

Family Size, Years of Education, and Women's Awareness of HIV and AIDS Epidemic in Ghana

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Abstract:

Background: Women's awareness and understanding of HIV and AIDS are critical components in mitigating the spread of the disease and promoting preventive behaviours.

Objective: In line with this, the study set out to investigate how family size and years of education influence women's awareness of HIV and AIDS epidemic in Ghana.

Methods: Data were processed with SPSS version 27 and analysed with frequency distribution, Pearson's chi-squared test of independence and binary logistic regression. The frequency distribution was used to summarise participants responses into proportions. The Pearson's chi-squared test of independence was used to test the hypotheses postulated in the study to either accept or reject the null hypotheses. However, the binary logistic regression was used to determine the effect of both family size, and years of education on women's awareness of AIDS epidemic.

Results: The study found that: years of education was positively correlated with women's awareness of AIDS epidemic in Ghana while family size was negatively correlated with women's awareness of AIDS epidemic in Ghana.

Conclusion: Women with higher years of education are significantly more likely to beware of AIDS, understand its transmission, and adopt preventive measures. Based on this, the study recommends that healthcare providers should endeavour to promote female education and reproductive health initiatives to help play a crucial role in enhancing awareness and curbing the spread of HIV/AIDS in Ghana.

Keywords: acquired immunodeficiency syndrome; awareness; epidemic; family size; years of education; women

Introduction

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) is one of the greatest challenges facing the world today in terms of health, development, and human security [1-3]. Globally, AIDS-related illnesses are noted to be the leading cause of death among women of reproductive age [4,5]; hence, it has claimed more than 32.7 million lives around the world [6]. Worldwide, new HIV infections have declined by 40% since the peak in 1998 [6,7]; but the infections continue to occur at an alarming rate among women and girls [6]. In sub-Saharan Africa, nearly 60% of all new adult infections are among women and each day nearly 1,400 women and girls acquire HIV [6,8,9]. Which is an indication that women in sub-Saharan Africa still bear the burden of the HIV and AIDS epidemic [6,9-11]. Much of this is due to gender inequities, which limit women's ability to negotiate safe sex or select when or with whom they have sex [6,12,13]. Women are also biologically more susceptible to HIV infection through heterosexual sex than are men [6]. And existing prevention methods —

although essential to the HIV fight but are not enough to control the epidemic among women [6].

The HIV and AIDS epidemic continues to pose significant public health challenges in sub-Saharan Africa, including Ghana [9,15-18]. Despite notable progress in reducing new infections and expanding access to antiretroviral therapy, the burden of the HIV—the causative agent of AIDS—remains high in Ghana [19-25], especially among women of reproductive age [1,26,27]. Women's awareness and understanding of HIV and AIDS epidemic are critical components in mitigating the spread of the disease and promoting preventive behaviours [28,29].

Women's awareness of HIV and AIDS is influenced by socio-demographic factors including family size and years of education (schooling) [30-32]. Particularly, education is a vital determinant of health knowledge which helps in shaping individuals' ability to access, interpret, and apply health information [33-35]. Women with higher levels of education are generally

more informed about the modes of HIV transmission, prevention strategies, and available healthcare services [30,36-38]. On the other hand, family size might influence or be influenced by awareness levels, as larger families often correlate with limited access to education and healthcare resources due to financial and logistical constraints [30,39,40].

Despite these insights, discrepancies remain in the literature. While education is widely recognised as a positive influence on HIV and AIDS epidemic awareness [41,42], the impact of family size is less clear and may vary based on regional, socioeconomic, and cultural contexts [43,44]. Moreover, many studies focus on specific populations, such as young women or pregnant women, limiting the generalisability of findings [45,46]. There is also a need for more nuanced analyses that consider the interplay between education, family size, and other socio-demographic factors in shaping women's awareness of HIV and AIDS epidemic in Ghana [41,43]. In line with this, the study set out to investigate how family size and years of education influence women's awareness of HIV and AIDS epidemic in Ghana.

