Title: Are men and women who adhere to gender-typical behavior more likely to engage in concurrent sexual partnerships? A nationally representative longitudinal data analysis

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Abstract

Men's and women's sexual practices – including having concurrent sexual partners – are strongly connected to gender norms. We developed an empirical measure of adherence to gender-typical behaviors (AGB) for respondents at each of the four waves of Add Health in an effort to quantitatively capture individuals' gender typicality. We tested the hypothesis that AGB at each wave would be associated with reporting concurrent sexual partnerships at Wave IV (ages 24-32). For men, adherence to male-typical behaviors in adolescence is a predictor of concurrent relationships in adulthood, suggesting that men's sexual behaviors in adulthood may be shaped by experiences of gender and masculinity in adolescence. For women, adherence to female-typical behaviors in adolescence is a risk factor for concurrent relationships in adulthood but less adherence to female-typical behaviors in adulthood is also a risk factor. Our findings demonstrate the importance of behavioral norms of masculinity and femininity in having concurrent sexual partners.

Introduction

Concurrency is officially defined by UNAIDS as, "overlapping sexual partnerships in which sexual intercourse with one partner occurs between two acts of intercourse with another partner" (p. 621) (UNAIDS Reference Group on Estimates, 2010) and has been hypothesized as an important driver of HIV transmission (Garnett & Johnson, 1997; Halperin & Epstein, 2004; Morris & Kretzschmar, 1997). Though the role of concurrent partnerships in the HIV epidemic has been hotly debated over the past decade (Kretzschmar & Carael, 2012; Lurie & Rosenthal, 2010; Morris, 2010; Padian & Manian, 2011), it is believed that concurrent sexual relationships facilitate the rapid spread of HIV through a sexual network during the acute infectious stage (UNAIDS, 2012; Wawer et al., 2005). Further studies have demonstrated that concurrent sexual partnerships help explain differences in prevalence of sexually transmitted infections (STI) between different demographic groups (Hamilton & Morris, 2015; Morris, Kurth, Hamilton, Moody, & Wakefield, 2009).

Sexual behaviors – such as concurrent sexual partnerships – are embedded within the system of social practices and are rarely motivated by solely biologically-driven sexual desires (Simon & Gagnon, 1973). As a result, researchers studying sexual behaviors and sexual risk have long considered cultural norms – especially norms of masculinity and femininity – as important to understanding individuals' sexual behaviors (Fleming, DiClemente, & Barrington, under review; Higgins, Hoffman, & Dworkin, 2010; Wingood & DiClemente, 2000). But, despite the importance of concurrency to HIV/STI prevention, research exploring the relationship between gender norms and concurrency has been limited to qualitative or cross-sectional research.

Previous qualitative and ethnographic studies have found that norms of masculinity are an important driver of men's concurrent partnerships (Bowleg et al., 2011; Brown, Sorrell, & Raffaelli, 2005; Carey, Senn, Seward, & Vanable, 2010; Psaki, Ayivi-Guedehoussou, & Halperin, 2013; Ragnarsson, Townsend, Ekstrom, Chopra, & Thorson, 2010; Ragnarsson, Townsend, Thorson, Chopra, & Ekstrom, 2009; Senn, Scott-Sheldon, Seward, Wright, & Carey, 2011;

Wamoyi & Wight, 2014). The norms associated with masculinity in most cultures include encouragement for men (especially unmarried men) to engage in sexual relationships with multiple women (Campbell, 1995; Connell, 1987; Courtenay, 2000; Gilmore, 1990; Mosher, 1991). According to a recent review of the qualitative evidence (Available upon request, (Fleming, DiClemente, et al., under review)), the relationship between concurrent partnerships and norms of masculinity can primarily be explained in terms of power dynamics and the social construction of the 'male sex drive'. First, masculinity theory highlights the role of men's female sexual partners in competing with other men for position in the social hierarchy (Connell, 1995). Thus, having multiple sexual parnters establishes his power over *other men* (Bowleg et al., 2011; Brown et al., 2005; Ragnarsson et al., 2009). Second, the gendered dimensions of sexuality are constructed in such a way that men's engagement with multiple partners can serve to assert their power over *women* (Brown et al., 2005; Ragnarsson et al., 2010). Finally, cultural notions of men's biological predisposition for multiple partners fuels norms of male sexuality that encourage multiple and concurrent partners (Carey et al., 2010; Holloway, 1984, 1996; Senn et al., 2011).

To my knowledge, only two quantitative studies have specifically examined the relationship between concurrency and masculine gender norms. Robertson et al. (2013) found that male partners of female sex workers in Mexico were more likely to have concurrent partners if they endorsed traditional masculine norms. A study in Swaziland and Botswana found that men who supported gender inequality norms were more likely to engage in multiple concurrent partnerships (Shannon et al., 2012). Both of these studies are cross-sectional and use gender ideology (e.g. attitudes towards the roles and rights of men and women) as their dimension of gender norms being measured.

Though studies of concurrent partnerships and gender norms often focus on men, there have been a few studies that have explored the role of feminine norms of women's involvement in concurrent relationships. Much of this research focuses on women who have a male partner who has multiple concurrent partnerships – rather than on women who themselves have multiple

concurrent partners. For example, qualitative research by Kerrigan et al. (2007), Adrinopoulos et al. (2006), and Sobo (1995) with urban African-American women in the U.S. have highlighted that women's willingness to stay with a man who has concurrent partners is due to gender norms that emphasize that women can attain economic stability and social status through their male partners. Additionally, Kerrigan et al. (2008) conducted a survey with a sample of 155 young women in Baltimore and found that women who supported traditional feminine norms were more likely to have partners who had multiple concurrent partners. An ethnographic study in rural Tanzania and another in South Africa also found support for the role of feminine norms in women's acceptance of male partner's concurrent relationships (Psaki et al., 2013; Wamoyi & Wight, 2014). But, the study by Wamoyi & Wight in Tanzania additionally found that women who engaged in multiple concurrent partnerships were considered to be fulfilling norms of the 'empowered modern' woman (Wamoyi & Wight, 2014).

