


RESEARCH ARTICLE

Association between women's empowerment and diarrhoea in children under five years: evidence from the 2017/18 Benin Demographic and Health Survey

Betregiorgis Zegeye¹, Dina Idriss-Wheeler² and Sanni Yaya^{3,4*} 

¹HaSET Maternal and Child Health Research Program, Shewarobit, Ethiopia, ²Interdisciplinary School of Health Sciences, Faculty of Health Sciences, University of Ottawa, Ottawa, Canada, ³School of International Development and Global Studies, University of Ottawa, Ottawa, Canada and ⁴The George Institute for Global Health, Imperial College London, London, UK

*Corresponding author: Email: sanni.yaya@uOttawa.ca

(Received 25 April 2021; revised 7 October 2021; accepted 8 October 2021; first published online 24 November 2021)

Abstract

Globally, diarrhoea is the third leading cause of death for under five-children. Women's empowerment can significantly reduce under-five mortality due to diarrhoea. This study investigated the association between women's empowerment and childhood diarrhoea in Benin using data from the 2017/18 Benin Demographic and Health Survey. A total of 7979 currently married women were included in the study. A logistic regression model was used to control for possible confounders. The prevalence of diarrhoea among children under five years of age was 13.6%. About 36.3% of the currently married women decided either alone or together with their husband on their own health, purchase of large household items and visiting family/relatives. Close to 65.4% of currently married women disagreed with all five reasons to justify wife-beating. The children of mothers who had decision-making power were less likely to have diarrhoea (aOR = 0.74, 95% CI: 0.57–0.96) than the children of mothers who had no decision-making power. Moreover, the children of mothers who disagreed with all five reasons to justify wife-beating (aOR = 0.79, 95% CI: 0.65–0.96) were less likely to have diarrhoea than the children of mothers who accepted wife-beating as a part of life. Women's age, educational level, wealth index and region were associated with childhood diarrhoea in Benin. The role of women's empowerment, as determined by decision-making power and wife-beating attitude, was found to be significantly associated with the risk of childhood diarrhoea in Benin, after adjusting for other variables. Therefore, it is essential for policymakers in Benin to reinforce strategies and interventions focusing on women's empowerment to avert childhood mortality caused by diarrhoea. This includes improving household economic status, women's education and decision-making power and enhancing awareness of women's human and democratic rights.

Keywords: Women's empowerment; Childhood; Diarrhoea

Introduction

Although there have been improvements in under-five child mortality rates over the last two and a half decades, these continue to be high in low- and middle-income countries (LMICs) (Lawn *et al.*, 2014; United Nation, 2015a; Wang *et al.*, 2016). Among 139 LMICs, only 24 nations met the Millennium Development Goals' (MDG) target to reduce child mortality by two-thirds (United Nation, 2015a; Wang *et al.*, 2016). The under-five mortality ratio is 1 in 147 in high-income countries, whereas in sub-Saharan Africa and Southern Asia, the ratio is 1 in 12 and 1 in 19, respectively. The current UN Sustainable Development Goal 3 (SDG-3) continues the global commitment, beyond the MDGs, to reduce under-five mortality to 25 deaths per

1000 live births by 2030 (United Nation, 2015b). According to the 2016 Global Burden of Disease (GBD) study, diarrhoea was the third leading cause of under-five child mortality in 2015 (GBD 2016 Cause of Death Collaborators, 2017) and continues to be the major cause of death among under-five children in low-income countries (WHO, 2017). In Africa and South Asia, over 80% of all under-five deaths were due to diarrhoeal diseases (UNICEF, 2012).

Benin had the fourth highest rate of childhood diarrhoea-related case fatalities in Africa in 2015 after Lesotho, Mali and Sierra Leone – accounting for an estimated 16 deaths per 10,000 children (Reiner *et al.*, 2018). Diarrhoeal disease-related case fatality rates increased between 2000 and 2016 in Benin, from 15 deaths per 10,000 to 16 deaths per 10,000 children, respectively (Reiner *et al.*, 2018). More recently, the 2018 CDC report published that diarrhoeal disease is fourth in the list of top ten causes of disease in Benin (CDC, 2018).

Efforts to address child mortality have focused on tackling immediate causes such as diarrhoea and pneumonia (Liu *et al.*, 2016). Several proximal and distal factors for childhood diarrhoeal disease (i.e. presence of latrine facility, waste disposal system, personal hygiene, income, maternal education) have been explored (Mihrete *et al.*, 2014; Teklemichael *et al.*, 2014; Dessalegn *et al.*, 2014; Mossie *et al.*, 2014; Alambo *et al.*, 2015; Liu *et al.*, 2016). However, the distal factors of gender equality and women's empowerment that fuel the immediate causes have received little attention (Marmot, 2005). Evidence shows that women's empowerment is a function of both demographic and socioeconomic factors in a society (Ndaimani *et al.*, 2018). Empowerment of women is the process of enabling them to have the power to navigate life's challenges in all areas of their lives (Mahmud *et al.*, 2012). It is the process of enabling women with less influence or power to make informed choices in all matters that affect their health and well-being and that of their children (Doku *et al.*, 2020).

Gender equality and women's empowerment are key components of the development agenda worldwide (United Nation, 2015b). Efforts towards achieving MDG-3, which sought to promote gender equality and women's empowerment, have led to some significant gains over the last two decades (United Nation, 2015a). The UN's SDG-5 continues the call to achieve gender equality and empower all women and girls by 2030 (UN Women, 2021). Among the indicators of women's empowerment, women's decision-making power and attitude towards wife-beating are two key components (Kishor & Subaiya, 2008; Jennings *et al.*, 2014; Hanmer & Klugman, 2016).

Conceptual framework

For a clearer understanding of the possible mechanisms and factors associated with how women's empowerment could affect child health, a heuristic model was created to organize key findings to date (Figure 1). Women's empowerment enhances the likelihood of maternal health services utilization such as antenatal care, health facility delivery and postnatal care services (Furuta & Salway, 2006; Nguyen *et al.*, 2014; Wado, 2018). Women's health autonomy (i.e. making decisions about own health care and not needing permission to seek medical help) and health care service utilization are positively associated with childhood services such as immunization and the treatment of fever and acute respiratory infections (Ariyo & Jiang, 2020). Additionally, women's empowerment has been shown to have a positive influence on water, sanitation and hygiene related interventions (Dery *et al.*, 2019).

Throughout the world, women are predominantly responsible for taking care of children in a household (Treas & Drobnič, 2010). To fulfil this responsibility, women need adequate resources within the home and a degree of control over the use of these (Alemayehu *et al.*, 2015). In other words, women with decision-making power (i.e. on use of household income) may also have influence over the quantity and quality of food purchased and consumed by her children (IFPRI, 2014; Abate & Belachew, 2017; Mekonnen *et al.*, 2021).

As for women's wife-beating attitude, women who disagree with or refuse to justify wife-beating tend to have a stronger role in decision-making (Ebrahim & Atteraya, 2018). They are

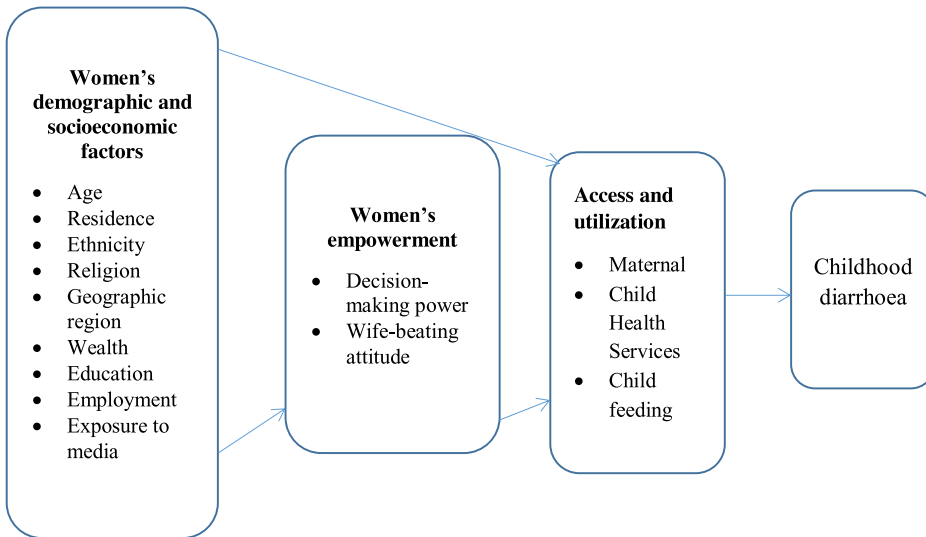


Figure 1. Theoretical framework for the association between women's empowerment and childhood diarrhoea.

