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The roles of non-heterosexuality outside of identity and gender non-conformity in Allostatic Load among young adults☆

Katsuya Oi *, Amanda M. Pollitt **

Northern Arizona University, USA

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ABSTRACT

Using the National Longitudinal Study of Adolescent to Adult Health, this study contrasted levels of Allostatic Load at the baseline and change observed between the age 20s and 30s, among self-identified Lesbians/Gays/Bisexuals and heterosexuals with non-heterosexual attraction/behavior (discordant heterosexuals), against heterosexuals without (concordant heterosexuals). In addition, the study tested if Allostatic Load differs for each of the sexual orientation group differs jointly or independently of gender non-conformity. The study found no Allostatic Load elevation for self-identified non-heterosexual men and women. For women only, a significantly greater elevation of Allostatic Load is observed among discordant heterosexuals. Independently, Allostatic Load is found higher for females appearing more androgynous. The findings suggest expanding the current scope of sexual minority research to consider the relevance of minority stress to those without a LGB identity, who may be exposed to stress from disparate sources related to their gender identity.

1. Introduction

A vast body of research documents various health disadvantages that have disproportionately affected sexual minority populations (a population defined as those who identify as non-heterosexual or who experience non-heterosexual attraction and/or behavior) in the past and present. Though the factors and pathways that contribute to those disadvantages are broad and complex, stress has been featured prominently in recent research. Many health disadvantages among sexual minorities are of psychological nature, such as depressive symptoms/suicidality, lower self-esteem, and risky health behavior (Fredriksen-Goldsen et al., 2014; Marshal et al., 2011; Oi & Wilkinson, 2018). Daily stress that sexual minorities are exposed to and thus accumulates over life course, could be a main driver of those disadvantages.

The minority stress model (Meyer, 2003) was conceived to account for psychological health disadvantages among sexual minorities. The model attributes those disadvantages primarily to stigma-based sexual minority stressors, including discrimination which may be explicit, implicit, de facto, de jure, internal or external. Motivated by this framework, an ever-growing number of studies have examined if such stress could "get under the skin" by contrasting metabolic and cardiovascular biomarkers, collectively termed as Allostatic Load, between and within sexual minority populations (Flentje et al., 2020; Juster et al., 2019; Richters et al., 2014). Typically extracted from assays of lipids, inflammation, and blood pressure, Allostatic Load is closely correlated with a myriad of chronic and degenerative diseases (e.g., stroke, heart attack, type-2 diabetes, cancer), and, ultimately, mortality (Juster et al. 2010, 2019; Juster et al., 2010).

One lingering issue for research on Allostatic Load for sexual minorities is that little research has been empirically conducted to understand who is physiologically affected by minority stress due to sexual orientation. Historically, public health focus on sexual minorities have been strictly tied to those with gay, lesbian, or bisexual (LGB) identities. However, both in reality and theory, there are those without a LGB identity who indicate their non-heterosexuality, either by behavior or thoughts, and thus are potentially exposed to minority stress. Furthermore, inter-personal and societal de facto sanctions against non-heterosexuality could target anyone who appears deviant from

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* Corresponding author. SBS Castro, 308 5 E McConnell Dr, AZ, 86011, USA.
** Corresponding author. Department of Health Sciences, Center for Health Equity Research, 1395 S Knoles Dr, Flagstaff, AZ, 86011, USA.
E-mail addresses: Katsuya.oi@nau.edu (K. Oi), Amanda.Pollitt@nau.edu (A.M. Pollitt).

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heterosexuality, which has more to do with gender non-conformity (GNC) rather than sexual orientation itself.

This study follows an extant approach to conceptualize Allostatic Load as a physiological proxy of minority stress but extends it by newly examining its relevance to subgroups that have been previously overlooked. In addition to LGB individuals, this study includes so-called *discordant* heterosexuals who do not identify as LGB but experience romantic attraction to and sexual behavior with members of their sex, those who appear non-conforming to norms expected of their respective gender, and anyone that falls in-between those groups.

To extend the approach with a life course perspective, the relevance of minority stress to sexual minorities is tested in a transitionary period from their 20s–30s during the 2010s. Though stress can be physiologically embedded at all stages of the lifespan, stress that occurs in adolescence and young adulthood can be particularly impactful on health outcomes (Pervanidou & Chrousos, 2012). Moreover, young adulthood is a key time when young people explore their gender and sexuality and develop intimate relationships (Meier & Allen, 2009), making sexual minority stress at this time particularly salient. Tracing the longitudinal elevation of Allostatic Load in this developmental period provides better theoretical understanding of pathways of how minority stress manifests over the life course.

1.1. Who are sexual minorities?

Current theoretical understanding of sexual orientation is that it is comprised of multiple dimensions, including sexual identity, sexual/romantic attraction, and sexual behavior (Laumann et al., 2000). Minority stress due to sexual orientation, then, could be experienced by those whose experiences do not align with heterosexuality in any of those dimensions. There has been a strong research focus on minority stress affecting primarily those who identify with a non-heterosexual identity but growing evidence in the past decade suggests higher levels of stress experienced also by those who indicate non-heterosexual attraction and/or behavior (Bostwick et al., 2010). For instance, some heterosexual men do engage in sexual behavior with other men. While their heterosexual identity may lessen potential exposure to external homo-negative/phobic encounters that target them, some individuals struggle between self-acceptance and social privileges endowed to heterosexuality (Quinn et al., 2019; Silva, 2017). In some other cases, they may experience an internal strife by recognizing social privileges associated with the "straight" label as well as social consequences of losing that label (Robinson & Vidal-Ortiz, 2013; Wolitski et al., 2006).

In short, any misalignment among sexual identity, attraction, and behavior warrants examination of potential stress elevation that results from it. Compared to those who rigidly identify themselves as heterosexual, Allostatic Load is likely higher for those who identify as non-heterosexual, as well as those who do not but experience non-heterosexuality by their sexual attraction/behavior.

1.2. GNC within sex

De facto/de jure sanctions against non-heterosexuality affirm the institutionalization of heteronormativity, which are embedded in heterosexist biases that permeate inter-personal interactions daily (Bishop et al., 2020). Underlying mechanisms of minority stress differ for male and female sexes, not only because of sex-based biology, but also because of this intimate link between heteronormativity and heterosexism. For example, non-heterosexual males are at risk of experiencing more severe forms of heterosexism and homonegativity (Ioverno & Russell, 2021). Non-heterosexual females do experience both to an extent, but their negative experiences often manifest in socio-economic disadvantages rather than physiological stress (Pearson & Wilkinson, 2017; Wright, 2016). For these biological and structural reasons, this study contrasts Allostatic Load levels within each sex.

