

Protective Behavior and Life Insurance

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Abstract

We study life insurance market responses to Covid-19 using unique national administrative data from Israel on purchases and cancellations of life insurance policies, and an internet survey of Americans' life insurance choices, risk attitudes, Covid-19 perceptions, and vaccination behavior. We see no evidence that life insurance purchases or cancellations were consistent with adverse selection during the pandemic, while we do find advantageous selection. Moreover, life insurance policyholders were more likely to get vaccinated, thus taking ex-post preventive action reducing their pandemic risk. Such positive reactive behavior has not been previously reported in the life insurance setting.

Keywords: Life insurance, advantageous selection, adverse selection, preventive behavior, health shocks

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1. Introduction

Risk management plays a key role in the modern treatment of human capital risk, and many economists have sought to better understand the relationship between such risk and the demand for various types of insurance (e.g., Rothschild & Stiglitz 1976; Friedman & Warshawsky 1990; Finkelstein & Poterba 2002, 2004; McCarthy & Mitchell 2010; Cutler et al. 2008; Spinnewijn 2017). This paper uses the Covid-19 health shock as a natural experiment, as it provides an opportunity to learn more about the demand for life insurance and the potential factors driving this demand. The pandemic outbreak was neither predictable in advance nor anticipated by consumers, insurance companies, or insurance regulators, yet the shock greatly affected population morbidity and mortality. Against the backdrop of the pandemic's immediate effect on mortality and ensuing uncertainty about its long-term consequences, we focus on consumer demand for life insurance during the pandemic.

To this end, we address two questions: (1) Was there evidence for either *adverse or advantageous selection* in the life insurance market, during the pandemic? and, (2) Were life insurance policyholders more or less likely to take *preventive measures* during this period? Using data collected during the pandemic from both Israel and the US, we study new purchases of life insurance along with cancellations of existing life insurance policies for subgroups more vulnerable to infection and possibly death during Covid-19. Furthermore, as the vaccine mitigating these risks was introduced and provided to Americans at no cost, we evaluate which people invested in vaccinations to reduce their chances of contagion and potential death due to the virus. Since the U.S vaccination was available in some states before others, we study actual vaccinations as well as intentions to get them, controlling for state-related characteristics with respect to vaccine eligibility.

We exploit two unique datasets for our analysis. The first, collected by the Israeli Insurance Commissioner for the purpose of this study, tracks total purchases and cancellations of life insurance policies by quarter 2019-2021 for the entire Israeli life insurance market, and separately for healthy and unhealthy individuals by age. These data enable us to compare the purchase/cancellation behavior of those more vulnerable to Covid-19 mortality risk (older, less healthy persons), versus those less vulnerable (younger, healthier people). A key advantage of the administrative dataset is that it reports actual life insurance purchases and cancellations for the country's entire market. Nevertheless, the information is aggregated and includes little information on buyers' characteristics and none on their perceptions. Moreover, since the dataset was collected by the Israeli insurance commissioner which gathered and aggregated the information for the overall Israeli market, no information is available over a longer timeframe. Accordingly, we also draw on a second dataset drawn from an internet-based survey of 2,549 US residents whom we queried about their perceptions of Covid-19 risk as well as their risk attitudes, risky behaviors, and vaccination status. As discussed below, a key benefit of the second survey is that we ask respondents about their sociodemographic characteristics as well as perceptions and intentions to take future actions. This permits us to identify whether those having and purchasing new life insurance were more or less likely to vaccinate. To verify that our respondents were eligible to get vaccinated when the survey was fielded, we linked the survey results to a database indicating when vaccines were made available by age and state (Skinner et al. 2022; Agrawal et al. 2022).

Since the two main datasets we use differed in their level of aggregation and the countries in which they were collected, they allow us to examine the impact of the Covid-19 shock in two distinct settings, enhancing the robustness of our evidence. We show, first, that there was no significant difference in the demand for new life insurance by older/sicker

Israelis than their younger/healthier counterparts. We also study life insurance policy cancellations, which are, of course, one-sided actions, to evaluate the possibility that insurers might have reacted to the pandemic either by refusing to sell to certain customers, or by charging them higher premiums. Since customers seeking to cancel existing policies during the pandemic merely had to notify their insurer without needing the seller's consent, we find no evidence that more vulnerable individuals were more likely to hold on to their life insurance policies during the pandemic, suggesting that adverse selection was not at work. A second finding is that among US respondents, peoples' subjective health assessments and their self-assessed chance of contracting Covid-19 had no effect on new life insurance purchases. Hence, both sets of results are consistent: we find no evidence that adverse selection was a major factor driving new life insurance purchases or cancellation of existing contracts during the pandemic. Moreover, we find evidence of advantageous selection in the US data, as the less risk tolerant were more likely to purchase new life insurance policies.

Of course, in other insurance markets, there are examples of moral hazard where insured policyholders can increase their risk exposure to receive insurance payouts (e.g., Pauly 1986). In the life insurance case, however, it seems implausible that those with an existing life insurance policy would die with higher frequency just because they were covered. Therefore, our study provides a unique setting in which to investigate decision making and risky behavior, against the backdrop of the Covid-19 shock. In addition, the unexpected outbreak provides a rare opportunity to investigate whether those who held life insurance were more likely to mitigate risk resulting from the pandemic. This is because an important way to protect against morbidity and death during the pandemic was to get vaccinated as soon as it was available. We show that, controlling on risk preferences, people who would get the vaccine were also more likely to already have had a life insurance policy. For robustness, we confirm this result using a variety of empirical methodologies including

logistic regression and a Nearest Neighbor Matching Analysis. We also provide additional analysis utilizing the health insurance dataset collected by Heffetz & Rabin (2023) and we replicate our results in the life insurance context. These analyses all support the finding of a significant positive association between holding life insurance and choosing vaccinations when confronted with the Covid-19 shock. We call this *preventive behavior*, and we argue that it is consistent with the notion that people who bought life insurance were systematically different from non-buyers. We further argue that this behavior extends beyond advantageous selection, as we examine the actions of the insured *after* they purchased insurance (prior to the pandemic), and who now had to make decisions regarding additional risk-reducing measures.