more likely to participate in decisions regarding income allocated to purchase items for themselves and their children, particularly on food and feeding practices, which affect children's health. Furthermore, they are not forced to provide foods that are only available in the home, which can be less expensive but less nutritious (Mekonnen *et al.*, 2021). Studies have shown that the mothers who have decision-making authority, and access to and sufficient control over economic resources, have a positive impact on their children's health (Richards *et al.*, 2013; Budu *et al.*, 2020). A systematic review by Pratley (2016) showed that women's empowerment had a positive association with the uptake of childhood immunization and good child feeding practices in developing countries. Furthermore, studies from sub-Saharan Africa have demonstrated that the children of mothers with inadequate decision-making capability on health care are more likely to suffer from malnutrition and related childhood morbidity and mortality (Fantahun *et al.*, 2007; Alemayehu & Meskele 2017). Recent work has found that women's socio-demographic factors – age, place of residence, ethnicity, religion, region, educational level, employment status, economic status and media exposure – influence both childhood diarrhoea (Woldeamanuel, 2020) and women's empowerment (MOWCY *et al.*, 2019).

The few studies that have looked at women's empowerment and child health have focused on child nutrition (Cunningham *et al.*, 2015; Yimer & Tadesse, 2015; Jones *et al.*, 2019; Kuche *et al.*, 2019; Abreha *et al.*, 2020). There is little evidence on the role of women's empowerment on childhood mortality, and in particular, the correlation between women's empowerment and childhood diarrhoea is largely unknown. As a result, this study examined the role of women's empowerment in the reduction of childhood diarrhoea prevalence in Benin using 2017/18 Benin Demographic and Health Survey data. It was hypothesized that women who make decisions on household, health and visiting family, as well as those who do not agree with any of the reasons to justify wife-beating, are less likely to have a child under five years of age who had diarrhoea in the weeks before the survey.

Methods

The health system in Benin

Located in West Africa, Benin has been one of the most politically stable countries in Africa following its democratic election in 1991 (Jhpiego, 2012; USAID, 2016). It had a population of

close to 11.5 million in 2018 (World Bank, 2019). The UNDP 2019 Human Development Index report ranks Benin 163 out of 189 countries (UNDP, 2019), with two-fifths (40%) of the population estimated to be living in poverty and within-country disparities and inequities resulting in non-inclusive economic growth (African Development Bank Group, 2020).

Historically, the focus of Benin's health system has been on the public sector, with stringent governing processes and centralized decision-making (SHOPS Project, 2013). The country's twelve departments are divided into 34 health zones, each containing 1–4 communes managed by health zone committees and management teams (USAID, 2016). Each zone has department health centres, community health centres and a hospital. A health zone office oversees all public and private health entities within a given zone, including private and public hospitals, clinics and pharmacies. The existence of a private health sector in Benin is a relatively new development that is quickly growing as a result of several factors, including accelerated urbanization and poor access to, and quality of, public services. Human resources for health are a major health system problem in Benin, particularly in regard to quantity, quality and distribution, and this adversely affects health service quality throughout the country (USAID, 2016).

Data sources

Data for analysis were extracted from the 2017/18 Benin Demographic and Health Survey (BDHS). This is the fifth in a series of DHS carried out in the country since 1996, except the 2018 Multiple Indicator Cluster Survey (MICS). The BDHS is a nationally representative survey with the aim of collecting data on many topics, including antenatal care, skilled delivery service, postnatal care, child immunizations services, maternal death, child death, nutritional status of women and their children, and HIV/AIDS. The survey was carried out with the technical assistance of Inner-City Fund (ICF) International provisioned through the USAID-funded MEASURE DHS Program. A two-stage stratified cluster sampling technique was applied. Large geographic settings (enumeration areas) were selected in the first stage through probability proportional to size (PPS). Then, fixed numbers of households were selected from each EA in the second stage using systematic sampling technique. Details of the methodology can be found in the 2017/18 BDHS final report (INSAE & ICF, 2019). The individual recode file (KR) was used for analysis. This study included data for 7979 currently married women aged 15–49.

Dependent variable

The outcome variable was 'childhood diarrhoea'. The passage of three or more loose or watery stools per day is considered diarrhoea (or more frequent passage than is normal for the individual) (WHO, 2017). In the DHS, women with under-five children are asked: 'has [child name] had diarrhoea in the last 2 weeks?' (INSAE & ICF, 2019, p. 521). Hence, analysis for this study included children under age five who were reported to have had diarrhoea in the 2-week period preceding the survey (WHO & UNICEF, 2013; Rutstein *et al.*, 2016). Childhood diarrhoea was a binary variable, with children under five who had diarrhoea in the 2 weeks preceding the survey coded '1' and those who did not coded '0'.

Independent (women's empowerment) variables

Women's empowerment is a key component for strategies promoting health and combating poverty in development work. No widely accepted measurement indicator exists because of the continued debate over the meaning of women's empowerment and multiple underlying theoretical perspectives (i.e. feminist, political philosophy, psychology, community development) (Gram *et al.*, 2019). Following Gram *et al.*'s (2019) pragmatic approach, it was determined that the best measures of women's empowerment that make 'the most sense for [our] own context'

(p. 1368) were decision-making and wife-beating attitude. The former is an objective measure and the latter a subjective measure. These are the two main indicators of women's empowerment used in research (Kishor & Subaiya, 2008). In order to assess empowerment, a decision-making gradient was used (moderately empowered or highly empowered) while attitude towards wife-beating provided a subjective measure to consider the cultural context.

A woman's decision-making power was assessed from whether they make specific decisions, either alone or jointly with their husband, on: 1) their own health care; 2) large household purchases and; 3) visits to family or relatives. If a woman did not make decision on any of the three decision-making parameters, either alone or with her husband, i.e. if all decisions were made by her husband or another member of the family, she was considered to have no decision-making power (i.e. not empowered). If a woman decided, either alone or jointly with her husband, on two of the three decision-making parameters, she was considered to have some decision-making power and coded '1' (moderately empowered). Finally, if a woman made decisions, either alone or together with her husband, on all three decision-making parameters, she was considered to have high decision-making power and coded '2' (highly empowered).

A woman's attitude to wife-beating was assessed from whether they disagreed with specific reasons for justifying wife-beating, i.e. burning food, arguing with husband, going out without telling husband, neglecting the children and refusing to have sexual intercourse with husband. If a woman disagreed with/did not justify all five wife-beating parameters, she was coded as 'disagrees/does not justify' wife-beating. If a women agreed it was justified or acceptable to beat a wife for any of the five stated reasons as a normal healthy part of life, she was coded as 'accepts/justifies' wife-beating (Kishor & Subaiya, 2008).

Control variables

Several individual- and community-level factors, based on previously available literature (Kishor & Subaiya, 2008; Mahmud *et al.*, 2012; Dessalegn *et al.*, 2014; Mihrete *et al.*, 2014; Teklemichael *et al.*, 2014; Alambo *et al.*, 2015; Oyediran, 2016; Gurm & Endale, 2017; Doku *et al.*, 2020; Astutik *et al.*, 2020), were considered as confounder variables and controlled for their influence on the outcome and independent variables (see Figure 1). The socio-demographic factors included maternal age (15–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49); woman's education (no formal education, primary school, secondary school, higher); husband's education (no formal education, primary school, secondary school, higher); woman's employment for cash (no, yes); religion (Vodoun, Islam, Catholic, Protestant Methodist, Other Protestant, Celestes, Other Christian, No Religion, Other); region (Alibori, Atacora, Atlantic, Borgou, Collines, Couffo, Donga, Littoral, Mono, Oueme, Plateau, Zou); place of residence (urban, rural); ethnicity (Adja and related, Bariba and related, Dendi and related, Fon and related, Yoa-Lokpa and related, Betamaribe and related, Peulh and related, Yoruba and related, Other Beninois, Other); and husband's occupation (not working, professional/technical/managerial, sales, agricultural self-employed, agricultural employee, services, skilled manual, other). The DHS wealth index was used to categorize respondents into poorest, poorer, middle, richer, richest wealth quintiles.

