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Original Research

Determinants of adolescent mortality in South Africa, 2001- 2007

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Abstract

Background: Maternal characteristics are key determinants of infant and child mortality in South Africa. Unemployment, living and working conditions are associated with adult mortality in the country. Little is known of the determinants of adolescent (10- 19 years old) mortality in South Africa. It is important to note the factors that are associated with adolescent mortality as this will prevent premature mortality and help adolescents grow into healthy and productive adults.

Method: Data from national Death Notification Forms are used for 2001 and 2007. The study population are males and females aged between 10 and 19 years old. Bivariate and multivariate logistic regression producing odds ratios is used to examine if an association exists between individual demographic and socioeconomic factors and adolescent mortality.

Results: Statistically significant results show that female adolescents have higher odds of dying from natural causes (4.85 in 2001 and 1.61 in 2007) of mortality compared to adolescent males. Education acts as a protective factor against all- cause and natural causes of death. However, education does not decrease the odds of unnatural or external (1.20- 5.26 in 2001 and 1.28- 1.51 in 2007) deaths among adolescents in South Africa. Further being married is seen to decrease the odds of all types of mortality (natural or disease and unnatural or accidental/ violent) among adolescents.

Conclusions: The socioeconomic determinants of adolescent mortality identified in the study are important for evidence- based programmes and strategies. Policy and programme developers can use the results of this study to target adolescents who are at higher risk of premature mortality. Using the study results, programmes can be tailored according to the socioeconomic profiles of adolescents.

INTRODUCTION

Mortality in African countries remains high. Overall life expectancy in the region is 46 years compared to the second lowest region, Asia, which has a life expectancy of 67 years [1]. In addition to overall mortality, age and cause- specific mortality rates on the continent are high. Infant mortality rates on the continent range from 109 infant deaths per 1,000 live births in Mali to 10.49 infant deaths per 1,000 live births in Botswana [2]. Adult mortality on the continent is equally as diverse. The World Health Organisation found that the probability of a man dying between age 15 and 60 years in Zimbabwe is 82.1% and 90.2% in Lesotho compared to the probability of a man of the same age dying in Sweden which is 8.3%, [3]. A study examining African Demographic Surveillance Sites found mortality is mainly caused by AIDS and malaria [4].

In South Africa, infant and adult mortality rates are also problematic. Infant mortality in the country was 42.67 deaths per 1,000 live births in 2012, while adults aged between 15 and 60 had a 40% probability of dying in 2011 [3, 5]. Cause of death research shows a prevalence of HIV/AIDS and other infectious disease mortality, as well as an emergence of non-communicable diseases among the South African population [6, 7]. The identified determinants of non-communicable disease related deaths among the adult

population are poverty and inequality, as well as lifestyle and behavioural choices [8, 9]. In addition, key determinants shaping child health and mortality in the country have been identified as poverty, poor maternal education, racial and gender inequalities, under-nutrition and HIV infection [10]. Studies have also noted that determinants of adult health and mortality in the country include unemployment, cultural practices and living and working conditions [11-13]. Little research has been done on the determinants of adolescent (10 -19 years old) mortality in South Africa.

Globally, adolescents face a number of serious health challenges including mental, sexual and reproductive health, including HIV/AIDS and the implications of alcohol and illicit drug abuse [14-16]. These health problems are not only an immediate threat to the survival of adolescents, but have long- term consequences that could affect their adult lives. These health issues could affect adolescents' ability to complete schooling, gain employment and provide for their families both financially and socially. Under such circumstances, government resources are placed under an immense amount of pressure to provide for dependent populations (children and the elderly) as well as for an unhealthy, unemployed adult population.

