Fat and Happy or Skinny and Sad?

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*There are plenty of empirical studies that explore the link between body shape and economic factors such as wages, happiness, and mental well-being. My research project analyzes a similar association on how body shapes, as measured by body mass index, impacts overall life satisfaction, utilizing data from the Canadian Community Health Survey (CCHS). I also include the potential effect of diabetes on the relationship between BMI and life satisfaction, where the negative effect of BMI on satisfaction of life is stronger for individuals without diabetes compared to those with diabetes. This is poignant considering the growing rate of diabetes worldwide which highlights the need for public health interventions to address both obesity and diabetes as potential sources of reduced well-being. My models also explore the nonlinear relationship between BMI and life satisfaction, showing that the negative effect of BMI on life satisfaction is weaker for higher BMI values, suggesting the negative impact of obesity on health becomes stronger once an individual reaches a certain level of excessive weight.Top of FormBottom of Form*

# I. ****Introduction****

Exploring the relationship between body shape and economic outcomes is important as it has significant implications for individuals, society, and policymakers. Understanding the relationship between BMI and outcomes such as wages, happiness, and mental health can help policymakers develop interventions to promote economic and health equity. The goal of my research is to provide insights on how an individual’s body mass index, for those with and without diabetes, may impact their economic opportunities, namely their overall well-being.

Several studies have found that individuals with higher BMIs are more likely to experience wage discrimination and face barriers to employment opportunities. A study by Cawley and Burkhauser (2008) found that obese women earn up to 24% less than their non-obese counterparts, while obese men earn up to 6% less. Their research has also linked higher BMIs to lower job performance ratings, fewer promotions, and higher rates of unemployment.

Other research provide evidence that body shape may also impact mental health and overall well-being. For example, individuals with higher BMIs are more likely to experience depression, anxiety, and lower life satisfaction (Mannucci et al., 2002). Alternatively, some studies have also found that certain body shapes, such as those perceived as more attractive, can provide advantages in the labor market, such as higher wages and greater employment opportunities (Zebrowitz, Tenenbaum, & Goldstein, 2003). However, the relationship between body shape and labour market outcomes is complex and can be influenced by various socioeconomic factors.

The literature suggests that there is a complex relationship between body shape and economic outcomes, and my study seeks to examine the specific connection between BMI and life satisfaction by using a dummy variable to analyze the outcomes of individuals with and without diabetes. Diabetes is a chronic disease that is often associated with obesity, which can affect an individual's life satisfaction. Therefore, the dummy variable can isolate the effect of BMI on life satisfaction without the confounding effect of diabetes. Additionally, I include various controls, such as gender, age, and fitness level, which will directly impact the independent and dependent variables. Furthermore, I will explore interactions and nonlinearity to moderate the effects of the explanatory variables.

The results of my analysis the regression models reveal a negative relationship between BMI and satisfaction levels, which is consistent with empirical previous research. However, my analysis is limited using cross-sectional data and self-reported measures, which may introduce errors and bias. I use the Breusch-Pagan test as my specification check where the results suggest presence of heteroscedasticity in the data, which may lead to incorrect inference. The robustness analysis provides additional support for the original findings that BMI has a negative impact on satisfaction levels.

# II. ****Data Description****

In my paper, I will be using the Canadian Community Health Survey 2017-2018 as a primary source of cross-sectional data to examine the relationship between body shape (measured by BMI) and life satisfaction among Canadians. It is a national survey conducted by Statistics Canada that gathers information on health determinants, health status, and health care utilization of Canadians. The survey covers a range of topics related to health, such as physical activity, nutrition, mental health, and chronic health conditions. The CCHS provides a robust and nationally representative dataset, making it an ideal source of data for my research question.

*Variables*

**GEN\_010** (renamed: “happy\_score”): This continuous variable measures individuals’ satisfaction with life in general where respondents answered using a scale of 0 to 10, where 0 means "Very dissatisfied" and 10 means "Very satisfied". This is the main dependent variable in my analysis.

