International Journal of Epidemiology, 2015, 764–775
doi: 10.1093/ije/dyu157
Advance Access Publication Date: 7 August 2014
Cohort Profile

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Cohort profile: The Cork BASELINE Birth Cohort Study: Babies after SCOPE: Evaluating the Longitudinal Impact on Neurological and Nutritional Endpoints

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Accepted 14 July 2014

Abstract

The Cork BASELINE Birth Cohort Study (Babies After SCOPE: Evaluating the Longitudinal Impact on Neurological and Nutritional Endpoints) was established with three main objectives: to investigate the effects of intrauterine growth restriction and early nutrition on metabolic health and neurodevelopment; to ascertain the incidence and determinants of food allergy and eczema in early childhood; and to describe early infant feeding, supplementation and nutritional status and their effects on physical and neurological growth and health outcomes. The SCOPE Ireland pregnancy cohort formed the basis of recruitment of infants to BASELINE [*n* 1537] and an additional 600 infants were recruited after delivery providing a total sample of 2137 between 2008 and 2011. Assessments were at day 2 and at 2, 6, 12 and 24 months, with 5-year assessments ongoing. Blood and DNA samples were biobanked at 15 and 20 weeks' gestation, birth, 24 months and 5 years. Body composition data were collected at 2 days and 2 months (air-displacement plethysmography) and at 5 years (dual-energy X-ray absorptiometry). Trans-epidermal water loss was measured at 2 days, 2, 6 and 24 months. Detailed dietary and validated developmental assessments were conducted at 24 months. Researchers interested in collaboration can contact [baseline@ucc.ie] and further information be found at [http://www.baselinestudy.net/ or http://www.birthcohorts.net/].

Key Messages

- Breastfeeding initiation rates were high for Ireland (70%); 34% were exclusively breastfeeding on hospital discharge. By 6 months, 25% were still breastfeeding with only 1% exclusively breastfeeding.
- Close to 95% of infants received due immunizations in a timely manner.
- Percentage body fat increased with increasing gestational age and in females.
- Skin barrier function is of great importance in assessing the risk of developing diseases, such as eczema and other atopic conditions. Transepidermal water is a simple non-invasive measurement of inside-out skin barrier function. Data from the Cork BASELINE birth cohort have facilitated the largest evaluation to date of transepidermal water loss in a normal-term neonatal population and enabled a reference dataset for this measurement to be established

Why was the cohort set up?

Fetal nutritional status has been linked with numerous adult diseases, namely hypertension, hypercholesterolaemia, type 2 diabetes and cardiovascular disease.[1] Fetal growth restriction may be associated with neurocognitive delay and long-term behavioural problems.[2] Maternal vitamin D status has a direct effect on bone growth[3] in infants but also on bone mass and fracture risk of the adolescent offspring.[4] There is some evidence that maternal and infant nutritional status may contribute to the increasing incidence of childhood allergies.[5–7] Moreover, because of the rising trend of allergies worldwide and the current rudimentary understanding of their origin, prevalence studies that characterize these diseases are invaluable to policymakers. It is clear, then, that to establish the pathophysiology of many childhood diseases it is necessary to look back to long before birth.

The Cork BASELINE birth cohort was established with three main objectives: to investigate the effect of intrauterine growth restriction (IUGR) and early nutrition on metabolic health and neurodevelopment; to ascertain the incidence and determinants of food allergy and eczema in early childhood; and to examine early infant feeding, weaning and nutritional status, with particular attention to vitamin D, and their effects on physical and neurological growth and health outcomes.

Longitudinal prospective Irish data during pregnancy and early infancy are not available and there are many knowledge gaps globally in the origins of paediatric and adult obesity and metabolic complications, suboptimal bone and muscle growth and development, neuro-cognitive performance and paediatric atopic disease.

Research objectives and measurements in this birth cohort were conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures were approved by the Clinical Research Ethics Committee of the Cork Teaching Hospitals, [ref ECM5(9) 01/07/2008]. The SCOPE Ireland study is registered at the Australian New Zealand Clinical Trials Registry (ACTRN12607000551493). The Cork BASELINE birth cohort study is registered at the United States National Institutes of Health Clinical Trials Registry (http://www.clinicaltrials.gov), ID: NCT01498965. Families provided written informed consent at 20 weeks' gestation or at birth.

Who is in the cohort?

