

Sexual minorities experience greater sexual and singlehood satisfaction, but lower life satisfaction and greater loneliness

An exploratory study using multiverse analysis

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Abstract

Even while joyful singlehood is becoming a more popular idea, Minority Stress Theory suggests that social stigmas around sexual and gender minority groups may result in additional stressors that negatively impact their life and relationship satisfaction. This exploratory analysis aims to explore the variations in life satisfaction, sexual satisfaction, satisfaction with single status, and loneliness levels among single individuals with different sexual orientations and gender identities. The confounders included in this study were age, race and length of singlehood. Data of satisfaction levels and demographic information were collected a baseline survey and a follow-up survey in 2022. The study employed a multiverse analysis approach that documents the potentially different results stemming from a set of potential decision branches. After building a total of 128 models, LGBQQ was found to be a frequently significant predictor in for all satisfaction measurements, but when further dividing the sexual minorities, some subgroups were significant in a higher proportion of models for a particular response. The male gender also appeared to be significant in all responses. The direction of effect for sexual minority groups were different across four responses and showed some inconsistency with Minority Stress Theory. LGBQQ individuals appeared to have higher sexual and singlehood satisfaction levels, but lower life satisfaction and greater loneliness compared to heterosexual individuals. On the other hand, males appeared to be less satisfied in life, sex life, and singlehood, but felt less lonely than females. However, male-sexual orientation interaction terms generally were less frequently significant and had mixed directions of effect in the models.

Introduction

Despite the media’s perpetuation of negative preconceptions about being single, the concept of happy singlehood has acquired popular acceptance as the number of single individuals has increased. It is essential to note, however, that the definition of joyful singlehood can change depending on a person’s sexual orientation and gender identity. According to the Minority Stress Theory, sexual minority groups may endure additional stressors as a result of the social stigmas around their sexual orientation, which may lead to poorer levels of life and relationship satisfaction (Meyer, 2003). However, research also indicates that persons with diverse sexual orientations may demonstrate varying degrees of happiness when individuals are not aggregated under a single minority group, and that their happiness may also be different depending on whether they are single or partnered (Mark et al., 2015).

As a result, **the purpose of this study is to conduct an exploratory analysis on how life satisfaction, sexual satisfaction, satisfaction with single status, and loneliness levels of single individuals may vary according to their sexual orientations and genders.** In addition to the association between response, sexual orientation and gender, the potential confounders included were age, race and length of singlehood. Our analysis took a multiverse analysis approach, where we explored multiple ways of data manipulation and model construction instead of a single final model. Two surveys were conducted via online platform in 2022 to collect demographic information and satisfaction measures of the participants.

Following the introduction, data summary describes the data collection and manipulation, and provided summary statistics to facilitate the analysis. Method section documents the decision branches of multiverse analysis, in which cumulative link models or cumulative link mixed models were used. Results section reports the findings from multiple branches and interprets the results in the context of the data. Finally, discussion section concludes the findings in this analysis and address limitations as well as future considerations of this study. Appendix at the end displays figures and tables that are relevant to the analysis.

Method

Data summary

Data were collected as a part of the online survey for a longitudinal study on autonomous motivations for dating on the platform Prolific. Demographic information collected in the survey including age, race and length of singlehood are the potential confounders in our study. The data collection process consisted of two phases, including a baseline survey conducted in January 2022 and a follow-up survey conducted six months later in July 2022. The main variables of interest were sexual orientation, including heterosexual, lesbian, gay, bisexual, queer, questioning (LGBQQ), and other sexual orientations, as well as gender, including male, female and other genders in the original survey. The main responses of this study were life satisfaction, sexual satisfaction, satisfaction with singlehood and total loneliness score, which was a sum of loneliness measurements using three questions from the UCLA Loneliness Scale (Russel, 1996). Each of the response survey question used different numbers and had different numbers of levels. Life satisfaction was coded from 1 to 4, satisfaction with singlehood also has 4 levels but was coded as 0 to 3, sexual satisfaction had 7 levels 1 to 7, and the total loneliness levels varied across data set used depending on the participants' responses. Other confounders included in this analysis were age, race, and length of singlehood, which were controlled in some of the decision branches.

This analysis only included people who were single by the time of the two surveys. Due to the small sample size in some of the sexual and gender subgroups, we only included male and female as the gender groups. To avoid correlated gender and sexual orientation and small subgroups, we combined gay and lesbian into homosexual, and we excluded people who identified as lesbian male or gay female. Also, participants who chose not to answer their sexual orientation or gender were removed from the study because they failed to provide information on the key variables in this analysis. After applying such exclusion, the baseline sample size was 3875 and the follow-up sample size was 2772. The identifying code number PID was used to match participants in baseline survey to follow-up survey to create the merged data set with a sample size of 2605, which included the single people who completed both surveys. Analysis on the follow-up survey was conducted using the merged data set because no demographic information was collected in the follow-up survey. Two alternatives of merged data set were created, one with the average satisfaction measurement from two surveys and the other with repetitive measurements from both surveys. Table 1 counted the number of participants in each of the sexual orientation and gender subgroups in the merged data set, where the numbers of queer male were relatively small compared to other subgroups.

Table 1: Merged data set sexual orientation and gender subgroups.

