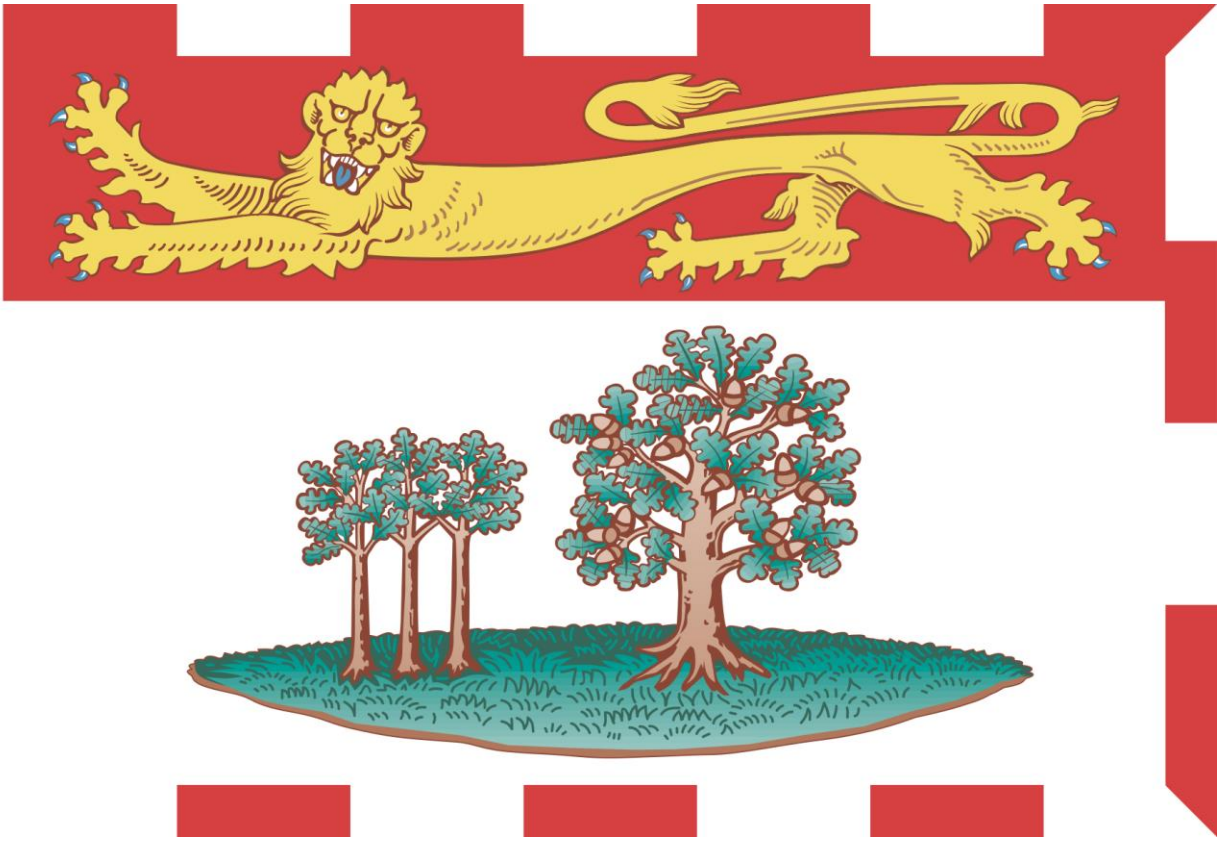
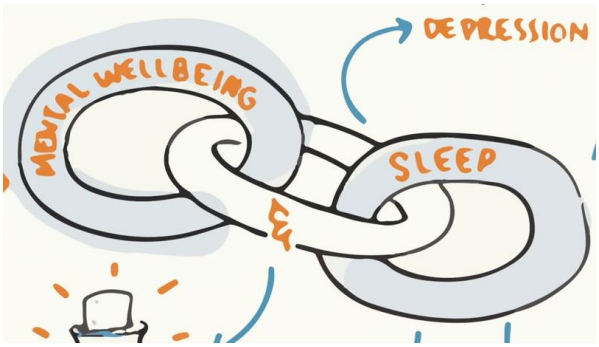
Results from the PEI Health Survey (2018)



Introduction

This survey was performed as part of Kinesiology 3420 (Introduction to Physical Activity and Chronic Disease Epidemiology) at the University of Prince Edward Island. Undergraduate Kinesiology students helped design an online survey of PEI residents, and used the resulting dataset to analyze the questions of their choosing.

For more information on the survey or the course itself, please contact Dr Travis Saunders (trsaunders@upei.ca).



PEI Mental Health Survey

The Effects of Sleep on Mental Health

The topic of Mental Health across Prince Edward Island is a new and constant conversation among all age groups; therefore, it is important to realize that Mental Health is an essential part of one's overall health and well being. According to the World Health Organization (WHO), "Good mental health helps people cope with the normal stresses of life, work productively, and contribute to their community; it can even help to reduce a person's risk of developing mental illness" (WHO, 2001). There are various kinds of mental health problems and illnesses ranging from those that are most familiar, such as anxiety and depression, to those that are less familiar and are possibly more serious, such as schizophrenia and bipolar disorder.

Health PEI explains that in any given year, 20% of Canadians are living with mental illness. By the age of 40, nearly 50% of Canadians will have experienced a mental illness (Health PEI). When families and caregivers are also considered, mental illness impacts almost everyone in some way. Once analyzing these statistics, it is not surprising that Prince Edward Island is struggling to meet the increasing need for mental health and addiction services. According to Health PEI, Community Mental Health Referrals have increased significantly each year and in 2014, PEI spent $17,507,649 in Acute Mental Health and $7,552,408 in Community Mental Health.

Sleep problems were once thought of as just symptoms of mental health conditions, but now research tells us that they may contribute to or even cause of them. According to Harvard Health, this statement means that treating the sleep disorder may help alleviate the symptoms associated with a mental health condition and vice versa (Quan, 2017). The Sleep Health Foundation reiterates this point by stating that "poor sleep and mental health are very closely linked; treating one condition will often improve the other." Finally, "although the relationship between sleep and mental health is not clearly understood, we believe that a good night's sleep helps foster both mental and emotional resilience" (*Sleep and Mental Health*). As for sleep guidelines, according to the National Sleep Foundation (*National Sleep Foundation…)* teenagers should be getting 8-10 hours of sleep a night and young adults should be getting 7-9 hours and older adults should be getting 7-8 hours a night.

Based on this evidence the purpose of this study was to analyze mental health characteristics and determine whether or not getting the recommended amount of 7-9 hours of sleep each night had an effect on these outcomes. It was hypothesized that between 7-9 hours of sleep will affect residents of Prince Edward Island's mental health positively.

The PEI Health Survey was conducted through an online survey available to residents of PEI or people who have lived here for at least three years, over the age of 16 years. The survey was distributed through social media advertisement, emails, and word of mouth. For our specific outcomes, we used the Canadian Mental Health Association (CMHA) Mental Health Meter and the Sleep Questionnaire for both weekdays and weekends. The CMHA Mental Health Meter assesses five important components of mental health, including the ability to enjoy life, resilience, balance, self-actualization, and flexibility. For our research, we decided to focus on only two of these outcomes: the ability to enjoy life and balance. Within each of these components, there are six questions to which the participant either answers agree or disagree. To further simplify the data, we only evaluated two of these questions for each outcome, which comprised of the questions "I often dwell on past experiences and daydream about different outcomes" and "My feelings of happiness are often overshadowed by worry about the future" for the ability to enjoy life section, and "I always make time for my hobbies" and "If life is a juggling act, then I think I'm a pretty good juggler" for the balance questions. We classified disagreeing with the ability to enjoy life questions and agreeing with the balance questions as positive mental health outcomes. Once all the data was collected, incomplete surveys that did not answer all the questions that we were evaluating were deleted, leaving our sample being 104 participants. Then, sleep times were calculated by normalizing all times to a 24-hour clock and taking a weighted average of weekday and weekend night sleeps. We classified an average sleep time between 7 and 9 hours as a "good sleep" and any more or less than that as a "bad sleep," based on evidence mentioned above. Then, the prevalence of getting a good sleep and agreeing or disagreeing with the questions as well as getting a bad sleep and agreeing or disagreeing with the statements was calculated.

Table 1. Prevalence of agreeing or disagreeing with mental health statements based on good or bad sleep times.

	Agree		**Disagree**	
	Good Sleep	Bad Sleep	Good Sleep	Bad Sleep
"I often dwell on past experiences and daydream about different outcomes."	40.6%	47.5%	**59.4%**	52.5%
"My feelings of happiness are often overshadowed	43.8%	50%	**56.3%**	50%

by worry about the future”				
“I always make time for my hobbies”	57.8%	**60%**	42.2%	40%
“If life is a juggling act, then I think I’m a pretty good juggler”	**84.4%**	72.5%	15.6%	27.5%

This table shows each prevalence of agreeing or disagreeing with each mental health statement based on whether they got a good sleep or not. Out of the 104 participants, 64 people had good average sleep time, and 40 had bad average sleep time. The bolded numbers indicate what type of sleep was associated with the more significant positive mental health outcome of each statement. For example, 59.4% of people with a good sleep disagreed with the statement “I often dwell on past experiences and daydream about different outcomes,” which is the desired outcome from that statement, while only 52.5% of the bad sleepers disagreed with it. The strongest prevalence was exhibited in the last question of “If life is a juggling act, then I think I’m a pretty good juggler,” where 84.4% of the good sleepers agreed with this positive mental health statement. This table also displays that regardless of sleep time, the mental health outcomes of the sample were generally more positive than negative, even though good sleep was almost always higher than bad sleep.