**hwtdgbmi** (renamed “BMI”): This continuous variable measures an individual's body mass index (BMI), which is calculated by dividing their weight in kilograms by the square of their height in meters. I will use this variable as the main predictor of life satisfaction in my analysis.

**CCC\_095** (renamed “diabetes”): This dummy variable measures whether an individual has been diagnosed with diabetes. It takes on a value of 1 if an individual has been diagnosed with diabetes and 0 otherwise. It is used as a moderator in the analysis to explore whether the relationship between BMI and life satisfaction differs for individuals with and without diabetes.

**dhhgage** (renamed “age”): This categorical variable states an individual’s age. I will use this variable as a control in my analysis, as age has been shown to affect BMI and life satisfaction directly.

**DHH\_SEX** (renamed “gender”): This categorical variable states an individual’s gender. I will use this variable as a control in my analysis, as gender has been shown to affect BMI and life satisfaction directly.

**paadvacv** (renamed “fitness”): This variable measures an individual's level of physical activity. I will use this variable as a control in my analysis, as fitness has been shown to affect BMI and life satisfaction directly.

**GEN\_015** (renamed “mental\_health”): Similar to happy\_score, this variable measures individual’s perceived mental health where respondents answered in categories: Excellent, Very good, Good, Fair, and Poor. I converted the responses to a continuous scale where 1 corresponds to Poor and 5 corresponds to Excellent.

I will utilize this variable as my dependent variable in my robustness analysis to test the sensitivity of the results and ensure that my findings are robust and consistent across different measures of well-being.

Table 1—Summary Statistics of Individuals’ Satisfaction Grouped by BMI Class and Diabetes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| BMI Class | Diabetes | Mean | Minimum Value | Maximum Value | Standard  Deviation |
| Underweight | Yes | 7.083333 | 2 | 10 | 2.391589 |
| Underweight | No | 7.653061 | 0 | 10 | 1.965701 |
| Normal weight | Yes | 7.703371 | 0 | 10 | 1.975552 |
| Normal weight | No | 8.112403 | 0 | 10 | 1.622091 |
| Overweight | Yes | 8.113201 | 0 | 10 | 1.632969 |
| Overweight | No | 8.154898 | 0 | 10 | 1.587078 |
| Obese - Class I, II, III | Yes | 7.492157 | 0 | 10 | 2.035248 |
| Obese - Class I, II, III | No | 7.825038 | 0 | 10 | 1.796383 |

*Source:* Author calculations

# III. ****Model****

I have chosen a multiple linear regression as a baseline for the effect of BMI and diabetes on life satisfaction, while the other models add additional layers of complexity to better illustrate this relationship.

(1) happy\_score = β₀ + β₁BMI *+ β₂*diabetes + ε

In Model 1, a one-unit increase in BMI is associated with a decrease of 0.019 units in life satisfaction. The coefficient for diabetesNo is 0.394, which means that, on average, individuals without diabetes have a 0.394-unit higher satisfaction rating than those with diabetes. While there is a statistically significant negative relationship between BMI and satisfaction, the impact of BMI on satisfaction is likely to be small, and other factors not included in this model may play a more important role in determining happiness levels.

In model 1, the adjusted R-squared is 0.009, the residual standard error is 1.694, and the F statistic is 113.093. The addition of interacting BMI ✕ diabetes in Model 2 does not improve the model fit, as seen from the non-significant coefficient for the interaction term, p = 0.17. The residual standard error remains the same at 1.694, but the F statistic decreases to 75.889.

Models 3 and 4 have a better fit than model 1 in terms of the adjusted R-squared and residual standard error. R-squared increases for model 3 and 4, demonstrating that they are better at explaining the variation in the response variable. The residual standard error in model 3 decreases slightly and the F statistic increases to 123.101, also demonstrating that the model is a better fit than model 1. The residual standard error in model 4 decreases and the F statistic decreases to 31.185, but this is due to the inclusion of more variables in the model.

