Sociodemographic factors and expenditure issues in Vietnamese consideration of periodic general health examination

Quan-Hoang Vuong

Centre Emile Bernheim, Université Libre de Bruxelles

50 Ave. Franklin D. Roosevelt, Bruxelles 1050, Belgium

Email: qvuong@ulb.ac.be

***

FPT University, FPT School of Business

VAS-FSB Building, Block C, My Dinh 1, Hanoi, Vietnam

Email: hoangvq@fsb.edu.vn

and

Quang-Hoi Vu

Quang-Vu-Hung Hoi (Foundation)

1st Floor, The Manor Towers, Me Tri, Tu Liem, Hanoi, Vietnam

Email: vuquanghoi@bitexco.com.vn

ABSTRACT

Medical expenditure is perceived as a major obstacle for people wanting to access healthcare services in general, and in particular periodic general health examinations (GHE). However, the extant literature concerning expenditure on periodic health examinations in Vietnam is rather scarce and lacking in specific figures. Therefore, this article aims to examine the price people are willing to pay to take GHE periodically. From analyzing a dataset of 2,068 subjects collected from Hanoi and its vicinities, our study confirms that demographic factors (gender, job status, marital status) and socio-economic factors (health insurance, low belief in healthcare quality and perceptions on public's health status) have significant effects on GHE fees. The probability of people accepting to spend a larger sum (>VND2mn) for periodic GHE is relatively low (<24%), and it appears that people are eager to benefit more

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from health insurance, and tend to spend less when being insured. Also, the skepticism towards the quality of health care services reduces the likelihood to accept higher medical expenses. On the other side, job and marital status all boost the demand on monitoring health status of individuals, thence, impacting positively on people's willingness to pay for a physical exam.

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INTRODUCTION

Periodic health examination was initiated by Dobell in 1861 as a measure to monitor the health status of patients with tuberculosis [1]. From the 1920s until the 1970s, US medical institutions encouraged this type of preventive services [2, 3]. Still, the question of whether its benefit outweighs the costs remains a popular controversy.

Numerous previous studies have shown that many procedures in periodic GHE were unnecessary and costly as 25% of them had no value, and the annual costs of those amounted to USD 47-194 million in America (2006). In Canada, periodic GHE have even been discouraged since 1979, because it wasted time, resources and furthermore included non-evidence-based services [8-10]. On the other hand, people's trust in medical services quality also have a significant effect on their decision [11, 12]. In Vietnam, patients more than occasionally have doubt in physician's advice [13]. Besides, most of preventive services such as regular healthcare examinations increases annually total health care costs [14, 15] at rates exceeding that of inflation [16], or even higher in case of chronic diseases [17, 18]. Therefore, there is a rich base of arguments against these medical examinations in favor of reserving resources for other, higher-quality services [19-21].

However, it has been proven that GHE has considerable benefits compared to their costs. In terms of personal benefit, checking health status regularly improves usage of healthcare services as well as reduces patients' anxiousness [6, 22]. Moreover, it helps avoid heavy treatment costs in case of severe illness since these screenings apparently works well on early disease detection [23]. GHE equally concerns public benefit: physicians would earn more whether or not the patients come, while health insurance companies would bear no loss [24].

It cannot be denied that people's readiness towards periodic GHE significantly depends on the costs [25]. But from a broader point of view, there are various other factors affecting both said readiness and the healthcare fees they might be willing pay, such as: health insurance, family/personal income, job status, gender, health status, education, personal medical knowledge, etc [26-28]. Those who work in the medical/healthcare sector, who have

above-average income, or who are civil servants, are more likely to participate in periodic health examinations; and, being ready for higher payments, their health status are generally better [27-30]. On the contrary, below-average-income citizens have restricted access to healthcare services and are less likely to take particular medical checks such as periodic GHE [27-29, 31]. Also, females tend to take regular physical examinations more than males due to their general self-care tendencies and their specific physiological attributes [12, 32]. To women, it was proven that periodic GHE has an obvious, positive impact on detecting and dealing with breast cancer and uterine fibroids [33, 34]. On the other side, male patients are more inclined to want to check their reproductive health. A UK study reported that total costs for male reproductive health checks have been increasing while average costs per person decreased [35].

