Eliciting Willingness to Pay without Bias: Evidence from a Field Experiment

Karen Blumenschein, College of Pharmacy and Martin School of Public Policy and Administration, University of Kentucky, Lexington, KY 40536-0082, USA; e-mail: kblum1@email.uky.edu

Glenn C. Blomquist, Department of Economics and Martin School of Public Policy and Administration, University of Kentucky, Lexington, KY 40506-0034, USA; e-mail: gcblom@uky.edu

Magnus Johannesson (corresponding author), Department of Economics, Stockholm School of Economics, Box 6501, SE-113 83 Stockholm, Sweden; e-mail: hemj@hhs.se

and

Nancy Horn, American Pharmacy Services Corporation, Frankfort, KY, USA; e-mail: nshorn@apscnet.org

Patricia Freeman, College of Pharmacy, University of Kentucky, Lexington, KY USA and American Pharmacy Services Corporation, Frankfort, KY, USA; e-mail: freeman@apscnet.org

February 23, 2005 draft

Abstract

Concern exists that hypothetical willingness to pay questions overestimate real willingness to pay. In a field experiment, we compare two methods of removing hypothetical bias, a cheap talk approach and a certainty approach. Subjects, who are diabetes patients, receive a real or hypothetical offer to purchase a pharmacist-provided diabetes management program at several prices. Individuals are placed in three treatment groups: real, stated preference after cheap talk, and stated preference with certainty follow-up. We find evidence of hypothetical bias for unadulterated contingent valuation in that the mean hypothetical willingness to pay is about twice as high as the real willingness to pay ($42 versus $22). Contingent valuation with certainty statements removes the hypothetical bias (mean of $20), but the cheap talk approach has no significant impact (mean of $44). Our findings suggest that willingness to pay can be accurately estimated by adding a simple follow-up question about the certainty of responses and that cheap talk is not a generally effective approach.

Key words: Willingness to pay, certainty statements, cheap talk, contingent valuation, field experiments, calibration, diabetes.
JEL-classification: C93, D61, I10, Q26.

Acknowledgements: We are indebted to Jason Shogren and Laura Taylor for detailed comments on the design of our experiment and the cheap talk script. We also thank Niklas Zethraeus for research assistance and Ronald Langley for suggestions about certainty statements. Finally, we are indebted to American Pharmacy Services Corporation and the following pharmacists who participated in this experiment: Matt Cull, Drane Stephens, Aaron McIntosh, Kathy Salyer, Steve and Alicia Dawson, Gary Hamm, Alyson and Leon Claywell, Jason Wallace and Melodie Hawkins. This research was supported by Cooperative Agreement Number E11/CCE421825 from the Centers for Disease Control and Prevention (CDC). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of CDC. Magnus Johannesson received financial support from the Swedish Research Council.

1. INTRODUCTION

Information about the willingness to pay for non-market goods is crucial for understanding the welfare implications of different policies. Ideally we would like to rely on actual choices for inferring willingness to pay. But for many public programs, especially those in the environmental and health area, revealed preference information is limited. This limitation can arise from the lack of markets or third-party financing. Researchers have therefore tried to estimate willingness to pay based on stated preferences that are hypothetical choices. This methodology, known as contingent valuation, is controversial in economics (Diamond and Hausman 1994; Carson et al. 2001; Ariely 2003).

At the heart of this controversy is the extent to which hypothetical choices correspond to real economic choices.[1] Several laboratory experiments comparing real and hypothetical willingness to pay, including studies by Cummings et al. (1995, 1997), suggest that hypothetical responses sometimes substantially overestimate willingness to pay (see the reviews by Harrison and Rutström (2005) and Harrison (forthcoming)). This problem is known as hypothetical bias.

The evidence on hypothetical bias has stimulated research into various ways of removing this bias. Cummings and Taylor (1999) introduced a cheap talk approach, which entails explicitly describing hypothetical bias and asking subjects to adjust for hypothetical bias in responding to willingness to pay questions. They also provided evidence of the effectiveness of the approach in experimental referenda about donations to public goods. Subsequent studies on the cheap talk approach have found mixed results. Brown et al. (2003), using a similar design as Cummings and Taylor, found that the effectiveness of the cheap talk

[1] In 1942 Wallis and Friedman (1942) criticized the use of hypothetical choices in experiments, and it has been debated ever since (Thaler 1995; Kagel and Roth 1995; Camerer and Hogarth 1999). In experimental economics it is standard practice to provide monetary incentives, whereas the bulk of experimental work in psychology is

approach varied with the price level. In a second-price auction for sports cards, List (2001) found that the cheap talk approach removed the hypothetical bias for nondealers, but not for dealers. In a study by Murphy et al. (2005) on a voluntary contribution mechanism, the cheap talk approach did not fully remove the hypothetical bias.

In this study we provide new evidence about the effectiveness of the cheap talk approach in a field experiment and test an alternative method of removing hypothetical bias, which we refer to as the "certainty approach". The certainty approach counts only "definitely sure" hypothetical yes responses as identified in a follow-up question as true yes responses. This approach has been effective in removing hypothetical bias in both laboratory and field experiments (Blumenschein et al. 1998, 2001). This approach is related to a strand of research in contingent valuation that incorporates different degrees of certainty in the contingent valuation questions themselves and adjusts the estimated willingness to pay (Johannesson et al. 1993; Ready et al. 1995, 2001; Alberini et al. 2003, and Evans et al. 2003). However, unlike our field experiment these previous studies have not made comparisons to real behavior. The purpose of this study is to compare adjusted stated behavior and real behavior when the adjustment is based on follow up questions about certainty.

The field experiment is carried out under the same conditions as a high quality contingent valuation study. Face-to-face interviews are used, and the subjects value a non-trivial good that is not available on the market. In an environment of social concern for obesity and diabetes we chose a diabetes management program as the good. It is primarily a private good, but spillovers exist from third party financing of health care. The subjects in the experiment are divided into three treatments groups: (1) real, (2) stated preference after cheap talk, and (3) stated preference with certainty follow up. Subjects receive a real or hypothetical offer to purchase a real, but previously unavailable, service at several different prices. By

---

based on hypothetical choices. For an overview of the methodological debate between psychologists and

varying the price across subjects it is possible to estimate the aggregate demand curve (Bishop and Heberlein, 1979). Our findings suggest that the cheap talk approach is not a generally effective method of removing hypothetical bias, but that it is possible to accurately estimate willingness to pay by adding a simple follow-up question about the certainty of responses.

2. EXPERIMENTAL DESIGN

The experiment involved three different treatments referred to as the "real group", "the hypothetical group" and the "cheap talk group". Subjects in the real group were given the opportunity to actually purchase a pharmacist-provided diabetes management program. Subjects in the hypothetical group received a dichotomous choice contingent valuation question about purchasing the same diabetes management program followed by a question about the certainty of their hypothetical responses (with the categories: probably sure/definitely sure). Subjects in the cheap talk group received a dichotomous choice contingent valuation question preceded by a cheap talk script. In all three groups the price was varied between $15, $40 and $80. The questionnaires were pilot-tested in a focus group of diabetics in Lexington, KY prior to the study. The focus group was also used to determine the prices used in the experiment. The data collection was carried out as "face-to-face" interviews, and the same trained interviewer carried out all the interviews.[2] The study had approval from the University of Kentucky Medical Institutional Review Board. Details of the experiment are further described below.

---

economists, see Hertwig and Ortmann (2001).

[2] List et al. (2004) found that subject anonymity can affect willingness to pay for a public good using a referendum format. They argue that subjects may vote yes to publicly advertise their own goodwill. However, any social approval should be less important with the diabetes management program used in our study.

2.1 The Good

The good used in our experiment was a pharmacist provided type-2 diabetes management program. This program was designed to assist type-2 diabetics in attaining optimal management of their diabetes, thereby enhancing their life quality and decreasing their utilization of expensive health care services such as Emergency Department visits and hospitalizations.

