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COHORT COMPONENT POPULATION ESTIMATES FOR IRELAND, 1911-1920: A NEW COUNTY-LEVEL DATASET FOR USE IN HISTORICAL DEMOGRAPHY

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Cohort component population estimates for Ireland, 1911-1920: A new county-level dataset for use in historical demography

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Abstract

This is a dataset of vital statistics and cohort component population estimates at a spatially-disaggregated level for the island of Ireland for the period 1911-1920. The raw data were digitised by the authors using official UK government statistics. The population estimates were then derived by the cohort component method. These data provide novel intercensal population estimates at the county level that will be beneficial for researchers working in historical demography, as well as in economic and social history. The data provided can be readily reused and extended by other researchers to produce further series and indicators. An example application of the data in this manner can be seen in Colvin and McLaughlin (2021), which combines the population estimates discussed here with mortality statistics from the Spanish flu pandemic in order to demonstrate how demographic composition affects the interpretation of data on public health crises.

Keywords

Demography, historical demography, population studies, population estimates, vital statistics, mortality, migration, Ireland, twentieth century. [J11, N33, N34]

Specifications Table

| Subject                        | Social Sciences |
|--------------------------------|-----------------|
| Specific subject area          | Historical Demography |
| Type of data                   | Tables |
| How data were acquired         | Manually digitised by the authors from official government publications and stored in spreadsheet files. |
| Data format                    | Raw
  Analysed
  Descriptive
  Statistical |
**Parameters for data collection**
Data pertaining to population change in Ireland was acquired for intercensal years covering the period 1911-1920, to include the end of the Spanish flu pandemic.

**Description of data collection**
Data were collected and digitised from official government publications.

**Data source location**
First-level administrative divisions of Ireland (32 counties), a region of the United Kingdom of Great Britain and Ireland (historical sovereign state, defunct in 1922)

**Data accessibility**
Repository name: UK Data Service
Direct URL to data: https://doi.org/10.5255/UKDA-SN-854673
Date published: 22 June 2021

**Related research article**
C. L. Colvin, and E. McLaughlin, 2021. Death, demography and the denominator: Age-adjusted Influenza-18 mortality in Ireland. *Economics and Human Biology* 41, 100984. Available at: https://doi.org/10.1016/j.ehb.2021.100984.

**Introduction**
This paper presents a novel historical demography dataset for Ireland in the period 1911-1920 inclusive, intended to serve as a comprehensive account of population change. The dataset contains new disaggregated estimates for the mid-year population and population composition for all 32 counties of Ireland, and with Belfast and Dublin reported separately, for each year between 1911 and 1920. Table 1 summarises this series, showing the average population estimates across all counties in each year by age group and sex.

The dataset also contains the various components of population change which are used to construct the main population estimates. These include: the number of births in each country per year (1911-1920); the number of deaths by age in each country per year (1911-1920), given in five-year age bins; the number of emigrants leaving from each county per year (1911-1919); estimates of the number of international immigrants entering each county per year (1911-1919); and estimates of troop movements into and out of each county per year (1914-16, 1919), which are treated as migration movements, as per convention, in the population estimates. Figures report the trends for total births (Figure 1) and total deaths (Figure 2) in Ireland over the period. Total deaths fluctuate around an 1911-1917 average of 72,994 before peaking during the years of the Spanish flu pandemic in 1918-1919 and falling sharply thereafter. Total births steadily decline over the period and remain depressed before rebounding following the end of World War I and the Spanish flu pandemic.

We believe our dataset will be beneficial to researchers working in Irish economic history, social history, and historical demography. We believe our population estimates can be readily used to
complement and enrich new studies, as well as provide opportunities for researchers to combine them with other data, in order to produce useful quantitative indicators. The time period covered by the dataset overlaps with noteworthy historical events such as the Irish revolutionary period, World War I, and the Spanish flu pandemic. These are areas where both existing studies have operationalised demographic data—for instance, see Fitzpatrick (1978) and Hart (1997) on the geographic distribution of Irish nationalism and revolutionary behaviour—and, additionally, researchers must consider the influence of demography in their analysis.

