

# **Pregnancy and Death: An examination of adolescent maternal mortality in South Africa**

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## **Introduction**

Maternal mortality in Sub-Saharan Africa is higher than any other region in the world. In countries such as Sierra Leone and Nigeria it is as high as 1,100 and 560 deaths per 100,000 live births [1, 2]. Currently in South Africa, the maternal mortality rate is 269 deaths per 100,000 live births [3]. Avoidable factors including patient-related, such as non-compliance (49%) and healthcare and health-worker factors (35%) issues are contributing to high rates of maternal mortality [4]. The national Department of Health has made attempts to reduce this, such as the implementation of a programme to reduce child and maternal mortality through strengthening primary healthcare in the country [5]. And while progress has been made, maternal mortality is down from 299 deaths per 100,000 live births in 2007 to current rates, South Africa still failed to meet its Millennium Development Goal of 38 deaths per 100,000 live births [3]. Behind this rate lies the need to better understand why South Africa has not been able to meet this goal and for this more research on maternal health in the country is needed.

In South Africa, alarmingly high rates of adolescent fertility are a topical issue at present [6-8]. And while research has identified the levels and determinants of adolescent fertility [9], none has addressed the issue of adolescent maternal mortality. Pregnant adolescents face stigmatization and are unable to afford healthcare [10, 11] which reduces accessibility and increases the risk of pregnancy complications and mortality, the extent of which however, is unknown.

The purpose of this paper is to determine the level and assess the direct and indirect causes of adolescent maternal mortality in South Africa. The health and survival of adolescent females is an important development goal of the national government [12]. Adolescents who transition into healthy and productive adults are a key social and labour resource for any country. For this reason, research addressing the levels and causes of adolescent mortality will contribute to reducing deaths and aid in achieving the youth development goals of the country.

### **Methods:**

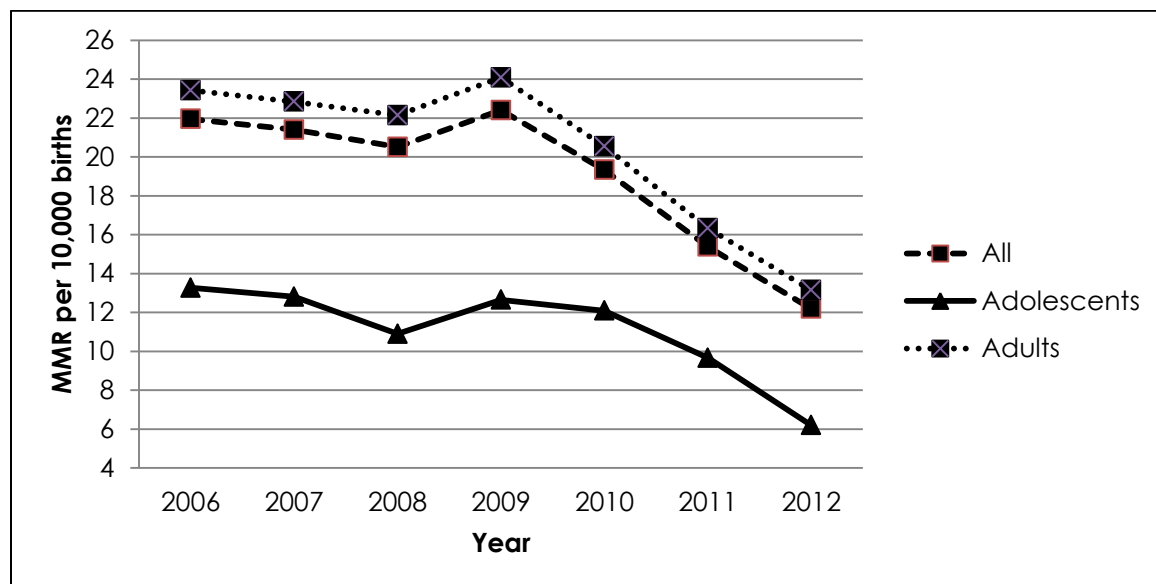
This study is an analysis of secondary data available in the public domain. Analysis is of all deaths recorded on Death Notification Forms from 2006 to 2012. Adolescent females who were pregnant at the time of their death (n1, 164) were analysed. These data are anonymized by Statistics South Africa before becoming available for public download. The data were not collected by the author and there is no need for IRB approval. Analysis of direct 'Maternal Conditions' (ICD-10 codes: O00-O99), and indirect causes of death were conducted to quantify the extent to which disease and injuries are contributing to adolescent maternal mortality in the country.

