Christmas Newsletter 2025

THE UNIVERSITY of EDINBURGH
Lothian Birth Cohorts

WELCOME!

Welcome to the Lothian Birth Cohorts (LBCs) 2025 Christmas newsletter!

As always, the LBC team has been hard at work throughout the year, and we're excited to share our latest updates. In this newsletter, you'll find highlights from recent developments, new publications, and events where we've presented our findings. Thank you for your continued support — none of this would be possible without you.

We hope you have a very happy festive season, and wish you and your loved ones all the best for 2026.

WAVE 7 OF THE LBC1936 COMPLETED!

A heartfelt thank you to everyone who took part in Wave 7 of the LBC1936 study. We were delighted to welcome 192 of you back to the Wellcome Trust Clinical Research Facility for your cognitive testing appointments, and 132 of you to the Edinburgh Imaging Facility for MRI scans. Many of you have now been involved in the study for over 20 years, and your continued commitment has helped create one of the world's most important resources for understanding ageing and brain health. We are deeply grateful for your dedication — we simply could not do this work without you.

The team is now busy preparing for a new wave of testing, due to begin early next year. We will be in touch soon as we start inviting you back again for Wave 8 of the LBC1936 study! This is an especially important wave. It's the final full round of follow-up for which we currently have funding. This wave of the study will conclude in the year of your 90th birthdays, aligning with the milestone reached by the Lothian Birth Cohort 1921, and offering unique opportunities for scientific comparison. We will of course also be aiming to see some of you beyond this, as Research Partners, in focus groups, and in other ways to collect data and ask for your insights as we continue this long-term programme of research.

LBC REUNION 2025

To celebrate the completion of the 7th wave of data collection, many of you joined the LBC team and collaborators at the study reunion. The reunion took place on a sunny Tuesday in June at the beautiful Edinburgh Futures Institute. It was a wonderful opportunity to celebrate

your dedication and commitment to the study, to show how your hard work and data have contributed to novel scientific discoveries, made a difference for future generations, and inspired our public engagement on healthy cognitive ageing. We hope you found the talks interesting and enjoyed the chance to catch up with friends and staff over coffee and cakes.

LBC SETTLE INTO NEW HOME AT EDINBURGH FUTURES INSTITUTE

After months of preparation, the Lothian Birth Cohorts team moved into our new home at the Edinburgh Futures Institute (EFI). Since August, we've been enjoying the open office space in this beautifully restored historic building, meeting new colleagues along the ward, and taking part in EFI-wide welcome events. In September, Professor Simon Cox introduced our team and research at the EFI Research Showcase. The event provided an opportunity to share the Lothian Birth Cohorts' findings, future plans, and the funding that supports our work. The showcase highlighted opportunities for collaboration with other centres and marked the start of a regular series of talks, held on the last Wednesday of each month. We look forward to hearing from more colleagues—and to welcoming collaborators and visitors to the ward, as part of EFI's commitment to open, shared working practices. Simon said: *It is testament to the study – including your hard work and the hard work of the team - that we are one of only a handful of groups across the university to be based in this new flagship building. This public-facing institute offers outstanding potential to share our important research findings, and to collaborate in new ways towards new discoveries about brain and cognitive ageing.*

LBC 1936 STAFF UPDATES

Welcome to the team, Ines

We're delighted to introduce a new member to the team: Dr Ines Mesa-Eguiagaray, a postdoctoral researcher with expertise in statistical genetics. At the Usher Institute, Ines contributed to population-based studies that integrated genetic, epigenetic, and lifestyle data to explore molecular and environmental mechanisms underlying breast and colorectal cancer. As part of the LBC group, she will be working with Dr Sarah Harris on longitudinal studies of proteins in the blood to understand changes in thinking and brain health before Alzheimer's disease develops. Ines said: '*I am excited to join and learn from such a collaborative team, and to contribute to identifying proteins that could become diagnostic and treatment targets for Alzheimer's disease, ultimately improving patients' outcomes and quality of life.*'

