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Journal of Adolescent Health 71 (2022) 63–69

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JOURNAL OF ADOLESCENT HEALTH

www.jahonline.org

Original article

# Partnership Dynamics and HIV-Related Sexual Behaviors Among Adolescent Mothers in South Africa: A Longitudinal Analysis of HIV Prevention Trials Network 068 Data

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*Article history:* Received July 27, 2021; Accepted February 3, 2022
*Keywords:* adolescent motherhood; HIV; sexual behaviors; communication; intimate partner violence; gender norms; relationship power

A B S T R A C T

**Purpose:** In South Africa, adolescent mothers have a three times higher risk of HIV acquisition than nonadolescent mothers. Yet, limited evidence exists regarding how early childbearing may affect HIV risk. A better understanding of adolescent mothers' partnership dynamics and sexual behaviors is critical to tailoring interventions to prevent new infections.
**Methods:** Data are from HIV Prevention Trials Network 068, a longitudinal study of adolescent girls and young women (AGYW) aged 13–20 in South Africa who were followed annually for up to 6 years. Log-binomial regression models were used to assess whether adolescent motherhood was associated with partnership dynamics (intimate partner violence, gender inequitable norms, low relationship power, no HIV prevention communication) and if the association between partnership dynamics and sexual behaviors (unprotected sex and transactional sex) varied by adolescent motherhood. Generalized estimating equations, with an exchangeable correlation structure, were used to account for nonindependence.
**Results:** Adolescent mothers were more likely than nonadolescent mothers to be in partnerships characterized by intimate partner violence, low relationship power, gender inequitable norms, and no HIV prevention communication. A higher proportion were also more likely to experience these dynamics, as well as engage in transactional sex, after giving birth. Poor partnership dynamics put AGYW at a higher risk for unprotected sex and transactional sex, regardless of adolescent motherhood status.
**Discussion:** Engaging adolescent mothers in interventions post birth and developing interventions that address power imbalances in AGYW's sexual partnerships have the potential to reduce engagement in HIV-related sexual behaviors and HIV risk in the long term.
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**IMPLICATIONS AND CONTRIBUTION**

This study demonstrates that poor partnership dynamics put adolescent girls and young women at a higher risk for unprotected sex and transactional sex, regardless of adolescent motherhood status. However, adolescent mothers are more likely than nonadolescent mothers to experience poor partnership dynamics, particularly after the birth of their children.

In sub-Saharan Africa (SSA), adolescent girls and young women (AGYW), aged 15–24, continue to bear a disproportionate burden of the HIV epidemic [1]. AGYW contribute to nearly 30% of all new HIV infections in the region. In South Africa,

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

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https://doi.org/10.1016/j.jadohealth.2022.02.003

this percentage translates to approximately 55,000 new infections among AGYW per year, which is almost four times the number contributed by their male peers [2,3]. Despite this high incidence, risk of HIV infection is not equally distributed among all AGYW. South African adolescent mothers have a three times higher risk of HIV acquisition compared to their non-parenting counterparts and are also more likely to report unprotected sex and transactional sex, both known predictors of HIV [4]. A better understanding of HIV-related sexual behavior drivers among adolescent mothers is critical to tailoring interventions to more effectively prevent new infections for this population.

Partnership dynamics (i.e., intimate partner violence [IPV], gender-equitable norms, relationship power, HIV communication) are well established drivers of HIV-related sexual behaviors among AGYW in South Africa. Conceptually, the Theory of Gender and Power suggests that these associations are reflective of economic, physical, and social imbalances in society which allow men to have more power over sexual decision-making [5,6]. Dyadic Power Theory additionally suggests that partners with higher or lower relational power will be less likely to suggest safer sexual behaviors, while partners who share equal power with others will be more likely [6,7]. Empirically, researchers have found a number of mechanisms for the associations among partnership dynamics and HIV-related sexual behaviors. First, AGYW who experience violence in their relationships may be afraid to ask their partners to use condoms for fear of a violent reaction [8]. Second, threats by male partners can discourage condom use, especially in the context of inequitable dynamics that stem from age differences or financial dependency [8–10]. Third, partnerships motivated by material exchange increase AGYW's vulnerability to violence and sexual exploitation [11]. Fourth, prevalent gender-based norms in South Africa discourage AGYW from being candid about their sexual interests and taking charge of their sexuality [12]. Fifth, power inequities and norms around sexual communication may inhibit AGYW from discussing HIV prevention with their partners [13].