Overall, these studies emphasize the role that gender norms – both masculine and feminine norms – play in concurrent sexual partnerships. The qualitative/ethnographic empirical evidence provides evidence for this link and the quantitative evidence provides preliminary – but limited – support for this relationship. But, the previous quantitative studies have never compared the association for men and women and did not look at the association longitudinally. Additionally, reliance on measures of gender ideology may be inadequate to assess this relationship. Theoretical understandings of gender emphasize that gender (femininity or masculinity) is not something that an individual *is,* but rather something that an individual *does* through their actions and interactions (Butler, 1993; West & Zimmerman, 1987). Given our understanding of gender as behavioral, it is important to examine the relationship between gender and concurrency using a measure of gender that is based on behaviors rather than attitudes.

One category of gender measures – 'gendered behavior measures' (Smiler & Epstein, 2010) – have never been used to study sexual behaviors, including engaging in multiple concurrent partnerships. These measures assess the extent to which an individual behaves in ways

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that are consistent with his/her same-sex peers. Analyses with this type of measure can both improve our understanding of the complex dynamics between gender and sexual behaviors and also help identify populations to target with HIV/STI prevention interventions.

This paper seeks to fill this gap by examining the role that a measure of adherence to gender-typical behavior across adolescence and adulthood plays in U.S. adults' engagement in concurrent relationships. We hypothesize that men who more closely adhere to male-typical behaviors in adolescence, emerging adulthood, and adulthood will be more likely to engage in multiple concurrent partnerships in adulthood. We hypothesize that the relationship for women will be weaker than the relationship for men, but that women who closely adhere to female-typical behavior at each life stage will be *less* likely to engage in multiple concurrent partnerships in adulthood.

Methods

Sample

We use data from all four waves of data collection from The National Longitudinal Study of Adolescent to Adult Health (Add Health). In 1994-95 (Wave I), Add Health recruited a school-based nationally representative sample of adolescents in grades 7-12 and followed them up in 1996 (Wave II), 2001-02 (Wave III), and 2008-09 (Wave IV). At Wave IV, the participants were between the ages of 24 and 32. For the analyses presented here, we use only those participants who were interviewed at all four waves and report having a recent or current partner. Our study relies exclusively on the longitudinal survey data, including demographic, attitudinal, and behavioral items. For more details on the Add Health study design, see Harris (K.M. Harris, 2011).

Measures

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Concurrent partnerships: We measured engagement in concurrent partnerships by asking each participant about their current main partner in the Wave IV interview: "During the time you and [partner] have had a sexual relationship, have you ever had any other sexual partners?". Thus, this measure represents a self-reported measure of ever having engaged in concurrent partnerships during the duration of the relationship.

Adherence to Gender-typical Behaviors (AGB): We build upon an uncommonly utilized technique for measuring gender to create a measure of Adherence to Gender-typical Behavior (AGB) using the four waves of Add Health. The measure assesses the extent to which an individual behaves in ways that are consistent with his/her same-sex peers within a given wave. To measure adherence to gendered behavior at each interview wave, we use a multi-step process similar to the one described by Cleveland, Udry, and Chantala (2001). Our measure differs from the Cleveland et al. measure in that it draws from a larger pool of survey items, is developed independently at each of the four waves, and is interpreted as a measure of Adherence to Gender-typical Behavior (AGB) rather than as an individual's Masculinity/Femininity.

For each wave, we identified the behavioral variables that were shown to be highly correlated with biological sex. Behaviors included a range from individual actions (e.g., exercising) to states of being (e.g., getting sad). Using these sets of variables (different at each wave), AGB was measured by creating model-predicted probabilities of 'being male' or 'being female' based on self-reported behaviors for each individual (See Appendix A for full list of items at each wave). For example, males' AGB scores (i.e. how closely they were aligned with behaviors of their same-sex peers) were lower if they reported 'crying frequently' but higher if they 'played an active sport.' These specific behavioral items were included based on empirical determinations of sex differences within our data, not selected based on theoretical assumptions about gender. We confirmed the reliability of this measure by conducting the same process with split-half samples and the measure responded well to various validity checks (Available upon request (Fleming, Harris, & Halpern, Under Review)).

As expected, AGB scores were skewed since most biological females had a high degree of adherence to female typical behaviors and most biological males had a high degree of adherence to male typical behaviors. As a result, for our analyses we ranked males and females separately by their AGB score and use their AGB percentile score in our analyses. A higher percentile indicates greater adherence to the behavior typical of one's own gender. For example, males with a percentile of 0.95 exhibited strong adherence to male-typical behavior at that wave and females with a percentile of 0.95 exhibited strong adherence to female-typical behavior at that wave. When we report odds ratios (Table 2), we use a different scaling (0-10, rather than 0.0-1.0) so that the odds ratios refer to a change of 10 percentage points in AGB percentile score.

Control variables: We controlled for demographic characteristics (age and race/ethnicity), relationship characteristics, and total number of sexual partners – each of which has been identified as risk factors for concurrency in the literature. We controlled for four relationship characteristics at Wave IV: whether or not the responded perceives their partner as having concurrent sexual relationships ('partner concurrent'), level of love for partner ('love'), level of happiness with partner ('happiness'), and level of commitment with partner ('commitment'). Our variables Love, Happiness, and Commitment were treated as continuous variables with a higher number indicating greater love, happiness, or commitment. We additionally controlled for number of sexual partners using three separate measures. We used the number of lifetime sexual partners reported at Wave III, number of lifetime partners reported at Wave IV, and number of sexual partners in the past 12 months reported at Wave IV.

