



Published in final edited form as:

*J Adolesc Health*. 2018 July ; 63(1): 57–61. doi:10.1016/j.jadohealth.2018.01.015.

## Trajectories of Sexual Orientation from Adolescence to Young Adulthood: Results from a Community-Based Urban Sample of Girls

Johnny Berona, Ph.D.<sup>a,\*</sup>, Stephanie D. Stepp, Ph.D.<sup>b</sup>, Alison E. Hipwell, Ph.D.<sup>b</sup>, and Kate E. Keenan, Ph.D.<sup>a</sup>

<sup>a</sup>Department of Psychiatry and Behavioral Neuroscience, University of Chicago Medical Center, Chicago, Illinois

<sup>b</sup>Department of Psychiatry, University of Pittsburgh, Pittsburgh, Pennsylvania

### Abstract

**Purpose:** To examine the longitudinal cohesion and stability of sexual minority status indicators.

**Methods:** The sample comprised 2,450 girls recruited from the city of Pittsburgh at ages 5–8 years. Sexual attraction, sexual partnering, romantic partnering, and sexual orientation identity were assessed between 14 and 22 years.

**Results:** Repeated measures latent class analysis identified three sexual minority trajectories: primarily other-sex oriented ( $n = 716$ ), primarily same-sex oriented ( $n = 90$ ), and bisexually oriented ( $n = 235$ ). Sexual minority status indicators displayed fluidity over time but cohered within latent classes.

**Conclusions:** Within this large sample of girls, several distinct sexuality trajectories emerged. Trajectories are relatively stable from adolescence to young adulthood.

### Keywords

Sexual orientation; Developmental trajectories; Sexual minority

---

Sexual minorities (i.e., same-sex attracted or identifying as lesbian, gay, or bisexual) experience disparities in physical (i.e., obesity, cardiovascular disease) and mental health (i.e., mood and anxiety disorders) across the life span [1,2]. While epidemiological research has advanced knowledge about the prevalence and correlates of health disparities, fundamental demographic and developmental questions remain unaddressed. Sexuality components demonstrate variability in age of onset within and across indicators cross-sectionally and longitudinally, presenting challenges in identifying sexual minority populations and tailoring interventions [3–8]. As there are no standardized methods of

---

\* Address correspondence to: Johnny Berona, Ph.D., Department of Psychiatry and Behavioral Neuroscience, University of Chicago, 5841 S. Maryland Avenue MC 3077, Chicago, IL 60637. johnnyberona@uchicago.edu (J. Berona).

**Contributions:** Individuals who made substantive contributions to this study are coauthors.

**Conflicts of interest:** The authors have no conflicts of interest to declare.

measuring sexuality indicators or consolidating this information optimally, the Institute of Medicine has recommended that methodological research in this area be prioritized [1].

Lifetime prevalence of sexual minority status is estimated to be up to 15% of the general population, leading to substantial heterogeneity among sexual minority youth [9,10]. Configurations of sexual minority status indicators can be oriented in a single direction (e.g., gay/lesbian identification and exclusively same-sex attraction and partnering) or branched and oriented in several directions (e.g., heterosexual identification and partnering with multiple genders) [11]. Cross-sectional observation of branched patterns can arise from variability in timing and sequencing of sexuality milestones such as awareness of same-sex attractions and self-identification as a sexual minority [12,13]. Initially considered a sequential process, accumulating evidence suggests that the timing and order of milestones vary widely with some differences by cohort and gender [14–17]. Recent changes in stigma and its structural manifestations have rapidly altered the social contexts in which sexual minority youth develop, thereby creating marked within-cohort variability in ages of first disclosure and partnering [18–20]. With respect to gender, females appear to be more likely than males to identify as a sexual minority before experiencing same-sex sexual partnering, to identify as a sexual minority at a later age, and to experience a shorter time interval between these two events [15,16]. However, there is a dearth of prospective research corroborating these patterns as described in cross-sectional and retrospective reports.

