Mental Health of Brazilian Immigrant Women: The Role of Discrimination, Social Support, and Community Strengths

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Abstract

Background: Little is known about the mental health status of Brazilians living in the U.S. We assessed the prevalence and correlates of depression among Brazilian women living in the U.S. to guide the development of culturally relevant community-based mental health interventions.

Method: We conducted an online survey among a convenience sample of Brazilian women living in the U.S. between July and August 2020. Eligible participants (age 18 and over, born in Brazil, English or Portuguese speaking) were recruited through Brazilian social media pages and community organizations. The survey included items to assess depression using the Center for Epidemiological Study Depression Scale (CES-D-10), as well as the Everyday Discrimination Scale (EDS), Oslo Social Support Scale (OSSS), as well as perceived community strengths (CS). We first assessed the correlation between CES-D-10 scores and EDS, OSSS, and CS. We then constructed multiple linear regression models to examine the relationships between EDS, OSSS, and CS with CES-D-10 scores.

Results: Participants (N=353) had a mean age of 39 years (SD = 12). Most spoke Portuguese (99.7%), and the majority also reported being proficient in English (70.2%). CES-D-10 scores ranged from 2 to 29, with a mean of 11.4 (SD = 6.2). Nearly half of the participants (47.4%) had CES-D-10 scores of 10 or greater, indicating the presence of depressive symptomatology. In a multivariable model controlling for significant covariates (age, time lived in U.S.), EDS was positively associated with CES-D-10 scores (β = 0.64, 95% CI = 0.45, 0.83), while OSSS was negatively associated with CES-D-10 scores (β = -0.53, 95% CI= -0.80, -0.27). No statistically significant relationship was observed between CES-D-10 and CS scores.

Conclusions: In this sample of Brazilian immigrant women, depressive symptomatology was highly prevalent, and experiences of discrimination were associated with increased symptoms of depression. There is a need to understand and address mental health in Brazilian immigrant women.

Introduction

Over the past decade, an increasing number of studies have examined the mental health of those who emigrate to the United States (U.S.). The U.S. is home to the largest immigrant population in the world, with an estimated foreign-born population of 44.8 million in 2018 (Budiman, 2020). Brazilians represent a growing immigrant group, with an estimated 450,000 living in the U.S., although some suggest this number substantially underestimates the population given the likelihood of undercounting undocumented Brazilians. An additional challenge to accurately enumerating the number and health status of Brazilians is that they are categorized as Hispanic/Latino in national health data, rendering them essentially indistinguishable from other Hispanic/Latino ethnicities (1) despite important historical, linguistic, and cultural differences from other Hispanic/Latino groups (e.g., Portuguese vs Spanish language; colonized by Portugal vs Spain; cultural influences from Portugal, Africa, and Indigenous groups vs Spanish) (2). Moreover, many Brazilians living in the U.S. do not view themselves as Hispanic (3).

Whereas some research points to better mental health among immigrants compared to native-born Americans (4,5), immigrants are a heterogeneous population, and there is variation in mental health status by country of origin, age, reasons for immigration, and duration of time in the U.S. (5,6). In addition, it is well-documented that many immigrants face stressors to their mental health, including discrimination, language barriers, acculturative stress, anti-immigrant policies, and fear of deportation (7–9). Yet, despite these known risk factors for adverse mental health, there are still many gaps in the literature, especially regarding the specific stressors and cultural/ language needs of individuals immigrating from different countries and regions.

Previous research has identified potentially high levels of depression and anxiety among Brazilian immigrants in the U.S. (3,10,11). For example, one study of approximately 400 Brazilian immigrants in Massachusetts conducted by the Consulate General of Brazil in Boston between 2013 and 2014 found that 35% of study participants reported depressive symptoms (Lazar-Neto et al., 2018). Lower incomes, lower English language proficiency, and poor perceived health status were correlated with depression (Lazar-Neto et al., 2018). More recently, a qualitative community assessment conducted in 2019 in Massachusetts identified mental health as a priority health concern among Brazilian immigrants, with immigration stressors, financial insecurity, and occupational health and safety issues contributing to mental health issues (Priebe Rocha et al., 2021).

