

# UCLA

## UCLA Previously Published Works

### Title

Author Correction: Study of 300,486 individuals identifies 148 independent genetic loci influencing general cognitive function

### Permalink

<https://escholarship.org/uc/item/512678qp>

### Journal

Nature Communications, 10(1)

### ISSN

2041-1723

### Authors

Davies, Gail

Lam, Max

Harris, Sarah E

et al.

### Publication Date

2019

### DOI

10.1038/s41467-019-10160-w

### Copyright Information

This work is made available under the terms of a Creative Commons Attribution License, available at <https://creativecommons.org/licenses/by/4.0/>

Peer reviewed

<https://doi.org/10.1038/s41467-019-10160-w>

OPEN

# Author Correction: Study of 300,486 individuals identifies 148 independent genetic loci influencing general cognitive function

Gail Davies<sup>1</sup>, Max Lam et al.<sup>#</sup>

Correction to: *Nature Communications* <https://doi.org/10.1038/s41467-018-04362-x>, published online 29 May 2018.

Christina M. Lill, who contributed to analysis of data, was inadvertently omitted from the author list in the originally published version of this article. This has now been corrected in both the PDF and HTML versions of the article.

Published online: 01 May 2019



**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

© The Author(s) 2019

---

Correspondence and requests for materials should be addressed to I.D. (email: [i.deary@ed.ac.uk](mailto:i.deary@ed.ac.uk)).

<sup>#</sup>A full list of authors and their affiliations appears at the end of the paper.

