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Spatial pattern and influence of mass media exposure on sexual exposure among women with disabilities in sub-Saharan Africa

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Abstract

Background Globally, people with disability have significant limitations in expressing their sexuality, and studies suggest that women with disability have an increased risk of sexually related problems due to impairment in one or more functional domains affecting their sexual desire. Thus, this current study investigated the spatial patterns and the influence of mass media exposure on the sexual exposure of women with disability in sub-Saharan Africa (SSA).

Methods We utilised the latest secondary dataset with disability module from a demographic health survey conducted in 10 countries in SSA between 2010 and 2022. A sample size of 16,517 women with disabilities was included. We utilised spatial analysis to show the predicted prevalence of sexual exposure, whilst multilevel binary logistic regression was used to examine the association between mass media exposure, the included covariates and sexual exposure. The five models developed were presented using adjusted odds ratio (aOR) with corresponding 95% confidence intervals (CI), and statistical significance was determined at $p < 0.05$.

Results The country with the highest prevalence of sexual exposure among women with a disability was Rwanda (77.13%), followed by Mali (72.03%), and the lowest was South Africa with 52.01%. Furthermore, women with disability who were exposed to mass media [aOR = 1.22; 95%(CI = 1.12–1.32)] had higher odds of being sexually exposed compared to those who had no mass media exposure. At the same time, those within the richest wealth index [aOR = 1.33; 95%(1.12–1.59)] were more likely to be sexually exposed compared to those who were within the poorer wealth index. On the other hand, women with disability who reside in communities with higher literacy levels [aOR = 0.80; 95%(CI = 0.71–0.90)] had lower odds of being sexually exposed compared to those who reside in communities with lower literacy levels.

Conclusions and recommendations Findings from this study revealed that the majority of women with disability in SSA were sexually exposed, with those exposed to mass media having a higher risk of being sexually exposed. Thus, there is a need for policymakers to institute educational programs that promote the sexual and reproductive health of women with disability through the mass media.

Keywords Mass media, Sexual exposure, Spatial pattern, Women with disabilities, Sub-Saharan Africa

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Odimegwu *et al. Archives of Public Health* (2025) 83:232

Page 2 of 15

Text box 1. Contributions to the literature

• This study provides the first comprehensive analysis of country-level variations in sexual exposure among women with disabilities in sub-Saharan Africa, filling a critical gap in sexual health research.
• It highlights the underexplored role of mass media in influencing sexual exposure among women with disabilities, offering new insights for public health interventions targeting media education for this group.
• The study advances the understanding of socio-demographic factors, such as age, education, and wealth, that intersect to shape sexual exposure among women with disabilities in low-resource settings.

Background

Disability remains a major public health issue worldwide [1]. As of 2021, an estimated 1.3 billion people or 16% of the global population, were living with some form of disability, the majority of whom live in low- and middle-income countries [2]. Women experience a higher prevalence of disability than men, with an estimated 19% of women worldwide having a disability compared to 12% of men [3]. People with disability experience various forms of physical, social, economic, psychological, cultural, and political limitations and discrimination [4], which have a negative impact on their function and activity performance [5]. Comparatively, women with disability suffer high levels of discrimination, gender stereotyping [2, 4], and disability-associated burden (i.e., years lived with disability) [6] compared to men with disability or men and women without disability. Evidence suggests that women with disability have an increased risk of sexual transmitted infection-related problems, such as sexually transmitted infections (STIs) [7], HIV infection [7, 8], and unintended pregnancies [9]. However, issues of sexual exposure among women with disability are barely addressed in most societies [10, 11], particularly in sub-Saharan Africa (SSA) [12].

Disability can be described as difficulty in functioning or participating in one or more aspects of life domains due to the presence of a health condition that interacts negatively with an individual's personal (e.g., age and gender) and environmental (e.g., access to infrastructure, discriminatory policies, and societal attitudes) circumstances [3]. In other words, disability is not just a health problem but an interplay between health-related functional limitations and an individual's physical and social environment [2]. Generally, people with disability have significant limitations in activity performance, such as sexual exposure, due to impairment in one or more functional domains, including physical, cognitive, visual, and hearing functions [10, 13].

Human sexuality, which comprises sexual acts, sexual orientation, gender identities and roles, pleasure, intimacy, and reproduction [14], is an essential component of health and an integral part of human life [15]. The term "sexual exposure" is often used to represent "sex", and it refers to the way humans experience or express their sexuality [14]. Sexual exposure can also be described as any behaviour or activity that is sexually arousing [15], such as sexual intercourse or masturbation [15, 16]. Despite being a common problem for most women, sexual and reproductive health-related issues among women with disability are rarely assessed and often left untreated by healthcare providers [11]. Meanwhile, women with disability have a higher risk of sexual and reproductive health problems, including HIV infection [7, 8], unintended pregnancies [9], pregnancy-related complications, and adverse birth outcomes [17]. Besides, women with disability are highly exposed to non-consensual sex or sexual exploitation, sexual abuse, and sexual violence [2, 18], which increases their risk for sexual and reproductive health problems.

Some studies conducted in other regions have suggested that women with disability have decreased frequency of sexual exposure and less sexual satisfaction, which is often related to physical restrictions and the perceived lack of sexual attractiveness [10, 19]. However, others argued that women with disability have similar levels of sexual exposure compared to those without disability [20]. The World Health Organization contends that women with disability are often prejudiced to be asexual [3]; thus, the use of permanent contraceptives to control fertility among women with disability is widespread [20, 21]. Although women with a disability and those without disability are entitled to the same sexual and reproductive health rights [22], women with a disability may have to hide their sexuality and sexual exposure to avoid social stigma and embarrassment or to conform to societal demands [23]. Thus, low sexual esteem [10] and high sexual dysfunction [15, 24] are common problems experienced by women with disability. Also, unsafe sexual exposure, including non-use of condoms and multiple sexual partners [25, 26], are common problem among individuals with disability and contributes to the high burden of disease among women with disability [27].

Despite the advancement of technology and the increasing use of social media [28], mass media (radio, television, and print media) continue to play a vital role in the dissemination of information, social transformation, and community involvement, affecting the decision-making and behaviour of many people [29]. In SSA, for instance, evidence shows that increased frequency of watching television is associated with increased household decision-making capacity of women[30]. Similarly, mass media exposure is associated with increased sexual autonomy and safer sex negotiation [31] and increased

Odimegwu *et al. Archives of Public Health*   (2025) 83:232

Page 3 of 15

help-seeking behaviour for sexual violence among women in SSA [32].

