Supplementary Information

Details of individual participating IBD cohorts

REMIND Network – Prospective cohort of CD patients (NCT03458195) included at time of ileocolonic resection, recruited in 15 centers from the REMIND network. Extensive biobanking at surgery and post-operative endoscopy. The aims are to identify predictors of post-operative endoscopic recurrence, and to better understand the pathophysiology of recurrence.

CCIM German cohort – Cohort was recruited through the Comprehensive Center for Inflammation Medicine (CCIM) of the University Hospital. Tertiary referral center with an IBD ambulance.

SPARC IBD – Study of a Prospective Adult Research Cohort with IBD – is a multicentered longitudinal study of adult IBD patients. The goal of the study is to find predictors of response to therapy and predictors of relapse that will lead to precision medicine strategies and new therapeutic targets that will improve the quality of life of patients with IBD. Data and biosamples are used for basic, clinical, and translational research.

Belgium IBD ULG – IBD clinics, Erasme hospital, Brussels, Belgium (2800 IBD patients, 650 patients on biologics) within the Belgium IBD Consortium together with the IBD clinical and research groups of ULG, ULB and ULiège.

The Miami cohort – made up of IBD patients from both an academic Crohn's and colitis referral center (the University of Miami Crohn's and Colitis Center) and a large, community-based practice (GastroHealth) in South Florida.

The MIRIAD Biorepository – Cedars-Sinai recruits adult and pediatric IBD patients who attend the IBD Centers at Cedars-Sinai as well as through collaborators across the world (particularly East Asia). Both adult and pediatric subjects are recruited and while the majority of subjects are of Northern European and Ashkenazi Jewish emphasis on African-American and Hispanic recruitment (the latter through a collaboration with the University of Puerto Rico).

The Nurses' Health Studies – NHS is among the largest prospective investigations into the risk factors for major chronic diseases in women.

FINRISK – The population-based FINRISK study has been followed up for IBD and other disease end-points using annual record linkage with the Finnish National Hospital Discharge Register, the National Causes-of-Death Register and the National Drug Reimbursement Register. Controls were chosen to have a high polygenic risk score for IBD without an IBD diagnosis. A detailed description of the FINRISK cohort can be found at Borodulin et al.

NIDDK IBD Genetics Consortium – The NIDDK Inflammatory Bowel Disease Genetics Consortium (IBDGC) was created in 2002 by the National Institute of Diabetes, Digestive and Kidney diseases (NIDDK) to advance knowledge on the inflammatory bowel diseases, specifically Crohn's Disease and Ulcerative Colitis. The Consortium consists of six genetic research centers (GRC) and a data coordinating center (DCC) that prospectively recruits a combination of cases, controls, and trios to gather a large collection of samples and linked phenotype information. DNA samples are used to conduct genetic linkage and association studies. For more information please see https://ibdgc.org/

NIDDK-Quebec – a cohort of Crohn's disease patients, and healthy controls (spouses and/or "best friend") recruited in the Province of Quebec, Canada as part of the activities of the Montreal-Boston Genetic Research Center (GRC, Rioux is PI), one of six GRCs of the NIDDK-funded IBD Genetics Consortium (https://ibdgc.uchicago.edu/grc/montreal/). Patients and controls were recruited at university-based hospitals throughout the province by gastroenterologists specializing in IBD that formed the Quebec IBD Genetics Consortium. For more information please see https://www.medgeni.org/projects/qibdgc

Genome Quebec-GENIZON – a cohort of Crohn's disease patients, and healthy controls, of French Canadian origin recruited in the Province of Quebec, Canada. Previously collected by Genizon Biosciences Inc. but now part of a public biobank overseen by Génome Québec. For more information please visit: https://www.genomequebec.com/genizon-biobank/

Belgium IBD Leuven center – a tertiary referral center for IBD. Annually 3.000 patients are followed up in the clinic (2/3 are CD and 1/3 is UC). Patients are recruited via the IBD clinic to participate in the research on IBD by providing biomaterials and clinical data, stored in the electronic clinical records (KWS or Clinical Working Station) to the IBD Biobank (CCare, PI: Séverine Vermeire, EC approval). Controls are also recruited into CCare as healthy spouses of the included patients and through advertisements on campus. IBD Leuven is part of the Belgian IBD Genetics Consortium, together with the IBD clinical and research groups of ULG, ULB and ULiège.

MGH Pediatric Inflammatory Bowel Disease Center – a collection that provides care for children and adolescents with inflammatory bowel diseases (ulcerative colitis, indeterminate colitis, and crohn's disease).

PRISM (Prospective Registry in IBD Study at MGH) – a registry that includes more than 3,000 enrolled IBD patients and healthy controlled individuals.

SHARE – Investigators from seven major IBD centers formed the Sinai Helmsley Alliance for Research Excellence (SHARE) in 2010 to integrate information from basic science, epidemiology and information sciences to advance IBD research across multiple high-volume centers.

