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# An Investigation on Social Comparison and Life Satisfaction using Anchoring Vignettes

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# 1 Introduction

In recent years, there has been a growing interest amongst economist and policy-makers in using Life Satisfaction (LS) as an means to evaluate the welfare of individuals and societies (Alder, 2013). To measure LS, researchers directly ask individuals to evaluate their overall life situation and report their wellbeing as a single value. In surveys, individuals are usually asked the following question: *“Taking all things into account, on a scale of 0 to 10, how satisfied are you with your life overall?”*.

Using data on the socioeconomic conditions and personal characteristics of individuals, many studies investigated the extent to which economic, health, and social conditions affects LS (Asadullah, Xiao, & Yeoh, 2016; A. Clark, Frijters, & Shields, 2008; Blanchflower & Oswald, 2004). In these studies, the following model is commonly used:

$$y = Bx + e \tag{1}$$

where  $y$  is the self-reported LS (which can either be ordinal or cardinal in nature),  $x$  is a vector of life domains (ex: income and health), and personal characteristics such as age, gender, and ethnicity, and  $e$  is the error term that accounts for determinants of  $y$  that are not captured by the model.

From regression analysis, researchers estimate  $B$ , which represents the coefficients of  $x$  in the regression model. The marginal effect of each life domain on LS is thus determined, and the the question *“What makes for a good life?”* can be answered from empirical studies.

## 1.1 The Determinants of Life Satisfaction

This section briefly reviews the research litertaure on the determinants of life satisfaction.

## **Income**

Many previous studies focused on the relationship between the absolute levels of life domains and LS, and one domain that has been studied extensively is income. The general finding is that income has a positive effect on LS. Please refer to (Dolan et al., 2008) for a comprehensive review. (Helliwel & Barrington-Leigh, 2010; Deaton, 2008) showed that there is a linear relationship between LS and household income measured in logarithmic terms. This finding is interesting because it suggests income has significant effect on LS even in affluent societies; whereas classical economic theory expect the opposite due to the diminishing marginal utility of income.

## **Health**

Similarly, physical health is positively correlated with LS (Mroczek & Spiro, 2007; Andersson, 2008). Good health is associated with high LS, whereas chronic illness (ex: heart disease and diabetes), adverse health behaviours such as physical inactivity (Strine et al., 2008), and obesity (Kuroki, 2016) negativity impact LS. For this reason, health policies should be evaluated not only based on healthcare costs and physical health but also in the context of LS. For example, an effective campaign that promotes physical activity (walking for 30 minutes per day) has the additional value of not only improving people's health, but also their overall LS. Physical health also has secondary and indirect effects on LS since they influence other determinants of LS. For example, (Boonstra et al., 2013) found that patients with chronic musculo-skeletal pain report lower LS. This is in part exacerbated by the fact that chronic pain is negatively associated with lower satisfaction with job, sex life, and social relationships, which in turn further impacts LS.

## **Employment and Hours Worked**

Perhaps not surprisingly, work and daily activities have large influence on LS. Studies found that individuals who are unemployed have around 5-15% lower LS than those that are employed (Helliwell, 2003; Tella, MacCulloch, & Oswald, 2001). Furthermore, men are more adversely affected by unemployment than woman (A. Clark, 2003). This is likely due to the adverse impact of social pressure as

men are still considered by many societies (including the US) as the primary breadwinner. The authors in (A. Clark, 2003) suggests that the extent to which unemployment affects LS depends on whether an individual can substitute employment with other daily activities, maintain social relationships, and whether the individual can legitimately justify their unemployment status. This finding suggests that losing a job means more than losing a source of income. The unemployed individual also loses social contacts, a sense of purpose that comes from daily engagement in work, and social status that is associated with being employed – all of which negatively affects LS. While studies show that work is better than no work, the relationship between the amount of work (as measured in hours worked) and LS is equivocal. While some studies suggest that the number of hours worked has no effect on LS (Blanchflower & Oswald, 2004), this is contradicted by the results in other studies (Luttmer, 2005). It is possible that the relationship between the number of hours worked and LS is dependent on whether the individual finds the work enjoyable and rewarding, or whether the work is congruous with his/her life purpose. For example, an aspiring start-up owner and a factory worker who engages in menial tasks might both work equally long hours, but the start-up owner would likely be less adversely affected by the long hours than the factory worker.

## **Social Relationships**

One of the more surprising findings in the Life Satisfaction literature is the significant impact of social relationships and community trust on well-being. Generally speaking, having deep interpersonal relationships with family, close friends, and neighbours significantly improves LS, and can mitigate the adverse effects of even the most calamitous life circumstances such as spinal cord injury (van Leeuwen et al., 2010). In (Helliwel & Barrington-Leigh, 2010), the authors show that having a sense of belonging in one’s community, social trust, and trust in one’s co-workers are more important in explaining LS differences among respondents than income. (Powdthavee, 2008) used a shadow pricing method to estimate the equivalent monetary value of an increase in the frequency of contact with friends and relatives (move from contact once or twice a month to contact on most days). The result

suggests a remarkable valuation of social relationships: after controlling for individual fixed effects, an increase in social interaction with friends and relatives is equivalent to an increase in per capita household income of 15,500 GBP per year.

These results highlight the misguided belief in many societies that a happy life can only be achieved by acquiring wealth, even at the expense of social relationships and health, which are often viewed as secondary goals. Contrary to this view, individuals need to effectively allocate time and energy to daily work, building social relationships and trust, and improving physical health to achieve a high level of life satisfaction.

## **1.2 Positional concerns and Life Satisfaction**

Although research has shown that life satisfaction is dependent on the absolute level of various life domains such as income, health, and social relationships, many studies (Birdal & Ongan, 2016; Asadullah et al., 2016; Alpizar, Carlsson, & Johansson-Stenman, 2005; Gokdemir & Dumludag, 2012) underscore the importance of social comparison and social status. In particular, many studies suggest that once a basic level of affluence is achieved, LS is less dependent on the individual's absolute income level, but more on how his/her income compare to the income of a reference group.

In a pioneering study (Easterlin, 1973), Easterlin discovered that happiness is positively correlated with income within a country at a point in time; but over time, the average happiness of a country does not change with the increase in the average income. There are several explanations for this paradox. First, aside from absolute income levels, individuals might also care about their income relative to people in their community (ex: coworkers, friends, or relatives). For this reason, when the average income of a country increases, the individual and those around him/her will both experience an increase in income. Since there are no relative changes in income for individuals with respect to their reference groups, the average well-being of the country remain constant. Second, with rising income also come rising expectations. It is possible that an individual does not only assess his/her income

relative to a reference group, but also relative to his/her past income (A. Clark et al., 2008). For this reason, individuals need to acquire ever higher levels of income to achieve greater LS. The implication this finding is that economic development strategies that focus solely on GDP will not improve the wellbeing of the country in the long run. Rather, it will lead to a positional arm races in income and consumption as individuals continuously need to consume more than their peers to improve their relative position in the community (Frank, 2008).

In addition to relative income, there are several empirical studies (Carlsson, Johansson-Stenman, & Martinsson, 2007; Solnick, Hongb, & Hemenway, 2007; Solnick & Hemenway, 2005; Alpizar et al., 2005) that investigate the positional concerns of a wide range of goods and bads such as vacations, cars, car safety, poor air quality, and national infant mortality. The objective of these studies is to identify which goods (or bads) are important for social comparison, and to what extent does the positional concern for certain goods stronger than others.

In these studies, the positional concerns of goods are assessed through a survey in which respondents choose between Society A where they have a higher level of a given good in absolute terms, but have less compared to others, and Society B where they have less goods in absolute terms, but they are better off relative to others in the society. The degree of positional concerns for goods (and bads) are inferred from the respondent's repeated choices between Society A and different variations of Society B.

A key finding is that goods are generally more positional than bads. This is because positional concerns play a larger role in gains than in losses. For example, while people prefer having a higher income than others; at the same time, they will always opt for less pollution or less back pain regardless of how they compare to other people. The studies also support the idea that some visible goods such as cars, clothing, and houses are more positional than less visible goods such as car safety and vacations (Carlsson et al., 2007). One explanation for this is that individuals care about both material consumption and social status. By having relatively more visible goods than others, individuals can derive higher social status which in turn leads to greater life satisfaction (Solnick & Hemenway, 2005).

