January 2016

The Influence Of Varying Cost Formats On Decision

Changchuan Jiang
Yale University, changchuanjiang@gmail.com

THE INFLUENCE OF VARYING COST FORMATS ON DECISION MAKING

A master thesis presented by

Changchuan Jiang

To

The Department of Chronic Disease Epidemiology

For the Degree of Master of Public Health

Yale School of Public Health

New Haven, Connecticut

Apirl 15, 2016

Abstract

Objectives. The objective of this study was to explore the impact of specific cost formats on individuals' decision making.

Methods. Mechanical Turk workers completed a choice based conjoint (CBC) analysis survey designed to examine preferences for three second line agents used to treat diabetes: a sulfonylurea, exenatide, and insulin. Diabetes was chosen because the disease is familiar to the general public and people are generally aware of the importance of controlling blood sugar levels. The CBC survey included five attributes: route of administration, efficacy, risk of low blood sugar, frequency of checking blood sugar levels and cost. We developed seven versions of the CBC survey which were identical except for the cost attribute. We described cost in terms of: *Affordability, Monthly Co-pay, Dollar Sign Rating, How Expensive* or *How Cheap* compared to other medications, *Monthly Co-pay, Working Hours Equivalent* (per month) and *Percent of Monthly Income*. The resulting part-worth utilities were used to calculate the relative importance of cost and to estimate treatment preferences.

Results: Cost had the greatest influence on participants' decisions when framed in terms of Affordability and the lowest influence when framed in terms of *How Cheap* (compared to other drugs). Sulfonylurea is strongly preferred across *Affordability, Percentage of Monthly Income, Monthly Copay* and *Dollar Sign* formats. Exenatide is preferred when cost is described using the *How Cheap* and *How Expensive* format.

Conclusions. How to frame cost impacts subjects' medical decision remarkably. Patients will be the most cost-sensitive when cost is framed in terms of affordability, the least cost-sensitive when considering how cheap the medication is compared to others. Further researches are needed to evaluate the impact of presentation of cost on decision making in clinical contexts.

Acknowledgement

I am grateful to my supervisor, Dr. Liana Fraenkel, whose expertise, understanding, generous guidance and immense support made it possible for me to work on a research that was of remarkable interest to me. It is a great pleasure working with Dr. Fraenkel. Words can never be enough to thank your kindness, support and encouragement.

I would like to express my gratitude to Dr. Shiyi Wang for being my first reader of thesis, for finding out time to reply to my e-mails, for giving his precious and kind advice regarding to my study.

I am highly indebted to my academic advisor, Dr. Nicola Hawley for her immense support and caring advice in my work and study throughout M.P.H.

I would also like to thank Dr. Evelyn Heish for being an excellent guide for the past 2 years, providing me opportunities and suggestions in multiple fields, and for introducing me to Dr. Fraenkel.

I am grateful for all my teachers who put their faith in me and urged me to do better.

I am thankful to Ms. Yimeng Wang for giving the numerous valuable advice at the right time and for being a source of motivation.

Last but not the least, words can never be enough to show my appreciation to my parent Dr. Tianzhang Jiang, Ms. Jiefang Wang for their incredible understanding, support, encouragement and sacrifice that made it possible for me to pursue my career in this amazing country.

Table of Content

List of tables

Table 1. Attributes and levels included in the CBC survey

Versions	Levels
Route of administration	1 pill twice a day
	Injection (shot) under the skin once a day
Efficacy	Mildly effective (usually need another medication)
	Moderately effective (may need another medication)
	Extremely effective (this medication is enough)
Risk of low blood sugar	1% risk
	20% risk
	30% risk
Frequency of checking blood sugar levels	No monitoring necessary
	3 times per week
	1 time per day
Cost	
Affordability	Easily affordable
	Somewhat affordable
	Hard to afford
Monthly Co-pay	$15 for a one month's supply
	$120 for a one month's supply
	$350 for a one month's supply
Dollar Sign Rating	$
	$$
	$$$
How Expensive	This medicine is not more expensive compared to others
	This medicine is somewhat more expensive compared to others
	This medicine is much more expensive compared to others
How Cheap	This medicine is much cheaper compared to others
	This medicine is somewhat cheaper compared to others
	This medicine is not cheaper compared to others

Percentage of Monthly Income	0.6% of monthly income for a one month's supply
	5% of monthly income for a one month's supply
	15% of monthly income for a one month's supply
Working Hours Equivalent	1 hour of work for a one month's supply
	1 day of work for a one month's supply
	3 days of work for a one month's supply

Table 2. Description of the sample according to the group of participators [a]

Characteristic	Randomized versions							
	Affordability (N=176)[b]	Monthly Co-pay (N=162)[b]	Dollar Sign Rating (N=169)[b]	How Cheap (N=165)[b]	How Expensive (N=170)[b]	Percentage of Monthly Income (N=169)[b]	Working Hours Equivalent (N=152)[b]	p[c]
Age (years)	36.7 ± 12.6	35.0 ± 11.7	34.8 ± 11.8	34.2 ± 11.2	35.4 ± 11.7	36.4 ± 11.7	34.4 ± 9.7	0.31
Female	79 (44.9%)	77 (47.5%)	90 (53.3%)	89 (53.9%)	86 (50.6%)	81 (47.9%)	74 (48.7%)	0.64
Education level								0.30
Some high school	0 (0.0%)	2 (1.2%)	4 (2.4%)	1 (0.6%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
High school graduate	23 (13.1%)	22 (13.6%)	18 (10.7%)	15 (9.1%)	17 (10.0%)	21 (12.4%)	13 (8.6%)	
Some college	63 (35.8%)	48 (29.6%)	55 (32.5%)	58 (35.2%)	51 (30.0%)	56 (33.1%)	50 (32.9%)	
College graduate or more	90 (51.1%)	90 (55.6%)	92 (54.4%)	91 (55.2%)	102 (60.0%)	92 (54.4%)	89 (58.6%)	
Annual Income > $25,001	102 (58.0%)	103 (63.6%)	113 (66.9%)	95 (57.6%)	99 (58.2%)	114 (67.5%)	99 (65.1%)	0.22
Has health insurance	142 (80.7%)	131 (80.9%)	135 (79.9%)	146 (85.9%)	144 (87.3%)	144 (85.2%)	124 (81.6%)	0.39
Diabetic	10 (5.7%)	10 (6.2%)	8 (4.7%)	8 (4.9%)	10 (5.9%)	10 (5.9%)	5 (3.3%)	0.92
Takes medication(s) regularly	64 (36.4%)	48 (29.6%)	56 (33.1%)	53 (32.1%)	57 (33.5%)	59 (34.9%)	61 (40.1%)	0.58
Cost influences decision to try a medication								0.68
Never	18 (28.1%)	14 (29.2%)	15 (26.8%)	11 (20.8%)	14 (24.6%)	14 (23.7%)	14 (23.0%)	
Often	33 (51.6%)	27 (56.3%)	27 (48.2%)	31 (58.5%)	25 (43.9%)	35 (59.3%)	37 (60.7%)	
Always	13 (20.3%)	7 (14.6%)	14 (25.0%)	11 (20.8%)	18 (31.6%)	10 (17.0%)	10 (16.4%)	

[a] Table values are mean ± SD for continuous variables and n (column %) for categorical variables.

