

Transforming the Census

David Martin (NCRM, UK Data
Service)

NCRM Autumn School, 2017

Transforming the Census

- Censuses are changing!
- Why does it matter?
- International context
- ONS Census Transformation
- Administrative data
- Internet enumeration
- Big data
- Research implications
- [discussion]

Censuses are changing!

- Increasing demand for timely data
- Difficulty accessing addresses and people
- Falling response rates
 - More effort to achieve same response
- Increasing costs
- Dissolving definitions
 - Usual residence?
 - Household?
 - Main employment?...
- Development of new methods



Photos: David Martin



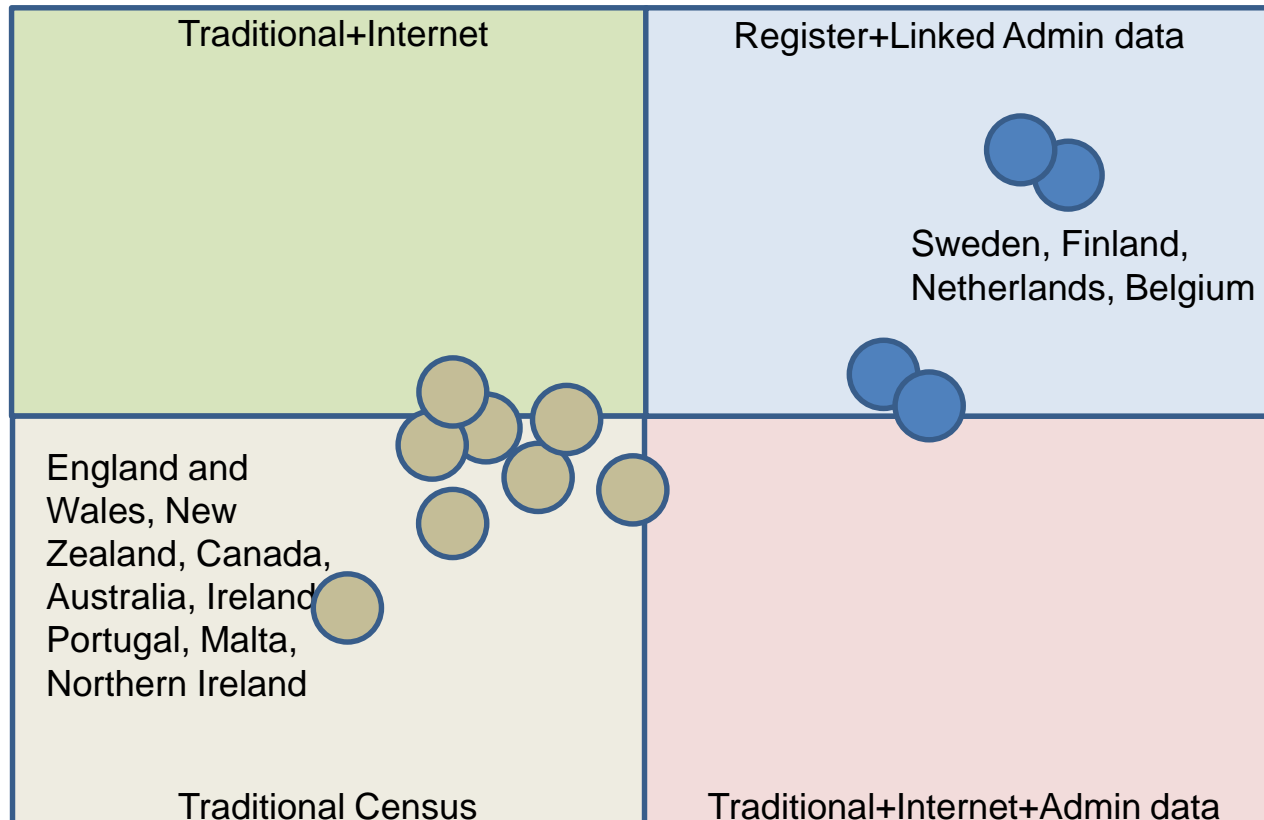
Photos: David Martin



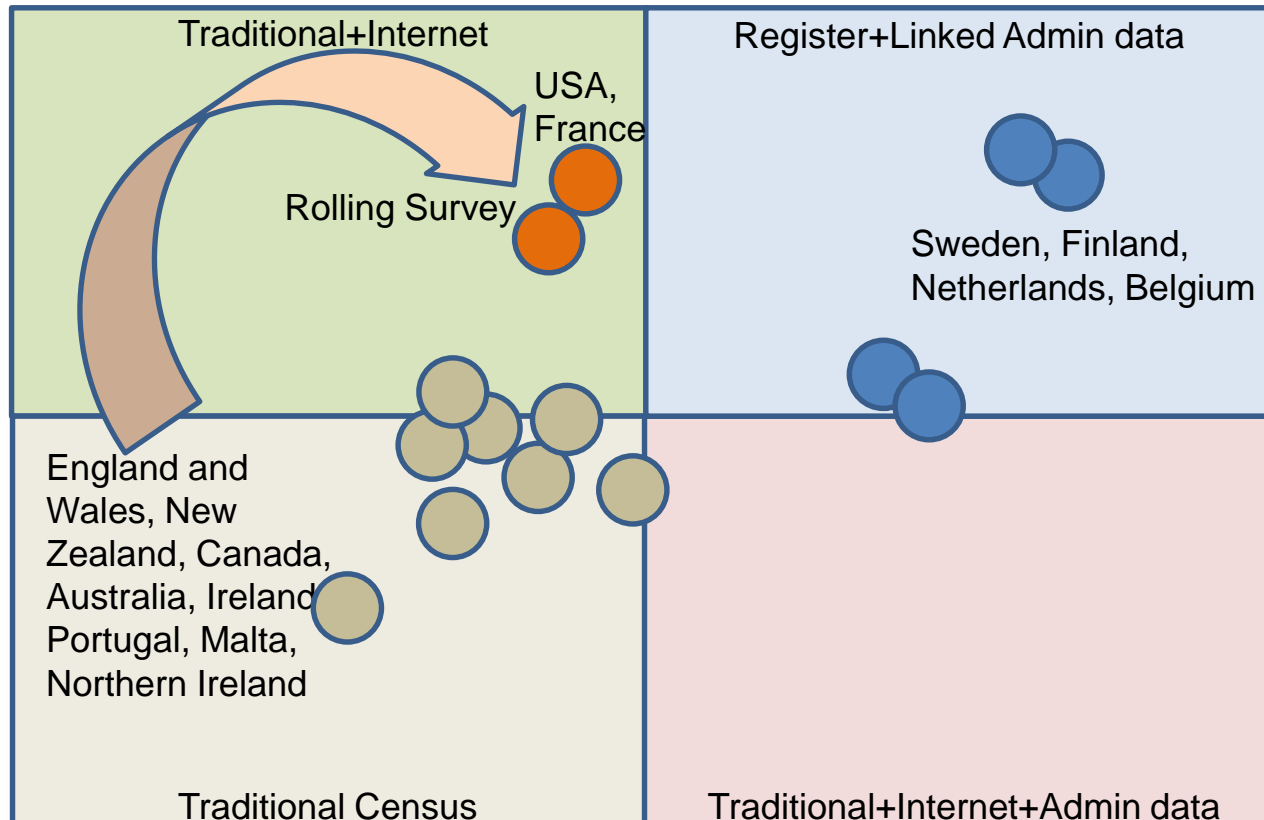
Census types

Traditional+Internet	Register+Linked Admin data
Traditional Census	Traditional+Internet+Admin data

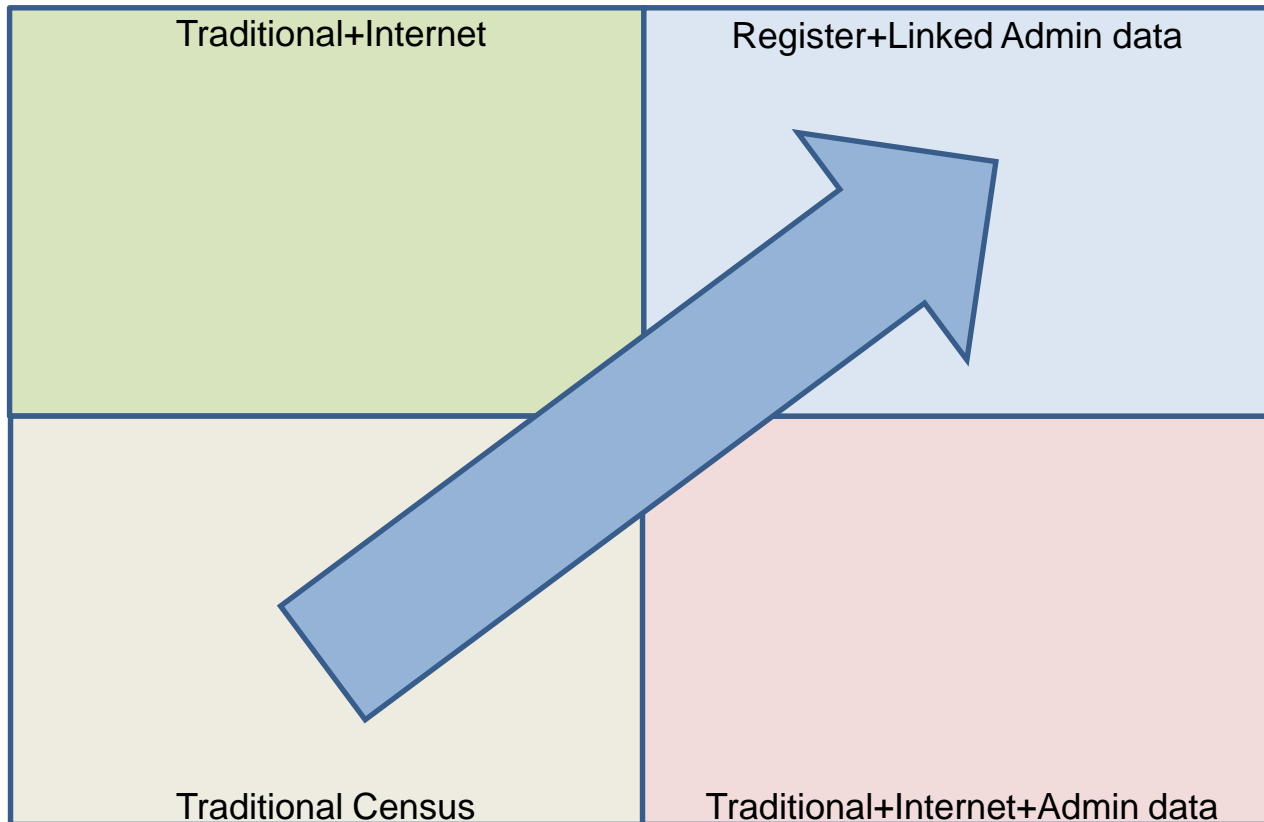
International context 2011



International context 2011



International context 2011



Why does it matter?