Existing research that seeks to exploit historical Irish demographic data has, for the most part, relied on official government statistics as provided in Irish census reports beginning in 1821. Vaughan and Fitzpatrick’s Irish historical statistics (1978)—an ancillary publication to the multi-volume New History of Ireland project—has proved a venerable resource to this end, compiling the statistical tables on populations and vital statistics between the 1821 and the 1971 censuses. While such data are appropriate in many cases, and hitherto have been the only option for researchers, the decennial frequency of census data calls into question their reliability when analysing events occurring in intercensal periods.

Demographic data can be an invaluable tool for quantitatively driven analyses of historical events, however a failure to use the most accurate and relevant data can potentially mislead and give rise to biased results. Colvin and McLaughlin (2021) provide an example of this using the Irish experience of the Spanish flu pandemic of 1918-1919, showing that a reliance on the nearest census for population data can distort the denominator used in mortality statistics. Our dataset is designed to address these concerns and we recommend its usage in future studies into the aforementioned areas of Irish history.

There is also a great deal of scholarly interest in Irish historical demography and geography for their own sake. Tracing the development of, and exploring the causes behind, the substantial and sustained Irish depopulation following the Great Famine into the twentieth century has received interdisciplinary attention; such exercises also extend beyond the academe, with the government of the Irish Republic having established a Commission on Emigration and other Population Problems in 1948. Guinnane (1997), an exhaustive analysis of post-Famine population change focussed primarily on rural Ireland, is a recent example in this area. Analysis of Irish population change and its relation to the economy has also extended to the pre-Famine period, such as in Graham and Proudfoot (1993), aided by various attempts at pre-censal population estimation. The construction of this dataset is also an effort in improving Irish population history, where we are seeking to address a lack of readily available demographic information for Ireland between the 1911 and 1926 censuses.
Experimental Design, Materials and Methods
Our population estimates are constructed using the cohort component method. This is a commonly used method in demography for future population projection, where the various components of population change—births, deaths, migration, and ageing—are aggregated to update both the total population amount as well as the population composition (presented by age-sex cohorts here) in each year. But rather than projecting future populations, we use this method to fill in gaps in the historical data and to address a lack of intercensal demographic information for Ireland between the 1911 and 1926 censuses.

The historical data that we have collected and digitised affords a relatively simple approach to the cohort component method that is largely atheoretical, requiring few assumptions or complex methods for projecting the components of population change.

We start with the population provided in the 1911 Census of Ireland (British Parliamentary Papers, 1913a), which was digitised by Clarkson et al. (1997) and Crawford et al. (1997). From here we employ the cohort component method to continually update the population within each age-sex cohort with changes that occur in subsequent periods. To do this, we use the following equation:

\[
P_{sact} = P_{sac(t-1)} + (B_{sact} - D_{sact} + I_{sact} - E_{sact})
\]

where \(P_{sact}\) is the population of sex \(s\), at age-range \(a\), in county \(c\), and at time \(t\); and \(B, D, I\) and \(E\) are the various components of population change, namely within-year births, deaths, immigration, and emigration, respectively. Where possible, we have gathered official, contemporary statistics relating to each of these components; all data sources and estimation methods are described below.

Births and Deaths
We gathered data on the numbers of births and deaths in each county in each year from the Registrar General’s Reports for Ireland. These report the number of births and deaths within each of the Poor Law Unions of Ireland, which were a second-level administrative unit used for the collection of vital statistics.

These were then aggregated to the 32 counties that constitute the country’s first-level administrative units. These were then further aggregated to Ireland’s four historic provinces (Connacht, Leinster, Munster, and Ulster); while not an official administrative unit, these are considered socially and culturally important. Finally, these were aggregated to the national total.

Both the birth and death statistics are broken down by sex, and death statistics are additionally reported by age in five-year bins. Together, these allow us to also estimate the change in the population by distinct age-sex cohorts.
We manually digitised the birth and death statistics from each of the Registrar General’s reports between 1911 and 1920 (British Parliamentary Papers, 1912b, 1913c, 1914b, 1915b, 1916c, 1917b, 1918b, 1919b, 1920b, 1921b).

**Migration**

Similarly, emigration statistics are also gathered from contemporary British parliamentary records, namely the *Emigration Statistics of Ireland* reports. These contain the number of emigrants from each of the 32 counties of Ireland, which again are broken down by sex and age groups. We digitised the reports corresponding to each year between 1911 and 1919 (British Parliamentary Papers, 1912a, 1913b, 1914a, 1915a, 1916a, 1917a, 1918a, 1919a, 1920a).

