

2011 UK Census Overview of E&I Process

**UNECE Work Session on Statistical Data Editing
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Overview

Background

2011 Census editing methodology:

- initial prototype;
- issues with inter-person relationship matrix;
- final item level imputation process;
- imputing skeletal records post coverage adjustment.

Concluding remarks

Background: UK Census Editing Strategy

Key principles:

- ⇒ all changes maintain data quality;
- ⇒ number of changes kept to a minimum; and
- ⇒ missing data imputed for all variables to provide complete and consistent database

Additional principles for IDC:

- ⇒ no unnecessary changes from paper;
- ⇒ minimise respondent burden - make user experience simple as possible;
- ⇒ adhere to web design best practice where possible;
- ⇒ ensure accessibility for everyone

Background: Overview of CANCEIS

CANadian Census Edit and Imputation System

- ⇒ generalised edit and imputation system
- ⇒ specify edits in decision logic tables
- ⇒ nearest neighbour imputation methodology
- ⇒ computationally efficient
- ⇒ simultaneous imputation of numeric & categorical variables

Background: 2011 Census Process

Mail out/back enumeration method:

- ⇒ Address Register;
- ⇒ 95% questionnaires mailed out to residential addresses;
- ⇒ hand delivered to hard to enumerate and collectives.

Data capture & coding outsourced to Lockheed Martin:

- ⇒ scanning then OCR/OMR;
- ⇒ set of preliminary edits at capture (multi-tick rules etc);
- ⇒ ACTR for complex coding.

