

1958 British Birth Cohort Study (National Child Development Study) Age 62 Sweep Biomeasures – 2023 Data Collection Update

Data Collection

The NCDS Age 62 Survey started fieldwork January 2020, was paused in March 2020 due to the COVID pandemic but re-started in November 2021 (the main interview was conducted by video call until April 2022 when interviewers re-started face to face visits but health visits were able to resume in November 2021). This sweep includes the following elements:

- 1) 90 minute face-to-face interview including cognitive assessments, self-completion questionnaire (conducted either via CASI or CAWI, depending on interview mode) and the collection of data linkage consents from cohort members and cohabiting partners (health and economic records)
- 2) 60 minute health visit
- 3) Additional paper self-completion questionnaire to be completed in advance of interview
- 4) Retrospective 'childhood circumstances' paper self-completion questionnaire
- 5) Online diet questionnaire to be completed on 2 days following health visit

The main stage of fieldwork was preceded by three pilot studies. A 'pre-pilot' focused on the biomeasures to be administered during the health visit was conducted in September 2018 with 36 members of the public aged 57 to 67. A pilot study involving an issued sample of 100 study members was conducted in February/March 2019. A 'dress rehearsal' involving an issued sample of 300 cohort members took place in June-September 2019. After main stage fieldwork was paused due to the pandemic, an additional 4-week 'Restart Interviewer Pilot' was conducted in May 2021 to assess video-interviewing (CAVI) as an alternative interview mode.

Trained NatCen Social Research and Kantar Public interviewers collect non-biomedical data (e.g. demographic, psychological, and economic information). Biomeasures are collected in home visits. At the beginning of fieldwork these visits were conducted by NatCen nurses only. Additional qualified health professionals (e.g. midwives, phlebotomists) and INUVI nurses were added to the health-interview field force during fieldwork. Subsequently, the 'nurse' visit was then referred to as the 'health visit'.

The following measurements will be administered in this order:

1. Seated and standing blood pressure*
2. Maximal grip strength
3. Venous non-fasting blood collection (including centrifugation)
4. Anthropometry: Weight and body fat, waist and hip circumference**
5. Timed normal walking speed
6. Standing balance: Leg raise

*The pre-pilot also included a measurement of how blood pressure responds to exercise. Blood pressure was measured after 3 minutes of stepping (using an

exercise step) and again after 3 minutes of rest. However, this measurement was dropped because of the length of time taken to administer.

**The pilot included height measurement and a minimum of 2 waist and 2 hip circumference measurements. Due to time limitations, height measurement was dropped and waist and hip circumference measured only once. As height needs to be inputted in the scale to obtain body fat measurements, nurses/health professionals enter the height previously measured in the NCDS biomedical sweep or the self-reported height from the interview.

This summary describes the equipment and protocol used and subsequently notes comparability with other key studies to foster cross-cohort comparative research.

Seated and Standing Blood Pressure

Equipment: Omron HEM-907 blood pressure monitor

Protocol

- Respondents are asked to sit silently and rest for 4 minutes.
- Two measurements are taken on the **left** arm, with a 1 minute interval in between each measure. (Three measurements were taken in the pre-pilot and pilot stages of NCDS. Due to time limitations, this was reduced to two measurements.)
- The respondent is then asked to stand for 1 minute.
- One standing measurement is taken, also on the left arm.

Comparability, within NCDS:

- The NCDS 44-45y biomedical used the same protocol as above (with a 5 minute rest) with an older model of the blood pressure monitor which is no longer available (Omron 705). The NCDS biomedical also measured seated blood pressure three times, whereas NCDS Age 62 will be measuring it twice due to time limitations.

Comparability, cross-cohort:

- With the exception of the resting time and number of seated measurements, this is the same protocol and equipment that NSHD (age 69) has used and that is used in BCS70 (46y) and ELSA; however, BP is taken on the right arm in those studies rather than the left.