Meanwhile, despite the numerous sexuality-related problems associated with people with disability [20], there are very limited studies on the sexual exposure of individuals living with disability in SSA. Besides, the few disability and sexual exposure related studies in SSA have largely focused on sexual abuse, sexual violence, and risk for HIV [8, 33], with some studies reporting inconclusive findings. For instance, a recent study found that increased exposure to mass media reduces the odds of sexual violence among women with disabilities in urban settings but higher odds were observed in rural settings [34, 35]. These limited studies and inconclusive findings affect the design and implementation of public health interventions or efforts to improve the sexual life of persons with disability in SSA. Meanwhile, given that previous studies have highlighted the poor sexual life and risky sexual behaviour of individuals with disability [36, 37], understanding the influence of mass media on sexual exposure or activity among women with disability in SSA could contribute towards the development and implementation of interventions that promote positive mass media influence while addressing the negative impact of mass media on sexual activity and reproductive health of women with disability.. Therefore, the current study seeks to investigate the spatial patterns and the influence of mass media exposure on the sexual exposure of women with disability in SSA.

Data and methods
Study design and participants
The research employed a retrospective of the latest secondary dataset sourced from the Demographic and Health Surveys (DHS), collected through a cross-sectional household survey across 10 countries in SSA between 2014 to 2022. The DHS is recognised for its comprehensive national representation and has been implemented in more than 90 low- and middle-income countries (LMICs) [38]. The survey typically encompasses questions about participants' socio-demographic characteristics, including mass media exposure, as well as various sexual and reproductive health indicators such as HIV and STI testing, abortion, family planning utilisation, and intimate and sexual partner violence, among others. These questions are directed at the head of household who has a reproductive-age woman (15–49) with disability through a structured questionnaire survey methodology, and the data used in this study were extracted from the responses from the household head on behalf of any woman with disability in the household [39]. DHS also collect information on different modules, which include questions on women's disability [40].

The DHS utilises a two-stage sampling process, where a primary survey unit is selected, and participants are randomly chosen from clusters within each country under study [39, 41]. In this study, one woman of reproductive age with disability per household, aged between 15 and 49 years, from every third household selected, was eligible to participate in the disability module. The eligible participants for this study had one or more disabilities captured in the DHS as a 'difficulty' and following the Washington Group (WG) Short Set of Disability Questions [42, 43], which include difficulty in seeing, walking, hearing, remembering, communication and self-care. However, this study only considered the difficulty in seeing, hearing, speaking and walking, resulting in a total sample size of 16,157 women with disability in 10 countries in SSA. The specific sample sizes for various countries within SSA are detailed in Table 1 of this study. The DHS is acknowledged as a high-quality secondary dataset and has been previously utilised in studies concerning sexual and reproductive health in SSA [30, 44]. The DHS datasets employed in this study are accessible to the public on the DHS website and can be downloaded for free upon request via https://dhsprogram.com/data/available-datasets.cfm.

Study variables
Study population
Women with disability were obtained from the DHS disability module questionnaire, where questions regarding women of reproductive age disability status were asked through the household head. The disability questions

Table 1 Distribution of weighted sample size among women with disabilities using demographic health survey datasets in eligible countries in sub-Saharan Africa included in the study from 2013 to 2022

S/N	Country	Survey year	Sample size	Sample size percentage
1	Chad	2014/2015	1,553	9.61
2	Democratic Republic of the Congo	2013/2014	991	6.13
3	Kenya	2021/2022	1,404	8.69
4	Malawi	2015/2016	1,499	9.28
5	Mali	2017/2018	947	5.86
6	Mauritania	2019/2022	2,436	15.08
7	Nigeria	2017/2018	629	3.89
8	Rwanda	2019/2020	1,694	10.48
9	South Africa	2015/2016	836	5.17
10	Uganda	2015/2016	4,168	25.80

The sample size is for the population of women with disabilities aged 15 to 49 in each country

mirrored the WG short set of disability questions, and the head of each eligible household was asked if any woman between the ages of 15–49 has difficulty in seeing, walking, hearing, remembering, communicating and self-care. The responses were No difficulty", "Some difficulty", "A lot of difficulties", and "Cannot do it at all". However, this study only considered responses regarding difficulty in seeing, hearing, speaking and walking and all women with at least one function difficulty in the 10 SSA countries were included in this study as women with disability [43].

Outcome variable

This study's outcome variable was sexual exposure, which was developed from the question on "recent sexual activity" asked in the women's recode file (IR). Sexual activity in this study, according to DHS, is regarded as having had sexual intercourse in the last four weeks [45]. In the DHS, women with disability were asked about their recent sexual activity. Responses were given as "never had sex", "not active in last 4 weeks", not active in the last 4 weeks due to postpartum, and lastly "active in last 4 weeks". The last responses were recoded as binary variables; the first three responses were coded as 0, representing "not sexually exposed", whilst the last response was coded as 1, representing "sexually exposed". This categorisation was informed by previous studies [16, 45].

Key independent variable

The key independent variable in this study was mass media exposure, which was assessed through three mediums: television viewing, radio listening, and newspaper reading. We constructed the mass media exposure variable by coding each medium as a binary variable, summing the values for all three, and categorising "1" as exposure to mass media and "0" as otherwise. Sensitivity analysis confirmed consistent results whether using individual media forms or the combined sum as the key independent variable [46].

Covariates

The covariates included in the regression analysis were chosen based on their bivariate relationship with the outcome variable as well as their relevance in existing literature [30, 44]. These include age, educational level, marital status, wealth index, place of residence, community literacy level, community socio-economic level, and community knowledge of modern methods level. The respondents' ages were grouped into three categories: 15–24, 25–34, and 35 and above. Women's education levels were classified as no education, primary education, and secondary or higher education. Marital status was divided into never married, currently married, and ever married, whilst the wealth index was divided into poorer, poorest, middle, richer, and richest. The residential areas were categorised as urban or rural. Other covariates such as community literacy level, community socioeconomic level, and community knowledge of modern method level were categorised as low, medium and high [30, 44, 46].

Conceptual frameworks of the study

This framework highlights the interaction between disabilities, sexual exposure, and key influencing factors among women with disabilities in SSA. It shows how mass media exposure, individual attributes, and community-level factors contribute to sexual exposure (Fig. 1).