[b] Percentages may not sum to 100% due to rounding.

[c] P-value is for F-test (continuous variables) or χ^2 test (categorical variables).

[d] Questions were answered only by participators who takes medication(s) regularly.

Table 3. Relative importance of each attribute across the seven cost formats

Attributes	Cost Format							
	Affordability	Monthly Co-pay	Dollar Sign Rating	How Cheap	How Expensive	Percentage of Monthly Income	Working Hours Equivalent	p [f]
Route of administration	11.3 ± 0.9 [a]	13.1 ± 1.0 [a, b]	10.5 ± 0.9 [a]	15.4 ± 1.0 [b]	12.4 ± 0.9 [a]	12.4 ± 0.9 [a]	12.2 ± 1.0 [a]	0.01
Efficacy	22.7 ± 1.0 [d]	27.7 ± 1.0 [b, c]	32.5 ± 1.0 [a]	30.1 ± 1.0 [a, b]	31.5 ± 1.0 [a]	25.4 ± 1.0 [c]	31.6 ± 1.0 [a]	<.0001
Risk of low blood sugar	23.1 ± 0.9 [c]	19.7 ± 1.0 [d]	23.5 ± 1.0 [c]	33.8 ± 1.0 [a]	28.3 ± 1.0 [b]	22.8 ± 1.0 [c]	28.9 ± 1.0 [b]	<.0001
Frequency of checking blood sugar levels	5.7 ± 0.4 [c]	6.7 ± 0.4 [b, c]	7.1 ± 0.4 [b]	8.7 ± 0.4 [a]	8.8 ± 0.4 [a]	6.5 ± 0.4 [b, c]	6.5 ± 0.4 [b, c]	<.0001
Cost	37.3 ± 0.9 [a]	32.8 ± 0.9 [b]	26.3 ± 0.9 [c]	12.1 ± 0.9 [e]	19.1 ± 0.9 [d]	33.0 ± 0.9 [b]	20.8 ± 1.0 [d]	<.0001

[a, b ,c , d, e] LS Means with the same letter are not significantly different.

[f] P-value is for F-test.

Table 4. Description of medications used to estimate preferences

Medications	Route of administration	Efficacy	Risk of low blood sugar	Frequency of checking blood sugar levels	Cost
Insulin	Injection (shot) under the skin once a day	Extremely effective (this medication is enough)	30% risk	1 time per day	Level 2 (Medium)
Sulfonylurea	1 pill twice a day	Moderately effective (may need another medication)	20% risk	3 times per week	Level 1 (Low)
Exenatide	1 pill twice a day	Moderately effective (may need another medication)	1% risk	No monitoring necessary	Level 3 (High)

List of figures

Figure 1. An example of one of the choice sets

	Option 1	Option 2	Option 3
How you take it	Injection (shot) under the skin once a day	1 pill twice a day	Injection (shot) under the skin once a day
How well the medication works	Extremely effective (this medication is enough)	Moderately effective (may need another medication)	Mildly effective (usually need another medication)
Risk of low blood sugar	1% risk	1% risk	20% risk
Frequency of checking your blood sugar level	3 times per week	No monitoring necessary	1 time per day
Cost to you	Somewhat affordable	Easily affordable	Easily affordable
	○	○	○

Figure 2. Cost utilities for each level across the seven formats.