Analysis

We provide descriptive statistics for key variables, including frequency distributions and means, to characterize the study population. All analyses were conducted in SAS version 9.3 using survey commands to account for the complex survey sampling design. Bivariate and multivariate logistic regression was carried out for males and females separately in order to assess

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the association between concurrency at Wave IV and AGB percentile at each Wave. To build our multivariate model, we first included our four AGB percentile scores as independent variables with concurrency as our dependent variable (Model 1). We subsequently add control variables: Model 2 – age and race, Model 3 – partnership characteristics, Model 4 – number of partners. Examining the association between concurrency and AGB percentile for each subsequent model allowed us to assess the unique contribution of AGB percentile to explaining variation in concurrency at Wave IV. In all analyses, we used longitudinal weights to assess only individuals with observations at all four data collection time points and to adjust for unequal probability selection into the sample and nonresponse over time. Additionally, we adjusted our variance estimates for clustering at the primary sampling unit and stratification by region.

Results

Table 1. *Reports of concurrency in adulthood (Wave IV) by biological sex, average AGB percentile at each wave, and control variables[†]*

	Total Male Sample	Males No Concurrent	Males Concurrent	Total Female Sample	Females No Concurrent	Females Concurrent
	N=6999	N=5269 (75.3%)	N=1730 (24.7%)	N=8066	N=6578 (81.6%)	N=1488 (18.5%)
AGB percentile W1[*]	0.50 (0.29)	0.48 (0.28)	0.54 (0.29)	0.50 (0.29)	0.50 (0.29)	0.51 (0.30)
AGB percentile W2[*]	0.50 (0.29)	0.49 (0.29)	0.54 (0.29)	0.50 (0.29)	0.50 (0.29)	0.52 (0.30)
AGB percentile W3[*]	0.50 (0.29)	0.49 (0.29)	0.56 (0.29)	0.50 (0.29)	0.50 (0.29)	0.52 (0.30)
AGB percentile W4[*]	0.50 (0.29)	0.49 (0.29)	0.54 (0.28)	0.50 (0.29)	0.51 (0.29)	0.47 (0.29)
Race[†] White(ref) (%)	52.4	80.6	19.4	52.2	83.1	16.9
AA/Black (%)	21.3	60.2	39.8	23.1	75.4	24.6
Asian/PI (%)	7.30	82.6	17.4	6.4	87.4	12.6
AmerIndian (%)	1.7	66.7	33.3	1.5	77.0	23.0
Hispanic (%)	17.3	73.0	27.0	16.8	83.5	16.5
Partner concurrent (%)	13.8	6.5	36.2	18.0	11.4	47.4
Love (range:1 to 4)[*]	3.7 (0.8)	3.7 (0.7)	3.4 (0.9)	3.7 (0.7)	3.8 (0.6)	3.48 (0.9)
Happy (range:1 to 3)[*]	2.6 (0.6)	2.7 (0.5)	2.4 (0.7)	2.6 (0.6)	2.7 (0.6)	2.23 (0.8)
Committed (range:1 to 4)[*]	3.4 (0.9)	3.6 (0.8)	2.8 (1.1)	3.5 (0.9)	3.7 (0.7)	2.87 (1.1)
# lifetime partners W3[*]	6.1 (8.5)	5.3 (7.4)	9.3 (10.9)	4.8 (6.1)	4.5 (5.6)	7.37 (8.1)
# lifetime partners W4[*]	17.4 (31.6)	13.5 (24.4)	30.4 (45.6)	10.1 (18.2)	8.4 (11.9)	17.94 (32.8)
# partners in past 12mth[*]	1.9 (3.3)	1.5 (2.3)	3.5 (4.9)	1.3 (1.8)	1.1 (1.2)	2.29 (3.2)

Note: using longitudinal weights, clustering at primary sampling unit, and stratification by region;
[*]Mean and standard deviation; [†]Percentages for Total Male and Total Female are column percentages and for Concurrent/No Concurrent are row percentages

Overall, 24.7% of men and 18.5% of women reported engaging in concurrent sexual relationships (see Table 1). For men and women, there is substantial variation by race/ethnicity. For example, 39.8% % of Black/African-American (AA) men, 27.0% of Hispanic men, and 19.4% White men had concurrent partners. Similarly, 24.6% of Black/AA women, 16.5% of Hispanic women, and 16.9% of White women had concurrent partners. About 13.8% of men and 18.0% of women perceived that their own partner had concurrent relationships. But, men and women without concurrent partnerships were less likely to feel their partners had concurrent relationship (6.5% and 11.4%, respectively) than men and women who did have concurrent partnerships (36.2% and 47.4%, respectively). Men and women with concurrent partnerships reported lower levels of love, happiness, and commitment compared to men and women who did not have concurrent partners. Finally, men and women with concurrent partnerships had a higher number of lifetime sexual partners at Wave III and Wave IV and a higher number of partners in

the past 12 months. For example, men who report concurrent partnerships have a mean of 30.4 lifetime partners as of Wave 4 data collection compared to only 13.5 partners for men who do not have concurrent partnerships.

Men's AGB percentile also varied by whether or not they have concurrent partners. At each wave, men with concurrent partners had a higher mean AGB percentile (W1: 0.54, W2: 0.54, W3: 0.56, W4: 0.54) than men who do not have concurrent partners (W1: 0.48, W2: 0.48, W3: 0.49, W4: 0.49). This means that, on average, men with concurrent partners more closely adhered to male-typical behaviors compared to men who did not have concurrent partners. For women, differences between AGB percentile for those with concurrent partnerships and those without were less substantial. At Waves 1, 2, and 3, women with concurrent partnerships had slightly higher AGB percentile scores suggesting that women with concurrent partnerships in adulthood, on average, adhered more-closely to female-typical behaviors in adolescence and emerging adulthood. But, at Wave 4, the opposite is true. Women with concurrent partnerships had a lower average AGB percentile (0.47) than women who did not have concurrent partnerships (0.51), suggesting that women without concurrent partnerships were adhering more closely to female-typical behaviors than women who did have concurrent partnerships.