Gail Davies<sup>1</sup>, Max Lam<sup>2</sup>, Sarah E. Harris<sup>1,3</sup>, Joey W. Trampush<sup>4,5</sup>, Michelle Luciano<sup>1</sup>, W. David Hill<sup>1</sup>, Saskia P. Hagenaars<sup>1,6</sup>, Stuart J. Ritchie<sup>1</sup>, Riccardo E. Marioni<sup>1,3</sup>, Chloe Fawns-Ritchie<sup>1</sup>, David C.M. Liewald<sup>1</sup>, Judith A. Okely<sup>1</sup>, Ari V. Ahola-Olli<sup>7,8</sup>, Catriona L.K. Barnes<sup>9</sup>, Lars Bertram<sup>10</sup>, Joshua C. Bis<sup>11</sup>, Katherine E. Burdick<sup>12,13,14</sup>, Andrea Christoforou<sup>15,16</sup>, Pamela DeRosse<sup>2,17</sup>, Srdjan Djurovic<sup>15,18</sup>, Thomas Espeseth<sup>19,20</sup>, Stella Giakoumaki<sup>21</sup>, Sudheer Giddaluru<sup>15,16</sup>, Daniel E. Gustavson<sup>22,23</sup>, Caroline Hayward<sup>24,25</sup>, Edith Hofer<sup>26,27</sup>, M. Arfan Ikram<sup>28,29,30</sup>, Robert Karlsson<sup>31</sup>, Emma Knowles<sup>32</sup>, Jari Lahti<sup>33,34</sup>, Markus Leber<sup>35</sup>, Shuo Li<sup>36</sup>, Karen A. Mather<sup>37</sup>, Ingrid Melle<sup>15,19</sup>, Derek Morris<sup>38</sup>, Christopher Oldmeadow<sup>39</sup>, Teemu Palviainen<sup>40</sup>, Antony Payton<sup>41</sup>, Raha Pazoki<sup>42</sup>, Katja Petrovic<sup>26</sup>, Chandra A. Reynolds<sup>43</sup>, Muralidharan Sargurupremraj<sup>44</sup>, Markus Scholz<sup>45,46</sup>, Jennifer A. Smith<sup>47,48</sup>, Albert V. Smith<sup>49,50</sup>, Natalie Terzikhan<sup>28,51</sup>, Anbupalam Thalamuthu<sup>37</sup>, Stella Trompet<sup>52</sup>, Sven J. van der Lee<sup>28</sup>, Erin B. Ware<sup>48</sup>, B. Gwen Windham<sup>53</sup>, Margaret J. Wright<sup>54,55</sup>, Jingyun Yang<sup>56,57</sup>, Jin Yu<sup>17</sup>, David Ames<sup>58,59</sup>, Najaf Amin<sup>28</sup>, Philippe Amouyel<sup>60</sup>, Ole A. Andreassen<sup>19,61</sup>, Nicola J. Armstrong<sup>62</sup>, Amelia A. Assareh<sup>37</sup>, John R. Attia<sup>63</sup>, Deborah Attix<sup>64,65</sup>, Dimitrios Avramopoulos<sup>66,67</sup>, David A. Bennett<sup>56,57</sup>, Anne C. Böhrer<sup>68,69</sup>, Patricia A. Boyle<sup>56,70</sup>, Henry Brodaty<sup>37,71</sup>, Harry Campbell<sup>9</sup>, Tyrone D. Cannon<sup>72</sup>, Elizabeth T. Cirulli<sup>73</sup>, Eliza Congdon<sup>74</sup>, Emily Drabant Conley<sup>75</sup>, Janie Corley<sup>1</sup>, Simon R. Cox<sup>1</sup>, Anders M. Dale<sup>22,76,77,78</sup>, Abbas Dehghan<sup>42,79</sup>, Danielle Dick<sup>80</sup>, Dwight Dickinson<sup>81</sup>, Johan G. Eriksson<sup>82,83,84,85</sup>, Evangelos Evangelou<sup>42,82</sup>, Jessica D. Faul<sup>48</sup>, Ian Ford<sup>86</sup>, Nelson A. Freimer<sup>74</sup>, He Gao<sup>42</sup>, Ina Giegling<sup>87</sup>, Nathan A. Gillespie<sup>88</sup>, Scott D. Gordon<sup>89</sup>, Rebecca F. Gottesman<sup>90,91</sup>, Michael E. Griswold<sup>92</sup>, Vilmundur Gudnason<sup>49,50</sup>, Tamara B. Harris<sup>93</sup>, Annette M. Hartmann<sup>87</sup>, Alex Hatzimanolis<sup>94,95,96</sup>, Gerardo Heiss<sup>97</sup>, Elizabeth G. Holliday<sup>63</sup>, Peter K. Joshi<sup>9</sup>, Mika Kähönen<sup>98,99,100</sup>, Sharon L.R. Kardia<sup>47</sup>, Ida Karlsson<sup>31</sup>, Luca Kleindam<sup>101,102,103,104</sup>, David S. Knopman<sup>105</sup>, Nicole A. Kochan<sup>37,106</sup>, Bettina Konte<sup>87</sup>, John B. Kwok<sup>107,108</sup>, Stephanie Le Hellard<sup>15,16</sup>, Teresa