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Using data linkage to create a national database of birth and maternity data for England and Wales

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Background

- When a baby is born in England and Wales, data are recorded in several separate information systems
- Data include common items, such as date of birth, mother's date of birth, postcode and NHS number which can be used as identifiers for linkage
- Many data items differ and are recorded in only one or two of these systems

Data recorded about newborn babies

- **Birth registration**

country of birth of mother and father, marital status of mother, parents' occupations, NHS number of baby, date of birth of baby, postcode

- **NHS Numbers for Babies (NN4B), since 2002**

gestational age for live births, ethnic category of the baby, time of birth, birth order within multiple births, NHS number of baby and mother, date of birth for baby and mother, postcode

- **England: Maternity Hospital Episode Statistics (HES)
Wales: Patient Episode Database for Wales (PEDW)
and National Community Child Health Database (NCCHD)**

parity, ethnic category of mother, mode of onset of labour and delivery, complications in pregnancy, NHS number of mother, date of birth of mother, postcode

Linkage of birth registration to NN4B records

- Linkage algorithm was developed in 2007 to link 2005 birth registration to NN4B records.
- From 2010, the registrar links the birth notification record to the registration details at the time of registration and produces a unique sequence number. A small number of records require probabilistic linkage where this unique identifier is missing.

Linkage algorithm

1. National Health Service (NHS) Number
2. Date of birth, mother's date of birth and birthweight
3. Date of birth, postcode and birthweight
4. Date of birth, mother's year of birth and birthweight
5. Date of birth, first 4 characters of postcode, birthweight
6. Date of birth, mother's date of birth and postcode
7. Date of birth, mother's year of birth and postcode
8. Date of birth, mother's date of birth and first 4 characters of postcode
9. Date of birth, mother's year of birth and first 4 characters of postcode
10. Date of birth and mother's date of birth
11. Date of birth and postcode
12. Date of birth and birthweight

Ref: Health Statistics Quarterly 2007, No 33, 25-33.

Linkage of birth registration and NN4B linked data to maternity HES

- Previous project, linkage on 2005 to 2007 data was carried out using algorithm devised by City University.

Old algorithm

1. NHS Number and partial date of birth of mother
2. Mother's date of birth and postcode
3. Postcode and mother's month and year of birth
4. Baby's date of birth, sex and postcode
5. Baby's month and year of birth and postcode
6. Baby's date of birth and first four characters of postcode

Ref: Health Statistics Quarterly 2011, No 49.

Revised algorithm

Step	NHS No mother	Date of birth mother	Sex	Postcode	
1	Exact	Exact	Exact	Exact	
2	Exact	Exact	Exact		
3	Exact	Partial	Exact	Exact	
4	Exact	Partial	Exact		
5	Exact			Exact	
6		Exact	Exact	Exact	where DOB is not 1 January and the POSTCODE is not in the 'ignore' list
7		Exact	Exact	Exact	where DOB is not 1 January
8	Exact				

Note: 2013 and 2014 birth registration to NN4B linked data are now available

Current project

- Data for 2005 to 2014 have been linked using the revised algorithm
- HSCIC : linkage to HES delivery and baby records for England
- NWIS: linkage to PEDW / NCCHD data for Wales

Linkage of birth registration and NN4B linked data to NCCHD/PEDW

- Stage 1 involved linkage to NCCHD using baby's NHS number
- Stage 2 involved linkage to PEDW using the following algorithm
 - 1 Mother's NHS number with oper code R14-R27
 - 2 DOB + Postcode with oper code R14 - R27
 - 3 DOB + Partial Post code with oper code R14 - R27
 - 4 Mother's NHS number with diag code O00-O99
 - 5 DOB + Post code with diag code O00-O99
 - 6 DOB + Partial Post code with diag code O00-O99

Linkage to subsequent hospital re-admission records

England

- Pilot carried out using 2005 data
- Subsequent hospital re-admission records linked using the unique patient identifier in HES, known as the HESID
- For babies born in 2005, any subsequent hospital episode the child had till 2013 were linked in (this will now be extended to 2014)
- Similarly, mothers with subsequent hospital spells after delivery were followed till 2013 and linked in (to be extended to 2014).