Bivariate and Multivariate Models

Bivariate associations between having concurrent partnerships and AGB percentile varied for men and women (see Table 2). For men, a higher AGB percentile at each wave was significantly associated with increased odds of having concurrent partnerships at Wave IV. For example, a 10 percentage point increase in a man's AGB percentile at Wave I was associated with a 10% increased odds of having concurrent partners at Wave 4 (OR: 1.10, 95% CI: 1.06-1.14). In contrast, the relationship for women was only significant at two waves (Wave II and Wave IV) and the direction of the significances was different. A 10 percentage point increase in a woman's AGB percentile at Wave II was associated with a 5% increased odds of having

concurrent partnerships at Wave IV (OR: 1.05, 95% CI: 1.02-1.08). But, increases in women's

AGB percentile at Wave IV were associated with decreased odds of engaging in multiple

concurrent partnerships at Wave 4 (OR: 0.94, 95% CI: 0.91-0.97).

Table 2. Unadjusted and adjusted odds ratios summarizing bivariate and multivariate results for association between adherence to gender-typical behaviors (AGB) percentile at each Wave and engaging in multiple concurrent partnerships in adulthood.

	Unadjusted			Adjusted		
	OR	95% CI	p	OR†	95% CI	p
MEN						
AGB Percentile - W1*	1.10	1.06 - 1.14	<.01	1.07	1.02 - 1.14	0.01
AGB Percentile - W2*	1.05	1.02 - 1.09	<.01	1.01	0.95 - 1.06	0.86
AGB Percentile - W3*	1.06	1.03 - 1.01	<.01	1.00	0.95 - 1.06	0.99
AGB Percentile - W4*	1.08	1.04 - 1.13	<.01	1.06	0.99 - 1.13	0.12
WOMEN						
AGB Percentile - W1*	1.02	0.99 - 1.06	0.24	1.01	0.96 - 1.07	0.71
AGB Percentile - W2*	1.05	1.02 - 1.08	<.01	1.07	1.01 - 1.13	0.03
AGB Percentile - W3*	1.01	0.97 - 1.05	0.59	0.99	0.94 - 1.04	0.68
AGB Percentile - W4*	0.94	0.91 - 0.97	<.01	0.96	0.91 - 1.01	0.10

*Scaled to be 0-10 such that ORs reflect a 10% change in AGB percentile
†Adjusting for all variables in Model 4 (as shown in Table 3 and 4)

After controlling for demographics, relationships characteristics, and number of partners

in the multivariate models, we found that greater adherence to male-typical behavior at Wave I

was significantly associated with reporting concurrent partnerships at Wave IV (p=0.01). A 10

percentage point increase in men's AGB percentile score at Wave I was associated with a 7%

increased odds of having concurrent partnerships at Wave IV (AOR: 1.07, 95% CI: 1.02-1.14). In

other words, men who have more male-typical behaviors at Wave I are more likely to have

concurrent partners at Wave IV. AGB percentile at the other waves was not significantly

associated with concurrency at Wave IV for males, though a higher AGB percentile score at

Wave IV was marginally associated with higher odds of concurrency at Wave IV (p=0.10; AOR:

1.06, 95% CI: 0.99-1.13).

Full results for each multivariate model with the men's data are reported in Table 3. The

other significant covariates in the final model (Model 4 of Table 3) were Black/African-American

and Hispanic race/ethnicity, perceiving partner as concurrent, increased level of love, decreased

level of commitment, number of lifetime partners at Wave III and number of partners in the past 12 months (all p<.01). In Model 4, we see that the coefficients for AGB percentile at Wave III and IV become non-significant whereas they were significant in previous models suggesting that the association is being attenuated by the inclusion of partner characteristic variables and number of partner variables.

For women, in the multivariate model with all control variables, we found that women who have greater adherence to female-typical behavior at Wave II were more likely to report concurrent relationships at Wave IV. A 10 percentage point increase in women's AGB percentile score was associated with a 7% increased odds of having concurrent partnerships (AOR: 1.07, 95% CI: 1.01-1.13). In other words, women who have more female-typical behaviors at Wave II are more likely to have concurrent partners at Wave IV. We additionally found that women with higher AGB percentile at Wave IV were slightly *less* likely to report concurrent relationships at Wave IV, though the relationship was non-significant (p=0.10; AOR: 0.96, 95% CI: 0.91-1.01).

Full results for each multivariate model with the women's data are reported in Table 4. Besides AGB percentile at Wave II, the other significant covariates in the final model were perceiving partner as concurrent, increased level of love, and decreased level of commitment (all p<.01). Unlike for men, race/ethnicity and number of partners were all non-significant. In Model 4 of Table 4, we see that the coefficient for AGB percentile at Wave 4 has become non-significant (p=0.10), the association being attenuated by the inclusion of number of partner variables.

Table 3: Men's reported concurrency in a relationship: Logistic regression results

	Model 1		Model 2		Model 3		Model 4	
	β	p	β	p	β	p	β	p
Intercept	-2.14	<.01	-2.43	<.01	0.55	0.65	0.42	0.75
AGB Percentile – W1	0.74	<.01	0.64	<.01	0.79	<.01	0.71	0.01
AGB Percentile – W2	0.10	0.59	-0.048	0.81	0.01	0.98	0.05	0.86
AGB Percentile – W3	0.36	0.06	0.40	0.04	0.19	0.50	0.00	1.00
AGB Percentile – W4	0.53	0.03	0.75	<.01	0.74	0.02	0.56	0.11
Age at Wave 4			0.00	0.95	-0.05	0.24	-0.07	0.09
Race White(ref)								
AA/Black			1.12	<.01	0.83	<.01	0.70	<.01
Asian/PI			-0.01	0.97	0.01	0.98	0.29	0.52
AmerIndian			0.58	0.27	0.67	0.15	0.56	0.25
Hispanic			0.46	0.01	0.49	0.01	0.56	<.01
Partner concurrent					1.95	<.01	1.97	<.01
Love					0.40	<.01	0.50	<.01
Happy					-0.18	0.21	-0.23	0.14
Committed					-0.87	<.01	-0.78	<.01
# lifetime partners W3							0.02	<.01
# lifetime partners W4							0.01	0.06
# partners in past 12mth							0.16	<.01

