

## Lothian Birth Cohorts' profiles and protocols: collect the set

The Lothian Birth Cohort studies began in 1999. The LBC1921 and LBC1936 studies have data that reach far beyond those originally anticipated. Here, we list the profile, protocol and summary articles that provide overviews of the studies. The table below provides a brief description of each article, including where to find it and when to cite it.

Publication year	Contents	Article
2004	LBC1921 Wave 1 Recruitment, testing and data	<p data-bbox="790 464 2078 528"><b>The Impact of Childhood Intelligence on Later Life: Following Up the Scottish Mental Surveys of 1932 and 1947.</b></p> <p data-bbox="790 533 1480 568"><b>Deary et al. <i>Journal of Personality and Social Psychology</i>.</b></p> <p data-bbox="790 572 1193 603"><b>doi: <a href="https://doi.org/10.1037/0022-3514.86.1.130">10.1037/0022-3514.86.1.130</a></b></p> <p data-bbox="790 608 2085 671"><b>Cite this as the protocol paper for baseline data collection (mean age 79 years) of the Lothian Birth Cohort 1921.</b></p> <ul style="list-style-type: none"> <li data-bbox="790 719 2114 855">• <b>Summary:</b> This is the first in a series of protocol and profiles papers published on the Lothian Birth Cohorts. It summarises the motivation behind the Scottish Mental Surveys of 1932 (SMS1932; <math>N=89,498</math>) and 1947 (SMS1947, <math>N=70,805</math>), and describes the follow-up studies inspired by discovery of their data. The contents include: <ul style="list-style-type: none"> <li data-bbox="887 863 2056 927">○ Details of recruitment and testing of surviving SMS1932 participants in older age as part of the Lothian Birth Cohort of 1921 (Wave 1).</li> <li data-bbox="887 935 2096 1034">○ Descriptions of the Scottish Mental Surveys (SMS), including details of the general intelligence sat by SMS participants (the Moray House Test No. 12; MHT), and reasons for the two SMS1947 subsamples: the 36-Day Sample, and 6-Day Sample.</li> <li data-bbox="887 1042 1928 1072">○ Brief details of the Aberdeen Birth Cohorts of 1921 (ABC1921) and 1936 (ABC1936).</li> <li data-bbox="887 1080 1957 1110">○ Descriptions of the original hypotheses to be examined using SMS and follow-up data.</li> <li data-bbox="887 1118 1980 1149">○ Descriptions of the contributions made by these studies to human intelligence research.</li> </ul> </li> <li data-bbox="790 1190 2018 1390">• <b>Analyses:</b> <ul style="list-style-type: none"> <li data-bbox="887 1225 2018 1289">○ The longest and largest follow-up of the stability of intelligence in the literature at the time (stability of IQ scores from age 11 to almost age 80).</li> <li data-bbox="887 1297 1827 1327">○ Examination of the predictive influence of sex on lifetime cognitive change.</li> <li data-bbox="887 1335 1644 1366">○ Test of the dedifferentiation hypothesis of cognitive ageing.</li> <li data-bbox="887 1374 2033 1396">○ First reports on the associations between childhood psychometric intelligence and longevity.</li> </ul> </li> </ul>

		<ul style="list-style-type: none"> <li>○ Novel results on the association between height and intelligence in older age.</li> </ul>
2007	LBC1936 Wave 1 Recruitment, testing and data	<p><b>The Lothian Birth Cohort 1936: a study to examine influences on cognitive ageing from age 11 to age 70 and beyond.</b>  <b>Deary et al. <i>BMC Geriatrics</i>.</b>  <b>doi: <a href="https://doi.org/10.1186/1471-2318-7-28">10.1186/1471-2318-7-28</a></b>  <b>Cite this as the protocol paper for baseline data collection (mean age 70 years) of the Lothian Birth Cohort 1936.</b></p> <ul style="list-style-type: none"> <li>• <b>Summary:</b> The Lothian Birth Cohort 1936 (LBC1936) study began five years after the LBC1921 study. This protocol paper was published following the first full wave of LBC1936 data collection (Wave 1; 2004-2007). The paper was intended to alert other researchers to the data available from the cohort. The contents include: <ul style="list-style-type: none"> <li>○ Details of recruitment and testing of surviving SMS1947 participants in older age as part of the Lothian Birth Cohort of 1936 (Wave 1).</li> <li>○ Recruitment flowchart.</li> <li>○ Comprehensive description of the cognitive test battery (including the MHT originally sat as part of the SMS1947).</li> <li>○ Details of: participant interview including social, medical history and medication questions; physical examination and interview; and LBC1936 study questionnaires.</li> <li>○ Information on data checking (clinic visit data, questionnaire data, and DNA quality control).</li> <li>○ A list of the main objectives of the LBC1936 study.</li> <li>○ Description of key research areas.</li> </ul> </li> </ul>
2011	LBC1936 Brain imaging	<p><b>Brain aging, cognition in youth and old age and vascular disease in the Lothian Birth Cohort 1936: rationale, design and methodology of the imaging protocol.</b>  <b>Wardlaw et al. <i>International Journal of Stroke</i>.</b>  <b>doi: <a href="https://doi.org/10.1111/j.1747-4949.2011.00683.x">10.1111/j.1747-4949.2011.00683.x</a></b>  <b>Cite this as the protocol paper for brain imaging of the Lothian Birth Cohort 1936.</b></p>