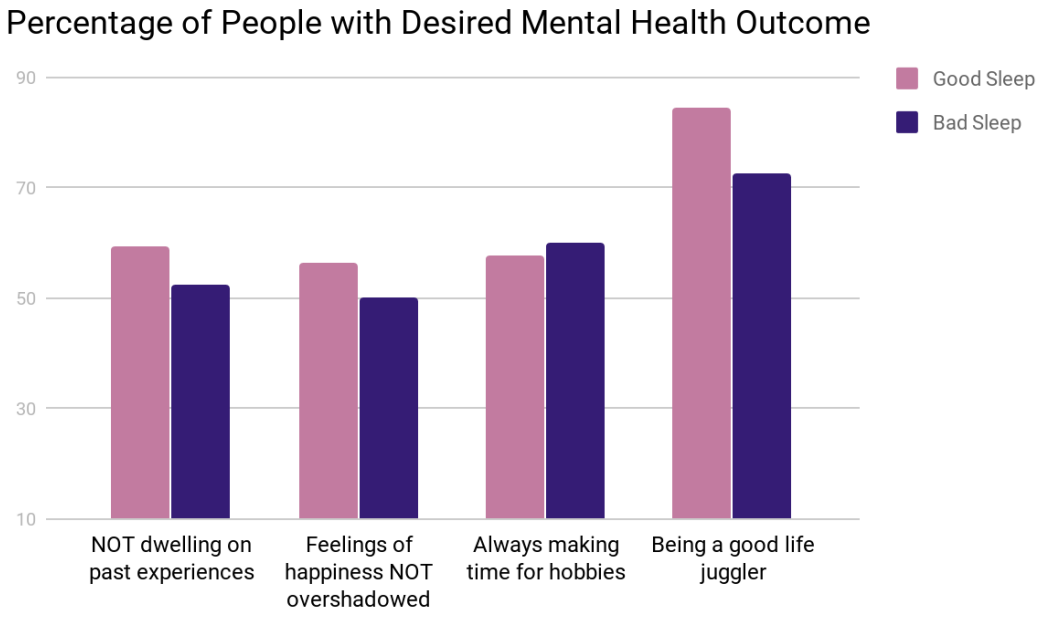


Figure 1. Graph showing the percentage of good sleepers and bad sleepers who responded to the statements related to the desired positive mental health outcomes.

As *Figure 1.* shows, in each of the mental health questions, except for the statement "I always make time for my hobbies", getting a good sleep is associated with a higher percentage of people responding to the positive outcome we were looking for in each question.

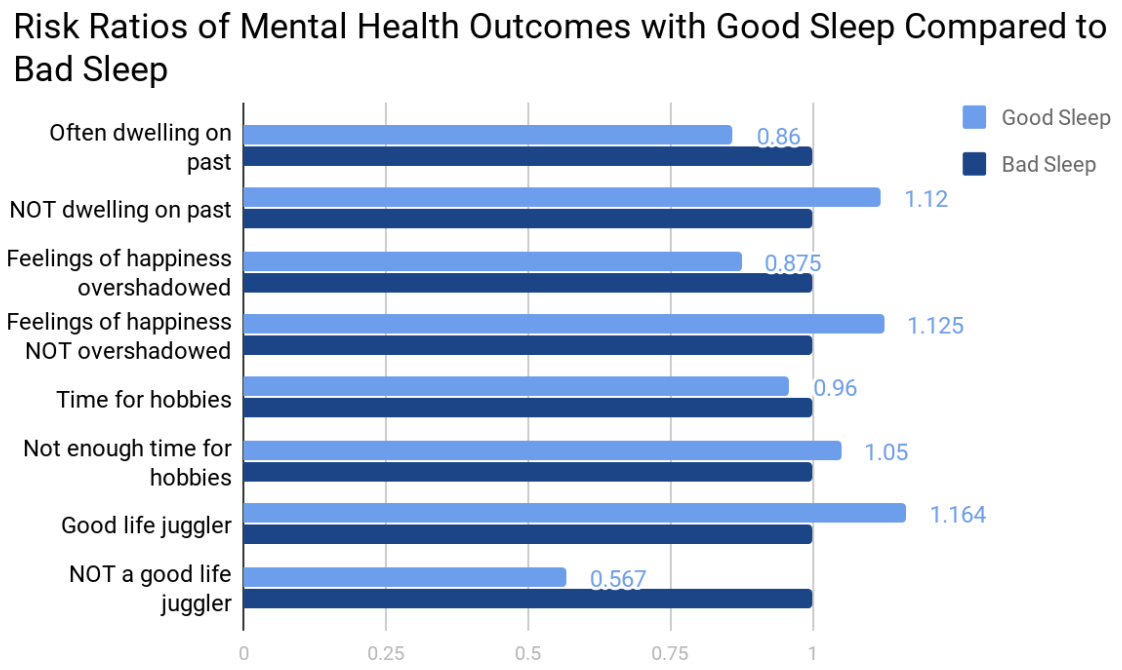


Figure 2. Risk ratios of each of the mental health outcomes when getting a good sleep compared to a bad sleep.

Figure 2. Demonstrates that the relative risk of getting a good sleep and not dwelling on past experiences and daydreaming about different outcomes is 1.12 compared to having a Bad sleep. This means that those who get a good sleep are 12% more likely to not dwell on past experiences. Next, it shows that the relative risk of having a good sleep and not having your feelings of happiness overshadowed by worry about the future is 1.125 compared to having a bad sleep. So those who get a good sleep are 12.5% more likely not to have their feelings of happiness overshadowed by worry about the future. On the other hand, the negative outcome of not making time for your hobbies is more prevalent in good sleepers, as the relative risk of having a good sleep and not having enough time for my hobbies is 1.05 compared to having a bad sleep. Therefore, those who get a good sleep are 5% more likely to feel like they do not have time for their hobbies. And finally, the relative risk of having a good sleep and being a pretty good life juggler is 1.164 compared to having a bad sleep, meaning that those who get a good sleep are 16.4% more likely to be a good life juggler.

We had some limitations while conducting the study. The first limitation is that our definition of mental health and the results from the survey are only based on two subcategories of mental health (Ability to enjoy life and Balance) and then two criteria within each of these categories. This limits the amount of information we got about the subjects mental health. The second limitation was that we weren't able to determine if the same people were always the ones answering the questions which reflect adverse mental health. This was because we took population averages for each statement. While looking at the data we had to delete some of the participants because of incomplete surveys. This left us with only 104 subjects. One significant

limitation that we found was that there are no definite conclusions on whether more than 9 hours of sleep is related to poor health. Although, we found that there was a general consensus among the scientific community that 7-9 hours was beneficial for our specific population. We also only looked at sleep time, so sleep quality was not evaluated and it could have a confounding impact on mental health. In the questionnaire that was given to participants, sleep and wake time were recorded using the 24-hour clock, which we believe some people could have gotten mixed up with. When we switched the times to the 24-hour clock, it could have altered the results. The last limitation that we found was that sleep times were calculated into weighted averages of both weekdays and weekends. This could have affected the results as well, as people may sleep differently depending on the day of the week.

In our study, the findings presented to be in favour of our hypothesis. For all mental health criteria, except for the question "making time for my hobbies," getting between 7-9 hours of sleep on average was greater associated with positive mental health outcomes. We think that the reason we had one exception, being that "making time for my hobbies" was better associated with "bad sleep," was because people who are busy with their hobbies, or those who engage in many hobbies, could be getting less sleep. The relative risks were close for all of the criteria, but they still displayed that good sleep time resulted in the better relative risk of responding with the positive mental health statements than bad sleep time. This could be evidence that there is a link between sleep time and psychological wellness and to recommend 7-9 hours of sleep each night to Islanders to promote better mental health. However, because of the closeness in the responses and risk ratios and due to the limitations mentioned previously, it is difficult to generalize these findings to an absolute conclusion of good sleep leading to positive mental health. We hope that more research will be conducted in this field in the future to help elaborate on our findings and to discover better what the link between sleep and mental health is to design sleep guidelines and health interventions that will improve and support Islanders suffering from mental health obstacles.

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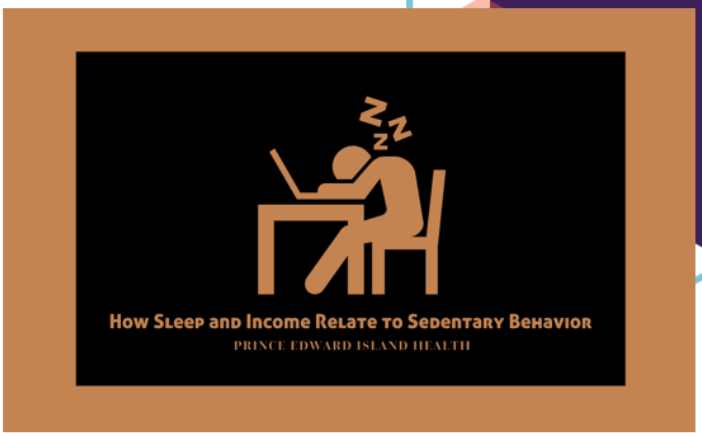


PEI Health Survey

Sedentary Behaviour and How it Relates to Income and Sleep Habits

For the purpose of the PEI Health Survey, we took a look into sedentary behaviour and how it relates to income and sleep habits. After conducting some research on the topic, we were left wondering whether or not those with low incomes and bad sleep habits participated in more sedentary behaviour than those with high incomes and good sleep habits. To collect our data, we used questions taken from the International Sedentary Assessment Tool, Sleep Questionnaire and Demographics. We considered PEI residents between the ages of 25-65. After data collection, we calculated the prevalence as well as the risks of being sedentary in the low incomes compared to high income (1.342). We also computed the risk of being sedentary for those who experience poor sleep and those who get a high quality of sleep (1.243). Our research supported our hypothesis that high income and good quality of sleep would lead to less sedentary lifestyles. However, the results were insignificant.