Lee<sup>37,106</sup>, Terho Lehtimäki<sup>109,110</sup>, Shu-Chen Li<sup>111,112</sup>, Christina M. Lill<sup>113</sup>, Tian Liu<sup>10,111</sup>, Marisa Koini<sup>26</sup>, Edythe London<sup>74</sup>, Will T. Longstreth Jr<sup>114,115</sup>, Oscar L. Lopez<sup>116</sup>, Anu Loukola<sup>40</sup>, Tobias Luck<sup>46,117</sup>, Astri J. Lundervold<sup>118,119</sup>, Anders Lundquist<sup>120,121</sup>, Leo-Pekka Lyytikäinen<sup>109,110</sup>, Nicholas G. Martin<sup>89</sup>, Grant W. Montgomery<sup>89,122</sup>, Alison D. Murray<sup>25,123</sup>, Anna C. Need<sup>124</sup>, Raymond Noordam<sup>52</sup>, Lars Nyberg<sup>120,125,126</sup>, William Ollier<sup>127</sup>, Goran Papenberg<sup>111,128</sup>, Alison Pattie<sup>129</sup>, Ozren Polasek<sup>130,131</sup>, Russell A. Poldrack<sup>132</sup>, Bruce M. Psaty<sup>11,133,134</sup>, Simone Reppermund<sup>37,135</sup>, Steffi G. Riedel-Heller<sup>117</sup>, Richard J. Rose<sup>136</sup>, Jerome I. Rotter<sup>137,138</sup>, Panos Roussos<sup>12,139,140</sup>, Suvi P. Rovio<sup>7</sup>, Yasaman Saba<sup>141</sup>, Fred W. Sabb<sup>142</sup>, Perminder S. Sachdev<sup>37,106</sup>, Claudia L. Satizabal<sup>143,144</sup>, Matthias Schmid<sup>145</sup>, Rodney J. Scott<sup>63</sup>, Matthew A. Scult<sup>146</sup>, Jeannette Simino<sup>92</sup>, P. Eline Slagboom<sup>147</sup>, Nikolaos Smyrnis<sup>94,95</sup>, Aïcha Soumaré<sup>44</sup>, Nikos C. Stefanis<sup>94,95,96</sup>, David J. Stott<sup>148</sup>, Richard E. Straub<sup>149</sup>, Kjetil Sundet<sup>19,20</sup>, Adele M. Taylor<sup>129</sup>, Kent D. Taylor<sup>137,138</sup>, Ioanna Tzoulaki<sup>42,79,150</sup>, Christophe Tzourio<sup>44,151</sup>, André Uitterlinden<sup>28,152</sup>, Veronique Vitart<sup>24</sup>, Aristotle N. Voineskos<sup>153</sup>, Jaakko Kaprio<sup>40,82,154</sup>, Michael Wagner<sup>103,104</sup>, Holger Wagner<sup>102</sup>, Leonie Weinhold<sup>145</sup>, K. Hoyan Wen<sup>28</sup>, Elisabeth Widen<sup>40</sup>, Qiong Yang<sup>36</sup>, Wei Zhao<sup>47</sup>, Hieab H.H. Adams<sup>28,155</sup>, Dan E. Arking<sup>67</sup>, Robert M. Bilder<sup>74</sup>, Panos Bitsios<sup>156</sup>, Eric Boerwinkle<sup>157,158</sup>, Ornit Chiba-Falek<sup>64</sup>, Aiden Corvin<sup>159</sup>, Philip L. De Jager<sup>160,161</sup>, Stéphanie Debette<sup>44,162</sup>, Gary Donohoe<sup>38</sup>, Paul Elliott<sup>42,79</sup>, Annette L. Fitzpatrick<sup>115,163</sup>, Michael Gill<sup>159</sup>, David C. Glahn<sup>32</sup>, Sara Hägg<sup>31</sup>, Narelle K. Hansell<sup>54</sup>, Ahmad R. Hariri<sup>146</sup>, M. Kamran Ikram<sup>28,30</sup>, J. Wouter Jukema<sup>164</sup>, Eero Vuoksima<sup>40,154</sup>, Matthew C. Keller<sup>165</sup>, William S. Kremen<sup>22,23</sup>, Lenore Launer<sup>93</sup>, Ulman Lindenberger<sup>111</sup>, Aarno Palotie<sup>40,166,167</sup>, Nancy L. Pedersen<sup>31</sup>, Neil Pendleton<sup>168</sup>, David J. Porteous<sup>1,3,25</sup>, Katri Räikkönen<sup>33</sup>, Olli T. Raitakari<sup>7,169</sup>, Alfredo Ramirez<sup>35,68,102</sup>, Ivar Reinvang<sup>20</sup>, Igor Rudan<sup>9</sup>, Dan Rujescu<sup>87</sup>, Reinhold Schmidt<sup>26</sup>, Helena Schmidt<sup>141</sup>, Peter W. Schofield<sup>170</sup>, Peter R. Schofield<sup>171,172</sup>, John M. Starr<sup>1,173</sup>, Vidar M. Steen<sup>15,16</sup>, Julian N. Trollor<sup>37,135</sup>