Background: 2011 Census Process

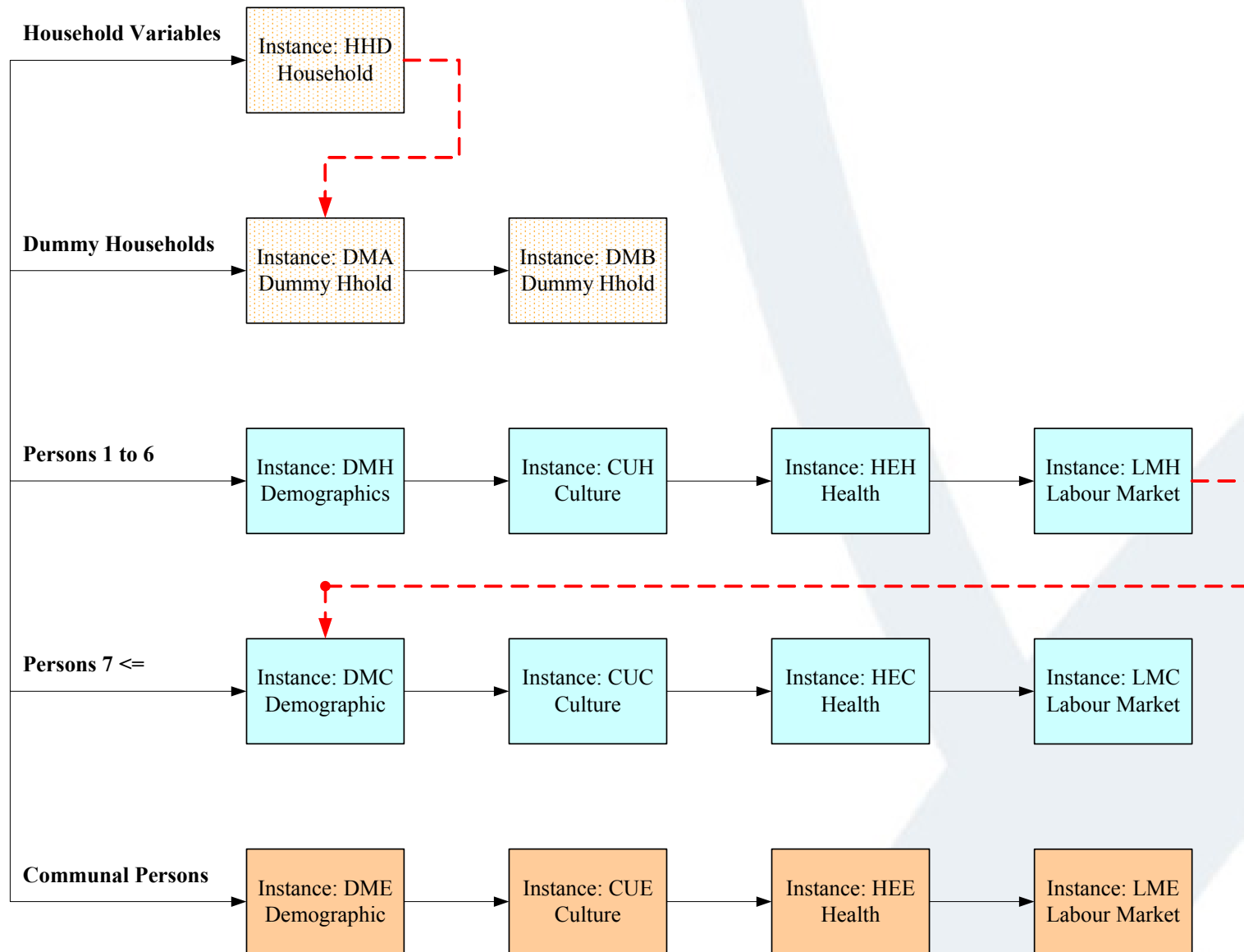
Remove False Persons

- ⇒ insufficient evidence that person exists;
- ⇒ mainly generated by recognition errors

Reconcile Multiple Responses

- ⇒ link responses to entities (households / collectives);
- ⇒ remove duplicate records;
- ⇒ 2001 carried out by Lockheed Martin;
- ⇒ no deletions - disregarded from logical data model.

2011 E&I: Prototype I



2011 E&I: Relationship matrix

Household questions - continued

- H6** How are members of this household related to each other? If members are not related, tick the 'Unrelated' box.
- If there are more than six people, contact us to request a Continuation Questionnaire
 - If you live alone ➔ Go to **H7**
 - If no-one usually lives here and there are no visitors staying overnight here on 27 March 2011, answer questions H7 to H11 on page 6 and then go to the Declaration on the front page

Example:
This shows how a household with two parents and four children are related to each other

Name of Person 1	Name of Person 2	Name of Person 3
First name ROBERT	First name MARY	First name ALISON
Last name SMITH	Last name SMITH	Last name SMITH
How is Person 2 related to Person 1: ➔ 1	How is Person 3 related to Person 2: ➔ 1 2	
Husband or wife <input checked="" type="checkbox"/>	Husband or wife <input type="checkbox"/>	
Same-sex civil partner <input type="checkbox"/>	Same-sex civil partner <input type="checkbox"/>	
Partner <input type="checkbox"/>	Partner <input type="checkbox"/>	
Son or daughter <input type="checkbox"/>	Son or daughter <input checked="" type="checkbox"/>	
Step-child <input type="checkbox"/>	Step-child <input type="checkbox"/>	
Brother or sister <input type="checkbox"/>	Brother or sister <input type="checkbox"/>	

- Using the same order you used in question H3 (page 3), write the name of everyone who usually lives here at the top of each column. Remember to include children, babies and people who have requested an Individual Questionnaire
- Tick a box to show the relationship of each person to each of the other members of this household

Name of Person 1	Name of Person 2	Name of Person 3
First name <input type="text"/>	First name <input type="text"/>	First name <input type="text"/>
Last name <input type="text"/>	Last name <input type="text"/>	Last name <input type="text"/>
ENTER NAME OF PERSON 1 HERE AS IN QUESTION H3		
How is Person 2 related to Person 1: ➔ 1	How is Person 3 related to Person 2: ➔ 1 2	
Husband or wife <input type="checkbox"/>	Husband or wife <input type="checkbox"/>	
Same-sex civil partner <input type="checkbox"/>	Same-sex civil partner <input type="checkbox"/>	
Partner <input type="checkbox"/>	Partner <input type="checkbox"/>	
Son or daughter <input type="checkbox"/>	Son or daughter <input type="checkbox"/>	
Step-child <input type="checkbox"/>	Step-child <input type="checkbox"/>	
Brother or sister <input type="checkbox"/>	Brother or sister <input type="checkbox"/>	
Step-brother or step-sister <input type="checkbox"/>	Step-brother or step-sister <input type="checkbox"/>	
Mother or father <input type="checkbox"/>	Mother or father <input type="checkbox"/>	
Step-mother or step-father <input type="checkbox"/>	Step-mother or step-father <input type="checkbox"/>	
Grandchild <input type="checkbox"/>	Grandchild <input type="checkbox"/>	
Grandparent <input type="checkbox"/>	Grandparent <input type="checkbox"/>	
Relation - other <input type="checkbox"/>	Relation - other <input type="checkbox"/>	
Unrelated (including foster child) <input type="checkbox"/>	Unrelated (including foster child) <input type="checkbox"/>	

