Impact of Transport Accident and Injury on Longevity in Two Selected Districts in Northern Ghana

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Abstract

Background: Injury-related mortality accounts for over 1.3 million people who died prematurely before attaining 70 years, and many of these occur in low- and middle-income countries. Evidence shows that injury-related deaths are on the rise in many parts of Ghana. Assuming that major health interventions were implemented and road traffic or injury deaths were reduced to no public health significance as envisaged by SDG target 3.6, how would it translate to improved longevity for households in the Kassena-Nankana East and West districts of the Upper East Region of Ghana.

Methods: Data was from the Navrongo Health and Demographic Surveillance Systems. Single and multiple decrement life table models were employed to estimate the effect of reducing road traffic or injury deaths on population longevity.

Results: Without road traffic or injury deaths, results showed an increase of about 2.1 additional years of life, from 67.8 to 69.9 years. There is a significant improvement in life expectancy at every age. Additionally, there is an overall increase survival rate

Conclusion: Health programmes and interventions on road traffic or injury deaths should be supported and strengthened to reduce road traffic or injury mortality.

Keywords: Mortality, Longevity, Life expectancy, Injury, Ghana

Introduction

A public health catastrophe is occurring on the blind side of humanity. Across the world, about 1.3 million people are estimated to die through road traffic accidents every year (WHO, 2018). Suicide and deaths from self-harm account for about 30% of global deaths. About 10 percent of all deaths which occurred in Africa in 2019 were classified as road traffic or injury deaths (World Health Organization, 2020). Injury-related mortality is on the rise in many parts of the world. Despite alarming statistics, health attention at both regional, national and local levels has not given priority to external causes of death. Addressing deaths from transport accidents and injuries is a global priority in the Sustainable Development Goals (SDGs), target 3.6 of SDG 3. Yet there is an incomprehensive understanding of the impact of this class of causes of death on longevity. We aimed to provide evidence that is crucial for tailoring resources and interventions towards reducing the burden of external causes of death and improving population well-being and longevity.

METHODS

Study area

The study region is the Upper East Region of Ghana. The Region is located in the north-eastern part of the country, between longitudes 0^0 and 1^0 West and latitudes 10^0 30' N and 11^0 N. It shares

boundaries with the Upper West Region of Ghana to the west, Burkina Faso to the north, the Republic of Togo to the east and the Northern Region of Ghana to the south. The study was conducted at the Kassena-Nankana East and West districts of the Upper East Region of Ghana.

Data source

We used longitudinal data from the Navrongo Demographic Surveillance Systems (NDSS) of the Navrongo Health Research Centre. The NDSS began in 1992 and the first wave of data updates occurred in July 1993. Since its inception, the NDSS has consistently and continuously monitored the population of all individual registered members within the demographic surveillance area (DSA) (Oduro et al., 2012). Deaths of all registered and eligible members of the NDSS are recorded, regardless of the place of death. In the NDSS, usually, deaths are commonly known compared to births. Therefore, per the approach adopted by the NDSS deaths are less likely to be underreported. However, due to cultural and religious beliefs, newborn children who are not yet registered under the NDSS and deaths of under-five-year children may hardly be reported. For instance, in the Kassena and Nankana sociocultural world, a spirit child is perceived to be responsible for the causes of illness, disability, and misfortune within the family in particular and the community in general (Denham et al., 2010).

The causes of death information was obtained through verbal autopsies (VA) conducted on the deaths of individuals who are registered members of the Navrongo Health and Demographic Surveillance Systems (HDSS) of the Centre (Oduro et al., 2012). A verbal autopsy is an oral postmortem process through which information on the events leading to the death of an individual is obtained from the relative of the deceased person using a standardized questionnaire (Baiden et al., 2007; Bawah et al., 2014). This approach is often used in settings where there is a lack of complete vital registration systems (VRS) with medical certification of deaths. Our study thus relied on the HDSS verbal autopsy data to estimate potential gains in life expectancy assuming health interventions were put in place, and injury-related mortalities were to be eliminated as major causes of death from the study area.

Data management and analyses

To ensure high-quality data, all completed registers and event forms are usually checked by the NDSS team for accuracy, internal consistency, misquotations and completeness. Data collection instruments and questionnaires usually undergo through rigorous review by supervisors to ensure that they are completed with no blanks, inconsistencies or errors before they are sent for data entry. The questionnaires which are detected to have been completed in error are usually taken back to the field for resolution if such detected errors cannot be resolved immediately. In addition, the NDSS usually holds a monthly review meeting (Zonal meetings) for field staff to report on their activities and to assess their performance. Further, the data was evaluated for age heaping and age misreporting.

