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Master Thesis

Marriage and the Mental Health of Sexual Orientation Minorities

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Abstract

Previous research shows a generally positive association between marriage and mental health in different-sex couples, with married individuals exhibiting better mental health than their unmarried counterparts. However, limited knowledge exists on how marriage affects the mental health of sexual minority individuals. Given that sexual minorities experience worse mental health than heterosexuals, it is crucial to explore whether marriage can help mitigate these disparities. This thesis examines the effect of marriage on the mental health of sexual minority individuals (lesbian, gay, and bisexual persons) compared to heterosexuals before, during, and after marriage in the United Kingdom. Using data from waves 1 to 13 of the United Kingdom Household Longitudinal Study, 20,715 participants (1,295 sexual minority and 19,420 heterosexual individuals) were analyzed through fixed-effect regression models to assess mental health changes across different marital phases by sexual orientation. Results reveal that marriage has a long-term positive effect on mental health for both sexual minority individuals and heterosexuals. Contrary to expectations, sexual minority individuals experience greater mental health gains from marriage than heterosexuals across all marital phases, though these effects were neither statistically significant nor robust. Despite the mental health benefits, disparities between sexual minorities and heterosexuals persist. While marriage can improve the mental health of sexual minorities, it alone is insufficient to overcome broader discrimination and minority stress. Reducing these ongoing disparities requires societal tolerance beyond institutional equality, alongside further research and data collection efforts to accurately understand and address marriage effects and mental health needs of sexual minorities.

Keywords

marriage, mental health, sexual minority individuals (LGB), longitudinal research, same-sex marriage, United Kingdom

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List of Abbreviations

APA - American Psychological Association
APC(-problem) - Age-Period-Cohort Identification Problem
AIC - Akaike Information Criterion
BHPS - British Household Panel Survey
BIC - Bayesian Information Criterion
CI - Confidence Interval
GenAI - Generative Artificial Intelligence
H1a/1b/2 - Hypothesis H1a/1b/2
IOM - Institute of Medicine (United States of America)
ISER - Institute for Social and Economic Research, University of Essex; encompasses UKHLS
LGB - lesbian, gay, bisexual
LOCF - Last Observation Carried Forward Imputation Method
M1/2/3/3_1/3_2 - Model 1/2/3/3_1/3_2
Max - Maximum
MCS-12 - Mental Component Summary Score; built from items of the Short-Form 12 Health Survey
Min - Minimum
n - Number of Clusters (Persons)
N - Number of Observations (Person-Years)
NIH - National Institute of Health (United States of America)
UK - United Kingdom (England, Wales, Scotland, Northern Ireland)
UKHLS - Understanding Society, United Kingdom Household Longitudinal Study
US - United States of America
SD - Standard Deviation
SF-12 - Short-Form 12 Health Survey
VIF - Variance Inflation Factor
WHO - World Health Organisation

1 Introduction

In recent years sexual orientation minority populations have gained increasing visibility (England et al., 2016; Gilroy & Kashyap, 2021; Rosenfeld, 2017) and with that continuous awareness and attention has been drawn to the substantial legal and health disparities they face compared to the heterosexual majority. Despite elevated efforts to gain and expand representative information and reduce discrimination (Badgett et al., 2021; Council of Europe, 2010), sexual minority individuals continue to experience unique stressors and hardships that heterosexual individuals do not encounter (e.g. Meyer, 1995, 2003b). These challenges result in various health disparities, such as below average well-being, life satisfaction, and increased physical health problems (Booker et al., 2017; Kroh et al., 2017). Especially striking and well-established is the mental health gap between sexual orientations, which shows that sexual minority individuals are at higher risks for mental health problems, including drug abuse, depression, suicidal thoughts, and self-harm (Booker et al., 2017; IOM, 2011; King et al., 2008; Lewis, 2009; Meyer, 2003b). Meta-analyses suggest that compared to heterosexuals, sexual minority individuals are approximately 2.5 times more likely to experience any mental disorder in their lifetime (King et al., 2008; Lewis, 2009; Meyer, 2003b).

Given these substantial mental health disparities faced by sexual minority individuals, understanding factors that can potentially mitigate them is crucial (Meyer, 2003b). Marriage potentially is such a factor, as it can positively influence mental health by strengthening both individual and social circumstances. The legalization of same-sex marriage being established in a growing number of countries over the last decades (e.g. Trandafir, 2015) represents a notable political change that reduces institutional discrimination and positively affects sexual minority populations' mental health. However, little is known about how entering marriage itself influences the mental health of sexual minority persons.

Previous research on different-sex couples has established a generally positive association between marriage and mental health, attributed to increased social, emotional, legal, and economic resources and spousal behavorial influence (e.g. Carr & Springer, 2010; Chen & van Ours, 2018; Frech & Williams, 2007; Gove et al., 1983; Hughes & Waite, 2009; Kamp Dush & Amato, 2005; Lamb et al., 2003; Mikucka et al., 2021; Musick & Bumpass, 2012; Simon, 2002; Strohschein et al., 2005; Stutzer & Frey, 2006; Umberson et al., 2013; Waite, 1995; Williams, 2003). This influence of marriage on mental health is not constant, but varies over time (Hughes & Waite, 2009; Huntington et al., 2022; Kalmijn, 2017; Mikucka et al., 2021; Williams, 2003).

Although the positive impact of marriage on mental health is well-documented for different-sex couples, evidence for a similar effect among sexual minority individuals remains sparse due to the relatively recent legalization of same-sex marriage and the consequent lack of extensive representative data. So far,

quantitative research has primarily focused on the effects of legalization, establishing the importance of legal same-sex relationship relationship recognition on public and personal health (e.g. Crespi, 2015; Gonzales, 2014; Gonzales & Blewett, 2014; Hatzenbuehler et al., 2012; Herdt & Kertzner, 2006; Herek, 2006; Kail et al., 2015; Kertzner, 2012; Pereira & Monteiro, 2017; Rostosky et al., 2009; Tatum, 2017; Teo et al., 2022). Only very few studies have directly examined the effects of marriage on mental health for sexual minority individuals, consistently finding a positive association (Chen & van Ours, 2018; LeBlanc et al., 2018; Riggle et al., 2010; Wight et al., 2013). However, these studies are predominantly based on cross-sectional convenience samples from the US and therefore have limited ability to net out selection effects (LeBlanc et al., 2018; Wight et al., 2013; Riggle et al., 2010). An exception is the longitudinal study by Chen and van Ours (2018), which used panel data from the Netherlands to address issues of reversed causality, finding well-being gains from same-sex marriage beyond selection. Only two studies compared the effects to those of heterosexuals, with mixed findings: while the effect of same-sex marriage was found to be similar to different-sex partnership in the study by Chen and van Ours (2018), Wight et al.'s (2013) findings reveal greater effects of being married for sexual minority individuals than for heterosexuals. Variations of the marriage effect over time have to the knowledge of the author so far not been examined for sexual minority individuals.

This thesis aims to fill these gaps and contribute to the existing literature by being one of the first to examine the relationship between marriage and the mental health of sexual minority individuals in the United Kingdom. It advances previous studies by using representative longitudinal data, to establish the directionality of results and investigate the mental health consequences of sexual minority marriage over time (Umberson et al., 2015; Wight et al., 2013). By comparing the effect of marriage on the mental health of sexual minority individuals to that of heterosexual individuals, the study aims to classify the extent of psychological benefits for sexual minority individuals and tries to uncover whether health disadvantages of the sexual minority population compared to the heterosexual majority persist despite reductions in institutional discrimination.
Based on these considerations, the thesis aims to answer the following research question:

How does marriage affect the mental health of sexual orientation minority individuals?

At this, the thesis' objective is to examine whether marriage has an effect on the mental health of self-identified sexual minority individuals (lesbian, gay, and bisexual persons) in the United Kingdom. Further sub-questions aim to provide a nuanced understanding of the association:

(1) *How does marriage affect the mental health of sexual minority individuals before, during and after the event?*

(2) *How does the effect of marriage differ between sexual minority individuals and heterosexual individuals?*

By examining within-person mental health changes over the transition from cohabitation to first marriage and comparing them to those of heterosexual individuals, the thesis strives to contextualize variations of the effect over time.

To address these research questions, first the theoretical framework is introduced in chapter 2. Meyer's Minority Stress Theory (1995; 2003b) builds the foundation for explaining the mental health disparities between sexual minority individuals and the heterosexual majority (section 2.1). The relationship between marriage and mental health is then discussed using literature on different-sex couples and qualitative studies of sexual minority individuals (section 2.2), leading to the development of a conceptual model (section 2.3) and hypotheses. Chapter 3 details the methodology, including an introduction of the United Kingdom Household Longitudinal Study (UKHLS) dataset, sample selection (section 3.1), and the operationalization of constructs (section 3.2). The chapter concludes with a description of the methods and statistical approach, its assumptions, and ethical considerations (sections 3.3 to 3.5). The presentation of results follows in chapter 4, beginning with descriptive statistics (section 4.1) and fixed effect regression analyses to assess within-person changes in mental health over the transition into marriage by sexual orientation (section 4.2), followed by robustness checks (section 4.3). In the final chapters (chapter 5 and 6), the results are summarized and interpreted, and thus the research questions are answered. Finally, strengths, limitations, implications and directions for future research are discussed.

2 Theoretical Framework

2.1 Mental Health of Sexual Minority Individuals

As "a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community" (WHO, 2022), *mental health* is of high relevance for personal abilities and functioning in society. It exists on a complex spectrum, characterized by different subjective experiences and outcomes, rather than merely describing the absence of mental illnesses or disabilities. An individual's mental health is determined by micro-level factors, such as psychological, emotional and biological characteristics, as well as macro-level influences, for example social, economic, political and environmental conditions (WHO, 2022).

Given its close link to personal experiences and societal conditions, sexual orientation plays a significant role in regard to mental health. At this, sexual minority individuals are likely to have worse mental health in any psychological disorder compared to heterosexual individuals (Booker et al., 2017; IOM, 2011; King et al., 2008; Lewis, 2009; Meyer, 2003b).

The term "*sexual minority*" broadly refers to individuals whose sexual orientation deviates from the heterosexual norm. This includes, but is not limited to, lesbian, gay, bisexual, and other non-heterosexual identities (NIH, 2024). Sexual orientation can change over the lifecourse, but it often follows relatively consistent personal patterns (Rosario et al., 2006). It is a multifaceted construct, involving emotional, romantic and/or sexual attractions on a continuum from exclusive attraction to the opposite sex to exclusive attraction to the same sex, alongside one's behavior and identity connected to those attractions (APA, 2008; Iguartua et al., 2009; Johns et al., 2013; Korchmaros et al., 2013; NIH, 2024; Reback & Larkins, 2010; Savin-Williams & Vrangalova, 2013; s. Appendix 1 for a visual conceptualisation of sexual orientation). These components of sexual orientation- desire, behavior, and identity- are interrelated but may not always align (Iguartua et al., 2009; Korchmaros et al., 2013; Reback & Larkins, 2010). Some persons may not disclose or self-identify with their sexual minority orientation identities due to stigma and discrimination, although they desire and engage in same-sex behavior (APA, 2008).

Meyer's (1995, 2003b) Minority Stress Theory provides a framework for understanding the unique challenges sexual minority individuals face and the resulting mental health disparities. The theory's core premise is that society imposes heteronormative and homo- and biphobic contexts on sexual minorities, in which non-heterosexual people are not equally recognized or validated. Consequently, sexual minority individuals face distal external stressors, such as stereotypes, prejudice, discrimination, and victimization, as well as proximal internal stressors, including internalized stigma, expectations of rejection, poor self-image, and identity concealment. These stressors manifest through both interpersonal interactions at the micro-level and institutional contexts at the macro-level (Meyer, 2003b). Evidence supports that these minority stressors may be the primary source of the mental health gap between heterosexuals and sexual minority individuals, as they hinder the capacities of minority individuals to adjust and engage effectively in their daily environments, elevating the risk of mental health challenges (e.g. Hatzenbuehler et al., 2008; Hatzenbuehler et al., 2010; Meyer, 1995; Meyer, 2003a; Meyer, 2003b).

2.2 Marriage and Mental Health

Access to same-sex marriage provides an opportunity for sexual minority individuals to enter a previously heteronormative context. This inclusion reduces an institutional form of discrimination, thereby alleviating a significant distal stressor, which could positively influence mental health.

Marriage, as a social institution, generally plays a vital role by providing benefits to both the individuals involved and society at large. According to Durkheim and Lukes (2013), the union of two spouses represents a “superficial expression of an internal and deeper condition” (p.50) where partners, through their complementariness, improve each other's lives by sharing social, emotional, and material resources. These gains from marriage are produced by the social contract between spouses and the state, whereby social norms, manifested in collective attitudes, ideas and behaviors towards marriage, shape the individual. At this, the institution of marriage is not constant, but transforms with social change (Durkheim, 1982; Waldman, 2013). The second demographic transition has shifted values towards more individualistic and self-actualizing norms, leading modern marriage to be less defined by traditional gender roles and the heterosexual nuclear family model (Lesthaeghe, 2010; Mills & Blossfeld, 2003; Zaidi & Morgan, 2017). This evolution has expanded the recognition of marriage to include same-sex couples in many Western societies, viewing the freedom to marry as a universal right, irrespective of sexual orientation. While the majority population shows declining marriage rates, and therefore deviation from the previous family trajectory norm (Zaidi & Morgan, 2017; Lesthaeghe, 2010; Mills & Blossfeld, 2003; Oláh et al., 2018), for sexual minority individuals, these recent demographic social changes in access to marriage rather open additional, previously unavailable heteronormative family formation paths (Bosley-Smith & Reczek, 2018; Moore & Stambolis-Ruhstorfer, 2013; Trandafir, 2015).

Considering marriage as a social good, same-sex marriage, like different-sex marriage, should be advantageous for both couples and the state (Waldman, 2013). From this sociological perspective building on Durkheim’s view of marriage as a social fact, marriage can only be examined by its impacts and not as a good itself (Durkheim, 1982). This study focuses on marriage’s effect on mental health, thus considering the construct from a micro-level perspective. While marriage can significantly influence a person's mental health by potentially strengthening both individual and social circumstances, it however interacts with many other mental health determinants and, on its own, has limited predictive power. Therefore, marriage should be seen as a condition that can strengthen or weaken mental health depending on a complex combination of factors. Nonetheless, insights into the role of marriage in mental health can guide effective promotion and prevention interventions (WHO, 2022).

While other forms of stable partnerships, such as cohabitation, civil unions, or registered same-sex partnerships also offer essential resources for mental health, legal marriage appears to provide greater benefits, potentially due to greater devotion and investment in a marital relationship (Poortman & Mills, 2012). Previous studies show that cohabiting individuals benefit compared to singles, but marriage offers additional advantages (Carr & Springer, 2010; Chen & van Ours, 2018; Kamp Dush & Amato, 2005; Lamb et al., 2003; Mikucka et al., 2021; Musick & Bumpass, 2012; Poortman & Mills, 2012; Umberson

et al., 2013; Waite, 1995). Sexual minority couples also have access to other forms of legal partnerships providing similar legal rights and protection, such as civil unions and registered same-sex partnerships. However, many perceive these alternatives as second-class substitutes that lack the same legal and private benefits as marriage (Lau & Strohm, 2011; Teo et al., 2022). This perception could be due to marriages' heteronormative connotation, persistent heteronormative hierarchies, and the higher tolerance and better understanding of this institution by mainstream society (Seidman, 2001; Wolkomir, 2009). Consequently, evidence about the health status of sexual minority individuals in civil unions or registered domestic partnerships is mixed. While some studies find individuals in these alternative legal statuses to report lower mental health than persons in same-sex marriage (LeBlanc et al., 2018; Riggle et al., 2010), other studies find those partnerships forms to not differ much from individuals in marriage, as predominantly the legal recognition is assumed to drive positive mental health effects (Wight et al., 2013).

Given that evidence suggests a marriage effect beyond cohabitation for sexual minority individuals, this paper specifically focuses on this transition. The ambiguous role of registered same-sex partnerships is beyond the scope of the current study and is therefore excluded. To isolate the effects of marriage from other partnership forms, only transitions from cohabitation to marriage should be considered. (Chen & van Ours, 2018; Lamb et al., 2003). Furthermore, the marital history matters, whereby first marriages tend to be more protective than subsequent marriages due to the negative impact of marital loss and potential changes in attitudes towards marriage (Barrett, 2000; Carr & Springer, 2010; Umberson et al., 2013). The focus of the current study is therefore on the effects of entering and staying in first marriage.

2.2.1 Explanations for the Positive Effect of Marriage on Mental Health

While there is longstanding support for the notion that marriage overall promotes health (Hank & Steinbach, 2018; Koball et al., 2010; Umberson et al., 2013), questions remain about whether these benefits extend universally to all individuals and across all health outcomes (Carr & Springer, 2010; Kalmijn, 2017). Marriage is commonly associated with better general health measures, such as self-rated health (Guner et al., 2018; Hughes & Waite, 2009), lower number of illnesses (Lorenz et al., 2006), and lower mortality risk (Blomgren et al., 2012; Hank & Steinbach, 2018). While evidence for its impact on physical health is however less clear (Carr & Springer, 2010; Hughes & Waite, 2009; Mikucka et al., 2021), prior research consistently shows marriage to have positive influences on mental health outcomes, including mental well-being (Gove et al., 1983; Kamp Dush & Amato, 2005; Musick & Bumpass, 2012), depressive symptoms (Frech & Williams, 2007; Hughes & Waite, 2009; Lamb et al., 2003; Lorenz et al., 2006), and psychological distress (Frech & Williams, 2007; Strohschein et al., 2005). Given this robust link between marriage and mental health, as well as the impact of minority stress on the mental health of sexual minority individuals, this study focuses on mental health as the outcome of interest.

Despite the limited number of studies examining the marriage effects on mental health for sexual minority individuals (s. Table 1), the existing research also shows an advantage for married individual in terms of subjective well-being (Chen & van Ours, 2018; Riggle et al., 2010), psychological distress (LeBlanc et al., 2018; Riggle et al., 2010; Wight et al., 2013), depressive symptoms (LeBlanc et al., 2018; Riggle et al., 2010), and problematic drinking (LeBlanc et al., 2018). Although the studies refer to different health outcomes and use varying methods to identify sexual orientation minorities, the mental health benefits of marriage were consistently positive across these studies (Chen & van Ours, 2018; LeBlanc et al., 2018; Riggle et al., 2010; Wight et al., 2013). However, effects were not always statistically significant. Importantly, just as for heterosexual individuals, marriage was repeatedly found to have larger mental health benefits than cohabitation or singlehood for sexual minority persons.

Even though sexual minority individuals at first glance seem to benefit from marriage just as heterosexuals do, the underlying reasons may differ and are affected by minority stress and the generally lower mental health level of the sexual minority group. Previous literature has established two main arguments for the marital advantage in mental health, which also appear relevant for sexual minority individuals: social selection and social causation (Carr & Springer, 2010; Hank & Steinbach, 2018; Koball et al., 2010; Mikucka et al., 2021).

According to the selection model, the association between marital status and mental health is a result of individuals with a specific pre-marital health status being more likely to get and stay married. Typically there is positive selection, with individuals with better mental health being more likely to marry due to their attractiveness to potential partners (Hank & Steinbach, 2018; Koball et al., 2010). However, negative selection can also occur, where individuals with poorer health or those who anticipate a decline in health marry because they assume more advantages of marriage (Carr & Springer, 2010; Mikucka et al., 2021).
This selection effect may be more pronounced for sexual minority individuals. Concerning positive selection, sexual minority individuals who choose to marry may experience lower levels of minority stress (Chen & van Ours, 2018). As marrying a partner of the same sex requires disclosing one's sexual minority identity, individuals that consider this step presumably have a greater comfort and resilience with their sexual orientation. Compared to persons who conceal their sexual identity, individuals who are accepting and open with it likely have a better mental health (Meyer, 2003; Morris et al., 2001). Rostosky et al. (2016) also highlight that married sexual minority individuals often display optimism, resilience, and a variety of coping skills to manage minority stress. Negative selection may also be evident, as marriage could be seen as a means to gain acceptance and benefits in a discriminatory societal context.

Table 1: Overview of Previous Quantiative Studies assessing Marriage Effects of Sexual Minority Individuals

Reference	Design*	Data/ Country	Year(s)	Dependent Variable	Identification of Sexual Minorities	Comparison Group		Findings	Statistically significant
						Marriage Comparison	Sexual Orientation		
Chen & van Ours (2018)	L	Longitudinal Internet Studies for the Social Sciences (LISS) panel, Netherlands	2008-2013	subjective well-being (happiness) **	gender of partner	marriage vs. cohabitation	different-sex relationships vs. same-sex relationships	- larger well-being gains of marriage than of cohabitation - effects of same-sex partnerships similar to different-sex partnerships - gender differences in same-sex partnerships: males stronger well-being effects of marriage, females stronger well-being in cohabitation	No
LeBlanc et al. (2018)	C	Dyadic study of 100 same-sex couples living in U.S. (own collection), U.S.	2015/2016	- non-specific psychological distress (K6 scale) - depressive symptomatology (CESD scale) - problematic drinking (AUDIT scale)	(self-identified) same-sex couples	marriage vs. domestic partnership/civil union vs. no legally recognized partnership	/	- Same-sex married lesbian, gay, and bisexual persons were significantly less distressed than lesbian, gay, and bisexual persons not in a legally recognized relationship - married lesbian, gay, and bisexual persons were less likely to show non-specific psychological distress, depressive symptomology or problematic drinking	No
Wight et al. (2013)	C	California Health Interview Survey (CHIS), U.S.	2009	non-specific psychological distress (K6 scale)	self-identified	married vs. registered domestic partnership vs. unmarried	lesbian, gay, bisexual (pooled) vs. heterosexual	- Psychological distress was not significantly distinguishable among same-sex married lesbian, gay, and bisexual persons, lesbian, gay, and bisexual persons in registered domestic partnerships, and heterosexuals. - Stronger effect of being married (compared to not being in a legal form of relationship) for LGB than for heterosexuals	Yes

Table 1 continued

Riggle et al. (2010)	C	Online survey sample (own collection?), U.S.	/ (not reported)	- psychological distress (Perceived Stress (PSS4) - depressive symptoms (CES-D-S) - well-being (internalized homophobia, presence of meaning in life)	self-identified	single vs. dating vs. commited relationship vs. legally recognized relationship	/	- participants in committed or legally recognized relationships reported less psychological distress and more well-being than single participants - participants in a legally recognized relationship reported less internalized homophobia, fewer depressive symptoms, lower levels of stress, and more meaning in their lives than those in committed relationships, even after controlling for other factors.	Yes

Note: own illustration

* Study Design: L = longitudinal, C = cross-sectional

** The study by Chen & van Ours (2018) does not examine mental health, but subjective well-being. As the study is the only previous longitudinal study on marriage effects of sexual minority individuals and as well-being and mental health are related constructs, it has been included in the literature overview

Longitudinal studies indicate that the positive effect of marriage on mental health extends beyond an individual's pre-existing mental health levels, hence suggesting that it is not solely driven by selection effects (Blekesaune, 2008; Chen & van Ours, 2018; Hank & Steinbach, 2018; Lamb et al., 2003; Umberson et al., 2013). Although this study focuses on the influence of marriage on mental health, selectivity must be regarded to achieve unbiased results (Mikucka et al., 2021). While it is difficult to completely rule out selectivity bias, longitudinal research offers improved opportunities to estimate the specific effects of marriage (e.g. Stutzer & Frey, 2006).

The causation perspective, also called the marital resource model, attributes marriage's positive effect on mental health to several interconnected mechanisms, which can broadly be categorized as intangible social and emotional resources, behavioral influences, and tangible legal and economic benefits (Chen & van Ours, 2018; IOM, 2011; Mikucka et al., 2021; Stutzer & Frey, 2006). These mechanisms likely apply to sexual minority individuals as well, given the legally equal access to marital status, rights and resources. However, minority stress underlies the experience of all these factors for sexual minority individuals. This may result in both positive ways, such as reduced minority stress enhancing marriage benefits, but also negative consequences as persistent minority stress can hinder the full realization of these mental health advantages.

First, married individuals benefit from increased psychosocial support. The spouse presents an easily accessible source of companionship, belonging, intimacy, acceptance, and a meaningful and loving connection, along with assistance, information, and guidance (Mikucka et al., 2021; Musick & Bumpass, 2012; Stutzer & Frey, 2006). Additionally, heightened certainty and quality of reciprocal dedication is a psychological resource distinct to marital relationships (Stanley et al., 2010; Stutzer & Frey, 2006). For sexual minority individuals, this heightened love and acceptance can alleviate internalized homo- or biphobia, enhance self-esteem, and mitigate internal minority stressors. As sexual minority individuals often face heightened vulnerability to mental health issues due to disparities in social support (Meyer, 2003b; Meyer, 1995), marriage can thus serve as a significant support mechanism to address this challenge. Beyond the spouse themself, their family and friend network can further strengthen and expand social integration (Blekesaune, 2008; Chen & van Ours, 2018; Kamp Dush & Amato, 2005). Generally same-sex couples are likely to have fewer social connections and support for their partnership than different-sex couples (Chen & van Ours, 2018). As marriage enhances social and legal legitimacy, and acceptance of the relationship in the minds of family, colleagues, community and society at large (Badgett, 2009; Haas & Whitton, 2015; Rostosky et al., 2016; Schecter et al., 2008; Shulman et al., 2012), for many sexual minority individuals marriage enables closer and more numerous bonds to their family (Schecter et al., 2008). As increased social support, love and broader validation, as well as diminished

loneliness and insecurity relieve stress, married individuals become less prone to mental health issues (Blekesaune, 2008; Stutzer & Frey, 2006) both due to direct effects and indirectly through reduction of both external and internal minority stressors. Despite these positive changes, some socio-emotional minority stressors may persist. For instance, some sexual minority individuals may hesitate to publicly label their partner as husband or wife due to continued internalized stigma, fear of mistreatment, and rejection (Rostosky et al., 2016).

Second, research on different-sex couples has shown that a spouse's expectations and practices can have behavioral influences on the married individual towards less risky, health-threatening, and more health-aware behaviors. For example, principles of the marital relationship and reciprocal monitoring may decrease substance use and poor eating habits and promote adherence to medication schedules, which can have beneficial impacts on mental health (Averett et al., 2013; Chen & van Ours, 2018; Mikucka et al., 2021; Umberson, 1992). Little is known about post-marriage behavioral changes specific for sexual minority individuals, but presumably parallels can be drawn to the beneficial behavioral influence found in different-sex couples. However, minority stress often contributes to unhealthy behaviors such as smoking or other drug-abuse among sexual minority individuals (Hatzenbuehler et al., 2008), which could potentially be reinforced with marriage by the spouse's similar coping mechanisms and a dependent lifestyle (LeBlanc et al., 2015).

Third, married individuals' advantages in mental health may arise from sharing socioeconomic resources and joint consumption. The likelihood of economic hardships are decreased, as legal privileges (e.g. joint taxation, access to spousal insurance) and (economic) specialization can offer stability and protect from adverse events. Further consumption and investment complementarities, such as shared values, beliefs, activities, and goods can contribute to better relationship quality, living arrangements, and lower stress levels, which reflects in higher mental health (Carr & Springer, 2010; Chen & van Ours, 2018; Mikucka et al., 2021; Stutzer & Frey, 2006). For sexual minority individuals, legal protection and security are a main reason for and effect of marrying, as marriage grants them the same state benefits as different-sex couples (Haas & Whitton, 2015; Rostosky et al., 2016; Schecter et al., 2008). Next to financial protection, especially the legal safeguards for families and children gained through marriage are of importance for sexual minority parents (e.g. Stambolis-Ruhstorfer & Descoutures, 2020). These tangible benefits give sexual minority individuals an increased sense of security and reduce minority stress, therefore leading to improved mental health (Haas & Whitton, 2015; Rostosky et al., 2016).

Summed up, same-sex marriage provides an opportunity for sexual minorities to enter a previously heteronormative context, thereby reducing a form of institutional discrimination and alleviating other external and internal minority stressors, which respectively could have beneficial consequences for

mental health. Sexual minority individuals especially profit from emotional effects, social validation, and the legal protection and security that comes with marriage (Rostosky et al., 2016; Schecter et al., 2008), which could elevate the mechanisms underlying the positive effect of marriage on mental health found among different-sex couples and have additional beneficial impacts on its own.

In this sense, marriage may have additional favorable effects for sexual minority individuals as it carries the importance of publicly and visibly affirming one's relationship and identity for oneself, important others and society as a whole (Schecter et al., 2008). For some getting married can be seen as a political act and extension of fighting for equality. The broader societal implications of acting as role models in the larger LGB+ community and counteract long lasting societal notions can empower married sexual minority individuals, strengthen their resilience, bring satisfaction, joy and have positive spillover to mental health (Rostosky et al., 2016; Schecter et al., 2008).

Therefore, beyond its conventional benefits, marriage mitigates the adverse effects of macro- and micro-level minority stressors on mental health, which could potentially reduce mental health disparities between heterosexual, lesbian, gay, and bisexual individuals (Wight et al., 2013).

2.2.2 The Effect of Marriage on Mental Health over Time

Despite these underlying mechanisms explaining the positive effects of marriage on mental health, the marriage effect is not a uniform one-time increase in mental health, but potentially affects mental health differently over the course of marriage. While the precise function of marriage's influence on mental health remains unclear due to mixed findings in literature on different-sex couples, it is likely that anticipation, event, short-, and long-term effects are at play (Mikucka et al., 2021). The effects of these phases may further differ for non-heterosexual individuals, yet theory or research on this is so far absent.

