

# Trends in Mortality and Perceived Cause of Death in Kersa Health and Demographic Surveillance System, 2008-2019

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## Background

- In Ethiopia, crude death rates and child mortality rate have dropped from 25.1 deaths per 1000 population and 270 deaths per 1000 live births in 1960 to 6.7 deaths per 1000 population and 55 deaths per 1000 live births in 2019 (UN-Online 2019).
- Infant mortality rates have also dropped from 160.2 deaths per 1000 live births in 1960 to 41.7 deaths per 1000 live births in 2010 (UN-Online 2019)
- Because of the large rural population in Ethiopia, poor utilization of health services and the lack of a vital registry system, HDSS sites provide record of mortality and changes over time through longitudinal surveillance.
- Kersa Health and demographic Surveillance System (Kersa HDSS) is collecting demographic events including death since September of 2007.
- This analysis tries to characterize mortality pattern and perceived causes of death of the site for the period of 2008-2019.

## Methods

- Kersa HDSS established in February 2007 which consists of a representative selection of Kabeles with average population size of 5000 each and collected primarily demographic and household data and information about vital events (births, deaths and migration) in the area.
- Follow up surveys beginning in September 2008 began collecting health information as part of the surveillance.
- In 2015 the population of the study site has been doubled to increase the population under surveillance to over 130,000 in 24 Kebeles.
- The Crude Death Rate, Infant Mortality Rate, Child (Under 5) Mortality Rate, Life Expectancy and Age-Specific Death Rate were calculated for each year's population from 2008 to 2019.
- The denominators used in all these rates represented the are the person-year contributed by each resident in the specified year. Linear regression analyses were done to estimate trends in the rates over time.
- The major perceived causes of death as reported by a close relative were also examined and grouped.
- The causes of death were classified for this analysis based on the classifications used in the Global Burden of Disease Study2010 (Lozano et al., 2012).

## Results

Mortality over the twelve-year period from 2008 to 2019 showed a significant reduction in the death pattern. Though the rates vary by sex, consistent reduction between the two gender is observed. Regression analysis showed that the slight rate of decrease of 0.54 deaths per 1000 population per year with a significant correlation coefficient of (r<sup>2</sup>=0.86) (Figure 1)  
The crude death rates were 11.19 in 2008 and fall to 5.53 in 2019 per 1000 population (Table 1). The average mortality rate for the twelve-year period was 8.39 deaths per 1000 population



Figure 1: Overall and sex specific death rate.

Year	Live Birth	Early-neonatal deaths	Late-neonatal deaths	Post-neonatal deaths	Neonatal deaths	Infant deaths	Under-five Deaths	ENMR	LNMR	PNMR	NMR	IMR	USMR
2008	1615	27	12	73	39	112	238	16.72	7.43	45.20	24.15	69.35	147.37
2009	1791	33	23	54	56	110	178	18.43	12.84	30.15	31.27	61.42	99.39
2010	2009	51	21	65	72	137	238	25.39	10.45	32.35	35.84	68.19	118.47
2011	1579	28	13	77	41	118	269	17.73	8.23	48.77	25.97	74.73	170.36
2012	1808	33	16	54	49	103	211	18.25	8.85	29.87	27.10	56.97	116.70
2013	2342	44	19	52	63	115	189	18.79	8.11	22.20	26.90	49.10	80.70
2014	2228	44	14	53	58	111	210	19.75	6.28	23.79	26.03	49.82	93.81
2015	3120	58	23	81	81	162	347	18.59	7.37	25.96	25.96	51.92	111.22
2016	3849	67	24	101	91	192	286	17.41	6.24	28.24	23.64	49.88	74.31
2017	4481	58	25	80	83	163	258	12.94	5.58	17.85	18.52	36.60	57.80
2018	4470	43	19	91	62	153	272	9.62	4.47	20.36	14.09	33.33	59.51
2019	3,291	41	17	82	58	140	281	12.46	5.17	24.92	17.62	42.54	85.38
<b>Average</b>								<b>17.17</b>	<b>7.59</b>	<b>28.97</b>	<b>24.76</b>	<b>53.66</b>	<b>101.25</b>

Table 1: Deaths and crude death rate of Kersa HDSS, Ethiopia

The neonatal, infant, and under-five mortality rates were 24.15, 69.35 and 147.37 in 2008 and becomes 17.62, 42.54 and 85.38 in 2019, respectively (Table 2).

