The mother during pregnancy and the puerperium: Detailed data abstracted from the clinical obstetric records of ALSPAC pregnancies [version 1; peer review: awaiting peer review]

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Abstract

Background: When the Avon Longitudinal Study of Parents and Children (ALSPAC) was planned, it was assumed that the clinical obstetric data would be easily accessible from the newly developed National Health Service computerised 'STORK' system. Pilot studies, however, showed that, although fairly accurate in regard to aspects of labour and delivery, it was, at the time (1990-2), inadequate for identifying the full antenatal and postnatal details of clinical complications and treatments of the women in the Study.

Methods: A scheme was therefore developed to train research staff to find and abstract relevant details from clinical records onto proformas designed for the purpose. Extracting such data proved very time consuming (up to six hours for complicated pregnancies) and consequently expensive. Funding for the enterprise was obtained piecemeal using specific focussed grants to extract data for subsamples of the Study, including a random sample to serve as controls.

Results: To date, detailed records have been completed for 8369 pregnancies, and a further 5336 (13,705 in total) have complete details on specific prenatal areas, including serial measures of maternal blood pressure, proteinuria and weight. In this Data Note we describe the information abstracted from the obstetric medical records concerning the mother during pregnancy, labour, delivery and the first two weeks of the puerperium. Information abstracted relating to the fetus (including fetal monitoring, presentation, method of delivery) and neonate (signs of asphyxia, resuscitation, treatment and well-being) will be described in a further Data Note.

Conclusions: These data add depth to ALSPAC concerning ways in which the signs and symptoms, procedures and treatments of the mother prenatally, intrapartum and postnatally, may impact on the long-term health and development of both mother and child. They augment the data collected from the mothers' questionnaires and the
'STORK' digital hospital data.

**Keywords**
ALSPAC, Pregnancy, Obstetric care, Labour, Delivery, Postpartum

This article is included in the Avon Longitudinal Study of Parents and Children (ALSPAC) gateway.

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**Abbreviations**

ALEC  ALSPAC Ethics and Law Committee

ALSPAC  Avon Longitudinal Study of Parents and Children

BMH  Bristol Maternity Hospital

CS  Caesarean section

CVS  Chorionic villus sampling

ECV  External cephalic version

EDD  Estimated date of delivery

EPDS  Edinburgh Postnatal Depression Scale

G.P.  General practitioner

Hb  Haemoglobin

IVF  In vitro fertilisation

LMP  Last menstrual period (date of)

LREC  Local Research Ethics Committee

MRC  Medical Research Council

NHMRC  National Health and Medical Research Council of Australia

NHS  National Health Service

NIH  National Institutes of Health, USA

PI  Principal investigator

PLIKS  Psychosis Like Symptoms

R & D  Research and development

STD  Sexually transmitted disease

TENS  Transcutaneous electrical nerve stimulation

WGH  Weston General Hospital

WHO  World Health Organisation

**Introduction**

**The rationale**

The Avon Longitudinal Study of Pregnancy and Childhood (ALSPAC - later renamed Avon Longitudinal Study of Parents and Children) was specifically designed to identify, inter alia, the possible adverse or beneficial effects of environmental features on the development and health of the child. Particular attention was paid to the pregnancy and the first year of life; the environment was defined as anything (other than genes) that might have an effect, as the developing fetus was especially sensitive to change during this period. Consequently, as pregnancy was known to be important for development of organs such as the brain, it was decided to obtain as much information as possible for this period. It was clear that the pregnant woman herself was best able to report on various environmental exposures to herself when at home, but it was not clear that she would be able to report accurately on the clinical progress of her pregnancy, including the investigations, diagnoses, medications and other treatments she may have undergone as part of antenatal and inpatient care.

**Designing the data collection tool**

There were a number of influences on the design of the data that have been collected. These were partly based on reviews of the literature to identify factors thought to influence the development of the child, and information used in other studies of births (e.g. the 1958 and 1970 National UK birth cohort studies), but the major influences (particularly in regard to recording data relevant to the hypertensive disorders of pregnancy) were those developed by Jean Golding and colleagues for (a) the International Study of the Hypertensive Disorders of Pregnancy funded by WHO (World Health Organisation), which took place in a number of developing countries including Thailand, Vietnam and China (Golding et al., 1988); and (b) The Jamaica Low Dose Aspirin Study (Golding et al., 1998).

The latter studies showed the importance of collecting the actual measurements (e.g. of blood pressure, proteinuria, haemoglobin) rather than relying on clinical diagnoses which were likely to vary with the clinician/hospital/country. This background dictated the importance of abstracting as many measurements as possible, as well as details of investigations and treatments. The data abstraction form (Birmingham et al., 2021a), with the instructions to the Data Abstractors (Birmingham et al., 2021b) and checkers (Birmingham et al., 2021c) have been made available (see Extended data).

**Structure of the obstetric services in Avon 1990-2**

The Study area (defined as that part of the county of Avon within the South West Regional Health Authority, hereinafter referred to as Avon (Boyd et al., 2019)) was served by consultant obstetric services based in the two major obstetric teaching hospitals within Bristol: Southmead Hospital and the Bristol Maternity Hospital (BMH) (subsequently known as St Michael’s Hospital). In addition, deliveries of low-risk pregnancies were undertaken at Weston General Hospital (WGH) situated in Weston-super-Mare. There were dedicated neonatal intensive care and special care baby units at BMH and Southmead but not at WGH. All pregnancy and delivery care was free as part of the National Health Service (NHS), and private practitioners were used rarely by the Avon maternity population.

Antenatal care was undertaken by general practitioners (G.P.s) and community midwives. For most pregnancies, one of the consultant obstetricians would also have been involved and, provided he/she was happy that the woman was not of very high risk, she would have had “shared care”. Very few women intended to have a home delivery.
Thus, for women enrolled in ALSPAC, the system for antenatal care in those at low risk involved shared care between hospital-based consultant obstetricians and midwives based in the community and working with the woman’s G.P. Women at high risk of complications would be more likely to have been seen throughout their pregnancy by the clinical obstetric services, mainly within the relevant hospital, although some obstetricians visited community clinics.

The contemporary protocols concerning care used by the medical staff at each of the three hospitals have been added to the ALSPAC archive as part of the University of Bristol Special Collections [Box 784]. These protocols should be used with caution as there is evidence that these guidelines were not always adhered to.

The hand-written clinical measurements and observations made in the community and those made in hospital were all paper records and filed by each hospital in a single folder, with the exception of fertility and psychiatric records, which were kept separately. Important information could be found in many different places within the records, having been documented variously by medical and nursing/midwifery staff. This required meticulous systematic scrutiny in order to abstract accurate data. Details of all pregnancy-related hospital admissions were also included in the record. For complex pregnancies the folder could be as thick as 6–8 inches, comprising A4-sized paper, frequently handwritten on both sides, as well as laboratory results on flimsy print outs.

The STORK digital record of pregnancy and delivery had been initiated in the two major hospitals before the start of the enrolment of the pregnant women in ALSPAC. Comparison of the data collected with the information desired showed that the information in the computerised record was reasonably accurate for many features of labour and delivery, but it lacked the fine detail, particularly in regard to antenatal and postnatal information - including the repeat measures such as of weight and blood pressure. The ALSPAC team reluctantly decided therefore to collect all relevant data by hand from the medical records.

Methods and materials
ALSPAC was designed to assess the ways in which the environment interacts with the genotype to influence health and development (Boyd et al., 2013; Fraser et al., 2013). Pregnant women resident in the Study area with an expected date of delivery between 1st April 1991 and 31st December 1992, were invited to take part. About 80% of the eligible population did so. The initial ALSPAC sample consisted of 14,541 pregnancies; of these initial pregnancies, there was a total of 14,676 fetuses, resulting in 14,062 live births and 13,988 children who were alive at one year of age. Information on the cohort parents and their offspring was collected using a variety of methodologies including self-completion questionnaires sent to Study mothers, fathers, teachers and the Study child, direct examination under standardized conditions, and linkage to educational data from the school system. Please note that the Study website contains details of all the data that is available through a fully searchable data dictionary and variable search tool (http://www.bristol.ac.uk/alspac/researchers/our-data/).

Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee (ALEC; IRB00003312) and the NHS Local Research Ethics Committees (LREC) (Birmingham, 2018). Detailed information on the ways in which confidentiality of the cohort is maintained may be found on the Study website: http://www.bristol.ac.uk/media-library/sites/alspac/documents/pearl/OV9089_linkage_detailed.pdf and details of all NHS Research Ethics approvals: http://www.bristol.ac.uk/media-library/sites/alspac/documents/governance/Research%20Ethics%20Committee%20approval%20references.pdf.