Statistical analysis

STATA version-14 software was used for data analysis. Editing and imputation of missing data were conducted by the DHS Programme before data were released for use (Rutstein & Rojas, 2006; Croft *et al.*, 2018). The DHSs in LMICs are prone to being incomplete as well as having partial or inconsistent reporting of responses for different questions because of the complexity of the questionnaires. The purpose of data editing and imputation in the DHS is to accurately reflect the population studied and makes it useable for analysis (Rutstein & Rojas, 2006; Croft *et al.*, 2018). Missing values on who usually make specific decisions were assumed to be someone other

than the respondent and excluded from the numerators (Kishor & Subaiya, 2008; Rutstein & Rojas, 2006; Croft *et al.*, 2018).

Descriptive statistics provided measures of frequencies and dispersion to provide a socio-demographic profile of the sample population using the exploratory variables. Inferential statistics were completed through non-parametric bivariate analysis using Pearson's chi-squared test between each of the independent variables and prevalence of childhood diarrhoea. This resulted in the unadjusted effect of the explanatory variables on the prevalence of childhood diarrhoea. A multicollinearity test was carried out using the variance inflation factor (VIF) to check for collinearity between explanatory variables; the results revealed no evidence of multicollinearity (VIF Mean = 1.20, VIF Max = 1.66, VIF Min = 1.02). Multivariable Logistic Regression (MLR) was used to determine the effect of women's decision-making power and wife beating attitude on the reduction in childhood diarrhoea, controlling for confounding variables and resulting in Adjusted Odds Ratios (aOR), using a 95% Confidence Intervals (CI) and testing for significance.

To account for the complex sampling design used to collect DHS data, the *svyset* and *subpop* STATA commands were used to weight the sample and reflect the population of married women (i.e. sampling clusters, strata and sub-population were appropriately considered).

Results

Background characteristics of respondents

Table 1 presents the socioeconomic characteristics of married Beninese women by prevalence of childhood diarrhoea. Of the 7979 currently married women included in the study, about 5.5% and 17.6% were in the age groups 15–19 and 20–24 years, respectively. More than three-fifths (60.3%) were rural residents, and nearly 66.3% of the women and 54.1% of their husbands had no formal education. About 27.3% had no decision-making power, either alone or together with their husbands, on any of the three decision-making parameters (own health, large purchases and visiting relatives), whereas 36.4% and 36.3% had decision-making power on two and three of the parameters, respectively. About 65.4% of the women disagreed with all five wife-beating justifications, and the rest (34.6%) justified or accepted at least one of the reasons. About 13.6% of the under-five children of currently married women had diarrhoea.

Prevalence of childhood diarrhoea by explanatory variables

The prevalence of diarrhoea in under-five children varied by explanatory variables (Table 1). For instance, about 13.7% of the under-five children of mothers with no formal education had diarrhoea, and the percentage decreased to 4.3% for those of mothers who attained higher education. Notably, a 19.3 percentage point difference in the prevalence of childhood diarrhoea was evident among children residing in the Atacora (25.9%) and Zou (6.6%) regions. Bivariate analysis showed all the variables included in the model were significantly associated with under-five childhood diarrhoea in Benin: woman's age and education, husband education and occupation, household wealth index, religion, ethnicity and urbanity/rurality, as well as the women's empowerment variables of decision-making and justification of wife-beating.

Women's empowerment as a predictor of childhood diarrhoea

Decision-making was found to be significantly associated with childhood diarrhoea (Table 2). The odds of childhood diarrhoea among children whose mother had decision-making power on all three decision-making parameters were lower (i.e. 26% less chance) compared with children whose mother had no decision-making power on any of the parameters (aOR = 0.74, 95% CI: 0.57–0.96). Furthermore, women's age (20–24 years: aOR = 1.94, 95% CI: 1.20–3.15; 25–29 years: aOR = 2.06, 95% CI: 1.25–3.40, 30–34 years: aOR = 1.78, 95% CI: 1.07–2.97), women's

Table 1. Socioeconomic characteristics of married Beninese women by prevalence of childhood diarrhoea, 2017/18 Benin DHS, $N = 7979$

Variable	Total n (%) ^a	Childhood diarrhoea n (%) ^a	χ^2 , p -value
Woman's age (years)			$\chi^2 = 18.59$, $p < 0.01$
15–19	623 (5.5)	52 (13.13)	
20–24	1944 (17.6)	262 (16.09)	
25–29	2649 (23.8)	343 (14.81)	
30–34	2033 (18.2)	206 (12.40)	
35–39	1726 (15.3)	147 (12.15)	
40–44	1168 (10.5)	60 (10.95)	
45–49	1027 (9.1)	30 (13.64)	
Woman's educational level			$\chi^2 = 16.25$, $p < 0.01$
No formal education	7399 (66.3)	716 (13.66)	
Primary school	1962 (17.8)	226 (16.04)	
Secondary school	1651 (14.6)	153 (12.61)	
Higher education	158 (1.3)	5 (4.31)	
Husband's educational level			$\chi^2 = 8.46$, $p < 0.05$
No formal education	5755 (54.1)	588 (14.11)	
Primary school	2130 (20.8)	224 (14.83)	
Secondary school	2063 (19.3)	182 (12.48)	
Higher education	656 (5.8)	48 (10.34)	
Husband's occupation			$\chi^2 = 17.74$, $p < 0.05$
Not working	249 (2.1)	25 (15.92)	
Professional/technical/managerial	1491 (13.6)	140 (13.35)	
Sales	1007 (9.1)	87 (11.68)	
Agricultural self-employed	4493 (40.0)	479 (14.80)	
Agricultural employee	322 (2.8)	40 (17.39)	
Services	1385 (12.7)	115 (11.29)	
Skilled manual	1820 (16.5)	186 (14.60)	
Other	370 (3.2)	25 (10.12)	
Woman employed for cash			$\chi^2 = 8.59$, $p < 0.01$
No	1441 (15.2)	174 (16.46)	
Yes	7797 (84.8)	706 (13.08)	
Wealth index			$\chi^2 = 31.49$, $p < 0.001$
Poorest	2261 (19.4)	258 (15.11)	
Poorer	2204 (19.8)	262 (16.48)	
Middle	2158 (20.0)	222 (14.12)	
Richer	2241 (20.9)	204 (12.97)	
Richest	2306 (19.9)	154 (10.03)	

(Continued)

Table 1. (Continued)

Variable	Total <i>n</i> (%) ^a	Childhood diarrhoea <i>n</i> (%) ^a	χ^2 , <i>p</i> -value
Religion			$\chi^2 = 21.36$, <i>p</i> < 0.01
Vodoun	1042 (9.3)	109 (15.18)	
Islam	3639 (32.9)	379 (14.10)	
Catholic	2362 (21.1)	184 (11.49)	
Protestant Methodist	534 (4.7)	55 (14.91)	
Other Protestant	387 (3.5)	42 (16.28)	
Celestes	872 (8.1)	89 (13.71)	
Other Christian	1489 (13.1)	131 (12.27)	
No religion	621 (5.3)	85 (18.52)	
Other	224 (2.0)	26 (15.38)	
Ethnicity ^b			$\chi^2 = 93.74$, <i>p</i> < 0.001
Adja	1493 (13.1)	143 (13.45)	
Bariba	1290 (12.2)	148 (15.71)	
Dendi	657 (6.1)	58 (12.18)	
Fon	3740 (34.5)	284 (11.08)	
Yoa-Lokpa	338 (3.1)	45 (18.83)	
Betamaribe	715 (6.0)	138 (26.14)	
Peulh	1,085 (9.4)	107 (12.81)	
Yoruba	1235 (10.5)	115 (13.25)	
Other Beninese	446 (3.7)	45 (13.20)	
Other	171 (1.4)	17 (13.82)	
Region			$\chi^2 = 173.13$, <i>p</i> < 0.001
Alibori	1398 (13.9)	162 (15.82)	
Atacora	973 (8.0)	187 (25.90)	
Atlantic	1100 (11.7)	93 (12.60)	
Borgou	1348 (12.4)	98 (9.61)	
Collines	900 (6.6)	67 (10.57)	
Couffo	728 (6.7)	65 (12.20)	
Donga	792 (6.4)	96(16.19)	
Littoral	803 (4.9)	60 (11.52)	
Mono	561(4.6)	63 (16.03)	
Oueme	830 (8.8)	65 (11.13)	
Plateau	697 (6.4)	95 (20.00)	
Zou	1040 (9.6)	49 (6.60)	
Place of residence			$\chi^2 = 5.06$, <i>p</i> < 0.05
Urban	4609 (39.7)	408 (12.73)	
Rural	6561 (60.3)	692 (14.50)	

