IMPACT

MAPPING VICTORIAN FERTILITY DECLINE

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

Campop Cambridge Group for the History of Population and Social Structure

UNIVERSITY OF CAMBRIDGE Department of Geography

University of Essex

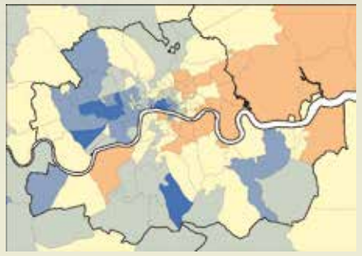
https://www.populationspast.org

Big data census analysis and interpretation

The Atlas of Victorian Fertility Decline *project is undertaking the mapping of human fertility and its decline during the Victorian period, in order to better understand the geographical and socioeconomic factors that affect birth rates*

Fertility rates have declined across the Western world over the past 150 years. Gaining a historical perspective of how and why these trends have developed can help improve our understanding of the way in which our society is shaped, as well as aiding the design of policies which are better able to influence fertility. The study has relevance to the major issues of the long-term impact of fertility decline on population health, social security and welfare. 'We feel that our project will contribute to knowledge about current and future fertility decline in other parts of the world,' explains Reid.

Dr Alice Reid at the University of Cambridge, UK, and Dr Eilidh Garrett at the University of Essex, UK, are working on an Atlas of Victorian Fertility Decline in England and Wales to understand how patterns of fertility changed geographically as a result of social changes. The project makes use of full-count census data at the national, regional and local levels from 1851 to 1911, available from the Integrated Census Microdata (I-CeM) project, along with the published annual and quarterly returns of the Registrar General covering the same period. The collated data have been used in spatial analyses to compare birth and death rates across different socioeconomic groups. This allows the researchers to address questions concerning how factors such as age, occupation and marital status affect fertility and to chart geographical fluctuations in births, marriages and infant mortality.



Fertility in London 1881, red=high, blue=low

CHALLENGES OF GEOGRAPHICAL RESEARCH

One of the biggest challenges for the researchers is getting to grips with the spatial dimensions of their data. Most previous historic demographic analysis of England and Wales has used counties (of which there were 55) or Registration Districts (c.614), but these units conceal considerable urban-rural variation, and the team wanted to examine smaller units that would allow them to be more geographically discriminating. 'In terms of geography we are using around 2000 Registration Sub-Districts (RSDs) in each year,' Reid explains. 'However there was considerable boundary change so the units do not always cover the same areas on the ground from year to year, and analysing change over time is not straightforward.'

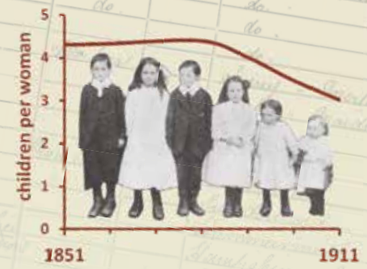
Garrett also contributes that: 'Most of the maps we produce for illustrative purposes and for our spatial-statistical analysis are based on RSDs. However, to aid our descriptions and illustrations, we have also allocated each RSD to one of eight types of place, based on their occupational structure and population density'. Such spatial delineation allows areas which have particular characteristics, such as concentrations of miners, textile workers or professionals, to be summarised geographically. The team uses spatial-statistical techniques which examine statistical correlations, while taking account of the fact that the units used may not be independent of each other. This allows the project to identify clusters or hotspots of population characteristics.

COLLABORATIVE EFFORT

The Fertility Atlas three-year project, funded by the Economic & Social Research Council (ESRC), builds on primary data produced by the I-CeM project. Led by Professor Kevin Schürer and Professor Eddy Higgs from the Universities of Leicester and Essex, UK, it enhanced existing machine-readable transcriptions of the individual level census data supplied by FindMyPast, by coding or standardising variables and creating new variables such as relationships within families. The Fertility Atlas team, led by Reid and Garrett, secured over £833,000 of funding, enabling them, together with Schürer and Higgs, to improve the accuracy of some of the variables while creating additional ones to further enhance the I-CeM datasets.

Research Associates Drs Hanna Jaadla and Joe Day are not only proficient demographers, but also expert users of geographic information systems GIS and statistical software, and critical input was provided by Schürer on a number of data-related issues. 'The boundary changes, urban-rural data variations and GIS database adaptation required to develop a workable dataset and enable its interpretation were complex,' notes Garrett.

> *'In many ways our project will raise more questions than it answers. We always suspected that many of the influences on fertility levels and how change happened were local'*



PUBLIC ENGAGEMENT

As part of the project, the team are developing an interactive website: www.populationspast.org. 'This allows users to choose a variable (such as marital fertility, illegitimate fertility, infant mortality, or percentage of married women working) and a year, and then produce a detailed map showing geographical patterns in that variable at a fine spatial level,' explains Reid. Users can zoom in to show a local area in more detail by clicking on the map, or they can search for an area of interest and the map will zoom in for them. The website is also able to show maps side-by-side so that users can compare the same variable for different years or different variables for the same year. They will also be able to download both the map image shown in their selection window and the data underlying that image. To aid interpretation, the website contains short descriptions of each variable, explaining how they are calculated and what they show, and elucidating trends over time and major patterns in the variable.

