Mental Health Mediates the Association Between Gender-Based Violence and HIV Treatment Engagement in US Women

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Background: Gender-based violence (GBV) is associated with poorer engagement in HIV care and treatment. However, there is a dearth of research on the psychological (eg, mental health) and structural (eg, food insecurity) factors that mediate and moderate this association. GBV could lead to poor mental health, which in turn affects adherence, whereas food insecurity could worsen the effect of GBV on engagement in care. This study uses data from the Women's Interagency HIV Study to address these gaps.

Methods: Women completed 6 assessments from 2013 to 2016 on GBV, mental health, food insecurity, adherence to antiretroviral therapy, and missed HIV care appointments in the past 6 months. Multilevel logistic regression models estimated associations between

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GBV and engagement in care and whether associations were mediated by depression, generalized anxiety disorder (GAD), and posttraumatic stress disorder (PTSD) and moderated by food insecurity.

Results: GBV was associated with higher odds of suboptimal adherence (adjusted odds ratio: 1.88; 95% confidence interval: 1.24 to 2.87) and missed appointments (adjusted odds ratio: 1.76; 95% confidence interval: 1.16 to 2.67). The association between GBV and adherence was mediated by depressive symptoms, GAD, and PTSD, accounting for 29.7%, 15.0%, and 16.5%, respectively, of the total association. The association between GBV and missed appointments was mediated by depression and GAD, but not PTSD, with corresponding figures of 25.2% and 19.7%. Associations did not differ by food insecurity.

Conclusions: GBV is associated with suboptimal engagement in care, which may be explained by mental health. Interventions should address women's mental health needs, regardless of food insecurity, when improving engagement in HIV care.

Key Words: gender-based violence, mental health, food insecurity, antiretroviral adherence

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INTRODUCTION

Despite having effective antiretroviral therapy (ART), engagement in HIV care and treatment remains suboptimal among US women living with HIV (WLHIV).[1,2] Gender-based violence (GBV) is a critical barrier to engagement in HIV care among WLHIV. GBV refers to violence perpetrated against an individual or a group on the basis of gender and can take the form of physical, sexual, or emotional abuse by intimate partners, family members, community members, and others.[3,4] The prevalence of intimate partner violence (IPV), a common type of GBV,[5] among WLHIV in the United States is 55%, which is more than double the rate in the general population.[6,7] GBV is associated with poorer HIV clinical outcomes, including detectable viral load, lower CD4 counts, and ART failure.[8–13] A meta-analysis found that IPV had a larger effect on ART adherence than stigma, financial constraints, and pill burden.[14]

Women who experience GBV may miss pills or HIV care appointments for multiple reasons; for example, if they have not disclosed their HIV status to a partner, if an abusive partner prevents them from taking medications,[15–17] or due to feelings of hopelessness.[18,19] GBV is associated with depression and posttraumatic stress disorder (PTSD),[20–23] and poor mental health is linked with nonadherence to ART.[24–27] Thus, one of the most plausible mediating pathways is that GBV leads to poorer mental health, which, in turn, leads to poor engagement in HIV care and treatment and poor clinical outcomes (Fig. 1).[8,14]

It is also plausible that poverty and structural barriers such as food insecurity may worsen the impact of GBV on engagement in care (Fig. 1). Nearly half of WLHIV in the United States are food insecure,[28] defined as having limited access to food and ability to acquire food.[29] Previous research has also shown strong associations between GBV and food insecurity[30–33] and between food insecurity and suboptimal adherence.[34–36] Women who report food insecurity may miss taking their HIV medications to prevent the side effects of taking ART on an empty stomach and when making trade-offs between spending limited resources on food instead of on transport to pickup medications.[35] Women who are food insecure are more vulnerable to the negative impacts of GBV. In a qualitative study among WLHIV in the United States, the stress of being food insecure, coupled with experiences of violence, led to a low appetite and made it difficult to take HIV medications with food.[37]

To effectively reduce the impact of GBV on engagement in care, several gaps in knowledge must be addressed. Although the mental health pathways linking GBV to suboptimal engagement in care have been described,[8,14,37,38] few studies have explicitly tested whether poor mental health mediates the association between GBV and engagement in care. Moreover, qualitative research has highlighted a complex relationship between food insecurity, GBV, and HIV care engagement,[37] yet no studies have tested whether food insecurity moderates the association between GBV and adherence—which could inform who should be prioritized for interventions.

