Lothian Birth Cohorts Christmas Newsletter

Season's greetings from the Lothian Birth Cohorts study team, and welcome to the LBC newsletter for 2018. We hope you have had a good year. We take this opportunity to update you on the annual progress of our research, and tell you about some of the events that took place in 2018. Everything you read about in this newsletter is a result of your involvement; we offer our warmest thanks for your participation. If you wish to get in touch, our contact details are at the end of the newsletter. Please let us know if you have moved house, or are about to, so that we can update your address and keep in touch. We are always delighted to hear from you. First, though, we begin with some very sad news.

Dear members of the Lothian Birth Cohort studies,

re: Professor John Starr

This is to let you know the awful news that our dear and valued colleague, and a Principal Investigator of the Lothian Birth Cohort studies, John Starr, died suddenly in early December.

John was Honorary Professor of Health and Ageing at the University of Edinburgh, founding Director of the Alzheimer Scotland Dementia Research Centre, Co-Director of the Centre for Cognitive Ageing and Cognitive Epidemiology (CCACE), Co-Director of the Scottish Dementia Clinical Research Network, and a practising consultant physician in the medicine of old age for NHS Lothian. This long list of major roles is testament to John's extraordinary energy and breadth of skills in research, clinical practice, and leadership. John graduated in Medicine from Cambridge and London. He first came to Edinburgh as a research fellow in the Department of Psychiatry in 1989, investigating the

relationship between blood pressure and cognition. After a stint at the renowned Hammersmith Hospital, John returned to Edinburgh as consultant and part-time Senior Lecturer in Geriatric Medicine at the Royal Victoria Hospital. His research excellence was ever to the fore and John was soon promoted to an honorary Chair at the University of Edinburgh.

Throughout his impressive research career John published over 500 papers, including many highly cited classics, notably on the Lothian Birth Cohorts, of which he was co-investigator from their inception in 1998. He conducted especially innovative work on the environmental epidemiology of dementias. Amongst other awards, John's work on the relationship between physical and mental health with Ian Deary and Lawrence Whalley was recognised by the prestigious Tenovus Scotland Margaret MacLellan Award in 2006.

John was a polymath. Largely unbeknownst to his medical and scientific colleagues, John was also an expert on ancient languages and the Dead Sea Scrolls. Indeed, he completed a PhD in 2013 in the School of Divinity at the University of Edinburgh on the "Quantitative Analysis of the Aramaic Qumran Texts".

We remember John with special fondness at The Lothian Birth Cohort studies. As co-investigator, he was an enthusiastic and creative contributor since the studies'

inception. He was the studies' doctor, responsible for the medical side of LBC research and many of you will remember him from the LBC reunions at the Assembly Hall where he presented findings on health and disease. He was an inspiring mentor and supervisor to young scientists in psychology, including many of the LBC team, and in clinical medicine, doing much to bring bright young clinical researchers into our research areas, and to stimulate and retain their interest. He co-authored many LBC publications including many highly cited papers.

John was a knowledgeable, inventive, cultured, and witty collaborator and good friend to the Lothian Birth Cohorts and to many more. He fizzed with ideas, many brilliant, some ahead of their time. John wrote the following short piece, not long ago, reflecting his modest and effective scientific approach and his mission to seed it in others: https://britishgeriatricssociety.wordpress.com/2018/05/11/my-heart-leaps-up/

Perhaps in this John authored his own best epitaph: "*for me living isn't about accumulating a list of achievements, or "impacts" as they might be termed, to be read out as a eulogy at my funeral. No, living is about being alive, that sequence of moments strung together from cradle to grave; and moments which inspire me with a sense of wonder, however ephemeral, are when I feel really alive. Research, suddenly seeing things revealed, just like moments when relationships deepen and transform, is able to bring such wonder into our lives*."

We will all miss John terribly. He is irreplaceable, and our lives will be the poorer for his untimely passing. We have sent condolences to his wife Claire and his children John, Robert, Toby, and Gabriel.

In sorrow,

Ian Deary

11.12.2018

Wave 5 of LBC1936 continues apace!

