# BMI levels among sexual minority women:

## *Examining the mediating effect of depression.*

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## *Abstract*

*This study investigated the relationship between being a sexual minority women and BMI and whether experiencing depressive symptomatology plays a mediating role in this relationship. This study limits itself to researching lesbian and bisexual women, including heterosexual women as a reference group. Sexual minority women generally have impaired mental health and in recent years elevated BMI levels have been found among lesbian women. The data used in this study is the 2018 cross-sectional dataset gathered by the CDC using their Behavioral Risk Factor Surveillance System (BRFSS). By means of multiple regressions, the proposed mediation model was tested, and it was found that both lesbian and bisexual women have higher BMIs than heterosexual women, and that bisexual women experience more depressive symptomatology than heterosexual women. Furthermore, using the bootstrapping method, it was confirmed that part of the effect of being a sexual minority woman on BMI can be explained by an impaired mental health amongst this population.*

## *Keywords*

*Sexual minority women; lesbians; bisexuals; minority stress; depression; obesity; overweight; BMI; health*

## *Introduction*

In January 2020, The American Medical Association Foundation (AMAF) announced a new initiative that aims to improve the LGBTQ health care. The AMAF Fellowship Commission for LGBTQ Health plans on doing this by creating "a pipeline of LGBTQ health specialists who are able to serve the health care needs of the LGBTQ community". In the announcement discrimination, stigma, access to health care and quality of health care are mentioned as factors that contribute to the existing health gap between LGBTQ people and cisgender heterosexuals (AMAF, 2020). This recent initiative and the publicity different media granted to it prove the societal relevance of further research in the LGBTQ health area. In this study I will investigate obesity among the female LGB population in the US. Those women who identify with any other identity than cisgender- heterosexual, lesbian or bisexual are not included in this study, considering the disparity in health issues with other identities that the LGBT+ acronym comprises. The BMI level is calculated by dividing one's weight in kilograms by their squared length in meters. Obesity is internationally defined as having a BMI level of over 30, having a BMI of over 25 indicates less severe overweight (CDC, 2020). The share of Americans with obesity has increased from 30.5% in 1999-2000 to 42.4% in 2017-2018, which makes this an all the more relevant topic to study (CDC, 2020). This increase is a major concern since obesity can lead to heart disease and stroke, high blood pressure, diabetes, cancer and many other life-threatening health problems. Secondly this study will investigate whether depressive symptomatology among sexual minority women (SMW) affect the chances of being overweight or obese, as it is known that LGBs have worse general health than their non-LGB(T) peers (Frederiksen-Goldsen, 2012). Since the population sample of this study exists of United States citizens, it is important to grasp the US context concerning the position of sexual minorities in the society. The norm, in the USA, is to be heterosexual and it is only since 2015 that homosexual marriage is allowed in all states (Governing. 2020). And even though attitudes towards homosexuals have been positively changing over the past decades, a considerate part of US citizens still thinks that a consensual relationship between two people of the same sex should not be legal (Hicks, 2006, Fetner, 2016). Remarkably, it was found that bisexual women experience the most discrimination and stigma with respect to heterosexual and lesbian women (Herek, 2002).

Concerning mental health among LGB people, the academic world has widely agreed upon the fact that lesbians, gays and bisexuals are more likely to have suicidal thoughts, show suicidal behaviour and commit suicide than their non-LGB(T) peers (Fergusson, 1999; Meyer, 2003; Mongelli et al, 2019; Ream, 2018; Skerret & De Leo, 2015). Broader mental health issues such as depression, anxiety and stress are more occurring among LGBs as well (Fergusson, 1999; Fredriksen-Goldsen, 2012; Meyer, 2003). In addition, abuse of diverse substances has a higher prevalence among this population than in the non-LGB(T) population (Goldbach, 2014; Jordan, 2000; Shifrin, 1992). A few researchers have noted that LGBs on average more often make use of mental health services than do their non-LGB(T) peers, but this specific topic has only been researched concisely (Cochran, 2003). There is enough reason to expect a link between this relatively worse mental health and a higher BMI, many scholars have found an association between the two (Burgess, 2017; Hruby, 2016). Given the elevated risk of mental health problems among LGBs, researching the coherence with other health problems within this population is important.