On one hand, the long-term resource accumulation model suggests that the marriage effect is cumulative across these phases and gradually increases with the time spent in marriage. This is due to a growing investment in and exposure to shared tangible goods (e.g., income, property, merged family and friends) and intangible resources (e.g., closeness, dedication, love, and trust) associated with marriage (Mikucka et al., 2021; Chen & van Ours, 2018; Kalmijn, 2017; Hughes & Waite, 2009; Dush & Amato, 2005). Also for sexual minority individuals resources are expected to accumulate over time. It further is conceivable that the reduction of perceived minority stress through marriage may take a while to unfold its mental health benefits, therefore leading to higher mental health gains over the course of marriage.

A study by Huntington et al. (2022) however claims that mental health tends to increase in the months preceding marriage, followed by a plateau or reduction in these improvements thereafter. This aligns with the short-term crisis adaptation model, which, on the other hand, proposes that increases in mental health at marriage and during the pre-marital anticipation phase are short-lived and not sustained long-term. This

fallback to the person-specific standard or a new, slightly higher plateau of mental health may result from adaptation and habituation to the marital situation, distress or dissatisfaction from new role demands, unmet expectations, or stable internal personality characteristics (Blekesaune, 2008; Chen & van Ours, 2018; Hughes & Waite, 2009; Huntington et al., 2022; Kalmijn, 2017; Musick & Bumpass, 2012; Stutzer & Frey, 2006). The assumptions of the short term crisis adaptation model appear even more relevant and likely in the case of sexual minority individuals, considering the role of minority stress. Especially the period leading up to and the year of marriage may positively affect sexual minority individuals. As marriage may be connected to a public disclosure of their sexual orientation, individuals build up heightened resilience and overcome internal minority stressors, which could positively affect their health (Meyer, 2003b; Morris et al., 2001). Short-term after marriage, the realization of increased privileges, emotional benefits, and enhanced social validation can further make sexual minority individuals feel a sense of entitlement and affirmation of their relationship and identity (Hatzenbuehler et al., 2010; Rostosky et al., 2016; Schecter et al., 2008). However, over the long term, the mental health benefits may diminish as persistent minority stressors and heteronormativity of society become increasingly apparent again (Meyer, 2003b).

Based on these considerations, the following hypotheses are proposed, to address the first sub research question concerning the transitional effect of marriage on the mental health of sexual minority individuals:

> H1a: The anticipation and immediate effect of marriage on mental health are positive for sexual minority individuals, mental health increases in the year before and the year of marriage.

> H1b: The effect of marriage on the mental health of sexual minority individuals is positive short-term after marriage, but decreases back to the person-specific standard in the long term.

2.2.3 The Heteronormative Context of Marriage Effects

While the so far described considerations suggest a positive effect of marriage on the mental health of sexual minority individuals, the overall impact is expected to vary and potentially be smaller than the one found for heterosexuals. Despite legally equal recognition, persistent minority stressors may limit the extent to which sexual minority individuals can fully benefit from the health advantages of marriage to the same extent that heterosexuals do (Fischer et al., 2016; LeBlanc et al., 2018; Riggle et al., 2010; Wight et al., 2013). Although institutional discrimination has decreased, the choice to marry is still made in a social setting marked by ongoing minority stress and stigmatization, fears and acts of discrimination, and victimization by society as whole, but also within workplaces, communities, and family contexts

(LeBlanc et al., 2018; Meyer, 2003b; Rostosky et al., 2016). This continuous backdrop of minority stress harms the mental health of sexual minority individuals, potentially undermining the positive effects of marriage (Hatzenbuehler et al., 2010; Meyer, 2003b; Rostosky et al., 2016).

Additionally, the traditionally patriarchal and heteronormative nature of marriage may diminish its effects on the mental health of sexual minority individuals. For many, marriage has not been a life goal due to its lack of accessibility (Rostosky et al., 2016). Others express ambivalence or concerns about marrying, worrying about the normative roots and stereotypes of the institution or its potential for assimilation into the majority's culture (Bosley-Smith & Reczek, 2018; Rostosky et al., 2016; Schecter et al., 2008; Stambolis-Ruhstorfer & Descoutures, 2020). The incorporation into a previously solely heterosexual institution seems to be a double-edged sword, which on one hand enabled justice, equality, and acknowledgement of same-sex relationships as ordinary and normal, but on the other hand may lead to a loss of uniqueness (Schecter et al., 2008). Multiple scholars argue that under a normalizing logic of fitting queer relationships into the heterosexual model, the latter's superiority is reinforced, heterosexual ideals are upheld, and heteronormative hierarchies are protected, while its power is concealed (Seidman, 2001; Wolkomir, 2009). In that regard, it is also questioned whether marriage rights reflect what sexual minorities need and desire from the government (Josephson, 2005). While access to marriage grants social inclusion and other privileges, continued heterosexual bias preserves minority stress, potentially leading to persistent mental health disparities.

In conclusion, despite reduced structural discrimination, persistent minority stress, traditional heteronormative roots, and differing wishes and perceptions of marriage likely result in smaller mental health benefits of marriage for sexual minority individuals compared to heterosexuals. This leads to the following hypothesis, related to the second sub-question:

> H2: The effect of marriage on mental health is less positive for sexual minority individuals than for heterosexual individuals.

2.2.4 Exceptions and Variations to the Positive Effect of Marriage on Mental Health

Although marriage has been predominantly found to have a positive impact on mental health, this effect can also be negative or negligible in some cases. Not all marriages are the same and whether an individual can reap mental health advantages is dependent on procedures and interactions within that specific marital framework. For example, poor marital quality, high conflict, or responsibility for an ill spouse might jeopardize mental health instead of elevating it (Carr & Springer, 2010; Mikucka et al., 2021).

While marriage can increase social resources, it also tends to monopolize them within the family. The decrease of the extent and frequency of nonfamilial contact (Pinquart, 2003) may have adverse health

effects, especially when the within-union support is insufficient (Mikucka et al., 2021). Also behavioral influences might have adverse effects if unhealthy habits are shared and reinforced (Franks et al., 2002; Meyler et al., 2007). Moreover, joint consumption and investments can potentially negatively impact mental health as complex negotiation and authority exercised by the spouse may introduce stress (Blekesaune, 2008).

Considering the different phases of the marital transition, it might also be that anticipation and event effects are overshadowed by the stress connected to organizing and carrying out a wedding which may negatively impact mental health (Mikucka et al., 2021).

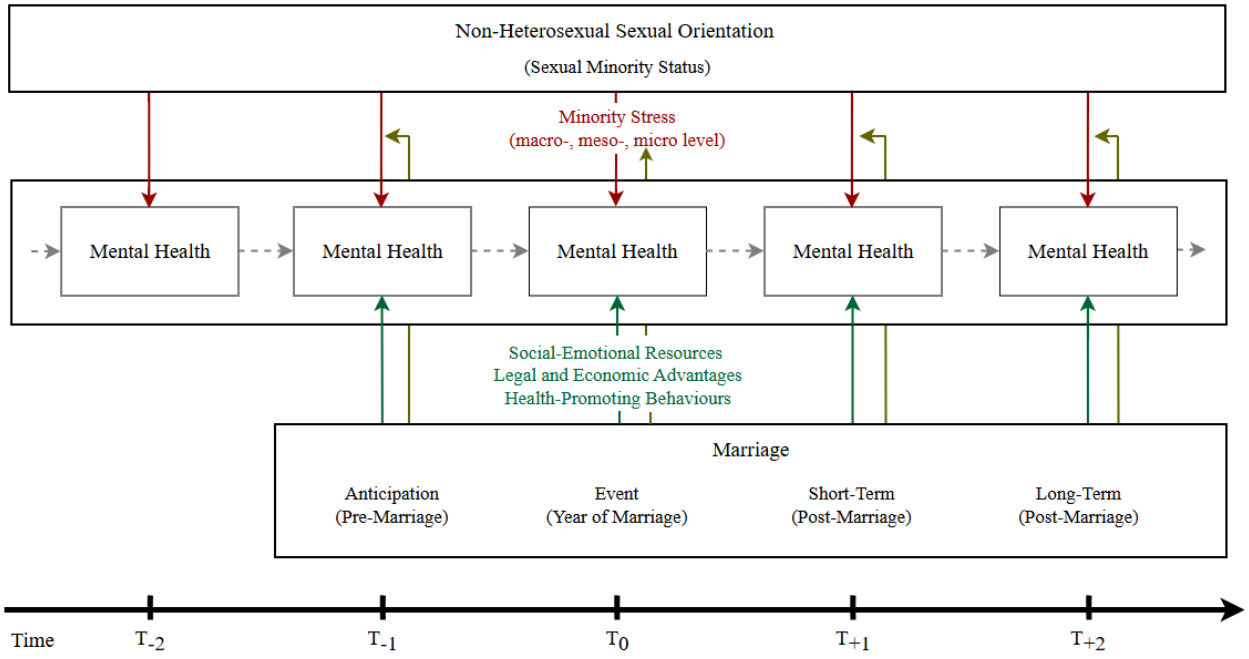
The effects of marriage on mental health can furthermore vary by personal and couple characteristics, such as gender (Blekesaune, 2008; Carr & Springer, 2010; Chen & van Ours, 2018; Kalmijn, 2017; Mikucka et al., 2021; Strohschein et al., 2005), distinct sexual orientation (Chen & van Ours, 2018), and education (Stutzer & Frey, 2006). Additionally there might be differences in marriage effects for sexual minority couples for whom marriage was not an accessible possibility when they began their relationship and those for whom it has always been available, as historical legal constraints might influence the perceived value and mental health benefits of marriage (Frost et al., 2015).

2.3 Conceptual Model

In summary, theoretical perspectives and empirical evidence suggest that marriage predominantly benefits the mental health of sexual orientation minority individuals, beyond selection effects. These mental health gains arise from socioemotional validation, legal and economic protection, health-promoting behavioral changes, and reduced internal and external minority stressors. The effect of marriage on mental health is thereby dynamic, varying across different phases of the marital trajectory. While the exact function of this impact over time is unclear, it seems likely that the mental health of sexual minority individuals improves before, during, and shortly after marriage, but these gains may not be sustained long-term. Despite mitigating some stressors, sexual minority individuals may not benefit from marriage to the same extent as heterosexual individuals due to persistent minority stress and the heteronormative nature of marriage.

The conceptual model (s. Figure 1) captures these key theoretical assumptions relevant to the current study and illustrates the interplay between sexual orientation, marriage, and mental health.

Figure 1: Conceptual Model



Sexual orientation, though fluid and capable of change over time, is treated as a generally stable construct. Non-heterosexual individuals face macro, meso, and micro level minority stressors adversely impacting their mental health (red arrows). This impact of minority stress is a backdrop persistent over all points in time, but its importance and strength of influence may vary. Mental health itself fluctuates over time and is influenced by both past and present conditions. The model acknowledges (with gray arrows) the potential feedback loop where previous mental health states can affect future ones, even though this interdependence is not explicitly tested in the study. Selection mechanisms, though not the primary interest of the study and thus not portrayed in the conceptual model, are acknowledged as they can bias the marriage effect: individuals with higher mental health are more likely to marry. Additionally, sexual minority individuals are less likely to self-select into marriage due to its historical unavailability as a heteronormative institution and the existence of other legal partnership options. Marriage, as a pivotal event, affects mental health already in a phase of anticipation, in the year of marriage, but also short- and long-term after individuals get married. Its positive influence on mental health is mediated by an increase of social emotional resources, legal and economic advantages as well as health-promoting behavioral changes (green arrows). The effects can thereby vary over the transitory phases. Next to the universal mechanisms, marriage additionally reduces minority stressors for sexual minority individuals by increasing social validation, legal protection, and internal resilience. Therefore, marriage potentially mitigates the adverse effect that a sexual minority status has on mental health (ochre arrows). This

reduction presumably occurs across all phases of the marital trajectory, but may differ in importance and magnitude over time.

3 Methods and Data

3.1 Plan of Analysis

To answer the research questions and assess the hypotheses, this study employs a quantitative explanatory research design using secondary longitudinal data from Understanding Society - the United Kingdom Household Longitudinal Study (UKHLS).

The longitudinal approach allows for examining marriage as a transition and quantifying the direction and strength of mental health changes within individuals over time. This method is crucial for understanding the dynamics of mental health before, during, and after marriage for sexual minority individuals, as questioned in sub-research question 1 and stated in Hypotheses H1a and H1b. Furthermore, portraying the within-person mental health trajectories over the different marital phases comparatively by sexual orientation directly addresses sub-research question 2 and Hypothesis H2, which posit differences in the marriage effect on mental health between sexual minority and heterosexual individuals. Using panel data is also advantageous for the constructs of research, as item non-response to sensitive topics like mental health or sexual orientation may gradually decline in panel surveys as respondents build trust over time, potentially enhancing data representation (Lynn & Knies, 2016). While large-scale representative quantitative data supports external validity and generalizability, it may however limit contextual in-depth understanding of sexual minority individuals' lived experiences, perceptions, and meanings related to marriage and mental health (Sechrest & Sidani, 1995). A possible downside of panel data is attrition bias, which could affect the validity and generalizability of findings if specific individuals of certain sexual orientation categories are more likely to drop out of the survey (Ployhart & Ward, 2011).

The study area of the United Kingdom was selected due to UKHLS being one of few representative large-scale panel surveys that gathers data on the self-identified sexuality of respondents as well as marital histories and mental health. As such, it allows accurate research on the situation of sexual minority individuals in the UK (ISER, 2023a; Knies, 2018; Ophir et al., 2023) and enables to assess marriage effects on mental health over time, aligning with the research questions. The UK context is characterized by a positively evolving legal and social environment for sexual minority communities (Flores, 2021), which may influence mental health outcomes.[1]

[1] According to the Global Acceptance Index Great Britain records steep increases in acceptance of LGB persons and rights over time, with being ranked the 9th most accepting country in 2020 (Flores, 2021). Key legislative milestones in the UK include the introduction of civil partnerships in 2005 and the inclusion of sexual orientation in anti-discrimination laws updated in 2007 and 2010. In March 2014 the British government effectively enforced the legalization of same-sex marriage to take effect in England, Wales, and Scotland. Northern Ireland's same-sex marriage legislation followed in 2020 (Ophir et al., 2023).

To provide an overview of the dataset, understand the distribution of key variables, and uncover potential selectivity processes, descriptive statistics will be used. The primary analytical method to answer the research questions is within-person fixed-effect regression, which examines individuals' mental health trajectory over the course of marriage. This approach is particularly suited to testing Hypotheses H1a and H1b, as it enables the examination of mental health changes within individuals over time, and Hypothesis H2, by comparing trajectories between sexual minority and heterosexual individuals. Fixed effects are furthermore advantageous for the current research as time-constant individual differences are controlled for as individuals serve as their own control (Brüderl & Ludwig, 2015). Therefore, biases from demographic differences and selection mechanisms are mitigated, which could not be extensively controlled for with other methods due to expectedly small sample sizes.

3.1.1 Data Source and Quality

This study uses data from Understanding Society (UKHLS), which is conducted by the Institute for Social and Economic Research (ISER) at the University of Essex, in collaboration with Kantar Public and the National Centre for Social Research. The ongoing representative panel study has interviewed the same individuals of the UK's resident population approximately every 12 months since 2009. As it builds on and incorporates the British Household Panel Survey (BHPS), it allows for long-term analysis of some households since 1991.

For this research, the protected Special Licence Access (SN 6931; ISER, 2023b) of thirteen waves of Understanding Society (2009-2022) was utilized, as it includes information on sexual orientation not available in the open access End User Licence (SN 6614). Although a combination with harmonized data from all eighteen waves of the BHPS (1991-2009) was initially considered to maximize sample size, the BHPS waves were excluded due to lack of required variables in a suitable form, particularly mental health which in full extent is only available in UKHLS. Therefore, the baseline datafile used in this thesis consists of the individual respondent files (*w_indresp*) from all available waves of UKHLS (waves 1-13), merged into a single long-format dataset, containing information on everyone aged 16 and above who had ever participated in UKHLS, encompassing 533,476 person-years nested within 89,348 individuals.

Understanding Society employs mixed-methods data collection, including face-to-face computer-assisted personal interviews, web interviews, and telephone mop-ups. This approach enhances participation, increases response rates, and balances the advantages and disadvantages of each mode (ISER, 2023a; Lynn & Knies, 2016). However, these alterations can also lead to changes in response patterns (D'Ardenne et al., 2017; Lynn et al., 2012). A more in-depth discussion of the survey procedure is available in ISER (2023a).

Generally, item non-response rates for marital status and mental health are consistently low, indicating the high quality of these measures (ISER, 2023a; Lynn & Knies, 2016). Understanding Society employs several quality assurance measures to ensure the reliability and validity of its data, such as having multiple advisory committees, research-informed development, maximizing continuity of robust and comparable standard measures, pilot-testing, accurate translations, and consistent data work conventions. Further information about UKHLS' quality criteria can be found in ISER (2023a) and Lynn and Knies (2016).

Adjustments for Understanding Society's survey design are necessary to accurately represent the UK's population structure and estimate standard errors correctly, as the data doesn't stem from one simple random sample. To account for unequal selection probabilities, differential non-response, and sampling error, a multitude of weights is provided (Knies, 2018). Refraining from utilizing weights and corrections for sample clustering and stratification will lead to biased results, as it assumes equal selection probability and response behavior among all participants and groups, including different waves, instruments, regions, and ethnicities (ISER, 2023a; Knies, 2018). For the current analysis, the most appropriate weight would be the one designed for longitudinal analysis of participants across all 13 waves aged 16 and above from the general population and ethnic minority samples, who completed full interviews and the self-completion questionnaire (*m_indscus_lw*). However, as this weight is developed for monotone attrition it introduces a very selective fixed-occasion design, restricting the sample to only respondents who continuously participated in all waves and gave full interviews (ISER, 2023a; Knies, 2018). Given the likely small number of sexual minority individuals experiencing marriage, a variable occasion design is more suitable to increase the sample size. Despite recognizing the potential limitations, the current study refrains from adjustments to the survey design and the use of weights due to the constraints imposed by monotone attrition and the need for a sufficient sample size of sexual minority individuals transitioning into marriage.

3.1.2 Sample Selection

From the merged long-format UKHLS base dataset spanning waves 1 to 13, an analytical sample specific to the proposed research was selected. A tabular overview of cases lost with each sample restriction, as well as connected changes in the outcome mental health can be found in Table 2, while Appendix 2 illustrates the selection process in the form of a flow chart.

First, the data was restricted to an 'at-risk' sample of individuals who could experience the event of first marriage. Thus, only those initially observed as unmarried upon entering the panel were regarded. As

prior marital history could affect mental health outcomes (Barrett, 2000; Carr & Springer, 2010; Umberson et al., 2013), individuals entering the panel as divorced, a former civil partner, widowed, a surviving civil partner, married, in a civil partnership, or separated but legally married/in a civil partnership were excluded from the unmarried at-risk sample. Furthermore, only participants at a legal age of marriage at panel entry were considered, resulting in the exclusion of 30 observations of 15-year old participants. Since 16- and 17-year olds were allowed to marry with parental permission at the time of data collection, no further age restrictions were applied. Instead, age will be controlled for in analyses (s. section 3.2.4). The restriction to this at-risk sample resulted in a noticeable decrease in mean mental health. This suggests that persons who were in a legal relationship at or before panel entry tend to have a slightly better mean mental health than the rest of the sample. As the decrease in mental health is substantive in size, the at-risk sample might be selective in their mental health level compared to the overall population.

The at-risk sample was furthermore subdivided into a treatment and control sample. This design is used to control for unobserved heterogeneity between individuals who get married (*treatment group*) and those who remain unmarried (*control group*) over the observed period, allowing for a more accurate assessment of the effect of marriage on mental health.

To guarantee a high-quality of treatment and control sample, remaining heterogeneity in the subsamples was accounted for. Consequently, persons who spent a person-year in any form of previous marriage or civil partnership prior to marriage or in the control sample were removed. This could for example be persons that first entered a registered same-sex civil partnership and got married to their civil partner at a later point in time. As the interest of the research is to analyze the effect of transition into the first legal marital union only, these cases are not desirable for the *treatment group*. Furthermore persons whose marriage is unobserved in annual data due to gaps or errors, were excluded from the *control sample*. After all refinements, the final control sample comprises 17,524 individuals (and a total of 102,127 person-years) that entered the panel as initially single or living as a couple and stayed in either of these states or switched between them over the observed period. Examples for possible trajectories of control group participants are presented in Appendix 3.

Also, further restrictions were made to adjust for heterogeneity in the *treatment group*. Since effects of remarriage on mental health may differ from those of first marriage (Barrett, 2000; Carr & Springer, 2010; Umberson et al., 2013) and since a reverse transition from marriage back into a single state (e.g., divorced, widowed, …) may adversely affect mental health (Blekesaune, 2008; Hughes & Waite, 2009; Strohschein et al., 2005; Williams, 2003), participants with reverse or repeated transitions should be removed from the treatment sample. However, to avoid overly restricting the sample size and to retain

Table 2: Overview of Cases Lost due to Sample Restrictions and Related Changes in the Outcome Mental Health

Restriction	Cases Lost	Cases Left		Mental Health	
		Person-Years	Persons	Mean	SD
		533,476	89,348	48.95	10.30
Restriction to at-risk sample	330,850	202,626	39,831	47.32	10.84
Restrictions to account for heterogeneity in the control sample and exclusion of civil partnership prior to marriage in the treatment sample	14,192	188,434	38,245	47.36	10.81
Restrictions to further account for heterogeneity in the treatment sample					
Removing reverse and repeated transitions	2,680	185,754	38,245	47.39	10.80
Restriction to transition from living as couple to marriage	9,469	176,285	36,995	47.39	10.82
Restriction to only valid observations (removal of missing data)					
Missing data on mental health variable	23,860	152,425	33,038	47.39	10.82
Missing data on sexual orientation variable	21,535	130,890	20,715	47.28	10.78
Missing data on control variables (age)	5	130,885	20,715	47.28	10.78
Observations of the analytical sample		130,885	20,715		

Source: own calculation, based on UKHLS data

valuable information regarding first marriage, observations for these respondents are included up to the point of their reverse transition. With this restriction thus only person-years, but not persons, are dropped from the analytical sample. To accurately portray the net effect of marriage, only transitions from cohabitation (living as couple) to marriage are considered. Individuals who indicated to be single in the year before marriage are excluded because it is unclear whether they were in a living-apart-together relationship and continued to live apart after marriage or moved in together. If marriage is connected to moving in, the observed transition might capture cohabitation effects rather than marriage effects. Therefore, individuals in the treatment sample entered the panel as either single or cohabitating and then lived as a couple before getting married. They are observed for as long as they indicate being in a married status. After these exclusions the treatment group consists of 3,191 individuals comprising 28,758 observations (person-years). Appendix 4 illustrates what the individual trajectories of persons in the treatment group can look like. It should be noted that there are a few caveats concerning the composition of the treatment group: While the focus on transitions from cohabitation to marriage is theoretically necessary to isolate marriage effects, the duration and nature of the cohabiting relationship, which may

influence cohabitation effects, is not regarded. Also cutting off observations from the first time point of a reverse status may overlook effects of emerging marital dissolution. Lastly, no restriction to a minimal interval of observations before and after marriage has been set, to not further limit information. By doing that, the number of observations used to estimate marriage effects at different phases of the marital trajectories differs and may not be well comparable.

Finally, only individuals with valid data on all relevant variables were eligible for analysis, those with non-response or other types of missing data were excluded. Cases lost due to missing data appeared to not be selective with respect to mental health, as indicated by the stability of mean and standard deviation of mental health after each missing data restriction.

Based on these considerations, the utilized analytical sample portrays all initially single or cohabitating never married persons aged 16 and above of the United Kingdom's resident population. Thereby, from the total 533,476 person-years nested in 89,348 respondents of the merged long-format UKHLS wave 1-13 dataset, only 130,885 person-years of 20,715 persons are being regarded for the analysis. Of the total analytical sample, 3,191 participants (15.40%) experienced a transition from living as a couple to first marriage over the observed period (treatment group). The remaining 17,524 participants (84.60%) stayed continuously unmarried, either single or cohabiting as a couple (control group). The average participant in the analytical sample took part in six waves of UKHLS, with participation ranging from one to all 13 waves. Compared to the overall UKHLS dataset, respondents of the analytical sample stayed on average slightly longer in the panel and had less variation in participation length. Respondents who married (treatment group) were on average observed across more waves and joined the panel earlier than those who did not marry (control group). These differences are partially inherent in the treatment group definition, as treatment group participants must be at least observed 1 year prior to marriage (anticipation phase) and at the year of marriage, while there is no minimum panel participation required for control group respondents.

3.2 Operationalisation

To empirically portray the theoretically specified concepts, suitable indicators are derived from UKHLS, enabling statistical analysis and assessment of research questions and hypotheses. Appendix 5 provides an overview of all the variables used for the research model in this paper with their new label descriptions in comparison to the original variables. Exact coding, labeling, and steps of operationalisations are described in detail in the supplementary Stata Do-File attached to this thesis ("01_datawork.do").

3.2.1 Mental Health

To capture the broad spectrum of general mental health, this research utilizes the Mental Health Component Summary Score (MCS-12) built from items of the Short Form-12 (SF-12) health survey, which has been assessed in Understanding Society. The MCS-12 is an approved valid and reliable instrument for measuring the mental health state and mental functioning and has been applied as a screening method for anxiety and depression (Gill et al., 2007; Ware et al., 1998). It assesses respondents' mental health over the past four weeks through questions on vitality, social functioning, role limitations due to emotional problems, and overall mental health, combining these into a summary measure calculated by norm-based scoring. This method transforms the scales to have a mean of 50 and a standard deviation of 10, facilitating comparative analysis (Ware et al., 1998). The MCS-12's multidimensional coverage, well-applicable scaling, comparative value, as well as high scores on various validity tests and a high reliability coefficient of 0.78 observed for the UK (Ware et al., 1998), justify its selection as an appropriate measure to holistically depict the construct of interest.

Understanding Society captures the MCS-12 yearly across all 13 waves by assessing the SF-12 instrument in self-completion questionnaires. This mode of collection allows for more privacy and can therefore mitigate effects of social desirability, allowing a higher quality of responses (D'Ardenne, 2017; Tourangeau & Yan, 2007). Nevertheless, it should be noted that self-reported statements related to mental health are not only based on subjective judgment but also on socially mediated standards, expectations, and benchmarks. The norm-based calculation and scaling of the MCS-12 account for these mechanisms. Additionally, survey samples may be selective as individuals with poor mental health are likely underrepresented due to health-related survey dropouts, higher item-level missing data and failing to complete self-completion modules (Perales & Baffour, 2018).

The MCS-12 is provided as the post-field derived variable *sf12mcs_dv* by Understanding Society. The scoring method for deriving this variable follows the intended calculation of the SF-12 mental health index as described by Ware et al. (2005) and is documented in a STATA syntax file made available by Understanding Society (Understanding Society, n.d.; file: "stata-sf12-dv-public.do"). For this study, the *sf12mcs_dv* variable is duplicated and transformed into the new variable *mentalhealth* to preserve the original data and ensure appropriate handling. Negative value categories such as -9 "missing," -8 "inapplicable," and -7 "proxy" are recoded to missing values.

3.2.2 Marriage

To measure the effect that marriage has on mental health over time, the independent construct marriage is operationalised as an event variable portraying the transition from cohabitation into first marriage. To depict the event of marriage, information on a person's marital status stored in the UKHLS post-field derived variable *mastat_dv* is used. This variable is constructed from responses to the questions "*What is [your] legal marital status?*" asked in the first year of participation and "*Since personal circumstances can change over time, we would just like to check some important information. What is [your] legal marital status?*" asked every following year. *Mastat_dv* thereby further distinguishes unmarried individuals living as a couple from single ones. This enables operationalizing the event of marriage only considering transitions from the marital state of *mastat_dv* 10 "living as couple" to 2 "married".

To analyze the impact of marriage on mental health over time, the transition is anchored using a dummy impact function. This function was chosen as the event of marriage is assumed to have an arbitrary instead of a consistent impact over time, including an anticipation effect prior to the transition. The dummy impact function designates five periods: the pre-event period (T_{-2}), representing more than one year before marriage and considered the baseline mental health period (value 0); the anticipation period (T_{-1}), one year before marriage (value 1); the event year (T_0), the first year observed as married (value 2); the short-term effects period (T_{+1}), one year after marriage (value 3); and the long-term effects period (T_{+2}), more than one and consecutive years after marriage (value 4). The choice of the time periods of the marriage dummies appears to be reasonable, as the number of observations in the anticipation period, year of event and short-term group are similarly spread. Combined these dummies reflect the total effect of marriage on mental health, while separately allowing to represent the effect of time and to compare changes before and after marriage.

3.2.3 Sexual Orientation

To capture sexual orientation empirically, ideally questions or scales accounting for the multidimensionality of the construct (s. section 2.1 and Appendix 1) should be used. Single-indicator measures may misclassify individuals who identify as heterosexual but have same-sex desires or behaviors, potentially hiding the severity of mental health disparities and biasing estimates (Johns et al., 2013; Korchmaros et al., 2013; Lindley et al., 2012; Munoz-Laboy, 2004; Young & Meyer, 2005). Nevertheless, sexual identity remains the most commonly used single-indicator measure for differentiating sexual minority individuals from heterosexuals (Rosario et al., 2006). So far, also all previous studies assessing marriage effects on the mental health of sexual minority individuals have relied on the facet sexual identity, either self-identified (LeBlanc et al., 2018; Riggle et al., 2010; Wight et al, 2013) or identified by the gender of partner (Chen & van Ours, 2018).

Using a single-indicator measure referring to the dimension of identity is also the case in the Understanding Society data: a participant's sexual orientation is collected through self-completion questionnaires as the variable *sexuor* with the question "*Which of the following options best describes how you think of yourself?*". Respondents could choose between the options 1 "heterosexual or straight", 2 "gay or lesbian", 3 "bisexual", 4 "other" and 5 "prefer not to say".