This study makes three significant contributions to the literature. First, our examination of behavior during the Covid-19 pandemic confirms that individuals did not boost their life insurance demand when confronted with the unexpected pandemic. Hence there was no evidence of adverse selection. Second, to the best of our knowledge, this is the first study to show that insured individuals were more likely to take proactive measures to mitigate Covid-19 risk when confronted with the health shock. Third, we contribute to the academic debate about the seemingly-surprising positive linkage between financial wellbeing and insurance. Specifically, we show that, while income was not a significant driver of *new* life insurance purchase during the pandemic, there was a positive relationship between income and pre-existing life insurance holdings, after controlling for many potential confounders.¹

Our last finding adds to the debate over the consistency of risk preferences across various domains. Thus Einav et al. (2012) found consistency in preferences within insurance

¹ This is consistent with prior studies including Gropper & Kuhnen (2021) who proposed that wealthier individuals face a different distribution of economic shocks or background risk, compared to the less wealthy. Armantier et al. (2023) suggested that wealthier individuals tend to overinsure, so as to avoid regret. Hurwitz and Sade (forthcoming) showed that individuals with high income were more likely to purchase longevity insurance.

domains, while Barseghyan et al. (2011) argued that risk preferences were not stable across contexts; Barseghyan et al. (2016) have sought to reconcile this puzzle. The present study contributes to this discussion by providing evidence of consistency in risk preferences extending beyond the insurance domain: specifically, between life insurance and vaccination behavior.

Our evidence will also interest the insurance industry and regulators. Life insurers are naturally concerned with buyer selectivity, as well as the question of how policyholders react to catastrophes or shocks. Our results on insurance selection patterns reveal that vulnerable (older/unhealthy) individuals did not exhibit an increased interest in or demand for life insurance in response to the pandemic, indicating that adverse selection was not prominent during this period. We also show that people who actively sought insurance were more likely to take precautionary measures, namely Covid-19 vaccination, when faced with the risk, suggesting that those individuals had a lower risk profile. Accordingly, both findings will be useful in informing insurers' risk management strategies and pricing models. Our insights highlight the need for more research, monitoring, and targeted policy responses to ensure that people are adequately insured and remain financially resilient during times of health shocks.

In what follows, Section 2 briefly describes prior literature. In Section 3 we introduce evidence from the Israeli insurance industry. In Section 4 we provide additional evidence from an online survey conducted in the US and Section 5 concludes.

2. Selected Prior Literature

Early theoretical work on the demand for insurance by Rothschild and Stiglitz (1976) stimulated a vast literature exploring the possibility of *adverse selection* in insurance markets, where insurers lack the private information that consumers have about their own

individual risk types. As they noted, such one-sided information can elevate demand for insurance among those more likely to be exposed to the risk. Theoretical models of asymmetric information predict a positive correlation between insurance coverage and the ex-post realization of risk occurrence (Chiappori & Salanie 2000; Chiappori et al. 2000), and some empirical indication of adverse selection has been reported for both the life insurance and the annuity marketplace.² Less conclusive evidence has also been found by Cawley & Philipson (1999) who noted that relatively risky customers were less, rather than more, likely to hold life insurance, while McCarthy & Mitchell (2010) showed that consumers holding life insurance experienced lower mortality risk.³ Finkelstein & McGarry (2006) documented that survey respondents who took preventive health care actions were more likely to buy long term care (LTC) insurance, but Wu et al. (2022) reported that individuals at high risk of needing residential frail care were more likely to buy LTC insurance. Eling et al. (2021) studied the relationship between risk attitudes and demand for LTC and life insurance, and they concluded that individuals willing to take more financial risks also purchased more insurance. Conversely, Cutler et al. (2008) observed that people who used preventive healthcare were more likely to buy insurance, and they also were less likely to enter a nursing home in later life. Boyer et al. (2020) found no evidence for adverse selection in the Canadian LTC insurance market.

Explanations for these mixed results could include the possibility that insurers may actually have insight into what might seem to be unobservable information when classifying applicants and setting insurance prices, along with information characterizing the buyers of such insurance products. Our unique setting, in which the Covid-19 health shock was neither

² Cohen & Siegelman (2010) review this literature; see also Friedman & Warshawsky (1990), Finkelstein & Poterba (2002, 2004), McCarthy & Mitchell (2010), Cutler et al. (2008), Hubener et al. (2014), and Post (2012), who report evidence consistent with the existence of adverse selection in life and annuity markets.

³ For comprehensive reviews regarding adverse vs advantageous selection in insurance markets, see Cohen & Siegelman (2010) and Einav et al. (2021).

predictable nor anticipated, allows us to better understand the pure effect of an increase in mortality risk on peoples' demand for life insurance.

Another factor that the academic literature suggested that could be driving the mixed results is *advantageous selection*,⁴ which occurs when risk intolerant people demand more insurance protection (Cutler et al. 2008; de Meza & Webb 2001; Fang et al. 2008; Fang & Wu 2018). Moreover, given that there is a growing body of literature indicating that peoples' risk preferences are quite heterogeneous, the correlation between preferences for insurance and expected insurance claims could differ depending on the type of insurance product considered (Cohen & Siegelman 2010; Finkelstein & McGarry 2006; Fang et al. 2008).