Jackie Parsons (139258), Jasmine Frizzell (137244), Grant Dever (113777)

Introduction

We chose to consider income levels and sleep quality as they relate to sedentary behavior (SB) patterns in the PEI population (aged 25-64). We know that sleeping better is associated with health benefits, and that sitting less is associated with improved health. Yet, how do these two behaviors relate, and are they connected? As a province, how can we apply the findings to get citizens sleeping better and sitting less. Income plays a role in overall quality of life, and those with lower incomes often have less access to resources and knowledge related to their health. Low-income job environments often look very different than high-income job environments; For example, access to standing desks and benefits for a corporate gym membership may not be available to low income earners. Are those in lower income jobs are more at risk for a sedentary lifestyle and the associated negative health outcomes? As a province, if there is a difference between groups, how can we level out the playing field and reduce time spent sitting?

There are many factors at play in determining a person's SB patterns. When researching theories, there were conflicts regarding income and SB. Our initial thoughts on this topic were that low income individuals often have more physically demanding work, which perhaps reduces sedentary time. On the other hand, high income earners are likely to have higher education resulting in greater access and knowledge in regard to resources like exercise programs and gym memberships, which could also reduce sedentary time. As for sleep behaviors and SB, little research has been conducted specifically investigating these two-health outcomes. Those who report being sedentary throughout most the day, may be influenced by their poor sleep patterns that lead to insufficient energy to engage in active behaviors throughout the day. Furthermore, those who participate mainly in active behaviors throughout the day, may be able to sleep better at night because they expended all of their daily energy. Conversely, those who are sedentary throughout the day may be those individuals who are actually capable of getting high quality sleep because they are used to being sedentary. Whereas those who are considered to be non-sedentary may have an difficulty laying down and getting a good night rest because they have trouble keeping still. After conducting our research, in relation to SB and income, children in low socioeconomic status (SES) households displayed lower levels of physical activity (PA), engage in more sedentary activities and have higher BMIs (Drenowatz, C., et al. 2010). A second study showed that levels of SB was greater in respondents of lower SES (Brodersen, N. H., et al. 2007). A third study showed that the home environments of children for PA and SB varied based on SES (Van, K. D. H., at al. 2007). When looking at academic research on sleep and SB, we found that short sleep duration and SBs in the form of screen time may be working together to increases the odds of a child becoming overweight (Must, A., Parisi, S. M., 2009). It was also suggested that anyone getting less than or more than 7-8 hours of sleep per night, were associated with less moderate-to-vigorous PA, prolonged TV viewing, as well as shorter sleep being associated with greater BMIs (Xiao, Q., et al. 2014). Another study suggested that transitioning 30mins/day of SB to sleep showed beneficial associations with insulin, HOMA-S, and HOMA-β, as well as LDL cholesterol in long sleepers (Buman, M. P. et al. 2013). When taking our initial thoughts and our academic findings into consideration, we hypothesized that those with higher incomes and who get a better night sleep will show lower levels of SB.

Methods

As a class, we asked our family, friends and acquaintances to participate in an online survey to gather information on lifestyles and daily activities. For this specific topic, we looked at PEI residents between the ages of 25-64 years because this age group was more likely to be financially independent and integrated into the workforce. We looked precisely at three different aspects of the survey: The International Sedentary Assessment Tool, Sleep Questionnaire and Demographics. For separating our participants into low and high incomes, we decided that we would take our data and separate them into a top half (high income) and bottom half (low income). We used the median to separate the classes because we had skewed data on the lower income level. It is most likely that many who participated were students, as it was a student run questionnaire and many of us asked our friends or shared it on Facebook. We found the median income to be approx. $40,000. Anyone who earned below $40,000 was assigned to the low-income group, and anyone above was considered high income. For defining SB, those in the top ½ most sedentary based on the International Sedentary Assessment Tool (ISAT) results was termed as the sedentary group. Those within the bottom ½ of the data with the least number of hours spent sedentary, were termed non-sedentary. Only those who completed all of the required questions were incorporated into our data set. Those who did not fill out all sections needed for the data set were not considered. If participants answered, “some of the time”, “seldom”, or “almost never” to the question “I sleep well” they were considered to be bad sleepers. If participants answered, “fairly often” or “almost always” to the question “I sleep well”, they were considered at be good sleepers. For SB, we used two data questions: During the last 7 days, how much time (hours) did you usually spend sitting on a weekday; on a weekend day. These included times spent at school or work, at home, while doing course work, and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch TV. These two questions incorporated total sedentary time in an average weekday and weekend day. We considered these two amounts and computed the average to tell us how many hours on average a person spends sedentary in a day (not specific to weekday or weekends). We found that some of our participants answered the question as if it was regarding to the whole week. To account for this, we divided any number >20 by 7, assuming it would be unlikely that they were sedentary for 20 hours and only slept 4 hours in a day, and assuming they misinterpreted the data. As we made these assumptions, and those who did answer a question were not accounted for in our analysis, this caused potential flaws in our data.

Results

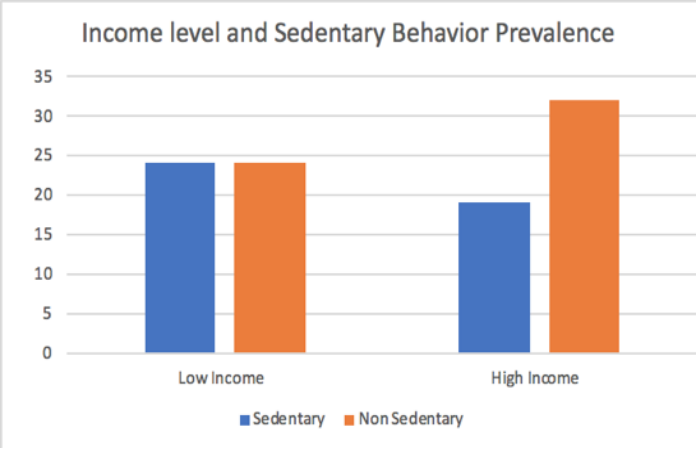
When looking at the trends between high income and low-income individuals, we see that there’s more high-income individuals (63%) engaging in non-sedentary behavior compared to

low income individuals (50%). Table 1 and Figure 1 compare income levels and sedentary behaviours of the participants.

Table 1: Income Level and Sedentary Behaviour Prevalence

	Low Income	High Income	Total
Sedentary	**24**	**19**	**43**
Non Sedentary	**24**	**32**	**56**
Total	**48**	**51**	**99**

Figure 1: Income Level and Sedentary Behaviour Prevalence

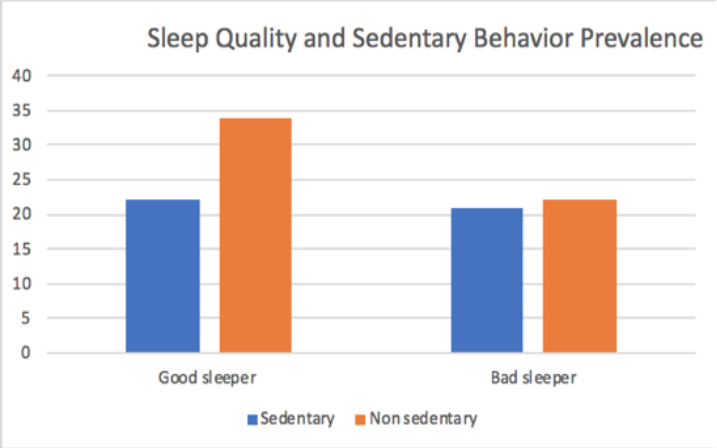


When considering the trends between good sleepers and bad sleepers, we see that there's more good sleepers engaging in non-sedentary behaviors (61%) than bad sleepers (51%), however more people reported being a good sleeper overall. Table 2 and Figure 2 compare the sleep quality and sedentary behaviours of the participants.

Table 2: Sleep Quality and Sedentary Behaviour Prevalence

	Good sleeper	Bad sleeper	Total
Sedentary	**22**	**21**	**43**
Non Sedentary	**34**	**22**	**56**
Total	**56**	**43**	**99**

Figure 2: Sleep Quality and Sedentary Behaviour Prevalence



Risk of being sedentary in the low income compared to high income = 1.342
Low Income & Sedentary: 24/48
High Income & Sedentary: 19/51

Relative Risk of being sedentary in the bad sleeper group compared to good sleeper group = 1.243
Bad Sedentary Sleepers: 21/43
Good Sedentary Sleepers: 22/56

When using a 95% confidence interval, we found that our data that we collected was not actually statistically significant, which potentially could be due to our small sample size.