The development of adolescents into healthy and productive adults is thus of vital importance to any country. In South Africa, policy and programmes have been put in place to ensure this outcome. The National Youth Policy 2009 – 2014 aims to empower young people so that they may realise their full potential [17]. The Department of Social Development's Youth Development Programme aims to assist youth with the successful completion of quality education and to provide out-of-school youth with skills to enhance their personal and work development [18]. These broad aims suggest the country's want for a healthy economically active future adult population. However, in order to achieve this, research into the socioeconomic factors that place adolescents at a higher risk of mortality is needed. Without this information, the goals of policy and programmes in the country will be unrealisable because of the lack of contextual knowledge behind it.

Adolescent risky behaviours have been known to contribute to health problems and mortality. Lack of contraceptive use, multiple sexual partners and the abuse of alcohol and drugs are behaviours acknowledged to place adolescents at higher risk of HIV infection [19-21]. Factors such poor parental monitoring, parents who abuse alcohol and drugs and general parent absenteeism all contribute to the likelihood that adolescents will engage in risky behaviours [22-25]. These studies, however, lack acknowledgment of the socioeconomic status of adolescents that, in addition to family structure, will predict their behaviours and consequential health outcomes.

Studying the socioeconomic determinants of mortality offers appropriate insight into the explanation of existing mortality rates and differentials in any population. This information will assist parents, planners and non- government agencies in achieving their respective goals of youth health and development. In particular, the study of the socioeconomic factors that place adolescents at higher risk of premature mortality is vital since literature has argued that the study of demographic factors alone are insufficient for the study of health outcomes [26-28]. Within this literature, it is argued that individual's health outcomes are associated to their socioeconomic status, in that it affects their ability to afford medical care, sufficient nutrition and shelter. Education is related to income and earning potential, which makes education a suitable measure of socioeconomic status in studies pertaining to health outcomes [29] .This measure of socioeconomic status relates to being able to afford better healthcare and live a healthier lifestyle which will improve health status. This important facet of contribution to health and survival cannot be overlooked in research and provides basis for the argument that demographic characteristics alone are insufficient in the understanding of factors that contribute to mortality. This study will answer the question: what are the socioeconomic factors which place adolescents at a higher risk of all, all causes and natural or unnatural causes of death in South Africa?

METHODS

Adolescents aged 10 to 19 years old are covered in this study. Both adolescent males and females are studied. Demographic and socioeconomic indicators are included for all adolescents represented in the surveys. South African Death Notification Forms for 2001 and 2007 are analysed. These forms are completed by medical doctors and other healthcare personnel when a death occurs and are then filed with the Department of Home Affairs. National statistics organisation, Statistics South Africa, collect these forms and other means of estimating national death statistics (from surveys, etc.) and combine the data for more robust mortality data in the country. This is done because the South African vital registration systems do not include deaths of non- South Africans and those without a South African birth certificate and/ or identity number. Thus this data is more representative of the entire population. The sample size for 2001 is 11,667 and for 2007 is 13,165 deceased adolescents.

All variables pertaining to the demographic and

socioeconomic characteristics of the deceased adolescents are provided on the Death Notification Forms. Table 1 shows a list of the predictor variables used in this study along with the variables descriptions, from where it appears on the Death Notification Form and measurements. For the purpose of comparison across the years, the same variables are used for 2001 and 2007.

Table 1. List of predictor variables, definitions and measurements

Variable	Description	Measurement
Sex	Under Section A of the Form: Particulars of the deceased - Sex	Nominal
Marital Status	Under Section A of the Form: Particulars of the deceased – Marital Status	Nominal
Education	Under Section F of the Form: Demographic Details – Deceased's education (specify only highest class achieved)	Ordinal
Province of Residence	Under Section F of the Form: Demographic Details- Province	Nominal

In order to answer the research question, inferential statistics was used. To begin, a bivariate logistic regression is fit to establish an association between the dependent (different forms of mortality outcomes) and each predictor variable provided for on Death Notification Forms.

Secondly, multivariate logistic regression was done to establish a relationship between each independent variable and each different cause of mortality outcomes. Since there are different cause of mortality outcomes (all- causes, natural causes and unnatural causes of death), the regression technique is repeated on all outcomes. Adjusted odds ratios are displayed to explain the likelihood of mortality occurring.