Despite adolescent mother's increased risk for HIV, there is limited evidence on partnership dynamics before and after the onset of motherhood and whether partnership dynamics influence HIV-related sexual behaviors among this population. One study found that adolescent mothers may be in relationships with higher IPV and lower relationship power than young adult mothers and older mothers [14]. In qualitative work, adolescent mothers often described distant relationships with their partners post pregnancy but also needing to stay connected to partners to ensure financial support for their child [15–17]. Researchers have hypothesized that partnership dynamics, as well as economic strain, limit adolescent mothers' ability to negotiate and engage in protected sex, thus increasing their vulnerability to HIV [17–19]. Few quantitative studies to date have examined differences in partnership dynamics for adolescent mothers compared to non-adolescent mothers, particularly in settings with a generalized HIV epidemic. Using longitudinal data to examine these differences is essential for understanding when to engage AGYW as they navigate partnerships and pregnancy during the transition to adulthood. Furthermore, understanding patterns of partnership dynamics among adolescent mothers, and how they influence sexual behaviors, provides necessary information to develop much needed HIV prevention interventions for this population.

To this end, the current analysis utilizes data from a longitudinal study of AGYW in rural South Africa to explore three specific research aims. First, we examine the longitudinal association between adolescent motherhood (child before age 19) and partnership dynamics (IPV, relationship power, gender-equitable norms, and HIV communication). Second, we examine whether partnership dynamics are more prevalent before or after birth among adolescent mothers. Third, we examine the associations among partnership dynamics and HIV-related sexual behaviors (unprotected sex and transactional sex) and whether they are modified by adolescent motherhood.

## Methods

### *HIV Prevention Trials Network 068 overview*

Data are from the HIV Prevention Trials Network 068 study (HPTN 068), a phase III randomized controlled trial which aimed to measure the effect of providing cash transfers, conditional on school attendance, on risk of HIV acquisition among AGYW. The study enrolled 2,533 AGYW aged 13–20 years who were attending high school grades 8–11 in the Agincourt Health and Socio-Demographic Surveillance System (HDSS) site in Bushbuckridge sub-district in Mpumalanga province, South Africa. Individuals who were pregnant or married at the time of recruitment, unable to read, intending to leave the study area before study completion, or without a parent or guardian in the house were ineligible to participate in the study. Young women were identified from the HDSS and visited at their homes to assess their eligibility to participate. Enrollment was limited to one young woman from each household and mean age at enrollment was age 15.

HPTN 068 enrollment visits began in 2011, and follow-up visits occurred for every subsequent year that the participant was in high school (up to grade 12). Follow-up visits for the original randomized controlled trial concluded in 2015. At each visit, a survey was administered to the participant via an audio computer-assisted self-interview, and biomarkers were collected. Following the end of the conditional cash transfer intervention, a post-intervention study visit occurred which also included an audio computer-assisted self-interview study questionnaire and biomarker testing. Additional details on recruitment, data collection, and laboratory procedures are available in the parent publication of the trial [20]. Of the 2,533 AGYW included in the original HPTN 068 cohort, we excluded 88 AGYW without at least one follow-up visit after enrollment and an additional 72 AGYW who were HIV positive at baseline, resulting in a final analytical sample of 2,373 AGYW who were followed for up to 5 years.

Institutional Review Board approval for this study was obtained from the University of North Carolina at Chapel Hill and the University of the Witwatersrand Human Research Ethics Committee. Each AGYW and their parent or guardian provided written informed consent at the home visit. Written assent was obtained for young women younger than 18 years. Consent and assent forms were available in English and Shangaan.