The profession of pharmacy is slowly progressing towards a ’patient care’ focus of practice rather than the historical ’drug dispensing’ focus. Pharmacists in a variety of practice settings are developing new clinical services and disease management programs to help patients achieve desired health outcomes. These services range from blood lipid management and diabetes education to smoking cessation programs and cancer risk assessment (Bluml et al. 2000; Rodriguez de Bittner and Haines 1997; Kennedy and Small 2001; Giles et al. 2001). Although new pharmacist provided patient care and disease management programs are being developed, these services are rarely provided in the community pharmacies where most people encounter pharmacists (Posey 2003). Thus, it is very unlikely that the general public has a pre-conceived market price for such services. Furthermore, in the current health care environment in the US, pharmacist provided disease management is rarely included as a benefit in health plans.

The scope of a comprehensive disease management program, such as the one in this experiment, exceeds the ethical obligations and expectations for required pharmacist service provision; therefore, it is not unethical for a pharmacist to deny the program to individuals who do not wish to pay for the service.

2.2 Subject Recruitment

Subjects were recruited from nine pharmacies in the state of Kentucky in the US. Three pharmacies were included in each of the experimental groups. The three pharmacies in the real group agreed to deliver the diabetes management program to any subject that purchased the good at the price offered. All of the pharmacists in the real group had received extensive training from the American Pharmacy Services Corporation Foundation for Education and Research on providing the diabetes management program prior to the implementation of this study. Only one price was used at each pharmacy, as the pharmacists were unwilling to charge patients within the same pharmacy different prices.

The pharmacists identified their type-2 diabetes patients who were age 18 or older and who had received a prescription for a type-2 diabetes medication in the past 6 months. Potential subjects were contacted by phone. After confirming the diagnosis of diabetes they were asked if they would participate in a scientific study that involved an interview of approximately 15-20 minutes. Individuals who agreed to participate in the study were given a mutually convenient appointment time for the interview, which was carried out in the pharmacy. As compensation, each subject received $25 upon completion of the survey. The interviews took place between May 1 and July 23, 2003. In total 267 patients were interviewed (90 in the real group, 91 in the hypothetical group and 86 in the cheap talk group).

2.3 The Questionnaires

Subjects were first given a questionnaire with background questions to fill in. In all experimental groups, a written description of the pharmacist-provided diabetes management

program was then given to the subject. (The description of the diabetes management program is given in Appendix 1.) The interviewer read the program description to the subject while the subject read along on his/her own copy. The interviewer responded to any questions the subject had regarding the service. Next, the interviewer gave the subject a written copy of the survey. The interviewer read the valuation/purchase question (including the cheap talk script in that treatment) to the subject and the subject marked his/her response on the survey form. In the hypothetical group the interviewer also read the certainty question to the subject, and again, the subject marked his/her response on the survey form.[3]

2.3.1 Real Group

Subjects in the real group were given the opportunity to purchase the diabetes management program at their pharmacy. After receiving a description of the diabetes management program the following question was posed:[4]

> "You are now being offered the opportunity to purchase the diabetes disease management service that was just described to you. All of the services that were described to you would be provided for one flat rate. If you choose to purchase the service, you will have to use some of your household income to pay for it here and now with cash, check or credit card.
>
> Will you buy this service here and now at a price of $ 40? Please circle your answer below."

[3] All data and questionnaires are available from the first author upon request.

2.3.2 Hypothetical Group

Subjects in the hypothetical group received a hypothetical dichotomous choice contingent valuation question. The question consisted of a description of the diabetes management program after which the following question was posed:

> "Assume that you are being offered the opportunity to purchase the diabetes disease management service that was just described to you. All of the services that were described to you would be provided for one flat rate. Assume that if you choose to purchase the service, you would have to use some of your household income to pay here and now with cash, check or credit card.
>
> Would you buy this service here and now at a price of $ 40? Please circle your answer below."

The dichotomous choice contingent valuation question was followed by a question in which the subjects were asked if they were "probably sure" or "definitely sure" of their yes (no) answer. This question was phrased in the following way:

> "**If you answered YES (NO)**, are you "probably sure" or "definitely sure" that you would (not) buy the diabetes management service here and now at a price of $ 40? Please circle your answer below."

[4] The price was varied between $15, $40, and $80, but below we illustrate the questions with a $40 price.

2.3.3 Cheap Talk Group

Subjects in the cheap talk group received a hypothetical dichotomous choice contingent valuation question preceded by a cheap talk script. We modeled our cheap talk script after the script used in the Cummings and Taylor (1999) study, with some adaptations due to the differences in the valuation question (a dichotomous purchase question versus a dichotomous referendum question) and the good (a predominately private, health good versus a public, environmental good). Cummings and Taylor (1999) used two versions of the cheap talk script; one with numbers to illustrate hypothetical bias and one without specific numbers. These two scripts yielded statistically indistinguishable results in their study. We used the script without numbers, as that is more generally applicable.[5] Such cheap talk has reduced hypothetical bias in some previous studies. (The full cheap talk script is given in Appendix 2 which is included for referees.) The following excerpts from the script illustrate the approach:

> "…in a recent study, a group of patients were asked if they were willing to purchase a disease management service that is similar to the diabetes disease management service that I have just described to you. Payment was hypothetical for these patients, as it will be for you. No one had to pay money if they said they would buy the disease management service. Another similar group of patients also participated in this study. These patients were offered the opportunity to actually purchase the disease management service at the same price. If patients in this second group agreed to purchase the program they really did have to pay money. On average, more patients

[5] A problem with using actual numbers to illustrate hypothetical bias is that the size of hypothetical bias (and thus numbers) may vary across studies and it therefore becomes unclear which numbers to use. There is also a risk that numbers will lead to anchoring if prices are given.

said “yes” when the purchase question was hypothetical than when it was real. We call this “hypothetical bias.”

“Hypothetical bias” is the difference that we continually see in the way people respond to hypothetical situations as compared to real situations…

How can we get people to think about their response to a hypothetical purchase question and respond as if it was a real purchase decision, where if they agree to the purchase they will really have to pay the price? How do we get them to think about what it means to really pay money, if in fact they really aren’t going to have to do it?

Let me tell you why I think we continually see this hypothetical bias, why people behave differently in a hypothetical purchase situation than they do when the purchase situation is real. I think that when we respond to hypothetical purchase questions, we give some thought to what we might do, but we know we can always change our minds especially if we don’t want to buy. But, when the purchase offer is real, and we would actually have to spend our money if we say yes, we think a different way**.**

If I were in your shoes… I would think about how I feel about spending my money this way. When I got ready to answer the question, I would ask myself: if this were a real offer to purchase the diabetes service, and I had to pay $40 if I said yes: do I really want to spend my money this way? If I really did, I would say yes; if I did not, I would say no…

In any case, I ask you to respond just exactly as you would respond if you were really going to face the consequences of your response: which is to pay money if you say yes. Please keep this in mind when responding to the question.”

2.4 Hypotheses and Tests

To test the null hypothesis of no hypothetical bias, the percentage of yes responses is compared between the experimental groups. Three comparisons are carried out: hypothetical versus real, hypothetical definitely sure versus real, and cheap talk versus real. The first comparison tests for the presence of hypothetical bias in a standard willingness to pay question and the other two comparisons test if the certainty approach and/or the cheap talk approach removes the hypothetical bias.

A contingency table Pearson chi-square test is used to compare the percentage of yes responses between the groups (D'Agostino et al. 1988). While this test is informative, the drawback of the non-parametric test is that it does not control for any differences in background variables between the groups. Therefore, we also carry out logistic regression analysis to test if the probability of a yes response differs between the groups, controlling for the background variables collected in the study.[6] The price of the diabetes management program is included in the regression analysis in order to derive the demand curve and estimate the mean willingness to pay. The mean willingness to pay is also estimated non-parametrically using the method developed by Kriström (1990).