Year	ENMR	LNMR	PNMR	NMR	IMR	USMR
2008	16.72	7.43	45.20	24.15	69.35	147.37
2009	18.43	12.84	30.15	31.27	61.42	99.39
2010	25.39	10.45	32.35	35.84	68.19	118.47
2011	17.73	8.23	48.77	25.97	74.73	170.36
2012	18.25	8.85	29.87	27.10	56.97	116.70
2013	18.79	8.11	22.20	26.90	49.10	80.70
2014	19.75	6.28	23.79	26.03	49.82	93.81
2015	18.59	7.37	25.96	25.96	51.92	111.22
2016	17.41	6.24	26.24	23.64	49.88	74.31
2017	12.94	5.58	17.85	18.52	36.60	57.80
2018	9.62	4.47	20.36	14.09	33.33	59.51
2019	12.46	5.17	24.92	17.62	42.54	85.38
<b>Average</b>	<b>17.17</b>	<b>7.59</b>	<b>28.97</b>	<b>24.76</b>	<b>53.66</b>	<b>101.25</b>

Table 2: neonatal, infant and under five deaths and rates for Kersa HDSS, Ethiopia

The infant mortality rate was found to be declining at 3.17 deaths per live births per year (r<sup>2</sup>=0.77) and the under-five mortality rate was increasing at 6.8 deaths per 1000 live births per year (r<sup>2</sup>=0.52) (Figure 2).