Up until the end of the previous era, most of the research done on the physical health of the LGB population was related to HIV and AIDS (McColl, 1994). In the past few years the body of scientific findings concerning this field has extended rapidly and many other aspects of physical health were researched. There has been found evidence for the higher prevalence of asthma, obesity, arthritis and cardiovascular disease among sexual minority women with respect to heterosexual women (Simoni, 2017). Moreover, access to and quality of healthcare for LGB people is given more and more attention in the scientific world, disclosing the inequalities between this population and non-LGB people (Collins, 2014; Dahlhamer, 2016; Shetty, 2016). However, not much is known yet about potential differences in health within the LGB population, let alone among SMW specifically.

Even though worldwide research on obesity among the LGB population is not scarce, scholars have not found consensus on the prevalence of this disease and the mechanisms that cause it. Bowen and colleagues (2008) reviewed the existing literature on obesity among sexual minority women. They found that of 13 studies that used heterosexual women as reference group, nine conclude that lesbian women have higher BMI's than heterosexual women, the other studies found no difference between the two groups. However, they also pointed out that none of these studies were methodologically very strong and they lacked representativeness. Seven years

later, Eliason and colleagues (2015) again did a systematic literature review on sexual minority women's weight. They reviewed 37 studies published between 2006 and 2014 and observed that the bulk of these studies found an association between being a sexual minority woman and overweight and obesity. Such findings do not exist for men. The contrary is being reported; that homosexual men are less likely to be overweight or obese than heterosexual men (Blosnich, 2014). This explains my choice to limit this study to women. In this study I will attempt to create clarity on this differently observed prevalence among women and add to the existing literature by including bisexual women, who are commonly excluded and not often not studied separately form lesbian women in LGB research. Even though the body of scientific literature on SMW is growing, research on the consequences of bisexual-specific minority stress is scarce (Katz-Wise, 2017). Bisexual women do need to be studied apart from lesbian women since previous studies have found that both groups are at risk of different types of health problems (Feinstein, 2017; Przedworski, 2014), bisexual women were, in fact, found to be at higher risk of experiencing mental distress and have poorer general health (Fredriksen-Goldsen, 2010).

The above mentioned is only a brief summary of all that is known about sexual minority women's health. Still there are gaps that need to be filled in this research area. One of which is the link between mental and physical health. Studies that use the understanding of mental health in trying to gain insight in certain physical health outcomes among this population are scarce. I will dive into these existing gaps by researching obesity among bisexual and lesbian women, with respect to heterosexual women, and investigate whether their mental health has a mediating effect on this relationship. With this study, I aim to shed some more light on the general health of bisexual women so that in the near future they will be able to receive the professional help they might sometimes need, in both the physical and mental health area. In addition, I pursue to gain more insight in the extent to which depressive symptomatology among SMW accounts for other health problems. This is necessary in order to be able to reduce the health gap between SMW and their heterosexual peers. In other words, I will attempt to answer the following research question: "*What is the effect of sexual orientation of women on the likelihood that they will have overweight or obesity and is this effect mediated by mental health?"*.

## *Theory*

As described in the previous paragraph, it has been found several times that lesbian women, on average, weigh more than heterosexual women. We are now left with the question as to how to explain this. What differentiates SMW from heterosexual women that could explain this difference in BMI? And where do bisexual women stand in the equation? In this chapter I argue for a mediation by bad mental health, more specifically its most severe form: depression. I will use Meyer's Minority Stress Model to explain the relation between being a sexual minority and having a bad mental health. This theory is by far the most dominant theory in this research area and Meyer himself, specifically, applied it to sexual minorities as well (Meyer, 2003). To shine light on whether and how bad mental health can lead to obesity I will apply the ideas of Lick and colleagues (2013) about unhealthy behaviour and altered health norms to this specific topic. I will derive three hypotheses from the theories, which collectively will test the mediation model that I propose (Figure 1).

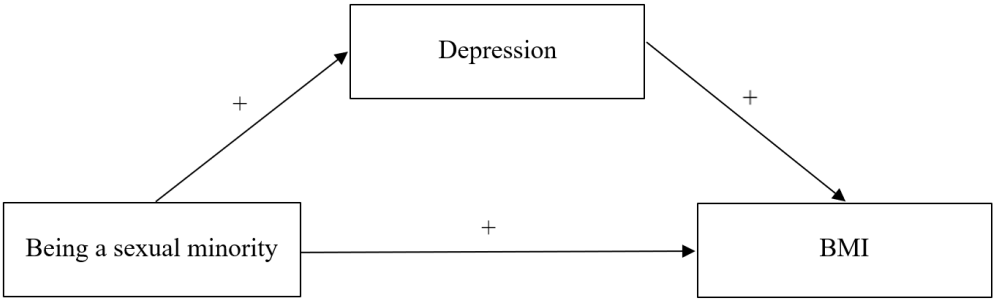


*Figure 1.* The mediation model for obesity. Sexual minority effects the likelihood of being obese, but this is, at least partly, true because the effect is being mediated by depression.