This study leveraged data from the Women's Interagency HIV Study (WIHS) to quantify the effects of GBV (including physical, sexual, and psychological violence) on suboptimal engagement in HIV care and treatment. We also sought to identify the mental health pathways involved, including depressive symptoms, generalized anxiety disorder (GAD), and PTSD. Mental health disorders affect many women who have experienced GBV, which typically manifest as symptoms of depression, anxiety, and PTSD.[39,40] Given our previous research[30,31] and the evidence base suggesting the importance of food insecurity for HIV treatment outcomes for women,[34–36] we assessed whether the association between GBV and engagement in care differs by food insecurity status. We hypothesized that: (1) GBV will be associated with poorer engagement in care (defined as suboptimal adherence to ART and missed clinic appointments) directly and indirectly through mental health and (2) the association between GBV and engagement in care will be greater for women who are food insecure vs. women who are food secure.

MATERIALS AND METHODS

Study Population and Procedures

We used longitudinal data from WIHS, a multisite, prospective cohort study of US women at risk of or living with HIV (now continuing as the MACS/WIHS Combined Cohort Study). Study procedures and eligibility criteria have been described elsewhere.[41] In brief, WIHS participants were recruited to represent the demographic profiles of WLHIV in the United States across 10 cities: Bronx, NY; Brooklyn, NY; Washington, DC; Chicago, IL; San Francisco, CA; Chapel Hill, NC; Miami, FL; Birmingham, AL; Jackson, MS; and Atlanta, GA. Women completed interviewer-administered questionnaires every 6 months on demographic characteristics, mental health, violence, psychosocial factors, and engagement in HIV care and treatment and had a brief clinical examination with laboratory tests. From April 2013 to April 2016 (visits

38–43), a module on food insecurity was added to the questionnaire as part of the WIHS Food Insecurity Substudy. Food insecurity data were collected over 6 study visits every 6 months. Participants provided written informed consent and were compensated for participation. The protocol was approved by institutional review boards at all sites in addition to the WIHS Executive Committee.

Measures

Primary Explanatory Variable

GBV was any sexual, physical, or psychological violence in the past 6 months. Sexual violence was assessed with the question, "Since your (month) study visit, has anyone pressured or forced you to have sexual contact? By sexual contact, I mean them touching your sexual parts, you touching their sexual parts, or sexual intercourse." Response options were yes, no, do not know, and declined to answer. Physical violence was assessed with the question, "Since your (month) study visit, have you experienced serious physical violence (physical harm by another person)? By that I mean were you ever hurt by a person using an object or were you ever slapped, hit, punched, kicked." The 2 questions on sexual and physical violence were in reference to "any person," which could include both partners and non-partners. The questions on psychological violence were in reference to a "current or previous" partner. This was assessed with 7 items (yes/no) such as whether a partner "threatened to hurt you or kill you, "prevented you from leaving or entering the house," and "prevented you from seeing your friends." Women who responded yes to any items were coded as having experienced psychological violence.

Mental Health Mediators

Depressive symptoms was a continuous variable measured using the Center for Epidemiological Studies Depression scale,[42] collected among all WIHS women during the Food Insecurity Substudy from April 2013 to April 2016 (visits 38–43). Anxiety was a continuous variable measured using the Generalized Anxiety Disorder (GAD)-7 scale,[43] collected from October 2013 to April 2016 (visits 39–43). PTSD symptoms was a continuous variable measured using the PTSD Checklist-Specific (PCL-S),[44] collected as part of the Neurocognition Substudy among a subset of women from April 2013 to April 2015 (visits 38–41). To reduce respondent burden, 25% of women answered the PCL-S items at one of the 4 visits with the aim that 100% of women would have a single measurement for PTSD across the 4-visit period. We created a cross-sectional data set by collapsing the data collected across the 4 visits for analyses examining PTSD as a mediator. GBV, engagement in care, and other variables were captured at the same visit that PTSD was assessed.