The subsample strategy
Unfortunately, for the first 10 years of the Study there was no designated core funding available, and ALSPAC survived by including a ‘fee’ in each grant application to contribute towards the funding of the central running of the Study. The initial funding obtained for ALSPAC was used for costs that could not be postponed: collection of contemporary information from mothers and their partners, as well as for processing and storage of biological samples. The obstetric records could be accessed and abstracted as and when funding became available. Although unavoidable, there was a major disadvantage with this strategy in that the relevant hospitals became short of storage space for records, and they were, by 2006, held on 19 different sites. Consequently, searching for any particular record took an average of two hours.

In parallel, some obstetric records were also stored in non-paper formats (optical discs or microfiche). Electronic tracing of hospital records was inefficient, with the systems frequently inaccurate and not kept up to date. Extensive knowledge of both the computer systems and physical environment was necessary to locate the records. Double or triple registration with equivalent sets of notes was not uncommon after a merger of two of the hospitals’ records departments.

Data abstraction is expensive primarily because it is extremely time consuming. ALSPAC was unable to obtain funding to extract the full set of detailed obstetric records relevant to all pregnancies in the Study. The fall-back position was to use parts of grants for specific projects and consequently the abstraction of many of the obstetric and neonatal records was funded using three types of funding sources: (a) specific project grants for the purpose; (b) as a small part of the ‘core funding’ from the Medical Research Council (MRC) and the Wellcome Trust after the year 2000, and (c) using portions of the ‘ALSPAC fee’ of the project grants obtained for ALSPAC in the early years of the Study. Below are listed the eight grants with funding for specific abstraction from the obstetric records.

1. Twins in a natural experiment to study causes of language delay; Jean Golding (PI), Michael Rutter, Karen Thorpe; Funder: Mental Health Foundation.

2. Twins in a natural experiment to study causes of language delay; Jean Golding (PI), Karen Thorpe, Sue Roulstone; Funder: South West Regional Health Authority R & D.
The association between different types of antenatal care and the mother’s anxiety and depression levels; Jean Golding (PI), David Jewell, Lindsay Smith, Ian MacGillivray, Helen Francomb; Funder: South & West Regional Health Authority.

Obstetric and medical consequences of teenage pregnancy; David Jewell (PI); Jean Golding; Funder: NHS Executive South & West R & D.

Evidence of the long-term consequences of caesarean section is required to allow informed maternal choice; Gordon Stirrat (PI), Jean Golding; Funder: Bupa Foundation.

Fetal loss in a multiple pregnancy: a possible cause of cerebral palsy; Peter Pharoah (PI), Department of Public Health, University of Liverpool, Bristol co-applicants: Helen Porter, Jeremy Berry, Jean Golding, Alan Emond; Funder: Children Nationwide/ National Lottery.

Factor V Leiden and adverse pregnancy outcome: An ALSPAC nested case-control study; Rodney Scott and Tracey Dudding, University of Newcastle, New South Wales, Australia; Funder: NHMRC via University of Newcastle, Australia.

Investigating genetic and epidemiological risk factors for sub-clinical psychosis-like symptoms (PLIKS) in a birth cohort study; Stan Zammit (PI); Funder: Department of Health National Clinical Scientist Award.

Publications as the result of these grants are available (Dudding et al., 2008; Patel et al., 2005a; Patel et al., 2005b; Rutter et al., 2003; Thorpe et al., 2003; Zammit et al., 2009), together with other publications specifically focussed on different subgroups.

Definition of the subsamples

As a result of the funded grants and the funding restrictions, to date only 8369 pregnancies have undergone selection for the detailed data abstraction using the proforma shown in the data abstraction form (see Extended data (Birmingham et al., 2021a)). The different selection criteria are described below.

(i) **Twins and closely spaced singletons:** This study compared the development of twin pairs with singletons with a closely spaced sibling. Abstraction of the obstetric and neonatal records was to test whether delay in twin development of speech was related to obstetric problems in pregnancy or whether it concerned the difficulties mothers had in relating to two similarly aged siblings; 94 twin pregnancies were compared with 97 pregnancies where there was a sibling born within 30 months of the Study child (Rutter et al., 2003).

(ii) **All multiple pregnancies:** After completion of the selection of the twins for the Rutter study, it was decided for completion to extract details of all remaining multiple pregnancies, regardless of the outcome of pregnancy (n = 188 in total).

(iii) **All fetal and neonatal losses:** These data will be described in the neonatal Data Note.

(iv) **Cerebral palsy and missing twins:** The children with diagnosed cerebral palsy were identified through the Community Child Health system. Only those with a Study placenta available were selected. This was part of the study headed by Peter Pharoah (see above) to determine whether there was any evidence of a missing twin among children with cerebral palsy.

In addition, we identified from the maternal questionnaires administered at 18 weeks gestation and two months post-delivery all those instances where the mother had indicated that, during pregnancy, she had been informed that she had, or might have had, a multiple pregnancy, but in fact she delivered a singleton. [The placenta of all in this group (n=67) were examined for signs of a missing twin as were their controls (n=124) and children with cerebral palsy who had placenta available (n=18)]. The results were largely negative and never published.

(v) **Delivered preterm:** In order to determine an accurate preterm delivery rate within ALSPAC, all deliveries with gestation <37 weeks identified using any of: mother’s stated estimated date of delivery (EDD), EDD based on date of last menstrual period (LMP), gestation on STORK, and obstetrician’s estimates of gestation were considered. If there was consistency between two or more records, the records were not selected for review and the delivery was judged to be preterm. If some estimates were <37 completed weeks and others were not, the records were obtained and the data abstracted, and a decision made by a consultant obstetrician using the clinical information in the notes, including the results from early ultrasound scans. This resulted in identification of two groups of pregnancies – one of definite preterm delivery (those of <36 weeks agreed by all sources; n = 480), and the other of possible preterm delivery upon which the decision had been made (<37 completed weeks n = 1022). These data were used to identify the ALSPAC preterm delivery rate as 5.5% (Little et al., 2004).

(vi) **Teenage mothers:** ALSPAC pregnancies to women aged <20 years at the time of delivery (n = 645).

(vii) **Mothers with depression:** This sample was selected to include women who were either depressed (defined as having a score of greater than 12 on the Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) completed by the mother during pregnancy and/or at eight weeks post-delivery (n = 1426).

(viii) **Caesarean section (CS):** Pregnancies resulting in caesarean sections were identified from the mothers’
questionnaires (at eight weeks, n = 1198) augmented with cases from the computer system STORK, which covered the two major hospitals BMH and Southmead (total n = 1473).

(ix) **Instrumental vaginal deliveries**: Pregnancies resulting in instrumental vaginal deliveries (i.e. using forceps or vacuum extraction) were identified from STORK (n = 1521). Consequently, deliveries outside the two major hospitals but who had instrumental deliveries will not have been selected unless picked up in other selections (e.g. in (xii) below).

(x) **Attended Children in Focus Research Clinic**: Selection of children included in Children in Focus (~10% sub-sample of children born in the last six months of 1992), used a quasi-random method (if the day of the mother’s birth was an odd or even number determined whether or not she would be eligible). The sample comprised those who were eligible and attended at least one of the 10 clinics for hands-on measurements (n = 1377).

(xi) **Had symptoms of psychosis like symptoms (PLIKS)**: At age 12 the children were interviewed in regard to a number of psychosis like symptoms. If they were positive on any of the signs, the delivery records were abstracted (n = 870; see Zammit et al., 2009 for details).

(xii) **Deliveries outside of Avon hospitals**: This group includes home deliveries, babies born before arrival at the hospital or delivered in hospitals outside the Avon area. These records were abstracted since it was likely that they would be difficult to find in the future (n=352).

(xiii) **Random sample**: The random sample was selected from the complete set of ALSPAC births for the depression study by the statistician Jon Heron. This selection was expanded as the other sections were completed. The selection includes (but is not confined to) pregnancies that appear within other sections (n=2760).

It is important to note that, in general, the data abstractors were not aware as to which group the pregnancy was in. This of course would have been obvious to them once they had accessed the medical records for selections on the type or place of delivery, teenage pregnancies, twins or preterm deliveries, but selections based on maternal depression or specific child outcomes were not revealed to them and they were blind as to whether the records concerned a specified group or the random control group.