Generally, in the scientific world, the worse mental health of LGB people is ascribed to their experiences with stigma, prejudice and discrimination. The Minority Stress Model (Meyer, 2003, 2007) amplifies the process behind these mechanisms. Besides experiencing general stressors, LGB people go through additional stress processes that are unique for their population. These are called minority stress processes. Theory on stress in general is well established and it was decennia ago that stressors were divided into two types in between which a continuum exists: distal stressors and proximal stressors (Meyer, 2003). More recently stressors rather specific to sexual minorities were attributed to either one of this type, as I will explicate below.

To begin with, the society that forms the context of anyone's existence, which in this study is the US society, adheres to norms and standards that do not match with those of LGB people's identity. In fact, sexuality is one of the most common grounds for violence in the US (The United States Department of Justice, n.d.). Furthermore, in some countries it is forbidden to even be homosexual. Thus, by solely being themselves LGB people experience incongruence with the world they live in. The stressors experienced as a consequence of these kinds of non-personal events and environments are called distal stressors (Meyer, 2003). On a rather personal level, called the proximal level, sexual minorities experience stressors as well. These can be seen as a consequence of the incongruence they experience in society. For example, merely expecting negative responses of their environment to expressions of their sexual identity, such as coming out or holding hands with a same-sex partner, might cause fear and distress. Concealment of the sexual identity may be a consequence of this, of which Meyer claims it is one of the most detrimental causes of stress. In the worst case, an LGB person internalizes these negative thoughts and events and believes himself to be worth less than a heterosexual peer. In other words, they might start to despise homosexuality as much as the homophobe people around them. Strikingly enough, it turns out that bisexuals experience more discrimination and stigma for having a dual sexual preference (Herek, 2002). The literature offers various reasons for this. First, bisexuals are perceived as a threat to the existing dichotomy of sexuality, between heterosexuality and homosexuality. Secondly, bisexuality is associated with nonmonogamy, which still is a taboo in many people's eyes. Thirdly, bisexuals are believed to contribute to the transmission of HIV and other STDs more than homosexual people (Herek, 2002; Worthen, 2013).

The literature also speaks of 'protective' factors, which compensate for stress. At the group-level sexual minorities can benefit a lot by 1) attending social occasions where they do not deviate from the norm but where the norm is to be lesbian, homosexual or bisexual and; 2) to be provided with "support for negative evaluation of the stigmatized minority group" (Meyer, 2003). Thus, for lesbians a good way to cope with negative experiences linked to stigma would be to go to a party for (gay) women only. You would think that this works the same way for bisexuals, however in reality bisexuals do not benefit from the coping mechanisms that lesbian women do benefit from; bisexual women do not find support in either the heterosexual or the homosexual community (Herek, 2002). It is therefore likely that bisexual women experience

more stress than lesbian women. I derive the following hypotheses from this theory: *Being bisexual is associated with worse mental health than being lesbian and being lesbian is associated with worse mental health than being heterosexual.*

Now that I have laid out the theory supporting the relation between sexual orientation and impaired mental health, I am moving on to the effect of an impaired mental health on BMI. Studies that link LGB people's relatively worse mental health to their relatively worse physical health do exist but supporting theories for this association remain strongly outnumbered compared to theories explaining the link between being LGB and mental health. The best substantiated theory is one that suggests three types of proximal stressors that may explain the relation between mental and physical health: a) psychological distress; b) cognitive appraisal style, and; (c) health behaviors and beliefs (Lick et al., 2013). The third type of stressor is the most relevant type for explaining sexual minority women's BMI. It states that negative social experiences following stigma lead to unhealthy behaviours, such as substance use, to suppress the distress these experiences cause. On top of that, this elevated exhibition of unhealthy behaviour is likely to account for a process of normalization within the LGB community. In other words, their perception of healthy behaviour changes, in a negative sense. This makes even the ones who experience far less, or no prejudice at all, more likely to exhibit unhealthy behaviour themselves (Lick et al., 2013). How can this be applied to obesity? Binge-eating, eating junk-food, high alcohol consumption and physical inactivity are all 'unhealthy' behaviours that can contribute to obesity. In the existing body of literature few has been said about the role of these specific health behaviours in the relation between mental- and physical health among LGBs. Nonetheless I assume that overweight and obesity can be explained by the same mechanism since it will not be the first time that the types of behaviours that cause overweight and obesity are mentioned as coping mechanisms for stress in the scientific literature (Wichianson, 2009; Rutledge, 1998; Ohrnberger, 2017). Based on the above reasoning, I expect that impaired mental health among SMW is positively associated with BMI. Therefore, my second hypothesis is: *Worse mental health is associated with a higher BMI.*