Steven T. Turner<sup>174</sup>, Cornelia M. Van Duijn<sup>28</sup>, Arno Villringer<sup>175,176</sup>, Daniel R. Weinberger<sup>149</sup>, David R. Weir<sup>48</sup>, James F. Wilson<sup>9,24</sup>, Anil Malhotra<sup>17,177,178</sup>, Andrew M. McIntosh<sup>1,179</sup>, Catharine R. Gale<sup>1,180</sup>, Sudha Seshadri<sup>142,143,181</sup>, Thomas H. Mosley Jr<sup>53</sup>, Jan Bressler<sup>157</sup>, Todd Lencz<sup>17,179</sup> & Ian J. Deary<sup>1</sup>

<sup>1</sup>Centre for Cognitive Ageing and Cognitive Epidemiology, Department of Psychology, School of Philosophy, Psychology and Language Sciences, The University of Edinburgh, Edinburgh EH8 9JZ, UK. <sup>2</sup>Institute of Mental Health, Singapore 539747, Singapore. <sup>3</sup>Medical Genetics Section, Centre for Genomic & Experimental Medicine, MRC Institute of Genetics & Molecular Medicine, University of Edinburgh, Western General Hospital, Edinburgh EH4 2XU, UK. <sup>4</sup>BrainWorkup, LLC, Los Angeles 90033 CA, USA. <sup>5</sup>Department of Psychiatry and Behavioral Sciences, Keck School of Medicine, University of Southern California, Los Angeles 90033 CA, USA. <sup>6</sup>Social, Genetic and Developmental Psychiatry Centre, Institute of Psychiatry, Psychology & Neuroscience, King's College London, De Crespigny Park, Denmark Hill, London SE5 8AF, UK. <sup>7</sup>Research Centre of Applied and Preventive Cardiovascular Medicine, University of Turku, Turku 20520, Finland. <sup>8</sup>Department of Internal Medicine, Satakunta Central Hospital, Pori 28100, Finland. <sup>9</sup>Centre for Global Health Research, Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, Teviot Place, Edinburgh EH8 9AG, Scotland. <sup>10</sup>Max Planck Institute for Molecular Genetics, Berlin 14195, Germany. <sup>11</sup>Cardiovascular Health Research Unit, Department of Medicine, University of Washington, Seattle 98101 Washington, USA. <sup>12</sup>Department of Psychiatry, Icahn School of Medicine at Mount Sinai, New York 10029 NY, USA. <sup>13</sup>Mental Illness Research, Education, and Clinical Center (VISN 3), James J. Peters VA Medical Center, Bronx 10468 NY, USA. <sup>14</sup>Department of Psychiatry, Brigham and Women's Hospital, Harvard Medical School, Boston 02115 MA, USA. <sup>15</sup>NORMENT, K.G. Jebsen Centre for Psychosis Research, Department of Clinical Science, University of Bergen, Bergen 5021, Norway. <sup>16</sup>Dr. Einar Martens Research Group for Biological Psychiatry, Center for Medical Genetics and Molecular Medicine, Haukeland University Hospital, Bergen 5020, Norway. <sup>17</sup>Center for Psychiatric Neuroscience, Feinstein Institute for Medical Research, Manhasset 11030 NY, USA. <sup>18</sup>Department of Medical Genetics, Oslo University Hospital, University of Bergen, Oslo 0424, Norway. <sup>19</sup>Department of Psychology, University of Oslo, Oslo 0373, Norway. <sup>20</sup>Division of Mental Health and Addiction, Oslo University Hospital, Oslo 0315, Norway. <sup>21</sup>Department of Psychology, University of Crete, Crete GR-74100, Greece. <sup>22</sup>Department of Psychiatry, University of California, San Diego 92093 CA, USA. <sup>23</sup>Center for Behavior Genetics of Aging, University of California, San Diego 92093 CA, USA. <sup>24</sup>Medical Research Council Human Genetics Unit, Institute of Genetics and Molecular Medicine, University of Edinburgh, Edinburgh EH4 2XU, UK. <sup>25</sup>Generation Scotland, Centre for Genomic and Experimental Medicine, University of Edinburgh, Edinburgh EH4 2XU, UK. <sup>26</sup>Department of Neurology, Clinical Division of Neurogeriatrics, Medical University of Graz, Graz 8036, Austria. <sup>27</sup>Institute of Medical Informatics Statistics and Documentation, Medical University of Graz, Graz 8036, Austria. <sup>28</sup>Department of Epidemiology, Erasmus University Medical Center, Rotterdam 3015, The Netherlands. <sup>29</sup>Department of Radiology and Nuclear Medicine, Erasmus University Medical Center, Rotterdam 3015, The Netherlands. <sup>30</sup>Department of Neurology, Erasmus University Medical Center, Rotterdam xxxxxx, The Netherlands. <sup>31</sup>Department of Medical Epidemiology and Biostatistics, Karolinska Institutet, Stockholm SE-171 77, Sweden. <sup>32</sup>Department of Psychiatry, Yale University School of Medicine, New Haven 06511 CT, USA. <sup>33</sup>Department of Psychology and Logopedics, Faculty of Medicine, University of Helsinki, Helsinki 00014, Finland. <sup>34</sup>Helsinki Collegium for Advanced Studies, University of Helsinki, Helsinki 00014, Finland. <sup>35</sup>Department of Psychiatry and Psychotherapy, University of Cologne, Cologne D-50937, Germany. <sup>36</sup>Department of Biostatistics, Boston University School of Public Health, Boston 02118 MA, USA. <sup>37</sup>Centre for Healthy Brain Ageing, School of Psychiatry, University of New South Wales, Sydney 2031, Australia. <sup>38</sup>Neuroimaging, Cognition & Genomics (NICOG) Centre, School of Psychology and Discipline of Biochemistry, National University of Ireland