(Continued)

Table 1. (Continued)

Variable	Total <i>n</i> (%) ^a	Childhood diarrhoea <i>n</i> (%) ^a	χ^2 , <i>p</i> -value
Decision-making empowerment			$\chi^2 = 29.38$, <i>p</i> < 0.001
Not empowered	3038 (27.3)	378 (16.24)	
Moderately empowered	4051 (36.4)	426 (14.32)	
Highly empowered	4081 (36.3)	296 (11.05)	
Wife-beating attitude			$\chi^2 = 19.23$, <i>p</i> < 0.001
Accepts/justifies	3793 (34.64)	439 (16.14)	
Disagrees/does not justify	7377 (65.36)	661 (12.57)	
Childhood diarrhoea			
No	6879 (86.4)		
Yes	1100 (13.6)		

^aWeighted.^bAll main categories include related ethnicities.

educational level (primary school: aOR = 1.36, 95% CI: 1.06–1.73), wealth index (richest: aOR = 0.67, 95% CI: 0.45–0.99) and region (Borgou: aOR = 0.42, 95% CI: 0.28–0.63; Zou: aOR = 0.40, 95% CI: 0.19–0.82) were all associated with childhood diarrhoea.

Another main finding from the current study was the significant association between the wife-beating attitude of the women and the prevalence of childhood diarrhoea. More specifically, under-five children whose mothers did not agree with, or justify, wife-beating for any of the five parameters (burning food, arguing with husband, going out without telling husband, neglecting the children, refusing to have sexual intercourse with husband) had a 21% lower chance of diarrhoea compared with those whose mothers thought that at least one of the wife-beating parameters was justified or acceptable (aOR = 0.79, 95% CI: 0.65–0.96) (Table 3).

Discussion

In low- and middle-income countries like Benin, childhood mortality remains high (Lawn *et al.*, 2014; Wang *et al.*, 2016). Confronting the immediate causes of mortality alone is not enough, and addressing other indirect socio-demographic factors such as women's empowerment is vital to reduce childhood mortality (Marmot, 2005). To the best of the authors' knowledge, this is the first study in the African context to assess the role of women's empowerment on reducing childhood diarrhoea using a large population-based sample.

As hypothesized, the study confirmed that women's decision-making power can reduce the prevalence of childhood diarrhoea. Consistent with a recent study in Indonesia (Astutik *et al.*, 2020), there was a significant difference in childhood diarrhoea reduction between women who had decision-making power compared with their counterparts who did not. Usually, women are the principal caregivers for children, the sick and families overall (Dimbuene *et al.*, 2018). If women were not empowered to make decisions, this can lead to adverse health outcomes for children, woman themselves and other family members (Godha *et al.*, 2013; Dimbuene *et al.*, 2018). Women's empowerment is highly linked with child health outcomes (Pratley, 2016).

An empowered woman is more likely to protect her child and herself by adopting good health behaviours through prevention measures such as hygiene and sanitation, and access to, and utilization of, health care services, immunization, vaccination and good nutrition (Kabeer, 2012). Studies in Myanmar (Mie *et al.*, 2019) and Bangladesh (Mainuddin *et al.*, 2015) have demonstrated a higher likelihood of accessing health care services (including child health services) among empowered women compared with non-empowered women. Moreover, studies conducted in

Table 2. Multivariable logistic regression analysis of association between women's decision-making power and prevalence of childhood diarrhoea, 2017/18 Benin DHS

Variable	aOR [95% CI]
Woman's decision-making power	
Not empowered (Ref.)	
Moderately empowered	0.82 (0.64–1.07)
Highly empowered	0.74 (0.57–0.96)*
Woman's age (years)	
15–19 (Ref.)	
20–24	1.94 (1.20–3.15)**
25–29	2.06 (1.25–3.40)**
30–34	1.78 (1.07–2.97)*
35–39	1.59 (0.93–2.70)
40–44	1.27 (0.69–2.34)
45–49	1.67 (0.83–3.35)
Woman's educational level	
No formal education (Ref.)	
Primary school	1.36 (1.06–1.73)*
Secondary school	1.26 (0.94–1.71)
Higher education	0.83 (0.21–3.23)
Husband's educational level	
No formal education (Ref.)	
Primary school	1.09 (0.85–1.39)
Secondary school	0.94 (0.71–1.25)
Higher education	0.73 (0.43–1.22)
Husband's occupation	
Not working (Ref.)	
Professional/technical/managerial	1.20 (0.58–2.49)
Sales	0.82 (0.39–1.70)
Agricultural self-employed	0.94 (0.46–1.92)
Agricultural employee	1.41 (0.62–3.24)
Services	0.82 (0.40–1.69)
Skilled manual	1.10 (0.54–2.24)
Other	0.82 (0.34–1.95)
Woman employed for cash	
No (Ref.)	
Yes	1.22 (0.92–1.62)

(Continued)

Table 2. (Continued)

Variable	aOR [95% CI]
Wealth index	
Poorest (Ref.)	
Poorer	1.11 (0.85–1.45)
Middle	0.96 (0.72–1.28)
Richer	0.86 (0.62–1.19)
Richest	0.67 (0.45–0.99)*
Religion	
Vodoun (Ref.)	
Islam	1.00 (0.68–1.47)
Catholic	0.86 (0.61–1.22)
Protestant Methodist	1.22 (0.77–1.91)
Other Protestant	1.33 (0.82–2.17)
Celestes	1.19 (0.79–1.80)
Other Christian	1.15 (0.83–1.60)
No religion	1.16 (0.75–1.79)
Other	0.69 (0.37–1.27)
Ethnicity^a	
Adja (Ref.)	
Bariba	1.23 (0.65–2.35)
Dendi	0.80 (0.37–1.72)
Fon	0.98 (0.59–1.62)
Yoa-Lokpa	1.43 (0.69–2.94)
Betamaribe	1.54 (0.75–3.18)
Peulh	1.19 (0.60–2.35)
Yoruba	0.92 (0.52–1.65)
Other Beninese	0.72 (0.30–1.76)
Other	1.66 (0.67–4.09)
Place of residence	
Urban (Ref.)	
Rural	1.01 (0.81–1.26)
Region	
Alibori (Ref.)	
Atacora	1.43 (0.85–2.39)
Atlantic	0.71 (0.39–1.31)
Borgou	0.42 (0.28–0.63)***
Collines	0.58 (0.32–1.05)
Couffo	0.65 (0.32–1.32)

(Continued)

Table 2. (Continued)

Variable	aOR [95% CI]
Donga	1.10 (0.65–1.86)
Littoral	0.69 (0.36–1.32)
Mono	0.75 (0.38–1.49)
Oueme	0.52 (0.26–1.03)
Plateau	1.37 (0.72–2.57)
Zou	0.40 (0.19–0.82)*

^aAll main categories related ethnicities.

Ref. = reference category.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

several developing countries, i.e. Ethiopia (MOWCY *et al.*, 2019), Nigeria and India (Ibrahim *et al.*, 2015), have shown that empowered women who actively participate in decision-making in the household are more likely to have a positive influence on child health outcomes.