How men and women are "supposed" to act per heterosexism is centered not only on sexual orientation but also on how masculine/feminine men/women appear (Butler, 2004). Within each sex, the Gender Schema Theory posits that the degree of gender conformity plays roles in the perceived level of stress (Bem, 1981; Juster et al., 2016; Starr & Zurbriggen, 2017). According to this theory, individuals who do not conform exclusively to feminine or masculine schemas (a set of behaviors, norms, and rules expected of females and males, respectively) are able to code-switch between different gendered contexts to better maintain their mental well-being and protect it against harms of heterosexism (Juster et al., 2016).

Lesbian, gay, and bisexual women and men are more likely to appear gender nonconforming than heterosexuals, and this gender nonconformity has been shown to be protective for mental health in young adulthood (Li, Pollitt, & Russell, 2016), suggesting some evidence for Gender Schema Theory. However, sexual minority individuals are also often singled out as deviant by transgressing against rigid heterosexist gender norms. The Gender Schema Theory could be contradictory to those common hostile experiences among sexual minorities, who felt assailed due to, *not in spite of,* apparent deviance from their assumed gender (Ioverno & Russell, 2021). One possibility is that higher Allostatic Load related to sexual minority stress is independent of, but conflated by, stress related to gender conformity/non-conformity. In another, the extent of minority stress felt by sexual minorities is jointly influenced by their sexual orientation and gender non-conformity. In the latter case, gender non-conforming could exacerbate stress for sexual minorities, possibly by deepening internal/external homophobia and homo-negativity that discordant heterosexuals are already vulnerable to. This study aims to test if that is the case.

1.3. Cumulative elevation of stress

Higher Allostatic Load in metabolic/vascular biomarkers has been consistently found among stigmatized groups, including racial/ethnic minorities and the socio-economically disadvantaged. With recent availability of biomarker data, a growing number of studies document that Allostatic Load is cumulative over time (Juster et al., 2010, 2016, 2016). Stress from various sources including, but limited to, minority stress, aggravates the body to the extent that it exhausts its physiological reserves and struggles to maintain homeostasis effectively (Juster et al., 2010).

It remains unexplored whether Allostatic Load is cumulative over time among sexual minorities. Minority stress, no matter how mild or acute, could linger in the body for a period of time and possibly permanently (Smith & Ingram, 2004; Waldo, 1999). As mentioned above, gender nonconformity could attenuate or exacerbate Allostatic Load over time, depending on sexual orientation (Li, Pollitt, & Russell, 2016).

A life course perspective further motivates testing whether Allostatic Load is cumulative among sexual minorities as they transition out of young adulthood. Young people explore their sexuality in adolescence and young adulthood; sexual identity development during this time is complex and fluid, particularly among non-heterosexual youth (Bishop et al., 2020). Moreover, this is a time in which young people begin to engage in their first romantic and sexual relationships while navigating school and career/occupational ladders (Pervanidou & Chrousos, 2012). Various forms of stigma experienced during this critical period can have strong impact physiologically over time among individuals who have non-heterosexual identities, attraction, or behavior, especially if they are also gender non-conforming (Saewyc, 2011). Determining whether minority stress experienced by sexual minorities manifests as Allostatic Load and accumulates over time therefore provides a new insight into underlying mechanisms that differentiate health outcomes across the life course (Kuh et al., 2003; Pervanidou & Chrousos, 2012). To this end, this study uses data of biomarkers collected in two time points: one between the year 2008 and 2009, and another between 2016 and 2018 from a nationally representative sample in the United States, to test if

Allostatic Load elevates to a greater extent for sexual minorities than those who rigidly identify themselves as heterosexual as they transition from early adulthood (24–32) to adulthood (33–43).

2. Hypotheses

The minority stress model suggests that individuals who experience any non-heterosexuality, including non-heterosexual identity, attraction, or behavior, experience stigma-based stressors that could be observable in metabolic/cardio-vascular systems. Thus, we hypothesize that, compared to those who identify as heterosexual who report heterosexual romantic attraction and sexual behavior (whom we refer to as concordant heterosexuals), Allostatic Load will be higher for those who identify as lesbian, gay, or bisexual (LGB) and for discordant heterosexuals (H1).

Gender Schema Theory argues that gender non-conformity could be protective for stress; however, this may not be true for non-heterosexual people, who are more likely to be gender non-conforming and experience retaliation for this gender non-conformity. We explore how gender non-conformity is related to Allostatic Load either jointly or independently of sexual orientation through two related hypotheses. First, we hypothesize that greater degrees of gender non-conformity are associated with higher Allostatic Load, regardless of sexual orientation (H2a). Second, we hypothesize that greater degrees of gender non-conformity are associated with higher Allostatic Load only among LGBs and discordant heterosexuals (H2b).

Finally, we take a life course perspective to understand how Allostatic Load may accumulate over time for individuals who experience non-heterosexuality and gender non-conformity. We hypothesize that Allostatic Load is not only higher for LGBs, discordant heterosexuals, and gender-nonconforming individuals in their 20s (Wave IV), but it also becomes further elevated as they transition into their 30s (Wave V) (H3).

3. Methods

3.1. Data and sample

This study draws data from the National Longitudinal Study of Adolescent to Adult Health (Add Health). The longitudinal design of Add Health provides repeated observations of those who were born between 1974 and 1983 over a period of nearly 30 years. Add Health Waves, I, II III, IV and V, took place in 1994, 1996, 2001, 2008, and 2016, respectively. Data for the main analysis were drawn from a subsample of participants in Add Health Waves IV/V (N = 8353). The current study included only those who had no missing information on baseline predictors, including race/ethnicity, gender, sexual identity, romantic attraction, sexual behavior and androgyny. The resulting study sample consists of 4,886 female and 3,467 male participants. All study members participated in Wave IV, but not all did in Wave V.

3.2. Measures

3.2.1. Allostatic load

Add Health field agents collected biomarker information from representative subsamples of the participants via physical exam/blood draws during an in-person home visit in Waves IV and V and their collection methodologies are described in detail elsewhere (Entzel et al., 2018; Whistsel et al., 2020). We followed methods of previous Add Health studies to construct an Allostatic Load index based on whether participants were at high risk for 7 of these biomarkers: diastolic blood pressure, systolic blood pressure, hemoglobin A1c (HbA1c), and C-reactive protein (CRP); triglycerides, total cholesterol, and high-density lipoprotein (HDL) cholesterol (Richardson et al., 2021). The following steps are taken to construct a single measure for Allostatic Load.