Discussion

After inputting our data as stated above, neither of our findings were significantly different. Therefore, our research suggests no significant relationships between sleep quality and sedentary behavior, or income level and sedentary behavior. We entered in our prevalence for each category into an online software that provided us with the risk ratios and confidence intervals for both conditions. Our risk ratios fell within the confidence interval meaning that no significant differences were found. Our survey had a small sample size, which made it harder to find significances compared to if we had a larger sample. The literature research that we reviewed supported our hypothesis. However, the research was mostly based on children, and there were no studies that specifically analyzed income level. Rather, some studies looked at socioeconomic status and sedentary behavior, which could explain the differences in our findings. We came across very few studies on the relationship of sleep and sedentary behavior. Nevertheless, the studies we found lead us to believe a better sleep would lead to less sedentary time. We adjusted our data for sedentary behavior under the assumption people

misinterpreted the question. This also could have been a flaw made by us during our data collection process.

Conclusion

Our findings did support our hypothesis, however there was no significant differences found in either health outcomes in relation to sedentary behavior. Sedentary behavior is a newer health concept. Therefore, a lot more research needs to be conducted that considers sedentary behavior and how it relates to other health outcomes. Based on our findings, having a higher income does not mean you are going to have a less sedentary lifestyle compared to someone with a low income. Additionally, quality of sleep does not influence sedentary behaviour. Hopefully, in the future larger studies will be conducted to better understand sedentary behavior and how it relates to other lifestyle variables. By better understanding these lifestyle variables through research, future guidelines could be created to help the general population live a healthier, less sedentary, lifestyle.

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The PEI Health Survey

Mental Illness&Food Insecurity

In Prince Edward Island, mental health is a topic that is on the rise for discussion. Mental illness affects many families Island wide, influencing family dynamics and relationships. Food security is also a topic of concern for many PEI residents. Food security is defined as having the availability and sufficient access at all times to adequate, safe, nutritious food to maintain a healthy life (Dictionary.com, 2018). Food insecurity is defined as the inadequate or insecure access to food due to financial constraints and/or being worried about not having sufficient quantities of food before getting money to buy more (Prince Edward Island Canada, Health and Wellness, 2013). In 2014, approximately 15% of PEI residents experienced food insecurity (Proof, 2018). In 2010, 15% of PEI residents experienced treatment for a mental illness (Prince Edward Island Canada, Health and Wellness, 2013). The purpose of our study was to see if there was a correlation between food insecurity and mental illness, specifically if mental illness is correlated with food insecurity. If there is a correlation between the two, then the data could be used by healthcare professionals and future researchers to develop a plan to reduce or improve mental health status and food security status within Prince Edward Island.

The data collection process of this study followed a precise methodology. The target population was Prince edward Island residents. The inclusion criteria for being a PEI resident was classified as being at least 16 years old and are a resident of PEI, or have lived on PEI for school, etc. for at least 3 years. The survey was distributed as an online survey through social media, emails, and word of mouth for approximately 5-7 days. Once the data was collected, the survey coordinator, Travis Saunders, granted access to the specific components of the data that were needed for the study. These components were the results of the section of the questionnaire about mental illness status, gender, and food security status. This data was presented in an excel file, which allowed the data to be sorted accordingly. Elimination of data was done for the participants who left questions unanswered. This was done to ensure there was the usage of complete and accurate data. The question to determine mental illness status was, “Has any health professional ever diagnosed you with or treated you for any of the following chronic health conditions?- (check all that apply) [Depression or Anxiety]”. If the participant answered with either depression and/or anxiety they were classified as having mental illness. The question to determine food security status was, “You and other household members worried that food would run out before you got money to buy more. Was that often true, sometimes true, or never true in the past 12 months- [You and other household members worried that food would run out before you got money to buy more.]” If the participant answered often true or sometimes true, they were

classified as being food insecure. This data was analyzed, the prevalence rates and risk ratios were then calculated from this data. The results of the study were then determined.

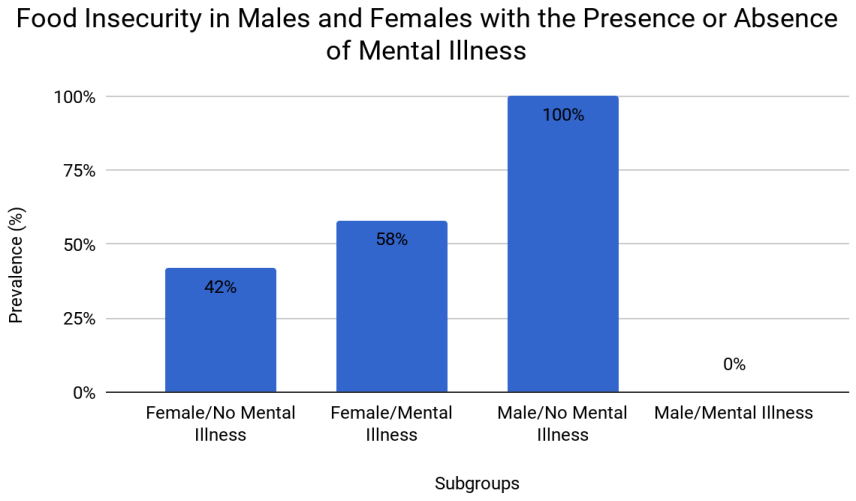
Based on the survey results, the prevalence of the following subgroups was found: men with mental illness and food insecurity, men with no mental illness and food insecurity, women with mental illness and food insecurity, and women with no mental illness and food insecurity. These results are demonstrated in *Table 1*. The total number of participants who were identified as food insecure was 24. Of these 24 participants, 21 were female and 3 were male. Of the females, 12 reported being diagnosed with a mental illness and 9 reported no diagnosis. Of the males, 0 reported to be diagnosed with a mental illness and 3 reported no diagnosis.

Table 1

Food Insecure	Mental Illness	No Mental Illness	Total
Male	0	3	3
Female	12	9	21
Total	12	12	24

Table 1 demonstrates the total number of participants that have identified as food insecure based on the PEI Health Survey, which was 24. The 24 food insecure participants were then broken down into subgroups based on mental health status and gender.

Figure 1 shows the prevalence for males and females who are considered to be food insecure either with or without a mental illness diagnosis.



The risk ratios for mental illness compared to no mental illness between males and females have been examined. Females with mental illness had a prevalence of 0.31 and females with no mental illness had a prevalence of 0.69. Then on the other hand men with mental illness had a prevalence of 0.31 and men with no mental illness had a prevalence of 0.69. Both risk ratios for comparing mental illness and no mental illness between males and females, the result was 1. This means that there is no difference in the risk between the groups.

Female & Mental Illness 57/185= 0.31 Male & Mental Illness 9/29= 0.31

Female & No Mental Illness 128/185= 0.69 Male & No Mental Illness 20/29= 0.69
Female with mental illness compared to male with mental illness: 0.31/0.31= 1
Female without mental illness compared to male without mental illness: 0.69/0.69= 1

Table 2

	Mental Illness	No Mental Illness
Female	0.31	0.69
Male	0.31	0.69
Risk Ratio	**1**	**1**

Table 2 shows the prevalence of males and females with or without mental illness. The risk ratios are female with mental illness compared to male with mental illness and female without mental illness compared to male without mental illness which are both 1.

The risk ratio for being food secure vs food insecure between males and females have been examined. Females that are food secure have a prevalence of 0.8865 and females who are food insecure have a prevalence of 0.114. Then we look at males and the prevalence for being food secure was 0.897 and being male and being food insecure was 0.103. Then risk ratios between males and females either being food secure or food insecure were calculated. It was found that the risk ratio for being female and food insecure compared to being a male and being food insecure was 0.904. Then being female who is food secure compared to male who is food secure resulted in a risk ratio of 0.988.

Female food secure: 164/185 = 0.8865 Males and food secure: 26/29= 0.897
Female food insecure = 21/185= 0.114 Males and food insecure: 3/29= 0.103

Females who are food insecure compared to males who are food insecure: 0.103/0.114= 0.904
Females who are food secure compared to males who are food secure : 0.8865/0.897=0.988

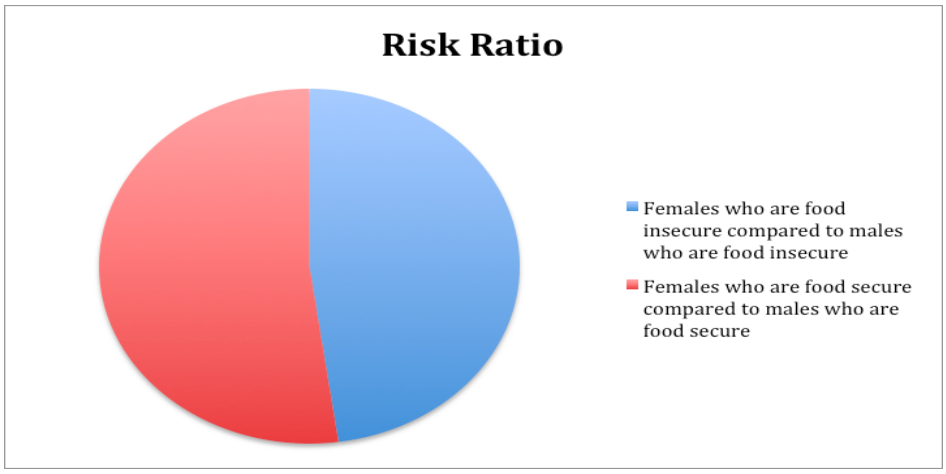


Figure 2 shows the risk ratios for females who are food insecure compared to males who are food insecure. Also shows females who are food secure compared to males who are food secure.