Contemporary statistics for immigration into Ireland do not exist. Instead, we use information on annual immigration figures reported by Department of Social Welfare (1955, p. 326). We assume that immigration follows a similar spatial pattern to emigration, and allocate immigrants to counties based on county emigration patterns. This is not a heroic assumption; immigration at this time mostly constituted returning emigrants, who would return to their families.

Table 2 reports the numbers of emigrants, in addition to our estimates on the number of immigrants, for each year between 1911 and 1920.

**Military Personnel**

We account for military enlistment during World War I and treat troop movements as migratory behaviour; Irish soldiers leaving for war is treated as emigration, and subsequent demobilisation is treated as (return) immigration. Military enlistment is treated in the same way in the population estimates provided by the *Registrar General’s Reports*; for example, the male population is estimated to have decreased by 49,881 between 1914 and 1915, and then increased by 63,000 between 1918 and 1919 (British Parliamentary Papers, 1921b, p. 40).

We estimate total Irish enlistment using contemporary military sources (British Parliamentary Papers, 1921a, p. 9; War Office, 1922, p. 363) and we disaggregate our total enlistment estimate to the county-level using an additional parliamentary source (British Parliamentary Papers, 1916b) that contains data on military age men in Ireland and which covers 97 per cent of the total Irish recruits. War Office statistics are used to estimate military mortality and these imply a mortality rate of 14 per cent for all military personnel.
Figure 3 is a county-level map of estimated total military recruitment over the period 1914-1916; high levels of military recruitment are observed mostly in urban areas and the counties of the province of Ulster.

Finally, table 3 reports the weights used to distribute migrants and military enlistment by age cohort. Contemporary estimates of recruitment discuss both the fitness for general service and the age of the population. The age of military service was between 19 and 41. It was noted at the time that Ireland’s lower share of the male population enlisting in the military was because ‘Ireland is chiefly composed of young men up to 18 years of age and of men over 50, as a large proportion of the remainder emigrate to the United States and Colonies’ (British Parliamentary Papers, 1921a, p. 9). We allocated military recruitment between the years 18 and 41 assuming the age of recruits is proportional to the share of the 18-44 county population.

Adjusting for Ageing
Once we have accounted for all deaths and migration flows within an age-sex cohort, we then move a share of each age group forward by one year, effectively ageing our population and updating the age structure in each year. To do this, we assume age group survival rates using weights calculated from the same age group in the 1926 census, which was then conducted and published separately for the UK-polity of Northern Ireland (Government of Northern Ireland, 1929) and the Irish Free State (Roinn Tionscail agus Tráchtála, 1928, 1929). Table 4 reports the weights that are applied to the upper boundaries of the age groups, these being the relevant ages for the ageing adjustment.

Age-Sex Cohort Categorisation
We mostly follow the age bins that are reported in the Registrar General’s Reports and in the Irish censuses, but we instead choose to group all of the under-5-years ages together into one single age band of 0-4 years and to collapse all ages over 65 into one single age band of 65+ years. The latter is less impactful in terms of our data’s granularity, but the choice was made due to perceived discrepancies with age statements in the 1911 census, our base year for the population estimates.

We elaborate on our choice to collapse the over-65s into a single age band: While Ireland’s census commissioners believed the self-reporting of age was more accurate in the 1911 census than in previous censuses (British Parliamentary Papers 1913a, p. 25), Budd and Guinnane (1991) raise concerns about the deliberate overstatement of one’s age to avail of the 1908 Old-Age Pensions Act. We choose to collapse all age bins over 65 years of age as a way to avoid potential distortions in the
1911 census, that may arise from the overstatement of ages, while not trying to manipulate the underlying census data.

Acknowledgments
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Declaration of Competing Interest
The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this paper.