The study is based in Cork (51.9°N), which is the largest county and includes the second largest city in Ireland. In 2007, the amalgamation of all three Cork maternity units into one centre, Cork University Maternity Hospital (CUMH), provided a unique opportunity to conduct research in pregnancy in Cork. CUMH, which is co-located with the Cork University Hospital, is the third largest maternity hospital in Ireland, with 8563 deliveries in 2012. As recruitment was regionally based, the generalizability of the data may be limited. In 2008, all primiparous women in Cork were invited to take part in the Screening for Pregnancy Endpoints (SCOPE) pregnancy cohort. The SCOPE cohort is an international collaboration of research groups interested in the study of major adverse outcomes in late pregnancy, particularly but not exclusively, pre-eclampsia, fetal growth restriction and spontaneous preterm birth[8] and as a consequence strict exclusion criteria were applied.[9] Detailed maternal, fetal and paternal information was obtained antenatally, as well as blood samples at 15 and 20 weeks' gestation, see Table 1. All women who participated in the SCOPE study were informed about the birth cohort, and if consent was obtained infants were registered to the Cork BASELINE birth cohort (stream 1). In early 2010, recruitment into the birth cohort was slower than projected, and in July of the same year a second recruitment commenced in the postnatal wards of CUMH, with a singleton pregnancy being the main inclusion criterion, (stream 2), see Figure 1. Responders were more likely

Table 1. Prenatal data available for infants recruited through the SCOPE study (*n* 1537)

Data	Weeks of gestation		
	14–16	19–21	24
Demographic	•		
Maternal date of birth	•		
Ethnicity	•		
Immigration	•		
Education	•		
Marital status	•		
Occupation	•		
Income	•		
Living situation	•		
Woman's birthweight, gestation, singleton/multiple pregnancy	•		
Obstetric history			
Previous miscarriage, termination, ectopic pregnancy	•		
Current pregnancy with same partner or not	•		
History of fertility	•		
Assisted reproductive technologies	•		
Duration of sexual relationship	•		
Exposure to partner's sperm	•		
Family history of pregnancy complications	•		
Gynaecological and medical history			
Polycystic ovarian syndrome	•		
Hypertension while on oral contraceptive	•		
Asthma	•		
Urinary tract infections	•		
Inflammatory bowel disease	•		
Thyroid disease	•		
Thromboembolism	•		
Family history of medical conditions	•		
Current pregnancy			
Vaginal bleeding early pregnancy	•	•	
Hyperemesis	•	•	
Infections	•	•	
Dietary information	•	•	
Supplement use	•	•	
Smoking, alcohol consumption and recreational drugs	•	•	
Lifestyle questionnaire (work, exercise, snoring, domestic violence)	•	•	
Psychological scales	•	•	
Clinical examination			
Height	•	•	
Weight	•	•	
Waist, hip, arm and head circumference	•	•	
Blood pressure	•	•	
Urine specimen	•	•	
Blood	•	•	
Ultrasound examination		•	•
Partner			
Blood		•	
Lifestyle		•	
Family medical history		•	

Table 2. Participant characteristics in the Cork BASELINE birth cohort stratified by recruitment streams 1 and 2 (%)

Characteristics	All 2137	Stream 1			Stream 2	*P*-value[b]
		Non-responder (*n* 232)	Responder (*n* 1537)	*P*-value[a]	(*n* 600)	
Maternal age (years)[c]	30.9 (4.7)	29.6 (4.7)	30.6 (4.4)	0.004	31.9 (5.1)	<0.001
<25	9	16	10	0.026	9	0.808
>35	21	13	16	0.703	32	<0.001
Caucasian	98	92	98	<0.001	98	0.815
Marital status						
Married	72	67	71	0.602	75	0.126
Education						
University	55	40	56	0.045	52	0.418
Smoking status						
Smoker	13	17	13	<0.001	13	0.955
Delivery mode						
Vaginal	73	77	73	0.171	69	0.342
Gender: Male	50	53	51	0.478	50	0.78
Response rate (% of population at delivery[d])						
2 months	92		94		86	
6 months	86		88		82	
12 months	82		83		78	
24 months	76		78		71	

[a]Differences between responders (*n* 1537) and non-responders (*n* 232) through stream 1.

[b]Differences among those recruited through stream 1 (*n* 1537) and stream 2 (*n* 600) were analysed using Pearson's chi square tests to compare categorical variables and independent t-tests for the continuous.

[c]All values reported as mean (SD).

[d]At delivery, *n* 2137 (stream 1: *n* 1537; stream 2: *n* 600).

to be Caucasian (98 vs 92%), have a university education (56 vs 40%) and non-smokers (13 vs 17%) compared with non-responders; however these data were only available for infants recruited through stream 1 and not stream 2, see Table 2. An overall response rate of 77% [stream 1 (78%); stream 2 (71%)] was achieved for the Cork BASELINE birth cohort study at 24 months, Table 2.

How often have the participants been followed up?

