Understanding Healthcare Experiences of Gender Minority Individuals: The Role of Gender Identity Non-Disclosure

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Abstract

While healthcare avoidance and negative healthcare experiences of gender minority (GM) individuals have been documented in current research, few studies have focused on the potential impact of gender identity non-disclosure towards general healthcare providers. This research investigated how gender identity non-disclosure towards general healthcare providers connects to negative healthcare experiences, healthcare avoidance, and depression in an online survey conducted among 19 GM participants.

In contrast to expectations and previous research, no significant relationships were found between negative healthcare experiences and gender identity non-disclosure, gender identity non-disclosure and depression, or healthcare avoidance. However, 63.16% of participants had not disclosed their gender identity to their healthcare provider, over half of the participants had experienced at least one instance of discrimination within healthcare, and 53% had avoided seeing a healthcare provider even though they felt like they needed to because of gender identity related concerns.

A limitation of the current research is its small sample size, which limited the ability to detect potentially significant effects. This research highlights the need for validated measures encompassing non-disclosure within the healthcare interactions of GM individuals, as well as GM-specific education for healthcare providers to reduce discrimination. Future studies with bigger samples sizes are essential to further explore these findings.

Keywords: Gender Minority, Gender Minority Stress, Negative Healthcare Experiences, Gender Identity Non-Disclosure, Healthcare Avoidance, Depression.

1. Introduction

Historically mental illness has been treated as residing within an individual. While external stressors have been taken into account, a significant responsibility for changing behaviours, thoughts, and emotions has fallen onto the person experiencing mental health challenges. However, a growing body of research indicates a shift in perspective, as symptoms commonly classified as psychopathologies may represent appropriate reactions to chronic stress and mistreatment (Tankersley et al., 2021). This is particularly evident for gender minority (GM) populations, which include individuals whose gender identity diverges from their sex assigned at birth (e.g., transgender, nonbinary, genderqueer; American Psychology Association, 2011). A higher prevalence of mental health problems within GM populations in comparison to non-GM individuals is well established within current research (Dhjene et al., 2016; Williams, 2021), and this disparity has been attributed to structural stigmatisation and discrimination of gender nonconformity which seems to extend into the healthcare context (Mezza et al 2024).

Structural stigmatisation seem to disadvantage GM individuals through multiple processes. Defined within the GM context, structural stigmatisation encompasses "the systematic devaluation and marginalisation of trans people that limit access to critical structural and social resources for wellbeing.” (King et al., 2020, p. 8). Central to structural stigmatisation is the reinforcement of a male/female binary gender system which privileges cisgender individuals whose gender identity aligns with their sex assigned at birth and systemically disadvantages individuals who do not conform (Link & Phelan, 2014; Schilt & Westbrook, 2009). The process of labelling GM individuals as non-normative impacts mental health outcomes directly by generating stress, which is linked to higher morbidity and mortality and indirectly by restricting

access to health-protective resources (Hatzenbuehler et al., 2013; Link & Phelan, 1995). Moreover, interactions with the healthcare system may be impacted by systematic stigmatization.

Despite advancements in inclusive policies and attitudes, negative healthcare experiences are disproportionately frequently experienced by GM individuals (Hughes et al., 2023). Having to teach a healthcare provider on one's own unique GM related health needs, use of incorrect names and pronouns and offensive or outdated language in regards to gender identity are examples of negative healthcare experiences GM encounter (Boyer et al. 2022). In a cross-national survey on discrimination of lesbian, gay, bisexual and transgender individuals, the European Union Agency for Fundamental Rights found that 34% of transgender individuals in Europe had experienced discrimination in a healthcare setting due to their gender identity (Publications Office of the European Union, 2014). This number is twice as high in comparison to sexual minorities, namely lesbian, gay, and bisexual individuals (Publications Office of the European Union, 2014). Consequently, the experiences of GM individuals within the healthcare context may impact their future utilisation of medical care.

The avoidance of engaging with the healthcare system among GM individuals represents a barrier to benefitting from healthcare. Healthcare avoidance encompasses behaviours like hesitance to seek medical care, underutilization of preventative care like routine screenings for physical and mental health, and the avoidance of healthcare altogether (Boyer et al. 2022). This avoidance behaviour, possibly stemming from past negative experiences within the healthcare setting where GM individuals have encountered discrimination or lack of understanding, is highlighted in a systematic review from Ayhan et al. (2020). In all studies examined in the review, negative healthcare experiences of GM individuals led to the avoidance of healthcare out of fear of stigmatisation (Ayhan et al. 2020). As coping by avoidance connects to delays in

seeking care for preventable health conditions and potentially gender-affirming care, the consequences seem to extend beyond physical health outcomes by potentially impacting mental well-being.

Negative healthcare experiences and subsequent healthcare avoidance among GM individuals seem to be linked to negative mental health outcomes. Extensive research has documented that in comparison to cisgender individuals, GM people experience consistently higher rates of mental health problems, including depression, anxiety, non-suicidal self-injury, and suicidality (Bettis et al., 2020, Valentine & Shipherd, 2018). Moreover, the delay of medical care out of fear of discrimination has been significantly positively associated with suicide attempts (Brennen et al. 2017). Within the healthcare context, negative healthcare experiences like instances of discrimination and lack of provider competence in caring for gender minority individuals seem to increase the vulnerability towards suicidal ideation and attempts (Kattari et al. 2020). GM individuals who had to educate a healthcare provider on their unique health needs have had a 1.3 higher likelihood of having experienced past-year suicidal ideation (Kattari et al. 2020). Moreover, individuals who perceived their provider as not being inclusive of GM identities were more likely to have had suicidal thoughts and to have made a suicide attempt in the past year (Gosling et al., 2022). The heightened prevalence of depression, suicidality, and negative healthcare experiences within GM populations can be conceptualised within the theoretical framework of Minority Stress Theory (Meyer, 2003).

Meyer's (2003) Minority Stress Theory offers an explanation for how negative healthcare experiences and resulting healthcare avoidance may impact the elevated prevalence of mental health disorders among GM individuals. This theory incorporates the impact of social, psychological, and structural factors which GM individuals face, into a model (Frost & Meyer,

2023). Hereby, a distinction is made between *general stress* such as daily hassles and major life changes, which are experienced by all people, and *minority stress*, the excess stress to which minority individuals are constantly exposed due to their identity (Frost & Meyer, 2023; Meyer, 2003). While the presence of general stress is linked to adverse health outcomes, the minority stress experienced in addition to general stress within GM populations presents an explanation for the likewise heightened prevalence of mental health disorders in this population (Meyer, 2003; Schneiderman et al, 2005). Meyer's minority stress theory, initially describing the experiences of sexual minorities, has been empirically applied to GM, showing the potential of explaining the increased prevalence of mental disparities in this population (Mezza et al., 2024).