Sexual orientation	Gender	Count
Heterosexual	Female	782
Heterosexual	Male	1103
Homosexual	Female	53
Homosexual	Male	99
Bisexual	Female	213
Bisexual	Male	102
Queer	Female	48
Queer	Male	9
Questioning	Female	111
Questioning	Male	23
Other	Female	52
Other	Male	10

Table 2 in Appendix provided a summary of the demographic information for participants in the merged data set with both baseline and follow-up survey data, including the mean and standard deviation for numeric

variables, or count for categorical variables. Among the participants who completed both surveys, the mean age was 24.7 and 58% of them were Caucasian. There was a roughly balanced gender distribution, but 72% of participants identified as heterosexual. The mean length of singlehood in months in follow-up survey appeared to be more than twice of that in the baseline, suggesting that those people who remained single during follow-up survey had been single for a longer period of time on average.

Multiverse Analysis

Decisions made by researchers in empirical studies could be arbitrary and could potentially lead to drastically different results. To enhance research transparency, the method of multiverse analysis involves analyzing all data sets created through different reasonable options, rather than following one pre-determined path of analysis (Steege et al., 2016). By building multiple universes with options for different data manipulation and model building, a multiverse analysis provides insights into how much conclusions may change due to data processing and analysis decisions, and which choices are the most essential to the robustness or fragility of results (Steege et al., 2016).

In this study, we conducted multiverse analysis on four responses, including life satisfaction, sexual satisfaction, satisfaction of singlehood, and total loneliness score. We first decided the data set used in the analysis, including baseline survey, follow-up survey, the average response value of baseline and follow-up surveys, and both baseline and follow-up surveys with two observations from each participant. Then we defined sexual orientation groups in two ways, one with binary grouping of heterosexual and LGBQQ aggregated and the other one with heterosexual, lesbian, gay, binary, queer, and questioning individuals separated. Consequentially, we chose whether to control for the covariates age, race and length of singlehood and whether to include gender and gender-sexual orientation interaction. Each response had $4 \times 2 \times 2 \times 2 = 32$ universes and we had a total of $32 \times 4 = 128$ universes in this multiverse analysis. Table 4 in Appendix lists the decisions we made in all 32 universes for one response.

Cumulative link models for ordinal regression

The original questions used Likert scales to gauge the individuals' levels of life satisfaction, sexual pleasure, satisfaction with singlehood, and loneliness, which were the four response variables in our study. For these variables, larger numbers denoted a greater degree of agreement with the issue, while smaller numbers indicated a lesser degree of agreement. To account for the ordered nature of the coded numbers representing a finite set factors that were ranked from least to greatest extent, we utilised ordinal regression with cumulative link models (CLM). The dependent variable in CLM is a function of the cumulative probability of the response being smaller or equal to a level. The independent variables in CLM for this study included a combination of aggregated or unaggregated sexual orientations, gender, age, race and length of singlehood, depending on different universes. For CLM, we assumed proportional odds, linearity of the predictor and the log odds of the response, and independent observations. The proportional odds assumption states that the effect of the predictor on the response are the same across all levels of the response variable (McNulty, 2021). Diagnostic graphs in Figure 5 Appendix revealed that there may be some violations of proportional odds assumption. However, the results from CLM with violated proportional odds assumption may still be robust in the sense that, although the magnitude of the estimates may not be reliable, the significance of predictors and direction of effects using cumulative link models should remain useful (Harrell, 2020).

Cumulative link mixed models

For the decision branches with both baseline and follow-up data with repetitive measurements, we used cumulative link mixed models (CLMM) to accommodate the fact that we had two responses from the same participant (Christensen, 2019). In the merged data set, those participant who did not drop out of the study had two responses to the satisfaction measurements, which were not independent and thus violated the independent observation assumption of the cumulative link model. Also, we would like to account for the

individual differences in their subjective assessment of satisfaction level. As a result, we used a cumulative link mixed model that included both fixed and random effects, where the fixed effects were the predictors we wanted to estimate, such as sexual orientation, gender and other confounders, and the random effects were the values that we wanted to take into consideration but did not want to estimate, such as subjects labelled by their PID.

After fitting all 128 models, we conducted likelihood ratio tests for cumulative link models and cumulative link mixed models that were nested in predictors and examined the models that we failed or did not fail to reject the null hypothesis. The null hypothesis of the likelihood ratio test was that the simpler model fitted the data as well as the complex model. The alternative hypothesis of the test was that the more complex model was a better fit for the data than the simpler model.

Results

We first examined the proportional odds assumption using diagnostic graphs, and in some cases the assumptions were reasonably met but some showed potential violations, mostly in the variables with multiple levels such as race and unaggregated orientations as shown in Appendix Figure 5 (UCLA: Statistical Consulting Group, n.d.). As a result, this could be a potential limitation and cause the estimate magnitude to be unreliable, but the significance of predictors and the direction of the estimates should remain useful (Harrell, 2020). Then we proceeded to fit CLMs and CLMMs according to our decision branches in Table 1. Because we had missing sexual satisfaction in both baseline and follow-up data, we filtered the missing value for the analysis of sexual satisfaction so the sample size was reduced by 1 in those universes.