This self-identification approach, collected via self-completion mode, allows for comparably good response rates and a valid acquisition of sexual orientation (Umberson et al., 2015). Despite the measures taken for increased privacy and anonymity, persons identified as sexual minority individuals are likely to be a selective group of those who are generally open about their sexual orientation (response bias) (Umberson et al., 2015).
While Understanding Society's measure may further miss the complexity of sexual orientation, as it doesn't assess the multidimensionality, identities beyond lesbian, gay, and bisexual, and the continuum of sexual orientation, the measure of sexual orientation deployed in Understanding Society has been utilized in previous sexual minority research and has demonstrated validity due to its high agreement with multi-item instruments (kappa statistics of 0.89) (Dharma & Bauer, 2017).

Sexual orientation isn't assessed annually to diminish the respondent's burden. By being a rotatory module, Understanding Society however accounts for the fluidity of the construct (ISER, 2023a). While adults above age 21 were asked for their sexual identity in waves 3 and 9, young adults aged 16 to 21 were questioned biannually from wave 3 onwards (sexual orientation measure available in waves 3, 5, 7, 9, and 11). With that, the identity discovery, development, and consolidation phase of sexuality in adolescence are accounted for (Iguartua et al., 2009; Rosario et al., 2006).
While the assessment of sexual orientation across multiple waves is an advantage of Understanding Society in terms of accurately portraying the fluid nature of the variable, it brings its challenges for the current research. It is overly complex to account for changes in sexual orientation in connection with what that implies for experiencing the event of marriage and its effect on mental health. To simplify the analysis, sexual orientation will therefore be treated as a time-constant variable, even though this doesn't represent the reality of the scientifically demonstrated fluidity of sexuality (Iguartua et al., 2009, Rosario et al., 2006). While the assumption that sexual orientation remains relatively stable over time is true for most individuals (APA, 2008), this implementation is seen as a significant limitation. In the present study, 310 individuals (1.50% of the total analytical sample) indicated a change in their sexual orientation across the observed person-years (for more details s. Appendix 6).

To operationalize sexual orientation as a fixed variable, the study uses a respondent's last valid answer from the *sexuor* variable across all years (Last Observation Carried Forward method, LOCF; Gad & Abdelkhalek, 2017). Compared to other options, such as fixing the most frequent answer (mode) of sexual orientation or to regard every individual who has identified with a non-heterosexual orientation at least once as a sexual minority individual, using LOCF is assumed to reduce bias as both the mode as well as past identifications may not accurately depict a person's current sexual orientation status and overlook fluidity. The chosen approach therefore best respects an individual's autonomy, agency, and self-determination in defining their sexual orientation. To secure that results are not dependent on the choice of imputation method, robustness checks considering different operationalisations of sexual orientation are performed (s. section 4.3).

Based on these considerations the new variable *LGB* is created, which reflects a respondent's last valid answer on *sexuor*. Participants, who across the whole panel consistently responded with the categories 4 "other", 5 "prefer not to say" or missing responses are excluded from the analysis, as their sexual orientation cannot be clearly identified. Although differences in the marriage effect by gender and specific sexual orientations are theoretically expected (Balsam et al., 2005; Fischer et al., 2016; LeBlanc et al., 2018; Morgenroth et al., 2022; Simon, 2002; Strohschein, 2005; Umberson, 1992), the main analysis does not differentiate between lesbian, gay, and bisexual respondents due to small sample sizes of these distinct categories experiencing the event of marriage. Instead, the categories are merged into one sexual minority (LGB) group and compared to heterosexuals as the overarching influence of minority stress still uniquely differentiates these groups.

3.2.4 Control Variables

To accurately estimate the effect of marriage on mental health, it is essential to account for potential confounding variables that could create spurious correlations or suppressor relationships (De Vaus, 2001). At this, it is important to consider all factors that could disrupt the relationship between marriage, sexual orientation, and mental health, but to also make parsimonious, well-reasoned choices of which factors to include, to avoid overfitting models or harmfully distorting estimates, particularly in a study with limited sample size. Therefore, only highly relevant, time-variant variables that are unidirectional common causes of entering marriage, mental health, and sexual orientation are included. As within-person estimations are used for the later analyses, unobserved heterogeneity originating from time-constant confounders (such as education or gender) is already accounted for (Brüderl & Ludwig, 2015). To control for temporal heterogeneity, the analysis considers age and period variations. Effects related to cohort differences and

social changes are also addressed through the within-person design of the analysis (Brüderl & Ludwig, 2015).

Age influences the likelihood of experiencing the event of first marriage, as shown by uniform age patterns of nuptiality frequencies across different societies (Coale, 1971). While the age of peak marriage risk varies by cohort and country, in Great Britain there has been an overall shift toward later (different-sex) marriages and a general decline in prevalence over time (Beaujouan & Bhrolcháin, 2011).
Research also indicates that age influences mental health, though findings are mixed. This is partially due to physical comorbidities or other age-related risk factors influencing mental health (Kessler et al., 2009; Jorm, 2000), or due to the age-period-cohort (APC) identification problem, which complicates the separation of age, period, and cohort effects on mental health (Bell, 2014). While the majority of people express mainly stable and high levels of mental health across time (Hopman et al., 2009), the prevalence of psychiatric disorders and symptoms is often found to decrease as people age, leading to overall improvements in mental health over the life course (Bell, 2014; George, 2013; Jorm, 2000; Ware et al., 1998). Cohort confounding shows that younger cohorts tend to have lower general mental health (Bell, 2014; George, 2013). Specifically related to the positive impact of marriage on mental health, Guner et al. (2018) found that the health gap between married and unmarried persons increased with age.
Age and cohort may also influence sexual orientation and openness about one's identity. Adolescence and young adulthood are key periods for sexual orientation discovery and consolidation, with greater fluidity observed in these phases compared to later adulthood where sexual orientation tends to stabilize (Iguartua et al., 2009; Rosario et al., 2006). Recent cohorts show a trend toward faster self-identification and earlier disclosure of sexual orientation (Bishop et al., 2020; Floyd & Bakeman, 2006).
Given these considerations, age is added as a confounder. Therefore, valid, non-negative values of the metric variable *age_dv*, which ranges from 15 to 104 years, are used. This derived variable, which is calculated from the date of birth held in the sample administration database and the interview date, is preferred over other age variables in Understanding Society since its computation and handling of missings allows for high reliability and since it has a higher information value than categorical age indicators. For further details on age modeling, including the decision to use a linear form based on model fit, see the attached do-files "01_datawork.do" and "02_dataanalysis.do".

To accurately estimate the effect of marriage on mental health, it is essential to account for significant legal and social changes over time, such as the legalization of same-sex marriage in Great Britain (2014) and Northern Ireland (2020). As pivotal moments in sexual minority rights, these events represent critical period shifts that impact access to marriage, mental health, and the openness of sexual orientation among

sexual minorities. While gradual periodic effects cannot be accounted for due to the APC-problem, the legalizations mark permanent shifts of increased equality, acceptance, and visibility of sexual minority individuals. Previous research has also shown that the legalization of same-sex marriage positively affects the mental health of sexual minority individuals, independently of their marital status (e.g. Crespi, 2015; Gonzales, 2014; Gonzales & Blewett, 2014; Hatzenbuehler et al., 2012; Herdt & Kertzner, 2006; Herek, 2006; Kail et al., 2015; Kertzner, 2012; Pereira & Monteiro, 2017; Rostosky et al., 2009; Tatum, 2017; Teo et al., 2022).

Based on this argumentation, period is added as a confounder to in the form of period dummies portraying the discrete events of same-sex marriage legalization in Great Britain in 2014 (*perioddummy_2014*) and in Northern Ireland in 2020 (*perioddummy_2020*).

Apart from age and period, other time-variant potential confounders such as social support, parental status, partnership quality and length of relationship were considered, but finally not added to the analysis due to the complexity of their relationship to sexual orientation, missing unidirectionality, or issues with data availability and large amount of missing values.

3.3 Analytical Strategy and Statistical Methods

To provide an overview of the dataset and understand the distribution of key variables, first, descriptive statistics are presented by sample affiliation (full analytical sample, treatment, and control group). For continuous variables (mental health), T-tests, for categorical variables with two groups (marriage), chi-squared tests, and for categorical variables with more than two groups (sexual orientation), ANOVA with post-hoc Tukey's Honest Significant Difference tests are conducted to examine whether differences in distributions are significant. While descriptive analyses don't allow assessment of the hypotheses, they present characteristics of the analytical sample and provide context for the regression results.

In order to answer the research question and test the hypotheses, within-person fixed-effect regression models are step-wise constructed. In the first model (M1) a bivariate regression of the event of marriage (*marriage_dummies*) and mental health (*mentalhealth*) is performed, to assess how the event of marriage generally influences an individual's mental health over the different event periods. To isolate the result from interfering factors, the second (M2) and further models incorporate the temporal confounders *age* and discrete period (*perioddummy_2014* and *perioddummy_2020*). For the comparison of the marriage effect by sexual orientation, separate models are estimated for sexual minority (LGB) (M3_1) and heterosexual individuals (M3_2) to maintain parsimony and account for baseline differences in mental health. Separate models allow for different assumptions, for instance concerning variance and

distributions, for each sexual orientation group, which is beneficial as heterosexual and LGB individuals show varying standard errors. While a single model with cross-level interaction would be more efficient for small sample sizes of married sexual minority individuals and would enable direct tests of differences across sexual orientation groups, separate models better portray distinct group dynamics and improve result accuracy and interpretability.

It is crucial to note that the fixed-effect parameters are derived from varying subsets of the sample. While the reference category of the marriage dummies, which reflects the baseline mental health level, is based on the whole analytical sample, the distinct marital phase parameters only utilize treatment group observations. Variability in the number of observations underlying the different marital phase parameters further arises from differing marriage durations, participation gaps and sample-restriction related exclusion of person-years. This variability should not significantly impact the results as heterogeneity has thoroughly been cleared in the sample selection and as the fixed effects models balance these irregularities. However, small sample sizes for sexual minority individuals, especially in the short-term period, may affect the reliability of fixed effects estimates. Detailed statistics on the observation distribution underlying the estimation of each marital phase parameter for each sexual orientation group are provided in Appendix 7.

Additional fixed effect analyses by distinct sexual orientation or gender have been considered to portray a more nuanced picture of potential marriage effects. The number of observations of these subgroups however appeared to be insufficient for reliable fixed effect estimation (s. Appendix 7). To still provide insights and context, the sexual orientation subgroups (i.e. gay, lesbian, and bisexual identity) are regarded in the descriptive analysis.

To ensure consistency of the findings, several robustness checks are conducted. These checks examine whether the marriage effects vary when different specifications of sexual orientation and marital phases are used.

All analyses are conducted using STATA 17 software (StataCorp, 2021), with additional modules such as distinct for simplified reporting of number of persons and person-years (Cox & Longton, 2008), estout (Jann, 2004, 2005, 2007) used for consistent and clear presentation of regression outputs, xttest3 for Modified Wald statistics for groupwise heteroskedasticity (Baum, 2001), and fitstat (Long & Freese, 2000) for model fit and information criteria. The corresponding do-file “02_dataanalysis.do” is available as an attachment to this thesis.

3.4 Regression Assumptions and Diagnostics

To ensure accurate and reliable results, the assumptions of multiple fixed effect regression models must be met (Wooldridge, 2010). Besides correct model specification, a random sample is required to estimate fixed effects. Since UKHLS data is collected through random sampling, cross-sectional selectivity is not expected to be an issue. While assessing linearity is challenging due to the nature of the data, no severe deviations from linearity were observed, suggesting that the linearity assumption is reasonably met. The exogeneity assumption, requiring that independent variables are uncorrelated with the error terms (Wooldridge, 2010), was tested using Durbin-Wu-Hausman tests to compare fixed effects and random effects models. The small p-value of the Hausman test ($p \leq 0.00$) indicates systematic differences in coefficients between the models. As this further suggests that the random effects model is likely inconsistent, fixed effect models are preferred for analyzing the relationships of interest (Hausman, 1978). Variables were operationalized in a way that ensures no high correlation among independent variables. The variance inflation factor (VIF) for the independent variables, calculated via an auxiliary OLS regression, is below 5 (mean VIF = 1.01), indicating no strong multicollinearity. It should be noted, that the estimation of VIF using auxiliary regressions might however not be robust in the presence of high leverage collinearity-enhancing observations in panel data (Ismaeel et al., 2021). The assumption of constant variance of error terms across all levels of the explanatory variables (homoscedasticity) was tested using the Modified Wald test. A p-value less than 0.05 led to rejecting the null hypothesis of homoscedasticity, indicating the presence of heteroskedasticity across groups (Greene, 2012). In panel data, errors should further not be correlated across time within the same entity (Wooldridge, 2010). The Wooldridge test for autocorrelation however revealed that there is significant evidence of first-order autocorrelation in the model's residuals, given the small p-value ($p \leq 0.00$). To address the issues of heteroskedasticity and autocorrelation, which can lead to inefficient estimates, invalid inferences, and biased standard errors, cluster-robust standard errors are used (Arellano, 1987). Detailed regression diagnostics testing these assumptions are presented in Appendix 8.

3.5 Ethical Considerations and Positionality

To ensure its integrity this study adheres to stringent ethical guidelines, discussed in this section.

Understanding Society follows an extensive Code of Ethics, including the Economic and Social Research Council Research Ethics Framework, Northern Ireland Statistics and Research Agency Ethical Guidelines, and the UK Data Protection Act, to prevent harm to its participants. Informed consent, voluntary participation, and confidentiality of data are ensured by comprehensive principles. These procedures are approved by various ethics committees, ensuring that ethical and legal obligations are always met (ISER, 2023a; Lynn & Knies, 2016).

Regarding the main variables of interest, specific considerations should be mentioned. Despite interviewers' confidentiality obligations, maintaining secrecy within households can be challenging, as family members may perceive they have the right to know what their kin answered or are present in the interview room. This might particularly affect the mental health variable in the present study and its assumed suggestibility by the partner and marriage, as replies may differ depending on who is present, or contamination effects might set in (Lynn & Knies, 2016). Generally, mental health and sexual orientation are sensitive topics that need special ethical regard. Understanding Society ensures increased privacy in the data collection by using self-completion questionnaires for these variables, which also allows heightened construct validity by mitigating social desirability bias (D'Ardenne, 2017; Tourangeau & Yan, 2007). Furthermore, the access to information on sexual orientation is safeguarded, requiring a Special Licence.

More information on considerations regarding data management can be found in the data user guide presented in Appendix 9. To enhance transparency the STATA do-files created for this thesis as supplementary material. Generative Artificial Intelligence (GenAI), particularly ChatGPT, has been used for brainstorming, statistical coding, and text improvement (for more information s. Appendix 10).

Lastly, as part of the ethical considerations, the positionality of the researcher is reflected. As the researcher does not belong to a sexual minority group, it is crucial to approach the research with sensitivity and awareness of potential biases. Previous qualitative studies have shown that some individuals in same-sex marriage express ambivalence towards the institution of marriage, viewing it as patriarchal and heteronormative (Bosley-Smith & Reczek 2018; Rostosky et al., 2016; Schecter et al., 2008; Stambolis-Ruhstorfer & Descoutures, 2020). Considering this, it is crucial to be mindful of not imposing a heteronormative lens onto the experience of sexual minority individuals. Consequently, this study aims to acknowledge and reflect on the unique meaning and impacts of marriage for sexual orientation minority individuals, rather than solely applying traditional marriage-effect paradigms from different-sex relationships.

While theoretically acknowledging the unique experiences of sexual minority individuals, the study methodologically includes some heteronormative elements. The assumption of a fixed sexual orientation over time contradicts evidence of its fluidity (Iguartua et al., 2009; Rosario et al., 2006). Using the most recent valid observation to impute sexual orientation may lead to misidentification and biased estimates. Given the small sample size of sexual minority individuals, such misidentifications are an important concern as they could substantially distort findings.

4 Analysis and Results

4.1 Descriptive Analyses

First, the distribution of the key variables by sample affiliation is presented, to highlight differences between participants who transitioned from cohabitation to first marriage (treatment group) and those who remained continuously single or living as a couple (control group). In-depth statistics and descriptions are available in Appendix 11.

Mental health scores are generally very densely distributed around the mean and both high and low values are rare. Participants who married report higher and more consistent average mental health scores at their initial observation compared to those who did not marry. This difference is statistically significant, suggesting that individuals with better mental health may be more likely to select into marriage.

Most respondents identified as heterosexual in their last valid panel interview. Sexual minorities only account for a very small share of the sample, with bisexual individuals being the largest group, followed by gay and lesbian participants. Even less sexual minority individuals are among the married sample, with only 46 bisexual persons, 20 gay persons, and 16 lesbian persons transitioning from cohabitation to first marriage during the observed period. This association between sexual orientation and marriage status is statistically significant, indicating differences in marriage rates across sexual orientation groups.

Next, additional descriptive statistics on mental health are presented, focusing on its relationship with sexual orientation, age, and changes over time, to provide further context for the research.

Heterosexual respondents, on average, have higher mental health scores at initial observation compared to sexual minority respondents (s. visualizations and a more detailed description in Appendix 12). Within the sexual minority group, gay individuals have higher mental health scores than lesbian respondents, while bisexual participants indicate the lowest initial mental health. These differences in mental health scores between sexual orientation groups are statistically significant.

Regarding information on mental health dynamics over time, Appendix 13 presents visualizations and detailed descriptions of these patterns for sexual minority individuals compared to heterosexuals by age and wave. The shape of the mental health distribution by age differs for heterosexual and sexual minority individuals. For heterosexual individuals the mean age distribution approximately forms a U-shape over the lifecourse, while for sexual minority individuals, mental health generally increases with age. Overall, the mental health of sexual minority respondents is consistently lower than that of heterosexuals across all ages, but the gap decreases over the life course. However, this analysis does not control for cohort effects, therefore an age-related increase in mental health cannot be conclusively determined.

Also across UKHLS waves, heterosexual respondents consistently have higher average mental health scores than sexual minority individuals. Initially in wave 1, the difference is small, but it widens over time

as both groups' mental health scores decline, with a steeper decrease observed among sexual minority individuals. Notable increases in mental health occur around waves 6, and for the sexual minority group also in wave 12, which is potentially linked to the legalization of same-sex marriage in Great Britain in 2014 and Nothern Ireland in 2020.

Finally, the combined descriptive analysis of mental health by marriage and sexual orientation provides insight into the relationships of the constructs of interest and gives an initial understanding for Hypothesis 2 (s. Table 3 and Figure 2).

Across all sexual orientations, individuals who marry (treatment group) have higher mental health scores at their first observation than those who remain unmarried (control group). The extent of this marriage-related mental health gap however varies by sexual orientation. Among both the married and the unmarried sample, heterosexuals have the highest mean mental health scores. The difference in mean mental health between heterosexuals who marry (50.15) and those who do not (49.03) is 1.51 points, which is a meaningful variation considering the MCS-12 measure's norm-based standard deviation of 10. For homosexual individuals, the gaps are even more pronounced: gay respondents who marry have an average 3.78 points higher mental health than those who stay unmarried, and lesbian respondents show a substantially large gap of 9.68 points. These variations might however be influenced by the small sample sizes of sexual minority individuals who get married. Bisexuals report the lowest average mental health scores among both those who marry (42.93) and those who remain unmarried (41.70). In addition to mean differences, the distribution of mental health scores is strongly compressed among ultimately married individuals, especially for gay and lesbian respondents. This compression is characterized by lower standard deviations, and smaller (interquartile) ranges, indicating less variability in mental health among respondents who marry compared to the control group. In contrast, unmarried individuals exhibit more extreme outliers, particularly very low mental health scores. While smaller sample sizes of individuals who get married might contribute to this compressed distribution, the consistency of this pattern across different sexual orientations suggests that those who marry, particularly gays and lesbians, are a homogenous, selective group with relatively stable and better mental health.

Table 3: Descriptive Statistics - Mental Health by Sexual Orientation by Sample Affiliation (unweighted sample)

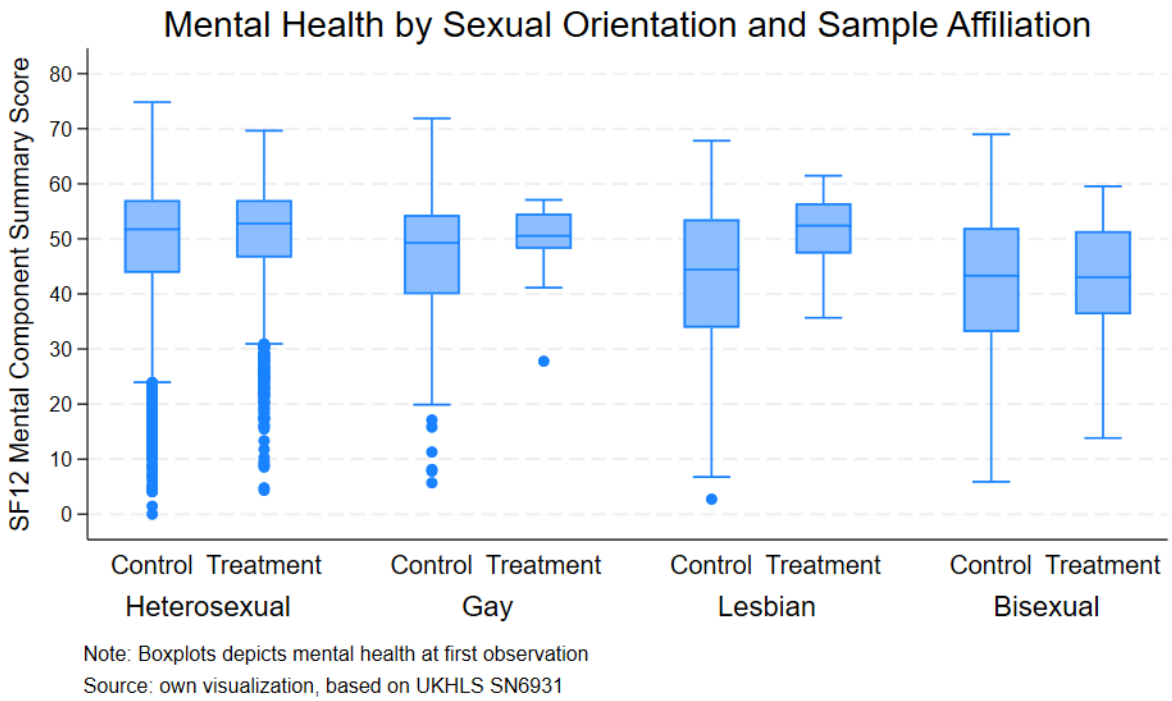
Multivariate Descriptive Table - Mental Health at Sample Entry by Sexual Orientation and Experiencing Marriage

		Full Analytical Sample				Treatment (Marriage) Sample				Control Sample				
		n	**Mean (SD)**	**Min - Max (Range)**	**95% CI**	**n**	**Mean (SD)**	**Min - Max (Range)**	**95% CI**	**n**	**Mean (SD)**	**Min - Max (Range)**	**95% CI**	**Mean Difference**
Sexual Orientation	Hetero-sexual	19,420	49.27 (10.12)	0 - 74.83 (74.83)	[49.13, 49.42]	3,109	50.54 (9.02)	4.32 - 69.66 (65.34)	[50.22, 50.85]	16,311	49.03 (10.30)	0 - 74.83 (74.38)	[48.88, 49.19]	1.50
	Gay	357	46.58 (11.38)	4.85 - 71.89 (67.04)	[45.50, 47.80]	20	50.15 (6.90)	27.77 - 57.08 (29.31)	[46.92, 53.38]	337	46.37 (11.57)	4.85 - 71.89 (67.04)	[45.13, 47.61]	3.78
	Lesbian	192	42.94 (13.48)	2.73 - 67.82 (65.09)	[41.02, 44.86]	16	51.81 (6.49)	35.66 - 61.45 (25.79)	[48.36, 55.27]	176	42.13 (13.67)	2.73 - 67.82 (65.09)	[40.10, 44.17]	9.68
	Bisexual	746	41.78 (12.83)	5.89 - 68.98 (63.09)	[40.86, 42.70]	46	42.93 (11.09)	13.83 - 59.54 (45.71)	[39.64, 46.22]	700	41.70 (12.94)	5.89 - 68.98 (63.09)	[40.74, 42.66]	1.23
	Total	20,715	48.90 (10.40)	0 - 74.83 (74.83)	[48.76, 49.04]	3,191	50.43 (9.07)	4.32 - 69.66 (65.34)	[50.12, 50.75]	17,524	48.62 (10.60)	0 - 74.83 (74.38)	[48.46, 48.78]	1.81

Note: All statistics are calculated for respondents' first mental health observation in the panel; n refers to the number of persons.

Source: own calculation, based on UKHLS data, SN 6931

Figure 2: Boxplots Mental Health by Sexual Orientation and Sample Affiliation (Treatment vs. Control Group)



Note: Boxplots depicts mental health at first observation
Source: own visualization, based on UKHLS SN6931

4.2 Fixed Effect Regression Analyses

This chapter evaluates the effect of marriage on the mental health (of sexual minority individuals), using stepwise fixed effects regression models. The focus of this analysis is on the Model 3 regressions, which differentiate by sexual orientation, as all hypotheses can be evaluated by them. The regression outputs of all models are presented conjointly in Table 4.

The bivariate model (M1; Table 4, column 1) solely shows the effect of the transition into marriage on mental health without controlling for confounding variables or distinguishing by sexual orientation. It is based on the full analytical sample (130,885 observations from 20,715 respondents). According to the bivariate model, mental health decreases in all phases of marriage compared to the average unmarried mental health level. These changes in mental health across the marital trajectory appear highly significant as the p-values below 0.01 of all coefficients reveal. Based on the bivariate model, it therefore seems like there is a potential cumulative negative effect of marriage on mental health in this sample. The very low adjusted R-squared (0.00383) however indicates that the model likely doesn't predict mental health accurately.

In the multiple model (M2; Table 4, column 2), the control variables specified in section 3.2.4 are additionally included in the full analytical sample fixed effect regression. With the addition of these confounders the direction of the effects changes, now showing a positive influence of all marital phases on mental health. Compared to the average unmarried mental health level, in the anticipation phase the within-person mental health level already increases by 0.38 points (95%-CI = [0.06, 0.70]), ceteris paribus. This change is significant on an alpha-level of 5% as the p-value of 0.03 indicates. During the year of marriage, the mean mental health of a person is 0.06 lower than in the anticipation stage, but still on average increased by 0.32 points (95%-CI = [0.00, 0.64]) compared to the unmarried reference level. This change is significant at the 10% level ($p = 0.06$). Compared to the average pre-marital and never married mental health level, the within-person change in mean mental health is, with 0.61 points (95%-CI = [0.24, 0.97]), significantly ($p \leq 0.00$) the greatest short-term after marriage, holding the control variables constant. This means a further improvement of average mental health by 0.29 points after the year of the event. Over the long-term period (more than one year to up to 11 years after marriage), the mean mental health level experiences a slight decline but remains, on average, 0.56 points (95%-CI = [0.22, 0.90]) significantly ($p \leq 0.00$) than the average mental health level of unmarried individuals when considering the average of all the years within this period. Testing for the total effect of marriage revealed that entering marriage overall has a highly significant effect ($p \leq 0.00$) on mental health.
As the AIC and BIC values decrease and the adjusted R-squared rises with the addition of control variables, the model with control variables (M2) demonstrates a proportionally better fit for explaining mental health compared to the simple bivariate regression model (M1).

To assess the hypotheses, Model 3 now integrates the distinction by sexual orientation by separately estimating one model for heterosexual respondents (M3_1; Table 4, column 3) and one for sexual minority (LGB) respondents (M3_2; column 4). The models are based on different numbers of observations: To estimate the parameters of the heterosexual model (M3_1), 123,167 observations stemming from 19,420 respondents have been used. The sexual minority model (M3_2) is based on 7,718 observations from 1,295 gay, lesbian, and bisexual participants. To facilitate the interpretation and visualize the differences in marriage effects between the sexual orientation categories, the average within-person mental health trajectories over the transition into marriage are illustrated in Figure 3.