This study found that women's attitude to wife-beating was associated with childhood diarrhoea. Previous studies have shown low health care service uptake among women who accept wife-beating as a healthy part of life in Bangladesh (Yount *et al.*, 2013; Khan & Islam, 2018). It is possible that these women have less awareness of their rights (Khan & Islam, 2018). A woman who disagrees with or does not justify wife-beating, may have higher self-esteem and stand up for herself and what she believes in, to the benefit of her children (Caruso *et al.*, 2010). She will often have control over financial resources, and have the confidence and intention to invest in her children's health, i.e. by correct feeding and hygiene practices and other related activities that lead to a decreased likelihood of childhood diarrhoea (Caruso *et al.*, 2010).

Intimate partner violence (IPV) could be intergenerational (Hines & Saudino 2002; Martin *et al.*, 2002; Vung *et al.*, 2008). Female children who witness their mothers in defeated and violent situations are more likely to accept wife-beating in their adult life (Vung *et al.*, 2008). In a community where wife-beating is socially customary, IPV is more prevalent. However, IPV is less likely among women who are empowered, either socially, economically or educationally (Jewkes, 2002).

Previous findings on the factors affecting the association between maternal age and the odds of childhood diarrhoea are inconclusive and seem to be context-specific. Studies in Tanzania (Edwin & Azage, 2019), Kenya (Samwel *et al.*, 2014), sub-Saharan Africa (Adedokun & Yaya, 2020) and elsewhere (Vasconcelos *et al.*, 2018) have shown that the children of older women have lower odds of childhood diarrhoea than those of adolescents or younger women. This could be because of their experience from having other children or their knowledge acquired from neighbours, relatives or health professional (Vasconcelos *et al.*, 2018; Edwin & Azage, 2019). The present study showed an association between women's age and the likelihood of childhood diarrhoea, with higher odds among the children of adult women (20–34 years) compared with those of younger women (15–19 years). Also, having more children may mean reduced attention and care and availability of proper, nutritional food with an increased number of siblings sharing resources and maternal support (Sonneveldt *et al.*, 2013).

Findings regarding the association between mother's age and use of child health services are mixed. The utilization of some maternal and child health services (i.e. institutional delivery) among younger women has been shown to be higher than among older women in India (Mondal *et al.*, 2020). The decrease in utilization of health services by experienced or older mothers may be due to previous experience of non-compassionate health facility services or belief that they have sufficient knowledge from their previous pregnancies, deliveries or related conditions and do not think they need the services (Zegeye *et al.*, 2021). It may also be linked to the

Table 3. Multivariable logistic regression analysis of association between women's wife-beating attitude and prevalence of childhood diarrhoea, 2017/18 Benin DHS

Variable	aOR [95% CI]
Woman's wife-beating attitude	
Accepts/justifies (Ref.)	
Disagrees/does not justify	0.79 (0.65–0.96)*
Woman's age (year)	
15–19 (Ref.)	
20–24	1.93 (1.19–3.14)**
25–29	2.03 (1.22–3.35)**
30–34	1.75 (1.04–2.93)*
35–39	1.55 (0.90–2.64)
40–44	1.24 (0.67–2.30)
45–49	1.62 (0.81–3.26)
Woman's educational level	
No formal education (Ref.)	
Primary school	1.38 (1.08–1.76)**
Secondary school	1.29 (0.96–1.75)
Higher education	0.84 (0.21–3.30)
Husband's educational level	
No formal education (Ref.)	
Primary school	1.08 (0.85–1.38)
Secondary school	0.94 (0.71–1.25)
Higher education	0.72 (0.43–1.22)
Husband's occupation	
Not working (Ref.)	
Professional/technical/managerial	1.27 (0.62–2.62)
Sales	0.88 (0.42–1.81)
Agricultural self-employed	0.99 (0.49–1.99)
Agricultural employee	1.55 (0.68–3.55)
Services	0.86 (0.42–1.75)
Skilled manual	1.17 (0.58–2.36)
Other	0.87 (0.36–2.06)
Woman employed for cash	
No (Ref.)	
Yes	1.16 (0.88–1.54)
Wealth index	
Poorest (Ref.)	
Poorer	1.14 (0.87–1.49)

(Continued)

Table 3. (Continued)

Variable	aOR [95% CI]
Middle	0.98 (0.73–1.30)
Richer	0.87 (0.63–1.21)
Richest	0.67 (0.46–1.00)
Religion	
Vodoun (Ref.)	
Islam	0.98 (0.67–1.45)
Catholic	0.85 (0.60–1.20)
Protestant Methodist	1.17 (0.74–1.84)
Other Protestant	1.29 (0.79–2.12)
Celestes	1.20 (0.79–1.80)
Other Christian	1.14 (0.82–1.59)
No religion	1.15 (0.75–1.76)
Other	0.71 (0.38–1.31)
Ethnicity ^a	
Adja (Ref.)	
Bariba	1.24 (0.65–2.36)
Dendi	0.79 (0.37–1.69)
Fon	0.98 (0.60–1.60)
Yoa-Lokpa	1.44 (0.71–2.94)
Betamaribe	1.60 (0.78–3.31)
Peulh	1.22 (0.62–2.40)
Yoruba	0.91 (0.52–1.58)
Other Beninese	0.74 (0.30–1.80)
Other	1.68 (0.70–4.03)
Place of residence	
Urban (Ref.)	
Rural	1.01 (0.81–1.26)
Region	
Alibori (Ref.)	
Atacora	1.47 (0.87–2.48)
Atlantic	0.74 (0.40–1.36)
Borgou	0.47 (0.31–0.71)***
Collines	0.62 (0.34–1.12)
Couffo	0.69 (0.34–1.40)
Donga	1.20 (0.70–2.04)
Littoral	0.73 (0.38–1.40)
Mono	0.77 (0.39–1.51)

(Continued)

Table 3. (Continued)

Variable	aOR [95% CI]
Oueme	0.56 (0.28–1.11)
Plateau	1.53 (0.83–2.84)
Zou	0.40 (0.20–0.83)*

^aAll main categories include related ethnicities.

Ref. = reference category.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

burden of management of large families, which leads to resource shortage and lesser likelihood of using health services (Sonneveldt *et al.*, 2013; Zegeye *et al.*, 2021). Reynolds *et al.* (2006) explored adolescent women's use of maternal and child health services in 15 developing countries; in general, they found no variation in maternal child health care use by mother's age. However, findings from India, Indonesia and Peru showed that adolescents 16 years or younger were less likely than their slightly older counterparts (17–24) to use health care services (Reynolds *et al.*, 2006). Women's status and power, relative to their male partner, tend to be lower with young/adolescent mothers in developing countries, and may play a role in their health care seeking behaviour (Reynolds *et al.*, 2006; Smith *et al.*, 2003).

Consistent with a prior study in Tanzania (Edwin & Azage, 2019), this study found higher odds of childhood diarrhoea among married women who attended primary education compared with those who had no formal education. However, this finding contradicts prior studies in Nigeria (Desmennu *et al.*, 2017) and Ethiopia (Woldu *et al.*, 2016). Variations in the prevalence of childhood diarrhoea among women with no formal education and those who attended primary education may be due to differences in other unknown risk factors for diarrhoea and need further exploration.

This study found lower odds of childhood diarrhoea among women in the wealthiest households compared with the poorest. Prior studies in Ethiopia reported similar findings (Geburu *et al.*, 2014; Gedefaw *et al.*, 2015; Woldu *et al.*, 2016). Wealthy households can afford the necessities of hygiene and sanitation, including soap and hand sanitizer (Woldu *et al.*, 2016). Furthermore, there was an association between region and childhood diarrhoea, and comparable findings have been reported in Tanzania (Edwin & Azage, 2019), Ethiopia (Bogale *et al.*, 2017; Atnafu *et al.*, 2020) and SSA (Yourkavitch *et al.*, 2018). This regional variation could be explained by the differences in factors affecting childhood diarrhoea such as improved latrine utilization coverage, access to and utilization of safe drinking water (Mengistie *et al.*, 2013; Clasen *et al.*, 2015; Atnafu *et al.*, 2020), weather conditions, socioeconomic status and access to, and utilization of, hygiene and sanitation facilities (Edwin & Azage, 2019). Since factors affecting childhood diarrhoea are multidimensional, exploring region-specific factors and designing region-specific intervention may be required to address this issue in highly vulnerable populations (Atnafu *et al.*, 2020).