Epi25 Controls – is a collaboration of more than 200 partners from over 50 research cohorts from around the world to investigate the genetics of epilepsy. Whole exome sequencing data from the following Epi25 cohorts were included in these analyses: Germany: Bonn; Germany: Kiel; Germany: Tuebingen; Germany: Leipzig; Ireland: Dublin; USA: Philadelphia/CHOP; USA: EPGP; USA: Human Epilepsy Project; and USA: Penn/CHOP. Detailed descriptions of the cohorts, study PIs and teams, and local acknowledgements can be found in Epi25 Collaborative, AJHG, 2021. (https://pubmed.ncbi.nlm.nih.gov/33932343/)

UK-IRL-UCL Controls – samples were extracted from EBV transformed peripheral blood lymphocytes from unscreened healthy British blood donors and from whole blood samples from healthy volunteers of UK or Irish ancestry.

MIGEN-Leicester Controls – cases were ascertained from two studies: (i) the British Heart Foundation Family Heart Study and (ii) the BRICCS Study. Control subjects were ascertained from the control subjects being recruited as part of the UK Aneurysm Growth Study (UKAGS). All exome sequencing was performed at the Broad Institute of Harvard and MIT; sample sequence capture was performed using Illumina's ICE Capture reagent and sequencing was performed on an Illumina HiSeq 2000 or 2500.

MIGEN-Ottawa Controls – The Ottawa Heart Study is a cross-sectional case-control study designed to identify genes that predispose to angiographically defined coronary artery disease. All exome sequencing was performed at the Broad Institute of Harvard and MIT; sample sequence capture was performed using Agilent SureSelect Human All Exon Kit v2 and sequencing was performed on an Illumina HiSeq 2000 or 2500.

ASC-NIMH Controls – The ARRA Autism Sequencing Collaboration was created in 2010 bringing together an expert large-scale sequencing center and a collaborative network of research labs focused on the genetics of autism. These groups worked together to utilize dramatic new advances in DNA sequencing technology to reveal the genetic architecture of autism through comprehensive examination of the exotic sequence of all genes. The Autism Sequencing Consortium (ASC) was founded by Joseph D. Buxbaum and colleagues as an international group of scientists who share autism spectrum disorder (ASD) samples and genetic data.

Supplemental acknowledgments of participating consortia and programs

Additional funding sources and acknowledgment of individual cohorts are as follows: We acknowledge the **Crohn's & Colitis Foundation's IBD Plexus Program** — the results published here are in part based on data obtained from the IBD Plexus program of the Crohn's & Colitis Foundation. We acknowledge the contribution of the **Oxford IBD cohort study** and the **Oxford GI biobank**, which are supported by the NIHR Oxford Biomedical Research Centre. **The Belgium Consortium** would like to acknowledge individual study support from FNRS (Fond National de la Recherche Scientifique, Belgium), funding from H2020 (SYSCID), FNRS (EOS N°30770923 / PDRs N° T.0190.19 and T.0096.19 / CDR N°J.0173.18) and Welbio

(COSIBD) and Myriam Mni, Emilie Théâtre, François Crins, Julia Dmitrieva, Valérie Deffontaine, Yukihide Momozawa and GIGA-Genomics core facility for assistance and technical assistance. **The Canadian IMAGINE cohort** acknowledges the Charles Wolfson Charitable Trust and the Canadian Institute for Health Research Grants SPOR-RN279389–358033. **The German CCIM cohort** acknowledges the German Excellence Initiative EXC 2167 and IMI Programm of the EU ("3TR"), and the European Regional Development Fund 01.2.2-LMT-K-718-04-0003. The **German IBD Consortium** would like to acknowledge the CCIM that receives infrastructure support from the DFG Cluster of Excellence "Precision Medicine in Chronic Inflammation" (PMI). **The Cedars-Sinai IBD study** was supported by the Cedars-Sinai MIRIAD IBD Biobank. The MIRIAD IBD Biobank receives funding from the Widjaja Foundation Inflammatory Bowel and Immunobiology Research Institute, NIDDK grants P01DK046763 and U01DK062413, and The Leona M. and Harry B. Helmsley Charitable Trust. The **SHARE consortium** would like to acknowledge The Leona M. and Harry B. Helmsley Charitable Trust. The **SPARC IBD Network** acknowledges that the results published here are in part based on data obtained from the IBD Plexus program of the Crohn's & Colitis Foundation. The **Miami cohort** was supported by the National Institute of Diabetes and Digestive and Kidney Disease Grant (R01DK104844). The **FINRISK controls** were part of the FINRISK studies supported by THL (formerly KTL: National Public Health Institute) through budgetary funds from the government, with additional funding from institutions such as the Academy of Finland, the European Union, ministries and national and international foundations and societies to support specific research purposes. The **UK-IRL Controls** were collected and sequenced with support from the Neuroscience Research Charitable Trust, the Central London NHS (National Health Service) Blood Transfusion Service and the National Institute of Health Research (NIHR) funded Mental Health Research Network. Whole exome sequencing of samples in the **Epi25 Collaborative** was done by the Broad Institute Genomics Platform and was supported by the NHGRI Centers for Common Disease Genomics Genomics (CCDG) grant (UM1HG008895) and the Stanley Center for Psychiatric Research. The **ASC-NIMH-Controls** cohort was first supported by a cooperative agreement grant to four lead sites funded by the National Institute of Mental Health (U01MH100233, U01MH100209, U01MH100229, U01MH100239), and renewed NIMH grants (U01MH111661, U01MH111660, U01MH111658 and U01MH111662), with additional support from the National Human Genome Research Institute through the Broad Center for Common Disease Genomics (UM1HG008895, Mark Daly, PI).