Postnatal visits were conducted at day 2 and at 2, 6, 12 and 24 months, see Figure 1. Between August 2008 and November 2011, 2183 mothers provided consent, of whom 73% were recruited through stream 1. Of the infants recruited through the stream 1, the Cork BASELINE birth cohort has access to detailed prospective antenatal data (Table 1) whereas retrospective antenatal data were collated at 2 months from all participants (Table 3). A research midwife approached the families after birth, registered the infant and completed day-2 measurements ($n = 2137$). The next contact point was prior to the 2 month assessment. However, infants <37 weeks of gestation were corrected for gestational-age; 2, 6, 12 and 24 month assessments were completed at a mean [standard deviation (SD)] age of 67 (11), 191 (12), 381 (16) and 785 (35) days, respectively. Not all children who participated in follow-up assessments completed the clinical assessments or were able or willing to give a blood sample at 24 months. Reasons for study withdrawal were not documented.

Infants remaining in the Cork BASELINE birth cohort were more likely to be born to older [>25 years (94 vs 78%)], married (75 vs 56%) women who did not smoke (89 vs. 78%) compared with those lost to follow-up (consent withdrawn or unable to contact family), all $P < 0.001$. Missing data are common in longitudinal research, due to attrition or non-response to questionnaire items, and inappropriate handling of missing data can lead to biased statistical interpretation. Multiple imputation will be employed to address the issue of missing data, which will help minimize bias and make use of all available data.

What has been measured?

Dietary assessment and feeding behaviour

Comprehensive data on infant nutrition were collected at each time-point: method of feeding, breastfeeding duration, infant formula brand, supplementary fluids, nutritional supplements and frequency of feeds.

Families were invited to complete a non-weighed food diary during infancy to assess complementary feeding

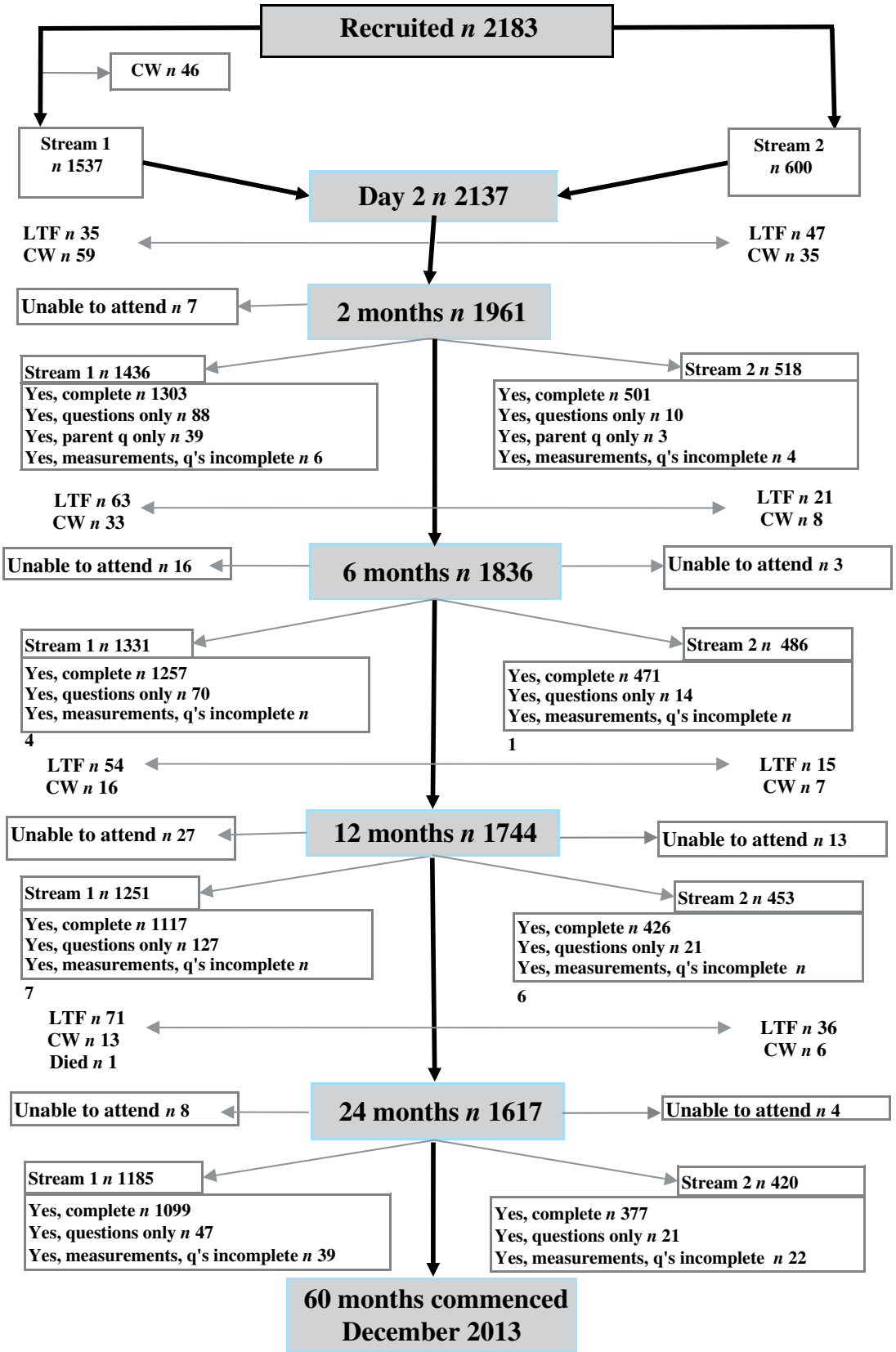

Figure 1. Flowchart through each stage of the study. *n*, number of infants; CW, consent withdrawn; LTF, lost to follow-up; q, questions.