In our last newsletter, we told you that we had just begun to welcome back participants for Wave 5 of the LBC1936 study. This year has proven to be very productive and we are now over three quarters of the way to completing the wave. To date, 362 of an anticipated 440 LBC1936 participants have attended the Wellcome Trust Clinical Research Facility for the 5th round of mental and physical tests, and 218 have had a 4th Magnetic Resonance Imaging (MRI) brain scan. Wave 5 fieldwork is expected to be completed in Spring 2019. For those who have not yet received their invitation to attend, we hope to see as many of you as possible in the New Year!

Those of you who have already been to see us this wave will know that we have a new questionnaire on musical experience and expertise, designed by Dr Katie Overy of the University of Edinburgh's Reid School of Music. The questionnaire asks about your experience throughout your lifetime of playing musical instruments, singing, reading musical notation, and listening to music. Dr Overy and LBC researchers hope to use the data to find out whether one's musical experience relates to their thinking skills in childhood and in older age.

We have also introduced a brand new cognitive test, never before completed by UK participants. The *Financial Capacity Instrument (FCI)* was designed to examine financial skills in older adults. The ability to manage finances is important for maintaining independence in older age. Successful financial management is dependent upon a number of skills, such as numeracy skills to correctly count and keep track of money, and complex problem solving skills to help make financial decisions, for example, deciding which insurance policy to take out. The FCI was originally developed by Dr Daniel Marson at the University of Alabama, and is a widely used in the US to measure of such skills. In an exciting new project, Ms Chloe Fawns-Ritchie and Professor Ian Deary collaborated with Dr Marson to develop, for the first time, a version of the FCI for UK audiences. You'll be the first to hear the results on the new musical experience and FCI items when data collection is complete.

Prof. Joanna Wardlaw (brain imaging lead; 3rd from left) and the radiography team at the new 3T scanning facility

The final major new development of Wave 5 was a pilot study to provide valuable validity data, testing the possibility of transition to new brain scanning technology in the future. With newly-awarded funds from the Medical Research Council (MRC), we aimed to invite 100 participants to have two magnetic resonance brain scans: one in the usual scanner (1.5T) at the Western General Hospital, and the second in a new scanner with a higher magnetic field (3T), at the Royal Infirmary Edinburgh. We are pleased to be on track to complete the pilot study in January 2019.

It is important to state how valuable the LBC1921 study is, in addition to the LBC1936. We still receive new medical updates on the LBC1921 participants and your data continue to be used in many scientific reports.

Opening night of The Art of Intelligent Ageing exhibition.
Photos by Stewart Attwood Photography (left, top and middle row) and Graham Clark.

The Art of Intelligent Ageing **Exhibition**

We were thrilled to end the year with a major exhibition that celebrated the coming together of science and art. In 2012, renowned artist, Fionna Carlisle, began work on a series of portraits of some LBC1921 and LBC1936 participants and research team members. LBC participants have been described as some of the world's most intensively studied participants. Your commitment to being tested every three years has taught us much about cognitive ageing, and about healthy ageing more generally. Fionna's portraits celebrate the individuality and personality of each sitter, adding a new facet to our detailed information on the LBCs.

The exhibition opened at the Fire Station gallery, Edinburgh College of Art, in October, with a busy and lively Private View for friends and family of the artist, the sitters, and the wider LBC research team. On display was the complete series of 22 portraits, interesting artefacts from the LBCs, and Fionna's new portrait of Nobel Prize winner Professor Peter Higgs was also unveiled. We were delighted to see so many of you visit the exhibition through November, and that it was very well received by the public. There was coverage on STV Evening News, and it received a 4-star review in The Scotsman from renowned art critic and academic Professor Duncan Macmillan. You can read his review here: https://tinyurl.com/ybbc8665

In Discussion… with Sheena McDonald

In a related event, leading print and broadcast journalist, Sheena McDonald hosted a discussion exploring the themes of ageing at the interface of art and science. Fionna Carlisle and LBCs' Director, Ian Deary, were joined by two of the LBC1936 participants who were sitters for Fionna's portraits displayed at the *Art of Intelligent Ageing* exhibition. She asked them about their personal experience of the portraiture process and of being a part of the LBC studies more generally, in what was a thought-provoking evening.