**Abstraction and checking of information**

As already noted, the data abstractors used a paper proforma which was identical for all subgroups (with the exception of the twin sample) on which to detail the information from the medical records (Extended data (Birmingham et al., 2021a)), rather than keying straight onto a digital form. This was because, for the most part, the medical records had little structure, particularly for women with complex histories including several hospital admissions in the pregnancy. Key pieces of information could be found in various entries and could be contradictory. Thus, the team who carried out the data abstraction had to be skilled in the recognition of source and validation of various items of information. They mainly had a background in midwifery and/or nursing. The relevant instructions to the data abstractors (including how to resolve contradictory information); definitions of the items to be recorded are shown in Extended data (Birmingham et al., 2021b). Each completed form was meticulously checked by another data abstractor without reference to the original records; instructions for such checks are shown in Extended data (Birmingham et al., 2021c). If queries or inconsistencies were unresolved, the records would be referred to again. These checks were made before the record folders were returned to the hospital record stores to prevent having to search for them a second time.

Once the forms had been completed and checked, the information was double keyed by an external bureau. There were two types of data – the data for which boxes had been ticked or numbers filled in (such as dates and the results of tests), and other details that were keyed in-house as text. The text is available for coding by those with particular interests, on application to the ALSPAC Executive. The more specific information is available and is summarised in Summary of the data available.

**The variable numbering system**

The variable numbers for most of this data set all start with the letters ‘DEL_P’ followed by a number. For simplicity this will be known as the P number throughout this paper. In addition, the question number is quoted – i.e. the actual question asked on the data abstraction form (Extended data (Birmingham et al., 2021a)), as well as to the instructions for the data abstractors, reproduced as Extended data (Birmingham et al., 2021b). The variable nomenclature differs, however, for data abstracted for the whole dataset (see The extended dataset abstraction), for the ultrasound scans (see Ultrasound scans) and the antenatal admissions (see Antenatal hospital extractions) although the form and instructions remain valid.

**Suggested statistical analysis using the subgroup design**

For analysis of the 8369 pregnancies, it is important to note the potential biases in ascertainment of some of the subgroups (see Definition of the subsamples). There are a number of alternative ways in which these could be addressed in statistical analyses, as suggested briefly below.

(a) If there is sufficient power, we recommend using the random sample only.

(b) An alternative is to include with the truly random sample the randomly ascertained group of pregnancies with livebirths followed up as Children in Focus.
or

(c) Combine all the groups and use conditional or unconditional analytic strategies taking account of the different groups (see Pearce (2016) for discussion of pros and cons).

Omissions from this Data Note
In this paper we have omitted information from the obstetric data abstraction that relates to the fetus or neonate. That information is described in a separate Data Note (in preparation) which concentrates on the details relevant to the fetus, the birth and the neonatal period. Thus, it describes separate records for each member of a multiple pregnancy, and includes details of fetal distress and gestation at delivery.

The extended dataset abstraction
Two grants awarded in 2006 (US National Institutes of Health [NIH]) and 2009 (Wellcome Trust) to DA Lawlor and colleagues provided funds to complete abstraction of certain data from the clinical obstetric records from all remaining eligible women. The selected data comprised ABO and Rhesus blood groups, and repeated measurements of weight, blood pressure, glycosuria, haemoglobin and proteinuria, but did not include many other antenatal, intrapartum and postnatal measurements, treatments or procedures. With this effort, data became available on a total of 13,706 women (13,899 offspring) with derived variables on hypertensive disorders of pregnancy, gestational diabetes, anaemia, and maternal weight gain. For analyses of these data there is no need to use the strategies described under Suggested statistical analysis using the subgroup design (http://www.bristol.ac.uk/alspac/external/documents/ALSPAC_Data_Dictionary.zip); see also Lawlor et al., 2010; Macdonald-Wallis et al., 2012; Macdonald-Wallis et al., 2014; Macdonald-Wallis et al., 2015).

Summary of the data available
In this section we describe most of the data available on the ALSPAC Study pregnancies. For further details of the data see the file in the ALSPAC Data Dictionary:


Serial measures during pregnancy
Ultrasound scans. At the time when the Study mothers were enrolled there was considerable discussion as to whether ultrasound scans were completely safe for the developing fetus – particularly for the child’s subsequent development (Reece et al., 1990). For this reason, details of all ultrasound scans were collected. Data collected for each scan included:

(a) gestation at which the scan was performed (calculated using the date of scan and the best clinical estimate of the EDD); (b) the reason for the scan; (c) the type of scan; and (d) the results of the scan (Table 1).

Among the 8369 women for whom the medical records data have been fully abstracted, 7945 (95%) had documentation for up to 33 scans occurring before the baby was born. The scans included those carried out in the community (usually in GP surgeries), in outpatient radiography clinics, and as part of inpatient care. All scans undertaken between conception and delivery were included. Any postpartum scans were excluded.

Type of scan was coded as: (A) Clinic scan; (B) Dating scan; (C) Departmental scan; (D) Doppler scan; (E) Follow-up scan; (F) Mini-scan; (G) Private scan; (H) Real time scan; (I) Routine scan; (J) ‘Survey scan’; (K) Trans-vaginal scan. Reasons for each scan were coded by the data abstractors with a coding schema developed by ALSPAC. The 27 codes used comprised:

1 The website will take you to the large Data Dictionary. Download this (it will take a couple of minutes) and select ‘Built files’; then select ‘Other’, then ‘Obstetric’ and then D4200_OA.

2 The website will take you to the large Data Dictionary. Download this (it will take a couple of minutes) and select ‘Built files’; then select ‘Other’, then ‘Obstetric’ and then D4201_OB.

Table 1. The variables used and numbers of responses for each ultrasound scan.

<table>
<thead>
<tr>
<th>Scan No.</th>
<th>Variables DEL</th>
<th>No. with gestation</th>
<th>No. with type</th>
<th>No. with Reason</th>
<th>No. with Result</th>
<th>No. (%) “Abnormal”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S010-3</td>
<td>7945</td>
<td>5214</td>
<td>7236</td>
<td>8103</td>
<td>3684</td>
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<tr>
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<td>S020-3</td>
<td>5491</td>
<td>3965</td>
<td>5186</td>
<td>5362</td>
<td>2562</td>
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<td>984</td>
<td>1025</td>
<td>491</td>
</tr>
</tbody>
</table>

[Admissions 6-33 are similarly available.]
(1) Maternal abnormality (e.g. fibroids); (2) Amniocentesis; (3) Biophysical profile; (4) Bleeding; (5) Choroid seen on previous scan; (6) Chorionic villus sampling (CVS); (7) Dates; (8) Fetal anomaly; (9) Fetal growth; (10) Fetal movements; (11) Multiple pregnancy; (12) Pelvimetry; (13) Placental location; (14) Presentation of baby; (21) More than one reason; (22) Volume of liquor; (23) Pre-eclampsia symptoms queried; (24) Fetal well-being; (25) Viability; (26) As part of fertility regime; (27) Suspected fetal abnormality. It should be emphasised that these categories of reasons were defined by what was written in the notes – the data abstractors were instructed not to assume, or guess.

The result of the scan was characterised as normal or abnormal. ‘Normal’ was coded if nothing out of the ordinary was noted, and ‘Abnormal’ if there was something of importance picked up on the scan including: breech or transverse presentation; date change by more than one week; low lying placenta; or presence of two or more fetuses (once identified, any subsequent scans that merely confirmed twins were coded as normal). The descriptions of the abnormalities were described as text and have not been coded yet.

**Antenatal hospital admissions.** This section did not include admissions of mothers who were in labour on admission, only admissions during pregnancy before the onset of labour. In all 5715 women were admitted to hospital at some point before the start of labour (DEL_H050). The total no. of admissions per woman varied from 0 to 18 (DEL_H002), and the no. of days in total that the mothers stayed as an inpatient ranged from 1 to 80 (DEL_H001).

For each admission, coded information was collected on three items: the gestation at admission (in days), the number of days stayed and the hospital involved (Table 2). The data abstractors were instructed to record as text the reasons for each admission together with details of any treatment (including medications) given. The text has been keyed (but not yet coded) and is available on request. Results of standard measurements taken in hospital (blood pressures, weight, etc) have been added to the serial measurements (see **Serial antenatal measurements made**). The instructions were to include only one measurement per day and, if there were more, to select the one with the highest diastolic blood pressure.

**Serial antenatal measurements made.** Measurements made at each antenatal visit and inpatient admission were recorded (Table 3); those made during labour and the postpartum period were noted elsewhere (see Labour and delivery and The mother in the puerperium). The measures recorded for each antenatal event include: (a) gestation in days; (b) place at which measurements were made, distinguishing between (i) community care, (ii) inpatient care, (iii) home visit, and (iv) consultant clinic; (c) maternal weight; (d) systolic and diastolic blood pressure; (e) proteinuria; (f) sites of oedema (if any); (g) haemoglobin level; and (h) level of glycosuria (Table 3). The actual data for each measurement is described in more detail in [http://www.bristol.ac.uk/alspac/external/documents/ALSPAC_Data_Dictionary.zip](http://www.bristol.ac.uk/alspac/external/documents/ALSPAC_Data_Dictionary.zip) and includes the extra data abstracted by Debbie Lawlor and team (see The extended dataset abstraction).