The study provides valuable evidence on the associations between women's empowerment and child health, considering the demographic and socioeconomic factors that interact with women's access to, and utilization of, health resources that can impact child health in Benin. It used recent, nationally representative population-based data that are comparable across countries. However, it had its limitations. First, as women's empowerment has no standardized measure, two indicators recommended by the DHS guidelines had to be used (Kishor & Subaiya, 2008). Second, as cross-sectional data were used, causal inference could not be made. Finally, some bias might have occurred due to self-reporting by the women during the interview process.

The government of Benin needs to prioritize women's empowerment by educating women through the adult education programmes, and economically empowering them through women-centred micro-finance schemes. Moreover, legal protection, as well as democratic and

human rights awareness, must be considered to reduce accepted attitudes towards wife-beating to empower Beninese women. Together, these interventions will help reduce childhood diarrhoea and other childhood negative health outcomes in Benin.

Acknowledgments. The authors thank the MEASURE DHS project for their support, and free access to their original data. More details regarding DHS data and ethical standards are available at: <http://goo.gl/ny8T6X>. Data for this study were sourced from the Demographic and Health surveys (DHS) and are available here: <http://dhsprogram.com/data/available-datasets.cfm>.

Funding. This research received no specific grant from any funding agency, commercial entity or not-for-profit organization.

Conflicts of Interest. The authors have no conflicts of interest to declare.

Ethics Approval. This study used publicly available data from DHS. Informed consent was obtained from participants prior to the survey. The DHS Program follows ethical standards for ensuring the protection of respondents' privacy. ICF International ensures that the survey complies with the US Department of Health and Human Services regulations for the respect of the right of human subjects. No further approval was required for this study since the data were secondary and available in the public domain.

Author Contributions. SY contributed to the study design and conceptualization. SY, BZ and DIW reviewed the literature, performed the analysis and critically reviewed the manuscript for its intellectual content. SY had final responsibility to submit for publication. All authors read and amended drafts of the paper and approved the final version.

References

- Abate KH and Belachew T (2017) Women's autonomy and men's involvement in child care and feeding as predictors of infant and young child anthropometric indices in coffee farming households of Jimma Zone, South West of Ethiopia. *PLoS One* 12(3), e0172885.
- Abreha SK, Walelign SZ and Zereyesus YA (2020) Associations between women's empowerment and children's health status in Ethiopia. *PLoS One* 15(7), e0235825
- Adedokun ST and Yaya S (2020) Childhood morbidity and its determinants: evidence from 31 countries in sub-Saharan Africa. *BMJ Global Health* 5, e003109.
- African Development Bank Group (2020) *Benin Economic Outlook. Macroeconomic Performance and Outlook*. URL: <https://www.afdb.org/en/countries-west-africa-benin/benin-economic-outlook> (accessed 17th May 2020).
- Alambo KA (2015) The prevalence of diarrheal disease in under five children and associated risk factors in Wolitta Soddo Town, Southern, Ethiopia. *ABC Research Alert* 3(2). doi.org/10.18034/abcra.v3i2.295
- Alemayehu M and Meskele M (2017) Health care decision making autonomy of women from rural districts of Southern Ethiopia: a community based cross-sectional study. *International Journal of Women's Health* 9, 213–221.
- Alemayehu YK, Theall K, Lemma W, Hajito KW and Tushune K (2015) The role of empowerment in the association between a woman's educational status and infant mortality in Ethiopia: secondary analysis of Demographic and Health Surveys. *Ethiopian Journal of Health Sciences* 25(4), 353–362.
- Ariyo T and Jiang Q (2020) Mothers' healthcare autonomy, maternal-health utilization and healthcare for children under-3 years: analysis of the Nigeria DHS data (2008–2018). *International Journal of Environmental Research and Public Health* 17(6), E1816.
- Astutik E, Efendi F, Sebayang SK, Hadisyatmana S, Has EMM and Kuswanto H (2020) Association between women's empowerment and diarrhea in children under two years in Indonesia. *Children and Youth Services Review* 113(C), <https://ideas.repec.org/a/eee/cysrev/v113y2020ics0190740919314604.html>
- Atnafu A, Sisay MM, Demissie GD and Tessema ZT (2020) Geographical disparities and determinants of childhood diarrheal illness in Ethiopia: further analysis of 2016 Ethiopian Demographic and Health Survey. *Tropical Medicine and Health* 48, doi.org/10.1186/s41182-020-00252-5
- Budu E, Seidu AA, Armah-Ansah EK, Sambah F, Baatiema L and Ahinkorah BO (2020) Women's autonomy in healthcare decision-making and healthcare seeking behaviour for childhood illness in Ghana: Analysis of data from the 2014 Ghana Demographic and Health Survey. *PLoS One* 15(11), e0241488.
- Bogale GG, Gelaye KA, Degefi DT and Gelaw YA (2017) Spatial patterns of childhood diarrhea in Ethiopia: data from Ethiopian Demographic and Health Surveys (2000, 2005, and 2011). *BMC Infectious Diseases* 17, 426.
- Caruso B, Stephenson R and Leon JS (2010) Maternal behavior and experience, care access, and agency as determinants of child diarrhea in Bolivia. *Revista Panamericana de Salud Pública* 28(6), 429–439.
- CDC (2018) *Fact Sheet of Benin*. URL: https://www.cdc.gov/globalhealth/countries/benin/pdf/Benin_Factsheet.pdf (accessed 19th March 2021).

- Clasen TF, Alexander KT, Sinclair D, Boisson S, Peletz R, Chang HH et al.** (2015) Interventions to improve water quality for preventing diarrhoea. *Cochrane Database of Systematic Reviews* **10**, CD004794.
- Croft, TN, Aileen MJ, Marshall C, Allen K et al.** (2018) *Guide to DHS Statistics*. ICF International, Rockville, MD, USA.
- Cunningham K, Ruel M, Ferguson E and Uauy R** (2015) Women's empowerment and child nutritional status in South Asia: A synthesis of the literature. *Maternal & Child Nutrition* **11**(1), doi.org/10.1111/mcn.12125
- Dery F, Bisung E, Dickin S and Dyer M** (2019) Understanding empowerment in water, sanitation, and hygiene (WASH): A scoping review. *Journal of Water, Sanitation and Hygiene for Development* **10**(1), 5–15.
- Desmennu AT, Oluwasanu MM, John-Akinla YO, Opeyemi O and Ayo AS** (2017) Maternal education and diarrhea among children aged 0–24 months in Nigeria. *African Journal of Reproductive Health* **21**(3), 27–36.
- Dessalegn M, Kumie A and Tefera W** (2014) Predictors of under-five childhood diarrhea, Mecha District, West Gojjam, Ethiopia. *Ethiopian Journal of Health and Development* **25**(3), 192–200.
- Dimbuene ZT, Amo-Adjei J, Amugsi D, Mumah J, Izugbara CO and Beguy D** (2018) Women's education and utilization of maternal health services in Africa: a multi-country and socioeconomic status analysis. *Journal of Biosocial Science* **50**(6), 725–748.
- Doku DT, Bhutta ZA and Neupane S** (2020) Associations of women's empowerment with neonatal, infant and under-5 mortality in low- and /middle- income countries: meta-analysis of individual participant data from 59 countries. *BMJ Global Health* **5**, e001558.
- Ebrahim NB and Atteraya MS** (2018) Women's decision-making autonomy and their attitude towards wife-beating: findings from the 2011 Ethiopia's Demographic and Health Survey. *Journal of Immigrant Minority Health* **20**, 603–611.
- Edwin P and Azage M** (2019) Geographical variations and factors associated with childhood diarrhea in Tanzania: a national population based survey 2015–16. *Ethiopian Journal of Health Science* **29**(4), 513.
- Fantahun M, Berhane Y, Wall S, Byass P and Högberg U** (2007) Women's involvement in household decision-making and strengthening social capital – crucial factors for child survival in Ethiopia. *Acta Paediatrica* **96**, 582–589.
- Furuta M and Salway S** (2006) Women's position within the household as a determinant of maternal health care use in Nepal. *International Family Planning Perspectives* **32**(1), 17–27.
- GBD 2016 Causes of Death Collaborators** (2017) Global, regional, and national age-sex specific mortality for 264 causes of death, 1980–2016: a systematic analysis for the Global Burden of Disease Study 2016. *The Lancet* **390**, 1151–1210.
- Gebru T, Taha M and Kassahun W** (2014) Risk factors of diarrheal disease in under-five children among health extension model and non-model families in Sheko District rural community, Southwest Ethiopia: comparative cross-sectional study. *BMC Public Health* **14**, 395.
- Gedefaw M, Takele M, Aychiluhem M and Tarekegn M** (2015) Current status and predictors of diarrhoeal diseases among under-five children in a rapidly growing urban setting: the case of city administration of Bahir Dar, Northwest Ethiopia. *Open Journal of Epidemiology* **05**(02), 89–97.
- Godha D, Hotchkiss DR and Gage AJ** (2013) Association between child marriage and reproductive health outcomes and service utilization: a multi-country study from South Asia. *Journal of Adolescent Health* **52**(5), 552–558.
- Gram L, Morrison J and Skordis J** (2019) Organising concepts of 'women's empowerment' for measurement: a typology. *Social Indicators Research* **143**(3), 1349–1376.
- Gurmu E and Endale S** (2017) Wife beating refusal among women of reproductive age in urban and rural Ethiopia. *BMC International Health and Human Rights* **17**, 6.
- Hanmer L and Klugman J** (2016) Exploring women's agency and empowerment in developing countries: where do we stand? *Feminist Economics* **22**(1), 237–263.
- Hines DA and Saudino KJ** (2002) Intergenerational transmission of intimate partner violence: a behavioral genetic perspective. *Trauma, Violence, & Abuse* **3**(3), 210–225.
- Ibrahim A, Tripathi S and Kumar A** (2015) The effect of women's empowerment on child health status: study on two developing nations. *International Journal of Scientific and Research Publications* **5**(4), <http://www.ijsrp.org/research-paper-0415/ijsrp-p4005.pdf>.
- INSAE and ICF** (2019) *Enquête Démographique et de Santé au Bénin, 2017–2018*. Institut National de la Statistique et de l'Analyse Économique, Cotonou, Bénin and Rockville, MD, USA.
- International Food Policy Research Institute (IFPRI)** (2014) *Measuring Progress Toward Empowerment: Women's Empowerment in Agriculture Index: Baseline Report* (Women's Empowerment in Agriculture Index, p. 62). United States Agency for International Development, the International Food Policy Research Institute, and the Oxford Poverty and Human Development Initiative. <http://cdm15738.contentdm.oclc.org/utis/getfile/collection/p15738coll2/id/128190/filename/128401.pdf>
- Jennings LM, Cherewick NM, Hindin M, Mullany B and Ahmed S** (2014) Women's empowerment and male involvement in antenatal care: analyses of Demographic and Health Surveys (DHS) in selected African countries. *BMC Pregnancy and Childbirth* **14**(1), 297.
- Jewkes R** (2002) Intimate partner violence: causes and prevention. *The Lancet* **359**(9315), 1423–1429.
- Jhpiego** (2020) *Benin*. *Jhpiego*. URL: <https://www.jhpiego.org/countries-we-support/benin/>