Longitudinal observation of branched patterns may be driven by sexual fluidity, a capacity for change within and across sexual minority status indicators over time [7]. Sexual fluidity has been observed across the life span, most prominently among females but more recently among males and gender minorities as well [21–23]. Although sexual fluidity has been documented across time intervals of several years, remarkably little is known about how attractions, partnering, and identity may fluctuate across shorter time frames [24]. Characterizing the longitudinal course of sexuality bears import for addressing health disparities because sexuality trajectories necessarily determine the timing and duration of minority stress exposure [25–28]. Earlier identification of sexual minority youth may facilitate linkage with resources such as school-based support (e.g., gay/straight alliances) and interventions that support adaptive coping to prevent adverse consequences of minority stress [29,30]. Understanding patterns of romantic and sexual partnering behaviors specifically has implications for sexual and reproductive health. Sexual minority youth are more likely to experience sexually transmitted infections and unintended pregnancies than exclusively heterosexual youth [31–35]. If developmental context and longitudinal variability are not considered, prevention efforts may not be adequately comprehensive and inclusive.

Large-scale cohort studies have found diverse sexuality trajectories across the life span [21–23]. However, to our knowledge no cohort study to date has prospectively tracked multiple sexuality components from adolescence to adulthood. For instance, the Add Health Study measured attraction and behavior at all waves but sexual identity only in adulthood [21]. This study addresses this gap in our understanding by examining joint trajectories of sexual attraction, sexual partnering, romantic partnering, and sexual identity in an urban sample of girls.

## Methods

Participants in the Pittsburgh Girls Study (PGS), an accelerated longitudinal cohort study, were drawn from a household enumeration of 5- to 8-year-old girls living in the City of Pittsburgh in 1999 [36]. Briefly, all disadvantaged low-income neighborhoods in Pittsburgh were selected for recruitment along with a random selection of half of the remaining neighborhoods in the city. Girls and their primary caregivers provided informed assent and consent to Institutional Review Board–approved protocols and were interviewed annually. The sample comprised 2,450 girls: 52% African-American, 41% European American, and 7% multiracial and other races. Retention in annual assessments ranged from 87.8% to 96.7%.

All sexuality indicators were assessed annually from ages 14 to 22 years. Participants reported sexual identity (heterosexual, mostly heterosexual, bisexual, mostly lesbian/gay, lesbian/gay), sexual attraction (only females, mostly females, males and females equally, mostly males, only males), whether they had a boyfriend and/or girlfriend, and whether they had sexual contact with males and/or females.

We conducted repeated measures latent class analysis (RMLCA) in Mplus with the above sexuality variables as indicators of class membership. This analysis was desirable in favor of other approaches (e.g., frequencies, cross-tabulations) because PGS is a probability sample and whole-case analysis could introduce bias and reduce generalizability. RMLCA handles missing data using robust full information maximum likelihood estimation. Data were structured with chronological age as the unit of time.

Given the range of health disparities sexual minorities experience, we assessed whether sociodemographic factors associated with health were also associated with sexual minority status. Multinomial logistic regression analysis examined whether latent class membership was predicted by age cohort, racial/ethnic minority status, receipt of public assistance, and single-parent status.

## Results

A significant proportion of the overall sample endorsed at least one sexual minority status indicator at some point during ages 14–22 years ( $n = 1,041$ ; 41.2% weighted). Within the sample the distribution of sexual minority status indicators was as follows: same-sex sexual attraction, 987 girls (39.0%); same-sex sexual partnering, 288 girls (11.5%); same-sex romantic partnering, 214 girls (8.2%); and sexual minority identity, 658 girls (26.6%).

The three-class RMLCA solution was the most parsimonious fit for the data (Table 1). The resulting classes included a primarily other-sex-oriented class ( $n = 716$ ) composed of girls identifying as heterosexual and mostly heterosexual with same-sex attraction but little same-sex partnering, a primarily same-sex-oriented class ( $n = 90$ ) with most individuals indicating lesbian/gay and mostly lesbian/gay identification and almost exclusively same-sex partnering, and a bisexually oriented class ( $n = 235$ ) that reported relatively consistent bisexual identity and attraction with an increasing number of female partners over time (Figure 1). Generally, the proportion of individuals endorsing same- and bisexually oriented

indicators within each class increased over time. Social/behavioral indicators (i.e., romantic and sexual partnering) progressed at slower paces than cognitive/affective indicators (i.e., sexual attraction and identity).