Other than that, these above factors also influence one another. A number of research papers have affirmed that health insurance improved the efficiency of health care services usages, and was especially beneficial for the poor who have demand for checkups, screenings and treatment [36-41]. But in a recent survey in the U.S, 63% of the uninsured are low-income although almost everyone considers health insurance to be important or very important, and 29% of them have average or poor health status [42]. Moreover, those with low income often have under-standard habitat and unhealthy living habits that lead to high risk of diseases, and, as a result, higher risk of astronomical treatment costs [43]. These costs, in turn, are even more severe when the patient is uninsured, or when they are only hospitalized in critical conditions [44-46]. Therefore, for policy making concerning health care in general and medical service pricing in particular, it is necessary to thoroughly consider all demographic and socioeconomic-related factors [27].

METHOD

Study Design and Location

The dataset was directly collected by the data team of Vuong & Associates, from September to October 2016. On the whole, a total of 2,068 observations have been recorded at a number of clinics, schools, companies and households in Hanoi and surrounding areas. Survey strictly followed ethical standards as established in the institution's Decision

V&A/07/2016. The questionnaires were then checked and signed by a team member, the supervisor, the head of V&A and the principal researcher.

Participants

The subjects of the research were chosen randomly; there was no discrimination whatsoever.

Statistical Analysis

Raw data is entered in MS Excel and saved as CSV files. Data manipulation and categorical structuring with multi-way contingency data tables were executed using R 3.3.1. The BCL model, specified in [47], is used for analyses. All dependent and explanatory variables in this article are discrete variables consisting of multiple categories. The multinomial logistic regression model is applied to predict the likelihood of a category of response variable Y in various conditions of predictor variable **x**, so as to evaluate the impact of response variable as well as their tendencies to change when the predictors change.

Although log-linear can be employed in this case, logistic regression was preferred for two reasons: i) the model is comprised of predetermined number of variables, thus showing each variable's significance more clearly; and, ii) explanations for estimated coefficients in empirical calculations can be acquired directly. Moreover, the BCL model can provide all odds ratios simultaneously between baselines and other categories.

The general equation of the baseline-categorical logit model is:

$$\ln \frac{\pi_j(\mathbf{x})}{\pi_J(\mathbf{x})} = \alpha_j + \boldsymbol{\beta}_j'\mathbf{x}, \qquad j = 1, \dots, J-1.$$

in which **x** is the independent variable; and $\pi_j(x) = P(Y = j|x)$ its probability. Thus $\pi_j = P(Y_{ij} = 1)$ with Y as the dependent variable.

In the logit model in consideration, the probability of an event is calculated as:

$$\pi_j(\mathbf{x}) = \frac{\exp(\alpha_j + \boldsymbol{\beta}_j'\mathbf{x})}{1 + \sum_{h=1}^{J-1} \exp(\alpha_h + \boldsymbol{\beta}_h'\mathbf{x})}$$

with $\sum_j \pi_j(\mathbf{x}) = 1$; $\alpha_J = 0$ và $\boldsymbol{\beta}_J = 0$; in which n is the number of observations in the sample, j the categorical values of an observation i, and h a row in basic matrix $\mathbf{X}_i$. Estimated probabilities can be used to predict the possibilities of the person's expenditure for a periodic

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GHE (low, medium, high) in certain conditions of such socio-economic and demographic variables [48-50].

Estimated coefficients are computed through multi-variable logistic regression and are used to calculate empirical probabilities [50-53]. The z-value and p-value indicate statistical significance of predictor variables in the models, with $p < 0.1$ being the conventional level of statistical significance required for a positive result [51].