Statistical analyses

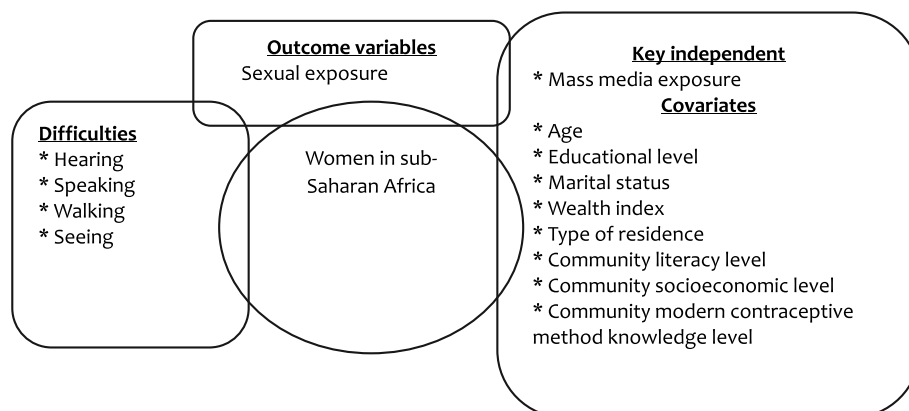The data were analysed using both spatial and multilevel analyses.

Fig. 1 Conceptual framework of mass media exposure, covariates and sexual exposure among women with disabilities in sub-Saharan Africa (Developed by authors)

Odimegwu *et al. Archives of Public Health* (2025) 83:232

Page 5 of 15

Spatial analysis

The geospatial maps were generated following a geostatistical model that considers the observations as binary indicators that follow a binomial probability distribution with a probability of success p. The probability was linked to the random spatial term through a logit link function. The spatial random term represents the point reference realisation of the sexual exposure data, and this was assumed to be spatially dependent for the different spatial locations, where a Gaussian distribution with zero mean and a spatially structured covariance matrix was assumed [47].

Furthermore, the geostatistical inference was realised through the stochastic partial differential equation, an approach that represents the continuous spatial random process in the form of a discretely indexed Gaussian Markov random field (GMRF), allowing for a Bayesian approximation through the integrated nested Laplace approximation (INLA) [48]. More details about the computational procedure of the geostatistics can be obtained from Lingren et al. [48] and Moraga [47]. The spatial maps were created for each selected country in SSA individually and then combined onto one or more screens for a clearer and more cohesive presentation.

The model for the spatial analysis was expressed as;

$$Y_i \sim Binomia(n_i, P_i)$$

where:

γ_i represents the sexual exposure status (1 if exposed, 0 if not exposed) in each country within SSA, n_i is the number of individuals in each country within SSA, and P_i is the probability of sexual exposure in each country within SSA.

The probability was linked to the spatial location s_j, through a logit link expressed as

$$logit(P_j) = \alpha + f(s_j)$$

where α is the model intercept and $Cov(y(S_i),\ y(S_j))$ is the spatially structured random component assumed to be distributed as a Matern Gaussian Field with zero mean and a Matern covariance function described as;

$$Cov(y(s_i), y(s_j)) = \frac{\sigma^2}{2^{\nu-1}\Gamma(\nu)} (\kappa \|s_i - s_j\|)^\nu K_\nu (\kappa \|s_i - s_j\|)$$

The stochastic partial differential equation (SPDE) approach was deployed as a result of the dense property of the covariance matrix by using the GMRF representation of the Gaussian Field (GF). This is given as

$$\left(\kappa^2 - \Delta\right)^{\frac{\alpha}{2}} \tau y(s) = \Psi(s)$$

where $\kappa > 0$ is a scale parameter, Δ is a Laplacian, $s \in \mathbb{R}^d$, α is the smoothness parameter, τ controls the variance, and $\Psi(s)$ is a Gaussian white noise process. The Matern covariance function is the exact and stationary solution of the SPDE.

Multilevel analysis

We employed a two-level multilevel binary logistic regression to examine the association between sexual exposure, covariates and mass media exposure whilst considering both individual and household/community levels [49, 50]. Women with disability were nested within households, and households were nested within clusters, and the clusters were treated as random effects to address community-level variability. In this study, individual-level variables were adjusted at the first level, while household and community variables were combined and adjusted at the second level. This approach accounts for the contribution of individual factors separately from the combined influence of household and community factors, as the latter tend to have similar effects [49].

The multilevel binary logistic regression was expressed as;

$$log\left(\frac{\mathcal{P}_{ij}}{1 - \mathcal{P}_{ij}}\right) = \beta_o + \beta_1 X_{ij} + U_j$$

where:

$\mathcal{P}_{ij}$ is the probability of the outcome (sexual exposure) for each woman with a disability i in the cluster j

β_o is the overall intercept.

β_1 represent the coefficient for mass media exposure for each woman with a disability i in the cluster j

X_{ij} is the predictor variable (mass media and covariates) for each woman with a disability i in the cluster j

$\mathcal{U}_j$ is the random effect for cluster j, accounting for variations between clusters.

Thus, five models were constructed from the multilevel: an empty model (Model I) with no predictors (random intercept), Model II with only the key independent variable (mass media exposure), Model III was individual-level variables whilst Model IV contained household/community-level variables, and the final Model V incorporating key independent variable, individual-level and community level variables. Adjusted odds ratios (aORs) and corresponding 95% confidence intervals (CIs) were provided for each model. The "melogit" command in Stata was utilised for model fitting to identify associated variables with the outcome variable (Sexual exposure). Model comparison was performed using the log-likelihood ratio (LLR), Akaike Information Criteria (AIC), and Schwarz's Bayesian Information Criteria (BIC), aiming for the model with the highest log-likelihood and lowest AIC for best fit [49, 50].

The women with disabilities' population sample weights (v005/1,000,000) were applied to all analyses to

Odimegwu *et al. Archives of Public Health*   (2025) 83:232

Page 6 of 15

address over- and undersampling. The "svy" command was used to consider the complex survey design and enhance the results' generalisability.

Multicollinearity was assessed using the Variance Inflation Factor (VIF). All VIF values were below the commonly accepted threshold of 10, indicating that multicollinearity does not pose a problem in the model (Table 2).

All analyses were conducted using Stata version 17.0 (Stata Corporation, College Station, TX, USA).