Most ( $n = 658$ ; 63.2%) participants reported at least one change in sexual orientation (mean  $[M] = 1.6$  changes,  $SD = 1.5$ ), which differed across classes,  $F(2, 1008) = 236.4, p < .001$ . The primarily same-sex class reported more frequent ( $M = 3.1, SD = 1.5$ ) sexual orientation changes than the bisexual class ( $M = 2.7, SD = 1.2$ ) and the primarily other-sex class ( $M = 1.0, SD = 1.1$ ). In multinomial regressions, public assistance and race/ethnicity were associated with class membership, but age cohort and single-parent household status were not. Relative to heterosexual youth, public assistance was associated with greater likelihood of membership in the bisexual class (odds ratio  $[OR] = 1.6$ ; 95% confidence interval  $[CI], 1.2-2.2; p < .01$ ) and the primarily other-sex class ( $OR = 1.2$ ; 95%  $CI, 1.0-3.5; p < .05$ ). Racial/ethnic minority status was associated with membership in the primarily other-sex class ( $OR = 1.5$ ; 95%  $CI, 1.2-1.8; p < .001$ ) and the primarily same-sex class ( $OR = 2.1$ ; 95%  $CI, 1.3-3.5; p < .01$ ).

## Discussion

The present study builds on prior research by prospectively examining the trajectories of sexual attraction, sexual partnering, romantic partnering, and identity in a large urban sample of girls across a 9-year period. A large proportion of this sample (41.2%) endorsed sexual minority status at least once from ages 14 to 22 years. We found that a three-class solution fits the sexual minority indicator data best. To our knowledge, this is the first cohort study to examine year-to-year changes in multiple facets of sexual orientation from adolescence to young adulthood within a probability sample. Previous studies have focused on one facet [22] or did not assess each facet across the same developmental periods [21]. As variability was found across most participants within this population-based sample, fluidity may be a normative aspect of sexual minority orientation.

Multiple distinct trajectories of sexuality were observed including primarily other-sex oriented, primarily same-sex oriented, and bisexually oriented classes. As was observed in Diamond's longitudinal study of female sexuality, nearly two-thirds of sexual minority participants reported at least one change in sexual orientation identification [12]. Similar to prior cohort studies, the primarily other-sex-oriented class was the largest sexual minority group [21-23]. In contrast to prior studies, separate primarily same-sex and bisexually oriented classes emerged within this sample. The bisexually oriented class was relatively large, endorsed fewer identity changes than the primarily same-sex-oriented class, and was characterized by stable and increasing reports of nonexclusive attractions. The identification of this class is likely attributable to methodology. Add Health utilized different assessment methods at 1, 5, and 13 years following baseline, whereas PGS assessed participants annually over 9 years. Additionally, the PGS distinguished between romantic and sexual partnering, whereas the Add Health study did not. The Growing Up Today Study assessed participants biennially but only assessed sexual identity. The Christchurch Health and Development Study assessed multiple components of sexuality but did so retrospectively at ages 21 and 25 years. Public assistance and racial/ethnic minority status were respectively

associated with membership in the bisexually oriented and primarily same-sex-oriented classes relative to the exclusively heterosexual class. Both factors were also associated with the primarily other-sex-oriented class. Structural manifestations of stigma impact socioeconomic status via influences on educational environments, employment opportunities, and housing stability [2]. Although we did not collect data on the sexual minority statuses of participants' parents, it is likely that the study methodology oversampling for low socioeconomic status at least partially accounts for the overrepresentation of sexual minority youth in this sample.

The results of this study have implications for future directions in sexual minority health research. Distinct temporal relations between sexuality components observed in prior samples were also observed here and suggest that, at least for females, cognitive/affective aspects of sexuality antecede social/behavioral aspects of sexuality. As such, intervention efforts seeking to identify youth who may be exposed to minority stress should utilize inclusive multicomponent measures to identify the widest range of youth. Within this sample, the primarily other-sex-oriented group displayed increasing rates of same-sex attraction over time but very little same-sex partnering. Future research should explore the experience of sexual minority stress and its health consequences within this subpopulation. These youth may have lower rates of sexual minority status disclosure, receive less support from other sexual minority youth, and experience more isolation and internalized stigma. Conversely, it is possible that the infrequency of same-sex attractions reduces the saliency of their self-perception as sexual minorities. For sexual minorities in general, sexuality components increased monotonically but at different paces. As such, it may be difficult to predict sexual minority status and engagement in specific sexual risk behaviors. Thus, interventions to reduce sexual risk behaviors should consider the potential impact of being inclusive of diverse groups of sexual minorities and addressing other-sex partnering behaviors, particularly given the high prevalence of fluidity.