This data set has the advantage of using all the medical records that could be retrieved, and consequently can be used to identify prevalence. Lawlor’s group have derived a number of useful variables including (a) maternal weight change between 0–18 weeks gestation (DEL_1128), (b) maternal weight change 18–28 weeks gestation (DEL_1129), maximum level of glycosuria (DEL-1034), and first haemoglobin measurement

<table>
<thead>
<tr>
<th>Admission no.</th>
<th>Variables DEL</th>
<th>No. pregnancies</th>
<th>Gestation at admission</th>
<th>Days stayed</th>
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<tr>
<td>2</td>
<td>H054-6</td>
<td>2460</td>
<td>34-305</td>
<td>1-70</td>
</tr>
<tr>
<td>3</td>
<td>H057-9</td>
<td>1039</td>
<td>65-303</td>
<td>1-49</td>
</tr>
<tr>
<td>4</td>
<td>H060-2</td>
<td>462</td>
<td>74-302</td>
<td>1-58</td>
</tr>
<tr>
<td>5</td>
<td>H063-5</td>
<td>204</td>
<td>103-302</td>
<td>1-18</td>
</tr>
<tr>
<td>6</td>
<td>H066-8</td>
<td>108</td>
<td>125-299</td>
<td>1-17</td>
</tr>
<tr>
<td>7</td>
<td>H069-71</td>
<td>44</td>
<td>186-300</td>
<td>1-17</td>
</tr>
<tr>
<td>8</td>
<td>H072-4</td>
<td>24</td>
<td>217-301</td>
<td>1-8</td>
</tr>
<tr>
<td>9</td>
<td>H075-7</td>
<td>13</td>
<td>219-301</td>
<td>1-7</td>
</tr>
</tbody>
</table>

[The admissions 10-18 continue in a similar format.]
Table 3. Numbers of pregnancies at each measurement event for which the following measurements were taken: A – place taken; B – gestation; C – maternal weight; D – blood pressure; E – level of proteinuria (recorded as nil; trace; +; ++; +++ or more; blood); F – oedema (coded as none; ankles only; hands only; face only; generalised; more than one site; and not otherwise stated (n.o.s)); G – level of haemoglobin (in g/dL); and H – level of glycosuria (recorded as nil; trace to +; ++; +++ or more; 0.25%; 0.5%; 1% or more). The first five of 49 possible measurement events.

<table>
<thead>
<tr>
<th>Visit No.</th>
<th>Var nos.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>*1</td>
<td>13548</td>
<td>13729</td>
<td>8944</td>
<td>7788</td>
<td>5420</td>
<td>10515</td>
<td>10011</td>
<td>5418</td>
</tr>
<tr>
<td>2</td>
<td>*2</td>
<td>13463</td>
<td>13541</td>
<td>11648</td>
<td>11828</td>
<td>10381</td>
<td>12868</td>
<td>1904</td>
<td>10379</td>
</tr>
<tr>
<td>3</td>
<td>*3</td>
<td>13279</td>
<td>13352</td>
<td>11697</td>
<td>12328</td>
<td>10934</td>
<td>12907</td>
<td>1003</td>
<td>10927</td>
</tr>
<tr>
<td>4</td>
<td>*4</td>
<td>13148</td>
<td>13209</td>
<td>11726</td>
<td>12499</td>
<td>11289</td>
<td>12845</td>
<td>1176</td>
<td>11292</td>
</tr>
<tr>
<td>5</td>
<td>*5</td>
<td>13050</td>
<td>13071</td>
<td>11641</td>
<td>12536</td>
<td>11541</td>
<td>12800</td>
<td>2301</td>
<td>11531</td>
</tr>
</tbody>
</table>

[The variable number for each measurement varies with the number of the measurement as shown above. For example, the systolic blood pressure is given by v1dab1g_systolic_bp* where the asterisk denotes the event number above.]

Table 4. Features concerning the conception.

<table>
<thead>
<tr>
<th>Information</th>
<th>P no.</th>
<th>Q no.</th>
<th>N with Data</th>
<th>N with criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVF conception</td>
<td>1000</td>
<td>B65</td>
<td>8369</td>
<td>63</td>
</tr>
<tr>
<td>Month of LMP</td>
<td>1004</td>
<td>B2amm</td>
<td>8218</td>
<td>8218</td>
</tr>
<tr>
<td>Certain of LMP</td>
<td>1005</td>
<td>B2b</td>
<td>8178</td>
<td>6737</td>
</tr>
</tbody>
</table>

[N.B. The extended abstracted dataset also include these data.]

Table 5. The intended and actual place of delivery.

<table>
<thead>
<tr>
<th>Place of delivery</th>
<th>Intended</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMH</td>
<td>3163</td>
<td>3189</td>
</tr>
<tr>
<td>Southmead</td>
<td>4486</td>
<td>4399</td>
</tr>
<tr>
<td>Weston General</td>
<td>457</td>
<td>369</td>
</tr>
<tr>
<td>Home</td>
<td>64</td>
<td>207</td>
</tr>
<tr>
<td>Other</td>
<td>99</td>
<td>169</td>
</tr>
</tbody>
</table>

(DEL_ 1047). For further information on this complete data set see: http://www.bristol.ac.uk/alspac/external/documents/ALSPAC_Data_Dictionary.zip

Features of pregnancy
Conception. Although data were collected on whether the pregnancy had resulted from fertility treatment, most of this information is coded as text, with the exception of in vitro fertilisation (IVF), which has been coded. Other sources of information on fertility treatment can be obtained from the maternal questionnaire D (for example variable D031 documents the methods used to help the woman conceive, and D032 identifies ovulation induction). The actual date of last menstrual period (LMP) was not recorded and is not available for confidentiality reasons. However, it was used for calculations of the various stages of gestation when events occurred. In contrast the month of LMP is available for analysis of seasonal effects, as is whether or not the woman was certain of the date of her LMP (Table 4).

Planning for obstetric care. The type of antenatal care planned is given in DEL_P1003. Of the 8307 pregnancies with this information, 8089 (97%) were planned to have shared care, and only 218 had a different plan. At the first antenatal visit a plan was also made as to where the baby would be delivered. Table 5 summarises the initial intention compared with where they actually were delivered.

Medical complications of pregnancy. Abstracted from the medical records were a number of specific conditions. The ALSPAC codes and numbers of women involved are shown in Table 6. It should be noted that a further source of bleeding, infections and other problems can be found in the questionnaires B, C and E, which detail the episodes by trimester.

Results of standard laboratory tests during pregnancy. The ABO and Rhesus blood groups of the women are shown in
Table 6. Medical complications during pregnancy.

<table>
<thead>
<tr>
<th>Bleeding history</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with Data</th>
<th>No. with condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of bleeding during pregnancy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st trimester</td>
<td>1040</td>
<td>B6jj</td>
<td>8369</td>
<td>935</td>
</tr>
<tr>
<td>2nd trimester</td>
<td>1041</td>
<td>B6kk</td>
<td>8369</td>
<td>415</td>
</tr>
<tr>
<td>3rd trimester</td>
<td>1042</td>
<td>B6ll</td>
<td>8369</td>
<td>647</td>
</tr>
<tr>
<td>Abruption</td>
<td>1044</td>
<td>B6w</td>
<td>8369</td>
<td>27</td>
</tr>
<tr>
<td>Threatened abortion*</td>
<td>1044</td>
<td>B6dd</td>
<td>8369</td>
<td>136</td>
</tr>
<tr>
<td>Placenta praevia*</td>
<td>1045</td>
<td>B6x</td>
<td>8369</td>
<td>81</td>
</tr>
<tr>
<td>Any of above</td>
<td>1046</td>
<td>derived</td>
<td>8369</td>
<td>1752</td>
</tr>
<tr>
<td>Infections noted in pregnancy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Genital herpes</td>
<td>1050</td>
<td>B6p</td>
<td>8369</td>
<td>29</td>
</tr>
<tr>
<td>Other STD</td>
<td>1051,2</td>
<td>B6q,B6cc</td>
<td>8369</td>
<td>3</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>1053</td>
<td>B6hh</td>
<td>8369</td>
<td>510</td>
</tr>
<tr>
<td>Vaginal infection</td>
<td>1054</td>
<td>B6mm</td>
<td>8369</td>
<td>1229</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>1055</td>
<td>B6r</td>
<td>8369</td>
<td>3</td>
</tr>
<tr>
<td>Diagnoses made by the clinicians involved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaemia*</td>
<td>1060</td>
<td>B6c</td>
<td>8369</td>
<td>1052</td>
</tr>
<tr>
<td>Hyperemesis*</td>
<td>1061</td>
<td>B6m</td>
<td>8369</td>
<td>86</td>
</tr>
<tr>
<td>Diabetes*</td>
<td>1030</td>
<td>B6k</td>
<td>8369</td>
<td>91</td>
</tr>
<tr>
<td>Eclampsia</td>
<td>1022</td>
<td>B6i</td>
<td>8369</td>
<td>0</td>
</tr>
<tr>
<td>Hypertensive disorders of pregnancy*</td>
<td>1020</td>
<td>B5</td>
<td>8175</td>
<td>668</td>
</tr>
<tr>
<td>Other complications of pregnancy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyperemesis*</td>
<td>1061</td>
<td>B6m</td>
<td>8369</td>
<td>86</td>
</tr>
<tr>
<td>Oligohydramnios</td>
<td>1103</td>
<td>B6u</td>
<td>8369</td>
<td>117</td>
</tr>
<tr>
<td>Polyhydramnios</td>
<td>1104</td>
<td>B6y</td>
<td>8369</td>
<td>114</td>
</tr>
<tr>
<td>Multiple pregnancy*</td>
<td>1107</td>
<td>B8a</td>
<td>8279</td>
<td>221</td>
</tr>
<tr>
<td>Threatened preterm labour*</td>
<td>1106</td>
<td>B6ee</td>
<td>8369</td>
<td>592</td>
</tr>
</tbody>
</table>