Table 2 Multicollinearity assessment of the included variables among women with disabilities using demographic health survey datasets in sub-Saharan Africa from 2013 to 2022

Variable	Variance inflation factor	Tolerance
Mass media exposure	1.84	0.54
Age of respondent	2.16	0.46
Educational level	1.95	0.51
Marital status	2.01	0.50
Wealth index	2.89	0.35
Type of residence	1.70	0.59
Community literacy level	3.12	0.32
Community socio-economic level	2.77	0.36
Community modern contraceptive knowledge	2.42	0.41
Mean variance inflation factor	**2.32**	

Results

Spatial prevalence and distribution

Figure 2 shows the predicted prevalence of recent sexual exposure among women with disabilities in Chad, DR Congo, Kenya, Malawi, Mali, and Mauritania, while Fig. 3 presents those for Nigeria, Rwanda, South Africa and Uganda. The findings indicate a mixed pattern of recent sexual exposure among respondents from Chad, particularly in the southern part of the country, where the majority of the dataset was observed, such that neighbouring locations display divergence patterns. In the case of DR Congo, the results show low sexual exposure among the respondents living in Kwango, Kasai, spanning through southern Kasai-Centra, Equateur, Maniema, Haut-Uele, and part of Ituri, but higher in parts of Tshuapa, Sankuru and northern parts of Kasai and Maniema regions. For Kenya, the estimates show no clear divide across the regions, but with varied patterns of high and low estimates among provinces in the Eastern part of the country.

The estimates for Malawi show a north–south divide, with low sexual exposure taking place among women with disabilities in the provinces that make up the southern region, but high in the central and northern ones. The results for Mali and Mauritania show small clusters of sexual exposure in the southern parts of both countries. In the case of Nigeria (Fig. 2), the results show a low prevalence of sexual exposure among women with
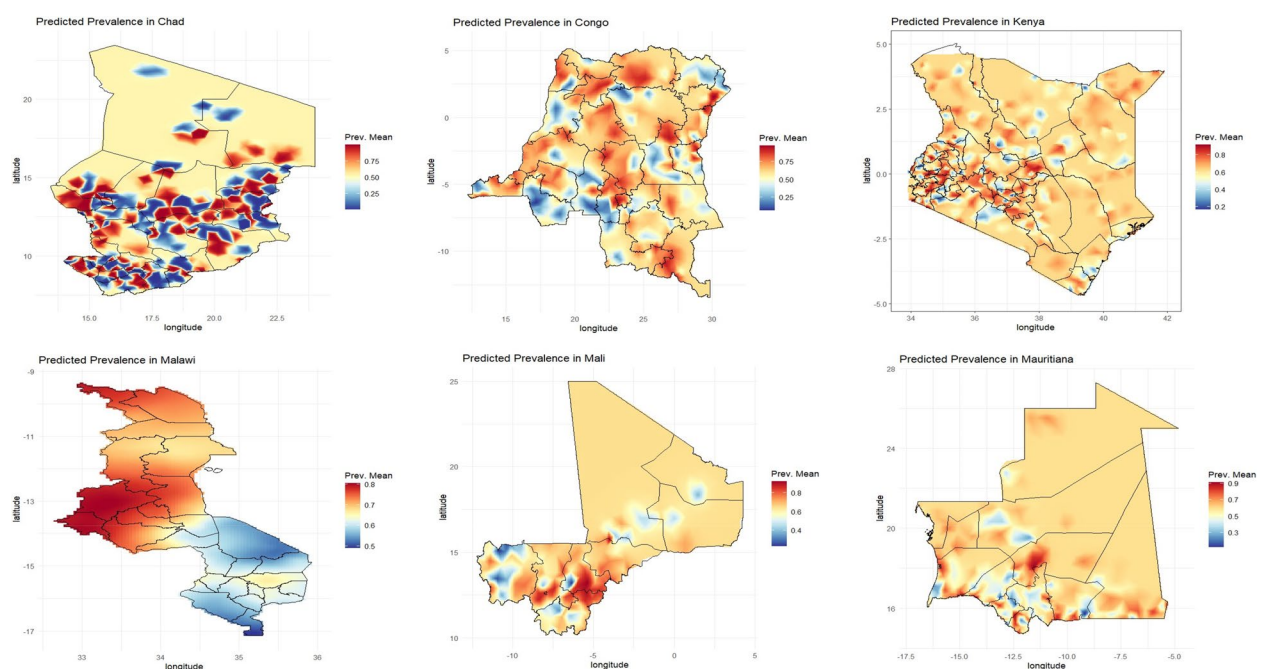

