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**Research Article**

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# How Health Insurance Knowledge Relates to Healthcare Utilization: Insights from Switzerland

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**Abstract**

**Background:** In Switzerland, basic health insurance is compulsory for all residents. A foundational level of health insurance knowledge (HIK) may be relevant to how individuals navigate a complex, choice-based insurance system and use healthcare.

**Methods:** Using data from the 2015 Swiss Health Behavior Survey (n = 1874), this study examined the association between selected dimensions of HIK and the number of doctor visits in the past 12 months. Probit and hurdle negative binomial (HNB) regression models were applied to investigate sociodemographic variations in HIK and its association with physician visits.

**Results:** Probit models showed that HIK varied across sociodemographic groups, most consistently by age. In unadjusted HNB models, greater HIK, particularly knowledge of the open enrollment policy, was associated with fewer doctor visits among those with at least one visit. This association diminished substantially after controlling for sociodemographic and health-related characteristics and was no longer statistically significant in the full sample. Physician visits were also associated with health status, age, gender, and household size. However, a robustness check restricted to respondents unexposed to a preceding question explicitly stating the open enrollment policy showed that the association between open enrollment knowledge and physician visits remained statistically significant.

**Conclusions:** HIK exhibited demographic patterning but no consistent association with the number of doctor visits after adjustment. Differences in estimates between the full and unexposed samples indicate that the observed HIK–utilization association may be sensitive to survey context. The demographic variations in HIK highlight the importance of accessible and understandable health insurance information, though such efforts should not be assumed to change utilization. Moreover, the potential relevance of HIK to healthcare utilization beyond the frequency of physician visits warrants further investigation.

**Keywords:** Health insurance knowledge, health insurance literacy, healthcare utilization, doctor visits, hurdle model, Switzerland, choice-based insurance systems

## 1. INTRODUCTION

Health insurance literacy (HIL) refers to "the degree to which individuals have the knowledge, ability, and confidence to find and evaluate information about health plans, select the best plan for their own (or their family's) financial and health circumstances, and use the plan once enrolled" (1). It reflects not only knowledge of insurance terms and regulations but also the financial skills and self-efficacy required to effectively select and use a health plan. Research has shown that HIL influences not only how individuals navigate insurance systems (e.g., 2, 3-5), but also how they access and utilize health care services (6-11).

While most empirical studies to date have been conducted in the United States (12), emerging evidence points to the broader relevance of HIL for health equity and cost-conscious healthcare

utilization (13-15). Yet, few studies have addressed this topic in other choice-based insurance systems, and even fewer have focused specifically on Switzerland, where complexity and individual choice are prominent features of the health insurance market.

In Switzerland, residents must choose among a wide variety of basic health insurance plans, which differ in costs and benefits due to variations in deductibles, managed care options, and premium rebates. A recent national survey indicated that nearly one third of Swiss residents face difficulties understanding or accessing health insurance information (16). Individuals with limited or insufficient HIL may fail to fully understand their entitlements or obligations, potentially leading to suboptimal utilization of healthcare services, such as delaying or avoiding needed care due to financial concerns (7, 8).

The most widely used validated instrument to assess health insurance literacy (HIL) is the Health Insurance Literacy Measure (HILM), which evaluates four domains: health insurance knowledge, information-seeking ability, document literacy, and financial and numerical skills (4). However, due to data constraints, this study cannot apply the full HILM tool. A Swiss-specific adaptation, the HILM-CH, was developed and validated in 2023 (17), but cannot be used for the present study, either. The HILM-CH postdates the dataset used in this study, which was derived from the 2015 Swiss Health Behavior Survey. While this survey included a variety of health insurance related questions, it was not designed around a specific HIL measurement instrument.

The present study focuses on a narrower but measurable construct: health insurance knowledge (HIK), operationalised through respondents' factual knowledge of specific plan features rather than

the self-reported confidence scales used in some HIL measures. Four HIK indicators are derived: (1) knowledge of the open enrollment policy, reflecting awareness of a system-level consumer protection; (2) knowledge of one's annual deductible and (3) knowledge of whether one has an alternative insurance model (e.g., managed care), both reflecting plan-specific understanding; and (4) a combined knowledge measure capturing knowledge of both deductible and model type. Together, these indicators serve as proxies for HIL, capturing key aspects of consumers' familiarity with their insurance coverage.

The central aim of this study is to empirically assess the association between HIK and the number of physician visits in Switzerland. Using a negative binomial hurdle model, the study tests whether higher levels of HIK are linked to more cost-conscious or effective patterns of healthcare utilization. Preliminary findings suggest that in uncontrolled analyses, higher HIK is associated with fewer physician visits. However, once accounting for sociodemographic and health-related characteristics, the association becomes statistically insignificant in the full sample. Nevertheless, a robustness check indicates that this lack of significance may reflect a measurement artifact rather than a true absence of association. This finding raises important questions about the role of HIK in shaping healthcare utilization, particularly in a highly regulated yet choice-rich and consumer-driven insurance environment like Switzerland.

The next three sections of this paper provide an overview of the institutional background, the data, and statistical methods. The results are presented in Section 5 and discussed in Section 6. The final sections critically reflect on the limitations of the study and conclude the paper.

## 2. INSTITUTIONAL BACKGROUND

In Switzerland, all residents are legally required to take out basic health insurance, known as LaMal (L'Assurance Maladie). The system is regulated by the federal government and consists of 34 private insurers offering standardized benefit packages as of 2026 (18). Insurers are mandated to accept all applicants for basic insurance, irrespective of age, gender, income, or pre-existing health conditions. This open enrollment policy ensures access but adds complexity to plan selection, particularly given the substantial variation in plan cost and structure.