Celebration of Scottish Cohort Studies

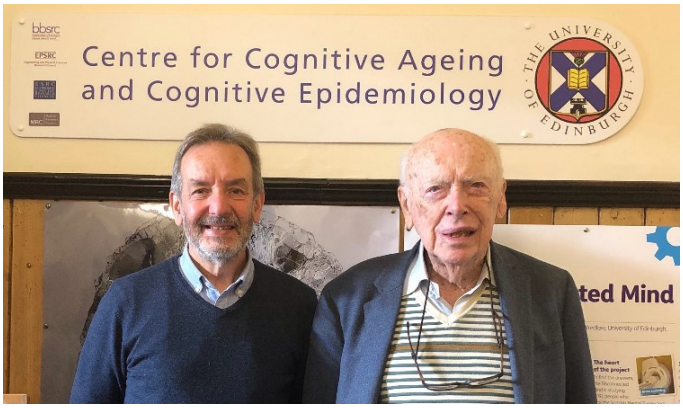
Participants and researchers celebrate Scottish cohort studies at Edinburgh's General Assembly Hall

On Sunday 10th June, a special event was held at Edinburgh's General Assembly Hall. Hundreds of participants and researchers from Scottish cohort studies came together to celebrate their contribution to healthcare research. We were delighted to see many LBC1936 study members there; you were by far the most numerous cohort in attendance. There were also participants from studies such as Generation Scotland, Aberdeen Children of the 1950s, and Theirworld Edinburgh Birth Cohort. The event was organised by the University of Edinburgh's Centre for Cognitive Ageing and Cognitive Epidemiology (CCACE), whose researchers (including us on the LBC team) were grateful for the opportunity to thank cohort members for their participation and dedication to the studies.

Professor Andrew Morris, Vice-Principal Data Science, opened the event, and was followed by a series of presentations by investigators from each cohort who described key scientific advancements that have been made possible by their studies. The day's programme covered research across the entire human lifespan, beginning with a presentation by Professor James Boardman on effects of premature birth, and ending with a talk from Professor David Batty on regional disparities in mortality. It's not too late to catch LBC Director Ian Deary's quirky and informative talk, "Ten Lothian Birth Cohort Commandments", available to view online: https://tinyurl.com/y7tvkgvl

Reflecting on the event, Professor Andrew McIntosh, interim Director of CCACE, said "*The cohort celebration allowed us to thank people for their participation in health research studies, feedback some of the key findings and discoveries and hear what most motivated people to take part. We were also able to collect information on their attitudes to different types of research and data use, such as access to their NHS samples and data and the sharing of blood samples and DNA. I think all of the investigators left renewed in their commitment to conducting cohort studies and determined to work more closely with participants and the public on designing studies that are enjoyable, meet the needs of society and form partnerships about the acceptable uses of their data and samples."* All of the day's talks are all available to view online: https://tinyurl.com/y7m7rl52

Visit from Nobel Prize winner James Watson



Professor Ian Deary catches up with Nobel Prize winner, Professor James D. Watson

"Why are more centres not devoted to intelligence and how it ages?" So said Professor James D. Watson when he visited the Lothian Birth Cohorts study on 11th September 2018. Professor Watson, who won the Nobel Prize in 1962 for his discovery of the structure of DNA, had visited us almost 10 years ago, and wanted to catch up on our progress. Spending most of the day at George Square, he had a long session with Ian Deary, and discussions and lunch with the LBC research team. Obviously, he was interested to hear about the latest genetic results that used the LBCs as well as UK Biobank and Generation Scotland data. Among the new data that most interested him were the sophisticated LBCs' brain imaging results and visualisations. "*It was an honour to have the world's best-known living scientist spend so much time with us, and to praise our research*," said LBC Director Ian Deary, "*and, at 90, Professor Watson is still engaged in science. He was stimulating for me and the team, and didn't just listen; he asked many challenging questions, still showing the curiosity that fuelled his discoveries*."

Out and about with the LBC team

Professor Deary is always keen that the story of the Lothian Birth Cohorts, and the findings of the research team based on your data, are communicated as widely as possible. He and his research team have attended meetings of many and varied groups throughout the year, spreading the word on the LBC studies to members of the public and to scientific audiences. In the next section, we provide a pick 'n' mix selection of just a few of the year's events.