There are several issues involving studies on the effect of positional concerns and life satisfaction. First, it is not possible for researchers to know the reference groups to which respondents compare their income and other life domains when assessing their social standing. Typically, researchers explicitly define the reference group for the respondents based on available data. For example, in (Asadullah et al., 2016), city average income was defined as the reference group income simply because it was available in the Chinese General Social Survey. In reality, there are many possible reference groups: individuals might compare themselves to relatives, friends, neighbours or coworkers. Individuals might also find it relevant to compare only with a specific subset of people in their reference groups. For example, it might be important for individuals to compare only with their immediate family members or with co-workers that has a similar level of seniority and education. Second, even if researchers were able to define a relevant reference group for the respondents, the income for high resolution reference groups (such as the average income of the respondent's neighbourhood) is generally not available from census data and thus cannot be used in regression analysis. In addition, information on other life domains such as BMI, frequency of exercise, and the number of close friends is even less likely to be available in census data, especially for high resolution reference groups.

There are only a handful of studies in the literature on the relative effects of life domains. In (Shields & Price, 2005), the authors found that the effect of unemployment on LS is dependent on the employment deprivation in the area. If the individual lives in an area with relatively high unemployment rate, then the negative effect of being unemployed can be mitigated. (A. Clark, 2003) uses the individual's life partner as the reference group to study the relative effects of unemployment. One of the main findings is that for an employed individual, having an unemployed partner results in a lower LS. In contrary, for the unemployed individual, having an employed partner improves his/her LS. There are also empirical studies on the relative concerns of physical health (Powdthavee, 2008), and body mass index (A. E. Clark & Etile, 2011).

In comparison to studies on relative income, there is only a small number of studies



that focus on the role of social comparison in other life domains such as physical health, social relationships, and community trust. Thus, more empirical studies is needed to investigate the relative effects of these life domains.

### 1.3 Research Objectives

Given the fact that many non-monetary life domains such as social relationships, employment, and physical health is important for LS; it is possible that individuals also care about their relative standings in these domains. Although a small number of studies suggest that in addition to relative income, LS is also dependent on social comparisons in a variety of domains, more empirical evidence is needed. Accordingly, the objectives of this research were chosen to address some of these outstanding questions in Life Satisfaction research, and can be summarized as follows.

1. Use a survey approach to verify the results in previous studies on the effects of the absolute levels of various life domains. Our focus will be on the effects of income, weekly hours worked, unemployment rate, physical health, social relationships, and community involvement, and social trust on life satisfaction. Since we prefer to use quantifiable variables, physical health is represented by three measures: 1) Frequency of Exercise, 2) Level of Pain and Discomfort, and 3) Body Mass Index (BMI). Similarly, social relationship is represented by 1) Number of Close Friends, 2) Frequency of seeing friends, and 3) Whether the individuals lives alone or with a partner. In the first phase of this project, we will field the survey to respondents living in the US. Once initial data from US respondents is collected and analyzed, the survey will be modified and field to respondents living in India.
2. Determine the extent to which social comparisons in various life domain affect life satisfaction. For example, do individuals care about whether he/she has less friends than most people in the community? And if so, how does the relative position in this domain affect LS? In sum, we are attempting to answer two important questions on the relative effect of life domains: 1) Which domain is important for social comparison? and 2) What is the positional concern of the domains that is identified by the respondent as important

for social comparison? Our survey is designed in a way that precipitate the respondents to identify relative domains that are most important to them. As mentioned previously, it is difficult for researchers to know a priori what reference group might be relevant for individuals. For this reason, we use the word “community” in the survey to refer to the reference group. By definition, community is a group of people that are similar in culture, values, and geographical proximity. Therefore, a community can be interpreted as workplace, neighbourhood, household, or city. In assessing the hypothetical situations in our survey (more on this in later sections), we want the respondents to interpret community as the reference group that is most important for social comparison.

3. Although we allow respondents to select the life domains that are important to them in the survey, this perceived importance of various life domains might not be a good predictor for their actual importance. We want to test the hypothesis that individuals do not know which domains is important for social comparisons, just as they do not know which life domain (in absolute terms) is important to them for a good life. To check for this hypothesis, we can directly ask the respondents to report their actual relative standings of the various life domains in their own communities. Next, we include the actual relative standings in our life satisfaction regression and compare the regression coefficients with the reported importance of the life domains.

## 2 Data and Method

This section begins with a brief overview on the methodology of anchoring vignettes, a survey technique that is used in this study. This is followed by a detail description on the design of the survey. Finally, the section concludes with an overview of Amazon’s Murk, a crowdsourcing platform that is used to conduct our survey, and a description of several strategies that were used to filter low quality survey responses.

### 2.1 Anchoring Vignettes

Anchoring vignettes is a set of supplementary questions that is presented to the survey respondents after the self-assessment questions in the survey. Rather than focusing on the respondents, a set of the vignettes that describe the life situation of a hypothetical person is presented to the respondents. The respondent is then asked to assess the life satisfaction of the hypothetical person using the same response scale as the self assessment questions.

For example, in our life satisfaction survey, the respondent is asked the following question in the self-assessment section:

*On a scale of 0 to 10, with 0 being extremely dissatisfied and 10 being extremely satisfied, how satisfied are you with your life overall?*

The respondent is then asked to evaluate the life satisfaction of five hypothetical persons that has the same culture and language as the respondent (the hypothetical persons are given names that are common in the respondent’s culture). However, the hypothetical persons might differ in other aspects of life such as income, physical health and social life. The following is an example:

*Please evaluate on a scale of 0 to 10, with 0 being extremely dissatisfied and 10 being extremely satisfied the life satisfaction of this person.*

David is 30 years old. He is employed and works 41 hours per week. The annual income

of his household is \$110,000. His body mass index (BMI) is 25, which is categorized as overweight by the World Health Organization (WHO). He usually experiences no pain or discomfort. He is active and walks 67 minutes per day, which is above the recommended level of physical exercise by government health agencies. He believes that in general, most people in his community can be trusted. He contacts his friends every day. He lives with his partner. He was involved in 4 community organizations/clubs in the past year. He has 9 friends that he considers to be close.

There are several reasons why anchoring vignettes is used in this study:

**Differential Item Functioning:** A major problem with survey responses is that there might be systematic differences between different groups of people in their interpretation of the response scale. For example, two respondents might report “7 out of 10 in a survey on their life satisfaction. However, it is possible that one person might have a higher actual LS than the other person because of differences in mood, personality, agreeability, or standards for interpreting the response scale. To account for this difference, known in the literature as differential item functioning (DIF), researchers ask respondents to evaluate the life satisfaction of hypothetical persons in supplementary vignette questions. Since the LS of the hypothetical person in the vignette is the same regardless of who is evaluating the vignette, the vignettes provide common reference points that can be used to identify the DIF for each respondent. By assuming that the respondents have the same DIF in the self-assessment and the vignette questions, and that all respondents understand the vignette description in the same way (a safe assumption since we provide mainly quantitative description in our vignettes), then we can eliminate the DIF bias in the self-assessment responses. The anchoring vignette approach has been widely used in many cross-national studies on LS (Kapteyn, Smith, & Soest, 2013; Kristensen & Johansson, 2008), and LS studies across different demographic groups (Crane, Rissel, Greaves, & Gebel, 2016). In summary, anchoring vignette is used to correct DIF and improve the comparability of survey responses from different countries or demographic groups.

**Data Unavailability:** One of the problems in investigating the positional concerns of life domains is the unavailability of data. For example, we might not be able to obtain data for the average level of pain and discomfort that is experienced by the respondent’s reference group (ex: his/her city) even from high resolution census. Thus, we cannot include the reference level of pain as an independent

variable in the regression model (Equation 1) and determine its effect on LS. However, we can circumvent this problem by framing the question in terms of the life satisfaction of hypothetical persons. We present to the respondents the life situation of hypothetical persons, each with different absolute level of pain and discomfort (based on real data from the General Social Survey), and different ranking within the hypothetical community (also based on real data). We can then model the relationship between vignette responses and the absolute level of life domains and their corresponding ranking that are presented in the vignettes. From this relationship, we can determine the respondent’s perception of the degree to which relative concerns of various life domains matter. In summary, we construct vignettes with absolute/relative levels of various life domains that are based on real survey data. Based the respondents responses to different vignettes, we can determine the perceived positional concerns on various life domains.