### *Measures*

Adolescent motherhood was based on the participant's current age and their response to the following item: "How many living children do you have, that you have given birth to?" A binary variable was created where those who were younger than 19 and reported a living child were coded as 1 and those who were older than 19 and reported a living child or did not report

**Table 1**
Participant characteristics at baseline by motherhood[a]

| Participant characteristics | All participants at baseline (N = 2,373) | | Adolescent mothers at baseline (N = 123) | | Not adolescent mothers at baseline (N = 2,213) | | Difference between groups at baseline | All participants at final visit (N = 1,964) | |
|---|---|---|---|---|---|---|---|---|---|
| | n | %/IQR | n | %/IQR | n | %/IQR | *p*-value | n | %/IQR |
| Demographics | | | | | | | | | |
| Median age | 15 | 14–17 | 17 | 16–18 | 15 | 14–16 | <.001 | 20 | 19–21 |
| In secondary school | 2,373 | 100% | 123 | 100% | 2,213 | 100% | 1.000 | 530 | 27% |
| Any orphanhood | 621 | 26% | 46 | 37% | 567 | 26% | <.001 | 669 | 34% |
| Median household monthly expenditure (Rand) | 289 | 185–480 | 239 | 161–346 | 291 | 186–486 | .175 | 419 | 276–643 |
| CCT intervention arm | 1,203 | 51% | 64 | 52% | 1,139 | 51% | .903 | 985 | 50% |
| Food insecurity in the past year | 799 | 34% | 49 | 40% | 741 | 33% | <.001 | 704 | 36% |
| Motherhood (any age) | 159 | 7% | 123 | 100% | 36 | 2% | <.001 | 379 | 19% |
| Adolescent mother (<19) | 123 | 5% | 123 | 100% | 0 | 0% | <.001 | 288 | 15% |
| Sexual behaviors | | | | | | | | | |
| Ever had sex | 631 | 27% | 123 | 100% | 482 | 22% | <.001 | 1,293 | 66% |
| Unprotected sex in the past 3 months | 184 | 8% | 44 | 36% | 132 | 6% | <.001 | 404 | 21% |
| Transactional sex in the past 3 months | 82 | 3% | 16 | 13% | 135 | 6% | <.001 | 328 | 17% |
| Number of sexual partners and relationship type[b] | | | | | | | | | |
| More than 1 partner in lifetime | 255 | 11% | 57 | 46% | 198 | 9% | <.001 | 641 | 33% |
| Main partner/boyfriend | 419 | 18% | 80 | 65% | 339 | 15% | <.001 | 972 | 49% |
| Casual sex partner | 244 | 10% | 54 | 44% | 190 | 9% | <.001 | 351 | 18% |
| Sex work client | 14 | 1% | 1 | 1% | 13 | 1% | .752 | 13 | 1% |
| Other | 23 | 1% | 6 | 5% | 17 | 1% | <.001 | 36 | 2% |
| Living with partner | 76 | 3% | 19 | 15% | 57 | 3% | .176 | 161 | 8% |
| Partnership dynamics | | | | | | | | | |
| Any physical IPV in the past year | 245 | 10% | 41 | 33% | 198 | 9% | <.001 | 173 | 9% |
| Low gender-equitable norms | 582 | 25% | 51 | 41% | 521 | 24% | <.001 | 258 | 13% |
| Low relationship power | 372 | 16% | 79 | 64% | 279 | 13% | <.001 | 518 | 26% |
| No HIV prevention communication | 235 | 10% | 53 | 43% | 182 | 8% | <.001 | 113 | 6% |

IPV = intimate partner violence; IQR = interquartile range.
[a] Total do not sum to 100% due to missing data.
[b] Participants were asked to name relationship types for last three sexual partners.

any living children were coded as 0 (reference group). Once a participant reported a living child before the age of 19, they were considered exposed to adolescent motherhood for all follow-up visits. The first report of current age was at baseline where the participant age range was 13–21. If participants were 19–21 at baseline, age at last pregnancy was used to classify them as adolescent mothers or not adolescent mothers.