(From perspective of England and Wales, 2017)

- Only source of high quality small area population distributions
- Unique combination of attribute detail and spatial resolution
- Small area denominator population for prevalence, standardized rates, deprivation indicators
- Census as driver of basic statistical geography – output areas, super output areas
- Range of integrated data products
- Multiple interactions linked via current address/address one year ago/workplace address
- Persons linked via household questions

Range of integrated outputs

- National big picture on small populations
- Small area aggregate data
- Integrated statistical boundary and georeferencing system
- Interaction data – flows between small areas
- Microdata samples
- Integration with Longitudinal Studies

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Census Support

Who we are

We provide access to and user support for 1971, 1981, 1991, 2001 and 2011 UK census data [Read more](#)

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 GO

Census Data Website

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LATEST TWEETS

RT @FailWise: This free @UKDataService Crime Surveys User Conference @RoyalStatSoc next month looks useful for #socialresearch in the 'offe...

RT @JenLBuckley: #LFSAPS2017 Duncan Elliott explaining work to improve the presentation of timeseries; key aims to improve timeliness and acc...

RT @JenLBuckley: #LFSAPS2017 Ian O'Sullivan talking about

LATEST NEWS

The Autumn 2017 UK Data Service Newsletter is out!

UK Data Service Annual Report 2016-2017 released

New guide: Mapping 2011 Census Microdata using R

1981 Census Microdata samples

The best places for women to live in Britain are revealed

UK DATA SERVICE CENSUS SUPPORT



The Census Support service is composed of data specialists who focus on making a wide range of data from the contemporary censuses from 1971 to 2011 as accessible as possible to research users.

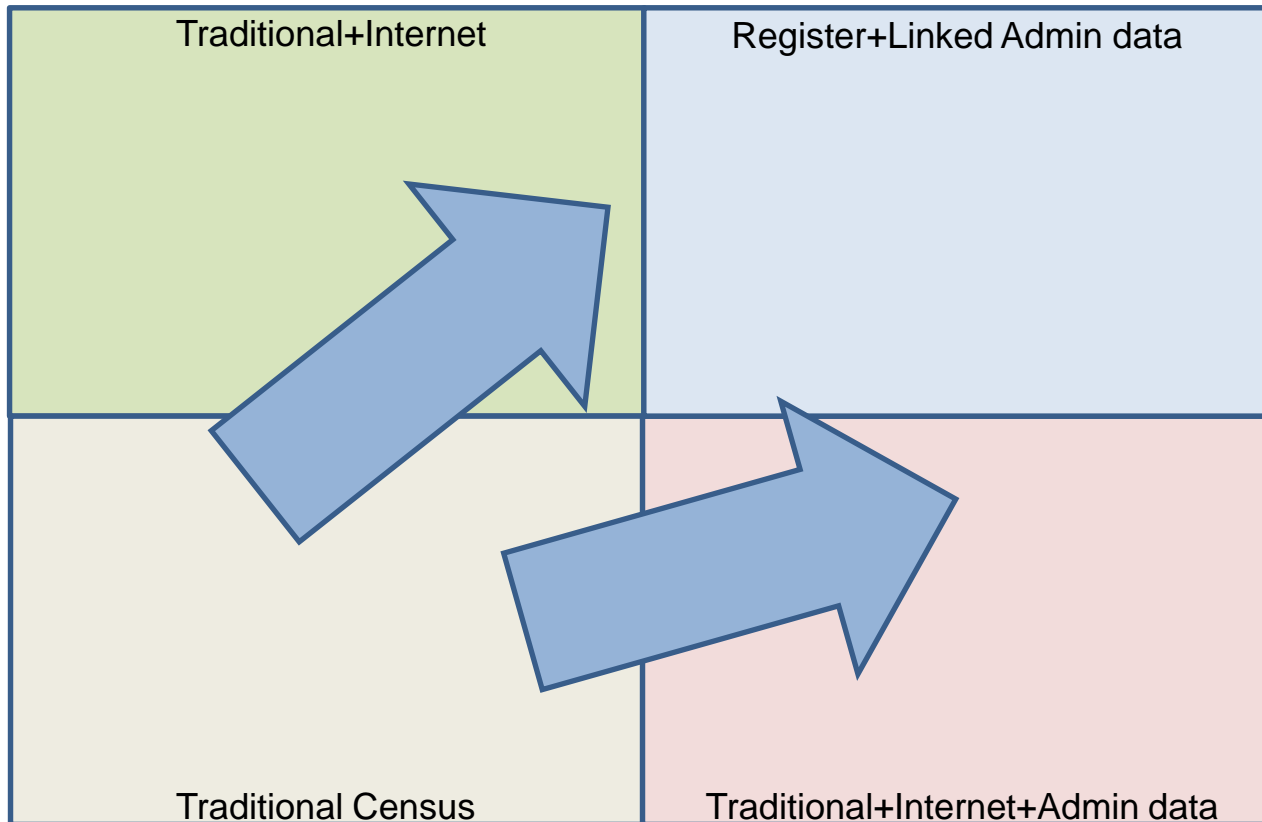
We provide access to census counts for areas, data on migration and commuting between areas, samples of anonymised census records and the boundary files necessary to map them.

PROGRESS TOWARDS 2021 AND BEYOND

QUICK ACCESS TO

- UK Data Service
- Aggregate data
- Flow data
- Microdata
- Boundary data

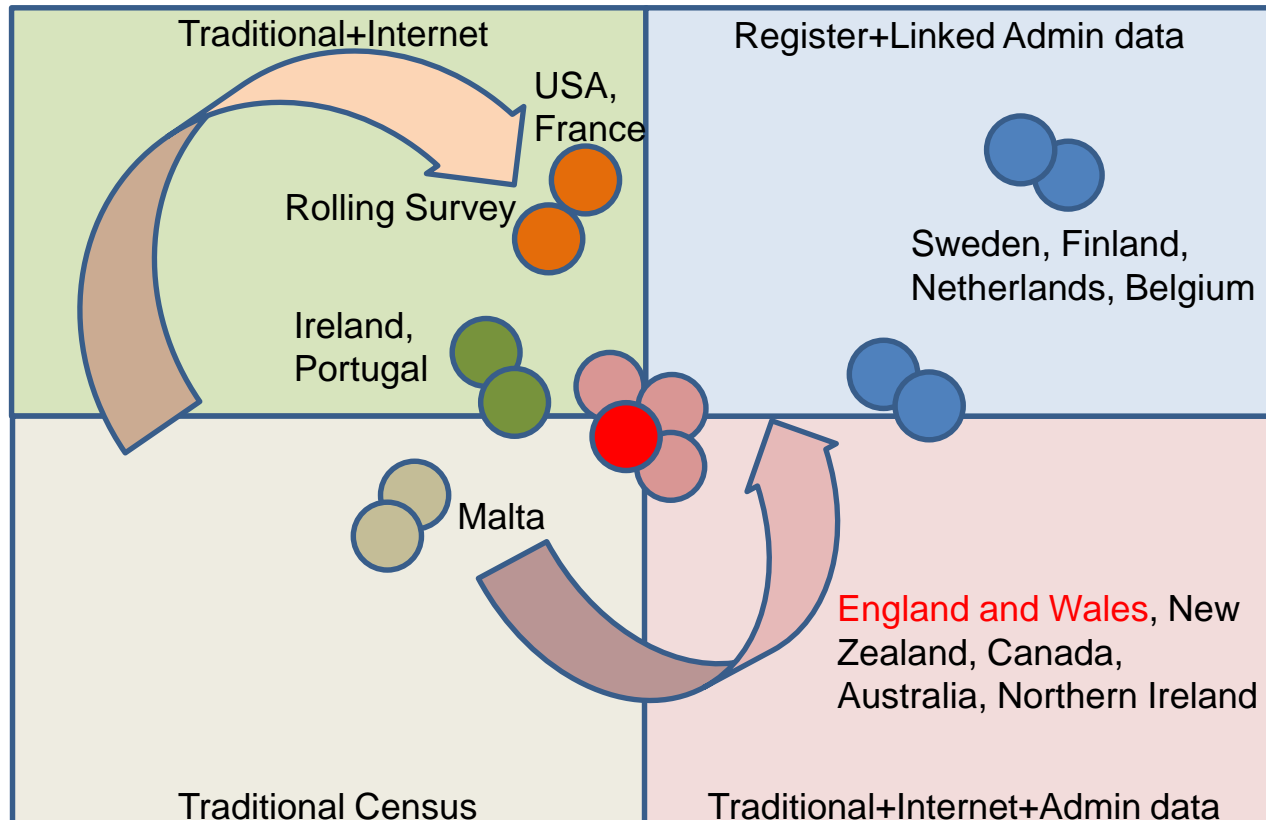
Two big shifts



2021 England and Wales Recommendations from the National Statistician:

- Increased use of administrative data and surveys in order to enhance the statistics from the 2021 Census and improve annual statistics between censuses.
- An online census of all households and communal establishments in England and Wales in 2021 as a modern successor to the traditional, paper-based decennial census. ONS recognises that special care would need to be taken to support those who are unable to complete the census online.