Given the relative lack of data on Brazilian immigrant health and the growing numbers of Brazilians living in the U.S., we sought to understand the prevalence of depressive symptomatology and to examine associations between depression and experiences of discrimination, available social support, and perceived community strengths among women. We focused on women, as they are often the family's health gatekeepers. Our analysis was guided by a framework offered by Cohen and Wills (12), whereby social support is viewed as having a beneficial effect on psychological outcomes at all times, regardless of stress levels (“direct effect” theory). Moreover, social support may act indirectly, “buffering” the impact of stressful life events, including the stress of discrimination. Based on this theory, we hypothesized that more experiences of discrimination and lower levels of social support would be associated with higher levels of depressive symptoms (direct effects). In addition, given research that a strong identification with the strengths of one’s cultural heritage may protect against the adverse effects of discrimination (13,14), we hypothesized that perceived community strengths would moderate the effects of discrimination on mental health (indirect effects).

Methods

We conducted a cross-sectional online survey between July and August 2020 that included items to assess mental health, discrimination, social support, and perceptions about community strengths. Those eligible to participate had to identify as female, be age 18 or over, be born in Brazil, speak and read either Portuguese or English, and currently reside in the U.S. We recruited a convenience sample through announcements on Brazilian social media pages (e.g., Facebook, WhatsApp), and outreach by our collaborations with local community social service providers and advocacy organizations. Those

interested in participating were directed to the survey URL, where they were provided with detailed information required for informed consent. After reviewing informed consent information, they were required to click a box stating their consent prior to proceeding to survey items. Participants could choose to complete the survey in English or Portuguese. After completing the survey, respondents were provided with a link to a separate URL to provide contact information if they wanted to receive a $20 Amazon gift card for survey completion, which took an average of 18.5 minutes.

Measures

Mental health: We assessed depressive symptomatology (the primary outcome) with the 10-item version of the Center for Epidemiological Study Depression scale (CES-D) (15,16). The CES-D has been widely validated (17), including among Brazilians (18). The 10-item version asked about the respondent's experiences in the past week, for example: "I was bothered by things that usually don't bother me," "I did not feel like eating; my appetite was poor," and "I felt depressed." Responses are on a scale of 0-3 (0 =Rarely or none of the time

[less than 1 day], 1= Some or a little of the time [1-2 days], 2 = Occasionally or a moderate amount of time [3-4 days], 3 = Most or all of the time [5-7 days]). We calculated a score by totaling all items (after reversing the positive mood items); possible scores range from 10-40, with higher scores indicating higher levels of depressive symptomatology. The CES-D-10 lists the threshold for depressive symptoms as a score greater than or equal to 10. Although scoring above a 10 does not directly correlate with a formal diagnosis, it does indicate a need for direct clinical assessment (19).

Discrimination: We used the validated 5-item Everyday Discrimination Scale (EDS) (20,21), which assesses perceptions of being treated unfairly by other people due to personal attributes such as race, ethnicity, age, gender, socioeconomic status, weight, sexual orientation, or other individual characteristics. The EDS has been used with immigrant populations, including Brazilian immigrants (see Molina et al., 2018), as well as with Brazilians in Brazil (22). Survey items assess the frequency of discriminatory experiences ("In your day-to-day life, how often do any of the following things happen to you?"), including instances where: "You are treated with less courtesy than other people," and "You are treated with less respect than other people are." Respondents are then asked to estimate the frequency of each of these experiences (0=never, 1=less than once a year, 2=a few times a year, 3=a few times a month, 4=at least once a week, 5=every day). We created a score by summing responses, such that higher scores indicate higher levels of discrimination (possible score range: 5-30).

Social support: We used the validated Oslo Social Support Scale (OSSS) to assess social support (24,25). The OSSS examines the perceived depth and breadth of access to social networks with three questions: "How many people are so close to you that you can count on them if you have great personal problems?" (none, 1-2, 3-5,>5) "How much interest and concern do people show in what you do?" (none, little, uncertain, some, a lot), and "How easy is it to get practical help from neighbors if you should need it (very difficult, difficult, possible, easy, very easy). An additional point was added to the score if the

participant reported being married. The summed score can range from 3-15, with higher scores indicating stronger social support.