The formula for logistic regression is as follows:

$$L_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots + \beta_k X_{ki}$$

Where: L_i = dependent variables, α = constant, β_k = regression coefficients, X = independent variables [30].

The outcome is adolescent mortality (yes or no) and the odds of adolescent mortality occurring at bivariate (Model I) and multivariate (Model II) levels are displayed along with p-values. Statistically significant (p-value<0.05) results are here discussed.

RESULTS

Table 2. Demographic and socioeconomic background of adolescents who died, 2001 – 2007

	2001			2007		
Characteristic	**Population***	**Deaths**	**Mortality rate**	**Population****	**Deaths**	**Mortality rate**
Total	**10,034,594**	**11,667**	**1.16**	**10,040,317**	**13,165**	**1.31**
Sex						
Male	4,964,807	6,217	1.25	5,016,679	7,092	1.41
Female	5,069,788	5,366	1.06	5,023,638	6,056	1.21
Marital Status						
Married	86,981	83	0.95	46,147	117	2.54
Living Together	67,926	70	1.03	42,108	0	0.00
Never Married	9,860,089	10,549	1.07	9,793,138	11,692	1.19
Widowed	10,115	14	1.38	5,736	9	1.57
Separated/divorced	9,483	29	3.06	3,372	2	0.59
Education						
Primary	5,876,893	2,621	0.45	70,286	70	1.00
Secondary	3,470,976	2,849	0.82	4,466,170	2,086	0.47
Incomplete Secondary	416,971	0	0.00	5,091,660	3,630	0.71
Province of residence						
Western Cape	868,122	768	0.88	762,384	731	0.96
Eastern Cape	1,699,928	1,688	0.99	1,803,011	1,917	1.06
Northern Cape	171,122	237	1.38	193,707	251	1.30
Free State	608,362	671	1.10	566,200	834	1.47
KwaZulu Natal	2,267,843	2,271	1.00	2,295,782	3,219	1.40
North West	793,165	621	0.78	695,025	807	1.16
Gauteng	1,435,155	1,541	1.07	1,269,291	1,803	1.42
Mpumalanga	750,119	661	0.88	691,854	1,141	1.65
Limpopo	1,449,813	803	0.55	1,518,961	1,106	0.73

*Population numbers are estimated from the 2001 South African Census and **2007 Community Survey

Table 2 shows that the overall mortality rate for adolescents in 2001 was 1.16 deaths per 1,000 adolescent population in South Africa. The mortality rate was also higher among males (1.25 deaths) than females aged 10- 19 years old. By marital status, the rate is highest among adolescents who were separated/ divorced (3.06) and widowed (1.38). In addition, adolescents with secondary education have a mortality rate of 0.82. By province of residence, the Northern Cape had the highest mortality rate at 273 adolescent deaths.

Table 2 also shows that the overall mortality rate for adolescents in 2007 increased to 1.31 deaths per 1,000 adolescent population in South Africa. The mortality rate again was higher among males (1.41 deaths) than females aged 10- 19 years old. By marital status, the rate is highest among adolescents who were married at 2.54 deaths and widows (1.57). The table also shows that adolescents with no education have a higher mortality rate (1.00) than those with primary (0.47) or secondary (0.71). By province of residence, Mpumalanga had the highest mortality rate at almost 2 adolescent deaths.

Table 3 shows that for Model I for 2001 with the exception of a few provinces of residence (Northern Cape, North West and Outside of South Africa) and tertiary education (p-value= 0.730), the predictor variables are each statistically significant (p-value<0.05). This model also shows that those who are married (0.00), divorced (0.00) or widowed (0.01) and those with an education, all have lower odds of mortality, than the reference categories. While females have almost even odds of dying with an odds ratio of 0.95.

When combining the predictor variables in the multivariate model (Model II), it is seen that females (0.86), who are married (0.02) and residing in provinces other than Limpopo, all have a lesser likelihood of dying.