Measurement procedure

This study categorized transport accident and injury deaths (external causes) to include causes of deaths associated with road traffic, suicide, self-harm, assault, tetanus, the spirit child phenomenon and other external causes. This classification was based on the WHO's major causes of mortality (World Health Organization, 2020) and the Global Burden of Disease Classifications (Murray & Lopez, 1996). To estimate the impact of transport accidents and injury deaths on longevity in the study area, deaths attributable to road traffic and other accidental causes were isolated from all-

cause mortality. The life expectancy for the area was then estimated with the assumption that some major public interventions were put in place, and road traffic and injury deaths were reduced to non-public health significance from this population.

Data Limitations

The limitations on the usage of VA tools to ascertain causes of death have been reported in studies (Herrera et al., 2017; Ramroth et al., 2012; Valecha et al., 2011). These limitations include the low sensitivity and specificity of such tools to measure disease mortality (Herrera et al., 2017), and difficulty in identifying malaria as a cause of death in holoendemic malaria regions (Ramroth et al., 2012). Additionally, verbal autopsy tools have been criticized on grounds of their potential misclassifications of causes of death particularly the controversial estimation of malaria mortality in India (Valecha et al., 2011). However, in the absence reliable death registration system which is a common problem in many SSA countries, verbal autopsy data becomes a viable alternative for analysing and estimating causes of death (Ohene et al., 2011; Ramroth et al., 2012; Rankin et al., 2012).

Results

Table 1 presents a general and multiple decrement life table for the KNE and KNW districts in 2016. In 2016, out of the 769 deaths recorded, 136 of them were categorized as external causes. To estimate the impact of external causes on longevity, we used cause deleted life table analysis (Table 2). First, we assumed that some major public interventions were put in place and external causes were reduced to non-public health importance in line with SDG target 3.6 and we modelled it impact on life expectancy at birth. Results showed an increase of about 2.1 additional years of life, from 67.8 to 69.9 years.

Table *1* A *general and* multiple decrement life table for the KNE & KNW, 2016

Age group	ALL Deaths	Pop	External causes	${}_nm_x$	${}_nq_x$	${}_nP_x$	${}_nd_x$	l_x	${}_nL_x$	T_x	e_x	${}_nq_x^{Ex}$	${}_nd_x^{Ex}$	l_x^{Ex}	${}_nm_x^{Ex}$
0-4	78	19,573	4	0.0040	0.0158	0.9842	1577	100000	395742	6782182	67.82	0.0002	20	9673	0.0002
5-9	29	19,353	11	0.0015	0.0075	0.9925	735	98423	487935	6386440	64.89	0.0023	223	9652	0.0006
10-14	8	19,283	1	0.0004	0.0021	0.9979	202	97688	486745	5898505	60.38	0.0003	25	9429	0.0001
15-19	10	17,779	7	0.0006	0.0028	0.9972	274	97486	484925	5411760	55.51	0.0020	192	9404	0.0004
20-24	14	14,948	8	0.0009	0.0047	0.9953	454	97212	481221	4926835	50.68	0.0027	260	9212	0.0005
25-29	25	11,710	15	0.0021	0.0106	0.9894	1027	96758	475824	4445614	45.95	0.0064	618	8952	0.0013
30-34	23	9,674	5	0.0024	0.0118	0.9882	1131	95731	469712	3969790	41.47	0.0026	247	8334	0.0005
35-39	22	7,866	4	0.0028	0.0139	0.9861	1314	94599	460630	3500078	37.00	0.0025	240	8087	0.0005
40-44	33	6,555	7	0.0050	0.0249	0.9751	2319	93286	448906	3039448	32.58	0.0053	497	7847	0.0011
45-49	36	6,817	9	0.0053	0.0261	0.9739	2371	90967	435283	2590541	28.48	0.0066	599	7350	0.0013
50-54	49	6,928	10	0.0071	0.0347	0.9653	3079	88596	417933	2155258	24.33	0.0072	637	6752	0.0014
55-59	55	5,953	12	0.0092	0.0452	0.9548	3861	85517	398372	1737325	20.32	0.0100	858	6115	0.0020
60-64	50	5,026	5	0.0099	0.0485	0.9515	3963	81656	372721	1338953	16.40	0.0050	405	5257	0.0010
65-69	70	4,143	8	0.0169	0.0811	0.9189	6297	77693	332887	966232	12.44	0.0096	747	4852	0.0019
70-74	97	3,351	12	0.0289	0.1350	0.8650	9636	71395	277918	633345	8.87	0.0177	1267	4105	0.0036

75-79	78	1,755	7	0.0444	0.2000	0.8000	12352	61759	123519	355428	5.76	0.0197	1220	2838	0.0040
80+	92	1,651	11	0.0557	1.0000	0.0000	49408	49408	231909	231909	4.69	0.0328	1619	1619	0.0067
Total	**769**	**162365**	**136**	**0.0047**	-	-	-	-	-	-	-	-	**9673**	**-**	-

Ex = External causes of death

${}_nm_x$ = Mortality rate for people in age group x to x + n.