Galway, Galway H91 TK33, Ireland. <sup>39</sup>Medical Research Institute and Faculty of Health, University of Newcastle, New South Wales 2308, Australia. <sup>40</sup>Institute for Molecular Medicine Finland (FIMM), University of Helsinki, Helsinki FI-00014, Finland. <sup>41</sup>Centre for Epidemiology, Division of Population Health, Health Services Research & Primary Care, The University of Manchester, Manchester M13 9PL, UK. <sup>42</sup>Department of Epidemiology and Biostatistics, School of Public Health, Imperial College London, London W2 1PG, UK. <sup>43</sup>Department of Psychology, University of California Riverside, Riverside 92521 CA, USA. <sup>44</sup>University of Bordeaux, Bordeaux Population Health Research Center, INSERM UMR 1219, F-33000 Bordeaux, France. <sup>45</sup>Institute for Medical Informatics, Statistics and Epidemiology, University of Leipzig, Leipzig 04107, Germany. <sup>46</sup>LIFE—Leipzig Research Center for Civilization Diseases, University of Leipzig, Leipzig 04107, Germany. <sup>47</sup>Department of Epidemiology, School of Public Health, University of Michigan, Ann Arbor, MI 48109, USA. <sup>48</sup>Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, MI 48104, USA. <sup>49</sup>Icelandic Heart Association, Kopavogur IS-201, Iceland. <sup>50</sup>University of Iceland, Reykjavik 101, Iceland. <sup>51</sup>Department of Respiratory Medicine, Ghent University Hospital, De Pintelaan 185, 9000 Ghent, Belgium. <sup>52</sup>Section of Gerontology and Geriatrics, Department of Internal Medicine, Leiden University Medical Center, Leiden 2333, The Netherlands. <sup>53</sup>Department of Medicine, Division of Geriatrics, University of Mississippi Medical Center, Jackson 39216 MS, USA. <sup>54</sup>Queensland Brain Institute, University of Queensland, Brisbane 4072, Australia. <sup>55</sup>Centre for Advanced Imaging, University of Queensland, Brisbane 4072, Australia. <sup>56</sup>Rush Alzheimer's Disease Center, Rush University Medical Center, Chicago 60612 IL, USA. <sup>57</sup>Department of Neurological Sciences, Rush University Medical Center, Chicago 60612 IL, USA. <sup>58</sup>National Ageing Research Institute, Royal Melbourne Hospital, Victoria 3052, Australia. <sup>59</sup>Academic Unit for Psychiatry of Old Age, University of Melbourne, St George's Hospital, Kew 3010, Australia. <sup>60</sup>Univ. Lille, Inserm, CHU Lille, Institut Pasteur de Lille, U1167-LabEx DISTALZ, F-59000 Lille, France. <sup>61</sup>Norwegian Centre for Mental Disorders Research (NORMENT), Institute of Clinical Medicine, University of Oslo, Oslo 0372, Norway. <sup>62</sup>Mathematics and Statistics, Murdoch University, Perth 6150, Australia. <sup>63</sup>Hunter Medical Research Institute and Faculty of Health, University of Newcastle, New South Wales 2305, Australia. <sup>64</sup>Department of Neurology/Bryan Alzheimer's Disease Research Center, and Center for Genomic and Computational Biology, Duke University Medical Center, Durham 27708 NC, USA. <sup>65</sup>Psychiatry and Behavioral Sciences, Division of Medical Psychology, and Department of Neurology, Duke University Medical Center, Durham 27708 NC, USA. <sup>66</sup>Department of Psychiatry, Johns Hopkins University School of Medicine, MD Baltimore 21287, USA. <sup>67</sup>McKusick-Nathans Institute of Genetic Medicine, Johns Hopkins University School of Medicine, MD Baltimore 21287, USA. <sup>68</sup>Institute of Human Genetics, University of Bonn, Bonn 53113, Germany. <sup>69</sup>Department of Genomics, Life and Brain Center, University of Bonn, Bonn 53113, Germany. <sup>70</sup>Departments of Behavioral Sciences, Rush University Medical Center, Chicago 60612 IL, USA. <sup>71</sup>Dementia Centre for Research Collaboration, University of New South Wales, Sydney 2031 NSW, Australia. <sup>72</sup>Department of Psychology, Yale University, New Haven 06520 CT, USA. <sup>73</sup>Human Longevity Inc, Durham 27709 NC, USA. <sup>74</sup>UCLA Semel Institute for Neuroscience and Human Behavior, Los Angeles 90024 CA, USA. <sup>75</sup>23andMe, Inc., Mountain View 94041 CA, USA. <sup>76</sup>Department of Cognitive Science, University of California, San Diego, La Jolla 92093 CA, USA. <sup>77</sup>Department of Neurosciences, University of California, San Diego, La Jolla 92093 CA, USA. <sup>78</sup>Department of Radiology, University of California, San Diego, La Jolla 92093 CA, USA. <sup>79</sup>MRC-PHE Centre for Environment, School of Public Health, Imperial College London, London W2 1PG, UK. <sup>80</sup>Department of Psychology, Virginia Commonwealth University, Richmond 23284 VA, USA. <sup>81</sup>Clinical and Translational Neuroscience Branch, Intramural Research Program, National Institute of Mental Health, National Institute of Health, Bethesda 20892 MD, USA. <sup>82</sup>National Institute for Health and Welfare, Helsinki FI-00271, Finland. <sup>83</sup>Department of General Practice and Primary Health Care, University of Helsinki, Helsinki 00290, Finland. <sup>84</sup>Helsinki University Central Hospital,

