Measuring Preferences and Predicting Outcomes

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1 Introduction

A growing number of surveys attempt to measure time, risk, and social preferences through either games or qualitative questions. Such data are useful for testing hypotheses about heterogeneous treatment effects, which also then could lead to policy prescriptions regarding who and how to target programs. However, there is little evidence on which types of measures are most effective at identifying preferences. Do games in which individuals are asked to play games with abstract decisions and actual cash payouts (i.e., laboratory experimental economics) work better than self-reported survey questions? Do the games need to include cash payouts? Can survey questions on sensitive topics be asked directly? A key question is whether the games, or survey questions, are better at predicting behavior and decisions outside of the research environment, but that can be convincingly associated with particular preferences.

As part of a field experiment in Uganda that examined the impact of a newly launched SMS-based health information service on semi-rural populations, we conducted extensive baseline and endline surveys. The health information service allows users to request reproductive and sexual health advice via SMS, as well as to query a clinic directory that includes clinic locations, services offered, and schedules. The overall research project is evaluating the impact of the service on 1) knowledge of sexual and reproductive health; and 2) related behaviors, both self-reported and observed (e.g. risky sexual behavior, clinic visits, or seeking preventive health services). The surveys included economic games, randomly chosen to be asked either with or without monetary incentives, as well as a range of qualitative questions focusing on economic preferences (attitudes toward fairness, time, self-control, risk, and ambiguity). We also randomly varied the method of asking survey questions about sensitive sexual topics, namely either directly or as part of a longer list of questions so that only aggregate and not individual responses could be identified, to see if this changed responses and increased the external validity of the data.

In sum, we were able to relate the game and survey data on economic preferences to "real-world" outcomes (health knowledge and self-reported health behaviors) and to the effectiveness of the intervention itself. Initial results suggest that for risk aversion, the games (especially when incentivized) explain more outcome variance than the qualitative survey questions. However, for time discounting the opposite seems to be true. In all cases, the magnitude of the effects is similar to that for demographic variables such as age, gender, and education, implying that it may be important to measure these economic preferences as a standard part of future surveys. We are also able to draw conclusions via factor analysis regarding which survey questions are most reliable, and how best to collect data on sensitive topics. In particular, regarding the latter, we find that married or cohabiting subjects under-report condom

usage while subjects who have never been married under-report. Females also underreport rates of infidelity, while males exhibit no bias on average.

2 Related Literature

In addition to the literatures related to our methodological questions, our paper is also indebted to the literature on the relationship between economic preferences and health behaviors. Fuchs (1982) was the first to empirically relate experimentally measured preferences to individual behaviors, including several related to health. He found that individuals who were more future-oriented were more likely to exhibit behaviors associated with better health consequences—such as exercising and seeking preventive health care—and less likely to exhibit behaviors associated with negative health consequences—such as smoking and eating unhealthy foods. There is a fairly large literature focused on relating experimentally measured risk and time preferences to health behaviors such as smoking (Anderson and Mellor, 2008; Barsky et al., 1997; Viscusi, 1991; Viscusi and Hersch, 2001), drinking (Anderson and Mellor, 2008; Barsky et al., 1997), cocaine and heroin abuse (Kirby and Petry, 2004), obesity (Anderson and Mellor, 2008; Komlos, Smith, and Bogin, 2004), not using seat belts (Anderson and Mellor, 2008) and demand for medical screening tests (Picone, Sloan, and Taylor, 2004) and vaccines (Chapman and Coups, 1999).

There has been very little work done relating economic preferences to risky sexual behavior. Chesson et al. (2006) appear to be the first to relate experimentally measured economic preferences and sexual behavior in their study of young adults in the United States. They focused on time preference and found that higher discount rates were significantly correlated with self-reported sexual behaviors and health outcomes such as ever having sex, having sex before age 16, and ever having gonorrhea or chlamydia. However, they did not find evidence of such a relationship between the discount rate and HSV-2 (the virus which produces genital herpes) status. Lammers and van Wijnbergen (2007) investigated the relationship between experimentally measured risk and time preferences and sexual health outcomes using incentivized experiments with a sample of university students in South Africa. They found that both being HIV+ and believing that you have a high chance of contracting HIV were significantly associated with lower levels of risk aversion and higher discount rates.

Qualitative vs. Game-Based Preference Measures

Only a few papers have directly addressed the relative performance of qualitative measures and game or lottery-based measures of economic preferences. Reynaud and Couture (2010) compared two standard methods of lottery elicitation of risk preferences: Weber et al.'s (2002) Domain-Specific Risk-Taking (DOSPERT) survey, and self-evaluated willingness to take risks. They found that some of the

lottery measures were significantly correlated with some domains of survey-elicited and self-assessed measurements (and in some cases the correlations between lottery-elicited and survey-elicited measures are negative).

Recently, Dohmen et al. (2011) analyzed the relationship between general and domain-specific risk preferences and risk behavior across different domains using large-scale survey data from the German Socio-Economic Panel (GSOEP) and experimentally validated these qualitative survey-based measures with a separate sample of subjects who answered both the GSOEP survey questions and participated in lottery-task to elicit risk preferences. Based on the significant correlations they found between their qualitative and game-based measurements, and the significant correlations between the qualitative measurements and actual reported behavior (e.g., holding stocks, being self-employed, smoking), Dohmen et al. advocate strongly for the use of qualitative measures of risk preferences in economic research.

Incentivized versus Hypothetical Games

It remains standard practice for laboratory experimental economics to incentivize experiments when possible. However evidence suggests that incentives do not help in all experimental contexts. Camerer and Hogarth (1999) reviewed 74 studies with varied incentives and concluded that incentives helped in some contexts and hurt in others and that the most common effect of incentives for games and risky choices was no effect on mean performance but a reduction in the variance of responses. Read (2005) also argues that in experimental settings where the non-monetary costs of incentivizing are high, incentivization should not be seen as a requirement.

In the context of a field experiment, particularly in a developing countries, it is sometimes difficult to incentivize a large sample due to accounting and internal control issues. As such, there is a stronger motivation here than in a lab setting to confirm that incentives do not have a significant effect since it is not trivial to incentivize an experiment, even given sufficient funding. Our data contributes to the evidence on the effect of incentives in this type of setting.