Dr Judy Okely visits Edinburgh Electrical Society

Edinburgh Electrical Society members attend Dr Okely's talk on the LBCs

In October, Dr Judy Okely presented at a meeting of the Edinburgh Electrical Society. The society, which is run for and by retired electrical engineers, hosts speakers from all sorts of different professional backgrounds. Judy was invited by an LBC1936 participant who is also a member of the Edinburgh Electrical Engineering Society. She spoke a bit about the background of the LBC studies and described some of the factors associated with healthy cognitive and brain ageing in the LBC samples, such as not smoking and being physically active. Judy said: "*It was a really enjoyable meeting, with plenty of interesting questions and debate, and my explanation of the 'wiring' of the brain went down especially well*!"

LBC at the Medico-Chirurgical Society of Edinburgh

The Medico-Chirurgical Society of Edinburgh has been going since 1821. Its first president was the estimable Dr Andrew Duncan. And it's still going strong. Its members are mostly retired doctors and their partners.

At the beginning of the year, they gave up their evening to come and hear LBC chief, Ian Deary, summarise the studies and their many contributions to healthy cognitive ageing. "*Their stamina was impressive*", said Ian. "*After my hour-long talk, the questions were still flowing in after the best part of half an hour. It was a nice mix of 'what-can-we-do-to-keep-our-marbles-rolling' and scientific curiosity*."

What Keeps You Sharp? Presentations for Brainworks Day and the Pint of Science Festival

Ex-LBC team member, and current collaborator, Dr Alan Gow, discussed LBC findings at a number of public engagement events in April and May. At 'Brainworks Day' in East Dunbartonshire, and the Pint of Science Festival in Edinburgh, he gave presentations mixing knowledge from the LBC about how lifestyle factors might affect thinking skills, with work being conducted at Heriot-Watt University, to better understand people's knowledge of those things. The presentations were conducted in the context of the 'What Keeps You Sharp?' survey, conducted by Dr Gow and colleagues at Heriot Watt, and completed by more than 3,000 people aged between 40 to 98 years-old. The survey links some of the beliefs the public have about the topic to what other research in the area suggests (including some LBC references), and directs people to resources so they can follow-up to get more information. The first public report from the survey was released in April and is intended to be used by members of the public, older peoples' groups and charities, and as a reference for family doctors or other health professionals. Follow this link for a related Age UK blog: https://tinyurl.com/yarjpbyu

Lothian Birth Cohorts symposium at the International Society for Intelligence Research (ISIR)

Professor Ian Deary (left), Dr Stuart Ritchie, and Dr David Hill at the annual ISIR conference

The ISIR's annual conference took place in Edinburgh on 13-15th July 2018. On the first morning this prestigious conference had a symposium devoted to the LBCs' findings, entitled 'Bringing Intelligence to Life in Edinburgh, Scotland'. Ian Deary gave an overview of the studies and some new results. Stuart Ritchie in two talks covered health and brain imaging associations with cognitive function and change. David Hill talked about our genetic studies. Ian said, "*This was a true compliment to the LBC studies, allowing us four talks devoted to the team's findings. Top intelligence researchers worldwide are fans of the LBCs*".

Brain and cognitive ageing: the cortex and beyond.

Dr Simon Cox was invited to give a talk at the 2nd SINAPSE Psychology Meeting at the University of Glasgow in May. The meeting was for Scottish MRI researchers with a focus on cognitive ability; they gathered to discuss new research and approaches. Simon's talk covered recent work in the LBC1936 and UK Biobank as the fundamental precursor to new approaches integrating brain imaging information from multiple modalities. It is hoped that these new approaches will improve understanding of the brain structural underpinnings of cognitive ageing. Simon outlined these new approaches, and the general programme of research which includes the collection and processing of large volumes of brain and cognitive data in these two important cohorts.

Scientific publication highlights

The LBC team and our collaborators have published over 400 peer-reviewed scientific articles using your data since the studies began, and 2018 has been as successful as ever. This year alone we have had more than 50 papers accepted for publication. Though space doesn't allow us to list all of our new results, we've selected a few standout items to tell you about. References for these and a selection of other publications from 2018 can be found on the last page.

METRO

THE WORLD'S MOST POPULAR FREE NEWSPAPER

WEDNESDAY MAY 30, 2018

Intelligence study makes a gene-ius discovery...

by STEPHEN DEAL

SCIENTISTS say they have identified a range of new genes which they believe are related to cleverness.

A team led by Edinburgh University found significant small signals from 148 genomic regions that were related to having better cognitive function. As many as 58 of the genetic signals have not been reported before.