Food Insecurity as a Moderator

Food insecurity was measured by the US Household Food Security Survey Module (HFSSM),[45] consisting of 18 items asking about the past 6 months (eg, "We worried whether our food would run out before we got money to buy more.").[46] Using the HFSSM scoring algorithm, we categorized individuals as having high food security, marginal food security (some uncertainty about food supplies, but little to no indications of change in diet or food intake), low food security (reduced quality, variety, or desirability of diet, but little or no indication of reduced food intake), or very low food security (multiple indications of disrupted eating patterns and reduced food intake). Marginal, low, and very low food security represent increasing severity of food insecurity. The HFSSM scale demonstrated high reliability (alpha = 0.91) in WIHS.

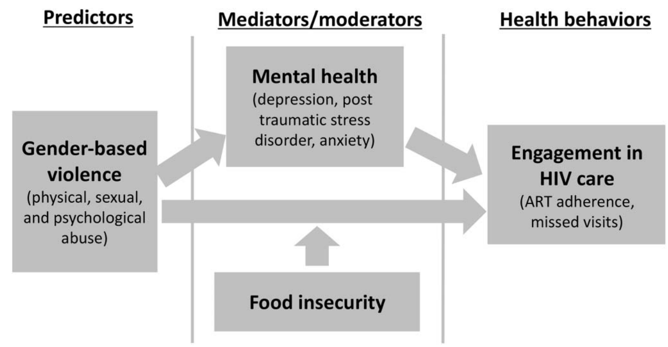

FIGURE 1. Mechanisms linking GBV with engagement in HIV care and treatment.

Primary Outcome Variables (Engagement in HIV Care and Treatment)

Suboptimal adherence to ART was assessed by self-report of how often participants took HIV medications as prescribed over the past 6 months (100% of the time; 95%–99% of the time; 75%–94% of the time; <75% of the time; and I have not taken any of my prescribed medications) and was captured from April 2013 to April 2016. Because a cutoff of 95% or higher represents an optimal level of adherence,[47,48] we dichotomized suboptimal adherence as reporting less than 95% adherence. Missed HIV care appointments were captured from October 2013 to April 2016 (visits 39–43) and was defined as having missed at least one scheduled HIV care appointment in the past 6 months that was not rescheduled (yes/no).

Covariates

Based on previous research in WIHS,[28,31] multivariable models adjusted for annual household income (≤$12,000, $12,001–$24,000, $24,001–$36,000, $36,001–$75,000, and >$75,000), race/ethnicity (non-Hispanic White, Hispanic, non-Hispanic Black/African American, or other), age (continuous variable), education (<high school degree or equivalent vs. ≥high school degree), and marital status (married/cohabitating vs. unmarried), and time on ART in years.

Analysis

We computed sample descriptive characteristics at the first visit of the WIHS Food Insecurity Substudy. We examined the associations between current GBV reported in the past 6 months with suboptimal adherence to ART and missed HIV care appointments in the past 6 months. To assess the relative importance of current vs. previous GBV as explanatory variables, we included a lagged variable for GBV in the initial models. Current GBV refers to the same visit in which adherence was assessed, whereas previous GBV refers to a lagged visit 6 months before the current visit. We found that previous GBV was not associated with current adherence to ART or missed appointments, and thus, our final models included only current GBV as the primary explanatory variable. To take full advantage of the longitudinal data, analysis models included data from all visits. We used 2-level logistic regression to model the association between GBV and suboptimal engagement in care or treatment, with women as a random effect, adjusting for covariates. We used random rather than fixed effects because we expected that time-invariant differences between individuals could influence women's engagement in care, and we wanted to directly estimate the association of these variables with our outcomes. Statistical interaction between GBV and food security was assessed using the multiplicative scale by including an interaction term in the multivariable models. The final multivariable analysis used longitudinal data from approximately 1600 women at the baseline visit. All analyses were performed using Stata 15.