The maternal mortality ratio in adolescents ( $\leq 19$  years) and adults ( $> 20$  years) was approximated from an analysis of the pregnant female's age and the 1,047,886 live births to adolescents during the period and applying the same proportion to all live births (n7,320,968) during the study period [13]. The adolescent maternal mortality ratio is 11.12 deaths per 10,000 live births. While the adult maternal mortality ratio is 20.35 deaths per 10,000 live births. Proportional mortality ratios were estimated using the total number of female adolescent deaths (n13,930) and all female deaths (n41,047) from

2006 to 2012 [14]. Conventional multiple decrement life table techniques were done to estimate the probability of dying from direct and indirect causes of death for the female population. Population age distribution was taken from the South African General Household Surveys from 2006 to 2012 [15].

## Results

### Levels of adolescent maternal mortality:



**Figure 1: Trends in maternal mortality ratio by age of the mother and year of death, South Africa, 2006- 2012**

Throughout the period, adolescent maternal mortality rates have been consistently lower than adult females (Figure 1). While rates of adolescent and adult maternal mortality rates appear to have peaked in 2009, it has been consistently declining ever since.

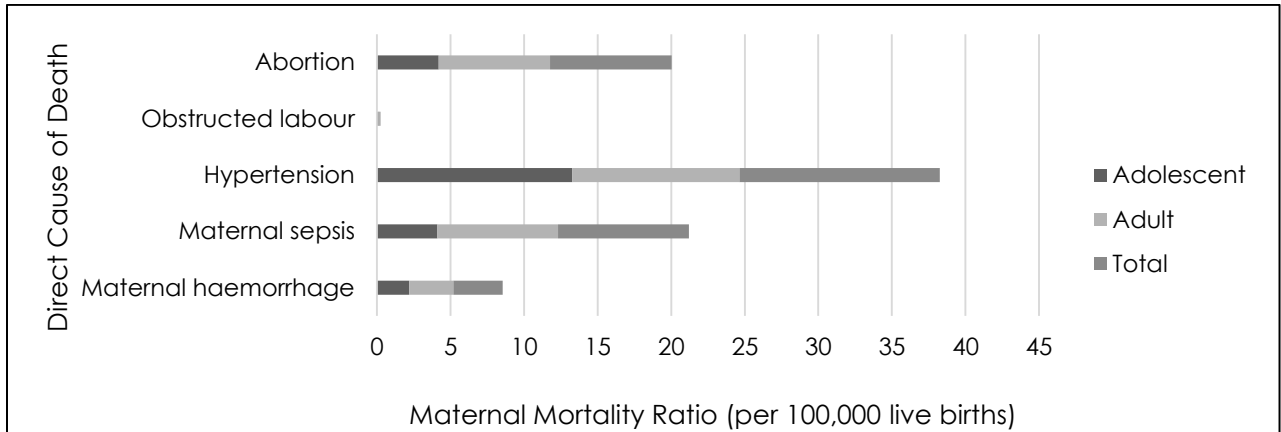
## Causes of adolescent maternal mortality:

**Table 1: Distribution of adolescent maternal mortality by cause of death, 2006- 2012**

Cause of Death	Deaths				
	Number	%	PMR(%)	P-value	
<b>Direct Causes</b>					
Maternal haemorrhage	23	9.20	3.99	0.000	
Maternal sepsis	43	17.20	7.45		
Hypertension	139	55.60	24.09		
Obstructed labour	1	0.40	0.17		
Abortion	44	17.60	7.63		
Sub- Total	250	100	43.33		
<b>Indirect Causes</b>					
Communicable (excl. maternal and neonatal)	82	25.08	14.21	0.000	
Non- Communicable	60	18.35	10.40		
Injuries	160	48.93	27.73		
<i>Suicide and self-inflicted</i>	4	2.5	0.69		
<i>Homicide and violence</i>	10	6.25	1.73		
<i>Other (transport, accidents, etc)</i>	146	91.25	25.30		
Ill- defined	25	7.65	4.33		
Sub-Total	327	100	56.67		
<b>Total</b>	<b>577</b>		<b>100</b>		