I suggest a mediation model, meaning that I expect the effect of sexual orientation on BMI to disappear when depression is brought into the equation. In other words, depression, at least partly, accounts for the heightened levels of BMI found among lesbian and bisexual women, bisexual women experiencing more depressive symptoms than lesbian and heterosexual

women and therefore having a higher average BMI than lesbian and heterosexual women and lesbian women experiencing more depressive symptoms than heterosexual women and therefore having a higher BMI than heterosexual women. My final hypothesis is: *The relationship between sexual orientation and obesity is partially mediated by mental health.*

# *Data & Method*

## Data

The Centers for Disease Control and Prevention (CDC) is the most prominent health organization in the US. It was initially founded in 1946 to fight Malaria. Today the organization is concerned with public health in general. In this study I make use of a data-gathering system called the Behavioral Risk Factor Surveillance System (BRFSS) which the CDC started in 1984. In 2011 a new weighting methodology called "raking" was introduced to the BRFSS, which made it possible to record additional demographic characteristics that increased the representativeness of each state's sociodemographic composition. The questionnaires used mainly contain questions about physical- and mental health and health behaviour, but also questions more demographics such as housing situation, education and employment. The 2018 cross-sectional dataset includes 437,436 respondents from 50 states of the United States, the District of Columbia, Guam, and Puerto Rico (CDC, 2020) of which some completed the questionnaire through their landline and some through their cell phone. The response rate of respondents called on their landline is 53.3% and the response rate of respondents called on their cell-phone is 43.4%. After selecting only the respondents that have a record on all variables that I will use, this study is left with a sample size of 2290.

## Variables

<u>Dependent Variable</u>

*Body Mass Index.* The dataset contains a variable called *BMI* which contains the Body Mass Index of the respondents times 100. This variable is computed by dividing the reported weight in kilograms of respondents by their reported height in meters times itself. I computed a new variable by dividing this original BMI variable by 100, so that it now contains the real BMI values of the respondents. The lowest value is 12.80 and the highest value is 70.48. The mean value is 28.78 with a standard deviation of 7.10.

Independent Variables

*Sexual orientation of females.* This is an existing variable that contains the sexual orientation of women. The question in the questionnaire that this variable is derived from ("Which of the following best represents how you think of yourself?") has 5 answer options: 1) lesbian or gay; 2) straight, that is, not gay; 3) bisexual; 4) something else and; 5) i don't know the answer. The respondents in the other answer categories, 4 and 5, will be left out of the analysis since it does not become clear as to what sexual orientation they identify which makes them of no use in this specific research. Therefore, the values 4 and 5 of this variable are set as missing. In order to be able to perform regression analyses, I have computed dummies for each of the three remaining categories. One for heterosexual women, one for lesbian women and one for bisexual women. In each of these dummies the value 1 represents the sexual orientation that the variable is named after and the value 0 stands for 'otherwise'.

*Depression.* The following two questions were combined to create a depression variable: "Over the last 2 weeks, how often have you been bothered by having little interest or pleasure in doing things?" and "Over the last 2 weeks, how often have you been bothered by feeling down, depressed or hopeless?". The answer categories of both questions are: 1) never; 2) for several days; 3) for more than half the days; 4) nearly every day; 5) don't know/not sure; 6) refused. The last two categories were set as missing, after which the variables corresponding to the previously mentioned questions were added up to create the scale variable *depression.* Consequently, the minimum value of this new variable is 2 and the maximum value is 8. The mean is 2.90 with a standard deviation of 1.55. The depression and anxiety category in the questionnaire consists of two more questions: "Over the last 2 weeks, how often have you been bothered by feeling nervous, anxious or on edge?" and "Over the last 2 weeks, how often have you been bothered by not being able to stop or control worrying?". The decision to exclude these questions is based on the beliefs that the latter say less about depression and more about anxiety and that the reliability of this research enlarges if only the depression related questions are included. Also, a depression scale with just the first two variables includes more respondents than a depression scale based on all four depression and anxiety variables. A reliability test was done to check the internal consistency of this computed depression scale, this test only included heterosexual, lesbian and

bisexual female respondents. The Cronbach's Alpha of the reliability test is .792 > .70, meaning the two questions are consistent enough to be taken together.