Thank you, Dave

We'd like to extend our heartfelt thanks and warmest wishes to David Liewald — or Dave, as he's known to the team — who has retired after more than two decades of dedicated service to the Lothian Birth Cohorts. Since joining the team in 2004, Dave has been an invaluable member of the core support group, providing expert computational support across a wide range of projects. His contributions have included everything from setting up and maintaining our computer systems, to developing software that supports genetic studies, brain imaging datasets, and even our popular Augmented Reality Glasses that illustrate brain ageing for the public. Dave's technical expertise, dedication, and good humour have been a cornerstone of our work. He has supported the team with generosity and skill, and his presence will be deeply missed. We wish Dave a retirement filled with fun, relaxation, and adventure — and we thank him for everything he's brought to the LBC team. Thank you, Dave!

SCIENTIFIC HIGHLIGHTS

Here are just a few of the discoveries our researchers and collaborators have made in 2025, using your data:

COGNITIVE AGEING

Tracking a Gene's Effect on Intelligence Over a Lifetime

Author: Ian Deary et al.

Journal: *Molecular Psychiatry*

This study used long-term data from the Lothian Birth Cohorts of 1921 and 1936 to explore how a genetic variant—*APOE e4*—affects cognitive ability across the lifespan. *APOE e4* is known to increase the risk of age-related cognitive decline and dementia, but its influence at different ages has been less clear. Researchers analysed scores from the Moray House Test, taken by participants at ages 11, 70, 76, 79, 87, and 90. They found that *APOE e4* had little to no effect on thinking skills in childhood to early older age. However, its impact grew steadily with age, becoming more pronounced by age 90. The effect remained even after accounting for health conditions like stroke or diabetes. But when participants who later developed dementia were excluded, the influence of *APOE e4* was weaker and often not statistically significant.

These findings suggest that *APOE e4* may make the brain more vulnerable to cognitive decline later in life, especially in the context of dementia. The LBC data provided a rare opportunity to track this genetic influence over nearly eight decades, helping researchers understand how genetic risk unfolds over time.

Cognitive Skills Become More Interconnected with Age

Author: Joanna Moodie et al.

Journal: *Journal of Gerontology: Psychological Sciences*

A recent study led by LBC postdoctoral researcher Dr Joanna Moodie looked at how thinking skills change as we get older. This research found that with age, different mental abilities such as memory, reasoning, problem-solving, and processing speed become more interconnected. Simply put, how you do on one kind of thinking test becomes more closely linked to how you do on others over time.

Using LBC1936 data, researchers found that the role of general thinking ability grew stronger over time. At age 70, it explained about a quarter of the differences in scores across tests; by age 82, it explained over a third. This shows that scores across different thinking tests became more similar with age. Skills that rely on learning and reasoning became more similar over time, while knowledge and experience-based skills (like vocabulary) played a smaller role in overall thinking. These changes suggest that the way our mental abilities work together shifts as we get older, which is important for understanding and supporting mental health in later life.

BRAIN AGEING

What One Scan Can Tell Us About Brain Ageing

Author: Anna Fürtjes et al.

Journal: *Nature Communications*

A new study led by Dr Anna Fürtjes, using LBC1936 data, explored how we can estimate lifelong brain changes from just one MRI scan. Normally, researchers need multiple scans over many years to measure how much the brain shrinks with age. In this study, scientists tested different ways to estimate brain shrinkage (atrophy) from a single scan and found one approach that worked especially well.

They discovered that the amount of brain shrinkage estimated this way was linked to thinking skills, overall health, and genetics. In fact, about 40% of the differences between people's atrophy could be explained by genetic factors. This finding helps researchers understand why some people's brains age more gently than others and highlights that genes beyond the well-known *APOE* also play a role.

Brain Maps of General Cognitive Ability

Author: Joanna Moodie et al.

Journal: *Translational Psychiatry*

In this study, researchers wanted to understand which areas of the brain—based on their size and shape—are most closely linked to differences in overall thinking ability, or general intelligence, among individuals. They looked at brain scans from over 38,000 people, including many participants from the LBC1936. The team examined the size, thickness, and

other features of different brain areas, as well as deeper biological characteristics, such as gene activity and chemical receptors.