*Instructions were to code whether or not accompanied by bleeding; *not necessarily a multiple delivery; *this was recorded even if ultimately delivered preterm; *the extended abstracted dataset also has this information.

Table 7, and the presence of Rhesus antibodies, together with other biochemical results in Table 8.

Procedures undertaken during pregnancy. With the exception of the straightforward ultrasound examinations (see Ultrasound scans), the most common procedures undertaken were biophysical profile, amniocentesis and giving anti-D to Rhesus negative women (Table 9).

Advice given to the pregnant woman. Only specific advice given during pregnancy and written as such within the notes are included in this section (Table 10). Further information written in the text is likely to expand on, for example, the type of diet recommended.

Other details of pregnancy. Information on all the various signs and symptoms occurring during pregnancy, together with
Table 7. ABO and Rhesus blood groups (including extended abstracted dataset).

<table>
<thead>
<tr>
<th>Blood group</th>
<th>Variable</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABO</td>
<td>v1dab3a_abo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- A</td>
<td></td>
<td>5839</td>
<td>43.0</td>
</tr>
<tr>
<td>- B</td>
<td></td>
<td>1225</td>
<td>9.0</td>
</tr>
<tr>
<td>- O</td>
<td></td>
<td>6097</td>
<td>44.9</td>
</tr>
<tr>
<td>- AB</td>
<td></td>
<td>416</td>
<td>3.1</td>
</tr>
<tr>
<td>Rhesus</td>
<td>v1dab3b_rhesus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- +ve</td>
<td></td>
<td>11242</td>
<td>82.8</td>
</tr>
<tr>
<td>- -ve</td>
<td></td>
<td>2337</td>
<td>17.2</td>
</tr>
</tbody>
</table>

Table 8. Results of other standard laboratory test during pregnancy.

<table>
<thead>
<tr>
<th>Test</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. tested</th>
<th>No. abnormal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketonuria</td>
<td>1076</td>
<td>B6t</td>
<td>8369</td>
<td>864</td>
</tr>
<tr>
<td>Urea and electrolytes</td>
<td>1077</td>
<td>B6ii</td>
<td>8369</td>
<td>1029</td>
</tr>
<tr>
<td>Alpha-fetoprotein*</td>
<td>1088</td>
<td>B6a</td>
<td>8369</td>
<td>92</td>
</tr>
<tr>
<td>Rubella immunity*</td>
<td>1089</td>
<td>B3c</td>
<td>7978</td>
<td>81</td>
</tr>
<tr>
<td>Rhesus antibodies</td>
<td>1087</td>
<td>B6aa</td>
<td>8369</td>
<td>29</td>
</tr>
<tr>
<td>Other antibodies</td>
<td>1090</td>
<td>B6v</td>
<td>8369</td>
<td>165</td>
</tr>
</tbody>
</table>

*Data also available in extended abstracted dataset; *information on gestation of test and abnormal levels are available.

Table 9. Procedures undertaken during pregnancy, prior to the onset of labour.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with information</th>
<th>No. having procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical cerclage</td>
<td>1120</td>
<td>B6h</td>
<td>8369</td>
<td>23</td>
</tr>
<tr>
<td>Amniocentesis*</td>
<td>1070</td>
<td>B6b</td>
<td>8369</td>
<td>226</td>
</tr>
<tr>
<td>Chorionic villus sampling (CVS)*</td>
<td>1071</td>
<td>B6i</td>
<td>8369</td>
<td>62</td>
</tr>
<tr>
<td>Biophysical profile</td>
<td>1074</td>
<td>B6e</td>
<td>8369</td>
<td>416</td>
</tr>
<tr>
<td>External cephalic version (ECV)</td>
<td>1121</td>
<td>B6n</td>
<td>8369</td>
<td>26</td>
</tr>
<tr>
<td>Failed ECV</td>
<td>1122</td>
<td>B6o</td>
<td>8369</td>
<td>38</td>
</tr>
<tr>
<td>Anti-D given</td>
<td>1088</td>
<td>B6d</td>
<td>8369</td>
<td>153</td>
</tr>
</tbody>
</table>

*Also available in the full data set; *excluding ultrasound examinations.

Information on medications taken were collected in three questionnaires completed by the mother and are available to view, with relevant frequencies among the Built Files as the A file (including gestation medication taken in early pregnancy), B file (for data relevant to the first 18 weeks of pregnancy), the C file (for the three months up to 32 weeks gestation), and the D file (for medication regularly taken). The frequencies of the medication data have been published (Headley et al., 2004).

Labour and delivery

In this section we include aspects relating to the mother but not to the fetus/infant. As a rule of thumb, if the measures for one member of a multiple birth could be different (e.g. presentation at the onset of labour), then the data are described in a further Data Note on the fetus/neonate. Although a complete distinction between the two is not feasible, we have tried to minimise the overlap.

In Table 11–Table 14 we describe the various procedures undergone, the methods used to induce and augment labour, the anaesthetics and analgesics used to reduce pain during labour and/or caesarean section, and the other medications administered.

Duration of the labour and delivery. Many of the details concerning the length of time various birth processes took are shown in Table 15. The variables available include the length of time from membrane rupture to delivery, admission to delivery and the start of labour to delivery. It should be noted that where data are missing, valid information may be available in the STORK dataset (see Mummé et al., 2020).

Other noted features of labour. There were a variety of different conditions noted in labour, including indications of pre-eclampsia (blood pressure, proteinuria, oedema), haemorrhage,
### Table 10. Advice given in pregnancy.

<table>
<thead>
<tr>
<th>Advice</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with information</th>
<th>No. having advice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest in bed for &gt; one week</td>
<td>1123</td>
<td>B9a</td>
<td>8037</td>
<td>50</td>
</tr>
<tr>
<td>Rest in bed for &lt; one week</td>
<td>1124</td>
<td>B9b</td>
<td>8038</td>
<td>606</td>
</tr>
<tr>
<td>Rest (not bed rest)</td>
<td>1125</td>
<td>B9c</td>
<td>8030</td>
<td>953</td>
</tr>
<tr>
<td>Reduce salt in diet</td>
<td>1126</td>
<td>B9d</td>
<td>8073</td>
<td>7</td>
</tr>
<tr>
<td>Special diet</td>
<td>1127</td>
<td>B9e</td>
<td>8071</td>
<td>118</td>
</tr>
</tbody>
</table>

### Table 11. The onset and process of labour: hospital admission, membrane rupture, induction, augmentation and caesarean section.

<table>
<thead>
<tr>
<th>Feature</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with information</th>
<th>No. with feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admitted to hospital*</td>
<td>1140</td>
<td>C2b</td>
<td>8049</td>
<td>7733 admitted from home</td>
</tr>
<tr>
<td>Admitted prior to, or in labour</td>
<td>1141</td>
<td>C2a</td>
<td>8163</td>
<td>4077 before labour</td>
</tr>
<tr>
<td>How membranes ruptured</td>
<td>1151</td>
<td>C3a</td>
<td>8167</td>
<td>761 at CS; 3795 artificially</td>
</tr>
<tr>
<td>Membrane rupture before labour</td>
<td>1154</td>
<td>C3c</td>
<td>8139</td>
<td>2279 before labour</td>
</tr>
<tr>
<td>Induction of labour*</td>
<td>1160</td>
<td>C4i</td>
<td>8212</td>
<td>1627 induced</td>
</tr>
<tr>
<td>Labour was augmented</td>
<td>1180</td>
<td>C4ii</td>
<td>7349</td>
<td>4813 augmented</td>
</tr>
<tr>
<td>Whether Caesarean section*</td>
<td>1212</td>
<td>C6c</td>
<td>8226</td>
<td>1454 CS: 519 elective; 935 emergency</td>
</tr>
</tbody>
</table>

*Reasons given as text.