'We anticipate that this website will be of particular interest to secondary schools,' suggests Garrett. 'Many geography and history syllabuses in England and Wales include a local project, and we feel that our website will allow students to gain an in-depth understanding not only of the past demography and socioeconomic structure of their own area, but to put that knowledge in the broader regional and national context.' Both Reid and Garrett also hope that, along with students and researchers in further and higher education, local and family historians as well as the wider public will also benefit from the website, as their tools and explanations will help to promote understanding of demographic measures and processes.

UNDERSTANDING FERTILITY DECLINE

While the current project relates just to England and Wales, the team is planning to apply for further funding to extend the work to Scotland. 'We have found a strong geographic gradient to fertility decline, spreading from the South East, and we are keen to see how Scotland fits into this pattern: will there be an 'Edinburgh effect' or will reduced fertility spread northwards from England?' adds Garrett, who wonders whether the low fertility rates seen in areas of textile manufacture in Lancashire and Yorkshire might also be present in Scotland during the late 19th and early 20th centuries.

The Fertility Atlas project provides the first opportunity to calculate age-specific fertility rates across Britain during the fertility decline, and the results offer a challenge to the orthodox view on the way that fertility fell. It has long been assumed that fertility fall is achieved through 'stopping' behaviour, whereby couples 'desire' a particular number of children from the outset of their union and stop reproducing when they reach that number. This may represent a reasonable scenario today when reliable contraception is widely available, but may not have held true for couples in the Victorian era. 'Our findings do not support an age pattern of fertility decline which would be produced by stopping behaviour (showing up as larger reductions in fertility among older women),' says Garrett. 'Instead, women of all ages appear to have been reducing their fertility.' This result is similar to recent patterns of fertility decline in Sub-Saharan Africa, in very different geographical and socioeconomic conditions, and calls into question the assumption that couples start their marriage with a target number of children in mind.

Project Insights

FUNDING
Economic & Social Research Council (ESRC) • Isaac Newton Trust

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PRINCIPAL INVESTIGATOR BIO
Dr Alice Reid completed her undergraduate degree in Philosophy, Politics and Economics at the University of Oxford, UK, an MSc in Demography at the London School of Economics, UK, and a PhD in Historical Demography at the University of Cambridge, UK. She has been based at the Cambridge Group for the History of Population and Social Structure (Campop), Department of Geography, University of Cambridge, for over 20 years. Her main research interests are in late 19th and early 20th century British demography, including the patterns, influences on, and consequences of: breastfeeding, midwifery and birth attendance, infant and child mortality, illegitimacy, and fertility.

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Impact Objectives

- Produce an explanation of how and why fertility fell in England and Wales during the Victorian period, highlighting any sub-national variations in levels and trends
- Demonstrate which places and socioeconomic groups of people led the fertility decline and how the trends spread between groups

Mapping Victorian fertility decline

Drs Alice Reid and Eilidh Garrett discuss their work assessing the history of human fertility decline across England and Wales in the late 19th and 20th centuries and identify the factors that can still be considered relevant today

Dr Alice Reid

Dr Eilidh Garrett

Why is the topic of historical fertility decline of so much interest to you?

AR: By understanding the past, we can inform our understanding of the present and the future. This is because the ways societies are shaped demographically and socially are contingent on past demographic and social trends. For example, ageing societies are mainly a consequence of sustained fertility decline, so the speed of a society's fertility decline determines the speed at which its population ages and the extent of the ensuing challenges. Demographic processes must follow certain rules and understanding the sorts of factors that may influence a particular decline will enhance our understanding of the process of fertility decline in general. We believe a clearer view of fertility decline in England and Wales, using data drawn over a lengthy timespan and covering a time of tremendous social and economic change, will better equip us to interpret fertility declines in the contemporary world.

What will be the wider benefits or impacts of this work?

EG: Fluctuations in fertility, such as the 19 per cent increase in births in England and Wales between 2001 and 2012, are often unexpected and demonstrate that the reasons why societies and individuals within them decide to change their fertility-related behaviour, and thus the number of children they have, are poorly understood.

AR: An improved understanding of the process of fertility decline will help make sense of the course of present and future fertility patterns and trends in Britain and elsewhere around the globe. Scholars and policy makers attempting to find out more about current and future demography often look to other times and places to gain insights into the reasons for demographic change. Such insights can help policy makers to design better policies with which to influence fertility-related behaviour and they can enable those making population projections to improve their assessments of the course of future fertility.

Are there any challenges with this type of research that you have had to address? How have you done this?

EG: Historical data are full of challenges that can affect our analysis and interpretation of the data. Respondents may have given incorrect answers, geographical boundaries may have changed, or the data transcription may contain errors. The use of big data also creates challenges; the 1911 census alone contains the records of 36 million people. It is very important to assess whether the inaccuracies and omissions make the datasets biased in any way, whether such biases might affect the results we obtain, and what might be done to reduce their impact. To address this, we have undertaken a rigorous process of checking distributions, comparing results across place and time, assessing consistency, and considering the extent to which data peculiarities might have led to any untoward results.

Can you talk briefly about some of the results you now have? Have you found any trends that are particularly interesting?

AR: Our preliminary results show that even in the middle of the 19th century, there were considerable geographic differences in fertility determined both by the age at which women married and the rate at which married women had children. Such geographic differences remained once the fertility decline was established, although the decline itself was predominantly due to reductions of fertility within marriage. There were also significant social variations in the timing and speed of marital fertility decline. In conjunction with the trends in marital fertility, we looked at trends in fertility inside and outside of marriage, and have found that fertility started to decline earlier outside than inside marriage.