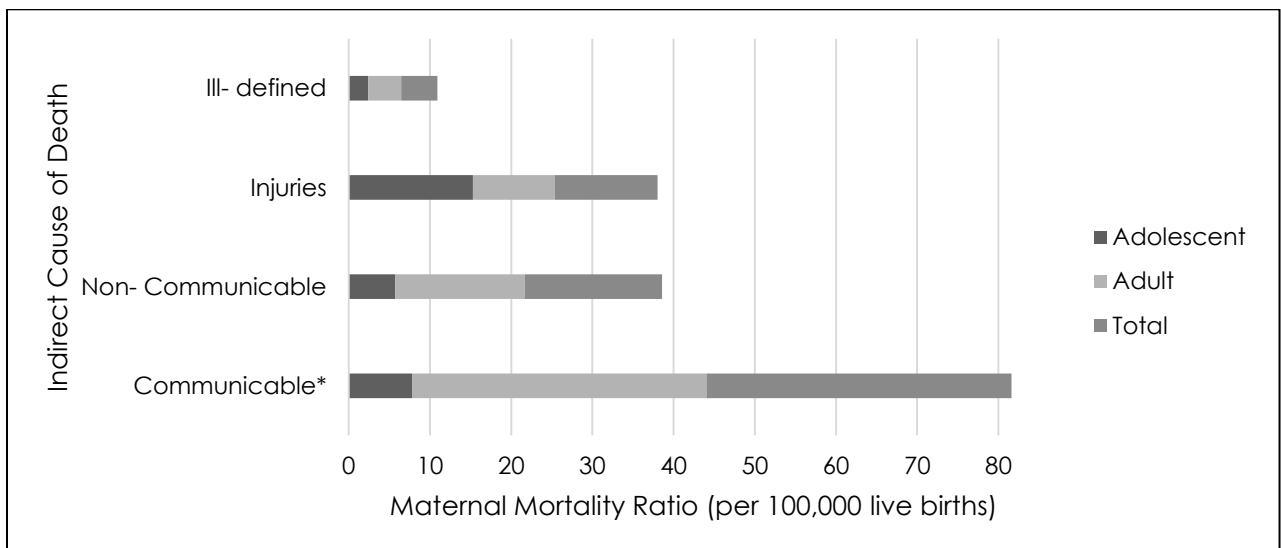
Hypertension is the leading medical cause of death among adolescents (55.60%) females in South Africa (Table 1). Hypertension contributes 24.09% (PMR) to the overall mortality of pregnant adolescent females. In addition, abortion accounts for 17.60% of pregnant adolescent females over the period. Further the PMR for deaths from abortion is 7.63%. Overall, direct causes of death, contribute 43.33% (PMR) of all pregnant adolescent deaths.

All other communicable deaths contribute 25.08% of deaths with a PMR of 14.21%. Injuries contribute almost 50% of all pregnant adolescent deaths. More specifically, homicide and violence contribute 6.25% (PMR) of all deaths and all other forms of non-disease causes of death (other) have a PMR of 25.30%.



**Figure 2(a): Maternal mortality ratios by direct medical cause of death, South Africa, 2006- 2012**

Hypertension is the leading direct cause of maternal mortality for adolescent and adult females at 13.61 deaths per 100,000 live births overall (Figure 2(a)). In addition, hypertension causes more deaths to adolescents (13.26 deaths per 100,000 live births) than adult (11.38 deaths per 100,000 live births) females in the country. Alternatively, there are more adult deaths due to abortion than adolescent deaths with maternal mortality ratios of 7.56 and 4.20 respectively.



*\*excludes maternal causes*

**Figure 2(b): Maternal mortality ratios by indirect medical cause of death, South Africa, 2006- 2012**

By indirect causes of death, communicable causes of death, excluding obstetric causes, is the highest contributor to overall maternal mortality ratios (37.56 deaths per 100,000 live births). However, injuries are the highest indirect cause of death among pregnant adolescent females at 15.27 deaths per 100,000 live births compared to the 10.11 adult deaths per 100,000 live births from the same cause. Finally, non-communicable diseases are higher among adult (15.94) than adolescent (5.73) females in the country.