Control Variables

*Age.* I control for age since aging is by many scholars found to be associated with weight gain (Sasaki, 2015; Sund, 2010). I make use of the existing variable in the dataset that has categorized age in groups of 5 years. The minimum age is 18 and the maximum age is 99. Thus, in this 13 categories exist, making the lowest value 1 and the highest value 13. Category 14 (don't know/refused/missing) is set as missing. The mean of this variable is 7.18 meaning that the mean age lies between 50 and 59. The standard deviation is 3.25. I chose this specific variable because this variable contains most information since the categories are the smallest with respect to the other variables containing information about age. Given the large number of categories, I will consider this variable to be continuous. Having to group categories and make dummies would cause a loss of information and would unnecessarily complicate the regression.

*Education.* Among scholars, education is widely associated with body weight (Ball, 2005) as well as with depression (Kaplan, 1987; Ladin, 2008). Therefore, the second control variable is education. which is based on the question "What is the highest grade or year of school you completed?" and has six answer categories: 1) Never attended school or only kindergarten; 2) Grades 1 through 8 (Elementary); 3) Grades 9 through 11 (Some high school); 4) Grade 12 or GED (High school graduate); 5) College 1 year to 3 years (Some college or technical school); 6) College 4 years or more (College graduate). There is a seventh category that contains respondents who refused to answer this question which were set as missing, which leaves this variable with six values. I will consider this variable as continuous as well, for the same reasons as given above. The mean value is 4.89 with a standard deviation of 1.02.

*Income.* Income, is just as education, widely known to be negatively associated with weight (Ball, 2005). I make use of an existing variable in the dataset, that contains eight ascending income categories. The categories represent the annual household incomes. They are: 1) Less than $10.000; 2) $10.000 to less than $15.000; 3) $15.000 to less than $20.000; 4) $20.000 to less than $25.000; 5) $25.000 to less than $35.000; 6) $35.000 to less than $50.000; 7) $50.000 to less than $75.000; 8) $75.000 or more. I set the remaining categories, which were "don't know/not sure" and "refused" as missing. The mean is 5.29 and the standard deviation is 2.29.

*Physical Health.* In the regression with depression as outcome variable I control for physical health since this is scores of times mentioned as a predictor of depression in the scholarly world (Hruby, 2016; Kaplan, 1987). For this I make use of an existing variable that is based on the following question: “Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?”. The value of people who answered with “none” was changed from 88 to 0 and the two remaining useless categories, “don’t know/not sure” and “refused” were set as missing. The variable is now left with 31 values, which go from 0 to 30. Each value equals the number of days with which people replied to the question. The mean of this variable is 5.21 and the standard deviation is 9.33. It is important to keep in mind that, in this case, the higher the value, the lower the physical health. Table 1 contains an overview of all variables and their descriptive statistics.

*Table 1. Descriptive Statistics*

| **Variable** | **N** | **Min.** | **Max.** | **Mean** | **sd.** |
|---|---|---|---|---|---|
| BMI | 2290 | 12,80 | 70,48 | 28,78 | 7,10 |
| Heterosexual women | 2290 | ,00 | 1,00 | ,96 | ,21 |
| Lesbian women | 2290 | ,00 | 1,00 | ,01 | ,12 |
| Bisexual women | 2290 | ,00 | 1,00 | ,03 | ,17 |
| Depression | 2290 | 2,00 | 8,00 | 2,91 | 1,55 |
| Age | 2290 | 1 | 13 | 7,18 | 3,25 |
| Education level | 2290 | 2 | 6 | 4,89 | 1,02 |
| Income level | 2290 | 1 | 8 | 5,29 | 2,29 |
| Physical health | 2290 | ,00 | 30,00 | 5,22 | 9,33 |