International context 2021



Administrative data

- If we are collecting loads of administrative data and using it to check the census, couldn't we just use it to replace the census?
- Why are we paying to do this twice?
- Other countries do it - usually in combination with a population register...
- How quickly can we get there?
- What are the obstacles?
 - Technical, legal, practical, public acceptability ++ issues

Administrative data census

- Use existing government administrative data, collected in course of health care, education, benefits, taxation etc.
- Link at the person level to a statistical population database
- Each administrative data source brings additional variables
- Could replace/enhance existing
- Potential to update data annually, hence outputs always more up to date

<http://webarchive.nationalarchives.gov.uk/20160108085249/http://www.ons.gov.uk/ons/guide-method/census/2011/census-data/2011-census-data/2011-first-release/local-authority-quality-assurance/the-2011-census-qa-pack.zip>

QA Pack (excel 2007 onwards).xslm - Microsoft Excel non-commercial use

2011 Census QA Pack - Bristol, City of
Age-sex population distributions for All Persons, Males and Females with sex ratios
All persons - Bristol, City of

Age	2011 Census Counts ¹	2011 Census Estimates ¹	Lower 95% Confidence Interval	Upper 95% Confidence Interval	Rolled forward estimates ¹	Patient Register 2011 ²	School Census 2011 ^{3,4}	Social Security and Revenue Information 2011 ⁵	Comparator Lower Bound	Comparator Upper Bound	Response Rates
0-4	26,100	29,600	28,200	31,000	28,200	29,500		27,200	26,100	30,700	88%
5-9	20,400	22,800	21,900	23,800	21,300	23,600	21,400	22,500	21,400	24,800	89%
10-14	19,500	21,700	20,700	22,700	19,700	21,900	18,900	21,000	18,900	23,400	90%
15-19	24,400	27,000	26,100	28,000	24,100	26,400			22,900	27,500	90%
20-24	39,300	44,400	42,400	46,400	46,700	42,500			40,500	48,800	89%
25-29	37,300	40,800	39,400	42,100	47,600	44,100			42,300	49,400	91%
30-34	33,700	36,400	35,200	37,600	38,800	42,500			36,900	44,400	93%
35-39	28,700	30,400	29,600	31,300	31,100	36,400			28,400	39,000	94%
40-44	27,000	28,300	27,600	29,000	27,900	33,600			26,600	34,900	95%
45-49	26,300	27,100	26,200	28,000	27,000	31,700			25,900	32,700	97%
50-54	22,600	23,300	22,900	23,700	23,300	26,200			22,200	27,200	97%
55-59	19,700	20,400	20,000	20,800	20,000	22,300			19,300	22,900	97%
60-64	19,400	20,100	19,600	20,600	19,100	21,000			18,500	21,500	96%
65-69	14,700	15,200	14,800	15,600	15,000	15,700		16,700	14,600	16,100	97%
70-74	12,100	12,500	12,200	12,800	12,300	12,800		13,100	12,000	13,100	97%
75-79	10,200	10,700	10,400	11,000	10,400	10,700		10,900	10,300	10,900	96%
80-84	8,200	8,500	8,300	8,800	8,600	8,600		8,800	8,500	8,600	96%
85+	8,500	8,900	8,600	9,200	8,800	8,800		10,500	8,700	8,900	95%
Total	398,200	428,200	420,500	436,000	429,600	458,100	40,200	130,700			93%

Source: Office for National Statistics¹, National Health Service Information Centre², Department for Education³, Welsh Government⁴, Department for Work and Pensions/Her Majesty's Revenue and Customs⁵

Descriptive metadata for tables in this pack is provided on previous pages - Descriptive metadata for terms used -

2011 Census QA Pack - Bristol, City of

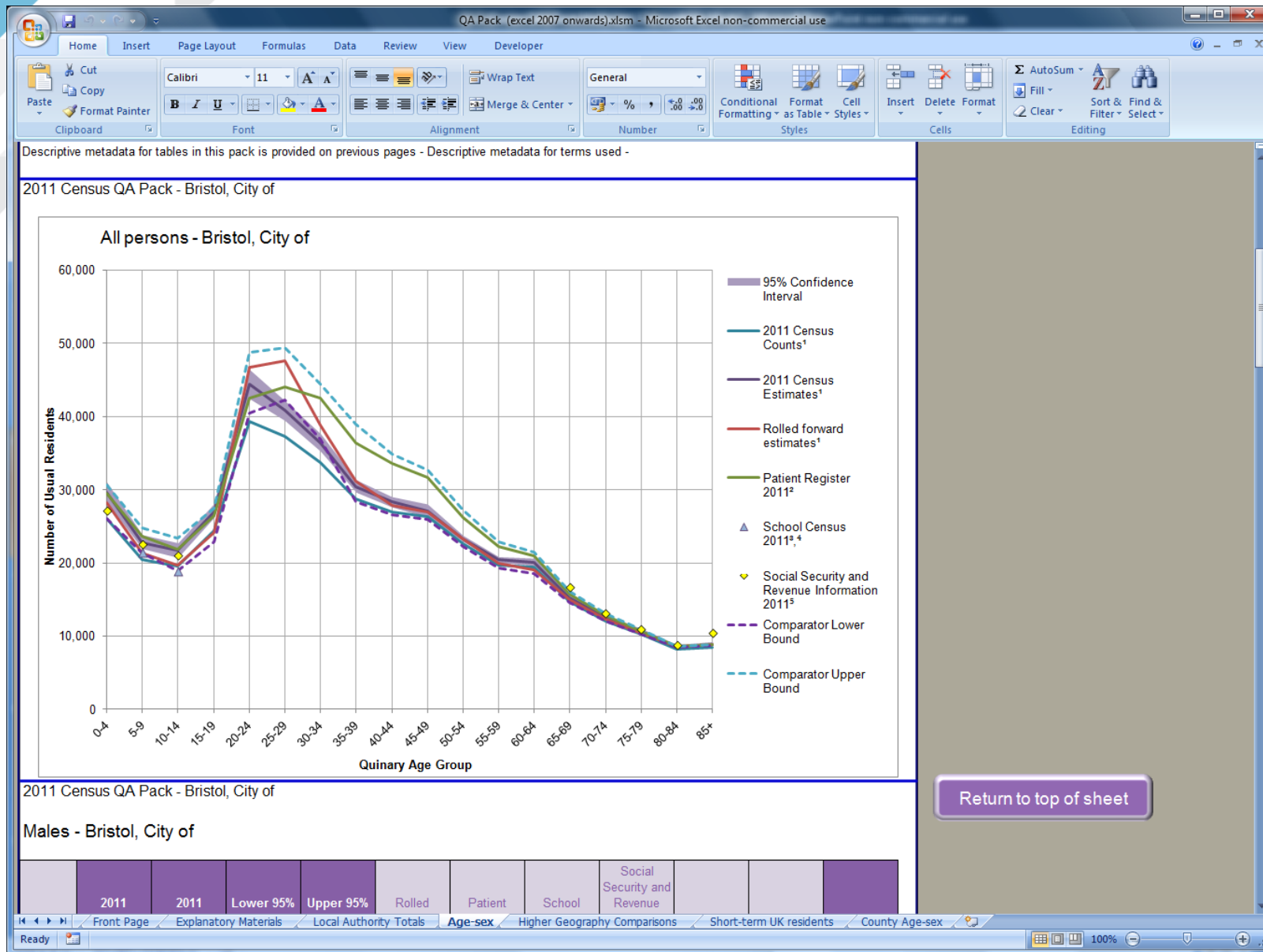
All persons - Bristol, City of

60,000

95% Confidence Interval

Ready Front Page Explanatory Materials Local Authority Totals Age-sex Higher Geography Comparisons Short-term UK residents County Age-sex 100%

- Front Page
- Explanatory Materials
- Local Authority Totals
- County and Region proportional comparisons
- Short-term residents
- Switch between counts & proportions



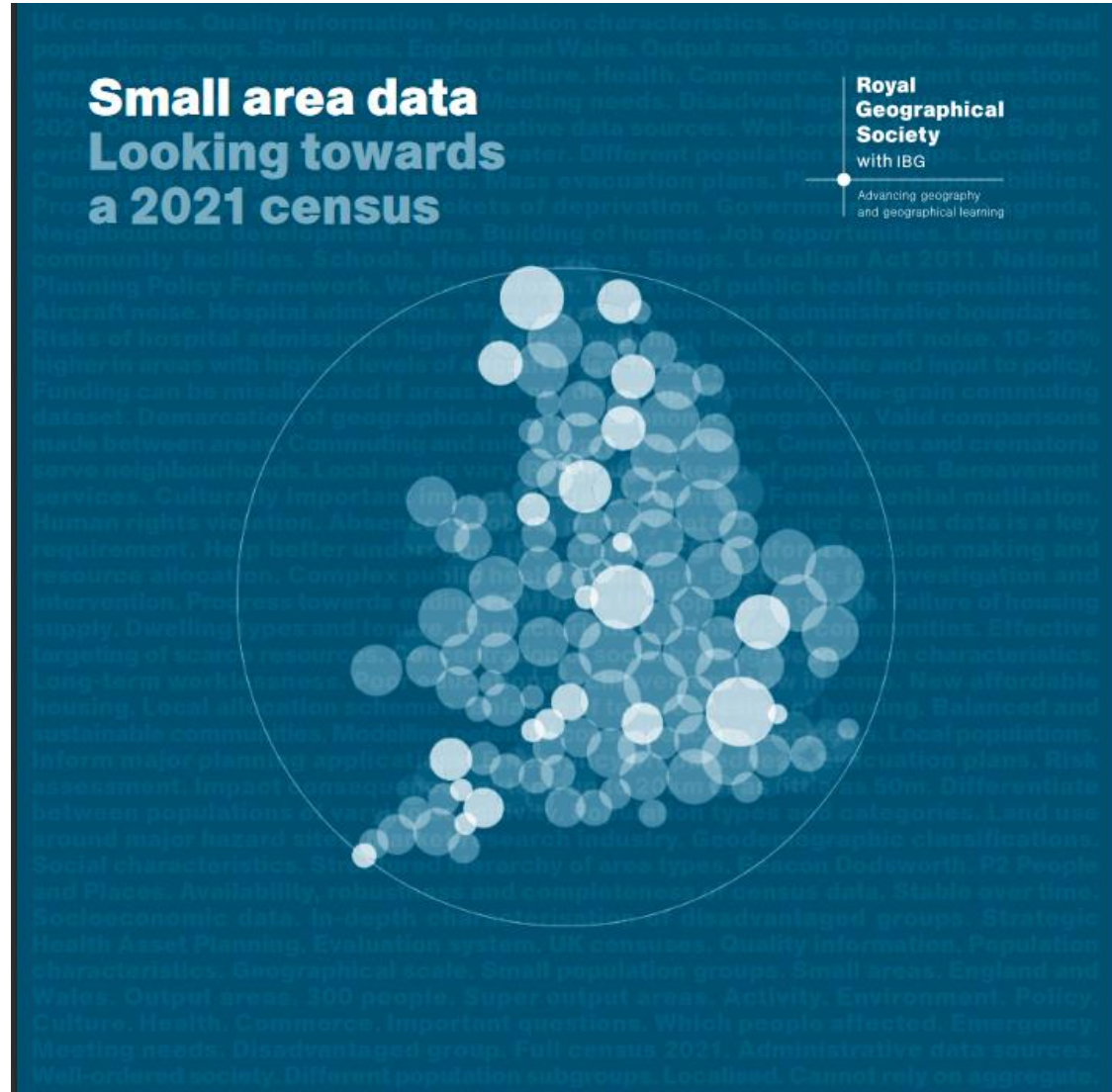
<http://webarchive.nationalarchives.gov.uk/20160108085249/http://www.ons.gov.uk/ons/guide-method/census/2011/census-data/2011-census-data/2011-first-release/local-authority-quality-assurance/the-2011-census-qa-pack.zip>