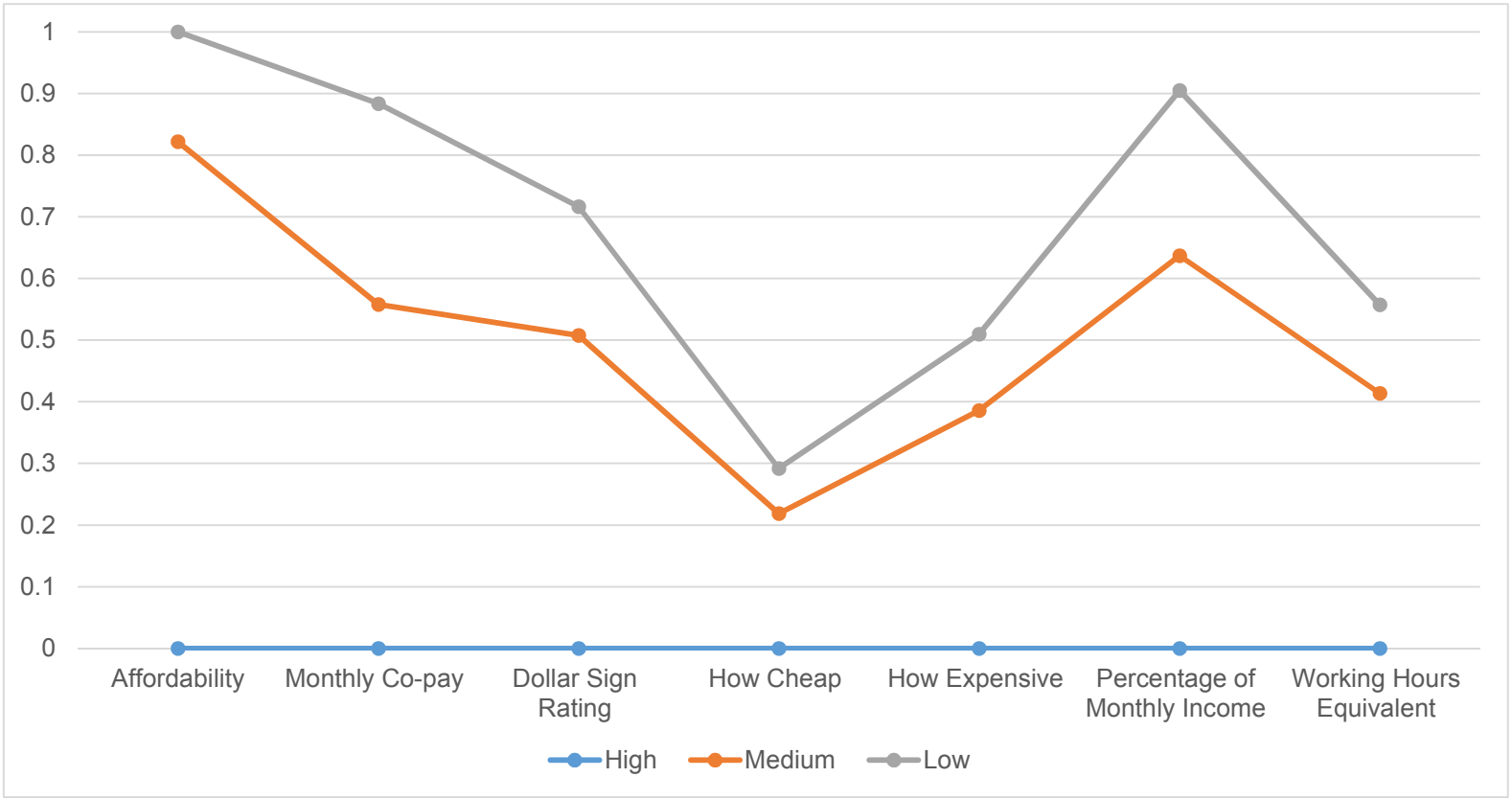


Figure 3. Relative importance of attributes across cost formats

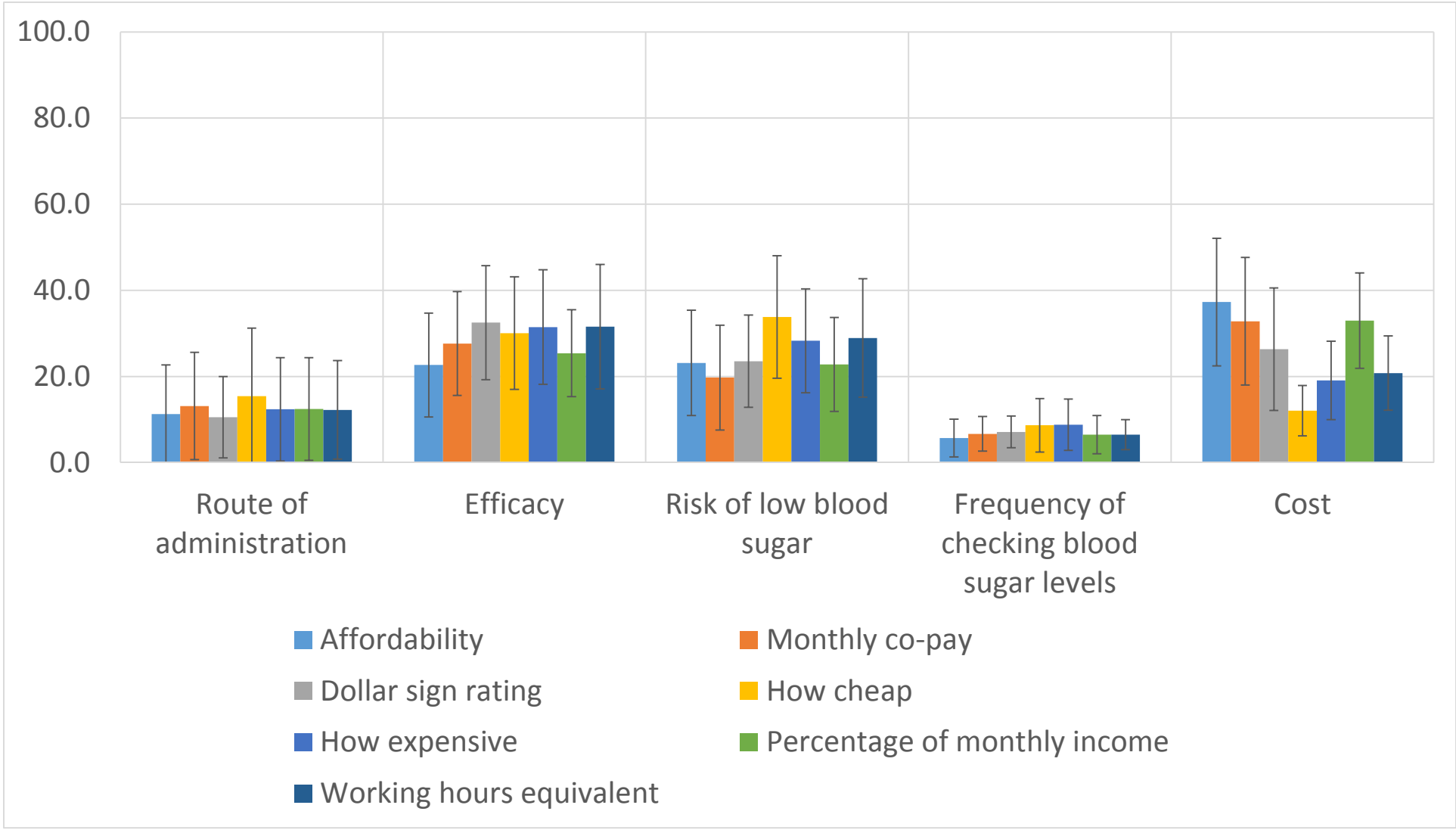


Figure 4. Estimated preference among exenatide, sulfonylureas and insulin