An empirical challenge facing those seeking to empirically test the advantageous selection hypothesis is that peoples' risk exposures as well as their risk preferences must both be taken into account (de Meza & Webb 2001), though few datasets contain information on these two factors. One approach in past studies has been to control for how much money people spend on services reducing risk; for example, Fang et al. (2008) used medical care spending as an indicator of risk attitudes. Other researchers include self-reported risk aversion metrics when analyzing risk preferences and insurance choices (Schmitz 2011).⁵ In what follows, using survey responses, we explicitly measure risk-taking behavior as well as risk preferences, allowing us to explore how the natural experiment occasioned by the Covid-19 pandemic helps illuminate the factors shaping the demand for life insurance.

⁴This is similar to the definition of propitious selection suggested by Hemenway (1990, 1992).

⁵ Tasso and Zhang (2022) review evidence on risk preferences elicited in 400+ surveys.

3. Evidence from the Israeli insurance industry

To explore how life insurance demand relates to peoples' behavior regarding life insurance, we first analyze aggregate evidence gathered specifically for this research, by the Israeli Insurance Commissioner for the period 2019-2021, allowing us to investigate trends in the demand for life insurance in Israel before and during the pandemic. The dataset reports quarterly total purchases and cancellations of life insurance policies for the entire market, differentiating the behavior of those with higher risk of contracting Covid-19 versus their lower-risk counterparts indicated by which consumers had to pay a higher premium due to their poor health and being older than age 50. Since the insurers were aware of these consumer characteristics, we cannot perform a direct "unused observables test" to determine whether there is a correlation between the demand for life insurance and individual traits associated with risk but not utilized by the insurer (Finkelstein & Poterba 2006). To overcome this limitation, and since we also do not directly observe conditions that life insurers may have imposed on buyers during this period, we also collected data on policy *cancellations* undertaken solely by consumers, independent of insurer actions or observed information. The information about life insurance cancellations offers a unique setting in which we can test for adverse selection, even without knowledge of the parameters used for pricing by the insurer.

To this end, we first analyze the relation between Israelis' risk levels and demand for life insurance before and during the pandemic. Here vulnerable individuals are defined as those required to pay a premium for poor health conditions and being age 50+; conversely, non-vulnerable people are defined as those younger and not required to pay a poor health premium. Next, we compare the ratio of purchases of new life insurance policies among the vulnerable versus the non-vulnerable across time, along with the ratio of life insurance policy cancellation for the same two subgroups. Figure 1 documents that there was no

marked change in life insurance purchases or cancelations over the period 2019-2021. These results imply that, compared to the non-vulnerable, the vulnerable were neither more likely to purchase new life insurance policies nor to cancel their policies more often during Covid-19. That is, we find no evidence of unusual adverse selection.

Figure 1 here

4 Internet-based Survey of US Residents

4.1 Data and Methodology

Since the Israeli dataset contains only aggregate information, it is not informative on peoples' potentially relevant individual characteristics and risk perceptions, and what we do observe was also known to the insurance providers. Studying the cancellation of life insurance policies overcomes some of these limitations, yet observing micro life insurance demand behavior is still of interest. To this end, we designed and fielded three surveys of 2,549 US residents age 28-83 using internet-based Prolific studies conducted in March 2020, March-April 2021, and August 2021, targeting the same individuals.^{6,7} After dropping respondents who did not answer questions about their Covid-19 exposure, our main measure of (subjective) risk, the analysis sample included 2,068 individuals. In addition to information on sociodemographic characteristics, we also elicited respondents' risk and time preferences, risky behaviors, existing life insurance policies, and new life insurance purchases during the pandemic.⁸ Though this dataset lacks insurance policy prices, our

⁶ Launched in 2014 by Oxford University, Prolific (www.prolific.ac) is an online platform enabling researchers to recruit subjects for economic and social experiments (e.g., Hurwitz et al., 2022). It also collects a range of demographic variables for subjects, allowing researchers to screen participants according to key criteria such as age and sex. We screened participants according to residency and age, as well as effort expended (measured using past Prolific performance). We also included a 'skip question' to evaluate respondent attentiveness.

⁷ In the literature there is a trend toward employing several (experimental and survey) methods within a single research study, as we do here, since this can often enrich the discussion, address concerns, enhance robustness, and effectively investigate a specific research question (c.f., Dohmem et al. (2011), Gafni et al. (2021), Heimer et al. (2023), and Hurwitz and Sade (forthcoming)).

⁸ Information about insurance was asked in the 2021 wave of the survey, and it included questions about purchases made during the first year of the pandemic.

approach is justified given no evidence of insurance companies raising premiums or reducing policy availability in response to the Covid-19 pandemic (Harris et al. 2021). Moreover, we asked respondents about their actual or intended Covid vaccine status, and to verify that these respondents were actually eligible to receive vaccines when the surveys were fielded, we exploited the State Policy Database (Skinner et al 2022; Agrawal et al. 2022) reporting state-level vaccination policies enacted during the pandemic. Accordingly, when analyzing the relation between vaccination and life insurance, we also provide a separate analysis focusing only on eligible individuals, by age and state.

To complement our previous findings from the Israeli industry data, we use the US surveys to evaluate a multivariate empirical model of the factors associated with peoples' attitudes toward *purchasing new life insurance* during the pandemic. As our goal is to determine whether people's mortality risk correlated with the demand for new life insurance during Covid-19, we also control on *age* and *health*. Given that Covid-19 was an aggregate shock, we also ask people about their subjective chances of *exposure to Covid-19*.⁹ Other controls include factors likely to shape risk preferences (Barrios & Hochberg 2021) such as *income, education, age, sex, marital and health status, financial literacy*, and self-reported *political affiliation*.¹⁰

Next, we assess whether risk averse individuals sought to purchase new life insurance during the pandemic, which would indicate advantageous selection. To this end, we measured respondents' *time preferences* (based on Khwaja et al. 2007) and *risk preferences* (following Weber et al. 2002). Risk behavior is captured separately for financial and nonfinancial behaviors as the sum of responses to five and nine questions, respectively, on a 5-point Likert-type scales about peoples' likelihood of engaging in various risky

⁹ Specifically, we asked people in March 2020 about their estimated probability of contracting Covid-19.