Specifically, the study seeks to:

- 1) Ascertain if family size influences women's awareness of HIV and AIDS epidemic in Ghana;
- 2) Analyse whether years of education predict women's awareness of HIV and AIDS in Ghana.

The study further hypothesised that there is no statistically significant relationship between family size, years of education, and women's awareness of HIV and AIDS in Ghana.

Methods

Data source

Data for the study were extracted from the 2022 GDHS. Data extracted revolved family size, years of education and awareness of AIDS epidemic. Primarily, these DHS data were preferred hence, it is nationally representative and offers a wealth of standardised, and reliable data [47-49].

Measures

The independent variables (IVs) are family size, and years of education. These variables were carefully chosen to examine how they interplay to influence women's awareness of AIDS epidemic in Ghana. The variables were indicators themselves. More importantly, understanding the influence of family size and years of education on women's AIDS awareness might help identify gaps, target interventions, and ultimately improve both women's health and broader public health outcomes [50-53] while the dependent variable (DV) is Awareness of AIDS epidemic.

Data Processing and Analysis

Data were processed with SPSS version 27 and analysed with frequency distribution, Pearson's chi-squared test of independence and binary logistic regression. The frequency distribution was used to summarise participants responses into proportions. The Pearson's chi-squared test of independence was used to test the hypotheses postulated in the study to either accept or reject the null hypotheses. However, the binary logistic regression was used to determine the effect of both family size, and years of education on women's awareness of AIDS epidemic.

Ethical Consideration

The DHS Program Implementers sought ethical approval from both Ghana Health Service Ethical Review Committee and ICF Institutional Review Board. This was done to assure that the survey procedures were in accordance with Ghana's, US, and international ethical research standards.

Results

In order to identify the proportion of women who are aware of the AIDS epidemic in Ghana triggered data extraction on a single item (ever heard of AIDS) used by the 2022 GDHS for analysis. After the analysis, the results revealed that 2623(90.6%) of women had heard of AIDS epidemic while 271(9.4%) had never heard of AIDS epidemic.

To ascertain the family size of women in Ghana instigated data extraction on a single item (number of household members) for analysis. After the analysis, the results revealed that 17.7% of the women had four (4) membership in the family while 0.0% had either eighteen or nineteen membership in the family (see Table 1).

Variable	Frequency	Percentage
Number of household members		
2	189	6.5
3	433	15.0
4	513	17.7
5	502	17.3
6	433	15.0
7	310	10.7
8	191	6.6
9	104	3.6
10	79	2.7
11	41	1.4
12	28	1.0
13	30	1.0
14	23	0.8
16	5	0.2
17	6	0.2
18	1	0.0
19	1	0.0
22	5	0.2
Total	2894	100.0

Table 1: Family Size in Ghana

Source: GDHS (2022).

Table 2 has outcome of Pearson's chi-squared test of independence on family size and women's awareness of AIDS epidemic in Ghana. This analysis was conducted to test the hypothesis there is no statistically significant relationship between family size and women's awareness of AIDS epidemic

in Ghana. Statistically significant relationship was between family size [$\chi^2=112.243$, $p<0.001$] and women's awareness of AIDS epidemic in Ghana.

Variable	No (%)	Yes (%)	Total n (%)	χ^2	P-value
Number of household members				112.243	0.001
2	5.8	94.2	189(100.0)		
3	7.2	92.8	433(100.0)		
4	6.4	93.6	513(100.0)		
5	4.0	96.0	502(100.0)		
6	9.7	90.3	433(100.0)		
7	12.9	87.1	310(100.0)		
8	14.1	85.9	191(100.0)		
9	16.3	83.7	104(100.0)		
10	19.0	81.0	79(100.0)		
11	19.5	80.5	41(100.0)		
12	21.4	78.6	28(100.0)		
13	43.3	56.7	30(100.0)		
14	26.1	73.9	23(100.0)		
16	20.0	80.0	5(100.0)		
17	0.0	100.0	6(100.0)		
18	0.0	100.0	1(100.0)		
19	0.0	100.0	1(100.0)		
22	20.0	80.0	5(100.0)		

Table 2: Relationship between Family Size and Women's Awareness of AIDS Epidemic in Ghana

Note: Row percentages in parenthesis, Chi-square significant at (0.001), (0.05), (0.10)

No: not aware Yes: aware

Source: GDHS (2022).