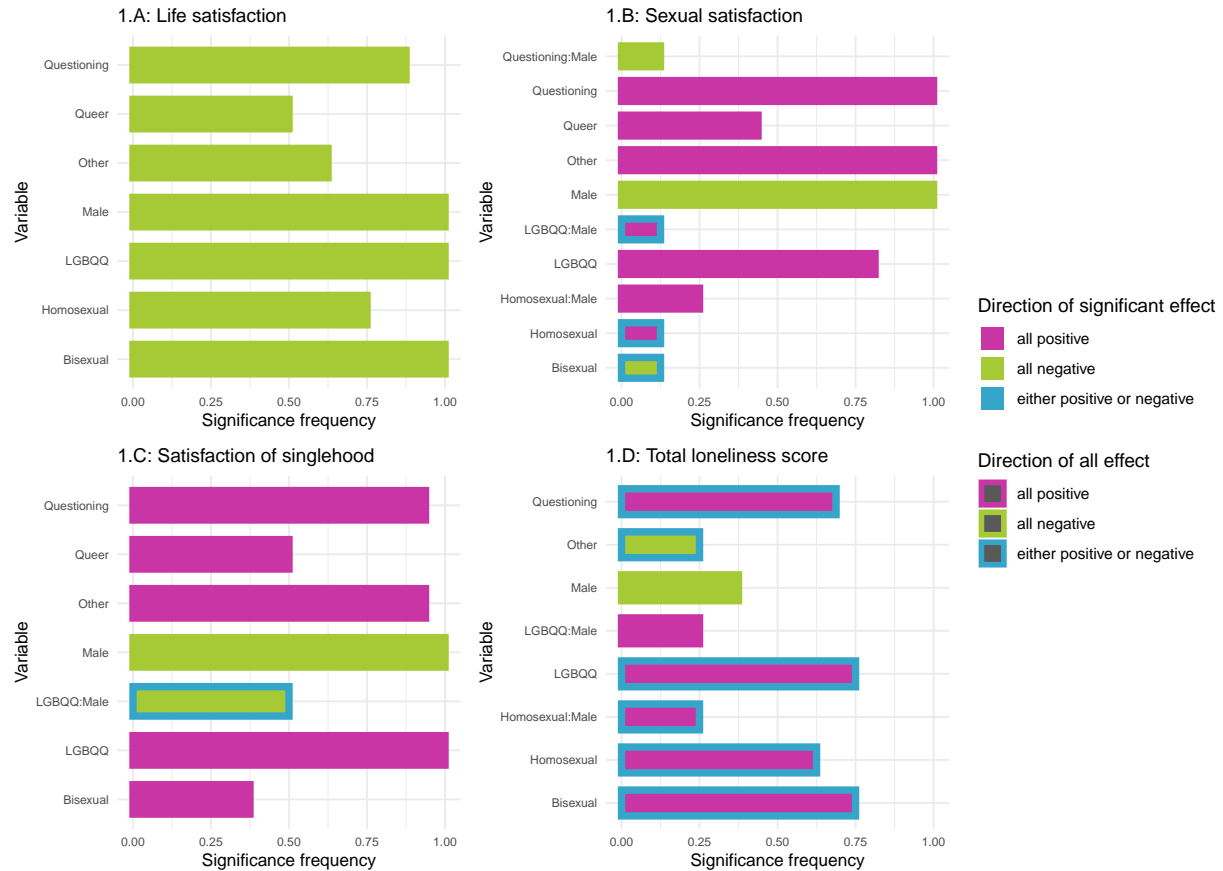


Figure 1. Significance frequency of variables in the models for four responses. Only the variables that had a p-value < 0.05 in at least one model were included in this figure, and their direction of effects were color-coded differently in models where they were significant (filling) or in all models (outline). Note that the variable heterosexual was the reference level and thus not showing in the models.

Based on the results from all 128 universes or models for life satisfaction, sexual satisfaction, satisfaction of singlehood, and total loneliness score, different variables were significant predictors for different responses. We define the significance frequency of a variable as the proportion of $p\text{-value} < 0.05$ in all models containing this predictor for a specific response. The baseline or reference level for aggregated or unaggregated LGBQQ was heterosexual, and the baseline level for gender was female. Figure 1 demonstrates the predictors that had a $p\text{-value} < 0.05$ in at least one model for four responses, respectively. The variable LGBQQ in the branch of aggregated sexual minorities had a $p\text{-value} < 0.05$ in $(57/64) = 89\%$ of models containing this variable across all four responses, which was also shown in Figure 2. However, when we further divided LGBQQ into individual sexual minority subgroups, different subgroups were more frequently significant across four responses. Questioning, bisexual and other were significant in all responses, but homosexual and queer were not significant in any models for singlehood satisfaction and total loneliness, respectively. In sexual and singlehood satisfaction models, questioning and other were significant in almost all models containing unaggregated LGBQQ, but other sexual orientation was only significant in about 25% of total loneliness models, as shown in Figure 1.D. On the other hand, the male gender was significant in all life, sexual and singlehood satisfaction models, but only 37.5% of total loneliness models containing gender had significant male predictor, as shown in Figure 1.D. A closer examination of male effects in Appendix Figure 3 revealed that the proportion of significant predictor male was the lowest and the magnitude of estimates were closer to zero in total loneliness score models, meaning that the effect of gender was weaker on loneliness. This weaker effect on total loneliness score may be true for all variables, where no predictor was significant in all total loneliness models containing this predictor, as shown in Figure 1.D. Male-sexual orientation interaction terms were also significant in some of the sexual and singlehood satisfaction, and total loneliness score models, but were significant in a lower proportion of models.