There are several notable strengths of this study's methodology that facilitate a novel contribution to our understanding of sexuality development from adolescence to young adulthood. We employed data from a large probability sample with an accelerated cohort design. This sampling frame provided us with the ability to interpret findings in terms of their generalizability. While it is understood that sexuality is multifaceted, few studies have utilized multicomponent measures. The use of an annual assessment allowed for a clearer view of the subtle year-to-year changes that are not captured over longer assessment periods. Data were structured such that the time metric was chronological age rather than assessment wave. This approach leverages the accelerated cohort design, yielding trajectories that are interpretable in a developmental context. Perhaps the strongest methodological improvement over prior studies is the time frame assessed. Prospective assessment from ages 14–22 years provides an unusually expansive characterization of how sexuality unfolds across developmental periods.

Results of this study should be interpreted in light of its limitations. First, our assessment of sexuality imposed constraints on potential responses. Participants were asked to indicate only one identity on a modified Kinsey scale (i.e., heterosexual, mostly heterosexual, bisexual, mostly lesbian/gay, lesbian/gay). Including other sexual orientation identities (e.g.,

asexual), allowing the endorsement of multiple identities, and providing a free response item may have facilitated the identification of additional sexual minority groups. Second, measures of romantic and sexual partnering were restricted to the gender of partners. We did not collect data regarding the number of partners or the length of relationships. Orientation toward the number of partners (i.e., none, one, or multiple) is an additional sexuality parameter that represents an important area of future research [1]. This information would have provided us with the ability to examine in greater detail the distribution of participants' relationship patterns, including whether the trajectories identified here can be further differentiated. Third, the sample for this study included primarily Caucasian and African-American participants. It is unclear whether comparable trajectories would be identified in females of different racial/ethnic backgrounds.

Findings of this prospective study indicate that sexual minority populations have heterogeneous trajectories, that cognitive/affective sexual minority status indicators develop earlier than behavioral indicators, and that fluidity is common among sexual minority females. This study recruited females, but prior research has found that sexual minority males and gender minorities also exhibit fluidity [5,6]. Future research should examine how the timing and pacing of attractions, romantic and sexual partnering, and identification over time are differentially associated with exposure to minority stress and health outcomes. Disaggregating diverse trajectories is crucial to a more integrative and comprehensive account of sexual orientation broadly as well as identifying turning points in development that can lead to health disparities among sexual minority youth.

## Acknowledgments

This research was supported by the Ford Foundation, National Institutes of Mental Health (R01 MH56630), and National Heart, Lung, and Blood Institute (R01 HL137246). Study sponsors did not contribute to the study design, data analysis, or preparation of this report.

## References

- [1]. Institute of Medicine Committee on Lesbian, Gay, Bisexual, and Transgender Health Issues and Research Gaps and Opportunities. The health of lesbian, gay, bisexual, and transgender people: Building a foundation for better understanding. Washington (DC): Institute of Medicine; 2011.
- [2]. Hatzenbuehler ML, Phelan JC, Link BG. Stigma as a fundamental cause of population health inequalities. *Am J Public Health* 2013;103:813–21. [PubMed: 23488505]
- [3]. Mustanski B, Van Wagenen A, Birkett M, et al. Identifying sexual orientation health disparities in adolescents: Analysis of pooled data from the Youth Risk Behavior Survey, 2005 and 2007. *Am J Public Health* 2014;104:211–7. [PubMed: 24328640]
- [4]. Mock SE, Eibach RP. Stability and change in sexual orientation identity over a 10-year period in adulthood. *Arch Sex Behav* 2011;41:641–8. [PubMed: 21584828]
- [5]. Ott MQ, Corliss HL, Wypij D, et al. Stability and change in self-reported sexual orientation identity in young people: Application of mobility metrics. *Arch Sex Behav* 2011;40:519–32. [PubMed: 21125325]
- [6]. Katz-Wise SL, Reisner SL, Hughto JW, et al. Differences in sexual orientation diversity and sexual fluidity in attractions among gender minority adults in Massachusetts. *J Sex Res* 2016;53:74–84. [PubMed: 26156113]
- [7]. Diamond LM. Sexual fluidity in male and females. *Curr Sex Health Rep* 2016;8:249–56.