Within the minority stress theory, two interacting processes are described. *Distal stressors* originate from external sources like other individuals or institutions and can take the form of discrimination, harassment, verbal or physical assault, microaggressions and being denied services, resources or opportunities due to cisgender normative laws, policies, and cultural norms (Frost & Meyer, 2023; Hidalgo et al. 2019; Mezza et al. 2024). *Proximal stressors* impact the individual on a personal, subjective level and include the concealment of identity to avoid discrimination and expecting or perceiving prejudice from others (Hidalgo et al. 2019). The stressors within Meyer's (2003) minority stress theory can have a trickle-down effect, as distal stressors may promote the expectations to be discriminated against due to one's identity and/or lead individuals to hide their identity to protect themselves (Frost & Meyer, 2023; Tankersley, 2021). While concealing one's identity can be protective in certain environments, choosing not to disclose one's gender identity in the healthcare context might be connected to adverse health outcomes.

Therefore, gender identity non-disclosure to a healthcare provider might be a relevant barrier to benefitting from healthcare. In a study within a lesbian population, disclosure of sexual identity has been associated with improved healthcare service use, communication, and general comfort (Steele et al., 2006). Simultaneously, non-disclosure or concealment of identity has been linked to occasional delay of care, as well as having an impact on the provider's ability to understand and address health needs (Hughes et al., 2023). This highlights an essential aspect of non-disclosure, as it can be both a protective measure and a potential risk for adverse health outcomes. Recent evidence suggests that one of the main barriers to disclosing one's gender identity to a healthcare provider may be the lack of provider inquiry about the patient's minority identity (Rossman et al., 2017). This is consistent with further findings reporting that provider-related characteristics seem more likely to influence the patients' disclosure of identity than the patients' personal characteristics like general openness about their minority identity (Steele et al., 2006). Therefore, the inclusion of provider inquiries in relation to gender identity non-disclosure seems to be relevant for exploring barriers to obtaining health care.

2. Current Research

While healthcare avoidance and negative healthcare experiences of GM individuals are well documented in current research, few studies have focused on the potential impact of gender identity non-disclosure. Identity disclosure has been found to have a significant impact on the uptake of healthcare use within sexual minority populations (Steele et al., 2006). Additionally, a majority of research has combined both sexual and gender minority individuals into one population, thereby leaving a gap regarding the unique experiences of GM individuals (Ayhan et al., 2019). Much existing research involves individuals experiences within gender clinics;

consequently few studies focus on GM experiences outside of specialized care (Boyer et al. 2022). Therefore, the current research attempts to explore how gender identity non-disclosure towards general healthcare providers might connect to (negative) healthcare experiences and healthcare avoidance with the following research question: What impact do negative healthcare experiences have on gender identity non-disclosure to the general provider, depression, and healthcare avoidance of gender minority individuals? Additionally, the following sub-questions (SQ) will be explored:

(SQ1) How do GM individuals in this sample experience discrimination in healthcare?

(SQ2a) How do GM individuals in this sample disclose their gender identity to their primary healthcare provider?

(SQ2b) How do GM individuals in this sample disclose their gender identity on inquiry from their primary healthcare provider?

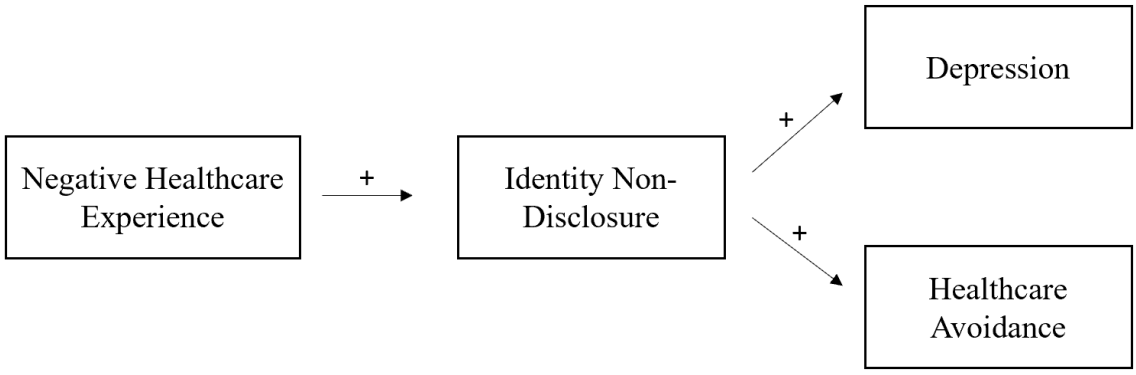
(SQ3) To what extent do negative healthcare experiences predict gender identity non-disclosure in this sample?

(SQ4) To what extent does gender identity non-disclosure predict healthcare avoidance in this sample?

(SQ5) To what extent does identity non-disclosure predict depressive symptoms in this sample?

Figure 1

Visualisation of the Expected Relationship between Variables



3. Methods

3.1. Participants

The participants were recruited through means of convenience sampling, making use of social media and local organisations like Think With Pride and J&SV Exaltio, in addition to personal circles. Specifically, a short message and link to the Qualtrics survey were shared on WhatsApp and per e-mail, with the incentive to be shared with individuals within the networks of the local organisations. Additionally, SONA, the test subject pool of the University of Twente has been made use of. Participants recruited through the SONA system were rewarded 0,25 study credits at completion of the survey. Participants who were younger than 16, did not agree to give informed consent, or left a majority of the questions unanswered were excluded from the study. Participants who indicated that their gender identity diverges from their sex assigned at birth as well as intersex individuals were included in the study, resulting in a sample of 19 participants. The age of this sample lies between 17 and 27 years old, with a mean age of 22.68 (*SD* = 2.38). Overall, most participants in the sample identified as non-binary (44.8%), followed by 8 (27.5%) of participants indicated that they were binary transgender. Additionally, 5 (17.2%) indicated that they were still questioning their gender identity and 3 (10.3%) choose to self-describe as genderfluid or genderqueer.