## Analysis

I will test the proposed mediation model through four multiple regression analyses using SPSS Statistics 25 and Syntax. In each regression I will add control variables in the second model

using the enter method. Before conducting the multiple regressions, I checked the assumptions that need to be met in order to be able to do this statistical test. The total number of respondents within this research is N = 2290, which means the assumption of a large enough sample size is well met. The Kolmogorov-Smirnov statistic for the dependent variable, BMI, is .078 ($p < ,001$), which indicates that this variable is not (perfectly) normally distributed. Allen et al. (2014), however, talk of the need for an 'approximate' normal distribution. Looking at the Histogram and Normal Q-Q Plot of this variable, the assumption appears to be met; the records on the BMI variable are nearly normally distributed. The same goes for the other three continuous variables, namely income, education and age. Neither of these variables are perfectly normally distributed but given the large sample size of each regression and the fact that the distribution of the records in each variable does not deviate enormously from a normal distribution, I will not consider this to be a problem. I chose not to delete any 'outliers' within the BMI variable, even though statistically speaking there are many of them (approximately 3% of all the records lie above the upper whisker of the box plot). The value of 70.48, which is the highest value on this variable, is particularly high and indicates severe obesity (CDC, 2020). However, it is not an unrealistic number. The other variables do not hold any outliers. Each regression has met the fourth assumption, namely that of the absence of high multicollinearity between predictor variables. The Tolerance statistics were greater than ,1 and the VIF statistics were less than 10. Lastly, I checked the normality, linearity and homoscedasticity of the residuals of the predictor variables, accordingly with how Allen et al. (2014) advise. There were no clear patterns to be found in the spread of points on the scatterplots of standardized residuals against standardized predicted values. The first regression analysis will test the relation between sexual orientation and BMI. In this regression I will control for education level, income and age. This regression is necessary to be able to, in combination with the fourth regression, test the third hypothesis. The second regression analysis will test the relation between sexual orientation and depression, controlling for education level and physical health. The final regression analysis will test whether depression indeed has a mediating effect between sexual orientation and BMI. This ultimate regression will be of sexual orientation and depression on BMI. The same controls as in the first regression will be used, namely: education level, income and age. Finally, to be able to statistically determine the significance of the mediating effect of depression between sexual orientation and BMI, I performed an extra statistical test, namely a Bootstrap test.

## *Results*

To approach the question of whether the effect of sexual orientation of women on BMI is mediated by depression, four multiple regression analyses (MRA) were conducted. Firstly, an MRA was performed to investigate the total effect of the sexual orientation of women on BMI. As explained in the previous chapter, this regression is necessary to test the third hypothesis, that I will come back to after discussing the results of the fourth and final regression. Using the enter method, it was found that in combination, sexual orientation, education level, income and age accounted for a significant 2,5% of the variability in BMI ($R^2$ = .025, adjusted $R^2$ = .023, $F$ (5, 2283) = 11.895, $p$ < .001). The unstandardized and standardized coefficients and the standard error of the unstandardized coefficient of the individual predictor variables are presented in Table 2, Model 1. The model shows that the difference in predicted BMI between heterosexual women and bisexual women is significant (β = -.087, t (2288) = -2.746, p < .05). Meaning that being heterosexual accounted for a 2.369 lower BMI than bisexual women. The difference between the effects of being lesbian on BMI and being bisexual on BMI, however, was not significant, as can be seen in the same model. I performed an extra MRA in which I, instead of leaving out bisexual women, left out heterosexual women to see whether the difference in effect of heterosexual and lesbian women on BMI is significant or not, which it was (β = .049, t(2288) = 2.337 , p < .05).

Table 2

Summary of Multiple Regression Analyses for Variables Predicting BMI (N = 2289)

| | Model 1 | | | Model 2 | | | Model 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| Variabele | *B* | *SE B* | *β* | *B* | *SE B* | *β* | *B* | *SE B* | *β* |
| Heterosexual women (versus bisexual women) | -2.369 | .863 | -.087** | | | | -1.976 | .862 | -.058* |
| Lesbian women (versus bisexual women) | .522 | 1.485 | .009 | | | | .653 | 1.477 | .011 |
| Education Level | -.507 | .167 | -.073** | -.443 | .167 | -.064** | -.437 | .167 | -.063** |
| Income Level | -.209 | .074 | -.067* | -.128 | .076 | -.041 | -.130 | .076 | -.042 |
| Age | -.151 | .046 | -.069** | -.166 | .045 | -.076*** | -.143 | .046 | -.065** |
| Depression | | | | .526 | .099 | .115*** | .497 | .099 | .109*** |
| $R^2$ | | .025 | | | .032 | | | .036 | |
| F for change in $R^2$ | | 13.817*** | | | 9.455*** | | | 8.387 | |