These regions contained genes that have previously been associated with better brain structure, and with lower risk of neurodegenerative and neurodevelopmental disorders, as well as physical and psychiatric illnesses.

Scientists said the results could help improve understanding of the declines

and 102 who had taken part in 57 studies in Australia, Europe and North America.

Lead researcher Prof Ian Deary said: 'Less than a decade ago, we were searching for genes related to intelligence with about 3,000 participants, and we found almost nothing.

'Now, with 100 times that number of participants, and with more than 200 scientists working together, we have discovered almost 150 genetic regions that are related to how clever people are.'

The study found that the genetic signature associated with increased

Dr Gail Davies led the largest-ever investigation of the genetic contributions to general cognitive function, with a sample size of over 300,000 individuals (including LBC participants), treble the size of any other study to date. The study was published in one of the world's top scientific journals, *Nature Communications,* in May, and was covered by almost 70 national and international news outlets. Dr Davies and team made several original findings relating to genetic loci and pathways contributing to the heritability of general cognitive function. Results include: 148 genome-wide significant independent loci, 709 cognition-related genes, and gene-expression levels across the cortex all associated with general cognitive function. They also found significant overlap between general cognitive function, reaction time, and many health variables such as eyesight, hypertension, and longevity.

Just a few months earlier, Dr David Hill also made it into the news with the first well powered genome-wide association study (GWAS) on intelligence. In this study, David and colleagues identified 187 independent regions of the genome linked to intelligence. They also found evidence that over 500 genes were linked to intelligence differences and that the process by which new brain cells are created, called neurogenesis, underpins some of the individual differences in intelligence. The results indicated that the regions of the genome that are linked to intelligence are also linked to longevity as well as differences in socio-economic status in Great Britain today. Furthermore, the researchers showed that it is possible to predict 7% of intelligence differences from DNA alone, a figure that is set to rise as larger samples become available. Dr Hill's GWAS of intelligence illustrates how LBC1936 data is contributing to understanding intelligence differences and related differences in physical health.

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DNA tests can predict intelligence, scientists show for first time

share

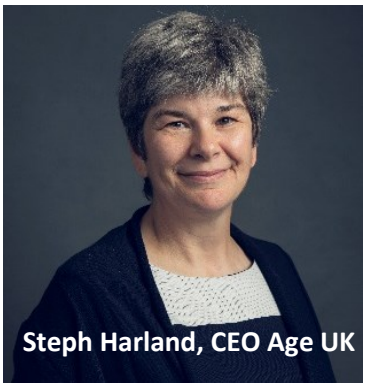
Save 223

It took us many months of data entry and careful checking for errors, to have the full set of data from LBC1936 Wave 4 visits to the study ready for researchers to analyse. The first 4-wave LBC1936 analyses were hotly anticipated, and we have been delighted to see several papers published using 4 waves of cognitive ability data spanning almost the entire 8th decade of life (collected at ages 70, 73, 76 and 79 years), in the past few months.

Dr Drew Altschul used the 4-wave cognitive data to investigate associations between cognitive ability and diabetes, in a study published in *Diabetologia*. He describes the study here. "*The association between type 2 diabetes and cognitive dysfunction is well established, but the direction of causality in the interplay between them has not been extensively investigated. The prevailing perception is that type 2 diabetes leads to cognitive dysfunction and dementia; there is substantial evidence showing that accelerated cognitive decline in type 2 diabetes begins in midlife. We examined elevated blood sugar and cognitive function in the LBC1936, and contrary to what we predicted, we find no link between diabetes risk at age 70 and differences in cognitive function over the subsequent decade. However, having had higher cognitive function as a child did predict lower diabetes risk at age 70. This is in line with existing findings on other health outcomes - higher early life cognitive function is associated with a wide variety of better mental and physical health outcomes*." In a ringing endorsement of Drew's work, the journal commissioned a commentary from key researchers in the field, to highlight the importance of these results for health policy and practice.