		<ul style="list-style-type: none"> <li>• <b>Summary:</b> Brain MRI and neurovascular ultrasound was first introduced at Wave 2 of the Lothian Birth Cohort 1936 study (LBC1936). This paper describes the imaging and analysis protocols developed to study the sample. The contents include: <ul style="list-style-type: none"> <li>○ A detailed report of the brain MRI protocol designed to capture qualitative and quantitative measures of grey and white matter atrophy, severity and location of white matter lesions, enlarged perivascular spaces, brain mineral deposits, microbleeds, and integrity of major white matter tracts.</li> <li>○ Description of the neurovascular ultrasound protocol, including measures of velocity, stenosis, and intima-media thickness of the carotid and vertebral arteries.</li> <li>○ Information on scanning equipment, sequence parameters, definitions of key imaging features, qualitative visual rating scale details, and descriptions of quantitative structural image analysis, diffusion tensor (DT), magnetisation transfer (MT), T<sub>1</sub>-mapping, and tractography MRI measures.</li> <li>○ Description of key hypotheses to be tested using LBC1936 imaging data.</li> <li>○ Description of statistical analysis methods.</li> <li>○ Study organisation and funding details.</li> </ul> </li> </ul>
2012	<p>LBC1921 Data available in Waves 1, 2, 3</p> <p>LBC1936 Data available in Waves 1, 2</p>	<p><b>Cohort Profile: The Lothian Birth Cohorts of 1921 and 1936.</b>  <b>Deary et al. <i>International Journal of Epidemiology</i>.</b>  <b>doi: <a href="https://doi.org/10.1093/ije/dyr197">10.1093/ije/dyr197</a></b></p> <p><b>Cite this as the profile paper for Lothian Birth Cohort 1921 Waves 1, 2, 3 and Lothian Birth Cohort 1936 Waves 1, 2.</b></p> <ul style="list-style-type: none"> <li>• <b>Summary:</b> This combined cohort profile article describes the origins, tracing, recruitment, and follow-up testing of both the Lothian Birth Cohort of 1921 (LBC1921) and the Lothian Birth Cohort of 1936 (LBC1936). At time of publication, Wave 4 of follow-up testing was underway in the LBC1921, and Wave 2 of follow-up testing had been completed in the LBC1936. The contents include: <ul style="list-style-type: none"> <li>○ Details of core funding, including the principal aims of each grant</li> <li>○ Reports on attrition in the LBC studies and how it affects key variables (differences between returnees and non-returnees).</li> <li>○ Tables summarising cohort composition and measurements taken at each wave of testing.</li> <li>○ Summary of key findings and publications from the LBC1921 and LBC1936 studies until 2012.</li> </ul> </li> </ul>

