Age and sex- specific spatial-temporal patterns of mortality using civil registration and vital statistics (CRVS) in Namibia

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Background: This paper fulfills two objectives. The primary aim is to estimates age and sex-specific spatial and temporal patterns of mortality in Namibia. Second, demonstrates the use civil registration system (CRS) data, as an alternative source of vital statistics.

In many developing countries, data for estimating mortality are derived from census or surveys, however, these are done at intermittent interval thereby making it difficult to establish the risk dynamics. Adequate and up to date mortality statistics play a crucial role in first, for monitoring progress towards meeting national goals; second for planning policy development; and third for appraisal of the policy. Such activities require timely data.

Although data has been increasing become available through surveys such as the Demographic and Health surveys (DHS), the gap between, often 4 to 7 years, makes it difficult for monitoring and evaluation. To circumvent this problem, some countries have established demographic surveillance systems, nevertheless, these have limited coverage to provide a comprehensive picture of the country of focus.

Recently, the civil registration system (CRS) has been advocated as an alternative to provide vital statistics. The CRS is a national population register, in which every vital event of interest can be monitored. It provides a continuous profile of the population of the country, be it birth and deaths, at any given time. The challenge in Africa is that very few countries have functional CRS which can be used to estimate mortality. The United Nation Economic Commission for

Africa (UNECA), considering the importance the CRS offers at providing vital statistics, and essentially by complementing or reducing the cost burden of doing censuses has established a programme of evaluating the civil registration and vital statistics (CRVS) in the African continent.

The Namibia CRVS was evaluated for completeness in 2014. Namibia has about 92% complete civil registration in comparison to other African countries (MoHSS, 2014). This study, therefore, explores the use of CRVS data in Namibia to study the mortality dynamics in the country. This study aims to examine age and sex-specific spatial-temporal mortality patterns in Namibia using (CRVS) in Namibia over time (1990-2013).

Methods: Mortality data for the period 1990-2013, obtained from Ministry of Home Affairs and Immigration civil registration system, were used. Cumulative mortality ratios were calculated by using the population of the three censes (1991, 2001, and 2011). Furthermore cumulative mortality risk was calculated by region, sex, and years. Line graphs were used to show mortality trends and differentials over the years. Next, Poisson regression model was used to determine the variation in mortality risks among the regions, sex and age groups.

Results and Discussion: From 1990-2013 a total of 353,179 deaths cases were reported in Namibia, giving a crude death rate of 160 per 1000 persons, using the 2011 census totals. Figure 1 indicates that mortality risks generally increased from 1990-2013 with the highest risk in 2002-2006, notably increased mortality in urbanized regions like Khomas and Oshana regions. Figure 2 displays the geographical patterns of mortality risks of females (top in purple) and males (bottom in green) for different nine age groups in Namibia. It observed that the risk increased in children aged 5-9 until adults aged 35-59 and it decayed for old aged group (60+) in Namibia.