**Contribution to overall maternal mortality:**

**Table 2: Probability of dying with and without main direct and indirect cause of death among pregnant women, 2006- 2012**

	Age group	nq <sub>x</sub>	nq <sup>i</sup> <sub>x</sub>	
			Direct	Indirect
Adolescents	10-14	0.0001	0.00002	0.00007
	15-19	0.0015	0.00032	0.00149
Adults	20-24	0.0039	0.00078	0.00394
	25-29	0.0058	0.00125	0.00581
	30-34	0.0061	0.00143	0.00611
	35-39	0.0043	0.00107	0.00429
	40-44	0.0019	0.00063	0.00188
	45-49	0.0009	0.0005	0.00088
	50-54	0.0008	0.00054	0.00078
	55-59	0.0002	0.00008	0.0001

The probability of dying ( ${}_nq_x$ ) and probability of dying if direct and indirect causes were eliminated ( ${}_nq_x^i$ ) from the pregnant female population in South Africa is seen in Table 2. For young adolescents (10- 14 years old) the probability of dying in general ( ${}_nq_x$ ) during pregnancy is practically non-existent (0.0001 or 0.01%) and the probability drops even further in the absence of direct causes (0.002%) and indirect (0.007%) causes of death. While the probabilities are higher for older adolescents who are pregnant at 0.15% overall probability dying, but again the probabilities decrease with the elimination of direct and indirect causes. Adult females have consistently higher probabilities of dying during pregnancy and similar large reduction in the absence of these causes.

## **Discussion**

### *Key findings*

The aim of this paper is to learn the levels and causes of adolescent maternal mortality in South Africa. Adolescent maternal mortality rates are lower than adult rates in South Africa. This is similar to results of a study in Mozambique which found adolescents to contribute to 22% of all maternal mortality [16]. In other parts of Africa, pregnancy is a leading cause of adolescent female mortality, with rates much higher than South Africa and Mozambique [17]. In countries such as Chad, Guinea, Mali, and Niger, high prevalence of child marriage and early pregnancy, with about half of adolescents giving birth before the age of 18 years old, is perpetuating adolescent maternal mortality [18]. In South Africa and Mozambique child marriage is not nearly as prevalent as elsewhere and this could explain the reduced contribution of adolescents to overall maternal mortality in these countries.

Maternal mortality in South Africa is decreasing over time. This is a unique feature in Sub-Saharan Africa, with other countries in the region, such as Nigeria, Ethiopia and the Democratic Republic of Congo, experiencing increasing maternal mortality rates [19]. Healthcare facilities in South Africa have undergone major reform over the last 20 years, increasing access and affordability for the general population [20]. In the area of obstetric care, the level of antenatal care visits in South Africa is high with 97% of 208 adult females interviewed in a Johannesburg study reporting that they sought care early in their pregnancy [21]. And while access to care could be contributing to reduced maternal mortality, South Africa's declining fertility rates offers another possible explanation. The national Total Fertility Rate (TFR) has declined from 3.2 to 2.6 births between 1996 and 2012 [22, 23]. However, the declining trend in South Africa does not signify that the country is on par with more developed countries. Maternal mortality rates in the US are 29 deaths per 100,000 live births and in Austria it is as low as 4 deaths per 100,000 live births [24]. This comparison proves that South Africa still has a far way to go to further reduce maternal mortality. Despite the overall improvements in healthcare in South Africa, for pregnant adolescents, incomplete medical histories and discrimination from hospital staff is also known to prevent them from seeking the necessary care [25, 26].

A systematic review of causes of maternal mortality found hemorrhaging to be the leading cause of death in Africa [27]. In South Africa though, this study and another found that hypertension to be the leading cause of adolescent and adult maternal death [28]. Hypertension in South Africa is a noteworthy contributor to mortality with 9% of all deaths in the country were attributed to this disorder [29]. Risk factors associated



with hypertension are poor diet and stress [30]. Among pregnant females therefore stress and diet need to be frequently monitored as potential mortality hazards. At prenatal care visits this is offered, however, one study found that only 41% of pregnant adolescents access this service in South Africa [31].

A second concerning cause of death affecting pregnant adolescents is abortion. While abortion practices are legal in South Africa and have been for almost 20 years, there remains a restriction on the accessibility of safe abortions for adolescents. In Africa it was found that 29 abortions per 1,000 women were done in 2003 and 97% of these were unsafe [32]. In South Africa, race, class, stigma and geographical location are known boundaries to women wishing to seek these services safely and hence resorting to unsafe abortions which guarantee privacy and are quick but are not always done by trained service providers and associated with an increased risk of complications, while one study even found that women's late decision to terminate their pregnancy (second trimester onwards) increases their risk of maternal mortality and morbidity [33-35].