Note: using longitudinal weights, clustering at primary sampling unit, and stratification by region

Table 4: Women's reported concurrency in a relationship: Logistic regression results

	Model 1		Model 2		Model 3		Model 4	
	β	p	β	p	β	p	β	p
Intercept	-1.64	<.01	-1.40	0.20	0.22	0.89	-0.84	0.60
AGB Percentile – W1	0.11	0.65	0.09	0.67	0.08	0.77	0.11	0.71
AGB Percentile – W2	0.44	0.03	0.67	<.01	0.78	<.01	0.64	0.03
AGB Percentile – W3	0.03	0.90	-0.02	0.92	-0.18	0.51	-0.11	0.68
AGB Percentile – W4	-0.76	<.01	-0.74	<.01	-0.68	<.01	-0.43	0.10
Age at Wave 4			-0.01	0.82	0.00	0.95	0.00	0.97
Race White(ref)								
AA/Black			0.52	<.01	-0.2292	0.27	-0.19	0.39
Asian/PI			-0.48	0.20	-0.5936	0.14	-0.50	0.18
AmerIndian			0.46	0.19	0.5284	0.72	0.16	0.55
Hispanic			-2.43	0.36	0.1554	0.80	-0.05	0.71
Partner concurrent					1.7923	<.01	1.74	<.01
Love					0.52	<.01	0.59	<.01
Happy					-0.19	0.17	-0.22	0.12
Committed					-1.06	<.01	-0.93	<.01
# Lifetime partners W3							0.02	0.18
# Lifetime partners W4							0.02	0.09
# Partners in past 12mth							0.26	0.10

Note: using longitudinal weights, clustering at primary sampling unit, and stratification by region

Discussion

      We found that adherence to gender-typical behavior is an important factor in U.S. men and women's engagement in concurrent sexual relationships. For men, greater adherence to male-typical behaviors in adolescence was the strongest predictor of having concurrent relationships in adulthood, suggesting that men's sexual behaviors in adulthood may be shaped by experiences of gender and masculinity in adolescence. Greater adherence to male-typical behavior at other time points were also associated with increased likelihood of having concurrent partners for men, but the effects were attenuated after controlling for other factors. Adherence to gender-typical behavior is also important for females but the story is more complicated. Women who more closely adhere to female-typical behaviors in adolescence are more likely to have concurrent relationships in adulthood, possibly indicating a relationship similar to men where experiences of gender and femininity in adolescence shape sexual behaviors into adulthood. However, for females, less adherence to female-typical behaviors in adulthood was associated with increased odds of engaging in a concurrent sexual relationship. Below we discuss our findings and implications for future research and interventions.

      First, the fact that adherence to gender-typical behavior in adulthood was not significantly associated – after controlling for other factors – with adulthood concurrency for both men and women was not hypothesized, however it supports the overarching hypothesis from Add Health that adolescence is a sensitive period that shapes later life experiences and outcomes (K. M. Harris, Gordon-Larsen, Chantala, & Udry, 2006; Lee, Harris, & Gordon-Larsen, 2009). We also know that adolescence is a sensitive time for development of a gender (i.e., masculine or feminine) identity (Barker, 2005; Cohan, 2009; Hyde, Howlett, Drennan, & Brady, 2005). Adolescent males and females with highest adherence to gender-typical behavior may be the young men and women who are most concerned about attracting sexual partners and how other perceive them. When they engage in romantic or sexual relationships during this period, these

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adolescents may be more likely to engage in multiple and sometimes concurrent sexual partnerships because of both increased opportunities and as a way to emphasize their sexual desirability to peers. This sexual activity in adolescence then sets these adolescents on a trajectory of sexual behavior into their adulthood (Scott et al., 2011). By the time they reach adulthood, their status as masculine or feminine is more well-established, by their appearance, engagement in steady sexual relationships, and possibly through their profession (Connell, 1995) and their adherence to gender-typical behaviors in adulthood may be less relevant. Therefore, AGB in adulthood is less important for engaging in concurrent partnerships. However, the roots of the concurrent partnerships in adulthood stems in part from trajectories established in adolescence, precisely the time when adherence to gender-typical behaviors is most salient.

Future research is needed to examine *how* adherence to gender-typical behaviors influences sexual behaviors. Particularly for women, we see that the relationship with concurrent partnerships changes direction between AGB in adolescence and AGB in adulthood. Future research could explore the motivations for women to engage in multiple concurrent partnerships and how that might differ in adolescence and adulthood. In general, there is a need to better understand how different dimensions of gender are influencing men and women's sexual behaviors. There is evidence that gender matters, but we lack robust evidence using large nationally representative samples and taking a longitudinal perspective. Most large demographic surveys lack any scales related to gender norms or other aspects of gender. We took advantage of a unique measurement technique to conduct these analyses. While future research should continue exploring AGB in Add Health and other large surveys, ultimately demographic surveys need to incorporate other validated scales of gender to better understand how they relate to sexual behaviors and concurrency.

Our findings also suggest that interventions that address gender norms are needed to prevent engagement in concurrent partnerships. Many have called for 'gender-transformative' interventions that ask men and women to challenge existing harmful gender norms that encourage

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sexual behaviors that are harmful for health (Dunkle & Jewkes, 2007; Gupta, 2000). A recent systematic review found that gender-transformative interventions can effectively shift gender norms and reduce risks for HIV/STI (Dworkin, Treves-Kagan, & Lippman, 2013). These interventions have generally not specifically measured impacts on concurrent partnerships and future research could expand to incorporate these measures. Additionally, our findings suggest that these interventions should be implemented in adolescence when gender formation is occurring and potentially most important for future concurrent sexual partnerships.