### Table 12. Drugs and procedures to induce or augment labour.

<table>
<thead>
<tr>
<th>Drug or procedure</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with information</th>
<th>No. receiving drug/procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For induction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vaginal prostaglandin gel</td>
<td>1161</td>
<td>C4iia</td>
<td>8369</td>
<td>90</td>
</tr>
<tr>
<td>Prostaglandin pessaries</td>
<td>1162</td>
<td>C4iib</td>
<td>8369</td>
<td>1209</td>
</tr>
<tr>
<td>Extra-amniotic prostaglandins</td>
<td>1163</td>
<td>C4iic</td>
<td>8369</td>
<td>4</td>
</tr>
<tr>
<td>Oral prostaglandins</td>
<td>1164</td>
<td>C4iid</td>
<td>8369</td>
<td>1</td>
</tr>
<tr>
<td>Artificial rupture of membranes</td>
<td>1165</td>
<td>C4iie</td>
<td>8369</td>
<td>496</td>
</tr>
<tr>
<td>Infusion of syntocinon</td>
<td>1166</td>
<td>C4iif</td>
<td>8369</td>
<td>409</td>
</tr>
<tr>
<td>Other method*</td>
<td>1167</td>
<td>C4iig</td>
<td>8369</td>
<td>134</td>
</tr>
<tr>
<td><strong>For augmentation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artificial rupture of membranes</td>
<td>1181</td>
<td>C4iib</td>
<td>7558</td>
<td>3286</td>
</tr>
<tr>
<td>Mobilisation of the mother</td>
<td>1182</td>
<td>C4iic</td>
<td>7558</td>
<td>1925</td>
</tr>
<tr>
<td>Syntocinon infusion</td>
<td>1183</td>
<td>C4iid</td>
<td>7558</td>
<td>1817</td>
</tr>
<tr>
<td>Other method*</td>
<td>1184</td>
<td>C4iie</td>
<td>7558</td>
<td>17</td>
</tr>
</tbody>
</table>

*Described as text.
pyrexia, ketonuria and maternal distress. In addition, position in labour as well as whether a water birth or blood transfusion took place (Table 16). Nevertheless, there were a large number of descriptions written by the data abstractors which have not been coded as yet. Notably, only 1147 (14%) of the 8369 women with detailed data abstractions had no complications during labour.

The mother in the puerperium

Conditions present in the puerperium. The NHS expectation at the time, after the mother had been discharged home, was for the community midwifery team to follow up the mother for the first 14 days after delivery. The midwife’s notes were eventually included in the hospital record folder, and were thence available for scrutiny by the data abstractor, together with those notes made by the clinical team in hospital. From these records, information on the perineal consequences of delivery (episiotomy or tears), postpartum haemorrhage and anaemia were noted, markers of postpartum pre-eclampsia, deep vein thrombosis and pulmonary embolism, and other conditions including infections and procedures such as catheterisation and sterilisation (Table 17).

Medications taken postpartum. A wide variety of drugs were administered to mothers post-delivery, including painkillers (varying from general anaesthetic and strong opiates to paracetamol), injected drugs to prevent haemorrhage (ergometrine, oxytocin (syntocinon) or a mixture of the two (Syntometrine)), antibiotics and a variety of other medications (Table 18). Out of the 8369 women, only 31 (0.4%) had no medications at all. It should be noted that mothers also recorded medications they took during this time period (see the E built file). In contrast to the antenatal medication records, these have not yet been coded.

### Table 13. Anaesthetics and analgesics administered to mother in labour or at caesarean section.

<table>
<thead>
<tr>
<th>Painkiller administered</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with data</th>
<th>No. receiving the substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaesthetic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General anaesthetic</td>
<td>1220</td>
<td>C7ig</td>
<td>8369</td>
<td>651</td>
</tr>
<tr>
<td>Lumbar epidural</td>
<td>1221</td>
<td>C7ii</td>
<td>8369</td>
<td>2558</td>
</tr>
<tr>
<td>Caudal epidural</td>
<td>1222</td>
<td>C7ib</td>
<td>8369</td>
<td>2</td>
</tr>
<tr>
<td>Epidural not otherwise stated</td>
<td>1223</td>
<td>C7id</td>
<td>8369</td>
<td>36</td>
</tr>
<tr>
<td>Perineal infiltration</td>
<td>1224</td>
<td>C7ij</td>
<td>8369</td>
<td>1079</td>
</tr>
<tr>
<td>Pudendal block</td>
<td>1225</td>
<td>C7im</td>
<td>8369</td>
<td>254</td>
</tr>
<tr>
<td>Spinal anaesthetic</td>
<td>1226</td>
<td>C7in</td>
<td>8369</td>
<td>435</td>
</tr>
<tr>
<td>Analgesics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas and air</td>
<td>1227</td>
<td>C7if</td>
<td>8369</td>
<td>5623</td>
</tr>
<tr>
<td>Diamorphine</td>
<td>1228</td>
<td>C7ic</td>
<td>8369</td>
<td>186</td>
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<td>Pethidine</td>
<td>1229</td>
<td>C7ik</td>
<td>8369</td>
<td>2430</td>
</tr>
<tr>
<td>Pethilorphan</td>
<td>1230</td>
<td>C7ii</td>
<td>8369</td>
<td>4</td>
</tr>
<tr>
<td>Fentanyl</td>
<td>1231</td>
<td>C7ie</td>
<td>8369</td>
<td>412</td>
</tr>
<tr>
<td>Birthing pool</td>
<td>1232</td>
<td>C7ia</td>
<td>8369</td>
<td>119</td>
</tr>
<tr>
<td>Hot bath/hydrotherapy</td>
<td>1233</td>
<td>C7ih</td>
<td>8369</td>
<td>968</td>
</tr>
<tr>
<td>Transcutaneous electrical nerve stimulation (TENS)</td>
<td>1234</td>
<td>C7io</td>
<td>8369</td>
<td>521</td>
</tr>
<tr>
<td>Other*</td>
<td>1235</td>
<td>C7ip</td>
<td>8369</td>
<td>1015</td>
</tr>
<tr>
<td>No pain relief</td>
<td>1236</td>
<td>C7iq</td>
<td>8369</td>
<td>428</td>
</tr>
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*Described as text.
### Table 14. Other medication given in labour or at caesarean section.

<table>
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<tr>
<th>Medication</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with information</th>
<th>No. receiving drug</th>
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<td>Antibiotics</td>
<td>1240</td>
<td>7iia</td>
<td>8369</td>
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<td>Diazepam</td>
<td>1241</td>
<td>7iic</td>
<td>8369</td>
<td>5</td>
</tr>
<tr>
<td>Nitrazepam</td>
<td>1242</td>
<td>7iif</td>
<td>8369</td>
<td>1</td>
</tr>
<tr>
<td>Temazepam</td>
<td>1243</td>
<td>7iip</td>
<td>8369</td>
<td>8</td>
</tr>
<tr>
<td>Phenobarbitone</td>
<td>1244</td>
<td>7iit</td>
<td>8369</td>
<td>8</td>
</tr>
<tr>
<td>Phenytoin</td>
<td>1245</td>
<td>7ij</td>
<td>8369</td>
<td>32</td>
</tr>
<tr>
<td>Phenergan</td>
<td>1246</td>
<td>7ih</td>
<td>8369</td>
<td>1685</td>
</tr>
<tr>
<td>Ranitidine</td>
<td>1247</td>
<td>7il</td>
<td>8369</td>
<td>1245</td>
</tr>
<tr>
<td>Dexamethasone</td>
<td>1248</td>
<td>7ib</td>
<td>8369</td>
<td>5</td>
</tr>
<tr>
<td>Dichloralphenazone</td>
<td>1249</td>
<td>7iid</td>
<td>8369</td>
<td>1</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>1250</td>
<td>7iie</td>
<td>8369</td>
<td>412</td>
</tr>
<tr>
<td>Ritodrine</td>
<td>1251</td>
<td>7iil</td>
<td>8369</td>
<td>27</td>
</tr>
<tr>
<td>Salbutamol</td>
<td>1252</td>
<td>7iim</td>
<td>8369</td>
<td>7</td>
</tr>
<tr>
<td>Sodium citrate</td>
<td>1253</td>
<td>7iin</td>
<td>8369</td>
<td>1038</td>
</tr>
<tr>
<td>Stemetil</td>
<td>1254</td>
<td>7iio</td>
<td>8369</td>
<td>366</td>
</tr>
<tr>
<td>Oxygen</td>
<td>1255</td>
<td>7iig</td>
<td>8369</td>
<td>1713</td>
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<td>Other*</td>
<td>1256</td>
<td>7iit</td>
<td>8369</td>
<td>782</td>
</tr>
<tr>
<td>None of the above</td>
<td>1257</td>
<td>7iir</td>
<td>8369</td>
<td>3875</td>
</tr>
</tbody>
</table>

*Described as text.