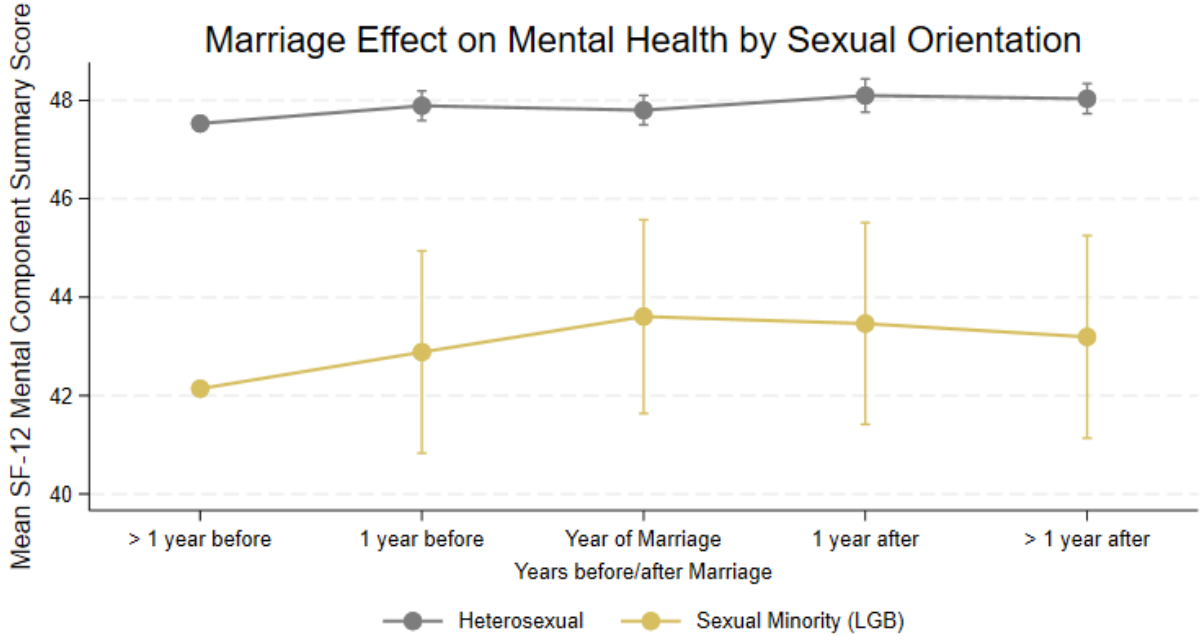
Table 4: Fixed Effect Models - Regression Output

Fixed Effect Regressions for the Effect of Marriage on Mental Health

	Bivariate Model estimate [95%-CI]	Full Model estimate [95%-CI]	Full Model Heterosexual Sample estimate [95%-CI]	Full Model Sexual Minority Sample estimate [95%-CI]
Main Effect				
Transition into Marriage (Ref.:*Pre-Marriage or Control Group*)				
Anticipation (1 year before marriage)	-0.719*** [-1.036,-0.401]	0.380** [0.0582,0.702]	0.359** [0.0336,0.685]	0.745 [-1.359,2.848]
Year of Marriage	-1.204*** [-1.517,-0.891]	0.319* [-0.00469,0.642]	0.270 [-0.0572,0.597]	1.466 [-0.567,3.498]
Short-term after (1 year after marriage)	-1.291*** [-1.638,-0.943]	0.607*** [0.244,0.970]	0.567*** [0.199,0.935]	1.323 [-0.785,3.431]
Long-term after (2 - 11 years after marriage)	-2.709*** [-3.010,-2.408]	0.559*** [0.216,0.903]	0.504*** [0.156,0.852]	1.053 [-1.096,3.203]
Control Variables				
Age		-0.395*** [-0.417,-0.373]	-0.386*** [-0.409,-0.364]	-0.530*** [-0.631,-0.429]
Period - Years of Same-Sex Marriage Legalization				
Year 2014 (England, Wales, Scotland)		0.441*** [0.292,0.590]	0.429*** [0.277,0.581]	0.646* [-0.0864,1.378]
Year 2020 (Northern Ireland)		-0.481*** [-0.659,-0.302]	-0.489*** [-0.673,-0.305]	-0.358 [-1.107,0.390]
Constant	47.59*** [47.55,47.62]	60.72*** [59.98,61.46]	60.81*** [60.05,61.57]	58.62*** [55.53,61.71]
Adjusted R-squared	0.00383	0.0274	0.0268	0.0353
AIC	883784.9	880657.9	826661.1	53742.8
BIC	883824.1	880726.3	826729.2	53791.4
N	130885	130885	123167	7718

Source: own calculations, data from UKHLS SN6931 (wave 1-13)
* p < 0.10, ** p < 0.05, *** p < 0.01

Figure 3: Visualization Marriage Effect across Time based on Heterosexual and Sexual Minority Fixed Effect Regression Models



Note: The depicted lines are based on different number of observations and separate fixed effects regression models
Source: own visualization, based on UKHLS SN6931

Across both models all phases of the transition into marriage show positive effects. The mental health trajectory of heterosexuals (M3_1) over the transition into marriage thereby matches the one of the full analytical model (M2): Already one year before marriage the average mental health increases by 0.36 points (95%-CI = [0.03, 0.69]) within-persons compared to the mean unmarried mental health level, ceteris paribus. In the following year of marriage the mental health decreases a bit again (0.09 points difference between anticipation phase and year of marriage), but is still 0.27 points higher compared to the average pre-marital and unmarried mental health level, holding the control variables constant. The 95% confidence interval (95%-CI = [-0.06, 0.58]) however indicates that for some heterosexual individuals, the effect of the year of marriage can also be negative, though this decrease in mental health is of negligible size. In relation to the reference period, an individual's mental health is the highest in this phase short-term after marriage (0.57; 95%-CI = [0.20, 0.94]). With further years passing after marriage the mental health benefits decrease a bit by around 0.06 points, but are still significantly higher long-term (0.50; 95%-CI = [0.16, 0.85]) than before marriage, in anticipation, or during the year of marriage. Compared to the model of the full analytical sample (M2), the effect of the year of marriage on mental health lost its significance ($p = 0.12$). All other marriage phase estimates remain significant: the anticipation effect is significant on an alpha level of 5% ($p = 0.04$), and the effects of the short-term ($p \leq 0.00$) and long-term phase after marriage ($p \leq 0.00$) are significant on an alpha-level of 1%. The total

effect of marriage on mental health for heterosexual individuals is highly significant as well ($p \leq 0.00$), as additional tests reveal.

For sexual minority individuals this pattern of mental health changes over the phases of marriage is different. Compared to the reference group, mental health typically increases over the anticipation phase (0.75; 95%-CI = [-1.36, 2.85]) and peaks with an improvement of on average 1.47 points (95%-CI = [-0.57, 3.50]) during the year of marriage, holding the control variables constant. These results are generally in line with the expected direction of effects proposed in Hypothesis 1a. After marriage, the mental health within individuals on average decreases slightly, but ultimately stays higher than the average pre-marital or never married mental health level. At this, the within-person change from the year of marriage to one year after marriage (short-term) is connected to a reduction of 0.14 mental health points on average, and the change from this phase to multiple years after marriage (long-term) amounts to a decrease of 0.27 points of mean mental health, ceteris paribus. Therefore, sexual minority individuals benefit from an on average by 1.05 points (95%-CI = [-1.10, 3.20]) improved mental health long-term after marriage, compared to their average unmarried mental health level. As this is in contrast to the assumption that the positive effects of marriage on mental health are not sustained long-term, Hypothesis 1b is rejected.

When tested for the significance of the total effect of marriage, the high p-value of 0.61 indicates that overall, marriage does however not statistically significantly influence mental health for sexual minority individuals. This is not surprising as none of the individual marriage phase parameters are significant for the sexual minority sample (p-values between 0.18 and 0.52). As the parameters of marital phases are only based on very few observations for the sexual minority group (s. Appendix 7), the estimation is further not very precise. Additionally, the continuous specification of age likely reduces statistical power due to the limited number of sexual minority observations. Alternative models using categorical specifications of age (5-year intervals or 10-year intervals) did however also not yield significant marriage effects and were discarded due to their worse model fit, lacking parsimony, and lower informational content. The 95% confidence intervals reported throughout the text and depicted in Table 4 and Figure 3 show that the effect of each marital phase on mental health can vary vastly within the sexual minority group. Considering the lower ends of the 95% confidence intervals, marriage can even have sizable negative effects at each timepoint of the marital trajectory, till up to -1.36 points worse mean mental health in the anticipation phase in relation to the reference period, ceteris paribus. It is however also possible that sexual minority individuals benefit from even greater within person changes when the upper boundaries of the 95% confidence intervals are regarded. Some sexual minority individuals may

therefore experience a within-person change of up to 3.50 points increase in mental health in the year of marriage compared to the mean unmarried mental health level.

Despite the potentially negative manifestation of the marriage effect within the 95% confidence interval, on average marriage has an about twice as high effect on the mental health of sexual minority individuals than for heterosexual individuals across all marital phases. On average, the increase in mental health is 0.39 points greater for sexual minority individuals than for heterosexual individuals in anticipation, 1.20 in the year of marriage, 0.76 short-term, and 0.55 long-term after marriage. Based on these considerations, Hypothesis 2 is, contrary to expectations, not supported.

As underlined earlier in descriptive statistics, the graph additionally shows that there's a wide gap in the mean mental health level of sexual minority individuals compared to heterosexual individuals. Although sexual minority individuals show on average greater mental health gains from marriage, their mean mental health level continuously stays below the one of heterosexuals across all phases of the transition into marriage. Depending on the occurrence of the extremes of the 95% confidence interval values, the mental health gap between heterosexuals and sexual minority individuals could substantially decrease, but also further widen.

Looking at the effects of control variables allows for further contextualization of the marriage effects. In 2014, when same-sex marriage was legalized in England, Scotland, and Wales, both sexual minority as well as heterosexual individuals experience an increase in mean mental health scores, ceteris paribus. This positive effect of the 2014 legislation period is on average stronger for sexual minority individuals (0.65; 95%-CI = [-0.09, 1.38]) than for heterosexuals (0.43; 95%-CI = [0.28, 0.58]). Although the legalization period, and therefore the access to marriage, positively influences mental health, its impact on sexual minority individuals is smaller than the effects of actual marriage across all marital periods. These 2014 effects are statistically significant, with heterosexuals showing significance at the 1% level ($p \leq 0.00$) and sexual minorities at the 10% level ($p = 0.08$). In contrast, the effects of 2020, when same-sex marriage was legalized in Northern Ireland, are negative for both heterosexual individuals (-0.49; 95%-CI = [-0.67, -0.31]; significant at $p \leq 0.00$) and sexual minority individuals (-0.38; 95%-CI = [-1.11, 0.39]; not significant, $p = 0.35$). While this is contrary to the expectation of positive mental health impacts from the legislation and discrepant to the descriptive data, the broader context of the year 2020 must be considered. Although regional differences between Northern Ireland and Great Britain in social and cultural dynamics affecting the acceptance and integration of same-sex marriage could be at play, it is more likely that the Covid-19 pandemic and the connected economic downturns, lockdowns, and health crises contribute to the negative effects of 2020 on mental health scores. The observed descriptive increase in mental health

for sexual minority individuals in 2020 may reflect specific positive experiences of some persons, whereas the regression analysis provides a more nuanced view by adjusting for other influencing factors.
Regarding age, both sexual orientation groups show significant negative effects at an alpha level of 1% (p-values ≤ 0.00). At this, the decline is more pronounced for sexual minority individuals, with mental health on average decreasing by 0.53 points (95%-CI = [-0.63, -0.43]) each additional year of age, compared to 0.39 points (95%-CI = [-0.41, -0.36]) for heterosexual respondents. Considering that the age effects reflect yearly declines and are comparable in size to the marriage effects of heterosexuals, age strongly affects mental health and plays a crucial role. Especially for sexual minority individuals these strong negative age effects contrast the descriptive findings of rather consistent mental health increases with age. As the descriptive analysis doesn't control for confounding variables, its age trajectories likely reflect cohort effects. At this, younger cohorts of sexual minority individuals may experience better mental health due to improving societal conditions, support, and acceptance over time. Controlling for these cohort effects and other confounders, the fixed effects regression reveals that aging itself however negatively affects mental health, potentially due to age-related challenges that are not mitigated by societal changes.

The separate models both have an improved fit compared to the full analytical sample model (M2). According to AIC, BIC, and adjusted R-squared, the model for sexual minority individuals (M3_2) at this has the best model fit, which may however be connected to the reduced number of observations.

4.3 Robustness Checks

To assess the consistency of the findings under varying model specifications, several robustness were performed. Detailed descriptions and results of these robustness checks are available in Appendix 14 (differing sexual orientation specifications) and Appendix 15 (differing operationalizations of the marital phases).
First, it has been tested if different methods to fix sexual orientation over time lead to varying results. Regardless of the specification of sexual orientation, for sexual minority individuals marriage effects on mental health remain positive and statistically insignificant across all marital phases. However, the temporal pattern of the effect varies. For heterosexual individuals, the direction, size, and pattern of marriage effects over time is robust across all sexual orientation specifications.
Second, the robustness of marriage effects to different temporal specifications of marital phases was assessed. Again, all marriage effects for sexual minority individuals remain positive across different marital period specifications, but sizes and patterns vary. Extending the temporal periods generally increased marriage effects for sexual minority individuals, especially long-term effects, but substantially

decreased short-term ones. Also for heterosexual individuals most marital effects increased in size, but compared to sexual minority individuals the changes are not that vast.

An additional robustness analysis focusing solely on individuals who got married over the observed period and neglecting control group observations, indicated potential selection bias as all marriage effects are substantially smaller in size than in the main models for both heterosexual and sexual minority individuals. Furthermore, long-term effects take on a negative direction, which is of especially strong size for sexual minority individuals. It should be noted that these effects of models exclusively regarding persons that got married are based on very small samples and are not significant, yet they suggest distinct mental health trends for the control and treatment group.

Overall, across most robustness checks, marriage effects on the mental health of sexual minority individuals remained positive and larger than for heterosexuals, supporting the main findings and refuting Hypothesis 2. Regarding the temporal pattern of marriage effects for sexual minority individuals, there are however ambiguities connected to the changes of model and variable specifications. Hence, the findings concerning changes in sexual minority individuals' mental health over the marital trajectory are not robust, and a definite answer to sub-research question 1 and assessment of Hypotheses 1a and 1b can not be concluded from the main model. Furthermore, effects of selection into marriage seem to significantly influence results.

5 Discussion

5.1 Summary

This study aimed to investigate the effect that a transition from cohabitation to first marriage has on the mental health of sexual orientation minority (i.e. lesbian, gay, and bisexual) individuals. Using data from waves 1 to 13 of the United Kingdom Household Longitudinal Study (UKHLS), a total of 20,715 persons (1,295 sexual minority and 19,420 heterosexual individuals) were examined using fixed-effect regression models to portray within-person changes in mental health over the transition into marriage.

Overall, marriage was found to have a positive effect on the mental health of sexual minority individuals, although this effect was not statistically significant. Despite the lack of significance, the quantification of the effects is crucial, as sexual minority individuals experience substantial changes, with up to more than one-tenth increase in the standard deviation of mental health. While marriage generally improves mental health for most sexual minority individuals, the wide 95% confidence intervals suggest that marriage can also negatively affect the mental health of some.

To provide a nuanced understanding of these findings, two sub research questions were examined. The first sub-question focused on the transitional impact of marriage over time. In line with Hypotheses 1a, the mental health of sexual minority individuals already increases in the year before marriage and rises even further in the year of marriage. At this, the immediate effect of the event presents the biggest mental health increase compared to the pre-marital mental health level. After the event of marriage, the mental health of sexual minority individuals gradually decreases over time. These reductions are however relatively small in size and the post-marriage mental health level stays continuously higher than the mental health level of unmarried sexual minority individuals and even the one of the anticipation phase, contradicting Hypothesis 1b. However, none of these phase-specific effects were significant, and robustness checks indicated that this temporal pattern is inconsistent. Therefore, no definitive answer can be provided regarding the precise development of sexual minority individuals' mental health before, during, and after the event of marriage.

The second sub-question investigated differences between sexual minority individuals and heterosexuals. Both groups experience mental health benefits from marriage, but contrary to Hypothesis 2, the increase is consistently stronger for sexual minority individuals than for heterosexual ones. However, despite higher gains from marriage, sexual minority individuals show sustained lower average mental health than heterosexuals. Whether the slight convergence of mental health differences, stimulated by the greater mental health increases of sexual minority individuals, is significant or substantial and able to reduce mental health disparities can not be concluded.

Additional insights on the context of these findings reveal that there are significantly less sexual minority individuals among the persons that got married than among the group of persons that stayed single or living as a couple. A strong positive selection into marriage is suggested, with individuals who get married having higher initial mental health levels than those who remain unmarried. This selection effect was more pronounced among homosexual individuals than heterosexuals, although the small sample size of married lesbian and gay respondents may inflate these differences.

5.2 Discussion of Results in Connection to Theory and Previous Literature

The main finding of the on average heightened mental health of married sexual minority individuals compared to single or cohabiting unmarried ones is in line with the results of previous literature (LeBlanc et al., 2018; Riggle et al., 2010; Wight et al. 2013), which partially also reported non-significant positive effects due to small sample sizes (Chen & van Ours, 2018; LeBlanc et al., 2018).

As stated by the causation model, underlying mechanisms of increased social-emotional resources, advantageous behavioral influences, and shared economic and legal benefits, could be the explanation for the sizable positive effects on mental health that marriage on average provides (Chen & van Ours, 2018;

IOM, 2011; Mikucka et al., 2021; Stutzer & Frey, 2006). These mechanisms do not only directly enhance mental health but also indirectly benefit sexual minority individuals by reducing minority stressors. Specifically, heightened social-emotional support from the spouse and personal social network (Blekesaune, 2008; Chen & van Ours, 2018; Kamp Dush & Amato, 2005; Mikucka et al., 2021; Musick & Bumpass, 2012; Schecter et al., 2008; Stanley et al., 2010; Stutzer & Frey, 2006), but also validation from society at large (Badgett, 2009; Haas & Whitton, 2015; Rostosky et al., 2016; Schecter et al., 2008; Shulman et al., 2012), mitigate both internal and external minority stressors and promote the mental health of sexual minority individuals (Schecter et al., 2008). Additionally, spousal influence can deter unhealthy coping mechanisms and encourage healthier behaviors (Chen & van Ours, 2018). Finally, legal privileges and security conveyed through marriage offer further safeguards for sexual minority individuals, diminishing minority stressors and strengthening mental health (Haas & Whitton, 2015; Rostosky et al., 2016).

Nonetheless, a person's ability to benefit from mental health advantages depends on the dynamics and practices within the specific marital context. Individual circumstances such as poor marital quality, high conflict, or caring for an ill spouse may explain why marriage can negatively affect some sexual minority individuals (Carr & Springer, 2010; Mikucka et al., 2021). Next to that, variations by personal attributes and sexual orientation subgroups are expected (Chen & van Ours, 2018; Fischer et al., 2016; LeBlanc et al., 2018; Mikucka et al., 2021), which however couldn’t be specified in the analysis.

No previous study has examined the effect of marriage on the mental health of sexual orientation minorities across different marital phases. The anticipation and planning of marriage, combined with increased socio-emotional, behavioral, and financial investments, may explain the pre-marital increase in mental health. Additionally, sexual minority individuals may further build up heightened resilience to minority stressors as they prepare for the legally publicly anchored disclosure of their sexual orientation. Apart from being a positive life event connected to personal fulfillment and social recognition, the marriage ceremony itself may further feel like an instantaneous liberation from minority stressors and celebration of not only the relationship, but also one’s identity (Schecter et al., 2008), explaining the increased mental health in the year of marriage. While the year after marriage may lack the excitement and importance compared to the event itself, hence leading to the small decrease in mental health gains, this period may also be where the effects of increased legal and social integration, support, validation, security, and recognition of the relationship become most apparent to the sexual minority individual. All these positive mechanisms, once established, persistently grant elevated mental health stability long-term. Some particular benefits, such as improved legal protection for the children of married sexual minority parents, may only be fully realized long-term. The small decrease in marriage effects on mental health

over time may be attributable to habituation and adaptation to the marital situation (Mikucka et al., 2021; Stutzer & Frey, 2006). Beyond that, persistent experiences of minority stress despite the elimination of institutional discrimination could dampen the full potential of mental health. Still, the results suggest increased resilience to minority stressors provided by marriage is retained long-term, indicating that mental health benefits of marriage are not just "honeymoon" effects. Therefore, neither the long-term resource accumulation model (Chen & van Ours, 2018; Hughes & Waite, 2009; Kamp Dush & Amato, 2005) nor the short-term crisis adaptation model (Chen & van Ours, 2018; Hughes & Waite, 2009; Huntington et al., 2022) can exclusively describe the mental health trajectory over the course of marriage for sexual minority individuals. While the marriage effect of sexual minority individuals accumulates up to the year of the event, reductions occur in the years after, contradicting the long-term resource accumulation model, which posits long-term cumulative increases. However, contrary to the short-term crisis adaptation model, the overall positive effect of marriage on mental health persists long-term and is not just short-lived or falling back to the person-specific standard. The complex interplay between universal marriage-related benefits and minority stress likely is responsible for these more nuanced patterns of mental health changes over time that the previous heteronormative models don't fully capture. Therefore, a more integrated theoretical approach is needed to better understand the unique experiences of sexual minority individuals in the context of marriage.

The finding that the marriage effect on mental health is greater for sexual minority individuals than heterosexuals corresponds to the results of Wight et al. (2013) and can be explained in different ways. First, next to the universal mechanisms underlying the positive effect of marriage on mental health, marriage provides additional benefits for sexual minority individuals as it mitigates negative effects of minority stress uniquely experienced by this group (Rostosky et al., 2016). The social implications of marriage are likely to carry more weight for the mental health of sexual minority individuals because they are associated with the importance of equality in legal rights, public and visible confirmation of one's relationship and identity for oneself, important others, and society at large (Rostosky et al., 2016; Schecter et al., 2008). Second, sexual minority individuals may benefit from the general mechanisms of the marriage effect to a larger extent. For example, same-sex married individuals report higher levels of spousal support than persons in different-sex marriages, which can offer a protection for mental health (Donnelly et al., 2018). Also, as same-sex couples have fewer social connections and support for their partnership (Chen & van Ours, 2018), the increase of closer and more numerous familial ties through marriage (Schecter et al., 2008) can have stronger benefits for their mental health compared to heterosexuals. Third, sexual minority individuals may be less affected by the patriarchal heteronormative expectations underlying marriage, which may especially hinder mental health gains for heterosexual

women (Gove & Tudor, 1973; McHale & Crouter, 1992; Nock, 1998). For instance, sexual minority couples tend to be more equal in the division of household tasks (Giddings et al., 2014; Jepsen & Jepsen, 2015; Solomon et al., 2005), and may therefore also generally have more equal roles in marriage than traditional heterosexual families. There is also less societal expectation for sexual minority individuals to marry as for heterosexual individuals. Hence, sexual minority marriages are more selected and might be based on relationships with better relationship quality and a stronger, more explicit motivation to marry, which could positively influence mental health. Also transforming social norms and demographic changes affecting heterosexual and sexual minority individuals differently could be the reason for discrepancy in mental health gains of marriage. While the trend towards self-realization and diverse family trajectories reduces the centrality of marriage for heterosexuals (Lesthaeghe, 2010; Mills & Blossfeld, 2003; Oláh et al., 2018; Zaidi & Morgan, 2017) and thereby also the mental health benefits of the institution, for sexual minority individuals this diversity opens up previously unavailable heteronormative paths of family formation (Ophir et al., 2023), which through their new accessibility and equality are of greater importance and allow for higher mental health gains.

The various minority stressors sexual minority individuals face, such as prevailing stereotypes, prejudice, discrimination, victimization, internalized stigma, expectations of rejections and poor self-image (Meyer, 2003), may however also explain why sexual minority individuals continue to have lower average mental health than heterosexuals, despite higher gains from marriage.

Concerning the additional findings, the proportionally higher share of heterosexuals selecting into marriage is not surprising as the access to marriage has long been restricted for sexual minority individuals (Lau and Strohm, 2011). The heteronormative patriarchal connotation of the construct may not only deter sexual minority individuals from entering the institution, but also contributes to it not being an expected preset step in their life course (Bosley-Smith & Reczek, 2018; Rostosky et al., 2016; Schecter et al., 2008; Stambolis-Ruhstorfer & Descoutures, 2020). Furthermore, sexual minority persons have the additional possibility to enter a registered same-sex civil partnership as a form of legal union besides marriage. Selection of individuals with already higher mental health into marriage can be explained by individuals with better mental health being more attractive to potential partners, but also being more likely to decide to marry (Hank & Steinbach, 2018; Koball et al., 2010). Lower levels of perceived minority stress or better resilience and coping skills can be reasons for this mental health difference between sexual minority individuals that get married and those who stay unmarried (Chen & van Ours, 2018; Rostosky et al., 2016). While marrying a partner requires the legal and public disclosure of one's sexual minority identity, generally embracing and openly expressing the sexual identity typically increases mental health (Meyer, 2003; Morris et al., 2011).

5.3 Limitations and Strengths

This study is subject to several limitations that impact the interpretation, validity, and generalizability of results. As research on marriage effects for sexual minority individuals is scarce, there is a lack of theoretical explanation for the mental health changes across different phases of the marriage trajectory. Existing models for heterosexual individuals, such as the long-term accumulation model and the short-term crisis adaptation model, do not fully capture the mental health development of sexual minority individuals. Developing theories that move beyond heteronormative narratives is an important step for future research. While this study provides insights into the potential directions and magnitude of marriage effects on the mental health of sexual minority individuals, it does not delve into the mechanisms or moderators underlying these effects. Furthermore, the study may be subject to omitted variable bias, as some important confounders may not have been included due to a high number of missing values and sample size constraints. Although the fixed-effects regression analysis accounts for time-constant heterogeneity, time-varying factors like relationship duration (Kalmijn, 2017), relationship quality (Carr & Springer, 2010; Mikucka et al., 2021), social support (LeBlanc et al., 2018; Mikucka et al., 2021), welcoming environments (Riggle et al., 2010), and the strength of the desire to marry could still affect the results.

The validity of the findings might further be affected by the implemented variable operationalization and sample selection strategy. Regarding the sample selection, no restrictions were set for a minimum number of data points surrounding the transition event, which might introduce bias if incomplete information disproportionately affects certain phases. As the advisable restriction to only participants with sufficient observations however reduces the sample size, it was not feasible for the current study. Additionally, the definitions of the treatment and control groups should be viewed with caution. The treatment group may not fully be able to rule out adjacent effects of cohabitation or marital dissolution, since the length of pre-marital cohabitation or anticipation of marital dissolution were not regarded. Because of the missing constraint to a minimal number of observations, members in the control group may only be present in the panel for a short duration. As their abstention from marriage during the observed period does not imply that they would always remain unmarried beyond the available observations, this partially brief participation in the panel may bias results. Results may also vary depending on the amount and length of phases underlying the marriage transition operationalisation. Robustness checks indicate that the pattern and significance of the marriage effect over time change with different specifications of the length of the marital phases. Although the mental health variable is valid and reliable, the distribution and average level of mental health may be biased as health-related survey dropouts may result in an underrepresentation of individuals with poor mental health (Perales & Baffour, 2018). This could further lead to an overestimation of the marriage effect. However, the marriage effect on mental health could also

be reversely distorted as mental health was found to decline rather steeply over the course of the panel study, potentially due to panel effects or individual and societal factors. A further limitation is the necessary pooling of sexual minority individuals into one category due to sample size constraints. This lack of differentiation between distinct sexual and gender identities underestimates the heterogeneity in experiences and needs related to marriage and mental health. For instance, men in same-sex partnerships may be more affected by institutional settings than women, because they are more likely victims of homophobic beliefs and actions (Fischer et al., 2016). While sexual minority women show larger mental health issues (LeBlanc et al., 2018) and are happier cohabitating, male sexual minorities' mental health seems to improve more when entering marriage (Chen & van Ours, 2018). The larger benefit for men compared to women may further be connected to the patriarchal character of the institution and men's overall privileged status (Reczek et al., 2017). Bisexual individuals face unique stressors, such as erasure from both heterosexual and homosexual communities, as well as tension both from minority stress, but also from patriarchy and social expectations around marriage, resulting in distinct and more severe mental health challenges (Balsam et al., 2005; Morgenroth et al., 2022; Ophir et al., 2023). Even though the current study wasn't able to depict more refined sexual orientation differences in the marriage effect, the descriptive results already show vast variations in the initial mental health level, where bisexuals are the most disadvantaged. Additionally, the use of a single-indicator measurement of sexual orientation with limited response options, as employed in UKHLS, does not account for the multifaceted continuum and variety of identities (Igartua et al., 2009; Johns et al., 2013; Korchmaros et al., 2013; Lindley et al., 2012; Munoz-Laboy, 2004; Savin-Williams & Vrangalova, 2013; Young & Meyer, 2005). Moreover, while the operationalisation of sexual orientation as a time-constant variable is necessary for this analysis, it doesn't account for the fluidity of sexual identity (Iguartua et al., 2009; Rosario et al., 2006), and may result in inaccurate identification of sexual minority individuals. Robustness checks further showed that the imputation method used to create a time-constant sexual orientation variable affected both the size and temporal pattern of marriage effects.

As repeatedly mentioned throughout this section, the small sample size of this study is a root limitation that may introduce bias, prevents more in-depth analysis, and affects the generalizability, significance, and precision of the results. Apart from sample selection infringing the representativeness of the study population, the outcomes are also not applicable to a broader population since no weights or adjustments for unequal selection probabilities, differential non-response, and sampling error have been used. While using these correction measures would have resulted in an essential loss of participants, the results are based on the problematic assumptions of equal selection probability and response behavior among all participants and groups, including different waves, instruments, regions, and ethnicities (ISER, 2023a; Knies, 2018).

Despite these limitations, this study contributes to the generally scarce literature on marriage effects for sexual minority individuals in several ways. First, it advances previous studies by conducting longitudinal analysis based on high-quality population-based panel data. This approach overcomes the limitations of earlier cross-sectional studies (LeBlanc et al., 2018; Riggle et al., 2010; Umberson et al., 2015; Wight et al., 2013) and demonstrates that mental health gains attributed to marriage exist beyond mere selection effects. To the knowledge of the author, it furthermore is the first study that uses the longitudinal structure of the data to distinguish the effect of marriage on the mental health of sexual minority individuals across different temporal phases. Secondly, alongside the study by Chen and van Ours (2018), this research is one of the first attempts to examine marriage effects for sexual minority individuals outside the United States. This expansion is important, as the mental health potential of different union types is influenced by the social environment (Fischer et al., 2016). In European countries, where unmarried cohabitation is more accepted, marriage has a less central position (Soons & Kalmijn, 2009; Thornton & Young-DeMarco, 2001), and welfare states offer more generous support, individuals may benefit less from marriage, and the mental health difference between unmarried and married couples is smaller (Mikucka et al., 2021).