Indirect Survey Methods

Response bias is a central problem in survey research and particularly in research addressing sensitive topics where respondents may be reluctant to report socially undesirable behavior. One approach to soliciting more honest answers is to use indirect methods of question design. We use two different indirect questioning methods here. We use the *item count technique* (ICT) to elicit responses to two questions with binary responses and a variant of the *randomized response technique* (RRT) to elicit responses to a question with a quantitative response.

RRT was introduced by Warner (1965). In this technique each subject is randomly assigned to one of two groups, with their assignment unknown to the interviewer. Subjects are instructed to indicate whether they belong to the group with the sensitive attribute if they have been assigned to the first group and to indicate whether they belong to the group *without* the sensitive attribute if they have been assigned to the second group. By this design, the underlying response of each individual is not disclosed to the interviewer, reducing the incentive for respondents to give inaccurate responses in order to conceal sensitive information. Greenberg, et al. (1971) extended RRT to address questions with quantitative responses. Pollock and Beck (1976) compared Greenberg's design to two other RRT variants designed to elicit quantitative responses—an additive method and a multiplicative method—where subjects are asked to add (or multiply) their response by a randomly drawn number.

ICT—also known as the *list experiment* or *unmatched count* method—was introduced by Miller (1984). In this method, subjects are asked to report how many items in a list apply to them. Respondents are randomly assigned to either a control or treatment group. The control group is presented with a list of some number of innocuous (non-sensitive) statements and asked to report how many of these apply to themselves. The treatment group receives the same instructions but their list includes the sensitive item of interest in addition to the innocuous items. The proportion of the treatment group endorsing the sensitive item can be estimated using these two distributions.

2 Methods

As mentioned above, the survey questions we analyze here were part of an evaluation by Innovations for Poverty Action (IPA) of an a health intervention in Uganda which provided easily accessible information on SRH to subjects via mobile phone. This intervention utilized a short message service (SMS) capability added to all mobile phones using one of the largest mobile phone networks in Uganda. This capability enabled individuals to send free SMS messages with questions about SRH or local health services and receive responses from a database.

A randomized control trial was used to assess the impact of this service, randomly assigning 60 trading centers in the districts of Masaka, Mpigi, Mityana and Mubende to either the treatment or control group. These districts were selected based on the criteria that (1) the population be primarily Luganda speaking and (2) the District Health Officers are cooperative and a high proportion (above 90%) of the clinics there follow reporting procedures. Within these districts, trading centers were selected according to size, remoteness, network coverage and geographical spread. Criteria for individual eligibility were 18-35 years of age, ownership of a phone in the network by a member of the household and a minimum education of six years of primary school. These criteria were established through a 'Power user Identification Survey' in pilot areas in September 2008. The random assignment of individual trading

centers to treatment status yielded a sample that is balanced across all observable characteristics. Treatment locations were exposed to a targeted high intensity marketing campaign from August through October 2009. The goal of this campaign was to achieve higher uptake in treatment locations then in control locations.

This survey module was administered at the end of the endline survey of the evaluation to a sample of approximately 2400. As such, these preference questions and self-reported behaviors followed modules addressing demographics, use of the SMS service, and SRH knowledge, attitudes and outcomes.

2.1 Preference Measures

In order to assess the predictive power of qualitative and game-based measures we construct indices measuring preferences based on qualitative questions and on games respectively. We then compare how well the qualitative and the game-based measures explain outcomes in SRH knowledge, attitudes, and behavior. Our qualitative measures of economic preferences are based on composite indices of responses to descriptive survey questions. The questions in each index are grouped based on intuition supported by a Pearson and Polychoric correlation-based factor analysis.

The qualitative risk aversion measure is constructed from level of agreement with two statements and two hypothetical choices between a riskier and a safer option. The statements are: "I would not ride in a boda boda with a driver I don't know after dark," and "Relative to other people, I am willing to take risks in my life." The two hypothetical choices are between investing in a safe but low-return business or a risky but potentially high-return business and between taking a medicine to reduce a pain or undergoing a surgery that would cure you entirely but with a small risk of death. The qualitative ambiguity aversion measure is constructed from level of agreement with three statements: "If I am uncertain about the responsibilities of a job, I get very anxious," "I don't feel comfortable around people I don't know," and "It usually disturbs me when I am uncertain of the effects of my actions." The qualitative impatience scale is based on a hypothetical choice: if you were sick, would you prefer to get medicine today that will make you feel somewhat better, or to wait a week for a better medicine that would make you feel entirely better? The qualitative time inconsistency scale is constructed from level of agreement with three statements: "If I get money, I tend to spend it too quickly," "Many of my choices in the past I now regret making," and "I often change my mind and don't follow through with my original intentions."

Our game-based measures of economic preferences are constructed from subjects' choices between monetary gambles. For half of our sample, these games are incentivized (with one randomly selected choice becoming relevant for payment at the end of the interview). Our game-based elicitation of risk preferences is constructed from three choices between gambles—each with 50/50 of receiving the low or high amount— with one gamble a lower risk, lower return relative to the other. Our game-based

measure of ambiguity aversion is based on one choice between a 50/50 chance of winning 5000 UGX or losing 1000 UGX or a winning 7000 UGX if it rains in Beijing the next day and losing 1000 UGX if it does not. Our game-based measure of impatience is constructed from responses to four intertemporal choices, three of these questions are between a fixed payoff now or a higher payoff two weeks in the future (this higher payoff is increasing through the three questions) while the fourth question is a choice between the fixed payment two weeks in the future or (the lowest) higher payment four weeks in the future. We create a game-based dummy for time inconsistency based on whether responses to this final question and a question with the same payoffs but receipt of payment either immediately or two weeks in the future.