Fig. 2 Predicted prevalence of sexual exposure among women with disabilities using the demographic health survey datasets in Chad, Democratic Republic of the Congo, Kenya, Malawi, Mali and Mauritania from 2013 to 2022. The estimates are at 1 × 1 km spatial resolution
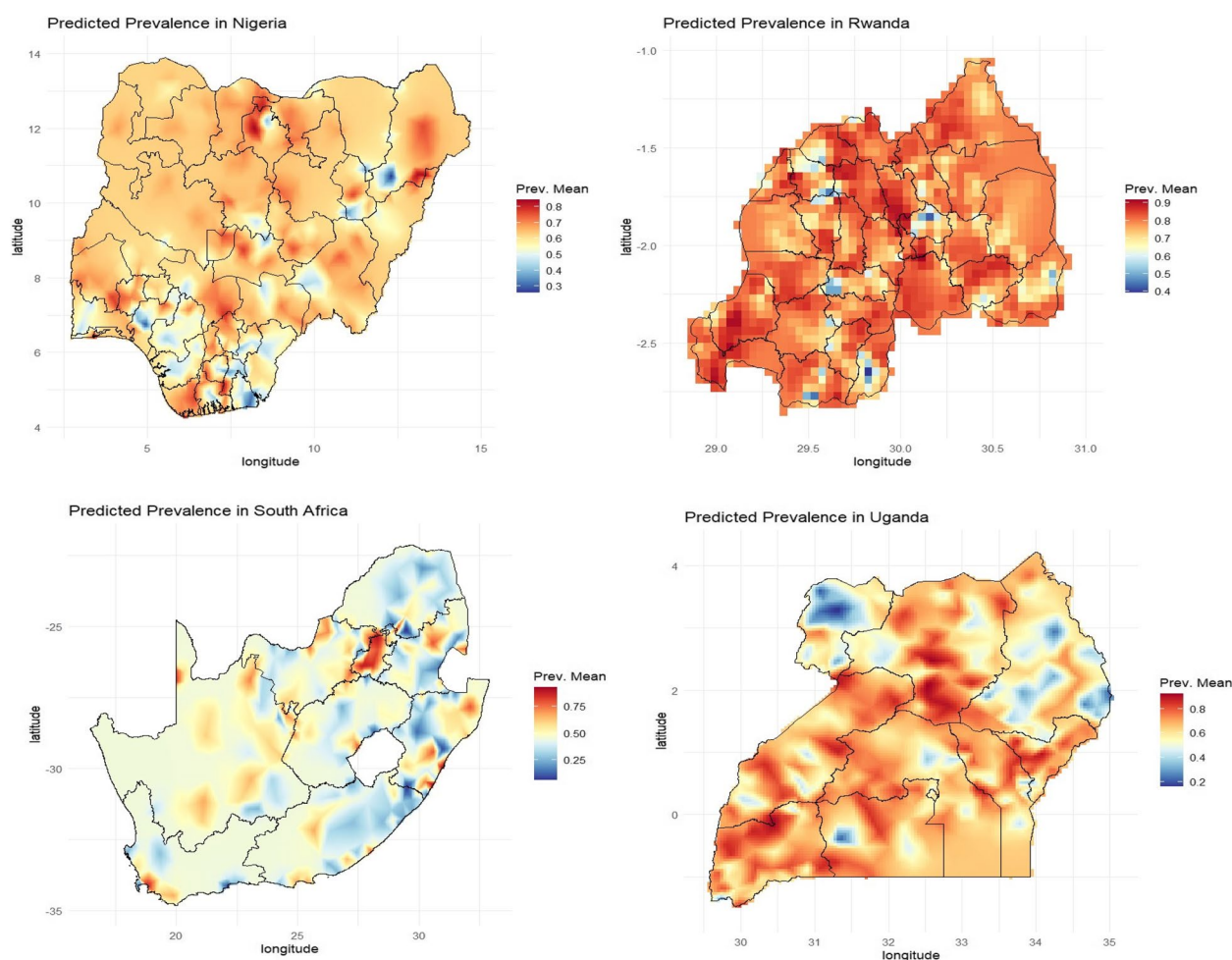
Fig. 3 Predicted prevalence of sexual exposure among women with disabilities using the demographic health survey datasets in Nigeria, Rwanda, South Africa and Uganda from 2013 to 2022. The estimates are at 1 × 1 km spatial resolution

disabilities in the southern part of the country, but high in parts of Kano, Borno, spanning through Adamawa State, whereas for Rwanda, the estimates show high prevalence throughout the country. Results for South Africa reveal low sexual exposure in most of the country, except in Gauteng Province; on the other hand, in Uganda, the prevalence appears high in all parts of the country except West Nile and parts of Karamoja, Teso and Bukedi provinces that make up the Karamaja region.

Weighted country-level prevalence of sexual exposure among women with disabilities in sub-Saharan Africa

Figure 4 below shows the weighted country prevalence of sexual exposure among women with disability in SSA. In South Africa, 47.99% of women with disability were not sexually exposed, while 52.01% were sexually exposed. Similarly, in Chad, 46.69% of these women fall into the "not sexually exposure" category, with 53.31% classified as sexually exposure. Congo

DR shows a prevalence of women with disability who were sexually exposed (59.48%) compared to those who were not sexually exposed (40.52%). Furthermore, Kenya, Mauritania, Uganda, and Malawi show that the majority of women with disability in the country were sexually exposed, ranging from 62.29% to 64.63%. Conversely, Mali and Rwanda show a higher prevalence of sexually exposure women with disability (72.03% and 77.13%, respectively) compared to those who reported not being sexually exposed (27.97% and 22.87%, respectively).

Key independent, individual and community-level characteristics

This table presents the key independent, individual and community-level characteristics of sexual exposure among a sample of 16,517 women with disability in SSA. Among those with no exposure to mass media, 41.61% were not sexually exposed, while 58.39% were sexually
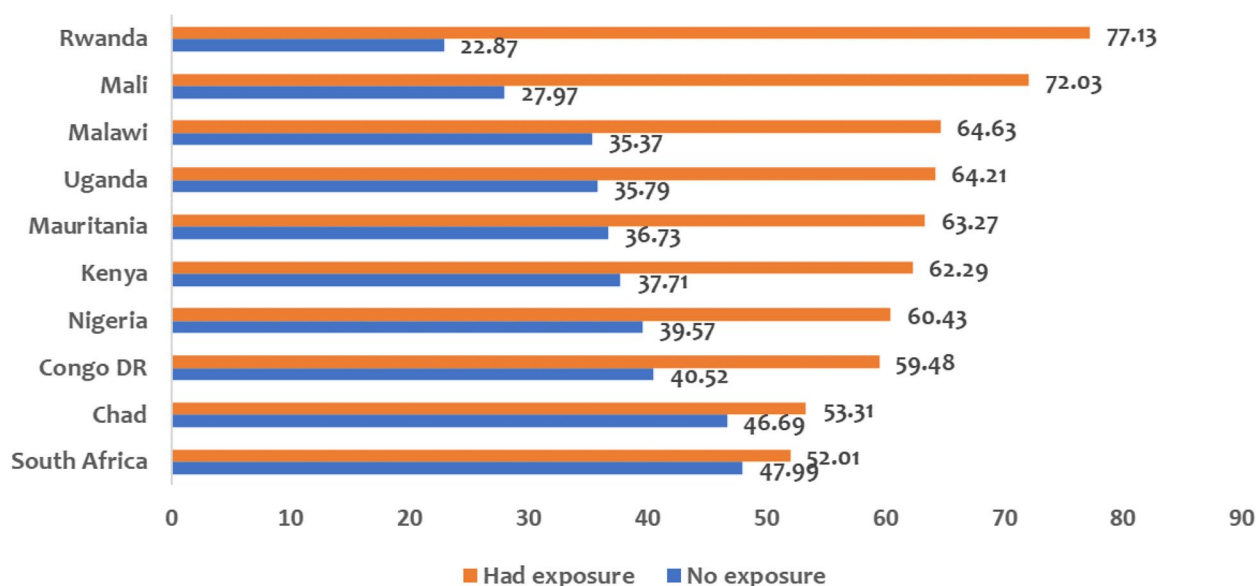
Odimegwu *et al. Archives of Public Health*   (2025) 83:232

Page 8 of 15

Fig. 4 Weighted country-level prevalence of sexual exposure among women with disabilities using the demographic health survey datasets in sub-Saharan Africa from 2013 to 2022

exposed; while among those with exposure to mass media, 33.98% were not sexually exposed, and 66.02% were sexually exposed.