Further analysis was conducted with binary logistic regression on family size and women's awareness of AIDS epidemic in Ghana. This analysis was

conducted to determine the influence of family size on women's awareness of AIDS epidemic in Ghana (see Table 3).

Variable	B	Wald	Sig.	Exp(B)	95%CI	
Number of household members (2=1.0)						
3	-0.221	0.373	0.541	0.801	0.394	1.630
4	-0.107	0.088	0.767	0.899	0.445	1.817
5	0.398	1.068	0.301	1.489	0.700	3.170
6	-0.553	2.487	0.115	0.575	0.289	1.144
7	-0.874	6.105	0.013	0.417	0.208	0.835
8	-0.980	6.875	0.009	0.375	0.180	0.781
9	-1.151	7.943	0.005	0.316	0.142	0.704
10	-1.333	9.938	0.002	0.264	0.115	0.604
11	-1.367	7.419	0.006	0.255	0.095	0.682
12	-1.485	7.141	0.008	0.227	0.076	0.673
13	-2.516	27.245	0.000	0.081	0.031	0.208
14	-1.742	9.428	0.002	0.175	0.058	0.532
16	-1.398	1.451	0.228	0.247	0.025	2.403
17	18.419	0.000	0.999	99832715.008	0.000	0.000
18	18.419	0.000	1.000	99832715.008	0.000	0.000
19	18.419	0.000	1.000	99832715.008	0.000	0.000
22	-1.398	1.451	0.228	0.247	0.025	2.403
Constant	2.784	80.289	0.000	16.182		

Table 3: Binary Logistic Regression Results on Family Size and Women's Awareness of AIDS Epidemic in Ghana

Source: GDHS (2022).

After processing the data, the logistic regression model was significant at -2LogL = 1706.424; Nagelkerke R² of 0.068; $\chi^2=92.973$; $p<0.001$ with correct prediction rate of 90.6%. More importantly, the Model Summary which shows a Nagelkerke R² of 0.068 suggests that the model explains 6.8% of variance in the likelihood of women's awareness of AIDS epidemic

in Ghana. With this percentage contribution to the entire model, the results confirmed the whole model significantly predict women's awareness of AIDS epidemic in Ghana.

Table 3 revealed that seven (7) member household was significantly related to women's awareness of AIDS epidemic at $p=0.013$, (OR=0.417, 95%CI

([0.208-0.835]). This variable identifies those women to have 0.4times less likely to beware of AIDS epidemic compared with their counterparts with two (2) member household (see Table 3). Further, eight (8) member household was significant at $p=0.009$, (OR=0.375, 95%CI ([0.180-0.781])). This variable classifies those women to have 0.4times less likely to beware of AIDS epidemic compared with their counterparts with two (2) member household (see Table 3). Furthermore, nine (9) member household was significant at $p=0.005$, (OR=0.316, 95%CI ([0.142-0.704])). This variable recognises those women to have 0.3times less likely to beware of AIDS epidemic compared with their counterparts with two (2) member household (see Table 3).

Again, ten (10) member household was significant at $p=0.002$, (OR=0.264, 95%CI ([0.115-0.604])). This variable categorises those women to have 0.3times less likely to beware of AIDS epidemic compared with their counterparts with two (2) member household (see Table 3). Also, eleven (11) member household was significantly related to women's awareness of AIDS epidemic at $p=0.006$, (OR=0.255, 95%CI ([0.095-0.682])). This variable identifies those women to have 0.3times less likely to beware of AIDS epidemic compared with their counterparts with two (2) member household

(see Table 3). Additionally, twelve (12) member household was significant at $p=0.008$, (OR=0.227, 95%CI ([0.076-0.673])). This variable categorises those women to have 0.2times less likely to beware of AIDS epidemic compared with their counterparts with two (2) member household (see Table 3).