Text Relay 18001 0300 0201 160 Census helpline 0300 0201 101 www.cer

For Person 5 (James), there is a tick next to 'Son or daughter' in the columns for Persons 1 and 2 to show he is the son of Robert and Mary. Columns 3 and 4 show he is the brother of Persons 3 and 4 (Allison and Stephen).

Name of Person 4	Name of Person 5	Name of Person 6
First name STEPHEN	First name JAMES	First name SARAH
Last name SMITH	Last name SMITH	Last name SMITH
How is Person 4 related to Person 5: ➔ 1 2 3	How is Person 5 related to Person 6: ➔ 1 2 3 4 5	
Husband or wife <input type="checkbox"/>	Husband or wife <input type="checkbox"/>	Husband or wife <input type="checkbox"/>
Same-sex civil partner <input type="checkbox"/>	Same-sex civil partner <input type="checkbox"/>	Same-sex civil partner <input type="checkbox"/>
Partner <input type="checkbox"/>	Partner <input type="checkbox"/>	Partner <input type="checkbox"/>
Son or daughter <input checked="" type="checkbox"/>	Son or daughter <input checked="" type="checkbox"/>	Son or daughter <input checked="" type="checkbox"/>
Step-child <input type="checkbox"/>	Step-child <input type="checkbox"/>	Step-child <input type="checkbox"/>
Brother or sister <input type="checkbox"/>	Brother or sister <input checked="" type="checkbox"/>	Brother or sister <input checked="" type="checkbox"/>

Name of Person 4	Name of Person 5	Name of Person 6
First name <input type="text"/>	First name <input type="text"/>	First name <input type="text"/>
Last name <input type="text"/>	Last name <input type="text"/>	Last name <input type="text"/>
How is Person 4 related to Person 5: ➔ 1 2 3	How is Person 5 related to Person 6: ➔ 1 2 3 4	How is Person 6 related to Person 4: ➔ 1
Husband or wife <input type="checkbox"/>	Husband or wife <input type="checkbox"/>	Husband or wife <input type="checkbox"/>
Same-sex civil partner <input type="checkbox"/>	Same-sex civil partner <input type="checkbox"/>	Same-sex civil partner <input type="checkbox"/>
Partner <input type="checkbox"/>	Partner <input type="checkbox"/>	Partner <input type="checkbox"/>
Son or daughter <input type="checkbox"/>	Son or daughter <input type="checkbox"/>	Son or daughter <input type="checkbox"/>
Step-child <input type="checkbox"/>	Step-child <input type="checkbox"/>	Step-child <input type="checkbox"/>
Brother or sister <input type="checkbox"/>	Brother or sister <input type="checkbox"/>	Brother or sister <input type="checkbox"/>
Step-brother or step-sister <input type="checkbox"/>	Step-brother or step-sister <input type="checkbox"/>	Step-brother or step-sister <input type="checkbox"/>
Mother or father <input type="checkbox"/>	Mother or father <input type="checkbox"/>	Mother or father <input type="checkbox"/>
Step-mother or step-father <input type="checkbox"/>	Step-mother or step-father <input type="checkbox"/>	Step-mother or step-father <input type="checkbox"/>
Grandchild <input type="checkbox"/>	Grandchild <input type="checkbox"/>	Grandchild <input type="checkbox"/>
Grandparent <input type="checkbox"/>	Grandparent <input type="checkbox"/>	Grandparent <input type="checkbox"/>
Relation - other <input type="checkbox"/>	Relation - other <input type="checkbox"/>	Relation - other <input type="checkbox"/>
Unrelated (including foster child) <input type="checkbox"/>	Unrelated (including foster child) <input type="checkbox"/>	Unrelated (including foster child) <input type="checkbox"/>



2011 E&I: Relationship matrix

Accessibility Text size A A A Text colour A A A

H1 - Household Questionnaire - England

[Help and information \(opens in new window\)](#)

Your progress Household questions [Save and come back later](#)

Household questions X

- H1 - H2 ✓ Finished
- H3 ✓ Finished
- H4 - H5 ✓ Finished
- H6 In progress
- H7 - H8
- H9 - H10
- H11
- H12
- H13
- H14

[Individual questions](#)

[Visitor questions](#)

[Submission](#)

H6 [Quick help +](#)

How are members of this household related to each other? If members are not related, select the 'Unrelated' option.