Furthermore, significant predictors had robust results in terms of consistent directions of effect regardless of decisions, as shown by the either all positive or all negative filling color of bars in Figure 1. An example for such consistency was also demonstrated in Figure 2, where all the significant predictors LGBQQ had the same direction of effect for a particular response. On the other hand, the effect directions could be either positive or negative if we consider all models regardless of the predictor’s statistical significance in the model, indicated as the outline color of bars in Figure 1. For example, LGBQQ had a mix of positive and negative estimates for total loneliness score as demonstrated by the blue outline in Figure 1.D and a mix of red and yellow intervals in Figure 2.D. However, predictors that were significant in at least one model for life satisfaction had consistent direction of effect across all universes or models for this response, even if they may not be significant in all models, shown as the same color of fillings and outlines of the bars in Figure 1.A. Compared to heterosexual individuals, all sexual minority groups, aggregated or not, appeared to have negative estimate and thus lower life satisfaction, as shown in Figure 1.A. In sexual and singlehood satisfaction model, most sexual minority groups had positive estimates when compared to heterosexual, except for bisexuals having negative estimate for sexual satisfaction. On the contrary, most sexual minority groups had positive estimates for total loneliness score comparing to heterosexual, with the exception of the other orientation. Male, when comparing with female, had negative estimate for life, sexual and singlehood satisfaction, and total loneliness score, meaning that males appeared to be less satisfied in life, sexual and singlehood but felt less lonely. Male-sexual minority interaction terms appeared to have different directions of effects, where in sexual satisfaction models, questioning-male interaction effect was negative but homosexual and aggregated LGBQQ-male interaction effects were positive. Also note that Figure 1.A showed consistent negative direction across predictors regardless of their significance, but Figure 1.D showed that most predictors in total loneliness models had mixed directions in models where they were and were not significant in.

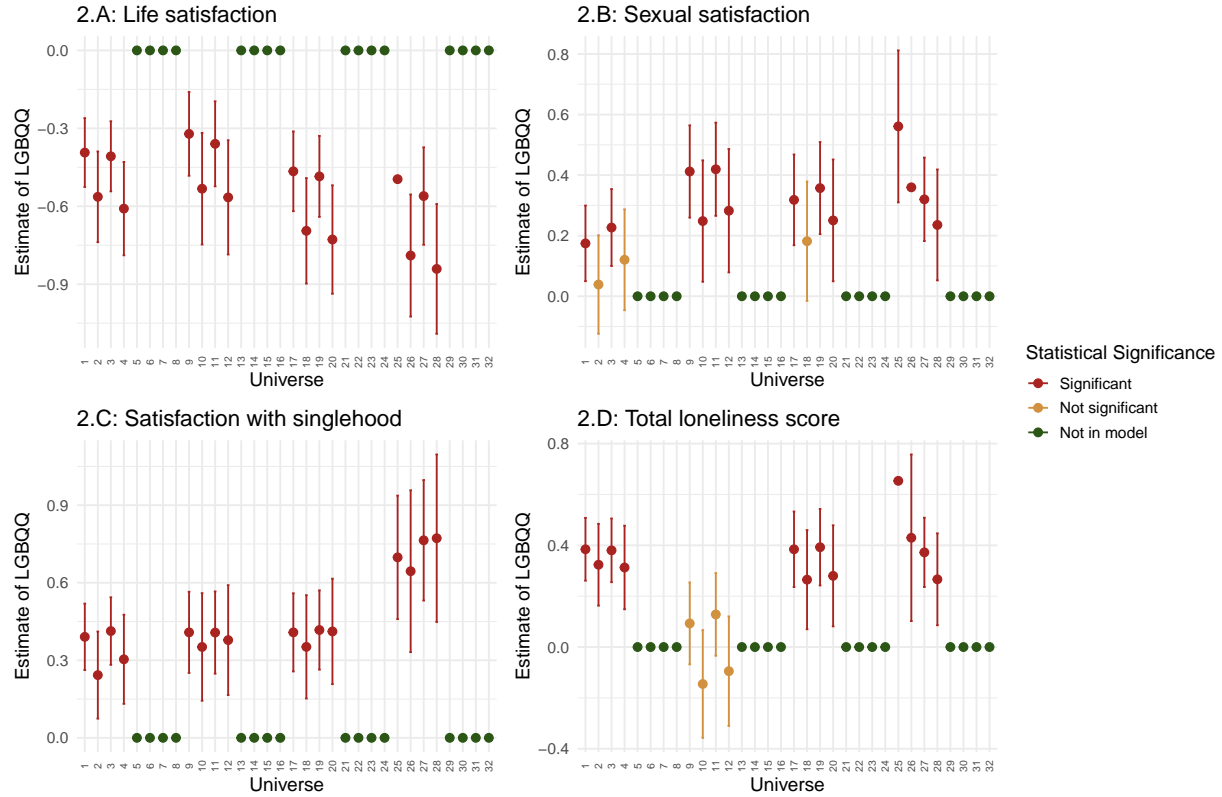


Figure 2. Estimates, confidence intervals and significance of LGBQQ. The statistical significance was color-coded, and confidence intervals were shown as error bars. The dots at the axis with 0 estimate indicated that LGBQQ was not in the model. All red dots (significant) had the same direction of effect, whereas the yellow dots (insignificant) may have the opposite direction of effect, as shown in the case of total loneliness score.

On the other hand, we compared the goodness-of-fit of the nested models. The likelihood ratio tests between all nested models revealed that for all CLMs of life satisfaction, sexual satisfaction, and satisfaction with singlehood, we preferred the more complex model for our data. We failed to reject the null hypothesis that the simpler model fitted the data as well as the more complex model in some likelihood ratio tests for CLMs of total loneliness score and CLMMs of all responses. All those tests that we failed to reject were different in the inclusion of gender. On the other hand, the likelihood ratio tests preferred the models that controlled for confounders age, race and length of singlehood. When inspecting the distribution of length of singlehood, we found that it was a bimodal distribution due to a large amount of people who were perpetually single and had never been in a relationship, as shown in Appendix Figure 4. The variable length of singlehood had a $p\text{-value} < 0.05$ in 93.75% of models of life satisfaction and 100% of models for sexual satisfaction that controlled for this confounder. However, this variable was significant in only 43.75% of models for satisfaction with singlehood and 50% of models for total loneliness score controlling for confounders. Thus, length of singlehood appeared to have a stronger relationship with life and sexual satisfaction that was resilient to different data manipulation and modeling decisions.