## 2.2 Survey Design

The purpose of this study is to determine the extent of to which absolute and relative levels of various life domains affect LS with a survey approach. The survey is organized into three main sections: 1) Self Report on Life Satisfaction, 2) Vignettes, and 3) Demographic Survey and Comprehension Test.

### Self Report on Life Satisfaction

In the first section of the survey, respondents were asked to provide an assessment of their overall life satisfaction, as well as their satisfaction in four aspects of their lives: 1) job and daily activities, 2) health, 3) social contacts and family life, and 4) household income. We use a 10 points response scale (with 0 for being extremely dissatisfied, and 10 for being extremely satisfied) and allow the respondents to choose non-integer values (up to one decimal place) for their answers. The starting location of the slider handle and the life satisfaction indication is initially hidden from view to avoid bias. In addition, the ordering of the questions were designed to avoid primacy bias – respondents were asked to evaluate their overall LS before the other life domains. This ordering ensures that the respondents overall LS assessment would not be influenced by their assessment in other aspects in life (priming effect).

## Anchoring Vignettes

In the Vignettes section, the respondents were presented with five anchoring vignettes. They were asked to evaluate the life satisfaction of the hypothetical person in the vignettes using the same response scale as the self assessment section. The anchoring vignettes were presented to the respondents after the self-assessment to minimize the effect of the respondents current life circumstances on their vignette responses.

Each vignette contains the name, gender, and age of the hypothetical person, as well as a short description of the his/her life situation in terms of the following life domains.

- Annual household income
- Hours worked
- Body Mass Index (BMI)
- Generic pain and discomfort
- Frequency of Exercise
- Number of close friends
- Frequency of seeing friends
- Number of community organizations involved in the past 12 months
- Living alone/with a partner
- Reported trust in the community

The life domains in the vignettes were categorized into three groups: income and employment, health and social relationships and community trust. The order of appearance of the life domains in the vignette description is randomized. This is done to prevent the respondent from placing too much emphasis on a specific life domain (or a particular group of life domains) in their evaluation of the vignettes. To make the information more accessible for the respondents, the text for each life domain group was given a specific color: the text that describes the hypothetical person's income and employment is brown, and the text that corresponds to health and social relationship is green and blue respectively.

The names of the hypothetical person in the vignettes were chosen to be as neutral as possible by selecting from a list of common baby names in the United States in 1987 and 2016. The age and employment status of the hypothetical person is the same in all vignettes: 30 year’s old and employed. For all other life domains, they were generated from an algorithm that is summarized as follows.

**Life Domain Values Selection:** The life domain values are generated by randomly selecting from a set of predefined probability distributions. The probability distributions for the life domains are based on data from various sources: the US Census Bureau, the US Bureau of Labour Statistics, Canadian General Social Survey (GSS), and Canadian Community Health Survey (CCHS). For example, the value for BMI is selected from one of the ten distributions based on data from CCHS. In general, there are two steps in selecting life domain values:

- Distribution selection: we start by randomly choosing a probability distribution from a pool of predefined distributions (based on census or survey data).
- Value selection: after a probability distribution is chosen, a value (and its corresponding percentile in the distribution) is selected from the chosen distribution.

For some life domains (ex: hours worked and generic pain and discomfort), additional probability distributions were generated by shifting or modifying the skewness of a reference probability distribution from real data. The purpose of generating these additional distributions is to introduce variations in the distributions (which represents different communities) from which we select the life domains. For example, the BMI value of a vignette might be selected from a community with a large proportion of mildly obese people (BMI  $\geq 30$ ). In this case, an individual with a BMI of 30 will be in the 50th percentile in his/her community. If it is also possible for the BMI to be selected from a community with a large proportion of underweight people (BMI less than 18.5), then a BMI of 30 would be relatively high in this alternate community. By selecting life domain values from a large pool of different probability distributions, we ensure independence between the absolute value and the relative rank of the life domain. In other words, we would not be able to infer the rank of an individual based on his/her absolute level of a life domain.

**Reference Level:** Two of the vignettes are generated based on a “reference level” (from one to four). Each reference level is associated with a certain range in the life domain distributions from which the life domain value is selected. For example, if the first vignette has a reference level of 1, then the household income would be selected only from the first quartile of the chosen income distribution. Accordingly, the hypothetical individual in this vignette would also have few social contacts, medium to severe level of pain and discomfort, very high (or very low) BMI, and other life domain values that is generally associated with difficult life situations. In a similar way, the second vignette is generated based on a randomly selected reference level. The reason for using reference level is that various life conditions are often correlated. Vignettes would be more realistic if they are associated with a reference level. Furthermore, if the vignettes are generated completely by chance, then this might result in life descriptions with some positive features that are offset by negative features. In this case, the respondent might give a middle response for most vignettes. Thus, we want only some of the life domains in the vignettes to be randomly generated.

**Vignettes Matching Plan:** The third, fourth, and fifth vignettes are randomly generated, but are subjected to a matching plan: the third vignette inherit the value of one life domain from the first vignette, and another from the second vignette; the forth vignette inherit life domain values from the first three domains, and the fifth vignette has four features common to the first four vignettes. This matching plan would ensure the comparability in the vignettes, and that not all life domains in the vignettes are randomly generated.

## Relative life domains

One of the objectives of this study is to determine which domain is important for social comparison. Instead of posing this question directly to the respondents in the self-report section, we infer their positional concerns from their choices in the Vignettes section.

The respondents have the option of accessing additional information on how the hypothetical individual compares to others in his/her community in terms of various life domains. This information is initially hidden until the respondent clicks on a button (one for each of the life domains) that is located on the vignette page. Once a button is clicked, the corresponding relative domain information is revealed after a five seconds delay. We expect the respondent to choose only the domains that he/she perceives to



be important for evaluating life satisfaction. The reason is that the 5 seconds delay for each relative domain impose a significant time cost for the respondent. Even if the respondents are not motivated by financial returns and might care about the quality their survey responses; nearly all of them also care about how efficiently they are spending their time. From the respondent’s perspective, it is optimal to do a survey that has high financial returns and a low time cost. Thus, although the respondent can click on every button on the vignette page to reveal relative information for all the life domains, we expect the respondents to selectively choose the most important ones. By observing the domains that are selected and the order in which they are selected, we can determine the domains that the respondent prioritized over all others in social comparison and LS evaluation.

### **Demographics and Comprehension Test**

The survey collects demographic information about the respondents such as age, gender, household income, level of education, marital status, household size, country of residence, and state of residence. The demographic survey is deliberately placed at the end of the survey to avoid bias in the self report and Vignettes sections from priming effects. To ensure high quality data, the respondents are given a comprehension test after the Vignettes section. The test consists of two multiple answer questions in which the respondents are asked to select the life domains (from a list of options) that appeared in the vignettes. The purpose of the test is check whether or not the respondent read through the vignette descriptions (instead of just randomly selecting a response). The result from the comprehension tests allow us to vet low quality responses. In addition to the comprehension test, we implemented other quality control features that will be presented in details in the next section.

## **2.3 Amazons MTurk and Quality Control**

We conduct our survey using Amazons Mturk, a crowd-sourcing platform that is used for recruiting and compensating workers for online surveys. Many studies (Buhrmester, Kwang, , & Gosling, 2011; Mason & Suri, 2012) show that Mturk is a cost-effective method of collecting consistent and reliable data. The results of studies conducted on Mturk is comparable to the results obtained from lab-based experiments and online domains such as social media websites, albeit at a lower cost. In addition, MTurk participants tend to have a more diverse demographic than paid laboratory subjects and other online communities.

One of the drawbacks of online surveys is the potential for low quality responses. Although evidences show that most Mturk workers are not primarily motivated by financial incentives (Mason & Suri, 2012), there is a small group of workers that only care about earning money on Mturk by finding the fastest and easiest way to complete surveys (these group of people are generally known as spammers in the Mturk community).

One method suggested in (Mason, Suri 2012) to deter spammers is to ask a very simple question (ex:  $1+1 = ?$ ) at the start of the survey. If the respondent skips the question or provides a wrong answer, then we should question the legitimacy of his/her responses in the rest of the survey.

We also implemented a confirm window in case the respondents fail to provide a response for the Vignette questions. This provide a chance for the respondent to check their own work before proceeding to the next page.