### Table 15. Hours of onset and durations of various features of labour and delivery.

<table>
<thead>
<tr>
<th>Feature</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with information</th>
<th>Range</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hour of admission</td>
<td>1142</td>
<td>C1ahr</td>
<td>7870</td>
<td>00-23</td>
<td>12 noon</td>
</tr>
<tr>
<td>Time from admission to delivery (hr)</td>
<td>1143</td>
<td>C1a,e</td>
<td>7854</td>
<td>-3 to 1304</td>
<td>9 hr</td>
</tr>
<tr>
<td>Hour of membrane rupture</td>
<td>1150</td>
<td>C1bhr</td>
<td>7360</td>
<td>00-23</td>
<td>10a.m</td>
</tr>
<tr>
<td>Rupture of membranes to delivery (hr)</td>
<td>1152</td>
<td>C1b, e</td>
<td>7352</td>
<td>0-1759</td>
<td>4 hr</td>
</tr>
<tr>
<td>Hour labour started</td>
<td>1190</td>
<td>C1chr</td>
<td>7278</td>
<td>00-23</td>
<td>12 noon</td>
</tr>
<tr>
<td>Length of 1st stage of labour (hr)</td>
<td>1191</td>
<td>DV</td>
<td>6701</td>
<td>0-534</td>
<td>6 hr</td>
</tr>
<tr>
<td>Length of 2nd stage of labour (min)</td>
<td>1192</td>
<td>DV</td>
<td>6783</td>
<td>0-585</td>
<td>30 min</td>
</tr>
<tr>
<td>Length of 3rd stage of labour (min)</td>
<td>1401</td>
<td>DV</td>
<td>8120</td>
<td>0-275</td>
<td>5 min</td>
</tr>
</tbody>
</table>
Admission and discharge from hospital. The women stayed in hospital for a median of three days but a maximum of five weeks post-delivery. Once discharged 222 (2.6%) were readmitted for a variety of reasons (Table 19). Further details of all women are available as text.

Discussion and conclusions
This paper demonstrates the wealth of data collected on 8369 pregnancies, selected for a variety of reasons, many of which result in a population weighted with high risk pregnancies; consequently, the pregnancies in this group include all those resulting in fetal/neonatal deaths, multiple births, caesarean sections, preterm deliveries, and cerebral palsy. Care needs to be taken when using these data alone. We are hoping to fill the gaps eventually. When (and if) further data are added, this Data Note will be updated. In the meantime, we have made some suggestions as to ways in which the current data could be analysed.

One of the major reasons why such detailed data were collected concerns the importance of being able to determine the long-term consequences of exposures to the fetus from medications and procedures undertaken during pregnancy. Medications of potential importance include the anaesthetics and analgesics (e.g. opiates including Fentanyl) taken during labour, the drugs used to induce and augment labour (including prostaglandins and synthetic oxytocin), and the analgesic drugs given to the mother postnatally if she was breast feeding.

---

Table 16. Complications of, and procedures in, labour.

<table>
<thead>
<tr>
<th>Feature</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with information</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>1261</td>
<td>C9bsys</td>
<td>6851</td>
<td>Range 60-160; median 130</td>
</tr>
<tr>
<td>Systolic pressure</td>
<td>1262</td>
<td>C9bdia</td>
<td>6860</td>
<td>Range 35-140; median 80</td>
</tr>
<tr>
<td>Diastolic pressure</td>
<td>1264</td>
<td>C10b</td>
<td>3930</td>
<td>Range 0 - +++</td>
</tr>
<tr>
<td>Proteinuria</td>
<td>1265</td>
<td>C13f</td>
<td>8369</td>
<td>1</td>
</tr>
<tr>
<td>Eclampsia</td>
<td>1266</td>
<td>C12a</td>
<td>5657</td>
<td>376</td>
</tr>
<tr>
<td>Oedema present</td>
<td>1267</td>
<td>C12b</td>
<td>371</td>
<td>described</td>
</tr>
<tr>
<td>Other conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemorrhage</td>
<td>1268</td>
<td>C8</td>
<td>7488</td>
<td>18 abruption; 8 placenta praevia; 312 non-specific haemorrhage</td>
</tr>
<tr>
<td>Pyrexia</td>
<td>1269</td>
<td>C13p</td>
<td>8369</td>
<td>578 pyrexial</td>
</tr>
<tr>
<td>Maternal distress</td>
<td>1271</td>
<td>C13e</td>
<td>8369</td>
<td>1076</td>
</tr>
<tr>
<td>Ketonuria</td>
<td>1272</td>
<td>C11a</td>
<td>7326</td>
<td>3929 positive</td>
</tr>
<tr>
<td>Level</td>
<td>1273</td>
<td>C11b</td>
<td>3910</td>
<td>Range 0 to +++</td>
</tr>
<tr>
<td>Position in labour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left lateral</td>
<td>1300</td>
<td>C13i</td>
<td>8369</td>
<td>2287</td>
</tr>
<tr>
<td>Right lateral</td>
<td>1301</td>
<td>C13q</td>
<td>8369</td>
<td>727</td>
</tr>
<tr>
<td>Procedures in labour</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water birth</td>
<td>1302</td>
<td>C13r</td>
<td>8369</td>
<td>31</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>1310</td>
<td>C13a</td>
<td>8369</td>
<td>11</td>
</tr>
<tr>
<td>Catheterised</td>
<td>1311</td>
<td>C13b</td>
<td>8369</td>
<td>3116</td>
</tr>
<tr>
<td>Other complications*</td>
<td>1312</td>
<td>C13s</td>
<td>8369</td>
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<td>No complications</td>
<td>1313</td>
<td>C13t</td>
<td>8175</td>
<td>1147</td>
</tr>
</tbody>
</table>

*Described in text.
<table>
<thead>
<tr>
<th>Condition</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with information</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Episiotomy, perineal tears, haemorrhages and anaemia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Episiotomy</td>
<td>1410</td>
<td>C16a</td>
<td>8197</td>
<td>2197</td>
</tr>
<tr>
<td>Perineal tear</td>
<td>1412</td>
<td>C16b2</td>
<td>8195</td>
<td>4243</td>
</tr>
<tr>
<td>- 1st degree</td>
<td>1411</td>
<td>C16b</td>
<td>8195</td>
<td>550</td>
</tr>
<tr>
<td>- 2nd degree</td>
<td>1411</td>
<td>C16b</td>
<td>8195</td>
<td>1679</td>
</tr>
<tr>
<td>- 3rd degree</td>
<td>1411</td>
<td>C16b</td>
<td>8195</td>
<td>112</td>
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<tr>
<td>Post-partum haemorrhage</td>
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<td>D2a</td>
<td>8174</td>
<td>1240</td>
</tr>
<tr>
<td>- type</td>
<td>1424</td>
<td>D2b</td>
<td>1238</td>
<td>Primary – 1192</td>
</tr>
<tr>
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<td>- amount (ml)</td>
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<td>D2c</td>
<td>1199</td>
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<td>8369</td>
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<td><strong>Cardiovascular markers</strong></td>
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<td>Systolic blood pressure</td>
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<td>D8sys</td>
<td>7983</td>
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<td>D8dia</td>
<td>7995</td>
<td>Range 20-112; median 70</td>
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<tr>
<td>days after delivery</td>
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<td>dv</td>
<td>7976</td>
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<td>D1w</td>
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<td>Results</td>
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<td>----------------------</td>
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<td>D1u</td>
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<td>D1j</td>
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<td>1088</td>
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<tr>
<td>Depression</td>
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<td>D1q</td>
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<td>D1x</td>
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<tr>
<td>No disorder noted</td>
<td>1501</td>
<td>D1y</td>
<td>8121</td>
<td>73</td>
</tr>
</tbody>
</table>

*Also available in the extended abstracted dataset; *a* days after delivery the last blood pressure was recorded; *b* described as text.