Our two outcome variables included: unprotected sex and transactional sex. *Unprotected sex* in the previous 3 months was operationalized as a binary variable and defined as having reported any instance of condom-less sex in the previous 3 months for each study visit. *Transactional sex* in the previous 3 months was operationalized as a binary variable and defined as reporting feeling like you had to have sex because you were given money or gifts by any named partner in the previous 3 months.

Our four exposures included perceived low relationship power, IPV, low gender-equitable beliefs, and no HIV prevention communication. IPV was measured using the previously validated 6-item World Health Organization scale [21]. A binary variable was created to represent any or no experiences of physical IPV in the past 12 months. *Gender-equitable beliefs* were measured using the Gender-Equitable Men's Scale, an instrument previously validated among this study population [22]. The original 24-item Gender-Equitable Men's Scale instrument was restricted to 13 items based on a previous psychometric analysis indicating improvement in the properties of the scale for females when the remaining 11 items were removed [23]. A binary variable was created where low support (scores in the bottom two terciles) for equitable gender norms was coded as 1 and high support (scores in the *top* tercile) for equitable gender norms was coded as 0, per scale recommendations. *Power in sexual relationships* was measured using the 12-item Sexual Relationship Power Scale, adapted for South Africa [24]. A binary variable was created where low power was coded as 1 and defined as below the third tercile and high power was coded as 0 and defined as above the third tercile [25]. HIV-related communication was measured by the item "Have you ever talked with this partner about preventing HIV?" A binary variable was created to represent no HIV prevention discussion with any named partners versus HIV prevention discussion with all named partners or some named partners.

Our covariates included the following baseline measures: age of young woman and HPTN 068 study intervention arm assignment. Time-varying controls include schooling (current grade in school), orphan status, ever had sex, socioeconomic status (measured as quartiles of per-capita household consumption), and depression. These variables were selected a priori and have been shown to be associated with incident HIV infection and HIV-related sexual behaviors among AGYW in Southern Africa [26]. The construction of various covariates has been described in prior publications [20].

### *Data analysis*

First, we described participant characteristics at visit 1 and visit 5 and then compared participant characteristics across

**Table 2**
Association between adolescent motherhood and partnership dynamics

| Partnership dynamic | Unadjusted | | Adjusted[a] | |
|---|---|---|---|---|
| | RR | 95% CI | RR | 95% CI |
| Low relationship power | 1.40[a] | (1.08–1.33) | 1.16[a] | (1.04–1.41) |
| Any physical IPV in the past year | 1.29[a] | (1.11–1.50) | 1.25[a] | (1.06–1.62) |
| Low gender-equitable norms | 1.04 | (0.98–1.10) | 1.11[a] | (1.05–1.17) |
| No HIV prevention communication | 1.66[a] | (1.42–1.95) | 1.59[a] | (1.33–1.90) |

CI = confidence interval; IPV = intimate partner violence; RR = risk ratio.
[a] Adjusted for age, study arm assignment, education, assets, orphanhood, and ever having sex.

adolescent motherhood categories using chi-squared tests. Second, we used separate log-binomial regression models to estimate unadjusted and adjusted risk ratios (aRRs) for the association between adolescent motherhood and each partnership dynamic variable. The adolescent motherhood exposure was lagged by one time point; the exposure was from the previous time point and the outcomes were partnership dynamics measured at the current time point. Third, we used McNemar's tests to compare the occurrence of partnership dynamics before and after birth among participants who became adolescent mothers after study enrollment. Fourth, we used separate log-binomial regression models to estimate unadjusted risk ratios and aRRs for the association between each partnership dynamic and each sexual behavior. Partnership dynamic exposures were lagged by one time point; the exposure was from the previous time point and the outcome was the sexual behavior in the past 3 months measured at the current time point. We then examined evidence for modification of the relationship between partnership dynamics and sexual behaviors by adolescent motherhood by estimating stratified aRRs for adolescent mothers, and nonadolescent mothers. For all models, generalized estimating equations were used to account for the nonindependent repeated measures from the same participant using an exchangeable correlation structure. Adjusted models controlled for age, orphan status, HPTN 068 study intervention arm assignment, study visit (i.e., time), current grade in school or graduation, reporting ever having sex, depression, and socioeconomic status. All analyses were conducted using StataSE, version 14.2 (College Station, TX).