¹⁰ Political affiliation was measured given prior evidence for its association with vaccination (e.g. Khubchandani et al. 2021).

financial and non-financial activities (e.g., wagering a day's income in a high-stakes poker game or riding a bicycle without a helmet). These responses also allow us to disentangle the effects of risk attitudes versus peoples' willingness to get vaccinated, where the latter would directly reduce their risk of infection.

Finally, we examine the characteristics of people who *already had life insurance* prior to the pandemic. Our main variable of interest is whether respondents had been *vaccinated* against Covid-19, which we interpret as indicative of subjects' willingness to reduce their risk given the pandemic shock. We also include a variable for peoples' *intentions* to get the vaccine, to account for the fact that some were unable to get vaccinated by the time the second survey wave was distributed (March-April 2021). This also helps us disentangle peoples' intentions versus actions to mitigate risk.¹¹ We also relied on the aforementioned State Policy Database to construct a personal *eligibility* variable by age and state.

4.2 Results: Internet-based Survey of US Residents

Table 1 reports descriptive statistics for our online survey of US respondents along with variable definitions.¹² The respondents' mean age was 48.3, and just over half (56%) were female; 62% had college+ education¹³; and 62% were married.¹⁴ Around two-fifths (39%) had life insurance, and 11% had purchased coverage in the current year. Subjects' self-reported chances of getting Covid-19 was 15%. Almost one-third (32%) were eligible to get the vaccine, 28% of the respondents reported having been vaccinated as of Spring 2021, and an additional 46% expected to be vaccinated. A majority (84%) believed their

¹¹ Since we queried people early in the pandemic, work restrictions did not yet differ for the unvaccinated versus vaccinated. Hence, peoples' expressed desire to be vaccinated was driven primarily by their wish to reduce their risk.

¹² A correlation table for all variables appears in the Appendix.

¹³ Of these, 39% had completed a Bachelor's degree, compared to 32% in the US population between 2015-2019, according to U.S. Census Bureau data (McElrath and Martin 2021).

¹⁴ This fraction is higher than in the U.S. Census Bureau (Historical Marital Status Tables (census.gov)), which reported that 53% of the population was married in 2020.

health was good/very good/excellent; and 54% considered themselves to be Democrats. Consistent with previous empirical literature, our results also show that income was positively associated with holding life insurance.

Table 1 here

Adverse selection

To test for adverse selection in the US dataset, we explore the determinants of the demand for new life insurance policies during the outbreak of the Covid-19 pandemic using multivariate analysis. Table 2 reports average marginal effects from Logit models, where Columns 1-3 include the full sample; Columns 4-5 include only respondents age 50+,¹⁵ and Columns 7-9 include only participants reporting themselves to be unhealthy. The estimated marginal effects show that older individuals, the less healthy, and those expecting to get Covid-19 (private information known only to the individual) were not more likely to purchase new life insurance during the pandemic, again providing no evidence of adverse selection.¹⁶ We do find that being married was positively associated with the demand for new life insurance, and that the state-specific measure of political affiliation (proxy for being a Democrat or voting for Biden) was negatively correlated with the likelihood of buying new life insurance during the pandemic. Finally, our results indicate that being financially literate was positively associated with the demand for new life insurance, which could result from the previously-documented positive association between financial literacy and cognitive abilities (Muñoz-Murillo et al. 2020; Paraboni et al. 2021; Post et al. 2023)

Table 2 here

¹⁵ In results available on request, we also replicated the analysis for older respondents age 60+ and the outcomes are qualitatively and quantitatively similar.

¹⁶ Appendix Figure 1 provides further supporting evidence using Google trends, exploring the time path of US internet users' interest in life insurance between January 2020 and November 2021. Evidently, the number of searches for life insurance during the first year of the pandemic (2020) in the US did not increase markedly, confirming that people did not overwhelmingly seek life insurance during the pandemic. This result is consistent with our results reported above using both data sources.

Advantageous Selection

Table 2 also reports estimated effects of financial and non-financial risk preferences on the demand for new life insurance during the pandemic, focusing on attitudes toward risky behaviors in different domains. In the full sample, the more risk loving (averse) were less (more) likely to buy life insurance. Specifically, for our main specification (Columns 2-3), risk lovers in the financial domain were about 19% (-0.022/0.114) less likely to buy life insurance. The magnitude of the effect for the non-financial risk preferences was similar, but significant only at the 10% level.

Preventive Behavior

Figure 2 presents the proportion of participants who chose to vaccinate, along with the share of participants who either were vaccinated or expected to receive the vaccine, shown separately for people with and without existing life insurance prior to the pandemic. Results indicate that people already holding life insurance policies were significantly more likely to be vaccinated. Specifically, while 32% of respondents with existing life insurance were vaccinated, the figure was only about a quarter (26%) of those having no life insurance. Moreover, the likelihood of respondents having life insurance to answer that they either were vaccinated or expected to get the vaccine was 80%, versus 71% of those without life insurance. This confirms that life insurance purchasers differed systemically than non-purchasers, holding other factors constant.