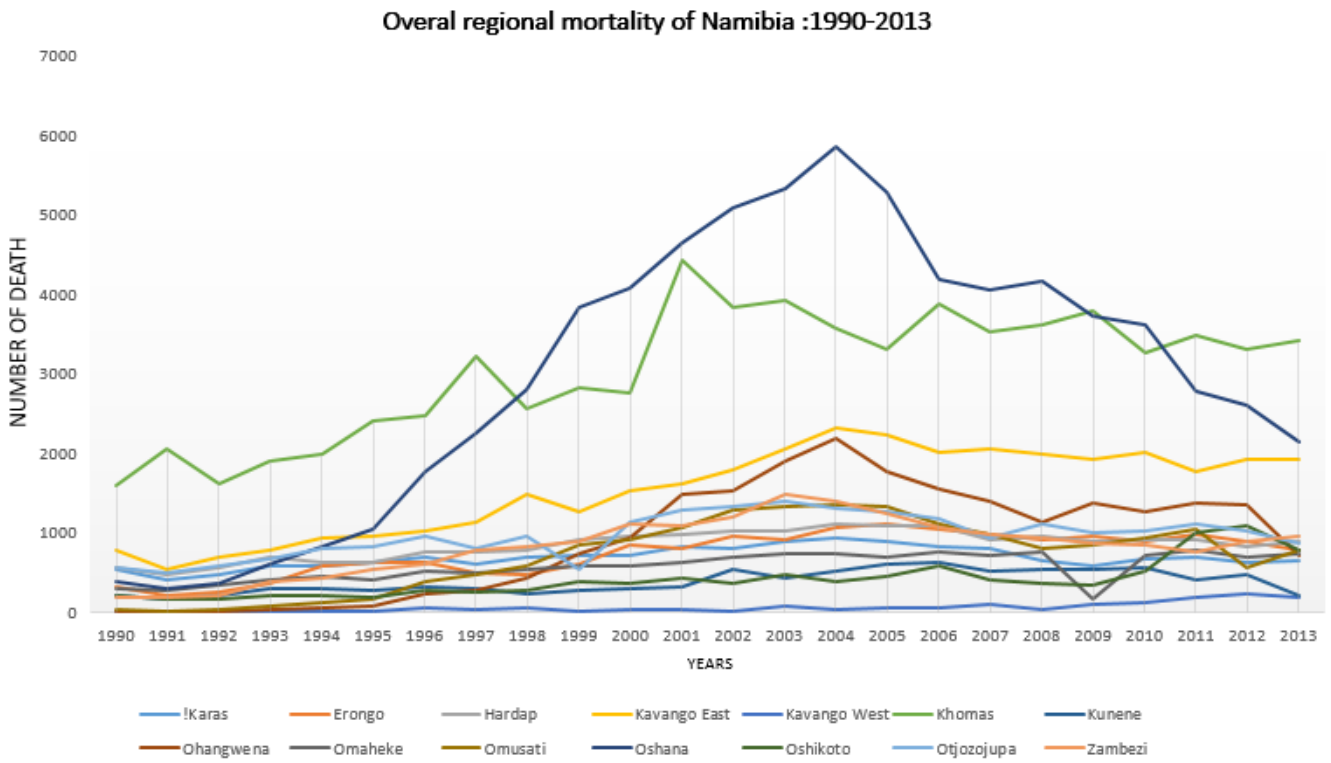
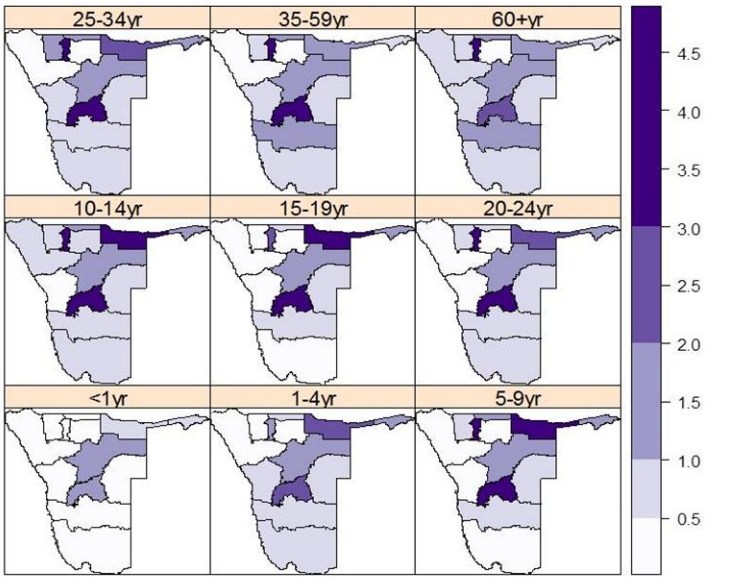


Figure 1: Overall regional mortality trend from 1990-2013 by region.

