Comparison of childhood mortality trends from the direct and the indirect methods in high HIV settings

Chifundo Kanjala, MPhil in Demography, UCT

1.1. Background

The analysis of trends of mortality under the age of 5 (childhood mortality) in Africa reveal that childhood mortality started declining in the second half of the twentieth century (Ahmad, Lopez and Inoue, 2000). The speed of decline reduced from around the mid 1980s in many African countries. Some countries, for example Kenya, actually experienced a reversal of trends (Central Bureau of Statistics (CBS) [Kenya], Ministry of Health (MOH) [Kenya] and ORC Macro, 2004). As pointed out by Walker, Schwartlander and Bryce (2002), HIV/AIDS has often been singled out as the major contributor to these adverse trends. In addition to having an impact on the trends of childhood mortality, HIV/AIDS is also said to be affecting the measurement of childhood mortality (Ward and Zaba, 1999; Mahy, 2003). It is important to understand the exact impact of HIV/AIDS on childhood mortality measurement to ensure the accuracy of childhood mortality trends constructed in high HIV prevalence settings.

The aim of this study is to analyse the consistency of childhood mortality trends derived from the direct method of childhood mortality measurement and those from the indirect method. The data used are from Kenya and Malawi DHS surveys and censuses done during the period 1990 to 2004.

1.2. Methods

Direct estimates of childhood mortality presented in DHS reports for Kenya and Malawi in the periods 1993 to 2003 and 1992 to 2004 respectively were confirmed using a STATA code. The STATA code was shown to produce the same estimates as those presented in DHS reports (Table 1 and Table 2). Indirect mortality estimates were calculated using the Brass children ever born children surviving method (Brass method). The north family of the Princeton model life tables was used for both Kenya and Malawi since previous studies showed this family as the

most suitable for both countries (Population Division United Nations Secretariat, 1990) and Malawi (Malawi National Statistical Office, 2002).

X-Y plots of the infant mortality rate (IMR) and the under-5 mortality rate (U5MR) for each of the four childhood mortality - country combinations (IMR Kenya, IMR Malawi, U5MR Kenya and U5MR Malawi) were done. In each of these four combinations, the same pair of axes was used to plot the trends of childhood mortality from direct and indirect estimates. Comparison was then done to check whether the trends from the two methods were consistent.

1.3. Results

The results in Table 1, Table 2, Table 3 and

Table 4 from both the direct and the indirect methods show that childhood mortality is much higher in Malawi than it is in Kenya. Despite the fact that (according to the direct estimates) childhood mortality in Kenya was worsening since the mid-1980s while it has been continuously declining in Malawi, Malawian childhood mortality remained above Kenyan childhood mortality throughout the period of analysis.

The results also show that the direct and the indirect estimates are generally at different levels during overlapping periods. The differences in the levels are however not consistent for the two countries. While Kenyan indirect estimates are generally above the direct estimates in the period before 1990 and then they fluctuate above and below the direct estimates after 1990, the Malawian indirect estimates are generally below the direct ones.

Finally, the trend analysis shows that the direct and the indirect childhood mortality estimates for the period from the 1970s to the early 2000s in Malawi and Kenya generally give inconsistent trends. In the case of Kenya, while the direct estimates declined and then increased over time, the indirect estimates generally gave a roughly level trend with a lot of fluctuations. The trend constructed from the direct Malawian estimates is generally declining, while the indirect estimates gave an initially declining then increasing trend over time ignoring the estimates from the 2004 Malawian DHS, which gave lower estimates than those from the earlier surveys during the period of overlap.

Table 1: Direct childhood mortality estimates for Kenya

1993 DHS					1998 DHS					2003 DHS				
Time	IMR		U5MR		Time	IMR		U5MR		Time	IMR		U5MR	
	Reported	Calculated	Reported	calculated		Reported	calculated	Reported	calculated		Reported	calculated	Reported	calculated
1970.9	-	99.9	-	152.4	1975.9	-	83.9	-	129.8	1981	-	74.6	-	111.0
1975.9	-	71.6	-	124.4	1980.9	-	66.3	-	99.6	1986	-	66.7	-	107.5
1980.9	68.9	68.9	101.8	101.8	1985.9	61.9	61.9	89.6	89.6	1991	73.0	72.6	105	105.0
1985.9	63.4	63.4	89.7	89.7	1990.9	67.7	67.7	98.9	98.9	1996	73.0	73.4	110.0	110.4
1990.9	61.7	61.7	96.1	96.1	1995.9	73.7	73.7	111.5	111.5	2001	77.0	77.2	115.0	114.6

Table 2: Direct childhood mortality estimates for Malawi

1992 DHS					2000 DHS					2004 DHS				
Time	IMR		U5MR		Time	IMR		U5MR		Time	IMR		U5MR	
	Reported	Calculated	Reported	calculated		Reported	calculated	Reported	calculated		Reported	calculated	Reported	calculated
1970.3	-	172.9	-	358.9	1978.2	-	133.0	-	276.0	1982.4		117.3	-	215.3
1975.3	-	153.1	-	306.0	1983.2	-	129.4	-	251.8	1987.4		104.4	-	214.6
1980.3	136.4	137.9	258.0	259.3	1988.2	135.5	135.5	247.4	247.4	1992.4	104.0	103.9	190.0	189.7
1985.3	137.5	137.9	246.3	246.6	1993.2	122.7	122.7	219.7	219.6	1997.4	112.0	112.5	187.0	186.8
1990.3	134.3	134.6	233.8	233.8	1998.2	103.8	103.8	188.6	188.6	2002.4	76.0	76.1	133.0	133.3