Figure 2 here

We supplement this result with a Nearest Neighbor Matching analysis which pairs individuals' financial risk preferences, income, education, age, sex, marital status, health, financial literacy, and political affiliation, but differing by insurance status. The result is a significant positive sample average treatment affect (SATE) of 0.05 (standard error of 0.02). This indicates that, had the uninsured group been insured, it would have been significantly

more likely to get vaccinated, controlling on all observed factors other than insurance status. This implies there is a positive association between peoples' decisions to hold life insurance and get vaccinated, suggesting that the same behavioral trait affects both decisions.

In an additional sensitivity analysis, we assessed whether the significant positive correlation between having life insurance and getting vaccinated continues to hold after controlling for additional personal characteristics and attitudes (Appendix Table 2). Results confirm the positive correlation between getting an early vaccination (February-April 2021) and holding life insurance acquired pre-pandemic.¹⁷ Among those not yet vaccinated but anticipating getting the vaccine, the chances of having pre-existing life insurance were also significantly higher. For the (smaller) subgroup of vaccine-eligible participants, being vaccinated was also positively correlated with having pre-existing life insurance, while it was not for those stating they intended to be vaccinated.¹⁸

These additional results all contribute to confirmation of what we are calling *preventive behavior*: that is, during the pandemic, people who got and sought immunization were also more likely to have had pre-existing life insurance, after controlling for risk preferences and risk types. Importantly, to the best of our knowledge, such behavior was not factored into the pricing of life insurance policies, as we focus on the conduct of individuals with pre-existing policies, and the pandemic itself was an unforeseen event. In the present context, this implies that those who purchase life insurance during the normal course of affairs also are more active in mitigating life-threatening risks when faced with unexpected health shocks.¹⁹

¹⁷ Specifically, our base specification (column 1) indicates that the vaccinated were 38% ($=0.150/0.387$) more likely to have pre-existing life insurance.

¹⁸ In results available on request, we also used Principal Component Analysis (PCA) to tease out the principal components (variables groupings) that best explain variance in the data (Giri 2004; Viyas et al., 2006). This generated five principal components with eigenvalues (variance) above 1. The weights of insurance and vaccination in the fourth principal component were above 30%, implying that together they explain a substantial amount of variation in the data.

¹⁹ To validate the robustness of our primary findings, we also conducted a replication analysis utilizing data collected by Heffetz and Rabin (2023) with information on health insurance and measures implemented to

5 Conclusions and Implications

This paper studies how the demand for life insurance responded to the exogenous change in mortality risk experienced during the unexpected health shock occasioned by the Covid-19 pandemic. To this end, we analyze an aggregate-level Israeli dataset on purchases and cancellations of life insurance policies, as well as a survey-based panel fielded on a US sample. The unique aggregate Israeli data offered no evidence of changes in life insurance purchases or cancellations. The US survey data revealed that older, less healthy people, as well as those more exposed to the virus, were not more likely to purchase life insurance during the pandemic. Accordingly, we found no support for adverse selection in these life insurance markets. Instead, we showed that risk tolerant (averse) individuals were less (more) likely to purchase insurance during the pandemic, consistent with advantageous selection. Finally, we also provided evidence for *protective behavior*: that is, persons with pre-existing life insurance policies were more likely to get the Covid-19 vaccine, reducing their exposure to the health shock.

Our research is important since the findings extend beyond the context of Covid-19: that is, there is a reasonable possibility of new pandemics in the not-too-distant future (Sodhi et al. 2023), as well as other unforeseen health-related shocks. Our study therefore contributes to the academic discussion surrounding selection effects in insurance markets, since the results add a new dimension to the understanding of risk selection dynamics during health crises. Additionally, we shed light on a previously unexplored topic we have called protective behavior among insurance buyers.

mitigate the risk of contracting Covid-19, including vaccination, as well as various demographic variables. Results confirmed that individuals who received vaccination were significantly less likely to hold bad health insurance or no insurance at all. Additionally, we observed that wearing masks and practicing social distancing did not have a significant effect, above and beyond vaccinations, on the likelihood of holding health insurance. The replication of our results using an additional dataset in this health insurance context further supports the preventive reactions identified in our study.

We show that life insurance buyers were more inclined to actively engage in risk reducing vaccinations following the global health shock, confirming that these policyholders exhibited a proactive approach to risk management.²⁰ This also has important implications for insurance industry practice and policy design. For instance, to the best of our knowledge and based on conversations with industry experts, insurers do not currently incorporate preventive behavior in their pricing policy, yet our research suggests that it could be advisable to start considering these when setting pricing.

²⁰ Interestingly, these results extend other medical research showing that people who experience idiosyncratic health shocks such as cancer or heart attacks do undertake preventive behavior after being diagnosed; see Zhang et al (2022).