Wales

- Linkage established using the NHS number

Sources of information on cause of death

- **Death registration**
stillbirths, infant and child deaths
- **Centre for Maternal and Child Enquiries (CMACE) /
Mothers and Babies Reducing Risk through Audits
and Confidential Enquiries-UK (MBRRACE-UK)**
stillbirths and neonatal death notification form

Linkage of CMACE/MBRRACE data

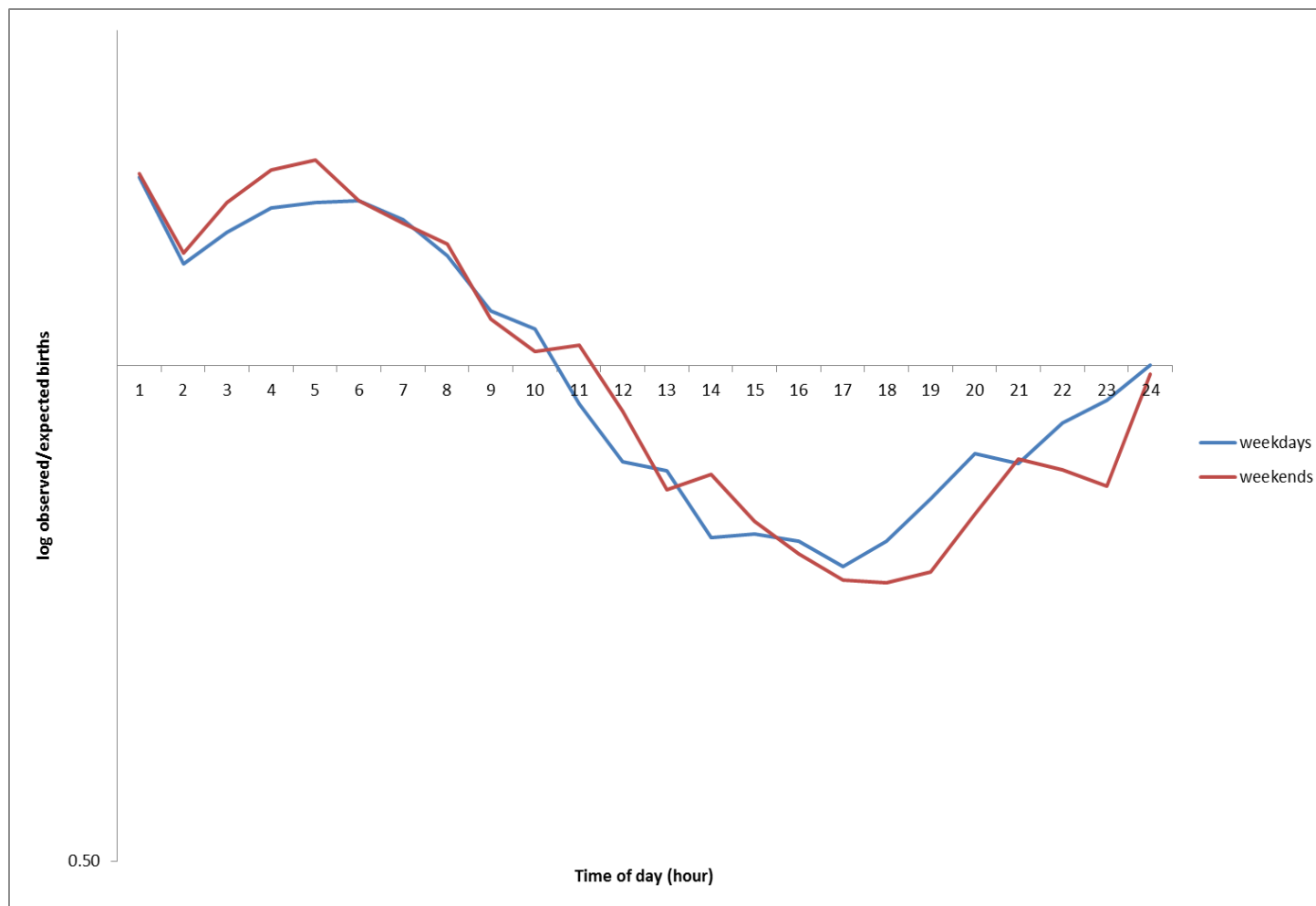
- Anonymised data available for 2005, 2008 and 2010
- Applied to access identifiable data for 2013 and 2014 from MBRRACE
- CMACE/MBRRACE data will be linked to birth registration-NN4B linked records
- Linkage algorithm currently being developed on 2005 data using:
day of the week, month of birth, year of birth, gestational age, time of birth, mother's age and place of delivery (trust code)