The standard health plan for adults has an annual deductible of CHF 300 and provides unrestricted access to all licensed general practitioners and specialists (19). Individuals aged 19 and older may instead choose a higher, voluntary deductible, up to a maximum of CHF 2500, in exchange for premium rebates (20). Alternatively, individuals can enroll in an alternative insurance model with gatekeeping features, such as a family doctor (GP) model, health maintenance organization (HMO), or telemedicine model, collectively often referred to as managed care. These highly regulated managed care plans have voluntary deductibles and offer a premium rebate, which is 20% of the premium of the standard health plan, though the actual rebate is subject to the risk-adjusted cost differences between the managed care plan and the standard health plan (19, 21).

Premiums are community-rated but differ by region, age, and insurer, and low-income households receive subsidies co-financed by the federal government and cantons (21). Recent research demonstrates that while Switzerland's system ensures broad access, the variation in plan design and terminology poses substantial challenges for consumers with low insurance literacy (16). This

is particularly relevant to this study, which investigates how insurance knowledge is associated with healthcare utilization.

## 3. DATA

### *3.1 Swiss Health Behavior Survey*

The data for this study come from the 2015 "Health Behavior in Switzerland" survey, a nationally representative dataset commissioned by a market research firm (22). A total of 2,044 randomly selected individuals aged 15 to 74 from the German- and French-speaking parts of Switzerland completed an online questionnaire. The survey comprised 32 questions spanning topics such as general health status, health behaviors, insurance coverage, healthcare utilization, and sociodemographic background.

Respondents aged 15–18 (n = 126) were excluded because they are subject to different deductible regulations (CHF 0 – 600 instead of CHF 300 – 2500). Further exclusions were made for missing data on education (n = 26) with the answer "does not know/no answer", chronic illness (n = 16) with the answer "does not know/no answer", and nationality (n = 1) with missing or inconsistent responses, as well as one additional observation excluded to achieve model convergence. The final analytical sample thus consists of 1,874 individuals.

### *3.2 Variable definitions*

Definitions of the outcome and predictor variables are presented in Table 1. Healthcare utilization is a broad term that describes the use of and access to services for the purpose of preventing and curing health problems, promoting health and well-being, or obtaining information about one's health (23). Owing to data availability, the main outcome variable in this study is defined as the number of doctor visits within the previous 12 months (excluding routine checkups). Respondents were first asked whether they had visited a doctor at all. Those who answered affirmatively were then asked to report the total number of visits. Due to limitations in the dataset, it was not possible to differentiate between visits to general practitioners and specialists.

**[Insert Table 1 here]**

Four binary indicators were constructed to address the narrower concept of health insurance knowledge (HIK). The first one is the knowledge of open enrollment, based on whether respondents correctly rejected the false statement that insurers may deny access to basic insurance. The indicator for knowledge of the annual deductible depicts whether respondents correctly identified their annual deductible from a multiple-choice list. It is coded as high HIK if the respondent selected a specific deductible category (including 'Other') rather than indicating they did not know it. The indicator for knowledge of alternative insurance model is created based on providing a definite answer (yes or no) to whether they were enrolled in a managed care plan. Finally, the combined HIK indicator is coded 1 only if respondents demonstrated knowledge of both deductible level and managed care enrollment status. These HIK variables serve as proxies for insurance-related literacy as described by Paez et al. (2014), focusing on plan-specific understanding rather than the broader HIL construct.

Control variables include self-rated health (collapsed into three categories), presence of chronic illness, and key sociodemographic factors: gender, age (five brackets), educational attainment, household income (four brackets), household size (three brackets), Swiss citizenship, and language region (German, French, or mixed-speaking cantons).

### *3.3 Descriptive statistics*

Descriptive statistics are presented in Table 2. There are two patterns relevant for the empirical analysis described in Section 4.

**[Insert Table 2 here]**

First, as Table 2 displays, the probability of visiting a doctor at all is nearly identical across HIK groups (66 – 70%), but the average number of visits differs greatly. Respondents with low knowledge of open enrollment report an average of 4.55 visits, compared to 3.11 visits for those with high knowledge. This gap between the extensive margin (any visit) and the intensive margin (visit count) foreshadows the results in Section 5: HIK shows no association with the probability of visiting a doctor, but an association with the number of consultations among those who do visit a physician, at least before adjustment.

Second, Figure 1 shows that the gap in visit counts is not driven only by extreme outliers. The median is lower for the high-knowledge group (1 vs. 2 visits) and the interquartile range is

narrower, even with outliers excluded from the plot. This overdispersed, zero-inflated distribution (Additional file 1) supports the use of hurdle negative binomial specification used in Section 4.2 over a standard Poisson or OLS model.

**[Insert Figure 1]**

Furthermore, Table 2 shows that respondents with higher HIK are more likely to be male, older, in better health, and from higher-income, more-educated households. These sociodemographic characteristics are commonly associated with healthcare utilization (13). A multivariate analysis is introduced in Section 5 to account for this overlap and test whether the unadjusted association in Figure 1 survives once these characteristics are controlled for.

The sample demonstrates the highest levels of knowledge about the alternative insurance model (93.5%) and annual deductible (92.8%), somewhat lower level for open enrollment (88.6%), and lowest for the combined knowledge measure (88.9%), since the latter requires correct knowledge on both components simultaneously.

## 4. METHODS

### *4.1 Probit model for health insurance knowledge*

The first step in the analysis explores which individual characteristics are associated with health insurance knowledge (HIK). Since the four HIK indicators are binary, a set of probit models is

used to assess the probability of observing a high level of knowledge based on the predictors. The predictors are summarized in the vector $x$ and the model is specified as:

$$\Pr(HIK = high|x) = \Phi(x'\alpha) \qquad (1)$$

where $\Phi(.)$ represents the cumulative density function (CDF) of the standard normal distribution. The vector $\alpha$ contains the parameters to be estimated via maximum likelihood estimation, capturing the direction and strength of the association between HIK and $x$.