- [8]. Talley AE, Sher KJ, Steinley D, et al. Patterns of alcohol use and consequences among empirically derived sexual minority subgroups. *J Stud Alcohol Drugs* 2012;73:290–302. [PubMed: 22333337]
- [9]. Savin-Williams RC, Ream GL. Prevalence and stability of sexual orientation components during adolescence and young adulthood. *Arch Sex Behav* 2007;36:385–94. [PubMed: 17195103]
- [10]. Savin-Williams RC, Joyner K, Rieger G. Prevalence and stability of self-reported sexual orientation identity during young adulthood. *Arch Sex Behav* 2012;41:103–10. [PubMed: 22302504]
- [11]. van Anders SM. Beyond sexual orientation: Integrating gender/sex and diverse sexualities via sexual configurations theory. *Arch Sex Behav* 2015;44:1177–213. [PubMed: 25772652]
- [12]. Rosario M, Schrimshaw EW, Hunter J. Ethnic/racial differences in the coming-out process of lesbian, gay, and bisexual youths: A comparison of sexual identity development over time. *Cultur Divers Ethnic Minor Psychol* 2004;10:215–28. [PubMed: 15311975]
- [13]. Savin-Williams RC, Cohen KM. Developmental trajectories and milestones of lesbian, gay, and bisexual young people. *Int Rev Psychiatry* 2015;27:357. [PubMed: 26555639]
- [14]. Russell ST, Fish JN. Mental health in lesbian, gay, bisexual, and transgender (LGBT) youth. *Annu Rev Clin Psychol* 2016;12:465–87. [PubMed: 26772206]
- [15]. Diamond LM. Female bisexuality from adolescence to adulthood: Results from a 10-year longitudinal study. *Dev Psychol* 2008;44:5–14. [PubMed: 18194000]
- [16]. Katz-Wise SL, Rosario M, Calzo JP, et al. Endorsement and timing of sexual orientation developmental milestones among sexual minority young adults in the Growing Up Today Study. *J Sex Res* 2017;54:172–85. [PubMed: 27148762]
- [17]. Calzo JP, Antonucci TC, Mays VM, et al. Retrospective recall of sexual orientation identity development among gay, lesbian, and bisexual adults. *Dev Psychol* 2011;47:1658–73. [PubMed: 21942662]
- [18]. Cohler BJ, Hammack PL. The psychological world of the gay teenager: Social change, narrative, and “normality”. *J Youth Adolesc* 2006;36:47–59.
- [19]. Hammack PL, Cohler BJ. Narrative, identity, and the politics of exclusion: Social change and the gay and lesbian life course. *Sex Res Soc Policy* 2011;8:162–82.
- [20]. Meyer IH. Does an improved social environment for sexual and gender minorities have implications for a new minority stress research agenda? *Psychol Sex Rev* 2016;7:81–90. [PubMed: 27642514]
- [21]. Fish JN, Pasley K. Sexual (minority) trajectories, mental health, and alcohol use: A longitudinal study of youth as they transition to adulthood. *J Youth Adolesc* 2015;44:1508–27. [PubMed: 25956289]
- [22]. Calzo JP, Masyn KE, Austin SB, et al. Developmental latent patterns of identification as mostly heterosexual versus lesbian, gay, or bisexual. *J Res Adolesc* 2017;27:246–53. [PubMed: 28498531]
- [23]. Fergusson DM, Horwood LJ, Ridder EM, et al. Sexual orientation and mental health in a birth cohort of young adults. *Psychol Med* 2005;35:971–81. [PubMed: 16045064]
- [24]. Diamond LM, Dickenson JA, Blair KL. Stability of sexual attractions across different time scales: The roles of bisexuality and gender. *Arch Sex Behav* 2017;46:193–204. [PubMed: 27873031]
- [25]. Coker TR, Austin SB, Schuster MA. Health and healthcare for lesbian, gay, bisexual, and transgender youth: Reducing disparities through research, education, and practice. *Annu Rev Public Health* 2009;45:213–5.
- [26]. Mustanski B, Birkett M, Greene GJ, et al. Envisioning an America without sexual orientation inequities in adolescent health. *Am J Public Health* 2014;104:218–25. [PubMed: 24328618]
- [27]. Meyer IH. Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychol Bull* 2003;129:674–97. [PubMed: 12956539]
- [28]. Hatzenbuehler ML. How does sexual minority stigma “get under the skin”? A psychological mediation framework. *Psychol Bull* 2009;135:707–30. [PubMed: 19702379]
- [29]. Marx RA, Kettrey HH. Gay-straight alliances are associated with lower levels of school-based victimization of LGBTQ+ youth: A systematic review and meta-analysis. *J Youth Adolesc* 2016;45:1269–82. [PubMed: 27221632]