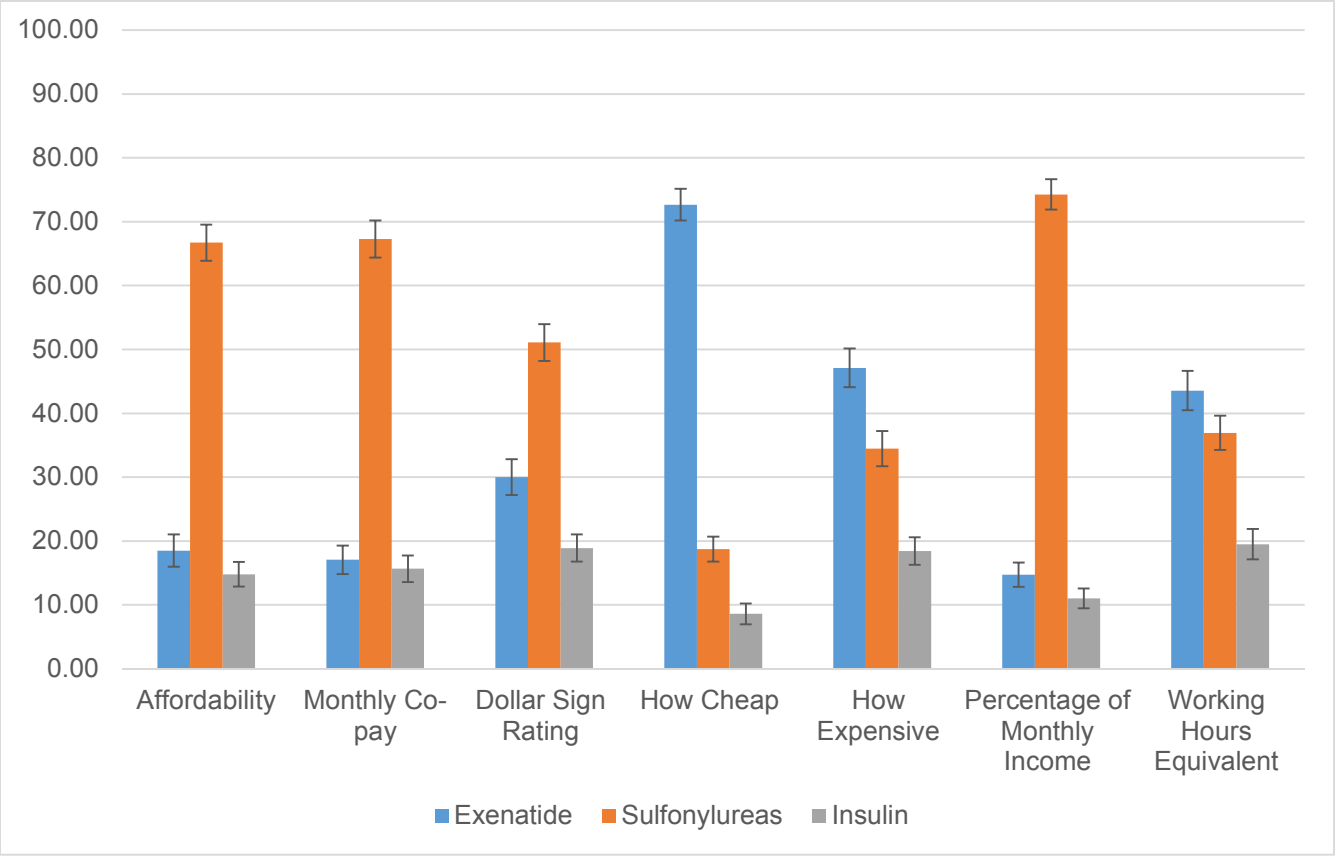
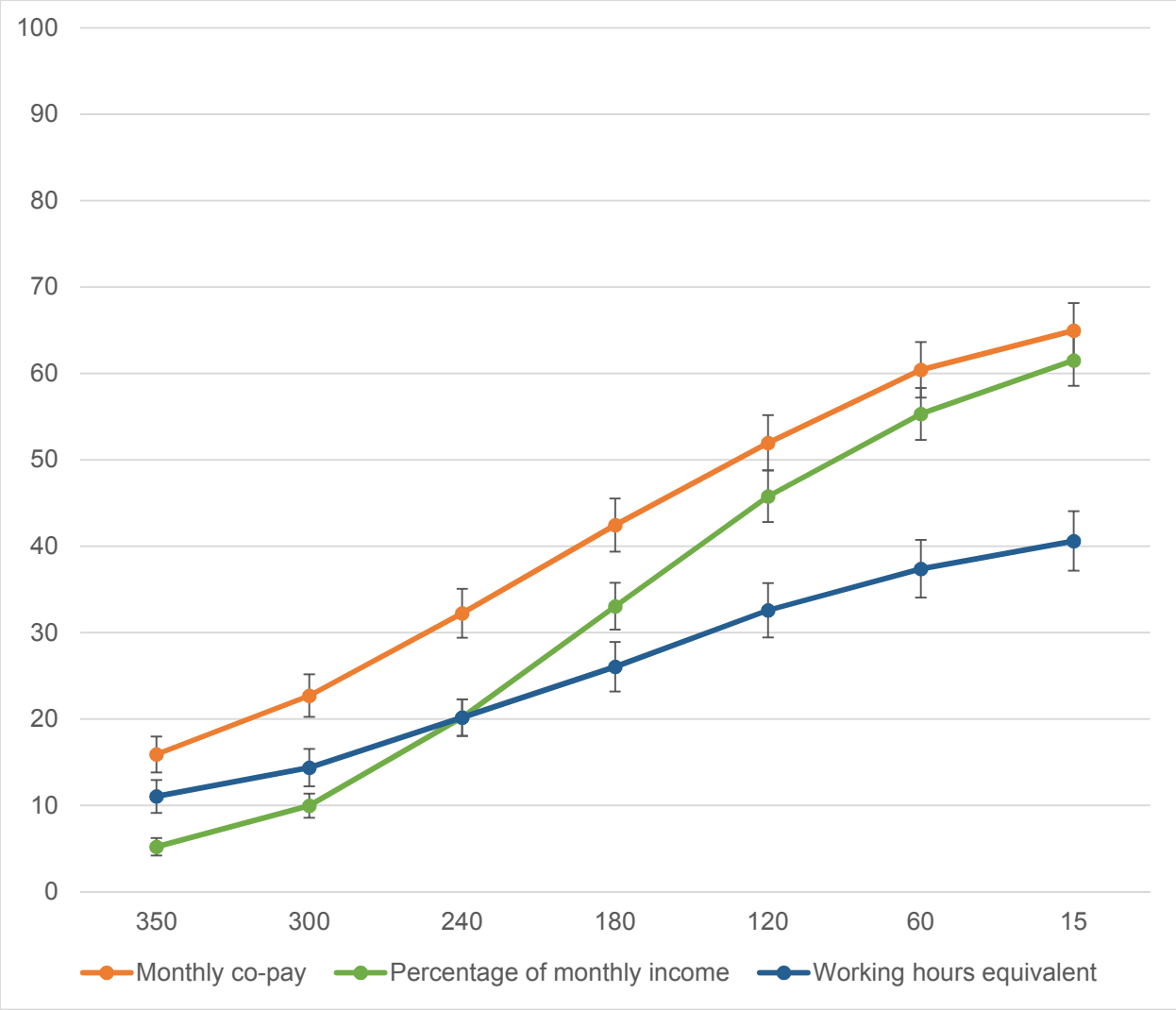


Figure 5. Estimated probability of choosing insulin over exenatide as the cost of exenetide is decreased.