Average marginal effects (AMEs) are computed to facilitate interpretability. These effects quantify how the probability of reporting high HIK changes with a one-unit shift in each covariate, holding other variables constant. This approach follows established practice in microeconometric modeling of binary outcomes (24).

### *4.2 Hurdle negative binomial (HNB) regression model for doctor visits*

A hurdle negative binomial (HNB) model is applied to analyze whether health insurance knowledge is associated with healthcare utilization, measured as the number of physician visits during the past 12 months.

HNB models are highly appropriate for overdispersed count data with an excess of zero values, which is a common feature in healthcare utilization data. Compared to standard Poisson or negative binomial models, the HNB model provides a better fit. This is confirmed by both information criteria (Akaike and Bayesian information criteria) and formal testing (25), and aligns with its recent application to health literacy and utilization within the European context (26).

Originally proposed by Mullahy (1986) (27), hurdle models offer an established approach for estimating healthcare utilization, as they explicitly separate the initial physician visit from the frequency of subsequent visits (e.g., 28, 29, 30). One study applied a hurdle model to assess the impact of health information on doctor visits using Swiss data (31), though empirical applications of hurdle frameworks to HIL or insurance knowledge remain limited.

The hurdle model framework simultaneously captures physician visits in two stages. It assumes that decision-making regarding physician visits comprises two processes, i.e., the process governing the decision about consultation with a physician (0, 1) and the process of deciding the number (1, 2, 3 …) of consultations. Thus, the first part of the hurdle model distinguishes between visiting a physician or not by applying a binary outcome regression. In the second part, a zero-truncated negative binomial model is adopted to measure the intensity of physician visits, conditional on visiting a doctor. This framework accounts for the separate latent processes governing contact and subsequent frequency (25). The hurdle negative binomial (HNB) model can be formalized as:

$$P(\#doctor\ visits = 0|x) = f_1(0;\lambda_1) \qquad (2)$$

$$P(\#doctor\ visits = j|x) = \frac{1-f_1(0;\lambda_1)}{1-f_2(0;\lambda_2)} f_2(j;\lambda_2),\ j > 0 \qquad (3)$$

where $f_1(0;\lambda_1)$ is the probability function describing the distribution when the outcome is zero, as opposed to non-zero, with parameter $\lambda_1$ (a logistic regression model is adopted for this part as implemented in the Stata package hnblogit). The function $f_2(j;\lambda_2)$ is a count data distribution for

positive integers, with a truncated-at-zero negative binomial specification. The two parts of the model are estimated jointly. In the output, the first part yields odds ratios (ORs) for the likelihood of having zero versus a positive number of doctor visits, while the second part produces incidence rate ratios (IRRs) for the number of visits among those with at least one visit.

While all four HIK indicators were examined in the probit models, only two HIK indicators, i.e., the knowledge of open enrollment and the combined knowledge measure were included in the HNB models. Four model specifications were estimated. While Models (1) – (3) test the two HIKs indicators separately and jointly without adjustment, Model (4) accounts for sociodemographic and health-related controls. The HNB modeling approach allows the present study to test whether HIK is related to either the decision to consult a physician or the frequency of visits once care is initiated.

## 5. RESULTS

### *5.1 Health insurance knowledge and sociodemographic characteristics (Probit model)*

Table 3 presents the average marginal effects (AMEs) and the robust delta-method standard errors (SEs) generated from the probit models predicting four different indicators of health insurance knowledge (HIK): (1) knowledge of the open enrollment policy of the Swiss insurance system, (2) knowledge of one's annual deductible, (3) knowledge of whether one is enrolled in an alternative insurance model, and (4) a combined indicator capturing knowledge of both deductible and alternative model.

**[Insert Table 3 here]**

In terms of gender, female respondents were slightly less likely to know the open enrollment policy, with an average marginal effect of −2.85 percentage points (AME = –0.0285, SE = 0.0146, p = 0.051). No statistically significant gender differences were observed for the other three HIK indicators.

Older respondents generally had higher predicted probabilities of demonstrating health insurance knowledge, although the magnitude and statistical significance varied across age groups and HIK indicators. For instance, the age group of 66 –75 had predicted probabilities of HIK that were 6.6 to 15.5 percentage points higher than the group aged 19 – 35 across all four indicators.

Respondents from French-speaking regions were more likely to know about the open enrollment policy but were less likely to know whether they had an alternative insurance model.

Household income showed mixed results. Whereas medium household income was positively associated with knowledge of open enrollment, high household income was negatively associated with knowledge of personal deductible. Respondents with missing income data showed a similarly mixed pattern, with a higher probability of knowing about open enrollment but a lower probability for the other three indicators. Compared to single-person households, larger households were less likely to be aware of the other three indicators.

No statistically significant differences were observed for education level or self-reported health, whereas Swiss nationality was marginally positively associated with knowledge of alternative model status.

Exploratory cross-tabulations (not presented) showed weakly positive associations between the open enrollment indicator and the other HIK measures, suggesting that the indicators capture related dimensions of health insurance knowledge.

### *5.2 Health insurance knowledge and the number of doctor visits (HNB model)*

The results from the hurdle negative binomial (HNB) models are reported in Tables 4 and 5, distinguishing the extensive margin (any physician use) from the intensive margin (number of visits among users). Table 4 shows results of Models (1) – (4) for the two HIK indicators about open enrollment and combined knowledge, and Table 5 presents the outputs of sociodemographic and health-related controls from Model (4).