This research has been conducted using the UK Biobank Resource under application number 45669.

Participants in the **INTERVAL** randomized controlled trial were recruited with the active collaboration of NHS Blood and Transplant England (www.nhsbt.nhs.uk [nhsbt.nhs.uk]), which has supported field work and other elements of the trial. We thank Klaudia Walter and Kousik Kundu for help with INTERVAL WGS quality control. DNA extraction and genotyping were co-funded by the National Institute for Health Research (NIHR), the NIHR BioResource (http://bioresource.nihr.ac.uk [bioresource.nihr.ac.uk]) and the NIHR Cambridge Biomedical Research Centre (BRC-1215-20014) [*]. This research was supported by the NIHR Cambridge Biomedical Research Centre (BRC-1215-20014) and NIHR Newcastle Biomedical Research

Centre [BRC-1215-20001]. Sequencing was supported by the Wellcome Trust grant number 206194. The academic coordinating centre for INTERVAL was supported by core funding from the: NIHR Blood and Transplant Research Unit in Donor Health and Genomics (NIHR BTRU-2014-10024), UK Medical Research Council (MR/L003120/1), British Heart Foundation (SP/09/002; RG/13/13/30194; RG/18/13/33946) and NIHR Cambridge BRC (BRC-1215-20014) [*]. A complete list of the investigators and contributors to the INTERVAL trial is provided in reference [**]. The academic coordinating centre would like to thank blood donor centre staff and blood donors for participating in the INTERVAL trial.

This work was supported by Health Data Research UK, which is funded by the UK Medical Research Council, Engineering and Physical Sciences Research Council, Economic and Social Research Council, Department of Health and Social Care (England), Chief Scientist Office of the Scottish Government Health and Social Care Directorates, Health and Social Care Research and Development Division (Welsh Government), Public Health Agency (Northern Ireland), British Heart Foundation and Wellcome.

*The views expressed are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care.

**Di Angelantonio E, Thompson SG, Kaptoge SK, Moore C, Walker M, Armitage J, Ouwehand WH, Roberts DJ, Danesh J, INTERVAL Trial Group. Efficiency and safety of varying the frequency of whole blood donation (INTERVAL): a randomized trial of 45 000 donors. Lancet. 2017 Nov 25;390(10110):2360-2371.

Consortia

Belgium IBD Consortium

Isabelle Cleynen[24], Denis Franchimont[38], Michel Georges[41], Edouard Louis[41], Souad Rahmouni[41], Séverine Vermeire[85,86]

Cedars-Sinai IBD Consortium

Philip Fleshner[50], Carol Landers[50], Dermot P.B. McGovern[50], Gil Melmed[50], Emebet Mengesha[50], Shervin Rabizadeh[50], Stephan Targan[50], Eric Vasiliauskas[50]

International IBD Genetics Consortium

Maria T. Abreu[6], Jean-Paul Achkar[97], Vibeke Andersen[98], Charles N. Bernstein[18], Steven R. Brant[30,89], Luis Bujanda[99], Siew Chien Ng[100], Judy H. Cho[42], Mark J. Daly[2,3,4,49], Lee A. Denson[101], Richard H. Duerr[88], Lynnette R. Ferguson[102], Denis Franchimont[38], Andre Franke[35], Richard Gearry[103], Hakon Hakonarson[104], Jonas Halfvarson[105], Caren Heller[62], Hailiang Huang[3,4], Antonio Julià[106], Judith Kelsen[31], Hamed Khalili[21], Subra Kugathasan[27], Juozas Kupcinskas[58], Anna Latiano[107], Edouard Louis[41], Reza Malekzadeh[108], Jacob L. McCauley[17], Dermot P.B. Mcgovern[50], Christopher J. Moran[23], David T. Okou[65], Tim Orchard[109], Aarno Palotie[2,3,4,49,68,69], Miles Parkes[90], Joel Pekow[56], Uroš Potočnik[110], Graham Radford-Smith[111], John D. Rioux[45,96,] Manuel A. Rivas[5], Gerhard Rogler[112], Bruce Sands[42], Mark S. Silverberg[78], Harry Sokol[15], Séverine Vermeire[85,86], Rinse K. Weersma[87], Ramnik J. Xavier[46,47,48,91,92,93,94,95]