Table 3: Indirect childhood mortality estimates for Kenya

1993 DHS			1998 DHS			1999 Census			2003 DHS		
Time	IMR	U5MR	Time	IMR	U5MR	Time	IMR	U5MR	Time	IMR	U5MR
1979.9	70.9	111.1	1984.2	77.0	122.0	1985.1	72.9	114.6	1989.8	72.5	113.9
1982.7	66.2	102.7	1987.1	66.1	102.5	1988.0	73.1	115.0	1992.7	62.5	96.2
1985.2	65.8	102.1	1989.7	55.5	84.0	1990.6	68.3	106.5	1995.1	77.7	123.2
1987.5	66.9	104.0	1992.1	68.7	107.2	1993.0	68.9	107.5	1997.4	66.1	102.6
1989.5	64.0	98.9	1994.3	69.5	108.6	1995.2	68.4	106.7	1999.4	75.7	119.6
1991.2	68.0	106.0	1996.0	77.7	123.3	1997.1	83.7	134.0	2001.1	78.3	124.3

Table 4: Indirect childhood mortality estimates for Malawi

1992 DHS			1998 census			2000 DHS			2004 DHS		
Time	IMR	U5MR	Time	IMR	U5MR	Time	IMR	U5MR	Time	IMR	U5MR
1978.2	155.9	263.2	1984.1	130.8	220.9	1986.4	136.1	230.0	1989.8	107.6	178.3
1981.0	143.6	242.6	1986.9	126.2	213.0	1989.2	123.9	208.7	1992.7	102.6	168.7
1983.7	135.0	228.2	1989.5	121.3	204.0	1991.8	121.3	203.9	1995.5	100.7	165.3
1986.1	140.0	236.7	1992.0	122.5	206.2	1994.2	117.0	196.0	1998.1	100.1	164.2
1988.3	150.1	253.5	1994.2	125.5	211.8	1996.4	130.8	221.0	2000.5	95.7	156.0
1990.2	169.6	285.8	1996.1	134.5	227.3	1998.2	130.9	221.1	2002.5	98.0	160.2

1.4. Discussion and conclusion

The aim of this study was to check the consistency of the childhood mortality trends constructed from direct and indirect methods in high HIV prevalence settings.

The comparison of the trends done suggests that the two methods give different trends. The trends from the direct method are more clearly defined compared to those from the indirect method.

The levels of childhood mortality from the two methods are also different. This observation is in accord with the results from the analysis of levels of infant mortality done by Adetunji (1996). While Adetunji used statistical analysis of the levels of infant mortality, this study uses graphical analysis. The differences in the levels of the direct and the indirect estimates are not consistent between the two countries reviewed. While the direct estimates are generally lower than the indirect estimates in the case of Kenya, the direct estimates for Malawi are generally at higher levels than indirect ones.

The Kenya indirect estimates are also more volatile than those for Malawi. It appears that the fluctuations are not due to the inherent properties of the indirect method (since they are absent in the Malawi estimates). The causes of these fluctuations require further investigation.

Though Malawi is showing higher childhood mortality than Kenya, childhood mortality is improving over time in Malawi while it has been increasing in Kenya since the mid 1980s.

The choices of the model life tables to use with Malawian and Kenyan data were made on the basis of other studies. The North family of the Princeton model life table system was used in the past for Kenya (Population Division United Nations Secretariat, 1990; United Nations, 1992) and Malawi (Malawi National Statistical Office, 2002).

The use of the Princeton model life tables in African high HIV prevalence settings is problematic. This is the case because the construction of the Princeton model life tables was informed by mortality data from HIV/AIDS free and largely European populations (United Nations, 1983).

Both the direct and the indirect childhood mortality estimates are biased downwards (Mahy, 2003). This bias is due to the dependence of childhood mortality on maternal mortality. The children of the infected mothers have higher mortality than the children in the general population. If the infected mothers die, then the mortality of their children is not reported, this leads to the downwards bias in the estimates.

Though the current study shows that, for Kenya and Malawi, there is inconsistency between the trends of childhood mortality from direct and the indirect estimates, it however does not provide a method of reconciling the trends from these methods. It also does not specify the role of HIV/ AIDS in causing the trends to be inconsistent. Only two countries were considered in this study. It would be useful to analyse trends from a greater number of countries to see if there are any systematic ways in which the trends are related.

1.5. References

Adetunji, J.A. 1996. "Infant Mortality Levels in Africa. Does Method of Estimation Matter?" *Genus* **52**(3-4):89-106.

Ahmad, O.B., A.D. Lopez and M. Inoue. 2000. *The decline in child mortality: a reappraisal*. Geneva: World Health Organization.

Central Bureau of Statistics (CBS) [Kenya], Ministry of Health (MOH) [Kenya] and ORC Macro. 2004. *Kenya Demographic and Health Survey 2003*. Calverton, Maryland: CBS and ORC Macro.

Mahy, M. 2003. *Measuring Child Mortality in AIDS-Affected Countries*. New York: United Nations.

Malawi National Statistical Office. 2002. *Malawi population and Housing Census 1998*. Zomba: Malawi National Statistical Office.

United Nations. 1983. *Manual X: The Indirect techniques for Demographic*. New York: United Nations.

Walker, N., B. Schwartlander and J. Bryce. 2002. "Meeting international goals in child survival and HIV/ AIDS", *The Lancet* **360**

Ward, P. and B. Zaba. 1999. "The Effect of HIV/ AIDS on the Estimation of Child Mortality Using the Children Surviving/ Children Ever Born Technique," Paper presented at IUSSP Conference. Copenhagen, Denmark.