Another effective way to vet low quality responses is to check the time spent on each page in the survey. If the time spent is on a survey page is significantly lower than the average time by other respondents, then it is very likely that the respondent is a spammer. We can determine a threshold of time spent on the survey pages based on an initial pilot test for our survey and use this as a condition to filter responses. We also encourage high quality responses by rewarding the respondents. In the survey, if the respondent provides answers for the first three vignettes, and the time spent for each vignettes is above 30 seconds, then we would offer a \$0.05 bonus to the respondent when he/she reaches the fourth vignette page.

Finally, we can also filter bad responses by identifying obvious patterns of responses. For example, if the respondent report high LS (for example, 8 or above) for all his/her answer choices (including the self report and the vignette sections), then this gives us reason to question the legitimacy of the responses. In addition, in the demographics page, if the respondent always chooses one option (ex: the lowest option), then it is likely that the respondent is not serious in answering the demographics questions. We can extend our suspicion to responses in other parts of the survey also. To filter low quality responses, we can programmatically implement a filter for recognizable response patterns and allow the web application to autonomously reject these questionable responses.

## Appendix A: The Life Conditions Survey

In this section, the layout and design of the survey is presented.

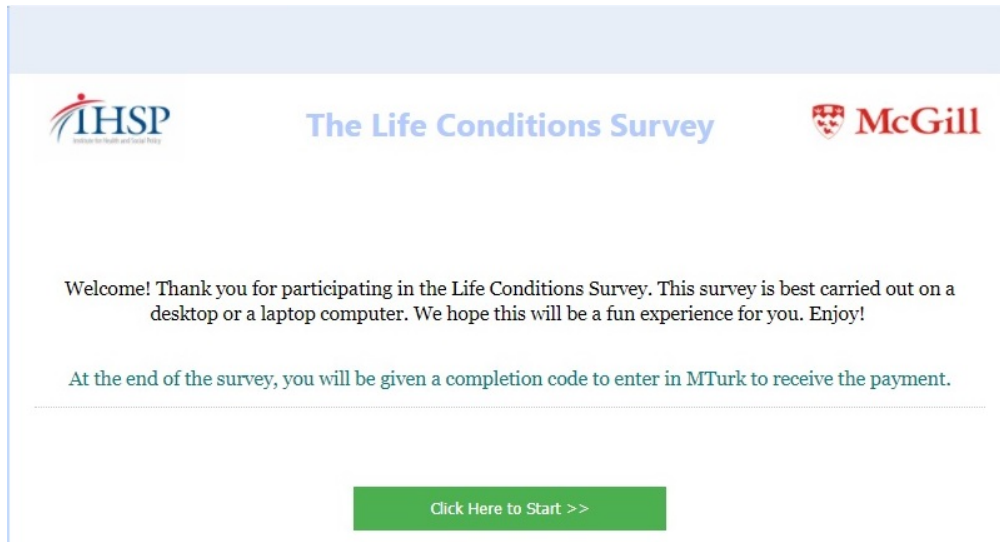


Figure 1: The Welcome Page provides general instructions about the survey.

## Self Report on Life Satisfaction

Please use the sliders to answer the following questions.

How satisfied are you with your life overall? 4.9

Very Dissatisfied (0) Very Satisfied (10)

How satisfied are you with your social contacts and family life? 4.5

Very Dissatisfied (0) Very Satisfied (10)

How satisfied are you with your overall health? 2.9

Very Dissatisfied (0) Very Satisfied (10)

How satisfied are you with the total income of your household? 6.8

Very Dissatisfied (0) Very Satisfied (10)

How satisfied are you with your job and/or other daily activities?

Very Dissatisfied (0) Very Satisfied (10)

Next

Figure 2: The Self Report Section.

In the the Self Report Section, respondents are asked to report their overall LS, and

evaluate their satisfaction on several important life domains using slider bars. The respondents rate their LS on a scale of 0 to 10, with 0 being very dissatisfied and 10 being very satisfied. To avoid bias, the slider handle and the life satisfaction indication (which appears next to each question) is initially hidden until the respondents click on the slider.

## Vignette 1

**The following vignette questions are the most important part of the survey. Please take the time to read each question and think about your answer carefully.**

You will be presented with five vignettes describing different hypothetical living situations. Please use the slider to record what you believe each individual's life satisfaction is most likely to be (with 0 being extremely dissatisfied and 10 being extremely satisfied).

If you need information on how an individual compares to others in his/her community, click on the buttons below the vignette to get more information.

For example, clicking on the Income button will reveal the ranking of the individual's income in the community. A rank of 80% indicates that the individual has a higher income than 80% of the people in his/her community, and a lower income than 20%.

At the end of this section there will be comprehension questions about the content of these vignettes. It is important to read each vignette thoroughly in order give your possible answer.

---

Figure 3: Vignette instructions.

In the Vignette Section, detail instructions are provided at the top of the page (Figure 3). For each vignette, the respondent is presented with a description of the life of a hypothetical person (Figure 4). The respondent is asked to evaluate the life satisfaction of the hypothetical person based on information given in the vignette. Optionally, the respondent can click on the life domain buttons located below the vignette description to reveal additional information on how the hypothetical person compares to others in his/her community. After clicking on a button, there is a 5 seconds delay before the corresponding relative information box appears.

The relative information box consists of a short description on the individual's ranking in his/her community and a graphical representation of this information. As shown in Figure 5, the hypothetical individual has a higher income than 90% of the people in her

Please evaluate the Life Satisfaction of this person

Isabella is 30 years old. The annual income of her household is \$105,000. She is employed and works 39 hours per week. She was involved in 4 community organizations/clubs in the past year. She lives with her partner. She has 9 friends that she considers to be close. She contacts her friends every day. She believes that in general, most people in her community can be trusted. She is active and walks 67 minutes per day, which is above the recommended level of physical exercise by government health agencies. She usually experiences no pain or discomfort. Her body mass index (BMI) is 24, which is categorized as normal weight by the World Health Organization (WHO).

(Optional) Click on the buttons to learn more about Isabella's community

Income	Weekly Hours Worked	Unemployment Rate
Frequency of Exercise	Pain and Discomfort	Body Mass Index (BMI)
Number of Close Friends	Frequency of Seeing Friends	Community Involvement
Live alone/with a partner	Trust	

Figure 4: Vignette description and relative domain buttons.

community.

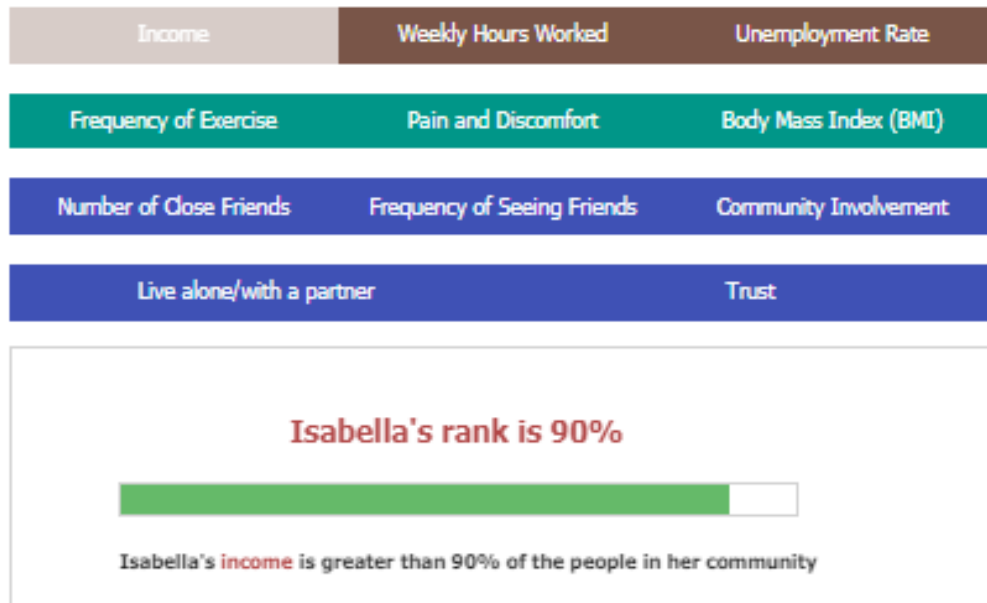


Figure 5: Relative information box.

The relative information of three life domains (Unemployment rate, Live alone/with a partner, and Trust) are related to the socio-economic state of the hypothetical community rather than relative standing of the hypothetical individual. Thus, the information for these domains is presented in a pie chart rather than on a bar graph (see Figure 6).