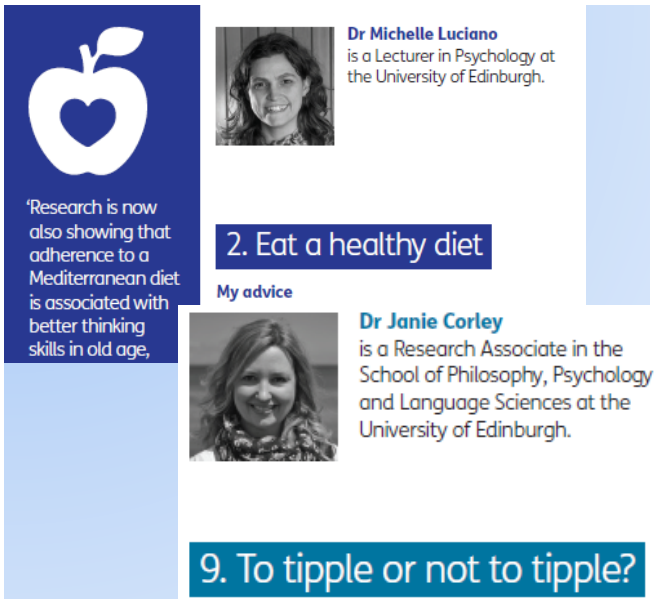
Age UK News

We were pleased to announce, in February, that Steph Harland had been appointed as the new Chief Executive of Age UK. Steph has a long history at Age UK, and at Age Concern before that, first joining the organisation in 2002. We're thrilled to have Steph to help lead Age UK towards an exciting future.


Steph Harland, CEO Age UK

Public benefit and influencing policy

From the outset of the Disconnected Mind project, it has been the ambition of Age UK to use the LBC studies' research as an evidence base to raise awareness of cognitive ageing among the general public and professional audiences. This year we developed and published a plain-language guide for public audiences: '*Staying sharp in later life; your expert guide to ageing well*'. Written in collaboration with the University of Edinburgh, world leading experts on cognitive ability and brain health provide accessible summaries of the latest research on a range of subjects from exercise and brain training, to diet, smoking and alcohol. Much of the advice on these controllable lifestyle factors is based on research from the LBC studies, and several LBC researchers and collaborators were invited to contribute, including Professor Joanna Wardlaw, Group Leader for brain imaging in the LBC1936, and current LBC1936 team member, Dr Janie Corley (who some of you will have met at your 3-yearly visit to the study!). The guide is available by request to Age UK.



Our Staying Sharp webpages, launched in 2017, also feature LBC results, and provides tips on how to 'stay sharp' based on evidence on the risk and protective factors for healthy cognitive ageing based on LBC findings and other recent research. They have continued to be popular in 2018, with 17,312 visitors from January to November, each spending an average of 4 minutes on the pages (which we are told is quite high)! The webpages include an animation of Ian riding his bike and giving advice on how to 'stay sharp'. You can find the Staying Sharp webpages here: https://www.ageuk.org.uk/information-advice/health-wellbeing/mind-body/staying-sharp/

As part of our winter story, we've launched a digital advent calendar with a new treat every day, like videos about our work and features with some of our celebrity ambassadors. Find it here: https://advent.ageuk.org.uk/

Finally, the theme of our Winter Campaign this year is 'No one should have no one to turn to', highlighting how Age UK's Advice Line supports older people – especially those 2.5 million who feel they have no-one to turn to - 365 days a year. Read more about the campaign and see the ads on the Age UK website at: https://www.ageuk.org.uk/get-involved/no-one/

A copy of this newsletter with links to all of the online content is available on our website, and you can stay up to date on recent LBC research by checking the regularly updated list of publications at:
www.lothianbirthcohort.ed.ac.uk

Thanks again from the LBCs team & Age UK

As a member of the Lothian Birth Cohorts, you are helping to further our knowledge and understanding of how our thinking skills change over time, how to maintain thinking skills along with brain health and a healthy lifestyle. And you are helping to train the best new researchers in this important scientific field. The LBCs' research team and Age UK are enormously grateful for all of the time and information which you have given, and continue to give, as LBC members since the project began. We look forward to seeing you in 2019 and beyond.

To let us know if there is any change to your address, or if you would like a copy of any of the papers listed, contact us at:

Lothian Birth Cohort Studies
University of Edinburgh,
7 George Square,
Edinburgh,
EH8 9JZ
Contact:
0131 651 1681 **or** lbc1936@ed.ac.uk **(LBC1936)**
0131 651 1682 **or** Alison.Pattie@ed.ac.uk **(LBC1921)**

Yours sincerely,

Professor Ian J. Deary *Study Director*, **Ms Adele Taylor** *Study Co-ordinator,* **Dr Janie Corley, Dr William Hill, Mrs Alison Pattie, Dr Judy Okely, Ms Danielle Page** *Research Associates*, **Mr Paul Redmond** *Data Manager*

Dundas Estate at Christmas. Photograph by Iain Kendall Photography: http://iainkendallphoto.com/.