Discussion

With an increased societal acceptance of being happily single, it is recognized that the satisfaction measurements of single individuals may vary based on their sexual orientation and gender identities. Using two surveys conducted 6-month apart in 2022, the study aims to perform an exploratory analysis of how life satisfaction, sexual satisfaction, satisfaction with being single, and loneliness levels of single people may vary depending on their sexual orientations and genders.

Having recognized the impact of of arbitrary decisions on findings, a multiverse analysis approach was

implemented and a total of 128 models or universes was built and examined. Based on the 128 universes, the predictor aggregated LGBQQ appeared to be the most frequently significant in models of life satisfaction, sexual satisfaction, satisfaction with singlehood and total loneliness score. However, when further dividing down the sexual minority group, some subgroups of LGBQQ were significant in a higher proportion of models, depending on different responses. Questioning, bisexual and other were significant in all responses, where questioning and other were overall more frequently significant, implying that their statistical significance was more robust to different decisions. Homosexual and queer appeared to be significant in models for three responses, and they were not significant in any models for satisfaction with singlehood and total loneliness score, respectively. On the other hand, the male gender appeared to be significant in all life, sexual and singlehood satisfaction models and some total loneliness score models, meaning that the significance of gender to satisfaction measurements may be robust to arbitrary decisions. Only some of the male-sexual orientation interaction terms were significant in sexual and singlehood satisfaction and total loneliness score models, but their significance frequency was on the lower side.

In terms of the direction of effects, it appeared that all predictors had consistent directions in the models that they were significant in, but could have mixed directions in all models containing them. Different from the Minority Stress Theory, aggregated LGBQQ and all sexual minority subgroups had higher sexual satisfaction and satisfaction of singlehood than heterosexual, except for bisexual individuals feeling less satisfied in their sex life. However, LGBQQ individuals felt less satisfied in life and more lonely, in accordance with Minority Stress Theory. This makes sense because there is a close relationship of sex and singlehood to one's sexual orientation and thus may involve a narrower, more intimate circle with individuals with similar sexualities and social identities. However, life satisfaction and loneliness may be influenced by a wider range of factors such as social support, economic stability, and personal fulfillment, which may be a major source of social stigma and stress implied in the Minority Stress Theory. On the other hand, male individuals appeared to have low life, sexual and singlehood satisfaction, but felt less lonely, comparing to female individuals. Interestingly, the interaction between male and sexual orientation appeared to have different directions of effects depending on the sexual minority group or subgroup that interacted with gender. For instance, in sexual satisfaction models, questioning-male interaction had negative effects but homosexual and aggregated LGBQQ-male interaction effects were positive. We could also infer that the response life satisfaction was more robust to different decisions because the directions of effect for the variables that were significant in at least one universe were consistent in all models, even in those models where they were not statistically significant. On the other hand, most predictors in total loneliness models appeared to have different directions of effect in models where they were and were not significant in, implying that the results for total loneliness may be less robust to changes.

Most likelihood ratio tests preferred complex models with confounders, with the exceptions in CLMs for total loneliness score and CLMMs for all responses. Among the tests where we preferred the simpler model, the difference in the two models was the inclusion of gender. However, because the male gender was a significant predictor in most models with gender across four responses while the male-sexual orientation interaction effects were less frequently significant, we inferred that it was the male and sexual orientation interaction terms that resulted in the preference of exclusion of gender in total loneliness score CLMs and CLMMs for all responses. In general, male-sexual orientation interaction terms were less frequently statistically significant and had inconsistent directions for all four responses. Thus, future studies may decide to not interact gender with sexual orientations.

Among the confounders, length of singlehood has a bimodal distribution because many people in this study had never been in a relationship. The variable length of singlehood appeared to be significant in almost all models for life and sexual satisfaction but only in half of the models for satisfaction with singlehood and total loneliness score, that controlled for confounders. As a result, we inferred that there may be a stronger effect of length of singlehood on life and sexual satisfaction that may be examined in future studies.

There were several strengths about this study. With lots of participants in both baseline and follow-up surveys, we had large sample sizes after data exclusion and merging. Also, the sample consisted of people with diverse racial backgrounds, which could reduce bias in the study. This study was also limited in several perspectives. Despite the multiverse analysis, the study could still be confounded, because we had limited demographic information on the participants and could not account for some variables such as

geographical religious and cultural background. The nature of the multiple universes was likewise limited, as 128 universes did not encompass all potential variations. Also, the responses to Likert scales were subjective and based on honesty. Also, we summed the three Likert scales for a total loneliness score, which may not be meaningful because the question options were not numeric in nature. Because the follow-up data did not recollect demographic information, we assumed that gender and sexual orientations remained the same throughout the 6 months, acknowledging that they could be fluid. Another limitation of this study was that the number of sexual and gender minority individuals may still be too small to capture a significant difference in the responses. A previous analysis with the male-lesbian and female-gay subgroups revealed complete separation and missing estimate problems because the prediction may be too perfect in those very small groups. Although this was not an issue in this analysis with only the combined homosexual group, it was still a limitation to be aware of. Also, the violation of the proportional odds assumption may lead to unreliable magnitude, which implies that we may not be able to capture the dynamics across levels of a response using a single model (Harrell, 2020). Further investigation could compare the difference between every two levels of a satisfaction measurement. Finally, due to the nature of exploratory analysis, we were not able to make causal inferences and our results were less robust than those of a randomized control trial. Future research with more demographic information and greater number of sexual minorities is needed to examine the intricacies of singlehood and its relationship to overall well-being. In terms of confounders, other studies may investigate a potential difference in individuals who are long-term single or transiently single. Eventually, we can obtain a greater knowledge of the nuances of the human experience and strive toward establishing a society that is more inclusive and supportive for all.