First, each biomarker is recoded into deciles. This practice was recommended due to the reliance of lipid assays on dried capillary blood and the technologies used for collection and processing by Add Health (Entzel et al., 2018). To account for known design effects in each Add Health survey, decile ranks were assigned based on the distribution observed in each Wave. Deciles of each biomarker were then converted to z-scores, so that converted values of biomarkers could be treated as continuous variables with consistent minimum/maximum range (i.e., −1.57-1.57). Finally, the z-scores were summed across the biomarkers, to create a single index of Allostatic Load. Higher index values indicate the extent to which study members deviate above the Wave-specific average of all biomarkers.

3.2.2. Sexual behavior, attraction, and identity

This study drew separate measures for sexual behavior, attraction, and identity, and combined them to categorize participants into 1) concordant heterosexuals, 2) LGBs, and 3) discordant heterosexuals. The measures were asked in both Waves IV and V. For identity, participants were determined to be a lesbian/bisexual/gay (LGB) when they self-reported that they were bisexual, attracted to both men and women, mostly homosexual, or 100% homosexual, in response to the question asking for them to select one identity most reflective of their sexual identity.

The remaining participants (100% mostly heterosexuals) were sorted into concordant or discordant heterosexuals by referencing whether they responded positive to the following questions: “have you ever had a romantic attraction to a [member of their own sex]?" and “considering all sexual activities, with how many partners [of their own sex] have you ever had sex?“. If they did respond positively to at least one of the questions, they are considered as discordant heterosexuals. The identification of these groups is based on the measures in each Wave and could vary between Waves, which is plausible given the evolving nature of sexuality over the life course (Laumann et al., 2000). This study therefore uses the grouping measure as a time-varying independent variable.

3.2.3. Androgyny scale

Gender non-conformity is operationalized with an androgyny scale with a question asking respondents “on average how do you think people would describe your appearance, style, dress?” with the following categories to respond with: “very feminine”, “feminine”, somewhat feminine”, “equally feminine and masculine”, “somewhat masculine”, “masculine”, “very masculine”. These categorizes were assigned a numeric value, 0, 1, 2, 3, 4, 5, 6, respectively. This scale was applied to female respondents, so that a higher numeric value indicates a greater degree of deviation in appearance from their sex. The scale was reversed (e.g., very masculine is assigned a 0) for male respondents for the same reason. The scale was measured only in Wave V.

3.2.4. Covariates

Sexual minorities and non-sexual minorities differ in various demographic and socio-economic characteristics. The following measures were therefore included to account for those characteristic differences: race/ethnicity reported in Wave I, age reported in Wave IV, total income, educational attainment, unemployment status, and statuses for parenthood, cohabitation, and marriage. Similar to the sexuality grouping, measures for those characteristics, besides race/ethnicity and age, were reported in both Waves IV and V and thus treated as time-varying.

Income was also measured initially with the respondents’ total earnings in nominal dollars in Wave IV, which are then adjusted for inflation and re-categorized into the same brackets used to measure in Wave V as follows: 0/4999, 5000/9999, 10000/14999, 15000/19999, 20000/24999, 25000/29999, 30000/39999, 40000/49999, 50000/74999, 75000/99999, 100000/149999, 150000/199999, 200000+. Starting with the lowest bracket, these categories are consecutively numbered so that this income measure ranges from 1 to 13. Educational attainment is measured in five categories with shown values: 0) did not

finish a high school education 1) high school diploma or GED, 2) post-high school education/vocational/some college, 3) a four-year college degree, 4) a graduate degree, and 5) a Ph.D. or other professional education such as law and medical degrees. Unemployment status was measured in each Wave by indicating whether one was working for pay at the time of interview. Marital status and cohabitation status are confirmed when they reported they were married or cohabiting with their partner at the time of interview. All the other circumstances were considered as not married and cohabiting. Parenthood status is measured by confirming whether they have at least one child under care or not.

4. Analytic plan

This study employs multi-level Ordinary Least Square Models to predict the Allostatic Load index measured in Waves IV and V. As indicated above, the study data are structured in two-levels in which observations pooled from Waves IV and V (level 1) are nested within respondents (level 2). Multi-level models were used to account for unobserved random variability (i.e., heterogeneity) in the Allostatic Load index across the respondents, referred to as random effects. All models were survey weighted using the longitudinal weight named "GSW145" available in Add Health, which adjusts the models for the sampling design of Add Health as well as attrition across waves. Thus, model results are nationally representative. Detailed discussion of preserving the representativeness of the sample via the weight can be found elsewhere (Chen & Harris, 2020).

The models include random intercepts, which account for baseline differences between respondents (i.e., unobserved time-constant heterogeneity). In addition, we include a fixed effect of over-time change in the Allostatic Load index with a dichotomous variable for wave of observation (0 = Wave IV; 1 = Wave V). The coefficient associated with Wave V is interpreted as change since Wave IV.

To test the hypotheses, a series of these multi-level models stratified by sex were constructed with varying covariate specifications. To test H1, the first model estimates differences in the Allostatic Load index among three groups with a dummy coded main effect for sexual orientation: concordant heterosexuals (reference category), LGBs, and discordant heterosexuals. To test H2a H2b, and H3, a series of interaction terms among the sexual orientation groups, the androgyny scale, and the Wave V dummy were added. Those interaction terms are introduced and described in detail as the result are discussed in the following section.

5. Results

On average, respondents were 28.69 years old at Wave IV. Add Health is a nationally representative dataset and thus the racial/ethnic make-up of the sample is consistent with that of the US population (67.0% white, 14.8% Black, 8.4% Hispanic, and 3.0% another race). We show weighted descriptive statistics for time invariant study variables by sex and sexual orientation status (concordant heterosexual, LGB, and discordant heterosexual) in Table 1 and for time-varying study variables in Table 2.

Across Waves and the sexual orientation groups, AL index is higher on average for males than females, indicating biological sex differences captured in metabolic/cardio-vascular marker, and thus the need for the sex-based stratification of analyses to better serve the purposes of this study. Averages of AL reveal no specific patterns across the sexual orientation group or over time, while patterns for parenthood, marriage, cohabitation are divergent.