**Table 18. Medications taken in the postpartum period.**

<table>
<thead>
<tr>
<th>Medication</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with Information</th>
<th>No. given the drug</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Painkillers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General anaesthetic</td>
<td>1510</td>
<td>D3j</td>
<td>8369</td>
<td>124</td>
</tr>
<tr>
<td>Morphine</td>
<td>1513</td>
<td>D3q2</td>
<td>8369</td>
<td>1259</td>
</tr>
<tr>
<td>Pethidine</td>
<td>1515</td>
<td>D3t2</td>
<td>8369</td>
<td>109</td>
</tr>
<tr>
<td>Omnopon</td>
<td>1517</td>
<td>D3r2</td>
<td>8369</td>
<td>160</td>
</tr>
<tr>
<td>Lignocaine</td>
<td>1519</td>
<td>D3n2</td>
<td>8369</td>
<td>1356</td>
</tr>
<tr>
<td>Co-dydramol</td>
<td>1521</td>
<td>D3d2</td>
<td>8369</td>
<td>3632</td>
</tr>
<tr>
<td>Co-proxamol</td>
<td>1523</td>
<td>D3e2</td>
<td>8369</td>
<td>574</td>
</tr>
<tr>
<td>Voltarol</td>
<td>1525</td>
<td>D3z2</td>
<td>8369</td>
<td>1086</td>
</tr>
<tr>
<td>Paracetamol</td>
<td>1527</td>
<td>D3s2</td>
<td>8369</td>
<td>4500</td>
</tr>
<tr>
<td><strong>To prevent haemorrhage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ergometrine</td>
<td>1531</td>
<td>D3f2</td>
<td>8368</td>
<td>318</td>
</tr>
<tr>
<td>Syntocinon</td>
<td>1533</td>
<td>D3w2</td>
<td>8369</td>
<td>2965</td>
</tr>
<tr>
<td>Syntometrine</td>
<td>1535</td>
<td>D3x2</td>
<td>8369</td>
<td>5755</td>
</tr>
<tr>
<td><strong>Other prophylaxis</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anti-D</td>
<td>1601</td>
<td>D3b2</td>
<td>8369</td>
<td>808</td>
</tr>
<tr>
<td>Mini-pill</td>
<td>1603</td>
<td>D3p2</td>
<td>8369</td>
<td>162</td>
</tr>
<tr>
<td>Iron</td>
<td>1593</td>
<td>D3k2</td>
<td>8369</td>
<td>1774</td>
</tr>
<tr>
<td>Folic acid</td>
<td>1591</td>
<td>D3h2</td>
<td>8369</td>
<td>217</td>
</tr>
<tr>
<td><strong>Other medications</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Progesterone</td>
<td>1541</td>
<td>D3u2</td>
<td>8369</td>
<td>136</td>
</tr>
<tr>
<td>Fentazin</td>
<td>1551</td>
<td>D3g2</td>
<td>8369</td>
<td>0</td>
</tr>
<tr>
<td>Metoclopramide</td>
<td>1553</td>
<td>D3o2</td>
<td>8369</td>
<td>302</td>
</tr>
<tr>
<td>Stemetil</td>
<td>1555</td>
<td>D3v2</td>
<td>8369</td>
<td>757</td>
</tr>
</tbody>
</table>
Concerning procedures, long-term effects on the fetus of repeated ultrasound examinations have not, to our knowledge, been considered in the literature. There is some evidence that ultrasound has a warming effect on certain tissues – and in theory this may result in damage to the brain or other organ of the developing fetus. Among the 8369 women, the maximum number of scans recorded was 33. This was considerably above the recommendations at the time.

It may be claimed that the pregnancies of 30 years ago will have no relevance today. However, there are two reasons for looking at the long-term effects of the features of the treatment of the mother as shown here: (i) even if a substance/procedure is no longer used, any long term effects (positive or negative) will add to basic biological knowledge, and (ii) if still being used, the study of these data will add to overall knowledge as to their safety (or the risks attached to their use) throughout life.

In looking at long-term effects, data from ALSPAC have a major advantage in that the offspring from these pregnancies have been followed up over time and have a unique wealth of information on neurocognitive, sensory, biological and health outcomes. In addition, genetic and epigenetic markers are available to add depth to any investigations.

The data described in this Data Note are confined to what was documented in the medical record. It is important to point out, however, that other relevant data are available including the computerised STORK data (Mummé et al., 2020), and the prospective data collected from the women during pregnancy and after delivery, using detailed self-report questionnaires administered at 18 and 32 weeks gestation as well as at eight weeks postpartum. These provide information on a variety of signs and symptoms occurring during and after the pregnancy, together with the non-obstetric medications taken.

**Strengths and limitations**

There are four major strengths of these data. Firstly, each item was abstracted from the paper medical record with a strict protocol and meticulous checking; secondly, the data collected were documented at the time that the maternal examinations were undertaken, the treatments prescribed and the observations made, so that there was no element of retrospective recall; thirdly, these data can be augmented by information from the maternal questionnaires completed prenatally and postnatally.

---

### Table 19. Hospitalisation(s) post-delivery.

<table>
<thead>
<tr>
<th>Hospitalisation(s)</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with Information</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of stay after delivery</td>
<td>1620</td>
<td>Dv</td>
<td>8054</td>
<td>Range 0-38, Median 3</td>
</tr>
<tr>
<td>Place discharged to</td>
<td>1621</td>
<td>D5</td>
<td>8215</td>
<td>Home 7715</td>
</tr>
<tr>
<td>Took own discharge</td>
<td>1622</td>
<td>D6</td>
<td>7872</td>
<td>8</td>
</tr>
<tr>
<td>Readmitted &lt; six weeks post-delivery*</td>
<td>1623</td>
<td>D7</td>
<td>8187</td>
<td>222</td>
</tr>
</tbody>
</table>

*Reasons keyed as text.*

---

### Table 18. Medication given

<table>
<thead>
<tr>
<th>Medication</th>
<th>P no.</th>
<th>Q no.</th>
<th>No. with Information</th>
<th>No. given the drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temazepam</td>
<td>1557</td>
<td>D3y2</td>
<td>8369</td>
<td>420</td>
</tr>
<tr>
<td>Fybogel</td>
<td>1561</td>
<td>D3i2</td>
<td>8369</td>
<td>360</td>
</tr>
<tr>
<td>Lactulose</td>
<td>1563</td>
<td>D3m2</td>
<td>8369</td>
<td>1565</td>
</tr>
<tr>
<td>Anusol</td>
<td>1565</td>
<td>D3c2</td>
<td>8369</td>
<td>492</td>
</tr>
<tr>
<td>Kamillosan</td>
<td>1571</td>
<td>D3i2</td>
<td>8369</td>
<td>713</td>
</tr>
<tr>
<td>Witch hazel</td>
<td>1573</td>
<td>D3za2</td>
<td>8369</td>
<td>385</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>1581</td>
<td>D3a2</td>
<td>8369</td>
<td>2121</td>
</tr>
<tr>
<td>Other drugs*</td>
<td>1611</td>
<td>D3zb</td>
<td>8369</td>
<td>4044</td>
</tr>
<tr>
<td>No drugs</td>
<td>1612</td>
<td>D3zc</td>
<td>8369</td>
<td>31</td>
</tr>
</tbody>
</table>

*Described as text.*
on her signs and symptoms, procedures undertaken and medications taken, to provide a different aspect of the pregnancy; and fourthly, and importantly, the data provide an important baseline from which to assess the long-term benefits and possible hazards of the various facets of maternity care.

There is one major limitation of the data – which is that, with the exception of the important longitudinal information on blood pressure, weight and diabetes, the details on many aspects of maternal exposures and conditions are missing for over 5000 pregnancies. Admittedly, by the selection criteria used on the 8369, the majority of the more complex pregnancies have already been abstracted, but for valid epidemiological analysis the population of all ‘normal’ pregnancies are also needed. It is hoped that efforts can be made in the future to fill this important gap.

**Data availability**

**Underlying data**

ALSPAC data access is through a system of managed open access. The steps below highlight how to apply for access to the data included in this data note and all other ALSPAC data:

1. Please read the ALSPAC access policy which describes the process of accessing the data and samples in detail, and outlines the costs associated with doing so.

2. You may also find it useful to browse our fully searchable research proposal database which lists all research projects that have been approved since April 2011.

3. Please submit your research proposal for consideration by the ALSPAC Executive Committee. You will receive a response within 10 working days to advise you whether your proposal has been approved.

**Extended data**


Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

**Acknowledgements**

We are extremely grateful to all the families who took part in this study, the midwives for their help in recruiting them, and the whole ALSPAC team, which includes interviewers, computer and laboratory technicians, clerical workers, research scientists, volunteers, managers, receptionists and nurses.

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