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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 immigrates 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.

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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	Total									
	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									
	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65+
1911	233,901	221,819	216,925	213,148	188,489	310,205	272,342	197,108	136,278	203,055
1912	249,627	224,855	214,989	211,012	183,433	308,026	270,780	196,370	136,923	192,265
1913	242,796	231,226	213,156	211,367	182,947	310,858	270,772	197,702	140,234	188,259
1914	237,294	235,346	212,980	211,705	183,858	314,218	271,158	198,966	143,473	186,117
1915	233,053	237,731	213,721	212,489	170,078	287,751	245,483	199,603	146,219	181,930
1916	227,115	238,881	214,854	213,635	165,592	272,820	229,290	198,802	148,968	178,509
1917	220,723	238,787	215,992	214,962	172,073	275,423	227,438	196,621	151,182	174,424
1918	214,729	237,445	216,875	216,165	179,350	282,028	228,958	194,921	153,813	174,385
1919	209,140	234,785	217,123	216,892	212,843	334,043	268,741	192,416	154,868	170,381
1920	211,535	231,979	217,086	217,955	215,378	342,883	271,557	192,871	156,608	169,727
Year	Females									
	0-4	5-9	10-14	15-19	20-24	25-34	35-44	45-54	55-64	65+
1911	224,571	215,495	209,663	207,789	184,230	323,358	263,084	195,937	145,037	231,644
1912	245,486	219,150	207,939	206,211	182,921	323,403	262,742	194,793	143,484	223,695
1913	239,758	225,921	206,394	204,456	182,512	326,221	264,839	195,854	146,048	219,518
1914	233,805	230,356	206,511	203,470	182,889	329,343	267,131	197,159	148,560	215,045
1915	228,624	232,922	207,539	203,940	184,828	333,103	269,527	198,533	150,644	210,258
1916	221,388	233,962	208,902	205,074	187,197	337,287	272,176	200,212	152,971	206,319
1917	214,807	233,547	210,151	206,408	189,495	341,510	274,837	201,727	155,118	201,574
1918	208,687	231,865	211,101	207,900	191,893	345,887	277,831	203,671	157,967	200,821
1919	203,041	228,919	211,294	209,248	194,309	349,579	279,982	204,648	159,426	195,647
1920	204,515	225,937	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	Total	Male	Female
4	0.205	0.206	0.203	0.203	0.206	0.2	0.208	0.206	0.21
9	0.187	0.19	0.184	0.19	0.193	0.185	0.181	0.181	0.181
14	0.203	0.206	0.199	0.202	0.207	0.196	0.205	0.205	0.205
19	0.19	0.194	0.186	0.188	0.194	0.182	0.196	0.196	0.196
24	0.187	0.18	0.194	0.187	0.181	0.194	0.186	0.179	0.192
34	0.083	0.084	0.083	0.084	0.085	0.082	0.083	0.082	0.083
44	0.084	0.086	0.082	0.083	0.085	0.082	0.086	0.088	0.084
54	0.092	0.098	0.086	0.092	0.1	0.084	0.092	0.092	0.091
64	0.079	0.077	0.081	0.08	0.078	0.081	0.078	0.075	0.08

Source: Government of Northern Ireland (1929); Roinn Tionscail agus Tráchtála (1928, 1929).

Figure 1: Total births in Ireland, 1911-1920.

