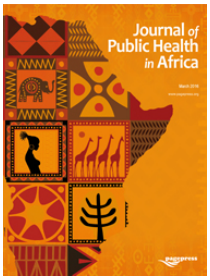

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Factors contributing to changes in contraceptive use among adolescent girls in Zambia: a decomposition analysis

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Key words*:* factors; contraceptive use; adolescent girls; decomposition; Zambia.

Contributions: MC, conceptualised the study, designed the methodology, led the formal data analysis, and wrote the initial draft manuscript; TGG, KH, reviewed the methodology, results of the study and the manuscript; TGG, KH, supervised and approved the work. All authors approved the final version to be published.

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Abstract

Despite its documented benefits, contraceptive use among adolescents remains low, particularly in low-and middle-income countries. This study aimed to decompose the main factors contributing to the changes in contraceptive use among adolescent girls in Zambia over the period 1996 to 2014. Data on adolescent girls aged 15-19 years from Zambia Demographic and Health Survey data were analysed using multivariate decomposition analysis of change. Stata 15/MP (Stata-Corp LLC) was used for analysis, at a 95% confidence level. A p-value of 0.05 was used to determine statistical significance. The sample included 9,072 adolescent girls. Contraceptive use increased by 3% from 7.6% in 1996 to 10.6% in 2013/14. Change in modern contraceptive use among adolescents was mainly due to differences in coefficients (changes in population behaviour). Increases in age contributed to the change in contraceptive use, resulting in 2.94% and 9.33% increases for 17- and 18-year-olds respectively. Marriage or living with a partner contributed the largest change (44%) while living in a rural area accounted for approximately 20%. Interventions targeting improving contraceptive use in adolescents should be responsive to the needs of various age groups, places of residence, and educational levels for maximum benefits.

Introduction

Teenage pregnancies continue to pose health and socio-economic problems for adolescents, globally.[1] it is estimated that in developing countries, approximately 21 million girls aged 15 to 19 years get pregnant while about 12 million of them give birth, yearly. [1] Each year, a further 777,000 girls under the age of 15 years give birth, globally.[1,2] It is estimated that by 2035, 19.2 million adolescent girls across the world would have given birth.[3] The extent of the problem of adolescent pregnancy is put into context by examining data from Demographic Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) on the proportion of girls aged 20 to 24 years who had a live birth by age 15 or 18 years. The most recent global estimates available show that 19 per cent or approximately one in five women between the ages of 20 to 24 had a live birth by their 18th birthday.[4] A systematic review on adolescent pregnancy found a pooled adolescent pregnancy prevalence of 18.8% in Africa, overall, and 19.3% for sub-Saharan Africa (SSA).[5]

Adolescent pregnancies have major health and socio-economic consequences for young mothers and their babies. The leading cause of mortality among adolescent girls aged 15-19 years is due to complications from pregnancy and childbirth complications, and 99% of the global deaths occur in low- and middle-income countries.[6] The risk of eclampsia, puerperal endometritis and systemic infections is higher in adolescent mothers aged 10–19 years compared to women aged 20–24

years.[7,8] Furthermore, unsafe abortions among adolescent girls ages 15-19 years, estimated at 3.9 million annually, contribute to maternal mortality and morbidity rates, as well as lasting health problems.[2]Adolescent pregnancies also have repercussions for the new-born babies. Children born to adolescent mothers have increased risks of low birth weight, preterm delivery, and severe neonatal conditions.[7]

In addition to adverse health outcomes, adolescent pregnancies have economic and social consequences such as social stigma and discrimination from communities and/or families, resulting in them having to leave their family home, consequently increasing their vulnerability to violence and abuse, and potentially facing increased poverty and economic hardships.[9] Early and unintended pregnancy also affects adolescent girls' schooling, disrupting their future economic opportunities, causing them to miss out on the overall benefits of education that contribute to their physical and emotional growth, including increases in knowledge and life skills, higher self-confidence and better outcomes in life.[9,10] Furthermore, adolescent childbearing is associated with lower educational attainment, and it can perpetuate a cycle of poverty from one generation to the next.[11]