In the regression analysis we control for a host of background variables collected in the study. To test and control for an income effect we include annual household income, household size, and an indicator for wealth (if the subject owns his or her residence).[7] To control for differences in health and health behavior we include the following variables: previous participation in a diabetes management program, membership in a diabetes support

[6] Using a probit model instead of a logit model yielded similar results and does not change the reported conclusions.

[7] For household income the subject could either fill in the exact amount or mark one of the following categories: <$5000, $5000-10000, $10001-20000, $20001-30000, $30001-50000, $50001-100000, $100001-150000, >$150000. A continuous income measure was constructed by setting the income for each subject to the midpoint of the interval ($175,000 was used as the midpoint for the highest income category).

group, time since diabetes was diagnosed, perceived diabetes severity (mild, moderate, or severe), if the subject has suffered from any of the following complications from diabetes: cardiovascular disease, renal disease, vision problems, or neuropathies; if any family member has suffered from complications of diabetes, smoking, body mass index, an indicator for whether the subjects knows his/her hemoglobin A_1C level[8], and perceived general health status (excellent, very good, good, fair, poor). We also control for the following socioeconomic characteristics: age, gender, years of education and ethnic background. Finally, we control for an indicator of the time cost of participating in the diabetes management program (the travel time to the pharmacy).[9]

3. RESULTS

3.1 Background Characteristics

Table 1 provides the background characteristics for the three experimental groups.[10] There are great similarities among the experimental groups in terms of background characteristics such as household income, household size, home ownership, age, and ethnic background. In only three cases is the difference between groups significant at the 5% level. We control for differences in the regression analysis.

[8] Hemoglobin A1c (HbA1c), also referred to as glycosylated hemoglobin, is a useful indicator of how well the blood glucose level has been controlled in the recent past and is routinely used to monitor diabetic patients; complications of diabetes can be delayed or prevented if the HbA1c level can be kept close to 7%.

[9] There was missing data for household income for four subjects and for body mass index for two subjects. In the regression analysis we imputed the mean value of household income and body mass index in the sample for these subjects to avoid losing any observations. Excluding the six observations with missing data from the regression analysis leads to similar results, and does not change the conclusions reported below.

[10] For continuous variables a two-sided t-test was used to test for statistical differences between the groups. For the categorical variables a contingency table Pearson chi-square test was used.

3.2 Experimental Results

The experimental results are shown in Table 2. In the real group 45% of the subjects bought the diabetes management program at a price of $15, 23% bought the program at a price of $40, and 10% of the subjects bought the program at a price of $80. If there is hypothetical bias, then these percentages will be higher in the hypothetical group. We find this is clearly the case; the percentage of yes responses is higher at all prices in the hypothetical group. Overall the percentage of "buyers" is about twice as high in the hypothetical group (45% versus 26%), and this difference is highly significant.

The overall percentage of yes responses in the cheap talk group (45%) is the same as in the hypothetical group, thus the hypothetical bias is also significant in the cheap talk group. The certainty approach seems to work better in terms of reducing hypothetical bias. The overall percentage of definitely sure yes responses is close to the percentage of real yes responses (24% versus 26%), and we cannot reject the null hypothesis of no difference in this case.

The results of the parametric tests using logistic regression analysis are shown in Table 3.[11] In the regressions we include dummy variables for the experimental groups. We run two regression equations for the two interpretations of yes responses in the hypothetical group. The first one includes all yes responses in the hypothetical group; the second one only includes the definitely sure yes responses (i.e. the probably sure yes responses are coded as "no"). In the first regression, the dummy variable for the hypothetical group is highly significant, and the marginal effect is 23.4 percentage points.[12] Also the dummy variable for the cheap talk group is highly significant, with a marginal effect of 24.9 percentage points. In

[11] The continuous variables (price, time with diabetes, body mass index, age, education, household size, household income, and travel time) are included without any transformation in Table 3. We also tested a logarithmic transformation for these variables, and that yielded similar results.

the second regression, the one that only includes definitely sure yes responses, the hypothetical dummy variable is close to zero and not significant implying that the certainty approach is effective in removing the hypothetical bias.

We can see also that there is a highly significant effect of price in the regression equations, consistent with a downward sloping demand curve.[13] There is also a significant effect of income and the indicator for wealth. Higher income and wealth shift the demand curve outwards, consistent with economic theory. The negative effect of household size on demand might also reflect an income effect (as the income per household member decreases with household size). Membership in a diabetes support group is also associated with a significantly higher demand for the diabetes management program, as is knowledge about the hemoglobin A_1C level. These variables might reflect a greater concern for the impact of diabetes. There is also a tendency for an effect of the perceived general health status, with a higher demand for subjects with a worse overall health status. Patients with a worse health status may derive greater health gains from participating in the diabetes management program. As suggested by the work of Viscusi and Evans (1990), a worse health status may also decrease the marginal utility of income, which will increase the willingness to pay for a given health gain.

3.3 Aggregate Demand Curves and Willingness to Pay

In Figures 1 and 2 we show the non-parametric and parametric aggregate demand curves. The parametric demand curves are based on the logistic regression equations in Table

[12] The marginal effects are evaluated at the mean of the other covariates.

[13] We also tested adding interaction terms between the price and the experimental group dummy variables, allowing the slope of the aggregate demand function to vary between the experimental groups. It has been argued that the slopes will differ for hypothetical and real willingness to pay data, due to a higher variance in the hypothetical willingness to pay (Haab et al. 1999). The interaction terms were, however, not significant at the

3 and are estimated at the mean of the covariates. The figures confirm the previous results. The hypothetical and cheap talk demand curves are relatively close and both overestimate the actual demand. The certainty calibration through recoding, in contrast to cheap talk, leads to a demand curve that is close to the real demand curve.

The mean willingness to pay can be estimated as the area below the demand curves, and the estimated means are shown in Table 4.[14] Using the parametric method the mean real willingness to pay is $22 and the mean hypothetical willingness to pay is $42. The cheap talk approach yields a mean willingness to pay of $44, whereas the certainty approach yields a mean willingness to pay of $20. The non-parametric and the parametric methods yield similar estimates of the mean willingness to pay especially for the real and definitely sure hypothetical willingness to pay. The difference of $2 between the real and definitely sure willingness to pay, for both the non-parametric and parametric methods, is not statistically different from zero.

3.4 Sensitivity analysis

As an additional test of whether or not the definitely sure yes responses differ from the real yes responses, we compare the effects of all covariates between the real group and the definitely-sure hypothetical group. This is done by adding interaction terms between the hypothetical group dummy variable and all the other variables; equivalent to running separate

---

10% level (individually or jointly) and we could not reject the null hypothesis of equal slopes between the experimental groups.