Based on our conceptual model and the mediation method used by Weiser et al within WIHS,[28] we estimated the mental health pathways through which GBV may affect engagement in care or treatment. We calculated the direct and indirect effects for each mental health pathway by taking the products of the regression coefficients of each leg of the path from fully adjusted mediation models that included one mental health mediator at a time.[49] Indirect effects were calculated only for paths in which each leg was statistically significant ($P < 0.05$). We confirmed the assumption that each mental health meditator did not have a statistical interaction with GBV for each outcome.[49]

RESULTS

Sample Characteristics

At the baseline visit (N = 1732), the mean age was 48 years, 67% had a high school education or less, 72% was non-Hispanic Black, and 28% reported being married (Table 1). Across their lifetime, 62% of women reported ever experiencing GBV. At the baseline visit, 5.2% of women experienced sexual or physical violence or psychological violence in the past 6 months. Nearly half of women (44%) experienced any food insecurity (defined as marginal, low, or very low food security). The prevalence of depression, GAD, and PTSD symptoms using established cutoffs for each scale was 35%, 17%, and 14%, respectively. Two-thirds of women were virally suppressed (66%), 17% reported suboptimal adherence, and 14% missed at least one care appointment in the past 6 months.

Suboptimal Adherence to ART

In the unadjusted models, current experience of GBV was associated with suboptimal adherence to ART in the past 6 months (Table 2). Previous GBV (ie, lagged GBV) was not associated with suboptimal adherence to ART, as noted in the Methods section. Depressive symptoms, GAD, and PTSD symptoms were also associated with suboptimal adherence to ART in the unadjusted models. In the adjusted models, current GBV remained associated with 1.88 higher odds of suboptimal adherence [95% confidence interval (CI): 1.24 to 2.87]. Adjusted models also showed that for each one-unit increase in depression score, there was 1.04 higher odds of suboptimal adherence (95% CI: 1.03 to 1.05). In addition, for each one-unit higher GAD score, there was 1.06 higher odds of suboptimal adherence (95% CI: 1.04 to 1.08), and for each one-unit increase in PTSD score, there was 1.40 higher odds of suboptimal adherence (95% CI: 1.13 to 1.74). Food insecurity did not modify the association between GBV and suboptimal adherence (not included in models in Table 2).

Missed Care Appointments

In the unadjusted models, current GBV was associated with missing at least one HIV care appointment in the past 6 months (Table 2). Previous GBV was not associated with missed care appointments. Depression and GAD symptoms were associated with missed care appointments in the unadjusted models. In the adjusted models, the association of current GBV with missed care appointment was attenuated and was associated with 1.76 higher odds of a missed care appointment (95% CI: 1.16 to 2.67). Adjusted models also showed that for each one-unit increase in depression score, there was 1.03 higher odds of a missed care appointment (95% CI: 1.01 to 1.03). In addition, for each one-unit increase in GAD score, there was 1.05 higher odds of a missed care appointment (95% CI: 1.03 to 1.07). Food insecurity did not modify the association between GBV and missed care appointments.

Mediation Analyses

Table 3 lists the total, direct, and indirect effects for each mediation model by the 2 outcomes variables. The adjusted mediation models for suboptimal adherence showed that depression, GAD, and PTSD symptoms accounted for 29.7%, 15.0%, and 16.5% of the total association of GBV with suboptimal adherence, respectively (Table 3). The adjusted mediation models for missed care appointment showed that depression and GAD symptoms accounted for 25.2% and 19.7% of the total association of GBV with missed care appointments, respectively.

DISCUSSION

In this longitudinal study with more than 1700 WLHIV, GBV was independently associated with suboptimal adherence to ART and at least one missed care visit. These findings are consistent with 2 reviews, which found that women who experience violence are less likely to adhere to ART and achieve viral suppression.[14,50] Most studies have used cross-sectional designs and did not use large, national samples of US WLHIV, other than a WIHS study that found that women

TABLE 1. Descriptive Statistics for the Study Sample (N = 1732)

Variable	N (%) or Mean (SD)
Age	47.8 (9.1)
Race/ethnicity	
Non-Hispanic White	178 (10.8%)
Hispanic	244 (14.7%)
Black	1186 (71.6%)
Other	48 (2.9%)
Annual household income	
$12000 or less	853 (53.7%)
$12001–24000	354 (22.3%)
$24001–36000	174 (11.0%)
$36001–75000	138 (8.7%)
$75001 or higher	70 (4.4%)
High school education or higher	1111 (67.1%)
Married	489 (28.2%)
Any lifetime GBV	1021 (61.6%)
Any recent GBV	85 (5.2%)
Food insecurity status	
High food security	923 (56.7%)
Marginal food security	252 (15.5%)
Low food security	242 (14.9%)
Very low food security	212 (13.0%)
Depressive symptoms (yes/no)	579 (35.3%)
Generalized anxiety disorder (yes/no)	183 (16.9%)
PTSD (yes/no)	126 (13.7%)
Suboptimal adherence to ART (<95%)	302 (17.4%)
Undetectable viral load	1060 (66.1%)
Missed 1+ clinic appointments	136 (14.2%)
Length of time on ART (yr, median, IQR)	7.8 (3.0–14.5)

