flood risks against which the estimated probability of buying protection sits at 38%, 31%, and 35%, respectively, within the most risk averse households. We take this room for improvement to signal greater potential for MI options. However, the decision to buy life insurance and property insurance also happens to be the most responsive to risk aversion, decreasing by 14 and 7 percentage points, on average, as the risk comfort index increases; in contrast, insurance in the other areas decreases between 5 and 6 percentage points.

In the WTP decision, for which we consider specific injury, critical illness, life, and property insurance policies with prescribed premiums obtained from a partner insurer that operates in Canada, the predicted probabilities suggest that individuals tend to choose either one of the two end categories (highest premium or less than lowest premium), depending on their attitude towards insurance and risk aversion; correspondingly, the low and medium premiums attract between 9% and 27% of individuals, with little or no variation across different degrees of positive view of insurance, negative view of insurance, and risk comfort. Incremental increases in the three indices are thus more likely to appear as jumps in the WTP (from low to high if the positive view index increases and from high to low if the negative view index or risk comfort index increases). However, the change in the estimated percentage of individuals between the two end categories is, on average, always larger

when the positive view index increases, a result which highlights that a positive attitude towards insurance is a more relevant consideration in the WTP decision than risk aversion.

The persistent absence of variation in the middle WTP categories across all policies considered as the three key attitudinal indices increase begs the question of whether the presentation of the WTP information, with open-ended questions only available at the low end, inadvertently privileged the selection of the end categories, a possibility which we plan on tackling in a future iteration of the survey, but it also signifies the scope of untapped opportunities for MI which offers more accessible, financially and otherwise, insurance options and should thus attract individuals with lower WTP levels. More generally, the main implication of the WTP analysis as to the benefit of MI options lies in the prospect that they promote a more positive view of insurance companies, appealing to concepts such as social business, consumer-centered approach, and corporate social responsibility.

When working with a pseudo continuous measure of WTP that maximizes the use of the information from the open-ended questions, we confirm the statistical significance of the attitudes towards insurance and risk and the greater impact of the positive view of insurance but also detect consistently larger effects on WTP for more comprehensive policies, whenever two policies are available (for injury, critical illness, and life), and larger effects of the positive attitude towards insurance and of the risk comfort index on the WTP for property insurance.

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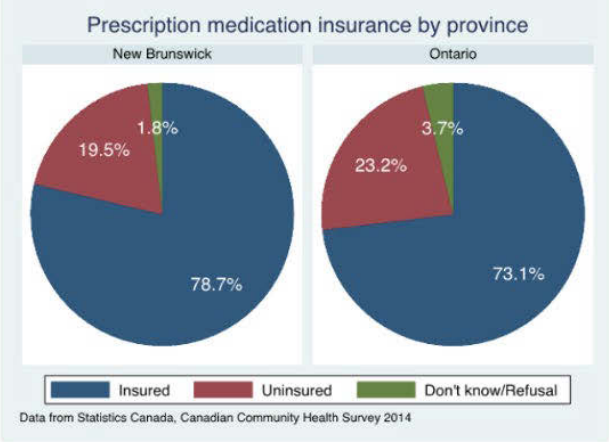
# Appendix A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Ontario
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78.7%
3.7%
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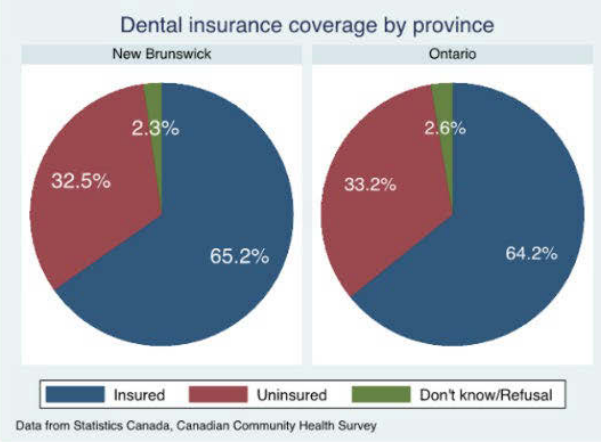
Insured
Uninsured
Don't know/Refusal
Data from Statistics Canada, Canadian Community Health Survey 2014


Dental insurance coverage by province
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Ontario
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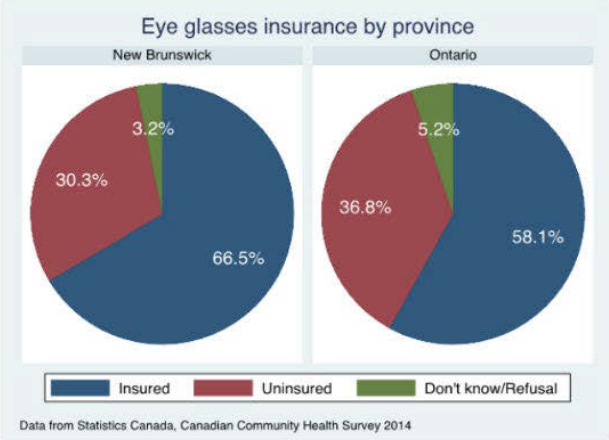
32.5%
65.2%
2.6%
33.2%
64.2%
Insured
Uninsured
Don't know/Refusal
Data from Statistics Canada, Canadian Community Health Survey