Table 3. Bivariate (Model I) and multivariate (Model II) logistic regression showing individual predictor variables and all-cause adolescent mortality, producing odds ratios, 2001 and 2007, South Africa

Characteristic	2001				2007			
	Model I		Model II		Model I		Model II	
	Odds Ratio	*p-value*	Odds Ratio	*p-value*	Odds Ratio	*p-value*	Odds Ratio	*p-value*
Sex								
Male*	1.00		1.00		1.00		1.00	
Female	0.95	*0.003*	0.86	*0.000*	0.89	*0.000*	0.75	*0.000*
Marital Status								
Single*	1.00				1.00		1.00	
Married	0.00	*0.024*	0.02	*0.000*	0.02	*0.000*	0.02	*0.000*
Widowed	0.01	*0.003*	0.00	*0.000*	0.012	*0.000*	0.013	*0.000*
Divorced	0.00	*0.001*	*(omitted)*		0.013	*0.000*	(omitted)	
Education								
None*	1.00		1.00		1.00		1.00	
Primary	0.32	*0.000*	2.37	*0.320*	0.35	*0.000*	0.62	*0.000*
Secondary	0.34	*0.000*	2.43	*0.054*	0.81	*0.000*	0.13	*0.000*
Tertiary	0.10	*0.730*	1.09	*0.531*	0.30	*0.000*	0.11	*0.000*
Province of residence								
Western Cape*	1.00		1.00		1.00		1.00	
Eastern Cape	1.23	*0.000*	0.95	*0.488*	1.37	*0.000*	0.68	*0.000*
Northern Cape	0.93	*0.359*	0.67	*0.000*	0.93	*0.303*	0.69	*0.002*
Free State	0.82	*0.000*	0.59	*0.000*	0.85	*0.001*	0.5	*0.000*
KwaZulu-Natal	1.15	*0.001*	0.72	*0.000*	1.34	*0.000*	0.51	*0.000*
North West	0.91	*0.080*	0.55	*0.000*	0.94	*0.200*	0.5	*0.000*
Gauteng	0.87	*0.001*	0.66	*0.000*	0.94	*0.172*	0.57	*0.000*
Mpumalanga	1.17	*0.004*	0.75	*0.000*	1.24	*0.000*	0.58	*0.000*
Limpopo	1.21	*0.000*	1.01	*0.868*	1.15	*0.004*	0.61	*0.000*
Outside South Africa	0.61	*0.193*	0.30	*0.232*	1.34	*0.123*	0.73	*0.241*

*denotes the Reference Category

Model I for 2007 showed, similarly, the statistical significance of the predictor variables, again with the exception of a few South African provinces. This bivariate model shows that the odds of female mortality were lower than the almost even odds of 2001 at 0.89. Similar to the 2001 model results, this model also shows that having a marital status (that is, not being single) and some education (primary, secondary or tertiary) are all associated with decreased odds of adolescent mortality. Also similar to the 2001 model, it is seen that adolescents living in the Eastern Cape (1.37), KwaZulu Natal (1.34), Mpumalanga (1.24) and Limpopo (1.15) are all at higher odds of mortality than the Western Cape which was selected as the reference category.

For Model II, it is seen that females (0.75), who are married (0.02) or widowed (0.013) and residing any of the nine provinces, all have a lesser likelihood of dying. In this model compared to its 2001 equivalent, level of education produced decreased odds of all mortality, and the findings are statistically significant, proving that education has a protective effect against all-causes of adolescent mortality, compared to adolescents who have no education.

Table 4 shows that for 2001 Model I, the predictor variables are each statistically significant. This model shows that females (4.53) and those who are married (1.52), have increased odds of mortality, compared to the reference categories. While adolescents with, primary (0.30), secondary (0.21) or tertiary (0.08) education have lesser odds of dying.