## Results

### *Participant characteristics*

Of the 2,373 AGYW who were HIV negative at baseline, 5% (N = 123) were adolescent mothers and at the final study visit, 15% (N = 288) were adolescent mothers. Adolescent mothers at baseline were older (median age 17 vs. 15, $p < .01$) and more likely to report orphanhood (37% vs. 26, $p < .01$) and food insecurity (40% vs. 33%, $p < .01$). Adolescent mothers at baseline also had higher sexual risk than nonadolescent mothers; they were more likely to have to report unprotected sex (36% vs. 6%, $p < .01$) and transactional sex (13% vs. 6%, $p < .01$) in the past 3 months. In terms of partner characteristics, adolescent mothers at baseline were more likely to have more than one partner in their lifetime (46% vs. 9%, $p < .01$) and classify their named partners as casual sex partners (44% vs. 9%, $p < .01$) (Table 1).

### *Adolescent motherhood and partnership dynamics*

Table 2 reports the aRRs for the relationship between adolescent motherhood and partnership dynamics. Adolescent mothers, compared to nonadolescent mothers, were more likely to experience physical IPV in the past year (aRR 1.25, 95% confidence interval [CI] 1.06–1.62), low gender equitable norms (aRR 1.11, 95% CI 1.05–1.17), low relationship power (aRR 1.16, 95% CI 1.04–1.41), and not discuss HIV prevention with any of their named partners (aRR 1.59, 95% CI 1.33–1.90).

Table 3 reports the proportion of adolescent mothers who reported any of the four partnership dynamics before or after birth of their child (N = 222). A higher proportion experienced physical IPV after birth compared to before birth (44% vs. 20%, $p < .01$). Similarly, a higher proportion of adolescent mothers experienced low gender equitable norms (73% vs. 66%, $p < .01$), any HIV prevention communication (90% vs. 46%, $p < .01$), and low relationship power (62% vs. 40%, $p < .01$) after birth compared to before birth.

### *Partnership dynamics and unprotected sex*

Among all participants, experiencing physical IPV (aRR 1.42, 95% CI 1.22–167), low relationship power (aRR 1.24, 95% CI 1.06–1.45), and not discussing HIV prevention with any of their named partners (aRR 1.24, 95% CI 1.01–1.53) increased participant's risk for unprotected sex in the past 3 months. Low gender-equitable norms did not increase participant's risk for unprotected sex (aRR 1.01, 95% CI 0.89–1.14). In addition, adolescent motherhood did not significantly modify the relationship between any of the four partnership dynamics and unprotected sex (Figure 1). However, among adolescent mothers in our sample (N = 357), 53% reported an instance of unprotected sex after the birth of their child (Table 3).

**Table 3**
Partnership dynamics and sexual behaviors before and after birth among adolescent mothers (N = 222)[a]

| Partnership dynamic & sexual behaviors | Before birth | | After birth | | McNemar's test |
|---|---|---|---|---|---|
| | n | % | n | % | *p*-value |
| Partnership dynamics | | | | | |
| Low relationship power | 89 | 40% | 137 | 62% | <.001 |
| Any physical IPV in the past year | 44 | 20% | 97 | 44% | <.001 |
| Low gender-equitable norms | 147 | 66% | 162 | 73% | <.001 |
| Any HIV prevention communication with partners | 103 | 46% | 199 | 90% | <.001 |
| HIV-related sexual behaviors | | | | | |
| Unprotected sex | 222 | 100% | 111 | 50% | <.001 |
| Transactional sex | 29 | 13% | 102 | 46% | <.001 |

AGYW = adolescent girls and young women; IPV = intimate partner violence.
[a] This sample is limited to AGYW who became mothers before age 19 during the study.