Table 3. Information gathered at postnatal visits during the Cork BASELINE birth cohort study

Information	Pregnancy	Day 2	2 months	6 months	12 months	24 months	60 months
Maternal							
Demographic							
Marital status	•		•				•
Country of birth	•		•				
Ethnicity	•		•				
Education	•		•				•
Occupation	•		•				•
Income	•		•				•
Housing type	•		•				•
Household composition	•		•				•
Maternity care	•		•				
Mode of delivery	•		•				
Eating habits during pregnancy			•				
Maternal quality of life			•	•	•	•	•
Parental self-reported allergies							
Asthma, eczema, rhinitis, pets, bee/wasp, medication, latex, foods			•				
Home environment							
Mould/dampness	•		•	•	•	•	•
Flooring	•		•	•	•	•	•
Heating	•		•	•	•	•	•
Urban or rural	•		•	•	•	•	•
Farm	•		•	•	•	•	•
Pets	•		•	•	•	•	•
Tobacco smoke exposure	•		•	•	•	•	•
Cleaning products	•		•	•	•	•	•
Painting	•		•	•	•	•	•
Childcare arrangements				•	•	•	•
Infant							
Method of feeding			•	•	•	•	•
Eating behaviour			•	•	•	•	•
Solid food			•	•	•	•	
Complementary feeding diary				•			
2-day weighed diary						•	
Food propensity questionnaire						•	
Supplement use			•	•	•	•	•
Child care				•	•	•	•
Bathing			•	•	•	•	•
Washing clothes			•	•	•	•	•
Bottle sterilization			•	•	•		
Pacifier use			•	•	•	•	
Illnesses/medication			•	•	•	•	•
Immunizations			•	•	•	•	•
Allergies			•	•	•	•	•
Sun exposure						•	•
Sleeping						•	•
Screen time (TV/computer)						•	•
Physical activity							•
Developmental milestones			•	•	•	•	•
Neurodevelopmental assessment						•	•
Gender		•					
Clinical examination							
Anthropometry		•	•	•	•	•	•
Body composition		•	•				•

(Continued)

Table 3. Continued

Information	Pregnancy	Day 2	2 months	6 months	12 months	24 months	60 months
Atopic eczema		•	•	•		•	•
Transepidermal water loss		•	•	•		•	•
Skin prick testing[a]						•	•
Blood pressure						•	•
Muscle strength							•
Biological samples							
Umbilical cord blood		•					
Buccal swabs[b]		•	•	•	•	•	
Venous blood						•	•

[a]SPT throughout the first 2 years if parents reported an adverse reaction.
[b]Buccal swabs taken at postnatal visit if no cord blood was obtained.

practices. This diary captured information on early food intake and exposure, and was not designed to quantify food or nutrient intake. Parents were provided with the diary at 2 months and instructed to record information prospectively on a daily basis once their infant commenced solid food and for the following 6 weeks. Information included: date and time of each feeding occasion, food description, method of preparation if homemade, brand if pre-prepared product, number of spoons consumed at each eating occasion.

At the 24 month assessment, parents were asked to complete a weighed food diary for their child over 2 non-consecutive days within a single week. This diary captured quantitative data on food and nutrient intakes. A non-quantitative food propensity questionnaire (FPQ) was administered by a researcher to attain habitual data on food intake and supplement use over the previous 4 weeks, see Table 3. At 5 years, parents and children are completing a modified FPQ.

Supplementation

With supplementation practice an a priori objective, detailed data were captured at each time-point, which included type of supplement, brand name, age of supplementation, frequency of administration, whether recommended by a healthcare professional and, if vitamin D was provided, the dose was required.

Eating behaviour

The Children's Eating Behaviour Questionnaire[10] was completed at each assessment and will provide a very useful tool in ascertaining if eating behaviours are associated with rapid weight gain and overweight/obesity.

Allergy assessment

Standardized allergy questionnaires were adopted from the Euro-Prevall study[11] and The International Study of Asthma and Allergies in Childhood (ISAAC).[12] Potential allergy (eczema, food allergy, allergic rhinitis and asthma) was identified by using serial allergy questionnaires, with the main focus on eczema and food allergy throughout the first 2 years and the focus shifting towards asthma and allergic rhinitis at 5 years.

