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Screening for cervical cancer among women with behavioral health conditions-A systematic review

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A B S T R A C T

Cervical cancer screening is credited with dramatically reducing cervical cancer mortality in the United States. There is a lack of consensus on whether women with behavioral health conditions (mental health or substance use) receive cervical cancer screening at rates similar to women without the conditions.

Using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines, we searched for articles and abstracts of conference proceedings in PubMed, EMBASE, Web of Science and the EBSCO databases: CINAHL, PsycINFO, Psychosocial and Behavioral Science Collection, Academic Search Premier Databases, and the ProQuest database Applied Social Sciences Index and Abstracts from January 1, 2000 to July 31, 2020. Eligibility criteria included studies conducted in the United States, published in English, and comparing cervical cancer screening rates of women with and without behavioral health conditions. Of 1,242 unique articles screened, 52 were included in the full text review. And after title/abstract/and full-text review, 14 articles met the eligibility criteria. Six studies examined both mental health and substance use conditions, two studies only examined substance use disorders, and six studies examined only mental health conditions. Substance use disorders were associated with a decreased likelihood of receiving screening. This study yeilded inconclusive findings on the relationship between mental health conditions and cervical cancer screening. More research is needed to better understand the relationship between behavioral health conditions and cervical cancer screening.

1. Introduction

In the United States (U.S.), cervical cancer screening contributes to the drastic reduction in yearly cervical cancer incidence and deaths (Benard et al., 2014; Fontham et al., 2020). The American Cancer Society recommends that individuals with a cervix initiate cervical cancer screening with human papillomavirus (HPV) testing every five years at the age of 25 years through the age of 65 years (Fontham et al., 2020). Given limited access to HPV testing, cotesting (HPV testing in combination with cytology), is recommended every 5 years, or cytology alone every 3 years (Fontham et al., 2020). Despite the success of screening in preventing cervical cancer, improvement in cervical cancer mortality has not been uniform across all groups due to not meeting the recommended screening guidelines (Francoeur et al., 2022). Individuals with behavioral health conditions (mental health or substance use conditions) are more likely to experience health disparities compared to the general population (Nordentoft et al., 2013; Wang et al., 2021; Musuuza et al., 2013). A *meta*-analysis examining global cancer screening disparities between people with mental health conditions and the general population found that women with mental health conditions were less likely to be screened for cervical cancer (Solmi et al., 2020). However, the study's focus on global trends does not clarify if its findings can be generalized to all women in the U.S..

A systematic review conducted in 2013 in the U.S. had mixed findings concerning whether mental health conditions were associated with not meeting recommendedcervical cancer screening guidelines; however, the study did not examine the influence of substance use disorders on screening (Aggarwal et al., 2013). Substance use and mental health conditions are likely to co-occur (Hartz et al., 2014; Jackson et al., 2015; Conway et al., 2016). For example, individuals with severe psychotic disorders had four times higher odds of smoking, heavy alcohol use, and recreational drug use than individuals in the general population (Hartz

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Table 1
Characteristics of included studies (n = 14).