NIDDK IBD Genetics Consortium

Manisha Bajpai[113], Arthur M. Barrie III[88], David G. Binion[88], Sondra Birch[76], Alain Bitton[19], Krzysztof Borowski[114], Gregory Botwin[50], Gabrielle Boucher[115], Steven R. Brant[30,89], Wei Chen[88], Judy H. Cho[42], Roberto Cordero[116,117], Justin Côté-Daigneault[118], Mark J. Daly[2,3,4,49], Lisa W. Datta[30], Jeffrey M. Dueker[88], Richard H. Duerr[88], Melissa Filice[114], Philip Fleshner[50], Kyle Gettler[42], Mamta Giri[42], Philippe Goyette[45], Ke Hao[119], Talin Haritunians[50], Yuval Itan[120], Elyse Johnston[88], Carol Landers[50], Mark Lazarev[121], Dalin Li[50], Dermot P.B. McGovern[50], Emebet Mengesha[50], Miriam Merad[122], Raquel Milgrom[114], Shadi Nayeri[114], John D. Rioux[45,96], Klaudia Rymaszewski[114], Ksenija Sabic[120], William B. Sabol[88], Bruce Sands[42], L. Philip Schumm[76], Marc B. Schwartz[88], Mark S. Silverberg[78], Claire L. Simpson[116,117], Joanne M. Stempak[114], Christine R. Stevens[2,3,4], Stephan R. Targan[50], Ramnik J. Xavier[46,47,48,91,92,93,94,95]

NIHR IBD BioResource

Christopher Alexakis[123], Dhar Anjan[124], Richard Appleby[125], Bijay Baburajan[126], Michelle Baker-Moffatt[127], Paul Banim[128], Jamie Barbour[129], John Beckly[130], Roisin Bevan[131], Stuart Bloom[132], Monica Bose[133], Johanne Brooks[134], Deborah Butcher[135], Jeffrey Butterworth[136], Martyn Carter[134], Katie Clark[137], Andy Cole[138], Joseph Collum[139], Fraser Cummings[140], Albert Davies[141], John Decaestecker[142], Aminda Desilva[143], Stephen Foley[144], Anton Gunasekera[145], Laura Hancock[146], Mina Hanna[147], Ailsa Hart[148], David Hobday[149], Hein Htet[150], Peter Irving[53,54], Mark Jarvis[151], Babur Javaid[152], Matthew Johnson[153], Rizwan Kassan[154], Nick Kennedy[155], Alexandra Kent[156], Klaartje Kok[157], Konrad Koss[158], Conor Lahiff[159], Christopher A. Lamb[59,60], Jonathan Landy[160], Charlie Lee[161], Stephen Lewis[162], Andy Li[150],Jimmy Limdi[163], Alan Lobo[164], Juliette Loehry[165], Chris Macdonald[166], John Mansfield[60], John Mclaughlin[167], Simon Mclaughlin[168], Yin Miao[169], Gordon Moran[170], Ajay Muddu[171], Charles Murray[172], Prakash Nair[135], Chuka Nwokolo[173], Arabis Oglesby[174], Chirag Oza[175], Simon Panter[149], Miles Parkes[90], Ruth Penn[176], Kath Phillis[177], Richard Pollok[178], Natalie Prescott[72], Cathryn Preston[179], Monira Rahman[180], Arvind Ramadas[181], John Ramage[182], Subramaniam Ramakrishnan[183], Matt Rutter[131], John Saunders[184], Shaji Sebastian[185], Christian Selinger[186], Rakesh Shah[175], Dan Sharpstone[187], Richard Shenderey[188], Achuth Shenoy[189], Udi Shmueli[190], Alison Simmons[79], Salil Singh[191], Leena Sinha[192], Ganesh Sivaji[193], Katie Smith[194], Melissa Smith[195], Paul Smith[196], Helen Steed[197], Sreedhar Subramanian[198], Byron Theron[199], Judith Tidbury[200], Theresa Tindall[201], Mark Tremelling[202], Deven Vani[203], Ajay Verma[204], Gareth Walker[205], Dawn Warren[206], Alastair Watson[202], Emma Wesley[207], Alan Wiles[208], Joy Wilkins[209], Horace Williams[210], Annette Woods[211]

Regeneron Genetics Center

Goncalo Abecasis, Amelia Averitt[12], Joshua Backman[12], Xiaodong Bai[12], Suganthi Balasubramanian[12], Nilanjana Banerjee[12], Suying Bao[12], Aris Baras[12], Christina Beechert[12], Boris Boutkov[12], Michael Cantor[12], Siying Chen[12], Giovanni Coppola[12], Amy Damask[12], Andrew Deubler[12], Lee Dobbyn[12], Aris Economides[12], Gisu Eom[12], Manuel Allen Revez Ferreira[12], Caitlin Forsythe[12], Erin D. Fuller[12], Arkopravo Ghosh[12], Christopher Gillies[12], Zhenhua Gu[12], Lauren Gurski[12], Lukas Habegger[12], Alicia Hawes[12], Marcus B. Jones[12], Eric Jorgenson[12], Hyun Min Kang[12], Katia Karalis[12], Michael Kessler[12], Shareef Khalid[12], Jack Kosmicki[12], Olga Krasheninina[12], Rouel Lanche[12], Michael Lattari[12], Dadong Li[12], Alexander Li[12], Nan Lin[12], Daren Liu[12], Adam Locke[12], Alexander Lopez[12], Luca A. Lotta[12], Sameer Malhotra[12], Kia Manoochehri[12], Adam J. Mansfield[12], Jonathan Marchini[12], Anthony Marcketta[12], Evan K. Maxwell[12], Joelle Mbatchou[12], Lyndon J. Mitnaul[12], George Mitra[12], Arden Moscati[12], Mona Nafde[12], Sean O'Keeffe[12], Max Orelus[12], John D. Overton[12], Maria Sotiropoulos Padilla[12], Razvan Panea[12], Charles Paulding[12], Tommy Polanco[12], Manasi Pradhan[12], Ayesha Rasool[12], Jeffrey G. Reid[12], William Salerno[12], Thomas D. Schleicher[12],