[14] In the estimation of mean willingness to pay with the non-parametric method it was assumed that the maximum willingness to pay was equal to the highest price ($80) used in the study, and that the proportion of subjects with zero willingness to pay was equal to the proportion of 'no' responses at the lowest price used in the study ($15). The variance of mean willingness to pay was estimated based on 2,000 bootstrap replications using the method of Tambour and Zethraeus (1998). The estimation of mean willingness to pay in the parametric method was based on estimating the area below the demand curve using the formula: $-(1/\beta)\ln(1+e^{\alpha})$, where β is the price coefficient in the logistic regression equation and α is the constant in the logistic regression equation (with the effect of all other covariates added to the constant). See Johansson (1995, p. 113) for details.

regression functions for the real group and the definitely sure hypothetical group.[15] With a likelihood ratio test we test if the hypothetical dummy variable and the interaction terms improve the significance of the model. We cannot reject the null hypothesis of no significant difference between the regression models at the 10% level.[16]

Our results suggest that probably sure and definitely sure yes responses are quite different (i.e. probably sure yes responses correspond to real "no" responses). To further investigate this, we estimate two separate regressions on the hypothetical group data. The first regression (n=69) count probably sure yes responses as yes and exclude the definitely sure yes responses, and the second regression (n=72) count definitely sure yes responses as yes and exclude the probably sure yes responses. If the two categories of yes responses are identical the estimated coefficients and explanatory power should be similar for the two regressions. The results of these two regressions, shown in Table 5, differ substantially. In the regression on probably sure yes responses, the McFadden pseudo-R^2 is 0.233, no variable is significant at the 5% level, and the regression equation is far from significant (chi-square 18.895 (23 df); p=0.707). In the regression on definitely sure yes responses the McFadden pseudo-R^2 is 0.584 and the regression equation is highly significant (chi-square=51.804 (23 df); p=0.001). Both the price variable and the wealth indicator is also highly significant with the expected signs. Household income has the expected sign, but is not quite significant (p=0.187).[17]

In the experimental results in Table 2 the percentage of yes responses at the $80 price in the cheap talk group seems high; i.e. substantially higher than in the hypothetical group and somewhat higher than at the $40 price in the cheap talk group. We therefore investigated if the background characteristics differed in the $80 cheap talk group compared to the rest of the

[15] The interaction terms are added to the second regression model in Table 3 ("Definitely sure yes responses in hypothetical group"), but with the cheap talk group excluded.
[16] The chi-square value of the test is 32.11 (26 df) and the critical value at the 10% level is 35.56.
[17] These regressions include the same variables as the regression results in Table 3 (except the experimental group dummy variables), with the exception that two variables (diabetes support group and renal disease) are excluded due to a lack of variation in the dependent variable for one of the dummy variable categories.

sample. There is a significant difference at the 5% level for only two of the over twenty background characteristics. The number of subjects that had previously participated in a diabetes management program is higher in the cheap talk group at the $80 price (22% versus 8%) and the number of patients with vision problems is higher in this group (59% versus 36%). Both of these variables are controlled for in the regression analysis. In the regression analysis, the vision problem variable is far from significant and has a point estimate that is close to zero. The variable for previous participation in a diabetes management program has a sizeable positive point estimate, but is not quite significant. Six of the twenty-seven subjects at the $80 price in the cheap talk group had previously participated in a diabetes management program and four of them said yes in the hypothetical willingness to pay question. This may be one explanation for the high rate of yes responses in the cheap talk group at the $80 price. As an extra sensitivity analysis we therefore re-estimated our results excluding all subjects that had previously participated in a diabetes management program (24 subjects). After this exclusion the fraction of yes responses in the cheap talk group is 61% at $15, 37% at $40, and 33% at $80, and the overall fraction of yes responses is still significantly higher than in the real group (44% in the cheap talk group and 23% in the real group; p=0.005).[18] The effect of the cheap talk group is also still highly significant in the regression analysis (p=0.012 in the first regression equation in Table 3 and p=0.006 in the second regression equation in Table 3).

The follow-up question about the certainty of yes/no responses was also included in the cheap talk group. The overall percentage of definitely sure yes responses is 30% in the cheap talk group, which according to a chi-square test is not significantly different from the percentage of real yes responses (26%; p=0.489) or the percentage of definitely sure yes responses in the hypothetical group (24%; p=0.365). We also re-estimated the second regression equation in Table 3 only counting definitely sure yes as yes responses in the cheap

[18] The p-values comparing the cheap talk group and the real group at the individual prices are now 0.102 ($15),

talk group. The cheap talk group dummy variable is not significant in that regression equation (coefficient=0.406; p=0.322; marginal effect=0.068). We also tested pooling the definitely sure yes responses in the hypothetical group and the cheap talk group, including a dummy variable for this joint sample (comparing definitely sure yes responses for the pooled hypothetical and cheap talk groups with the real yes responses). This dummy variable is not significant (coefficient=0.108; p=0.760; marginal effect=0.018). The overall percentage of definitely sure yes responses in the pooled sample is 27%, which according to a chi-square test is not significantly different from the percentage of real yes responses (26%; p=0.785)

4. DISCUSSION AND CONCLUDING REMARKS

Our field experiment yields two important findings for eliciting willingness to pay using contingent valuation. First, hypothetical bias was removed with the follow-up certainty question; this approach yielded responses that were indistinguishable from the real decisions. Second, the cheap talk approach was not effective in removing hypothetical bias. We discuss each of these findings in turn below.

Prior evidence on the cheap talk approach is mixed. Cummings and Taylor (1999) found that the cheap talk approach was effective in removing hypothetical bias in experimental referendums about donations to public goods. However, in the recent studies by List (2001), Brown et al. (2003), and Murphy et al. (2005), the cheap talk approach was only effective in specific sub-groups. The diabetics in our study have had diabetes for an average of about nine years. To the extent that the diabetics in our study are informed and experienced, like the card dealers in List's experiment, our finding that hypothetical bias in stated preferences for the diabetes management program is not mitigated by cheap talk is similar to List's finding. In

---

0.234 ($40), and 0.052 ($80).

terms of validity, we think our findings are important evidence. Our field experiment is carried out in a similar fashion as an actual contingent valuation study. Face-to-face interviews (which are often recommended) are used and subjects value a non-trivial good for which there is no available market price on which to anchor. The consistent effects of price and income also support the validity of our results.

The certainty approach yielded consistent estimates of willingness to pay. These results are encouraging and they are consistent with previous evidence from both a laboratory experiment on a private good and a field experiment on a health care good (Blumenschein et al. 1998, 2001).[19,20] This is also a very practical approach as it only entails adding a simple follow-up question to a contingent valuation study.

A potential concern with the certainty approach is that the correspondence between definitely sure yes responses and real yes responses is just a coincidence. Only counting definitely sure yes responses as yes responses will clearly lower the incidence of yes answers and by coincidence it may fall so much that it equals the proportion of real purchases in the real group. To address this concern it is necessary to establish a link between the degree of certainty in hypothetical yes responses and real yes responses. This can be studied if the same individuals first respond to a hypothetical contingent valuation question followed by a certainty question and then face a real purchase decision, i.e., a within subject design. This has been done in previous experiments with similar results. The degree of certainty in

[19]Johannesson et al. (1998) also used a similar, but not identical, approach. The study also used a certainty follow-up question to distinguish between "true" and "false" yes responses, but the study was carried out in another language (Swedish) with a somewhat different phrasing of the question. The translation of the two certainty categories would correspond to "fairly sure" and "absolutely sure" rather than "probably sure" and "definitely sure". In the study the percentage of absolutely sure yes responses was significantly lower than the proportion of real yes responses (and the approach thus over adjusted for hypothetical bias).

[20] A similar approach was also used by Champ et al. (1997), which compared hypothetical dichotomous choice questions about donating a specified amount to a public good with actual donations to the public good. They assessed the certainty of the hypothetical donation responses on a 1-10 scale from very uncertain to very certain. They found that hypothetical donations significantly exceeded real donations, but that there was no significant difference if only subjects that were very certain of their yes response (i.e. 10 on the scale) were counted as real yes responses. Similar results were also found by Champ and Bishop (2001).

hypothetical yes responses is a very strong predictor of whether a hypothetical yes response corresponds to a real yes response (Blumenschein et al. 1998; Johannesson et al. 1999).

Why do certainty statements that follow contingent valuation reduce hypothetical bias? One straightforward explanation is that definitely yes more closely resembles the response necessary to make a purchase in real market situations. The manner in which the offer is made requires a decision that must be made immediately. Only respondents who are ready to produce the cash, check, or credit/debit card get to purchase. If probably yes signals some interest, but not enough to make the payment when offered the opportunity, then probably yes is tantamount to no. A sales representative will not let the person have the product unless payment is made.