Study	Setting	Design	*Rating of the Quality of Evidence	Screening Guidelines	Age Range	Sample Size
	Examined Cervical Cancer Screening and Mental Health and Substance Use					
Abrams, 2012	Maryland, U.S.	Cross-sectional	4	NR[1]	19–64	104,157 women enrolled in Maryland's Medicaid program
Asgary, 2017	New York, U.S.	Cross-sectional	4	NR	21–65	143 homeless women in shelters and shelter clinics
Byrne, 2010	Florida, U.S.	Cross-sectional	4	ACS[2]	18+	39,063 non-institutionalized US civilians
Crawford, 2016	United States	Cross-sectional	4	USPSTF[3]	40–65	66,402 women with access to care
Fletcher, 2014	Texas, U.S.	Cross-sectional	4	CDC[4], NIH[5], HIVMA[6]	45.4 (avg.)	138 HIV-positive female smokers
James, 2017	California, U.S.	Cohort	3	California triennial screening rate published by CDC	18–67	31,308 women enrolled in California Medicaid and received care in a California specialty mental health clinic
	Cervical Cancer Screening and Substance Use Only					
Maclaughlan, 2011	United States	Cross-sectional	4	ACS, USPSTF, ACOG[7]	21–65	150,786 women
Nelson, 2009	United States	Cross-sectional	4	USPSTF	25–64	2,070 women
	Cervical Cancer Screening and Mental Health Conditions Only					
Massetti, 2017	United States	Cross-sectional	4	USPSTF	18–39	90, 821 women
Pirraglia, 2004	United States	Cohort	3	USPSTF	50+	3,297 women
Weitlauf, 2013	United States	Cross-sectional	4	ACOG, ACS, USPSTF	18–61	34,213 women
Xiang, 2015	United States	Cross-sectional	4	ACOG	40–74	17,770 women
Yee, 2011	New Mexico, U.S.	Cohort	3	USPSTF	50–65	606 women
Zhang, 2019	United States	Cross-sectional	4	NR	21–65	3,014 women

***Rating of the Quality of Evidence –** 3: Case control studies or Retrospective study, 4 case series with or without intervention; cross-sectional study.
[1] NR: not reported.
[2] ACS: American Chemistry Society.
[3] USPSTF: United States Preventive Services Taskforce.
[4] CDC: Center for Disease Control and Prevention.
[5] NIH: National Institute of Health.
[6] HIVMA: HIV Medicine Association.
[7] ACOG: American College of Obstetricians and Gynecologists.

et al., 2014). Therefore, an up-to-date synthesis of the literature that focuses on examining both mental health and substance use disorders is warranted. This systematic review aimed to conduct a synthesis of the literature to examine whether women with behavioral health conditions are less likely to adhere to cervical cancer screening guidelines compared to those without behavioral health conditions.

2. Methods

We used the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Moher et al., 2009). We conducted searches for articles and abstracts published in peer-reviewed journals, conducted in the U.S. and published in English between January 1, 2000, to July 30, 2020. The following databases were searched August 14–17, 2020: PubMed; EMBASE; Web of Science; EbscoHost's PsycINFO, CINAHL, Psychosocial and Behavioral Science Collection, and Academic Search Premier; and ProQuest's Applied Social Sciences Index & Abstracts. Search results were limited to English language, full-text manuscripts within 20 years of publication, then uploaded into and duplicate citations removed by Covidence software (Covidence. Better systematic review management. Accessed May 17, 2022).

The final search strategy consisted of truncated and phrase-searched keywords (limited to title or abstract where available) and subject headings for the concepts of substance-related and mental disorders, cervix and uterine cancers and HPV, and screening (see final search strategy sample in Appendix A). Four reviewers (RM, ER, AJ, TL) independently screened study titles and abstracts identified from the literature search. Full-text articles were assessed for eligibility based upon the prespecified inclusion criteria guided by the population, intervention, comparison, and outcome (PICO) framework (Schardt et al., 2007). Because this systematic review did not have the objective of examining interventions, we included studies that investigated receipt of cervical cancer screening (i.e., Pap smear, HPV test) as an outcome. We assessed the quality of studies using the Joanna Briggs Institute Critical Appraisal Tool risk of bias assessment (Munn et al., 2014; Munn et al., 2015). This study is exempt from Institutional Board Review.

3. Results

After removing duplicate results, the initial search yielded 1,242 articles for abstract screening (Appendix B). A total of 52 studies were

Table 2
Cervical Cancer Screening Among Individuals with Mental Health vs. Substance Use.