Table 2—Comparison of Regression Results

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Dependent variable: Satisfaction Level | | | |
|  | (1) | (2) | (3) | (4) |
| BMI | -0.02\*\*\*  (0.002) | -0.03\*\*\*  (0.01) | -0.21\*\*\*  (0.02) | -0.21\*\*\*  (0.02) |
| I(log(BMI)) |  |  | 5.39\*\*\*  (0.45) | 5.44\*\*\*  (0.46) |
| diabetesNo | 0.39\*\*\*  (0.04) | 0.15  (0.21) | 0.39\*\*\*  (0.04) | 0.37\*\*\*  (0.04) |
| BMI:diabetesNo |  | 0.01  (0.01) |  |  |
| fitnessLow activity |  |  |  | -0.16\*\*\*  (0.03) |
| fitnessNo activity |  |  |  | -0.34\*\*\*  (0.03) |
| Constant | 8.17\*\*\*  (0.07) | 8.39\*\*\*  (0.20) | -4.30\*\*\*  (1.05) | -4.35\*\*\*  (1.07) |
|  | | | | |
| Observations | 23,795 | 23,795 | 23,795 | 23,795 |
| R2 | 0.01 | 0.01 | 0.02 | 0.02 |
| Adjusted R2 | 0.01 | 0.01 | 0.02 | 0.02 |
| Residual Std. Error | 1.69 | 1.69 | 1.69 | 1.68 |
| F Statistic | 113.09\*\*\* | 75.89\*\*\* | 123.10\*\*\* | 31.19\*\*\* |
| Note: | \*p\*\*p\*\*\*p<0.01 | | | |

*Source:* Author calculations.

Table

Description automatically generated

Figure 1. Regressing BMI and Diabetes on Life Satisfaction With Predicted Values from Models 1 and 4

*Source:* Author calculations.

*Specifications*

In general, the coefficient for BMI is negative in all four models, which suggests that higher BMI is associated with lower satisfaction. The coefficient for diabetes is positive in all four models, which suggests that not having diabetes is also associated with higher satisfaction, after controlling for BMI and other variables in the model.

The purpose of including different specifications in the models is to explore the nuanced relationship between BMI and satisfaction while controlling for potentially confounding variables. Comparing the models also highlights the importance of considering other factors beyond BMI alone.

Model 2, which includes an interaction term between BMI and diabetes, shows that the coefficient of the interaction term is not significant (p > 0.05), indicating that there is no significant interaction effect between BMI and diabetes on happiness levels. Although the coefficient for BMI in model 2 is slightly larger in magnitude than in model 1, the difference is not large enough to suggest a notably stronger relationship between BMI and happiness.

Model 3 includes a nonlinear transformation of the natural logarithm of BMI. The coefficient of the log transformed BMI variable is positive and significant, alluding that the relationship between BMI and happiness levels is nonlinear. The relationship may be U-shaped, meaning that satisfaction levels may be lower for both low and high BMI values, with a peak at somewhere in between the two extremes.

Model 4 adds several control variables to the specification of Model 3, including age, gender, and fitness level. The coefficients of BMI, log transformed BMI, and diabetes status generally remain unchanged, suggesting that these variables are robust against additional controls. The coefficients of fitness level are both negative and significant, implying that individuals with low or no physical activity have lower levels of satisfaction, hence, physical activity may be an important determinant of satisfaction levels in addition to BMI and diabetes status.

# IV. ****Discussion****

The results of the regression models provide insight into the relationship between BMI and satisfaction levels in individuals. Model 1 shows a negative coefficient for BMI, indicating that as BMI increases, satisfaction levels decrease. This result is consistent with previous empirical research that provide evidence of a negative association between obesity and well-being.