Eye glasses insurance by province
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30.3%
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Insured
Uninsured
Don't know/Refusal
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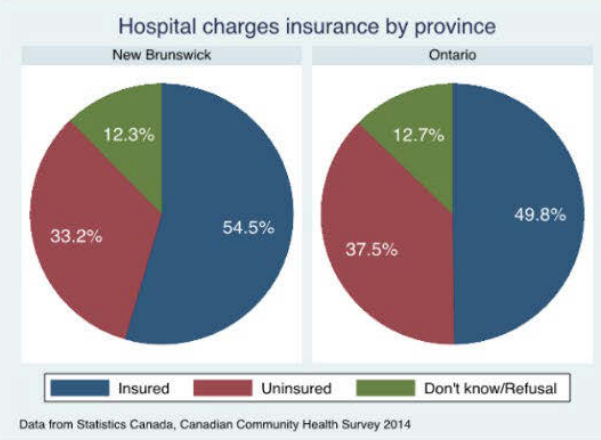
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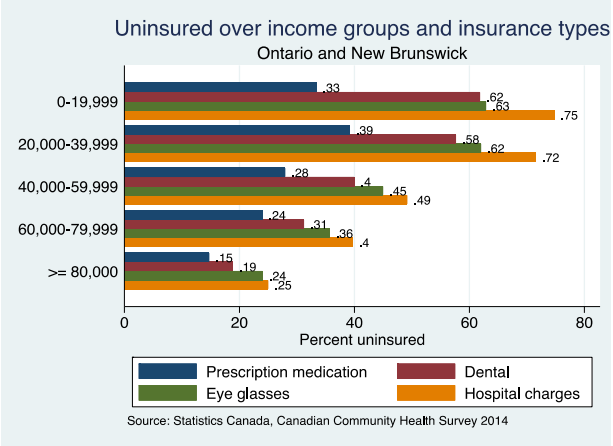
49.8%
Insured
Uninsured
Don't know/Refusal
Data from Statistics Canada, Canadian Community Health Survey 2014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.63
.75
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.58
.62
.72
.28
.4
.45
.49
.24
.31
.36
.4
.15
.19
.24
.25
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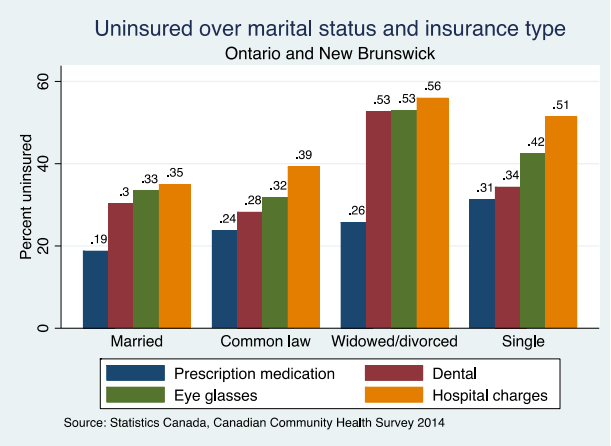
20
40
60
80
Percent uninsured
Prescription medication
Dental
Eye glasses
Hospital charges
Source: Statistics Canada, Canadian Community Health Survey 2014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.53
.56
.31
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Married
Common law
Widowed/divorced
Single
Prescription medication
Dental
Eye glasses
Hospital charges
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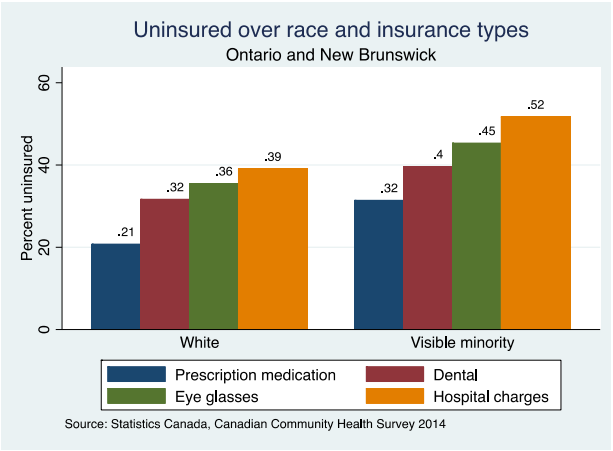


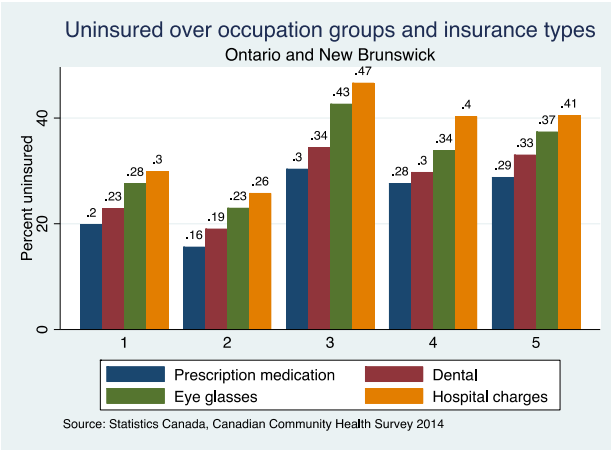


1 = Management, Natural and Applied Sciences, Health, Social Sciences, Education, Religion, Art, Culture and Recreation
2 = Business, Finance, Administration
3 = Occupations relating to Sales and Service
4 = Trades, Transport and Equipment Operator
5 = Occupations Unique to Primary Industry, Processing, Manufacturing and Utilities