Perceived community strengths: The community strengths (CS) measure included four items to assess the perceived strengths of Brazilian immigrant communities. Items were created by the study investigators based on findings from our prior qualitative studies (3,26) and were cognitively tested among five Brazilian immigrant women prior to use Participants reported how strongly they agree to strongly disagree with the following items: “We are resilient and strong,” “We work harder than most,” “We have close-knit families,” and “We are willing to help one another.” Response options were on a 5-point Likert scale (1= strongly agree to 5= strongly disagree). To create a score, we summed responses across items to create a score that could range from 1 to 20.

Socio-demographic characteristics: We utilized items from the Brazilian Census (27) to assess socio-demographic characteristics such as race/ethnicity (White, Black, Indigenous, Asian, Pardo [“mixed”]), and educational attainment (less than primary education, primary education but incomplete secondary education, complete secondary but incomplete tertiary education, complete tertiary education or more, don’t know). Items from the Behavioral Risk Factor Surveillance System (28) were utilized to assess age in years (continuous), household income (less than $10,000, $15,000-$25,000, $25,001 - $50,000, $50,0001- $75,000, <$100,000, don’t know), and insurance status (insured, uninsured). We also asked participants how many years they had lived in the U.S., what languages they spoke (Portuguese, English, Spanish, other languages (please specify), what languages they spoke at home (Portuguese only, some Portuguese and some English, English only, other (please specify) and whether they were currently affiliated with a religion (yes, no).

All survey items were pre-tested in Portuguese among five Brazilian immigrants for item flow and comprehension. Afterward, the instrument was translated into Portuguese by a certified American Translators Association translator and reviewed by native Portuguese speakers.

Analysis

Missing data analytics were performed and suggested that 2% of the data on variables to be analyzed were missing, and these were subsequently imputed using multiple imputation with m = 10 imputations. Descriptive statistics, including percentages, means, standard deviations, and ranges were examined for all variables. To examine the structure and internal consistency of scaled variables (i.e., discrimination, social support), we assessed McDonald’s omega, and deemed an omega of $\geq$ 0.70 to be acceptable (29). We used ANOVA tests to examine associations between CES-D-10 scores and categorical variables and linear regression to compare CES-D-10 scores with continuous variables (age, time living in the U.S). Statistical significance was considered at the $p<0.05$ level. Data analysis was done using R version 4.1.2.

(30).

Results

Sample Characteristics

Of the N = 390 women participants, N = 37 did not complete the CES-D-10, and were thus excluded from the analysis, bringing our analytic? final sample size to N = 353. Nearly all participants spoke Portuguese (99.7%), and the majority (93.1%) completed the survey in Portuguese, but most (70.2%) also were proficient in English. The majority identified their race as White (60%), with 22% identifying as Pardo (mixed-race). Most participants identified as Latina (79%), although a few (4%) identified s as Hispanic. More than two-thirds (69%) were married about half (52%) had household incomes of $50,000 or below. Approximately half (51%) had completed tertiary education (U.S. college degree equivalent). Most (70%) were married. The mean number of years living in the U.S. was 12 (standard deviation [SD- = 9, range = 0.25–40). A third (78%) had public insurance, while 20% were uninsured. See Table 1.

Table 1
Socio-demographic characteristics by CES-D-10 cutoff scores, Brazilian Immigrant Health Study (N = 353)

Characteristic	Overall, N = 353[1]*	CES-D Below 10, N = 142[1]	CES-D 10 or Above, N = 185[1]	p-value[2]
Age	39 (12)	42 (12)	36 (11)	< .001
Racial identity				
Black	23 (6.5%)	9 (6.3%)	13 (7.0%)	0.57
Indigenous	4 (1.1%)	1 (0.7%)	3 (1.6%)	
Multiracial	21 (5.9%)	5 (3.5%)	13 (7.0%)	
Other	18 (5.1%)	8 (5.6%)	8 (4.3%)	
Pardo	79 (22%)	28 (20%)	43 (23%)	
White	208 (59%)	91 (64%)	105 (57%)	
Married/living as married	244 (69%)	103 (73%)	127 (69%)	0.52
Household income				0.34
Less than $10,000	63 (18%)	26 (18%)	33 (18%)	
$15,000-$25,000	55 (16%)	19 (13%)	31 (17%)	
$25,001 - $50,000	64 (18%)	28 (20%)	34 (18%)	
$50,0001- $75,000	58 (16%)	17 (12%)	37 (20%)	
$75,001-$100,000	40 (11%)	19 (13%)	18 (9.7%)	
Higher than $100,000	49 (14%)	23 (16%)	25 (14%)	
Don't know	24 (6.8%)	10 (7.0%)	7 (3.8%)	
Education				0.11
Incomplete primary education	24 (6.8%)	8 (5.6%)	12 (6.5%)	
Complete primary education and incomplete secondary education	36 (10%)	15 (11%)	13 (7.0%)	
Complete secondary and incomplete tertiary education	119 (34%)	39 (27%)	72 (39%)	
Complete tertiary education	170 (48%)	80 (56%)	86 (46%)	
Incomplete primary education	24 (6.8%)	8 (5.6%)	12 (6.5%)	
Don't know	4 (1.1%)	0 (0%)	2 (1.1%)	