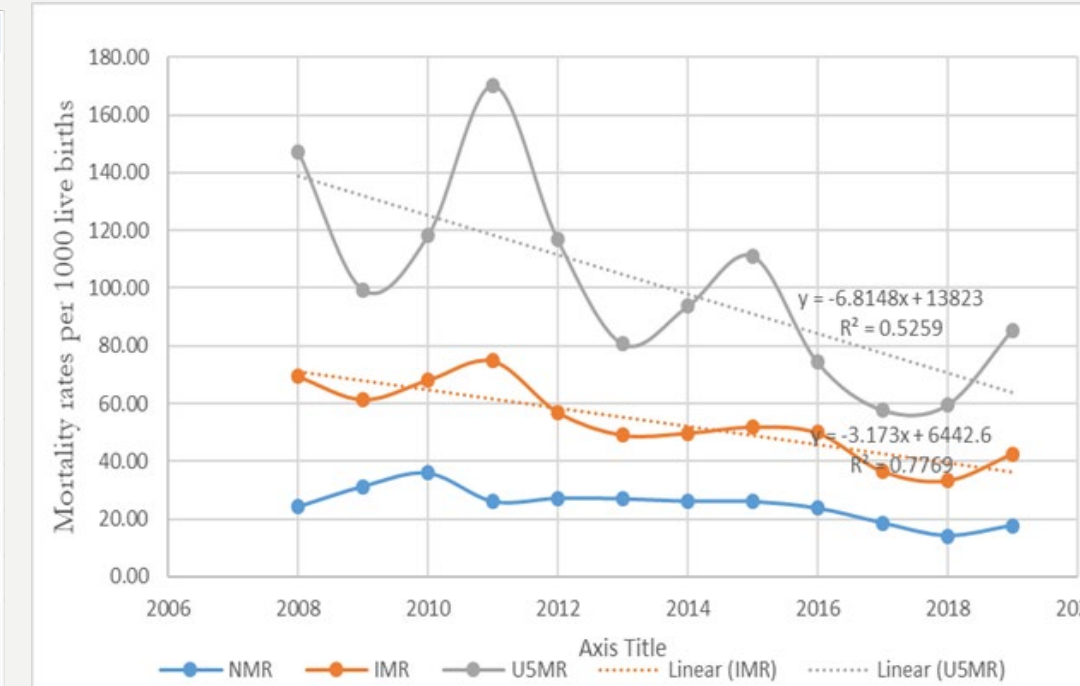


Figure 2: A twelve-year pattern of neonatal, infant and under-five mortality

Mortality rates were highest during infancy, childhood (under 5 years) and old age (65+ years) and increased with age (after age 5). Overall, the mortality rate increased significantly, by 6.2 deaths per 1000 population, with each five-year age group (r<sup>2</sup>=0.58). Mortality rates were similar for men and women throughout more or less. Between age groups 35-39 to 60-64 years, men had greater mortality rates than women (Figure 3). Life expectancy at birth has changed significantly over 12-year period with annual increase of 1.34 years (Figure 4)