Study	Mental Health and Cervical Cancer Screening			Substance Use and Cervical Cancer Screening		
	Sample Size by Mental Health Condition	Prevalence of Cervical Cancer Screening	Model Results of Receiving Screening Compared to Control Group	Sample Size by Substance Use	Cervical Cancer Screening Prevalence	Model Results of Screening Compared to Control Group
Examined Cervical Cancer Screening and Mental Health and Substance Use						
Abrams, 2012	• Psychosis (n = 4,747) • Bipolar or Mania (n = 3,319) • Depression (n = 5,014) • Control group (n=85,375)	• Psychosis= 25% • Bipolar or Mania=29% • Depression= 32% • Control group = 18%	• Psychosis, (AOR=1.46 ; 95% CI = 1.36,1.57) • Bipolar disorder or mania, (AOR= 1.59 ; 95% CI = 1.43, 1.76); • Depression, (AOR=1.78; 95% CI = 1.61, 1.96)	• Substance Use - (n=1,104) • Control group - (n = 6,122)	• Substance Use (excluding tobacco)= 27% • Control group=18%	Substance use = (AOR=.80; 95% CI = 75, .85)
Asgary, 2017	• History of mental illness (n = 122) • Control group (n = 40)	NR	No statistical association between mental health and screening. Did not report effect.	• Substance Use - (n=56) • Control group - (n = 106)	NR	No statistical association between mental health and screening. Did not report effect.
Byrne, 2010	Mental Health Days not good daily N/A • Daily – 2454 • Less than daily – 36,052 27	NR	Daily not good mental health days compered to none (AOR 0.90; 95% CI= 0.78, 1.03)	• Smokers - (n = 8,179) • Control group - (n =30884)	4,710 had a pap test $\leq$ 3 years)	Smokers =(AORs 0.60; 95% CI= 0.55, 0.66)
Crawford, 2016	• Depression – (n=15,950) • Control – (n=50,452)	• Screened on time- 22% vs. Control group 48%	$p < .05$	• Current Smoker (n=8,969) • Former smoker –(n=16,176) • Control – (n=40,992)	Screened on time • Current Smoker =12.8% • Former smoker =23.3% • Control= 63.9%	$p< .05$
Fletcher, 2014	• Anxiety-(n=18) • Depression –(n= 94)	NR	NR	• Illicit drug use - (n=48) • Hazardous drinking -(n=33)	• NR	Non-Adherence • Hazardous drinking (OR=5.30; 95% CI=1.92, 14.67)Cigarettes smoked per day (OR=1.07; 95% CI=1.03, 1.12)
James, 2017	• Schizophrenia Spectrum Disorders (n=13,149, 42%) • Major Depressive Disorder (n=9,079, 29%)	• Schizophrenia & Major Depressive Disorder = 20.2% • Comparison =42.3%	Compared Anxiety (ARR =1.28; 95% CI = 1.14-1.45), Bipolar (ARR =1.17; 95% CI = 1.10, 1.25) and Major Depressive disorder (ARR =1.21; 95% CI = 1.13, 1.30)) to Schizophrenia.	History of drug use	NR	History of drug use (ARR =1.01; 95% CI =.96, 1.07)
Cervical Cancer Screening and Substance Use Only						
Maclaughlan, 2011	N/A	N/A	N/A	Total n= 890586.37% current smokers 52.8% never smokers 40.8% former smokers	• Never smokers = 83.7% • Current smokers = 81.7%	Current smokers (OR=0.53, (0.47-0.59)) compared to never smokersFormer smokers (OR: 1.10; 95% CI: 1.02-1.18) compared to never smokers
Nelson, 2009	N/A	NR	NR	• Current smokers (n = 398) Never smokers (n = 1,185)Former smoker (n=487)	• Current smoker- 74.01% Never smoker- 86.38%Former smoker 88.07	p=0.0008
Cervical Cancer Screening and Mental Health Conditions Only						
Massetti, 2017	• Mental Health problems = (n=20,344, 22.4%)	• Adherence • With mental health- 84.7% • Control- 85.6%	• p=0.273	N/A	N/A	N/A
Pirraglia, 2004	• Low depressive symptom burden- (n=2493) • Moderate burden -(n=312) • High burden - (n=492)	NR	• High Symptom Burden compared to low symptom burden= (OR 0.88; 95% CI= 0.76,1.03) • Moderate Symptom Burden compared to low symptom burden= (OR 1.00; 95% CI= 0.85, 1.17).	N/A	N/A	N/A
Weitlauf, 2013	• PTSD-(n = 5,668) • Depression- (n = 11,627)	• PTSD= 77% • Depression= 75% • Control =75%	• PTSD=(OR: 1.14; 95% CI= 1.06, 1.22)	N/A	N/A	N/A