Deepika Sharma[12], Alan Shuldiner[12], Carlo Sidore[12], Katherine Siminovitch[12], Eli Stahl[12], Jeffrey C. Staples[12], Jeffrey Staples[12], Kathie Sun[12], Ricardo H. Ulloa[12], Kyoko Watanabe[12], Louis Widom[12], Sarah E. Wolf[12], Jiwen Xin[12], Bin Ye[12], Blair Zhang[12], Andrey Ziyatdinov[12]

SHARE Consortium

Ashwin N. Ananthakrishnan[9], William A. Faubion[37], Bana Jabri[56], Michael D. Kappelman[212], Sergio A. Lira[213], Millie Long[75], Rodney D. Newberry[64], Robert S. Sandler[75], R. Balfour Sartor[75], Ramnik J. Xavier[46,47,48,91,92,93,94,95]

SPARC IBD Network

Meenakshi Bewtra[214,215,216], Stacie Bishop[217], Shrinivas Bishu[218], Matthew Bohm[219], Loren P. Brook[220], Alex Bruss[221], Freddy Caldera[222], Matthew Cioba[64], Raymond K. Cross[223], Sushila Dala[56], Themistocles Dassopoulos[224], Parakkal Deepak[225], Richard H. Duerr[88], Monika Fisher[219], Rayna Haque[226], Peter Higgins[218], Austin Katona[227], Manreet Kaur[228], Baylee Kinnett[64], Joshua Korzenik[226], James D. Lewis[62], Anna Markert[226], Brice Messenger[226], Vessela Miladinova[88], Lizbeth Nunez[221], Maia Paul[226], Joel Pekow[56], Lilani Perera[229], Laura E. Raffals[230], Gormon Joel Reynolds[231], William B. Sabol[88], Sumona Saha[222], Elizabeth A. Scoville[232], Richa Shukla[228], Scott B. Snapper[233,234], Katerina Wells[224], Uni Wong[223], Andres J. Yarur[221,235]

UK IBD Genetics Consortium

Tariq Ahmad[7], Ailsa Hart[148], Chris Hawkey[148], Peter Irving[53,54], Christopher Lamb[59,60], Charlie Lees[236], John Mansfield[60], Craig Mowat[237], Bill Newman[146], Miles Parkes[90], Natalie Prescott[72], Jack Satsangi[236], Alison Simmons[79], Holm Uhlig[82,83], David Wilson[236]

Affiliations:

[1]Genomics of Inflammation and Immunity Group, Human Genetics Programme, Wellcome Sanger Institute, Wellcome Genome Campus, Hinxton, Cambridgeshire, UK

[2]Program in Medical and Population Genetics, The Broad Institute of MIT and Harvard, Cambridge, MA, USA

[3]Stanley Center for Psychiatric Research, The Broad Institute of MIT and Harvard, Cambridge, MA, USA

[4]Analytic and Translational Genetics Unit, Department of Medicine, Massachusetts General Hospital, Boston, MA, USA

[5]Department of Biomedical Data Science at Stanford University, Stanford, CA, USA

[6]Crohns and Colitis Center, Leonard M. Miller School of Medicine, University of Miami, Miami, FL, USA

[7]Royal Devon and Exeter Hospital, Exeter, Devon, UK

[8]Hopital Saint-Louis, APHP, Universite de Paris, INSERM U1160, Paris, France

[9]Division of Gastroenterology, Crohns and Colitis Center, Massachusetts General Hospital, Boston, MA, USA

[10]Department for Human Biology, University of Haifa, Haifa, Israel

[11]Departments of Medicine and Genetics, Albert Einstein College of Medicine, Bronx, NY, USA

[12]Regeneron Genetics Center, Tarrytown, NY, USA

[13]Human Genetics Programme, Wellcome Sanger Institute, Wellcome Genome Campus, Hinxton, Cambridgeshire, UK

[14]The Institute for Aging Research, the Nathan Shock Center of Excellence in the Basic Biology of Aging and the Paul F. Glenn Center for the Biology of Human Aging Research at Albert Einstein College of Medicine of Yeshiva University, Bronx, NY, USA

[15]Sorbonne Universite, Saint Antoine Hospital, Gastroenterology Department, F-75012 Paris, France

[16]John P. Hussman Institute for Human Genomics, Leonard M. Miller School of Medicine, University of Miami, Miami, FL, USA

[17]The Dr. John T. Macdonald Foundation Department of Human Genetics, Leonard M. Miller School of Medicine, University of Miami, Miami, FL, USA

[18]University of Manitoba, Winnipeg, Manitoba, Canada

[19]McGill University and McGill University Health Centre, Montreal, Canada

[20]Department of Internal Medicine, University Medical Center Schleswig-Holstein, Kiel, Germany

[21]Clinical and Translational Epidemiology Unit, Massachusetts General Hospital, Boston, MA, USA