Oshana, Khomas and Kavango regions experienced a high risk of mortality meanwhile regions like Oshikoto, Kunene, and Omaheke had a low risk of mortality. Oshana region exhibit a higher risk in males aged 15-19 compared to females even a higher risk exhibit in females aged 60 and above compared to males. A differences of mortality risk between males and females was also observed in !Karas region with males being at high risk for aged 5-9 and 15-19. Figure 3 shows the evolution of geographical patterns of mortality risks in Namibia from 1990-2013 for females (Purple) and males (Green). From 1990 to 1997 there was a low risk in both sex groups then an increase in mortality risk in all regions was encountered during 1999 to 2007. In 1999 the highest cases of mortality risk were observed in both females and males in country compare to other years. The southern part, some central part and some part of the northern regions in Namibia had a low relative risk of mortality.



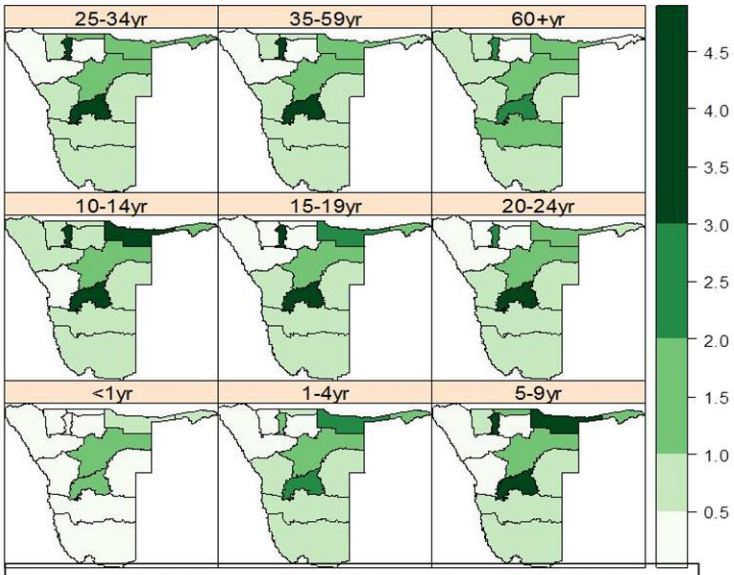


Figure 2: Spatial temporal distribution of mortality risks between 1990-2013 for females (Purple) and males (Green) of 9 different age groups