**[Insert Table 4 here]**

In Table 4, results of extensive margin show no significant association between HIK and the probability of visiting a doctor across all four model specifications. The ORs for both HIK indicators were close to 1 and remained statistically insignificant throughout. On the contrary, intensive margin results display a strong negative association between the open enrollment indicator and the number of doctor visits in the unadjusted models, i.e., among respondents with

at least one visit, those knowing the open enrollment policy had approximately 43 – 46% fewer expected visits. However, the association weakened substantially, once sociodemographic and health status variables were accounted for as in Model 4. Although the IRR went up to 0.913, it was no longer statistically significant in the full sample. A subsequent robustness check suggests that the loss of statistical significance should be interpreted with caution.

According to the survey design, a randomly assigned half of respondents answered a preceding question that explicitly stated the open enrollment policy before their knowledge of this policy was assessed. The proportion classified as having high HIK was 86.0% among respondents who did not receive the preceding question, in comparison to 91.2% among those who did. This difference indicates that the preceding wording may have provided respondents with information relevant to the subsequent open enrollment question. To assess the possible impact of the informative preceding wording on the estimated association between HIK and healthcare utilization, the full HNB model using only the subsample unexposed to the preceding wording (N = 931) was re-estimated. In the full sample, the adjusted model [Model (4) in Table 4] showed no statistically significant association between the knowledge of open enrollment and the number of doctor visits (IRR = 0.913, $p > 0.10$). On the contrary, the corresponding model in the subsample showed a statistically significant negative association (IRR = 0.729, $p < 0.05$), suggesting that respondents knowing the open enrollment policy had less frequent physician visits among those with at least one visit. The different results between the two model specifications indicate that the estimated association between HIK and healthcare utilization may be sensitive to this survey feature. This will be discussed further in Section 6.

Table 5 presents the results of Model (4) for control variables. Women were more likely than men to visit a doctor (OR < 1) and to have more visits once they had at least one visit (IRR > 1). Individuals with chronic illness and poorer self-rated health had significantly higher odds of initiating a physician visit and the subsequent visit frequencies, relative to those in better health. Larger households had higher likelihood of having at least one visit than single-person households (OR < 1), though household size showed no significant association with visit frequency among those who visited at least once. Relative to respondents aged 19 – 35, older age groups (36-65) generally had fewer expected visits, though the magnitude and statistical significance varied across groups. While the French-speaking regions showed modestly higher visit frequency than the German regions, the mixed language regions showed the opposite result.

**[Insert Table 5 here]**

Overall, HIK was positively associated with age, showed a less consistent relationship with income, and had no association with education or health (Table 3). The negative association between knowledge of open enrollment and the number of doctor visits weakened substantially after background characteristics were controlled for, though not across all models, as shown in the robustness check above. The number of doctor visits was primarily associated with health status, gender, age, and household size (Table 5), whereas its associations with HIK indicators were less consistent and sensitive to the survey context.

## 6. DISCUSSION

HIL is increasingly recognized as an important factor influencing how individuals navigate complex insurance and healthcare systems, and validated measurement tools have been developed in several countries (4, 32, 33), including Switzerland (17). However, empirical evidence on how HIL relates to healthcare utilization remains heavily concentrated in the US (11, 13). Due to data constraints, this study did not apply a comprehensive HILM, but instead used selected dimensions of health insurance knowledge as a narrower proxy for HIL to examine their association with physician visits in the Swiss context.

The findings suggest that HIK is socially patterned, aligning broadly with evidence from other healthcare systems, where insurance-related knowledge differs across demographic groups (33, 34). However, variations in HIK do not necessarily mirror differences in healthcare utilization. Age showed the strongest and most consistent gradient in HIK, though the size of the difference varied across age groups (Table 3). The association between age and the number of physician visits showed a different pattern, with respondents aged 36 – 65 visiting less often than the youngest group while the oldest group (66 – 75) did not differ significantly (Table 5). Gender and household size showed an even more direct mismatch. Women and larger households, both groups with lower levels of HIK, were more likely to visit a physician than men and single-person households (Tables 3 and 5). This indicates that demographic differences in HIK and healthcare use may reflect partly distinct processes. However, this cross-sectional study cannot establish the mechanisms underlying these divergent patterns. It remains unclear whether HIK and physician visits are directly related or if differences in healthcare needs, household circumstances, or other unobserved characteristics are involved.

One possible explanation for the weak association between HIK and utilization may relate to the structure of the Swiss health insurance system. Because the mandatory basic insurance offers a standardized and comprehensive benefit package (21), consumer choice concerns primarily factors such as insurers, premiums, deductibles, and insurance models (35), rather than variations in covered services. Prior Swiss evidence suggests that higher deductibles correlate with reduced healthcare utilization, owing to both moral hazard and self-selection by healthier individuals into higher-deductible plans (36). Using a representative Swiss dataset, a related study demonstrates that health insurance system knowledge is associated with deductible choice in ways that correspond to individuals' healthcare needs, but not with healthcare utilization behaviors like doctor consultations (37). This finding offers one plausible explanation for the weak HIK–utilization association observed in this study: knowledge about the insurance system may matter more for choices of health plans such as the deductible than for the frequency of doctor visits. This interpretation cannot be tested directly with the present data but may suggest a direction for future research. However, this does not imply that HIK is unrelated to broader healthcare utilization, as this study did not account for other aspects of care, such as care type, setting, urgency, or delayed and forgone care.

When interpreting the findings, it is important to note that preceding survey wording about the open enrollment policy was associated with a higher level of this specific HIK for part of the sample, and with differences in estimates of physician visits (Section 5.2). This suggests that the estimated association between HIK and utilization may be sensitive to survey context, and the null result in the full sample should be interpreted with caution.

Taken together, the findings suggest that there is a genuine but weak association between HIK and healthcare utilization in Switzerland, yet the relationship is sensitive to both model specification and measurement context.