(*continued on next page*)

Table 2 (*continued*)

Study	Mental Health and Cervical Cancer Screening			Substance Use and Cervical Cancer Screening		
	Sample Size by Mental Health Condition	Prevalence of Cervical Cancer Screening	Model Results of Receiving Screening Compared to Control Group	Sample Size by Substance Use	Cervical Cancer Screening Prevalence	Model Results of Screening Compared to Control Group
			• Depression = (OR: 1.05; 95% CI= .99 ,1.12)			
Xiang, 2015	• Serious Psychological Distress (SPD) – (n=1,340) • Control =(n=16,430)	• SPD =72.27% • Control =85.37%	• SPD = (OR: 0.59; 95% CI= 0.45, 0.77)	N/A	N/A	NA
Yee, 2011	• Mental health diagnosis (MHD) =(n=321, 53%) • Control =(n=285, 47%)	• MHD= 84% • Without MHD= 80%	• MHD compared to control: (OR:1.71; 95% CI= 0.91, 3.21)	N/A	N/A	N/A
Zhang, 2019	• Anxiety - (n=299) • Depression-(n =307)	NR	Missing screening • Anxiety (OR=1.430; 95% CI =1.009, 2.026) • Depression (OR=1.689; 95% CI=1.208, 2.362)	N/A	N/A	N/A

*NR – Not Reported *NA –Not applicable, Adherence = adherence to cervical cancer screening guidelines. ARR Adjusted Risk Ratio.

included in the full-text review. During full manuscript review, however 38 studies were excluded because they lacked data on outcome variables, were conducted outside of the study period, were conducted outside of the United States, and lacked a comparison group resulting in 14 studies being included for data extraction after full text screening.

3.1. Study characteristics

All studies included were observational. Out of the 14 included studies, 11 were cross-sectional and three were cohort studies (Table 1).

The sample size varied across studies with a total of 543,788 participants (range = 138–150,786) and age ranges of 18–74 years. Several studies evaluated a specific population, such as women enrolled in Maryland's Medicaid program (Abrams et al., 2012) and HIV-positive female smokers (Fletcher et al., 2014). The U.S. Preventive Screening Task Force (USPSTF), which recommends cervical cancer screening every three years for women aged 21 to 65, was the most commonly referenced guideline (n = 7) (Curry et al., 2018). The remaining studies referenced guidelines from the National Institutes of Health (NIH), American Cancer Society (ACS), and American College of Obstetricians and Gynecologists (ACOG). Three studies did not reference specific guidelines used to determine adherence to screening (Abrams et al., 2012; Asgary et al., 2017; Zhang et al., 2020). This limited our ability to compare findings across studies given lack of clarity of definition used for cervical cancer screening and limited our assessment of the rigor and strength of specific articles. Among the studies examining the relationship between mental illness and cervical cancer screening, the most frequently examined mental health condition was depression. Tobacco addiction was the most frequently examined substance use disorder among the studies examining the relationship between substance use disorders and cervical cancer screening.

3.2. Cervical cancer screening among women with behavioral health diagnosis

There were mixed findings among the studies that examined the relationship between mental health diagnosis and cervical cancer screening (Table 2). Specifically, three studies reported that mental health conditions were negatively associated with the likelihood of screening (Zhang et al., 2020; Crawford et al., 2016; Xiang, 2015). Abrams et al. (2012) reported increased odds of screening among those with mental health conditions. The rest of the studies found no association between mental health conditions and cervical cancer screening.