Contraceptive use remains one of the major interventions towards prevention of pregnancy among adolescents. Guidelines have been published by the World Health Organisation (WHO) on Preventing Early Pregnancy and Poor Reproductive Outcomes, which emphasise the increased use of contraception by adolescents who are at risk of unplanned pregnancy.[12] However, contraceptive use among adolescents remains low, particularly in low-income countries (LICs).[13–17] Studies have shown that in LICs, contraceptive prevalence rate (CPR) among adolescent females aged 15–19 years is low at 21% for all methods (modern and traditional).[15,18,19] This is despite the documented benefits of using contraceptives, which include the freedom to decide the number of children to have and child spacing, improved health outcomes, such lower maternal and infant mortality[20,21] and improvements educational and economic outcomes.[22,23]

Despite contraceptive use being relatively low in most sub-Saharan countries, it has been increasing over the years.[24] Various factors have been associated with contraceptive use among women, including adolescents. Among these are age,[17,25,26] education,[14,26] wealth,[14,25] residence,[17,25] marital status,[13,17] work status, knowledge of ovulatory cycle, visit of health facility.[13,27] The contribution of these factors to the changes in contraceptive use among adolescent girls varies from country to county. Decomposition analysis conducted in Tanzania found that difference in coefficients contributed more (87.5%) to increase in modern contraceptive prevalence rate (mCPR) than differences in women's characteristics (12.5%). Women's characteristics included partner's education levels, recent sexual activity and being visited by a family planning worker, while most

increase in modern contraceptive use was attributed to rural population (44.1%) and women who experienced a termination of pregnancy (7.1%).[24] It has also been found that increases in the use of modern contraceptives are what drive increases in the rate of contraceptive use and not changes in women's parity composition.[28] A study in Ethiopia found that 34% of the overall change in modern contraceptive use resulted from difference in women's characteristics (age, educational status, religion, couple concordance on family size, and fertility preference), while two-thirds of the increase was due to difference in coefficients (mainly changes in contraceptive use behaviour among the rural population (33%) and among Orthodox Christians (16%) and Protestants (4%).[17]

In Zambia, contraceptive prevalence rate among adolescents remains low, although it has increased slightly from 1996 to 2013/14.[26] With factors that are associated with contraceptive use in adolescent girls aged 15-19 years having been established, it is important to understand the contribution to the observed change in the contraceptive prevalence rate. Therefore, this study is aimed at investigating the main factors contributing to the changes in contraceptive use among adolescent girls in Zambia over the period 1996 to 2014.

Materials and Methods

Cross-sectional data from four (4) Zambia Demographic and Health Surveys, spanning from 1996 to 2014, was analysed. The Zambia Demographic and Health Survey (ZDHS) is a nationally representative sample survey of Zambian households that provides country level information on various indicators, including fertility levels and trends, mortality, contraceptive use and family planning methods, as well maternal and child health, including HIV and AIDS. The ZDHS employs two stage stratified sampling and targets women and men aged, 15-49 and 15-59 respectively. The sampling frame used for the ZDHS is typically adopted from the Census of Population and Housing of the Republic of Zambia (CPH) from the Central Statistical Office.[29]

Using a two-stage stratified cluster sample design, a representative sample of households was drawn for all the surveys, with the first stage being the selection of Enumeration Areas (EAs) (or clusters) and the second stage the selection of households. The sample was stratified in two stages from the CPH frames (1990, 2000 and 2010). Dividing each province into rural and urban ensured stratification was achieved. In the previous studies, provinces were stratified into 18 strata and 20 strata in the 2013/14 survey. In each stratum, the samples were selected independently in every stratum through a two-stage selection process. At all lower levels, stratification and proportional allocation were attained through sorting the sampling frame by geographical/administrative order and using a probability proportional to size selection process in the first stage. All females and males aged, 15-

49 and 15-59 respectively, who lived permanently in the sampled housholds or were visitors present in the household on the night preceeding the survey, were eligible to participate in the survey. [29]

Data analysis focused on adolescent girls aged 15-19 years. All adolescents who answered questions on the current contraceptive method were included in the analysis. Current contraception method, which was the dependent variable, was recoded into a binary outcome, those currently using and those not using any contraceptive method. Explanatory variables included in the analysis were age, residence, province, the highest level of education, and marital status. Since the ZDHS involved more than one level, variables on cluster and household were also included. Data from the four ZDHS surveys were combined by appending the data sets from 1996, 2001/2 and 2007 to the 2013/14 ZDHS. Descriptive analysis was done, and results were presented using proportions. Where appropriate, Chi-square and Fischer's exact tests were used to test for association between the outcome and explanatory variables.