Introduction

Numerous studies have found that out-of-pocket cost strongly influences patients' decision-making. Goldman et al [1] and Cole et al [2] found that a 10% increase in cost sharing is associated with 1-6% reduction in patients' prescription drug spending and decreased medication adherence. Shapiro et al [3] showed that patients participating in a cost-sharing program were less likely to seek medical care for minor symptoms and to be hospitalized for more serious symptoms compared to those receiving free care. Patients also consider cost when comparing available treatment options. Tseng et al [4] found that of 5,085 diabetic patients across 10 health plans, at least two-thirds were willing to consider lower cost medications with less efficacy, more frequent dosing, or a slightly higher chance of side effects. Despite the significant impact of cost on patient decision-making, medication expense is rarely discussed during medical encounters [5,6] and, in general, physicians feel uncomfortable discussing costs with their patients [7,8]. Compounding the problem is that specific costs vary widely and are often difficult to access [9].

The increasing awareness of cost as a possible treatment harm has led to a call to recognize cost as a specific attribute that should be weighed in parallel with other treatment characteristics [10–12]. This stance is compatible with recent studies demonstrating that most patients want to know about out-of-pocket costs and feel comfortable discussing cost with their physicians [13]. However, little is known about how best to describe cost and whether different cost formats influence patient decision making. Blumenthal-Barby et al [14] found that cost-related data were mentioned in 56% of the patient decision aids using nine different approaches. However, whether and how varying formats influenced decision making was not examined.

In order to address this gap in knowledge, we designed an experimental study to explore the impact of specific cost formats on individuals' decision making. We used an online choice-based conjoint (CBC) survey to quantify how the presentation of cost information influences the

importance that individuals attach to out-of-pocket costs and to their preferences for specific treatment options. CBC is a widely used method to elicit preferences that has been shown to yield valuable insights across many health-related scenarios [15,16]. Participants' preferences are measured by their choices on a set of hypothetical options described by a predefined list of attributes. Responses generate a set of part-worth utilities that can be used to calculate the relative importance of each attribute and to predict preference for specified treatment options.

The survey was designed to elicit preferences for a range of medications used to treat diabetes mellitus. Diabetes was chosen because the disease is familiar to the general public and people are generally aware of the importance of controlling blood sugar levels. We developed seven versions of the survey which were identical except for the format used to describe out-of-pocket cost. Given the known influence of format on patients' choices, we hypothesized that the relative importance of cost and treatment preferences will vary by format.

Methods

Subjects

We recruited 1500 participants from Amazon's Mechanical Turk (MTurk). MTurk is an online labor market. Its population is more demographically diverse than standard internet samples [17]. Participants on MTurk are internally motivated and produce psychometrically sound data [18,19]. While, not representative of a patient population, MTurk is a valuable approach to examine the impact of manipulating factors using experimental designs. We included subjects currently living in U.S who were at least 20 years old. Participants were paid $1.00.

Survey

We developed an educational overview of diabetic medication management, and an explanation of each of the attributes and levels included in the survey, using Qualtrics (see Appendix). At the end of the educational component, we provided subjects with a link to access

one of the seven versions of the CBC survey using random assignment. Randomization was conducted by Qualtrics.

The CBC survey was designed, conducted and analyzed with Sawtooth Software, Choice Based Conjoint, Version 8.4.3. The survey included five attributes (see Table 1). Three levels were used in all attributes except for route of administration. The attributes were selected based on the content of a previously published decision aid [20]. We developed seven versions of the CBC survey. All seven versions were identical except for the cost attribute. We described cost in terms of: *Affordability*, *Monthly co-pay*, *Dollar Sign Rating*, *How Expensive* compared to other medications, *How Cheap* compared to other medications, *Monthly Co-pay*, and *Working Hours Equivalent* (per month) and *Percent of Monthly Income* (Table 1). The levels for *Working Hours Equivalent* and *Percent of Monthly Income* were defined based on WHO reports on affordability of medications and the median net compensation U.S. per capita [21,22].

Participants were asked to respond to 12 CBC choice sets, each including three options. A “None” option was not included. An example of a choice set is provided Figure 1. We used the software’s complete enumeration strategy to construct the 12 choice sets. This approach ensures that 1) each level is shown as few times as possible in a single task; 2) each level is shown approximately an equal number of times across the choice tasks; and 3) the level of one characteristic is chosen independently of the levels of other characteristics, so that each characteristic level's effect can be reliably estimated. The program was set to generate a design for 300 versions of the CBC survey in each group. The standard error for each level was 0.02 and the efficiencies reported were all 1.000. In addition to the 12 random CBC choice sets, two fixed tasks with a clear advantageous option were set to check participants’ attention. After the respondents completed the CBC survey, we collected data on participants’ age, gender, income, education level, history of chronic medication use, occupation and whether or not they had diabetes.

Statistical Analysis

For each respondent, part-worth utilities (zero-centered values) were calculated for each level of each attribute using Hierarchical Bayes (HB) modeling (Sawtooth CBC/HB system for hierarchical Bayes estimation version 8.4.6). The part-worth utilities are interval data. HB modeling has the advantage that it can better incorporate heterogeneity between respondents' choices [23]. In HB modeling, the sample averages (prior information) are used to update the individual utilities in a number of iterations until the sample averages stop changing between iterations. After this convergence, the cycle is run several thousand more times and the estimates of each iteration are saved and averaged. We rescaled the utilities on a scale of 0 to 1, using the highest cost level as the reference (0) and the highest utility across all formats as 1.

We calculated the percentage of importance that respondents assigned to each attribute by dividing the range of part-worth utilities for each attribute by the sum of the ranges and multiplying by 100. We used Sawtooth Software Market Research Tools (SMRT) to estimate preferences for three potential second line medications for type 2 diabetes [24]: insulin, a sulfonylurea, and exenatide. For this simulation, a sulfonylurea was assigned the lowest level, insulin the middle level, and exenatide the most expensive level across cost formats. The levels assigned to each of these treatment options are provided in Table 4. We also used SMRT to illustrate participants' price sensitivity for preferring insulin over exenatide as monthly co-pays for exenatide were decreased from $350 to $15 per month while holding the cost of insulin at $120 per month.