Limitations

While our study offers important new evidence for the relationship between engaging in multiple concurrent partnerships and one's performance of gender, the findings should be considered in light of methodological limitations. We use a measure of concurrent that does not match the gold-standard measure (UNAIDS Reference Group on Estimates, 2010). Our measure does capture overlapping sexual relationships, but we have no information about the timing of this overlap. Thus, in the case of a long-term relationship, it is possible that the overlap occurred years ago.

Conclusions

Concurrency has emerged as an important topic to understand for HIV/STI prevention and effectively reducing concurrency requires understanding the social dimensions of this sexual behavior. Considering and assessing the role of gender norms on men's and women's behaviors can help effectively target approaches for reducing sexual risk. Sexual risk reduction interventions may specifically need to target gender norms that encourage risk behaviors such as concurrency.

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APPENDIX A.
WAVE 1 – Final Variable List (sorted by contribution to the model)

#	Question (Response Min/Max)	Min/ Max	Boys Mean	Boys SD	Girls Means	Girls SD	(Boy-Girl M) /(Boy SD)	Wald Chi-sq contribution to model
1	*Frequency of Crying* (0=Never; 4=Every day)	0/4	0.16	0.43	0.64	0.81	-1.13	320.95
2	*Frequency of playing an active sport* (0=Not at all; 3=5 or more times)	0/3	1.70	1.13	1.07	1.08	0.56	227.93
3	*Got into a physical fight* (0=Never; 2=more than once)	0/2	0.62	0.79	0.32	0.62	0.38	145.53
4	*How do you think of yourself in terms of weight?* (1=very underweight; 5=very overweight)	1/5	2.99	0.77	3.32	0.80	-0.43	118.76
5	*How much do you feel that your friends care about you?* (1=not at all; 5=very much)	1/5	4.11	0.82	4.35	0.79	-0.29	91.10
6	*Hours per week playing video/computer games* (0-99 hours)	0/99	4.22	8.15	1.35	3.85	0.35	89.85
7	*What do you think your chances are of getting an STD?* (1=very high; 5=no chance)	1/5	4.16	0.95	4.40	0.87	-0.25	78.88
8	*How many hours do you spend working for pay* (0-140 hours)	140	8.35	12.42	7.04	11.00	0.11	72.65
9	*Have you ever received an out-of-school suspension from school?* (0=No; 1= Yes)	0/1	0.37	0.48	0.21	0.41	0.34	71.93
10	*Frequency of poor appetite* (0=never/rarely; 3=most of the time)	0/3	0.35	0.62	0.60	0.78	-0.41	70.81
11	*Frequency of wearing a helmet while cycling* (0=Never; 4=Always)	0/5	1.38	2.10	2.08	2.36	-0.33	58.79
12	*Hours per week listening to the radio* (0-99 hours)	0/99	15.75	19.45	18.54	20.71	-0.14	58.01
13	*Frequency of doing work around the house* (0=Not at all; 3=5 or more times)	0/3	1.92	0.91	2.15	0.87	-0.26	55.80
14	*Upset by difficult problems* (1=strongly agree; 5=strongly disagree)	1/5	2.59	1.03	2.31	0.96	0.27	39.07
15	*How much do you feel adults care about you?* (1=not at all; 5=very much)	1/5	4.30	0.87	4.44	0.79	-0.17	36.76
16	*Frequency of moodiness* (0=Never; 4=Every day)	0/4	1.09	0.96	1.50	1.06	-0.43	31.80
17	*You have a lot to be proud of* (1=strongly agree; 5=strongly disagree)	1/5	1.65	0.70	1.78	0.75	-0.18	28.79
18	*Have you taken a pledge to remain a virgin until marriage?* (0=No; 1= Yes)	0/1	0.09	0.29	0.16	0.37	-0.24	28.11
19	*Frequency of exercise* (0=Not at all; 3=5 or more times)	0/3	1.61	1.09	1.66	1.02	-0.04	27.90
20	*Rely on gut feelings to make decisions* (1=strongly agree; 5=strongly disagree)	1/5	2.92	1.14	3.08	1.12	-0.14	22.04
21	*Trying to gain/lose/maintain weight?* (1=Lose; 4=nothing)	1/4	2.40	0.95	2.08	1.11	0.33	19.42
22	*You never get sad* (1=strongly agree; 5=strongly disagree)	1/5	3.47	1.00	3.81	0.89	-0.34	18.60
23	*How likely is it that you will go to college* (1=low; 5=high)	1/5	3.98	1.22	4.27	1.09	-0.24	15.97
24	*You felt you were just as good as other people* (0=never/rarely; 3=most of the time)	0/3	1.96	1.01	1.79	1.01	0.16	15.31
25	*Frequency wearing a seatbelt in the car* (0=Never; 4=Always)	0/4	2.95	1.24	3.22	1.10	-0.22	10.12

WAVE 2 – Final Variable List (sorted by contribution to the model)