Characteristic	Overall, N = 353[1*]	CES-D Below 10, N = 142[1]	CES-D 10 or Above, N = 185[1]	p-value[2]
Time in US (years)	12 (9)	14 (10)	10 (8)	< .001
(Missing)	1	0	1	
Health Insurance				0.20
Yes	278 (79%)	117 (82%)	137 (74%)	
No	67 (19%)	22 (15%)	43 (23%)	
Don't know/Not sure	8 (2.3%)	3 (2.1%)	5 (2.7%)	
CES-D-10 Score	11.4 (6.2)			
(Missing)	26			
Social Support Score	9.52 (2.53)	10.49 (2.37)	8.92 (2.36)	< .001
(Missing)	4	0	2	
Everyday Discrimination Score	8.4 (3.3)	6.9 (2.5)	9.7 (3.4)	< .001
(Missing)	35	3	24	
Community Strengths Score	15.5 (3.0)	15.8 (2.7)	15.2 (3.2)	0.07
(Missing)	28	8	10	

[1]Mean (SD); n (%)

[2]Independent t-test for continuous variables, chi-square test for categorical.

*N = 26 of the sample had missing data on the CES-D-10 and are only presented in the overall column. Their data were imputed in the main analyses using multiple imputation with *m* = 10 imputations. These N = 26 participants are not included in the comparisons of the CES-D Below 10 and CES-D 10 or above analyses.

Scores on the CES-D-10 ranged from 2 to 29, with a mean score of 11.4 (SD = 6.2). Just over half (52%) had CES-D-10 scores of 10 or greater. The coefficient omega for the CES-D-10 in this sample was 0.88, suggesting good reliability. Scores on the EDS ranged from 5 to 22, with a mean of 8.3 (SD = 3.3). The coefficient omega for the EDS in this sample was 0.83, indicating good internal reliability. Scores on the OSSS ranged from 3 to 15 (mean = 9.5, SD = 2.5). The coefficient omega for OSSS was marginal at 0.69, suggesting slightly less than desirable reliability.

Correlations among the dependent and independent variables are shown in Table 2. A statistically significant positive association was found between CES-D-10 and EDS scores, whereas there was a

significant negative association between the CES-D-10 and CS, CES-D-10 and OSSS, EDS and CS, and the EDS and OSS. No statistically significant association was found between OSSS and CS.

Table 2
Correlations among CES-D-10 scores with discrimination, social support, and perceived community strengths, Brazilian Immigrant Health Study (N = 353)

Scale	Center for Epidemiological Study Depression scale (CES-D-10)	Everyday Discrimination Scale (EDS)	Community Strengths (CS)	Oslo Social Support Scale (OSS)
Center for Epidemiological Study Depression scale (CES-D-10)	-	0.44 (0.34, 0.53)***	-0.14, (-0.24, -0.03)*	-0.34 (-0.43, -0.23)***
Everyday Discrimination Scale (EDS)		-	-0.10 (-0.22, 0.01)	-0.22 (-0.32, -0.11)***
Community Strengths (CS)			-	0.10 (-0.01, 0.20)
Oslo Social Support Scale (OSS)				-

Note: * = p < .05, ** = p < .01, *** = p < .001

We also examined CES-D-10 scores (< 10, ≥ 10) by socio-demographic characteristics. The results, shown in Table 1, suggest that both age and number of years living in the U.S. were associated with CES-D-10 cutoff scores.