5.1. Differences in Allostatic Load by sexual orientation groups

According to H1, we expected that Allostatic Load would be significantly higher for LGBs and discordant heterosexual respondents compared to concordant heterosexual respondents. Table 3 shows no differences in Allostatic Load among the three sexual orientation groups for either sex, thus contradicting H1. The coefficient for Wave V is significantly positive for females, suggesting an increase in Allostatic Load between Waves IV and V experienced by female, but not by males. Random effects are also significant for both males and females, meaning that the baseline level of Allostatic Load and subsequent change between Waves IV and V significantly vary across the individuals.

5.2. Association between gender Non-Conformity and Allostatic Load

In Table 3, Allostatic Load is estimated to be different by the androgynous scale and the sexual orientation groups, independently of one another (H2a). The results are supportive of H2a for females but not for males. Independently of sexual orientation, Allostatic Load was significantly higher for more androgynous females, with a 0.27 z-score increase per one unit on the scale ($p < 0.001$). On the other hand, a 0.17 z-score *decrease* ($p = 0.05$) is found for their male counterparts.

Table 1
Descriptive statistics of time invariant study variables by sex and sexual orientation.

Females												
	Concordant Heterosexuals (n = 4080)				LGB (n = 189)				Discordant Heterosexuals (n = 617)			
	Mean	SE	95% CI		Mean	SE	95% CI		Mean	SE	95% CI	
Androgynous Scale	0.89	0.02	0.86	0.92	1.91	0.14	1.64	2.18	1.14	0.05	1.05	1.24
Age	28.74	0.04	28.67	28.81	28.46	0.16	28.15	28.77	28.53	0.09	28.35	28.70
White	0.65	0.01	0.63	0.67	0.60	0.04	0.51	0.68	0.71	0.02	0.67	0.76
Black	0.16	0.01	0.15	0.18	0.18	0.03	0.11	0.24	0.10	0.01	0.08	0.12
Hispanic	0.09	0.01	0.08	0.10	0.11	0.03	0.05	0.17	0.08	0.01	0.05	0.10
Other	0.03	0.00	0.02	0.03	0.05	0.02	0.01	0.10	0.04	0.01	0.02	0.06
Males												
	Concordant Heterosexuals (n = 3203)				LGB (n = 123)				Discordant Heterosexuals (n = 141)			
	Mean	SE	95% CI		Mean	SE	95% CI		Mean	SE	95% CI	
Androgynous Scale	0.57	0.02	0.54	0.60	1.70	0.17	1.36	2.03	1.02	0.14	0.74	1.30
Age	28.90	0.04	28.82	28.99	28.90	0.20	28.49	29.30	29.40	0.16	29.08	29.73
White	0.66	0.01	0.64	0.68	0.59	0.06	0.48	0.71	0.54	0.06	0.42	0.65
Black	0.14	0.01	0.13	0.16	0.13	0.04	0.06	0.20	0.16	0.04	0.08	0.24
Hispanic	0.08	0.01	0.07	0.10	0.14	0.04	0.06	0.21	0.23	0.06	0.11	0.34
Other	0.04	0.00	0.03	0.05	0.03	0.02	−0.01	0.07	0.04	0.02	−0.01	0.08

Note. LGB = lesbian, gay, or bisexual identified. Concordant heterosexuals reported both a heterosexual identity and different-sex attraction and behavior; discordant heterosexuals reported a heterosexual identity and same-sex attraction and/or behavior. The androgynous scale (0–6) and age are measured at Wave V; race/ethnicity is measured at Wave I.

Table 2
Descriptive statistics of time-varying study variables by sex and sexual orientation.

Concordant Heterosexuals																
	Females								Males							
	Wave IV (n = 4080)				Wave V (n = 1799)				Wave IV (n = 3203)				Wave V (n = 1434)			
	Mean	SE	95% CI		Mean	SE	95% CI		Mean	SE	95% CI		Mean	SE	95% CI	
Allostatic Load	−0.52	0.08	−0.67	−0.37	−0.41	0.12	−0.63	−0.18	0.73	0.08	0.58	0.88	0.65	0.12	0.42	0.88
Unemployed	0.19	0.01	0.17	0.20	0.23	0.02	0.20	0.26	0.18	0.01	0.16	0.19	0.13	0.01	0.11	0.15
Income	5.49	0.06	5.37	5.61	6.57	0.12	6.34	6.80	7.01	0.06	6.88	7.13	7.85	0.11	7.63	8.08
Education	2.30	0.02	2.26	2.35	2.60	0.03	2.53	2.67	2.07	0.03	2.01	2.12	2.31	0.04	2.23	2.40
Parenthood	0.40	0.01	0.38	0.42	0.80	0.01	0.77	0.82	0.30	0.01	0.28	0.32	0.72	0.02	0.68	0.75
Cohabiting	0.18	0.01	0.17	0.20	0.11	0.01	0.09	0.13	0.21	0.01	0.19	0.23	0.13	0.01	0.11	0.16
Married	0.51	0.01	0.48	0.53	0.67	0.02	0.64	0.70	0.41	0.01	0.39	0.43	0.60	0.02	0.56	0.63
LGB																
	Females								**Males**							
	Wave IV (n = 189)				Wave V (n = 99)				Wave IV (n = 123)				Wave V (n = 78)			
	Mean	SE	95% CI		Mean	SE	95% CI		Mean	SE	95% CI		Mean	SE	95% CI	
Allostatic Load	−0.61	0.32	−1.24	0.02	−0.37	0.58	−1.52	0.79	0.80	0.40	0.00	1.60	0.57	0.55	−0.53	1.68
Unemployed	0.11	0.03	0.05	0.17	0.15	0.05	0.04	0.26	0.09	0.03	0.03	0.15	0.11	0.06	−0.01	0.23
Income	5.24	0.28	4.69	5.79	6.78	0.41	5.97	7.59	6.66	0.33	6.01	7.32	7.38	0.52	6.34	8.42
Education	1.92	0.10	1.72	2.12	2.60	0.13	2.33	2.87	2.21	0.12	1.96	2.45	2.52	0.20	2.13	2.91
Parenthood	0.31	0.05	0.21	0.40	0.42	0.07	0.28	0.55	0.06	0.03	0.00	0.13	0.11	0.05	0.00	0.22
Cohabiting	0.36	0.05	0.27	0.46	0.28	0.07	0.15	0.41	0.28	0.05	0.17	0.39	0.30	0.07	0.15	0.44
Married	0.22	0.04	0.14	0.30	0.42	0.07	0.29	0.56	0.06	0.03	−0.01	0.12	0.26	0.07	0.12	0.40
Discordant Heterosexual																
	Females								**Males**							
	Wave IV (n = 617)				Wave V (n = 396)				Wave IV (n = 141)				Wave V (n = 64)			
	Mean	SE	95% CI		Mean	SE	95% CI		Mean	SE	95% CI		Mean	SE	95% CI	
Allostatic Load	−0.65	0.17	−0.98	−0.32	−0.11	0.23	−0.56	0.34	0.50	0.42	−0.34	1.34	0.78	0.48	−0.17	1.73
Unemployed	0.11	0.02	0.08	0.14	0.24	0.03	0.18	0.30	0.22	0.07	0.09	0.35	0.09	0.04	0.01	0.17
Income	5.16	0.16	4.84	5.48	5.92	0.23	5.47	6.37	5.82	0.32	5.20	6.45	7.08	0.46	6.17	8.00
Education	2.05	0.05	1.94	2.16	2.35	0.07	2.21	2.50	1.95	0.12	1.71	2.18	2.48	0.23	2.02	2.95
Parenthood	0.42	0.03	0.37	0.47	0.75	0.03	0.69	0.80	0.27	0.05	0.16	0.37	0.68	0.09	0.49	0.86
Cohabiting	0.28	0.02	0.23	0.32	0.19	0.03	0.13	0.24	0.15	0.03	0.08	0.22	0.21	0.09	0.03	0.40
Married	0.40	0.03	0.35	0.45	0.54	0.03	0.47	0.60	0.41	0.07	0.29	0.54	0.41	0.09	0.24	0.58