#	Question (Response Min/Max)	Min/ Max	Boys Mean (SD)	Girls Means (SD)	(Boy-Girl M) /(Boy SD)	Wald Chi-sq contribution to model
1	*Frequency of crying* (0=Never; 4=Every day)	0/4	0.20 (0.46)	0.74 (0.79)	-1.18	196.98
2	*Frequency of sunbathing in the summer* (1=frequently; =never)	1/4	3.46 (0.85)	2.74 (1.14)	0.85	186.07
3	*Frequency of playing an active sport* (0=Not at all; 3=5 or more times)	0/3	1.68 (1.12)	1.04 (1.07)	0.57	175.63
4	*How you think of yourself in terms of weight* (1=very underweight; 5=very overweight)	1/5	3.01 (0.73)	3.32 (0.77)	-0.43	137.54
5	*Have you ever driven a car* (0=No; 1= Yes)	0/1	0.84 (0.36)	0.77 (0.42)	0.20	70.54
6	*Frequency of doing work around the house* (0=Not at all; 3=5 or more times)	0/3	1.93 (0.88)	2.18 (0.84)	-0.29	68.28
7	*Likely to use sunscreen* (1=very likely; 3=unlikely)	1/3	2.63 (0.65)	2.34 (0.79)	0.45	66.39
8	*You like to take risks* (1=strongly agree; 5=strongly disagree)	1/5	2.30 (1.01)	2.62 (1.07)	-0.32	62.15
9	*Frequency of poor appetite* (0=never/rarely; 3=most of the time)	0/3	0.36 (0.62)	0.64 (0.79)	-0.44	58.91
10	*Difficult problems make you very upset* (1=strongly agree; 5=strongly disagree)	1/5	2.55 (1.06)	2.22 (1.00)	0.31	53.04
11	*Hours per week playing video/computer games* (0-99 hours)	0/95	3.85 (7.41)	1.33 (3.76)	0.34	52.82
12	*How much do you feel that your friends care about you?* (1=not at all; 5=very much)	1/5	4.17 (0.83)	4.42 (0.80)	-0.30	51.03
13	*Past 12 months, how often get into a serious physical fight* (0=never; =5 or more times)	0/3	0.33 (0.63)	0.16 (0.43)	0.28	39.67
14	*You will graduate from college* (1=almost no chance; 5=almost certain)	1/5	3.73 (1.21)	4.05 (1.12)	-0.26	34.44
15	*You received testing/treatment for an STI/AIDS in past year* (0=No; 1= Yes)	0/1	0.04 (0.20)	0.08 (0.27)	-0.19	26.94
16	*Past 12 months, how often deliberately damage property that wasn't yours* (0=Not at all; 3=5 or more times)	0/3	0.25 (0.60)	0.11 (0.38)	0.23	26.84
17	*Times used sunlamp or a tanning bed in your life* (0=never; 1=1time; 5= >20 times)	0/5	0.21 (0.82)	0.75 (1.53)	-0.65	26.54
18	*You like yourself just the way you are* (1=strongly agree; 5=strongly disagree)	1/5	1.75 (0.81)	2.09 (0.98)	-0.42	18.31
19	*You live without much thought for the future* (1=strongly agree; 5=strongly disagree)	1/5	3.43 (1.11)	3.69 (1.03)	-0.24	16.75
20	*Number of past thirty days chewed tobacco* (0-30 days)	0/30	1.23 (5.07)	0.07 (0.93)	0.23	12.46
21	*Frequency of wearing a helmet while cycling* (0=Never; 4=Always)	0/5	1.67 (2.22)	2.33 (2.38)	-0.30	11.67
22	*You felt you were just as good as other people* (0=never/rarely; 3=most of the time)	0/3	2.00 (1.00)	1.88 (0.99)	0.12	9.59
23	*Frequency wearing a seatbelt in the car* (0=Never; 4=Always)	0/4	2.94 (1.23)	3.24 (1.08)	-0.25	9.50
24	*How honestly answered questions* (1=not honestly at all; 4=completely honestly)	1/4	3.28 (0.87)	3.48 (0.72)	-0.23	9.08
25	*You felt lonely* (0=never/rarely; 3=most of the time)	0/3	0.40 (0.66)	0.53 (0.74)	-0.20	6.73
26	*Frequency of moodiness* (0=Never; 4=Every day)	0/4	1.12 (0.90)	1.51 (0.97)	-0.44	6.73
27	*You are emotional* (1=strongly agree; 5=strongly disagree)	1/5	2.56 (0.98)	2.14 (0.94)	0.43	6.71

WAVE 3 – Final Variable List (sorted by contribution to the model)

#	Question (Response Min/Max)	Min/Max	Boys Mean (SD)	Girls Mean (SD)	(Boy-Girl M) /(Boy SD)	Wald Chi-sq contribution to model
1	You were sad, during the past 7 days (0=never/rarely; 3=most of the time)	0/4	0.66 (0.63)	1.26 (0.68)	-0.96	327.33
2	In past 7 days, how many times doing work around the house (0=not at all; 7=7 or more times)	0/7	3.82 (2.26)	5.02 (2.13)	-0.53	157.24
3	What do you think of yourself in terms of weight? (1=very underweight; 5=very overweight)	1/5	3.15 (0.78)	3.50 (0.79)	-0.45	124.22
4	In past 7 days, how many times did you participate in gymnastics, weight lifting (0=not at all; 7=7 or more)	0/7	1.39 (1.95)	0.50 (1.22)	0.45	119.33
5	I can do a good job stretching the truth when I talk to people (1=not true; 5=very true)	1/5	2.85 (1.36)	2.22 (1.27)	0.47	86.09
6	Hours per week playing video/computer games (0-168 hours)	0/168	6.39 (10.54)	3.18 (6.57)	0.30	82.87
7	How many times engage in a hobby (e.g. play cards, arts and crafts, musical, etc.) (0=not at all; 7=7 or more)	0/7	2.91 (2.40)	2.43 (2.13)	0.20	67.20
8	In past 7 days, how many times did you rollerblade/ski/racquet sports or aerobics (0=not at all; 7=7 or more)	0/7	0.59 (1.39)	0.61 (1.38)	-0.01	66.70
9	You like to take risks (1=strongly agree; 5=strongly disagree)	1/5	2.31 (0.99)	2.77 (1.08)	-0.47	60.02
10	Have you used legal performance enhancing substances for athletes (i.e. creatine) (0=No; 1= Yes)	0/1	0.15 (0.36)	0.01 (0.12)	0.38	59.98
11	In past 7 days, how many times did you participate in strenuous team sport (0=not at all; 7=7 or more)	0/7	0.93 (1.65)	0.19 (0.82)	0.45	54.30
12	Do you own a handgun? (0=No; 1= Yes)	0/1	0.14 (0.35)	0.04 (0.21)	0.28	52.69
13	Past 12 months, how often deliberately damage property that wasn't yours (0=Not at all; 3=5 or more times)	0/3	0.17 (0.47)	0.05 (0.25)	0.25	43.12
14	In past 7 days, how many times hang with friends or talk on the telephone for more than 5 minutes? (0=not at all; 7=7 or more)	0/7	4.28 (2.41)	4.38 (2.35)	-0.04	39.02
15	Number of past thirty days chewed tobacco (0-30 days)	0/30	1.38 (5.68)	0.07 (0.99)	0.23	33.65
16	Have you ever been expelled from school (0=No; 1= Yes)	0/1	0.11 (0.31)	0.04 (0.20)	0.20	29.37
17	Past 12 months, how often take part in physical fight where your group against another group (0=Not at all; 3=5 or more times)	0/3	0.19 (0.51)	0.04 (0.20)	0.30	28.37
18	Have you ever paid someone to have sex with you? (0=No; 1= Yes)	0/1	0.05 (0.22)	0.01 (0.07)	0.21	26.38
19	Have you ever played games for money or taken part in another type of gambling for money? (0=No; 1= Yes)	0/1	0.51 (0.50)	0.32 (0.47)	0.38	25.92
20	In past 7 days, how many times did you walk for exercise (0=not at all; 7=7 or more)	0/7	1.36 (2.18)	1.81 (2.16)	-0.21	24.05
21	In past 7 days, how many times did you bike/skate/dance/skateboard (0=not at all; 7=7 or more)	0/7	1.56 (2.00)	1.10 (1.68)	0.23	23.74
22	In past 7 days, how many times did you watch TV in the past seven days (0=not at all; 7=7 or more)	0/7	5.49 (2.14)	5.33 (2.18)	0.07	21.03
23	How important is being faithful is for a successful marriage? (1=not important; 10=very important)	1/10	9.58 (1.30)	9.80 (0.94)	-0.17	16.83