- [30]. Hatzenbuehler ML, Pachankis JE. Stigma and minority stress as social determinants of health among lesbian, gay, bisexual, and transgender youth: Research evidence and clinical implications. *Pediatr Clin North Am* 2016;63:985–97. [PubMed: 27865340]
- [31]. Zaza S, Kann L, Barrios LC. Lesbian, gay, and bisexual adolescents: Population estimate and prevalence of health behaviors. *JAMA* 2016;316:2355–6. [PubMed: 27532437]
- [32]. Everett BG, Schnarrs PW, Rosario M, et al. Sexual orientation disparities in sexually transmitted infection risk behaviors and risk determinants among sexually active adolescent males: Results from a school-based sample. *Am J Public Health* 2014;104:1107–12. [PubMed: 24825214]
- [33]. Riskind RG, Tornello SL, Younger BC, et al. Sexual identity, partner gender, and sexual health among adolescent girls in the United States. *Am J Public Health* 2014;104:1957–63. [PubMed: 25121821]
- [34]. Herrick AL, Marshal MP, Smith HA, et al. Sex while intoxicated: A metaanalysis comparing heterosexual and sexual minority youth. *J Adolesc Health* 2011;48:306–9. [PubMed: 21338904]
- [35]. Hipwell AE, Stepp SD, Keenan K, et al. Examining links between sexual risk behaviors and dating violence involvement as a function of sexual orientation. *J Pediatr Adolesc Gynecol* 2013;26:212–8. [PubMed: 23726138]
- [36]. Keenan K, Hipwell A, Chung T, et al. The Pittsburgh Girls Study: Overview and initial findings. *J Clin Child Adolesc Psychol* 2010;39:506–21. [PubMed: 20589562]