Note: Allostatic Load = summed z-scores of 7 biomarkers: diastolic blood pressure, systolic blood pressure, hemoglobin A1c (HbA1c), and C-reactive protein (CRP); triglycerides, total cholesterol, and high-density lipoprotein (HDL) cholesterol Income = 0–13: buckets 0/4999–200000+ in dollars, Education = 0-5: did not finish a high school education 1) high school diploma or GED, 2) post-high school education/vocational/some college, 3) a four-year college degree, 4) a graduate degree, and 5) a Ph.D. or other professional education).

5.3. Joint differences in Allostatic Load by sexual orientation and androgyny

In accordance with H2b, joint differences in Allostatic Load by sexual orientation and androgyny are alternatively examined in Table 4. The coefficients for the three sexual orientation groups are parameterized to be average differences in Allostatic Load compared to *concordant heterosexuals* when all reported 0 on the scale (i.e., very feminine females/very masculine males). The interaction coefficient with the androgyny scale for each group (estimates under "✖ androgynous scale" in Table 4) quantifies the extent to which Allostatic Load is differentiated per one-unit increase on the androgynous scale for that group.

We did not find support for H2b for either sex: LGB and discordant heterosexuals females and males did not have higher Allostatic Load at higher levels of androgyny when compared to non-androgynous concordant heterosexuals. Instead, we found that the interaction between androgyny and Allostatic Load was positive for concordant heterosexual females ($p < 0.05$), such that for every one unit increase in androgyny, concordant heterosexual females have a 0.29 z-score increase in Allostatic Load. The coefficient was also positive but not significant at the 95% threshold among any of the male groups (with the p-value of 0.09 for concordant heterosexual males being the lowest).

5.4. Cumulative stress in adulthood

H3 specifies that Allostatic Load is elevated over time, to a greater extent for discordant heterosexuals and LGBs, compared to concordant heterosexuals. Because it is left unspecified whether it makes difference independently of, or jointly with, gender non-conformity, this is tested under two specifications. The first specification is derived from H2a (sexual orientation and androgyny independently affect Allostatic Load), and the second is derived from H2b (sexual orientation and androgyny jointly affect Allostatic Load).

The main coefficients for LGBs and discordant heterosexuals are z-score differences in Allostatic Load compared to concordant heterosexuals in Wave IV. The coefficient of Wave V then refers to a z-score change between Waves IV and V for concordant heterosexuals. The interaction coefficients noted as "LGBs/Discordant Heterosexuals ✖ Wave V" refer to z-score changes between Waves IV and V compared to concordant heterosexuals. Similarly, the interaction term labeled "Androgynous Scale ✖ Wave V″ is a z-score difference per one unit increase on the androgynous scale in Wave V, compared to that of Wave IV.

Partial support for H3 is found with respect to sexual orientation as shown in Table 5. For concordant heterosexual females, between-Wave change is a 0.36 z-score increase ($p = 0.03$). While change is estimated to be also positive for their male counterparts, it is not statistically significant ($b = 0.10$, $p = 0.52$). Allostatic Load is elevated even more for discordant heterosexual females, netting a 0.91 z-score increase since Wave IV ($0.36 + 0.55$, $p = 0.04$). An elevation of Allostatic Load is estimated to be also greater for their male counterparts (by 0.47), however, without statistical significance ($p = 0.38$). For both sexes, Allostatic Load is *not* significantly higher for discordant heterosexuals or LGBs in Wave IV.

Table 3
Multi-level OLS regression models predicting Allostatic Load.

	Model 1 (Females)			Model 2 (Males)		
	B	SE	P	B	SE	P
Wave V	**0.46**	**0.11**	**< 0.001**	0.05	0.13	0.70
LGB[a]	−0.43	0.29	0.14	0.08	0.32	0.81
Discordant Heterosexual[a]	−0.07	0.16	0.64	−0.22	0.31	0.48
Androgynous Scale	**0.26**	**0.07**	**< 0.001**	**−0.17**	**0.09**	**0.05**
Age	**0.07**	**0.04**	**0.04**	**0.20**	**0.04**	**< 0.001**
Black[b]	**0.96**	**0.16**	**< 0.001**	0.22	0.19	0.25
Hispanic[b]	0.37	0.22	0.09	−0.20	0.24	0.41
Other[b]	**1.17**	**0.41**	**< 0.001**	0.08	0.44	0.85
Unemployed	0.01	0.13	0.95	−0.10	0.16	0.54
Income	**−0.04**	**0.02**	**0.05**	−0.02	0.02	0.38
Education	**−0.23**	**0.06**	**< 0.001**	**−0.42**	**0.06**	**< 0.001**
Parenthood	**−0.45**	**0.12**	**< 0.001**	0.12	0.14	0.39
Cohabiting	−0.04	0.16	0.81	−0.07	0.18	0.72
Married	0.00	0.13	0.99	−0.13	0.14	0.35
Intercept	**−2.18**	**1.05**	**0.04**	**−3.83**	**1.10**	**< 0.001**
Random Intercept	**5.59**	**0.32**	**< 0.001**	**4.78**	**0.34**	**< 0.001**

Note. Unstandardized estimates shown. Allostatic Load measured in z-score. Income = 0–13. Education = 0-5.
Wave V indicates Z-score change in Allostatic Load between Waves IV and Wave V.
[a] Concordant heterosexuals as the reference.
[b] White as the reference.