The main risk ratio we looked at for this study was having mental illness and being food insecure which has been shown in this study and we have found that men with mental illness and food insecurity compared to women with mental illness and food insecurity: 0.58/0= error. This has happened because there was a zero for men with mental illness and food insecurity, this gave us a calculation error leaving us unable to calculate the risk ratio. Then we looked at men without mental illness and food insecurity compared to women without mental illness and food insecurity: 0.42/1= 0.42. This means that men without mental illness have 0.42 times the risk of being food insecure compared to women without mental illness. Therefore, women without mental illness have a higher risk of being food insecure than men without mental illness.

Since for our previous risk ratios, there was a zero leading to an error, we decided to go further and do gender specific calculations. We looked at men and women specifically with and without mental illness, so, men with mental illness and food insecurity compared to men with no mental illness and food insecure: 1/0= 0 error. Again, since there were zero men in the comparison group, a risk ratio was unable to be calculated. Then we looked at women with mental illness and food insecure compared to women with no mental illness and food insecure: 0.42 /0.58 =0.724. This means that woman who are not mentally ill have 0.724 times the risk of being food insecure compared to women who are mentally ill. Therefore, women who are mentally ill have a higher risk of being food insecure.

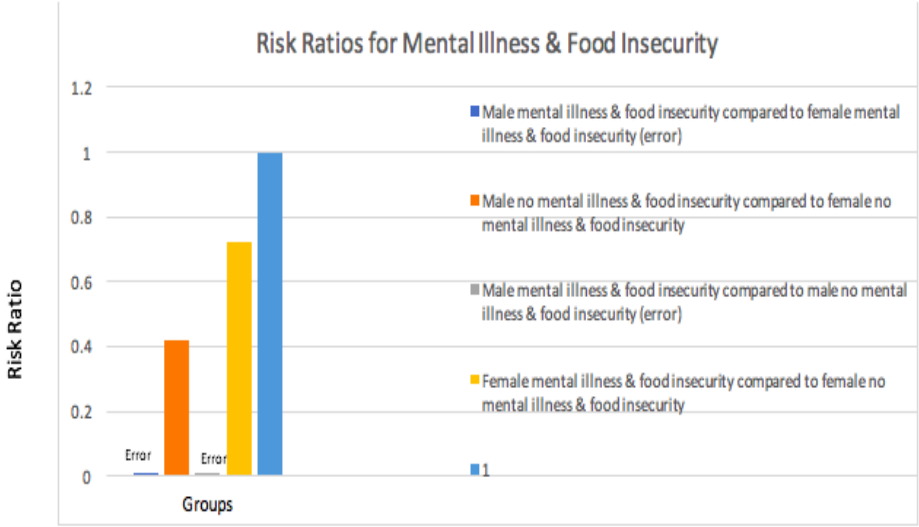


Figure 3 represents the risk ratios for mental illness and food insecurity.

It is believed that there were not enough male participants in the study to come to any conclusions about the health status of PEI related to mental health and food insecurity in the male population. Females without mental illness have a higher risk of being food insecure than males without mental illness and females diagnosed with a mental illness were more likely to be food insecure than those females not diagnosed with a mental illness. However, due to the small sample size and possible cofactors, the results are not statistically significant.

An implication for this study is that there was a small sample size. The sample did not have enough male participants and there were unanswered questions in the data, therefore those participants had to be removed, resulting in an even smaller sample. With health related surveys,

or any survey, there is always the chance of participants reporting themselves better off than they actually are. In this case, participants may not want to admit to having a mental illness or they may not want to admit that they are unable to provide food for themselves or for their dependents. One of the health outcomes focused on was mental health status which was only classified as depression and/or anxiety. A limitation is that there is more to mental illness than just depression and anxiety. The second health outcome, food insecurity, was only defined by one generalized question for this study. The data collection period for this survey was too short, therefore, if the data collection period was longer, this would ensure a larger sample size and thus, provide the possibility of more significant results and conclusions.

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Heart Disease and Diabetes in Relation to Food Insecurity

Introduction

Coronary heart disease results from atherosclerosis which occurs when there is build-up of atheromas, or plaque, leading to obstruction of the arteries. Diabetes is chronic disease caused by a deficiency in the production of insulin or in its use to transport glucose from the blood into other tissues. Heart diseases are the second leading cause of death among Canadians, while diabetes is the seventh leading cause of death among Canadians (Public Health Agency of Canada, 2015). Common risk factors among both heart disease and diabetes include obesity and insulin resistance, which can both result from an inadequate diet, or food insecurity. With four million Canadians facing food insecurity (Household Food Insecurity in Canada – PROOF, 2016), it is a major problem which negatively impacts many aspects of Canadian overall health.

Due to the magnitude of these problems, we chose to investigate to see if there was a link between having food insecurity and also being diagnosed with diabetes or heart disease. Based on our understanding of the diseases, we hypothesized that food insecurity would be positively correlated with having diabetes and heart disease.

Methodology

Data was collected through the use of a health survey that was available to all Prince Edward Island residents above the age of 16 who have been living in the province for at least three years, including students who travel out of province in the summer. There were 166 individuals with data that was relevant to our research question and with the use of excel we were able to sort the data received from those individuals. There were six questions from the survey that we collected our data from. These questions included:

- What is your current age?
- Has any health professional ever diagnosed you with or treated you for any of the following chronic health conditions (Heart Disease)?
- Has any health professional ever diagnosed you with or treated you for any of the following chronic health conditions (Diabetes)?
- Have you and other household members worried that food would run out before you got money to buy more?
- The food that you and other household members bought just didn't last, and there wasn't any money to get more?
- You and other household members couldn't afford to eat balanced meals?

We classified someone as having heart disease or diabetes if they answered “yes” to the corresponding question. We also defined someone as having food insecurity if they answered “sometimes true” or “often true” to any of the three questions regarding food security.

Results

After analyzing the data we found that there were five people who reported having heart disease and of those five, one person was also food insecure. As you can see in Table 1, we found that the prevalence of having heart disease and food insecurity was 3.2% and the

prevalence of just having heart disease was 3.0%. We then calculated the relative risk of having heart disease and found that people with food insecurity were 1.07 times more likely to have heart disease than people without food insecurity, with a 95% confidence interval of We also calculated that the odds of having heart disease was 3.3% for people with food insecurity and 3.1% for people without food insecurity. The odds ratio was 1.06 which was almost identical to the relative risk.

Risk Factor Status	Disease Present (heart disease)	Disease Absent	Risk of Heart Disease (Prevalence)	Odds of Heart Disease
Present (food insecure)	1	30	1/(1+30) = 3.2%	1/30 = 3.3%
Absent (food secure)	4	131	4/(4+131) = 3.0%	4/131 = 3.1%
Total	5	159		
Relative Risk = [1/(1+30)] / [4/(4+31)] = 0.032/0.030 = 1.07 95% confidence interval: 0.18-6.49 Odds Ratio = (1/30) / (4/131) = 1.06				

Table 1. Table relating the number of people with heart disease and food insecurity and the calculations of relative risk and odds ratio.

We then looked at diabetes and found that there were seven people who reported having diabetes and of those seven, four people were also food insecure. As you can see in Table 2, we found that the prevalence of having diabetes and food insecurity was 12.9% and the prevalence of just having diabetes was only 2.2%. After calculating the relative risk we found that people with food insecurity were 5.86 times more likely to have diabetes than people without food insecurity, with a 95% confidence interval of 2.08-12.06. The odds of having diabetes was 14.8% for people with food insecurity and 2.3% for people without food insecurity and the odds ratio was 6.43 which was slightly higher than the relative risk. The relative risk of having heart disease or diabetes is also shown in Figure 1 which allows easy comparisons to be made between people with food insecurity and people without food insecurity.

Risk Factor Status	Disease Present (diabetes)	Disease Absent	Risk of Diabetes	Odds of Diabetes
Present (food insecure)	4	27	4/(4+27) = 12.9%	4/27 = 14.8%
Absent (food secure)	3	132	3/(3+132) = 2.2%	3/132 = 2.3%
Total	7	159		
Relative Risk = [4/(4+27)] / [3/(3+132)] = 0.129/0.022 = 5.86 95% Confidence Interval: 2.08-12.06 Odds Ratio = (4/27) / (3/132) = 6.43				

Table 2. Table relating the number of people with diabetes and food insecurity and calculations of relative risk and odds ratio.