Also, thirteen (13) member household was significant related to women's awareness of AIDS epidemic at $p<0.001$, (OR=0.081, 95%CI ([0.031-0.208])). This variable identifies those women to have 0.08times less likely to beware of AIDS epidemic compared with their counterparts with two (2) member household (see Table 3). Then, fourteen (14) member household was significant related to women's awareness of AIDS epidemic at $p=0.002$, (OR=0.175, 95%CI ([0.058-0.253])). This variable identifies those women to have 0.2times less likely to beware of AIDS epidemic compared with their counterparts with two (2) member household (see Table 3).

To ascertain the years of education of women in Ghana triggered data extraction on single item (total number of years of education) used by the 2022 GDHS for analysis. After the analysis, the results revealed that 36.8% of women had schooled for twelve (12) years while 0.6% had schooled for three (3) years (see Table 4).

Total number of years of education	Frequency	Percentage
0	832	28.7
3	18	0.6
4	34	1.2
5	36	1.2
6	284	9.8
9	38	1.3
10	130	4.5
11	76	2.6
12	1064	36.8
15	27	0.9
16	50	1.7
17	22	0.8
18	283	9.8
Total	2894	100.0

Table 4: Years of Education of Women in Ghana

Source: GDHS (2022).

Table 5 has outcome of Pearson's chi-squared test of independence on years of education and women's awareness of AIDS epidemic in Ghana. This analysis was conducted to test the hypothesis there is no statistically

significant relationship between years of education and women's awareness of AIDS epidemic in Ghana. Statistically significant relationship was found between years of education [$\chi^2=270.061$, $p<0.001$] and women's awareness of AIDS epidemic in Ghana.

Variable	No (%)	Yes (%)	Total n (%)	χ^2	P-value
Total number of years of education				270.061	<0.001
0	23.0	77.0	832(100.0)		
3	16.7	83.3	18(100.0)		
4	2.9	97.1	34(100.0)		
5	11.1	88.9	36(100.0)		
6	7.4	92.6	284(100.0)		
9	10.5	89.5	38(100.0)		
10	3.8	96.2	130(100.0)		
11	5.3	94.7	76(100.0)		
12	3.1	96.9	1064(100.0)		
15	0.0	100.0	27(100.0)		
16	2.0	98.0	50(100.0)		
17	0.0	100.0	22(100.0)		
18	1.4	98.6	283(100.0)		

Table 5: Relationship between Years of Education and Women's Awareness of AIDS Epidemic in Ghana

Note: Row percentages in parenthesis, Chi-square significant at (0.001), (0.05), (0.10)

No: not aware Yes: aware

Source: GDHS (2022).

Further analysis was conducted with binary logistic regression on years of education and women's awareness of AIDS epidemic in Ghana. This analysis was necessary to determine the effect of years of education on women's awareness of AIDS epidemic in Ghana (see Table 6).

Variable	B	Wald	Sig.	Exp(B)	95CI	
Total number of years of education (0=1.0)						
3	0.399	0.391	0.532	1.490	0.427	5.201
4	2.286	5.038	0.025	9.833	1.336	72.366
5	0.869	2.620	0.106	2.384	0.833	6.825
6	1.317	29.788	0.000	3.732	2.326	5.988
9	0.929	3.017	0.082	2.533	0.888	7.227
10	2.008	18.774	0.000	7.449	3.003	18.476
11	1.680	10.422	0.001	5.363	1.935	14.870
12	2.231	130.750	0.000	9.309	6.351	13.646
15	19.992	0.000	0.998	481366138.821	0.000	0.000
16	2.681	6.998	0.008	14.601	2.003	106.432
17	19.992	0.000	0.998	481366138.821	0.000	0.000
18	3.034	35.357	0.000	20.784	7.645	56.502
Constant	1.211	215.715	0.000	3.356		

Table 6: Binary Logistic Regression Results on Years of Education and Women's Awareness of AIDS Epidemic in Ghana

Source: GDHS (2022). Significant at 0.05.