2.2 Outcome Measures

Outcome measures (for the analysis of qualitative vs. game-measured preferences and for the impact of incentivization) are composite indices measuring SRH knowledge, attitudes, behavior, and health outcomes. The two indices measuring SRH knowledge assess knowledge on HIV transmission and methods of contraception. The *HIV knowledge index* is based on responses indicating whether subjects know that HIV can be transmitted during pregnancy, delivery, and breastfeeding and that it cannot be transmitted by sharing food or through mosquito bites. The *contraception knowledge index* is based on how many methods of contraception a subject can name (the methods named: pills, injections, male condoms, female condoms, foam, IUD, implants, emergency pill, female sterilization, male sterilization).

The *condom use attitudes index* is composed of the respondent's level of agreement with the statement that "a male condom should always be put on before intercourse," and "it is not embarrassing to buy or ask for a condom." The *perceived relative non-riskiness index* is based on the respondent's perceived risk-taking relative to other people and their perceived risk of contracting. The *non-promiscuity index* contains responses on whether the respondent was unfaithful to a partner during the preceding 3 months and their number of sexual partners in the past three months. (Note that these two questions were asked indirectly of half the respondents and we control for whether the questions were asked directly in our analysis.) The *safe sex behavior index* is composed of responses on whether the respondent's their most recent sexual partner was as a casual acquaintance or a commercial sex worker, whether a male condom was used at last sex, and whether any type of contraceptive was used at last sex. These indicators are all positive only for those who report having had sex in the last year. The *health services use index* contains information on whether the respondent has ever been tested for HIV, ever sought treatment for an STD, and ever visited a health center or health worker for an issue related to SRH. The *healthy outcomes index* contains information on whether the respondent has ever had an STD, ever had symptoms

of an STD (bad smelling discharge, or genital sore or ulcer), whether the respondent (or their partner) was currently pregnant, and whether the respondent's (or their partner's) current pregnancy was unwanted.

2.3 Indirect Survey Design

We use two techniques to elicit indirect responses to sensitive questions about sexual behavior. We used the item count technique (ICT) to elicit indirect responses to two sensitive questions with binary responses and the additive randomized response technique (RRT) to elicit responses to a sensitive question with a quantitative response.

The binary questions were (1) whether a male condom was used the last time the subject had sex and (2) whether the subject had been unfaithful to a partner in the last 3 months. For each question, subjects were randomly assigned to the control (directly questioned) group or the treatment (indirectly questioned) group. Prior to the introduction of the ICT instructions, control subjects were asked, "True or False: the last time you had sexual intercourse, a male condom was used."

Figure 1.

129.	**ONLY USE THIS IF LIST 1 = "A"** Please tell me how many of the following statements are true for you, but not which ones in particular: 1. Your family owns a house 2. Your biological father is alive 3. You raise goats 4. You really like posho **WRITE 9 IF REFUSED TO ANSWER**	NUMBER OF TRUE STATEMENTS……. ☐	
130.	**ONLY USE THIS IF LIST 1 = "B"** Please tell me how many of the following statements are true for you, but not which ones in particular: 1. Your family owns a house 2. Your biological father is alive 3. You raise goats 4. You really like posho 5. The **last time** you had sexual intercourse, a male condom was used.		

	WRITE 9 IF REFUSED TO ANSWER	NUMBER OF TRUE STATEMENTS…..…… …… ☐	

The quantitative question we asked was how many sexual partners each respondent had in the last 3 months. As with the ICT questions, subjects were randomly assigned to the control (directly questioned) group or the treatment (indirectly questioned) group. The control group was simply asked, "How many sexual partners have you had in the last three months?" Whereas the treatment group was given the following instructions by the enumerator:

Figure 2.

133.	**ONLY USE THIS IF DICE = "YES"** I will now ask you a potentially sensitive question. In order to keep your answer private, I will ask you to roll a die and then add your true answer to the rolled number. You will only report the sum to me. For example, if you rolled 3 and I asked you how many eyes you have, you would tell me 5. Now, please turn around and roll the die. Make sure that I do not see the rolled number. Keep this number in your mind. I will now ask you the question. Remember, only tell me the sum of the rolled die and your true answer. How many sexual partners have you had in the last three months? **WRITE 99 IF REFUSED TO ANSWER**	NUMBER OF PARTNERS…. ☐☐	

The underlying responses for the treatment group could thus be computed by subtracting the average die roll (3.5) from each indirect response, allowing comparison with the direct responses from the control group.

3 Results

3.1 Qualitative vs. Game-Based Preferences

Using the survey data on measures described above we estimate the following ordinary least squares model:

$$Y_i^{jk} = \alpha + \beta^{jk} Qualitative_i + \gamma^{jk} Game_i + \delta Demographics_i + \varepsilon_i$$

Where *i* indexes the individual, *k* indexes our different outcome measures, and *j* indexes the economic preference measures discussed above (risk aversion, ambiguity aversion, and impatience). $Qualitative_i$ and $Game_i$ are the qualitative and game indices respectively for individual *i*. $Demographics_i$ is a vector of demographic features.

The results of this estimation are presented in tables 1-8. Three specifications of the regression are presented (one with no demographic controls, one with limited demographic controls, and one with full demographic controls) and we will focus on the third specification with full demographic controls in our discussion of the results.

Results on the relationship between risk aversion and our outcomes of interest are presented in table 1 (knowledge and attitude indices) and table 2 (behavior and health outcome indices). The qualitative measure of risk aversion has a negative and strongly significant relationship to the perceived relative non-riskiness index ($\beta = -0.608$, $p < 0.01$). The game measure of risk aversion has a positive and strongly significant correlation with the contraception knowledge index ($\beta = 0.068$, $p < 0.01$) and the health services use index ($\beta = 0.041$, $p = 0.04$), and a negative and weakly significant correlation with the non-promiscuity index ($\beta = -0.043$, $p = 0.08$).

Results on the relationship between ambiguity aversion and our outcomes of interest are presented in table 3 (knowledge and attitude indices) and table 4 (behavior and health outcome indices). The qualitative measure of ambiguity aversion is positively and significantly associated with the contraception knowledge index ($\beta = 0.049$, $p = 0.01$), the perceived relative non-riskiness index ($\beta = 0.192$, $p < 0.01$), and the safe sex behavior index ($\beta = 0.074$, $p = 0.03$), and negatively and significantly associated with the condom use attitudes index ($\beta = -0.034$, $p = 0.03$). The game measure of ambiguity aversion is negatively and significantly associated with the safe sex behavior index ($\beta = -0.067$, $p = 0.01$).