Person 2: ...
How is .. related to .. ?

Person 3: ...
How is .. related to .. ?

How is .. related to .. ?

Person 4: ...
How is .. related to .. ?

How is .. related to .. ?

How is .. related to .. ?

Person 5: ...
How is .. related to .. ?

How is .. related to .. ?

How is .. related to .. ?

How is .. related to .. ?

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Internet Data Capture

- ⇒ capture up to 30 people
- ⇒ complete names one time
- ⇒ auto population of name fields;
- ⇒ ensure consistency of responses across questions;
- ⇒ negate misreporting relat'ships

2011 E&I: Relationship matrix

Considerations:

- ⇒ expect 99.5% of households return single form;
- ⇒ uncertainty surrounding take-up of IDC;
- ⇒ IDC: automatically capture up to 30 people;
- ⇒ paper completion: contact Census Helpline for one or more continuation forms;
- ⇒ evidence of break in data quality between h'hold form and continuation form.

2011 E&I: Relationship matrix

Inter-person relationships:

- ⇒ only impute erroneous direct responses;
- ⇒ construct reciprocals later;
- ⇒ evidence of systematic errors.

2001 Census

Person Number	Person Number									
	1	2	3	4	5	6	7	8	9	10
1	-	R	R	R	R	R	R	R	R	R
2	✓	-	R	R	R	-	-	-	-	-
3	✓	✓	-	R	R	-	-	-	-	-
4	✓	✓	✓	-	R	R	-	-	-	-
5	✓	✓	✓	✓	-	R	R	-	-	-
6	✓	-	-	✓	✓	-	R	R	-	-
7	✓	-	-	-	✓	✓	-	R	R	-
8	✓	-	-	-	-	✓	✓	-	R	R
9	✓	-	-	-	-	-	✓	✓	-	-
10	✓	-	-	-	-	-	-	✓	✓	-