Beyond 2011 thinking: Statistical options

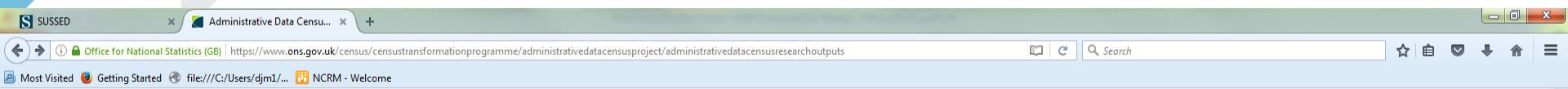
Census options	Traditional Census (long form to everyone)
	Rolling Census (over 5/10 year period)
	Short Form (everyone), Long form (Sample)
	Headcount + Annual Survey (US model)
Administrative data options	Aggregate analysis
	(Intermediate) Sample linkage e.g. 1% of postcodes
	100% linkage to create 'statistical population spine'
Survey option(s)	Address register + Survey



(31 July 2014)



<http://www.rgs.org/NR/rdonlyres/80857592-3D48-4C2B-9CB9-52A107AE249F/21508/RGSIBGPpolicyDocumentSmallAreaDataForweb1.pdf>



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[Administrative Data Census Research Outputs](#)

Administrative Data Census Research Outputs

These outputs are part of our research into whether we can use administrative data to produce population and census statistics in the future.

What the outputs show us

These outputs show what we could produce from an Administrative Data Census and give users an idea of their quality.

Our research so far

We will be focusing on the three key types of information that the census currently gives us. View everything we have published so far on:

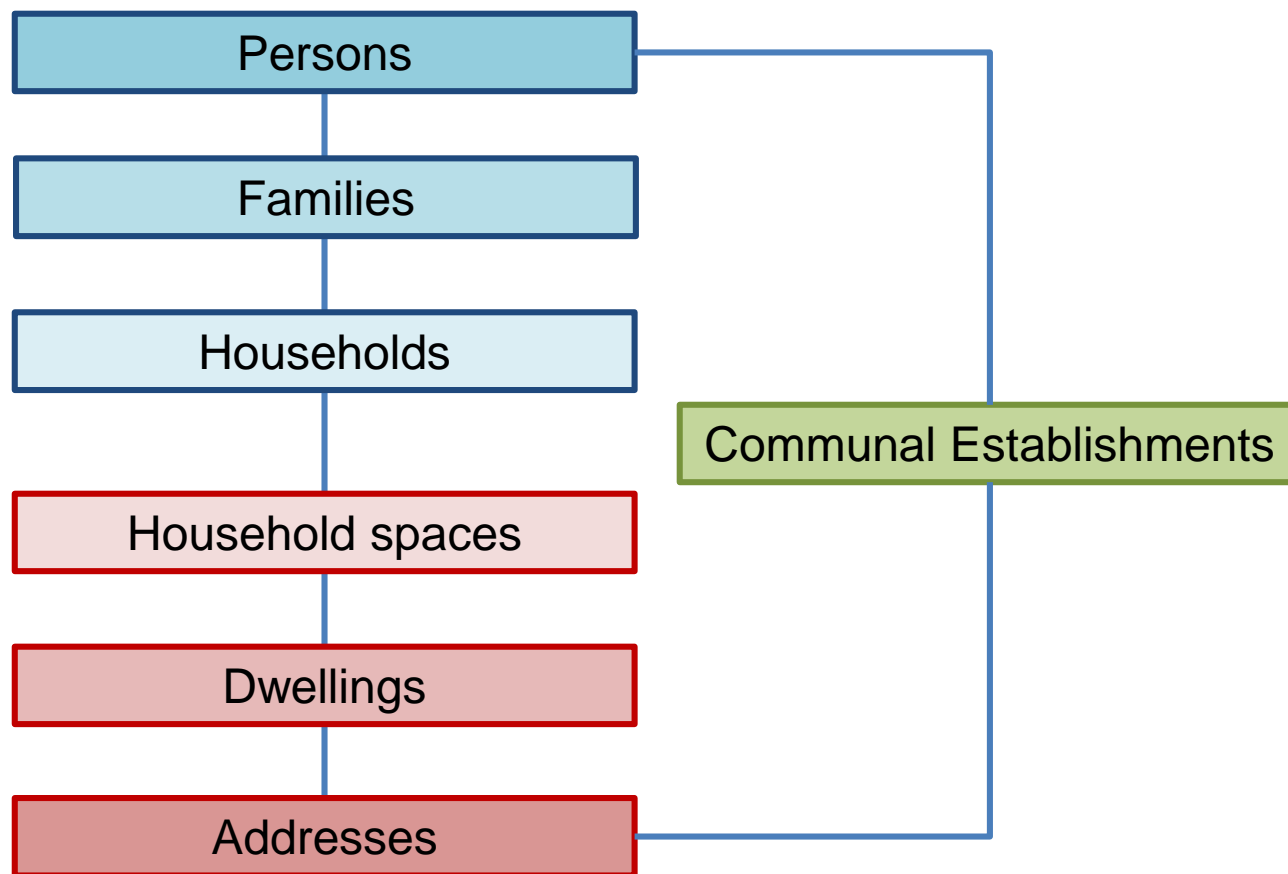
- [size of the population](#)
- [population characteristics](#)
- [households and families](#)

What's next?

Each year, we aim to expand the breadth, depth and accuracy of our Research Outputs. This is dependent on the availability of the data and its statistical quality.

<https://www.ons.gov.uk/census/censustransformationprogramme/administrativedatacensusresearchoutputs>

(Non-exhaustive) hierarchy of census entities



Before you start

Who should complete this questionnaire?

The householder is responsible for ensuring that this questionnaire is completed and returned.

The **householder** is the person who lives, or is present, at this address who:

- owns/rents (or jointly owns/rents) the accommodation; and/or
- is responsible (or jointly responsible) for paying the household bills and expenses

A **household** is:

- one person living alone; or
- a group of people (not necessarily related) living at the same address who share cooking facilities and share a living room or sitting room or dining area

What should you complete on this questionnaire?

- **Household questions on pages 3-6** about this household and its accommodation
- **Individual questions on pages 7-30** for every person who usually lives in this household. Every person who has been, or intends to be, in the UK for 3 months or more should be included in these questions at their usual UK address
- **Visitor questions on the back page (page 32)** for all other people staying overnight in this household on 27 March 2011

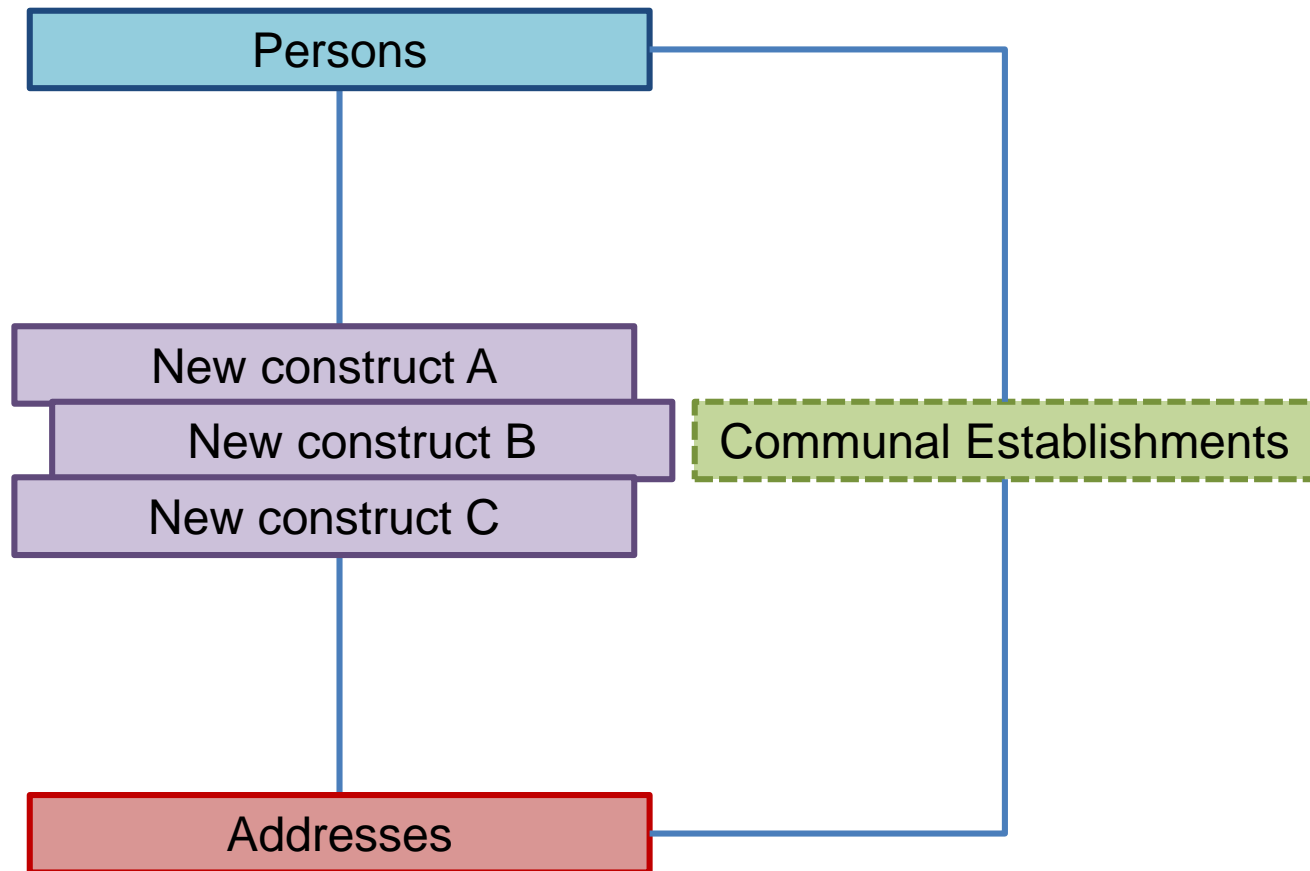
It is important to include visitors staying overnight in this household to make sure no-one is missed. Visitors who usually live elsewhere in the UK must also be included on a census questionnaire at their usual address.

You will find further information about who to include in this questionnaire on page 31.

Will you need extra questionnaires?