Results on the relationship between impatience and our outcomes of interest are presented in table 5 (knowledge and attitude indices) and table 6 (behavior and health outcome indices). The qualitative

measure of impatience has a positive and significant correlation to the HIV knowledge index (β = 0.054, p = 0.01), the perceived relative non-riskiness index (β = 0.105, p < 0.01), and the safe sex behavior index (β = 0.068, p = 0.01) and a negative and significant correlation with the health services use index (β = -0.039, p = 0.07). The game measure of impatience has a negative and weakly significant coefficient with the non-promiscuity index (β = -0.042, p = 0.09) and a negative and significant correlation with the safe sex behavior index (β = -0.061, p = 0.08). The relationship between impatience and the safe sex behavior index is one of the instances where the qualitative and game measures of the preference are both significantly correlated with the outcome but the relationships run in opposite directions.

Results on the relationship between time inconsistency and our outcomes of interest are presented in table 7 (knowledge and attitude indices) and table 8 (behavior and health outcome indices). The qualitative measure of time inconsistency has a positive and strongly significant correlation with the perceived relative non-riskiness index (β = 0.142, p < 0.01) and a negative and strongly significant correlation with the non-promiscuity index (β = -0.077, p < 0.01). The game measure of time inconsistency has a positive and significant correlation with the HIV knowledge index (β = 0.125, p = 0.07) and a negative and strongly significant correlation with the perceived relative non-riskiness index (coefficient = -0.204, p < 0.01). The relationship between time inconsistency and the perceived relative non-riskiness index is another case where the two preference measures are significantly correlated with the outcome, but the relationships run in opposite directions.

In addition to this comparison between our game measures and qualitative measures in general, we also assessed which qualitative questions were most effective in explaining the outcome measures. To do this, we analyzed a similar model to the one described above, only with each qualitative question in turn taking the place of the qualitative and game-measured indices:

$$Y_i^{jk} = \alpha + \beta^{jk} QualitativeQuestion_i + \gamma Demographics_i + \varepsilon_i$$

Within the three categories of risk, time, and ambiguity preferences we compared the usefulness of each qualitative question based on which question was significantly related to the most outcomes. In the risk domain, level of agreement with the statement, “Relative to other people, I am willing to take risks in my life.” In the time inconsistency domain, level of agreement with the statement, “Many of my choices in the past I now regret making.” And in the time discounting domain, a hypothetical choice between receiving a medicine today which would make you feel somewhat better or receiving a better medicine in a week that would make you feel entirely better again. In the ambiguity domain we found that none of the three relevant questions were strongly related to more than two outcome measures.

Table 1. Relationship between qualitative & game-measured risk aversion and knowledge & attitudes

	HIV knowledge index			Contraception knowledge index			Condom use attitude index			Perceived relative non-riskiness index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk aversion	-0.007	0	-0.01	0.031	0.016	0.018	0.004	-0.004	0.006	-0.553***	-0.563***	-0.608***
(qualitative)	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]
Risk aversion	0.027	0.021	0.019	0.050***	0.056***	0.068***	0.018	0.002	0.007	0.040***	0.040**	0.031
(game)	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.01]	[0.02]	[0.02]
Married or		-0.032	-0.041		0.104**	0.102**		-0.03	-0.026		0.001	0.003
cohabiting		[0.04]	[0.04]		[0.04]	[0.04]		[0.03]	[0.03]		[0.04]	[0.04]
Controls for demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs.?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Qual = Game Wald test p-val	0.207	0.459	0.338	0.501	0.178	0.081	0.618	0.852	0.984	0	0	0
R^2	0.004	0.048	0.054	0.026	0.123	0.132	0.005	0.025	0.026	0.288	0.303	0.352
Observations	2408	1917	1881	2409	1918	1882	2404	1913	1878	2409	1918	1882

Table 2. Relationship between qualitative and game-measured risk aversion and behavior and health outcomes

	Non-promiscuity index			Safe sex behavior index			Health services use index			Healthy outcomes index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk aversion	-0.013	-0.007	-0.001	0.007	0.01	0.009	0.035*	-0.006	0.001	0.034	0.009	0.006
(qualitative)	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Risk aversion	-0.036*	-0.051**	-0.043*	0.016	0.028	0.036	0.026	0.041**	0.041**	-0.004	0.006	0.006
(game)	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.03]
Controls for demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other preferences?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Qual = Game Wald test p-val	0.366	0.171	0.2	0.801	0.641	0.472	0.776	0.067	0.117	0.274	0.917	0.987
R^2	0.005	0.031	0.033	0.006	0.019	0.031	0.005	0.233	0.236	0.003	0.106	0.107
Observations	2399	1918	1882	2409	1918	1882	2409	1918	1882	2409	1918	1882

Table 3. Relationship between qualitative and game-measured ambiguity aversion and knowledge and attitude outcomes

	HIV knowledge index			Contraception knowledge index			Condom use attitudes index			Perceived rel. non-riskiness index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Ambiguity aversion (qual)	-0.027 [0.02]	-0.019 [0.02]	-0.025 [0.02]	0.027* [0.02]	0.049** [0.02]	0.048*** [0.02]	-0.040*** [0.01]	-0.034** [0.02]	-0.029* [0.02]	0.142*** [0.03]	0.138*** [0.03]	0.192*** [0.02]
Ambiguity aversion (game)	0.029 [0.02]	0.012 [0.02]	0.012 [0.02]	0.002 [0.02]	-0.022 [0.02]	-0.031 [0.02]	-0.01 [0.02]	-0.006 [0.02]	-0.008 [0.02]	-0.040* [0.02]	-0.051** [0.02]	-0.023 [0.02]
Qual = Game Wald test p-val	0.03	0.211	0.151	0.325	0.015	0.007	0.246	0.348	0.483	0	0	0
Controls for demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
R^2	0.005	0.049	0.054	0.022	0.122	0.132	0.007	0.026	0.026	0.044	0.062	0.352
Observations	2394	1903	1881	2395	1904	1882	2391	1900	1878	2393	1904	1882