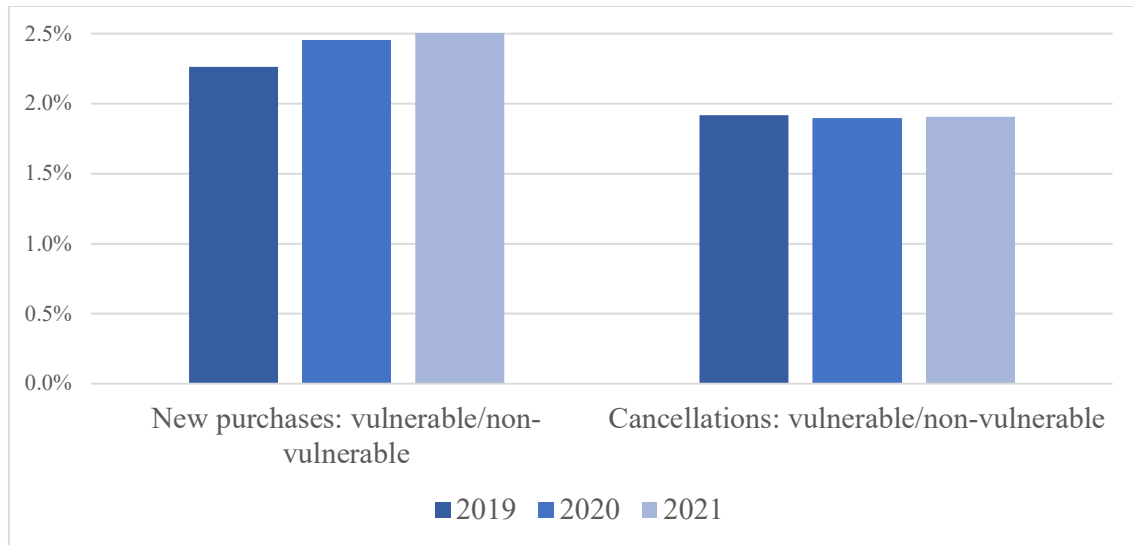
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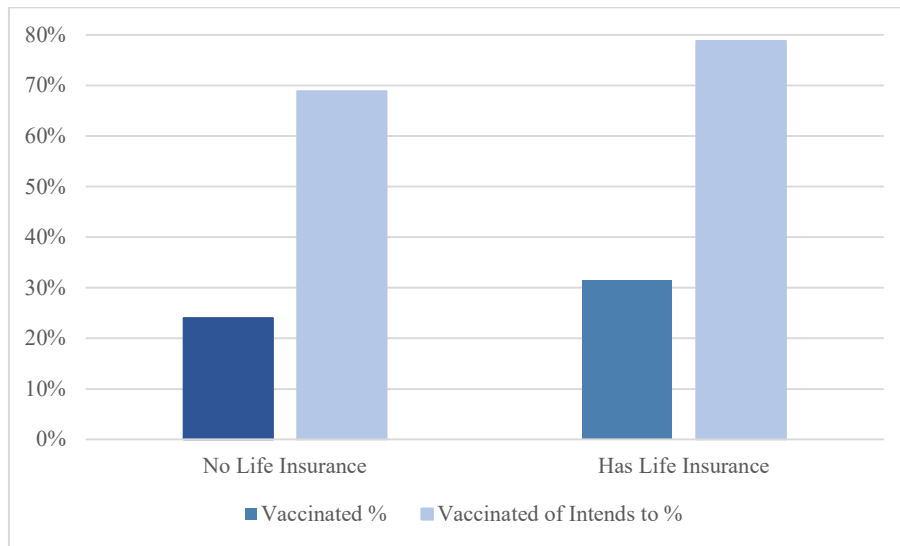
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Figure 1. New purchases and cancellations of life insurance in Israel: 2019-2021

Note: This figure reports new purchases and cancellations of existing life insurance policies over time as the ratio of vulnerable to non-vulnerable policyholders (older and unhealthy versus young and healthy). Source: Authors' calculations using data supplied by the Israeli Insurance Commissioner.

Figure 2. Life insurance and vaccination behavior: US respondents



Note: The figure presents the percent of respondents who were vaccinated for Covid-19 and the percent of respondents who were either vaccinated or intended to receive the vaccine. Source: Authors' calculations using survey fielded in the US; see text.

Table 1: Descriptive statistics and variable definitions: US Respondents

Variables	Mean	Std. Dev	Min	Median	Max
New life insurance purchase	0.11	0.32	0	0	1
Has old life insurance	0.39	0.49	0	0	1
Risk taking financial	1.78	0.73	1	1.6	5
Risk taking non-financial	2.06	0.60	1	2	5.00
Vaccinated	0.28	0.45	0	0	1
Expect to be vaccinated	0.46	0.50	0	0	1
Get Covid %	0.15	0.17	0	0.1	1
Income	0.44	0.50	0	0	1
College+	0.62	0.49	0	1	1
Age	48.30	10.63	28	46	83
Female	0.56	0.50	0	1	1
Married	0.62	0.48	0	1	1
Good health	0.84	0.37	0	1	1
FinLit index	2.54	0.74	0	3	3
High Disc. Rate	0.24	0.43	0	0	1
%voted Biden by state	51.21	8.71	26.6	50	92.1
Vaccination eligible	0.32	0.47	0	0	1

N=2,068

Note: *New life insurance* = 1 for respondents who owned their life insurance less than a year, and 0 otherwise. *Has old life insurance* = 1 for individuals who owned their life insurance for more than a year, and 0 otherwise. *Risk taking financial* and *Risk taking non-financial* are constructed as the sum of responses to 5 and 9 questions respectively on a 5-point Likert-type scale about the likelihood of engaging in risky activities (a higher score represents a lower likelihood of engaging in risky behaviors, or risk aversion). *Vaccinated* = 1 if respondent was vaccinated at the time of the second survey (March-April 2021), and 0 otherwise. *Expect to be vaccinated* = 1 if respondent expected to be vaccinated when the second survey was distributed and 0 otherwise. *Get Covid%* is a self-reported probability of contracting the virus in 2021. *Income* = 1 if participant's household income was higher than the national median, and 0 otherwise. *College+* = 1 if the participant's reported education was higher than high school, and 0 otherwise. *Good health* = 1 if participant indicated that his health was either good, very good, or excellent. *Financial literacy* measured according to the number of financial literacy questions answered correctly (Lusardi and Mitchell 2008, 2014). *High Disc. Rate* measures time preferences according to four questions about peoples' preferences for winning versus losing various amounts of money immediately versus a year later (Khwaja et al. 2007; i.e., win \$20 vs. \$30, lose \$20 vs. \$30, win \$1,000 vs. \$1,500, lose \$1,000 vs. \$1,500). *%voted for by state* is the percent of individuals who voted for Biden in respondent's state. *Consider self Democrat* is a direct measure of political affiliation =1 if participant considered herself to be Democrat (vs Republican or other). *Vaccination eligible* = 1 if end date of the second survey (March-April 2021) was before vaccination eligible date in respondent's state, and 0 otherwise. Source: Authors' calculations using US survey; see text.