Eczema was diagnosed after 6 months using the UK Working Party's Diagnostic Criteria.[13] If eczema was present on the day of examination, eczema severity was assessed by the Scoring for Atopic Dermatitis (SCORAD) severity index[14] at all ages and by the Nottingham Eczema Severity Score (NESS)[15] at 12 and 24 months.

Trans-epidermal water loss [TEWL ($g_{water}/m^2/h$)] is a simple noninvasive measurement of inside-out skin barrier function and measurements were carried out using a widely validated open chamber system (Tewameter® TM 300, Courage+Khazaka Electronic, Cologne, Germany), see Table 3. These measurements were performed in an environmentally controlled room (temperature ~20°C and relative humidity ~40–60%), were taken on the lower volar site of the right forearm, after at least 10 min of acclimatization, and the average of three values was recorded.

Infants with possible food allergy were investigated by skin prick testing (SPT) of suspected allergens, and a food challenge was performed to confirm or refute a diagnosis of food allergy. All infants had SPT at the 24- and 60-months visits with consent of parents, for common food, inhalant and hymenoptera (bee and wasp) allergens.

Neurodevelopmental assessment

At all ages, data on baby activities and developmental milestones were included in the BASELINE questionnaires and interviews. At 24 months, all children were screened using three self-report questionnaires: the Ages and Stages Questionnaire,[16] the Child Behavior Checklist[17] and Greenspan's Social-Emotional Growth Chart.[18] At 5 years, the Child Behavior Checklist[17] is being repeated as well as

the interviewer-administered Kaufmann Brief Intelligence Test, second edition (KBIT-2).[19]

A nested case-control cohort of 24 month-old toddlers [infants with birth weight below the 10th centile on individualized centiles and/or whose body fat was below the 10th centile (adjusted for both sex and age)] were selected and matched with controls from across all centile ranges above the 10th percentile. These children were invited to attend for a detailed developmental assessment of their cognitive, language and motor development, which were assessed using the Bayley Scales of Infant and Toddler Development third edition (Bayley III).[20] One of its primary functions is to identify children with developmental delay, and it is divided into five tasks: language (receptive and expressive), motor (gross and fine motor) and cognitive function.

Anthropometric assessment

Anthropometric measures were completed at each visit, including length/height, weight and head circumference, and were conducted according to standard operating procedures. Body composition was measured at 2 days and 2 months using air displacement plethysmography with the PEA POD Infant Body Composition System (COSMED USA, Concord, CA)[21] and body composition and bone mineral density (total body and lumbar spine) are being measured at 5 years using DXA (GE Healthcare Lunar iDXA^{TM}).

Biological sample collection and biobanking

Biological samples were collected and processed using standard methodologies to ensure preservation of specimen integrity and minimize *in vitro* artefact. Biological samples were obtained at 15 and 20 weeks' gestation, birth, 24 months and 5 years or at unscheduled reviews according to clinical requirement. After collection, biological samples were immediately stored at 5°C and were then processed, aliquoted and bar coded as per protocol within 3 h of sample collection and stored at −80°C.

Umbilical blood was divided into serum, plasma [EDTA (ethylenediaminetetraacetic acid), and buffy coat samples were obtained from the EDTA sample] and a TEMPUS^{TM} Blood RNA tube (Applied Biosystems, Life Technologies) tube was also collected. At 24 months and 5 years, a venous blood sample was collected for routine haematology, serum and plasma storage (EDTA samples were shipped for later DNA extraction at the University of Dundee, Scotland). If umbilical cord blood was not collected, DNA was obtained by buccal smear (purchased from DNA Genotek, Ottawa, ON) at one of the postnatal visits.

Using a liquid chromatography-tandem mass spectrometry (LC-MS/MS) a method that is traceable to the National Institute Standards Technology (NIST) reference measurement procedure,[22] serum 25-hydroxyvitamin D concentrations will be measured in umbilical cord blood and at 24 months and 5 years, along with iron status and relevant biomarkers of metabolic health.

Data management

All data collected during the study were stored on a centralized, secure internet-based database [FDA (Food and Drug Administration) and HIPAA (Health Insurance Portability Accountability Act) compliant], which was established by Medical Science Online (MedSciNet), Sweden. This secure, reliable data entry and tracking system continues to be crucial for data collection, management and subsequent analysis. Data management included individual checks on all data for each participant, including checks for transcription errors, and detection of illogical or inconsistent data and outliers.

What has it found? Key findings and publications

A list of all publications to date is available at [http://www.baselinestudy.net/].