- If there are more than six people in this household, or there are more than three visitors staying overnight, you can choose either to complete the entire questionnaire online, or fill in this questionnaire and contact us to request one or more **Continuation Questionnaires**

Potential hierarchy of administrative entities



Internet enumeration

- 2010/11 Censuses – internet completion an optional extra
 - England and Wales 2011 – 16%
- Higher quality from internet responses
- Post-2011 increased emphasis
 - New Zealand 2013 – 34% (24.5%-38.7%)
 - Australia 2016 – 10.6% (target 65%)*
 - Canada 2016 – 68.3% (39.5%- 71.2%)
- Most 2020/2021 enumerations aiming for internet as primary channel (New Zealand 2018)
- Deliver code, invite online completion, follow-up/support those that do not complete

*DDOS attack on night of Census (!)



Household Questionnaire

England

Office for National Statistics



Complete online

www.census.gov.uk

Your personal internet access code is:

OR fill in this paper questionnaire and post it back using the pre-paid envelope supplied.

If your address is incorrect or missing, enter your correct address here:

Postcode

Declaration

This questionnaire has been completed to the best of my knowledge and belief.

Signature

Date

Telephone number

We may contact you if we need to collect missing information.

If you have lost your envelope, please return to: FREEPOST 2011 Census, Processing Centre, UK

Return to:
FREEPOST 2011 Census,
Processing Centre, UK

A message to everyone - act now

Everyone should be included in the census - all people, households and overnight visitors.

It is used to help plan and fund services for your community - services like transport, education and health.

Please complete your census questionnaire on 27 March 2011, or as soon as possible afterwards. You can fill it in online or on paper.

Taking part in the census is very important and it's also compulsory. You could face a fine if you don't participate or if you supply false information.

Your personal information is protected by law. Census information is kept confidential for 100 years.

So help tomorrow take shape and be part of the 2011 Census.

J. N. Matheson

Jill Matheson
National Statistician

Where can you get help?

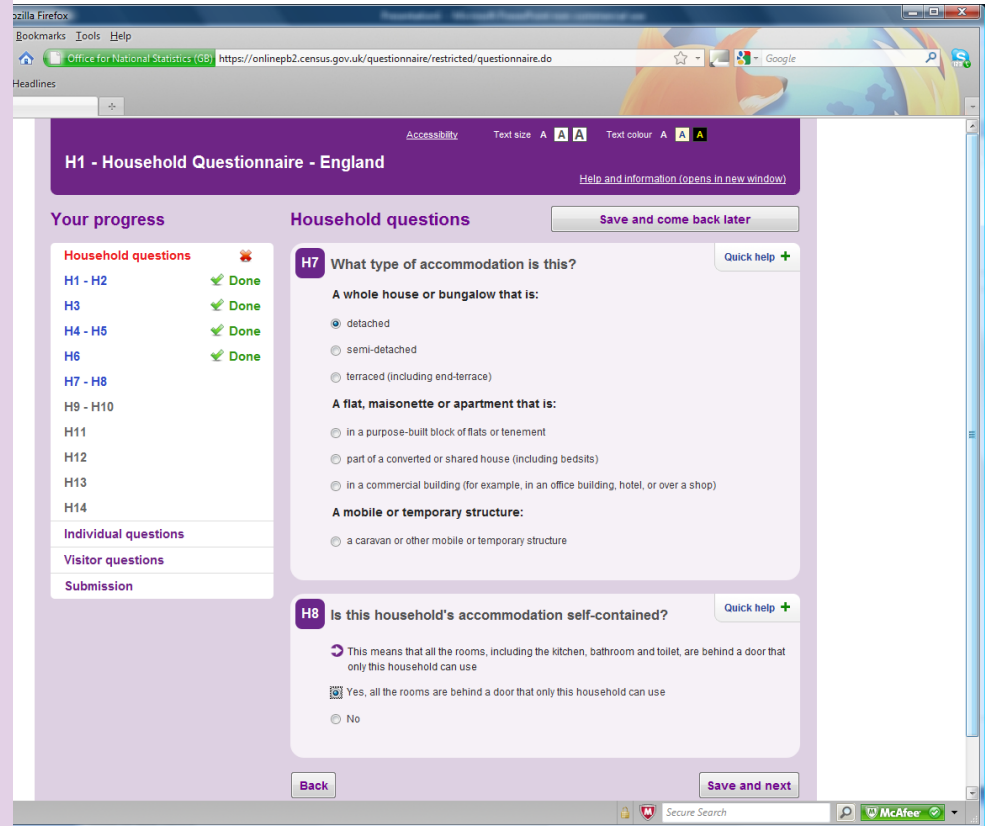
- www.census.gov.uk
- Census helpline 0300 0201 101
- Text Relay 18001 0300 0201 160

Help is available in large print and Braille

H1



101001



BIG data shift?

- Data about things and events as proxies for population presence and characteristics
- Population locations at home/work, travel, inc. entry/exit checks for international migration...
- Potential replacement of (some) census and administrative sources, but limited attributes and VERY limited linkage
- Challenges of acceptability, coverage, bias, calibration and stability of messy data
- Context is everything!
- Big Data could augment good admin data, but will still be demand for large coverage surveys

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Mobile phone tracking data 'could replace census questions'

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Thousands of people have had their movements tracked by the Office for National Statistics to see if they can find out where they live and work.

(7 Nov 2017)

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Mobile phone tracking data 'could replace census questions'

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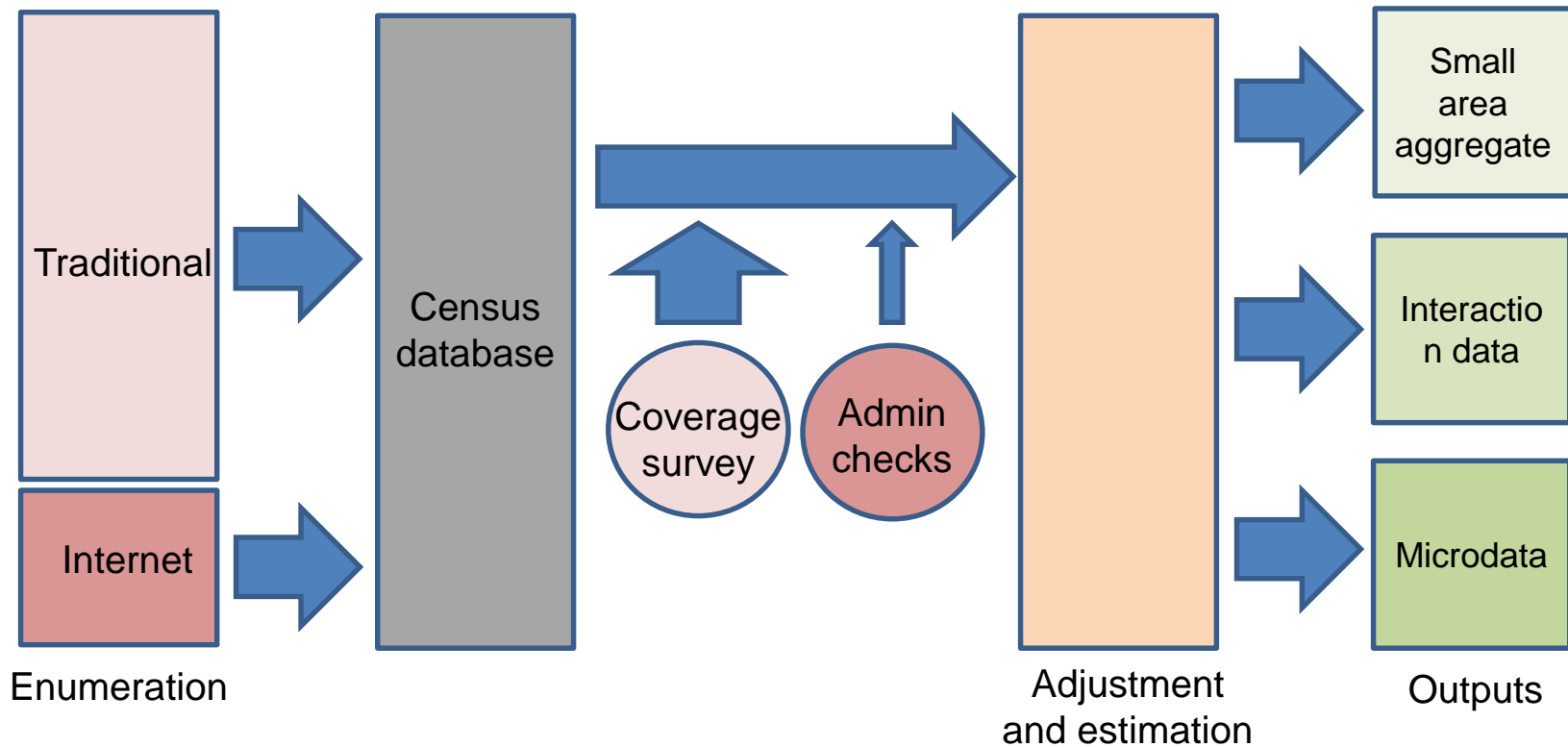


Thousands of people have had their movements tracked by the Office for National Statistics to see if they can find out where they live and work.