Table 1

Demographic Table

Categories	Frequency	Percentage
Gender*		
Female	5	17.2
Male	3	10.3
Nonbinary	13	44.8
Questioning	5	17.2
Self- described	3	10.3
Sex		
Female	14	73.7
Male	5	26.3
Intersex	0	0
Country of Residency		
Netherlands	11	57.9
Germany	8	42.1

Note. *Individuals had the option to pick multiple options based on what describes them best

3.2 Design and Procedure

The study received ethical approval from the BMS Ethics Committee/Domain Humanities and Social Sciences on April 4th, 2024 (Number 240516). All data was collected in April and May 2024. The survey was administered online using Qualtrics software and was part of a larger study. Participants took an average of 16.4 minutes to complete the survey, with one participant taking 280 minutes to complete the survey and therefore being considered an outlier for the computation of the mean. First, all individuals were provided with the participant information including the description and aim of the study. Next, an informed consent form was administered, followed by demographic questions including age, gender identity, sex assigned at birth, and country of residency. Then, the participants were asked to fill in a questionnaire on

general health, including depression. Lastly, one question each for healthcare avoidance, gender identity disclosure, and provider discrimination was administered, followed by 6 sub questions. The survey ended with a debriefing text including further information on the constructs measured in the questionnaire and resources for the possibility of emotional distress in response to recalling themes of discrimination within the survey.

3.3 Measures

3.3.1 Demographic Data

Demographic data has been acquired by using the Diversity Minimal Item Set (DiMIS) items. The DiMIS has been established as a tool for routine data collection on nine domains measuring various facets of diversity (Stadler et al., 2023). The domains cover the following areas: gender (1), age (2), socioeconomic status (3), care responsibility (4), sexual orientation (5), ethnicity and race (6), religious affiliation (7), mental health (8), physical health and disability (9). In congruence with the recommendations of Stadler et al. (2023), the current study only includes necessary items, specifically, gender (1) and age (2).

3.3.2 Depression

Participants' severity of depressive symptoms was measured utilising the Patients Health Questionnaire (PHQ-9). The nine items of this measure represent the nine diagnostic criteria for the DSM-IV depressive disorders and can be answered with four options, scored accordingly: 0 = “Not at all”, 1 = “Several days”, 2 = “More than half the days” and 3 = “Nearly every day”. From these a total score is calculated with scores between one and nine indicating minimal to mild depressive symptoms while scores from 10 to 27 point towards moderate to severe symptoms (Kroeke et al., 2001). The PHQ-9 has been established as a measure with high internal consistency ($\alpha = 0.89$), good reliability and validity in a study involving eight primary care and

seven obstetrical clinics (Kroeke et al., 2001). In the current study a similarly high internal consistency is present ($\alpha = 0.81$).

3.3.3 Negative Healthcare Experiences

This measure is a subset of eight questions from the Trans PULSE survey. Originally made up of 87 pages on a wide range of health topics, it was administered among 433 self-identified trans people in Ontario Canada (Scheim et al., 2017; Trans PULSE Survey, 2012). Since the launch of the survey in 2009, the items and resulting data have been used in multiple studies, such as the one of Boyer et al. (2022), which used the items for negative experiences with healthcare practitioners in the healthcare setting. Boyer et al. (2022) defined practitioners as "anyone delivering healthcare to the participant", which for the purpose of this study, was redefined as "healthcare provider, the one you see most often". The participants were presented with the question prompt "Has your healthcare provider ever…" which was followed by items like "Refused to care for you because of your gender?", "Refused to discuss or address gender-related health concerns?" and "Told you they did not know enough about gender-related care to provide it?" and could be answered with either "Yes" or "No". All items were summed, with higher scores indicating a higher number of negative healthcare experiences.

3.3.4 Healthcare Avoidance

Patients' healthcare avoidance is measured with a single item from the Trans PULSE survey which was similar to the last measure implemented in the study of Boyer et al. (2022). The item "Have you ever avoided seeing a healthcare provider (even though you felt you needed to) because you were worried about how they might react to your gender identity?" can be answered with "Yes" and "No" based on this participants were classified as either "avoidant" or "non avoidant".

3.3.5 Gender Identity Disclosure to Provider and Provider Inquiry

To measure gender identity disclosure to the healthcare provider, each participant was asked “Do you believe your doctor knows what your gender identity is?” which could be answered with “Yes, I disclosed without being asked,” “Yes, disclosed because my doctor asked” “They probably assume it,” or “Someone else told them”, and “No”. Within those answers, the answer option of “Yes, disclosed because my doctor asked” indicates provider gender identity inquiry. Within the research of Mosack et al. (2013), this item has been used in reference to sexual minorities, which for the purpose of this study was adjusted to gender minorities. Furthermore, the pronouns referring to the healthcare provider were changed from binary he/she to a more inclusive they/them. For the statistical analysis, the variable was constructed by coding the answers “Yes, I disclosed without being asked,” “Yes, disclosed because my doctor asked” as gender identity disclosure and “They probably assume it,”, “Someone else told them” and “No” as gender identity non-disclosure.

3.3.6 Statistical Analysis

Prior to the collection of the data, a power analysis, utilising G*Power was conducted to determine the minimum necessary sample size. For a linear multiple regression including a fixed model and one regression coefficient, the effect size was set to 0.15. The α error probability was set to 0.05 and power (1-β error probability) was 0.8. Utilising these values, the power analysis indicated a minimum sample size of 55. Thus, the current study was underpowered and caution should be exercised when reviewing these findings.

After the data was collected and exported from Qualtrics, the data analysis was performed using R-Studio v.4.3.3. First, the data was prepared for further analysis by removing irrelevant columns. Participants who did not consent to the participation or had more than 5% of

missing values were removed from the dataset (Lee & Huber, 2021). For demographic data like age, sex assigned at birth, gender identity, and country of residence, means, standard deviations, and percentages were calculated. Similarly, for the single-item measures of patient health care avoidance and gender identity disclosure, percentages were calculated. Individual and the total mean of the PHQ-9 were computed. For negative healthcare experiences, the score was summed up for every individual as well as a general mean and standard deviation.

Next, the sub-questions were explored through descriptive and statistical analysis to examine how the sample had experienced discrimination within healthcare (SQ1). A descriptive analysis of the percentage of GM individuals that have disclosed their gender identity to their healthcare provider (SQ2a) was performed. Similarly, the number of participants that have disclosed their gender identity to their healthcare provider because of provider inquiry (SQ2b) was explored. In order to explore the relationship between negative healthcare experiences and gender identity non-disclosure (SQ3), a logistic regression was established, with negative healthcare experiences as the independent variable and gender identity non-disclosure as the dependent variable. Next, a linear probability model with gender identity non-disclosure as the independent and healthcare avoidance as the dependent variable was constructed (SQ4). In order to explore whether identity non-disclosure to the provider predicts the severity of depressive symptoms GM individuals in this sample experience (SQ5), a linear regression with gender identity non-disclosure as the independent and depression as the dependent variable was constructed. All three models were tested on their corresponding assumptions including linearity and additivity, independence of errors, homoscedasticity, normality of errors, absence of multicollinearity, and outliers as suggested by Berg (2024).