The respondent age shows that women Who were sexually exposed increase with age, from 56.07% in the 15–24 age group to 64.26% in the 35 and above age group. In the same vein, women with disability with at least a primary level of education (66.28%) were sexually exposed, whilst 73.54% of those currently married were sexually exposed compared to 25.31% of never-married women with disability. Women with disability Who reside in communities with high literacy levels had 64.64% of sexual exposure, whilst those Who reside in similar communities with high modern contraceptive knowledge had 48.58% of sexual exposure. A X^2 Significant association was found between mass media exposure, including covariates, and sexual exposure ($p < 0.05$) except for the community literacy level variable (Table 3).

Multi-level fixed effects
The measure of associations for the relationship between mass media exposure, including covariates and sexual exposure among women with disability in SSA was examined using five adjusted models (Model I to V). The last model (Model V) for the key independent variable shows that women with disability who were exposed to mass media [aOR = 1.22; 95%(CI = 1.12–1.32)]had higher odds of being sexually exposed compared to those who had no mass media exposure.

At the individual level, women with disability between the ages of 25–34 [aOR = 1.15; 95%(CI = 1.03–1.28)] were more likely to be sexually exposed compared to those aged 15–24; in the same vein, those who had secondary education and above [aOR = 1.36; 95%(CI = 1.20–1.53)], women with disability who were currently married [aOR = 10.06; 95%(8.45–11.98)], those within richest wealth index [aOR = 1.33; 95%(1.12–1.59)], and those residing in rural residence [aOR = 1.23; 95%(CI = 1.10–1.37)] reported a higher odds of being sexually exposed compared to women with disability who had no education, never married, those within poorer wealth index and those residing in urban area respectively.

The community-level results show that women with disability who reside in communities with high socioeconomic status [aOR = 1.44; 95%(CI = 1.27–1.65)] were more likely to be sexually exposed compared to those who reside in communities with lower socioeconomic status. On the other hand, women with disability who reside in both communities with higher literacy levels [aOR = 0.80; 95%(CI = 0.71–0.90)] and modern contraceptive method knowledge [aOR = 0.64; 95%(CI = 0.50–0.80)] were less likely to be sexually exposed compared to those who reside in communities with both lower literacy levels and modern contraceptive method knowledge (Table 3).

Random effects
The measures of variation in sexual exposure, as interpreted by the result from the ICC in model V, show a

Odimegwu *et al. Archives of Public Health*   (2025) 83:232

Page 9 of 15

Table 3 Key independent variables, individual and community-level characteristics of women with disabilities and sexual exposure using the demographic health survey datasets in sub-Saharan Africa from 2013 to 2022

Variables (*n* = 16,157)	Frequency (%)	Sexual exposure (%)		*P*-value(X^2)
Key independent variable		No exposure	Had exposure	
Mass media exposure				< 0.001
No exposure	5,051 (31.26)	41.61	58.39	
Had exposure	11,106 (68.74)	33.98	66.02	
Covariates				
Individual level				
Age of respondents				< 0.001
15–24	2,505(15.51)	43.93	56.07	
25–34	7,293(45.14)	34.30	65.70	
35 & above	6,357(39.35)	35.74	64.26	
Educational level				< 0.001
No education	3,992(24.71)	39.60	60.40	
Primary	7,535(46.64)	33.72	66.28	
Secondary and above	4,630(28.66)	37.88	62.12	
Marital status				< 0.001
Never married	976 (6.04)	74.69	25.31	
Currently married	10,277(63.61)	26.46	73.54	
Ever married	4,904(30.35)	49.49	50.51	
Wealth index				< 0.001
Poorest	3,600(22.28)	44.31	55.69	
Poorer	3,245(20.09)	37.23	62.77	
Middle	3,100(19.19)	36.29	63.71	
Richer	3,151(19.50)	31.94	68.06	
Richest	3,061(18.94)	30.73	69.27	
Type of residence				< 0.001
Urban	5,029(31.13)	34.38	65.62	
Rural	11,128(68.87)	37.26	62.74	
Community level				
Community literacy level				0.50
Low	5,357(33.15)	37.51	62.49	
Medium	5,896(36.49)	36.15	63.85	
High	4,904(30.35)	35.36	64.64	
Community socio-economic level				< 0.001
Low	9,985(61.80)	39.39	60.61	
Medium	1,059(6.56)	28.68	71.32	
High	5,113(31.64)	32.05	67.95	
Community modern contraceptive methods knowledge level				< 0.05
Low	15,048 (93.14)	35.43	64.57	
Medium	527(3.26)	46.46	53.54	
High	581(3.60)	51.42	48.58	

Countries included, Chad, Democratic Republic of the Congo, Kenya, Malawi, Mali, Mauritania, Nigeria, Rwanda, South Africa and Uganda

13% variation in sexual exposure among women with disability in SSA between the ICC (0.13). This was an increase of 1% from model I to IV (0.12). The variation in the ICC shows the likelihood of women with disability being sexually exposed in these selected countries in SSA was attributed to clustered variations in those countries. At the same time, the recorded variation in the value of Schwarz's BIC and AIC from model I to V affirms the goodness of the last model (model V) in predicting the likelihood of the included variables in explaining the

Odimegwu *et al. Archives of Public Health*   (2025) 83:232

Page 10 of 15

engagement of sexual exposure among women with disability in the countries selected (Table 4).

Discussion

Findings from this study revealed varying country-level prevalence of sexual exposure among women with disability in SSA, ranging from 52.01% in South Africa to 77.13% in Rwanda. Women with disability who were exposed to mass media had higher odds of being sexually exposed compared to those who had no mass media exposure. Age, education, marital status, wealth index, place of residence (urban versus rural), community-level socioeconomic status, community-level literacy, and modern contraceptive method knowledge influenced the odds of sexual exposure among women with disability.

In this study, we found that the majority of women with disability in SSA are sexually exposed, albeit at varied country levels. Although we could not find comparable studies on the prevalence of sexual exposure among women with disability in SSA, our prevalence estimates are lower than what was reported in an earlier study in the United States, where 90% of women with disability were found to be sexually exposed [20]. Plausibly, the prevalence disparities could be explained by the differences in sociocultural settings where the studies were conducted. Arguably, societies that are more receptive to the sexual exposure of women with disabilities and provide sexual and reproductive health services for such women are more likely to record a higher prevalence of sexual exposure among disabled women [51, 52]. In contrast, women with disability in SSA often encounter several barriers towards sexual expression due to stigmatisation, alienation, and discrimination, which are usually orchestrated by community members, family, and healthcare workers [12]. This could be attributed to the negative societal labelling of women with disability as asexual, as well as the erroneous perceptions, fear, and myths surrounding sexuality and disability [53]. Therefore, considering that the majority of disabled women across the countries in SSA are sexually exposed, as found in the present study, there is a need to implement targeted interventions to provide sexual and reproductive health services to women with disability in SSA, as well as demystify sexuality among women with disability. Such interventions will not only promote the sexual and reproductive health of women with a disability but will further increase their sexual participation.