Multivariate decomposition analysis of change was used to determine the major factors contributing to the difference in the contraceptive use among adolescents over the 1996 to 2014 period. Multivariate decomposition has been used extensively in quantifying the contributions of observed variables to group differences with multivariate regression models.[30–32] In this study, the multivariable decomposition method proposed by Powers, Yoshioka and Yun[30] was used to analyse the data. It was further used to determine what the source of difference was in terms of the composition (Characteristics) of the adolescent girls' population and the difference in the effect of characteristics (Coefficients) between the surveys over time. The analysis with done using logistic regression models, adjusting for the sampling weight, based on data from 1996 and 2014 ZDHS. The analysis was focused on how the contraceptive prevalence rate changes due to differences in adolescent girls' characteristics and how these factors lead to the differences across the DHS surveys conducted between the reference period. This difference can be attributed to compositional changes between surveys (i.e., differences in characteristics) and to changes in effects of the selected explanatory variables (i.e., differences in the coefficients due to changes in population behaviour). Therefore, the observed difference in modern contraceptive use among adolescent girls between different surveys is additively decomposed into a characteristics (or endowments) component and a coefficient (or effects of characteristics) component.[33] Stata 15/MP (Stata-Corp LLC) was used to perform the analysis, at a 95% confidence level with a p-value of 0.05 are what determined significance. The SVY STATA command was employed to control the clustering effect of complex sampling (stratification and multistage sampling procedures).

Ethical considerations

Ethical approval (REF No BE288/18) for this study was obtained from the University of KwaZulu-Natal Biomedical Research Ethics Committee (UKZNBREC) and University of Zambia Biomedical Research Ethics Committee (UNZABREC), reference number REF. No. 157-2019 as part of PhD research. Permission to use the data was obtained from Demographic and Health Surveys (DHS) Program.

Results

Descriptive results

Analysis was done across four ZDHS surveys and included a total of 9072 adolescent girls. The majority (42%) were from the 2013/14 ZDHS while 18% were from the 2007 survey, with 20% from the 2001/2 survey and 20% from the 1996 survey. Results in Table 1 reflect, across all the survey years, the distribution of adolescent girls who were included in the analysis.

Contraceptive use among adolescent girls aged 15-19 years, over the period 1996 to 2014, was 9.8%, ranging from 7.6% in 1996 to 10.6% in 2013/14 (Table 1). Across all survey years, in each of the survey years, the age distribution ranged from 18.1 to 23.2%. Regarding education level, in the earlier survey years, the majority of adolescent girls had primary education while in the latter years (2007 and 2013/14), majority of adolescent girls had secondary education or higher. In terms of marital status, most of the adolescent girls had never been married. However, over the survey years, the proportion of adolescent girls who reported being married reduced from 25.3% to 15.5% (Table 1). Knowledge of modern contraceptives increased from 87.5% in 1996 to 95.6% in 2013/14.

Decomposition analysis results

Table 2 below shows results from the decomposition analysis of contraceptive use among adolescent girls over the period 1996 to 2014. There was a total of 24,432 adolescents who were included in the analysis. This decomposition, however, focuses on the year 1996 and 2014 as the key years at the beginning and end of the reference period.

Results from the decomposition analysis showed that change in modern contraceptive use among adolescents was mainly due to difference in coefficients (changes in population behaviour). Increase in age contributed to the change in contraceptive use over the reference period, 2.94% and 9.33% for 17- and 18-year-olds respectively. Being married or living with a partner contributed the largest change with regard to marital status. This contributed about 44% to the observed change in

contraceptive use among adolescents, while living in a rural area accounted for approximately 20% of the change.

Compositional changes also accounted for some changes in contraceptive use among adolescents over the years. Changes in composition relating to Education, particularly regarding secondary education and higher, accounted for 290%. With regard to residence, rural areas contributed about 13% of the change while changes in age composition among older adolescents, 18 and 19-year-olds, accounted for approximately 7 and 2 percent, respectively.