[22]Channing Division of Network Medicine, Department of Medicine, Brigham and Womens Hospital, Boston, MA, USA

[23]Massachusetts General Hospital, Boston, MA, USA

[24]Department of Human Genetics, KU Leuven, Leuven, Belgium

[25]Professeur Chef de Service chez APHP and Universite Paris-6, Paris, France

[26]Department of Human Genetics, Emory University, Atlanta, GA, USA

[27]Emory University School of Medicine and Children's Healthcare of Atlanta, Atlanta, GA, USA

[28]Human Genetics Informatics, Wellcome Sanger Institute, Wellcome Genome Campus, Hinxton, Cambridgeshire, UK

[29]University of Miami, Miami, FL, USA

[30]Meyerhoff Inflammatory Bowel Disease Center, Department of Medicine, Johns Hopkins University School of Medicine, Baltimore, MD, USA

[31]Childrens Hospital of Philadelphia, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA

[32]University of Rome Sapienza, Rome, Italy

[33]IRGB - CNR, Cagliari, Italy

[34]Genomics Platform, The Broad Institute of MIT and Harvard, Cambridge, MA, USA

[35]Christian-Albrechts-University of Kiel and University Medical Center Schleswig-Holstein, Kiel, Germany

[36]Helsinki University Central Hospital, Helsinki, Finland

[37]Mayo Clinic, Rochester, Rochester, MN, USA

[38]Erasme Hospital, ULB, Brussels, Belgium

[39]Psychiatric and Neurodevelopmental Genetics Unit, Center for Genomic Medicine, Massachusetts General Hospital, Boston, MA, USA

[40]Center for Precision Psychiatry, Massachusetts General Hospital, Boston, MA, USA

[41]University of Liège, ULG, Liège, Belgium

[42]Icahn School of Medicine at Mount Sinai, New York, NY, USA

[43]Department of Endocrinology and Metabolism, Hadassah Medical Center and Faculty of Medicine, Hebrew University of Jerusalem, Israel

[44]University Medical Center Schleswig-Holstein, Kiel, Germany

[45]Research Center Montreal Heart Institute, Montreal, Canada

[46]Infectious Disease and Microbiome Program, The Broad Institute of MIT and Harvard, Cambridge, MA, USA

[47]Center for Computational and Integrative Biology, Massachusetts General Hospital, Boston, MA, USA

[48]Department of Molecular Biology, Massachusetts General Hospital, Boston, MA, USA

[49]Institute for Molecular Medicine Finland, FIMM, HiLIFE, University of Helsinki, Helsinki, Finland

[50]F. Widjaja Foundation Inflammatory Bowel and Immunobiology Research Institute, Cedars Sinai Medical Center, Los Angeles, CA, USA

[51]Institute of Biomedicine, University of Eastern Finland, Kuopio, Finland

[52]Christian-Albrechts-University of Kiel, Kiel, Germany

[53]Department of Gastroenterology, Guys and Saint Thomas Hospital, London, UK

[54]School of Immunology and Microbial Sciences, Kings College London, London, UK

[55]Director of Genetic Resources and Services, Center for Rare Jewish Genetic Disorders, Bonei Olam, Brooklyn, NY, USA

[56]University of Chicago Medicine, Chicago, IL, USA

[57]Department of Medicine, Helsinki University Hospital, and Research Program for Clinical and Molecular Metabolism, University of Helsinki, Finland

[58]Department of Gastroenterology and Institute for Digestive Research, Lithuanian University of Health Sciences, Kaunas, Lithuania

[59]Translational and Clinical Research Institute, Newcastle University, Newcastle upon Tyne, NE2 4HH, UK

[60]Department of Gastroenterology, Newcastle upon Tyne Hospitals NHS Foundation Trust, Newcastle upon Tyne, NE1 4LP, UK

[61]University College London, London, UK

[62]Crohns and Colitis Foundation, New York, NY, USA

[63]McMaster University, Hamilton, Ontario, Canada

[64]Washington University School of Medicine, St. Louis, MO, USA

[65]Institut National de Sante Publique (INSP), Abidjan, Côte d'Ivoire

[66]Department of Gastroenterology and Hepatology, University Medical Centre Utrecht, Utrecht, The Netherlands

[67]Albert Einstein College of Medicine, Bronx, NY, USA

[68]Department of Neurology, Massachusetts General Hospital, Boston, MA, USA

[69]Department of Psychiatry, Massachusetts General Hospital, Boston, MA, USA

[70]Department of Gastroenterology and Hepatology, Maastricht University Medical Centre+, Maastricht, The Netherlands

[71]Department of Gastroenterology and Hepatology, Amsterdam University Medical Centres, Amsterdam, The Netherlands

[72]Department of Medical and Molecular Genetics, Kings College London, London, UK

[73]School of Medicine, Johns Hopkins University, Baltimore, MD, USA

[74]Research Programs Unit, Immunobiology, University of Helsinki, Helsinki, Finland

[75]Center for Gastrointestinal Biology and Disease, University of North Carolina School of Medicine, Chapel Hill, NC, USA

[76]Department of Public Health Sciences, University of Chicago, Chicago, IL, USA

[77]IBD BioResource, NIHR BioResource, Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK

[78]Mount Sinai Hospital, Toronto, Ontario, Canada

[79]MRC Human Immunology Unit, NIHR Biomedical Research Centre, Radcliffe Department of Medicine, University of Oxford, Oxford, UK

[80]Department of Pediatrics, Emory University School of Medicine and Children's Healthcare of Atlanta, GA, Atlanta, GA, USA

[81]Shaare Zedek Medical Center, Jerusalem, Israel

[82]Translational Gastroenterology Unit and Biomedical Research Centre, Nuffield Department of Clinical Medicine, Experimental Medicine Division, University of Oxford, Oxford, UK

[83]Department of Pediatrics, John Radcliffe Hospital, Oxford, UK

[84]Department of Gastroenterology and Hepatology, Leiden University Medical Center, Leiden, The Netherlands

[85]University Hospitals Leuven, Leuven, Belgium

[86]Department of Chronic Diseases and Metabolism, KU Leuven, Leuven, Belgium

[87]Department of Gastroenterology and Hepatology, University of Groningen and University Medical Center Groningen, Groningen, The Netherlands

[88]University of Pittsburgh, Pittsburgh, PA, USA

[89]Crohns Colitis Center of New Jersey, Department of Medicine, Rutgers Robert Wood Johnson Medical School and Department of Genetics and the Human Genetics Institute of New Jersey, Rutgers University, New Brunswick and Piscataway, NJ, USA

[90]Department of Gastroenterology, Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK

[91]Kurt Isselbacher Professor of Medicine at Harvard Medical School, Cambridge, MA, USA

[92]Core Institute Member, The Broad Institute of MIT and Harvard, Cambridge, MA, USA

[93]Klarman Cell Observatory, The Broad Institute of MIT and Harvard, Cambridge, MA, USA

[94]Immunology Program, The Broad Institute of MIT and Harvard, Cambridge, MA, USA

[95]Center for Microbiome Informatics and Therapeutics at MIT, Massachusetts Institute of Technology, Cambridge, MA, USA

[96]Faculty of Medicine, Université de Montréal, Montreal, Canada

[97]Cleveland Clinic, Cleveland, OH, USA

[98]Focused Research Unit for Molecular Diagnostic and Clinical Research, Hospital of Southern Jutland, Denmark

[99]Osakidetza-Basque Health Service, Bilbao, Spain

[100]The Chinese University of Hong Kong, Hong Kong

[101]Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

[102]The University of Auckland, Auckland, New Zealand

[103]Department of Medicine, University of Otago, Christchurch, New Zealand

[104]Children's Hospital of Philadelphia, Philadelphia, PA, USA

[105]Dept. Of Gastroenterology, Faculty of Medicine and Health, Örebro University, Örebro, Sweden

[106]Rheumatology Research Group, Vall d'Hebron University Hospital, Barcelona, Spain

[107]Fondazione IRCCS Casa Sollievo della Sofferenza, Gastroenterology Unit, San Giovanni Rotondo, Foggia, Italy

[108]DDRI, Tehran University of Medical Sciences, Tehran, Iran

[109]Imperial College, London, UK

[110]University of Maribor, Faculty of Medicine, Center for Human Molecular Genetics and Pharmacogenomics, Maribor, Slovenia

[111]QIMR Berghofer MRI, Herston, Australia

[112]Department of Gastroenterology and Hepatology, University Hospital Zurich, Zurich, Switzerland

[113]Division of Gastroenterology and Hepatology, Department of Medicine, Rutgers Robert Wood Johnson Medical School, New Brunswick, New Jersey, USA

[114]Zane Cohen Centre for Digestive Diseases, Lunenfeld-Tanenbaum Research Institute, Sinai Health System, Toronto, ON, Canada

[115]Montreal Heart Institute, Research Center, Montreal, Canada

[116]Department of Genetics, Genomics, and Informatics

[117]University of Tennessee Health Science Center, Memphis, Tennessee, USA

[118]Centre Hospitalier de l'Université de Montréal (CHUM), Montreal, Canada

[119]Department of Genetics, Icahn School of Medicine at Mount Sinai, New York, NY, USA

[120]Charles Bronfman Institute for Personalized Medicine, Departments of Medicine and Genetics, Icahn School of Medicine, New York, NY, USA

[121]Harvey M. and Lyn P. Meyerhoff Inflammatory Bowel Disease Center, Department of Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland, USA

[122]Precision Immunology Institute, Icahn School of Medicine at Mount Sinai, New York, NY, USA

[123]Royal Surrey County Hospital NHS Foundation Trust Royal Surrey County Hospital, UK

[124]County Durham and Darlington NHS Foundation Trust Darlington Memorial Hospital, UK

[125]Chelsea and Westminster Hospital NHS Foundation Trust West Middlesex University Hospital, UK

[126]Maidstone & Tunbridge Wells NHS Trust Maidstone Hospital, UK

[127]Portsmouth Hospitals NHS Trust Queen Alexandra Hospital, Portsmouth, UK

[128]James Paget University Hospitals NHS Foundation Trust James Paget University Hospital, UK

[129]Gateshead Health NHS Foundation Trust Queen Elizabeth Hospital, UK

[130]Royal Cornwall Hospitals NHS Trust Royal Cornwall Hospital, UK

[131]North Tees and Hartlepool NHS Foundation Trust University Hospital of North Tees, UK