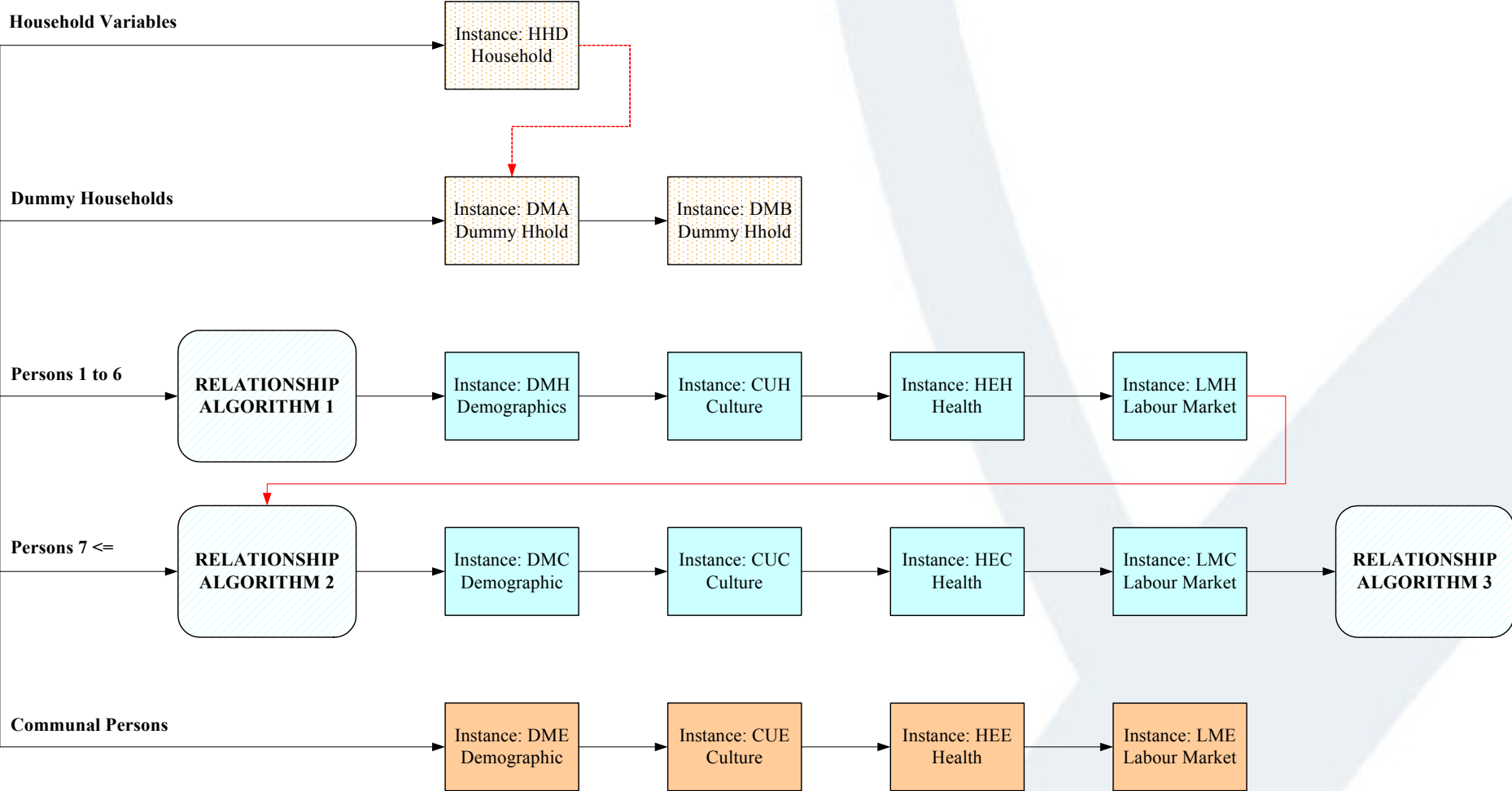
2011 Census

Person Number	Person Number										
	1	2	3	4	5	6	7	8	9	10	11
1	-	R	R	R	R	R	R	R	R	R	R
2	✓	-	R	R	R	R	-	-	-	-	-
3	✓	✓	-	R	R	R	-	-	-	-	-
4	✓	✓	✓	-	R	R	-	-	-	-	-
5	✓	✓	✓	✓	-	R	-	-	-	-	-
6	✓	✓	✓	✓	✓	-	-	-	-	-	-
7	✓	-	-	-	-	-	-	R	R	R	R
8	✓	-	-	-	-	-	✓	-	R	R	R
9	✓	-	-	-	-	-	✓	✓	-	R	R
10	✓	-	-	-	-	-	✓	✓	✓	-	R
11	✓	-	-	-	-	-	✓	✓	✓	✓	-

2011 E&I: Relationship matrix

- Stage 1 Apply RA1 to all household persons to correct for misreported relationships.
- Stage 2 Impute Persons 1to6 module applying the complete set of edit rules.
- Stage 3 Apply RA2 to persons 7<= to ensure imputation not caused erroneous Relationships to HRP.
- Stage 4 Impute Persons 7<= applying within person edits only.
- Stage 5 Apply RA3 to impute missing values in relationships for persons 8<=.

2011 E&I: Final process



2011 E&I: Post Coverage Item Imputation

Following PES:

- ⇒ match survey data to census records;
- ⇒ estimate households and persons missed by census;
- ⇒ derive coverage weights and calibrate to estimates;
- ⇒ use weights to identify donor households and individuals;
- ⇒ 2001 process caused spikes for uncontrolled variables;
- ⇒ 2011 create ‘skeletal’ records with controlled variables;
- ⇒ CANCEIS to impute for uncontrolled variables.

Concluding remarks

Lots to do between now and live running:

- ⇒ finalise post coverage item imputation
- ⇒ tuning CANCEIS
- ⇒ QA full set of DLT's and relationship algorithms

Direct benefits of generalised system:

- ⇒ significant cost savings and efficiency gains;
- ⇒ flexibility and transparency;
- ⇒ manage variability country specific differences
- ⇒ easy to manage late changes.