Table 4. Relationship between qualitative and game-measured ambiguity aversion and behavior and health outcomes

	Non-promiscuity index			Safe sex behavior index			Health Services Use Index			Healthy outcome index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Ambiguity aversion (qual)	-0.039* [0.02]	-0.023 [0.02]	-0.02 [0.02]	0.061** [0.03]	0.076** [0.03]	0.074** [0.03]	0.019 [0.02]	0.009 [0.02]	0.011 [0.02]	0.018 [0.02]	0.014 [0.02]	0.01 [0.02]
Ambiguity aversion (game)	-0.003 [0.02]	-0.02 [0.02]	-0.007 [0.02]	-0.039* [0.02]	-0.071*** [0.02]	-0.067** [0.03]	0.045** [0.02]	0.02 [0.02]	0.006 [0.02]	0.011 [0.02]	-0.007 [0.03]	-0.008 [0.03]
Qual = Game Wald test p-val	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs.?	0.215	0.92	0.714	0.01	0.001	0.001	0.341	0.702	0.853	0.82	0.594	0.643
R^2	0.006	0.028	0.033	0.009	0.024	0.031	0.005	0.231	0.236	0.003	0.107	0.107
Observations	2385	1904	1882	2395	1904	1882	2395	1904	1882	2395	1904	1882

Table 5. Relationship between qualitative and game-measured impatience and knowledge and attitude outcomes

	HIV knowledge index			Contraception knowledge index			Condom use attitudes index			Perceived relative non-riskiness index		
Impatience	0.042**	0.048**	0.054***	-0.025	-0.017	-0.027	-0.024	-0.013	-0.015	0.037	0.034	0.105***
(qualitative)	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Impatience	0.002	0.016	0.02	-0.022	-0.015	-0.021	-0.015	-0.01	-0.009	0.007	0.001	0.024
(game)	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Controls for demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs.?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Qual = Game Wald test p-val	0.147	0.31	0.293	0.913	0.942	0.833	0.749	0.93	0.835	0.436	0.433	0.022
R^2	0.005	0.05	0.054	0.021	0.119	0.132	0.006	0.025	0.026	0.03	0.048	0.352
Observations	2396	1906	1881	2397	1907	1882	2392	1902	1878	2396	1907	1882

Table 6. Relationship between qualitative and game-measured impatience behavior and health outcomes

	Non-promiscuity index			Safe sex behavior index			Health services use index			Healthy outcome index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Impatience	0.008	-0.004	0.001	0.074***	0.074***	0.068***	-0.032	-0.033	-0.039*	0.004	0.01	0.009
(qualitative)	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Impatience	-0.059***	-0.049*	-0.042*	-0.060**	-0.063*	-0.061*	-0.001	0.014	0.012	-0.017	-0.016	-0.015
(game)	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.03]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]
Controls for demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Qual = Game Wald test p-val	0.042	0.237	0.267	0.001	0.005	0.009	0.339	0.175	0.138	0.493	0.434	0.477
R^2	0.007	0.031	0.033	0.011	0.024	0.031	0.003	0.231	0.236	0.002	0.107	0.107
Observations	2387	1907	1882	2397	1907	1882	2397	1907	1882	2397	1907	1882

Table 7: Relationship between qualitative and game-measured time inconsistency and knowledge and attitude outcomes

	HIV knowledge index			Contraception knowledge index			Condom use attitudes index			Perceived relative non-riskiness index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Time inconsistency (qualitative)	-0.021	0	-0.004	-0.047**	-0.022	-0.021	-0.037*	-0.022	-0.017	0.180***	0.200***	0.142***
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.02]
Time inconsistency (game)	0.114*	0.101	0.125*	0.091*	0.07	0.065	0.03	0.028	0.013	-0.132	-0.179**	-0.204***
	[0.06]	[0.07]	[0.07]	[0.05]	[0.05]	[0.06]	[0.05]	[0.06]	[0.06]	[0.08]	[0.08]	[0.08]
Controls for demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Qual = Game Wald test p-val	0.044	0.176	0.077	0.012	0.11	0.177	0.214	0.397	0.626	0	0	0
R^2	0.005	0.049	0.054	0.025	0.12	0.133	0.007	0.026	0.027	0.058	0.083	0.367
Observations	2411	1917	1875	2412	1918	1876	2407	1913	1872	2410	1918	1876

Table 8. Relationship between qualitative and game-measured time inconsistency and behavior and health outcomes

	Non-promiscuity index			Safe sex behavior index			Health services use index			Healthy outcome index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Time inconsistency (qualitative)	-0.092***	-0.074***	-0.077***	0.006	0.023	0.006	0.017	0.003	0.003	0.062***	0.046*	0.037
	[0.02]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Time inconsistency (game)	-0.003	-0.043	-0.059	0.123	0.126	0.119	-0.012	0.022	0.011	-0.043	0.069	0.061
	[0.07]	[0.08]	[0.08]	[0.07]	[0.09]	[0.09]	[0.06]	[0.06]	[0.05]	[0.06]	[0.07]	[0.07]
Controls for demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Qual = Game Wald test p-val	0.243	0.727	0.835	0.171	0.299	0.26	0.633	0.743	0.893	0.141	0.773	0.766
R^2	0.012	0.034	0.039	0.007	0.02	0.031	0.003	0.23	0.237	0.006	0.109	0.109
Observations	2402	1918	1876	2412	1918	1876	2412	1918	1876	2412	1918	1876

3.2 Incentives

Using the survey data on measures described above we estimate the following ordinary least squares model:

$$Y_i^{jk} = \alpha + \beta^{jk} Game_i + \gamma^{jk}(Game_i \times Incentivized_i) + \delta Incentivized_i + \theta Demographics_i + \varepsilon_i$$

Where again, *i* indexes the individual, *k* indexes the eight composite indices summarizing SRH knowledge, attitudes, behaviors and health outcomes, and *j* indexes the economic preference measures discussed above (risk aversion, ambiguity aversion, and impatience). Again, $Game_i$ is the game-based index for individual i. $Incentivized_i$ is a dummy equal to one if individual *i* was incentivized. $(Game_i \times Incentivized_i)$ is the interaction between the game-based preference index and the incentivization dummy, capturing the effect of incentivization on how well the preference measure predicts the outcome measure. $Demographics_i$ is a vector of demographic features of individual *i*. The results of this estimation are presented in tables 9-16. Note that we do not display the coefficients of the $Incentivized_i$ dummy itself since, as expected, they do not reflect any direct effect of incentivization on outcomes. We also do not display tables relating measures of ambiguity aversion and incentivization to outcomes as we found no evidence of a significant incentivization effect in these relationships.