After processing the data, the logistic regression model was significant at -2LogL = 1541.962; Nagelkerke R² of 0.184; $\chi^2=257.435$; $p<0.001$ with correct prediction rate of 90.6%. More importantly, the Model Summary which shows a Nagelkerke R² of 0.184 suggests that the model explains 18.4% of variance in the likelihood of women's awareness of AIDS epidemic in Ghana. With this percentage contribution to the entire model, the results confirmed the whole model significantly predict women's awareness of AIDS epidemic in Ghana.

Table 6 revealed that schooled for four (4) years was significantly related to women's awareness of AIDS epidemic at $p=0.025$, (OR=9.833, 95%CI ([1.336-72.366])). This variable identifies those women to have 9.8times more likely to beware of AIDS epidemic compared with their counterparts who had no years of education (see Table 6). Further, schooled for six (6) years was significant at $p<0.001$, (OR=3.732, 95%CI (2.326-5.988)). This variable classifies those women to have 3.7times more likely to beware of AIDS epidemic compared with their counterparts who had no years of education (see Table 6). Furthermore, schooled for ten (10) years was significant at $p<0.001$, (OR=7.449, 95%CI ([3.003-18.476])). This variable recognises those women to have 7.4times more likely to beware of AIDS epidemic compared with their counterparts who had no years of education (see Table 6).

Again, schooled for eleven (11) years was significant at $p<0.001$, (OR=5.363, 95%CI ([1.935-14.870])). This variable categorises those women to have 5.4times more likely to beware of AIDS epidemic compared with their counterparts who had no years of education (see Table 6). Also, schooled for twelve (12) years was significantly related to women's awareness of AIDS epidemic at $p<0.001$, (OR=9.309, 95%CI ([6.351-13.646])). This variable identifies those women to have 9.3times more likely to beware of AIDS epidemic compared with their counterparts who had no years of education (see Table 6). Additionally, schooled for sixteen (16) years was significant at $p=0.008$, (OR=14.601, 95%CI ([2.003-106.432])). This variable categorises those women to have 14.6times more likely to beware of AIDS epidemic compared with their counterparts who had no years of education (see Table 6). Moreover, schooled for eighteen (18) years was significant at $p<0.001$, (OR=20.784, 95%CI ([7.645-56.502])). This variable categorises those women to have 20.8times more likely to beware of AIDS epidemic compared with their counterparts who had no years of education (see Table 6).

Discussion

The study aimed to investigate the influence of family size and years of education on women's awareness of the AIDS epidemic in Ghana. The findings reveal that years of education increase AIDS awareness among women. This finding is consistent with previous studies which found that awareness regarding HIV/AIDS was highest among higher educated women and lowest among the illiterate women [54-59]. This finding suggests that education, particularly for girls and young women, is a powerful tool for increasing AIDS awareness [60,61]. More education leads to better understanding of HIV/AIDS transmission, prevention methods, and access to health services [30,61,62]. Further, it suggests that education plays a crucial role in empowering women with the knowledge and skills to protect themselves and others from HIV infection [63]. The plausible explanation to this finding could be that those women have increased access to schooling and have AIDS education and life skills training been incorporated into the curriculum which have immensely increased their understanding on HIV prevention information, improved their access to health services, and reduced their vulnerability to risky sexual behaviours [62,64].