4. Results

Data Preparation

The dataset was examined for missing values prior to the analysis. 42 GM participants filled out the survey. From these initial 42 responses, 23 were deemed incomplete and excluded from the final dataset as they had more than 5% of missing values with the majority of the data missing within the variables needed for the data analysis, leaving 19 responses. Therefore, the final sample consisted of 19 participants. The first part of the data analysis was the computation of descriptive information and general correlations, which is available in Table 2.

Table 2

Descriptive Statistics of the Variables Negative Healthcare Experiences, Gender Identity Non-Disclosure, Healthcare Avoidance and Depression

	M	*SD*	Range	Frequency (n)	Percentage (%)	NHE	GID	HA	PHQ-9
Negative Healthcare Experiences (NHE)	0.79	0.92	0-3			1			
Gender Identity Non-Disclosure (GID)						.48*	1		
Not Disclosed				12	63.2				
Disclosed				7	36.8				
Healthcare Avoidance (HA)						.37	.24	1	
Avoidant				10	53				
Non Avoidant				9	47				

Depression ((PHQ-9)	11.8	5.6	4 - 23		.20	-.26	.29	1

Note: NHE = Negative Healthcare Experiences; PHQ-9 = Patients Health Questionnaire; GID = Gender Identity Non-Disclosure; HA = Healthcare Avoidance. *$p < .05$.

4.1. Descriptive Statistics

Most notable is the high frequency of gender identity non-disclosure. Among the 19 participants, 12 (63.16%) had not disclosed their gender identity to their provider. Three participants (15.79%) reported to have disclosed their gender identity because they were asked by their provider, and four (21.05%) individuals disclosed their gender identity without being asked. Thus, a majority of the sample reported not having disclosed their gender identity to their healthcare provider, while the lowest number of participants had disclosed after inquiry from their healthcare provider.

In regard to negative healthcare experiences, most notably, none of the participants reported having been discouraged from exploring their gender by a healthcare provider. The number of affirmative responses per negative healthcare item is shown in Table 3.

Table 3

Number of "Yes" Responses for each Negative Healthcare Experiences Item (n=19)

Item	n (%)
Have you ever felt you were disrespected by your healthcare provider (the one you see most often) because of your gender identity or expression?	3 (15.79)
Has your healthcare provider (the one you see most often) ever...	
Discouraged you from exploring your gender?	0

Inconsistently used or misused your name and preferred pronouns?	5 (26.32)
Refused to care for you because of your gender?	1 (5.26)
Refused to discuss or address gender-related health concerns?	2 (10.53)
Told you they did not know enough about gender-related care to provide it?	5 (26.32)
Used hurtful or insulting language when discussing your gender?	2 (10.53)

4.2. Sub Question Testing

4.2.1 Logistic Regression Analysis

To explore whether negative healthcare experiences predict gender identity non-disclosure in this sample, a logistic regression was constructed. The logistic regression model was tested for the assumption of linearity of the independent variable and log odds by conducting the Box-Tidwell test. An interaction term between the predictor and its natural logarithm was added to the model. The interaction term was not statistically significant (B = -1.73, SE = 1.80, z = -0.96, p = .34), indicating that the assumption of linearity of the logit was met. Therefore, the relationship between negative healthcare experiences and the log odds of gender identity non-disclosure can be considered linear. Subsequently, the logistic regression analysis was carried out as planned.

Table 4

Logistic Regression Results between Negative Healthcare Experiences and Gender Identity Non-Disclosure

	Estimate	*SE*	z-value	95% CI
Intercept	-1.45	0.76	-1.90	[-3.94, 1.04]
Negative Healthcare Experiences	1.07	0.63	1.69	[-0.15, 2.29]

The logistic regression model was not statistically significant ($\chi^2 = 3.50$, 95% CI [-3.94, 1.04]), suggesting that negative healthcare experiences don't contribute significantly to the model. Negative healthcare experiences don't seem to predict gender identity non-disclosure (*B* = 1.07, *SE* = 0.63, *z* = 1.69, 95% CI [-0.15, 2.29]). Overall, the analysis suggests that negative healthcare experiences do not significantly predict gender identity non-disclosure in this sample.

4.2.2 Linear Probability Model

To explore how gender identity non-disclosure relates to healthcare avoidance in this sample, a linear probability model was set up with gender identity non-disclosure as the independent and healthcare avoidance as the dependent variable. As the model assumes the violation of linearity and homoscedasticity, the remaining assumption of normally distributed errors was checked by using a Q-Q plot. The residuals in this sample seem to follow a normal distribution, therefore, the linear probability model was run as planned.

Table 5

Linear Probability Results between Gender Identity Non-Disclosure and Healthcare Avoidance

	Estimate	*SE*	t-value	95% CI
Intercept	0.42	0.15	2.85	[0.13, 0.71]

Gender Identity Non-Disclosure	0.29	0.24	1.24	[-0.18, 0.76]

The results indicated that gender identity non-disclosure was not a significant predictor of health care avoidance (β = 0.29, *SE* = 0.24, *t*(17) = 1.23, 95% CI [-0.18, 0.76]). Overall, the model did not seem to indicate that gender identity non-disclosure significantly affects healthcare avoidance in this sample.

4.2.3 Linear Regression Analysis

To explore how gender identity non-disclosure relates to depressive symptoms in this sample, a linear regression analysis was constructed. The linear model was tested for assumptions. Through plotting the residuals, it became evident that this model did not seem to show a linear relationship. Furthermore, the Shapiro-Wilk test showed that the residuals varied significantly from a normal distribution (W = 0.92, $p < 0.05$). Utilizing the studentized Breusch-Pagan test, the model showed heteroscedasticity (*BP* = 2.05, df = 1, $p = .15$). As multiple assumptions of the linear model were violated, Spearman's rank correlation was utilised as a non-parametric test and revealed a non-significant moderate negative correlation between gender identity non-disclosure and depression ($p = -0.31$, p = .18). Despite the violation of assumptions, a linear regression analysis was computed[1].

Table 6

Linear Regression Results between Gender Identity Non-Disclosure and PHQ-9

	Estimate	*SE*	t-value	95% CI

[1] This choice was made in agreement with the thesis supervisor.

Intercept	12.76	1.55	8.20	[9.72, 15.81]
Healthcare Avoidance	-1.85	1.70	-1.09	[-5.18,1.47]

Note. Results are computed using a linear model despite violation of assumptions.

This test evaluated the strength and direction of the relationship between depressive symptoms and gender identity non-disclosure which, in this sample was not statistically significant (β = -1.85, *SE* = 1.70, *t*(17) = -1.09, 95% CI [-5.18, 1.47]). Therefore, gender identity non-disclosure does not seem to predict depressive symptoms in this sample.