Conclusions

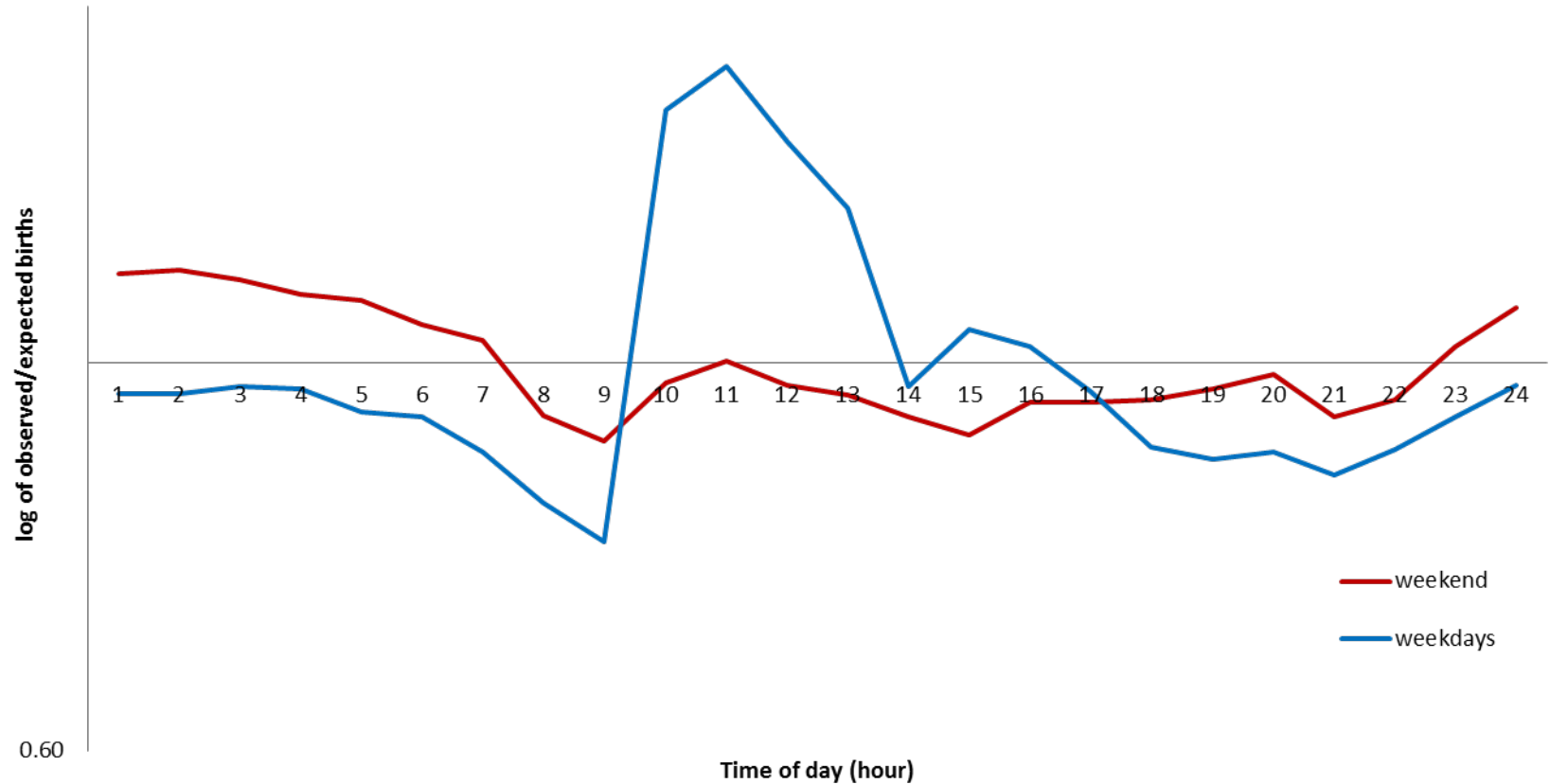
- Linkage methods for achieving good linkage rates have been established for linking national datasets on births, maternity care, and cause of stillbirths and neonatal deaths
- Linking data has the potential to extend scope and range of data available for research and national statistics
- To gain maximum benefit, improvements are needed in the quality and completeness of maternity data in England