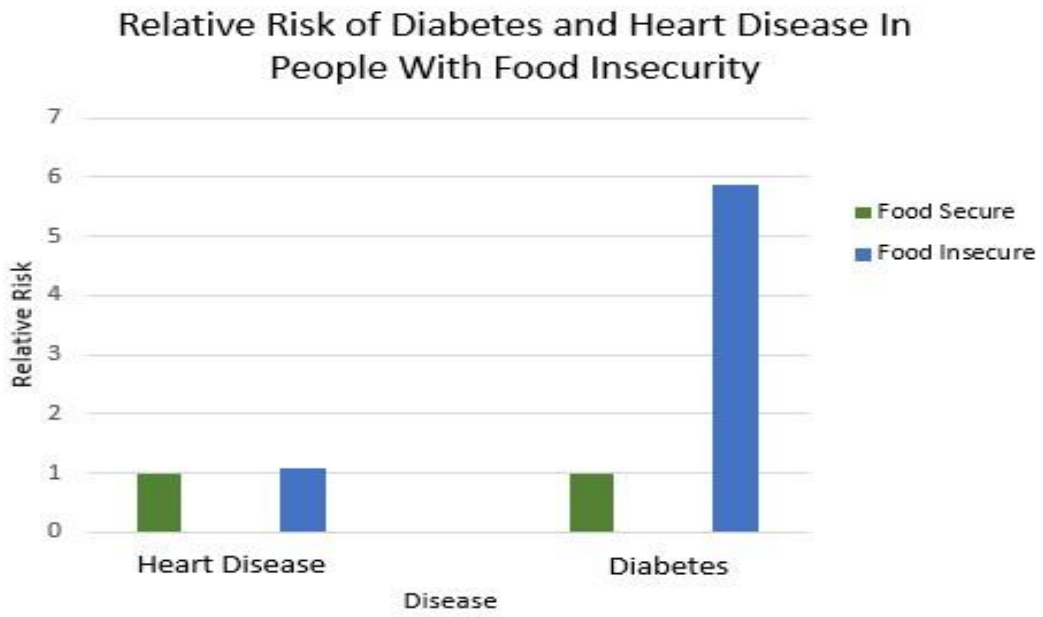

Figure 1. Graph showing a visual comparison of the relative risk of having heart disease or diabetes in those with food insecurity and those without food insecurity.

Since the presence of food insecurity did in fact increase the risk of having diabetes, we thought it would be useful to determine what age group had the highest risk of being food insecure. As you can see in Table 3, people under the age of 30 had a much higher risk of being food insecure compared to those over the age of 30. The risk for those under 30 was 25.6% while the risk for those over 30 was only 10.5%. After calculating the relative risk we found that individuals under the age of 30 were actually 2.44 times more likely to be food insecure then individuals who are 30 and over with a 95% confidence interval of 1.86-3.19. The odds of being

food insecure was also much higher for those under 30, which was 34.3%, than for those over 30, which was 11.8%.

Risk Factor Status	Condition Present (Food Insecure)	Condition Absent (Food Secure)	Risk of Being Food Insecure (Prevalence)	Odds of Being Food Insecure
Present (under 30)	23	67	23/(23+67) = 25.6%	23/67 = 34.3%
Absent (aged 30 and over)	8	68	8/(8+68) = 10.5%	8/68 = 11.8%
Total	31	135		
Relative Risk = [23/(23+67)] / [8/(8+68)] = 0.256/0.105 = 2.44 95% Confidence Interval: 1.86-3.19 Odds Ratio = (23/67) / (8/68) = 2.91				

Table 3. Table showing the relationship between food insecurity and age.

Implications and Limitations

The implications of the results are that people with food insecurity are 5.86 times more likely to have diabetes than people without food insecurity. This difference was found to be statistically significant since the 95% confidence interval was 2.08-12.06. It would be very useful to study this relationship further to look for ways to try to combat this high risk and to find ways to decrease the number of people who are facing food insecurity. Since four million Canadians are currently food insecure, that means four million people are at an increased risk of having or developing diabetes. Another implication of the results is that younger people are at an increased risk of being food insecure, therefore, they are also at an increased risk of having diabetes. This means that interventions need to be implemented at younger ages as well as older ages to help prevent food insecurity, and by association, diabetes.

The limitations of this analysis were that a large number of the people who completed the survey were between the ages of 20 and 30. This may have impacted the results we obtained for both diabetes and heart disease as these diseases tend to show up later in life. We also were unable to distinguish between type 1 or type 2 diabetes, which may have affected the conclusions made regarding diabetes. Type 1 diabetes is not affected by lifestyle factors since it is an autoimmune disorder so food insecurity would not have the impact that it has for type 2 diabetes. If we knew which type of diabetes participants had, it would allow for more accurate conclusions to be made. We also considered the amount of physical activity to be a confounding variable since low levels of physical activity is also a risk factor for diabetes and heart disease. We do not know if people with food insecurity were also not engaging in enough physical activity which could have contributed to the development of the disease. To control for this confounder, we would need to know the physical activity levels of those with food insecurity to determine if differences in physical activity levels had an influence on the results obtained.

Conclusions

Based on the data that was collected and analyzed, we can conclude that people who are food insecure are 5.86 times more likely to have diabetes than people who are not food insecure, which is in agreement with our hypothesis. We can also conclude that people who are under the age of 30 are 2.44 times more likely to be food insecure, putting them at an increased for having diabetes compared to people aged 30 and over. We cannot make any conclusions regarding heart disease and food insecurity as our results were not statistically significant so further investigation will need to be conducted in this area.

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The PEI Health Survey

How Socioeconomic Status affects Physical Activity and Food Security

Introduction

A person's or a households socioeconomic status is a large determinant for how a person lives their daily life or how they live their overall lifestyle. In our study we are looking at how socioeconomic status affects a person's food security and physical activity Socioeconomic status is split up into two groups, low socioeconomic status, considered to be an annual income less than 40,000 – 50,000 dollars. High socioeconomic status is considered to be an annual income higher than 50,000 – 60,000 dollars. An aspect of daily life that would be affected by not have sufficient funds is a person's food security. Food security is defined as the state of having reliable access to a sufficient quantity of affordable, nutritious food. Food insecurity is defined as the state of being without reliable access to a sufficient quantity of affordable, nutritious food due to financial constraints. Food insecurity is a grave problem in Canada that negatively affects a person's physical, which is the other aspect this study looks at, mental and social health, costing the healthcare system a substantial amount of resources. 1 in 8 households in Canada is food insecure, that's over 4 million Canadians (2018).

Between the years of 2011 and 2012, 8.4% (1,098,900) of Canadian households were food insecure. These households were sometimes uncertain of having, or unable to acquire, enough food to meet the needs of all members; this is due to insufficient money for food. Food insecurity is also split up into two different categories, moderate and severe food insecurity (2017).

Moderate food insecurity accounts for 5.8% of Canadian households, this affects the quality and/or quality of the food consumed. Severe food insecurity accounts for 2.6% of Canadian households, this reduces their food intake and disrupts their eating patterns (2017).

The other aspect of this research topic is how socioeconomic status affects the physical activity of individuals. Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure. While physical inactivity is defined as expending less than 1.5 k/can/kg/day in leisure physical activities. That is equivalent to walking a little over two kilometer, approximately 3000 steps (Bumgardner, 2017). Physical inactivity has been identified as the fourth leading risk factor for global mortality causing an estimated 3.2 million deaths globally (*Physical Activity).*

Some guidelines for physical activity are; youth, ages 12-17, should be accumulating 60 minutes of moderate to vigorous activity daily. Vigorous intensity activities should be done 3

days/week, and muscle/bone strengthening activities 3 days/week/ Moderate intensity activity is defined as activities ranging between 3 - <6 METS, these activities require more oxygen consumption than light intensity; Vigorous activity are activities ≥6 METS, it requires the highest amount of oxygen consumption to complete an activity (Prosch, 2013). Adults, ages 18 – 64, should be accumulating 150 minutes of moderate to vigorous aerobic activity in bouts of 10 minutes or more, there are also benefits to add in muscle/bone strengthening exercises twice a week and the more physical activity completed is better for improved health benefits. Older adults, ages ≥ 65, should accumulate 150 minutes of moderate to vigorous intensity aerobic physical activity per week, adding in bone and muscle strengthening twice a week is also beneficial; balance exercise is helpful to prevent falls increasing their quality of life (*Canadian Physical Activity and Sedentary Behaviour*).

For this research project we hypothesized that if a person has a low annual income level, than they will have a lower amount of physical activity and less food security, compared to a person with a higher annual income. The purpose of this research project was to observe the trends between physical activity, food security and a person's annual income level.

Methodology:

First, each person conducting this research project had to take the Ethics Certification in order to access the data collected from the PEI Health Survey. Proceeding the certification, we then set standards as to who can fit our sampling criteria; which included people who resided in PEI, were at least the age of 16 years old, and was living on the island for at least 3 years which also include students from away. After the standards were laid out, we had roughly a week to recruit participants and we utilized social media, other classes, family & friends, and Moodle. Following the sampling deadline, Dr. Saunders divided up the results accordingly into the groups the results pertain to. The results we will be focussing on in this paper are related to annual income level and how it affects physical activity and food security. To note, the raw data was given to us in excel, for us to organize and then analyze; weaving out what was not fully answered to ensure the most accurate measures. In regard to our results, we measured the prevalence rates of overall resistance training, prevalence of overall aerobic training, the prevalence of resistance training in both low or high socioeconomic status (SES) and the prevalence of aerobic training in both low or high socioeconomic status. Furthermore, the risk ratio of being classified as a low or high socioeconomic status was calculated. To add, the risk ratio of high or low SES, cutting their food due to insufficient money was computed. Last calculation was the risk ratio for participating in aerobic exercise with annual income less than 40k-50k compared to annual income greater than 50k-60k. Lastly, we used outside resources to check for consistency and then finally we identified our limitations.