RESULTS

Collected data shows respondent's answers to the questions related to personal information and psychological factors affecting the cost that they deem reasonable for each periodic GHE. Personal information that will be considered are:

- Gender ("Sex"), includes "Male" and "Female";
- Marital status ("Maritalstt"), was divided into two categories "married" (already been married", and other (have not got married or other status); and
- Job status ("Jobstt"), was categorized into "stable" (having stable jobs), and "other" (having unstable jobs, or being student, retired, home-maker and others)

Besides, several other socio-economic factors will also be taken into account, those are:

- Health insurance ("HealthIns"), consists of "Yes" (the person is insured) and "No" (uninsured);
- Hesitation towards periodic GHE due to lack of trust in health care quality "Lessbelqual", this is a dichotomous variable, consisting of two responses "Yes" and "No"; and
- Perception towards public health status ("CHPerc"), comprises "bad" (not good, problematic) and "other" (good, quite good and others)

The consistent dependent variable for this research is affordable cost ("Affcost"), which is the cost respondents would willingly pay for one periodic GHE, and is divided into three levels "low" (less than VND1mn), "med" (between VND1-2mn) and "hi" (above VND2mn).

During data survey, one in six persons refused to be interviewed for questionnaires. Females are more often ready to answer than males (64.80%). Those who already get married and who h stable jobs account for high proportions (57.35% and 54.30% respectively) among

participants. Conversely, those having other marital status or being retired take up very small portions (0.24% and 1.79%). Due to health insurance being compulsory, 82.21% are reported to be insured.

Table 1. Basic statistical indicators

Characteristics	N	Percentage (%)
Sex		
Male	728	35.2
Female	1340	64.8
Marital status		
Married	1186	57.35
Unmarried	877	42.41
Other	5	0.24
Job status		
Stable	1123	54.3
Unstable	171	8.27
Student	548	26.5
Retired	37	1.79
Home-maker	85	4.11
Other	104	5.03
Health insurance		
Yes	1700	82.21
No	368	17.79
Hesitation due to less belief in healthcare quality		
Yes	554	26.79
No	1514	73.21
Perception towards public's health status		
Good	337	16.3
Quite good	722	34.91
Not good, problematic	749	36.22
Unknown	260	12.57

Affordable self-paid cost for a periodic GHE

Less than VND 1mn	876	42.36
From VND 1mn to 2mn	909	43.96
Above VND 2mn	283	13.68

Note: VND 1mn ≈ US$ 45 (formal exchange rate: US$ 1 equals approximately 22,200 Vietnamese Dong as of November 2016)

As shown in Table 1, the majority of respondents have a positive attitude towards medical service quality: 73.21% of them do not have any hesitation towards GHE. Regarding respondent's perceptions towards public health status, "bad" (problematic) is the most-received answer (36.22%), mostly with environmental pollution and hygiene and food safety issues cited as reasons. With respect to willing charge for a periodic GHE participation, it turns out that lower than VND2mn is the most favored answer (86.32%).

Employing logistic regression estimations with dependent variable "AffCost" against three independent variables "HealthIns", "Lessbelqual" and "CHPerc", the results are reported in the following table:

Table 2: Estimation results

	Intercept	"HealthIns"	"Lessbelqual"	"CHPerc"
		"yes. HealthIns"	"yes. Lessbelqual"	"bad.CHPerc"
	β_0	β_1	β_2	β_3
logit(low|hi)	0.746*** [4.480]	0.595*** [3.548]	0.515** [3.059]	-0.608*** [-4.253]
logit(med|hi)	0.828*** [5.120]	0.433** [2.675]	0.230 [1.355]	-0.118 [-0.852]
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1; z-value in square brackets; baseline category for: "HealthIns"= "no", "Lessbelqual"= "no", "CHPerc"= "other". Residual deviance: 11.43 on 8 d.f.				

As can be seen in Table 2, most estimated coefficients are statistically significant, implying correlations between the three socio-economic factors mentioned above and the acceptable cost of periodic GHE.

