Month of birth and longevity in Utah: the best time to be born?

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Introduction

The effect of month of birth on the longevity of a cohort has been the subject of a number of papers and was also tested in the past in England and证实 that early life conditions affected by seasonal variations impact longevity. Such early life conditions include variations in maternal and fetal nutrition, which could create susceptibility to chronic disease or infections later in life. Infectious disease in infancy or early childhood might also have effects on the immune system, changing future susceptibility to chronic and infectious diseases. This project aims to test the month of birth effect on longevity for the UPDB sample database.

Data and methods

The Utah Population Database (UPDB) sample that we used contains almost a fourth of a million records of Mormon and non-Mormon individuals in Utah, born before 1869 and survived at least until the age of 15.

To estimate the effect of month of birth on longevity—measured as the time between exact dates of birth and death—the mortality hazard was modeled in Cox regressions in which the cohort effect (as indexed by the birth year) was a categorical variable, with December as a reference month. Accelerated failure time models (with Weibull distribution) were used to estimate the expected differences in longevity as a result of the month of birth effect.

Results

For the sample of individuals born in 1890 or before who died after age 50 (with complete information on birth and death dates (N = 23,223), month of birth is significantly related to longevity. Those born in March-August have a lower longevity than those born in September-January. With December as a reference month, the effect is most pronounced for those born in the latter three decades of the 19th century. Among the males born in 1870 or later who died at ages 50 or older (N = 58,222), there are no significant effects of birth month on longevity. Among male Mormons (N = 31,889) a significant 5.8% increase in the hazard is observed, among male non-Mormons (N = 26,323) the hazard ratios are below 1.0 for all months but the only marginally significant reductions in the hazard are in February (6.0%) and November (2.7%). In the cohort of females born in 1870 or later who died at age 50 or older (N = 54,374) there are strong and statistically significant increases in the death hazard for those born in March (7.8% increases in hazard), April (6.6%), May (5.4%), June (5.8%), and August (5.8%). In this group, in Mormon females (N = 31,910) the effects are similar but much stronger, sometimes twice that of all females. For non-Mormon females (N = 22,446), the pattern of effects is similar to the one already observed, but not statistically significant.

Effects according to Cause of Death

In the individuals of the cohort born between 1870-1900 who died after age 50 of heart disease (N = 63,299) and non-Mormons (N = 48,767), the month-of-birth effects in non-Mormons are not statistically significant, while those in Mormons are stronger than in the general sample, with significant hazard ratios of 1.071 for March, 5.0% for April, 6.2% for May, and 7.3% for June. Among the males born in 1870 or later who died at ages 50 or older (N = 58,222), there are no significant effects of birth month on longevity. Among male Mormons (N = 31,889) a significant 5.8% increase in the hazard is observed, among male non-Mormons (N = 26,323) the hazard ratios are below 1.0 for all months but the only marginally significant reductions in the hazard are in February (6.0%) and November (2.7%). In the cohort of females born in 1870 or later who died at age 50 or older (N = 54,374) there are strong and statistically significant increases in the death hazard for those born in March (7.8% increases in hazard), April (6.6%), May (5.4%), June (5.8%), and August (5.8%). In this group, in Mormon females (N = 31,910) the effects are similar but much stronger, sometimes twice that of all females. For non-Mormon females (N = 22,446), the pattern of effects is similar to the one already observed, but not statistically significant.

Effects in the cohorts born before 1870, between 1870-1889 (N = 46,206), and between 1889-1899 (N = 89,020), the results are very similar, with statistically significant differences in longevity as a result of the month of birth effect. With December as a reference month, the effect is much stronger and perceptible by month of birth the largest for March and the smallest for April. For males (N = 22,983) there are statistically significant hazard ratios above 1.0 for the months March to August but the increase is statistically significant only for March. For females (N = 23,223), there are significant hazard ratios from March to August, with mortality hazards increasing from 7.6% to 8.0%. For those in the 1870-1900 birth cohort who died of cancer (N = 10,711) a February birth reduces the hazard of death by 8.9%. A July birth reduces the mortality hazard by 8.6%, at marginal significance, and a September birth significantly reduces the hazard by 12.1%. The effects are not significant for males, but for females it is clear that the birth month has an effect. For those born in the months March to August in a “bad” year, the risk of death is 13.9% compared to the reference of December. A July birth reduces the hazard of death by 11.4%.

Results in the three decades of the 19th century

For those born in 1870-1900, our results conflicted with previous literature and therefore been selected as “bad” years of high mortality. The years 1871, 1872, 1873, 1875, 1879, 1882, 1888, 1891 have been identified as “bad” years of high mortality. When the month-of-birth effect was computed for “good” and “bad” years the result was unexpected. In those born in “bad” years, the shortening effect of having been born in March and increases above 53% in all other months between February and June. For those born in “good” years, the only significant hazard ratio is for those born in March, in which the reduction is statistically significant. The suppression by “bad” times” of the “month of birth” effect on longevity, suggested by some authors, is not supported by this evidence.

Month of birth by social class

Measuring the socioeconomic status of the family at the time of birth by the occupation of the father, the effect of month of birth longevity seems to be particularly intense in class I (judges, engineers, doctors etc.), class II (carpenters, plumbers, mechanics, etc.) than in class III (farmers, agricultural laborers, etc.). Analysis of the data that died after age 50, born in 1870- 1900, reveals in class I (N = 8962) a significant reduction (11.4%) of the mortality hazard for those born in September, while for those whose fathers were in class II (N = 8039) a 13.9% increase in mortality hazard is found for those born in June. However, for those born in class III (N=22356), no significant effect is observed.

Table 1: Month of birth effects (with December as reference) in the UPDB for cohort born in 1870-1900, and in the “good” and “bad” years of the period. Hazard ratios significant at the 5% level are highlighted in green.

<table>
<thead>
<tr>
<th>Month of Birth</th>
<th>Hazard Ratio</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>April</td>
<td>1.044</td>
<td>0.424</td>
</tr>
<tr>
<td>May</td>
<td>1.071</td>
<td>0.087</td>
</tr>
<tr>
<td>June</td>
<td>1.080</td>
<td>0.954</td>
</tr>
<tr>
<td>July</td>
<td>1.044</td>
<td>0.0297</td>
</tr>
<tr>
<td>August</td>
<td>1.044</td>
<td>0.0306</td>
</tr>
<tr>
<td>September</td>
<td>1.048</td>
<td>0.0296</td>
</tr>
<tr>
<td>October</td>
<td>1.071</td>
<td>0.0292</td>
</tr>
</tbody>
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References

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