Model II shows that females (4.85) who reside in any of the nine provinces have a higher likelihood of dying from natural causes. Marital status (married and widowed) in this model produced increased odds of natural cause mortality, however, the findings are not statistically significant.

Model I for 2007 also showed the statistical significance of all the predictor variables. This shows that the odds of female mortality are 1.50 times more than that of adolescent males. Contrary to the 2001 model results, this model also shows that having a marital status (that is, not being single) is all associated with decreased odds of adolescent mortality from natural causes of death. Similar to the 2001 model, it is seen that adolescents living in any of the nine South African provinces all have higher odds of mortality than the Western Cape which was selected as the reference category (odds ratio=1).

Table 4. Bivariate (Model I) and multivariate (Model II) logistic regression showing individual predictor variables and natural causes of adolescent mortality, producing odds ratios, 2001 and 2007, South Africa

	2001				2007			
Characteristic	**Model I**		**Model II**		**Model I**		**Model II**	
	Odds Ratio	***p-value***	**Odds Ratio**	***p-value***	**Odds Ratio**	***p-value***	**Odds Ratio**	***p-value***
Sex								
Male*	1.00		1.00		1.00		1.00	
Female	4.53	*0.000*	4.85	*0.000*	1.50	*0.000*	1.61	*0.000*
Marital Status								
Single*	1.00		1.00		1.00		1.00	
Married	1.52	*0.013*	1.32	*0.328*	0.014	*0.000*	0.017	*0.000*
Widowed	0.11	*0.022*	0.65	*0.784*	0.006	*0.000*	0.005	*0.000*
Divorced	(omitted)		(omitted)		0.007	*0.000*	(omitted)	
Education								
None*	1.00		1.00		1.00		1.00	
Primary	0.30	*0.000*	0.28	*0.000*	0.01	*0.000*	0.097	*0.000*
Secondary	0.21	*0.000*	0.19	*0.000*	0.02	*0.000*	0.013	*0.000*
Tertiary	0.08	*0.000*	0.08	*0.000*	0.07	*0.000*	0.065	*0.000*
Province of residence								
Western Cape*	1.00		1.00		1.00		1.00	
Eastern Cape	2.76	*0.000*	2.46	*0.000*	1.82	*0.000*	0.98	*0.846*
Northern Cape	2.72	*0.000*	2.43	*0.000*	1.27	*0.027*	0.74	*0.070*
Free State	4.42	*0.000*	2.72	*0.000*	1.61	*0.000*	0.88	*0.336*
KwaZulu-Natal	4.09	*0.000*	2.81	*0.000*	2.45	*0.000*	0.92	*0.498*
North West	5.06	*0.000*	6.09	*0.000*	1.79	*0.000*	0.92	*0.518*
Gauteng	2.72	*0.000*	1.99	*0.000*	1.58	*0.000*	0.75	*0.026*
Mpumalanga	4.51	*0.000*	4.09	*0.000*	2.51	*0.000*	1.14	*0.290*
Limpopo	4.19	*0.000*	3.72	*0.000*	2.30	*0.000*	1.15	*0.270*

*denotes the Reference Category

For Model II, it is seen that females (1.61), who reside in Mpumalanga (1.14) or Limpopo (1.15) have higher odds of dying from natural causes of death. In this model again similar to 2001, level of education produced decreased odds of natural cause mortality. Finally Model II showed that when incorporating other individual characteristics (predictors), being married (0.017) or widowed (0.05) and having any level of education is associated with lesser odds of mortality compared to single adolescents with no education.

Table 5, model I 2001, shows that, the predictor variables are each statistically significant (p-value<0.05). This model shows that females (0.22) and those who are married (0.64), have decreased odds of mortality, compared to the reference categories. While adolescents with education, primary (3.35), secondary (4.68) or tertiary (1.27) have increased odds of dying from unnatural causes of death.

Model II for 2001, combines all the predictor variables into a single model. It is seen that females (0.76) who reside in any of the nine provinces have a lower likelihood of dying from unnatural causes.