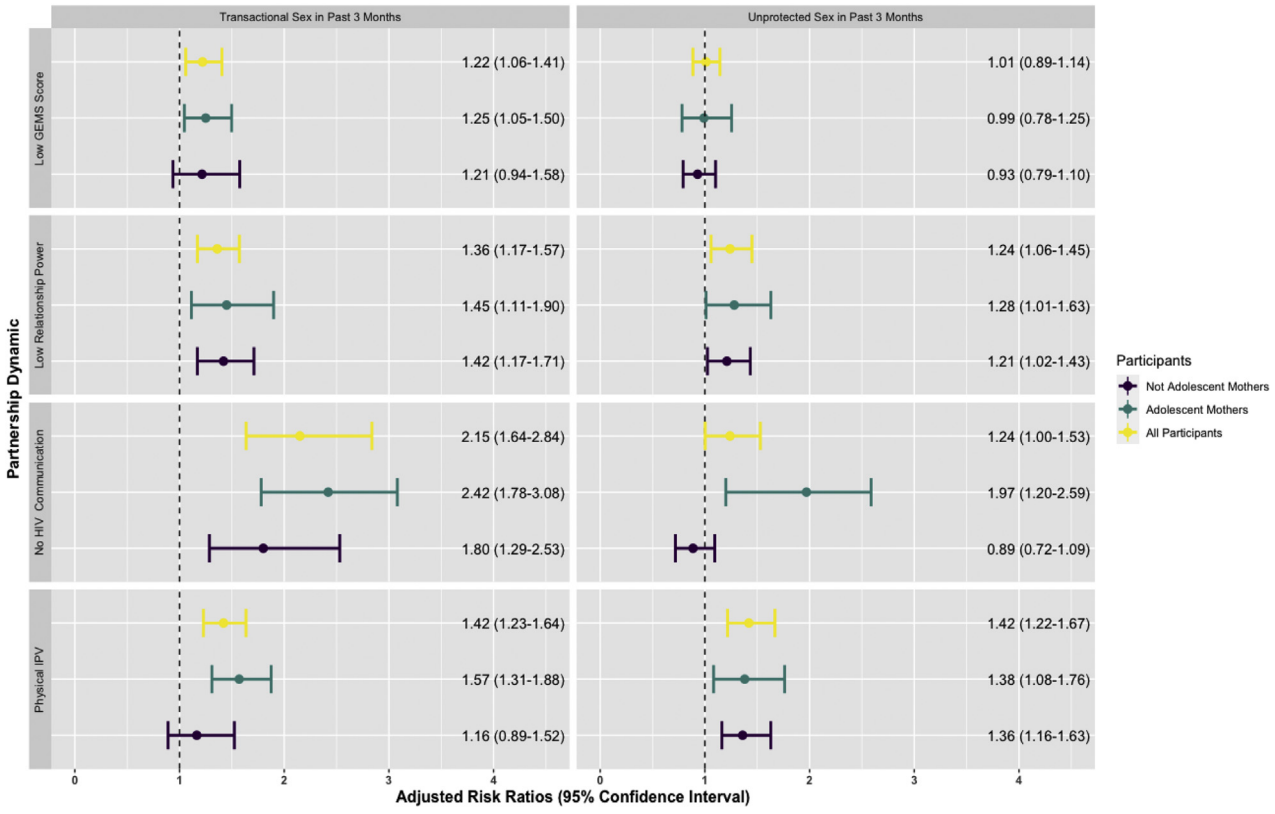



**Figure 1.** Partnership dynamics and sexual behaviors by adolescent motherhood. GEMS = Gender- Equitable Men's Scale; IPV = intimate partner violence.