Socio-demographic factors

Mean maternal age (30.9 years) was comparable with that reported nationally,[23] in which mothers giving birth in 2010 were aged 31.5 years. Participants were mainly Caucasian (98%) and this mirrors the most recent complete Irish Census of 2006 (95%).[24] Overall 27% of deliveries were by caesarean section (national average of 28%),[23] and 53% of women had completed university, which is more than reported for childbearing women in Cork (23%).[24] An average birthweight of 3.5 kg was reported, which is similar to nation reports.[23] Preliminary infant health data throughout the first 12 months are presented in Table 4. In the first 12 months of life, 82% of families reported any infection with 65% exposed to antibiotics in the same period. Health authorities strongly advise that infants are immunized, and the data showed that almost 95% of infants received due vaccinations in a timely manner.

Nutrition

At hospital discharge, 70% of infants had received any breast milk, with only 34% being exclusively breastfed on

Table 4. Infant health in the first year of life (*n* 2137)

Health			*n* (%)
After delivery			
Neonatal unit admittance			205 (10)
Phototherapy for jaundice			74 (4)
Hospital discharge after birth			
≤ 3 days			1313 (61)
>5days			102 (5)
Infections			
Any in the first year			1416 (82)
Within the first 2 months			158 (8)
Between 2 & 6 months			808 (44)
Between 6 & 12 months			1087 (67)
Antibiotics			
Any in the first year			1135 (65)
Oral antibiotic within the first 2 months			111 (6)
Between 2 & 6 months			548 (30)
Between 6 & 12 months			873 (51)
Immunizations	2 months	6 months	12 months
BCG at birth	1830 (94)	1897 (97)	1902 (98)
6 in 1 & PCV at 2 months	1125 (58)	1876 (96)	1887 (97)
6 in 1 & Men C at 4 months	–	1748 (96)	1795 (99)
6 in 1 & Men C/PCV at 6 months	–	715 (39)	1696 (93)
MMR/PCV	–	–	698 (41)

BCG, Bacillus Calmette–Guérin; 6 in 1, diphtheria, tetanus, pertussis, haemophilus influenza B, hepatitis B, polio); PCV, pneumococcal conjugate vaccine; Men C, meningitis C; MMR, mumps, measles and rubella.

discharge. At 6 months, 23% were still receiving any breast milk in combination with infant formula and/or solids, with only 1% exclusively breastfeeding.[25] At 12 months, 70% and 23% of infants were provided with infant formula and cow's milk, respectively. The mean (SD) age of complementary feeding was 20 (3.6) weeks, with 18% and 2% of infants provided with solid foods early (<17 weeks) and late (>26 weeks), respectively. After the implementation of a national infant vitamin D supplementation policy (May 2010), 49%, 64% and 44% were supplemented at 2, 6 and 12 months, compared with 4%, 11% and 11% supplemented at 2, 6 and 12 months prior to the policy, respectively.[26]

Body composition

The reference distribution (with 5th percentile intervals) of weight, length, head and mid-upper arm circumference at birth, 2, 6 and 12 months by sex are presented in Table 5. Birth weight and length are used as surrogate measures of *in utero* growth but poorly reflect neonatal adiposity. Air-displacement plethysmography has been validated for the measurement of body composition in the neonatal population.[27] Of the 786 infants measured, fat mass and fat-free mass were measured in 743 (94.5%) infants within 96 h of birth and reference centiles for percentage body fat according to gestational age and sex were generated.[27] Percentage body fat increased with gestational age; mean (SD) percentage body fat at 36.0–37.9 weeks of gestation was 8.9 (3.5), at 38–39.9 weeks of gestation was 10.3 (4) and at 40–41.9 weeks of gestation was 11.2 (4.3) ($P < 0.001$). Female infants had higher percentage body fat ($P < 0.001$) at each time-point than male infants.

Epidermal barrier function

Normative values for TEWL in early life were established.[28] A mean of three readings was recorded from 1036 term (37–42 weeks) and 18 late preterm infants (34–37 weeks) within 96 h of birth. Full-term neonatal TEWL measurements have a normal distribution [mean (SD) 7.06 (3.41) g of water/m^2/h] and mean (SD) preterm neonatal TEWL measurements were 7.76 (2.85) g of water/m^2/h. This is the largest evaluation to date of TEWL in a normal-term neonatal population and constitutes a reference dataset for this measurement using an open-chamber system.

Main strengths and weaknesses

The main strengths include: hypothesis-led investigation and multidisciplinary team; extensive biobanking (which includes early and mid gestation maternal blood and DNA,

Table 5. Reference intervals for anthropometric measures of weight, length, head and mid-upper arm circumference for females and males at birth, 2, 6 and 12 months