To a lesser extent, but nonetheless worrisome, are the number of adolescent maternal mortality deaths due to injury. Among youth, injury as a cause of death is particularly prevalent at 162.5 deaths per 100,000 population [36]. Within this categorization of cause of death are suicide and homicide deaths. While results here do not show a momentous number of suicide or homicide deaths, those present can be related to mental health issues and violence against women in the country. Research has shown that depression worsens with unwanted pregnancies contributing to suicide rates

among adolescents [37]. In addition, violence against women, including intimate partner violence, in the country is high at 336 acts of physical assault against women per 10,000 female population [38]. Research has also found that intimate partner violence is associated with unplanned and unwanted pregnancies [39, 40].

### *Strengths and limitations*

Firstly, the pooled data of seven years of Death Notification Forms increased the size of the adolescent maternal deaths sample. This has enabled a more robust quantitative and inferential analysis. The combined sample is also larger than any previous hospital-based records used in maternal mortality studies in South Africa. Secondly, the use of lifetables makes it possible to estimate the contribution of specific causes of death to probability of dying by age. By using associated single decrement lifetables, this study was able to identify the gains in survival if maternal causes of death were eliminated from the mortality experience of adolescent females. This has important policy and programme implications because it provides empirical proof of the need to reduce direct and indirect causes of maternal mortality. Lastly, this study has addressed an issue which has been overlooked in adolescent health research in South Africa. Adolescent maternal mortality is occurring in the country, and this study has contributed to knowledge through identifying the levels and causes contributing to this occurrence which compromises the future social and economic development of the country.

Outside of hospital data, which is scarce, maternal mortality statistics are difficult to ascertain. Death Notification Forms have been used in this study to obtain national estimates of maternal mortality. However, this data source is limited in its capturing of

pregnancy status at the time of death. The percentage of missing cases for pregnancy status ranges from 1.41% to 32.44% over the period. For this reason, the data has been pooled into a single dataset to increase the sample size and provide better estimates.

### *Implications of the study*

There is a difference in the levels and causes of adolescent and adult maternal mortality in South Africa. This result is important because it means that the same approach to maternal care that is used for adults should not be used for adolescents. Adolescence is a pivotal developmental stage, whereby adolescents are gaining independence for the first time but are still reliant on care and tutelage. This makes the phase of adolescence markedly different from child and adulthood. For this reason, age-sensitive approaches should be developed and monitored to address the specific needs of pregnant females at different ages in the country. Further, although rates are not as high for adolescents as for adult women, pregnant adolescents are still dying. In order to combat this, further research into the health-seeking challenges of pregnant adolescents should be conducted. And since not all pregnancies are wanted, resulting in stressful and harmful circumstances, research into the termination of pregnancy practices of adolescents would further assist in the reduction of hypertension and abortion as contributors to adolescent maternal mortality.

Should hypertension, abortion, violence and other direct and indirect causes of maternal mortality be removed from the mortality experience of pregnant adolescents, the probability of adolescents who are pregnant dying practically disappears. Since the direct causes are all obstetric and pregnancy related, improved healthcare

facilities, including the early and efficient detection of obstetric complications, will improve the survival of adolescents. Continued improvements to healthcare facilities in South Africa, paying special attention to youth obstetric care provided, particularly in the area of de-stigmatizing adolescent pregnancy and subsidizing costs should remain a priority. Ensuring that hospitals are appropriately stocked and staffed with specialized care for pregnant adolescents and adults, will reduce the number of maternal fatalities in the country.

Indirect causes of death can also be reduced through improving healthcare but injury and non-communicable disease mortality can even more easily be reduced through behavioral change. The promotion of safe and healthy lifestyle choices through community engagement and education, especially among adolescents could prevent unwanted pregnancies as well as any complications arising thereof. In addition, healthy lifestyle choices encourage positive health seeking behavior such as prenatal care visits.

The health and development of pregnant adolescents is hindered by the risk of mortality associated with pregnancy. In recognizing that these deaths are avoidable and unnecessary, appropriate measures can be designed and implemented to ensure the survival of adolescent females.

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