Meanwhile, the spatial distribution of the prevalence of recent sexual exposure among women with physical disability showed varied patterns across the countries surveyed. For instance, while Kenya showed no clear divide in the distribution of sexual exposure to women with physical disability across the regions, we observed

a north–south divide in countries like Malawi and Nigeria, with low sexual exposure seen among women in the southern regions but high among those in the northern regions. These variations could be attributed to socioeconomic and cultural disparities across the regions. In Nigeria, for instance, women in the northern parts of the country experience early marriage and sexual debut compared to those in the southern parts of the country [54], which could contribute to increased sexual exposure among women with physical disability [20] in the northern parts of the country.

Consistent with findings from previous studies [55, 56], our findings revealed that women with disability who were exposed to mass media had higher odds of being sexually exposed compared to those who had no mass media exposure. Mass media exposure (e.g., access to radio and television) is associated with increased access to information and education on sexuality, sexual exposure, and reproductive health among women with disability [57]. For instance, among young disabled women in Ethiopia, 62.2% learned about sexual and reproductive health on the radio and television [58]. Similarly, 45.7% of disabled women in Turkey Who had knowledge of sexually transmitted infections obtained the information through the media compared to 34.8% who had the information from their friends [24]. Aside from demystifying sexual exposure among individuals with a disability, the media also serves as a major source of information on sexual and reproductive health services, including the use of modern contraceptives [59, 60] and sexual aids [61], which could enhance disabled women's ability to be sexually exposed. As reported by Rade et al. [56], the uptake of sexual and reproductive health services among women with disability increases with increasing mass media exposure. Therefore, given that mass media exposure has a positive influence on sexual behaviour among women in SSA [62], our findings highlight the need to improve access and use of mass media among women with a disability while providing educational content on sexuality and sexual exposure to women through the media. Nonetheless, it is also important to educate women with disability on the responsible use of mass media to limit their exposure to hazardous media information or content.

The findings also revealed that women with disability aged 25–34 years were more likely to be sexually exposed compared to those aged 15–24 years. Similar findings were reported in previous studies [16, 63, 64], albeit in the general population. Evidence suggests that women aged 25–34 years have higher autonomy in sexual and reproductive health decision-making compared to those below 25 years [65]. Besides, in SSA, women aged 25–34 years are more likely to be married or live with a sexual partner, which could increase their sexual exposure [16]. As found

Odimegwu *et al. Archives of Public Health*   (2025) 83:232

Page 11 of 15

Table 4 Multilevel logistic regression models of mass media, covariates, and sexual exposure among women with disabilities using demographic health survey datasets in sub-Saharan Africa from 2013 to 2022

Variables (n = 16,157) Fixed effects	Model I	Model II aOR[95% CI]	Model III aOR[95% CI]	Model IV aOR[95% CI]	Model V aOR[95% CI]
Key independent					
Mass media exposure					
No exposure		1	1		1
Had exposure		1.35[1.25–1.45]			1.22[1.12–1.32]
Individual level					
Age of respondents					
15–24			1		1
25–34			1.16[1.04–1.29]		1.15[1.03–1.28]
35 & above			1.00[0.89–1.11]		1.00[0.89–1.11]
Educational level					
No education			1		1
Primary			1.58[1.45–1.73]		1.46[1.33–1.61]
Secondary and above			1.45[1.30–1.63]		1.36[1.20–1.53]
Marital status					
Never married			1		1
Currently married			9.76[8.22–11.60]		10.06[8.45–11.98]
Ever married			3.35[2.82–3.99]		3.37[2.82–4.02]
Wealth index					
Poorest			1		1
Poorer			1.16[1.04–1.29]		1.13[1.01–1.26]
Middle			1.28[1.14–1.43]		1.22[1.09–1.36]
Richer			1.48[1.32–1.67]		1.34[1.19–1.53]
Richest			1.66[1.44–1.91]		1.33[1.12–1.59]
Type of residence					
Urban			1		1
Rural			1.17[1.05–1.29]		1.23[1.10–1.37]
Community level					
Community literacy level					
Low				1	1
Medium				0.97[0.88–1.06]	0.92[0.83–1.01]
High				0.99[0.89–1.10]	0.80[0.71–0.90]
Community socio-economic level					
Low				1	1
Medium				1.71[1.46–2.01]	1.58[1.34–1.87]
High				1.46[1.33–1.60]	1.44[1.27–1.65]
Community modern contraceptive methods knowledge level					
Low				1	1
Medium				0.50[0.41–0.62]	0.60[0.49–0.75]
High				0.57[0.46–0.71]	0.64[0.50–0.80]
Random effects					
PSU variance (95% CI)	0.43[0.36–0.52]	0.45[0.37–0.54]	0.45[0.37–0.54]	0.45[0.37–0.55]	0.47[0.39–0.57]
ICC	0.12	0.12	0.12	0.12	0.13
LR TestX^2	$X^2$495.17, $p < 0.001$	$X^2$507.75, $p < 0.001$	$X^2$455.24, $p < 0.001$	$X^2$505.59, $p < 0.001$	$X^2$468.71, $p < 0.001$
WaldX^2	1	64.03, $p < 0.001$	1337.99, $p < 0.001$	161.39, $p < 0.001$	1415.41, $p < 0.001$
Model fitness					
Log-likelihood	−10,678.71	−10,646.68	−9907.52	−10,595.74	−9847.62
AIC	21,361.42	21,299.35	19,841.05	21,207.49	19,735.25

Odimegwu *et al. Archives of Public Health*   (2025) 83:232

Page 12 of 15

Table 4 (continued)

Variables (*n* = 16,157) Fixed effects	Model I	Model II aOR[95% CI]	Model III aOR[95% CI]	Model IV aOR[95% CI]	Model V aOR[95% CI]
BIC	21,376.84	21,322.49	19,941.31	21,269.19	19,889.5
Number of clusters	16,524	16,524	16,524	16,524	16,524