Model I for 2007 also shows the statistical significance of all the predictor variables, with the exception of a few of the provinces. This bivariate model shows that the odds of female mortality from unnatural causes are lower than that of adolescent males. Similar to the 2001 model results, this model also shows that having a marital status (that is, not being single) is all associated with decreased odds of adolescent mortality from unnatural causes of death. In addition, it is seen that adolescents living in the Eastern Cape (1.07) province have almost even odds of mortality from unnatural causes similar to that of the Western Cape which was selected as the reference category (odds ratio=1). All other provinces are seen to be associated with lesser likelihood of dying from unnatural causes.

In Model II, it is seen that females (0.37), who are married (0.01) and who reside in provinces other than the Eastern and Northern Cape, have lesser odds of dying from unnatural causes of death. In this model again similar to 2001, level of education produced increased odds of unnatural causes, proving that education does not have protective effect against unnatural causes of adolescent mortality.

Table 5. Bivariate (Model I) and multivariate (Model II) logistic regression showing individual predictor variables and unnatural causes adolescent mortality, producing odds ratios, 2001 and 2007, South Africa

Characteristic	2001				2007			
	Model I		Model II		Model I		Model II	
	Odds Ratio	*p-value*	Odds Ratio	*p-value*	Odds Ratio	*p-value*	Odds Ratio	*p-value*
Sex								
Male*	1.00		1.00		1.00		1.00	
Female	0.22	*0.000*	0.21	*0.000*	0.35	*0.000*	0.37	*0.000*
Marital Status								
Single*	1.00		1.00		1.00		1.00	
Married	0.64	*0.008*	0.76	*0.329*	0.02	*0.000*	0.01	*0.000*
Widowed	0.09	*0.022*	1.54	*0.781*	(omitted)		(omitted)	
Education								
None*	1.00		1.00		1.00		1.00	
Primary	3.35	*0.000*	3.52	*0.000*	1.64	*0.000*	1.41	*0.000*
Secondary	4.68	*0.000*	5.26	*0.000*	1.28	*0.000*	1.51	*0.000*
Tertiary	1.27	*0.000*	1.20	*0.000*	1.95	*0.000*	1.28	*0.000*
Province of residence								
Western Cape*	1.00		1.00		1.00		1.00	
Eastern Cape	0.36	*0.000*	0.41	*0.000*	1.07	*0.218*	1.11	*0.389*
Northern Cape	0.37	*0.000*	0.41	*0.000*	0.79	*0.016*	1.02	*0.878*
Free State	0.23	*0.000*	0.37	*0.000*	0.50	*0.000*	0.62	*0.000*
KwaZulu-Natal	0.24	*0.000*	0.36	*0.000*	0.77	*0.000*	0.71	*0.002*
North West	0.20	*0.000*	0.16	*0.000*	0.58	*0.000*	0.56	*0.000*
Gauteng	0.37	*0.000*	0.50	*0.000*	0.67	*0.000*	0.90	*0.388*
Mpumalanga	0.22	*0.000*	0.24	*0.000*	0.60	*0.000*	0.53	*0.000*
Limpopo	0.24	*0.000*	0.27	*0.000*	0.58	*0.000*	0.72	*0.009*

*denotes the Reference Category

DISCUSSION

This study has attempted to identify the individual determinants of all-cause, natural and unnatural causes of adolescent death in South Africa. The issue of determinants of adolescent mortality is not well documented in literature. A possible explanation for this is the dearth of information regarding adolescents in the country. Using the Death Notification data, this study has identified, few but key determinants of adolescent mortality in the country.

First, adolescent females are less likely to die than males. For all-cause mortality, this is similar to Bugard and Treiman (2006) who found that adult males are 1.31 times more likely to die than females. This study identifies further sex differentials with regard to determinants by cause of mortality [31]. For instance, it is seen that females are more likely to die from natural causes than males.