The researchers found that certain parts of the brain are especially important for general thinking ability. These include regions that support memory, problem-solving, and attention. These areas don't work alone—their structure reflects how brain cells are connected and how they communicate with each other. Remarkably, the patterns linking brain structure to thinking ability were consistent across all groups studied.

This gives more detail about the many ways in which our brains are built and organized to support how well we think, and these features remain important even in older age. By studying these patterns, scientists hope to better understand how the brain supports thinking and how it changes as we grow older. As part of this work, the researchers created a detailed map showing how different areas of the brain are connected to overall thinking and specific mental skills. This map will help guide future research into how the brain supports different aspects of behaviour and thinking.

BEYOND BRAIN AND COGNITIVE AGEING

A New Way to Measure How the Body Ages

Author: Juan-Felipe Perez-Correa et al.

Journal: *Genome Biology*

While it's easy to count how many birthdays we've had, that number doesn't always show how well our bodies are really ageing. Scientists are now using changes in our DNA to get a better idea of "biological age" — how well our bodies are ageing beneath the surface, rather than just how old we are.

In a recent study published in Genome Biology, researchers, using data from large studies, including LBC1921 and LBC1936 cohorts, tested a new way of estimating this biological age. Instead of giving one single number, the new method looks at DNA patterns and estimates a range of likely ages for each person. This gives a more complete picture of how steadily someone is ageing, showing whether their biological ageing is consistent or more variable.

The team found that people whose DNA showed more stable patterns of ageing tended to be in better health and lived longer — especially among those in the LBC1921 group. This discovery could help scientists understand the difference between healthy and unhealthy ageing, and may one day improve how doctors assess health and disease risk.

Air Pollution and Dementia Risk Across Life

Author: Otto-Emil Jutila et al.

Journal: *Environmental Epidemiology*

A new study led by PhD student Otto-Emil Jutila using LBC1936 data from 572 LBC1936 participants, who provided lifetime residential history in 2014, has looked at how air pollution throughout life might be linked to dementia in later years. Using a detailed air pollution model, researchers estimated participants' exposure to fine particulate matter (PM2.5) at different points in time, from 1935 through 2007. The study found that higher cumulative exposure to air pollution over a lifetime was linked to an increased risk of Alzheimer's disease. Interestingly, exposure during specific short periods didn't show a strong link. But when looking at long-term exposure starting even before birth, the results suggested that 45+ years of exposure were weakly associated with a higher risk of Alzheimer's indicating the likely low-level but cumulative effects of pollution exposure over the lifespan. These findings highlight the importance of considering life-long exposure to air pollution when thinking about dementia risk. Otto told The Guardian: "*Air pollution exposure is a life-course problem with long-term detrimental effects on health*." The study has received attention in both academic and media circles and underscores the potential value of policies to reduce air pollution throughout life as a way to protect brain health.

OUR RESEARCH IN THE NEWS AND COMMUNITY

FROM GRIP STRENGTH TO GREEN SPACES: LBC IN THE MEDIA

The Lothian Birth Cohorts have received plenty of media coverage lately, showcasing the importance of LBC research. One example is a renewed interest in research on grip strength. A recent Times article mentioned an important study from 2014 that included data from the LBC1921 participants. The study showed how hand grip strength can tell us a lot about a person's general health and how long they might live. This work is still being used by researchers today and reminds us how important it is to look at physical ability throughout life.

BBC Future recently highlighted the benefits of gardening, touching on themes central to ageing and cognitive wellbeing. With growing recognition of how outdoor activities support mental health, physical resilience, and social connections, LBC research led by Dr Janie Corley continues to inform discussions on lifestyle factors that promote healthy ageing. Janie's work has reached wide audiences through over 60 news stories across the UK and beyond, and was further acknowledged when she provided expert comment for Environmental Health News following the Royal Horticultural Society's landmark State of Gardening report. Using AI mapping to assess green space across the UK, the study revealed stark disparities: while 41% of London's land is garden, the figure drops to 19% in Leeds, 25% in Edinburgh, and 27%

in Cardiff. Janie emphasised that gardens benefit both health and the environment, buffering challenges such as heat, flooding, and pollution, and she joins the Royal Horticultural Society in calling on government to guarantee "Space to Grow" in all new housing developments, treating gardens as essential infrastructure rather than a luxury. This engagement underscores the role of LBC research in shaping national conversations on environmental and public health.