5. Discussion

This research investigated how gender identity non-disclosure towards general healthcare providers connects to negative healthcare experiences, healthcare avoidance, and depression. Perhaps the most striking finding is that among the gender minority sample, two-thirds of participants had not disclosed their gender identity to their provider and disclosing one's gender identity after provider inquiry was reported the least out of all answer possibilities. These results are in line with those of findings from McKay and Watson (2019), who found a similar percentage of 66.8% of gender identity non-disclosure in their sample of 5,637 gender minority youth. These results may be explained by a general lack of provider inquiry as previous research identified provider-related characteristics to be more likely to influence the patients' disclosure patients' personal characteristics like general openness about their minority identity (Steele et al., 2006). Moreover, Steele et al. 's (2006) study found that all participants in their study disclosed after being asked by a practitioner. As this research is not limited to specialized gender care, the

novelty of these findings lies within the suggestion that gender identity non-disclosure seems to be present in the general practice setting as well.

In this study, over half of the participants had experienced at least one instance of discrimination within healthcare, with participants most frequently reporting that they had been told that their healthcare provider does not know enough about gender-related care to provide it and inconsistently used or misused their name and preferred pronouns. These results seem to be consistent with Hughes et al. (2023), who report that most education on sexual and gender minority health in the Netherlands is informal. This lack of sexual and gender minority related information within the training of physicians may be associated with limited research and information on the health of these minority populations. Furthermore, the lack of gender-related provider knowledge has been linked to serious outcomes for GM individuals. GM individuals who had to educate a healthcare provider on their unique health needs have been found to have a 1.3 higher likelihood of having experienced past-year suicidal ideation (Kattari et al. 2020). These findings seem to highlight the need for inclusion of gender minority health within medical education to reduce the impact that gaps in provider knowledge may have on GM patients' health.

One interesting finding is that over half of the participants in the sample reported moderate to high symptoms of depression (Kroeke et al., 2001). These findings are supported by previous research on greater instances of symptoms of depression within gender minority populations (Bettis et al., 2020; Valentine & Shipherd, 2018). Furthermore, these findings are in agreement with the Minority Stress Theory which emphasises the additional stress experienced by GM individuals contributes to the likewise heightened prevalence of symptoms of mental

disorders. Therefore, the current findings add to the growing knowledge of mental health disparities currently present for GM individuals.

Another relevant finding consists of a majority of the sample (53%) reporting to have avoided seeing a healthcare provider, even though they felt like they needed to because of their gender identity. These results match those observed in earlier studies including Boyer et al. (2022) who reported on 40% of healthcare avoidance in their study. Furthermore, these findings are also in line with Meyer's (2003) Minority Stress Theory. Specifically, the avoidance behaviour stemming from the anticipated discrimination within a healthcare interaction seems to be a reaction to the distal stress of previous discriminatory experiences. As over half of the current sample had experienced instance of discrimination within their healthcare interactions, a similarly high proportion of healthcare avoidance seems to support the explanation proposed by the Minority Stress Theory. This avoidance behaviour relating to anticipation of discrimination may lead to a delay in seeking care for preventable health conditions and has previously been associated with suicide attempts (Brennen et al. 2017). Giving these findings, addressing the discriminatory experiences taking place within the healthcare environment could have a significant influence on the health outcomes of GM individuals.

One unanticipated finding was that gender identity non-disclosure did not affect healthcare avoidance in this sample. These results differ from the findings of Boyer et al. (2022) as well as the systematic review of Ayhan et al. (2020) who found an association between negative healthcare experiences and healthcare avoidance. A possible explanation for this may be the general underpoweredness of the current research, which was emphasized by a wide confidence interval. Similarly, this limitation may have impacted the following results.

No significant relationship was found between negative healthcare experiences and gender identity non-disclosure. However, the wider confidence interval suggests a potential relationship that could not be detected as the current study was not adequately powered. A possible explanation for these findings may fit with the Minority Stress Theory (Meyer, 2003). The presence of negative experiences and lack of security about the healthcare interaction causes the anticipation of further negative experiences, which thereby leads to less disclosure. The previous negative experiences represent distal stressors, which in turn become internalised and lead to anticipation of more discrimination and avoidance.

No correlation was found between gender identity non-disclosure and depression. This is inconsistent with the previously hypothesised positive relationship between those factors, as sexual identity disclosure has been associated with improved healthcare service use and through the possibility of earlier screening and preventative care which might have been linked to less depressive symptoms (Boyer et al, 2022; Steele et al., 2006). In addition to the underpoweredness of the analysis, another reason for this inconsistency may lie within the protective factors that non-disclosure of gender identity might have for this population. As gender minority individuals choose to not-disclose, they might not be exposed to negative healthcare experiences and discrimination because of their gender identity within the immediate healthcare interaction. However, there might still be negative repercussions for their mental health stemming from actively hiding one's identity like chronic stress and internalised stigma which are both risk factors linked to mental health disorders (Meyer, 2003; Frost & Meyer, 2023). While disclosing one's gender identity to a healthcare provider has been linked to positive effects on healthcare uptake, for some GM individuals, gender identity disclosure may

compromise their safety within the healthcare environment. Therefore non-disclosure may be necessary to remain safe (Steele et al., 2006).

A strength of the current research lies within exploring the healthcare experiences of GM individuals outside of gender clinics. With focus on the interaction with the general practitioner, this research provides insight into the prevalence of gender identity non-disclosure within regular healthcare interactions and emphasizes the crucial decision making process GM individuals face when seeking care in a non-specialized environment.

A notable limitation of existing research which had an impact on the current study, is the lack of validated and available scales. While a multitude of scales exist to measure specific constructs, few can be applied to the specific experiences of GM individuals within the healthcare environment. Part of this may be the rare distinction between sexual and gender minorities within current research, which is highlighted in the systematic review of discrimination against sexual and gender minority in the healthcare setting by Ayhan et al. (2019), as only four out of the 30 reviewed articles included a gender minority subgroup.

Another limitation of the current research is the small sample size. As this research investigated the experiences of individuals who are part of a minority group, recruiting a sufficient amount of participants turned out to be challenging. While the current sample size limited the extent to which this research could detect effects which are true in reality, the descriptive statistics provided valuable insight. The correlation found between negative healthcare experiences and gender identity non-disclosure, despite a general lack of power, offers direction for future research.