The majority of studies that examined the association between substance use and cervical cancer screening (n = 6/8) reported that substance use was significantly associated with a decreased likelihood of cervical cancer screening. Two studies found no significant association between substance use and cervical cancer screening (Asgary et al., 2017; James et al., 2017). The majority of studies examiningsubstance use (n = 5/8) reported that tobacco use was significantly associated with a decreased likelihood of receiving cervical cancer screening (Fletcher et al., 2014; Crawford et al., 2016; Byrne et al., 2010; MacLaughlan et al., 2011; Nelson et al., 2018).

3.3. Other factors associated with behavioral health conditions and cervical cancer screening

Across all studies, race, insurance status, and education levels were the most commonly included covariates with residence (urban/rural) being the least common covariate. The majority of studies controlled for race with the exception of two studies, Weitlauf et al., 2013 and Zhang et al., 2019. One study compared significant factors associated with screening by type of behavioral health conditions: having bipolar disorder, major depressive disorder, or generalized anxiety disorder was associated with increased cervical cancer screening compared to those with schizophrenia (James et al., 2017).

3.4. Risk of bias assessment

We assessed bias using the Joanna Briggs Institute risk of bias assessment tool (Munn et al., 2014; Munn et al., 2015). Quality assessment parameters were used to assess selection bias in the included studies (Table 3). The majority of the studies (12/14), were judged as having low risk of bias. However, six out of the 14 studies did not report their funding sources or conflicts of interest. Only two studies were deemed to have a high risk of bias by the research team because they did not use objective criteria when identifying subpopulations or did not identify any subpopulations (Asgary et al., 2017; Byrne et al., 2010).

4. Discussion

The majority of the studies reported that individuals who smoke are less likely to be adherent to cervical cancer screening recommendations. Results of studies examining the relationship between mental health conditions and cervical cancer screening were mixed, likely due to the heterogeneity of mental health conditions examined. Moreover, no

Table 3
Joanna Briggs Institute risk of bias assessment.

	Listed Funding Sources	Identified Conflicts of Interest	Sample Representative of Target Population	Appropriate Recruitment of Participants	Sample size adequate enough generalize findings?	Subjects and the setting described in detail?	Data analysis conducted with sufficient sample coverage	Objective, standard criteria used for the measurement of the condition?	Condition measured reliably?	Appropriate statistical analysis?	Confounding factors identified and accounted for?	Subpopulations identified using objective criteria?
Abrams, 2012	Y	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Asgary, 2017	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Byrne, 2010	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Crawford, 2016	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fletcher, 2014	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
James, 2017	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Maclaughlan, 2011	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Massetti, 2017	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nelson, 2009	U	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pirraglia, 2004	Y	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Weitlauf, 2013	Y	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Xiang, 2015	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Yee, 2011	Y	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Zhang, 2019	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

*Y- Yes, N-No, U-Unclear.

studies examined the relationship between having comorbid mental health and substance use disorders and receipt of cervical cancer screening.

Despite the growing prevalence of substance use disorders among women, (Zibbell et al., 2018; Fazel et al., 2017) we found few studies examined the relationship between substance use disorders and cervical cancer screening. In 2018, over 7.2 million women were diagnosed with a substance use disorder (Substance Abuse and Mental Health Services Administration., 2019). Between 1999 and 2014, the rate of women using opioids while pregnant more than quadrupled (Haight et al., 2018). Beyond the increase in illicit drug use, high consumption of alcohol use, high-risk drinking, and alcohol use disorder were reported among women between 2001 and 2013 (Grant et al., 2017). Yet, only four studies in our review examined substance use disorders other than tobacco use (i.e., illicit drug use and alcohol use) (Abrams et al., 2012; Fletcher et al., 2014; Asgary et al., 2017; James et al., 2017). This may be due to the strong evidence linking tobacco use and increased risk for cancer (Vineis et al., 2004). Illicit substance use may be different compared to tobacco use in regard to risk factors, frequency of use, and short or long-term effects (Patrick et al., 2022). Additionally, the use of tobacco is more prevalent compared to illicit substance use (Peacock et al., 2018). Therefore it is important that studies seeking to ascertain the relationship between cancer screening and substance use consider these differences and include women who use harder drugs. Given that studies found women who used tobacco were less likely to be screened, there is a need to adapt and implement evidence-based interventions to increase screening rates.