A multiple linear regression modeled the relationships between EDS, OSSS, CS with CES-D-10 scores, controlling for age and number of years living in the U.S. Results determined that EDS was positively associated with CES-D-10 scores (β = 0.64, SE = 0.10, 95% CI = 0.45, 0.83, p < 0.001), while social support was negatively associated with CES-D-10 scores (β = -0.53, SE = 0.13, 95% CI =-0.80, -0.27, p < 0 .001). No statistically significant relationship was observed between CS and CES-D-10 scores (β = -0.16, p = 0.11). Neither age (β = -0.05, p = 0.12) nor time (β = -0.05, p = 0.27) in the U.S. were statistically significant in the multivariable model. The R^2 for this model was 0.28, 95% CI 0.19, 0.36, indicating a medium-to-large effect size (31).

Discussion

In this sample of Brazilian immigrant women living in the U.S., it is notable that the mean CES-D-10 score was 11.4 (SD = 6.2), as CES-D-10 scores of 10 or greater can indicate the presence of depression. The mean score identified in this study exceeds that of participants in several studies examining mental

health among Latinos in the U.S. For example, The Hispanic Community Health Study/Study of Latinos, a cohort study of Hispanic/Latino men and women living in the U.S., found a mean CES-D-10 score of 7.3 (SE = 0.05) (Rodriquez et al., 2021). It is particularly concerning that nearly half (47%) of participants had CES-D-10 scores of 10 or greater. A separate analysis of data from The Hispanic Community Health Study/Study of Latinos determined that 27.8% of study participants during the first study visit (2008–2011) and 24.2% during the second study visit 2 (2014-17) had CES-D-10 scores of greater or equal to 10 (33), Other research conducted with Hispanics/Latinos in the U.S. has found a smaller percentage of participants having depressive symptomatology than was identified in the current study (34, 35).

There are important cultural and linguistic differences between Brazilians and other Hispanic/Latino groups in the U.S., yet limited research has examined depression among Brazilian immigrants. As noted earlier, a 2013–2014 study of Brazilian immigrants in Massachusetts found that 35.3% of participants had symptoms of depression as measured by the CES-D-10, which is also lower than what was found in the current study (36). The high prevalence of depressive symptomatology in the present study may reflect that the data were collected near the start of the COVID-19 pandemic. However, depressive symptomatology in the study sample also exceeds national population estimates assessed during this same time period. For example, in April 2020, the same time frame as the current study, a cross-sectional study of a nationally representative sample of adults in the U.S. found that approximately one-third (32%) of respondents experienced significant depressive symptoms in the week before survey completion, as determined by CES-D-10 scores of 10 or higher (37). Another possible explanation for the high prevalence of depressive symptoms in the current study is that our study focused on women, and prior research has found a higher level of depression amiong women compared to men (38, 39). Nonetheless, whether the prevalence of depressive symptoms among study participants increased due to the pandemic, there is a clear need to identify and address factors negatively impacting the mental health of Brazilian immigrant women in the U.S.

We also found that experiences of discrimination were linked with higher levels of depressive symptomatology, a finding that has been reported by numerous other studies conducted among diverse samples (40–44). Discrimination is widely recognized as a social determinant of health and a factor that negatively impacts mental health (41, 44). A recent analysis of data from the U.S. All of Us Cohort Study (N = 62,651) found that discrimination was associated with 21% increased odds of having moderate to severe depression (Lee et al., 2021). Taken together, the findings of prior research and of this study indicate that discrimination may be an important social determinant of health among Brazilian immigrants living in the U.S.

In the current study, social support was associated with lower CES-D-10 scores indicating that social support may mediate the association between discrimination and mental health. Other studies also have found that social support is protective against depression (45) and may be protective of mental health in the context of discriminatory experiences (46, 47). There are a variety of types of social support, including emotional (e.g., companionship, love, empathy), instrumental (i.e., tangible aid and assistance), informational (e.g., advice, suggestion, information), and appraisal (i.e., information useful for self-

evaluation) (48). Different forms of social support may operate differently in the face of discrimination. For example, emotional support, including sympathy, understanding and acceptance, could help to reduce personal sense of threat and attenuate negative emotions. Appraisal support could potentially help to develop positive self-awareness and reduce internalized stigmatization. This is an important area for further study, particularly since prior studies have produced equivocal results about the impact of and types of social support that protective in the face of discrimination (49–51). Unfortunately, we are not able to draw conclusions from this study since we did not assess types of social support.

