Introduction

# Introduction

## Fertility in Europe

### Declining fertility

### Differences between European regions

### Comparisons with other countries and regions

## Lexis surfaces

### Mapmaking: Three dimensional relationships on a two dimensional surface

### Treating time like space

### Age as relative time

### Year as absolute time

## Demographic definitions of fertility

### Age-specific fertility rates

### The age/fertility relationship

### Total fertility rates (Period-based)

## Period measures and cohort measures

### Period-based total fertility as a ‘synthetic cohort’ measure

### The problem of this approach for mortality estimation

### The problem of this approach for fertility estimation

## The problem of the incomplete cohort

### The ‘low fertility’ of women born in the 1990s

### The ‘high fertility of women born in the 1960s

### First births and tempo changes

# Methods

## Data

### Human Fertility Database: http://www.humanfertility.org/

### Human Fertility Collection: http://www.fertilitydata.org/

### Preferential ‘munging’ of the two:

#### HFD;

#### 2) HFC:

##### i) STAT: Official statistical data : Data that come from statistical publications and official websites of national statistical offices

##### ii) ODE: European Demographic Observatory (L'Observatoire Démographique Européen)

##### Reference: <http://www.fertilitydata.org/cgi-bin/collections.php>

### Additional ‘munging’

## Software: R with Github

### R packages:

#### Lattice/LatticeExtra: main maps

#### R2stl: 3D printable STL files (HFD only)

#### Wickhamese packages – readr, tidyr, stringr, dplyr, purr – for general data management and automation

### Github

#### <https://github.com/JonMinton/comparative_fertility/>

#### <https://github.com/JonMinton/Statistical_Sculpture/>

## Cumulative cohort fertility rates

### Given ASFRs, at what age do different birth cohorts ‘achieve’ a given number of children?

### CCFRs of 1.30, 1.50, 1.80, and 2.05 are highlighted as contours

#### 2.05 = ‘replacement fertility levels’

#### The 1.30 line always below 1.50 line, 1.50 below 1.80, 1.80 below 2.05

#### If a contour line is not visible for a particular birth cohort, that birth cohort did not achieve that cumulative fertility rate

#### If 2.05 line not visible: long term ageing and declining population

### For the final latticeplot – country tiles are coloured by region, and arranged by fertility rate in last year

## Graphs produced

### Heatmaps of age ~ year

### Contour maps of age ~ year

### Heat maps of age ~ birth year

### Individual CCFR maps

### Latticeplot – all countries

# Results

## Selected age ~ year heatmaps

## Selected age ~ year contour maps

## Selected age ~ birth year heatmaps

## Selected Individual CCFR maps

## The latticeplot

# Discussion

## Methodological contributions

### Much data can be shown and made sense of at a time

#### Nearly 100 000 values represented in the latticeplot

### Complex data vis: A need to slow… down

### Guiding through steps

### Intuitive sense of where different countries are heading

### Plotting of contours gives an approximate sense of trajectories:

#### Extrapolate iff age < 42? Vertical if age >= 42?

### Ordering in latticeplot is for last year but implied trendlines suggest which are stabilising and which are changing

## Substantive contributions

### Most (‘developed’) countries do not achieve replacement fertility levels

### Countries that have include: Albania, Iceland, Ireland, New Zealand, USA, Norway?

### No strong overall relationship between countries’ CCFRs and regions

#### Southern and Central European countries tend have low fertility

#### Small countries with relatively high fertility

### Ordering in latticeplot is by fertility in last year, but lines show

## Speculations

### Primary and secondary effects of migration

#### USA fertility recovery and Mexican immigration?

### Germany, Austria and openness to migration

### Differences between Scotland and England/Wales (‘Wangland’)

### Regional differences within countries

#### London and the rest

## Europe and mass migration beyond

### Almost all European countries need migration to stabilise dependency ratios

### Within EU, countries with lower fertility appear more accepting of refugees

### Small countries and high fertility rates? Iceland, Ireland

Literature

Methods

Results

Discussion