The study also has methodological strengths enhancing the validity of the results. The use of within-person fixed-effect models enhances statistical power in the context of a low number of cases and the need to only use a limited amount of predictors, as time-constant between-person differences are automatically controlled for (Brüderl & Ludwig, 2015). By focusing solely on transitions from cohabitation to first marriage and excluding influences of partnership formation, cohabitation, and marital dissolution, the study effectively isolates the marriage effect from other related impacts. While this strictness reduces the sample size, it enhances the reliability and validity of the results. Additionally, the self-identification of sexual minority individuals, although coming with its limitations, offers a more accurate depiction compared to the method of identifying sexual minority individuals by their partner's gender, as used by Chen and van Ours (2018). A final strength of the study is the comparison of the marriage effects on sexual minority individuals to those on heterosexual individuals as this allows for a better understanding, classification, and contextualization of the strength and meaning of the results.

6 Conclusion

The current study was motivated by the mental health disparities that sexual minority individuals face and the question of whether marriage, as a socially significant and increasingly legally accessible institution, could help mitigate these inequalities. Situated within the broader context of established mental health benefits of marriage for different-sex couples and the advantages of same-sex marriage legalization, this

study provides new insights into how marriage affects the mental health of sexual minority individuals over time, revealing both potential benefits and ongoing challenges.

While this study represents a first step for insights into the effects of marriage on the mental health of sexual minority individuals over time, more research is needed to substantiate and expand the results. Future studies should investigate under which conditions, for which outcomes, for whom, and through which pathways marriage, its context, and its transitional process affect mental health. This includes accounting for mediators (e.g. social-emotional resources, legal and economic benefits, and behavioral influences), moderators (e.g. the suppression of minority stress), further confounders, and a more nuanced differentiation between sexual and gender identities. Studies comparing the effects of various unions (e.g. marriage compared to registered domestic partnerships, cohabiting partnerships, living apart together unions) and exploring the impact of further intersecting factors such as race, socioeconomic status and cultural background are also needed. The comparison to other types of relationships allows contextualizing the size and scope of effects. Looking at intersectionality is critical, as multiple minority statuses can increase stress, enhance mental health risks, and alter the role of marriage. Individuals with more privileged statuses are likely to have more resources to cope with minority stress than those with fewer privileges (Rostosky et al., 2016). Additionally, as the rights and position of sexual minority groups within a nation may play a crucial role for the size of benefits they can yield from marriage, further research on other country contexts is necessary to gain better understanding of cross-country differences and country specific patterns (Blekesaune, 2008).

Despite growing efforts for data collection, the current lack of large-scale representative data constrains the ability to draw generalizable conclusions, especially for comparative studies that require a high number of sexual minority participants. Research on marriage effects for sexual minority individuals has been especially limited due to the relatively recent legalization of same-sex marriage and the resulting scarcity of comprehensive data (Umberson et al., 2015). Future research should leverage increased data collection efforts and the incorporation of sexual orientation questions in large-scale surveys (Badgett et al., 2021; Ophir et al., 2023; Perales et al., 2020; Reczek, 2020). Doing so will help to fill gaps in understanding of how marriage affects the mental health of sexual minority individuals.

In conclusion, while the mitigation of institutional discrimination through the legalization of same-sex marriage opens up pathways that can enhance the mental health of sexual minority individuals, persistent informal discrimination and minority stress create a backdrop to the social inclusion and benefits that marriage can provide (Fischer et al., 2016; Rostosky et al., 2016). Addressing ongoing mental health disparities requires broader normative tolerance beyond institutional equality (Fischer et al., 2016).

Further research on the interaction between minority stress, the legal environment and its effects on sexual minority individuals, is crucial for developing and providing adequate health services, psychoeducational programs, advocacy initiatives, and ally-building efforts (Rostosky et al., 2016; Rostosky & Riggle, 2011). While married sexual minority individuals generally exhibit higher initial mental health levels and experience improvements in their mental health over time, unmarried sexual minority individuals may face cumulative disadvantages, making them particularly vulnerable. Therefore, in addition to addressing persistent informal discrimination, policies focusing on the mental health of unmarried sexual minority individuals are essential to alleviate social inequalities and improve the overall mental health of the sexual minority population. Finally, ongoing efforts to obtain and expand representative data and research are necessary to draw robust conclusions and reduce discrimination and inequalities faced by sexual minority groups (Badgett et al., 2021; Council of Europe, 2010; Perales et al., 2020; Reczek, 2020; Umberson et al., 2015).

References

Reference to the Dataset Used

The present thesis uses the following data:

University of Essex, Institute for Social and Economic Research. (2023b). Understanding Society: Waves 1-13, 2009-2022 and Harmonised BHPS: Waves 1-18, 1991-2009: Special Licence Access. [data collection]. 17th Edition. UK Data Service. SN: 6931, DOI: http://doi.org/10.5255/UKDA-SN-6931-16

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Ethical approval statement:

The University of Essex Ethics Committee has approved all data collection on Understanding Society main study, COVID-19 surveys and innovation panel waves, including asking consent for all data linkages except to health records. Requesting consent for health record linkage was approved at Wave 1 by the National Research Ethics Service (NRES) Oxfordshire REC A (08/H0604/124), at BHPS Wave 18 by the NRES Royal Free Hospital & Medical School (08/H0720/60) and at Wave 4 by NRES Southampton REC A (11/SC/0274). Approval for asking consent for health record linkage and for the collection of blood and subsequent serology testing in the March 2021 wave of the COVID-19 study was obtained from London – City & East Research Ethics Committee (21/HRA/0644). Approval for the collection of biosocial data by trained nurses in Waves 2 and 3 of the main survey was obtained from the National Research Ethics Service (Understanding Society – UK Household Longitudinal Study: A Biosocial Component, Oxfordshire A REC, Reference: 10/H0604/2). The biosocial data collection at IP12 'Understanding Society Health Innovation Panel: Biomeasure and health data collection from the Innovation Panel of the UK Household Longitudinal Study' was approved by East of England – Essex Research Ethics Committee, Ref 19/EE/0146.

List of References

American Psychological Association. (2008, October 29). Understanding sexual orientation and homosexuality. https://www.apa.org/topics/lgbtq/orientation

Arellano, M. (1987). Practitioners' Corner: Computing Robust Standard Errors for Within-groups Estimators. *Oxford Bulletin of Economics and Statistics*, *49*(4), 431–434. https://doi.org/10.1111/j.1468-0084.1987.mp49004006.x

Averett, S. L., Argys, L. M., & Sorkin, J. (2013). In sickness and in health: An examination of relationship status and health using data from the Canadian National Public Health Survey. Review of Economics of the Household, 11(4), 599–633. https://doi.org/10.1007/s11150-012-9143-z

Badgett, M. V. L. (2009). When Gay People Get Married: What Happens When Societies Legalize Same-Sex Marriage. In *When Gay People Get Married*. New York University Press. https://doi.org/10.18574/nyu/9780814791141.001.0001

Badgett, M. V. L., Carpenter, C. S., & Sansone, D. (2021). LGBTQ Economics. *Journal of Economic Perspectives*, *35*(2), 141–170. https://doi.org/10.1257/jep.35.2.141

Balsam, K. F., Beauchaine, T. P., Mickey, R. M., & Rothblum, E. D. (2005). Mental Health of Lesbian, Gay, Bisexual, and Heterosexual Siblings: Effects of Gender, Sexual Orientation, and Family. *Journal of Abnormal Psychology*, *114*(3), 471–476. https://doi.org/10.1037/0021-843X.114.3.471

Barrett, A. E. (2000). Marital Trajectories and Mental Health. Journal of Health and Social Behavior, 41(4), 451–464. https://doi.org/10.2307/2676297

Baum, C. (2001), XTTEST3: Stata Module to Compute Modied Wald Statistic for Groupwise Heteroskedasticity. In: Statistical Software Components from Boston College Department of Economics. Chestnut Hill, MA, USA: Boston College Department of Economics.

Beaujouan, E., & Ní Bhrolcháin, M. (2011). Cohabitation and marriage in Britain since the 1970s. Population Trends, 145, 31–55. https://doi.org/10.1057/pt.2011.16

Bell, A. (2014). Life-course and cohort trajectories of mental health in the UK, 1991–2008 – A multilevel age–period–cohort analysis. Social Science & Medicine, 120, 21–30. https://doi.org/10.1016/j.socscimed.2014.09.008

Bishop, M. D., Fish, J. N., Hammack, P. L., & Russell, S. T. (2020). Sexual identity development milestones in three generations of sexual minority people: A national probability sample. Developmental Psychology, 56(11), 2177–2193. https://doi.org/10.1037/dev0001105

Blekesaune, M. (2008). Partnership Transitions and Mental Distress: Investigating Temporal Order. Journal of Marriage and Family, 70(4), 879–890. https://doi.org/10.1111/j.1741-3737.2008.00533.x

Blomgren, J., Martikainen, P., Grundy, E., & Koskinen, S. (2012). Marital history 1971-91 and mortality 1991-2004 in England & Wales and Finland. *Journal of epidemiology and community health*, *66*(1), 30–36. https://doi.org/10.1136/jech.2010.110635

Booker, C. L., Rieger, G., & Unger, J. B. (2017). Sexual orientation health inequality: Evidence from Understanding Society, the UK Longitudinal Household Study, Preventive Medicine, Volume 101, 126-132. https://doi.org/10.1016/j.ypmed.2017.06.010.

Bosley-Smith, E. R., & Reczek, C. (2018). Before and after "I Do": Marriage processes for mid-life gay and lesbian married couples. *Journal of Homosexuality*, *65*(14), 1985–2004. https://doi.org/10.1080/00918369.2017.1423213

Brüderl, J., & Ludwig, V. (2015). Fixed-effects panel regression. Sage Handbook of Regression Analysis and Causal Inference, 327–356.

Carr, D., & Springer, K. W. (2010). Advances in Families and Health Research in the 21st Century. *Journal of Marriage and Family*, *72*(3), 743–761. https://doi.org/10.1111/j.1741-3737.2010.00728.x

Chen, S., & van Ours, J. C. (2018). Subjective Well-being and Partnership Dynamics: Are Same-Sex Relationships Different? Demography, 55(6), 2299–2320. https://doi.org/10.1007/s13524-018-0725-0

Coale, A. J. (1971). Age patterns of marriage. Population Studies. https://www.tandfonline.com/doi/abs/10.1080/00324728.1971.10405798

Council of Europe, & Commitee of Ministers. (2010). *Empfehlung des Ministerkomitees an die Mitgliedstaaten über Maßnahmen zur Bekämpfung von Diskriminierung aufgrund von sexueller Orientierung oder Geschlechtsidentität*. https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=09000016804c2c2f

Cox, N. J., & Longton, G. M. (2008). Speaking Stata: Distinct observations. The Stata Journal, 8 (4), pp.557-568. Stata Press.

Crespi, L. (2015). Considering the impact of the legalization of same-sex marriage on the psychological health of lesbians. *Psychoanalysis, Culture & Society*, *20*(3), 228–232. https://doi.org/10.1057/pcs.2015.30

D'Ardenne, J., Collins, D., Gray, M., Jessop, C., & Pilley, S. (2017). Understanding Society. Assessing the risk of mode effects Review of proposed survey questions for waves 7-10 of Understanding Society. Understanding Society Working Paper Series, No.2017-04, NatCen Social Research.

De Vaus, D. A. (2001). Research design in social research. Reprinted. Los Angeles: Sage.

Dharma, C., & Bauer, G. R. (2017). Understanding sexual orientation and health in Canada: Who are we capturing and who are we missing using the Statistics Canada sexual orientation question? Canadian Journal of Public Health, 108(1), e21–e26. https://doi.org/10.17269/CJPH.108.5848

Donnelly, R., Robinson, B. A., & Umberson, D. (2019). Can Spouses Buffer the Impact of Discrimination on Depressive Symptoms? An Examination of Same-sex and Different-sex Marriages. Society and Mental Health, 9(2), 192–210. https://doi.org/10.1177/2156869318800157

Durkheim, E. (1982). The Rules of Sociological Method (S. Lukes, Ed.). Macmillan Education UK. https://doi.org/10.1007/978-1-349-16939-9

Durkheim, É., & Lukes, S. (2013). The division of labour in society (W. D. Halls, Trans.; Second edition). Palgrave Macmillan.

England, P., Mishel, E., & Caudillo, M. L. (2016). Increases in Sex with Same-Sex Partners and Bisexual Identity Across Cohorts of Women (but Not Men). *Sociological Science*, *3*, 951–970. https://doi.org/10.15195/v3.a42

Fischer, M. M., Kalmijn, M., & Steinmetz, S. (2016). Does tolerance matter? A comparative study of well-being of persons in same-sex and mixed-sex unions across nine European countries. *European Societies*, *18*(5), 514–534. https://doi.org/10.1080/14616696.2016.1207793

Flores, A. R. (2021). Social Acceptance of LGBTI People in 175 Countries and Locations, 1981 to 2020. UCLA School of Law, Williams Institute.

Floyd, F. J., & Bakeman, R. (2006). Coming-out across the life course: Implications of age and historical context. Archives of Sexual Behavior, 35(3), 287–296. https://doi.org/10.1007/s10508-006-9022-x

Franks, M. M., Pienta, A. M., & Wray, L. A. (2002). It Takes Two: Marriage and Smoking Cessation in the Middle Years. Journal of Aging and Health, 14(3), 336–354. https://doi.org/10.1177/08964302014003002

Frech, A., & Williams, K. (2007). Depression and the Psychological Benefits of Entering Marriage. Journal of Health and Social Behavior, 48(2), 149–163. https://doi.org/10.1177/002214650704800204

Frost, D. M., Meyer, I. H., & Hammack, P. L. (2015). Health and well-being in emerging adults' same-sex relationships: Critical questions and directions for research in developmental science. Emerging Adulthood, 3(1), 3-13. doi:10.1177/2167696814535915

Gad, A. M., & Abdelkhalek, R. H. M. (2017). Imputation Methods for Longitudinal Data: A Comparative Study. International Journal of Statistical Distributions and Applications, 3(4), 72-80. https://doi.org/10.11648/j.ijsd.20170304.13

George, L. K. (2013). Life-Course Perspectives on Mental Health. In C. S. Aneshensel, J. C. Phelan, & A. Bierman (Eds.), Handbook of the Sociology of Mental Health (pp. 585–602). Springer Netherlands. https://doi.org/10.1007/978-94-007-4276-5_28

Giddings, L., Nunley, J., Schneebaum, A., & Zietz, J. (2014). Birth Cohort and the Specialization Gap Between Same-Sex and Different-Sex Couples. Demography, 51(2), 509–534. https://doi.org/10.1007/s13524-013-0267-4

Gill, S. C., Butterworth, P., Rodgers, B., & Mackinnon, A. (2007). Validity of the mental health component scale of the 12-item Short-Form Health Survey (MCS-12) as measure of common mental disorders in the general population. Psychiatry Research, 152(1), 63–71. https://doi.org/10.1016/j.psychres.2006.11.005

Gilroy, C., & Kashyap, R. (2021). Digital Traces of Sexualities: Understanding the Salience of Sexual Identity through Disclosure on Social Media. *Socius*, *7*, 23780231211029500. https://doi.org/10.1177/23780231211029499

Gonzales, G. (2014). Same-Sex Marriage—A Prescription for Better Health. *New England Journal of Medicine*, *370*(15), 1373–1376. https://doi.org/10.1056/NEJMp1400254

Gonzales, G., & Blewett, L. A. (2014). National and State-Specific Health Insurance Disparities for Adults in Same-Sex Relationships. *American Journal of Public Health*, *104*(2), e95–e104. https://doi.org/10.2105/AJPH.2013.301577

Gove, W. R., Hughes, M., & Style, C. B. (1983). Does Marriage Have Positive Effects on the Psychological Well-Being of the Individual? *Journal of Health and Social Behavior*, *24*(2), 122–131. https://doi.org/10.2307/2136639

Gove, W. R., & Tudor, J. F. (1973). Adult Sex Roles and Mental Illness. *American Journal of Sociology*, *78*(4), 812–835. http://www.jstor.org/stable/2776605

Greene, W. (2012). Econometric analysis (7. ed., international ed.). Pearson.

Guner, N., Kulikova, Y., & Llull, J. (2018). Reprint of: Marriage and health: Selection, protection, and assortative mating. European Economic Review, 109, 162–190. https://doi.org/10.1016/j.euroecorev.2018.06.002

Haas, S. M., & Whitton, S. W. (2015). The Significance of Living Together and Importance of Marriage in Same-Sex Couples. *Journal of Homosexuality*, *62*(9), 1241–1263. https://doi.org/10.1080/00918369.2015.1037137

Hank, K., & Steinbach, A. (2018). Families and Health: A Review (pp. 23–39). https://doi.org/10.1007/978-3-319-72356-3_3

Hatzenbuehler, M. L., McLaughlin, K. A., Keyes, K. M., & Hasin, D. S. (2010). The Impact of Institutional Discrimination on Psychiatric Disorders in Lesbian, Gay, and Bisexual Populations: A Prospective Study. *American Journal of Public Health*, *100*(3), 452–459. https://doi.org/10.2105/AJPH.2009.168815

Hatzenbuehler, M. L., Nolen-Hoeksema, S., & Erickson, S. J. (2008). Minority stress predictors of HIV risk behavior, substance use, and depressive symptoms: Results from a prospective study of bereaved gay men. *Health Psychology*, *27*(4), 455–462. https://doi.org/10.1037/0278-6133.27.4.455

Hatzenbuehler, M. L., O'Cleirigh, C., Grasso, C., Mayer, K., Safren, S., & Bradford, J. (2012). Effect of Same-Sex Marriage Laws on Health Care Use and Expenditures in Sexual Minority Men: A Quasi-Natural Experiment. *American Journal of Public Health*, *102*(2), 285–291. https://doi.org/10.2105/AJPH.2011.300382

Hausman, J. A. (1978). Specification Tests in Econometrics. Econometrica, 46(6), 1251–1271. https://doi.org/10.2307/1913827

Herdt, G., & Kertzner, R. (2006). I do, but i can't: The impact of marriage denial on the mental health and sexual citizenship of lesbians and gay men in the United States. *Sexuality Research and Social Policy Journal of NSRC*, *3*(1), 33–49. https://doi.org/10.1525/srsp.2006.3.1.33

Herek, G. M. (2006). Legal recognition of same-sex relationships in the United States: A social science perspective. *American Psychologist*, *61*(6), 607–621. https://doi.org/10.1037/0003-066X.61.6.607

Hopman, W.M., Harrison, M.B., Coo, H., Friedberg, E., Buchanan, M., & Vandenkerkhof, E. (2009). Associations between chronic disease, age and physical and mental health status. *Chronic diseases in Canada, 29 3*, 108-16 .

Hox, J., Moerbeek, M., & Schoot, R. van de. (2010). Multilevel Analysis: Techniques and Applications, Second Edition (2nd ed.). Routledge. https://doi.org/10.4324/9780203852279

Hughes, M. E., & Waite, L. J. (2009). Marital Biography and Health at Mid-Life. *Journal of Health and Social Behavior*, *50*(3), 344–358.

Huntington, C., Stanley, S. M., Doss, B. D., & Rhoades, G. K. (2022). Happy, Healthy and Wedded? How the Transition to Marriage Affects Mental and Physical Health. Journal of Family Psychology : JFP : Journal of the Division of Family Psychology of the American Psychological Association (Division 43), 36(4), 608–617. https://doi.org/10.1037/fam0000913

Igartua, K., Thombs, B. D., Burgos, G., & Montoro, R. (2009). Concordance and discrepancy in sexual identity, attraction, and behavior among adolescents. The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine, 45(6), 602–608. https://doi.org/10.1016/j.jadohealth.2009.03.019

Institute of Medicine (US) Committee on Lesbian, Gay, Bisexual, and Transgender Health Issues and Research Gaps and Opportunities. (2011). *The Health of Lesbian, Gay, Bisexual, and Transgender People: Building a Foundation for Better Understanding*. National Academies Press (US). http://www.ncbi.nlm.nih.gov/books/NBK64806/

Institute for Social and Economic Research. (2023a). Understanding Society: Waves 1-13, 2009-2022 and Harmonised BHPS: Waves 1-18, 1991-2009, User Guide. Colchester: University of Essex.

Institute for Social and Economic Research. (2023b). Understanding Society: Waves 1-13, 2009-2022 and Harmonised BHPS: Waves 1-18, 1991-2009: Special Licence Access. [data collection]. 17th Edition. UK Data Service. SN: 6931, DOI: http://doi.org/10.5255/UKDA-SN-6931-16

Ismaeel, S., Midi, H., & Sani, M. (2021). Robust Multicollinearity Diagnostic Measure For Fixed Effect Panel Data Model. Malaysian Journal of Fundamental and Applied Sciences, 17, 636–646. https://doi.org/10.11113/mjfas.v17n5.2391

Jann, Ben (2004). ESTOUT: Stata module to export estimation results from estimates table. Available from http://ideas.repec.org/c/boc/bocode/s439301.html.

Jann, Ben (2005). Making regression tables from stored estimates. The Stata Journal 5(3): 288-308.

Jann, Ben (2007). Making regression tables simplified. The Stata Journal 7(2): 227-244.

Jepsen, C., & Jepsen, L. K. (2015). Labor-Market Specialization within Same-Sex and Difference-Sex Couples. Industrial Relations: A Journal of Economy and Society, 54(1), 109–130. https://doi.org/10.1111/irel.12078

Johns, M. M., Zimmerman, M., & Bauermeister, J. A. (2013). Sexual attraction, sexual identity, and psychosocial wellbeing in a national sample of young women during emerging adulthood. Journal of Youth and Adolescence, 42(1), 82–95. https://doi.org/10.1007/s10964-012-9795-2

Jorm A. F. (2000). Does old age reduce the risk of anxiety and depression? A review of epidemiological studies across the adult life span. *Psychological medicine*, *30*(1), 11–22. https://doi.org/10.1017/s0033291799001452

Josephson, J. (2005). Citizenship, Same-Sex Marriage, and Feminist Critiques of Marriage. *Perspectives on Politics*, *3*(2), 269–284. https://doi.org/10.1017/S1537592705050206

Kail, B. L., Acosta, K. L., & Wright, E. R. (2015). State-Level Marriage Equality and the Health of Same-Sex Couples. *American Journal of Public Health*, *105*(6), 1101–1105. https://doi.org/10.2105/AJPH.2015.302589

Kalmijn, M. (2017). The Ambiguous Link between Marriage and Health: A Dynamic Reanalysis of Loss and Gain Effects. Social Forces, 95(4), 1607–1636. https://doi.org/10.1093/sf/sox015

Kamp Dush, C. M., & Amato, P. R. (2005). Consequences of relationship status and quality for subjective well-being. *Journal of Social and Personal Relationships*, *22*(5), 607–627. https://doi.org/10.1177/0265407505056438

Kertzner, R. M. (2012). A Mental Health Research Perspective on Marital Rights and Civil Marriage for Lesbians and Gay Men. *Journal of Gay & Lesbian Mental Health*, *16*(2), 136–145. https://doi.org/10.1080/19359705.2012.652577

Kessler, R. C., Birnbaum, H. G., Shahly, V., Bromet, E., Hwang, I., McLaughlin, K. A., Sampson, N., Andrade, L. H., de Girolamo, G., Demyttenaere, K., Haro, J. M., Karam, A. N., Kostyuchenko, S., Kovess, V., Lara, C., Levinson, D., Matschinger, H., Nakane, Y., Browne, M. O., Ormel, J., … Stein, D. J. (2010). Age differences in the prevalence and co-morbidity of DSM-IV major depressive episodes: results from the WHO World Mental Health Survey Initiative. *Depression and anxiety*, *27*(4), 351–364. https://doi.org/10.1002/da.20634

King, M., Semlyen, J., Tai, S. S., Killaspy, H., Osborn, D., Popelyuk, D., & Nazareth, I. (2008). A systematic review of mental disorder, suicide, and deliberate self harm in lesbian, gay and bisexual people. *BMC Psychiatry*, *8*(1), 70. https://doi.org/10.1186/1471-244X-8-70

Knies, G. (2018). Understanding Society. The UK Household Longitudinal Study. Waves 1-8 User Guide. Institute for Social and Economic Research University of Essex Colchester Essex.

Koball, H. L., Moiduddin, E., Henderson, J., Goesling, B., & Besculides, M. (2010). What Do We Know About the Link Between Marriage and Health? Journal of Family Issues, 31(8), 1019–1040. https://doi.org/10.1177/0192513X10365834

Korchmaros, J. D., Powell, C., & Stevens, S. (2013). Chasing sexual orientation: A comparison of commonly used single-indicator measures of sexual orientation. Journal of Homosexuality, 60(4), 596–614. https://doi.org/10.1080/00918369.2013.760324

Kroh, M., Kühne, S., Kipp, C., & Richter, D. (2017). *Einkommen, soziale Netzwerke, Lebenszufriedenheit: Lesben, Schwule und Bisexuelle in Deutschland*.

Lamb, K. A., Lee, G. R., & DeMaris, A. (2003). Union Formation and Depression: Selection and Relationship Effects. *Journal of Marriage and Family*, *65*(4), 953–962. https://doi.org/10.1111/j.1741-3737.2003.00953.x

Lau, H., & Strohm, C. (2011). The Effects of Legally Recognizing Same-Sex Unions on Health and Well-Being. *Minnesota Journal of Law & Inequality*, *29*(1), 107.

LeBlanc, A. J., Frost, D. M., & Bowen, K. (2018). Legal Marriage, Unequal Recognition, and Mental Health Among Same‐Sex Couples. *Journal of Marriage and Family*, *80*(2), 397–408. https://doi.org/10.1111/jomf.12460

Lesthaeghe, R. (2010). The Unfolding Story of the Second Demographic Transition. *Population and Development Review*, *36*(2), 211–251. https://doi.org/10.1111/j.1728-4457.2010.00328.x

Lewis, N. M. (2009). Mental health in sexual minorities: Recent indicators, trends, and their relationships to place in North America and Europe. *Health & Place*, *15*(4), 1029–1045. https://doi.org/10.1016/j.healthplace.2009.05.003

Lindley, L. L., Walsemann, K. M., & Carter, J. W. (2012). The association of sexual orientation measures with young adults' health-related outcomes. American Journal of Public Health, 102(6), 1177–1185. https://doi.org/10.2105/AJPH.2011.300262

Long, J. S., & Freese, J. (2000). FITSTAT: Stata module to compute fit statistics for single equation regression models. Statistical Software Components S407201, Boston College Department of Economics, revised 22 Feb 2001.

Lynn, P., Burton, J., Kaminska, O., Knies, G., & Nandi, A. (2012). An initial look at non-response and attrition in Understanding Society – Institute for Social and Economic Research. Institute

for Social and Economic Research (ISER). Retrieved 17 May 2024, from https://www.iser.essex.ac.uk/research/publications/working-papers/understanding-society/2012-02

Lynn, P., & Knies, G. (2016). Understanding Society. The UK Household Longitudinal Study. Waves 1-5 Quality Profile. Institute for Social and Economic Research University of Essex Colchester Essex.

McHale, S. M., & Crouter, A. C. (1992). You Can't Always Get What You Want: Incongruence between Sex-Role Attitudes and Family Work Roles and Its Implications for Marriage. Journal of Marriage and Family, 54(3), 537–547. https://doi.org/10.2307/353240

McNeish, D. M., & Stapleton, L. M. (2016). The Effect of Small Sample Size on Two-Level Model Estimates: A Review and Illustration. Educational Psychology Review, 28(2), 295–314. https://doi.org/10.1007/s10648-014-9287-x

Meyer, I. H. (1995). Minority Stress and Mental Health in Gay Men. *Journal of Health and Social Behavior*, *36*(1), 38–56. https://doi.org/10.2307/2137286

Meyer, I. H. (2003a). Prejudice as Stress: Conceptual and Measurement Problems. *American Journal of Public Health*, *93*(2), 262–265.

Meyer, I. H. (2003b). Prejudice, Social Stress, and Mental Health in Lesbian, Gay, and Bisexual Populations: Conceptual Issues and Research Evidence. *Psychological Bulletin*, *129*(5), 674–697. https://doi.org/10.1037/0033-2909.129.5.674

Meyler, D., Stimpson, J. P., & Peek, M. K. (2007). Health concordance within couples: A systematic review. Social Science & Medicine (1982), 64(11), 2297–2310. https://doi.org/10.1016/j.socscimed.2007.02.007

Mikucka, M., Arránz Becker, O., & Wolf, C. (2021). Revisiting marital health protection: Intraindividual health dynamics around transition to legal marriage. Journal of Marriage and Family, 83(5), 1439–1459. https://doi.org/10.1111/jomf.12784

Mills, M., & Blossfeld, H.-P. (2003). Globalization, uncertainty and changes in early life courses. *Zeitschrift Für Erziehungswissenschaft*, *6*(2), 188–218. https://doi.org/10.1007/s11618-003-0023-4

Moore, M. R., & Stambolis-Ruhstorfer, M. (2013). LGBT Sexuality and Families at the Start of the Twenty-First Century. *Annual Review of Sociology*, *39*(1), 491–507. https://doi.org/10.1146/annurev-soc-071312-145643

Morgenroth, T., Kirby, T. A., Cuthbert, M. J., Evje, J., & Anderson, A. E. (2022). Bisexual erasure: Perceived attraction patterns of bisexual women and men. *European Journal of Social Psychology*, *52*(2), 249–259. https://doi.org/10.1002/ejsp.2773

Morris, J. F., Waldo, C. R., & Rothblum, E. D. (2001). A model of predictors and outcomes of outness among lesbian and bisexual women. American Journal of Orthopsychiatry, 71(1), 61–71. https://doi.org/10.1037/0002-9432.71.1.61

Muñoz-Laboy, M. A. (2004). Beyond 'MSM': Sexual Desire Among Bisexually-Active Latino Men in New York City. Sexualities, 7(1), 55–80. https://doi.org/10.1177/1363460704040142

Musick, K., & Bumpass, L. (2012). Re-Examining the Case for Marriage: Union Formation and Changes in Well-Being. Journal of Marriage and the Family, 74(1), 1–18. https://doi.org/10.1111/j.1741-3737.2011.00873.x

National Institute of Helath (NIH). (17th January 2024). NIH Style Guide. Sex, Gender, and Sexuality. Retrieved from: https://www.nih.gov/nih-style-guide/sex-gender-sexuality, last accessed: 27.06.2024

Nock, S. L. (1998). Marriage in Men's Lives. Oxford University PressNew York, NY. https://doi.org/10.1093/oso/9780195120561.001.0001

Oláh, L.S., Kotowska, I.E., Richter, R. (2018). The New Roles of Men and Women and Implications for Families and Societies. In: Doblhammer, G., Gumà, J. (eds) A Demographic Perspective on Gender, Family and Health in Europe. Springer, Cham. https://doi.org/10.1007/978-3-319-72356-3_4

Ophir, A., Boertien, D., & Vidal, S. (2023). Sexuality and Demographic Change: Documenting Family Formation Trajectories and Cohort Change in the LGB Population. *Demography*, *60*(5), 1581–1605.

