Discrepancy in the early childhood mortality rates obtained from the two recent surveys of Nepal

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ABSTRACT

Introduction: In Nepal, early childhood mortality rates are derived from the Demographic and Health Surveys, which are prone to sampling and non-sampling errors being the probabilistic in nature. Thus, it is required to compare these mortality rates with other similar national survey to validate the findings.

Methods: Early childhood mortality rates were calculated using one of survival analysis methods or Kaplan-Meier Life Table technique on birth histories of the 2011 Nepal Demographic Health Survey and 2011 Nepal Living Standard Survey. Life table standard errors were used to calculate confidence interval in order tostatistically compare the early childhood mortality rates within and between these surveys.

Results: Life table estimates of early childhood mortalities on the 2011 Nepal Demographic Health Survey birth histories were similar to the published rates. Both surveys revealed declining trend of these mortality rates. However, estimates from 2011 Nepal Living Standard Survey were found to be significantly lower than the 2011 Nepal Demographic and Health Survey. Further, neonatal mortality was found to be stagnant during 1996-2000 and 2001-2005 periods using Living Standard Survey rather than 2001-2005 and 2006-2010 periods using Demographic and Health Survey.

Conclusion: Two nationally representative surveys of Nepal carried out at same calendar year using similar survey design and identical analysis technique, gave a drastically different early childhood mortality rates.

Keyword: Demographic and Health Survey, infant mortality, life Table Estimate, niving Standard Survey, Nepal, neonatal mortality.

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INTRODUCTION

Reliable estimates of the early childhood mortality are usually obtained from the vital registration system. When it is incomplete then sample vital registration system or population survey or even census is used to estimate these rates. As the vital registration system is grossly inadequate, sampling registration system is not yet in place and data from censuses are not reliable¹, childhood mortality rates are derived from the Demographic and Health Survey (DHS) in Nepal. Since DHS is a nationally representative probabilistic survey, it is also prone to sampling and non-sampling errors. Thus, DHS mortality rates need to be compared with similar survey to validate them. This is important as infant mortality remained stagnant between 2006 and 2011 in Nepal largely due to the stagnant neonatal mortality. So, the main aim of this study is to compare the early childhood mortality rates using life table technique on 2011 Nepal Demographic and Health Survey (NDHS) and 2011 Nepal Living Standard Survey (NLSS) datasets.

METHODS

Life Table technique is used to estimate early childhood mortality rates using Kaplan-Meier method.²This tool is capable of handling probability of occurrence of an event (success) with respect to the specified time (days, weeks, months etc..).³ It is a survival analysis technique that gives the probability of surviving for the specified time intervals and its complement gives the probability of dying or the mortality rates. As life table provides standard error of the estimates, one can also calculate the 95% confidence intervals of these mortality rates for further statistical comparisons within and between surveys. The data for the study comes

from the birth history records of the 2011 NDHS and 2011 NLSS. STATA MP 13.1 software⁴ is used for the data analysis.

RESULTS

Neonatal mortality rates (NNMR) for five years before the 2006⁵ and 2011⁶NDHS surveys i.e. 2001-2005 and 2006-2010 periods have remained identical in terms of point estimate (33 neonatal deaths per thousand live births) as well as interval (or period) estimate (26 to 39 neonatal deaths per thousand live births) (Table 1).

Table 1: Reported early childhood mortalityrates, 2006 and 2011 NDHS

	2006 NDHS - Reported Rates							
Periods	Calendar year	NNMR	PNNMR	IMR	CMR	U5MR		
	2001 - 2005	33	15	48	14	61		
0-4		(26 - 39) ¹	(12- 19) ¹	(40 - 56) ¹	(10 - 17) ¹	(52- 70) ¹		
5 - 9 ²	1996 – 2000	43	30	72	26	96		
10-14 ²	1991 — 1995	49	33	82	38	117		
	2011 NDHS - Reported Rates							
Periods	Calendar year	NNMR	PNNMR	IMR	CMR	U5MR		
	2006 - 2010	33	13	46	9	54		
0-4		(26 - 39) ¹	(10 - 17)1	(39 - 53) ¹	(6 - 12) ¹	(47 - 62) ¹		
5 - 9²	2001 - 2005	37	23	60	10	70		
10-142	1996 – 2000	45	25	70	19	87		

Note: 1. Figures in the parentheses are 95% Confidence Intervals obtained using the reported standard errors for a five year period before the survey.

2. The 95% CI for these periods are not calculable as standard errors were not reported.

For five years period prior to the survey, the infant mortality rate declined by 2 deaths per thousand live births which is only attributed to the decrease in the post-neonatal mortality rate (PNNM) by the same margin for this period. Similarly, child mortality rate (CMR) declined

from 14 deaths to 9 deaths per thousand live births whereas under-five mortality rate (U5MR) decreased from 61 to 54 deaths per thousand live births between 2006 and 2011. As the confidence intervals overlap for all the mortality rates for the five years prior to the survey, these declines were not statistically significant.

For 2001-2005 period, all the mortality rates were higher for 2011 NDHS except the CMR which was lower in the 2006 NDHS. On the other hand, mortality rates were slightly lower for 1996-200 period for 2011 NDHS except the NNMR which was higher in the 2006 NDHS.