Unit of General Practice, Helsinki FI-00029, Finland. <sup>85</sup>Folkhälsan Research Centre, Helsinki 2018, Finland. <sup>86</sup>Robertson Centre for Biostatistics, University of Glasgow, Glasgow G12 8QQ, United Kingdom. <sup>87</sup>Department of Psychiatry, Martin Luther University of Halle-Wittenberg, Halle 06108, Germany. <sup>88</sup>Virginia Institute for Psychiatric and Behavioral Genetics, Virginia Commonwealth University, Richmond 23298 VA, USA. <sup>89</sup>QIMR Berghofer Medical Research Institute, Brisbane 4029, Australia. <sup>90</sup>Department of Neurology, Johns Hopkins University School of Medicine, Baltimore 21287 MD, USA. <sup>91</sup>Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore 21205 MD, USA. <sup>92</sup>Department of Data Science, University of Mississippi Medical Center, Jackson 39216 MS, USA. <sup>93</sup>Intramural Research Program National Institutes on Aging, National Institutes of Health, Bethesda 20892 MD, USA. <sup>94</sup>Department of Psychiatry, National and Kapodistrian University of Athens Medical School, Eginition Hospital, Athens 11528, Greece. <sup>95</sup>University Mental Health Research Institute, Athens GR-156 01, Greece. <sup>96</sup>Neurobiology Research Institute, Theodor-Theohari Cozzika Foundation, Athens 11521, Greece. <sup>97</sup>Department of Epidemiology, University of North Carolina Gillings School of Global Public Health, Chapel Hill 27599 NC, USA. <sup>98</sup>Department of Clinical Physiology, Tampere University Hospital, and Finnish Cardiovascular Research Center, Tampere FI-33014, Finland. <sup>99</sup>Faculty of Medicine and Life Sciences, University of Tampere, Tampere 33521, Finland. <sup>100</sup>Department of Clinical Physiology, Finnish Cardiovascular Research Center—Tampere, Faculty of Medicine and Life Sciences, University of Tampere, Tampere 33014, Finland. <sup>101</sup>Department of Psychiatry Medical Faculty, University of Cologne, Cologne 50923, Germany. <sup>102</sup>Department of Psychiatry and Psychotherapy, University of Bonn, Bonn 53127, Germany. <sup>103</sup>German Center for Neurodegenerative Diseases (DZNE), Bonn 53127, Germany. <sup>104</sup>Department for Neurodegenerative Diseases and Geriatric Psychiatry, University of Bonn, Bonn 53127, Germany. <sup>105</sup>Department of Neurology, Mayo Clinic, Rochester 55905 MN, USA. <sup>106</sup>Neuropsychiatric Institute, Prince of Wales Hospital, Sydney 2031, Australia. <sup>107</sup>Brain and Mind Centre—The University of Sydney, Camperdown, NSW 2050, Australia. <sup>108</sup>School of Medical Sciences, University of New South Wales, Sydney 2052, Australia. <sup>109</sup>Department of Clinical Chemistry, Fimlab Laboratories, Finnish Cardiovascular Research Center—Tampere, Faculty of Medicine and Life Sciences, University of Tampere, Tampere 33014, Finland. <sup>110</sup>Department of Clinical Chemistry, Finnish Cardiovascular Research Center—Tampere, Faculty of Medicine and Life Sciences, University of Tampere, Tampere 33014, Finland. <sup>111</sup>Max Planck Institute for Human Development, Berlin 14195, Germany. <sup>112</sup>Technische Universität Dresden, Dresden 01187, Germany. <sup>113</sup>Genetic and Molecular Epidemiology Group, Lübeck Interdisciplinary Platform for Genome Analytics, Institutes of Neurogenetics & Cardiogenetics, University of Lübeck, Lübeck, Germany. <sup>114</sup>Department of Neurology, School of Medicine, University of Washington, Seattle 98195-6465 WA, USA. <sup>115</sup>Department of Epidemiology, University of Washington, Seattle 98195 WA, USA. <sup>116</sup>Department of Neurology and Psychiatry, University of Pittsburgh, Pittsburgh 15213 PA, USA. <sup>117</sup>Institute of Social Medicine, Occupational Health