Conclusion

With the purpose of exploring the differences in life satisfaction, sexual satisfaction, satisfaction with single status, and total loneliness scores among single adults with various sexual orientations and gender identities, we conducted a multiverse analysis with 128 models and found that LGBQQ was a frequently significant predictor for all satisfaction measurements, but when the sexual minorities were further subdivided, their significance varied for different responses. Questioning, bisexual and other sexual orientations were also significant in all models, but other and homosexual were only significant in models for three out of four responses. In addition, the male gender appeared significant in all responses. Also, the direction of effect for a significant predictor was consistent for a given response in models in which this predictor was significant, but the direction could be inconsistent in all models containing this predictor. Compared to heterosexuals, LGBQQ persons appeared to have higher sexual and singlehood satisfaction, but lower life satisfaction and increased loneliness. Males, on the other hand, appeared to be less content with their life, sex life, and singlehood, but experienced less loneliness. In contrast, male-sexual orientation interaction terms exhibited lower effects, mixed directions, and were less frequently statistically significant in all models across four responses.

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Appendix

Table 2: Demographic characteristics of participants in merged data set with both baseline and follow-up survey data.

Characteristic	N = 2,605
Age	24.7 (5.1)
Gender	
Female	1,259 (48%)
Male	1,346 (52%)
Race	
African	265 (10%)
Caribbean	14 (0.5%)
Caucasian	1,510 (58%)
East Asian	105 (4.0%)
Latino/Hispanic	312 (12%)
Middle Eastern	54 (2.1%)
Other	254 (9.8%)
South Asian	91 (3.5%)
Sexual Orientation	
Heterosexual	1,885 (72%)
Homosexual	152 (5.8%)
Bisexual	315 (12%)
Queer	57 (2.2%)
Questioning	134 (5.1%)
Other	62 (2.4%)
Length of Singlehood: Baseline	120.5 (125.7)
Length of Singlehood: Follow-up	267.2 (113.0)

¹ Mean (SD); n (%)

Table 3: Structure of Multiverse Analysis. This table demonstrates the decision branches for each response in our study, resulting in a total of 32 universes or models for one response, and 128 universes or models in total in this study.

Data Used	Sexual Orientation	Control for Confounders	Gender Interaction	Universe
Baseline	LGBQQ aggregated	Do not control	No gender	1
			Male vs Female	2
		Control	No gender	3
			Male vs Female	4
	LGBQQ unaggregated	Do not control	No gender	5
			Male vs Female	6
		Control	No gender	7
			Male vs Female	8
Follow-up	LGBQQ aggregated	Do not control	No gender	9
			Male vs Female	10
		Control	No gender	11
			Male vs Female	12
	LGBQQ unaggregated	Do not control	No gender	13
			Male vs Female	14
		Control	No gender	15
			Male vs Female	16
Average of both	LGBQQ aggregated	Do not control	No gender	17
			Male vs Female	18
		Control	No gender	19
			Male vs Female	20
	LGBQQ unaggregated	Do not control	No gender	21
			Male vs Female	22
		Control	No gender	23
			Male vs Female	24
Repetitive measurement	LGBQQ aggregated	Do not control	No gender	25
			Male vs Female	26
		Control	No gender	27
			Male vs Female	28
	LGBQQ unaggregated	Do not control	No gender	29
			Male vs Female	30
		Control	No gender	31
			Male vs Female	32