## 7. STUDY LIMITATIONS AND FUTURE RESEARCH

While this study offers insights into the relationship between health insurance knowledge and healthcare utilization in a mandatory health insurance system, several limitations must be noted. First, the cross-sectional design does not allow causal inference or establish a temporal sequence between HIK and doctor visits. Second, the four reported HIK indicators capture selected dimensions of insurance knowledge rather than a comprehensive measure of HIL, and physician visits represent a single aspect of healthcare utilization. Third, the data were collected in 2015, so the findings may not reflect the current health insurance and healthcare landscape. Finally, the survey wording used to assess the open enrollment indicator may have affected both the measurement of HIK and its estimated association with physician visits. To address these limitations, future research adopting updated data, contemporary validated multidimensional HIL measures and broader utilization metrics would allow for investigation of the HIL-utilization association in the current healthcare environment. In particular, longitudinal and quasi-experimental designs would allow further examination of potential causal mechanisms and consumer behavior dynamics in healthcare utilization over time.

## 8. CONCLUSIONS

This study contributes to the growing research on health insurance literacy by examining a narrower and measurable construct, health insurance knowledge (HIK), and its association with doctor visits in Switzerland. HIK was found to vary across demographic groups, most consistently by age, with younger adults showing the lowest level of knowledge. The association between HIK and doctor visits, however, was weak and sensitive to both model specifications and survey wording.

These findings do not imply that health insurance knowledge or literacy is unrelated to other aspects of healthcare, though this could not be examined directly with the present data. In particular, the demographic differences in HIK highlight the potential value of making health insurance information accessible and understandable for individuals with lower levels of knowledge, without assuming such efforts will necessarily change healthcare utilization.

Future research using updated data, validated comprehensive HIL measures, more detailed utilization information, and longitudinal or quasi-experimental designs could provide further evidence on the relationship between HIL and healthcare use, and inform efforts to strengthen the population's capacity to understand and navigate the healthcare system.

**Abbreviations**

| | |
|---|---|
| AME(s) | Average marginal effect(s) |
| HIK | Health insurance knowledge |
| HIL | Health insurance literacy |
| HILM | Health insurance literacy measure |

| | |
|---|---|
| HNB | Hurdle negative binomial |
| IRR(s) | Incidence rate ratio(s) |
| OR(s) | Odds ratio(s) |
| SE(s) | Standard error(s) |

## Declarations

### Ethics approval and consent to participate

The data for this study were collected based on the online panel of the YouGov Schweiz (former LINK Institut) Internet-Panel. Members of the online panel provided general informed consent to participate in surveys, and they may choose whether to participate in any specific survey. The data provided by the YouGov Schweiz fully protects respondent anonymity. Therefore, according to Art. 2 of the Swiss Human Research Act and the corresponding regulations defined in the Human Research Ordinance, no ethical approval for the present study is required.

### Consent for publication

Not applicable.

### Availability of data and materials

The data supporting the findings of this study were collected as part of a broader research project by YouGov Schweiz (former LINK Institut) and are not publicly available due to institutional and licensing restrictions imposed by the Center for Health, Policy and Economics (CHPE) at the University of Lucerne, Switzerland. However, the data are available free of charge for the purpose of scientific research and education upon reasonable request to chpe@unilu.ch, subject to a formal data use agreement.

**Competing interests**

No conflict of interest.

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**Authors' contributions**

The author conducted the study, performed the data analysis, interpreted the results, and wrote the manuscript. The author read and approved the final manuscript.

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**Declaration of generative AI use**

The study design, data analyses, interpretations, conclusions, and initial manuscript drafts represent the author's sole work. Large language models (Claude by Anthropic and ChatGPT) were used during manuscript preparation to improve readability and check internal consistency. The author thoroughly reviewed, verified, and edited AI-suggested texts, and takes full responsibility for the final content.

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**Table 1. Definitions of variables**

| Variable | Definition |
|---|---|
| **Outcome variable** | |
| Doctor visits | Number of doctor visits in past 12 months (excluding routine checkups) |
| **Predictor variables** | |
| ***Health insurance knowledge (HIK)*** | |
| Knowledge of open enrollment | 1 (high HIK), if respondent knows that insurers must accept all applicants, 0 (low HIK) else |
| Knowledge of annual deductible | 1 (high HIK) if respondent selects a specific deductible category (i.e., did not indicate "don't know"), 0 (low HIK) if answer is "I don't know" |
| Knowledge of alternative insurance model | 1 (high HIK) if respondent answers yes or no when asked whether they have an alternative model for compulsory basic health insurance (e.g., managed care), 0 (low HIK) if answer is "I don't know" |
| Combined knowledge (deductible and alternative model) | Joint specification of the two indicators above; coded 1 (high HIK) only if both are high, 0 (low HIK) else |
| **Control variables** | |
| ***Health status*** | |
| Chronic illness | 1 if chronic or permanent illness or health problem lasting, or expected to last, at least 6 months, 0 if no; missing responses ('don't know/no answer') excluded from the analytic sample |
| Subjective health status | Self-perceived health status in 3 categories: 1 for very good health, 2 for good health, 3 for mediocre, bad, or very bad health |
| ***Sociodemographic characteristics*** | |
| Female | 1 for females, 0 for males |
| Age | Age divided into 5 groups: 19-35, 36-45, 46-55, 56-65, 66-75 |
| Education | Highest educational attainment in 3 categories: up to lower secondary education, upper secondary education, tertiary education; missing responses ('don't know/no answer') excluded from the analytic sample |
| Income | Household monthly gross income (in CHF) in 4 categories: up to 6000, 6001-10000, 10001 or higher; household income missing (does not know/no answer, see note below) |
| Household size | Number of persons residing in a household in 3 categories: 1 for single-person households, 2 for two-person households, 3 for three or more persons |
| Swiss | 1 for Swiss nationality, 0 for non-Swiss; missing or inconsistent responses excluded from the analytic sample |
| Region of residence | 25 cantons divided into 3 language regions: German-speaking cantons, French-speaking cantons, mixed German-French-speaking cantons |

*Source*: Swiss Health Behavior Survey 2015

*Note*: Respondents who did not know or declined to state their household income (n = 415, 22.2% of the sample) were retained as a separate 'missing' category to preserve sample size. Due to the likely heterogeneous reasons for non-disclosure, coefficients in the regression models should not be interpreted as reflecting a specific income level.