${}_nq_x$ = Probability of dying between ages x and x + n.

${}_np_x$ = Probability of surviving between ages x and x + n.

l_x = Number surviving at each age.

${}_nd_x$ = Number of deaths between ages x and x + n.

${}_nL_x$ = Person-years lived between ages x and x + n.

T_x = Person-years lived beyond age x.

e_x = Life expectancy at age x

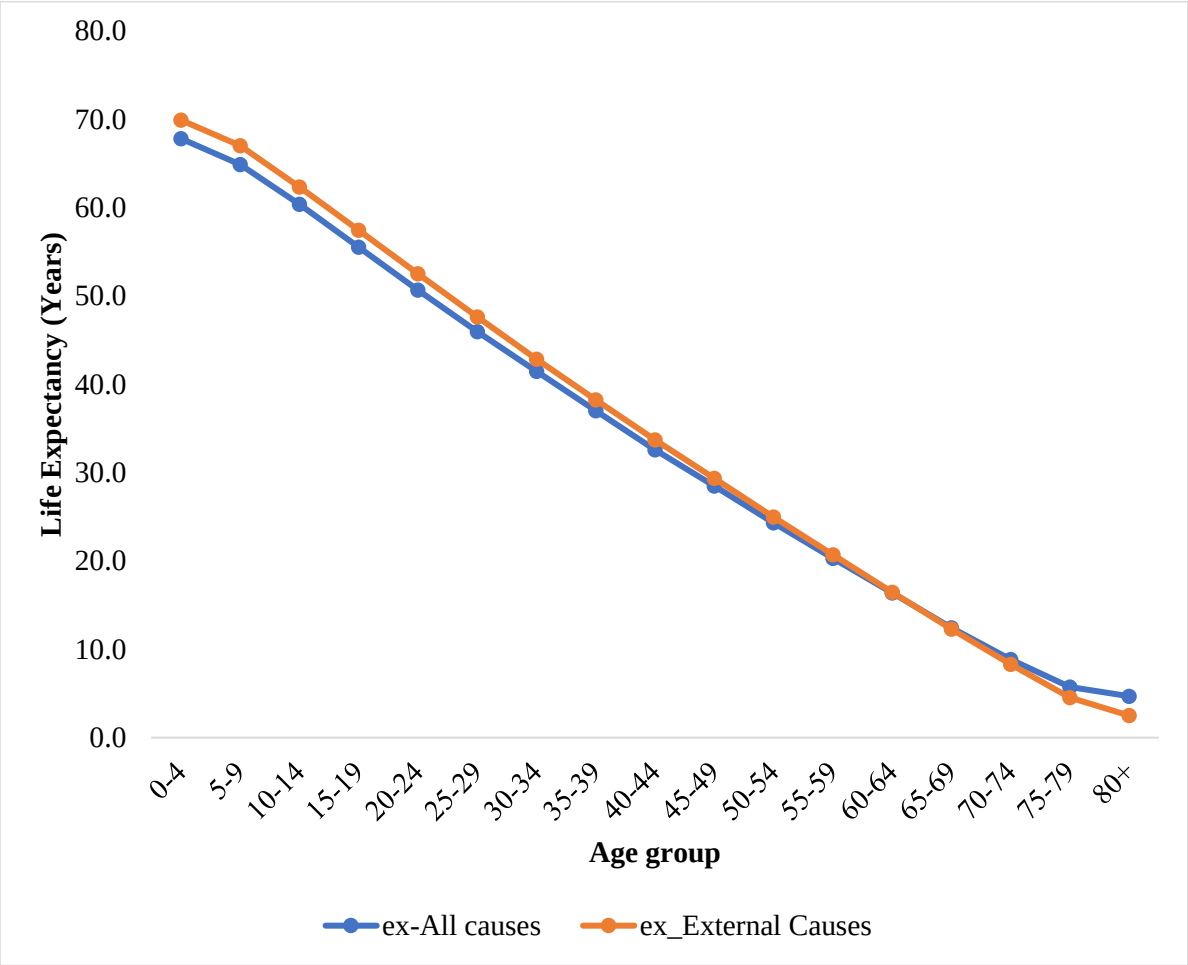
Table 2 Associated single-decrement life table for causes of death other than External causes of death