Your LBC1921 and LBC1936 data produced more than 50 publications in 2018. Here are some of the highlights.

Publications

Newly 'in press'

Alloza, C., et al. (in press). Polygenic risk score for schizophrenia and structural brain connectivity in older age: a longitudinal connectome and tractography study. *NeuroImage*.

Aichele, S., et al. (in press). Fluid intelligence predicts change in depressive symptoms in later life: the Lothian Birth Cohort 1936. *Psychological Science*.

Booth, T., et al. (in press). Reaction time variability and brain white matter integrity. *Neuropsychology.*

Chauhan, G., et al. (in press). Genetic and lifestyle factors for MRI-defined brain infarcts in a population-based setting. *Neurology*.

Cuckic, I., et al. (in press). Cognitive ability does not predict objectively measured sedentary behaviour: evidence from three older cohorts. *Psychology and Aging*.

Fawns-Ritchie, C., et al. (in press). The role of cognitive ability in the association between functional health literacy and mortality in the Lothian Birth Cohort 1936: a prospective cohort study. *BMJ Open*.

Hamilton, O., et al. (in press). An epigenetic score for BMI based on DNA methylation correlates with poor physical health and major disease in the Lothian Birth Cohort. *International Journal of Obesity.*

Published online

Hill, W. D., et al. (2018). A combined analysis of genetically correlated traits identifies 187 loci and a role for neurogenesis and myelination in intelligence. *Molecular Psychiatry*. https://doi.org/10.1038/s41380-017-0001-5

Marioni, R. E., et al. (2018). Tracking the Epigenetic Clock Across the Human Life Course: A Meta-analysis of Longitudinal Cohort Data. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*. https://doi.org/10.1093/gerona/gly060

Okely, J. A., et al. (2018). Longitudinal Associations between Loneliness and Cognitive Ability in the Lothian Birth Cohort 1936. *The Journals of Gerontology: Series B*. https://doi.org/10.1093/geronb/gby086

Palmer, V. J., et al. (2018). What Do Older People Do When Sitting and Why? Implications for Decreasing Sedentary Behavior. *The Gerontologist*. https://doi.org/10.1093/geront/gny020

In print

Altschul, D. M., et al. (2018). Cognitive function in early and later life is associated with blood glucose in older individuals: analysis of the Lothian Birth Cohort of 1936. *Diabetologia*, *61*(9), 1946-1955.

Cole, J. H., et al. (2018). Brain age predicts mortality. *Molecular Psychiatry*, *23*, 1385-1392.

Corley, J., et al. (2018). Healthy cognitive ageing in the Lothian Birth Cohort studies: marginal gains not magic bullet. *Psychological Medicine*, *48*, 187–207.

Cox, S. R., et al. (2018). Brain cortical characteristics of lifetime cognitive ageing. *Brain Structure & Function*, *223*, 509-518.

Davies, G., et al. (2018). Study of 300,486 individuals identifies 148 independent genetic loci influencing general cognitive function. *Nature Communications*, 9, 2098.

Gale, C. R., et al. (2018). Attitudes to ageing and objectively-measured sedentary and walking behaviour in older people: The Lothian Birth Cohort 1936. *PloS One*, *13*, e0197357.

Gale, C. R., et al. The epigenetic clock and objectively measured sedentary and walking behavior in older adults: the Lothian Birth Cohort 1936. *Clinical Epigenetics*, *10*, 4.

Ligthart, S., et al. (2018). Genome analyses of >200,000 individuals identify 58 loci for chronic inflammation and highlight pathways that link inflammation and complex disorders. *American Journal of Human Genetics*, *103*, 691-706.

McGrory, S., et al. (2018). Towards Standardization of Quantitative Retinal Vascular Parameters: Comparison of SIVA and VAMPIRE Measurements in the Lothian Birth Cohort 1936. *Translational Vision Science & Technology*, *7*, 12.