Discussion

Over the period 1996 to 2014, contraceptive use among adolescents in Zambia increased by 3%. Decomposition analysis showed that the change was as a result of population behaviour and compositional changes in the age group 15 – 19 years over this period. The behaviour of adolescent girls, as they get older, as well as compositional changes in this age group contributed to the increase in population change over the reference period. The effect of women's characteristics, such as age and educational status, are compares well to other findings of similar studies.[17]

Bearing in mind the association of education with contraceptive use,[14,26] the increase in the proportion of adolescent girls who are in school contributed to the change in contraceptive use. The increase in the composition of adolescent girls' attainment of secondary education or higher showed a significant effect on modern contraceptive use, similar to the findings of the study by Worku et al.[33] This can be attributed to deliberate government policies to keep adolescent girls in schools. Various Non-governmental organisations also have projects aimed at ensuring adolescent girls remain in school. Free education in government schools may have also contributed to increase in adolescent girls who are in school.

Decomposition analysis also showed that residence had an effect on modern contraceptive use among adolescent girls. About 14 percent of the change was due to compositional changes in rural areas and about 20% due to changes in the behaviour among rural adolescent girls. This is similar to findings by Worku et al.[33] With increase in the proportion of adolescent girls in rural areas who attain higher levels of education, this could have also contributed to increase in contraceptive use in rural areas. Furthermore, deliberate government policies such as Comprehensive Sexuality Education for both in and out of school adolescents and improving access to contraceptives[34] may have contributed to this.

About 45% of the increase in modern contraceptive use among Zambian adolescent women was observed over the period 1996 to 2014, and this was attributable to changes in modern contraceptive use behaviour among married adolescents. Modern contraceptive use has increased over the reference

period from 13.07% in 1996 to 43.76 in 2013/14. This can be attributed to adolescents who reported being married or living together with a man, being more likely to use contraceptives compared to those who had never married.[13,35,36] This could be attributed to married adolescents receiving partner support in using contraceptives,[37] them being more likely to afford contraceptives due to financial support from the partner,[13] or them being likely to practice family planning and take measures to prevent pregnancy compared to the unmarried as a result of regular exposure to sexual intercourse and the risk of unplanned pregnancy.[26]

Strengths and limitations

The study did have some strengths and limitations, especially given that it was based on DHS data from four surveys. Firstly, some variables included in the analysis may have either changed or been added over time. Secondly, DHS data is based on self-reporting, and therefore prone to social desirability bias. Thirdly, given the cross-sectional nature of DHS, causal inferences about the relationships observed in the data cannot be made. However, despite these limitations, the study highlights the results from decomposition analysis, which showed that the change in modern contraceptive use was as a result of population behaviour and compositional changes in the age group 15 – 19 years between 1996 and 2014. This has vital implications for programs aimed at improving increasing contraceptive use among adolescents. Furthermore, the study used nationally representative data of adolescent girls in Zambia. This ensures that the findings generated from this study can be generalized to the study population.

Conclusions

Modern contraceptive use among adolescent girls in Zambia has remained low over time, with only a modest increase of 3% in the period from 1996 10 2014. The results from the decomposition analysis showed that the change was as a result of population behaviour and compositional changes in the age group 15 – 19 years over this period. Changes in characteristics (compositional changes) were mostly in education with moderate changes in age and residence while changes in coefficients (population behaviour) were mainly in age, marriage, and residence. These findings suggest that interventions aimed at influencing population behaviour should be responsive to the needs of various age groups, places of residence, and educational levels in order to yield maximum benefits in improving contraceptive use among adolescent girls. The government has introduced free education, but it is important to keep the girls in school. Therefore, programmes aimed ensuring girls stay in school longer should be promoted. Comprehensive sexuality education also needs to be strengthened

especially for out-of-school girls. It is best suited to provide accurate information about contraceptives to adolescents. Furthermore, health promotion and education activities such as provision of contraceptives also need to be enhanced and strengthened. Improving access to contraceptives may contribute positively to their use.