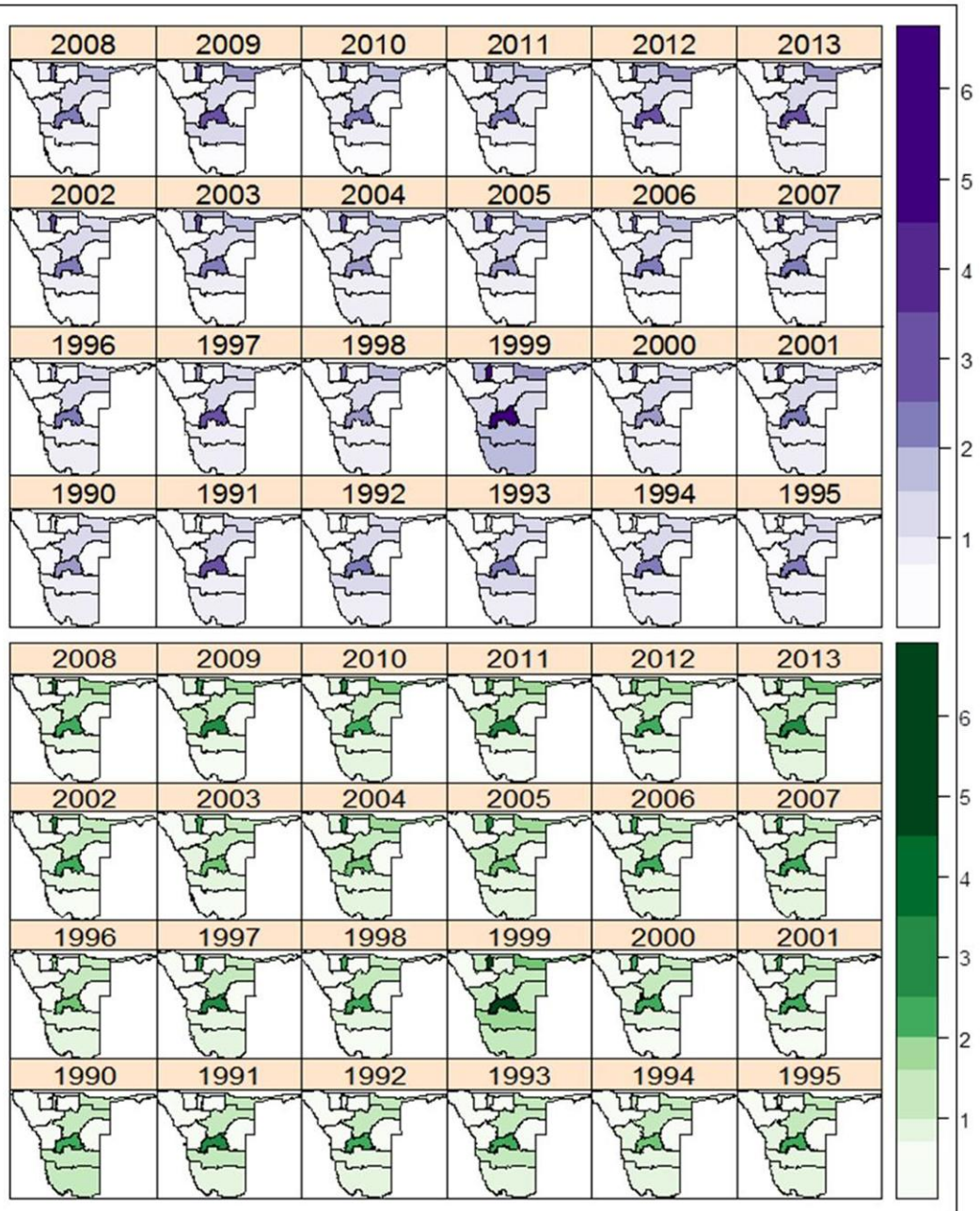


Figure 3: Spatial temporal distribution of mortality risks between 1990-2013 for females (Purple) and males (Green)

Figure 4 reveals the temporal trend in mortality risk for six selected Namibian regions during the period 1990-2013 whereby the top 3 are regions with highest risk throughout and the bottom 3 are those regions with the lowest risk.