Pearce, J., et al. (2018). Life course of place: a longitudinal study of mental health and place. *Transactions of the Institute of British Geographers.43,* 555-572.

Pinter, D., et al. (2018). Predictors of gait speed and its change over three years in community-dwelling older people. *Aging*, *10*, 144–153.

Sibbett, R. A., et al. (2018). Does incipient dementia explain normal cognitive decline determinants? Lothian birth cohort 1921. *Psychology and Aging*, *33*(4), 674.

Taylor, A. M., et al. (2018). Cohort Profile Update: The Lothian Birth Cohorts of 1921 and 1936. *International Journal of Epidemiology*, *47*(4), 1042-1042r.

Wiseman, S. J., et al. (2018). Cognitive abilities, brain white matter hyperintensity volume, and structural network connectivity in older age. *Human Brain Mapping*, *39*, 622–632.

If you want to read more about how the Lothian Birth Cohort studies have progressed in the past few years and what's being done with your data, you can find out more in our latest LBCs profile paper, free to download from the *International Journal of Epidemiology* website (https://academic.oup.com/ije/article/47/4/1042/4931207) or request a copy from the team.

International Journal of Epidemiology, 2018, 1–19
doi: 10.1093/ije/dyy022
Cohort Profile

Cohort Profile

Cohort Profile Update: The Lothian Birth Cohorts of 1921 and 1936

Adele M Taylor,[1] Alison Pattie[1] and Ian J Deary[1,2]*

[1]Department of Psychology and [2]Centre for Cognitive Ageing and Cognitive Epidemiology, University of Edinburgh, Edinburgh, UK

*Corresponding author. Centre for Cognitive Ageing and Cognitive Epidemiology and Department of Psychology, University of Edinburgh, 7 George Square, Edinburgh EH8 9JZ, UK. E-mail i.deary@ed.ac.uk.

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The original cohort

The original Lothian Birth Cohorts of 1921 (LBC1921) and 1936 (LBC1936) were designed as follow-up studies to the Scottish Mental Surveys of 1932 (SMS1932) and 1947 (SMS1947), respectively.[1] The SMS1932 took place simultaneously across schools in Scotland on 1 June 1932, and used the Moray House Test (No. 12; MHT) of general intelligence. Almost every child attending school and born in 1921 ($N = 87\,498$) was tested.[2] The same MHT was administered to almost every child born in 1936 and attending school on 4 June 4 1947 for the SMS1947 ($N = 70\,805$).[3] As described in the Cohorts Profile published in 2012,[4] decades later, participants of both Surveys, mostly living in Edinburgh and the surrounding area (the Lothians) in older age, were invited to participate in the Lothian Birth Cohort (LBC) studies. Between 1999 and 2001, 550 of the SMS1932 were recruited to Wave 1 of the LBC1921 study, at a mean age of 79 years. Between 2004 and 2007, 1091 members of SMS1947 were recruited to Wave 1 of the LBC1936 study, at a mean age of 70 years. Both cohorts re-sat the MHT at initial follow-up. In addition, a large amount of other cognitive, psychosocial, lifestyle, medical, biomarker, genetic, brain imaging and other data were collected. There are baseline protocol articles for LBC1921[5] and LBC1936,[6] and a separate baseline brain imaging protocol article for LBC1936.[7]

What is the reason for the new data collection?

There are two main reasons for the Profile Update. First, there have been new waves of data collection since the LBCs' profiles were reported.[4] Second, there have been many new types of data collected.

New waves of data collection

The LBC studies set out principally to examine the nature and determinants of non-pathological cognitive ageing from childhood to older age, and within in older age.[5] Waves of testing have been conducted at roughly 3-yearly intervals since inception: the LBC1921 have been followed up five times, from age 79 to age 92 years;[8–11] and the LBC1936 have been followed up four times from age 70 to age 79 years.[6,9,11] A fifth wave of the LBC1936 study started in autumn 2017 and tests the LBC1936 participants in their early 80s. New waves of data collection since the LBCs' profiles were published in 2012 (LBC1921 Waves 4 and 5; LBC1936 Waves 3 and 4) have been conducted during key periods of ageing, where the risk of onset of cognitive impairment and dementia is increased. Consequently, the scope of the studies has extended to identifying more risk and protective factors that have the potential to be interventions to reduce the risk of cognitive loss in later