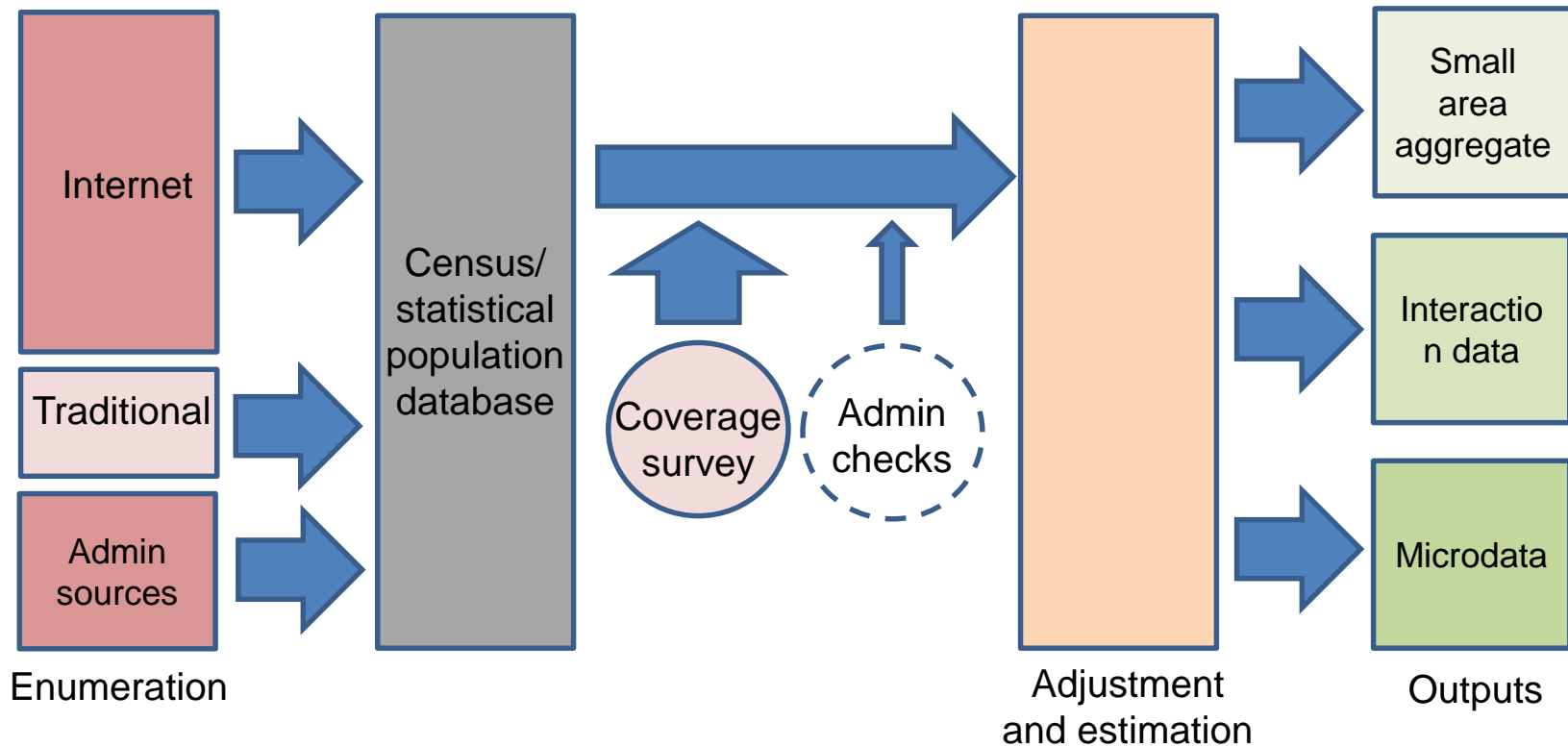
(7 Nov 2017)

Anonymised, imputed flows >15 at LA-LA level, for 3 LAs over 4 weeks, on one network!

2011 Census processing model



2021 Census processing model



Some questions for you

- Which census variables might be of most use to your research?
- How might they be affected by 2021 internet enumeration?
- Could they be obtained without conducting a census?
- What would the biggest challenges be?
- (Think: concepts, definitions, data sources –admin/big data? data quality and matching issues)

Discussion



D.J.Martin@soton.ac.uk

Photo: Dave Martin

GREEN – Some data available to ONS

Demographics

Age
Sex
Marital or Legal Partnership Status

Education

Term Time Address

Ethnicity, Identity, Language & Religion

Ethnic group
Citizenship (passport held) or Nationality

Health

Disability and Long Term Health Conditions

Housing

Accommodation Type
Number of Rooms
Number of Bedrooms
Tenure and Landlord (if renting)

Labour Market

Employed (including students, excluding self employed)
Economically inactive, unable to work i.e. long term sick
Unemployed (including students)

Migration

Country of Birth

AMBER – Some data available but ONS currently doesn't have access

Demographics

Household Composition

Education

Qualifications held

Ethnicity, Identity, Language & Religion

Ethnic group
Citizenship (passport held) or Nationality
English language proficiency
Welsh language
Main languages used

Health

Disability and Long Term Health Conditions

Housing

Tenure and Landlord (if renting)
Second residences

Labour Market

Number of hours worked
Industry
Year Last Worked
Economically inactive, retired

Migration

Country of birth
Internal/International Migration (including address one year ago)

Travel

Number of Cars/Vans

RED – Limited or no data available

Demographics

Family relationships

Ethnicity, Identity, Language & Religion

National identity
Religion

Health

General Health
Amount of unpaid care provided

Housing

Self-containment of accommodation

Labour Market

Economically inactive, looking After Family
Address of place of work
Supervisor Status
Occupation

Travel

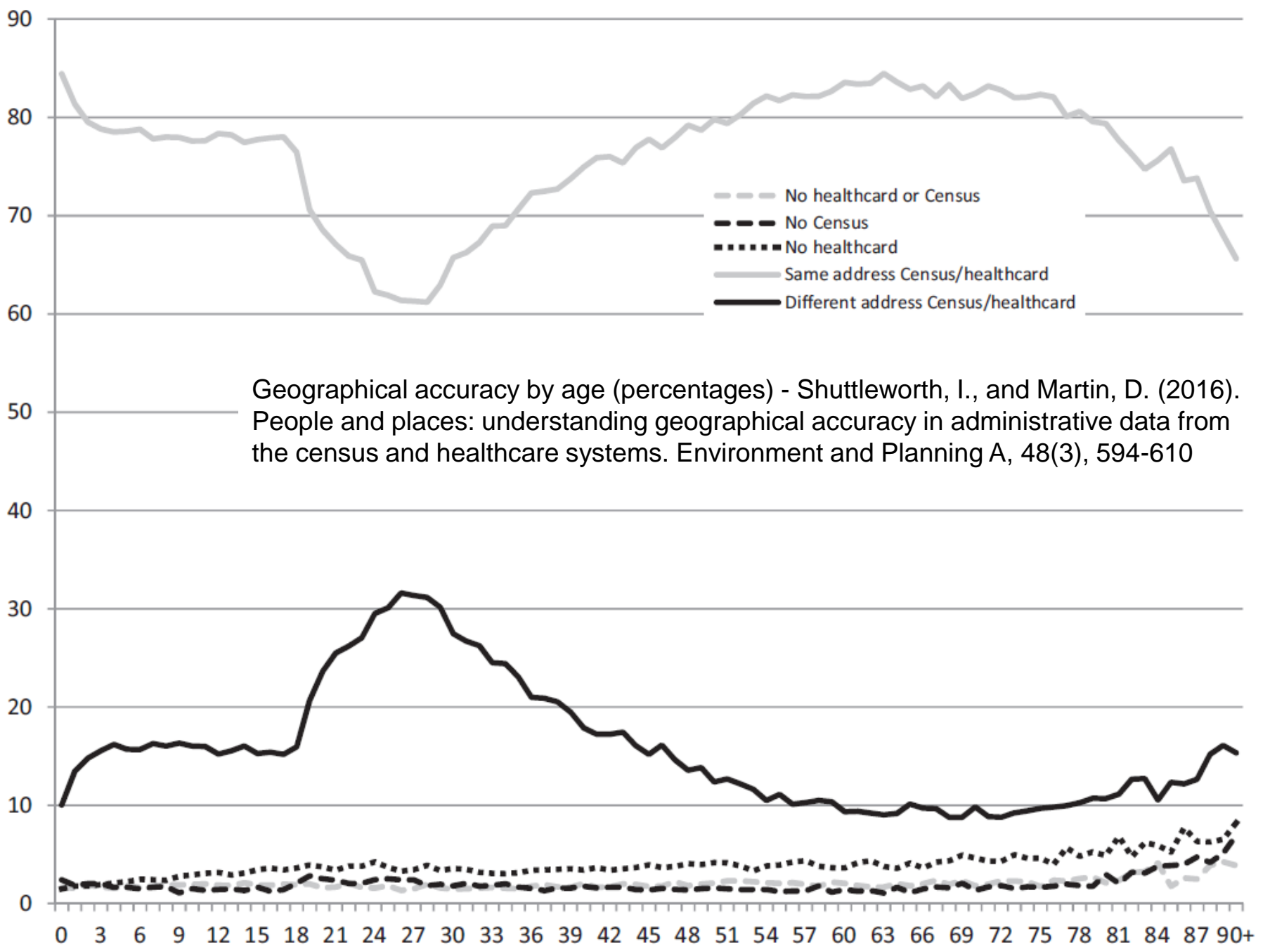
Method of transport to place of work

<https://www.ons.gov.uk/census/transformationprogramme/administrativedatacensusproject/administrativedatacensusannualassessments/annualassessmentofprogressintroducingthisyearsassessment>

<u>GREEN – Some data available to ONS</u>	<u>AMBER – Some data available but ONS currently doesn't have access</u>	<u>RED – Limited or no data available</u>
<p>Demographics Age Sex Marital or Legal Partnership Status</p>	<p>Demographics Household Composition</p>	<p>Demographics Family relationships</p>
<p>Education Term Time Address</p>	<p>Education Qualifications held</p>	<p>Ethnicity, Identity, Language & Religion National identity Religion</p>
<p>Ethnicity, Identity, Language & Religion Ethnic group Citizenship (passport held) or Nationality</p>	<p>Ethnicity, Identity, Language & Religion Ethnic group Citizenship (passport held) or Nationality English language proficiency Welsh language Main languages used</p>	<p>Health General Health Amount of unpaid care provided</p>
<p>Health Disability and Long Term Health Conditions</p>	<p>Health Disability and Long Term Health Conditions</p>	<p>Housing Self-containment of accommodation</p>
<p>Housing Accommodation Type Number of Rooms Number of Bedrooms Tenure and Landlord (if renting)</p>	<p>Housing Tenure and Landlord (if renting) Second residences</p>	<p>Labour Market Economically inactive, looking After Family Address of place of work Supervisor Status Occupation</p>
<p>Labour Market Employed (including students, excluding self employed) Economically inactive, unable to work i.e. long term sick Unemployed (including students)</p>	<p>Labour Market Number of hours worked Industry Year Last Worked Economically inactive, retired</p>	<p>Travel Method of transport to place of work</p>
<p>Migration Country of Birth</p>	<p>Migration Country of birth Internal/International Migration (including address one year ago)</p>	
	<p>Travel Number of Cars/Vans</p>	

<https://www.ons.gov.uk/census/transformationprogramme/administrativedatacensusproject/administrativedatacensusannualassessments/annualassessmentofprogressintroducingthisyearsassessmenttowardsadministrativedatacensus2021#introducing-this-years-assessment>

Geographical accuracy by age (percentages) - Shuttleworth, I., and Martin, D. (2016).
 People and places: understanding geographical accuracy in administrative data from
 the census and healthcare systems. *Environment and Planning A*, 48(3), 594-610



Home > Census > Census Transformation Programme > Administrative Data Census Project >

Administrative Data Census Research Outputs > Size of the population >

Research Outputs: Estimating the size of the population in England and Wales, 2017 release

Research Outputs: Estimating the size of the population in England and Wales, 2017 release

Research and population statistics from a methodology different to that currently used in the production of official population statistics. These Research Outputs are not official statistics on the population.