- Jones R, Haardörfer R, Ramakrishnan U, Yount KM, Miedema S and Girard AW (2019) Women's empowerment and child nutrition: the role of intrinsic agency. *SSM – Population Health* **9**, 100475.
- Kabeer N (2012) Women's economic empowerment and inclusive growth: labor markets and enterprise development. *School of Oriental and African Studies. SIG Working Paper*. URL: <https://www.idrc.ca/sites/default/files/sp/Documents%20EN/NK-WEE-Concept-Paper.pdf> (accessed 19th March 2021).
- Khan MN and Islam MM (2018) Women's attitude towards wife-beating and its relationship with reproductive healthcare seeking behavior: a countrywide population survey in Bangladesh. *PLoS One* **13**(6), e0198833.
- Kishor S and Subaiya L (2008) Understanding women's empowerment: a comparative analysis of Demographic and Health Surveys (DHS) Data. *DHS Comparative Report No. 20*. Macro International Inc., Calverton, MD, USA. URL: <https://www.dhsprogram.com/publications/publication-CR20-Comparative-Reports.cfm> (accessed 23rd April 2020).
- Kuche D, Moss C, Eshetu S, Ayana G, Salasibew M, Dangour AD and Allen E (2019) Factors associated with dietary diversity and length-for-age z-score in rural Ethiopian children aged 6–23 months: a novel approach to the analysis of baseline data from the Sustainable Undernutrition Reduction in Ethiopia evaluation. *Maternal & Child Nutrition* **16**(1), e12852.
- Lawn JE, Blencowe H, Oza S, You D, Lee AC, Waiswa P *et al.* (2014) Every newborn: progress, priorities, and potential beyond survival. *The Lancet* **384**(9938), 189–205.
- Liu L, Oza S, Hogan D, Chu Y, Perin J, Zhu J *et al.* (2016) Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals. *The Lancet* **388**(10063), 3027–3035.
- Mahmud SN, Shah M and Becker S (2012) Measurement of women's empowerment in rural Bangladesh. *World Development* **40**(3), 610–619.
- Mainuddin AKM, Bagum HA, Rawal LB, Islam A and Islam SMS (2015) Women's empowerment and its relationship with health seeking behavior in Bangladesh. *Journal of Family and Reproductive Health* **9**(2), 65–73.
- Marmot M (2005) Social determinants of health inequalities. *The Lancet* **365** (9464), 1099–1104.
- Martin SL, Moracco KE, Garro J, Tsui AO, Kupper LL, Chase JL *et al.* (2002) Domestic violence across generations: findings from northern India. *International Journal of Epidemiology* **31**(3), 560–572.
- Mekonnen AG, Odo DB, Nigatu D, Sav A and Abagero KK (2021) Women's empowerment and child growth faltering in Ethiopia: evidence from the Demographic and Health Survey. *BMC Women's Health* **21**, 42.
- Mengistie B, Berhane Y and Worku A (2013) Prevalence of diarrhea and associated risk factors among children under-five years of age in Eastern Ethiopia: a cross-sectional study. *Open Journal of Preventive Medicine* **3**(7), 446–453.
- Mie HNM, Hnin ZL and Khaing W (2019) Empowerment and barriers to health care access among currently married women: secondary data analysis of the 2015–16 Myanmar Demographic and Health Survey. *DHS Working Paper No. 146*. ICF, Rockville, MD, USA.
- Mihrete TS, Alemie GA and Teferra AS (2014) Determinants of childhood diarrhea among under five children in Benishangul Gumuz regional state, northwest Ethiopia. *BMC Pediatrics* **14**(1), 102.12.
- Mondal D, Karmakar S and Banerjee A (2020) Women's autonomy and utilization of maternal healthcare in India: evidence from a recent national survey. *PLoS One* **15**(12), e0243553.
- Mossie TB, Tadesse DG and Kassa AW (2014) Childhood diarrheal disease among children under the age of five years at Dejen district, Northwest Ethiopia. *American Journal of Health Research* **2**(4), 177–181.
- MOWCY, UNICEF Ethiopia and SPRI (2019) *Gender Equality, Women's Empowerment and Child Wellbeing in Ethiopia*. URL: <https://www.unicef.org/ethiopia/media/2811/file/Gender%20Equality,%20Women's%20empowerment%20and%20child%20wellbeing%20in%20Ethiopia.pdf>
- Ndaimani A, Mhlanga M and Dube-Mawerewere V (2018) The association between women's empowerment and uptake of child health services: a Demographic and Health Survey based synthesis. *DHS Working Papers No. 139*. ICF, Rockville, MD, USA.
- Nguyen KH, Hoang V and Nguyen KTB (2014) Are empowered women more likely to deliver in facilities? An explorative study using the Nepal Demographic and Health Survey 2011. *International Journal of Maternal and Child Health* **2**(2), 74–85.
- Oyediran KA (2016) Explaining trends and patterns in attitudes towards wife-beating among women in Nigeria: Analysis of 2003, 2008, and 2013 Demographic and Health Survey data. *Genus* **72**(1), doi.org/10.1186/s41118-016-0016-9
- Pratley P (2016) Associations between quantitative measures of women's empowerment and access to care and health status for mothers and their children: a systematic review of evidence from the developing world. *Social Science & Medicine* **169**(1), 119–131.
- Reiner RC Jr, Graetz N, Casey DC, Troeger C, Garcia GM, Mosser JF *et al.* (2018) Variation in childhood diarrheal morbidity and mortality in Africa, 2000–2015. *New England Journal of Medicine* **379**(12), 1128–1138.
- Reynolds HW, Wong EL and Tucker H (2006) Adolescents' use of maternal and child health services in developing countries. *International Journal of Family Planning Perspectives* **32**(1), 6–16.
- Richards E, Theobald S, George A, Kim JC, Rudert C, Jehan K and Tolhurst R (2013) Going beyond the surface: Gendered intra-household bargaining as a social determinant of child health and nutrition in low and middle income countries. *Social Science & Medicine* **95**, 24–33.