However, not all of estimated coefficients are statistically significant. Therefore, the Goodness-of-fit test is used to ensure more solid conclusions. The estimated multi-way

contingency table (provided in Appendix C) shows that all fitted counts are larger than 5; coupled with the fact that the size of sample is quite large, $G^2 =$

$2 \sum observed \left[\log\left(\frac{observed}{fitted}\right)\right]$ is deduced to have an approximate chi-squared distribution of [54-55].

Considering the null hypothesis $H_0 : \beta_i = 0$, p-values are computed as follows:

$$\text{P-value} = \text{Pro}(\chi^2_{(df)} < G^2) = \text{Pro}(\chi^2_{(8)} < 11.4258) = 0.179.$$

Although the P-value = 0.179 does not present a fantastic goodness-of-fit, however, when combining with 6 out of 8 highly significant coefficients, the specification is still reasonable well fitted for further consideration. That means the model, albeit imperfect, is still worthwhile for considering the following empirical observations.

From Table 2, regression equations are constructed depicting relationships between the response variable and the predictor variables as follows:

$$\ln\left(\frac{\pi_{low}}{\pi_{hi}}\right) = 0.746 + 0.595 \times \text{yes. HealthIns} + 0.515 \times \text{yes. Lessbelqual}$$
$$- 0.608 \times \text{bad. CHPerc} \tag{Eq.11}$$

$$\ln\left(\frac{\pi_{med}}{\pi_{hi}}\right) = 0.828 + 0.433 \times \text{yes. HealthIns} + 0.230 \times \text{yes. Lessbelqual}$$
$$- 0.118 \times \text{bad. CHPerc} \tag{Eq.12}$$

Table 3 presents distributions of probabilities of willing payments for a periodic GHE conditional upon three socio-economic factors: health insurance, low belief in health care quality and perceptions on public's health.

Table 3: Probabilities of periodic GHE willing payments against socio-economic factors

"AffCost"	"low"				"med"				"hi"			
"HealthIns"	"yes"		"no"		"yes"		"no"		"yes"		"no"	
"Lessbelqual" |"CHPerc"	"bad"	"other"	"bad"	"other"	"bad"	"other"	"bad"	"other"	"bad"	"other"	"bad"	"other"
"yes"	0.413	0.540	0.351	0.476	0.468	0.375	0.467	0.389	0.119	0.085	0.182	0.135
"no"	0.335	0.458	0.275	0.391	0.504	0.423	0.486	0.424	0.161	0.119	0.239	0.185

Similarly, the same procedures are applied to figure out the correlations between periodic GHE willing payments and three demographic factors: gender, job status and marital status. Table 4 displays the estimation results of logistic regression model among these above variables.

Table 4: Estimation results of regression among willing payments for GHE and gender, job status, marital status

	Intercept	"Jobstt"	"Maritalstt"	"Sex"
		"Stable.Jobstt"	"Other. Maritalstt"	"Male"
	β_0	β_1	β_2	β_3
logit(low|hi)	1.141***	-0.444**	0.852***	-0.265·
	[4.480]	[3.548]	[3.059]	[-4.253]
logit(med|hi)	1.050***	0.045	0.544***	-0.234·
	[5.120]	[2.675]	[1.355]	[-0.852]
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1; z-value in square brackets; baseline category for: "Jobstt"= "other", "Maritalstt"= "married", "Sex"= "female". Residual deviance: 18.6811 on 8 degrees of freedom.				

Using the goodness-of-fit test, the fitted contingency table is computed and presented in Appendix D. P-value is calculated as: $\text{Pro}(\chi^2_{(8)} < 18.6811) = 0.017 < 0.1$, suggesting a satisfactory goodness of fit for the model. This inference reinforces the associations between the above mentioned variables which were preliminarily affirmed as a result from Table 4.

In the same manner, Eq.21 và Eq.22 are formed based on Table 4:

$$\ln\left(\frac{\pi_{\text{low}}}{\pi_{hi}}\right) = 1.141 - 0.444 \times \text{stable.Jobstt} + 0.852 \times \text{other.Maritalstt} - 0.265 \times \text{Male} \tag{Eq.21}$$

$$\ln\left(\frac{\pi_{\text{med}}}{\pi_{hi}}\right) = 1.050 + 0.045 \times \text{stable.Jobstt} + 0.544 \times \text{other.Maritalstt} - 0.234 \times \text{Male} \tag{Eq.22}$$

Distributions of probabilities of periodic GHE willing payments conditional upon gender, marital status and health insurance are presented in Table 5.