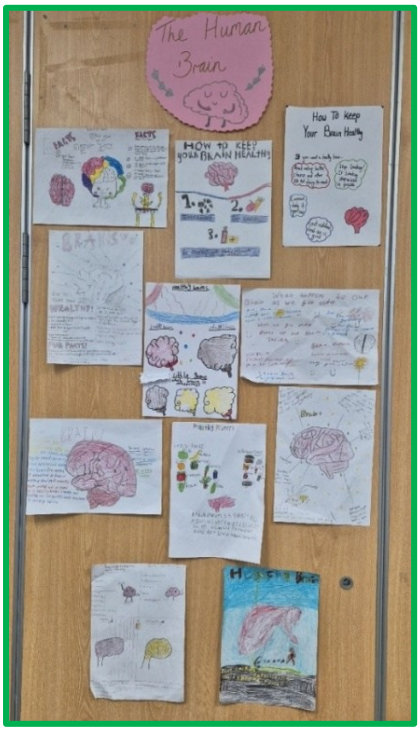
Simon Cox was also featured on BBC Future recently, offering his insights on reaction times and what they can tell us about brain health. Studies like the LBCs help scientists understand how thinking skills change as we get older, and what might help keep our minds sharp.

BBC FUTURE

To access these online resources:

1. **Open your camera app (on most smartphones)**
2. **Hold your phone so that the QR code is visible in the camera's view**
3. **A link should appear – tap to open.**

CELEBRATING BRAIN AWARENESS WEEK AT ST FRANCIS PRIMARY SCHOOL



On 12 March, nearly 50 excited P7 pupils at St Francis Primary School took part in Brain Awareness Week workshops, exploring the fascinating world of brain health and thinking skills. The sessions were led by volunteers from the LBC research team and Boroughmuir High School, who made the workshops interactive and fun. The pupils learned about the LBC studies, and how your data is helping scientists understand memory, brain function, and how the brain changes as we age.

To bring these ideas to life, the children played a board game called "Who Gets to Be 100?", answered practice questions from the original LBC tests, and took on cognitive challenges in teams. Competitive spirits ran high as they tackled questions and tested their own cognitive skills! They even got to explore 3D-printed brain models created using LBC data. The room buzzed with excitement, with many pupils asking, '*Can you come back tomorrow?*'

The Boroughmuir High School volunteers added to the energy, helping the children work together and keeping the sessions engaging. As a creative finale, the pupils made posters showcasing what they had learned about keeping their brains healthy, sharing advice on how to stay mentally active and fit for life.

CASTLEBRAE COMMUNITY SCIENCE FESTIVAL

On 21 March, over 200 people joined the Castlebrae Science Festival, organised by the community engagement team at Edinburgh BioQuarter. It was a fun and lively afternoon full of hands-on science, where families, students, and teachers could explore and discover together. Following last year's success, we returned with our interactive display table, featuring 3D-printed brains and augmented reality glasses that show brain ageing using real data from the Lothian Birth Cohorts. Children and parents had the chance to ask questions, explore the displays, and learn about brain health and ageing in a fun, accessible way.

We were supported by volunteers from Edinburgh Neuroscience, whose expertise and enthusiasm helped make the experience lively and engaging. A particularly heart-warming moment was seeing students and teachers from St Francis Primary and Niddrie Mill Primary, who recognised our team from previous school visits. Their excitement and curiosity showed the lasting impact of connecting young minds with science.

Feedback from attendees was overwhelmingly positive, with everyone rating the festival 5 out of 5. Parents especially enjoyed learning alongside their children, sharing in the excitement and discovery. A huge thank you to Edinburgh BioQuarter, our dedicated volunteers, and the enthusiastic families who joined us. We look forward to creating more hands-on science opportunities in the future!

EXPLORING PROTEINS TO UNDERSTAND DISEASE

Proteins are the building blocks of life, controlling almost everything that happens inside our cells. In the LBCs, we measure them in your blood. Studying them—a field known as *proteomics*—helps scientists better understand health, disease, and how new treatments might work.