*Partnership dynamics and transactional sex*

Among all participants, experiencing physical IPV (aRR 1.42, 95% CI 1.23–1.64), low equitable gender norms (aRR 1.22, 95% CI 1.06–1.41), low relationship power (aRR 1.36, 95% CI 1.17–1.57), and no HIV prevention discussion with partners (aRR 2.15, 95% CI 1.64–2.84) increased participant's risk for transactional sex in the past 3 months. However, adolescent motherhood did not modify the relationship between any of the four partnership dynamics and transactional sex (Figure 1). Among adolescent mothers in our sample (N = 357), a higher proportion reported transactional sex after birth than before birth (46% vs. 8%, $p < .01$) (Table 3).

## Discussion

The present study aimed to examine the association among adolescent motherhood, partnership dynamics, and HIV-related sexual behaviors in rural South Africa. Adolescent mothers were more likely to be in relationships characterized by physical IPV, low gender-equitable norms, low relationship power, and no communication about HIV prevention. A higher proportion of adolescent mothers experienced these partnership dynamics after the birth of their child compared to before birth. Experiencing physical IPV, low relationship power, and no communication about HIV prevention put all participants at a higher risk for unprotected sex and transactional sex, regardless of adolescent motherhood status. The only exception being that we found no association between low gender-equitable norms and unprotected sex. Taken together, our findings suggest that having a child during adolescence increases a young women's vulnerability to poor partnership dynamics which are in turn associated with HIV-related sexual behaviors. These findings align with existing empirical research linking AGYW partnership dynamics and HIV-related sexual behaviors but are the first to longitudinally examine these relationships among adolescent mothers and nonadolescent mothers [4,14,18,27,28].

Our findings related to the timing of partnership dynamics and adolescent motherhood differ from related existing literature among adult mothers in SSA. For example, studies have found that adult mothers were likely to experience IPV and low relationship power both during pregnancy and the postpartum period [29–31]. Among adolescent mothers in our sample, a higher proportion experienced IPV and low relationship power after the birth of their child, compared to before birth. Although these estimates were unadjusted, they highlight the vulnerability of adolescent mothers and suggest that engaging pregnant and parenting adolescents in interventions that provide skills to counter existing gender and power imbalances in their intimate partnerships could be beneficial for HIV prevention during the postpartum period. Couple-based interventions such couple-based counseling during HIV testing, prenatal visits, and postnatal visits have been shown to increase social support, communication, efficacy, and trust among couples in SSA and could be a promising approach to improving partnership dynamics [32–38]. However, marriage rates are low among this population (<1% of AGYW in South Africa are married) so additional research on how to engage partners in nonformal relationships for couple-based interventions is needed [39–41].

Although adolescent mothers were more likely to be in relationships characterized by poor partnership dynamics, there

was not a significant difference in the associations among partnership dynamics and HIV-related sexual behaviors between adolescent mothers and nonadolescent mothers. These results suggest that addressing poor partnership dynamics among all AGYW would be beneficial but given the high prevalence among adolescent mothers, intervening among population might have a significant impact. It is also possible that we did not detect a significant difference due to the small sample of adolescent mothers included in our analysis (N = 357). Another potential reason for this result is the way some of our partnership dynamics and HIV-related sexual behaviors were measured. For scales measuring IPV and relationship power, participants were asked to answer items with reference to their "current partner or partner in the past." For the scale measuring gender-equitable norms, participants were asked to answer items with reference to "relationships between men and women." Our HIV prevention communication exposure and HIV-related sexual behavior outcomes were a result of participants being asked to answer items with reference to their last three sexual partners. Although median number of partners was 1 (interquartile range 1–2) across all study visits but the final visit (median 2, interquartile range 1–3), it is possible that there was a disconnect between the reference partner for partnership dynamics and the reference partner for HIV-related sexual behaviors.