Grip Strength

Equipment: Jamar Plus+ Digital Hand Dynamometer

Protocol

- Exclusions: swelling or inflammation, severe pain or recent injury in their hands, surgery to the hand in the last 6 months, blood pressure over ≥ 200 mmHg for systolic or ≥ 120 mmHg for diastolic.
- Following the NIH Toolbox protocol, respondents are seated with both feet flat on the floor with their arm close to but not touching their side, and elbow at a 90-degree angle. The respondent holds the dynamometer with their thumb facing upwards and wrist in neutral position; the nurse/health professional supports the dynamometer. The handle position is set at '2' for all respondents.
- Four measurements are taken starting with the left hand: left, right, left, right.

Comparability, within NCDS: n/a not measured previously in NCDS.

Comparability, cross-cohort:

- Grip strength has previously been measured in BCS70 (46y), ELSA and NSHD (63y, 69y).
- However, the instrument that will be used in this sweep differs from that of BCS70 and ELSA, which uses an analogue dynamometer, the Smedley spring-gauge dynamometer. Research conducted by the 1946 cohort team with Carli Lessof from Kantar Public showed that grip strength results are significantly affected by whether an analogue or digital dynamometer is used. The Jamar digital dynamometer that will be used has been the most widely used instrument in studies of grip strength, with established test-rest, inter-rater and intra-rater reliability according to a recent meta-analysis (Dodd 2016). The Jamar was used in NSHD (69y) and was also found to be comparable to the Nottingham dynamometer used in NSHD (63y).
- BCS70 (46y) and ELSA protocols also differ as it requires that the respondent stand (if able). In this sweep, we will be using a seated protocol, which is the most widely used protocol in grip strength studies (Roberts et al 2011). NSHD, ALSPAC, SABRE and NIH Toolbox all use a seated protocol. Further, recent attempts at standardisation in grip strength measurements use as its basis the seated positioning recommended by the American Society of Hand Therapists for this instrument.
- In the pre-pilot we attempted to use the same seated positioning (also known as the Southampton protocol) used in the age 63 and 69 sweep of NSHD but chose the NIH Toolbox positioning instead (this is also the 2015 American Society of Hand Therapists protocol- MacDermid et al). The NIH Toolbox protocol is different from the Southampton protocol in two ways. First, it does not require the respondent to rest their arm on the arms of a straight-backed chair. In the pre-pilot we encountered many inconsistencies in the execution of the NSHD/Southampton protocol in respondents' homes due to the lack of availability of appropriate chairs, the variety of chairs used and respondents' heights in relation to the arms of the chair. As the NIH Toolbox positioning is nearly identical to NSHD/Southampton's and due to the expected greater reliability of a protocol that does not require a specific kind of chair, we tested the NIH positioning for the pilot and found that nurses/health professionals were able to adhere to this protocol with much greater consistency. The second difference is that this protocol specifies that a standard handle position (set at '2') should be used. In the pre-pilot and pilot, we had nurses/health professionals adjust the handle position to fit each respondent's hand, per the Southampton protocol. However, we found that nurses/health professionals fit the handle to respondents inconsistently. Both for standardisation of the measurement and procedure and due to the extra time taken to adjust the handle, we chose to have the handle position set at 2 for all participants. This is the position that has been found to yield the maximal grip strength for most subjects, and though it was not recorded in the data, the vast majority of NSHD participants were sized to position 2.

Venous Blood Collection (non-fasting) and Centrifugation

Equipment: Venous blood collection kit (butterfly or vacutainer needle); Clinispin Horizon 642 VFD (horizontal rotor).

Protocol

- Exclusions: taking anticoagulant drugs, clotting/bleeding disorder, a fit in the last 5 years
- Blood will be taken from the right arm (where possible).
- Five blood tubes will be collected in the order listed below, following manufacturer recommended order-of-draw and inversion procedures:
 - One 5 ml Rapid Serum tube* (6 inversions)
 - One 2.5 ml SST tube (6 inversions)

- One 3 ml K₂ EDTA tube (10 inversions)
- One 6 ml K₂ EDTA tube (10 inversions)
- One 5 ml PPT EDTA tube* (10 inversions)
- The Rapid Serum tube will be left to clot in a vertical position for 5-8 minutes.
- After the blood in the Rapid Serum tube has clotted, the *asterisk tubes listed above will then be centrifuged according to the recommended centrifugation time and speed of 10 minutes at 1500g, which is pre-set on the centrifuge.