Perales, F. & Baffour, B. (2018). Respondent Mental Health, Mental Disorders and Survey Interview Outcomes. Survey Research Methods. 12. 161-176. 10.18148/srm/2018.v12i2.7225.

Perales, F., Simpson Reeves, L., Plage, S., & Baxter, J. (2020). The Family Lives of Australian Lesbian, Gay and Bisexual People: A Review of the Literature and a Research Agenda. *Sexuality Research and Social Policy*, *17*(1), 43–60. https://doi.org/10.1007/s13178-018-0367-4

Pereira, H., & Monteiro, S. (2017). The Role of Political and Legislative Changes in the Everyday Lives of LGB Individuals: The Case of Portugal. *Sexuality Research and Social Policy*

Pinquart, M. (2003). Loneliness in married, widowed, divorced, and never-married older adults. Journal of Social and Personal Relationships, 20(1), 31–53. https://doi.org/10.1177/0265407503020001186

Ployhart, R. E., & Ward, A.-K. (2011). The "Quick Start Guide" for Conducting and Publishing Longitudinal Research. Journal of Business and Psychology, 26(4), 413–422. https://doi.org/10.1007/s10869-011-9209-6

Poortman, A. R., & Mills, M. (2012). Joint investments in marriage and cohabitation: The role of legal and symbolic factors. Journal of Marriage and Family, 74(2), 357–376. https://doi.org/10.1111/j.1741-3737.2011.00954.x

Reback, C. J., & Larkins, S. (2010). Maintaining a heterosexual identity: Sexual meanings among a sample of heterosexually identified men who have sex with men. Archives of Sexual Behavior, 39(3), 766–773. https://doi.org/10.1007/s10508-008-9437-7

Reczek, C. (2020). Sexual‐ and Gender‐Minority Families: A 2010 to 2020 Decade in Review. *Journal of Marriage and the Family*, *82*(1), 300–325. https://doi.org/10.1111/jomf.12607

Reczek, C., Liu, H., & Spiker, R. (2017). Self-rated health at the intersection of sexual identity and union status. Social Science Research, 63, 242–252. https://doi.org/10.1016/j.ssresearch.2016.09.013

Riggle, E. D. B., Rostosky, S. S., & Horne, S. G. (2010). Psychological distress, well-being, and legal recognition in same-sex couple relationships. *Journal of Family Psychology*, *24*(1), 82–86. https://doi.org/10.1037/a0017942

Rosario, M., Schrimshaw, E. W., Hunter, J., & Braun, L. (2006). Sexual identity development among gay, lesbian, and bisexual youths: Consistency and change over time. Journal of Sex Research, 43(1), 46–58. https://doi.org/10.1080/00224490609552298

Rosenfeld, M. J. (2017). Moving a Mountain: The Extraordinary Trajectory of Same-Sex Marriage Approval in the United States. *Socius*, *3*, 2378023117727658. https://doi.org/10.1177/2378023117727658

Rostosky, S. S., & Riggle, E. D. B. (2011). Marriage Equality for Same-Sex Couples: Counseling Psychologists as Social Change Agents. The Counseling Psychologist, 39(7), 956–972. https://doi.org/10.1177/0011000011398398

Rostosky, S. S., Riggle, E. D. B., Horne, S. G., & Miller, A. D. (2009). Marriage amendments and psychological distress in lesbian, gay, and bisexual (LGB) adults. *Journal of Counseling Psychology*, *56*(1), 56–66. https://doi.org/10.1037/a0013609

Rostosky, S. S., Riggle, E. D. B., Rothblum, E. D., & Balsam, K. F. (2016). Same-Sex Couples' Decisions and Experiences of Marriage in the Context of Minority Stress: Interviews From a Population-Based Longitudinal Study. Journal of Homosexuality, 63(8), 1019–1040. https://doi.org/10.1080/00918369.2016.1191232

Savin-Williams, R. C., & Vrangalova, Z. (2013). Mostly heterosexual as a distinct sexual orientation group: A systematic review of the empirical evidence. Developmental Review, 33(1), 58–88. https://doi.org/10.1016/j.dr.2013.01.001

Schecter, E., Tracy, A. J., Page, K. V., & Luong, G. (2008). Shall we marry? Legal marriage as a commitment event in same-sex relationships. Journal of Homosexuality, 54(4), 400–422. https://doi.org/10.1080/00918360801991422

Sechrest, L., & Sidani, S. (1995). Quantitative and qualitative methods: Is There an Alternative? Evaluation and Program Planning, 18(1), 77–87. https://doi.org/10.1016/0149-7189(94)00051-X

Seidman, S. (2001). From identity to queer politics: Shifts in normative heterosexuality. In The new social theory reader: Contemporary debates, edited by S. Seidman and J. Alexander. New York: Routledge.

Shulman, J. L., Gotta, G., & Green, R.-J. (2012). Will Marriage Matter? Effects of Marriage Anticipated by Same-Sex Couples. Journal of Family Issues, 33(2), 158–181. https://doi.org/10.1177/0192513X11406228

Simon, R. W. (2002). Revisiting the Relationships among Gender, Marital Status, and Mental Health. American Journal of Sociology, 107(4), 1065–1096. https://doi.org/10.1086/339225

Solomon, S. E., Rothblum, E. D., & Balsam, K. F. (2005). Money, Housework, Sex, and Conflict: Same-Sex Couples in Civil Unions, Those Not in Civil Unions, and Heterosexual Married Siblings. Sex Roles, 52(9), 561–575. https://doi.org/10.1007/s11199-005-3725-7

Soons, J. P. M., & Kalmijn, M. (2009). Is Marriage More Than Cohabitation? Well-Being Differences in 30 European Countries. Journal of Marriage and Family, 71(5), 1141–1157. https://doi.org/10.1111/j.1741-3737.2009.00660.x

Stambolis-Ruhstorfer, M., & Descoutures, V. (2020). Licence required: French lesbian parents confront the obligation to marry in order to establish kinship. *International Social Science Journal*, *70*(235–236), 79–97. https://doi.org/10.1111/issj.12241

Stanley, S. M., Rhoades, G. K., & Whitton, S. W. (2010). Commitment: Functions, Formation, and the Securing of Romantic Attachment. Journal of Family Theory & Review, 2(4), 243–257. https://doi.org/10.1111/j.1756-2589.2010.00060.x

StataCorp. (2021). Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC.

Strohschein, L., McDonough, P., Monette, G., & Shao, Q. (2005). Marital transitions and mental health: Are there gender differences in the short-term effects of marital status change? Social Science & Medicine, 61(11), 2293–2303. https://doi.org/10.1016/j.socscimed.2005.07.020

Stutzer, A., & Frey, B. S. (2006). Does marriage make people happy, or do happy people get married? The Journal of Socio-Economics, 35(2), 326–347. https://doi.org/10.1016/j.socec.2005.11.043

Tatum, A. K. (2017). The Interaction of Same-Sex Marriage Access With Sexual Minority Identity on Mental Health and Subjective Wellbeing. *Journal of Homosexuality*, *64*(5), 638–653. https://doi.org/10.1080/00918369.2016.1196991

Teo, C., Metheny, N., & Chum, A. (2022). Family support modifies the effect of changes to same-sex marriage legislation on LGB mental health: Evidence from a UK cohort study. *European Journal of Public Health*, *32*(1), 35–40. https://doi.org/10.1093/eurpub/ckab139

Thornton, A., & Young-DeMarco, L. (2001). Four Decades of Trends in Attitudes toward Family Issues in the United States: The 1960s through the 1990s. Journal of Marriage and Family, 63(4), 1009–1037.

Tourangeau, R., & Yan, T. (2007). Sensitive Questions in Surveys. Psychological Bulletin, 133, 859–883. https://doi.org/10.1037/0033-2909.133.5.859

Trandafir, M. (2015). Legal Recognition of Same-Sex Couples and Family Formation. *Demography*, *52*(1), 113–151.

Umberson, D. (1992). Gender, marital status and the social control of health behavior. Social Science & Medicine, 34(8), 907–917. https://doi.org/10.1016/0277-9536(92)90259-S

Umberson, D., Thomeer, M. B., Kroeger, R. A., Lodge, A. C., & Xu, M. (2015). Challenges and Opportunities for Research on Same-Sex Relationships. *Journal of Marriage and Family*, *77*(1), 96–111. https://doi.org/10.1111/jomf.12155

Umberson, D., Thomeer, M. B., & Williams, K. (2013). Family Status and Mental Health: Recent Advances and Future Directions. In C. S. Aneshensel, J. C. Phelan, & A. Bierman (Eds.), *Handbook of the Sociology of Mental Health* (pp. 405–431). Springer Netherlands. https://doi.org/10.1007/978-94-007-4276-5_20

Understanding Society. (n.d.). UKHLS derived variable syntax. Retrieved from: https://www.understandingsociety.ac.uk/documentation/mainstage/syntax/ukhls-derived-syntax, last accessed: 17.05.2024

Waite, L. J. (1995). Does Marriage Matter? *Demography*, *32*(4), 483–507. https://doi.org/10.2307/2061670

Waldman, A. E. (2013.). Marriage Rights and the Good Life: A Sociological Theory of Marriage and Constitutional Law. HASTINGS LAW JOURNAL, 64.

Ware, J., Kosinski, M., & Keller, S. (1998). SF-12: How to Score the SF-12 Physical and Mental Health Summary Scales

Ware, J.E., Kosinski, M., Turner-Bowker, D., Gandek, B., Keller, S.D., & Konsiński, M. (2005). How to score version 2 of the SF-12(R) health survey (with a supplement documenting version 1).

World Health Organization (WHO) (2022, June 7). Mental health. Retrieved from: https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response; last accessed: 25.05.2024

Wight, R. G., LeBlanc, A. J., & Lee Badgett, M. V. (2013). Same-Sex Legal Marriage and Psychological Well-Being: Findings From the California Health Interview Survey. *American Journal of Public Health*, *103*(2), 339–346. https://doi.org/10.2105/AJPH.2012.301113

Williams K. (2003). Has the future of marriage arrived? A contemporary examination of gender, marriage, and psychological well-being. *Journal of health and social behavior*, *44*(4), 470–487.

Wolkomir, M. (2009). Making Heteronormative Reconciliations: The Story of Romantic Love, Sexuality, and Gender in Mixed-Orientation Marriages. Gender & Society, 23(4), 494–519. https://doi.org/10.1177/0891243209340033

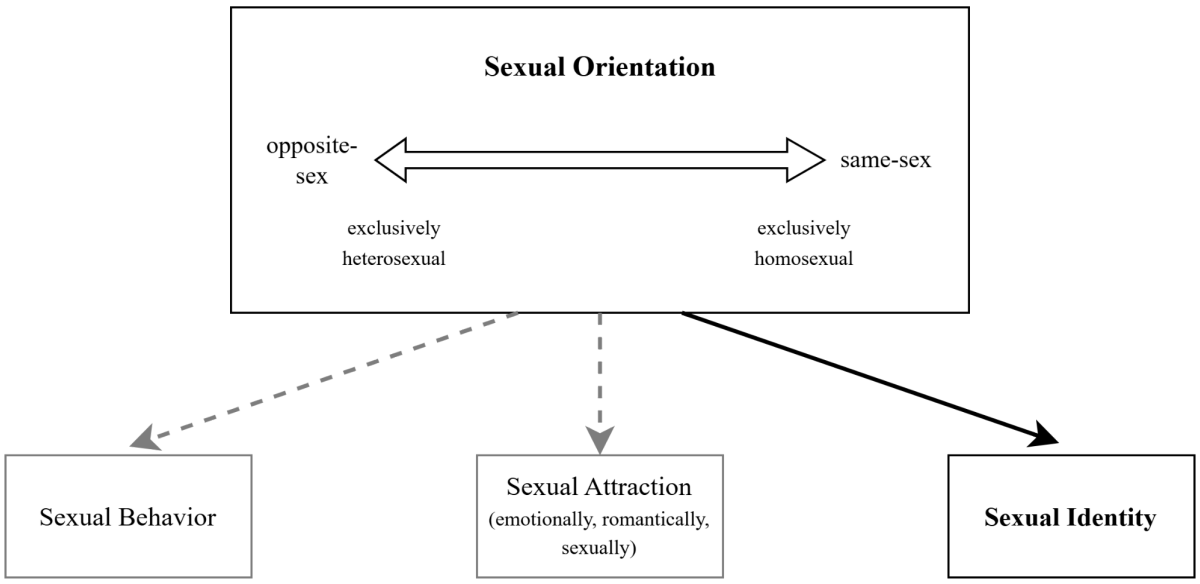
Woolridge, J. M. (2010). Econometric Analysis of Cross Section and Panel Data.

Young, R. M., & Meyer, I. H. (2005). The trouble with 'MSM' and 'WSW': Erasure of the sexual-minority person in public health discourse. American Journal of Public Health, 95(7), 1144–1149. https://doi.org/10.2105/AJPH.2004.046714

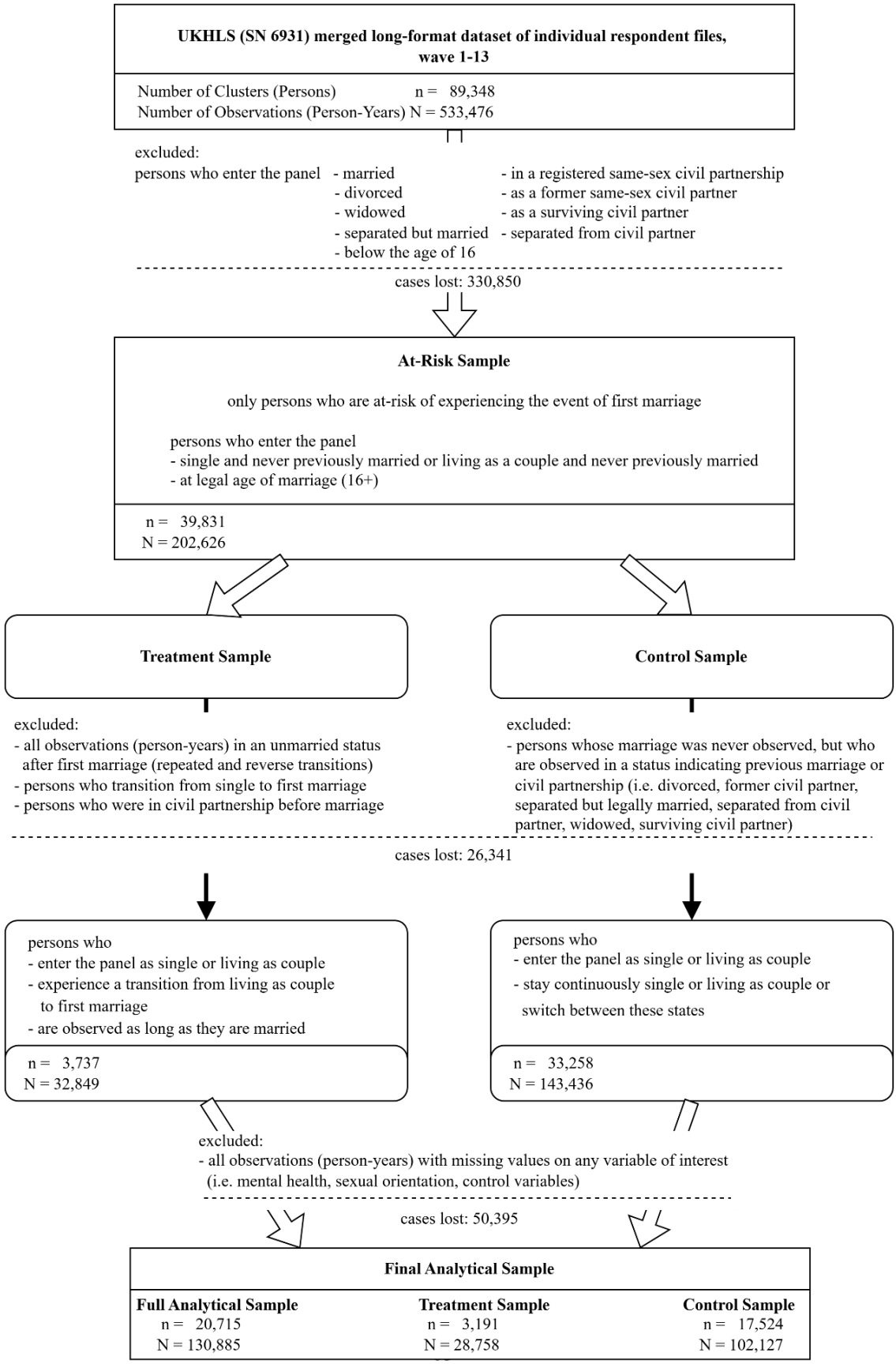
Zaidi, B., & Morgan, S. P. (2017). The Second Demographic Transition Theory: A Review and Appraisal. *Annual Review of Sociology*, *43*, 473–492. https://doi.org/10.1146/annurev-soc-060116-053442

Appendix

Appendix 1: Concept Specification Sexual Orientation



Appendix 2: Flow Chart Sample Selection Process



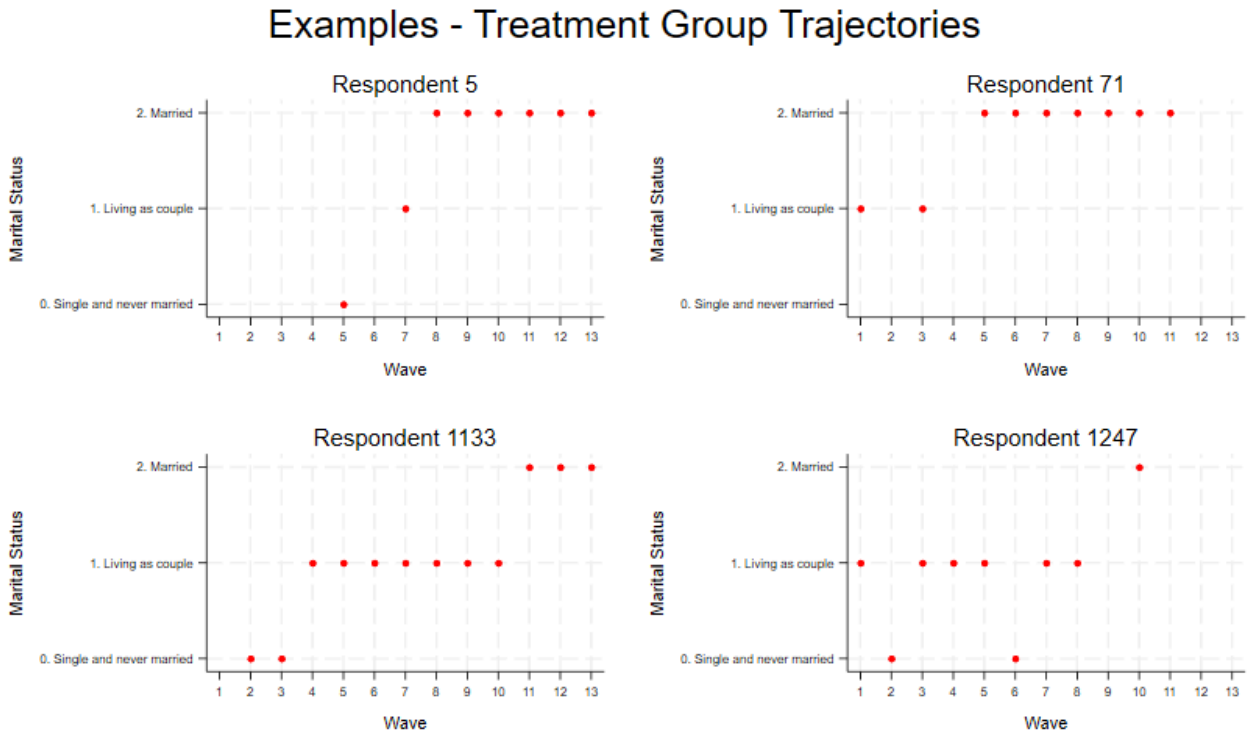
Note: own illustration

Appendix 3: Control Sample - Example Trajectories

source: own visualization, based on UKHLS data

The figure visualizes possible control group trajectories. The base analytical sample consists of all persons who entered the panel as single or living as a couple (never married or in another form of legal union before). Of this sample the control group reflects persons who continuously stayed single or living as a couple over the observed period. Still trajectories differ. As the panel is unbalanced not all respondents are observed across the same waves or participate in the same number of waves. Besides just staying either single or only living as a couple throughout the whole observed period, control group respondents can also switch between these statuses.

Appendix 4: Treatment Sample - Example Trajectories



source: own visualization, based on UKHLS data

The figure visualizes possible treatment group trajectories. The base analytical sample consists of all persons who entered the panel as single or living as a couple (never married or in another form of legal union before). Of this sample the treatment group reflects persons who experience a transition from cohabitation (living as couple) to marriage over the observed period. Still trajectories differ. As the panel is unbalanced not all respondents are observed across the same waves or participate in the same number of waves. Duration in cohabitation prior to marriage differs between respondents, as well as observed duration spent in marriage. Furthermore, respondents can switch between being single and living as a couple multiple times before getting married- the trajectory from singlehood to cohabitation to marriage doesn't need to be linear.

Appendix 5: Overview of Variables Used

Role of Variable	Concept	Scale Level	New Variable Name	New Variable Label	Original Variable Name and Survey Question or Label	Waves assessed	Further Information on Original Variable	Further Information on Transformation
Independent Variable (X1)	(Transition from Cohabitation into first) **Marriage**	ordinal	*marriage _dummies*	Dummy impact function for the event of marriage	*mastat_dv* - De facto marital status based on the questions: "What is [your] legal marital status?" asked for the first year observed and "Since personal circumstances can change over time, we would just like to check some important information. What is [your] legal marital status?" asked in every following year.	all UKHLS waves	- Post-field derived variable - Uses information from the derived age variable (*age_dv*) and child interview outcomes (*_ivfio*) to decide whether a person is a child under 16 - Own category for participants who indicate to live with a partner or live as a same sex couple (*livewith* == 1 | *livewith* == 3) - UKHLS provides the stata-syntax for deriving *mastat_dv*	- Dummy impact function for the event of transition from living as couple to first marriage - Time Periods/ Categories: Baseline mental health: > 1 years before marriage (T_{-2}) Anticipation: 1 year before marriage (T_{-1}) Transition into marriage: year of event (T_0) Short-term: 1 year after marriage (T_{+1}) Long-term: > 1 years after marriage (T_{+2})
Dependent Variable (Y)	**Mental Health**	metric	*mentalhealth*	SF-12 Mental Component Summary	*sf12mcs_dv* - SF12 Mental Component Summary MCS-12 score	all UKHLS waves	- Post-field derived variable - Converts valid answers to the origin items into a single mental functioning score, resulting in a continuous scale with a range of 0 (low functioning) to 100 (high functioning) (according to scoring method of Ware et al.) - items used for MCS-12: general health (*w_sf1)*, limitation of * typical activities *(w_sf2a)*, * several flights of stairs *(w_sf2b)*, * work accomplishments *(w_sf3a)*, * kind of work *(w_sf3b)* by one's health, Whether emotional problems lead to * accomplishing less (*w_sf4a)*,	- Negative values changed into missings

							* being less careful than usual (*w_sf4b),* Whether pain interfered with work *(w_sf5)*, Whether health or emotional problems interfered with social activities *(w_sf7)*, Whether participant * felt calm and peaceful *(w_sf6a)*, * had a lot of energy *(w_sf6b)*, * felt downhearted and depressed *(w_sf6c)* - Assessed through self-completion questionnaire - UKHLS provides the stata-syntax for deriving *sf12mcs_dv*	
Comparison-Variable (X2)	**Sexual Orientation**	nominal	*LGB*	Last Sexual Orientation	*sexuor* - "Which of the following options best describes how you think of yourself?" answer options: * heterosexual or straight, * gay or lesbian, bisexual, * other, * prefer not to say, * don't know	wave 3, 5, 7, 9, 11 for young adults (age 16-21) wave 3, 9 for adults	- Assessed through self-completion questionnaire	- Transformed into a time-constant variable by imputing the last valid observation (Last Observation Carried Forward method) - Differentiation between heterosexual individuals and sexual minority (LGB) individuals
Time-variant Control Variable (CV1)	**Age**	metric	*age*	Age, missings identified	*age_dv*	all UKHLS waves	- Post-field derived variable - Calculated using date of birth held in the sample administration database (*dob_dv*) and interview date (*intdat_dv*). Uses age at time eligible for interview (*dvage*) to compute birthyear (*doby_dv*) where missing - Recorded to missing sample members whose interview outcome is inconsistent with the suggested age +/- one year - Range of 15 to 104	- Negative values changed into missings

Time-variant Control Variable (CV2, CV3)	**Years of same-sex marriage legalization (Period**)	nominal	*perioddummy_2014* *perioddummy_2020*	- Same-sex marriage legalization Great Britain - Same-sex marriage legalization Northern Ireland	*intdaty_dv*	all UKHLS waves	- Date (year) where personal adult interview took place - To compute derived interview dates, crosswave inconsistencies in recorded interview dates were resolved	- Transformation into two dummies to account for period effects of 2014 and 2020

Source: own illustration

Appendix 6: Changes in Sexual Orientation

Changes in Sexual Orientation across valid Observations

	Persons	Percent
Changes from Heterosexual to any other Sexual Orientation	220	(1.06)
Heterosexual → Gay	23	(0.11)
Heterosexual → Lesbian	22	(0.11)
Heterosexual → Bisexual	175	(0.84)
Changes from Gay to any other Sexual Orientation	8	(0.04)
Gay → Heterosexual	6	(0.03)
Gay → Bisexual	2	(0.01)
Changes from Lesbian to any other Sexual Orientation	18	(0.08)
Lesbian → Heterosexual	11	(0.05)
Lesbian → Bisexual	7	(0.03)
Changes from Bisexual to any other Sexual Orientation	100	(0.49)
Bisexual → Heterosexual	74	(0.36)
Bisexual → Gay	12	(0.06)
Bisexual → Lesbian	14	(0.07)
Total Changes in Sexual Orientation		
Number of Changes	346	(1.67)
Number of Persons indicating Change(s)	310	(1.50)
Number of Persons with Consistent Answers	20,405	(98.50)

Notes: The total number of changes is higher than the number of persons indicating change as some persons have indicated multiple changes. The table only portrays observed changes. As sexual orientation is a rotary item and only asked in specific waves of UKHLS, there potentially are participants' whose changes in sexual orientation are unobserved.

Source: own calculation, based on UKHLS SN 6931

Appendix 7: Number of Observations used to Estimate the Marital Phase Parameters

Number of Observations (N: Person-Years) for Estimating *marriage_dummies*

	Dummy Impact Function Categories					
	T-2: Pre-Marriage	T-1: Anticipation	T0: Year of Marriage	T+1: Short-Term	T+2: Long-Term	Total
Full Analytical Sample	111,270	2,752	3,023	2,514	11,326	130,885
Sexual Orientation Samples						
Heterosexual Sample	104,007	2,678	2,941	2,450	11,091	123,167
Sexual Minority (LGB) Sample	7,263	74	82	64	235	7,718
Homosexual Sample	3,614	34	36	24	93	3,801
Bisexual Sample	3,649	40	46	40	142	3,917
Gendered Sexual Orientation Samples						
Heterosexual Men Sample	47,709	1,240	1,370	1,144	5,167	56,630
Heterosexual Women Sample	56,290	1,438	1,571	1,306	5,924	66,529
Sexual Minority Men Sample	3,649	26	30	21	68	3,794
Sexual Minority Women Sample	3,611	48	52	43	167	3,921

Note: red highlighted cells likely have a too low number of observations to estimate meaningful fixed effects. While specific guidelines for fixed effects models are less commonly detailed, it is generally advised in regression modeling to have a sufficient number of observations relative to predictors to ensure reliable estimates and avoid overfitting. Recommendations for multilevel and fixed effects models suggest considering the complexity of the model and ensuring adequate sample size to maintain statistical power and precision in the estimates (McNeish & Stapleton, 2016; Wooldridge, 2012; Hox et al., 2010). The red marking is used for cells with lower than 10*k (number of predictors) = 70 observations, this boundary is however rather arbitrary.