We excluded subjects who did not answer either of the attention-check questions correctly: 48 participants failed to answer both attention-check questions correctly and 122 failed to answer one correctly. We subsequently excluded an additional 77 participants who completed the survey in less than 3.5 minutes (the 5th percentile). Preference data were imported into SAS Version 9.3 and merged with the respondents' characteristics. We compared participants' characteristics across the seven versions, using the chi-square test for categorical data and ANOVA for continuous data. We compared the relative importance of the cost attribute

across the seven formats using ANOVA and Tukey's method to correct for multiple comparisons. The study was approved by the Human Investigation Committed at our institution.

Results

Participants

1163 eligible participants were included in the final analyzes. Participants' age ranged from 18 to 73 years, with a mean of 35.3 years (SD, 11.5 years). Most participants had finished high school (99.5%), 37.6% earned less than $25,000 per year, and 34.2% took medication regularly. Characteristics were similar across the seven versions of the CBC survey (Table 2).

Cost Utilities and Relative Importance

Figure 2 plots the rescaled utilities for each level of cost across the seven formats. Lowering cost from the high to medium level had a larger impact compared to lowering cost from the medium to lowest level for all formats. This difference was most evident for the *Affordability* and *Percent of Monthly Income* formats. Increasing cost from the lowest to the medium level had the greatest impact in the *Monthly Co-pay* and *Percent of Monthly Income* formats.

The relative importance of cost differed significantly across the seven cost formats (Table 3, Figure 3). Cost had the greatest influence on participants' decisions when framed in terms of *Affordability*, with the relative importance of cost in this version being significantly higher than in the remaining six. In contrast, cost had the least influence on participants' decisions when framed as *How Cheap*. Cost was the most influential of the five attributes when framed in terms of *Affordability*, *Monthly Co-pay* or *Percentage of Monthly Income*.

Treatment Preferences

Predicted preferences for insulin, exenatide, and a sulfonylurea are described in Figure 4. A sulfonylurea is strongly preferred option across four of the cost formats. Exenatide is preferred when cost is described using the *How Cheap* format. In this format, the risk of low

blood sugar is the most important attribute (Table 3), and it is substantially lower with exenatide than a sulfonylurea. A similar pattern is seen with the *How Expensive* format. Preference for insulin, the most effective, albeit the riskiest option, is low across all cost formats.

Figure 5 reveals the estimated preferences for insulin (Held fixed at $120 per month) over exenatide as out-of-pocket costs of exenatide are decreased from $350 to $15 per month. When described in terms of *Percent of Monthly Income* or *Monthly Co-pay*, preference for insulin supersedes that of exenatide once the cost of insulin is decreased to $60 or less per month. When described in terms of *Working Hours Equivalent*, insulin is never preferred over exenatide, even at the lowest copays.

Discussion

In this study, we explored whether and how varying cost presentation formats influence individuals' decision making. Our results demonstrated that the relative importance of cost and treatment preference are sensitive to the manner in which cost is described. We found that cost had the largest impact when described in terms of *Affordability* and the lowest impact when described in terms of *How Cheap* the medication is compared to other options. *Affordability* may have had the largest impact on subjects' choices because the lowest level "Hard to Afford" may be especially displeasing. In addition, unlike the formats describing a specific numeric estimate, "Hard to Afford" is likely to have a negative impact on all subjects, regardless of income level. *Affordability* may also be the most evaluable format. According to the evaluability hypothesis, attributes which are more easily evaluated have a larger impact on choice[25]. While we were not surprised to find that the *How Cheap* format had the smallest influence on subjects' choices, we did not expect "This medicine is much more expensive compared to others" to be less concerning to subjects then several of the other formats. It is possible, that people are accustomed to medications being expensive, thus perhaps dampening the impact of this format on subjects' reactions. Interestingly, subjects were more influenced by cost when described in

terms of *Percent of Monthly Income* than *Working Hours Equivalent* despite these two formats representing equivalent cost estimates. “15%” may have been perceived as larger to subjects than “3 days” of income. Alternatively, *Percent of Monthly Income* may be more “evaluable” than *Working Hours Equivalent*. *Percent of Monthly Income* may also have had a greater impact, since it may have been more easily interpreted as income lost, compared to *Working Hours Equivalent*. This explanation would be in keeping with prospect theory’s description of loss aversion [26,27].

The differences in the impact of cost over the formats studied translated into differences in preferred treatment options. Despite being less effective and more likely to cause hypoglycemia than insulin, the sulfonylurea is preferred across four of the seven formats because they are less costly. Exenatide, the most expensive option, is preferred in the remaining three formats, most notably when using the *How Cheap* format. This finding has potentially important clinical implications, as varying terminology may influence patients in a manner which could alter treatment decisions. Thus, future research should determine if alternative formats impact on patients’ decisions in clinical settings.

To the best of our knowledge, this is the first study to explore the impact of varying cost formats on subjects’ decision making. We used a randomized, between-subjects, experimental design, which enabled us to isolate the effect of the manipulated variable. In addition, CBC enabled us to quantify the relative importance of cost as an attribute, to compare differences in subjects’ reactions to increasing cost from a low to medium level versus a medium to high level, and to estimate preferences for competing treatment options. There are also several limitations of the study. First, as with other studies using simulated scenarios, stated preferences may not reflect the actual decision-making process in a clinical setting which involves many other important issues. Furthermore, although we designed the surveys based on a pre-established decision-aid for escalation of diabetic care, patients may consider other attributes when making treatment decisions. In addition, since this study was conducted online using MTurk workers,

most of whom were not taking medications on a regular basis, we were not able to describe differences between participants and patients with diabetes. Next, this study focused only on the escalation of diabetes treatment. Further research should examine whether the similar effects would be observed in other scenarios. Lastly, we hypothesized that evaulability may have accounted for some of the differences seen. Future studies should test this hypothesis and explore additional reasons underlying the variability observed in this study.

In summary, we found that the format by which cost is presented has a significant impact on peoples' choices. Participants in this study were most cost-sensitive when considering how affordable a medication is, and least influenced by cost when considering how cheap a medication is compared to others. When using actual numerical values to describe co-pays, *Working Hours Equivalent* hours has less impact than either *Monthly Co-pays* or *Percent of Monthly Income.* Clinicians and researchers should be aware of the potential impact of variable presentation formats on decision making. These results support the need to evaluate the impact of presentation of cost on decision making in clinical contexts.

Reference

1 Goldman DP, Joyce GF, Zheng Y. Prescription drug cost sharing: associations with medication and medical utilization and spending and health. JAMA 2007;298:61–9.

2 Cole JA, Norman H, Weatherby LB, Walker AM. Drug copayment and adherence in chronic heart failure: effect on cost and outcomes. Pharmacotherapy 2006;26:1157–64.