** p < .05. ** p < .01. p < .001*

Secondly an MRA was performed to test the effect of sexual orientation on depression (H1). Using the enter method, it was found that sexual orientation, physical health and education level together accounted for a significant 21,3% of the variability in depression ($R^2$ = .213, adjusted $R^2$ = .212, $F$ (4, 2284) = 154,449, $p$ < .001). Table 3 shows a summary of this regression. The effect of being heterosexual, in relation to being bisexual, on depression is significant (β = -.108, t (2288) = -4.831, p < .001), meaning that being bisexual accounts for a .809 lower predicted score on the depression scale in relation to bisexuals. That is almost a whole point on a scale that only counts 7 values. The difference in effect on depressive feelings between lesbian women and bisexual women is not significant, as can be seen in Table 3. An extra MRA was conducted to test whether the difference in effect on depressive feelings between heterosexual women and lesbian women is significant. It is not. Hypothesis 1 is therefore only partially confirmed.

Table 3
*Summary of Multiple Regression Analysis Predicting Depression (N = 2289)*

| Variable | *B* | *SE B* | *β* |
|---|---|---|---|
| Straight women (versus bisexual women) | -.809 | .168 | -.108*** |
| Lesbian Women (versus bisexual women) | -.545 | .291 | -.042 |
| Physical Health | .067 | .003 | .404*** |
| Education Level | -.215 | .029 | -.141*** |

** p < .05. ** p < .01. p < .001*

To test the second hypothesis, a third MRA was performed. This is a regression testing whether depression affects BMI (H2). Again, I controlled for education level, income and age. A summary of this regression can be observed in Table 2, Model 2. The enter method indicated that depression, education level, income level and age account for 3.2% of the variance in BMI ($R^2$ = .032, adjusted $R^2$ = .030, $F$ (4, 2284) = 18.913, $p$ < .001). The results reveal that the effect of depression on BMI is significant (β = .115, t (2288) =5,332, p < .001), meaning that the more depressive symptomatology someone experiences, the higher their BMI will be. With each increase on the depression scale that I used in this analysis the BMI level rises with .526. This

means that being really depressed or being not depressed at all can cause a 3.682 difference in BMI. Hypothesis 2 is confirmed.

The final regression was conducted to test whether the effect of sexual orientation on BMI, which I found to be partly significant in the first regression, is mediated by depression (H3). Therefore, both the two dummies of sexual orientation and the variable depression are added as independent variables in the regression, controlling for education level, income level and age. All of these variables together (independent variables and control variables) accounted for 3.6% of the variance in BMI ($R^2$ = .036, adjusted $R^2$ = .034, $F$ (6, 2282) = 14.229, $p$ < .001). Model 3 in Table 2 contains a summary of this regression. The same pattern as the one that appeared in model 1 can be observed in this regression; the difference in effect on BMI between heterosexual women and bisexual women is significant (β = -.058, t(2288) =-2.294, p < .05), but the difference between the effects of lesbian women and bisexual women on BMI is not. In addition, as was the case in the first regression, an extra regression with another reference group shows that the effect of being lesbian on BMI, with respect to being heterosexual, is significant as well (β = .044, t (2288) = 2.135, p < .05). The unstandardized coefficient that indicates the difference in BMI between bisexual and heterosexual women, is quite large; being bisexual accounts for a -1.976 higher BMI with respect to heterosexual women. The effect of the newly added independent variable depression is highly significant (β = .109, t (2288) =5.027, p < .001). In other words, it seems that the effect of sexual orientation on BMI is indeed mediated by depression. Since both the relation between sexual orientation and depression and the relation between depression and BMI was found to be (at least partly) significant, I tested the mediation analyses using the bootstrapping method. The 95% CI of the indirect effects was obtained with 5000 bootstrap resamples (Preacher & Hayes, 2008). The results confirmed the mediating role of depression in the relation between sexual orientation and BMI (β = .14; CI = .01 to .33). However, the direct effect of sexual orientation on BMI when controlling for depression is still (partly) significant, thus we cannot confirm full mediation. Hypothesis 3 is confirmed.