### **IMPLICATIONS AND CONTRIBUTION**

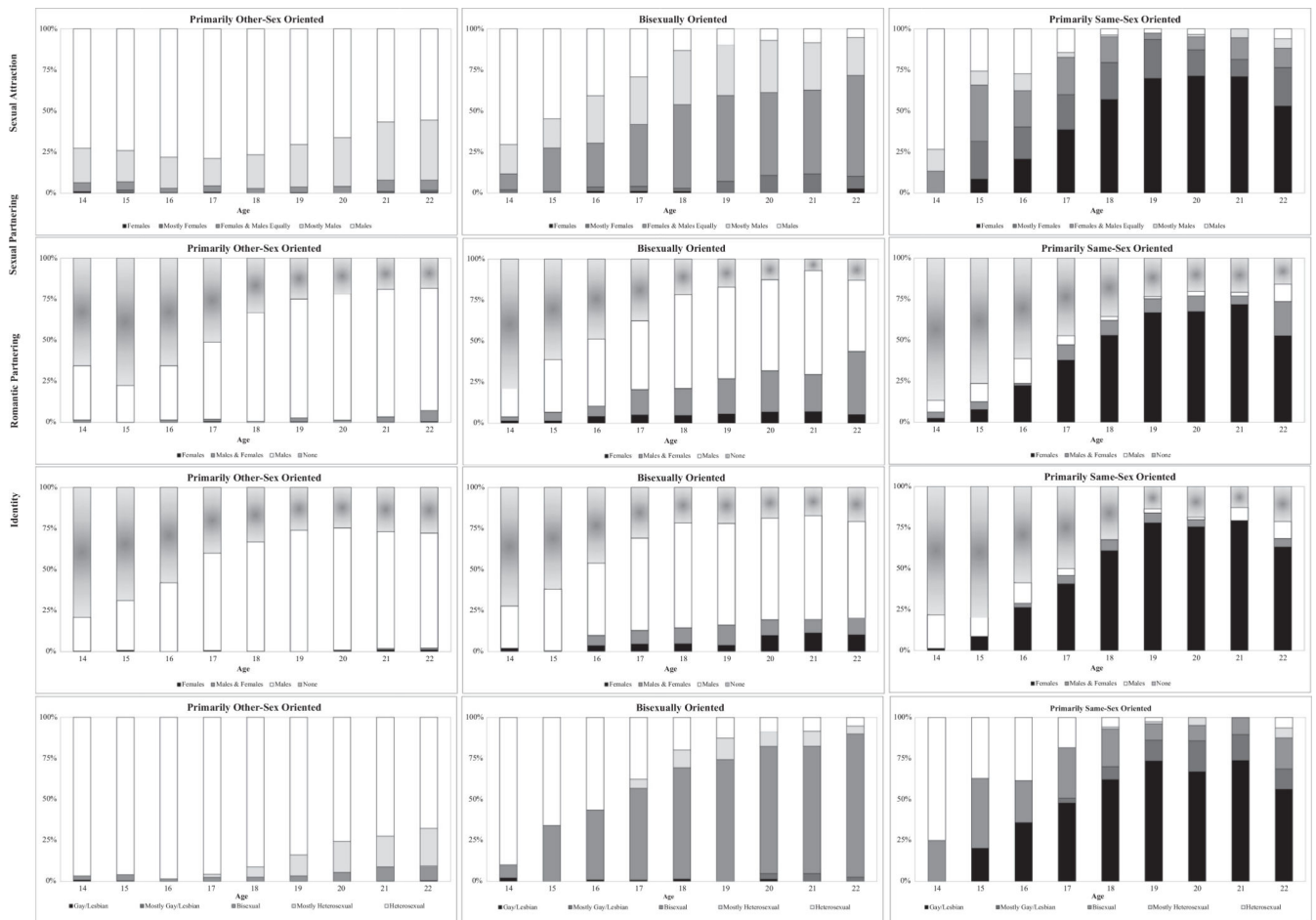
Sexual minorities experience many health disparities. However, sexuality is multifaceted and less is known about how those components might change over time. This study found three distinct sexual minority trajectories from adolescence to young adulthood. Results highlight sexual diversity and the importance of considering multiple aspects of sexuality.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript



**Figure 1.** Distribution of sexual orientation component endorsement for sexual minority latent classes in the Pittsburgh Girls Study. Rows display sexual orientation components: sexual attraction, sexual partnering, romantic partnering, and sexual identity. Columns show the resulting latent classes: primarily other-sex oriented (n = 716), bisexually oriented (n = 235), and primarily same-sex oriented (n = 90). Percentages reflect the proportion within the total number of sexual minority participants (n = 1,041). The y-axes within each graph show the proportion within each class endorsing each response option. X-axes reflect age in years at each measurement.

**Table 1**

Comparison of latent class model fit statistics

Number of classes	Log likelihood	AIC	BIC	aBIC	LMR-A	Entropy
1	-23,702.65	47,609.30	48,113.99	47,790.02	-	-
2	-20,200.32	40,810.65	41,824.98	41,173.87	6984.935 ****	.97
3	-18,997.31	38,610.61	40,134.58	39,156.33	2401.869 ****	.97
4	-18,125.72	37,073.44	39,107.04	37,801.65	1,742.54	.95
5	-18,090.39	37,208.79	39,752.03	38,119.49	1,735.15	.96

When comparing models, lower AIC, BIC, and aBIC values and significant LMR-A *p* values indicate improved model fit.

aBIC = sample-size adjusted BIC; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; LMR-A = Lo-Mendell-Rubin-Adjusted Likelihood Ratio Test.

\*\*\*\*

*p* < .0001.