- Rutstein SO and Rojas G** (2006) *Guide to DHS Statistics: Demographic and Health Surveys Methodology* (Demographic and Health Survey's DHS Toolkit of Methodology for the MEASURE DHS Phase III Project, p. 168). USAID.
- Rutstein SO, Staveteig S, Winter R and Yourkavitch J** (2016) Urban child poverty, health, and survival in low- and middle-income countries. *DHS Comparative Reports No. 40*. ICF International, Rockville, MD, USA. URL: <https://www.dhsprogram.com/publications/publication-CR40-Comparative-Reports.cfm> (accessed 19th March 2021).
- Samwel M, Eddison M, Faith N, Richard S, Elizabeth K-M and Dougals N** (2014) Determinants of diarrhea among young children under the age of five in Kenya, evidence from KDHS 2008-09. *African Population Studies* **28**, 2.
- SHOPS Project** (2013) *Benin Private Health Sector Assessment Brief*. Strengthening Health Outcomes through the Private Sector Project, Abt Associates Inc., Bethesda, MD. URL: <https://www.shopsplusproject.org/sites/default/files/resources/Benin%20Private%20Health%20Sector%20Assessment%20Brief.pdf>
- Smith LC, Ramakrishnan U, Ndiaye A, Haddad L and Martorell R** (2003) The Importance of Women's Status for Child Nutrition in Developing Countries: International Food Policy Research Institute (Ifpri) Research Report Abstract 131. *Food and Nutrition Bulletin* **24**(3), 287–288.
- Sonneveldt E, Plosky WD and Stover J** (2013) Linking high parity and maternal and child mortality: what is the impact of lower health services coverage among higher order births? *BMC Public Health* **13** (Supplement 3), S7.
- Teklemichael G, Mohammed T and Wondwosen K** (2014) Assessment of the risk factor of diarrheal disease in under-five children among the health extension model and non-model family in Sheko district rural community, Southwest Ethiopia. *BMC Public Health* **14**, 395.
- Treas J and Drobnic D** (eds) (2010) *Dividing the Domestic: Men, Women, and Household Work in Cross-National Perspective*. Stanford University Press.
- UN Women** (2021) *SDG 5: Achieve Gender Equality and Empower all Women and Girls*. URL: <https://www.unwomen.org/en/news/in-focus/women-and-the-sdgs/sdg-5-gender-equality>
- UNDP** (2019) *Inequalities in Human Development in the 21st Century: Human Development Report 2019*. Briefing note for countries on the 2019 Human Development Report Benin. URL: http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/BEN.pdf (accessed 18th May 2020).
- UNICEF** (2012) *Pneumonia and Diarrhea Tackling the Deadliest Diseases for the World's Poorest Children*. UNICEF, New York.
- United Nations** (2015a) *Millennium Development Goals Report* URL: http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%2028July%201%29.pdf (accessed 19th March 2021).
- United Nations** (2015b) *Sustainable Development Goals*. URL: <http://www.un.org/sustainabledevelopment/sustainable-development-goals/> (accessed 19th March 2021).
- USAID** (2016) *African Strategies for Health. Health Financing Profile: Benin*. URL: http://www.africanstrategies4health.org/uploads/1/3/5/3/13538666/country_profile_-_benin_-_us_letter.pdf
- Vasconcelos MJOB, Rissin A, Figueiroa JN, Lira PIC and Batista Filho M** (2018) Factors associated with diarrhea in children under five years old in the state of Pernambuco, according to surveys conducted in 1997 and 2006. *Revista de Saúde Pública* **52**, 48.
- Vung ND, Ostergren P-O and Krantz G** (2008) Intimate partner violence against women in rural Vietnam – different socio-demographic factors are associated with different forms of violence: need for new intervention guidelines? *BMC Public Health* **8**(1), 55.
- Wado Y D** (2018) Women's autonomy and reproductive health-care-seeking behavior in Ethiopia. *Women & Health* **58**(7), 729–743.
- Wang H, Bhutta Z, Coates M, Coggeshall MS, Dandona L, Diallo K et al.** (2016) Global, regional, national, and selected subnational levels of stillbirths, neonatal, infant, and under-5 mortality, 1980-2015: a systematic analysis for the global burden of disease study 2015. *The Lancet* **388**, 1725–1774.
- World Health Organization (WHO)** (2017) *Diarrhoeal Disease*. WHO, Geneva. URL: <http://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease>
- WHO and UNICEF** (2013) *Ending Preventable Child Deaths from Pneumonia and Diarrhea by 2025: The Integrated Global Action Plan for Pneumonia and Diarrhea (GAPPD)*. WHO, Geneva. URL: https://www.who.int/maternal_child_adolescent/documents/global_action_plan_pneumonia_diarrhoea/en/ (accessed 19th March 2021).
- Woldeamanuel BT** (2020) Trends and factors associated with healthcare utilization for childhood diarrhea and fever in Ethiopia: further analysis of the Demographic and Health Surveys from 2000 to 2016. *Journal of Environmental and Public Health* **2020**, e8076259.
- Woldu W, Bitew BD and Gizaw Z** (2016) Socioeconomic factors associated with diarrheal diseases among under-five children of the nomadic population in northeast Ethiopia. *Tropical Medicine and Health* **44**, 40.
- World Bank** (2019) *The World BANK in Benin*. URL: <https://www.worldbank.org/en/country/benin/overview> (accessed 19th March 2021).
- Yimer F and Tadesse F** (2015) *Women's Empowerment in Agriculture and Dietary Diversity in Ethiopia*. International Food Policy Research Institute (IFPRI). ESS II Working Paper, p. 19). International Food Policy Research Institute. URL: <https://www.ifpri.org/publication/womens-empowerment-agriculture-and-dietary-diversity-ethiopia>

- Yount KM, Halim N, Schuler SR and Head S** (2013) A survey experiment of women's attitudes about intimate partner violence against women in rural Bangladesh. *Demography* **50**(1), 333–357.
- Yourkavitch J, Burgert-Brucker C, Assaf S and Delgado S** (2018) Using geographical analysis to identify child health inequality in sub-Saharan Africa. *PLoS One* **13**(8), e0201870.
- Zegeye B, El-Khatib Z, Ameyaw EK, Seidu A, Ahinkorah BO, Keetile M et al.** (2021) Breaking barriers to healthcare access: a multilevel analysis of individual- and community-level factors affecting women's access to healthcare services in Benin. *International Journal of Environmental Research and Public Health* **18**(2), 750.
- Woldu W, Bitew BD and Gizaw Z** (2016) Socioeconomic factors associated with diarrheal diseases among under-five children of the nomadic population in northeast Ethiopia. *Tropical Medicine and Health* **44**, 40.
- World Bank** (2019) *The World BANK in Benin*. URL: <https://www.worldbank.org/en/country/benin/overview> (accessed 19th March 2021).
- Yount KM, Halim N, Schuler SR and Head S** (2013) A survey experiment of women's attitudes about intimate partner violence against women in rural Bangladesh. *Demography* **50**(1), 333–357.
- Yourkavitch J, Burgert-Brucker C, Assaf S and Delgado S** (2018) Using geographical analysis to identify child health inequality in sub-Saharan Africa. *PLoS One* **13**(8), e0201870.
- Zegeye B, El-Khatib Z, Ameyaw EK, Seidu A, Ahinkorah BO, Keetile M et al.** (2021) Breaking barriers to healthcare access: a multilevel analysis of individual- and community-level factors affecting women's access to healthcare services in Benin. *International Journal of Environmental Research and Public Health* **18**(2), 750.