who experienced any physical or sexual abuse were less likely to be taking ART.[51] To assess the timing of GBV in relation to engagement in care, we evaluated whether previous and current GBV predicts engagement in care and found that only current GBV was predictive and, therefore, retained current GBV in our mediation models. Although we cannot rule out reverse causality, one explanation may be that acute experiences of GBV have more immediate effects on missed pills and appointments as opposed to previous experiences of GBV that occurred well before the event of nonadherence.

We also extend previous research by explicitly testing for mental health mediators. Our study suggests that GBV affects engagement in care through depression, GAD, and PTSD symptoms. Depression and GAD were mediators for both adherence to ART and appointments, although PTSD only mediated the association with ART adherence. The role of PTSD should not be discounted, however, because PTSD measures were collected in a smaller subset, and thus, it is possible we would have found a mediating relationship with appointment attendance in a larger sample. Overall, these findings substantiate qualitative studies describing how GBV triggers emotional distress and depressive symptoms, causing forgetfulness to take medications and intentional missing of pills and appointments.[15,17,18,52] Although previous research has not identified the exact time of when symptoms of depression (or anxiety or PTSD) develop after a traumatic event, most studies examine a period of 3–6 months for observing changes in mental health in response to a stressor. A seminal study found that most severe events lead rapidly to depression, occurring in the first 3 weeks after a negative event, and another study found that most of the life events associated with major depression onset occurred within the first month after the event.[53,54] Although certainly GBV can have long-term impacts on mental health, the shorter-term associations that we found by assessing GBV, mental health, and adherence within a 6-month period may indicate a pattern of shorter-term impacts of GBV.

Contrary to our hypothesis, we did not find that food insecurity moderates the association between GBV and engagement in care. Previous work within WIHS has shown that GBV and food insecurity are associated and that food insecurity is associated with worse HIV treatment outcomes.[28,31] Approximately two-thirds of women who

TABLE 2. Logistic Regression Models Examining Associations Between GBV and Engagement in HIV Care and Treatment in the Women's Interagency HIV Study: United States, 2013–2016

Variable	Unique Women (Person Visits)	Odds Ratio (95% CI)	*P*	Unique Women (Person Visits)	Adjusted Odds Ratio (95% CI)	*P*
Analysis 1: suboptimal adherence to ART						
Explanatory variable GBV	1689 (7438)	1.86 (1.23 to 2.82)	1665 (7203)	1665 (7203)	1.88 (1.24 to 2.87)	0.003
Mediators						
Depressive symptoms	1690 (7434)	1.04 (1.03 to 1.05)	<0.001	1666 (7197)	1.04 (1.03 to 1.05)	<0.001
GAD symptoms	1637 (5987)	1.05 (1.03 to 1.08)	<0.001	1612 (5806)	1.06 (1.04 to 1.08)	<0.001
PTSD symptoms	840	1.31 (1.08 to 1.59)	0.006	803	1.40 (1.13 to 1.74)	0.002
Analysis 2: missed HIV care appointments						
Explanatory variable GBV	1732 (6430)	1.97 (1.30 to 3.00)	<0.001	1706 (6231)	1.76 (1.16 to 2.67)	0.008
Mediators						
Depressive symptoms	1732 (6424)	1.03 (1.02 to 1.04)	<0.001	1706 (6224)	1.03 (1.01 to 1.03)	<0.001
GAD symptoms	1735 (6466)	1.06 (1.04 to 1.07)	<0.001	1709 (6256)	1.05 (1.03 to 1.07)	<0.001
PTSD symptoms	899	1.19 (0.94 to 1.50)	0.140	8wp66	1.03 (0.80 to 1.33)	0.830

Adjusted models controlled for age at visit, employment status, income, race or ethnicity, education, marital status, and time on ART.