WAVE 4 – Final Variable List (sorted by contribution to the model)

#	Question (Response Min/Max)	Min/ Max	Boys Mean (SD)	Girls Means (SD)	(Boy-Girl M) /(Boy SD)	Wald Chi-sq contribution to model
1	Have you ever used chewing tobacco at least 20 times in your entire life? (0=no; 1=yes)	0/1	0.20 (0.40)	0.01 (0.11)	0.47	204.74
2	Have you ever been arrested? (0=no; 1=yes)	0/1	0.41 (0.49)	0.17 (0.38)	0.49	141.66
3	When you go outside on a sunny day for more than one hour, how likely are you to use sunscreen or sunblock? (1=very likely; 3=unlikely)	1/3	2.65 (0.66)	2.32 (0.83)	0.50	128.80
4	I have a vivid imagination (1=strongly agree; 5=strongly disagree)	1/5	2.22 (0.96)	2.48 (1.00)	-0.28	123.17
5	I don't talk a lot (1=strongly agree; 5=strongly disagree)	1/5	3.20 (1.12)	3.60 (1.08)	-0.35	117.98
6	I sympathize with others' feelings (1=strongly agree; 5=strongly disagree)	1/5	1.99 (0.75)	1.66 (0.68)	0.44	84.33
7	In the past seven days, how many times did you participate in gymnastics, weight lifting, or strength training? (0=not at all; 7=7 or more times)	0/7	1.27 (1.91)	0.54 (1.27)	0.38	79.66
8	Hours per week playing video/computer games (0-105 hours)	0/105	4.45 (9.45)	1.93(5.70)	0.27	55.88
9	In past 7 days, how many times did you walk for exercise (0=not at all; 7=7 or more times)	0/7	1.73 (2.35)	2.15 (2.25)	-0.18	55.36
10	I have frequent mood swings (1=strongly agree; 5=strongly disagree)	1/5	3.50 (1.06)	3.09 (1.10)	0.38	51.38
11	How often do you pray privately? (0=never; 7=more than once a day)	0/7	3.55 (2.63)	4.56 (2.38)	-0.38	48.08
12	During typical summer week, how many hours do you spend in the sun during the day? (0-99 hours)	0/99	17.52 (19.64)	10.56 (12.78)	0.35	47.82
13	Have you ever been in the military? (0=no; 1=yes)	0/1	0.12 (0.32)	0.03 (0.16)	0.28	45.43
14	In the past 7 days, how many times did you participate in strenuous team sports such as football, soccer, basketball, lacrosse, rugby, field hockey, or ice hockey? (0=not at all; 7=7 or more times)	0/7	0.49 (1.19)	0.11 (0.58)	0.32	41.99
15	In the past 7 days, you felt too tired to do things. (0=never or rarely; 3=most or all of the time)	0/3	0.72 (0.71)	1.01 (0.82)	-0.40	39.88
16	I worry about things (1=strongly agree; 5=strongly disagree)	1/5	2.56 (1.04)	2.09 (0.89)	0.44	39.20
17	Compared to other people your age, how intelligent are you? (1=moderately below; 6=extremely above)	1/6	4.01 (1.05)	3.86 (0.99)	0.15	30.61
18	I am not interested in other people's problems (1=strongly agree; 5=strongly disagree)	1/5	3.38 (0.98)	3.76 (0.90)	-0.39	27.68
19	I like to take risks (1=strongly agree; 5=strongly disagree)	1/5	2.79 (0.98)	3.18 (0.98)	-0.40	25.99
20	In the past 24 hours, have you participated in vigorous activity long enough to work up a sweat, get your heart thumping, or get out of breath? (0=no; 1=yes)	0/1	0.49 (0.50)	0.33 (0.47)	0.33	23.39
21	I get stressed out easily (1=strongly agree; 5=strongly disagree)	1/5	3.46 (0.96)	3.02 (1.05)	0.46	22.28
22	I am not really interested in others. (1=strongly agree; 5=strongly disagree)	1/5	3.69 (0.81)	3.93 (0.73)	-0.30	18.61