Further with regard to sex differentials, this study has found females to have lower odds of adolescent mortality from unnatural causes of death compared to males. Makiwane and Kwizera (2009) found that although unnatural mortality declined marginally between 1997 and 2004, male unnatural death rates are considerably higher than that of females (which remained almost constant throughout the period). Which the authors argue is firstly in line with rates elsewhere in the world and secondly, a result of the risky behaviours more commonly associated males than females [32].

This study has determined that education decreases the odds of all causes of adolescent mortality. The effect of maternal education on child survival has been documented in many studies [33]. Barret and Brown (1996) argue that women with higher education are more likely to secure steady, better- paying jobs and are more likely to marry husbands with higher educational levels [34]. This translates into better living conditions and better decision-making within the household. As Bhuiya et. al (1990) argue, education better equips people, especially women with better knowledge and attitudes about health and health-seeking practices [35].

Interestingly, this study did not find evidence that education decreases the odds of dying from unnatural causes of death. In South Africa, over the past three decades educational opportunities have expanded massively to the benefit of African youth and women in general. However literature has revealed that while secondary school enrolment has increased for disadvantaged groups, little advancement has been made in reducing the number of young people with little or no education [32]. It is these young people who are particularly vulnerable to unemployment and premature mortality. While race has not been covered in this study, it is argued that African/Black youth in South Africa are more likely to incomplete their education due to financial constraints than any other racial group, while gender inequalities are also cited as contributing to the under- education of the countries young people [32]. However, this study did find that the odds of adolescents dying from unnatural causes of death did decline from 2001 to 2007 in the country, thus proving that the situation in the country is improving.

This study has shown that the condition of being married decreases the odds of all causes, natural and unnatural causes of adolescent mortality (Tables 6.1 - 6.4). Similarly, Nikoi (2009) found that single adults in his study were observed to be on average twice more likely to die when compared to adults who are married (115% more). In addition, adults who are divorced had 57% more likelihood to die when compared to those who are married. Though adults whose spouses have died had a 35% more risk to death when compared with adults who are married [36]. According to Nikoi, his results were similar to findings from studies conducted in Bulgaria, Finland and the USA where unmarried persons regardless of their sex generally had higher probabilities of dying compared to married in all the three countries [37].

LIMITATIONS

For this study, the following study limitations should be noted. First, due to the cross- sectional nature of the data causal relationships cannot be determined. Second, death is noted as an underreported occurrence despite adult death registration in the country having improved to about 90%, some deaths remain unregistered [6]. In addition, the study is restricted to the information made available on Death Notification Forms. An example of a consequence of this restriction is that other inferential statistical tests, such as Hazard or Survival modelling, cannot be done because the data source does not collect information on living adolescents, who are used in such models as ‘censored’ or ‘control’ groups. Finally, the data used are from 2001 and 2007, it is thus worth noting that determinants in subsequent years may have changed.

CONCLUSIONS

Useful and informative determinants of adolescent mortality were identified in this study. Education and marital status act as protective factors against premature mortality among adolescents in South Africa. The National Youth Policy (2009- 2014) which aims to address the needs of South African youth, supports specific interventions in the areas of education, health and well-being, economic

participation and social cohesion [38]. It is within the focus of this policy that the importance of school and family in preventing adolescent mortality from natural causes is particularly relevant. Further, the First National Policy Guidelines for South African Adolescents and Youth clearly specifies in its fifth principle that "gender considerations are fundamental for adolescent and youth health, mainly because they are important determinants of access to economic resources, social services and other opportunities" [39]. In addition to gender considerations such as this, the policy guidelines can benefit from this study's finding that female adolescents have a higher likelihood of death due to natural causes, which are disease and infirmary. This warrants sex- specific programmes to address the challenges teenage girls are experiencing in accessing healthcare and preventing the contraction of disease. Overall, given the results of this study, national programmes are encouraged to develop evidence- based prevent strategies to effectively meet the needs of adolescents.

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