In this section

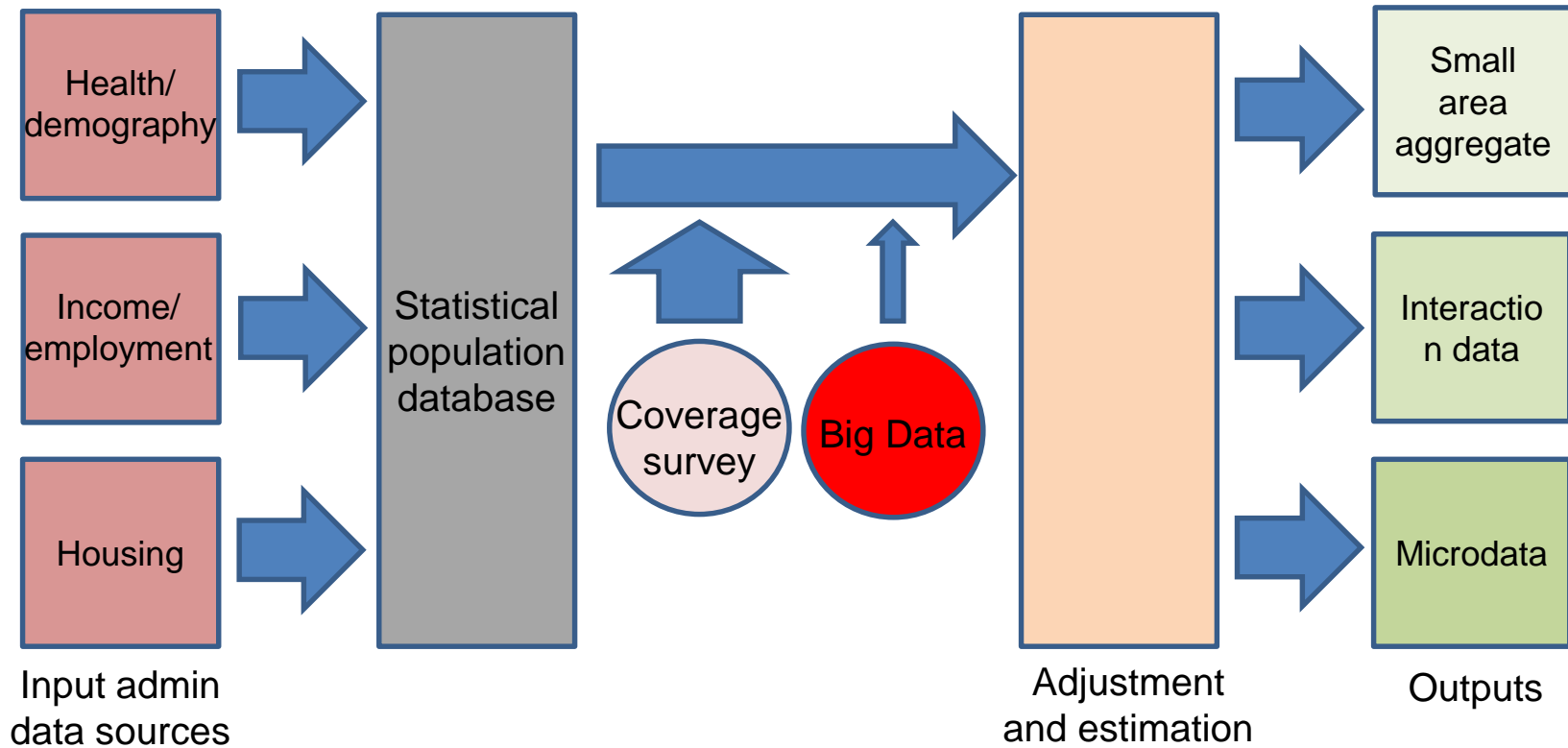
1. Disclaimer
2. Main points
3. Things you need to know about this release
4. Our aim
5. How do the 2016 estimates perform at a national (England and Wales) and country level?
6. How do the 2016 estimates perform at the local authority level?
7. Further developments and next steps
8. Feedback
9. Annex A – Feedback on the 2016 publication

https://www.ons.gov.uk/census/censustransformationprogramme/administrativedatacensusproject/administrativedatacensusresearchoutputs/sizeofthepopulation/researchoutputs/estimatingthesizeofthepopulationinenglandandwales2017release

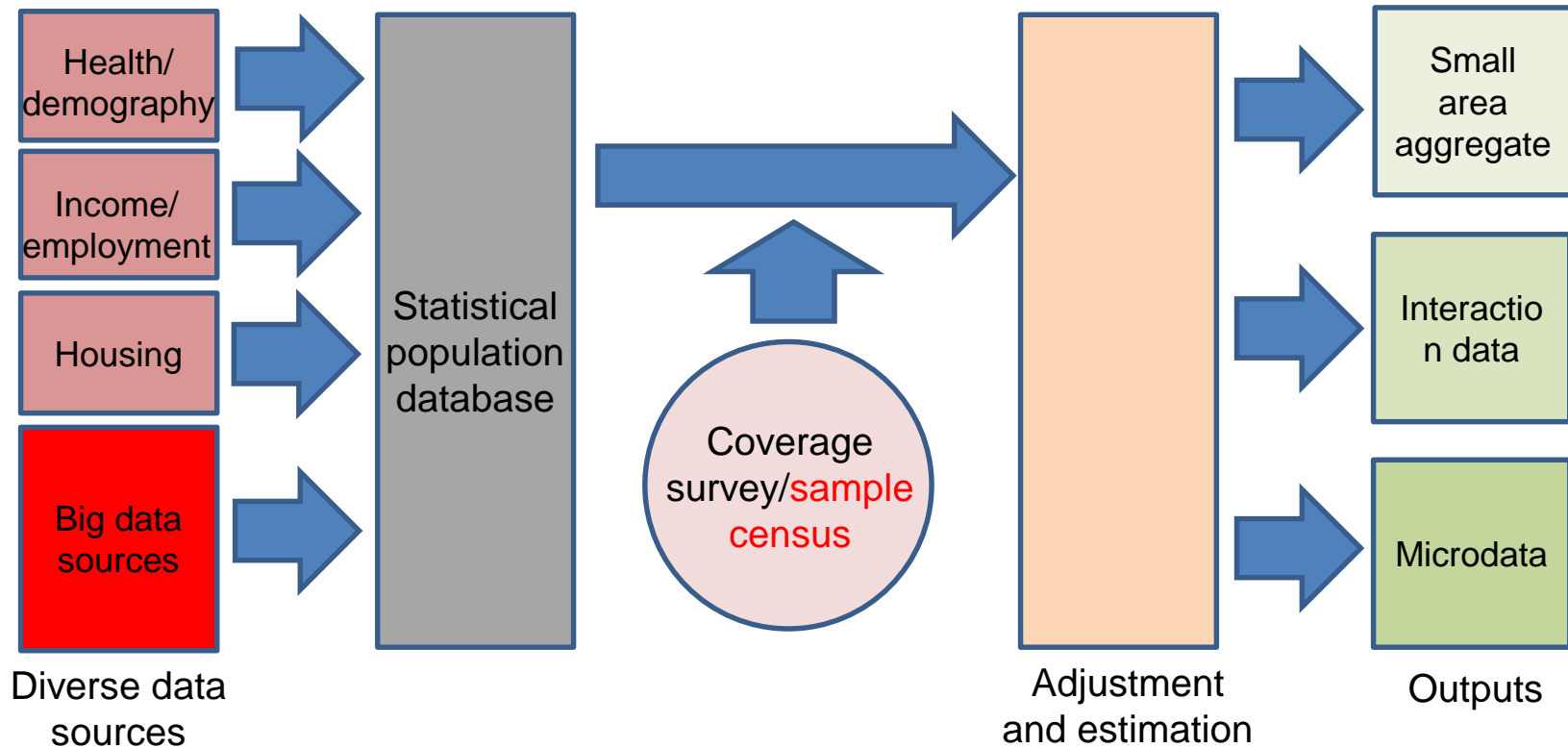
Possible new construct A: “household-dwelling unit” (Statistics Finland)

- Consists of the permanent occupants of a dwelling
 - Related concepts include: building, dwelling, consumption unit, residential home, structure of household-dwelling unit
- Concept adopted in 1980 census. In earlier years the concept of household was used, which consisted of family members and other persons living together who made common provision for food

Admin Census processing model



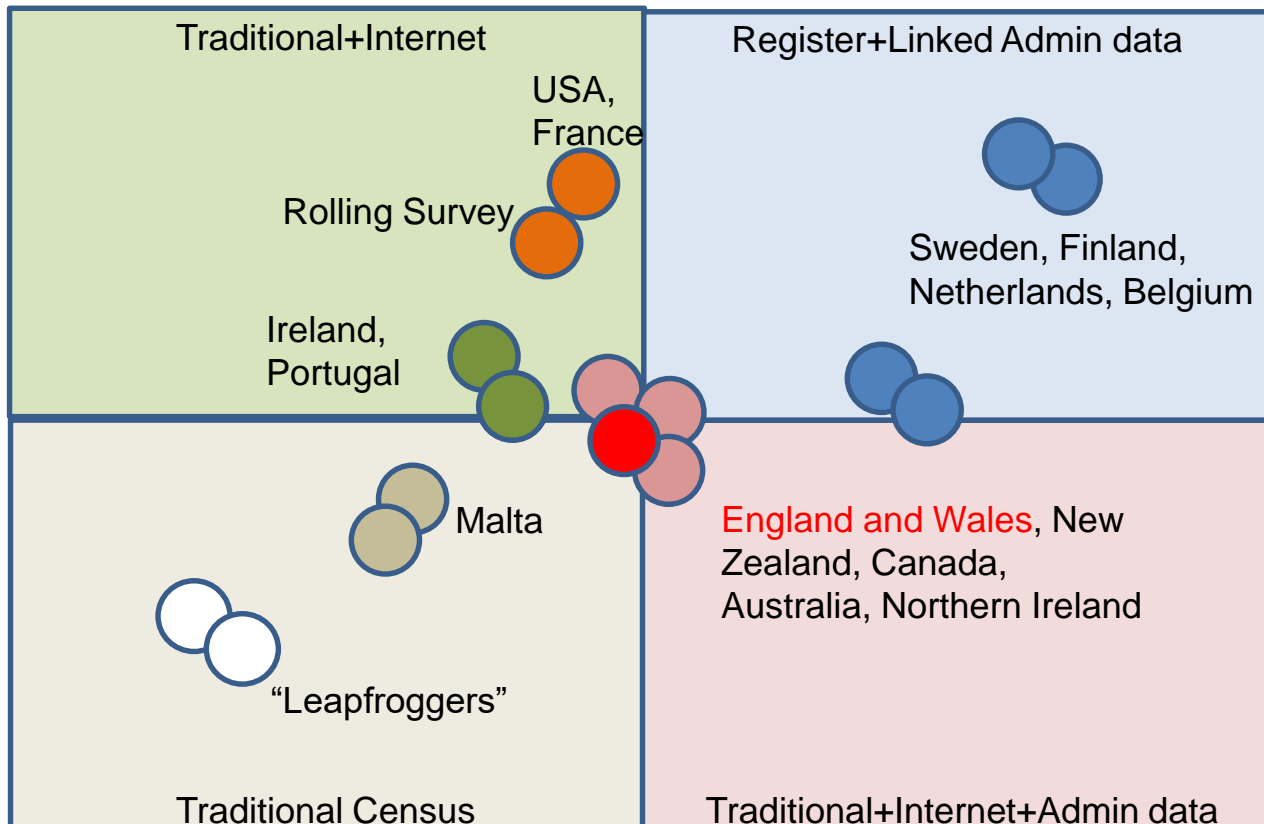
Future Statistical population processing model