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Table 1: Distribution of adolescent girls by background characteristics and survey year, ZDHS 1996–2013/14

				Year							
		1996 (N=1982)	**%**	**2001/2 (N=1806)**	**%**	**2007 (N=1598)**	**%**	**2013/14 (N=3686)**	**%**	**Total (N=9072)**	**%**
Contraceptive Use	No	1,831	92.4	1,630	90.3	1,424	89.1	3,296	89.4	8,181	90.2
	Yes	151	7.6	176	9.8	174	10.9	390	10.6	891	9.8
Age (Years)	15	395	19.9	372	20.6	370	23.2	735	19.9	1,872	20.6
	16	419	21.1	326	18.1	330	20.7	759	20.6	1,834	20.2
	17	369	18.6	325	18.0	303	19.0	674	18.3	1,671	18.4
	18	404	20.4	406	22.5	299	18.7	774	21.0	1,883	20.8
	19	395	19.9	377	20.9	296	18.5	744	20.2	1,812	20.0
Highest Education Level	No Education	174	8.8	158	8.8	69	4.3	69	1.9	470	5.2
	Primary	1,254	63.3	1,073	59.4	756	47.3	1,418	38.5	4,501	49.6
	Secondary & Higher	554	28.0	575	31.8	773	48.4	2,197	59.6	4,099	45.2

Marital Status	Never in Union	1,435	72.4	1,307	72.4	1,302	81.5	3,058	83.0	7,102	78.3
	Married/Living with Partner	501	25.3	449	24.9	270	16.9	572	15.5	1,792	19.8
	Widowed/Separated/Divorced	46	2.3	50	2.8	26	1.6	56	1.5	178	2.0
Knowledge of any method	Knows no method	247	12.5	127	7.0	150	9.4	162	4.4	686	7.6
	Knows modern methods	1,728	87.5	1,677	93.0	1,447	90.6	3,519	95.6	8,371	92.4
Residence	Urban	799	40.3	639	35.4	809	50.6	1,850	50.2	4,097	45.2
	Rural	1,183	59.7	1,167	64.6	789	49.4	1,836	49.8	4,975	54.8

Table 2: Decomposition of change in modern contraceptive use among adolescents in Zambia, 1996 to 2014.

Reference group (A): Year==1 (2014) --- Comparison group (B): Year_2==0 (1996)					
Modern Contraceptive Use		P>z	[95% Conf.	Interval]	
E	-0.01232	0.001	-0.01972	0.00491	
C	0.06823	0	0.05443	0.08204	
R	0.05592	0	0.04486	0.06697	
Due to Difference in Characteristics (E)					
Modern Contraceptive Use	Coef.	P>z	[95% Conf.	Interval]	Pct.
Age (Years)					
15	Ref				
16	-0.00112	0.446	-0.00401	0.00177	-2.01
17	-0.00113	0.422	-0.00389	0.00163	-2.02
18	0.00424	0.405	-0.00573	0.0142	7.58
19	0.00153	0.406	-0.00208	0.00513	2.73
Marital Status					
Never in Union	Ref				
Married/Living with Partner	-0.07002	0.407	-0.2356	0.09556	-125.22
Widowed/Separated/Divorced	-0.00321	0.423	-0.01106	0.00464	-5.74
Residence					
Urban	0	.	0	0	0
Rural	0.00778	0.456	-0.01266	0.02822	13.91
Education					

No Education	Ref				
Primary	-0.11258	0.512	-0.44921	0.22405	-201.34
Secondary & Higher	0.1622	0.514	-0.32508	0.64948	290.07
Due to Difference in Coefficients (C)					
Modern Contraceptive Use	Coef.	P>z	[95% Conf.	Interval]	Pct.
Age (Years)					
15	Ref				
16	-0.01192	0.19	-0.02975	0.00591	-21.32
17	0.0022	0.805	-0.01527	0.01968	3.94
18	0.00522	0.575	-0.01302	0.02345	9.33
19	-0.00474	0.569	-0.02107	0.01159	-8.48
Marital Status					
Never in Union	Ref				
Married/Living with Partner#	0.02513	0	0.01112	0.03914	44.94
Widowed/Separated/Divorced	0.00217	0.115	-0.00053	0.00488	3.88
Residence					
Urban	Ref				
Rural	0.01114	0.315	-0.0106	0.03288	19.92
Education					
No Education	Ref				
Primary	-0.01887	0.648	-0.09987	0.06213	-33.75
Secondary & Higher	-0.01508	0.41	-0.05092	0.02077	-26.96
Secondary & Higher	-0.01508	0.41	-0.05092	0.02077	-26.96