On 9 May, the University of Edinburgh hosted the *Molecular Epidemiology Symposium: The Role of Proteomics in Disease*, co-organised by Dr Sarah Harris and Professor Riccardo Marioni, both researchers with the Lothian Birth Cohorts. Around 100 researchers gathered to share the latest discoveries in proteomics, using advanced technologies that can measure thousands

of proteins at once. Sarah presented her research, funded by the National Institutes of Health, on protein markers that could reveal early signs of cognitive decline before dementia begins. Riccardo led a lively Q&A with Dr Robert Scott from GSK about how proteomics can support new drug development. '*It was a highly educational day filled with inspiring talks*,' said Sarah. The event, supported by One Health Genomics Edinburgh and sponsored by bioXcelerate AI, highlighted how studying proteins could transform the way we understand and treat diseases like Alzheimer's in the future.

FAMILIES EXPLORE BRAIN HEALTH AT UNIVERSITY WORKSHOP

On Saturday 10 May, families from Glasgow and Craigmillar joined the University of Edinburgh for an inspiring workshop on lifelong learning and brain health. Hosted by the University's Widening Participation Team and delivered by the LBC team for IntoUniversity – a charity that works with children and their families to raise aspirations, build confidence, and support educational attainment, the event welcomed 40 P6 and P7 students with their parents and carers.

Participants enjoyed hands-on activities, including the "Bridge Your Mind" walking tour, which linked Edinburgh landmarks to insights from the Lothian Birth Cohort studies. Children played "The Game of Life: Who Wants to Be 100?", exploring how lifestyle choices—like staying active or learning a new skill—can support brain health. Parents and carers joined a Q&A on cognitive research and brain health.

Families praised the workshop, with one parent saying, '*I learned alongside my children and found it useful to think about educational opportunities for both them and myself*,' and another adding, '*Excellent experience, learned a lot!*'

The event's success was thanks to the enthusiasm of volunteers from the Lothian Birth Cohorts and PhD students in Translational Neuroscience, making learning engaging, informative, and fun for all.

DOORS OPEN DAY AT EFI

On Saturday 27 September, we joined colleagues at the Edinburgh Futures Institute for Doors Open Day, hosting a stall about the Lothian Birth Cohorts and our research into brain and cognitive ageing. It was a lively and engaging day, with a steady stream of visitors from a wide range of backgrounds and ages. Families, local residents, visitors from across Scotland, and international guests all stopped by to learn more. Some were drawn in by our 3D-printed brains, others tested out our Augmented Reality glasses,

and many stayed to have thoughtful conversations about the study, its findings, and what they mean to them. A particular highlight was welcoming an LBC participant who had marked the date during our study reunion in June. Several visitors came because they knew someone who had taken part in the study and wanted to find out more.

SECOND YEAR OF HEALTHY BRAINS AT BOROUGHMUIR HIGH SCHOOL

The second year of the S5 Healthy Brains programme at Boroughmuir High School is well underway. We've now completed the first phase, where students heard from an inspiring line-up of researchers and clinicians connected to the Lothian Birth Cohorts and beyond. The talks spanned a wide range of themes—from cognitive ageing and long-term testing to genetics, mental health, and clinical care. Professor Ian Deary set the scene with the history and key findings of cognitive ageing research, followed by Sabela Mendez, who described the cognitive tests participants have completed over the past 20 years. Dr Sarah Harris highlighted how genes and proteins influence brain health, while Dr Matthew Iveson examined mental health across the lifecourse. Dr Catriona Nieven then offered a clinical perspective, sharing her experiences as a doctor on a geriatric ward. The programme also included a visit to the Edinburgh Futures Institute, where Simon Cox gave an inspiring talk on neuroscience. Building on these insights, the students will now turn their attention to creating science communication materials based on what they've learned. These will include activities designed for younger pupils, with a small group preparing to join our team in local primary schools next spring. We're delighted to be working with a group of S6 volunteers, who will support this next phase and collaborate with the S5 class. We're looking forward to seeing what the students create—and how they bring brain health research to life for new audiences.