Another explanation of how certainty statements produce a good match between statements and actual purchase behavior draws on social psychology. Sample and Warland (1973) view attitude as a predisposition to behavior. They hypothesize and find that certainty of attitude is a moderator variable that produces better measurement of attitude and intention and better prediction of behavior. Certainty is used to partition people into more homogenous groups. Attitude is a major predictor of both intentions and behavior for the high-certainty group. Fazio and Zanna (1978a, 1978b) and Raden (1985) also explore the link between attitude and behavior and state that individuals who hold attitudes with greater certainty and more confidence behave more consistently. More recently Ajzen (1991) offers a theory of planned behavior in which attitudes, subjective norms, and perceived behavioral control predict intentions and, in turn, intentions predict behavior. Intentions capture motivational forces. The stronger the intention, the stronger is the link to behavior.

The Fujii and Gärling (2003) application of attitude theory to improve the accuracy of stated preferences for travel modes provides a clearer link yet between stated willingness to pay, certainty statements, and behavior. Their assessment is that the single most important

insight from attitude theory is that behavioral intention, the commitment to act, is the best predictor of behavior. Stated preference methods are designed to elicit stable preferences that reflect a well-behaved utility function. Stated preference is interpreted as a behavioral intention. Fujii and Gärling's view is that preference is composed of two parts, core preference determined by the utility function and contingent preference that may depend on factors such as framing, response mode, and anchoring. Studies that do not eliminate contingent preference embedded in stated preference data will produce results that do not match well with behavior. They expect that weak intention cause errors in predicting behavior. Their before and after panel survey of use of a new subway line in Kyoto, Japan in 1997-1998 shows that strength of intention to ride the new line (yes instead of yes to some degree) was a factor that substantially increased the match between intention and behavior.

Our findings that follow-up certainty statements permit reclassification of yes responses so that stated willingness to pay and purchase behavior match well is consistent with the view from social psychology that strength of attitude and intention improve the link between them and behavior. Our findings are consistent too with the view that only strong, certain stated purchase intentions match well with the typical market purchase. Cheap talk appears to be effective in mitigating hypothetical bias in some applications and ineffective in others. Our evidence suggests that certainty statements will be more effective in removing hypothetical bias, but further research is warranted.

APPENDIX 1: DESCRIPTION OF THE DIABETES MANAGEMENT PROGRAM

Pharmacist-Provided Diabetes Management Program

Description

Controlling diabetes is extremely important for your health. When diabetes is not properly controlled it can lead to complications such as nerve problems, heart problems, sexual problems, kidney failure, blindness, and amputations. These complications usually occur in people who have had uncontrolled diabetes for many years. Many studies have shown keeping your blood sugar and hemoglobin A1c at recommended levels can delay or even prevent these complications. You can significantly ***improve your health, feel better*** and ***prevent these complications*** by maintaining an appropriate diet and exercise plan and taking your diabetes medicines properly. Your ***pharmacist*** can provide ***education*** and motivation to help you understand and control your diabetes.

This diabetes program was developed by pharmacists at the American Pharmacy Services Corporation. The program incorporates all of the latest recommendations for optimal diabetes management from the American Diabetes Association and the Centers for Disease Control and Prevention. The program will allow you and your pharmacist to work together as a team to reach your desired blood sugar and hemoglobin A1c levels through appropriate medication use, monitoring, and lifestyle changes. This program will last three months and will consist of ***three formal appointments*** with your pharmacist. With your permission, your pharmacist will ***measure*** your blood sugar, hemoglobin A1c, and conduct other tests to assess your overall health at the beginning and end of the program. This will allow your pharmacist to make recommendations to you and your physician to maximize the effectiveness of your diabetes therapy. You will have the ***opportunity to discuss*** any concerns or problems you have during any of the scheduled visits.

The first visit with your pharmacist will last between 45 minutes to one hour. During this visit, your pharmacist will take a medication history and discuss with you the medicines you take for diabetes. You will take a short survey to ***assess symptoms*** associated with diabetes and you will complete a short questionnaire about the ***relationship of hemoglobin A1c to diabetes control***. Your pharmacist will then ***discuss*** the results of these surveys with you. Your pharmacist will review the relationship of diabetes control to symptoms and blood sugar testing, the proper way to take your diabetes medicine, and target levels for blood sugar and hemoglobin A1c to prevent complications in the future. In addition your ***pharmacist will measure*** your blood sugar, hemoglobin A1c, blood pressure and weight. These measures will help your pharmacist assess the progress that you make during the three month program.

The second visit will last between 25 to 35 minutes. Your pharmacist will again ask you to complete a short ***survey to assess symptoms associated with diabetes***. Then, your pharmacist will provide you with information about eating a healthy ***diet***, maintaining regular ***exercise***, and weight control if you are overweight. In addition, your pharmacist will ***measure*** your blood sugar and weight, discuss any problems you have encountered since the last visit, and ***answer any questions*** you may have.

The third and final visit will last between 30 to 45 minutes. You will complete a short survey assessing your diabetes symptoms and control. Your pharmacist will measure your blood sugar, hemoglobin A1c, weight, and blood pressure. Your pharmacist will discuss the

progress you have made since the first visit and will review potential complications associated with uncontrolled diabetes and ***provide tips to help you maintain the progress*** you have made during the program. You will have the opportunity to discuss any problems you have encountered since the last visit and ask questions.

At the end of the third month, you may choose to continue the diabetes management program, and you can ask your pharmacist to schedule new appointments with you to best suit your individual needs.

APPENDIX 2: THE CHEAP TALK SCRIPT (with a $ 40 price).

Assume that you are being offered the opportunity to purchase the diabetes disease management service that was just described to you. Assume that if you choose to purchase the service, you would have to use some of your household income to pay here and now with cash, check or credit card.

I am going to ask you: "Would you buy this service at a price of $ 40."

But, before you answer the question, I want to describe a problem that we have in studies like this one. This is a hypothetical purchase question – not a real one. If you say that you would purchase the diabetes service, you will not actually purchase the service or pay any money at the end of our interview. But, I would like for you to respond to the question as though your response would involve a real cash payment. And that is the problem. In most studies of this kind, folks seem to have a hard time doing this. They respond differently to a hypothetical purchase question, where they do not really have to pay money, than they do in a real purchase situation where they actually will have to pay money.

For example, in a recent study, a group of patients were asked if they were willing to purchase a disease management service that is similar to the diabetes disease management service that I have just described to you. Payment was hypothetical for these patients, as it will be for you. No one had to pay money if they said they would buy the disease management service. Another similar group of patients also participated in this study. These patients were offered the opportunity to actually purchase the disease management service at the same price. If patients in this second group agreed to purchase the program they really did have to pay money. On average, more patients said "yes" when the purchase question was hypothetical than when it was real. We call this "hypothetical bias."

"Hypothetical bias" is the difference that we continually see in the way people respond to hypothetical situations as compared to real situations – people seem to respond differently to purchase questions when they really don't have to pay money as a result of their response. In the real offer to purchase the disease management service, where people knew they would have to pay money if they said "yes", fewer said "yes" than when payment was hypothetical and people knew they would not pay anything if they said "yes".

How can we get people to think about their response to a hypothetical purchase question and respond as if it was a real purchase decision, where if they agree to the purchase they will really have to pay the price? How do we get them to think about what it means to really pay money, if in fact they really aren't going to have to do it?

Let me tell you why I think we continually see this hypothetical bias, why people behave differently in a hypothetical purchase situation than they do when the purchase situation is real. I think that when we respond to hypothetical purchase questions, we give some thought to what we might do, but we know we can always change our minds especially if we don't want to buy. But, when the purchase offer is real, and we would actually have to spend our money if we say yes, we think a different way. When we are faced with the possibility of having to spend money, we think about our options: if I spend money on this, that is money I don't have to spend on other things. If I spend money on a diabetes management service, that is money I don't have to spend on groceries, go to a movie, or perhaps spend on some other way of improving my diabetes. So when the payment is real we answer in a way that takes into account the limited amount of money we have. We answer

realizing that we just don't have enough money to do everything we might like to do. This is just my opinion, of course, but it is what I think may be going on in hypothetical purchase questions.