	Birth				2 months				6 months				12 months			
Percentile Females	Weight kg	Length cm	Head cm	M-arm cm	Weight kg	Length cm	Head cm	M-arm cm	Weight kg	Length cm	Head cm	M-arm cm	Weight kg	Length cm	Head cm	M-arm cm
	n 1063	*n* 1038	*n* 1048	*n* 1038	*n* 884	*n* 886	*n* 880	*n* 881	*n* 839	*n* 836	*n* 839	*n* 840	*n* 744	*n* 744	*n* 746	*n* 741
5	2.52	46.0	32.0	9.0	4.3	54.3	37.5	10.6	6.4	64.0	41.6	12.8	8.1	71.5	44.3	13.5
10	2.85	47.4	33.0	9.0	4.5	55.1	37.9	11.0	6.7	64.5	42.0	13.0	8.5	72.5	45.0	13.8
15	2.99	48.0	33.0	9.5	4.7	55.9	38.0	11.3	6.9	65.0	42.4	13.3	8.7	73.0	45.2	14.0
20	3.08	48.5	33.5	9.8	4.7	56.0	38.3	11.5	7.1	65.5	42.5	13.5	8.9	73.8	45.5	14.3
25	3.15	49.0	34.0	10.0	4.8	56.5	38.5	11.5	7.2	66.0	42.9	13.7	9.1	74.0	45.6	14.5
30	3.22	49.1	34.0	10.0	4.9	56.9	38.7	11.8	7.4	66.0	43.0	14.0	9.3	74.5	45.9	14.6
35	3.28	49.5	34.0	10.0	5.0	57.0	39.0	12.0	7.5	66.5	43.1	14.0	9.4	75.0	46.0	14.8
40	3.35	50.0	34.0	10.0	5.1	57.4	39.0	12.0	7.6	67.0	43.3	14.2	9.5	75.0	46.2	15.0
45	3.40	50.0	34.5	10.0	5.2	57.8	39.1	12.0	7.7	67.0	43.4	14.3	9.7	75.5	46.3	15.1
50	3.44	50.3	34.5	10.4	5.3	58.0	39.3	12.2	7.8	67.5	43.5	14.5	9.8	76.0	46.5	15.3
55	3.50	50.5	35.0	10.5	5.4	58.4	39.5	12.4	7.8	67.5	43.7	14.5	9.9	76.0	46.5	15.4
60	3.57	51.0	35.0	11.0	5.5	58.5	39.6	12.5	7.9	68.0	44.0	14.7	10.0	76.5	46.8	15.5
65	3.63	51.0	35.0	11.0	5.5	59.0	39.7	12.5	8.1	68.0	44.0	14.9	10.2	77.0	47.0	15.6
70	3.68	51.5	35.2	11.0	5.6	59.1	39.9	12.7	8.2	68.5	44.2	15.0	10.3	77.3	47.1	15.9
75	3.74	51.8	35.5	11.0	5.7	59.5	40.0	12.9	8.3	69.0	44.4	15.1	10.5	77.5	47.4	16.0
80	3.85	52.0	35.8	11.0	5.8	60.0	40.2	13.0	8.4	69.0	44.5	15.3	10.6	78.0	47.5	16.2
85	3.94	52.4	36.0	11.5	5.9	60.1	40.4	13.2	8.6	69.5	44.8	15.5	10.8	79.0	47.9	16.5
90	4.05	53.0	36.0	12.0	6.0	60.7	40.6	13.4	8.8	70.0	45.0	15.8	11.1	79.5	48.2	16.8
95	4.21	53.7	36.6	12.0	6.3	61.2	41.0	14.0	9.2	71.0	45.6	16.5	11.8	80.5	48.6	17.2
Males	*n* 1073	*n* 1056	*n* 1060	*n* 1052	*n* 925	*n* 925	*n* 919	*n* 919	*n* 890	*n* 888	*n* 888	*n* 890	*n* 794	*n* 796	*n* 796	*n* 792
5	2.66	46.7	32.8	9.0	4.6	55.3	38.3	11.0	6.9	64.6	42.6	13.0	8.7	73.0	45.4	13.7
10	2.90	48.0	33.0	9.2	4.8	56.3	38.6	11.4	7.2	65.5	43.2	13.4	9.1	74.0	46.0	14.1
15	3.01	48.6	34.0	9.5	5.0	57.0	39.0	11.5	7.4	66.1	43.5	13.6	9.3	74.5	46.4	14.5
20	3.14	49.0	34.0	9.9	5.1	57.5	39.3	11.9	7.5	67.0	43.7	14.0	9.5	75.0	46.5	14.6
25	3.21	49.4	34.0	10.0	5.3	57.9	39.5	12.0	7.7	67.0	44.0	14.0	9.6	75.5	46.8	14.8
30	3.30	49.9	34.5	10.0	5.4	58.0	39.6	12.1	7.8	67.5	44.1	14.2	9.8	76.0	47.0	15.0
35	3.35	50.0	35.0	10.0	5.5	58.4	39.8	12.3	8.0	68.0	44.3	14.3	10.0	76.0	47.1	15.2
40	3.42	50.5	35.0	10.0	5.6	58.6	40.0	12.5	8.1	68.0	44.5	14.5	10.1	76.5	47.3	15.3
45	3.48	50.8	35.0	10.0	5.7	59.0	40.0	12.5	8.2	68.5	44.6	14.6	10.2	77.0	47.5	15.5
50	3.54	51.0	35.0	10.5	5.7	59.1	40.3	12.7	8.3	69.0	44.7	14.7	10.3	77.3	47.6	15.5
55	3.60	51.1	35.5	10.5	5.8	59.5	40.5	12.9	8.4	69.0	44.9	14.9	10.5	77.5	47.8	15.7
60	3.66	51.5	35.6	11.0	5.9	59.6	40.5	13.0	8.5	69.5	45.0	15.0	10.7	78.0	48.0	15.8
65	3.73	51.9	36.0	11.0	6.0	60.0	40.7	13.0	8.7	69.7	45.2	15.2	10.8	78.0	48.1	16.0
70	3.79	52.0	36.0	11.0	6.1	60.2	41.0	13.2	8.8	70.0	45.4	15.4	10.9	78.5	48.2	16.2
75	3.85	52.5	36.0	11.0	6.2	60.5	41.1	13.4	8.9	70.5	45.5	15.5	11.1	79.0	48.5	16.4
80	3.96	52.9	36.3	11.5	6.3	61.0	41.3	13.5	9.1	71.0	45.8	15.7	11.2	79.5	48.7	16.5
85	4.06	53.0	36.6	11.6	6.4	61.4	41.5	13.7	9.3	71.0	46.0	16.0	11.5	80.0	49.0	16.8
90	4.15	53.7	37.0	12.0	6.7	62.0	41.9	14.0	9.6	72.0	46.4	16.2	11.8	80.5	49.5	17.0
95	4.35	54.3	37.2	12.0	6.9	62.8	42.3	14.3	9.9	72.5	46.9	16.7	12.3	81.5	50.0	17.5