Similar to a previous systematic review, studies in our review reported mixed findings on cervical cancer screening among women with mental illness (Aggarwal et al., 2013). Another systematic review and *meta*-analysis, however, reported that mental health conditions are associated with decreased cervical cancer screening globally (Solmi et al., 2020). The studies that met the inclusion criteria of the current review were heterogeneous in terms of the mental health conditions examined. Specific mental health conditions examined included anxiety, depression, and severe psychological distress. The conditions are unique in terms of symptomology and management, therefore limiting our ability to compare results across studies. This study thus seems to indicate a need for two changes: Additional studies that examine cervical cancer screening across the variety mental health conditions and use of more standardized diagnostic criteria for mental illnesses.

More than half of the studies included in this review were cross-sectional studies that examined nationally representative samples. Some studies were targeted to specific underserved or high-risk populations, including women living with HIV, homeless women, or populations served by the Medicaid program. Women living with HIV have higher rates of HPV infection and cervical precancer development, moreover, they also have a higher risk of cervical cancer progression likely due to limitations withreceiving cervical cancer screening (Denslow et al., 2014; Stelzle et al., 2021). Fletcher et al. found that women living with HIV who engaged in hazardous drinking and smoking more cigarettes were more likely to miss cervical cancer screening (Fletcher et al., 2014). The finding implies the need for targeted interventions for women living with HIV and behavioral health conditions. The study that examined homeless women living in shelters, found no association between behavioral health conditions and cervical cancer screening (Asgary et al., 2017). Substance use disorders decreased the odds of screening among Medicaid populations; however, mental health conditions were associated with increased screening. Substance abuse may have different effects on influencing cervical cancer screening in different populations; therefore, further research is needed.

Interventions that aim to increase cervical cancer screening rates among women with behavioral health conditions should address reported barriers to cervical cancer screening and unmet reproductive health care services, including cost, access to care, stigma, and fear of mistreatment by providers (Clifton et al., 2016; Murphy et al., 2021).

Additionally, women with mental health conditions who also live with other comorbidities may prioritize care for their pre-existing uncontrolled conditions over preventative screenings (Murphy et al., 2021). Better integration of mental health services within primary care settings may improve screening rates for women with mental health conditions who are already in contact with the health system (Lasser et al., 2011).

The results of our systematic review should be interpreted with the following limitations in mind. First, we may have missed some relevant articles; however, our collaboration with a professional librarian and comprehensive search using several medical and public health related databases may mitigate this concern. Second, the heterogeneous design of the studies that met the inclusion criteria is a barrier to making comparisons across studies. Studies included in this review varied in terms of design, settings, behavioral health conditions, populations, screening guidelines used, and methods of reporting screening outcomes ed. For example, although all studies showed that substance use was associated with lower screening rates, the types of substances assessed varried by study (e.g. tobacco vs. illicit substances such as heroin). Given that the substances may have varried immediate and long-term effects, caution should be used when interpreting our findings. Results were interpreted according to each study's definition of meeting cervical cancer screening recommendations. Given that only 14 studies met the inclusion criteria, and the variability in these studies, it is difficult to make broad conclusions across all studies.

5. Conclusion

Substance use disorders may be associated with a decreased likelihood of receiving screening. However, results should be interpreted with caution given the heterogenous study designs. This study yeilded inconclusive findings on the relationship between mental health conditions and cervical cancer screening. More research is needed to better understand the relationship between behavioral health conditions and cervical cancer screening.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Availability of data

Template data collection forms, data extracted from included studies, and other materials used in this review are available upon reasonable request. Contact Rahma Mkuu.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2023.102238.

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