MERRY CHRISTMAS, AND THANK YOU FROM THE LBC TEAM

As a member of the LBC, your contributions are helping to further our knowledge and understanding of cognitive, brain, and general ageing. Thank you for your continued interest and involvement; we look forward to seeing you in 2026 and beyond.

LBC publication highlights 2025

- Bernabeu, E., et al. (2025). Blood-based epigenome-wide association study and prediction of alcohol consumption. Clinical Epigenetics.
- Chamberlain, J. D., et al. (2025). Development and validation of an epigenetic signature of allostatic load. Bioscience Reports.
- Chybowska, A. D., et al. (2025). A blood- and brain-based EWAS of smoking. Nature Communications.
- Conole, E. L. S., et al. (2025). Epigenetic clocks and DNA methylation biomarkers of brain health and disease. Nature Reviews Neurology.
- Corley, J., et al. (2025). Dietary exposures and risk of anxiety and depression symptoms in the Lothian Birth Cohort 1936: A cohort-level GLAD Project analysis. Wellcome Open Research.
- Davyson, E., et al. (2025). Insights from a methylome-wide association study of antidepressant exposure. Nature Communications.
- Deary, I. J., et al. (2025). Effect sizes of APOE e4 on the same general cognitive ability test taken by the same people from age 11 to age 90: The Lothian Birth Cohorts 1921 and 1936. Molecular Psychiatry.
- de Kort, F. A. S., et al. (2025). Cerebral white matter hyperintensity volumes: Normative age- and sex-specific values from 15 population-based cohorts comprising 14,876 individuals. Neurobiology of Aging.
- Foote, I. F., et al. (2025). Uncovering the multivariate genetic architecture of frailty with genomic structural equation modelling. Nature Genetics.
- Fürtjes, A. E., et al. (2025). Lifetime brain atrophy estimated from a single MRI: Measurement characteristics and genome-wide correlates. Nature Communications.
- Jutila, O.-E. I., et al. (2025). Life-course exposure to air pollution and the risk of dementia in the Lothian Birth Cohort 1936. Environmental Epidemiology.
- Malkowski, O. S., et al. (2025). Correlates and determinants of physical activity among older adults of lower versus higher socio-economic status: A systematic review and meta-analysis. International Journal of Behavioral Nutrition and Physical Activity.
- Moodie, J. E., et al. (2025). Cognitive dedifferentiation in later life: Longitudinal findings from the Lothian Birth Cohort 1936. The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences.
- Moodie, J. E., et al. (2025). Brain maps of general cognitive functioning: Neuroimaging and neurobiological signatures. Translational Psychiatry.
- Nagarajan, P., et al. (2025). A large-scale genome-wide study of gene–sleep duration interactions for blood pressure in 811,405 individuals from diverse populations. Molecular Psychiatry.
- Park, W., et al. (2025). AI-based deformable hippocampal mesh reflects hippocampal morphological characteristics in relation to cognition in healthy older adults. NeuroImage.
- Perez-Correa, J.-F., et al. (2025). Weighted 2D-kernel density estimations provide a new probabilistic measure for epigenetic age. Genome Biology.

- Senaratne, D., et al. (2025). Adverse childhood experiences and chronic pain in adults aged 86: Findings from the Lothian Birth Cohort 1936. Frontiers in Aging.
- Shen, X., et al. (2025). A methylome-wide association study of major depression with out-of-sample case–control classification and trans-ancestry comparison. Epidemiology.
- Smith, H. M., et al. (2025). DNA methylation-based predictors of metabolic traits in Scottish and Singaporean cohorts. The American Journal of Human Genetics.

Would you like to receive LBC email updates?

We launched the LBC participant email mailing list in Spring 2023. If you, or your friends and family members, would like to receive our quarterly Disconnected Mind Newsletters from the LBC team, please email us at lbc.ke@ed.ac.uk to sign up.

Contact us

If you'd like to get in touch with the team, we'd be delighted to hear from you!

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Please note: Although our team is now based at the Edinburgh Futures Institute (EFI), as mentioned at the reunion and in this newsletter, we are still using the 7 George Square address for all postal mail.