A non-parametric approach to decompose the young adult mortality hump by causes of death

Motivation
- The young adult mortality hump is the temporary deviation of the force of mortality during adolescence and early adulthood.
- Despite deeply rooted beliefs that accidents are to blame, the cause-of-death mortality during adolescence and early adulthood is not established.
- Gender or sex differences are virtually unknown.

Data
- Age- and cause-specific death rates (Mx) were produced for the United States of America, for both sexes, over the period 1959 to 2010.
- Part of the new HMD cause-of-death data (cod.mortality.org) is limited to age 10-90 to avoid ontogenescence, old-age plateau and stochasticity.
- The 91 original causes of death were grouped according to the shape of their rates.
- Events of undetermined intent are generally included as part of the new HMD cause-of-death data.

Conclusion
- While it is not always possible to identify cause-specific hump contributions, it is possible to estimate by how much death rates (see right) deviate from senescence.
- It must be measured by the amount of cause-deleted mortality.
- Cause-deleted mortality can be estimated by measuring by how much cause-specific hump contributions to the hump are not established.
- The young adult morality hump is the temporary deviation of the force of mortality during adolescence and early adulthood.
- Gender or sex differences are virtually unknown.

Method
- We claim cause-specific contribution can be extracted by estimating by how much cause-deleted mortality hump contributions to senescence are not established.
- The hump is proportional to the sum of deaths in 2010 from causes w/o hump by exposure.
- Contributions to the hump are decomposed into cause-deleted components.

Method with Illustration
- Non-parametric 2-component model \( \mu = \gamma_1 + \gamma_2 \).
- \( \gamma_1 \) is the cause-deleted component.

Cause- and age-specific rates
- The force of mortality.
- The age-specific death rates (Mx) were produced for the United States of America, for both sexes, over the period 1959 to 2010.
- The young adult morality hump is the temporary deviation of the force of mortality during adolescence and early adulthood.
- Gender or sex differences are virtually unknown.

Cause-deleted mortality
- Cause-deleted components.
- The hump is proportional to the sum of deaths in 2010 from causes w/o hump.
- Contributions to the hump are decomposed into cause-deleted components.

Extract cause-specific hump contributions
- \( D_2 \) is the cause-specific hump.
- \( D_1 \) is the cause-deleted component.
- \( D_2 \) is the cause-specific hump.
- \( D_1 \) is the cause-deleted component.

US Males
- Hump costs between 0.8 and 1 year of LE.
- Initially almost 100% due to accidents.
- \( HIV \) adds 0.3 from 1965 to 1995.
- Now 2/3 is suicides, homicides and poisoning.
- Poisoning is probably a cohort artifact.
- Peak reached from 19 (accidents) to 23 (suicides).

US Females
- Reached 0.35 year of LE in 1995.
- Mainly driven by traffic accidents.
- \( HIV \) never contributed significantly.
- Peak is shifting in recent years.
- Suicides, homicides and poisoning are up.

Method
- Prove coherent and adaptive.
- Will be available in a R package.

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