Research Findings

Prevalence of Physical activity Among Persons With High/Low Socioeconomic Status

To find the prevalence of physical activity, we looked at both aerobic and resistance exercises; The PEI Health Survey ask the participants "What was your total personal income during the previous year" we then asked them "Do you participate in aerobic/cardiovascular training regularly" and also "Do you participate in resistance training regularly?", they were to answer yes or no on these questions. We then took the overall prevalence of aerobic and resistance training, and then we organized our data into two subgroups, whether they had low Socioeconomic status or high socioeconomic status, and whether they said yes or no to participating in aerobic or resistance training. The original data set had 152 participants and after elimination due to not answering the required questions we were focusing on; we ended up with a total of 103 who were able to validate our findings and able to complete the questionnaire fully. Out of the 103 qualified participants 41(40%) participated in resistance training regularly, 67 out of the 103 participants participated in aerobic exercise regularly (60%). Out of the 103 participants 62 were considered to have a low socioeconomic status, and 41 had high socioeconomic status. We then took the prevalence of resistance training and aerobic training among people with low socioeconomic status, 21 out of 61 (20.3%) participated in regular resistance training, while 35 out of 62 (56%) said they participated in aerobic training regularly. The then looked at the prevalence of resistance and aerobic exercise among people with high socioeconomic status, 20 out of 41 (48.8%) said they participated in resistance training regularly, while 32 out of 41(78%) said they participated in aerobic training regularly.

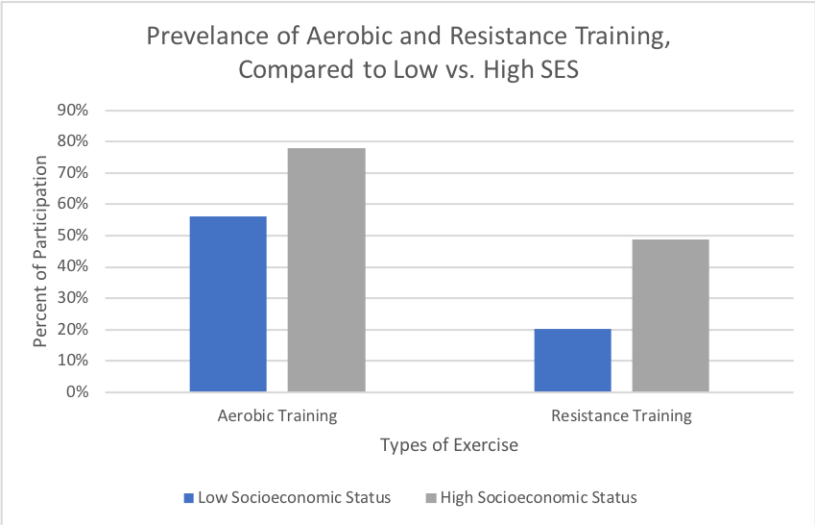

Figure 1 represents the prevalence or aerobic and resistance training among people with high and low SES

Relative Risks

Having a low socioeconomic status compared to having a high socioeconomic status

Low Socioeconomic status was 62 out of the total 103 participants = 0.6

High Socioeconomic status was 41 out of the total 103 participants = 0.4

So in this study you were more likely to have a low socioeconomic status (SES) compared to an individual with high SES

People with low income compared to high income people, who in the last 12 months cut the size of meals or skip meals because there wasn't enough money for food

	>$40,000 - $50,000	<$50,000 - $60,000	Total
Yes	6	0	6
No	56	40	96
Total	62	40	102

Relative Risk (RR) = (6/6+0) / (56/40+56)
RR = 1 / 96
RR = 0.0104

Aerobic exercise with an annual income less than $40,000 - $50,000 compared to an annual income greater than $50,000 - $60,000

	>$40,000 - $50,000	<$50,000 - $60,000	Total
Yes	35	32	67
No	27	9	36
Total	62	41	103

RR = (35/35+32) / (27/27+9)
RR = (35/67) / (27/36)
RR = 0.522 / 0.75
RR = 0.696

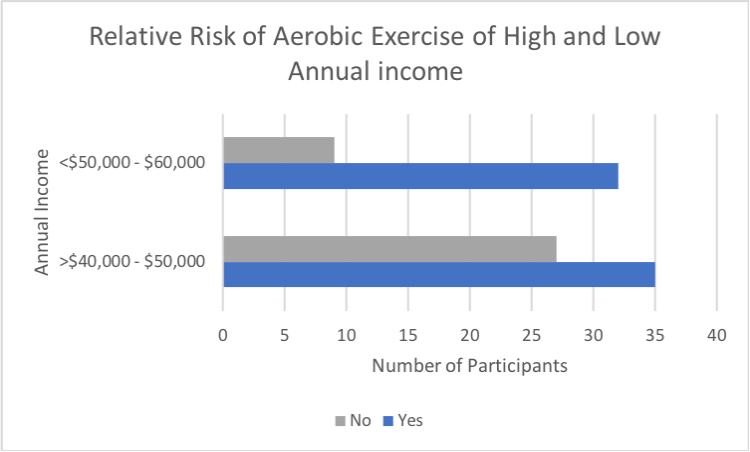

Figure 2 represents the relative risk of aerobic exercise of persons with high versus low socioeconomic status

Limitations:
There was a number of limitations in this research design that we would need to change in the future for more accurate results. Some of the limitations include; small sample size, incompletion of fully answering the questions, there was biased answers and also false answers. Other limitations included were the amount of time was limited and also the fact most of us never conducted this type of research project before. Therefore, if we were to complete this research project again we would need to; select a larger sample, select the sample randomly, conduct multiple surveys within the same sample, use log sheets for food security/physical activity and also use pedometers for physical activity.

Conclusion:
To summarize, the data we collected was very seldom due to our small sample size plus all the data we had to weave out; which made it difficult to make a conclusion based on our results. However, we pulled data from multiple other studies which were consistent with our results for prevalence and we concluded that our hypothesis stands correct; people who are classified with a high socioeconomic status will be more food secure and participate in more physical activity compared to the people who are classified in the low socioeconomic group. As for the relative risk, However, there needs to be further research conducted to find out what the reasoning for our hypothesis to stand true and what sort of implementations we can do to positively change this outcome for the future.

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Introduction:

This projects basis and research was done for, and will be included in the PEI Health Survey report. Our focus was looking at people of no specific age, sex, or race in Prince Edward Island. We compared people with or without asthma and people with or without arthritis, to

levels of physical activity. There were two subsets to the physical activity category and they were, aerobic physical activity, and resistance training physical activity. There were certain questions that better supported our area of research, and were used to gather information for these comparisons. There were various questions taken from the *Fantastic Questionnaire*, the *International Physical Activity Questionnaire*, and as well, specific questions we have formed to help us get a deeper look at these subgroups.

We believed that comparing these two subgroups of diseases to both levels of physical activity would reveal that some people are abstaining from exercise due to their disease although exercise may be one of the most valuable tools to help manage their condition. We hypothesized that people with asthma would abstain from participating in aerobic physical activity due to difficulty breathing, and people with arthritis would abstain from participating in resistance training physical activity due to sore or painful joints.

Prevalence of Asthma:

To find the prevalence of asthma we asked our participants in the PEI Health Survey "Do you have Asthma"? We then asked our participants if they participate in regular aerobic or resistance training physical activity? We then organized our data into different sub groups; people with and without asthma, people that participate or do not participate in aerobic physical activity, and people that do or do not participate in resistance training physical activity. Out of all the participants in the PEI Health Survey only 176 met the criteria for our portion of the study. Subjects were eliminated from our portion of the survey if they did not answer one or more of our questions. Out of the 176 eligible participants in our study 30 (17%) were found to have asthma. Of the 30 people that have asthma, 16 (53%) stated that they did participate in regular aerobic physical activity while 14 (47%) said that they did not. Of the 30 people that have asthma 10 (33%) stated that they do participate in regular resistance training physical activity, while 20 (67%) said that they do not. In comparison, 146 (83%) of the eligible 174 participants in our survey did not have asthma. Of the 146 participants who did not have asthma 93 (64%) of them stated that they do participate in aerobic physical activity, while 53 (36%) admitted that they do not. Of the 146 who do not have asthma, 62 (42%) stated that they do participate in regular resistance training while 84 (58%) admitted that they do not participate in regular resistance training.

Relative Risk of Asthma:

To find the Relative Risk in our population, the participants were asked a few simple questions. The first question was do you have asthma? Next up they would answer whether they participated in aerobic/cardiovascular training regularly? And the next question was, Do you participate in resistance training regularly? Once those three questions were answered for each subject, we were able to calculate the Relative Risk for people participating in aerobic, and resistance training physical activity among people with asthma. In our study, 30 participants had asthma, and 16 of them participated in regular aerobic physical activity. There was 14 people with asthma who did not participate in regular aerobic physical activity. Once we found those numbers, 16/30=0.53 (Participate in), and 14/30=0.47(Do not participate in), we divided them together to get the Relative risk of people with asthma who participate in aerobic physical activity compared to no physical activity. The Relative Risk was calculated to be 0.47/0.53= **0.89.** The same three questions were used, but this time, the Relative Risk was calculated for people without asthma.

In our study, 146 participants did not have asthma. Of those, 93 participants participated in regular aerobic physical activity, while 53 of the participants did not. Once we found those numbers, 93/146=0.63 (Participate in), and 53/146=0.36 (Do not participate in). The Relative Risk for people participating in aerobic physical activity among people without asthma was calculated to be 0.36/0.63=**0.57**

The next subject for Relative Risk, was the resistance training physical activity among people with or without asthma. Again as stated earlier, 30 of our participants had asthma. 10 of those participants participated in regular resistance training, while 20 did not. Those numbers were calculated to be 10/30=0.33 (Participate in), and 20/30=0.67(Do not participate in) regular resistance training physical activity. The Relative Risk of people with asthma who participated in resistance training physical activity compared to those who did not is 0.33/0.67=**0.49.** The next Relative Risk that was calculated was for, people without asthma who participated or did not participate in regular resistance training physical activity. Also stated above, 146 participants in our population did not have asthma. 62 of those participants participated in regular resistance training, while 84 did not. Those numbers were calculated to be 62/146=0.42 (Participate in), and 84/146=0.58(Do not participate in). The Relative Risk of people without asthma who

participated in resistance physical activity compared to those who did not was calculated to be 0.42/0.58=**0.72**

Prevalence of Arthritis:

For the prevalence of Arthritis, we asked the question "If you have arthritis, does exercise make it worse?" The available answers were "yes", "no", and "Not Applicable". Therefore anyone who answered yes or no, would be counted in our population with arthritis, and any who answered "Not Applicable" was considered our population of people without Arthritis. The aforementioned 176 individuals used to collect the Asthma data are the same used to collect data for Arthritis. It was determined that 24/176 (14%) of our participants had Arthritis, meaning the other 152 (86%) did not.