Births and their outcome by time of day and day of the week

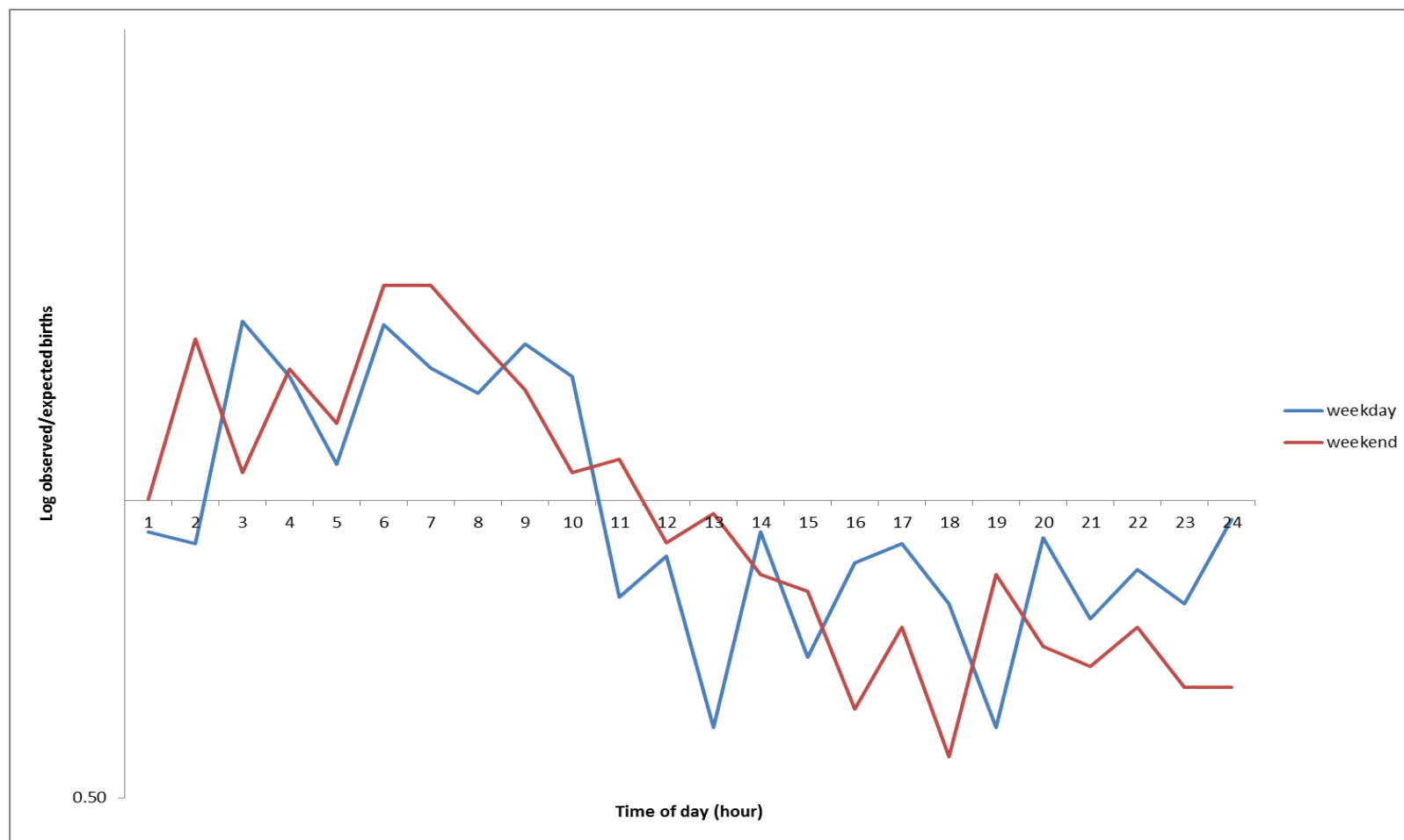
Live singleton home births at term by time of day and day of week, England and Wales, 2005-2012



Live singleton term hospital births by time of day and day of week, England and Wales, 2006



Live singleton preterm home births by time of day and day of week, England and Wales, 2005-2012



Live singleton preterm hospital births by time of day and day of week, England and Wales, 2006