We do not find strong evidence that incentivization improves the predictive power of our preference measures. We find a positive and significant correlation of the risk aversion-incentivization interaction term and the healthy outcomes index (β = 0.117, p = 0.03), a negative and significant impatience-incentivization interaction term and the HIV knowledge index (β = -0.085, p = 04). We also find a positive and significant correlation between the time inconsistency-incentivization interaction and the health services use index (β = 0.212, p = 0.07), and a negative and significant correlation between the same interaction term and the safe sex behavior index (β = -0.346, p = 0.05).

Table 9. Relationship between incentivization, risk aversion and knowledge & attitude outcomes

	AIDS knowledge index			Contraception knowledge index			Condom use attitudes index			Perceived relative non-riskiness index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk aversion	0.028	0.016	0.008	0.044**	0.032*	0.045**	0.007	-0.013	-0.013	-0.012	-0.043	-0.032
	[0.02]	[0.03]	[0.03]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]
Incentivized X risk aversion	-0.002	0.012	0.021	0.022	0.056	0.052	0.025	0.032	0.04	0	0.069	0.06
	[0.03]	[0.04]	[0.04]	[0.03]	[0.03]	[0.04]	[0.03]	[0.03]	[0.03]	[0.05]	[0.05]	[0.05]
Controls for demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs. & interactions?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
R^2	0.005	0.049	0.054	0.025	0.124	0.129	0.006	0.026	0.027	0.028	0.047	0.055
Observations	2417	1923	1898	2418	1924	1899	2413	1919	1894	2416	1924	1899

Table 10. Relationship between incentivization, risk aversion and behavior & outcomes

	Behavior									Outcomes		
	Non-promiscuity index			Safe sex behavior index			Health services use index			Health outcome index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Risk aversion	-0.036	-0.059	-0.057	-0.012	0.017	0.026	0.035	0.028	0.023	-0.021	-0.04	-0.046
	[0.03]	[0.04]	[0.04]	[0.03]	[0.03]	[0.04]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]
Incentivized X risk aversion	-0.005	0.012	0.021	0.059	0.023	0.026	-0.009	0.03	0.038	0.048	0.105**	0.117**
	[0.04]	[0.05]	[0.05]	[0.04]	[0.05]	[0.06]	[0.04]	[0.04]	[0.05]	[0.05]	[0.05]	[0.05]
Controls for demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs & interactions?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
R^2	0.006	0.031	0.033	0.007	0.019	0.027	0.003	0.232	0.235	0.003	0.109	0.111
Observations	2408	1924	1899	2418	1924	1899	2418	1924	1899	2418	1924	1899

Table 11. Relationship between incentivization, impatience and knowledge & attitude outcomes

	HIV knowledge index			Contraception knowledge index			Condom use attitudes index			Perceived relative non-riskiness index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Impatience	0.036	0.069**	0.070***	-0.011	-0.01	-0.01	-0.002	-0.008	-0.007	-0.005	-0.035	-0.043
	[0.02]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.02]	[0.02]	[0.02]	[0.03]	[0.03]	[0.04]
Incentivized X	-0.056	-0.088**	-0.085**	-0.03	-0.017	-0.024	-0.037	-0.009	-0.011	0.038	0.086*	0.089
impatience	[0.04]	[0.04]	[0.04]	[0.03]	[0.04]	[0.04]	[0.03]	[0.03]	[0.03]	[0.05]	[0.05]	[0.05]
Controls for other demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs. & interactions?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
R^2	0.005	0.05	0.054	0.02	0.118	0.129	0.006	0.026	0.027	0.03	0.049	0.055
N	2398	1908	1898	2399	1909	1899	2394	1904	1894	2398	1909	1899

Table 12. Relationship between incentivization, impatience and behavior & outcomes

	Non-promiscuity index			Safe sex behavior index			Health services use index			Health outcome index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Impatience	-0.061**	-0.044	-0.041	-0.036	-0.034	-0.021	-0.015	-0.006	-0.017	-0.02	-0.02	-0.018
	[0.03]	[0.03]	[0.03]	[0.04]	[0.04]	[0.04]	[0.03]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]
Incentivized X	0.009	-0.011	-0.01	-0.023	-0.03	-0.049	0.017	0.027	0.039	0.007	0.012	0.018
impatience	[0.04]	[0.04]	[0.04]	[0.04]	[0.05]	[0.05]	[0.03]	[0.04]	[0.04]	[0.04]	[0.05]	[0.05]
Controls for other demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs & interactions?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Ye
R^2	0.007	0.031	0.033	0.008	0.021	0.027	0.002	0.23	0.235	0.003	0.107	0.111
N	2389	1909	1899	2399	1909	1899	2399	1909	1899	2399	1909	1899

Table 13. Relationship between incentivization, time inconsistency and knowledge & attitude outcomes