In any case, the only way that we know to get people like you to respond to our hypothetical purchase question just like you would respond if the purchase offer was real is to simply ask you: when you reply to the hypothetical purchase question below, please do the following:

- Think about what you are replying to. If this were real and you said yes, you would actually have to pay $40 right now – do you really want the diabetes management service enough that you would be willing to spend the money?

- If I were in your shoes, and I were asked whether or not I would purchase the diabetes management service that was just described at a price of $40, I would think about how I feel about spending my money this way. When I got ready to answer the question, I would ask myself: if this were a real offer to purchase the diabetes service, and I had to pay $40 if I said yes: do I really want to spend my money this way? If I really did, I would say yes; if I did not, I would say no -- I wouldn't throw my money around. That is just my opinion, of course. You must do whatever you want to do.

- In any case, I ask you to respond just exactly as you would respond if you were really going to face the consequences of your response: which is to pay money if you say yes.

Please keep this in mind when responding to the question.

So, assume that you are being offered the opportunity to purchase the diabetes disease management service that was described to you. Assume that if you choose to purchase the service, you would have to use some of your household income to pay here and now with cash, check or credit card.

Would you buy this service here and now at a price of $ 40?

Please circle your answer below.

Yes

No

REFERENCES

Ariely, D., Loewenstein, G. and Prelec, D. (2003). "Coherent arbitrariness": stable demand curves without stable preferences. *Quarterly Journal of Economics* 118, 73-105.

Ajzen, Icek. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50, 179-211.

Alberini, A., Boyle, K. and Welsh, M. (2003). Analysis of contingent valuation data with multiple bids and response options allowing respondents to express uncertainty. *Journal of Environmental Economics and Management* 45, 40-62.

Bishop, R.C. and Heberlein, T.A. (1979). Measuring values of extramarket goods: are indirect measures biased? *American Journal of Agricultural Economics* 61, 926-930.

Blumenschein, K., Johannesson, M., Blomquist, G.C., Liljas, B. and O'Conor R.M. (1998). Experimental results on expressed certainty and hypothetical bias in contingent valuation. *Southern Economic Journal* 65, 169-177.

Blumenschein, K., Johannesson, M., Yokoyama, K.K. and Freeman, P.R. (2001). Hypothetical versus real willingness to pay in the health care sector: results from a field experiment. *Journal of Health Economics* 20, 441-457.

Bluml, B.M., McKenney, J.M., Cziraky, M.J. (2000). Pharmaceutical care services and results in Project ImPACT: Hyperlipidemia. *Journal of the American Pharmaceutical Association* 40, 157-65.

Brown, T.C., Ajzen, I. and Hrubes, D. (2003). Further test of entreaties to avoid hypothetical bias in referendum contingent valuation. *Journal of Environmental Economics and Management* 46, 353-361.

Camerer, C.F. and Hogarth, R.M. (1999). The effects of financial incentives in experiments: a review and capital-labor-production framework. *Journal of Risk and Uncertainty* 19, 7-42.

Carson, R.T., Flores, N.E. and Meade, N.F. (2001). Contingent valuation: controversies and evidence. *Environmental and Resource Economics* 19, 173-210.

Champ, P.A. and Bishop, R.C. (2001). Donation payment mechanisms and contingent valuation: an empirical study of hypothetical bias. *Environmental and Resource Economics* 19, 383-402.

Champ, P.A., Bishop, R.C., Brown, T.C. and McCollum, D.W. (1997). Using donation mechanisms to value nonuse benefits from public goods. *Journal of Environmental Economics and Management* 33, 151-162.

Cummings, R.G., Elliott, S., Harrison, G.W. and Murphy, J. (1997). Are hypothetical referenda incentive compatible? *Journal of Political Economy* 105, 609-621.

Cummings, R.G., Harrison, G.W. and Rutström, E.E. (1995). Homegrown values and hypothetical surveys: is the dichotomous choice approach incentive-compatible? *American Economic Review* 85, 260-266.

Cummings, R.G. and Taylor, L.O. (1999). Unbiased value estimates for environmental goods: a cheap talk design for the contingent valuation method. *American Economic Review* 89, 649-665.

D'Agostino, R.B., Chase, W. and Belanger, B. (1988). The appropriateness of some common procedures for testing the equality of two independent binomial populations. *American Statistician* 42, 198-202.

Diamond, P.A. and Hausman, J.A. (1994). Contingent valuation: is some number better than no number? *Journal of Economic Perspectives* 8, 45-64.

Evans, M.F., Flores, N.E. and Boyle, K.J. (2003). Multiple-bounded uncertainty choice data as probabilistic intentions. *Land Economics* 79, 549-560.

Fazio, Russell H. and Mark P. Zanna. (1978). Attitudinal qualities relating to the strength of the attitude-behavior relationship. *Journal of Experimental Social Psychology* 14, 398-408.

Fazio, Russell H. and Mark P. Zanna. (1978). On the predictive validity of attitudes: the roles of direct experience and confidence. *Journal of Personality* 46, 228-243.

Fujii, Satoshi and Tommy Gärling. (2003). Application of attitude theory for improved predictive accuracy of stated preference methods in travel demand analysis. *Transportation Research Part A* 37, 389-402.

Giles, J.T., Kennedy, D.T., Dunn, E.C. (2001). Results of a pharmacy-based breast cancer risk-assessment and education program. *Pharmacotherapy* 21, 243-55.

Haab, T.C., Huang, J.-C. and Whitehead, J.C. (1999). Are hypothetical referenda incentive compatible? A comment. *Journal of Political Economy* 107, 186-196.

Harrison, G.W. (forthcoming). Experimental evidence on alternative environmental valuation methods. Environmental and Resource Economics.

Harrison, G.W. and Rutström, E.E. (2005). Experimental evidence on the existence of hypothetical bias in value elicitation methods. In: Plott, C. and Smith, V.L. (eds.). *Handbook of Experimental Economics Results*. New York: Elsevier Science.

Hertwig, R. and Ortmann, A. (2001). Experimental practices in economics: a methodological challenge for psychologists? *Behavioral and Brain Sciences* 24, 383-451.

Johannesson, M., Blomquist, G.C., Blumenschein, K., Johansson, P-O., Liljas, B. and O'Conor, R.M. (1999). Calibrating hypothetical willingness to pay responses. *Journal of Risk and Uncertainty* 18, 21-32.

Johannesson, M., Johansson, P-O., Kriström, B. and Gerdtham, U-G. (1993). Willingness to pay for antihypertensive therapy: further results. *Journal of Health Economics* 12, 95-108.

Johannesson, M., Liljas, B. and Johansson, P-O. (1998). An experimental comparison of dichotomous choice contingent valuation questions and real purchase decisions. *Applied Economics* 30, 643-647.

Johansson, P-O. (1995). *Evaluating Health Risks: An Economic Approach*. Cambridge: Cambridge University Press.

Kagel, J.H. and Roth, A.E. (Eds.). (1995). *The Handbook of Experimental Economics*. Princeton, New Jersey: Princeton University Press.

Kennedy, D.T., Small, R.E. (2001). Development and implementation of a smoking cessation clinic in community pharmacy practice. *Journal of the American Pharmaceutical Association* 42, 83-92.

Kriström, B. (1990). A non-parametric approach to the estimation of welfare measures in discrete response valuation studies. *Land Economics* 66, 135-139.

List, J.A. (2001). Do explicit warnings eliminate the hypothetical bias in elicitation procedures? Evidence from field auctions for sportscards. *American Economic Review* 91, 1498-1507.