Source: own calculation, based on UKHLS SN 6931

Appendix 8: Detailed Regression Diagnostics Test Results

Exogeneity Assumption: Durbin-Wu-Hausman Test Results

Durbin-Wu-Hausman Tests

Fixed Effects Regression Model	Chi-squared Test Statistic	p-value
Full Analytical Sample (M2)	2886.12	≤ 0.0000
Heterosexual Sample (M3_1)	2146.69	≤ 0.0000
Sexual Minority Sample (M3_2)	246.68	≤ 0.0000

Source: own calculation, based on UKHLS SN 6931

Interpretation: The exogeneity assumption posits that explanatory variables are uncorrelated with the idiosyncratic error term. In fixed-effect models, this assumption extends to the time-varying component of the error term. Since the p-values of the Durbin-Wu-Hausman tests are very small (p <= 0.0000), the difference in coefficients between fixed effects and random effects models is systematic. At this random effect models are likely inconsistent as its model assumptions are violated (specifically the assumption that unique errors are uncorrelated with the regressors). Therefore the fixed effect models are preferred for the current study.

Multicollinearity: Variance Inflation Factor Results

Variance Inflation Factor

Variable	VIF	1/VIF
marriage_dummies		
anticipation	1.01	0.995002
event	1.01	0.994347
short-term	1.01	0.99468
long-term	1.04	0.964382
age	1.03	0.97503
perioddummy_2014	1.01	0.9918
perioddummy_2020	1.02	0.985068
LGB	1.01	0.993746
Mean VIF	1.01	

Source: own calculation, based on UKHLS SN 6931

Interpretation: There should be no exact linear relationship between the explanatory variables. In order to calculate the VIF to detect collinear variables the regression model had to be converted into an Ordinary Least Squares regression. No problem of multicollinearity was detected for this study, as all VIF values are below 5.

Homoscedasticity: Modified Wald Test Results

Modified Wald Tests for Groupwise Heteroscedasticity

Fixed Effects Regression Model	Chi-squared Test Statistic	p-value
Full Analytical Sample (M2)	8.50E+36	≤ 0.0000
Heterosexual Sample (M3_1)	1.20E+37	≤ 0.0000
Sexual Minority Sample (M3_2)	4.90E+34	≤ 0.0000

Source: own calculation, based on UKHLS SN 6931

Interpretation: The assumption of homoscedasticity posits that the variance of the error term should be constant across all levels of the explanatory variables. Since the p-values are less than 0.05, the null hypothesis of homoscedasticity is rejected, indicating the presence of heteroskedasticity across groups. Therefore, robust standard errors are used to correct for this.

Serial Correlation: Woolridge Test Results

Wooldridge Tests for Autocorrelation

Fixed Effects Regression Model	F-Test Statistic	p-value
Full Analytical Sample (M2)	271.065	≤ 0.0000
Heterosexual Sample (M3_1)	248.938	≤ 0.0000
Sexual Minority Sample (M3_2)	22.207	≤ 0.0000

Source: own calculation, based on UKHLS SN 6931

Interpretation: In panel data, errors should not be correlated across time within the same entity. Since the p-values are very small there is significant evidence of first-order autocorrelation in the model's residuals. This violates the serial corrleation assumption and can lead to inefficient estimates and biased standard errors. Furthermore, inference (e.g. confidence intervals and hypothesis tests) might be invalid. To address the issue of autocorrelation and heteroscedasticity, cluster-robust standard errors are used.

Appendix 9: Research Data Management Plan

1. General	
1.1 Name & title of thesis	Isabell Schuler - Marriage and the Mental Health of Sexual Orientation Minorities
1.2 *(if applicable)* Organisation. Provide details on the organisation where the research takes place if this applies (in case of an internship).	/

2 Data collection – the creation of data	
2.1. Which data formats or which sources are used in the project? For example: - theoretical research, using literature and publicly available resources - Survey Data - Field Data - Interviews	Provide a short description of the sources/data that you are going to use. Panel survey data from Understanding Society - the United Kingdom Longitudinal Household Survey (UKHLS) (wave 1-13); Special License Access (SN 6931); conducted by the Institute for Social and Economic Research at the University of Essex and available through the UK Data Service
2.2 Methods of data collection What method(s) do you use for the collection of data. (Tick all boxes that apply)	☐ Structured individual interviews ☐ Semi-structured individual interviews Structured group interviews ☐ Semi-structured group interviews ☐ Observations ☐ Survey(s) ☐ Experiment(s) in real life (interventions) ☑ Secondary analyses on existing data sets (if so: please also fill in 2.3) ☐ Public sources (e.g. University Library) ☐ Other (explain):
2.3. (If applicable): if you have selected 'Secondary analyses on existing datasets': who provides the data set?	☐ Data is supplied by the University of Groningen. ☑ Data have been supplied by an external party. (UK Data Service).

3 Storage, Sharing and Archiving	
3.1 Where will the (raw) data be stored *during* research? If you want to store research data, it is good practice to ask yourself some questions: - How big is my dataset at the end of my research? - Do I want to collaborate on the data? - How confidential is my data? - How do I make sure I do not lose my data? Need more information? Take a look at the site of the Digital Competence Centre (DCC)) Feel free to contact the DCC for questions: dcc@rug.nl	☑ X-drive of UG network ☐ Y-drive of UG network ☐ (Shared) UG Google Drive ☐ Unishare ☐ Personal laptop or computer ☐ External devices (USB, harddisk, NAS) ☐ Other (explain):
3.2 Where are you planning to store / archive the data after you have finished your research? Please explain where and for how long. Also explain who has access to these data NB do not use a personal UG network or google drive for archiving data!	☐ X-drive of UG network ☐ Y-drive of UG network ☐ (Shared) UG Google Drive ☐ Unishare ☐ In a repository (i.e. DataverseNL) ☑ Other (explain): data will be deleted after having finished the research (Expiry of access to data) The retention period will be 0 years.
3.3 Sharing of data With whom will you be sharing data during your research?	☐ University of Groningen ☐ Universities or other parties in Europe ☐ Universities or other parties outside Europe ☑ I will not be sharing data

- *continued on the next page* -

4. Personal data	
4.1 Collecting personal data Will you be collecting personal data? If you are conducting research with personal data you have to comply to the General Data Privacy Regulation (GDPR). Please fill in the questions found in the appendix 3 on personal data.	Yes/no Data is not self-collected, but yes personal data is used.
If the answer to 4.1 is 'no', please skip the section below and proceed to section 5	
4.2 What kinds of categories of people are involved? Have you determined whether these people are vulnerable in any way (see FAQ)? If so, your supervisor will need to agree.	My research project involves: ☑ Adults (not vulnerable) ≥ 18 years ☐ Minors < 16 years ☑ Minors < 18 years ☐ Patients ☑ (other) vulnerable persons, namely sexual minority individuals Research involves participants from UKHLS wave 1-13, aged 16 and above that took part in the adult interviews.
4.3 Will participants be enlisted in the project without their knowledge and/or consent? (E.g., via covert observation of people in public places, or by using social media data.)	Yes/no -> No If yes, please explain if, when and how you will inform the participants about the study.
4.4 Categories of personal data that are processed. Mention all types of data that you systematically collect and store. If you use particular kinds of software, then check what the software is doing as well. Of course, always ask yourself if you need all categories of data for your project.	☐ Name and address details ☐ Telephone number ☐ Email address ☐ Nationality ☐ IP-addresses and/or device type ☐ Job information ☐ Location data ☐ Race or ethnicity ☐ Political opinions ☑ Physical or mental health ☑ Information about a person's sex life or sexual orientation

	☐ Religious or philosophical beliefs ☐ Membership of a trade union ☐ Biometric information ☐ Genetic information ☐ Other (please explain below):

4.5 Technical/organisational measures Select which of the following security measures are used to protect personal data.	☐ Pseudonymisation ☑ Anonymisation ☑ File encryption ☐ Encryption of storage ☐ Encryption of transport device ☑ Restricted access rights ☑ VPN (secure connection method) ☐ Regularly scheduled backups ☐ Physical locks (rooms, drawers/file cabinets) ☐ None of the above ☑ Other (describe below): Multi-factor authentication, anti-virus software,protection of confidentiality of outputs
4.6 Will any personal data be transferred to organisations within countries outside the European Economic Area (EU, Norway, Iceland and Liechtenstein)? If the research takes places in a country outside the EU/EEA, then please also indicate this.	Yes/no If yes, please fill in the country. No tranferral of the data will take place, but the data was collected in the United Kingdom (England, Wales, Scotland, Northern Ireland)
5 – Final comments	
Do you have any other information about the research data that was not addressed in this template that you think is useful to mention?	/

Appendix 10: GenAI use

Across the thesis process the GenAI platform ChatGPT has been used.
The guidelines for GenAI use have been followed and reflected upon. As allowed, GenAI has been used for brainstorming, gaining inspiration, and language correction. As disallowed, no AI-generated text output has been copied and claimed as original work.

ChatGPT (versions 4o and 4o mini) has been used for the following tasks:

Inspiration

Explanation: ChatGPT has been used for various aspects of brainstorming and gaining inspiration. In the beginning of the research processes it has been used to find a suitable topic and dataset. Later on the main inspirational function was to get an overview of possibilities on how to approach specific tasks encountered during the research process.

Example Prompt (on the left in grey box) and Corresponding Answer (on the right):

Heyy, I'm working with longitudinal data. My variable of interest is sexual orientation.
The item for sexual orientation was not collected in every wave, but only is available in some waves. The survey years, where it wasn't collected, participants have a missing value.
Sexual orientation will be regarded as a fixed variable. While this doesn't
reflect the reality of scientifally proven fluidity of sexuality, it is necessary to simplify my analysis.
As in reality, sexual orientation can also vary across waves.
For example a observed respondent indicates to be heterosexual in wave 3. During wave 4, 5 and 6 he has missing values on the sexual orientation variable since it was not asked. In wave 7 he indicated to identify as bisexual.

What's the best (and most ethical way) to fix sexual orientation over time (without leading to wrong results due to misidentifying participants)?

Handling missing data in longitudinal studies, especially for variables like sexual orientation, requires careful consideration to ensure both methodological rigor and ethical integrity. Here's a suggested approach:

1. **Understand the Nature of Missing Data:** First, it's essential to understand why the data is missing. In your case, sexual orientation data is missing in certain waves because it wasn't collected. This is known as "missing completely at random" (MCAR) if the missingness is unrelated to any observed or unobserved variables.
2. **Consider Imputation Methods:** Imputation methods can be used to fill in missing values. However, given the sensitivity and complexity of sexual orientation, traditional imputation methods may not be suitable. Instead, consider using a method like multiple imputation with chained equations (MICE) or maximum likelihood estimation (MLE) if your statistical software supports it. These methods can preserve the variability and uncertainty inherent in sexual orientation.
3. **Explore Pattern of Change:** Examine patterns of change in sexual orientation over time for participants with available data. This can help identify common trajectories and inform how missing data should be handled. For example, if participants tend to maintain consistent sexual orientations over time, imputing missing values based on the most recent observation may be appropriate.
4. **Consult Literature and Experts:** Review existing literature on longitudinal studies and sexual orientation to understand common practices and ethical considerations. Additionally, consulting with experts in the field, such as psychologists or sociologists specializing in sexual orientation research, can provide valuable insights and guidance.
5. **Sensitivity Analysis:** Perform sensitivity analyses to assess the robustness of your findings to different approaches for handling missing data. This involves conducting analyses using different imputation methods or assumptions about missing data to evaluate the stability of your results.
6. **Transparent Reporting:** Clearly document and report your methods for handling missing data, including any assumptions made or limitations of the approach. Transparency is essential for ensuring the reproducibility of your research and allowing others to evaluate the validity of your findings.
7. **Ethical Considerations:** Recognize the potential impact of your research on participants and the broader LGBTQ+ community. Respect participants' self-identified sexual orientations and avoid imposing rigid categories that may not accurately capture their experiences. Ensure that your research adheres to ethical guidelines for human subjects research, including obtaining informed consent and protecting participants' confidentiality.

Coding

Explanation: ChatGPT provided assistance for coding in Stata. Thereby, ChatGPT was mainly used to explain and suggest statistical code for unfamiliar operations connected to the use of panel data (e.g. turning the time-varying sexual orientation variable into a time-constant variable; performing fixed effect regression diagnostics; …). It was also used to identify errors in self-written commands that did not function properly. ChatGPT's recommendations were thoroughly checked and reflected upon. While overall being a helpful aid, the AI produced code was not always correct.

Example Prompt (on the left in grey box) and Corresponding Answer (on the right):

I need some help with statistics (stata code).

I'm using longitudinal data from Understanding Society (United Kingdom Household Longitudinal Study - UKHLS).
The data is saved separately for each wave, with a wave prefix indacting the year (e.g. dataset a_indresp being the dataset for wave 1, b_indresp being the dataset for wave 2 and so on).
I want to merge the datasets into one long format dataset where person-years are nested in persons in the right periodically order.

So far I have a code that works and seems to correctly connect the datafiles in the right order. However, the variable indicating the wave is a floating variable. I don't want that. I want the wave variable to be a 'real variable' instead, so I can actually see the nested structure and do operations with it.

Here is my code so far:

```
foreach w in a b c d e f g h i j k l m {
   use "$data/ukhls/w'_indresp", clear
   rename w'_* *
   gen wave=strpos("abcdefghijklmnopqrstuvwxyz","w'")
   save w', replace
}

use a, clear

foreach w in b c d e f g h i j k {
   append using w'
}

sort pidp wave
```

It seems like you're on the right track. To convert the `wave` variable from a string to a numeric variable, you can simply use the `destring` command after merging your datasets. Here's how you can modify your code:

stata — Code kopieren

```
foreach w in a b c d e f g h i j k l m {
    use "$data/ukhls/`w'_indresp", clear
    rename `w'_* *
    gen wave = strpos("abcdefghijklmnopqrstuvwxyz", "`w'")
    save `w', replace
}

use a, clear

foreach w in b c d e f g h i j k {
    append using `w'
}

destring wave, replace
sort pidp wave
```

This will convert the `wave` variable from a string to a numeric variable while keeping its sequential order intact.

Text Improvement

Explanation: ChatGPT has been used to revise and improve the original writing. At this, fixing grammatical errors and recommendations for less repetitive, more appropriate, and more precise sentence structures have been the main use. It has been made sure that the original text was kept and that no entirely new paragraphs were produced. The suggestions were critically reflected upon and only partially embedded, while it was refrained from simply copying whole answers.

Example Prompt (on the left in grey box) and Corresponding Answer (on the right):

please revise this text
"First, married individuals benefit from increased psychosocial support. The spouse presents an easily accessible source of companionship, belonging, intimacy, acceptance and a meaningful and loving connection, but also offers assistance, information and guidance (Mikucka et al., 2021; Musick & Bumpass, 2012; Stutzer & Frey, 2006). Additionally, heightened certainty and quality of reciprocal dedication is a further psychological resource distinct to marital relationships (Stanley et al., 2010; Stutzer & Frey, 2006). For sexual minority individuals this increased love and acceptance from the spouse may alleviate internalized homophobia or biphobia, enhance self-esteem, and therefore mitigate internal minority stressors. As sexual minority individuals often face heightened vulnerability to mental health issues due to disparities in social support (Meyer, 2003b; Meyer, 1995), marriage can thus serve as a significant support mechanism to address this challenge.
Beyond the partner themself, their family and friend network can further strengthen and expand social integration (Chen & van Ours, 2018; Blekesaune 2008; Dush & Amato, 2005). While, compared to different-sex couples, same-sex couples are likely to have fewer social connections and support for their partnership (Chen & van Ours, 2018), marriage further enhances social and legal legitimacy, protection and acceptance of the relationship in the minds of family, colleagues, community and society at large (Rostosky et al., 2016; Haas & Whitton, 2015; Shulman et al., 2012; Badgett, 2009; Schecter et al., 2008). Therefore, for many sexual minority individuals marriage enables closer and more numerous bonds to their family (Schecter et al., 2008).
As increased social support and love, as well as diminished loneliness and insecurity both directly and indirectly relieve stress, married individuals become less prone to mental health issues (Blekesaune, 2008; Stutzer & Frey, 2006). The acquisition of empowering social connections, a decrease of internal, familial and societal homo- and biphobia and the overarching reduction of minority stressors are likely to promote mental health of married sexual minority individuals. With the reduction of external invalidation, also internalized stigma and feelings of marginalization are mitigated (Schecter et al., 2008).
Despite these positive changes, some socio-emotional minority stressors may persist. For instance, some sexual minority individuals may hesitate to publicly label their partner as husband or wife due to continued internalized stigma, fear of mistreatment, and rejection (Rostosky et al., 2016).

Make it more precise by ruling out repetitions.
Apart from these things, please also consider the following criteria for revision:
- correct grammar and spelling
- understandable, clear (yet scientific), precise language
- no overly complicated sentence structures; avoid obscure sentences
- keep repetitions to a minimum (both word repetitions, but also repetitions of content)
- only keep actually relevant information
- have a read threat and clear connection to the research question
- shorten by leaving out unnecessary things or repetition (don't shorten essential content)
- keep as much of my original text as possible

Sure, here is the revised text based on your criteria:

First, married individuals benefit from increased psychosocial support. A spouse provides companionship, intimacy, acceptance, and a meaningful connection, along with assistance, information, and guidance (Mikucka et al., 2021; Musick & Bumpass, 2012; Stutzer & Frey, 2006). Additionally, the certainty and quality of reciprocal dedication in marital relationships offer unique psychological resources (Stanley et al., 2010; Stutzer & Frey, 2006). For sexual minority individuals, this love and acceptance can alleviate internalized homophobia or biphobia, enhance self-esteem, and mitigate internal minority stressors. Given their vulnerability to mental health issues due to disparities in social support (Meyer, 2003b; Meyer, 1995), marriage serves as a significant support mechanism.

Beyond the partner, their family and friends can further strengthen social integration (Chen & van Ours, 2018; Blekesaune 2008; Dush & Amato, 2005). Same-sex couples may have fewer social connections and support than different-sex couples (Chen & van Ours, 2018), but marriage enhances the social and legal legitimacy, protection, and acceptance of the relationship among family, colleagues, and society (Rostosky et al., 2016; Haas & Whitton, 2015; Shulman et al., 2012; Badgett, 2009; Schecter et al., 2008). For many sexual minority individuals, marriage enables closer bonds with family (Schecter et al., 2008).

Increased social support and love, along with reduced loneliness and insecurity, directly and indirectly relieve stress, making married individuals less prone to mental health issues (Blekesaune, 2008; Stutzer & Frey, 2006). The acquisition of empowering social connections and the reduction of internal, familial, and societal homo- and biphobia promote the mental health of married sexual minority individuals. With reduced external invalidation, internalized stigma and feelings of marginalization are also mitigated (Schecter et al., 2008). However, some socio-emotional minority stressors may persist, as some sexual minority individuals may hesitate to publicly label their partner as a spouse due to internalized stigma, fear of mistreatment, and rejection (Rostosky et al., 2016).

This version maintains your original points while ensuring clarity, conciseness, and coherence.

Appendix 11: Descriptive Statistics by Sample Affiliation (unweighted sample)

	Full Analytical Sample			Treatment (Marriage) Sample			Control Sample				
Number of Person-Years	130,885			28,758			102,127				
Number of Persons	20,715			3,191			17,524				
Measure	**Frequencies (Percent)**	**Mean (SD)**	**Min - Max (Range)**	**Frequencies (Percent)**	**Mean (SD)**	**Min - Max (Range)**	**Frequencies (Percent)**	**Mean (SD)**	**Min - Max (Range)**	**Tests for Statistical Significant Difference p-value**	**Description**
Continuous Variables											
Mental Health (MCS)	20,715	48.90 (10.40)	0 - 74.83 (74.83)	3,191	50.43 (9.07)	4.32 - 69.66 (65.34)	17,524	48.62 (10.60)	0 - 74.83 (74.83)	0.000	MCS score with possible range 0 (low mental health) to 100 (high mental health)
Age	20,715	27.35 (13.76)	16 - 94 (78)	3,191	32.85 (11.19)	16 - 83 (67)	17,524	26.35 (13.95)	16 - 94 (78)	0.000	Years of age
Categorical Variables											
Sexual Orientation										0.000	self-identified sexual orientation; imputed from last valid observation (last observation carried forward, LOCF)
Heterosexual	19,420 (93.75%)			3,109 (97.43%)			16,311 (93.08%)				
Gay	357 (1.72%)			20 (0.63%)			337 (1.92%)				
Lesbian	192 (0.93%)			16 (0.50%)			176 (1.00%)				
Bisexual	746 (3.60%)			46 (1.44%)			700 (3.99%)				

Note: All statistics (except Mental Health for all observations) are calculated for respondents' first observation in the panel. Tests for Statistical Significant Difference refer to differences between treatment and control sample distribution. For categorical variables chi-squared tests and for continuous variables t-tests were performed.

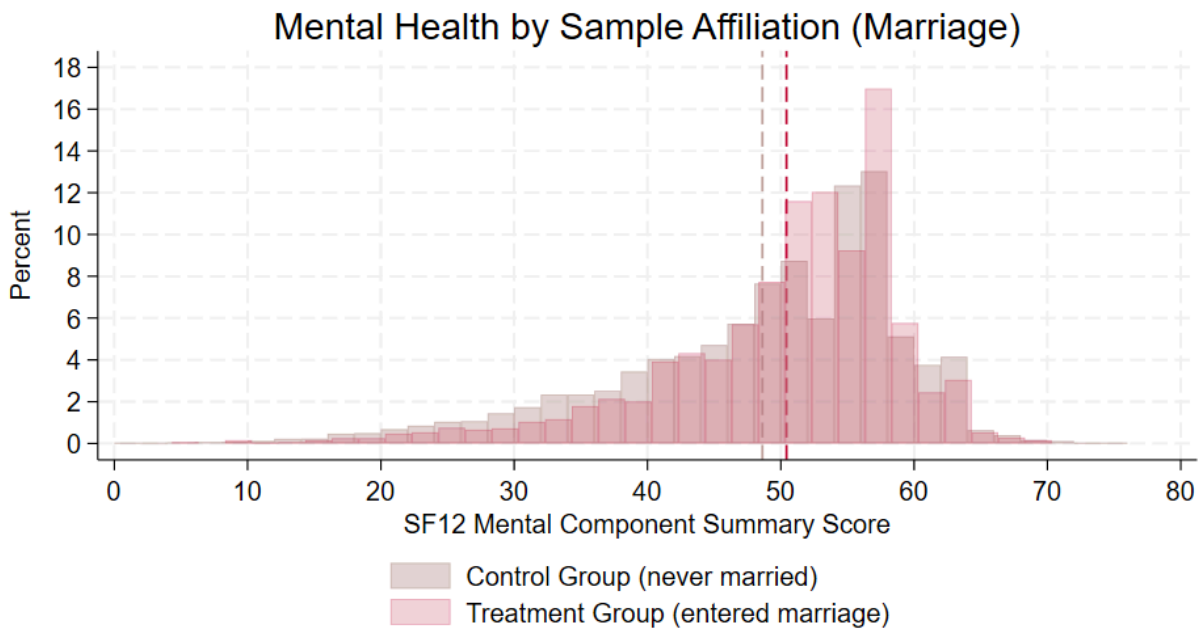
Source: own calculation, based on UKHLS SN 6931

Detailed Description of Mental Health Distribution by Sample Affiliation

Regarding the independent construct of mental health, the mean mental health component summary (MCS) score at the respondents' first observation is 48.90. Within the possible range of 0 (low mental health) to 100 (high mental health), the highest score in the analytical sample is 74.83. Both high and low values are however rare, as indicated by the 95% confidence interval (CI: [48.76, 49.04]), showing a dense distribution of mental health values around the mean.

Participants who married have a higher average mental health score at their initial observation (mean = 50.43; CI: [50.12, 50.75]) compared to those who did not marry (mean = 48.62; CI: [48.46, 48.78]). The mental health scores of the treatment sample are also more consistent, with a lower standard deviation (9.07 vs. 10.60 in the control sample) and a narrower range (65.34 vs. 74.83). The difference in average mental health scores between the treatment and control groups is -1.81 points, disadvantageous for the control group. As the 95% confidence interval for the differences in means (CI: [-2.20, -1.42]) doesn't include zero, the difference is statistically significant. This is further confirmed by the t-test results ($t(20{,}713) = -9.06$, $p \leq 0.000$), suggesting that individuals who get married have significantly higher initial mental health than those who remain unmarried. Despite being statistically significant ($p \leq 0.000$), the correlation between mental health and marriage status is positive but weak ($r = 0.06$).

Visualization: Histogram Mental Health by Sample Affiliation (Treatment vs. Control Group)



Note: Vertical lines represent mean values. Graph depicts mental health at first observation.
SF-12 MCS is a norm-based measure with a mean of 50 and a standard deviation of 10.

Source: own visualization, based on UKHLS SN6931

Detailed Description of Sexual Orientation Distribution by Sample Affiliation

Most participants identified as heterosexual (93.75%) in their last valid interview. Among sexual minority identities, bisexual respondents make up the largest share (3.60%), followed by gay (1.72%) and lesbian (0.93%) individuals.

This pattern of most frequent distribution remains consistent when regarding treatment and control sample separately. Compared to the full analytical sample, the share of each sexual orientation is similar among respondents that stayed unmarried (93.08% heterosexual; 3.99% bisexual; 1.92% gay; and 1.00% lesbian respondents). Among participants who entered marriage over the observed period (treatment sample) the share identifying as heterosexual is however much higher (97.43%). Consequently, sexual minority individuals are less presented in the treatment sample. Only 20 gay persons (0.63% of all persons that got married) and 16 lesbian persons (0.50%) experienced a transition from cohabitation to marriage over the observed period. Especially the share of bisexual respondents reduced to 1.44% (46 respondents), which amounts for a difference of 2.55% less than in the control sample. A chi-squared test confirms a statistically significant association between sexual orientation and marriage status ($\chi^2(3, N = 20{,}715) = 87.9977$, $p \leq 0.000$), suggesting that sexual orientation and marriage status are dependent, with significant differences in marriage rates among different sexual orientation groups.

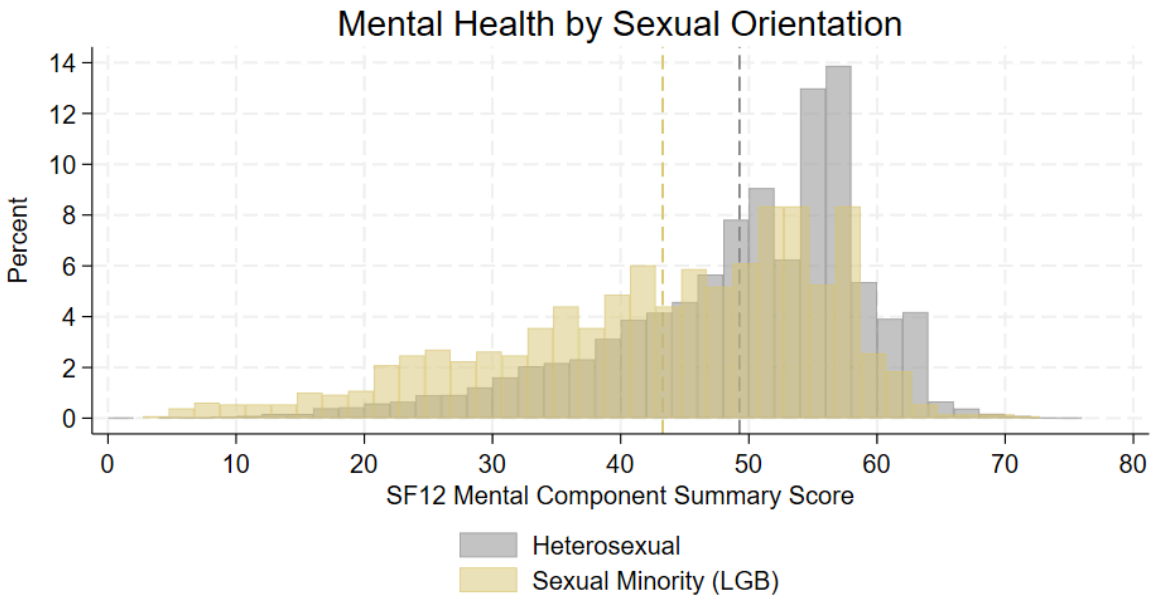
Description of Age by Sample Affiliation

The mean age in the full sample at panel entry is 27.35 years, ranging from 16 to 94 years. While the average age is rather young, the standard deviation of 13.76 years indicates a wide age distribution.

The mean initial age of participants who stayed unmarried (control group) is slightly younger at 26.35 years, with a similar age range and standard deviation (13.95 years). In contrast, the treatment group's mean initial age is higher at 32.85 years, with a narrower age range (16 to 83 years) and lower standard deviation (11.19 years). The 6.50-year age difference at sample entry between persons that get married and those who remain unmarried is significant ($t(20{,}713) = -24.91$, $p \leq 0.000$; CI: [-7.02, -5.99]). The positive correlation between age at panel entry and marriage ($r = 0.17$, $p \leq 0.000$) indicates that older age is associated with experiencing marriage, though the relationship is relatively weak.