Prospective research should explore the experiences of GM individuals within healthcare further, with the goal of creating validated measures which encompasses non-disclosure within

the healthcare interaction. Here, it may also be relevant to expand on the process of disclosing one's gender identity, which environmental factors impact non-disclosure and which role the perception of the interaction with the healthcare provider plays in it. The current study should be replicated with a larger sample and validated measures in order to gain a further insight into the role of gender identity no-disclosure within healthcare.

In addition, the current research highlights the need of providing opportunities for practitioners to receive education and training for the healthcare needs of GM individuals, therefore enabling them to better support their GM patients and reducing adverse health outcomes related to having to educate one's provider on GM related health needs.

To conclude, this research's objective of providing further insight into the healthcare experiences of GM individuals including the role of gender identity-disclosure was achieved. While no significant relationships were found between negative healthcare experiences, gender identity no-disclosure, depression, and healthcare avoidance in the current sample, light could be shed on the prevalence of healthcare avoidance, discrimination experiences, and gender identity non-disclosure. Recommendation for future research include the need for validated measures of healthcare experiences of GM individuals and GM-specific education for healthcare providers. These results have practical implications by informing future interventions about the currently present prevalence of gender identity non-disclosure, healthcare avoidance, and discrimination within the healthcare setting and the urgency to mitigate the negative effects of health disparities for GM individuals.

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Appendix A

Information Sheet

Welcome to our research study!

Participating involves completing a survey containing multiple questionnaires which will take about 15 minutes. This research project is conducted by Josie de Boer, Mihai Botea, Amelie Henk and Mars Schupiloff in fulfilment of the requirements of the bachelors program of psychology at the University of Twente, under the supervision of Dr Anne van Dongen and Dr Tessa Dekkers. We welcome your participation! In this study we are interested in the experiences of individuals who are part of a sexual and/or gender minority, between the ages of 16 and 42 and who have sufficient knowledge of English.

Sexual and Gender Minority includes individuals whose biological sex, sexuality, gender identity and/or gender expression deviate from majority norms. Encompassing lesbians, gay men, bisexuals and transgender individuals (LGBT); intersex people (people whose bodies do not have typically male or female sex characteristics due to variations in chromosomes, gonads, sex hormones and/or genitals); gender non-conforming people who may not see themselves as transgender; and people involved in same-sex relations who may not see themselves as lesbian, gay or bisexual, possibly preferring another word to self identify (such as polyamorous, queer or two-spirited) or possibly preferring no label at all.

By participating in this study you will get the benefit of earning credit points in the SONA system, if applicable for your situation. Furthermore, your participation will provide valuable information to our understanding of factors that impact the physical and mental health of sexual and gender minority individuals.

It is unlikely that there are any risks involved with participation in this project. The research project has been reviewed and approved by the BMS Ethics Committee at the University of Twente (Enschede, The Netherlands). However, should you experience any discomfort due to undertaking this study, consider giving yourself a moment of rest. Additionally, freely available resources for further support will be provided at the end of the survey.

Your participation in this project is completely voluntary and you may cease participation at any time. If you agree to participate, you can withdraw from participation at any time during the project without comment or penalty. However, once your responses have been analysed and we have de-identified them, you will be unable to withdraw. Your decision to withdraw participation will in no way impact your current or future relationship with the University of Twente.
The information and responses you provide will be treated confidentially and will be accessible only to members of the research team. Your responses to the questionnaire will form part of a larger data response set, which will initially be stored by Qualtrics. Research data from Qualtrics will be downloaded and stored securely on the University of Twente Google Drive or OneDrive allocation. Data will be password-protected and accessible only to members of the research team and their supervisors. As required by the University of Twente, all research data (survey responses and analysis) will be retained in a password-protected electronic file for a minimum period of five years before being destroyed. Participants' data will not be identifiable in any publication or reporting. Furthermore, the data provided during this project is subject to the European Union's laws and regulations regarding confidentiality and storage of personal data. In the interest of researcher transparency, a strictly de-identified version of the research data will be prepared and made available on the online open data repository Open Science Framework

(https://osf.io/). Research results will be reported in an academic thesis, and may also be disseminated via journal articles and/or conference presentations.

Please contact the research team members if you have any questions or require further information about the project.

Josie de Boer: j.m.deboer@student.utwente.nl

Miha Botea: m.botea@student.utwente.nl

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Dr. Anne van Dongen, Supervisor: a.vandongen@utwente.nl

Dr. Tessa Dekkers, Supervisor: t.dekkers@utwente.nl

No automatic feedback will be given to you about the results of this study. However, if you participate and wish to receive a summary of the research results once the study has been completed, you can email the research team members.

The University of Twente conducts research in accordance with the National Statement on Ethical Conduct in Human Research. If you do have any concerns or complaints about the ethical conduct of the project you may contact the Manager, Research Ethics on ethicscommittee-bms@utwente.nl. This project has received ethical approval from the University of Twente Human Research Ethics Committee BMS/Domain Humanities and Social Science.

Appendix B

Consent Form

1. I have read and understood the participant information sheet. I know that I may ask for more information about the project as it goes on.

2. I understand that this study involves filling out an online questionnaire.

3. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

4. I understand that my participation will be included in a large data set and immediately de-identified.

5. I understand that personal information collected about me that can identify me, [e.g. my email address or my identity code], will not be shared beyond the study team and immediately be de-identified once the data collection has been completed.

6. I understand that information I provided will be used for four academic theses, and may also be disseminated via journal articles and/or conference presentations. I understand that a strictly de-identified version of the research data may be published on the online open data repository Open Science Framework (https://osf.io/).

7. I understand that all information will be treated in the strictest confidence and used for research purposes only. I understand that I will not be personally identified on any reports from this project.

8. I assign and waive all claims to patents, commercial exploitation, property or any material or products which may form part of or arise from this study.

9. I understand that this research will comply with the National Health and Medical Research Council's National Statement on Ethical Conduct in Research Involving Humans and with the privacy politics of the University of Twente.

10. I understand that this study has been approved by the University of Twente Human Research Ethics Committee and that if I have any questions I can contact them via ethicscommittee-bms@utwente.nl.

Appendix C

Qualtrics Questionnaire

date of birth *

What is your date of birth (month and year)? MM/YYYY

occupation *

What is your occupation?

- ○ Psychology student
- ○ Other student, namely:
- ○ Working

residence *

What is your country of residence?

- ○ The Netherlands
- ○ Germany
- ○ Other country, namely:

intersex *

Are you intersex? Intersex individuals experience being born in a body that does not align with the typical definitions of male or female.

- ○ Yes
- ○ No
- ○ I don't know
- ○ Prefer not to say

Over the last 2 weeks, how often have you been bothered by any of the following problems?