There are three other features in the Vignette Section (Figure 7 and Figure 8). At the bottom left of the page, there is a “Review Previous Response” button that allows the respondent to review previous vignette responses. On the top right corner of the page, there is a pie chart that tracks the progress of the respondent. If the respondent attempts to proceed to the next vignette without providing a response to the current vignette, a dialog warning box will pop up.

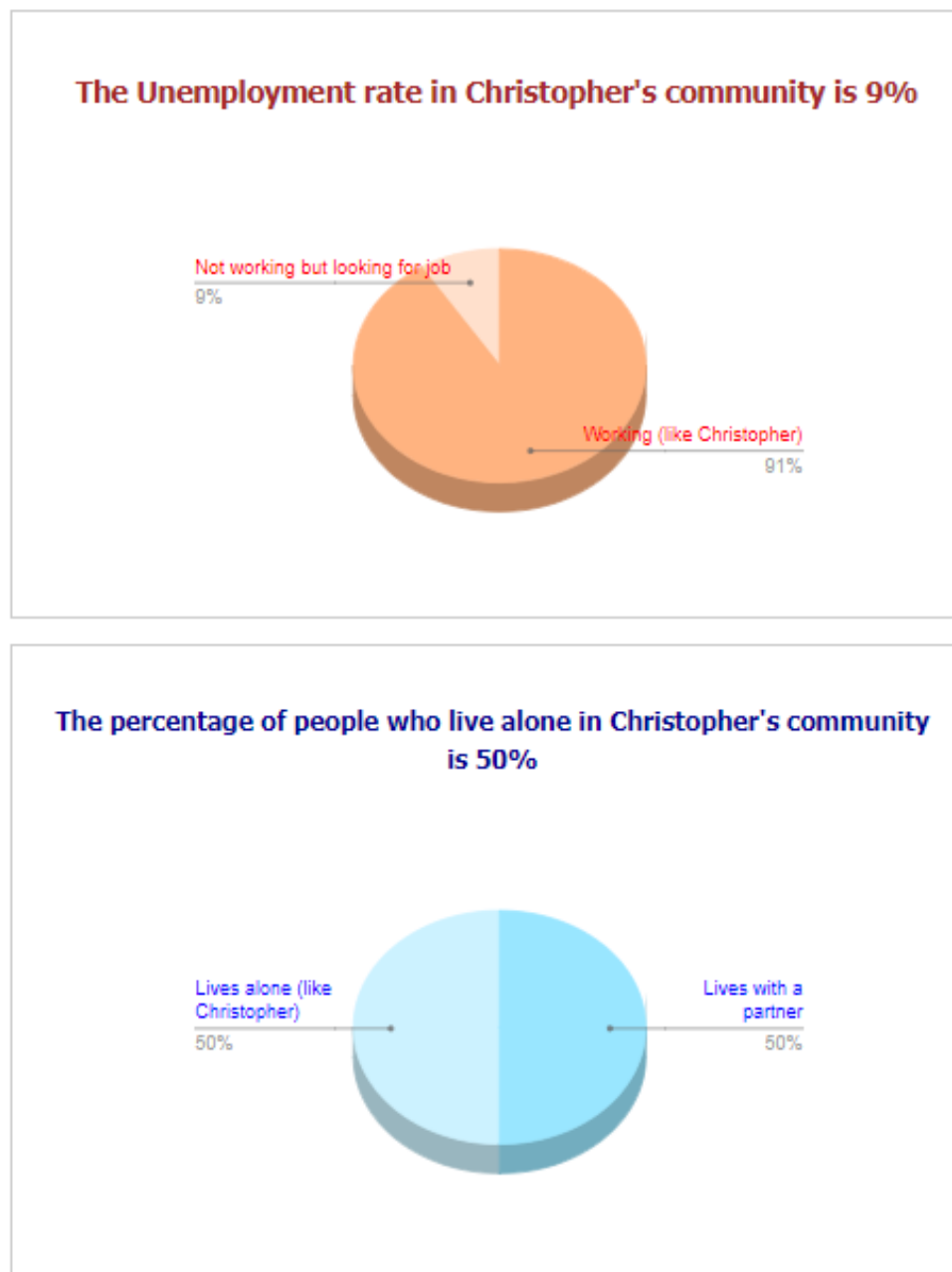


Figure 6: Relative information box for unemployment rate and live alone/ with a partner.



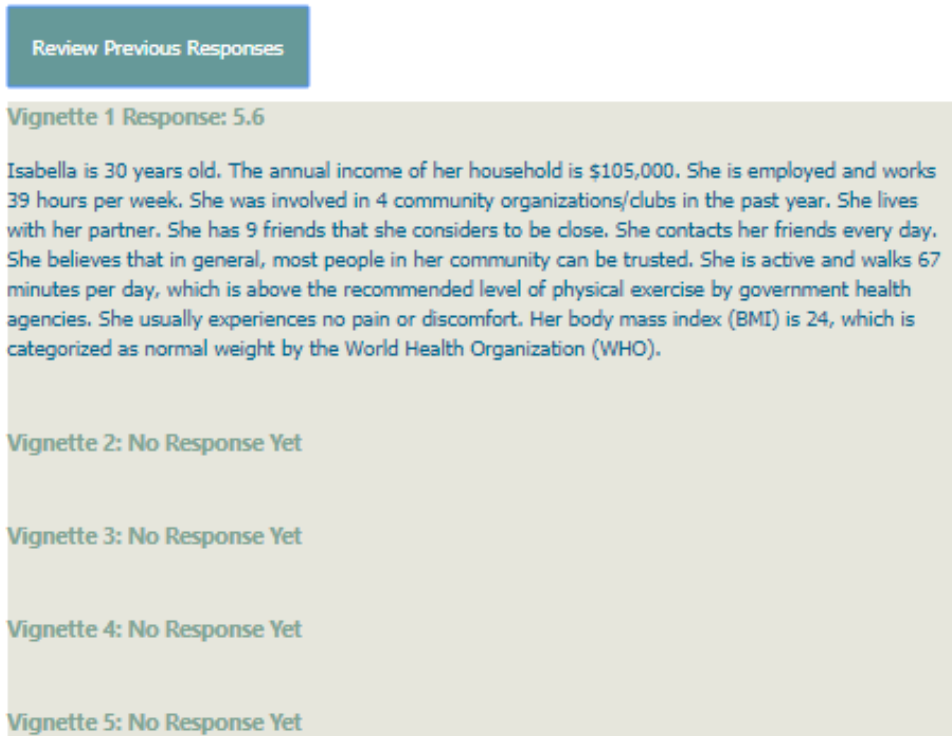


Figure 7: Previous Response button.

As a way to motivate the respondents and encourage high quality responses, the respondents are given a \$0.05 bonus if he/she provides a response for the first three vignettes and spend at least 30 seconds on each vignette page. The respondents that receive the bonus will be notified by a green pop-up box at the start of Vignette 4 (Figure 9). Respondents that are not eligible for the bonus will be presented with a short motivational message instead (Figure 10).

After the Vignette Section, the respondent is given a comprehension test (Figure 11) that consists of two multiple answers questions. This is followed by 14 demographics questions in the last section of the survey (Figure 12, 13, and 14). Finally, the respondent will be given a code to enter in Mturk for payment in the exit page.

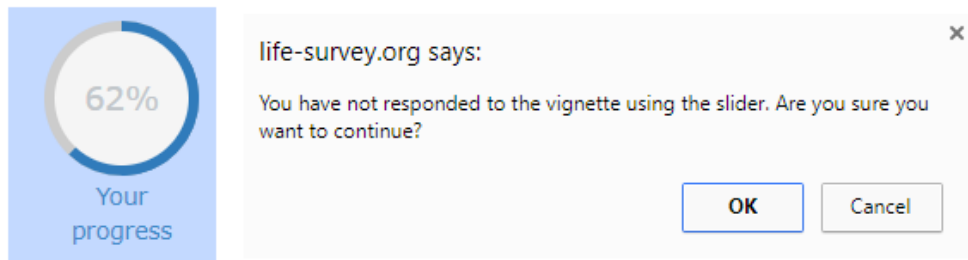


Figure 8: Progress Chart and dialog warning box.

## Vignette 4

**GREAT JOB!**

We are very happy with your progress. We will pay you an extra five cents for your great effort!