The study found that family size tends to lead to lower odds of AIDS awareness among women of which women from larger households (seven or more children) exhibited lower levels of knowledge. This finding implies that women with larger families may be more focused on raising children, might have less time or resources for education and awareness campaigns about HIV/AIDS [65-67]. The plausible explanation to this finding could probably be that these women have limited access to information, education, resources, and are prone to higher stress levels due to increased family demands [68-72]. Additionally, it could be that social norms and gender inequalities play a crucial role in limiting their ability to access health information and services [73-75].

The study found that relationship exists between years of education and women's awareness of AIDS epidemic in Ghana. Therefore, the null hypothesis was not confirmed. A p-value of <0.001 found indicates a strong relationship. This suggests that years of education has a higher influence on women's AIDS awareness in Ghana. This finding is in line with previous studies which found that there exists a significant positive association between higher levels of education and HIV-related knowledge level [30,76].

The study found that relationship exists between family size and awareness of AIDS epidemic in Ghana due to this the null hypothesis was refuted. A p-

value of <0.001 found indicates a strong relationship which meant that family size speaks more about women's AIDS awareness in Ghana.

The study found that 36.8% of women had schooled for twelve (12) years. This finding suggests a significant level of education attainment within the study population [77-79]. A 12-year schooling period typically corresponds to completion of both primary and secondary education indicating a basic level of formal education [80,81]. The plausible explanation to this finding could be that these proportion of educated women have access to various factors, including socioeconomic status, access to educational resources, and government policies [82]. However, the 0.6% of women who had schooled for three (3) years reason could be attributed to a combination of various factors such as economic incentives, social pressure, access to education, affordability, and cultural norms and government support [83].

The study found that 17.7% of Ghanaian women live in a four (4) member households. This suggests a significant segment of the population lives in nuclear, moderately sized families, which often correlates with better socioeconomic conditions, and greater access to education and health services [84-86]. A family of four is generally considered a moderate household size in Ghana, especially when compared to larger households (often 6 or more members) common in rural and low-income settings [87]. Smaller household sizes (like four members) are more common in urban areas where nuclear family structures and housing limitations are more prevalent [88]. Larger households are more typical in rural settings, where extended families often live together [88]. Smaller households may experience less strain on household resources such as food, education, and healthcare. Women in smaller households might have more time and resources to seek education or health services, including HIV/AIDS awareness programs [30].

Conclusion

The study on family size, years of education, and women's awareness of the AIDS epidemic in Ghana highlights a strong link between years of education and AIDS awareness among women. Women with higher years of education are significantly more likely to beware of AIDS, understand its transmission, and adopt preventive measures. Based on this, the study recommends that healthcare providers should endeavour to promote female education and reproductive health initiatives to help play a crucial role in enhancing awareness and curbing the spread of HIV/AIDS in Ghana.

Limitation of the Study

The study could not establish causal relationships between variables; hence, the GDHS data used were collected at a single point in time (cross-sectional), therefore, it only provided a snapshot rather than tracking changes or developments over time. As a result of this, the findings should be interpreted with caution.

Declaration

Abbreviations

AIDS	Acquired immunodeficiency syndrome
DHS	Demographic and Health Survey
DV	Dependent Variable
GDHS	Ghana Demographic and Health Survey
GSS	Ghana Statistical Service
HIV	Human Immunodeficiency Virus
IVs	Independent Variables
SPSS	Statistical Package for the Social Sciences

Ethics Approval and Consent to Participate

The GDHS Program obtained ethical approval from both The Ghana Health Service's Ethics Review Committee (ERC) and The ICF Institutional Review Board (IRB) for ethical review. This dual approval process assure that the survey adheres to ethical guidelines and protects the rights of participants.

Consent for publication

Not Applicable

Availability of Data and Materials

The datasets used is the 2022 GDHS data. Therefore, it is publicly available online at <https://dhsprogram.com/data>. This is Measure DHS Initiative or Program.

Competing Interests

Author did not register any conflict of interest.

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Author's Contributions

Anthony Edward Boakye is the sole author of the Manuscript

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