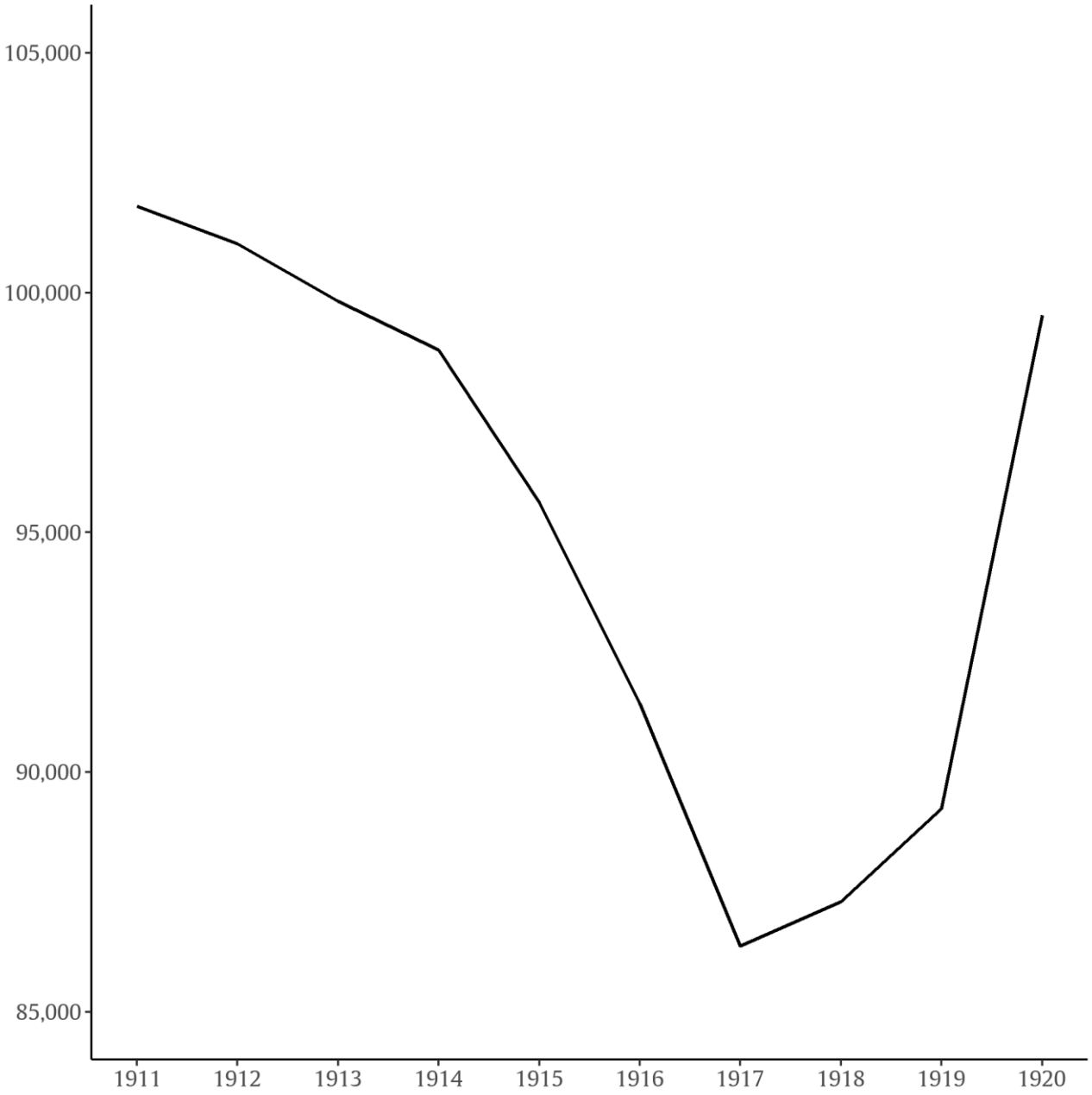


Figure 2: Total deaths in Ireland, 1911-1920.

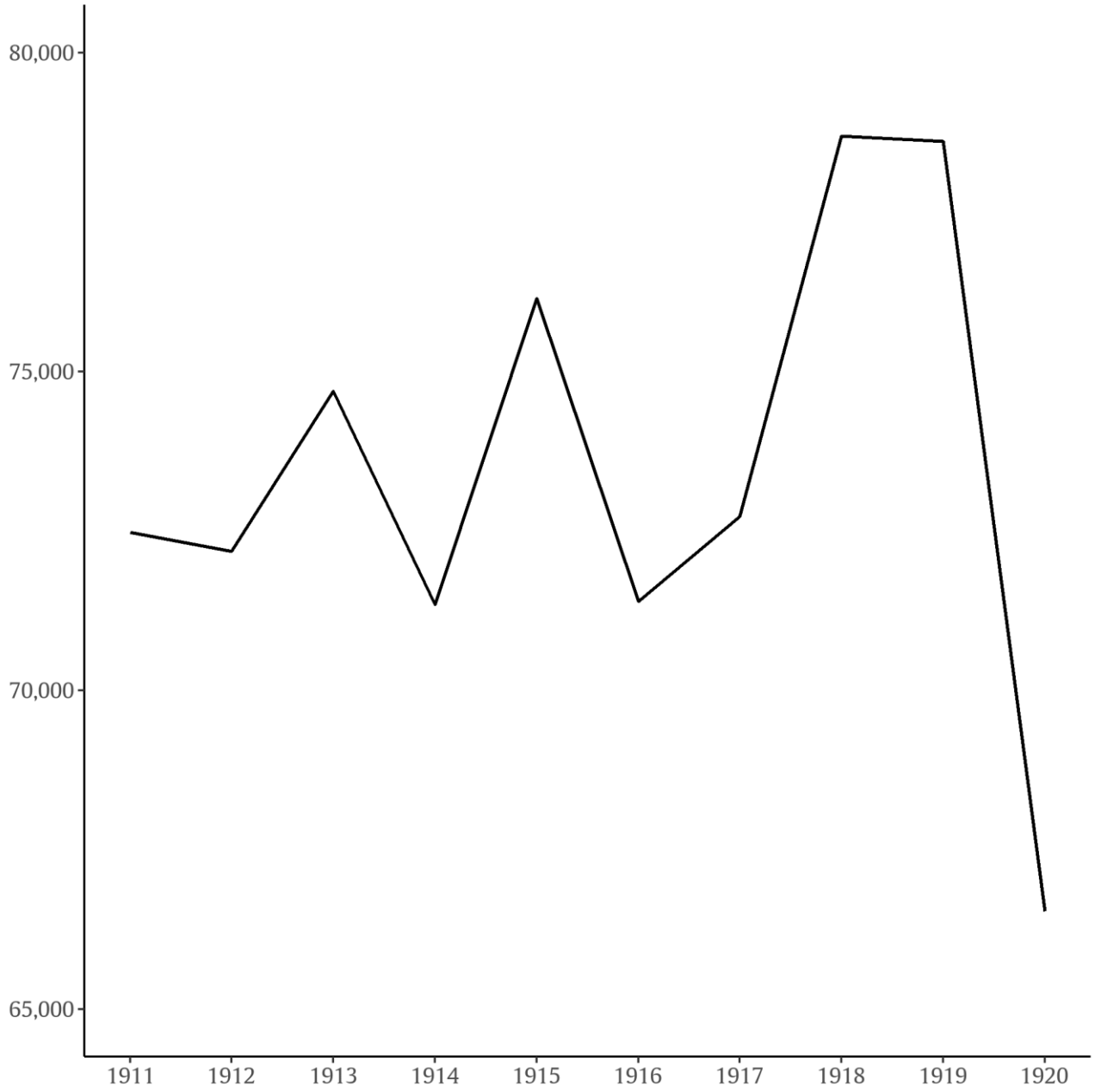


Figure 3: Estimated total military recruitment, 1914-1916.