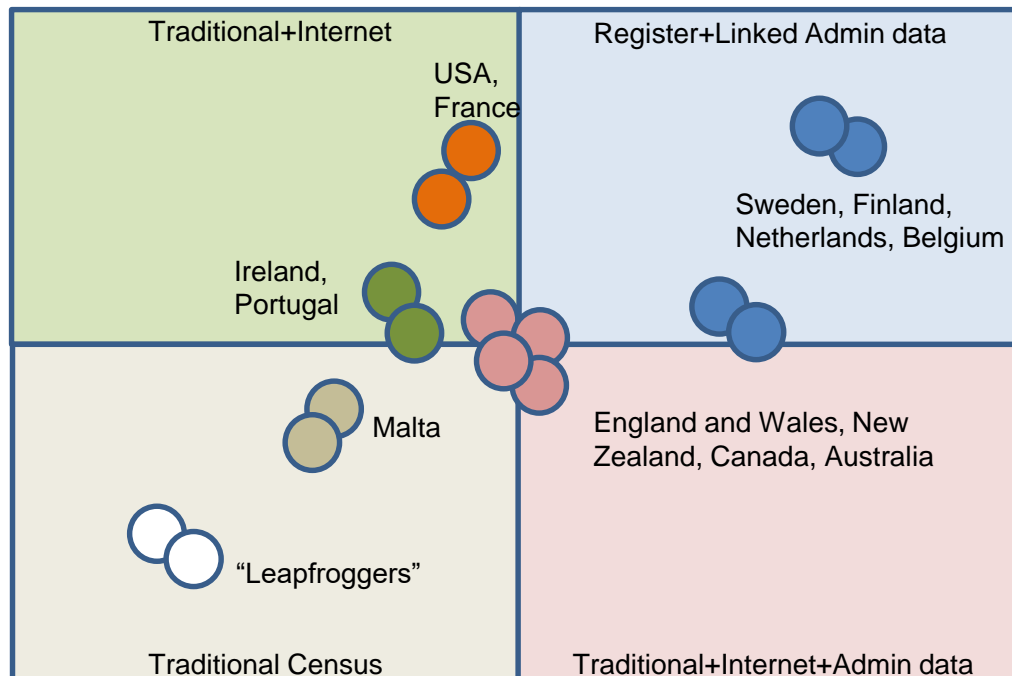
What future for the census?

- 2020/21 – conventional census questionnaires, primarily internet enumeration, administrative data integration
- New risks!
- Beyond 2021 – routinisation of administrative data integration, new data types from big data sources
- Ongoing calibration and extensive public debate re. acceptability of methods and value of data
- 2030/31 – diverse data sources but widespread concern over reliability – demand for large coverage surveys and integrated adjustment and estimation systems for official statistics

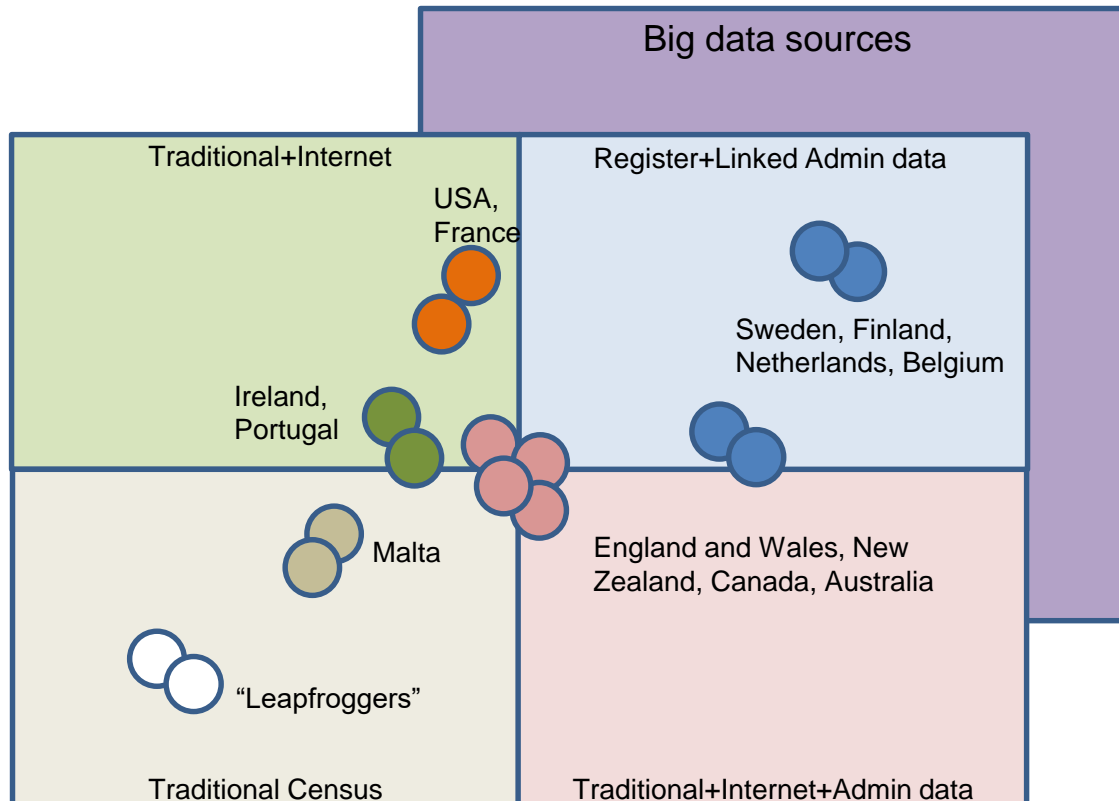
International context 2021



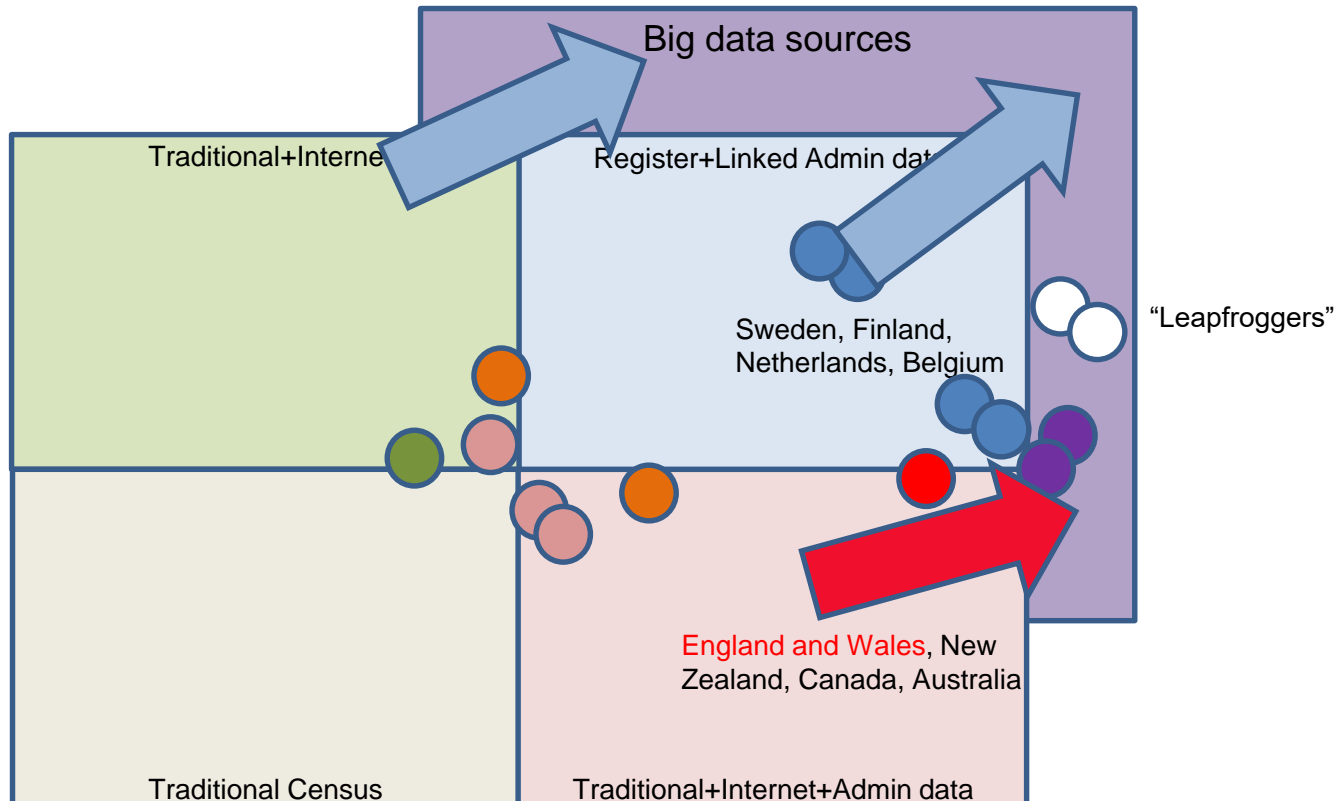
International context beyond 2021



International context beyond 2021



International context beyond 2021



Thank you!

17



D.J.Martin@soton.ac.uk

Photo: Dave Martin