World Academy of Science, Engineering and Technology
International Journal of Medical and Health Sciences
Vol:11, No:04, 2017

The Display of Age-Period/Age-Cohort Mortality Trends Using 1-Year Intervals Reveals Period and Cohort Effects Coincident with Major Influenza A Events

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Abstract : Graphic displays of Age-Period-Cohort (APC) mortality trends generally uses data aggregated within 5 or 10-year intervals. Technology allows one to increase the amount of processed data. Displaying occurrences by 1-year intervals is a logic first step in the direction of attaining higher quality landscapes of variations in temporal occurrences. Method: 1) Comparison of UK mortality trends plotted by 10-, 5- and 1-year intervals; 2) Comparison of UK and US mortality trends (period X age and cohort X age) displayed by 1-year intervals. Source: Mortality data (period, 1x1, males, 1933-1912) uploaded from the Human Mortality Database to Excel files, where Period X Age and Cohort X Age graphics were produced. The choice of transforming age-specific trends from calendar to birth-cohort years (cohort = period – age) (instead of using cohort 1x1 data available at the HMD resource) was taken to facilitate the comparison of age-specific trends when looking across calendar-years and birth-cohorts. Yearly live births, males, 1933 to 1912 (UK) were uploaded from the HFD. Influenza references are from the literature. Results: 1) The use of 1-year intervals unveiled previously unsuspected period, cohort and interacting period x cohort effects upon all-causes mortality. 2) The UK and US figures showed variations associated with particular calendar years (1936, 1940, 1951, 1957-68, 72) and, most surprisingly, with particular birth-cohorts (1889-90 in the US, and 1900, 1918-19, 1940-41 and 1946-47, in both countries. Also, the figures showed ups and downs in age-specific trends initiated at particular birth-cohorts (1900, 1918-19 and 1947-48) or a particular calendar-year (1968, 1972, 1977-78 in the US), variations at times restricted to just a range of ages (cohort x period interacting effects). Importantly, most of the identified “scars” (period and cohort) correlates with the record of occurrences of Influenza A epidemics since the late 19th Century. Conclusions: The use of 1-year intervals to describe APC mortality trends both increases the amount of information available, thus enhancing the opportunities for patterns’ recognition, and increases our capability of interpreting those patterns by describing trends across smaller intervals of time (period or birth-cohort). The US and the UK mortality landscapes share many but not all 'scars' and distortions suggested here to be associated with influenza epidemics. Different size-effects of wars are evident, both in mortality and in fertility. But it would also be realistic to suppose that the preponderant influenza A viruses circulating in UK and US at the beginning of the 20th Century might be different and the difference to have intergenerational long-term consequences. Compared with the live births trend (UK data), birth-cohort scars clearly depend on birth-cohort sizes relatives to neighbor ones, which, if causally associated with influenza, would result from influenza-related fetal outcomes/selection. Fetal selection could introduce continuing modifications on population patterns of immune-inflammatory phenotypes that might give rise to 'epidemic constitutions' favoring the occurrence of particular diseases. Comparative analysis of mortality landscapes may help us to straight our record of past circulation of Influenza viruses and document associations between influenza recycling and fertility changes.

Keywords : age-period-cohort trends, epidemic constitution, fertility, influenza, mortality
Conference Title : ICEID 2017 : International Conference on Epidemiology and Infectious Diseases
Conference Location : Boston, United States
Conference Dates : April 24-25, 2017