Table 5: Probabilities of periodic GHE willing payments based on demographic factors

"AffCost"	"low"				"med"				"hi"			
"Sex"	"male"		"female"		"male"		"female"		"male"		"female"	
"Jobstt"| "MaritalStt"	"other"	"married"	"other"	"married"	"other"	"married"	"other"	"married"	"other"	"married"	"other"	"married"
"stable"	0.416	0.314	0.434	0.335	0.469	0.482	0.474	0.498	0.115	0.204	0.092	0.167
"other"	0.535	0.424	0.553	0.448	0.370	0.399	0.371	0.409	0.095	0.177	0.076	0.143

DISCUSSION

Table 3 primarily shows that the likelihood of a person willing to spend a lot of money for GHE is relatively low (< 24%). This is also denoted in Fig.1: the line of probabilities of high spending ("hi") is completely under the "low" and "med" lines.
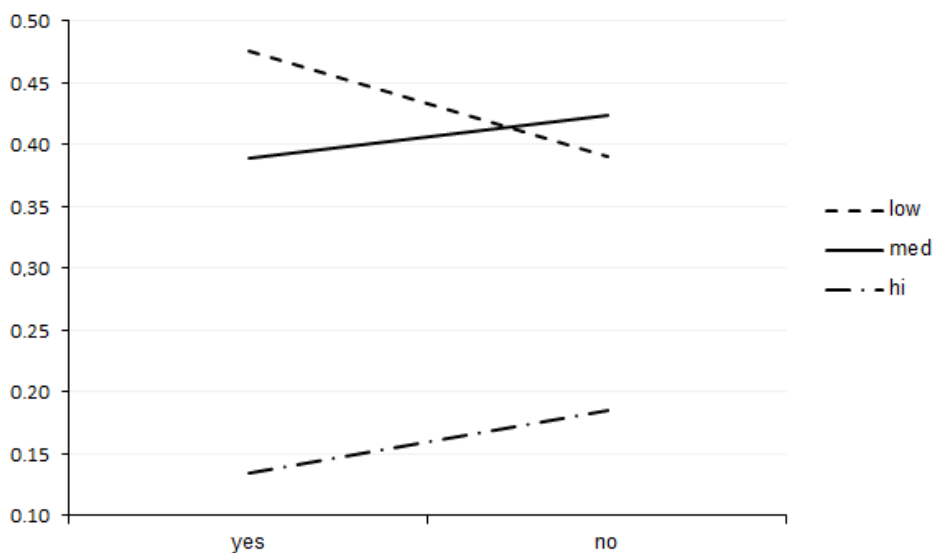

Figure 1. Probabilities of willing payments for a GHE among uninsured people having a negative perception of public's health

It can be also seen in Fig. 1 that both "hi" and "med" lines have an upward slope when moving from "yes" (hesitant to take GHE due to lack of trust in healthcare quality) to "no" (ready to take GHE), whereas the "low" line goes down. This means that by reducing concerns about the quality of health services, it is possible to increasing probabilities of higher spending on general health checks. Table 3 also suggests that uninsured individuals are more likely to

pay less for periodic GHE than the people without health insurance, with probabilities of "low" payments ranging from 33.5% to 54% and from 27.5% to 47.6% for both groups respectively.

Another fact worth noting is that people's perceptions of public health turns out to have a particularly strong influence on the amount of money one is willing to pay for GHE, especially when considering the probabilities of low payments; with variable "bad" having the highest estimate coefficients among the "CHPerc" group of independent variables in Eq.(11). More precisely, a positive view on public health could reduce the probabilities of low payments and increase the probabilities of medium and high payments (Table 3).