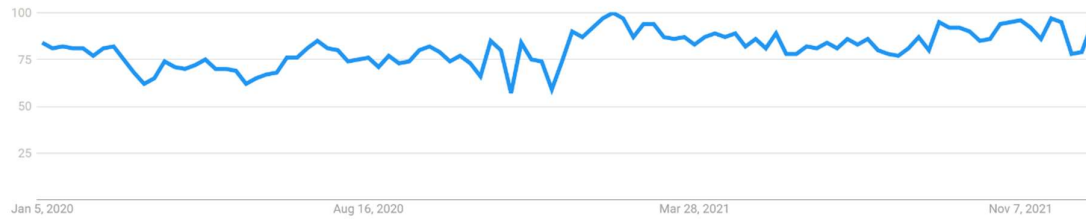
Table 2. Logit marginal effects of factors associated with new life insurance purchase: US respondents

	New life insurance purchase										
	Full sample			Age 50+			Unhealthy				
Risk taking financial	-0.019 *	-0.022 *	-0.023 **	-0.010	-0.016	-0.016	0.006	0.000	-0.001		
	(0.011)	(0.011)	(0.011)	(0.018)	(0.019)	(0.019)	(0.023)	(0.023)	(0.023)		
Risk taking non-financial	-0.019	-0.022 *	-0.020	-0.021	-0.034	-0.032	-0.014	-0.018	-0.017		
	(0.012)	(0.013)	(0.013)	(0.020)	(0.021)	(0.021)	(0.027)	(0.028)	(0.028)		
Get Covid %	-0.021	-0.027	-0.022	-0.152 *	-0.175 **	-0.168 ***	0.014	0.023	0.023		
	-0.042	-0.043	-0.042	-0.082	-0.084	-0.084	(0.083)	(0.083)	(0.083)		
Income		0.009	0.005		-0.008	-0.009		-0.005	-0.007		
		(0.015)	(0.015)		(0.023)	(0.023)		(0.040)	(0.040)		
College+		0.001	0.001		-0.019	-0.019		-0.004	-0.005		
		(0.016)	(0.016)		(0.023)	(0.023)		(0.035)	(0.035)		
Age		-0.001 *	-0.001 *		-0.005 ***	-0.005 ***		-0.002	-0.002		
		(0.001)	(0.001)		(0.002)	(0.002)		(0.002)	(0.002)		
Female		-0.004	-0.002		-0.034	-0.032		-0.042	-0.042		
		(0.015)	(0.015)		(0.022)	(0.022)		(0.035)	(0.035)		
Married		0.045 ***	0.046 ***		0.038	0.039 *		0.024	0.025		
		(0.016)	(0.016)		(0.023)	(0.023)		(0.034)	(0.034)		
Good health		-0.004	-0.006		0.006	0.004					
		(0.020)	(0.020)		(0.030)	(0.030)					
FinLit index		0.028 **	0.029 **		0.003	0.001		0.017	0.017		
		(0.011)	(0.011)		(0.017)	(0.016)		(0.024)	(0.024)		
High Disc. Rate		0.014	0.015		0.038	0.039 *		0.050	0.051		
		(0.016)	(0.016)		(0.024)	(0.023)		(0.034)	(0.035)		
% state voted for Biden		-0.002 **			-0.001			0.000			
		(0.001)			(0.001)			(0.002)			
Consider self Democrat			-0.011			-0.001			0.004		
			(0.014)			(0.021)			(0.034)		
N	2,068	2,068	2,068	856	856	856	341	341	341		
Pseudo R ²	0.005	0.024	0.020	0.010	0.037	0.035	0.001	0.027	0.026		
Mean of dep. var.	0.114	0.114	0.114	0.106	0.106	0.106	0.106	0.106	0.106		

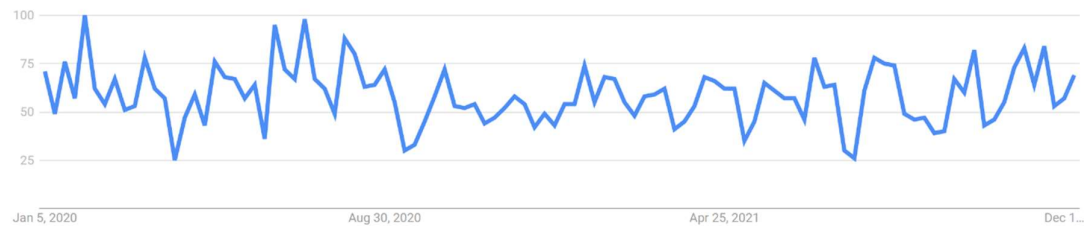
Note: Dependent variable =1 if respondent purchased new life insurance during the first year of the pandemic. Key control variables include attitudes toward risky behavior and self-reported probability of getting Covid; we also control on income, education, age, sex, being married, good health, financial literacy, discount rate and political affiliation. Standard errors in parentheses. *** p < 0.01. ** p < 0.05. Source: Authors' calculations using US survey; see text.

Appendix Figure 1. Interest in life insurance prior to and during the Covid-19 pandemic: Google Trends counts.

Panel A. US counts



Panel B. Israel counts



Note: To assess interest in life insurance over time, we used the Google trends tool (<https://trends.google.com/trends/>). Interest over time measured by number of searches using Google for the term “life insurance” reveals that there was no increase in searches for life insurance in the US or Israel during the Covid-19 pandemic. Source: Google trends.