List, J.A., Berrens, R.P., Bohara, A.K. and Kerkvliet, J. (2004). Examining the role of social isolation on stated preferences. *American Economic Review*, 94, 741-752.

Murphy, J.J., Stevens, T. and Weatherhead, D. (2005). Is cheap talk effective at eliminating hypothetical bias in a provision point mechanism? *Environmental and Resource Economics*, 30, 327-343.

Posey, L.M. (2003). Proving that pharmaceutical care makes a difference in community pharmacy. *Journal of the American Pharmaceutical Association,* 43, 136-39.

Raden, David. (1985). Strength-related attitude dimensions. *Social Psychology Quarterly* 48, 312-330.

Ready, R.C., Navrud, S. and Dubourg, W.R. (2001). How do respondents with uncertain willingness to pay answer contingent valuation questions? *Land Economics* 77, 315-326.

Ready, R.C., Whitehaed, J.C. and Blomquist, G.C. (1995). Contingent valuation when respondents are ambivalent. *Journal of Environmental Economics and Management* 29, 181-196.

Rodriguez de Bittner, M., Haines, S.T. (1997). Pharmacy-based diabetes management. *Journal of the American Pharmaceutical Association* 37, 443-55.

Sample, John and Rex Warland. (1973). Attitude and prediction of behavior. *Social Forces* 51, 292-304.

Tambour, T. and Zethraeus, N. (1998). Nonparametric willingness-to-pay measures and confidence statements. *Medical Decision Making* 18, 330-336.

Thaler, R. (1987). The psychology of choice and the assumptions of economics. In: Roth, A.E. (Ed.). *Laboratory Experimentation in Economics: Six Points of View*. Cambridge: Cambridge University Press, 99-130.

Viscusi, W.K. and Evans, W.N. (1990). Utility functions that depend on health status: estimates and economic implications. *American Economic Review* 80, 353-374.

Wallis, W.A. and Friedman, M. (1942). The empirical derivation of indifference functions. In: Lange, O., McIntyre, F. and Yntema, T.O. (Eds.). *Studies in Mathematical Economics and Econometrics in Memory of Henry Schultz*. Chicago: University of Chicago Press, 175-189.

Welsh, M.P. and Poe, G.L. (1998). Elicitation effects in contingent valuation: comparisons to a multiple bounded discrete choice approach. *Journal of Environmental Economics and Management* 36, 170-185.

TABLES

Table 1. Background characteristics (standard deviations in parentheses).

	Real group (n=90)	Hypothetical group (n=91)	Cheap talk group (n=86)	p-value real vs hypothetical	p-value real vs cheap talk
Income and wealth:					
Annual household income ($1,000)	31.34 (32.98)	30.58 (26.54)	31.26 (27.38)	0.867	0.988
Household size	2.43 (1.29)	2.54 (1.38)	2.14 (0.97)	0.597	0.089
Owns residence (%)	81.11	83.52	73.26	0.671	0.214
Health and health behavior:					
Previous participation in disease management (%)	10.00	8.79	8.14	0.780	0.668
Member of diabetes support group (%)	3.33	2.20	4.65	0.641	0.655
Time with diabetes (years)	8.49 (6.95)	7.99 (6.72)	10.16 (8.61)	0.625	0.160
Diabetes severity:				0.616	0.701
Mild (%)	33.33	27.47	34.88		
Moderate (%)	53.33	60.44	55.81		
Severe (%)	13.33	12.09	9.30		
Cardiovascular disease (%)	84.44	81.32	83.72	0.577	0.896
Renal disease (%)	13.33	3.30	8.14	0.014	0.267
Vision problems (%)	41.11	34.07	39.53	0.328	0.831
Neuropathies (%)	57.78	59.34	50.00	0.831	0.301
Complications of diabetes in family (%)	57.78	53.85	56.98	0.594	0.914
Smoking (%)	30.00	18.68	33.72	0.076	0.596
Body mass index	34.01 (8.62)	31.91 (6.23)	33.82 (7.97)	0.064	0.882
Know their hemoglobin A_1C level (%)	18.89	19.78	19.77	0.879	0.883
General health:				0.018	0.390
Excellent (%)	3.33	0.00	1.16		
Very good (%)	12.22	13.19	13.95		
Good (%)	28.89	36.26	38.37		
Fair (%)	31.11	41.76	31.40		
Poor (%)	24.44	8.79	15.12		
Socioeconomics:					
Age (years)	56.71 (13.00)	59.98 (13.05)	59.04 (13.88)	0.093	0.253
Women (%)	60.00	68.13	69.77	0.254	0.175
Education (years)	11.04 (3.24)	11.80 (3.59)	12.09 (3.09)	0.138	0.028
Ethnic background white (%)	90.00	92.31	90.70	0.584	0.876
Time cost:					
Travel time to pharmacy (minutes)	11.87 (8.99)	13.63 (8.41)	12.88 (9.20)	0.177	0.465

Table 2. Number (%) of yes responses in the experimental groups.

Price	Real group	Hypothetical group: All yes responses		Cheap talk group		Hypothetical group: Definitely sure yes responses	
	Number (%)	Number (%)	p-value*	Number (%)	p-value*	Number (%)	p-value*
$15	13/29 (45)	22/31 (71)	0.040	17/29 (59)	0.293	11/31 (35)	0.460
$40	7/30 (23)	14/34 (41)	0.129	11/30 (37)	0.260	11/34 (32)	0.423
$80	3/31 (10)	5/26 (19)	0.301	11/27 (41)	0.006	0/26 (0)	0.103
All	23/90 (26)	41/91 (45)	0.006	39/86 (45)	0.006	22/91 (24)	0.830

*p-value of the difference compared to the yes responses in the real group.

Table 3. Results of logistic regression analysis of the effect of experimental group on the probability of a yes response.

	All yes responses in hypothetical group				Definitely sure yes responses in hypothetical group			
	β	SE	p-value	Marginal effect	β	SE	p-value	Marginal effect
Constant	-2.545	1.933	0.188		-1.464	2.040	0.473	
Hypothetical group	1.046	0.400	0.009	0.234	-0.103	0.416	0.804	-0.019
Cheap talk group	1.114	0.405	0.006	0.249	1.215	0.411	0.003	0.229
Price	-0.033	0.007	<0.001	-0.007	-0.033	0.007	<0.001	-0.006
Household income	0.016	0.006	0.014	0.004	0.017	0.007	0.012	0.003
Household size	-0.324	0.156	0.038	-0.073	-0.378	0.169	0.025	-0.071
Owns residence	1.032	0.425	0.015	0.231	1.181	0.459	0.010	0.223
Disease management	0.699	0.516	0.176	0.156	0.795	0.540	0.141	0.150
Diabetes support group	2.047	0.924	0.027	0.458	1.745	0.835	0.037	0.329
Time with diabetes	-0.002	0.022	0.928	-0.005	-0.008	0.023	0.732	-0.001
Moderate diabetes*	0.463	0.359	0.197	0.104	0.368	0.372	0.322	0.069
Severe diabetes*	0.861	0.564	0.127	0.193	0.707	0.592	0.232	0.134
Cardiovascular disease	-0.013	0.443	0.976	-0.003	-0.082	0.462	0.858	-0.016
Renal disease	-1.102	0.668	0.099	-0.246	-0.826	0.679	0.224	-0.156
Vision problems	0.087	0.352	0.804	0.020	-0.089	0.364	0.808	-0.017
Neuropathies	0.196	0.358	0.584	0.044	0.619	0.376	0.100	0.117
Complications of diabetes in family	-0.221	0.318	0.486	-0.049	-0.264	0.327	0.419	-0.050
Smoking	-0.055	0.379	0.885	-0.012	-0.050	0.398	0.899	-0.009
Body mass index	0.032	0.022	0.146	0.007	0.024	0.022	0.275	0.005
Know hemoglobin A_1C	0.887	0.402	0.027	0.198	0.876	0.404	0.030	0.165
Good health#	1.303	0.517	0.012	0.291	0.898	0.514	0.080	0.170
Fair health#	0.773	0.529	0.144	0.173	0.457	0.527	0.385	0.086
Poor health#	1.094	0.665	0.100	0.245	0.585	0.674	0.385	0.110
Age	-0.001	0.015	0.959	-0.0002	-0.002	0.016	0.902	-0.0004
Woman	0.204	0.335	0.543	0.046	0.081	0.347	0.816	0.015
Education	-0.022	0.059	0.705	-0.005	-0.053	0.063	0.403	-0.010
Ethnic: white	-0.454	0.560	0.417	-0.102	-0.362	0.589	0.539	-0.068
Travel time	0.014	0.019	0.466	0.003	0.001	0.020	0.961	0.002
Number of obs.	267				267			
Chi-square	77.518		<0.001		70.319		<0.001	
Log-likelihood	-139.281				-131.112			
McFadden pseudo-R^2	0.218				0.211			
% individual prediction	76.030				76.030			

*Baseline category: mild diabetes; #Baseline category: Excellent or very good general health.