	Not at all	Several days	More than half the days	Nearly every day
Feeling nervous, anxious, or on edge	○	○	○	○
Not being able to stop or control worrying	○	○	○	○
Little interest or pleasure in doing things	○	○	○	○
Feeling down, depressed, or hopeless	○	○	○	○
Trouble falling or staying asleep, or sleeping too much	○	○	○	○
Feeling tired or having little energy	○	○	○	○
Poor appetite or overeating	○	○	○	○
Feeling bad about yourself — or that you are a failure or have let yourself or your family down	○	○	○	○
Trouble concentrating on things, such as reading the newspaper or watching television	○	○	○	○
Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	○	○	○	○
Thoughts that you would be better off dead or of hurting yourself in some way	○	○	○	○

Have you ever avoided seeing a healthcare provider (even though you felt you needed to) because you were worried about how they might react to your gender identity?

- ○ Yes
- ○ No

Page Break

Gender Identity Disc *

Display this question

If Have you ever avoided seeing a healthcare provider (even though you felt you needed to) because y... Yes Is Displayed

Do you believe your healthcare provider (the one you see most often) knows what your gender identity is?

- ○ Yes, I disclosed without being asked
- ○ Yes, I disclosed because my doctor asked
- ○ They probably assume it
- ○ Someone else told them
- ○ No

gender identity

Which of the following options applies to you the best? Check all that apply, multiple options may be selected.

- [ ] Female
- [ ] Male
- [ ] Non-binary
- [ ] I am still exploring my gender identity
- [ ] I choose to self-identify as
- [ ] Prefer not to say

sex

What sex were you assigned at birth (for example, on your birth certificate)?

- ○ Female
- ○ Male
- ○ Sex could not be determined/registered
- ○ I don't know
- ○ Prefer not to say

Have you ever felt you were disrespected by your healthcare provider (the one you see most often) because of your gender identity or expression?

- ○ Yes
- ○ No

Negative Health Care

Display this question

If Have you ever avoided seeing a healthcare provider (even though you felt you needed to) because y... Yes Is Displayed

Has your healthcare provider (the one you see most often) ever...

	Yes	No
Discouraged you from exploring your gender?	○	○
Inconsistently used or misused your name and preferred pronouns?	○	○
Refused to care for you because of your gender?	○	○
Refused to discuss or address gender-related health concerns?	○	○
Told you they did not know enough about gender-related care to provide it?	○	○
Used hurtful or insulting language when discussing your gender?	○	○