**Please use the slider to record what you believe this individual's life satisfaction is likely to be (with 0 being extremely dissatisfied and 10 being extremely satisfied).**

---

**Please evaluate the Life Satisfaction of this person**

Judy is 30 years old. She was involved in 0 community organizations/clubs in the past year. She lives with her partner. She has 2 friends that she considers to be close. She believes that in general, most people in her community can be trusted. She contacts her friends every day. She is employed and works 37 hours per week. The annual income of her household is less than \$10,000. She usually experiences a mild level of pain or discomfort. Her body mass index (BMI) is 21, which is categorized as normal weight by the World Health Organization (WHO). She is inactive and walks 11 minutes per day, which is below the recommended level of physical exercise by government health agencies.

Figure 9: Bonus popup box at the start of Vignette 4.

## Vignette 4

ALMOST DONE...

The survey is almost complete! We appreciate your effort!

**Please use the slider to record what you believe this individual's life satisfaction is likely to be (with 0 being extremely dissatisfied and 10 being extremely satisfied).**

Please evaluate the Life Satisfaction of this person

Karen is 30 years old. She has 2 friends that she considers to be close. She was involved in 3 community organizations/clubs in the past year. She believes that in general, most people in her community can be trusted. She lives with her partner. She contacts her friends every day. The annual income of her household is \$10,000. She is employed and works 41 hours per week. She is moderately active and walks 46 minutes per day, which is above the recommended level of physical exercise by government health agencies. Her body mass index (BMI) is 32, which is categorized as low risk obesity by the World Health Organization (WHO). She usually experiences a mild level of pain or discomfort.

Figure 10: Motivational message popup box at the start of Vignette 4.

## The Vignette Comprehension Test

Please answer the following comprehension questions about the previous vignettes. This is just to show us that you have read and understood the vignettes.

Don't worry, you do not need to get all the correct answers on these questions in order to receive payment, but please try your best.

**Warning: Please do not push the refresh or back button on your browser; otherwise all your responses will be lost and you would not be paid.**

**Question 1: Which of the following attributes related to the individual's health has appeared in at least one of the vignettes?**

- ☒ Amount of fruits and vegetables consumed per day
- ☐ Number of chronic diseases such as diabetes and asthma
- ☐ Depression or anxiety
- ☐ Amount of physical exercise per day
- ☐ Pain or discomfort

**Question 2: Which of the attributes about the individuals' life has appeared in at least one of the vignettes?**

- ☐ Frequency of seeing friends
- ☐ Reported trust in the community
- ☒ Income
- ☒ Living with a partner
- ☐ Number of close friends
- ☐ Number of promotions at work in the past three years
- ☐ Number of layoffs in the workplace in the past 12 months
- ☐ Hours of volunteer work per week

Submit

Figure 11: Comprehension test.

## A Few Last Questions About You

Please answer carefully the following questions.

1. What is your age?

2. What is your gender

3. What is the highest level of education you have completed?

- ☐ Attended high school but did not graduate
- ☐ High school graduate
- ☐ Attended college/university but did not graduate
- ☐ Bachelor's Degree
- ☐ Master's Degree
- ☐ Doctoral Degree
- ☐ Professional Degree

4. What is your marital status?

- ☐ Single
- ☐ Married or Cohabitating
- ☐ Divorced
- ☐ Widowed

5. Are you currently employed?

- ☐ Yes
- ☐ No, and looking for a job
- ☐ No, and NOT looking for a job

6. What is your personal annual income (before tax)?

Enter value or choose from the options:

- ☐
- ☐ Less than \$10 000
- ☐ \$10 000 - \$19 999
- ☐ \$20 000 - \$29 999
- ☐ \$30 000 - \$39 999
- ☐ \$40 000 - \$49 999
- ☐ \$50 000 - \$59 999
- ☐ \$60 000 - \$69 999
- ☐ \$70 000 - \$89 999
- ☐ \$90 000 - \$119 999
- ☐ \$120 000 - \$149 999
- ☐ More than \$150 000

Figure 12: Demographic page: Questions 1-6.

**7. What is your annual household income (before tax)?**

Enter value or choose from the options:

- ☐
- ☐ Less than \$10 000
- ☐ \$10 000 - \$19 999
- ☐ \$20 000 - \$29 999
- ☐ \$30 000 - \$39 999
- ☐ \$40 000 - \$49 999
- ☐ \$50 000 - \$59 999
- ☐ \$60 000 - \$69 999
- ☐ \$70 000 - \$89 999
- ☐ \$90 000 - \$119 999
- ☐ \$120 000 - \$149 999
- ☐ More than \$150 000

**8. How many people contribute to the total annual household income?**

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ More than 3

**9. How many people are there in your household?**

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6
- ☐ 7
- ☐ More than 7

**10. What is your age (again)?**

- ☐ Younger than 20
- ☐ 20-30
- ☐ 31-40
- ☐ 41-50
- ☐ 51-60
- ☐ 61-70
- ☐ Older than 70

Figure 13: Demographic page: Questions 7-10.

11. List up to 5 countries that you have lived in:

Country 1

Country 2

Country 3

Country 4

Country 5

12. Which state in the country that you live in?

13. Completion code: To generate your completion code, please enter your age in years. Your code will be displayed in the next page.

14. Please enter any comments that you may have about the survey. Thank you!

Submit

Figure 14: Demographic page: Questions 11-14.

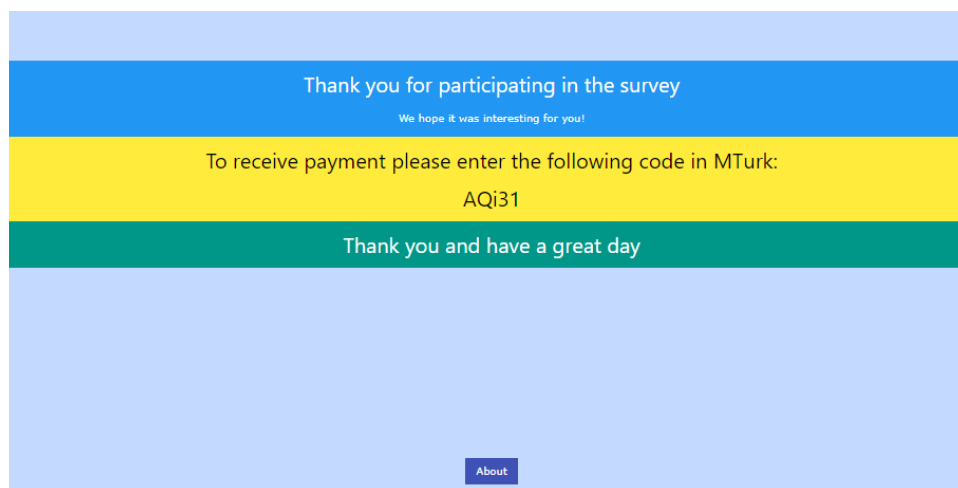


Figure 15: The Exit Page.



## Appendix B: Life Domain Data

This section presents the probability distributions from which the absolute values and relative ranking of the life domains in the vignettes are selected by a vignette generation algorithm (Please refer to Section 2.2 for the details of this process). For each life domain, the associated set of probability distributions are generated based on data from the following census and surveys:

- Household income: Income data from 510 US Metropolitan and Micropolitan area was used. The data source is U.S Census Bureau, Current Population Survey, 2016 Annual Social and Economic Supplement.
- Unemployment rate: Unemployment rate data from 505 US Metropolitan and Micropolitan area was used. The data source is U.S Census Bureau, Current Population Survey, 2016 Annual Social and Economic Supplement.
- Hours Worked: USA national data from the U.S Bureau of Labour Statistics, “Employment and Earnings 2016” was used. In addition, two other probability distributions were created (by shifting the reference probability distribution that is based on US Labour statistics data). We included the distributions of two other hypothetical communities (one with a lower average number of hours worked than the US, and another with a higher average than the US) in our selection pool (please refer to Section 2.2 for details on the selection process).
- BMI: The probability distributions were created based on skew norm fit of the ordinal BMI data of 10 Canadian provinces. The ordinal data has 5 categories (underweight, normal weight, overweight, obesity I, obesity II, and obesity III). Each category is associated with a specific range of BMI (for example, people with a BMI of less than 18.5 is classified as underweight). The data source is Canadian Community Health Survey 2007.
- Frequency of Physical Exercise: We used data from the Canadian Community Health Survey 2007. The data is ordinal with 3 categories: inactive- less than 30 minutes of walking per day, moderately active - between 30 to 60 minutes of walking per day, and active - between 60 to 90 minutes of walking per day. Since there are not a lot of between-group variance in the provincial data, we only used data from four provinces: PEI, New Brunswick, Ontario, and BC. To provide some variations in the pool of communities (ie: we want to include communities with very high or very low proportion of physically active/inactive people), we

created the probability distributions of three additional hypothetical communities (labeled as Hypothetical Community 1-3).