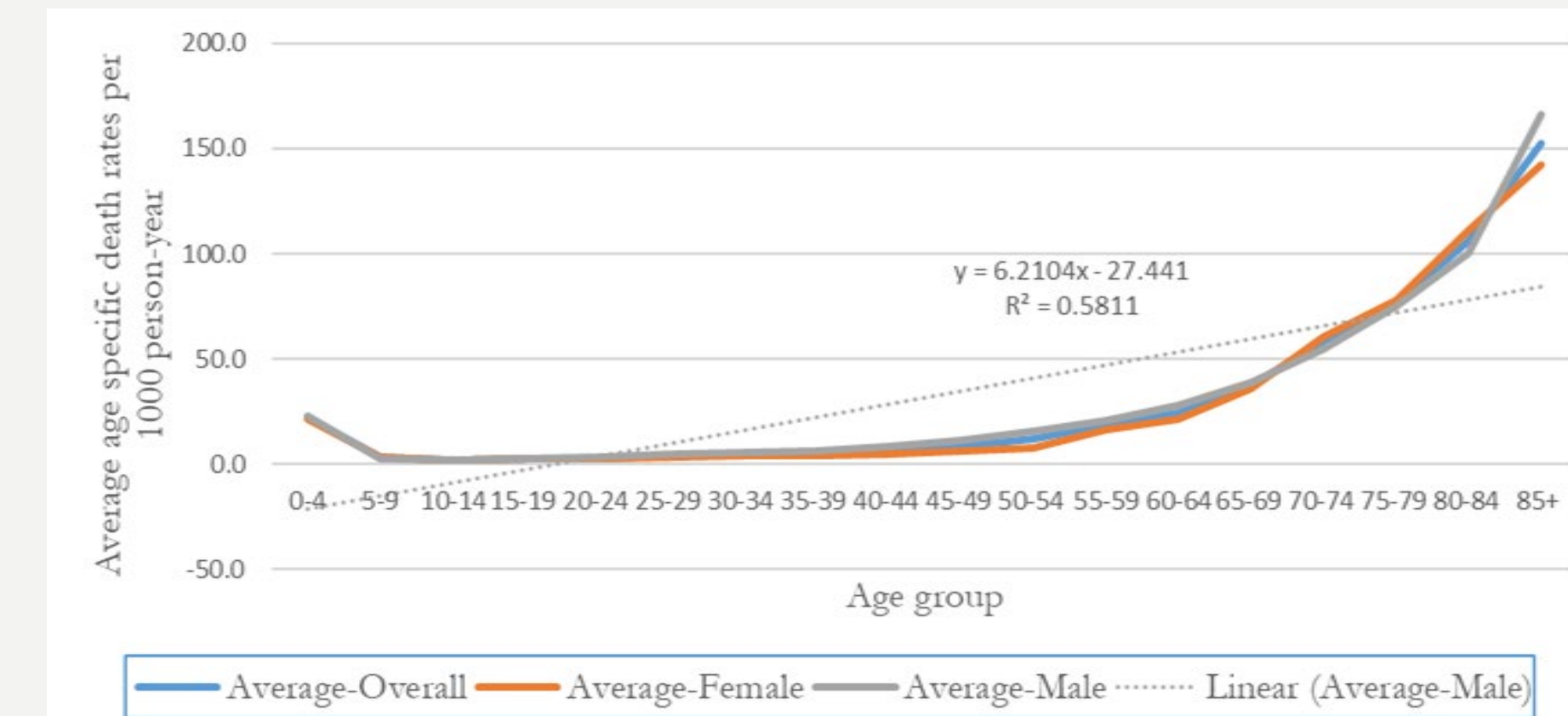


Figure 3: Average twelve-year age-specific death rate of Kersa HDSS, Ethiopia

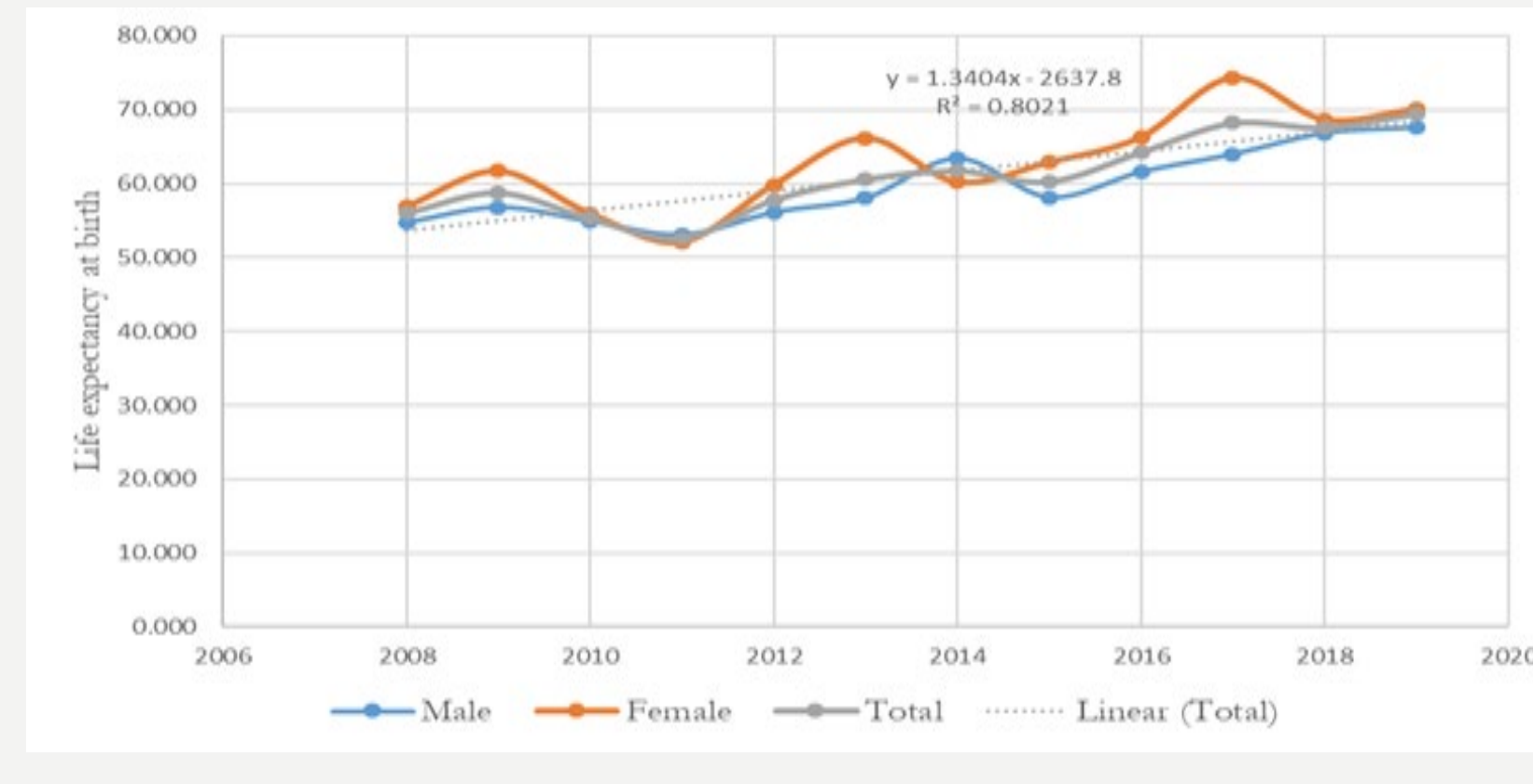


Figure 4: Life expectancy changes of over twelve-year period of Kersa HDSS, Ethiopia