Observing Table 4, it can be inferred that men are willing to pay more than women for regular checkups. Moreover, estimate coefficients of "MaritalStt" in Eqs.(21-22) are large, proving that marital status has a significant impact on spending for GHE. This remark is illustrated by the two probability lines in Fig.2 as follows.
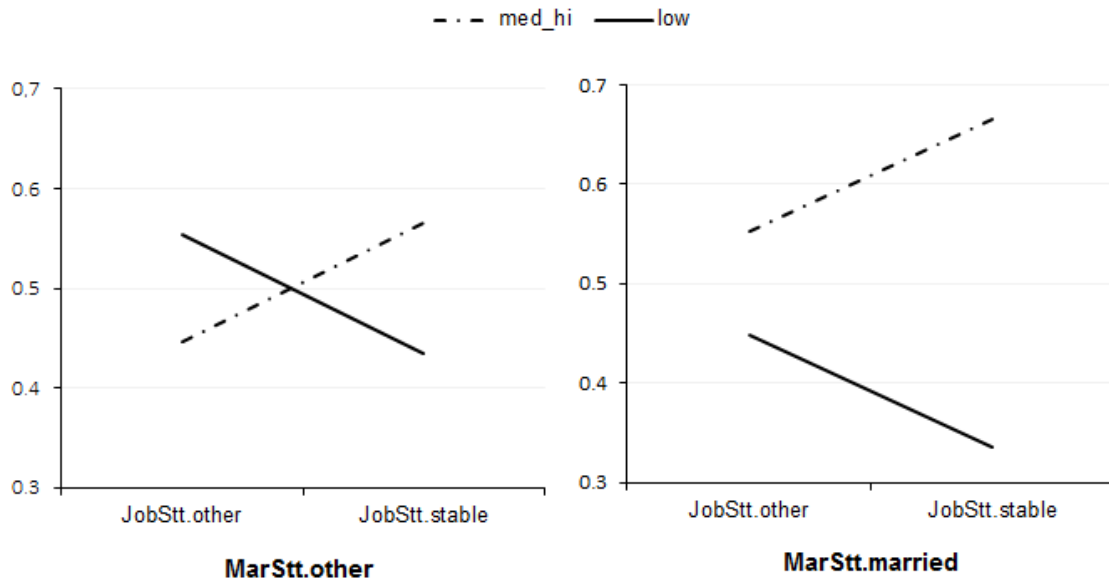

Figure 2. Probabilities of females' willing payments for GHE of females based on marital status

Figure 2 shows "low" on a downward trend and "med-hi" lines moving in the opposite slope when job status changes from "other" to "stable" in both left and right figures. The upward slope of "hi-med" lines indicates that people are willing to pay more for GHE once they get stable jobs. The opposite goes for "low".

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In addition, the "hi-med" lines' probabilities range from 44.7% to 56.6% in "MarStt.other" and from 55.2% to 66.5% in "MarStt.married". This means the probabilities of above-medium spending of married females would be higher than females with other marital status. It is also worthy to note that the two probabilities in Fig.2 (right) are completely separate, showing that married women always tend to be willing to pay more for periodic GHE, regardless of their jobs.

Recommendation

Based on the research results, healthcare policies should mind periodic GHE pricing. In order to lift the amount people are willing to pay for GHE, it is necessary to focus on improving the quality of medical services to reinforce the people's confidence in public healthcare, thus giving them a reason to spend more on health checks. It is equally important to keep in mind that health insurance also plays an important role in reducing costs for health care; therefore, the quality of services concerning health insurance must also be taken care of. In the long-run, seeing as socio-economic as well as demographic factors all make stark impacts on the labor policies should be proposed and implemented to raise employment rates and improve working environment.

CONCLUSION

Through analyzing the level of spending that Vietnamese people are ready to allocate to periodic medical checks, the study has exposed financial issues facing Vietnamese upon deciding on having GHE. The issues appear to have been of primary concern for women. This is because Vietnamese women, more often than men, tend to be very minute in allocating their budget to different aspects of their life, while the value GHE remains ambiguous to them. In contrast, although men in Vietnam are generally less inclined to care for their health compared to women and thus have lower demand for health examinations, they might be willing to pay at higher levels than women once matters of concerns arise (such as reproductive health, for example).