Appendix D

R Studio Code

```
# Load necessary libraries
library(tidyverse)
library(janitor)
library(ggplot2)
library(patchwork)
library(car)
library(lmtest)
library(nnet)
library(Hmisc)
library(psych)

# Read the CSV file
data <- read_csv("SGM_data_words_2.csv")

# Select columns
subset_data <- data %>%
 select(
  Progress, StartDate, EndDate,
  `date of birth`,
  occupation,
  occupation_2_TEXT,
  residence,
  residence_3_TEXT,
  `gender identity`,
  `gender identity_5_TEXT`,
  sex,
  intersex,
  `PHQ-9 & 4_3`,
  `PHQ-9 & 4_4`,
```

```
  `PHQ-9 & 4_5`,
  `PHQ-9 & 4_6`,
  `PHQ-9 & 4_7`,
  `PHQ-9 & 4_8`,
  `PHQ-9 & 4_9`,
  `PHQ-9 & 4_10`,
  `PHQ-9 & 4_11`,
  `Health Care Avoidanc`,
  `Gender Identity Disc`,
  `Negative Health Care`,
  `Negative Health Care_1`,
  `Negative Health Care_2`,
  `Negative Health Care_3`,
  `Negative Health Care_4`,
  `Negative Health Care_5`,
  `Negative Health Care_6`
 )

# Create new column combining "gender identity" and "sex"
subset_data <- subset_data %>%
 mutate(combined_gender = paste(`gender identity`, sex, sep = "/"))

# Create GM_subset based on specific conditions
GM_subset <- subset_data %>%
 filter(!(is.na(`gender identity`) | is.na(sex)) &
      (`gender identity` != sex | `gender identity` == "I choose to self-identify
as")) %>%
 filter(!(combined_gender %in% c("Female/Female", "Male/Male"))) %>%
 filter(as.numeric(as.character(Progress)) >= 75) %>%
 mutate(occupation = if_else(occupation == "Other student, namely:",
occupation_2_TEXT, occupation)) %>%
 select(-occupation_2_TEXT)
```

```
# Calculate time to complete questionnaire
GM_subset <- GM_subset %>%
 mutate(
  StartDate = as.POSIXct(StartDate, format = "%Y-%m-%d %H:%M:%S"),
  EndDate = as.POSIXct(EndDate, format = "%Y-%m-%d %H:%M:%S")
 )
GM_subset <- GM_subset %>%
 mutate(time = as.numeric(difftime(EndDate, StartDate, units = "mins")))
# Calculate the mean of the time column
mean_time <- mean(GM_subset$time, na.rm = TRUE)

# Filter out participant who took over 200 minutes
GM_subset_filtered <- GM_subset %>%
 filter(time <= 200)
mean_time_filtered <- mean(GM_subset_filtered$time, na.rm = TRUE)
mean_time_filtered

# Replace "I choose to self-identify as" with gender identity_5_TEXT
GM_subset <- GM_subset %>%
 mutate(`gender identity` = if_else(`gender identity` == "I choose to self-identify
as", `gender identity_5_TEXT`, `gender identity`)) %>%
 select(-`gender identity_5_TEXT`)

# Scoring PHQ-9
score_response <- function(response) {
 case_when(
  response == "Not at all" ~ 0,
  response == "Several days" ~ 1,
  response == "More than half the days" ~ 2,
  response == "Nearly every day" ~ 3,
 )
}
```

```
# List of columns to be scored
columns_to_score <- c("PHQ-9 & 4_3",
            "PHQ-9 & 4_4",
            "PHQ-9 & 4_5",
            "PHQ-9 & 4_6",
            "PHQ-9 & 4_7",
            "PHQ-9 & 4_8",
            "PHQ-9 & 4_9",
            "PHQ-9 & 4_10",
            "PHQ-9 & 4_11")

GM_subset_scored <- GM_subset %>%
 mutate(across(all_of(columns_to_score), score_response))

head(GM_subset_scored)

# Calculate Cronbach's alpha
selected_items <- GM_subset_scored[, columns_to_score]
alpha_result <- psych::alpha(selected_items)
print(alpha_result)

score_mapping <- c("Not at all" = 0, "Several days" = 1, "More than half the days" =
2, "Nearly every day" = 3)
phq_columns <- c("PHQ-9 & 4_3", "PHQ-9 & 4_4", "PHQ-9 & 4_5", "PHQ-9 & 4_6", "PHQ-9 &
4_7", "PHQ-9 & 4_8", "PHQ-9 & 4_9", "PHQ-9 & 4_10", "PHQ-9 & 4_11")
GM_subset <- GM_subset %>%
 mutate(PHQ_9 = rowSums(sapply(select(., phq_columns), function(x) score_mapping[x])))
%>%
 select(-all_of(phq_columns))

# Replace "Yes" with 1 and "No" with 0 in the "Health Care Avoidanc" column
```

```
GM_subset <- GM_subset %>%
 mutate(`Health Care Avoidanc` = ifelse(`Health Care Avoidanc` == "Yes", 1, 0))

# Calculate the frequency of each value (0 and 1) in the "Negative Health Care" column
GM_subset$`Negative Health Care` <- ifelse(GM_subset$`Negative Health Care` == "Yes",
1, 0)
negative_healthcare_counts <- table(GM_subset$`Negative Health Care`)
negative_healthcare_percentages <- prop.table(negative_healthcare_counts) * 100
negative_healthcare_table <- data.frame(Value = c("No", "Yes"), Frequency =
negative_healthcare_counts, Percentage = negative_healthcare_percentages)
print(negative_healthcare_table)

# Negative Healthcare Experiences
nhc_columns <- c("Negative Health Care_1", "Negative Health Care_2", "Negative Health
Care_3",
         "Negative Health Care_4", "Negative Health Care_5", "Negative Health Care_6")
GM_subset[nhc_columns] <- lapply(GM_subset[nhc_columns], function(x) ifelse(x ==
"Yes", 1, 0))
GM_subset$NHC_total <- rowSums(GM_subset[nhc_columns])

# Calculate Negative Healthcare Experiences total
nhc_columns <- c("Negative Health Care_1", "Negative Health Care_2", "Negative Health
Care_3",
         "Negative Health Care_4", "Negative Health Care_5", "Negative Health Care_6")


# Ensure `Gender Identity Disc` and `Health Care Avoidanc` are factors
GM_subset <- GM_subset %>%
 mutate(
  `Gender Identity Disc` = as.factor(`Gender Identity Disc`),
  `Health Care Avoidanc` = as.factor(`Health Care Avoidanc`)
 )
```

```
# Check the structure of the dependent variable
str(GM_subset$`Health Care Avoidanc`)

# Convert factor to numeric if necessary
if(is.factor(GM_subset$`Health Care Avoidanc`)) {
 GM_subset$`Health Care Avoidanc` <- as.numeric(as.character(GM_subset$`Health Care
Avoidanc`))
}

# Create a new column "GID" with binary values
GM_subset <- GM_subset %>%
 mutate(GID = case_when(
  `Gender Identity Disc` == "No", "They probably assume it,", "Someone else told them"
~ 0,
  `Gender Identity Disc` %in% c("Yes, I disclosed without being asked", "Yes, I
disclosed because my doctor asked") ~ 1
 ))

# Run the linear probability model
lpm_model <- lm(`Health Care Avoidanc` ~ `GID`, data = GM_subset)

# Display the summary of the model
summary(lpm_model)

# Get the residuals from the model
residuals <- residuals(lpm_model)

# Create QQ plot
qqnorm(residuals)
qqline(residuals)
```

```
# Checking Linearity Assumption of logistc regression: Box-Tidwell test
df$interaction_term <- df$NHC_total * log(df$NHC_total + 1)

# Fit the model with the interaction term
model <- glm(GID ~ NHC_total + interaction_term, family = binomial, data = df)
summary(model)

# Check for outliers and influential data points
logistic_model <- glm(GID ~ NHC_total, family = binomial, data = df)
influence_measures <- influence.measures(logistic_model)
summary(influence_measures)

# Fit the final logistic regression model
final_model <- glm(GID ~ NHC_total, family = binomial, data = df)
summary(final_model)

table(GM_subset$GID)

# Check the recoding
table(GM_subset$`Gender Identity Disc`)

# Calculate the frequency of each value in the recoded "Gender Identity Disc" column
gender_identity_disc_freq <- table(GM_subset$`Gender Identity Disc`)

# Calculate the percentage of each value in the recoded "Gender Identity Disc" column
gender_identity_disc_percentage <- prop.table(gender_identity_disc_freq) * 100

# Create a data frame with the frequency and percentage
gender_identity_disc_table <- data.frame(
 Value = names(gender_identity_disc_freq),
 Frequency = as.vector(gender_identity_disc_freq),
 Percentage = as.vector(gender_identity_disc_percentage)
```

```
)

# Print the frequency and percentage table
print(gender_identity_disc_table)



# Rename the column "Health Care Avoidanc" to "HCA"
GM_subset <- GM_subset %>%
 rename(HCA = `Health Care Avoidanc`)

# Linear regression model with `Gender Identity Disc` as the independent variable
lm_model <- lm(PHQ_9 ~ `GID`, data = GM_subset)
summary(lm_model)

# Compute Spearman correlation
spearman_test <- cor.test(GM_subset$PHQ_9, GM_subset$GID, method = "spearman")

# Print the results
print(spearman_test)

# Check linearity and additivity
GM_subset %>%
 ggplot(aes(x=`Gender Identity Disc`, y=PHQ_9)) +
 geom_point() +
 geom_line() +
 labs(x= "Gender identity non-disclosure", y ="Depression")

# Test distribution of residuls
lmodel_res <- lm_model$residuals
hist(lmodel_res)
qqnorm(lmodel_res)
qqline(lmodel_res)
```

```
# Calculate residuals
residuals_lm_model <- residuals(lm_model)

# Perform Shapiro-Wilk test on the residuals
shapiro_test <- shapiro.test(residuals_lm_model)
print(shapiro_test)

# Calculate predicted values
predicted_values <- predict(lm_model)

# Compute Spearman's rank correlation between predicted values and actual values
spearman_correlation <- cor.test(GM_subset$'Health Care Avoidanc', predicted_values,
method = "spearman")

# Print the result
print(spearman_correlation)



# Testing Linearity and Homoscedasticity
plot(lm_model, 1)
bptest(lm_model) # p-value should be non-significant indicating homoscedacity

# Testing Independence
GM_subset %>%
 add_residuals(lm_model) %>%
 add_predictions(lm_model) %>%
 mutate(obs_numb = row_number()) %>%
 ggplot(aes(x = obs_numb, y = resid)) +
 geom_point() +
 labs(x = "Number of observations", y = "Residuals")
```

```
durbinWatsonTest(lm_model) # p-value should be non-significant OR D-W Statistic
between 1.5 and 2.5 to have independence
```