	AIDS knowledge index			Contraception knowledge index			Condom use attitudes index			Perceived rel. non-riskiness index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Time inconsistency	0.122	0.039	0.072	0.134**	0.134*	0.140*	-0.011	0.029	0.027	-0.277***	-0.262**	-0.292**
	[0.08]	[0.08]	[0.08]	[0.06]	[0.07]	[0.07]	[0.06]	[0.07]	[0.07]	[0.10]	[0.12]	[0.12]
Incentivized X time inconsistency	-0.01	0.13	0.091	-0.071	-0.123	-0.146	0.089	-0.003	-0.009	0.253*	0.148	0.194
	[0.10]	[0.09]	[0.09]	[0.09]	[0.09]	[0.10]	[0.08]	[0.10]	[0.10]	[0.13]	[0.16]	[0.16]
Controls for other demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs & interactions ?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
R^2	0.006	0.05	0.054	0.022	0.12	0.129	0.006	0.026	0.027	0.032	0.05	0.055
N	2420	1924	1898	2421	1925	1899	2416	1920	1894	2419	1925	1899

Table 14. Relationship between incentivization, time inconsistency and behavior & outcomes

	Non-promiscuity index			Safe sex behavior index			Health services use index			Health outcomes index		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Time inconsistency	-0.039	-0.065	-0.095	0.294**	0.281**	0.266**	-0.116	-0.075	-0.079	-0.137	-0.019	-0.03
	[0.10]	[0.12]	[0.12]	[0.11]	[0.13]	[0.13]	[0.09]	[0.09]	[0.09]	[0.09]	[0.09]	[0.09]
Incentivized X time inconsistency	0.085	0.057	0.069	-0.340**	-0.319*	-0.346**	0.2	0.200*	0.212*	0.171	0.173	0.187
	[0.12]	[0.13]	[0.14]	[0.14]	[0.18]	[0.17]	[0.12]	[0.11]	[0.11]	[0.11]	[0.12]	[0.13]
Controls for other demographics?	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Controls for other prefs. & interactions?	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
R^2	0.005	0.029	0.033	0.01	0.021	0.027	0.004	0.231	0.235	0.003	0.107	0.111
N	2411	1925	1899	2421	1925	1899	2421	1925	1899	2421	1925	1899

3.3 Indirect Survey Methods

We compare the mean direct and mean imputed indirect response to each sensitive question for the entire sample as well as for subsamples divided along the dimensions of gender, age (younger or older than the median age in the sample of 25 years), and relationship status (whether or not a subject is either married or living with a partner). This subdivision of the sample is motivated by the expectation that social norms for sexual behavior may differ for subjects of different gender, age, and relationship status. We expect that these norms may relate not only to different patterns of behavior but also to different directions of response bias. We analyze the results of each of the three questions below.

Condom at last sex (see table 15)

Looking at the overall sample we do not see a significant difference in the proportion of the sample reporting condom use between direct and indirect questioning. However, when we break down the sample and analyze never married and married/cohabiting subjects separately it is clear that looking at the overall sample obscured different patterns of reporting between these two groups.

Among the never married, the proportion reporting condom use was significantly higher under direct questioning (46.34%) than under indirect questioning (36.72%) suggesting that the this subsample is overreporting condom use. Looking at further breakdowns of the never married group by gender and age, it appears that this overreporting is driven by men and women who are 25 and over.

In the married/cohabiting sample, the proportion reporting condom use is significantly lower under direct questioning (11.67%) than under indirect questioning (18.91%) suggesting that this sample is underreporting condom use and that the response biases run in opposite directions for the never married and married/cohabiting groups. Looking at the breakdown by gender and age, this bias appears to be mainly driven by women under 25.

Table 15. Differences between direct responses and imputed indirect responses to the question: "T/F: The last time you had sexual intercourse a male condom was used."

Category	*Direct (%)*	*N (direct)*	*Indirect (%)*	*N (indirect)*	*Difference**	*P-value***
Overall	**24.22**	**1222**	**24.10**	**1174**	**0.11**	**0.48**
Never married	**46.34**	**410**	**36.72**	**405**	**9.61**	**0.04**
Male	48.81	254	34.87	252	13.94	0.02
Male under 25	52.65	188	45.45	177	7.20	0.18
Male 25 and over	37.87	66	9.90	75	27.97	0.03
Female	42.30	156	39.78	153	2.52	0.39
Female under 25	44.76	105	51.33	104	-6.57	0.27
Female 25 and over	37.25	51	15.27	49	21.98	0.08
Married/cohabiting	**11.67**	**762**	**18.91**	**723**	**-7.23**	**0.03**
Male	13.60	316	15.53	306	-1.92	0.37
Male under 25	15.62	64	15.72	55	-0.10	0.15
Male 25 and over	13.09	252	18.95	251	-5.86	0.17
Female	10.31	446	21.42	417	-11.10	0.01
Female under 25	10.24	166	33.04	150	-22.80	0.00
Female 25 and over	10.35	280	14.88	267	-4.53	0.24

*Difference = Direct response – Imputed Indirect Response
** P-values displayed are one-sided

Infidelity in last three months (See table 16)

For this question we see that a significantly lower proportion reporting infidelity under direct questioning (13.26%) than under indirect questioning (18.35%). The apparent bias toward underreporting infidelity fits our expectations.

Breaking down the sample by marital status, gender and age group we see that this underreporting trend is strongest among never married women 25 years and over and married or cohabiting women under 25. In fact, for the small subsample of married or cohabiting men under 25 we see large and very significant *over*reporting of infidelity.

Table 16. Differences between direct and imputed responses to the question: "T/F: You have been unfaithful to a partner sometime in the past three months."

Category	*Direct (%)*	*N (direct)*	*Indirect (%)*	*N (indirect)*	*Difference**	*P-value***
Overall	**13.26**	**1244**	**18.35**	**1121**	**-5.09**	**0.05**
Never married	**15.06**	**405**	**22.41**	**397**	**-7.34**	**0.09**
Male	17.55	262	22.27	232	-4.71	0.25
Male under 25	18.32	191	23.91	166	-5.58	0.24
Male 25 and over	15.49	71	18.14	66	-2.65	0.42
Female	10.48	143	22.60	165	-12.11	0.09
Female under 25	10.75	93	9.83	115	0.92	0.46
Female 25 and over	10.00	50	51.99	50	-41.99	0.00
Married/cohabiting	**12.02**	**790**	**15.08**	**677**	**-3.05**	**0.21**
Male	21.13	336	22.31	279	-1.18	0.42
Male under 25	25.00	64	-6.62	55	31.62	0.01
Male 25 and over	20.22	272	29.41	224	-9.19	0.08
Female	5.28	454	10.01	398	-4.72	0.17
Female under 25	4.93	162	24.32	152	-19.39	0.01
Female 25 and over	5.47	292	1.16	246	4.31	0.23

*Difference = Direct response – Imputed Indirect Response
** P-values displayed are one-sided

Number of partners in last 3 months (See table 17)

For all demographic subgroups, the directly elicited number of partners is higher than the indirectly elicited number of partners, suggesting overreporting. Surprisingly this overreporting bias does not appear to be lower for married or cohabiting subjects than for never married subjects. The only subgroups for which we do not see significant overreporting of number of partners are never married women 25 years and over and married or cohabiting men under 25. However, note that these two subgroups are also much smaller than the other subgroups.