- Pain and Discomfort: We used ordinal data with 4 categories (no pain, mild pain, moderate pain, and severe pain) for 10 Canadian provinces. The data source is Canadian Community Health Survey 2007. To provide additional variations (ex: communities with high proportion of people with high/low levels of pain), we created four additional probability distributions (labeled as Hypothetical Community 1-4).
- Live alone/ with a partner: We used marital status data from 6 US Metropolitan and Micropolitan area. The data source is U.S Census Bureau, Current Population Survey, 2016 Annual Social and Economic Supplement. For the purpose of our survey, people who are divorced, separated, never married, or widowed are categorized as “Live alone”; while people who are “married” or “cohabiting” are categorized as “Live with a partner”. To provide more variations in the selection pool, we include data that we defined for 4 hypothetical communities.
- Number of close friends: We used national data from Canada General Social Survey (GSS) 2013, Canadians connection with family and friends. In addition to national data from GSS, we created the probability distributions of 2 other hypothetical communities to provide more variations in the selection pool (ex: we included a hypothetical lonely community with a high proportion of people that have zero to one close friend).
- Frequency of seeing friends: We used national data from the Canada General Social Survey (GSS) 2013, Canadians connection with family and friends. In addition to national data from GSS, we created the probability distributions of 2 other hypothetical communities to provide more variations in the selection pool.
- General Trust: We used data from 10 Canadian provinces from the Canada General Social Survey (GSS) 2013. “General Trust” is measured in the GSS by the proportion of people who reported that most people can be trusted.
- Community Involvement: We use national data from the Canada General Social Survey (GSS) 2008. “Community Involvement” is measured in the GSS by the proportion of people who reported that most people can be trusted. In addition, to provide variations in the selection pool (ex: communities with a very large proportion of people who report that most people can be trusted/cannot be trusted),

we created data for 4 hypothetical communities.

The probability distributions for the life domains are presented in the figures below.

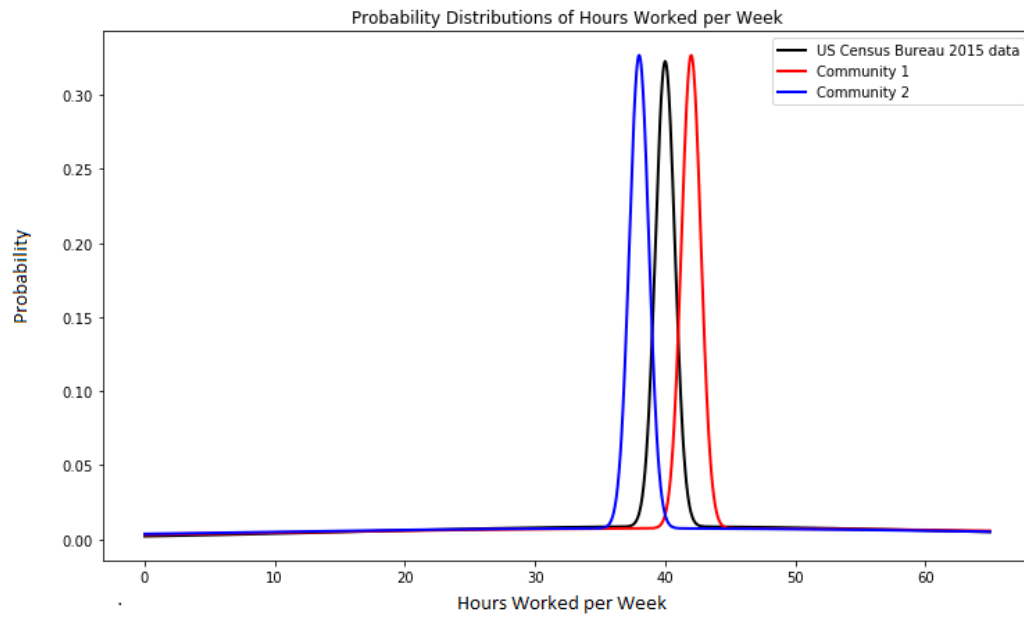


Figure 16: Probability Distributions of Hours Worked.

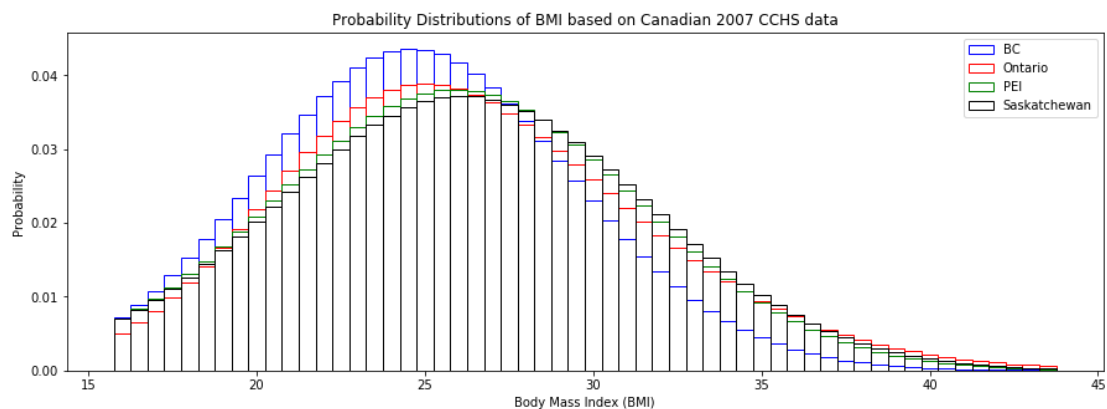


Figure 17: Probability Distributions of BMI.

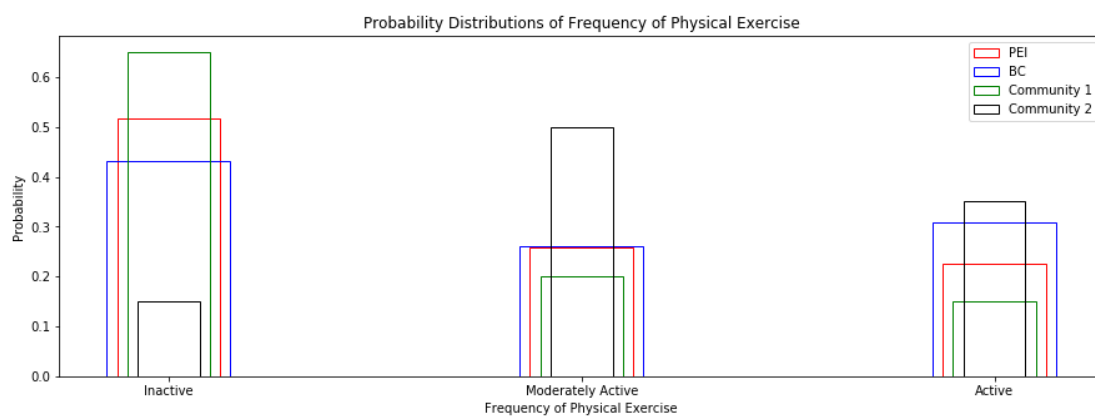


Figure 18: Probability Distributions of Frequency of Physical Exercises.