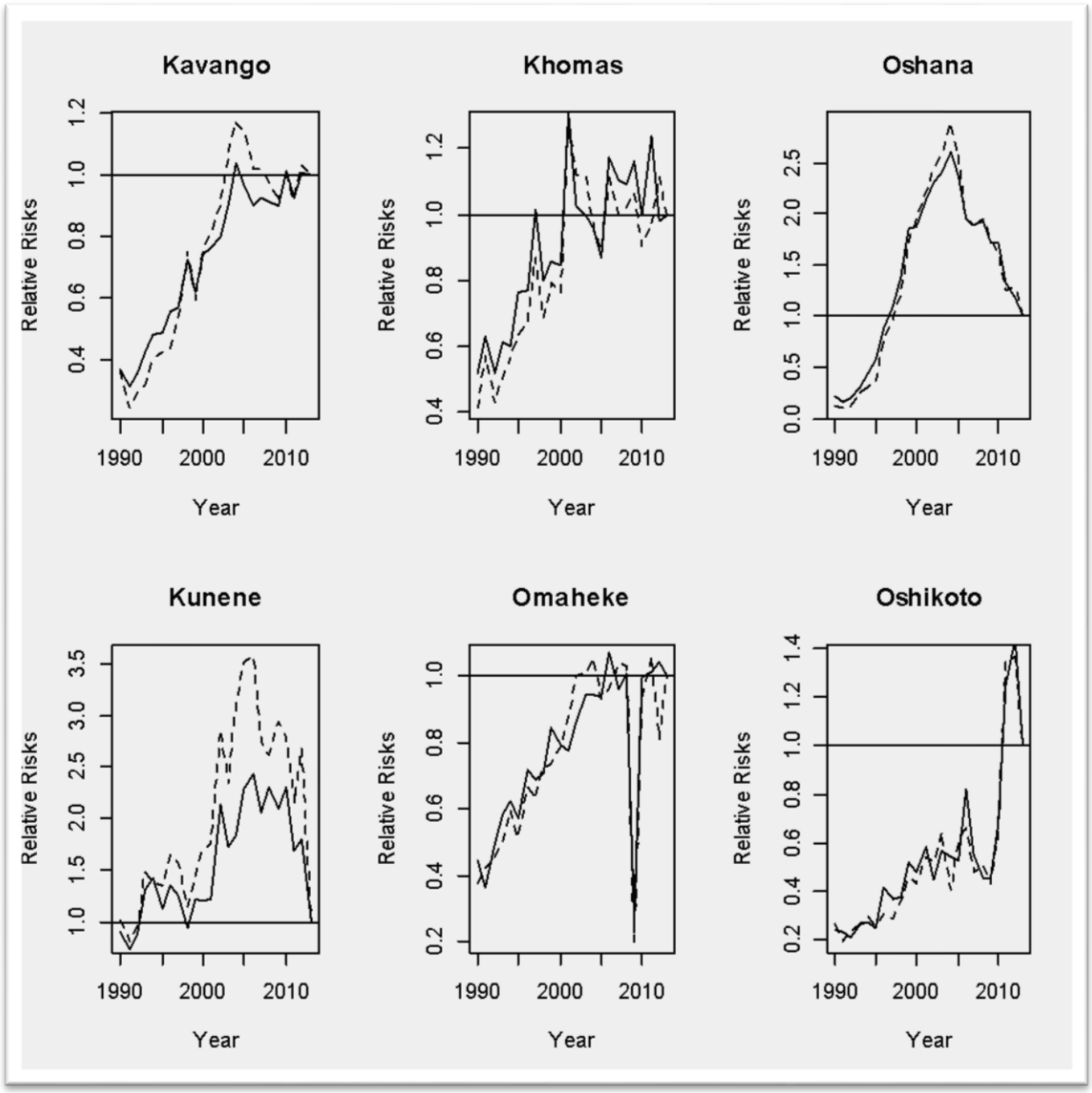


Figure 4: Mortality risk trend from 1990-2013 for females (dotted lines) and males (solid lines)

In Khomas region the mortality risks start increasing from 1990 throughout for both males and females with a high peak in 2001 to 2003. For Oshana Region both sex groups were vulnerable by the risk. The study reveals that from 1990-2005 the risk increased and with highest increase during 2001-2005. A drop down of the mortality risk occurred during 2007 in females and males in Omaheke region and a sudden increased risk was 2010 was experienced in Oshikoto region.

Regarding females, risks in Kavango region were higher than males in 2004 and 2005 and an increase of mortality risk was reported in Kunene region in a period of 2002-2006 then started declining.

Conclusion: This study will be helpful to facilitate the improvement of the understanding mortality patterns, and how it change with time in Namibia. It will also help on the improvement of the civil registration system and will give any idea to health planners and the government policy makers on where to pay more attention when they are planning.

This research work is ongoing, and our next steps will involve take the following steps: (i) fitting structured additive regression models in which we allow an interaction between region and year, exploring both linear and non-linear patterns in the trend; (ii) The model will further permit estimating region as spatially structured random effects in which conditional autoregressive (CAR) models will be fitted. The CAR models should assist in isolating any clustering that may exist in the regional variation of risk; (iii) estimating negative binomial regression models to account for extra Poisson variation (dispersion). All fitted models with be compared through some information criterion, particularly Akaike information criterion and Bayesian information criterion.

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