Of the 24 individuals with Arthritis, 16 (67%) stated that they did regularly participate in aerobic physical activity, whereas the other 8 (33%) did not. As for resistance training, 11/24 (46%) of people without arthritis did regularly participate in resistance training, leaving the other 13 (54%) to say they didn't regularly perform resistance training.

In comparison to these numbers, of our 152 participants without Arthritis, 94 (62%) stated that they participate in aerobic physical activity regularly. This means that the other 58 (38%) did not. In regards to resistance training, 61/152 (40%) of people without Arthritis said they do resistance training on a regular basis, while the other 91 (60%) said they did not.

Relative Risk of Arthritis:

For the Relative Risk of arthritis, there were some simple questions asked in our population, to get the data needed for the study. The first question was do you have arthritis, next was, do you participate in regular aerobic physical activity? And then, do you participate in regular resistance training? Once those three questions were answered for each subject, we were able to calculate the Relative Risk for people participating in aerobic, and resistance training physical activity among people with arthritis. I our population, 24 people had arthritis, Of those 24 people, 16 participated in regular aerobic physical activity(16/24=0.67). Of the 24 people who had arthritis, 8 did not participate in regular aerobic physical activity (8/24=0.33). After calculating those numbers, The Relative Risk of people with arthritis who participated in aerobic

physical activity compared to those who did not is **0.49**. In our population, 152 people in our study did not have arthritis. Of those 152 people, 5 did participate in regular aerobic physical activity(58/152=0.38). While 94 people in our study who did not have arthritis, did not participate in regular aerobic physical activity(94/152=0.62). One that data was gathered, The Relative Risk of people without arthritis who participated in aerobic physical activity compared to those who did not is 0.38/0.62= **0.61**.

Now moving onto arthritis compared to resistance training physical activity. Again in our population, there was 24 people with Arthritis, 13 of those people did participate in regular resistance physical activity(13/24=0.54). While 11 people who had arthritis did not participate in regular resistance training(11/24=0.46). With that data found, The RR of people with arthritis who participated in resistance physical activity compared to those who did not is 0.46/0.54=**0.85**. In our study 152 people did not have arthritis. 91 of those people did participate in regular resistance training(91/152=0.60). While 61 of those people did not participate in regular resistance training(61/152=0.40) With those numbers, The Relative Risk of people without arthritis who participated in resistance physical activity compared to those who did not is 0.40/0.60= **0.67**.

Conclusion:

Our findings ended up contradicting our hypothesis. We believed that our population with asthma would participate in less aerobic physical activity due to potential troubles with breathing. We also assumed that our participants with arthritis would perform less resistance training due to potential injury or soreness. It appears from our population sample that the majority of people do participate in regular aerobic physical activity regardless if they have asthma, arthritis or neither. In regards to resistance training, it appears that the majority of people do not participate in regular resistance training whether or not they had asthma, arthritis or neither. Consequently, we believe that the individuals in our study do not have sufficient background information on the benefits of resistance training. For this reason, we believe that further educating the general population on the benefits of lifting weights or resistance training would be very beneficial for their overall health and wellness. It is well documented that

resistance training offers numerous benefits to help manage arthritis pain. Resistance exercise keeps muscles around affected joints strong, lubricates joints, decreases bone loss and helps control joint swelling and pain"(Melone). We believe that if more people know all the benefits of the activity, you will see more participation.

A visual representation of our findings can be found in **Table 1** and **Table 2. Table 1** shows the relation of the relative risk between people with and without asthma, and whether they participate in aerobic physical activity regularly or not. As you can see, more people with asthma did participate in aerobic activity, than those with asthma who did not. Therefore, contradicting our hypothesis.**Table 2** also contradicts our hypothesis. This is because we believed that there would be less people participating in resistance training than not participating amongst those with Arthritis. The results for resistance training were actually quite similar whether the participants had Arthritis or not.

We believe our hypothesis' were inaccurate due to the fact that we didn't take account any specialized program for each individual. We didn't specifically ask which type of resistance training was being done, and each participants doctors could have them doing low intensity programs in an effort to improve their medical conditions.

Table 1:

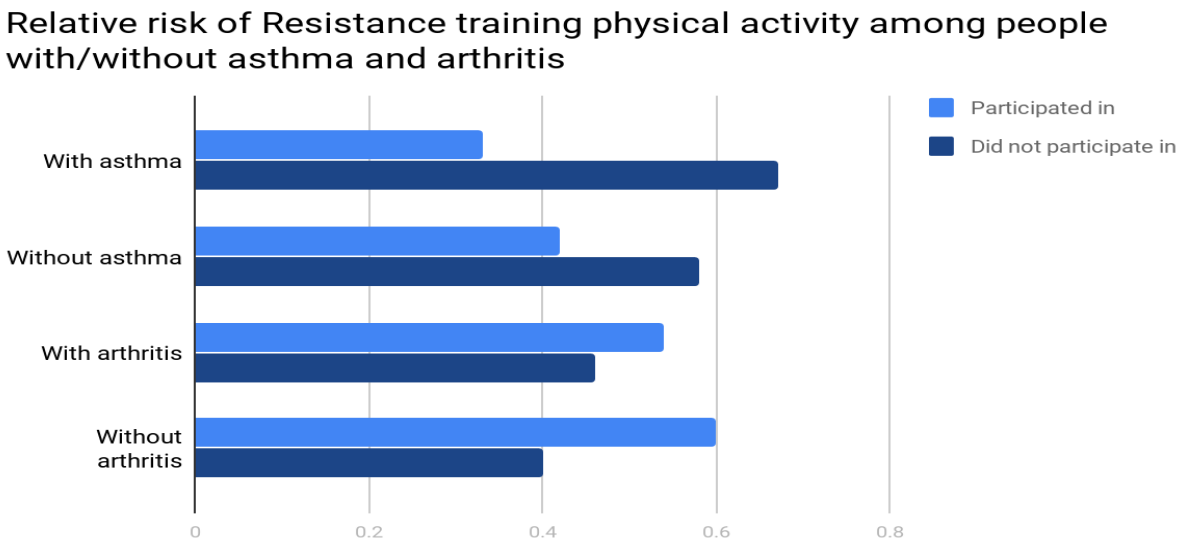
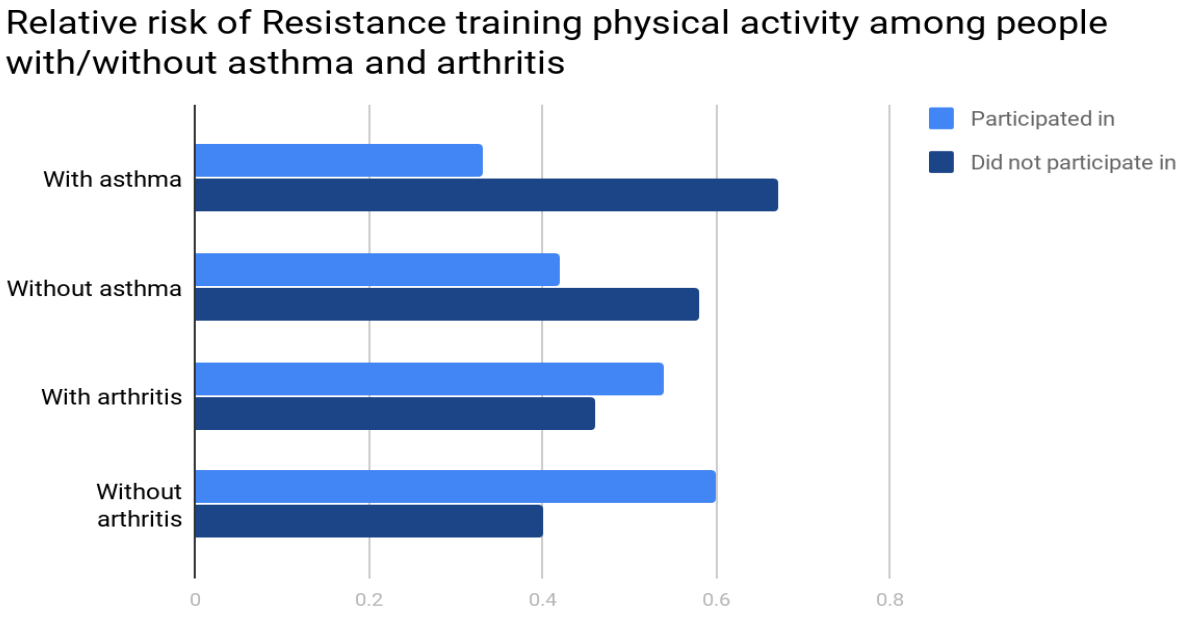


Table 2:



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