**Table 2. Descriptive statistics** (*N = 1874*)

| | Knowledge of open enrollment | | Combined knowledge (deductible + alternative model) | |
|---|---|---|---|---|
| | **Low HIK** | **High HIK** | **Low HIK** | **High HIK** |
| **Doctor visit (yes/no)** | 70.0% | 69.5% | 66.8% | 69.9% |
| **Number of doctor visits** | 4.554 (12.345) | 3.113 (6.144) | 2.962 (7.778) | 3.316 (7.052) |
| **Female** | 57.7% | 47.7% | 48.6% | 48.9% |
| **Age** | | | | |
| *19-35* | 35.7% | 25.8% | 67.3% | 21.8% |
| *36-45* | 22.1% | 23.3% | 13.9% | 24.3% |
| *46-55* | 23.0% | 25.6% | 10.1% | 27.2% |
| *56-65* | 11.7% | 13.2% | 5.3% | 14.0% |
| *66+* | 7.5% | 12.1% | 3.4% | 12.6% |
| **Chronic illness** | 43.2% | 40.8% | 29.8% | 42.4% |
| **Subjective health status** | | | | |
| *Very good* | 26.3% | 28.8% | 32.7% | 28.0% |
| *Good* | 54.0% | 57.1% | 55.3% | 56.9% |
| *Fair or poor* | 19.7% | 14.1% | 12.0% | 15.1% |
| **Region of residence** | | | | |
| *German* | 71.8% | 59.7% | 58.7% | 61.3% |
| *French* | 13.1% | 18.8% | 20.2% | 17.9% |
| *Mixed* | 15.0% | 21.5% | 21.2% | 20.7% |
| **Swiss** | 94.4% | 94.1% | 91.3% | 94.5% |
| **Education** | | | | |
| *Up to lower secondary* | 6.6% | 5.6% | 6.7% | 5.6% |
| *Upper secondary* | 58.2% | 48.8% | 53.8% | 49.3% |
| *Tertiary* | 35.2% | 45.6% | 39.4% | 45.1% |
| **Household income** | | | | |
| *Up to 6000* | 28.6% | 20.7% | 14.4% | 22.5% |
| *6001-10000* | 28.6% | 34.7% | 22.1% | 35.5% |
| *10001 or higher* | 19.7% | 22.6% | 18.8% | 22.7% |
| *Missing* | 23.0% | 22.0% | 44.7% | 19.3% |
| **Household size** | | | | |
| *1 person* | 16.4% | 15.9% | 7.2% | 17.0% |
| *2 persons* | 24.9% | 33.7% | 18.8% | 34.4% |
| *3 persons or more* | 58.7% | 50.5% | 74.0% | 48.6% |
| **Number of observations** | 213 | 1661 | 208 | 1666 |

**Table 2 (continued). Panel B: Prevalence of HIK indicators**

| HIK indicator | % high HIK |
|---|---|
| Knowledge of open enrollment | 88.6% |
| Deductible | 92.8% |
| Alternative insurance model | 93.5% |
| Combined knowledge (deductible + alternative model) | 88.9% |

*Source*: Swiss Health Behavior Survey 2015.

*Notes*: Reported numbers are proportions for each category, except the mean values for the number of doctor visits; standard deviations in parentheses. Combined knowledge measure is derived from knowledge of annual deductible and alternative insurance model; high for respondents who report knowledge of both, low else.