2015	LBC1936 Post-mortem brain tissue	<p><b>Post-mortem brain analyses of the Lothian Birth Cohort 1936: extending lifetime cognitive and brain phenotyping to the level of the synapse.</b>  <b>Henstridge et al. <i>Acta Neuropathologica Communications</i>.</b>  <b>doi: <a href="https://doi.org/10.1186/s40478-015-0232-0">10.1186/s40478-015-0232-0</a></b>  <b>Cite this as the protocol paper for post-mortem brain tissue sampling and analysis of the Lothian Birth Cohort 1936.</b></p> <ul style="list-style-type: none"> <li>• <b>Summary:</b> During Wave 3 (mean age 76) of LBC1936, participants were invited to give pre-mortem consent for post-mortem brain tissue donation. The aim was to extend brain characterisation to the level of the synapse, and to document synaptic alterations as a potential substrate for the neuropathological underpinnings of cognitive ageing. This paper showcases the information that can be generated post-mortem from LBC1936 donors. The contents include: <ul style="list-style-type: none"> <li>○ Details of novel post-mortem protocol for processing of tissue at autopsy, for the facilitation of high-resolution neuropathological analysis in the Lothian Birth Cohort 1936.</li> <li>○ Detailed information on post-mortem procedures, including tissue preparation and regions of interest for dissection; biochemistry, neuropathology, burden quantification, cortical thickness, and neuron and microglia density assessments; and electron microscopy, and array tomography.</li> <li>○ Pilot data from the first LBC1936 brain tissue donation</li> </ul> </li> <li>• <b>Analyses:</b> <ul style="list-style-type: none"> <li>○ Comparison of neuropathology in the brain tissue of the LBC1936 participant and Alzheimer’s-diseased (AD) and motor-neuron-diseased (MND) brain tissue.</li> </ul> </li> </ul>
2017	LBC1921 & LBC1936 Results summary from 1999-2017	<p><b>Healthy Cognitive Ageing in the Lothian Birth Cohort Studies: Marginal Gains Not Magic Bullet.</b>  <b>Corley et al. <i>Psychological Medicine</i>.</b>  <b>doi: <a href="https://doi.org/10.1017/S0033291717001489">10.1017/S0033291717001489</a></b>  <b>Cite this invited review to summarise the results of cognitive ageing research from the Lothian Birth Cohorts of 1921 and 1936 from 1999 to 2017.</b></p> <ul style="list-style-type: none"> <li>• <b>Summary:</b> This paper documents key results from more than 300 Lothian Birth Cohort studies’ publications, focusing on the reports of cognitive and brain ageing in relation to genetics, early life and demographics, lifestyle and psychosocial factors, health and biomedical factors. The concept of marginal gains, whereby there might be a cumulative effect of small incremental improvements across a wide range</li> </ul>

		<p>of lifestyle and health-related factors, is suggested as a useful way to think about healthy cognitive and brain ageing. The contents include:</p> <ul style="list-style-type: none"> <li>○ Discussion of results in context of one another, and in relation to existing findings from the field.</li> <li>○ Key methodological issues, such as confounding by early-life intelligence and social factors</li> <li>○ Discussion of areas requiring further investigation</li> </ul>
2018	<p>LBC1921 Data available in Waves 1, 2, 3, 4, 5</p> <p>LBC1936 Data available in Waves 1, 2, 3, 4</p>	<p><b>Cohort Profile Update: The Lothian Birth Cohorts of 1921 and 1936.</b>  <b>Taylor et al. <i>International Journal of Epidemiology</i>.</b>  <b>doi: <a href="https://doi.org/10.1093/ije/dyy022">10.1093/ije/dyy022</a></b>  <b>Cite this as the profile paper for Lothian Birth Cohort 1921 Waves 1, 2, 3, 4, 5, and Lothian Birth Cohort 1936 Waves 1, 2, 3, 4.</b></p> <ul style="list-style-type: none"> <li>• <b>Summary:</b> This paper describes the key ways in which the LBC1921 and LBC1936 studies have progressed since their 2012 cohorts' profile and how they stand in 2018. Together the cohorts' data spanned most of the period we think of as older age in humans (70 to 92 years). This profile update was intended as a useful tool to inform would-be collaborators of the broad range of data available from the cohorts, and to inspire new collaborative projects. The contents include: <ul style="list-style-type: none"> <li>○ Summary tables describing waves LBC1921 and LBC1936 data collection.</li> <li>○ Sample characteristics of LBC1921 and LBC1936 participants across study waves by returning status.</li> <li>○ Recruitment and attrition flowcharts.</li> <li>○ Description of new data types and experimental methods.</li> <li>○ Summary of key findings and publications between 2012 and 2017.</li> <li>○ Extensive report on all variables collected at each wave of testing (then-available and then-forthcoming) in the form of data grids.</li> </ul> </li> <li>• <b>Analyses:</b> Examination of how attrition affects key variables at each wave (completer vs dropout).</li> </ul>