The findings of this study should be interpreted with caution given study limitations, which include the use of a convenience sample, which limits generalizability. However, the fact that many Brazilians in the U.S. do not have documents makes it difficult, if not impossible, to develop a representative sampling frame. Furthermore, this study is a cross-sectional analysis, so temporal relationships between mental health, discrimination, and social support cannot be inferred. We did not assess the respondents' perceived causes for discrimination, so we cannot conclude that discrimination was due to immigration status, racial or ethnic identity, language, other factors, or to a combination of factors.

This study adds to the limited research on the mental health of Brazilian immigrant women living in the U.S. Our study suggests a critical need for services, given the high prevalence of depressive symptomatology. However, access to mental healthcare in the U.S. overall is challenging given the current increased need for mental healthcare post-pandemic (52) and the long-term shortage of mental healthcare providers in most regions (53). Even more challenging is finding providers that speak Portuguese and understand Brazilian culture –critical aspects of culturally competent mental healthcare —and there is evidence that having culturally competent providers can improve treatment engagement and retention in mental healthcare (54, 55). These efforts are needed, as are efforts to increase the pipeline of culturally and linguistically diverse providers and for healthcare care organizations to become culturally competent.

In the shorter term, there are promising models of community-based care that may be considered that do not require highly trained, licensed professionals. For example, there is a growing body of literature on the potential role of community health workers (CHWs) to provide outreach, and social support to address the mental health needs of communities. While the CHW model has received greater attention in low-to-middle income countries, there is growing interest in the U.S. (56). Currently, available evidence suggests that CHW interventions can be effective (56), although further research in the U.S. is needed. In particular, clarifying the role of CHWs in prevention and early intervention services vis-à-vis licensed professionals will be essential. Still, allowing CHWs to deliver these services could enable more highly trained mental health professionals to focus their expertise on those most in need of acute services. Regardless, there are models of lay-delivered care in the U.S. that are promising. For example, Mental Health First Aid (MHFA) is a program that trains members of the public to recognize and respond to signs of mental health concerns and substance use, with the goal of trainees being able to offer needed support (57). MHFA has been shown to increase trainees' ability to identify mental health symptoms in the community and to increase their confidence to intervene and offer health (58, 59). MHFA could be of interest to

Brazilian immigrants in the U.S. due to their sense of connection and ethnic identification (3), as well as research that demonstrates neighborhood social ties may buffer against serious psychological distress (60), and MHFA could potentially increase social cohesion. Qualitative research suggests that MHFA may be be well received by Hispanic populations (61).

In addition to identifying strategies to meet mental healthcare needs, foundational work is needed to address anti-immigrant xenophobia and racism in the U.S. Murray et al. (2022) provide an excellent review of work needed to address xenophobia and discrimination impacting Latino immigrants (62). They stress the importance of building resilience, resistance, and empowerment through “generative dialogue, community building, and the affirmation of culture” (62). While it is beyond the scope of this paper to describe these and other strategies, we do recognize that other types of intervention approaches to build resilience (i.e., those that seek solely to build coping skills in the face of discrimination) can verge on victim-blaming (63). It is essential to address the multiple levels of influence where discrimination operates, including at structural, organizational, and policy levels.

In summary, our findings clearly document the need to further understand and address the mental health needs of Brazilian immigrant women. Our findings emphasize the need to address the impact of discriminatory experiences on mental health and suggest that efforts to improve access to positive social support could be impactful. Further research is needed to further expand our understanding of the factors that contribute to poor mental health, harness the unique socio-cultural strengths and resilience of communities, and develop strategies to dismantle the root causes of xenophobia and discrimination.

Declarations

- Ethics approval and consent to participate: All study protocols and procedures were approved by the Institutional Review Board at Tufts University (protocol number: 00001838). All study activities were carried out in accordance with relevant guidelines and regulations of the Declaration of Helsinki. All participants provided informed consent.
- Consent for publication: Not applicable
- Availability of data and materials: The dataset generated and analyzed during the current study are available in the Open Science Framework (OSF) at https://osf.io/3jbv9/?view_only=36634ecd8ab94ea897e30939100e6797
- Competing interests: JDA and ZK have no competing interests. MG is an Associate Editor of BMC Public Health.
- Authors contributions: All authors made substantial contributions to the interpretation of data and have drafted the work or substantively revised it. All authors have approved the submitted version. All have agreed to both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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