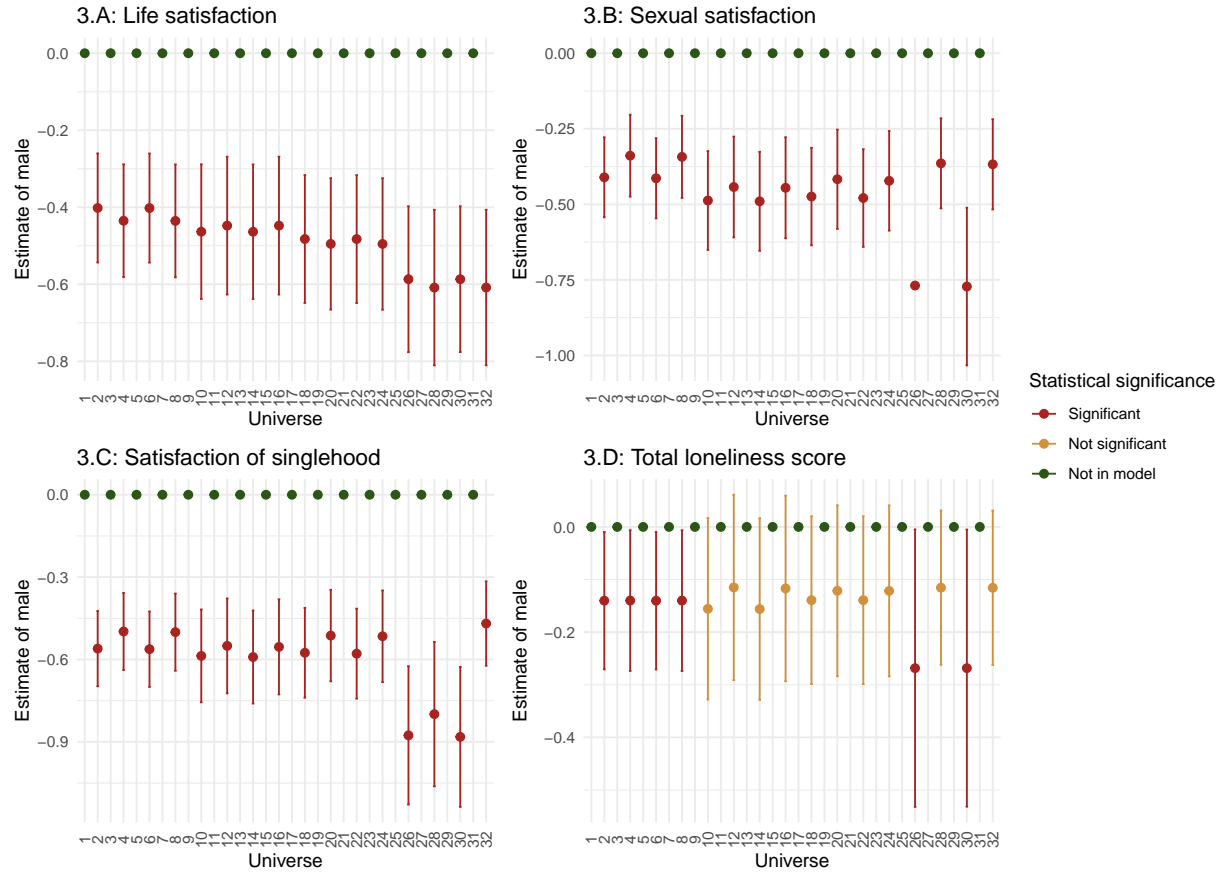


Figure 3. Estimates, confidence intervals and significance of male. Blue points in life satisfaction and satisfaction of singlehood indicated complete separation. Except for complete separation, male appeared to be all significant and negative in satisfaction with singlehood. The direction of effect for male were consistently negative regardless of its significance in the model, but male had a mixed-direction and potentially weaker effect on total loneliness score.

Figure 3 demonstrated that male had negative estimates for all four responses, and all estimates in life, sexual and singlehood satisfaction models were significant. The effect of male in total loneliness score models had consistent direction but a large proportion of the models with gender did not have significant male effect.