3 Shapiro MF, Ware JE, Sherbourne CD. Effects of cost sharing on seeking care for serious and minor symptoms. Results of a randomized controlled trial. Ann Intern Med 1986;104:246–51.

4 Tseng CW, Waitzfelder BE, Tierney EF, Gerzoff RB, Marrero DG, Piette JD et al. Patients' willingness to discuss trade-offs to lower their out-of-pocket drug costs. Arch Intern Med 2010;170:1502–4.

5 Shrank WH, Joseph GJ, Choudhry NK, Young HN, Ettner SL, Glassman P et al. Physicians' perceptions of relevant prescription drug costs: do costs to the individual patient or to the population matter most? Am J Manag Care 2006;12:545–51.

6 Alexander GC. Patient-physician communication about out-of-pocket costs. JAMA 2003;290:953.

7 Kelly RJ, Forde PM, Elnahal SM, Forastiere AA, Rosner GL, Smith TJ. Patients and physicians can discuss costs of cancer treatment in the clinic. J Oncol Pract / Am Soc Clin Oncol 2015;11:308–12.

8 Neumann PJ, Palmer JA, Nadler E, Fang C, Ubel P. Cancer therapy costs influence treatment: a national survey of oncologists. Health Aff (Millwood) 2010;29:196–202.

9 Cooke M. Cost consciousness in patient care - what is medical education's responsibility? N Engl J Med 2010;363:1–3.

10 Moriates C, Shah NT, Arora VM. First, do no (financial) harm. JAMA 2013;310:577.

11 Ubel PA, Abernethy AP, Zafar SY. Full disclosure — out-of-pocket costs as side effects. N Engl J Med 2013;369:1484–86.

12 Schrag D, Hanger M. Medical oncologists' views on communicating with patients about chemotherapy costs: A pilot survey. J Clin Oncol 2007;25:233–7.

13 Bullock J, Hofstatter EW, Yushak ML, Buss MK. Understanding patients' attitudes toward communication about the cost of cancer care. J Oncol Pract 2012;8:e50–e58.

14 Blumenthal-Barby JS, Robinson E, Cantor SB, Naik D, Russell HV., Volk RJ. The neglected topic: presentation of cost information in patient decision aids. Med Decis Making 2015;35:412–8.

15 Ryan M, Farrar S. Using conjoint analysis to elicit preferences for health care. BMJ 2000;320:1530–3.

16 Ryan M, Gerard K, Amaya-Amaya M. Using discrete choice experiments to value health and health care. Dordrecht: Springer Netherlands; 2008.

17 Paolacci G, Chandler J. Inside the turk: understanding mechanical turk as a participant pool. Curr Dir Psychol Sci 2014;23:184–8.

18 Casler K, Bickel L, Hackett E. Separate but equal? A comparison of participants and data gathered via amazon's mturk, social media, and face-to-face behavioral testing. Comput Hum Behav 2013;29:2156–60.

19 Buhrmester M, Kwang T, Gosling SD. Amazon's mechanical turk: a new source of inexpensive, yet high-quality, data? Perspect Psychol Sci a J Assoc Psychol Sci 2011;6:3–5.

20 Shillington AC, Col N, Bailey RA, Jewell MA. Development of a patient decision aid for type 2 diabetes mellitus for patients not achieving glycemic control on metformin alone. Patient Prefer adherence 2015;9:609–17.

21 Mendis S, Fukino K, Cameron A, Laing R, Filipe A, Khatib O et al. The availability and affordability of selected essential medicines for chronic diseases in six low-and middle-income countries. Bull World Heal Organ 2007;85.:279–88.

22 US Office of Social Security. Average wages, median wages, and wage dispersion. 2015.

https://www.ssa.gov/oact/cola/central.html. Accessed November 2, 2015.

23 Sawtooth Software. The CBC/HB System for hierarchical Bayes estimation version 4.0 technical paper. Sawtooth Software Research Paper; 2009 https://www.sawtoothsoftware.com/download/techpap/hbtech.pdf. Accessed March 31, 2016.

24 American Diabetes Association. Standards of medical care in diabetes--2015: summary of revisions. Diabetes Care 2015;38 Suppl:S4.

25 Hsee CK. The evaluability hypothesis: An explanation for preference reversals between joint and separate evaluestions of alternatives. Organ Behav Hum Decis Process 1996;67:247–57.

26 Tversky A, Kahneman D. Advances in prospect theory: cumulative representation of uncertainty. J Risk Uncertain 1992;5:297–323.

27 Kahneman D, Tversky A. Prospect theory: an analysis of decision under risk. Econometrica 1979;XLVII:263–91.

Appendix

Diabetes is a major health problem in the US. This survey is designed to help us understand how patients feel about blood sugar medications. Before we start the survey, we will provide you with some essential information about this disease.

What happens if diabetes isn't well controlled?

People with diabetes have increased levels of sugar in their blood. Over time, diabetes leads to an increased risk of heart disease, strokes, kidney disease, vision problems and neurologic disease.

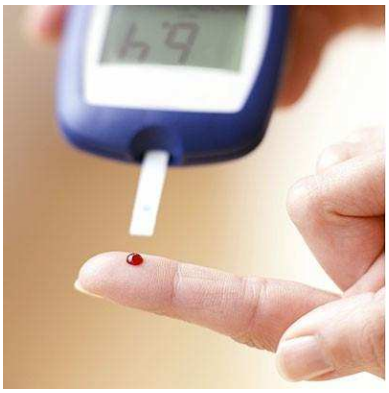
How is diabetes treated?

Blood sugars levels can be controlled with different types of medications. The main side effect of all of these medications is low blood sugar.

Low blood sugar is a condition that can cause symptoms ranging from sweating and feeling hungry to passing out, when the blood sugar level is too low. Low blood sugar is treated by administering sugar either in the form of food (example juice) or if necessary by an infusion.

How do patients make sure their blood sugar is at the correct level?

People with diabetes prick their skin to get a drop of blood. The drop of blood is put into a blood sugar monitor which displays the blood sugar level.



This survey is designed to help us understand how patients feel about medications.

Please imagine that you have diabetes and need to choose a medication.

The computer program will show you made-up treatment options for diabetes and then will ask you to pick the one you prefer. Take your time to read through each question. There are no right or wrong answers.

Each medication will be described using 5 pieces of information:

1. The way the medication is taken
2. The frequency of checking your blood sugar level
3. How well the medication works
4. Risk of low blood sugar
5. The cost to you

The next few pages will give you some more detail about each of these 5 facts:

There are 2 ways that these medications can be taken:

1. As **a pill twice a day:** Half are taken in the morning and half in the evening.
2. As **an injection (shot) under the skin**: You give yourself an injection once a day.