and Public Health (ISAP), University of Leipzig, Leipzig 04103, Germany. <sup>118</sup>Department of Biological and Medical Psychology, University of Bergen, Bergen 5009, Norway. <sup>119</sup>K. G. Jebsen Center for Neuropsychiatry, University of Bergen, Bergen N-5009, Norway. <sup>120</sup>Umeå Center for Functional Brain Imaging (UFBI), Umeå University, Umeå SE-901 87, Sweden. <sup>121</sup>Department of Statistics, USBE Umeå University, S-907 97 Umeå, Sweden. <sup>122</sup>Institute for Molecular Bioscience, University of Queensland, Brisbane 4072, Australia. <sup>123</sup>The Institute of Medical Sciences, Aberdeen Biomedical Imaging Centre, University of Aberdeen, Aberdeen AB25 2ZD, UK. <sup>124</sup>Division of Brain Sciences, Department of Medicine, Imperial College, London SW7 2AZ, UK. <sup>125</sup>Department of Radiation Sciences, Umeå University, Umeå SE-901 87, Sweden. <sup>126</sup>Department of Integrative Medical Biology, Umeå University, Umeå SE-901 87, Sweden. <sup>127</sup>Centre for Integrated Genomic Medical Research, Institute of Population Health, University of Manchester, Manchester M13 9PT, UK. <sup>128</sup>Karolinska Institutet, Aging Research Center, Stockholm University, Stockholm SE-113 30, Sweden. <sup>129</sup>Department of Psychology, School of Philosophy, Psychology and Language Sciences, The University of Edinburgh, Edinburgh EH8 9JZ, UK. <sup>130</sup>Gen-Info LLC, Zagreb 10000, Croatia. <sup>131</sup>Faculty of Medicine, University of Split, Split 21000, Croatia. <sup>132</sup>Department of Psychology, Stanford University, Palo Alto 94305-2130 CA, USA. <sup>133</sup>Department of Health Services, University of Washington, Seattle 98195-7660 WA, USA. <sup>134</sup>Kaiser Permanente Washington Health Research Institute, Seattle 98101 WA, USA. <sup>135</sup>Department of Developmental Disability Neuropsychiatry, School of Psychiatry, University of New South Wales, Sydney 2052, Australia. <sup>136</sup>Department of Psychological and Brain Sciences, Indiana University, Bloomington, IN 47405-7007, USA. <sup>137</sup>Institute for Translational Genomics and Population Sciences, Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center, Torrance, CA 90502, USA. <sup>138</sup>Department of Pediatrics, Harbor-UCLA Medical Center, Torrance 90509 CA, USA. <sup>139</sup>Department of Genetics and Genomic Science and Institute for Multiscale Biology, Icahn School of Medicine at Mount Sinai, New York 10029 NY, USA. <sup>140</sup>Mental Illness Research, Education, and Clinical Center (VISN 2), James J. Peters VA Medical Center, Bronx 10468 NY, USA. <sup>141</sup>Institute of Molecular Biology and Biochemistry, Centre for Molecular Medicine, Medical University of Graz, Graz 8036, Austria. <sup>142</sup>Robert and Beverly Lewis Center for Neuroimaging, University of Oregon, Eugene 97403 OR, USA. <sup>143</sup>Department of Neurology, Boston University School of Medicine, Boston 02118 MA, USA. <sup>144</sup>The National Heart, Lung, and Blood Institute's Framingham Heart Study, Framingham 01702-5827 MA, USA. <sup>145</sup>Department of Medical Biometry, Informatics and Epidemiology, University Hospital, Bonn D-53012, Germany. <sup>146</sup>Laboratory of NeuroGenetics, Department of Psychology & Neuroscience, Duke University, Durham 27708-0086 NC, USA. <sup>147</sup>Department of Molecular Epidemiology, Leiden University Medical Center, Leiden 2333, The Netherlands. <sup>148</sup>Institute of Cardiovascular and Medical Sciences, University of Glasgow, Glasgow G12 8QQ, United Kingdom. <sup>149</sup>Lieber Institute for Brain Development, Johns Hopkins University Medical Campus, Baltimore 21205 MD, USA. <sup>150</sup>Department of Hygiene and Epidemiology, University