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Table 1: Population mid-year estimates for Ireland, 1911-1920 (national totals by age-sex cohort).

| Year | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65+ |
|------|-----|-----|-------|-------|-------|-------|-------|-------|-------|-----|
| 1911 | 458,472 | 437,314 | 426,588 | 420,936 | 372,719 | 633,563 | 535,425 | 393,044 | 281,315 | 434,699 |
| 1912 | 495,113 | 444,006 | 422,928 | 417,222 | 366,354 | 631,429 | 533,522 | 391,163 | 280,406 | 415,959 |
| 1913 | 482,555 | 457,147 | 419,550 | 415,823 | 365,459 | 637,079 | 535,611 | 393,556 | 286,281 | 407,776 |
| 1914 | 471,099 | 465,702 | 419,491 | 415,174 | 366,748 | 643,561 | 538,289 | 396,125 | 292,033 | 401,162 |
| 1915 | 461,677 | 470,653 | 421,260 | 416,429 | 354,906 | 620,853 | 515,009 | 398,135 | 296,863 | 392,188 |
| 1916 | 448,503 | 472,843 | 423,756 | 418,709 | 352,790 | 610,107 | 501,466 | 399,014 | 301,939 | 384,828 |
| 1917 | 435,530 | 472,334 | 426,143 | 421,370 | 361,568 | 616,933 | 502,276 | 398,348 | 306,301 | 375,998 |
| 1918 | 423,416 | 469,309 | 427,976 | 424,065 | 371,243 | 627,915 | 506,789 | 398,592 | 311,780 | 375,207 |
| 1919 | 412,180 | 463,704 | 428,417 | 426,140 | 407,152 | 683,622 | 548,723 | 397,064 | 314,294 | 366,028 |
| 1920 | 416,051 | 457,917 | 428,229 | 428,281 | 411,554 | 697,106 | 554,856 | 399,553 | 318,602 | 363,921 |

| Year | Males | Females | Males | Females |
|------|-------|---------|-------|---------|
| 1911 | 233,901 | 221,819 | 216,925 | 213,148 |
| 1912 | 249,627 | 224,855 | 214,989 | 211,012 |
| 1913 | 242,796 | 231,226 | 213,156 | 211,367 |
| 1914 | 237,294 | 235,346 | 212,980 | 211,705 |
| 1915 | 233,053 | 237,731 | 213,721 | 212,489 |
| 1916 | 227,115 | 238,881 | 214,854 | 213,635 |
| 1917 | 220,723 | 238,787 | 215,992 | 214,962 |
| 1918 | 214,729 | 237,445 | 216,875 | 216,165 |
| 1919 | 209,140 | 234,785 | 217,123 | 216,892 |
| 1920 | 211,535 | 231,979 | 217,086 | 217,955 |

| Year | 20-24 | 25-34 | 35-44 | 45-54 | 55-64 | 65+ |
|------|-------|-------|-------|-------|-------|-----|
| 1911 | 188,489 | 310,205 | 272,342 | 197,108 | 136,278 | 203,055 |
| 1912 | 183,433 | 308,026 | 270,780 | 197,702 | 136,923 | 192,265 |
| 1913 | 182,947 | 310,858 | 270,772 | 197,702 | 140,234 | 188,259 |
| 1914 | 183,858 | 314,218 | 271,158 | 198,966 | 143,473 | 186,117 |
| 1915 | 170,078 | 287,751 | 245,483 | 199,603 | 146,219 | 181,930 |
| 1916 | 165,592 | 272,820 | 229,290 | 198,802 | 148,968 | 178,509 |
| 1917 | 172,073 | 275,423 | 227,438 | 196,621 | 151,182 | 174,424 |
| 1918 | 179,350 | 282,028 | 228,958 | 194,921 | 153,813 | 174,385 |
| 1919 | 212,843 | 334,043 | 268,741 | 192,416 | 154,868 | 170,381 |
| 1920 | 215,378 | 342,883 | 271,557 | 192,871 | 156,608 | 169,727 |

| Year | 25-34 | 35-44 | 45-54 | 55-64 | 65+ |
|------|-------|-------|-------|-------|-----|
| 1911 | 207,789 | 323,358 | 263,084 | 195,937 | 145,037 | 231,644 |
| 1912 | 182,921 | 323,403 | 262,742 | 194,793 | 143,484 | 223,695 |
| 1913 | 182,512 | 326,221 | 264,839 | 195,854 | 146,048 | 219,518 |
| 1914 | 182,889 | 329,343 | 267,131 | 197,159 | 148,560 | 215,045 |
| 1915 | 184,828 | 333,103 | 269,527 | 198,533 | 150,644 | 210,258 |
| 1916 | 187,197 | 337,287 | 272,176 | 200,212 | 152,971 | 206,319 |
| 1917 | 189,495 | 341,510 | 274,837 | 201,727 | 155,118 | 201,574 |
| 1918 | 201,101 | 207,900 | 191,893 | 345,887 | 277,831 | 203,671 | 157,967 | 200,821 |
| 1919 | 211,143 | 210,325 | 196,176 | 354,223 | 283,299 | 206,682 | 161,994 | 194,193 |
Table 2: Migration estimates for Ireland, 1911-1920.