**Table 3. Average marginal effects from probit models of health insurance knowledge**

| | Health insurance knowledge (HIK) | | | |
|---|---|---|---|---|
| | **Open enrollment** | **Deductible** | **Alternative model** | **Deductible + alternative model** |
| **Female** | -0.0285* | 0.0116 | 0.00230 | 0.0151 |
| | (0.0146) | (0.0112) | (0.0109) | (0.0134) |
| **Age** | | | | |
| (reference: *19-35*) | | | | |
| *36-45* | 0.0351* | 0.122*** | 0.0738*** | 0.138*** |
| | (0.0198) | (0.0161) | (0.0144) | (0.0174) |
| *46-55* | 0.0472** | 0.134*** | 0.101*** | 0.174*** |
| | (0.0198) | (0.0166) | (0.0159) | (0.0185) |
| *56-65* | 0.0365 | 0.0905*** | 0.0928*** | 0.141*** |
| | (0.0247) | (0.0194) | (0.0207) | (0.0240) |
| *66-75* | 0.0660** | 0.0970*** | 0.115*** | 0.155*** |
| | (0.0295) | (0.0262) | (0.0277) | (0.0301) |
| **Chronic illness** | -0.0109 | -0.0079 | 0.0150 | 0.0058 |
| | (0.0166) | (0.0120) | (0.0124) | (0.0148) |
| **Subjective health status** | | | | |
| (reference: *very good*) | | | | |
| *Good* | -0.0041 | -0.0080 | -0.0007 | -0.0054 |
| | (0.0173) | (0.0120) | (0.0122) | (0.0149) |
| *Fair to poor* | -0.0345 | 0.00717 | -0.0018 | 0.0075 |
| | (0.0245) | (0.0190) | (0.0189) | (0.0231) |
| **Region of residence** | | | | |
| (reference: *German*) | | | | |
| *French* | 0.0585*** | 0.0210 | -0.0359*** | -0.0198 |
| | (0.0205) | (0.0160) | (0.0136) | (0.0179) |
| *Mixed* | 0.0520*** | 0.0080 | -0.0236* | -0.0152 |
| | (0.0194) | (0.0135) | (0.0132) | (0.0163) |
| **Swiss** | 0.0065 | -0.0026 | 0.0369* | 0.0396 |
| | (0.0308) | (0.0244) | (0.0212) | (0.0274) |
| **Education** | | | | |
| (reference: *up to lower secondary*) | | | | |
| *Upper secondary* | -0.0015 | -0.0044 | 0.0226 | 0.0185 |
| | (0.0309) | (0.0251) | (0.0218) | (0.0279) |
| *Tertiary* | 0.0318 | 0.00205 | 0.0218 | 0.0357 |
| | (0.0322) | (0.0261) | (0.0224) | (0.0290) |
| **Household income** | | | | |
| (reference: *up to 6000*) | | | | |
| *6001-10000* | 0.0453** | -0.0216 | 0.0103 | 0.0156 |
| | (0.0203) | (0.0193) | (0.0165) | (0.0211) |
| *10001 or higher* | 0.0366 | -0.0401* | 0.0146 | -0.0081 |
| | (0.0238) | (0.0212) | (0.0194) | (0.0238) |
| *Missing* | 0.0388* | -0.0873*** | -0.0454*** | -0.0846*** |
| | (0.0220) | (0.0187) | (0.0164) | (0.0204) |
| **Household size** | | | | |
| (reference: 1 person) | | | | |
| *2 persons* | 0.0231 | 0.0160 | -0.0313 | -0.0125 |
| | (0.0234) | (0.0227) | (0.0208) | (0.0261) |
| *3 persons or more* | -0.0166 | -0.0452** | -0.0473** | -0.0697*** |
| | (0.0226) | (0.0212) | (0.0200) | (0.0243) |
| ***Number of observations*** | 1874 | 1874 | 1874 | 1874 |

*Source*: Swiss Health Behavior Survey 2015.

*Notes*: Average marginal effects (AMEs), computed as averages of individual changes, with robust delta-method standard errors (SEs) reported in parentheses. The combined indicator (last column) is coded 1 if respondents report knowledge of both deductible and alternative insurance model, 0 otherwise. All HIK variables and explanatory variables are defined in Table 1. Significance levels: $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

**Table 4. Hurdle negative binomial model of doctor visits and health insurance knowledge**

| | **Model (1)** | **Model (2)** | **Model (3)** | **Model (4)** |
|---|---|---|---|---|
| **Extensive margin (OR)** | | | | |
| **Knowledge of open enrollment** (1=high/0=low) | 1.020<br>(0.162) | | 1.024<br>(0.163) | 0.926<br>(0.162) |
| **Combined knowledge** (1=high/0=low) | | 0.866<br>(0.136) | 0.866<br>(0.136) | 0.892<br>(0.161) |
| **Intensive margin (IRR)** | | | | |
| **Knowledge of open enrollment** (1=high/0=low) | 0.570$^{**}$<br>(0.155) | | 0.540$^{**}$<br>(0.148) | 0.913<br>(0.117) |
| **Combined knowledge** (1=high/0=low) | | 1.112<br>(0.319) | 1.302<br>(0.274) | 0.955<br>(0.146) |
| ***Number of observations*** | 1874 | 1874 | 1874 | 1874 |
| ***Basic controls*** | | | | *included* |

*Source*: Swiss Health Behavior Survey 2015.

*Notes*: Odds ratios (ORs) at extensive margin for the probability of observing zero doctor visits as opposed to positive doctor visits from logistic regression. Incidence rate ratios (IRRs) at the intensive margin from truncated-at-zero negative binomial regression. Model (4) controls for gender, age, chronic illness, subjective health status, region of residence, nationality, education, household income and size (coded as in Table 1). Robust standard errors in parentheses. Significance levels: $^{*}$ $p < 0.10$, $^{**}$ $p < 0.05$, $^{***}$ $p < 0.01$.

**Table 5. Hurdle negative binomial model of doctor visits and control variables**

| | OR extensive margin | IRR intensive margin |
|---|---|---|
| **Female** | 0.767** | 1.350*** |
| | (0.0849) | (0.123) |
| **Age** | | |
| (reference: *19-35*) | | |
| *36-45* | 1.379** | 0.737** |
| | (0.214) | (0.103) |
| *46-55* | 1.267 | 0.768* |
| | (0.199) | (0.107) |
| *56-65* | 0.913 | 0.562*** |
| | (0.184) | (0.0857) |
| *66-75* | 0.778 | 0.780 |
| | (0.176) | (0.137) |
| **Chronic illness** | 0.328*** | 2.516*** |
| | (0.0431) | (0.263) |
| **Subjective health status** | | |
| (reference: *very good*) | | |
| *Good* | 0.559*** | 1.641*** |
| | (0.0652) | (0.209) |
| *Fair to poor* | 0.202*** | 4.212*** |
| | (0.0503) | (0.638) |
| **Region of residence** | | |
| (reference: *German*) | | |
| *French* | 0.809 | 1.213* |
| | (0.122) | (0.137) |
| *Mixed* | 0.880 | 0.806* |
| | (0.122) | (0.0945) |
| **Swiss** | 1.066 | 0.828 |
| | (0.234) | (0.175) |
| **Education** | | |
| (reference: *up to lower secondary*) | | |
| *Upper secondary* | 1.014 | 0.932 |
| | (0.259) | (0.162) |
| *Tertiary* | 1.183 | 0.986 |
| | (0.306) | (0.184) |
| **Household income** | | |
| (reference: *up to 6000*) | | |
| *6001-10000* | 1.033 | 0.937 |
| | (0.165) | (0.123) |
| *10001 or higher* | 1.036 | 0.910 |
| | (0.189) | (0.151) |
| *Missing* | 0.872 | 0.788* |
| | (0.155) | (0.111) |
| **Household size** | | |
| (reference: 1 person) | | |
| *2 persons* | 0.557*** | 1.144 |
| | (0.0957) | (0.164) |
| *3 persons or more* | 0.612*** | 0.876 |
| | (0.102) | (0.121) |
| ***Number of observations*** | 1874 | 1874 |

*Source*: Swiss Health Behavior Survey 2015.