The major perceived causes of death remained constant over the twelve-year period. Regression analyses showed that the proportion of each cause of death did not change significantly from one year to the next. The majority (53%) of all deaths were classified as unknown or other causes and sudden death (Figure 5).

Of the 47% of deaths for which a cause was known, 35% were attributable to Group I causes, 5% to jaundice, 5% to Group III causes and 2% to Group II causes (Figure 5).

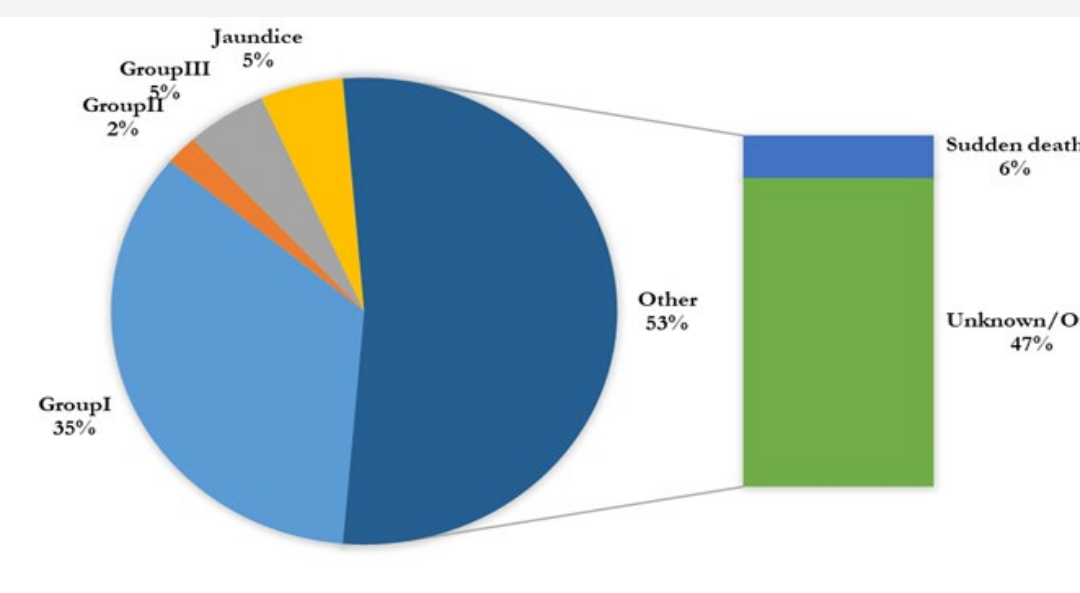


Figure 5: Perceived cause as reported by close relative of the deceased person in Kersa HDSS, Ethiopia

## Conclusions

- There is significant change in the rates of mortality in Kersa HDSS between 2008 and 2019, over the twelve-year period.
- The overall CBR dropped from 11.19 in 2008 to 5.53 in 2019.
- Similarly there is a drop in under-five mortality from 147.37 in 2008 to 85.38 for 2019, still it is one of the highest even compared to the national report.
- The primary cause of death, based on the perceived report from the close by family in Kersa HDSS was Group I causes (communicable, maternal, perinatal and nutrition deficiency related).
- There were significant differences in the other leading causes of death between men and women and children and adults.
- While this gives little insight into mortality decline in the area and its association with population growth, it does shed some light on the fact that Kersa, and possibly in Ethiopia, has not yet completed the epidemiological transition.

## References

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