Table 4. Mean willingness to pay in the experimental groups ($).

	Real group	Hypothetical group: all yes responses		Cheap talk group		Hypothetical group: definitely sure yes responses	
	Mean (SE)	Mean (SE)	p-value*	Mean (SE)	p-value*	Mean (SE)	p-value*
Non-parametric method	21.85 (3.73)	36.74 (3.84)	0.005	36.38 (4.21)	0.010	20.27 (3.55)	0.759
Parametric method	22.11 (4.71)	42.36 (6.34)	0.010	43.90 (6.56)	0.007	19.77 (4.34)	0.715

*p-value of the difference compared to the mean willingness to pay in the real group.

Table 5. Results of logistic regression analysis comparing the probably sure and definitely sure yes responses in the hypothetical group.

	Probably sure yes responses=1 (definitely sure yes responses excluded)				Definitely sure yes responses=1 (probably sure yes responses excluded)			
	β	SE	p-value	Marginal effect	β	SE	p-value	Marginal effect
Constant	-10.018	6.708	0.135		2.147	8.016	0.789	
Price	-0.022	0.016	0.150	-0.003	-0.155	0.050	0.002	-0.004
Household income	0.013	0.026	0.620	0.002	0.058	0.044	0.187	0.002
Household size	0.038	0.431	0.929	0.006	-0.367	0.671	0.585	-0.010
Owns residence	-0.352	1.260	0.780	-0.054	8.453	3.233	0.009	0.241
Disease management	0.115	1.230	0.926	0.018	2.512	2.670	0.347	0.071
Time with diabetes	0.035	0.075	0.644	0.005	-0.345	0.163	0.034	-0.010
Moderate diabetes*	1.434	1.063	0.177	0.222	2.991	2.090	0.152	0.085
Severe diabetes*	1.731	1.424	0.224	0.268	8.813	4.229	0.037	0.251
Cardiovascular disease	1.148	1.160	0.322	0.178	-0.521	1.979	0.792	-0.015
Vision problems	-0.341	0.937	0.716	-0.053	-2.883	2.022	0.154	-0.082
Neuropathies	-1.876	1.015	0.067	-0.290	2.328	1.739	0.181	0.066
Complications of diabetes in family	1.187	0.951	0.212	0.184	0.504	1.370	0.713	0.014
Smoking	-0.209	1.055	0.843	-0.032	1.815	1.928	0.346	0.052
Body mass index	0.072	0.071	0.310	0.011	-0.041	0.096	0.667	-0.001
Know hemoglobin	0.423	1.138	0.710	0.065	-0.327	1.462	0.823	-0.009
Good health#	2.890	1.811	0.111	0.447	1.810	2.204	0.412	0.052
Fair health#	2.205	1.826	0.227	0.341	-0.661	2.440	0.786	-0.019
Poor health#	3.248	2.289	0.156	0.503	-3.533	4.164	0.396	-0.101
Age	0.019	0.046	0.676	0.003	0.035	0.060	0.563	0.001
Woman	1.090	1.095	0.319	0.169	-0.738	1.127	0.512	-0.021
Education	0.091	0.135	0.499	0.014	-0.499	0.291	0.086	-0.014
Ethnic: white	-0.518	1.281	0.686	-0.080	0.941	2.531	0.710	0.027
Travel time	0.050	0.406	0.218	0.008	-0.211	0.130	0.103	-0.006
Number of obs.	69				72			
Chi-square	18.895		0.707		51.804		0.001	
Log-likelihood	-31.160				-18.414			
McFadden pseudo-R^2	0.233				0.584			
% individual prediction	79.710				84.722			

*Baseline category: mild diabetes; #Baseline category: Excellent or very good general health.

FIGURES

Figure 1. Non-parametric demand curves

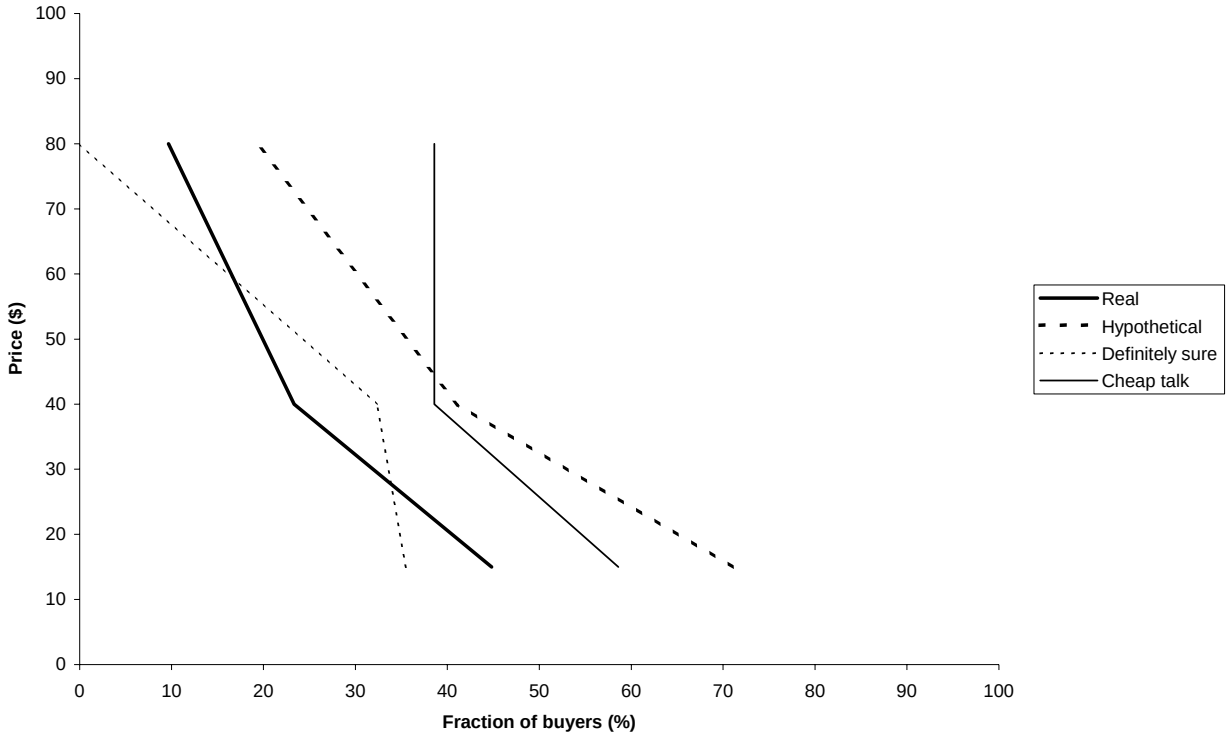

Figure 2. Parametric demand curves