How well the medication works:

The medications will be described as either:

Extremely effective: Extremely effective means that most patients' blood sugar levels decrease to the ideal range.

Moderately effective: Moderately effective means that most patients' blood sugar levels decrease significantly. But, some patients will need a second medication to keep their blood sugar in the ideal range.

Mildly effective: Mildly effective means that while the medication does help decrease blood sugar levels, almost every patient needs another medication to keep their blood sugar in the ideal range.

Low blood sugar is a **side effect** of many diabetes medications. Most diabetes medications help patients lower their blood sugar to the ideal level, but some of them often **go too far** and cause **this side effect of lower blood sugar**.

Mild symptoms of low blood sugar include feeling sweaty, dizzy, and trembling. If the blood sugar level is extremely low, people can become sleepy or confused, and may develop blurry vision and have trouble walking. Medications vary in **how frequently** diabetes medications cause this side effect.

3 risk levels of low blood sugar will be shown in this survey.

1. **1% risk**: This means that **1% or 1 per 100 people** who take this medication experience **the side effect of low blood sugar.**
2. **20% risk**: This means that **20% or 20 per 100 people** who take this medication experience **the side effect of low blood sugar.**
3. **30% risk**: This means that **30% or 30 per 100 people** who take this medication experience **the side effect of low blood sugar.**

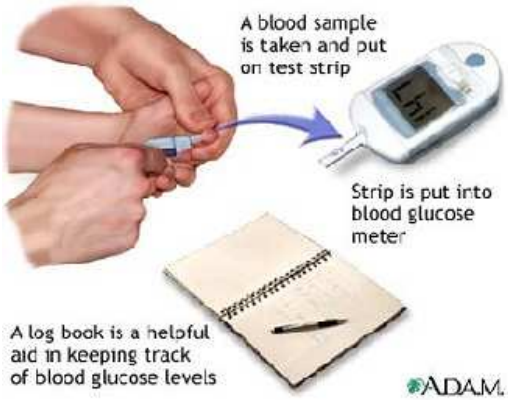
All patients with diabetes need to check their blood sugar levels regularly. This is done by pricking your skin to get a drop of blood as shown in the picture. A special monitor then displays the blood sugar level. Medication doses can then be adjusted based on the blood sugar levels. **How often blood sugar levels need to be checked depends on the medication you take.**

Attention: The frequency of checking blood sugar level is different from the frequency of taking medication.

The survey includes 3 options:

1. **No monitoring necessary:** This means that no blood sugar level monitoring is required while taking the medication.

2. **3 times per week:** This means that you need to check your blood sugar levels 3 times per week (every other day) while taking the medication. For example, you can do it every Monday, Wednesday and Friday or every Tuesday, Thursday, and Saturday.



3. **1 time per day:** This means that you need to check your blood sugar levels once each day. You can do it in the morning, afternoon or evening.

7 formats of cost

Affordability

Lastly you will also see some information on the **cost of the medication**. Here we are talking about the cost you need to pay out of pocket (whether or not you have insurance).

The survey will include 3 estimates of cost:

1. **Easily affordable:** This means that you don't need to make **any** changes in your budget in order to be able to pay for the medication.

2. **Somewhat affordable:** This means that you need to make **some** changes in your budget in order to be able to pay for the medication.

3. **Hard to afford:** This means that you need to make **major** changes in your budget in order to be able to pay for the medication.

Assume you have no other costs such as a deductible.

Monthly Co-pay

Lastly you will also see some information on the **cost of the medication**. Here we are talking about the cost you need to pay out of pocket (whether or not you have insurance).

The survey will include 3 estimates of cost:

1. **$350 for a one month's supply:** This means that you need to pay $350 for a one month's supply of medication.
2. **$120 for a one month's supply:** This means that you need to pay $120 for a one month's supply of medication.
3. **$15 for a one month's supply:** This means that you need to pay $15 for a one month's supply of medication.

Assume you have no other costs such as a deductible.

Dollar Sign

Lastly you will also see some information on the **cost of the medication**. Here we are talking about the cost you need to pay out of pocket (whether or not you have insurance).

The survey will include 3 estimates of cost:

1. **$$$:** This means that you need to pay $350 for a one month's supply of medication.
2. **$$:** This means that you need to pay $120 for a one month's supply of medication.
3. **$:** This means that you need to pay $15 for a one month's supply of medication.

Assume you have no other costs such as a deductible.

How Cheap (compared to other medication)

Lastly you will also see some information on the **cost of the medication**. Here we are talking about the cost you need to pay out of pocket (whether or not you have insurance).

The survey will include 3 estimates of cost:

1. This medicine is **cheaper** compared to others
2. This medicine is **somewhat cheaper** compared to others
3. This medicine is **much cheaper** compared to others

Assume you have no other costs such as a deductible.

How Expensive (compared to other medication)

Lastly you will also see some information on the **cost of the medication**. Here we are talking about the cost you need to pay out of pocket (whether or not you have insurance).

The survey will include 3 estimates of cost:

1. This medicine is **not more expensive** compared to others
2. This medicine is **somewhat more expensive** compared to others
3. This medicine is **much more expensive** compared to others

Assume you have no other costs such as a deductible.

Percentage of Monthly Income

Lastly you will also see some information on the **cost of the medication**. Here we are talking about the cost you need to pay out of pocket (whether or not you have insurance).

The survey will include 3 estimates of cost:

1. **15% of monthly income for a one month's supply:**

This means that a 1 month's supply of medication may cost you 15% of monthly income.

2. **5% of monthly income for a one month's supply:**

This means that a 1 month's supply of medication may cost you 5% of monthly income.

3. **1% of monthly income for a one month's supply:**

This means that a 1 month's supply of medication may cost you 1% of monthly income.

Assume you have no other costs such as a deductible.

Working Hours Equivalent

Lastly you will also see some information on the **cost of the medication**. Here we are talking about the cost you need to pay out of pocket (whether or not you have insurance).

The survey will include 3 estimates of cost:

1. **3 days of work for a one month's supply:**

This means that the cost of one month's supply of medication is the same as what you earn for 3 days of work.

2. **1 day of work for a one month's supply:**

This means that the cost of one month's supply of medication is the same as what you earn for 1 day of work.

3. **2 hour of work for a one month's supply:**

This means that the cost of one month's supply of medication is the same as what you earn for 1 hour of work.

Assume you have no other costs such as a deductible.