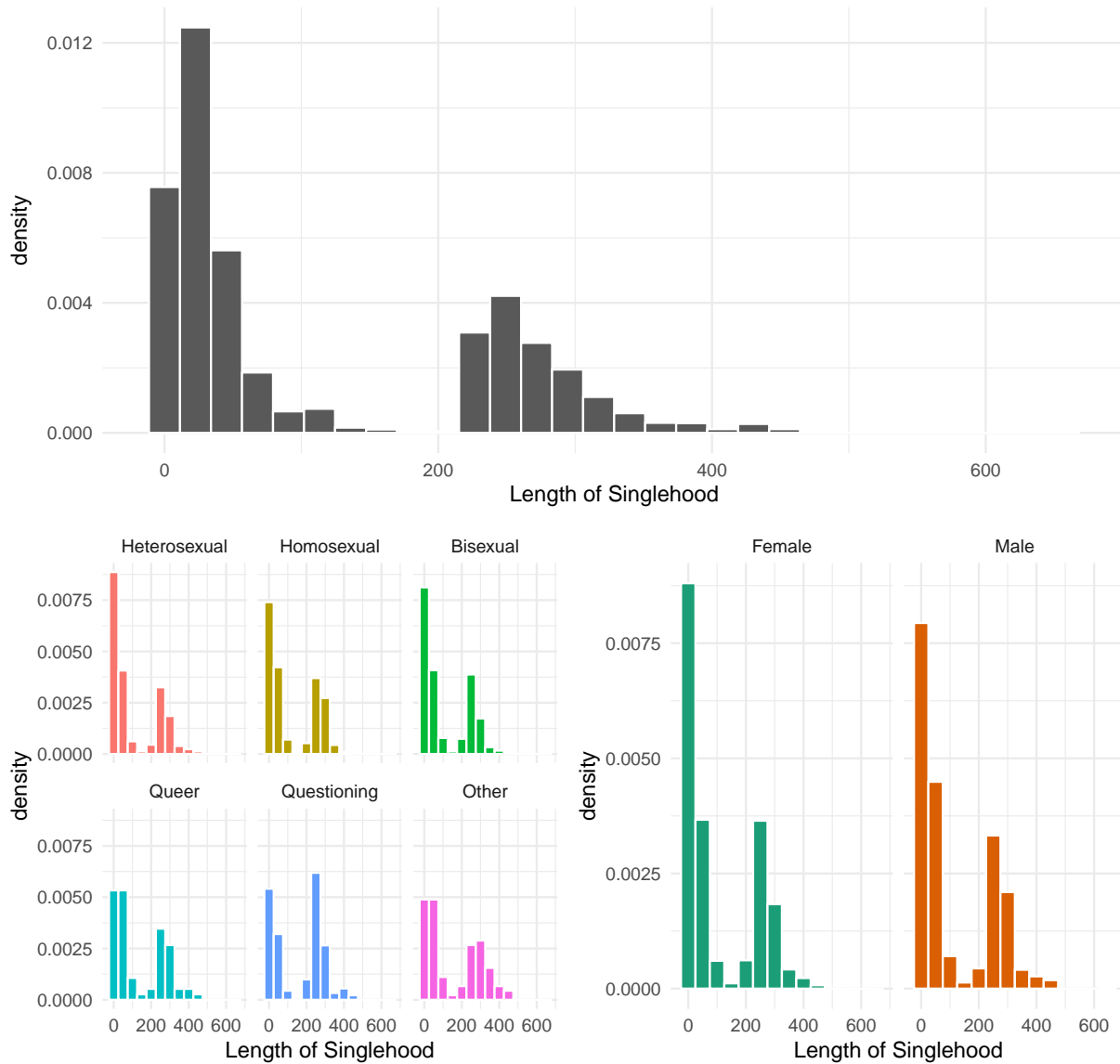


Figure 4. Baseline length of singlehood. All plots appear to have two modes, which may be due to the manipulation of length of singlehood for those who were perpetually single.

Figure 4 indicated the distribution of the baseline length of singlehood. All the histograms in Figure 4 appeared to be bimodal because there were people who had never been in a relationship before, and their length of singlehood was imputed as their age multiplied by 12. Also, there did not appear to be obvious differences in the length of singlehood for people with different genders and sexual orientations.

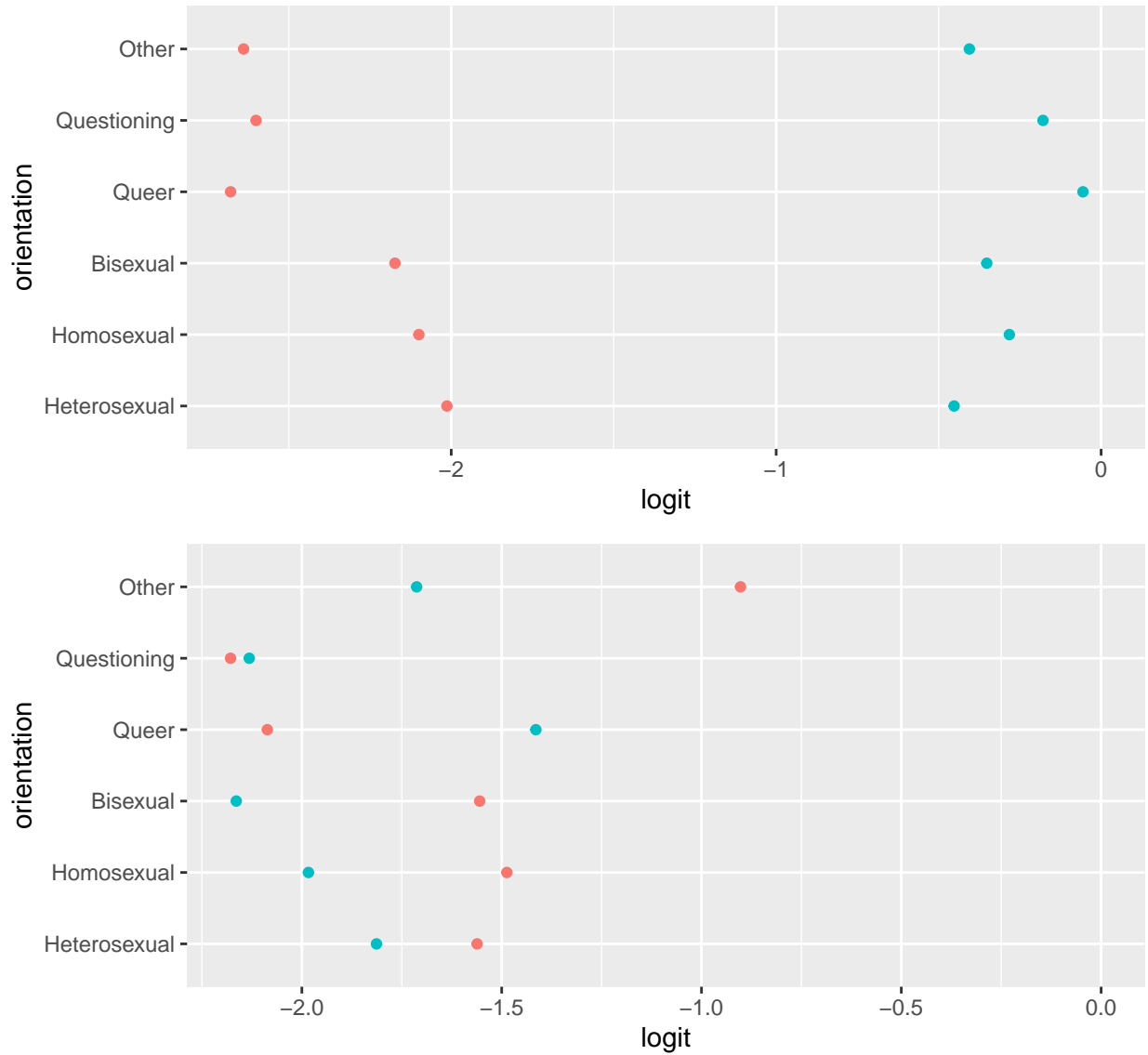


Figure 5. Proportional odds assumption diagnostic plots for sexual orientation in baseline life and sexual satisfaction.

The first plot in Figure 5 was for baseline life satisfaction and the second one is for baseline satisfaction with singlehood. In the first graph, the distances between the red and blue dots for some levels of the variable were similar, whereas the distances were more drastically different in the second plot, which suggested a violation of proportional odds assumption. Figure 5 is based on a method proposed by UCLA Statistical Consulting Group (n.d.).