With respect to the androgynous scale, no support for H3 is found. For both sexes, the scale has no impact on the extent of change in Allostatic Load between Waves. As seen in the previous analyses, the androgynous scale is associated with statistically significantly higher Allostatic Load for females ($p < 0.001$) and lower (but not statistically significantly) for males ($p = 0.15$) in Wave IV.

Finally, the analysis shown in Table 4 is extended to model joint influences on Allostatic Load by sexual orientation and androgyny. The interaction term between the androgynous scale and the sexual orientation groups is estimated separately in Waves IV ("Discordant Heterosexual ✖ Androgynous Scale") and V ("Discordant Heterosexual ✖ Androgynous Scale ✖ Wave V″). No significant interaction terms shown in Table 6 corroborate the findings from Table 3, that the androgynous scale differentiates Allostatic Load among females, regardless of sexual orientation.

6. Discussion

Minority stress, often approximated by Allostatic Load, has garnered increasing attention as one of the key mechanisms underlying health disparities for sexual minorities (Bodenmann et al., 2010; Marshal et al., 2011; Verrelli et al., 2019). Current understanding of minority stress is largely drawn from experiences among those who identify as LGB; this study aimed to expand the literature by theoretically and empirically examining whether minority stress affects other non-heterosexual populations. Existing reports consistently indicate a relatively large group of discordant heterosexuals in the US, who identify as heterosexuals yet experience non-heterosexual attraction and behavior (Rosario et al., 2011). Moreover, it remained unclear if gender non-conformity, commonly found among LGBs and discordant heterosexuals (Li et al., 2016), contributes independently or jointly to the extent of minority stress observable in Allostatic Load.

We hypothesized, but did not find, that Allostatic Load would be higher among LGB and discordant heterosexuals. We also expected that this association between sexual orientation and Allostatic Load would be stronger over time for LGB and discordant heterosexuals. Instead, we found that only discordant heterosexual females had greater elevation in Allostatic Load over time than concordant heterosexual females. Explanations as to why are many and ultimately speculative, but this study draws some insight from a life course perspective. For instance, grappilng with one's own sexual orientation can worsen Allostatic Load during the transition to adulthood particularly for discordant heterosexual females. Adolescence and young adulthood are time periods for development of sexuality and relationships; although exploring one's identity is normative during this time, prior research found earlier identification with an LGB identity is associated with better health outcomes (Katz-Wise et al., 2014; Oi & Wilkinson, 2018).

Table 4
Multi-level OLS regression models predicting Allostatic Load, with the effect of the androgynous scale estimated separately for each sexual orientation group.

	Model 1 (Females)					Model 2 (Males)				
	B	SE	P	95% CI		B	SE	P	95% CI	
Wave V	**0.45**	**0.11**	**< .001**	**0.24**	**0.67**	0.05	0.13	0.71	−0.20	0.29
LGB[a]	−0.41	0.45	0.36	−1.28	0.47	0.28	0.44	0.53	−0.59	1.14
Discordant Heterosexual[a]	0.07	0.23	0.77	−0.39	0.52	−0.24	0.40	0.55	−1.03	0.55
Concordant Heterosexual x Androgynous Scale[c]	**0.29**	**0.09**	**< .001**	**0.12**	**0.46**	−0.16	0.09	0.09	−0.34	0.03
LGB x Androgynous Scale[c]	0.26	0.20	0.18	−0.12	0.65	−0.28	0.24	0.23	−0.75	0.18
Discordant Heterosexual x Androgynous Scale[c]	0.16	0.16	0.33	−0.16	0.48	−0.14	0.26	0.58	−0.65	0.37
Age	**0.07**	**0.04**	**0.04**	**0.00**	**0.14**	**0.20**	**0.04**	**< .001**	**0.12**	**0.27**
Black[b]	**0.96**	**0.16**	**< .001**	**0.65**	**1.27**	0.23	0.20	0.25	−0.16	0.61
Hispanic[b]	0.38	0.22	0.09	−0.05	0.81	−0.20	0.24	0.40	−0.68	0.27
Other[b]	**1.17**	**0.41**	**< .001**	**0.37**	**1.97**	0.08	0.44	0.85	−0.78	0.94
Unemployed	0.01	0.13	0.95	−0.25	0.27	−0.10	0.16	0.54	−0.40	0.21
Income	**−0.04**	**0.02**	**0.05**	**−0.08**	**0.00**	−0.02	0.02	0.38	−0.07	0.03
Education	**−0.23**	**0.06**	**< .001**	**−0.34**	**−0.12**	**−0.42**	**0.06**	**< .001**	**−0.54**	**−0.30**
Parenthood	**−0.45**	**0.12**	**< .001**	**−0.69**	**−0.21**	0.12	0.14	0.39	−0.15	0.39
Cohabiting	−0.04	0.16	0.79	−0.36	0.27	−0.07	0.18	0.70	−0.43	0.29
Married	0.00	0.13	0.97	−0.26	0.25	−0.13	0.14	0.35	−0.42	0.15
Intercept	**−2.19**	**1.05**	**0.04**	**−4.25**	**−0.13**	**−3.82**	**1.10**	**< .001**	**−5.98**	**−1.67**
Random Intercept	**5.59**	**0.32**	**< .001**	**4.99**	**6.26**	**4.78**	**0.34**	**< .001**	**4.15**	**5.51**

Note. Unstandardized estimates shown. Allostatic Load measured in z-score. Income = 0–13. Education = 0-5.
Wave V indicates Z-score change in Allostatic Load between Waves IV and Wave V.
[a] Concordant heterosexuals with the androgynous scale of 0 as the reference.
[b] White as the reference.
[c] Z-score change per one unit increase on the scale, for respective sexual orientation group.

Table 5
Multi-level OLS regression models predicting Allostatic Load, with the interaction effects between Wave V and androgynous scale/sexual orientation groups.