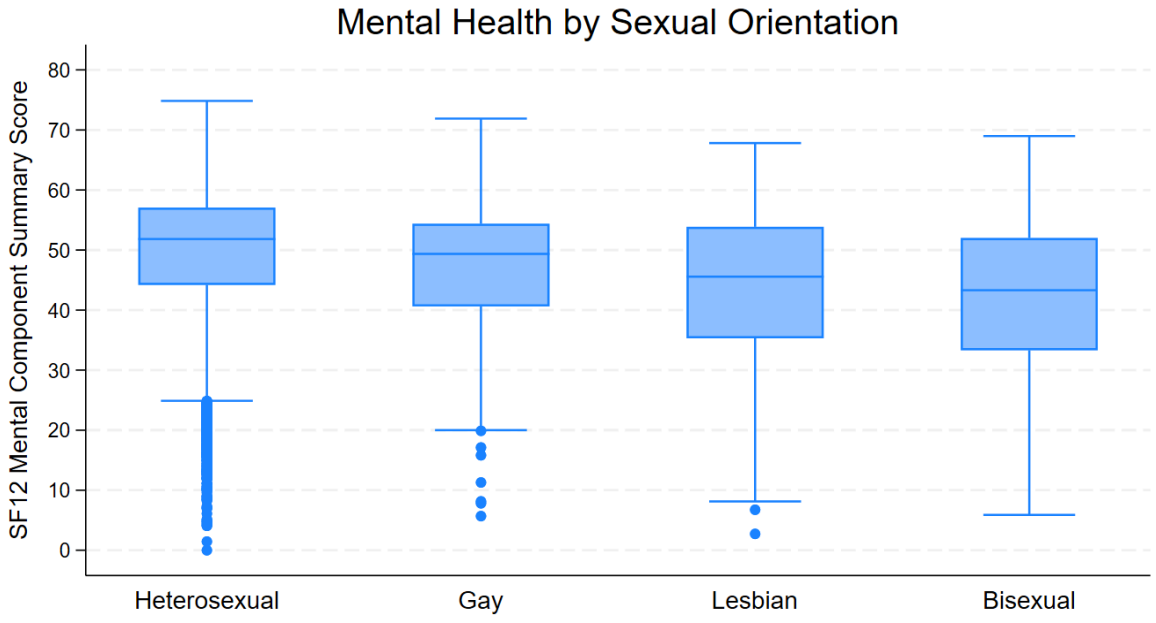
Appendix 12: Distribution of Mental Health by Sexual Orientation

Visualization: Histogram



Note: Vertical lines represent mean values. Graph depicts mental health at first observation
SF-12 MCS is a norm-based measure with a mean of 50 and a standard deviation of 10
Source: own visualization, based on UKHLS SN6931

Visualization: Boxplot



Note: Boxplots depicts mental health at first observation
Source: own visualization, based on UKHLS SN6931

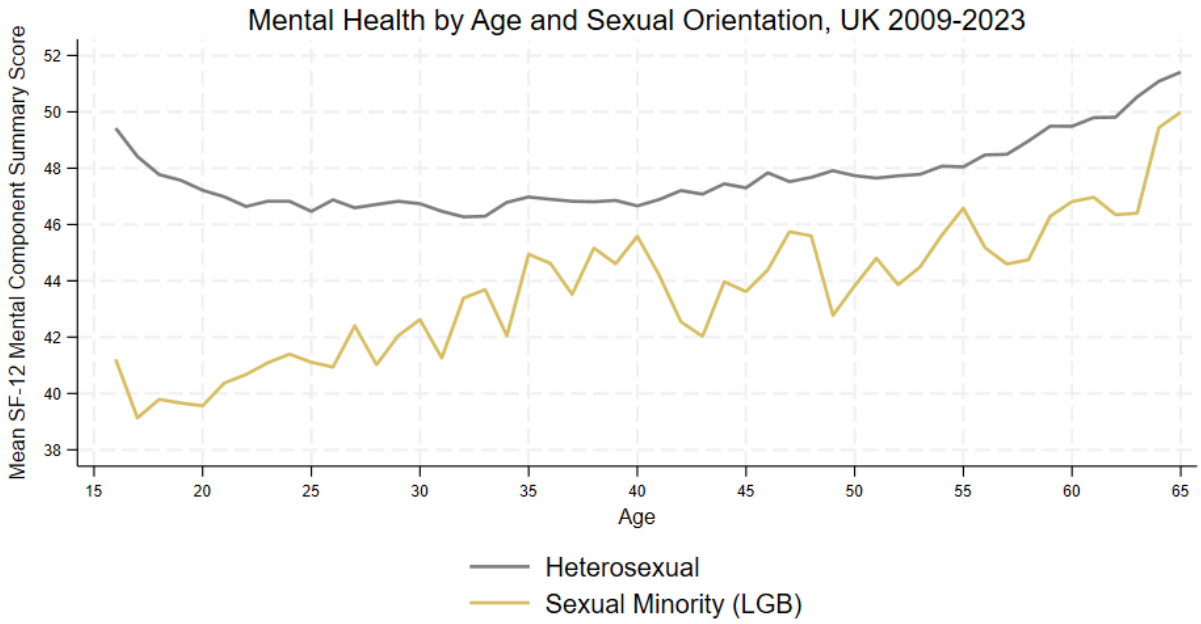
Detailed Description of Mental Health Distribution by Sexual Orientation

At first observation, heterosexual respondents on average show higher mean mental health (49.27) than sexual minority respondents, with a difference of 2.69 to 7.50 points depending on the specific minority identity. Within the sexual minority group, gay individuals have higher mental health scores (46.58) than lesbian respondents (42.94). Bisexual participants indicate the worst initial mental health with a mean of 41.78. The minimum (0) and maximum (74.83) mental health scores are both reported by heterosexual respondents, whose scores are generally more densely distributed (standard deviation: 10.12; CI: [49.13, 49.42]). Lesbian respondents' scores vary the most (standard deviation: 13.48; CI: [41.02, 44.86]), likely due to the small size of this group. ANOVA results ($F = 155.9$, $p \leq 0.0000$) indicate that these differences in mental health by sexual orientation are significant. The pairwise comparison presented by Tukey's HSD tests further specifies that the differences in mental health scores between most pairs of sexual orientation groups is significant, except between bisexual and lesbian individuals.

Appendix 13: Mental Health Dynamics over Time

Mental Health by Age and Sexual Orientation

Visualization: Lineplot



Note: Lineplot depicts mean mental health of every age. Ages above 65 are excluded from this depiction due to limited sample sizes for sexual minorities, which would not provide reliable patterns.

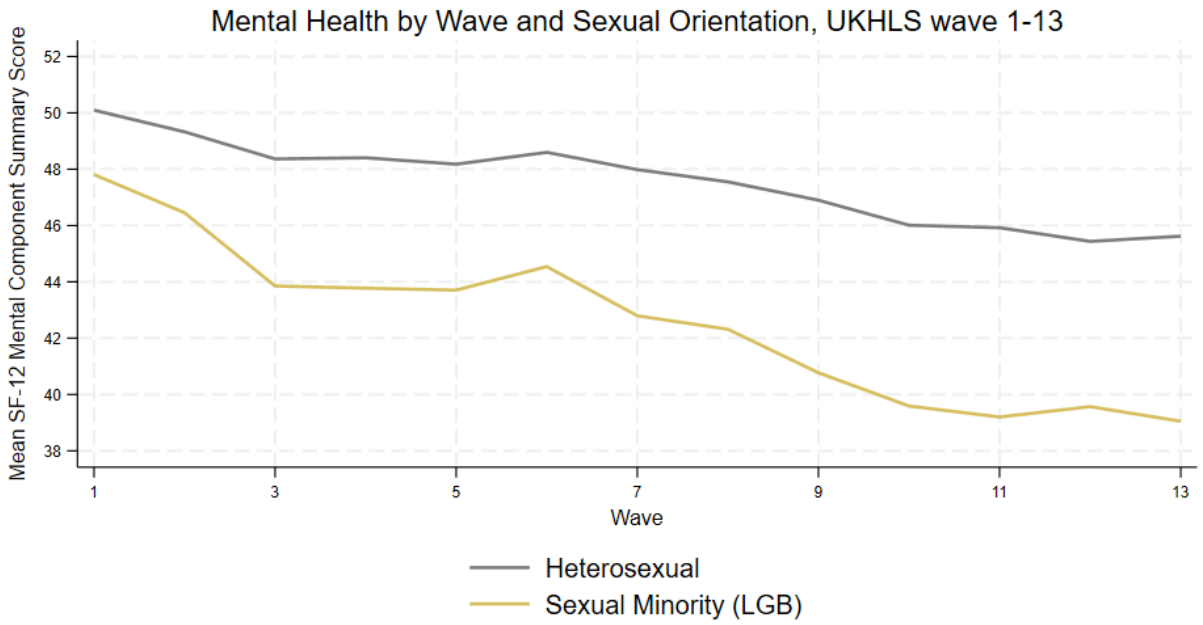
Source: own visualization, based on UKHLS SN6931

Description

While for heterosexuals the mean age distribution approximately forms a U-shape over the lifecourse, for sexual minority individuals mental health generally increases with age, despite stronger and more frequent fluctuations likely related to sample size. Both groups start with very different mental health at the age of 16, whereby the average mental health of sexual minority persons is much lower than the one of heterosexuals. During young adulthood, heterosexual persons however experience worse mental health trajectories than sexual minority individuals. While the mental health of heterosexual individuals stays on a comparatively stable low level throughout working years, sexual minority individual's mental health further improves, narrowing the gap. Both groups see an increase in mental health from retirement age on. Despite these trends, the mental health of sexual minority respondents remains continuously lower than that of heterosexuals across all ages. It should be noted that this analysis does not control for cohort effects, so an age-related increase in mental health cannot be conclusively determined.

Mental Health by Wave and Sexual Orientation

Visualization: Lineplot



Note: Lineplot depicts mean mental health of every wave
Source: own visualization, based on UKHLS SN6931

Description

Initially, in wave 1, heterosexual respondents have slightly higher mental health scores than sexual minority individuals. Over time, both groups experience a decline in mental health, with the decrease being more pronounced for sexual minority individuals. Apart from the general decline over time, small fluctuations in mean mental health occur around certain waves for both groups. Especially notable is an increase of mental health around wave 6, which apart from other potential influences, corresponds to the legalization of same-sex marriage in 2014 in England, Wales, and Scotland. Fitting to the same-sex marriage legalization in Northern Ireland, sexual minority individuals also experience a further smaller increase in mean mental health around wave 12, which is however absent for the heterosexual group.

Appendix 14: Robustness Checks - Different Specifications of Sexual Orientation

Description of Different Specifications

The robustness checks assess whether the results vary depending on the operationalization used to turn sexual orientation into a time-constant variable. Next to the LOCF specification referring to a respondent's last valid answer used in the main analysis, variables fixing the most frequent answer (mode) of sexual orientation and one that regards every individual who has identified with a non-heterosexual orientation at least once as a sexual minority individual, have been created (everLGB). Two different mode imputation variables have been assessed, to account for a more generous and stricter identification of sexual minority individuals if ambiguous modes have been detected for a person. This can for example be the case when a participant indicated in two waves that they identify with a heterosexual orientation and also in two other waves stated to be bisexual. The Mode (min value) imputation would now categorize this participant as heterosexual, while the Mode (max value) variable imputes the bisexual answer.

First, a sensitivity analysis assesses how the distribution of the sexual orientation categories varies across the different variable specifications. Then, fixed effect regression models, separately computed for the sexual minority and the heterosexual sample, show whether the marriage effects are robust or vary with different operationalisations of sexual orientation.

- *Appendix 15 continues on the next page* -

Distribution of Sexual Orientation across Different Specifications

Sensitivity Analysis - Distribution of Sexual Orientation by Different Imputation Methods

Imputation Method		**LOCF***	**Mode (min value)****	**Mode (max value)*****	**ever LGB********
		Number of Persons (Percent)	**Number of Persons (Percent)**	**Number of Persons (Percent)**	**Number of Persons (Percent)**
Sexual Orientation	Heterosexual	19,420 (93.75)	19,614 (94.69)	19,403 (93.67)	19,324 (93.29)
	Gay	357 (1.72)	341 (1.65)	347 (1.68)	350 (1.69)
	Lesbian	192 (0.93)	177 (0.85)	192 (0.93)	189 (0.91)
	Bisexual	746 (3.60)	583 (2.81)	773 (3.73)	852 (4.11)
	Total	20,715 (100.00)	20,715 (100.00)	20,715 (100.00)	20,715 (100.00)

* Last Observation Carried Forward, fixing respondents' last valid answer across all person-years; imputation method used for the main analyses

** Mode, fixing respondents' most frequent answer, in case of multiple modes lowest value is chosen (preference of heterosexual > gay > lesbian > bisexual)

*** Mode, fixing respondents' most frequent answer, in case of multiple modes highest value is chosen (preference of bisexual > lesbian > gay > heterosexual)

**** If ever identified with a sexual minority orientation (gay, lesbian, bisexual) regarded as such (preference of bisexual > lesbian > gay)

Source: own calculation, based on UKHLS data

Interpretation: The choice of LOCF shows a balanced distribution of sexual orientation between the other imputation methods. The share of heterosexuals is a bit higher than if regarding all persons that ever indicated a sexual minority orientation as such, but lower than if chosing a mode imputation with preference for heterosexual modes. The shares of heterosexual vs. sexual minority status don't vary too much between the different imputation methods. However, there are variations between the different sexual minority orientation categories. Respondents more likely identified as gay or lesbian than bisexual in their last valid observation, whereas a bisexual identity is more likely when trying to maximize the sexual minority sample by choosing the imputation methods of maximum value mode or ever identification with a sexual minority orientation.

Fixed Effect Regression Models

Robustness Check: Different Sexual Orientation Specifications - **Sexual Minority Sample**

	Main Model LOCF[1]	Mode[2] (min value)	Mode[3] (max value)	ever LGB[4]
	estimate (p-value)	estimate (p-value)	estimate (p-value)	estimate (p-value)
Main Effect				
Transition into Marriage (Ref.:*Pre-Marriage or Control Group*)				
Anticipation (1 year before marriage)	0.745 (0.487)	1.105 (0.355)	1.008 (0.328)	1.164 (0.258)
Year of Marriage	1.466 (0.157)	0.661 (0.590)	1.104 (0.281)	1.315 (0.199)
Short-term after (1 year after marriage)	1.323 (0.218)	0.380 (0.759)	1.352 (0.206)	1.614 (0.131)
Long-term after (2-11 years after marriage)	1.053 (0.337)	1.086 (0.323)	0.192 (0.855)	0.602 (0.568)
Control Variables				
Age	-0.530*** (0.000)	-0.437*** (0.000)	-0.479*** (0.000)	-0.530*** (0.000)
Period - Years of Same-Sex Marriage Legalization				
Year 2014 (England, Wales, Scotland)	0.646* (0.084)	0.699* (0.100)	0.660* (0.077)	0.676* (0.060)
Year 2020 (Northern Ireland)	-0.358 (0.348)	-0.392 (0.370)	-0.390 (0.319)	-0.401 (0.282)
Constant	58.62*** (0.000)	56.40*** (0.000)	57.39*** (0.000)	58.54*** (0.000)
Adjusted R-squared	0.0353	0.0251	0.0309	0.0361
AIC	53742.8	43341.7	54349.3	58900.5
BIC	53791.4	43388.9	54398.0	58949.8
N	7718	6264	7816	8441

Source: own calculations, data from UKHLS SN6931 (wave 1-13)

[1] Last Observation Carried Forward, fixing respondents' last valid answer across all person-years

[2] Mode, fixing respondents' most frequent answer, in case of multiple modes lowest value is chosen (preference of heterosexual > gay > lesbian > bisexual)

[3] Mode, fixing respondents' most frequent answer, in case of multiple modes highest value is chosen (preference of bisexual > lesbian > gay > heterosexual)

[4] If ever identified with a sexual minority orientation (gay, lesbian, bisexual) regarded as such (preference of bisexual > lesbian > gay)

Robustness Check: Different Sexual Orientation Specifications - **Heterosexual Sample**

	Main Model LOCF[1]	Mode[2] (min value)	Mode[3] (max value)	ever LGB[4]
	estimate (p-value)	estimate (p-value)	estimate (p-value)	estimate (p-value)
Main Effect				
Transition into Marriage (Ref.:*Pre-Marriage or Control Group*)				
Anticipation (1 year before marriage)	0.359** (0.031)	0.360** (0.030)	0.356** (0.032)	0.344** (0.038)
Year of Marriage	0.270 (0.106)	0.306* (0.066)	0.286* (0.086)	0.270 (0.106)
Short-term after (1 year after marriage)	0.567*** (0.003)	0.605*** (0.001)	0.575*** (0.002)	0.555*** (0.003)
Long-term after (2-11 years after marriage)	0.504*** (0.004)	0.537*** (0.002)	0.545*** (0.002)	0.510*** (0.004)
Control Variables				
Age	-0.386*** (0.000)	-0.393*** (0.000)	-0.390*** (0.000)	-0.385*** (0.000)
Period - Years of Same-Sex Marriage Legalization				
Year 2014 (England, Wales, Scotland)	0.429*** (0.000)	0.429*** (0.000)	0.429*** (0.000)	0.426*** (0.000)
Year 2020 (Northern Ireland)	-0.489*** (0.000)	-0.486*** (0.000)	-0.487*** (0.000)	-0.486*** (0.000)
Constant	60.81*** (0.000)	60.93*** (0.000)	60.91*** (0.000)	60.82*** (0.000)
Adjusted R-squared	0.0268	0.0275	0.0271	0.0267
AIC	826661.1	837201.7	826082.4	821435.4
BIC	826729.2	837269.8	826150.5	821503.4
N	123167	124621	123069	122444

Source: own calculations, data from UKHLS SN6931 (wave 1-13)

[1] Last Observation Carried Forward, fixing respondents' last valid answer across all person-years

[2] Mode, fixing respondents' most frequent answer, in case of multiple modes lowest value is chosen (preference of heterosexual > gay > lesbian > bisexual)

[3] Mode, fixing respondents' most frequent answer, in case of multiple modes highest value is chosen (preference of bisexual > lesbian > gay > heterosexual)

[4] If ever identified with a sexual minority orientation (gay, lesbian, bisexual) regarded as such (preference of bisexual > lesbian > gay)

Interpretation: For sexual minority individuals marriage effects on mental health remain positive and statistically insignificant across all marital phases regardless of sexual orientation impuation used. However, the temporal pattern of the effect varies: Generous identifications of sexual minority status (mode imputation using maximum value if ambiguous or imputation of sexual minority status if ever identified as LGB) show steady increases in mental health in anticipation, at the event and short-term after marriage, but a remarkable drop of these gains long-term. Stricter sexual minority identifications (mode imputation using maximum value if ambiguous) lead to a pattern where after strong increases in the anticipation phase, the gains of marriage decrease in the year of and the year after marriage, but rise again in the long-term. Due to the variations of the temporal pattern, no definite conclusion about the development of marriage effects across anticipation, event, short- and long-term phases can be made for sexual minority individuals (s. sub-research question 1). The assessment of Hypotheses 1a and 1b is not robust.

For heterosexual individuals, marriage effects were consistent in direction, size, and pattern over time across all sexual orientation specifications. Across all robustness models, marriage effects for sexual minority individuals are greater than for heterosexual individuals, consistently supporting the main findings regarding sub-research question 2 and rejection of Hypotheses 2.

The effects of control variables are insensitive to changes in the operationalisation of sexual orientation.

Appendix 15: Robustness Checks - Different Specifications of Marital Phases

Description of Different Specifications

These robustness checks assess whether the results vary depending on the operationalization used to define marital phases. Compared to the variable *marriage_dummies* used in the main analysis, different specifications have been created that vary the length of the marital phase intervals by extending the short-term period after marriage to up to 2 years (instead of just 1 year) or additionally also extending the anticipation phase to cover 2 years before marriage (instead of 1 year). Next to these extensions, an additional variable, that doesn't vary the length, but the reference group has been created. This specification only considers the treatment sample, i.e. the effects of the different marital phases are only in relation to the mental health level of individuals who marry prior to marriage and not compared to the average mental health of all unmarried persons (both persons who marry and those who don't marry across the observed period). With this specification persistent selectivites between control and treatment group can be excluded. However, the sample size used to estimate effects shrinks dramatically under this specification.

As in the previous robustness check (Appendix 15), first the distribution of the number of observations used to estimate the marriage effects across different specifications of marital phases is assessed (sensitivity analysis). Then, fixed effect regression models, separately computed for the sexual minority and the heterosexual sample, show whether marriage effects are robust or vary with different operationalisations of marital phases.

- *Appendix 16 continues on the next page* -

Distribution of Number of Observations across Different Specifications

Sensitivity Analysis - Distribution of Marriage_Dummies Person-Years by Different Marriage_Dummies Specifications

Imputation Method		**Marriage_Dummies***	**Longer Short-Term Period****	**Longer Anticipation & Short-Term Period*****	**Reference Group Treated Sample only********
		Number of Observations	**Number of Observations**	**Number of Observations**	**Number of Observations**
Marital Phase	Pre-Event (Ref.)	111,270	111,270	108,983	9,143
		(85.01)	(85.01)	(83.27)	(31.79)
	Anticipation	2,752	2,752	5,039	2,752
		(2.10)	(2.10)	(3.85)	(9.57)
	Event	3,023	3,023	3,023	3,023
		(2.31)	(2.31)	(2.31)	(10.51)
	Short-Term after	2,514	4,776	4,776	2,514
		(1.92)	(3.65)	(3.65)	(8.74)
	Long-Term after	11,326	9,064	9,064	11,326
		(8.65)	(6.93)	(6.93)	(39.38)
	Total	130,885	130,885	130,885	28,758
		(100.00)	(100.00)	(100.00)	(100.00)

* Pre-Event: >-1 years (treated & control sample), Anticipation: -1 year, Event: 0 years, Short-Term: +1 year, Long-Term: >+1 to +11 years; specification used for the main analyses

** Pre-Event: >-1 years (treated & control sample), Anticipation: -1 year, Event: 0 years, Short-Term: +1 to +2 years, Long-Term: >+2 to +11 years

*** Pre-Event: >-2 years (treated & control sample), Anticipation: -2 to -1 years, Event: 0 years, Short-Term: +1 to +2 years, Long-Term: >+2 to +11 years

**** Pre-Event: >-1 years (treated sample only), Anticipation: -1 year, Event: 0 years, Short-Term: +1 year, Long-Term: >+1 to +11 years

Source: own calculation, based on UKHLS data

Interpretation: With an extension of the short-term period after marriage, the number of observations used to estimate the short-term parameter increases, while fewer person-years underlie the estimation of the long-term effect compared to the original marriage_dummies specification used in the main analysis. Logically, if also the anticipation period is prolonged, observations for this phase increase, while the amount of observations in the pre-event reference period decreases. When only regarding the treatment sample to estimate the effect of marriage, the total number of person-years used to estimate the effects shrinks to 28,758 observations (compared to 130,885). In this specification the person-years are also very differently distributed across the marital phases. While the percentage of observation underlying the reference period is substantially smaller compared to the other specifications, all other marital phases record a way higher share of observations, which is especially inflated in the long-term phase.

Fixed Effect Regression Models

Robustness Check: Different Marriage_Dummies Specifications - **Sexual Minority Sample**

	Main Model[1]	Longer Short-Term Period[2]	Longer Anticipation and Short-Term Period[3]	Reference Group Pre-Marriage Only (no control group)[4]
	estimate (p-value)	estimate (p-value)	estimate (p-value)	estimate (p-value)
Main Effect				
Transition into Marriage *(Specification of Marital Phases for each Model s. Notes)* (Ref.: *Pre-Event*)				
Anticipation	0.745 (0.487)	0.818 (0.443)	1.769* (0.060)	0.00165 (0.999)
Year of Marriage	1.466 (0.157)	1.545 (0.133)	2.079* (0.053)	0.520 (0.673)
Short-term after	1.323 (0.218)	0.224 (0.836)	0.766 (0.495)	0.108 (0.938)
Long-term after	1.053 (0.337)	2.033** (0.048)	2.629** (0.017)	-0.743 (0.690)
Control Variables				
Age	-0.530*** (0.000)	-0.536*** (0.000)	-0.543*** (0.000)	-0.248 (0.180)
Period - Years of Same-Sex Marriage Legalization				
Year 2014 (England, Wales, Scotland)	0.646* (0.084)	0.653* (0.080)	0.633* (0.089)	0.762 (0.448)
Year 2020 (Northern Ireland)	-0.358 (0.348)	-0.375 (0.325)	-0.367 (0.337)	-2.062 (0.113)
Constant	58.62*** (0.000)	58.81*** (0.000)	58.96*** (0.000)	54.92*** (0.000)
Adjusted R-squared	0.0353	0.0357	0.0361	0.0262
AIC	53742.8	53739.4	53735.8	5293.0
BIC	53791.4	53788.0	53784.5	5325.6
N	7718	7718	7718	779

Source: own calculations, data from UKHLS SN6931 (wave 1-13)

[1] marriage_dummies specifications used for main analyses; Pre-Event: >-1 years (treated & control sample), Anticipation: -1 year, Event: 0 years, Short-Term: +1 year, Long-Term: >+1 to +11 years; specification used for the main analyses

[2] Pre-Event: >-1 years (treated & control sample), Anticipation: -1 year, Event: 0 years, Short-Term: +1 to +2 years, Long-Term: >+2 to +11 years

[3] Pre-Event: >-2 years (treated & control sample), Anticipation: -2 to -1 years, Event: 0 years, Short-Term: +1 to +2 years, Long-Term: >+2 to +11 years

[4] Pre-Event: >-1 years (treated sample only), Anticipation: -1 year, Event: 0 years, Short-Term: +1 year, Long-Term: >+1 to +11 years

Robustness Check: Different Marriage_Dummies Specifications - **Heterosexual Sample**

	Main Model[1]	Longer Short-Term Period[2]	Longer Anticipation and Short-Term Period[3]	Reference Group Pre-Marriage Only (no control group)[4]
	estimate (p-value)	estimate (p-value)	estimate (p-value)	estimate (p-value)
Main Effect				
Transition into Marriage *(Specification of Marital Phases for each Model s. Notes)* (Ref.: *Pre-Event*)				
Anticipation	0.359** (0.031)	0.368** (0.027)	0.492*** (0.002)	0.177 (0.316)
Year of Marriage	0.270 (0.106)	0.280* (0.093)	0.430** (0.020)	0.0121 (0.950)
Short-term after	0.567*** (0.003)	0.474*** (0.005)	0.631*** (0.001)	0.254 (0.268)
Long-term after	0.504*** (0.004)	0.577*** (0.003)	0.749*** (0.000)	-0.0139 (0.959)
Control Variables				
Age	-0.386*** (0.000)	-0.388*** (0.000)	-0.390*** (0.000)	-0.311*** (0.000)
Period - Years of Same-Sex Marriage Legalization				
Year 2014 (England, Wales, Scotland)	0.429*** (0.000)	0.431*** (0.000)	0.431*** (0.000)	0.566*** (0.000)
Year 2020 (Northern Ireland)	-0.489*** (0.000)	-0.489*** (0.000)	-0.487*** (0.000)	-0.875*** (0.000)
Constant	60.81*** (0.000)	60.86*** (0.000)	60.91*** (0.000)	60.22*** (0.000)
Adjusted R-squared	0.0268	0.0268	0.0269	0.0287
AIC	826661.1	826660.7	826654.1	184840.4
BIC	826729.2	826728.8	826722.1	184898.1
N	123167	123167	123167	27979

Source: own calculations, data from UKHLS SN6931 (wave 1-13)

[1] marriage_dummies specifications used for main analyses; Pre-Event: >-1 years (treated & control sample), Anticipation: -1 year, Event: 0 years, Short-Term: +1 year, Long-Term: >+1 to +11 years; specification used for the main analyses
[2] Pre-Event: >-1 years (treated & control sample), Anticipation: -1 year, Event: 0 years, Short-Term: +1 to +2 years, Long-Term: >+2 to +11 years
[3] Pre-Event: >-2 years (treated & control sample), Anticipation: -2 to -1 years, Event: 0 years, Short-Term: +1 to +2 years, Long-Term: >+2 to +11 years
[4] Pre-Event: >-1 years (treated sample only), Anticipation: -1 year, Event: 0 years, Short-Term: +1 year, Long-Term: >+1 to +11 years

Interpretation: For sexual minority individuals marriage effects on mental health remain positive, but sizes and patterns vary with different marital period specifications. With extensions of the temporal periods (i.e. broader short-term, or both broader anticipation and short term phase), the marriage effects tend to get bigger, especially long-term, while, however, the short-term effects are substantially smaller. It therefore seems like even earlier in the lead-up to marriage as well as in the year of the event itself, sexual minority individuals on average experience strong mental health benefits. Immediate post-marriage benefits are however not sustained short-term after marriage, but unfold and become more pronounced in the long-term. Compared to the main model, the marriage effects of anticipation, event, and long-term period become significant when both anticipation and short-term phase are extended. Due to the variations of the temporal pattern, no definite conclusion about the development of marriage effects across anticipation, event, short- and long-term phases can be made for sexual minority individuals (s. sub-research question 1). The assessment of Hypotheses 1a and 1b is not robust.
For heterosexual individuals, most marriage effects increase in size and become significant with broader marital phases, though the changes were less pronounced compared to sexual minorities. Across all robustness models with variations in the length of marital phases, marriage effects for sexual minority individuals are greater than for heterosexual individuals, consistently supporting the main findings regarding sub-research question 2 and rejection of Hypotheses 2.
Measures of model fit indicate that the model using extended marital phase specifications may proportionately be best suited to explain mental health for both the sexual minority as well as the heterosexual sample.

Focusing solely on individuals who got married over the observed period and neglecting control sample observations (s. column 4), revealed overall smaller marriage effects for sexual minority individuals. As the differences in effect sizes are substantial and the long-term effect of those who get married is even negative, selection bias seems to be present, where the continuously unmarried group has distinct mental health trends. For sexual minority individuals who got married over the observed period the anticipation effect is almost absent. The year of marriage is the most strongly connected to mental health gains, but short term afterwards those benefits decrease and even become largely negative long-term.
Also for heterosexual individuals there are tremendous differences between the main analytical model and exclusively regarding persons who got married. When only considering the mental health changes of those who got married, none of the effects of the marital phases appears to be significant. As for sexual minority individuals all marriage effects got weaker in size and in the long-term marriage even seems to on average, although just weakly, negatively affect mental health.
It should be noted that the effects exclusively regarding persons that got married are based on a very small sample and are not significant.