Appendix Table 1. Variable correlations: US respondents.

Variables	New life insurance purchase	Has old life insurance	Risk taking financial	Risk taking non-financial	Vaccinated	Expect to be vaccinated	Combined vaccination	Get covid%	Income	College+	Age	Female	Married	Good health	FinLit index	High Disc. Rate	%voted for Biden per state	Consider self democrat	Vaccination eligible	
New life insurance purchase	1																			
Has old life insurance	-0.28	1																		
Risk taking financial	-0.05	0.07	1																	
Risk taking non-financial	-0.05	-0.03	0.26	1																
Vaccinated	0.05	0.07	-0.04	-0.05	1															
Expect to be vaccinated	-0.03	0.03	0.01	-0.03	-0.58	1														
Combined vaccination	0.02	0.11	-0.03	-0.08	0.37	0.17	1													
Get covid%	-0.01	0.01	0.04	0.06	-0.22	0.17	-0.03	1												
Income	0.03	0.22	0.07	-0.08	0.09	0.02	0.12	-0.04	1											
College+	0.02	0.11	0.07	-0.13	0.16	0.06	0.24	-0.06	0.26	1										
Age	-0.02	-0.04	-0.20	-0.19	0.04	0.00	0.04	-0.04	-0.09	-0.04	1									
Female	-0.01	-0.07	-0.21	-0.11	0.03	-0.14	-0.12	0.01	-0.10	-0.06	0.09	1								
Married	0.07	0.18	0.04	-0.02	0.00	0.04	0.05	0.04	0.27	0.10	-0.05	-0.06	1							
Good health	0.01	0.13	0.03	-0.12	0.03	-0.02	0.01	-0.11	0.18	0.13	-0.06	-0.04	0.12	1						
FinLit index	0.06	0.04	-0.02	-0.07	0.05	0.10	0.17	-0.05	0.11	0.23	0.12	-0.19	0.04	0.10	1					
High Disc. Rate	0.02	0.00	-0.08	-0.03	0.09	-0.03	0.06	0.01	-0.05	-0.05	0.12	0.10	-0.01	-0.21	-0.03	1				
%voted Biden by state	-0.05	0.02	0.05	-0.07	0.02	0.06	0.09	-0.06	0.15	0.12	-0.03	-0.08	-0.01	0.08	0.04	-0.04	1			
Consider self democrat	-0.01	0.01	-0.01	-0.05	0.14	0.16	0.33	0.02	0.01	0.12	-0.08	0.02	-0.07	-0.02	0.06	0.02	0.06	1		
Vaccination eligible	0.00	0.00	-0.02	-0.01	0.33	-0.23	0.07	-0.09	-0.01	-0.01	0.16	0.05	-0.01	-0.01	-0.03	0.11	-0.14	-0.03	1	

Source: Authors' calculations using survey fielded in the US; see text.

Appendix Table 2. Logit marginal effects of factors associated with existing ownership of life insurance: US respondents

	Has old life insurance					
	Full sample			Vaccination eligible participants only		
Vaccinated	0.150 *** (0.029)	0.105 *** (0.030)	0.110 *** (0.031)	0.118 ** (0.050)	0.114 ** (0.049)	0.125 ** (0.052)
Expect to be vaccinated	0.104 *** (0.027)	0.068 ** (0.027)	0.072 *** (0.028)	0.024 (0.056)	0.013 (0.054)	0.022 (0.056)
Get covid%	0.060 -0.064	0.079 -0.062	0.083 -0.062	0.080 (0.121)	0.067 (0.116)	0.069 (0.117)
Income		0.143 *** (0.021)	0.141 *** (0.021)		0.114 *** (0.037)	0.109 *** (0.037)
College+		0.027 (0.023)	0.026 (0.023)		0.015 (0.039)	0.016 (0.039)
Age		0.000 (0.001)	0.000 (0.001)		0.000 (0.001)	0.000 (0.001)
Female		-0.025 (0.022)	-0.023 (0.022)		-0.031 (0.039)	-0.024 (0.039)
Married		0.122 *** (0.022)	0.122 *** (0.022)		0.177 *** (0.038)	0.175 *** (0.038)
Good health		0.124 *** (0.031)	0.123 *** (0.031)		0.172 *** (0.055)	0.170 *** (0.055)
FinLit index		-0.005 (0.015)	-0.004 (0.015)		-0.024 (0.026)	-0.021 (0.026)
High Disc. Rate		0.032 (0.025)	0.032 (0.025)		0.029 (0.041)	0.032 (0.041)
Risk taking financial		0.036 ** (0.015)	0.035 ** (0.015)		0.057 ** (0.026)	0.057 ** (0.026)
Risk taking non-financial		-0.010 (0.018)	-0.009 (0.018)		-0.018 (0.031)	-0.017 (0.031)
%voted Biden by state		-0.001 (0.001)			-0.002 (0.002)	
Consider self democrat			-0.014 (0.022)			-0.035 (0.039)
N	2,068	2,068	2,068	656	656	656
Pseudo R ²	0.010	0.067	0.067	0.008	0.084	0.084
Mean of dep. var.	0.387	0.387	0.387	0.387	0.387	0.387

Note: Dependent variable =1 if respondent has existing life insurance policies. Main controls include being vaccinated and expecting to be vaccinated; we also control for chance of getting Covid, income, education, age, sex, being married, in good health, financial literacy, discount rate, risk attitudes and political affiliation. Columns 5-8 replicate the same analysis for people eligible for the vaccine (see text). Standard errors in parentheses. *** p < 0.01. ** p < 0. Source: Authors' calculations using US survey; see text.