TABLE 3. Mediating Effects of Mental Health in the Association Between GBV and Engagement in HIV Care and Treatment

Mediator Models	Total Association	Direct Association	Indirect Association	Proportion Mediated
Analysis 1: association between GBV and suboptimal adherence to ART				
Depressive symptoms	0.59	0.41	0.18	29.73%
Generalized anxiety disorder	0.74	0.63	0.11	15.03%
PTSD	1.08	0.90	0.18	16.54%
Analysis 2: association between GBV and missed HIV care appointments				
Depressive symptoms	0.47	0.35	0.12	25.23%
Generalized anxiety disorder	0.54	0.43	0.11	19.68%

Separate mediator models were run for each mediating variable. All models controlled for age at visit, employment status, income, race or ethnicity, education, marital status, and time on ART.

reported recent GBV had food insecurity; however, the impact of GBV on care and treatment was not exacerbated by food insecurity. It is possible that although food insecurity is independently linked to both violence and engagement in care, it plays less of a role in the association between the 2. An additional explanation, which we did not test, could be that food insecurity leads to violence, which then leads to nonadherence through serial mediation. Similar relationships should be examined for other dimensions of material need insecurities (eg, housing instability, poor access to health care, etc.) that may play an important role.[55]

Our findings have important implications for programming. First, our findings suggest that it may be insufficient to reduce women's exposure to GBV when mental health is one of the main mechanisms through which ART adherence is affected. For example, it may be not be enough to refer women living with HIV to domestic violence shelters without simultaneously addressing their mental health. Existing interventions, most of which have focused on trauma around childhood sexual abuse, could be adapted to address GBV,[56–58] mental health, and engagement in care for WLHIV. In addition, victims of violence could be screened for mental health symptoms and referred to psychological services such as trauma-focused cognitive behavioral therapy, which could be integrated into HIV clinical care.[59] Based on our findings suggesting that exposure to violence may have short-term effects on the development of mental health symptoms, it would be prudent to intervene quickly on mental health before conditions worsen (eg, immediate referrals and linkage into mental health services). Of course, programs that focus on the primary prevention of violence are also needed to prevent the onset of mental health symptoms and subsequent nonadherence. Finally, based on our finding that food insecurity did not worsen the association between GBV and engagement in care, which could have signaled the need to prioritize who are food insecure, we recommend that violence interventions target all WLHIV. However, interventions still need to consider the importance of food insecurity for suboptimal adherence among WLHIV.[60]

Several limitations are noteworthy. Although the use of longitudinal data with lagged variables and mediators strengthens the plausibility of a causal link, it is still possible that poor adherence or mental health leads to GBV. Violence and mental health have a bidirectional relationship as shown through longitudinal studies,[61] although this evidence is scarce. GBV and mental health could operate in a vicious cycle, mutually affecting the other, to affect care engagement. Although evidence consistently shows that violence leads to poor mental health, it is possible that poor mental health could increase the risk of violence or conflict in interpersonal relationships. A second related limitation is our inability to show temporal ordering of events. We included all women across all visits in our analysis rather than selecting 3 time points to capture the temporal ordering of GBV, mental health, and adherence. This would have significantly reduced the number of observations in the analysis and the time gap between violence and adherence would be too long (eg, 1 year) for violence to affect mental health and then adherence, which we believed would occur in a shorter period. Indeed, we found that current, but not previous, GBV is associated with poor care engagement. Future studies could capture smaller intervals such as every 3 months or daily to parse out the temporal ordering of events. Third, our measure of GBV included both IPV and violence from nonpartners. Given that IPV is the most common form, it is likely that our measure of GBV is mostly capturing IPV; however, future studies should separate out the 2 types of violence to assess the same patterns hold. Finally, we relied on self-reported measures of violence and adherence, subject to recall and social desirability bias.

CONCLUSIONS

In summary, the results provide strong evidence that GBV is associated with suboptimal engagement in HIV care and treatment. This may occur through mental health pathways, including depression, GAD, and PTSD symptoms. Food insecurity did not modify the associations of GBV on adherence and engagement in care. Interventions for WLHIV should strive to reduce experiences of GBV while also addressing women's mental health to sustain progress toward improving HIV clinical outcomes and prevent the spread of HIV.

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