Countries included, Chad, Democratic Republic of the Congo, Kenya, Malawi, Mali, Mauritania, Nigeria, Rwanda, South Africa and Uganda

Weighted DHS

Exponentiated coefficients; 95% confidence intervals in brackets; AOR adjusted Odds Ratios, CI Confidence Interval

ICC Intra-Class Correlation, AIC Akaike's Information Criterion, PSU Primary Sampling Unit, BIC Schwarz's Bayesian Information Criteria, LR Test Likelihood ratio Test

Model I is the null model without any explanatory variables at the baseline model

Model II was adjusted for the key independent variable (Mass media)

Model III is adjusted for individual-level variables (Age of respondent, educational level, marital status, wealth index, and place of residence)

Model IV is adjusted for community-level variables (Community literacy level, community socio-economic level, community knowledge of modern methods)

Model V is the final model adjusted for key independent variables, individual and community-level variables

in the present study, women with disability who were currently married reported higher odds of being sexually exposed compared to those who were never married. Haynes et al. [20] suggested that young women with disability, as well as those who were not married, have an unmet need for contraceptive services, which could reduce their likelihood of being sexually exposed.

Similar to the findings of an earlier study by Vansteenwegen et al. [66], we found that women with disability who had higher education were more likely to be sexually exposed. The influence of education on sexual exposure could be attributed to the role of education in empowering women and enhancing their self-confidence and self-esteem [62], especially in making sexual and reproductive health decisions [67]. Besides, among women with disability, the school serves as a major source of information on sexual behaviour [24], including the use of contraception [68], which could contribute to the increased likelihood of sexual exposure among women. Also, our findings revealed that women with disability who were within the richest wealth index were more likely to be sexually exposed. Similar findings were reported in a previous study in Ethiopia [69]. Also, the current findings showed that women with disability who resided in communities with high socioeconomic status were more likely to be sexually exposed. Darteh et al. [67] reported that wealth is a major determinant of sexual behaviour and increased sexual exposure among women. Perhaps women with disability in communities with high socioeconomic status are more likely to be educated and wealthier, thus contributing to their increased likelihood of being sexually exposed.

Further, the current findings revealed that women with disability who resided in rural areas reported higher odds of being sexually exposed than those in urban areas. This finding contradicts a previous study that reported no significant difference in sexual exposure between disabled women residing in rural and urban areas [69]. The disparity in findings could be due to the varied scopes of the studies. Meanwhile, considering the limited access to sexual and reproductive health services among women with disability in rural areas [70], our findings highlight the need for policymakers to pay much attention to sexual exposure among disabled women in rural areas in order to minimise their risk for sexual and reproductive health problems [62]. Unexpectedly, we found that women with disability who resided in both communities with higher literacy levels and modern contraceptive method knowledge were less likely to be sexually exposed. Thus, we recommend further studies to explore the influence of community literacy level and modern contraceptive knowledge on sexual exposure among women with disability.

Strengths and limitations

Our use of the most recent nationally representative datasets of 10 countries across SSA to estimate the influence of mass media on sexual exposure among women with disability enhances the generalisation of our findings to disabled women in the countries surveyed. As far as we know, no previous study reported the prevalence of sexual exposure among reproductive-age women with a disability using nationally representative datasets in SSA. Thus, the current findings could serve as baseline data for future studies and monitoring of trends. Nonetheless, this study has some limitations. First, we did not determine the trend or nature of sexual exposure that the women with disabilities were engaged in. Thus, we could not report on their sexual risk behaviours, including risk for pregnancy and sexually transmitted infections. The study does not differentiate between types of disabilities. As such, it cannot account for how specific impairments

uniquely affect access to mass media or sexual exposure; at the same time, the current study did not determine the influence of specific types of mass media (e.g., radio, television, newspaper, etc.) on sexual exposure among women with disability. Finally, we could not infer causality but only reported on the association between mass media exposure and sexual exposure among women with disability due to the cross-sectional design of the present study.

Policy and practical implications

Findings from this study have important implications for public health and sexual and reproductive health among women with disability in SSA. Given that women with disability often encounter serious challenges in expressing their sexuality or getting access to sexual and reproductive health services, the current findings highlight the importance of developing and implementing targeted measures that address the sexual and reproductive health needs of women with disability in SSA, since the majority of them are sexually exposure. For instance, educating community members, families, and healthcare workers on sexuality and disability could help demystify the issue of sexuality among women with a disability and minimise the stigma, alienation, and discrimination often encountered by disabled women when expressing their sexuality or accessing sexual and reproductive health services. Also, considering the influence of mass media exposure on sexual exposure among women with disability, there is a need for policymakers to provide educational content on sexual and reproductive health promotion among women with disability through the media, whilst improving access and use of mass media among women with disability.

Additionally, interventions to improve sexual exposure among women with a disability could be targeted in regions with a low prevalence of sexually exposure women, disabled women aged 15–24 years, those with no education, those who are not married, those in the poorest wealth index, those in urban residence, and those in communities with lower socio-economic status. For instance, implementing policies to improve access to higher education among women with disability could heighten their knowledge and understanding of sexual exposure in their disability situation, promote safe sex practices (e.g., use of condoms), and improve sexual and reproductive outcomes. Promoting the sexual health and well-being of women with disability not only improves their emotional and psychological health but also reduces their risk for sexually transmitted infections and sexual abuse.

Conclusion and recommendation

Findings from this study revealed that the majority of women with disability in SSA are sexually exposed, with those exposed to mass media having higher odds of being sexually exposed. Thus, there is a need for policymakers to institute educational programs that promote the sexual and reproductive health of women with disability through the media, whilst improving access and utilisation of sexual and reproductive health services among women with disability. Also, interventions to improve sexual exposure among women with disability could be targeted in geographic regions with a low prevalence of sexually exposed women across the countries, disabled women aged 15–24 years, those with no education, those who are not married, those in the poorest wealth index, those in urban residence, and those in communities with lower socio-economic status.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Since the authors of this manuscript did not collect the data, we sought permission from the MEASURE DHS website and access to the data was provided after our intent for request was assessed and approved on the 13th of February 2024. Each SSA country's committee and the ethics Boards of partner organisations, such as the Ministries of Health, ethically accept the DHS surveys. The women who were interviewed gave either written or verbal consent during each of the surveys.

Consent for publication
Not applicable.

Odimegwu *et al. Archives of Public Health*   (2025) 83:232

Page 14 of 15

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Page 15 of 15

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