## *Discussion*

This study investigates the question of whether the effect of women's sexual orientation on the likelihood of obesity is mediated by depressive symptomatology. I found that being bisexual, with respect to being heterosexual, significantly elevates the likelihood of experiencing

depressive feelings. This is in line with my expectation that bisexual women experience more stress than lesbian and heterosexual women, which has to do with the associations that people have with this sexuality. In addition, it could be that bisexual women are indeed less able to benefit from the support of a community, given that the '(female) bisexual community' is much less visible than the lesbian community (Balsam, 2007). As explained in the theory chapter, being able to seek support in a community of equals is an important coping mechanism against stress. The absence of this mechanism for bisexual women makes it harder for them to deal with (bisexual-specific) minority stress, which may lead to mental health problems such as depression and anxiety. On the basis of the statistical analysis that I performed, nothing can be said about the effect of being lesbian on depression. Even though earlier studies did find that lesbians experience more depressive feelings than heterosexuals, almost no studies report on the difference in depressive feelings between lesbian and bisexual women (Fergusson, 1999; Meyer, 2003). Further research should investigate this relation and the mechanisms behind it. Secondly I was able to strengthen the validity of the positive association between depressive symptomatology and elevated BMI levels (Pine, 2001; Flórez, 2015; Clum, 2014). Lastly, in accordance with most existing literature on this topic (Bowen et al., 2008), I found that lesbian women and bisexual women have higher BMI's than heterosexual women. The difference between the effects of lesbian and bisexual women on BMI levels, though, is not significant. In addition, I was able to confirm that part of the effect of being a sexual minority on BMI runs through depression. Therefore, my third and final hypothesis "The relationship between sexual orientation and obesity is mediated by mental health" is confirmed. SMW women are more likely to be overweight and obese, but that is partly because they are more likely to experience depressive feelings which contribute to overweight and obesity. Apparently, there are still other mechanisms through which the remaining effect of sexual orientation on BMI can be explained. It could be possible that lesbian and bisexual women for some reason have lower ideal weights, which could be explained by the difference in norms concerning body ideals in the "lesbian and feminist" community and the norms that are adhered to in mainstream culture (Bowen et al., 2008; Eliason, 2015).

It is always a challenge to gather data on LGBT people since there are, statistically speaking, simply less of them compared to cisgender heterosexuals. Convenience sampling is therefore a popular sampling method in LGBT research (Bowen, 2008; Eliason, 2015). The

strength of this study is that the data used is not a convenience sample. In this study the N was mainly brought down by the inclusion of the depression variables; these variables contained many missing's which was the main cause for my sample size to be brought down from 238.911 female respondents to 2290 valid cases. Another side note on this study is that the data used is cross-sectional data. The representativeness of the snapshot is not guaranteed, and it is impossible to observe any development in individuals. A part of this lack of insight was compensated for controlling for age. Nevertheless, given the fact that I tested a mediation model, in which effects are not immediate but occur over time, the fact that the data is cross-sectional is definitely a limitation of this study.

## *Conclusion*

Once more, the health gap between LGBs and their peers is demonstrated. Despite the growing acceptance of sexual minorities, many of them have to deal with discrimination and prejudice at some point in their lives, which supposedly leads to mental health problems. This study was able to confirm that bisexuals experience more depressive symptomatology than heterosexual women, which is a very concerning finding. Bisexuals, both male and female, have been underexposed in the scientific literature for years. Now that scholars are more and more acknowledging them as a separate sexual minority in their studies, it is time to reach out to this group of people and offer them the help they need. Whether it be psychological help or medical help, or any other type of action that can serve as a means to diminish the existing health gap between bisexual women and heterosexual women. Furthermore, I found that both lesbian and bisexual women have elevated BMI levels in relation to heterosexual women. Overweight and obesity is occurring more and more in the recent decade, especially in the United States, thus the fact that these rates are even higher among SMW is very worrying. Given the fact that part of the effect of being a sexual minority on BMI runs through mental health, governments should make the acceptance of LGBTs more of a priority, since it is not unlikely that an impaired mental health is negatively associated with other specific physical health outcomes. I recommend that future research on this topic investigates this. It should also delve deeper into the differences between specific health issues among SMW since most research up until now has compared SMW with heterosexual women but fewer scholars have compared different sexual minority groups with each other. It is time we acknowledge bisexuality as a separate sexual orientation, and not consider them to be

half heterosexual and half homosexual. We should not only acknowledge them in the scientific world, but in any aspect of everyday life.

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