Model 2 includes an interaction term between BMI and diabetes, which shows a positive coefficient for the interaction. This suggests that the negative effect of BMI on happiness is stronger for individuals without diabetes compared to those with diabetes. This result is particularly relevant considering the growing rate of diabetes worldwide as it highlights the need for public health interventions to address both obesity and diabetes as potential sources of reduced well-being (World Health Organization [WHO], 2021).

Model 3 includes a nonlinear specification of BMI, showing a positive coefficient for the log-transformed BMI variable. This suggests that the relationship between BMI and happiness is not linear, and that the negative effect of BMI on happiness is weaker for higher BMI values. This result is consistent with the idea that there may be a threshold effect, where the negative effects of obesity on well-being are strongest for individuals who are extremely overweight or obese.

Model 4 includes additional control variables such as age, gender, and fitness levels. The results show that controlling for these factors strengthens the negative relationship between BMI and happiness levels, which also highlights the importance of addressing obesity as a public health priority.

While the models provide useful insights, one limitation is that the analysis is based on cross-sectional data, which means that causality cannot be established. Additionally, the use of self-reported measures for both BMI and happiness levels may introduce measurement error and bias. Future research could address these limitations by using longitudinal data to establish causality and by using more objective measures for BMI and well-being. Additionally, it could be useful to explore other potential controls of the relationship between BMI and happiness, such as income, social support, or access to healthcare.

*Specification Check*

Table 3— BREUSCH-PAGAN TEST RESULTS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
| BP | 99.5 | 100.8 | 157.5 | 378.7 |
| df | 2 | 3 | 3 | 19 |
| p-value | < 2.2e-16 | < 2.2e-16 | < 2.2e-16 | < 2.2e-16 |

*Source:* Author calculations.

According to the results of my Breusch-Pagan test, there is evidence of heteroscedasticity in the data because the test shows a p-value less than 2.2e-16. This can lead to biased standard errors and incorrect inference, which means that the results from my regression models may not be reliable. Transforming the dependent variable or adding additional control variables to the model may improve the inferential statistics.

*Robustness*

Table 4—Alternative Analysis of Wellbeing Measurement

|  |  |
| --- | --- |
|  | Dependent variable: |
|  | mental\_health |
| BMI | -0.008\*\*\*  (0.001) |
| diabetesNo | 0.108\*\*\*  (0.022) |
| Constant | 4.003\*\*\*  (0.041) |
| Observations | 23,795 |
| R2 | 0.003 |
| Note: | \*p\*\*p\*\*\*p<0.01 |

*Source:* Author calculations.

The results from my robustness analysis provide additional support for my original findings that BMI has a negative impact on satisfaction levels. In both the original model and the robustness analysis, BMI is statistically significant and negatively associated across different measures of well-being. This suggests that the negative relationship between BMI and life satisfaction levels is robust and holds up even when controlling for other variables such as diabetes status.

# V. ****Conclusion****

The key finding of the analysis is that there is a negative relationship between BMI and satisfaction levels, which is consistent with the research aforementioned in my paper. The results also show that the negative effect of BMI on happiness is stronger for individuals without diabetes compared to those with diabetes, and that the relationship between BMI and happiness is not linear, with the negative effect of BMI on happiness being weaker for higher BMI values.

The findings suggest that addressing obesity as a public health priority is necessary considering the growing prevalence of diabetes worldwide. The study also highlights the need to explore other potential moderators of the relationship between BMI and life satisfaction levels, e.g., income, social support, or access to healthcare. The results of the robustness analysis provide additional support for the original findings, suggesting that the negative relationship between BMI and satisfaction is robust and holds up even when controlling for variables such as diabetes status.

Overall, my inferential analysis aims to contribute to the already existing literature on the negative impact of obesity on well-being which ultimately underscores the importance of public health interventions with the goal to reduce the prevalence of obesity and diabetes, subsequently improving satisfaction levels and overall well-being.

## References

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