*Notes*: Table 5 reports the ORs and IRRs from Model (4) in Table 4; see Table 4 for the corresponding HIK indicator coefficients. Robust standard errors in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

## Figure 1 (Figure 1_boxplot.jpg):

**Figure 1. Distribution of doctor visits by knowledge of open enrollment**

*Source*: Swiss Health Behavior Survey 2015.

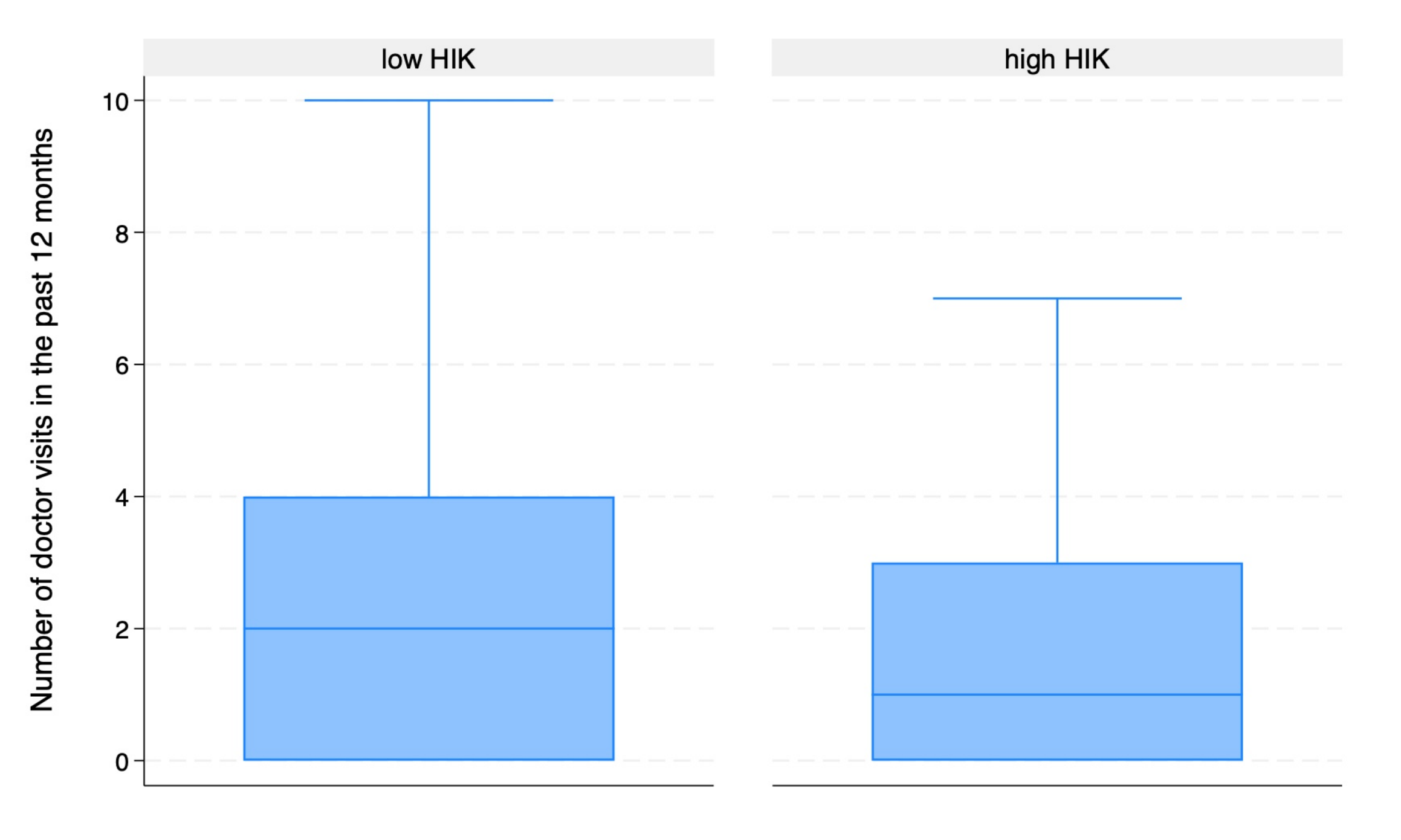
*Notes*: The graph shows a side-by-side boxplot for the distribution of doctor visits by respondents' knowledge of the open enrollment rule (low vs. high). First quartiles are zero in both distributions, the median is 2 for low HIK and 1 for high HIK, and the third quartile is 4 for low HIK and 3 for high HIK. Outliers outside the upper whisker are suppressed for better readability.

## Supplementary Information (Additional file 1_histogram.jpg):

**Additional file 1. Frequency distribution of annual doctor visits among survey respondents**

*Source*: Swiss Health Behavior Survey 2015.

*Notes:* Number of doctor visits above 30 are recoded to 30 for better readability.


low HIK
high HIK
Number of doctor visits in the past 12 months
10
8
6
4
2
0

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Additionalfile1histogram.jpg