In addition, skepticism remains on the quality of general health care services: people are afraid of wasting money on unwarranted services. As a result, they will restrict expenditure

on health care. Also because of that, people are more likely to look for lower medical expenses through health insurance services.

The outcomes of the research also point out the differences in views on health care spending between those having different marital status. The married are likely more concerned about the health of themselves and their family members, therefore are willing to pay more for medical care. Besides, having stable jobs could also raise the amount they are ready to pay for a periodic GHE. It is safe to conclude that people who have stable jobs often have higher demand for frequent follow-ups on their health status, and they do not hesitate to pay for the examinations if they have stable income.

Finally, for people whose first priority is health, they will spend more money on checking their health regularly, especially when there are signs of deterioration in public health. Their willingness to pay might be also, partly, in hopes of improving general health situation.

ACKNOWLEDGEMENT

APPENDIXES

Appendix A: Distribution of responses against predictor categories "HealthIns", "Lessbelqual" and "CHPerc"

"HealthIns"	"Lessbelqual"	"CHPerc"	"AffCost"		
			"low"	"med"	"hi"
"no"	"no"	"bad"	34	75	32
		"other"	60	60	29
	"yes"	"bad"	8	11	5

		"other"	29	18	7
"yes"	"no"	"bad"	152	240	72
		"other"	354	312	94
	"yes"	"bad"	58	44	18
		"other"	181	149	26

Appendix B: Distribution of responses against predictor categories "Jobstt", "Maritalstt" and "Sex"

"Jobstt"	"Maritalstt"	"Sex"	"AffCost"		
			"low"	"med"	"hi"
"stable"	"married"	"female"	171	256	88
		"male"	123	152	67
	"other"	"female"	53	70	17
		"male"	46	69	11
"other"	"married"	"female"	101	98	31
		"male"	30	49	20
	"other"	"female"	263	162	30
		"male"	89	53	19

Appendix C: Fitted distribution of responses against predictor categories "HealthIns", "Lessbelqual" and "CHPerc"

"HealthIns"	"Lessbelqual"	"CHPerc"	"AffCost"		
			"low"	"med"	"hi"
"no"	"no"	"bad"	38.8	68.5	33.7
		"other"	58.2	63.2	27.6

	"yes"	"bad"	8.4	11.2	4.4
		"other"	25.7	21.0	7.3
"yes"	"no"	"bad"	155.4	233.9	74.7
		"other"	348.1	321.5	90.4
	"yes"	"bad"	49.5	56.2	14.3
		"other"	192.2	133.5	30.3

Appendix D: Fitted distribution of responses against predictor categories "Jobstt", "Maritalstt" and "Sex"

"Jobstt"	"Maritalstt"	"Sex"	"AffCost"		
			"low"	med"	"hi"
"stable"	"married"	"female"	172.5	256.5	86.0
		"male"	107.4	164.8	69.8
	"other"	"female"	60.7	66.4	12.9
		"male"	52.4	59.1	14.5
"other"	"married"	"female"	103.0	94.1	32.9
		"male"	42.0	39.5	17.5
	"other"	"female"	251.6	168.8	34.6

		"male"	86.1	59.6	15.3

Appendix E. Probabilities of affordable cost for a GHE of those not having health insurance and having a negative outlook on public's health (Data used to produce Figure 1)

"Lessbelqual"|"AffCost"	"low"	"med"	"hi"
"yes"	0.476	0.389	0.135
"no"	0.391	0.424	0.185

Appendix F. Probabilities of affordable cost for a GHE of females against marital status (Data used to produce Figure 2)

"MaritalStt"	"other"		"married"	
"AffCost"	"med_hi"	"low"	"med_hi"	"low"
"JobStt.other"	0.447	0.553	0.552	0.448
"JobStt.stable"	0.566	0.434	0.665	0.335

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