	Model 1 (Females)					Model 2 (Males)				
	B	SE	P	95% CI		B	SE	P	95% CI	
Wave V	**0.36**	**0.16**	**0.03**	**0.04**	**0.67**	0.10	0.16	0.52	−0.20	0.41
LGB[a]	−0.51	0.30	0.09	−1.10	0.07	0.17	0.38	0.66	−0.58	0.92
Discordant Heterosexual[a]	−0.28	0.18	0.13	−0.64	0.08	−0.37	0.38	0.33	−1.12	0.37
Androgynous Scale	**0.27**	**0.08**	**< .001**	**0.11**	**0.43**	−0.14	0.10	0.15	−0.34	0.05
Androgynous Scale x Wave V[c]	−0.01	0.11	0.95	−0.22	0.21	−0.09	0.14	0.53	−0.36	0.19
LGB x Wave V[d]	0.27	0.52	0.60	−0.75	1.30	−0.28	0.57	0.62	−1.41	0.84
Discordant Heterosexual x Wave V[d]	**0.55**	**0.27**	**0.04**	**0.02**	**1.08**	0.47	0.54	0.38	−0.58	1.53
Age	**0.07**	**0.04**	**0.04**	**0.00**	**0.14**	**0.20**	**0.04**	**< .001**	**0.12**	**0.27**
Black[b]	**0.96**	**0.16**	**< .001**	**0.65**	**1.27**	0.22	0.19	0.25	−0.16	0.61
Hispanic[b]	0.37	0.22	0.09	−0.06	0.80	−0.19	0.24	0.43	−0.66	0.28
Other[b]	**1.18**	**0.41**	**< .001**	**0.38**	**1.98**	0.09	0.44	0.85	−0.77	0.94
Unemployed	0.00	0.13	0.98	−0.26	0.26	−0.09	0.16	0.57	−0.40	0.22
Income	−0.04	0.02	0.06	−0.08	0.00	−0.02	0.02	0.36	−0.07	0.02
Education	**−0.24**	**0.06**	**< .001**	**−0.35**	**−0.13**	**−0.42**	**0.06**	**< .001**	**−0.54**	**−0.30**
Parenthood	**−0.44**	**0.12**	**< .001**	**−0.68**	**−0.20**	0.11	0.14	0.45	−0.17	0.38
Cohabiting	−0.03	0.16	0.84	−0.35	0.28	−0.06	0.18	0.73	−0.42	0.29
Married	0.00	0.13	1.00	−0.26	0.26	−0.13	0.14	0.38	−0.41	0.16
Intercept	−2.15	1.06	0.04	−4.22	−0.08	**−3.85**	**1.10**	**< .001**	**−6.01**	**−1.69**
Random Intercept	**5.61**	**0.32**	**< .001**	**5.01**	**6.29**	**4.79**	**0.34**	**< .001**	**4.16**	**5.52**

Note. Unstandardized estimates shown. Allostatic Load measured in z-score. Income = 0–13 Education = 0-5.
Wave V indicates Z-score change in Allostatic Load between Waves IV and V.
[a] Concordant heterosexuals in Wave IV as the reference.
[b] White as the reference.
[c] Z-score difference in change between Waves IV and V, per one unit increase on the scale.
[d] Z-score difference for respective group between Waves IV and V, compared to concordant heterosexuals.

Table 6
Multi-level OLS regression models predicting Allostatic Load, with the interaction effects between Wave V, the androgynous scale, and sexual orientation.

	Model 1 (Females)					Model 2 (Males)				
	B	SE	P	95% CI		B	SE	P	95% CI	
Wave V	0.30	0.17	0.08	−0.03	0.64	0.11	0.16	0.49	−0.20	0.42
LGB[a]	−0.60	0.46	0.20	−1.51	0.32	0.21	0.48	0.66	−0.74	1.16
Discordant Heterosexual[a]	−0.21	0.27	0.43	−0.74	0.32	−0.21	0.49	0.67	−1.17	0.75
Androgynous Scale	**0.27**	**0.09**	**< .001**	**0.09**	**0.46**	−0.13	0.12	0.29	−0.36	0.11
LGB x Androgynous Scale	0.04	0.22	0.87	−0.39	0.47	−0.01	0.27	0.96	−0.55	0.52
Discordant Heterosexual x Androgynous Scale	−0.06	0.21	0.77	−0.47	0.34	−0.17	0.23	0.47	−0.63	0.29
Androgynous Scale x Wave V[c]	0.05	0.13	0.69	−0.20	0.30	−0.11	0.15	0.48	−0.41	0.19
LGB x Wave V[d]	0.65	0.90	0.47	−1.11	2.41	0.50	0.83	0.55	−1.13	2.12
Discordant Heterosexual x Wave V[d]	0.71	0.41	0.08	−0.09	1.52	−0.22	0.75	0.77	−1.69	1.26
LGB x Androgynous Scale x Wave V[e]	−0.18	0.38	0.62	−0.92	0.55	−0.59	0.52	0.26	−1.61	0.44
Discordant Heterosexual x Androgynous Scale x Wave V[e]	−0.22	0.26	0.40	−0.73	0.29	0.51	0.52	0.33	−0.51	1.54
Age	**0.07**	**0.04**	**0.05**	**0.00**	**0.14**	**0.20**	**0.04**	**< .001**	**0.12**	**0.27**
Black[b]	**0.96**	**0.16**	**< .001**	**0.65**	**1.27**	0.22	0.20	0.25	−0.16	0.61
Hispanic[b]	0.37	0.22	0.09	−0.06	0.81	−0.20	0.24	0.40	−0.68	0.27
Other[b]	**1.18**	**0.41**	**< .001**	**0.37**	**1.98**	0.08	0.44	0.85	−0.78	0.94
Unemployed	−0.01	0.13	0.96	−0.27	0.25	−0.08	0.16	0.59	−0.39	0.22
Income	−0.04	0.02	0.06	−0.08	0.00	−0.02	0.02	0.33	−0.07	0.02
Education	**−0.23**	**0.06**	**< .001**	**−0.34**	**−0.12**	**−0.43**	**0.06**	**< .001**	**−0.55**	**−0.31**
Parenthood	**−0.44**	**0.12**	**< .001**	**−0.68**	**−0.20**	0.11	0.14	0.41	−0.16	0.39
Cohabiting	−0.04	0.16	0.83	−0.35	0.28	−0.08	0.18	0.65	−0.44	0.27
Married	0.00	0.13	0.99	−0.26	0.26	−0.13	0.14	0.37	−0.41	0.15
Intercept	**−2.14**	**1.05**	**0.04**	**−4.21**	**−0.07**	**−3.80**	**1.10**	**< .001**	**−5.96**	**−1.64**
Random Intercept	**5.61**	**0.32**	**< .001**	**5.01**	**6.29**	**4.77**	**0.35**	**< .001**	**4.14**	**5.50**

Note. Unstandardized estimates shown. Allostatic Load measured in z-score Income = 0–13 Education = 0-5.
Wave V indicates Z-score change in Allostatic Load between Waves IV and V.
[a] Concordant heterosexuals in Wave IV with 0 on the scale as the reference.
[b] White as the reference.
[c] Z-score difference in change between Waves IV and V, per one unit increase on the scale.
[d] Z-score difference for respective group between Waves IV and V, compared to concordant heterosexuals.
[e] Z-score difference per one unit increase on the scale for respective group in Wave V.