| Year | Emigration (to overseas) | Immigration (from overseas) | Net migration |
|------|--------------------------|----------------------------|---------------|
|      | Males | Females | Total | From US | Total | Total |
| 1911 | 16,671 | 13,902 | 30,573 |         |       |       |
| 1912 | 15,325 | 14,019 | 29,344 |         |       |       |
| 1913 | 16,452 | 14,515 | 30,967 | 3,312  | 5,940 | +25,027 |
| 1914 | 10,660 | 9,654  | 20,314 | 4,466  | 7,779 | +12,535 |
| 1915 | 6,567  | 4,092  | 10,659 | 2,687  | 4,983 | +5,676 |
| 1916 | 1,743  | 5,559  | 7,302  | 2,409  | 4,020 | +3,282 |
| 1917 | 838    | 1,273  | 2,111  | 412    | 711  | +1,400 |
| 1918 | 442    | 538    | 980    | 177    | 448  | +532 |
| 1919 | 1,137  | 1,838  | 2,975  | 5,290  | 7,992 | -5,017 |
| 1920 | 6,044  | 9,487  | 15,531 | 3,877  | 6,018 | +9,513 |

Source: British Parliamentary Papers 1912a, 1913b, 1914a, 1915a, 1916a, 1917a, 1918a, 1919a, 1920a.
Table 3: Age-bin weights used for migrants and military personnel.

| Age band:        | 0-14 | 15-19 | 20-24 | 25-30 | 30-34 | 35-54 | 55+ | Total |
|------------------|------|-------|-------|-------|-------|-------|-----|-------|
| **Migrants**     |      |       |       |       |       |       |     |       |
| Male             | 0.09 | 0.13  | 0.42  | 0.18  | 0.1   | 0.08  | 0.01| 1     |
| Female           | 0.09 | 0.27  | 0.39  | 0.12  | 0.07  | 0.06  | 0.01| 1     |
| Total            | 0.09 | 0.2   | 0.4   | 0.15  | 0.08  | 0.07  | 0.01| 1     |
| **Military enlistment** |      |       |       |       |       |       |     |       |
| Male             | -    | -     | 0.24  | 0.41  | 0.36* | -     | -   | 1     |

Note: * 25-44

Source: Akenson (1993).
Table 4: Age bin boundary weights

| Age | All-Ireland |         | Irish Free State (26 counties) |         | Northern Ireland (6 counties) |         |
|-----|-------------|---------|-------------------------------|---------|-------------------------------|---------|
|     | Total       | Male    | Female                        | Total   | Male                          | Female  |
| 4   | 0.205       | 0.206   | 0.203                         | 0.203   | 0.206                         | 0.2     |
| 9   | 0.187       | 0.19    | 0.184                         | 0.19    | 0.193                         | 0.185   |
| 14  | 0.203       | 0.206   | 0.199                         | 0.202   | 0.207                         | 0.196   |
| 19  | 0.19        | 0.194   | 0.186                         | 0.188   | 0.194                         | 0.182   |
| 24  | 0.187       | 0.18    | 0.194                         | 0.187   | 0.181                         | 0.194   |
| 34  | 0.083       | 0.084   | 0.083                         | 0.084   | 0.085                         | 0.082   |
| 44  | 0.084       | 0.086   | 0.082                         | 0.083   | 0.085                         | 0.082   |
| 54  | 0.092       | 0.098   | 0.086                         | 0.092   | 0.1                            | 0.084   |
| 64  | 0.079       | 0.077   | 0.081                         | 0.08    | 0.078                         | 0.081   |

Source: Government of Northern Ireland (1929); Roinn Tionscail agus Tráchtála (1928, 1929).
Figure 1: Total births in Ireland, 1911-1920.
Figure 2: Total deaths in Ireland, 1911-1920.
Figure 3: Estimated total military recruitment, 1914-1916.