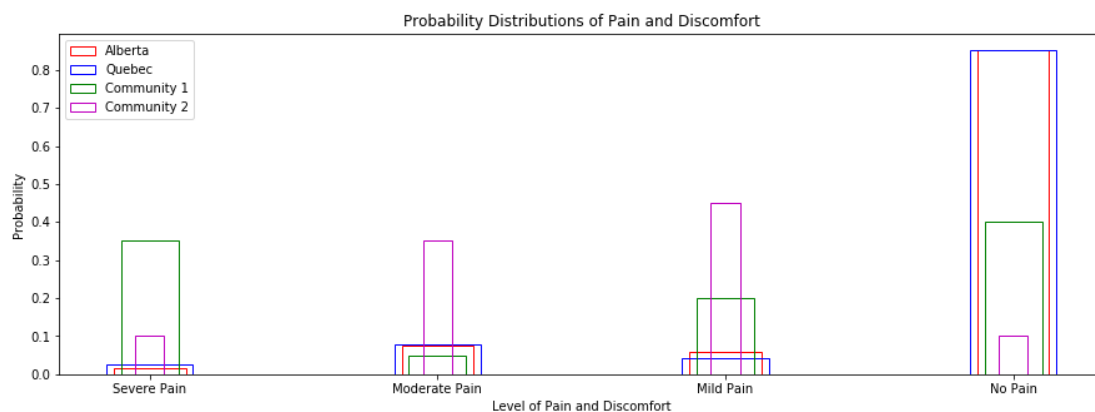


Figure 19: Probability Distributions of Pain and Discomfort.

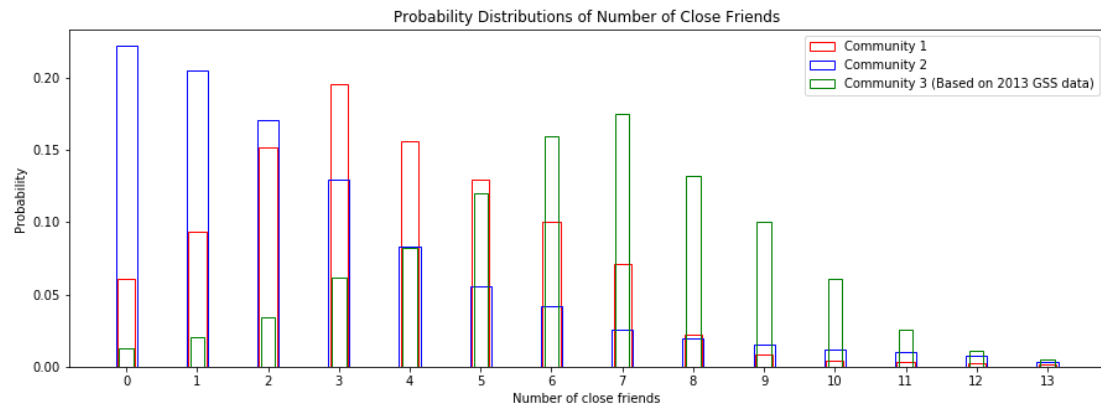


Figure 20: Probability Distributions of Number of Close Friends.

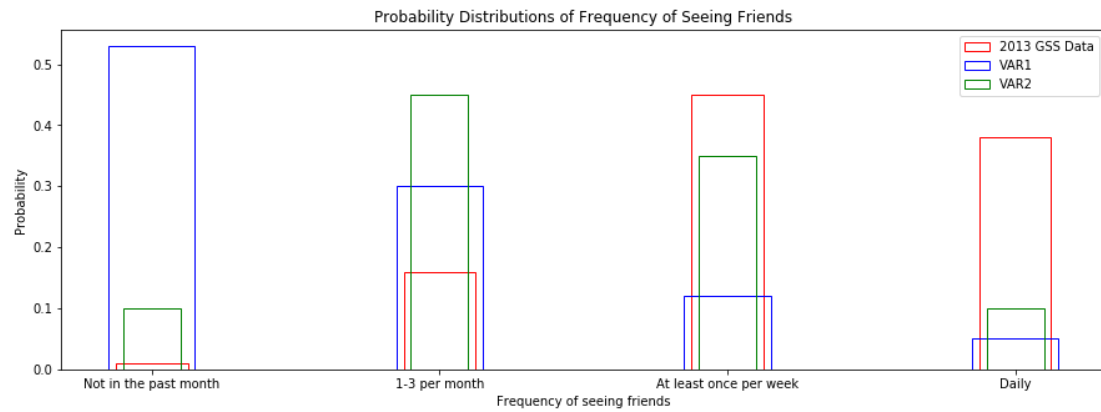


Figure 21: Probability Distributions of Frequency of Seeing Friends.

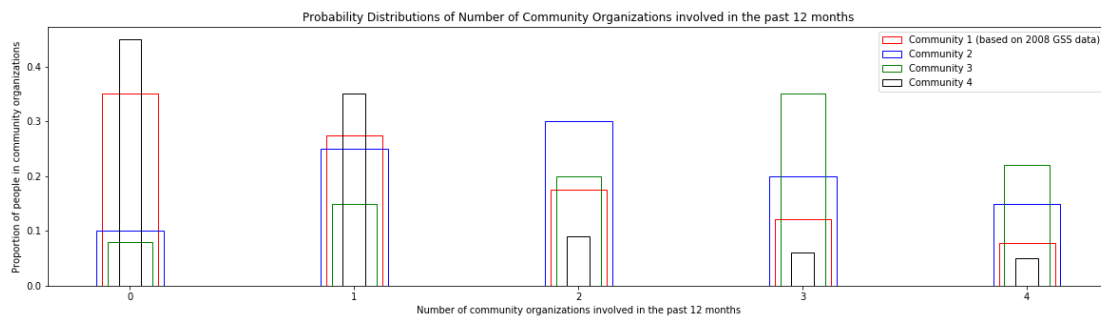


Figure 22: Probability Distributions of Community Involvement.

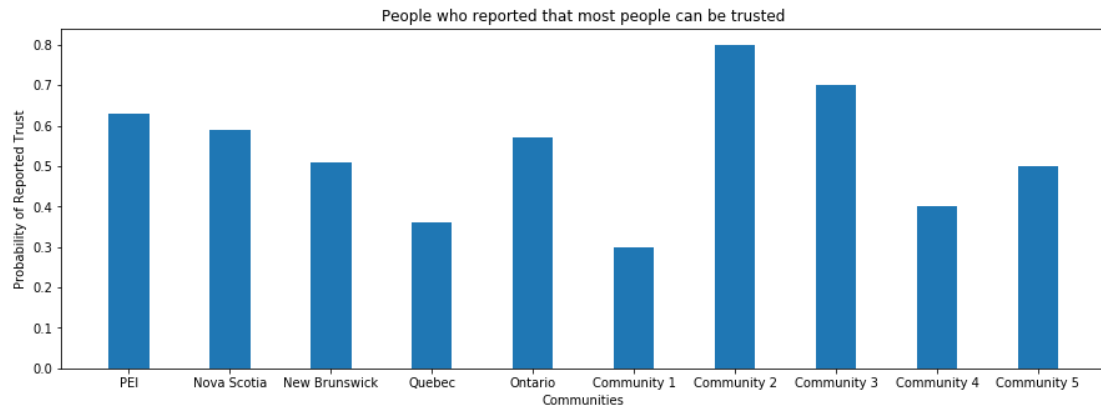


Figure 23: General Trust.

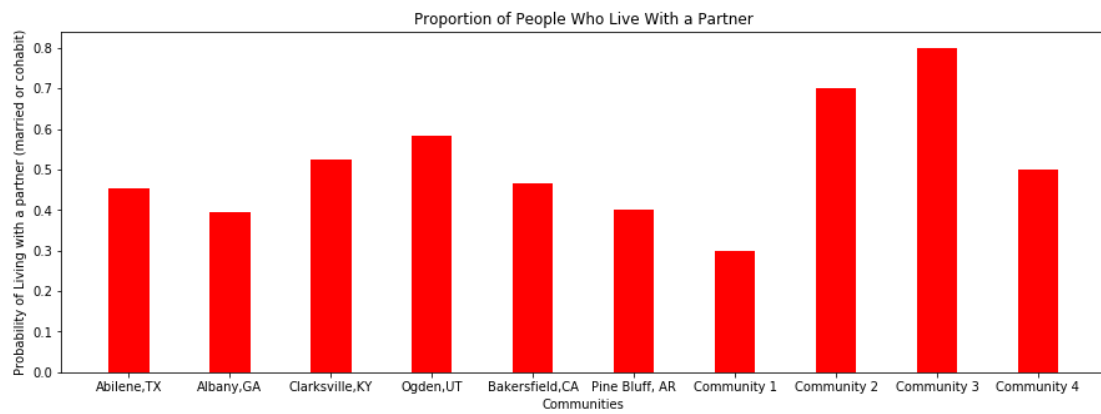


Figure 24: Living with a Partner/Live Alone.

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