Moreover, increasingly positive public attitudes towards one's LGB identity can buffer minority stress for adolecents since the 1990s (Bishop et al., 2020). But as one transitions into adulthood, the incongruence between identity and attraction/behavior may be experienced as more stressful than having an LGB identity (Ueno, 2010). This study did not determine specific sources of stress that are unique for females, but prior research suggests some sources of stress in work settings ranging from implicit biases/micro-aggressions in day-to-day interactions to overt harassments (Smith & Ingram, 2004).

We found that greater gender non-conformity was associated with higher Allostatic Load for females but associated with lower Allostatic Load for males. While many sexual minorities are gender non-

conforming (as seen in Table 1), and thus are likely affected by said sources of stress, gender may play a significant role in the processes of strress exposure and coping. Since the 1980s, the Gender Schema Theory (GST) represented a prominent proposition that gender non-conformity is protective of gender-related stress (Starr & Zurbriggen, 2017). The findings only partially support this proposition because androgyny heightens Allostatic Load observed in metabolic/cardiovascular biomarkers for females rather than lowers it. Men seen as more feminine experience some relief, rather than aggravation, of Allostatic Load compared to their non-androgynous counterparts. Based on prior studies, it can be speculated that feminine men may be able to better adjust to or navigate a potentially homonegative/heterosexist environment (Iwasaki & Ristock, 2007; Smith & Ingram, 2004). In contrast, experiences of females dealing with such an environment could compound sexism against them (Tilcsik et al., 2015; Ueno et al., 2013).

We found that this association between gender non-conformity and Allostatic Load did not differ based on sexual orientation. This finding need be first contextualized, based on the descriptive statistics showing that LGBs are found more androgynous than concordant heterosexuals and that is the case also for discordant heterosexuals but to a lesser extent (in as shown Table 1). These findings do not reduce minority stress due to sexual orientation into gender issues. On the contrary, they highlight disparate yet compounding sources of stress that sexual minorities must cope with. The inclusion and acceptance of LGBTQ + individuals are often misperceived by the public as interchangeable to tolerating non-heterosexist appearances (e.g., women appearing masculine). The findings re-assert that they are separate issues concerning equity, and need be addressed.

6.1. Limitations and future directions

The current study is one of the first to consider how multiple facets of sexuality (identity, attraction, and behavior) and androgyny are associated with stress elevation over time. Despite the strengths of the study, we argue that the findings here serve an exploratory, rather than explanatory, understanding of sexual minority stress. First and foremost, the Allostatic Load measure used in this study does not fully encompass sexual minority stress, nor does it represent what minority stress affects physiologically in its entirety. More comprehensive measures for Allostatic Load would include stress hormones such as cortisol (Juster et al., 2016). Effective prevention and mitigation of sexual minority stress call for more evidence based on multiple and more frequent modes of observations for stress directly tied to marginalized sexualities. Analyses that bridge between qualitative and quantitative data are critical towards this endeavor.

Relatedly, it need be emphasized that the version of Allostatic Load in this study is based on a particular subset of biomarkers, namely lipid, inflammatory, and cardio-vascular markers. The findings do not imply in any way that minority stress does not exist for LGBs, as the reviewed evidence suggests otherwise. Along with the measurement limitations, statistical power is also of note when analyzing sexual orientation groups in the data particularly for males, resulting in larger standard errors relative to females. A comprehensive battery of physiological markers as well as well-defined theoretical pathways are needed to provide conclusive evidence on the physiological manifestation of minority stress among LGBs, as well as discordant heterosexuals and gender non-conforming individuals alike.

This study pays limited attention to the fluidity of sexuality, although the time varying nature of the data accounts for changes in sexual identity within respondents. As descriptive statistics revealed, just as non-heterosexuality often does not align in terms of behavior, attraction, and identity, non-heterosexuality is not static over the life course (Cimpian & Timmer, 2020; Zhao et al., 2010). This limitation is inherent in the data themselves, as there were too few individuals in each category of sexual identity, behavior, and attraction to adequately safeguard against disclosure risk (e.g., heterosexuals with non-heterosexual attraction in an earlier wave who report no heterosexual attraction later). Sexual/gender identities evolve concurrently with sexual behavior – facilitating sexuality development with perceived or internalized constraints/stigma could be considered as a public health goal (Garcıa, 2009; Ioverno & Russell, 2021). Thus, we argue for additional data sources that oversample sexual minorities defined in inclusive ways.

6.2. Conclusion

How are these findings situated in the ongoing discussion of sexual minority stress? Evidence based on an Allostatic Load index informs the minority stress model on 1) whether it is observable in metabolic/cardio-vascular biomarkers, and on 2) whether minority stress is applicable to *any* sexual minority with a history of non-heterosexual attraction/behavior regardless of their sexual identity. Clearly, the lack of evidence for Allostatic Load associated with a non-heterosexual identity calls for future research to confirm. Nonetheless, we maintain our overarching argument that motivated this study: minority stress due to sexual orientation may be relevant beyond sexual identity and extends to those who experience non-heterosexual attraction and behavior. As alluded above, we speculate that the null findings for LGB males and females could be interpreted as a potentially positive prospect for health equity. The participants in Add Health were born after the initial wave of gay rights movement in the 60s and 70s, and their biomarkers were collected in their mid-20s/40s. While continued efforts to combat heterosexism and homonegativity are critical towards health equity, it can be also understood that the current level of disparities for sexual minorities would have been worse without the past efforts.

In closing, this study represents one of the first to test sexual minority stress in terms of Allostatic Load elevation. Despite these limitations in the measurements and data, the findings suggest expanding the current scope of sexual minority research to consider various aspects of non-heterosexuality besides identity, and to explore how sexual minority stress intersects with gender contexts, particularly for women.

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Ethical statement

We declare that the IRB review was exempted for this study, which is based on secondary data analysis of Add Health data. Both authors retain a DUA for restricted access to the data we used with University of North Carolina at Chapel Hill, approved by the IRB board at Northern Arizona University. Finally, we declare that there is no conflict of interest.

Declaration of competing interest

No conflict of interest is declared.

Data availability

The authors do not have permission to share data.

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