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	2011 NDHS – Life Table Rates								
Periods	Calendar year	NNMR	PNNMR	IMR	CMR	U5MR			
0-4	2006 - 2010	31	15	46	4	50			
		(26 - 36)	(13 - 17)	(40 - 52)	(2 - 6)	(44 - 57)			
5-9	2001 - 2005	38	22	60	10	70			
		(33 - 43)	(20 - 24)	(54 - 66)	(8 - 12)	(64 - 77)			
10-14	1996 – 2000	44	29	73	14	87			
		(39 - 49)	(27 - 31)	(66 - 79)	(12 - 16)	(80 - 94)			
	2011 NLSS – Life Table Rates								
Periods	Calendar year	NNMR	PNNMR	IMR	CMR	U5MR			
0-4	2006 - 2010	23	9	32	3	35			
		(18 - 28)	(7 - 11)	(26 - 39)	(1 - 5)	(28 - 42)			
5-9	2001 – 2005	27	14	41	7	48			
		(21 - 32)	(12 - 16)	(34 - 48)	(5 - 9)	(41 - 55)			
10-14	1996 – 2000	28	19	47	13	60			
		(23 - 34)	(17 - 21)	(40 - 54)	(12 - 16)	(53 - 68)			

rates, 2011 NDHS and 2011 NLSS

Table 2: Estimated early childhood mortality

Figures in the parentheses are 95% Note: Confidence Intervals obtained using the standard errors from the life table.

The estimated early childhood mortality rates from the 2011 NDHS birth histories data are similar to the reported point and interval estimates in the 2011 NDHS reports (Table 1 and 2). All the mortality rates were declining for 0-4 years compared to 5-9 and 10-14 years and, for 5-9 years compared to 10-14 years prior to the survey for both 2011 NLSS and 2011 NDHS (Table 2). However, these declines were not statistically significant for NNMR, IMR and CMR as the confidence internals for the sequinguennial periods overlapped with each other for the 2011 NDHS and all the rates for the 2011 NLSS.

Yet, the early childhood mortality estimates obtained from the 2011 NLSS data revealed a remarkable lower values for all the mortality rates compared to the 2011 NDHS estimates (Table 2). Further, as confidence interval of the NNMR, PNNMR and U5MR did not overlap between 2011 NLSS and NDHS, the declines were statistically different between these two surveys. Similarly, PNNMR, IMR and U5MR rates were also significantly different as the confidence intervals did not overlap between 2011 NDHS and 2011 NLSS for 2006-2010 period as well. All the mortality rates were statistically different for 2001-2005 and 1996-2000 periods except the CMR for 1996-2000 period between these surveys. Yet, 2011 NLSS estimates revealed that neonatal mortality was in fact stagnant during 2001-2005 period instead of 2006-2011 period as reported by the 2011 NDHS.⁶

DISCUSSION

Since the neonatal childhood mortality rates remained stagnant and other early childhood mortality rates declined without being statistically significant, we conclude that all these rates were same for the five years before the survey i.e. 2001-2005 and 2006 - 2010 for the 2011 NDHS. Similar findings were also observed by the further analysis of neonatal mortality using 2011 NHDS.⁷

Even though neonatal mortality, child mortality and under-five mortality estimates for 2001-2005 period were found to be higher for the

2011 NDHS, the differences were not statistically significant as these estimates were inside the 2006 NDHS confidence intervals. This means that these mortality estimates between 2006 and 2011 NDHS were not different. On the other hand, post-neonatal and infant mortality rate estimates from the 2011 NDHS did not overlap with the confidence interval of the 2006 NDHS indicating these rates being different statistically for the same period i.e. 2001-2005.

These results indicate that some of the early childhood deaths (events) must have been reported wrongly (declaration error) as not all the deaths rates were found to be same for 2001-2005 period. This is a common problem in birth histories as they are prone to recall bias from which these rates are calculated.⁸ Further, there seems to an agreement on early childhood mortality rates for the 1996-2000 period as all of them are nearly same from both the 2006 and 2011 NDHS in spite of mortality rates being slightly lower for this period for the 2011 NDHS. These can happen as the sample of events size decreases with the number of years prior to the survey result more extreme values giving erratic results.7,8

The most interesting result from this analysis is different phases of the stagnation of the neonatal mortality in Nepal as it is found stagnant for 1996-2000 and 2001-2005 periods using 2011 NLSS data unlike 2011 NDHS rates where it is widely reported to the stagnant for 2001-2005 and 2006-2010 periods (Table 1 and 2). Similar discrepancies were observed for other early childhood mortality rates obtained from these two surveys. It is difficult to accept these big differences as both surveys were based on robust study design, data collection, data entry and data validation techniques.^{6,9}

Thus, these results strongly suggest that Nepal needs a strong results of vital events from a different demographic data collection method i.e. vital or sample registration system to compare the estimates obtained from the large nationally representative surveys like NLSS and NDHS.

CONCLUSION

Life table estimates of childhood mortality is found to be consistent with the reported NDHS rates. Within survey comparison of NDHS and NLSS revealed that early mortality rates were declining in the country in the recent past i.e. five to fifteen years prior to the survey. However, between survey comparison revealed the problem in the mortality rates as they were found to be significantly different for 2011 NLSS and NDHS statistically for nearly all the periods prior to the survey. Even the stagnation of much reported neo-natal mortality was found to be different between the two surveys under consideration.

Two surveys carried out at same calendar year using similar survey design and identical analysis technique, gave a drastically different early childhood mortality rates thus warranting a closer scrutiny of the collected data and its quality. However, as the difference are very wide it is better to start an alternative system like sample registration system to scrutinize the results obtained from these large and nationally representative surveys by the concerned government agencies namely Ministry of Health and Population, Central Bureau of Statistics and United Nations agencies such as World Health Organization and United Nations Population Fund. This also means that lesson learned from the sample registration system should be used to strengthen the currently underperforming vital registration system as reliable data are fundamental for the planning and policy formulation in the country.

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