The following assays are conducted from the 2.5 ml SST and 3 ml K₂ EDTA tubes: Total and HDL cholesterol, glycated haemoglobin (HbA1c), triglycerides and high sensitivity c-reactive protein (hsCRP). Participants are provided results for total and HDL cholesterol as well as glycated haemoglobin. These analyses are conducted by RVI Newcastle.

Remaining tubes (RST, K₂ EDTA, PPT EDTA) are sent to University of Bristol for aliquoting and storage for future use:

K₂ EDTA – Buffy coat extracted which facilitates DNA extraction + 6 x 0.5ml aliquots

PPT EDTA – 6 x 0.5 ml aliquots

RST – 6 x 0.5 ml aliquots

A buffy coat is extracted from the 6ml K₂ EDTA tube which facilitates DNA extraction. Applications to make use of stored aliquots for research will be handled via the CLS Data Access Committee.

Comparability, within NCDS:

Total and HDL cholesterol, triglycerides, c-reactive protein (CRP) and glycated haemoglobin (HbA1c) were measured in the 44/45y biomedical follow-up and were measured on non-fasting serum by Olympus model AU640 autoanalyser. HbA1c, however, was analysed from whole bloods removed from a Citrate tube; in this sweep, HbA1c will be analysed from samples from an EDTA tube. In the biomedical follow-up, cell residues from the EDTA tube were sent to Bristol for DNA extraction; aliquots of plasma and citrated plasma were also stored. (Note: Citrate and CPDA tubes were collected in the biomedical follow-up, but will not be used in this sweep.)

Comparability, cross-cohort:

- Total and HDL cholesterol, triglycerides, c-reactive protein (CRP) and glycated haemoglobin were also measured in in BCS70 (46y), ELSA (waves 2, 4, 6, 8), and NSHD (69y), CRP only was measured in NSHD (63Y).
- In BCS70 (46y), remaining samples from the EDTA tube were stored for future analysis.

Anthropometry: Weight and Body Fat, Waist and Hip Circumference

Equipment: Tanita scale BF-522W, Tape measure

Protocol

- Body fat measurement exclusions: Wearing a pacemaker/internal defibrillator
- Waist and hip circumference exclusions: chairbound or having a colostomy/ileostomy

Comparability, within NCDS:

- Weight and waist and hip circumference were measured in the 44-45y NCDS biomedical sweep.
- Body fat has not previously been measured in NCDS.

Comparability, cross-cohort:

- These measurements use the same instrument and protocol as BCS70 (46y), MCS (7y-17y), ELSA and HSE. Waist and hip circumference are measured at least twice, however. The NSHD measured body fat via DXA among the clinic attending sub-sample (60-64y).

Timed Walk

Equipment: Measuring tape, stopwatch

Protocol

- Respondents are asked to walk 8 feet at a normal pace. They are timed from when their foot crosses the starting 'line' to when their foot crosses the finish 'line'.

Comparability, within NCDS:

- n/a not measured previously in NCDS.

Comparability, cross-cohort:

- The same protocol is used in ELSA and the NSHD at 69y.

Leg Raise/Balance

Protocol

- Exclusions: chair-bound/wheelchair bound, or using an aid for standing or walking
- Respondents stand on one foot with the other foot raised a few inches off the ground. Arms are folded across their chest.
- They are asked to try to stay balanced for as long as possible up to 30 seconds. Timing stops when they lose their balance, i.e. if their free foot touches the floor, their arms move away from their chest, or their balancing foot moves position.
- All respondents are asked to perform the test again with their eyes closed.

Comparability, within NCDS:

- Adulthood: n/a not measured previously in NCDS.
- However, simple indicators of balance were measured in childhood-adolescent (11y and 16y).

Comparability, cross-cohort:

- The protocol differs from the one-legged balance test used in BCS70 Age 46 Survey and ELSA. The key differences are that 1) respondents are not allowed to use their arms to maintain their balance but must keep them folded across their chest, and 2) all participants do the eyes-closed test rather than only those who have successfully completed 30 seconds of test with their eyes open. The arms-folded approach was decided due to concerns that allowing the use of arms conflates different dimensions of balance; allowing the use of arms also captures respondents' ability to self-correct. This arms-folded approach is comparable with NSHD (63y, 69y).