of Ioannina Medical School, Ioannina 45110, Greece. <sup>151</sup>Department of Public Health, University Hospital of Bordeaux, Bordeaux 33076, France. <sup>152</sup>Department of Internal Medicine, Erasmus Medical Center, Rotterdam 3015, The Netherlands. <sup>153</sup>Campbell Family Mental Health Institute, Centre for Addiction and Mental Health, University of Toronto, Toronto M5T 1L8, Canada. <sup>154</sup>Department of Public Health, University of Helsinki, Helsinki 00014, Finland. <sup>155</sup>Department of Radiology, Erasmus MC, Rotterdam 3015, The Netherlands. <sup>156</sup>Department of Psychiatry and Behavioral Sciences, Faculty of Medicine, University of Crete, Heraklion GR-71003, Greece. <sup>157</sup>Human Genetics Center, School of Public Health, University of Texas Health Science Center at Houston, Houston 77030 TX, USA. <sup>158</sup>Human Genome Sequencing Center, Baylor College of Medicine, Houston 77030-3411 TX, USA. <sup>159</sup>Neuropsychiatric Genetics Research Group, Department of Psychiatry and Trinity College Institute of Neuroscience, Trinity College Dublin, Dublin DO2 AY89, Ireland. <sup>160</sup>Center for Translational and Systems Neuroimmunology, Department of Neurology, Columbia University Medical Center, New York 10032 NY, USA. <sup>161</sup>Program in Medical and Population Genetics, Broad Institute, Cambridge 02142 MA, USA. <sup>162</sup>Department of Neurology, University Hospital of Bordeaux, Bordeaux 33000, France. <sup>163</sup>Department of Global Health, University of Washington, Seattle 98104 WA, USA. <sup>164</sup>Department of Cardiology, Leiden University Medical Center, Leiden 2333, The Netherlands. <sup>165</sup>Institute for Behavioral Genetics, University of Colorado, Boulder 80309 CO, USA. <sup>166</sup>Wellcome Trust Sanger Institute, Wellcome Trust Genome Campus, Cambridge CB10 1SA, UK. <sup>167</sup>Department of Medical Genetics, University of Helsinki and University Central Hospital, Helsinki 00014, Finland. <sup>168</sup>Division of Neuroscience and Experimental Psychology, School of Biological Sciences, Manchester Academic Health Science Centre, and Manchester Medical School, Institute of Brain, Behaviour, and Mental Health, University of Manchester, Manchester M13 9PL, UK. <sup>169</sup>Department of Clinical Physiology and Nuclear Medicine, Turku University Hospital, Turku 20520, Finland. <sup>170</sup>School of Medicine and Public Health, University of Newcastle, New South Wales 2308, Australia. <sup>171</sup>Neuroscience Research Australia, Sydney 2031, Australia. <sup>172</sup>Faculty of Medicine, University of New South Wales, Sydney 2052, Australia. <sup>173</sup>Alzheimer Scotland Dementia Research Centre, University of Edinburgh, Edinburgh EH8 9JZ, UK. <sup>174</sup>Division of Nephrology and Hypertension, Department of Internal Medicine, Mayo Clinic, Rochester, MN 55905, USA. <sup>175</sup>Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig 04103, Germany. <sup>176</sup>Day Clinic for Cognitive Neurology,

University Hospital Leipzig, Leipzig 04103, Germany. <sup>177</sup>Division of Psychiatry Research, Zucker Hillside Hospital, Glen Oaks 11004 NY, USA. <sup>178</sup>Department of Psychiatry, Hofstra Northwell School of Medicine, Hempstead 11549 NY, USA. <sup>179</sup>Division of Psychiatry, University of Edinburgh, Edinburgh EH10 5HF, UK. <sup>180</sup>MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton SO16 6YD, UK. <sup>181</sup>Glenn Biggs Institute for Alzheimer's and Neurodegenerative Diseases, University of Texas Health Sciences Center, San Antonio 78229 TX, USA. These authors contributed equally: Gail Davies, Max Lam. These authors jointly supervised this work: Todd Lencz, Ian J. Deary.