Table 17. Differences between direct and imputed responses to the question: "How many sexual partners have you had in the last three months?"

Category	*Direct*	*N (direct)*	*Indirect*	*N (indirect)*	*Difference**	*P-value***
Overall	**1.16**	**1243**	**0.75**	**1152**	**0.41**	**0.00**
Never married	**1**	**425**	**0.58**	**394**	**0.41**	**0.00**
Male	1.05	264	0.61	245	0.44	0.00
Male under 25	1.06	188	0.75	179	0.31	0.05
Male 25 and over	1.02	76	0.22	66	0.79	0.00
Female	0.90	161	0.54	149	0.36	0.01
Female under 25	0.93	112	0.43	96	0.5	0.00
Female 25 and over	0.83	49	0.72	53	0.11	0.36
Married/cohabiting	**1.28**	**765**	**0.85**	**714**	**0.42**	**0.00**
Male	1.40	331	1.08	286	0.32	0.00
Male under 25	1.45	53	1.46	64	-0.01	0.48
Male 25 and over	1.39	278	0.97	222	0.42	0.00
Female	1.19	434	0.70	428	0.48	0.00
Female under 25	1.24	170	0.71	147	0.53	0.00
Female 25 and over	1.16	264	0.70	281	0.46	0.00

*Difference = Direct response – Imputed Indirect Response
** P-values displayed are two-sided

References (incomplete)

Anderson, Lisa R. and Jennifer M. Mellor. (2008). "Predicting health behaviors with an experimental measure of risk preference." *Journal of Health Economics* 27: 1260-1274.

Barsky, Robert B., F. Thomas Juster, Miles S. Kimball, and Matthew D. Shapiro. (1997). "Preference Parameters and Behavioral heterogeneity: An Experimental Approach in the Health and Retirement Study." *Quarterly Journal of Economics* 112(2): 537-579.

Camerer, Colin F. and Robin Hogarth. (1999). "The Effect of Financial Incentives in Experiments: A Review and Capital-Labor-Production Framework." *Journal of Risk and Uncertainty* 19(1-3): 7-42.

Chapman, Gretchen B. and Elliot J. Coups. (1999). "Time Preferences and Preventive Health Behavior: Acceptance of the Influenza Vaccine." *Medical Decision Making* 19: 307-314.

Chesson, Harrell W., Jami S. Leichleter, Gregory D. Zimet, Susan L. Rosenthal, David I. Bernstein and Kenneth H. Fife. (2006). "Discount Rates and Risky Sexual Behavior Among Teenagers and Young Adults." *Journal of Risk and Uncertainty* 32: 217-230.

Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp, Gert G. Wagner. (2011). "Individual Risk Attitudes: Measurement, Determinants, and Behavioral Consequences." *Journal of the European Economic Association* 9(3): 522-550.

Fuchs, Victor R. (1982). "Time Preferences and Health: An Exploratory Study." In Fuchs, V.R. (Ed.) *Economic Aspects of Health.* Chicago: The University of Chicago Press.

Greenberg, Bernard G., Roy R. Kuebler, Jr., James R. Abernathy, and Daniel G. Horvitz. 1971. "Application of the Randomized Response Technique in Obtaining Quantitative Data." *Journal of the American Statistical Association* 66(334): 243-250.

Kirby, Kris N. and Nancy M. Petry. (2004). "Heroin and Cocaine Abusers Have Higher Discount Rates for Delayed Rewards than Alcoholics or Non-Drug-Using Controls." *Addiction* 99: 461-471.

Komlos, John, Patricia K. Smith, and Barry Bogin. (2004). "Obesity and the Rate of Time Preference: Is There a Connection?" *Journal of Biosocial Science* 36: 209-219.

Lammers, Judith and Sweder van Wijnbergen. (2007). "HIV/AIDS, Risk Aversion and Intertemporal Choice." Tinbergen Institute Discussion Paper No. 07-098/1.

Miller, Judith Droitcour. (1984). *A New Survey Technique for Studying Deviant Behavior*. Ph.D. dissertation, The George Washington University.

Picone, Gabriel, Frank Sloan, and Donald Taylor. (2004). "Effects of Risk and Time Preference and Expected Longevity on Demand for Medical Tests." *Journal of Risk and Uncertainty* **28**: 39-53.

Pollock, K.H., and Yuskel Bek. 1976. "A Comparison of Three Randomized Response Models for Quantitative Data." *Journal of the American Statistical Association* 71(356): 884-886.

Read, D. 2005. "Monetary incentives, what are they good for?" *Journal of Economic Methodology, 12*(2): 265–276.

Reynaud, Arnaud and Stéphane Couture. 2010. "Stability of Risk Preference Measures: Results From a Field Experiment on French Farmers." TSE Working Paper available at http://neeo.univ-tlse1.fr/2628/1/10-151.pdf

Viscusi, W. Kip. (1991). "Age Variations in Risk Perceptions and Smoking Decisions." *Review of Economics and Statistics* 73: 577-588.

Viscusi, W. Kip and Joni Hersch. (2001). "Cigarette Smokers as Job Risk Takers." *Review of Economics and Statistics* 83: 269-280.

Warner, Stanley L. 1965. "Randomized Response: A Survey Technique for Eliminating Evasive Answer Bias." *Journal of the American Statistical Association* 60(309): 63-69.