The associations among partnership dynamics and transactional sex highlight the interplay between structural vulnerability and HIV risk for AGYW, particularly adolescent mothers who were more likely to experience transactional sex after birth than before birth of their child. HIV risk associated with transactional sex does not necessarily arise from the payment received in exchange for sex but rather from the partnership dynamics that increase unprotected sex with transactional sex partners [42]. Partnership dynamics are a product of pervasive social norms and potentially reinforced by the economic situation of adolescent mothers in our study context. In rural South Africa, and as reflected in our study population demographics, adolescent mothers face high levels of orphanhood, poverty, limited employment opportunities, and increasing rates of school dropout after pregnancy [43,44]. South African law mandates that pregnant students be allowed to complete school after childbirth but inconsistent support from school staff, stigma from peers, limited family resources, and lack of childcare often prevent pregnant students from returning [43,45–47]. These factors diminish adolescent mother's capacity for sustainable, independent livelihoods and increase their economic dependence on male partners. This dependence might translate to engaging in transactional sex and enduring violence, insufficient access to HIV prevention resources, and reduced ability to negotiate conditions of sexual activity [17,48,49]. Taken together, HIV prevention interventions for this population must include both economic strengthening and gender transformative components if they want to help adolescent mothers tackle relationship imbalances that increase their risk for HIV.

In our analysis, we defined adolescent motherhood as having a child before the age of 19. This aligns with long existing definitions of adolescence (age 10–19) used by global health organizations for policy and programing for young populations. Although the associations for partnership dynamics and HIV-related sexual behaviors were slightly stronger for adolescent mothers compared to nonadolescent mothers, almost all the associations were significant among all participants, who were aged 13–24. These results suggest that females are not just vulnerable to these partnership dynamics and HIV-related sexual behaviors during adolescence but also as they transition into young adulthood. There have been recent calls by global health researchers to expand the definition of adolescence from age 10–19 to age 10–24 and to then disaggregate the definition into three age phases—young (10–14 years), middle (15–19 years), and late (20–24 years) adolescence [50]. Similar to our results, this expanded definition acknowledges a continuum of risk that starts in early life. Although low sexual activity and power limited our ability to categorize adolescent motherhood into young, middle, and late, results from Christofides et al. [4] show that early adolescent pregnancies (age <15) increase the incidence of HIV among South African women. Future research that examines the impact of partnership dynamics on HIV-related sexual behaviors during early adolescent motherhood would be particularly useful in the development of targeted HIV-prevention interventions for this vulnerable population.

Despite the strengths of using longitudinal data and our large sample size of AGYW, there are also a number of limitations that warrant discussion. First, adolescents who were not currently enrolled in school were not eligible to participate in the original trial. As such, our sample likely excludes adolescents, and adolescent mothers, highly vulnerable to future HIV infection, which may underestimate effect estimates. Second, information on having living children was self-reported and may be underreported. However, defining adolescent motherhood based on reporting of live births rather than reporting on pregnancy diminishes the likelihood of misclassifying adolescent girls as mothers who terminated or miscarried. Third, we were unable to distinguish the timing of motherhood and specific partnership dynamics that occurred close together. Although our analytic framework ensures temporality for most events by defining our exposure in the time period before outcome ascertainment, we did not adjust our results related to the timing of partnership dynamics before and after birth. Finally, there may also have been a Hawthorne effect of the trial where young women were less likely to drop out of school due to trial participation.

### *Conclusion*

Our study provides novel evidence that adolescent mothers are more likely to be in partnerships characterized by low relationship power, physical IPV, low gender equitable norms, and limited communication about HIV prevention. Adolescent mothers were more likely to experience these partnership dynamics after the birth of their child rather than before birth. Poor partnership dynamics put AGYW at a higher risk for unprotected sex and transactional sex, regardless of adolescent motherhood status. Engaging adolescent mothers in interventions post birth and developing interventions that address power imbalances in sexual partnerships and economic vulnerability have the potential to reduce engagement in HIV-related sexual behaviors and HIV risk in the long term.

## Funding Sources

NLB was supported by the National Institute of Allergy and Infectious Diseases (T32 AI00700140). The HIV Prevention Trials Network is funded by the National Institute of Allergy and Infectious Diseases (UM1AI068619, UM1AI068613, and UM1AI1068617), with co-funding from the National Institute of

Mental Health and the National Institute on Drug Abuse, all components of the US National Institutes of Health. This work was also supported by NIMH (R01MH087118) and the Carolina Population Center and its NIH Center Grant (P2C HD050924).

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