Age group	l_x	${}_np_x$	R^{-Ex}	p^{-Ex}	l_x^{-Ex}	${}_nq_x^{-Ex}$	${}_nd_x^{-Ex}$	${}_nq_x$ / ${}_nq_x^{-Ex}$	${}_nm_x^{-Ex}$	${}_nL_x^{-Ex}$	T_x^{-Ex}	e_x^{-Ex}
0-4	100000	0.9842	0.8974	0.9844	100000	0.0156	1557	1.027	0.0038	395864	6991930	69.9
5-9	98423	0.9925	0.6207	0.9948	98443	0.0052	511	1.437	0.0009	490495	6596066	67.0
10-14	97688	0.9979	0.8750	0.9982	97932	0.0018	178	1.143	0.0004	489011	6105571	62.3
15-19	97486	0.9972	0.2000	0.9992	97754	0.0008	82	5.006	0.0002	488078	5616561	57.5
20-24	97212	0.9953	0.3571	0.9980	97672	0.0020	195	2.804	0.0004	486841	5128482	52.5
25-29	96758	0.9894	0.4000	0.9958	97477	0.0042	413	2.508	0.0009	484111	4641641	47.6
30-34	95731	0.9882	0.7826	0.9908	97064	0.0092	897	1.279	0.0019	480352	4157530	42.8
35-39	94599	0.9861	0.8182	0.9887	96168	0.0113	1091	1.224	0.0023	473467	3677178	38.2
40-44	93286	0.9751	0.7879	0.9805	95076	0.0195	1857	1.273	0.0040	466199	3203711	33.7
45-49	90967	0.9739	0.7500	0.9805	93219	0.0195	1816	1.338	0.0040	455259	2737512	29.4
50-54	88596	0.9653	0.7959	0.9724	91403	0.0276	2519	1.261	0.0056	442914	2282253	25.0
55-59	85517	0.9548	0.7818	0.9649	88884	0.0351	3122	1.286	0.0072	427274	1839339	20.7
60-64	81656	0.9515	0.9000	0.9564	85762	0.0436	3737	1.114	0.0090	404818	1412065	16.5
65-69	77693	0.9189	0.8857	0.9286	82025	0.0714	5861	1.134	0.0150	373156	1007247	12.3
70-74	71395	0.8650	0.8763	0.8828	76165	0.1172	8928	1.151	0.0254	328205	634091	8.3
75-79	61759	0.8000	0.9103	0.8197	67237	0.1803	12120	1.110	0.0405	168092	305885	4.5
80+	49408	0.0000	0.8804	0.0000	55117	1.0000	55117	1.000	0.0491	137793	137793	2.5

R^{-Ex} = the proportion of death due to all causes other than external causes.

Figure 2 displays the estimated life expectancy for the overall mortality and the corresponding life expectancy without external for each age group. The life expectancy for the combined causes of mortality is compared with the corresponding life expectancy after isolating deaths that are related to road traffic accidents and injuries. The results also show an increase in life expectancy at every age if road traffic accidents and injuries were eliminated as a result of a major health intervention.

Figure 2 Comparison of estimated life expectancy for each age group without external causes, Kassena-Nankana East and West District, Ghana



Discussions

Our paper sought to estimate the impact of road traffic or injury deaths on longevity in two poor rural districts in Northern Ghana. We assumed that some major health interventions targeting road traffic or injury deaths were implemented and road traffic or injury mortality was reduced to unimportant levels such that it is no longer a public health concern in these districts. The results showed an increase in life expectancy at birth from 67.8 to 69.9 years, indicating gains in longevity in the absence of road traffic or injury of about 2.1 additional years.

If some major health interventions were put in place and road traffic or injury deaths were reduced to insignificant levels from this population as targeted in SDG target 3.6, it would translate into improvement in longevity. The gains in life expectancy vary between the different age groups. These findings are consistent with earlier studies which have observed similar age variation in mortality (Aksan & Chakraborty, 2023). These authors noted that changes in life expectancy do not lead to the same magnitude of change in mortality rates across all ages. The

findings in our paper are consistent with earlier studies (Bawah & Binka, 2007; Canudas-romo et al., 2014) conducted to estimate the impact of diseases on life expectancy. Bawah and Binka, for example, estimated that eliminating malaria in northern Ghana would result in six more years of population life expectancy. This is to be expected because eliminating malaria, implies that more lives would be saved and premature mortality would significantly decline. Our study observed that the proportion of people surviving at each age increases as the causes of death were modelled to be eliminated from the population. Our study found that if road traffic or injury deaths were eliminated from the study area as a result of a major health intervention, it translates to an additional 2.1 years of life expectancy. It is important, therefore, for policymakers and stakeholders in the health sector to prioritise and address these disease conditions to reduce the burden they pose to households living in the study area.

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