M-arm: mid upper arm circumference

paternal DNA, umbilical cord blood and DNA and paediatric sampling at 24 months and 5 years); high follow-up rate; clinically validated assessments and outcomes and a coherent and comprehensive longitudinal database. Study weaknesses include regionally based recruitment and the high proportion of tertiary-educated women in the study. Biological specimens of maternal blood at delivery or of infants at 6 or 12 months are not available. Due to a lag period between study initiation and arrival of the PEAPOD, and development of local hospital infrastructure, a small number of infants did not have body composition analysis (27%) or TEWL measurement performed (20%) 96 h after delivery.

In summary, data collected in the Cork BASELINE birth cohort will provide clinical researchers and policymakers with a reference platform for Irish children. This unique biobank of information will help make a significant contribution in addressing the knowledge deficits globally in the origins of paediatric and adult obesity and metabolic complications, suboptimal bone and muscle growth and development, neurocognitive performance and paediatric atopic disease. In addition this maternal-child cohort will

be an additional resource for researchers studying rare disorders of infant health, through collaboration with other European and international birth cohorts.[29]

Can I get hold of the data? Where can I find out more?

The Cork BASELINE birth cohort is involved in European collaborative projects including CHICOS [http://www.chicosproject.eu/], and contributes to tasks in three EU FP7 projects: ODIN (Food-Based Solutions for Optimal Vitamin D Nutrition, Contract 613977, which is co-ordinated by University College Cork), IFAAM (Integrated Approaches to Food Allergen and Allergy Risk Management, Contract 312147) and EarlyNutrition (Contract 289346). Researchers interested in collaboration can contact [baseline@ucc.ie] and further information be found at [http://www.baselinestudy.net/ or http://www.birthcohorts.net/].

Funding

The SCOPE Ireland Study was funded by the Health Research Board of Ireland (CSA 02/2007). L.C.K. is a Science Foundation Ireland (SFI) principal investigator (PI) (08/IN.1/B2083) and L.C.K., D.M. and M.K. are PIs in the SFI-funded Research Centre, INFANT (12/RC/2272). The birth cohort was funded by the National Children's Research Centre (NCRC) in 2008 and by a grant from the UK Food Standards Agency to J.O'B.H. and A.D.I. in 2009. The NCRC extended the funding in 2012 to allow extensive nutritional and metabolic phenotyping at 2 years and to enable a similar follow-up at 5 years. Dietary assessment at 2 years was partly funded by Danone Nutricia to M.K. Analysis of vitamin D status in SCOPE and BASELINE was supported by funding from the Higher Education Authority Program for Research in Third Level Institutions, Cycle 4.

Acknowledgements

We thank all the families for participating in the birth cohort and the research team.

Author contributions

D.M. is the BASELINE PI and J.O'B.H., L.C.K., A.D.I. and M.K. are co-PIs leading the research in BASELINE in their specialist fields; L.C.K. is the PI of SCOPE. S.O'D. carried out data collection, database construction and data analysis from birth to 12 months. S.O'D. and M.K. drafted the manuscript and M.K. had responsibility for the final content. All authors reviewed and approved the final submission.

Conflicts of interest: None declared.

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