[132]University College London Hospitals NHS Foundation Trust University College Hospital, UK

[133]Princess Alexandra Hospital NHS Trust Princess Alexandra Hospital, UK

[134]East and North Hertfordshire NHS Trust Lister Hospital, UK

[135]North West Anglia NHS Foundation Trust Peterborough City Hospital, UK

[136]Shrewsbury and Telford Hospital NHS Trust Royal Shrewsbury Hospital, UK

[137]St Helens and Knowsley Teaching Hospitals NHS Trust Whiston Hospital, UK

[138]University Hospitals of Derby and Burton NHS Foundation Trust Royal Derby Hospital, UK

[139]East Lancashire Hospitals NHS Trust Royal Blackburn Hospital, UK

[140]University Hospital Southampton NHS Foundation Trust Southampton General Hospital, UK

[141]University Hospitals of Morecambe Bay NHS Foundation Trust Furness General Hospital, UK

[142]University Hospitals of Leicester NHS Trust Leicester General Hospital, UK

[143]Royal Berkshire NHS Foundation Trust Royal Berkshire Hospital, UK

[144]Sherwood Forest Hospitals NHS Foundation Trust King's Mill Hospital, UK

[145]Ashford & St Peter's Hospitals NHS Foundation Trust Ashford Hospital, UK

[146]Manchester University NHS Foundation Trust Wythenshawe Hospital, UK

[147]Lewisham and Greenwich NHS Trust Queen Elizabeth Hospital & University Hospital Lewisham, UK

[148]London North West University Healthcare NHS Trust Ealing Hospital & St Marks Hospital, London, UK

[149]South Tyneside and Sunderland NHS Foundation Trust South Tyneside District Hospital, UK

[150]Western Sussex Hospitals NHS Foundation Trust Worthing Hospital & St Richard's Hospital, UK

[151]Basildon & Thurrock University Hospitals NHS Foundation Trust Basildon University Hospital, UK

[152]Bedford Hospital NHS Trust Bedford General Hospital, UK

[153]Luton and Dunstable University Hospital NHS Foundation Trust Luton and Dunstable University Hospital, UK

[154]North West Anglia NHS Foundation Trust Hinchingbrooke Hospital, UK

[155]Royal Devon & Exeter NHS Foundation Trust Royal Devon and Exeter Hospital, UK

[156]Kings College Hospital NHS Foundation Trust Kings College Hospital, UK

[157]Barts Health NHS Trust The Royal London Hospital, UK

[158]East Cheshire NHS Trust Macclesfield District General Hospital, UK

[159]Milton Keynes University NHS Foundation Trust Milton Keynes University Hospital, UK

[160]West Hertfordshire Hospitals NHS Trust Hemel Hempstead Hospital & Watford General Hospital, UK

[161]NHS Lothian Western General Hospital, UK

[162]University Hospitals Plymouth NHS Trust Derriford Hospital, UK

[163]Pennine Acute Hospitals NHS Trust Fairfield General Hospital, UK

[164]Sheffield Teaching Hospitals NHS Foundation Trust Royal Hallamshire Hospital, UK

[165]Salisbury NHS Foundation Trust Salisbury District Hospital, UK

[166]North Cumbria Integrated Care NHS Foundation Trust Cumberland Infirmary Hospital, UK

[167]Salford Royal NHS Foundation Trust Salford Royal Hospital, UK

[168]Royal Bournemouth & Christchurch Hospitals NHS Foundation Trust Royal Bournemouth Hospital, UK

[169]East Suffolk and North Essex NHS Foundation Trust Ipswich Hospital, UK

[170]Nottingham University Hospitals NHS Trust Queen's Medical Centre, UK

[171]York Teaching Hospital NHS Foundation Trust Scarborough Hospital, UK

[172]Royal Free London NHS Foundation Trust Royal Free Hospital, UK

[173]University Hospital Coventry & Warwickshire NHS Trust University Hospital, Coventry, UK

[174]Dorset County Hospital NHS Foundation Trust Dorset County Hospital, UK

[175]Mid Essex Hospital Services NHS Trust Broomfield Hospital, UK

[176]Buckinghamshire Healthcare NHS Trust Wycombe Hospital, UK

[177]Chesterfield Royal Hospital NHS Foundation Trust Chesterfield Royal Hospital, UK

[178]St George's University Hospitals NHS Foundation Trust St George's Hospital, UK

[179]Bradford Teaching Hospitals NHS Foundation Trust Bradford Royal Infirmary, UK

[180]Surrey and Sussex Healthcare NHS Trust East Surrey Hospital, UK

[181]South Tees Hospitals NHS Foundation Trust James Cook University Hospital, UK

[182]Hampshire Hospitals NHS Foundation Trust Basingstoke and North Hampshire Hospital, UK

[183]Warrington and Halton Hospitals NHS Foundation Halton Hospital & Warrington Hospital, UK

[184]Royal United Hospitals Bath NHS Foundation Trust Royal United Hospital, UK

[185]Hull University Teaching Hospitals NHS Trust Hull Royal Infirmary, UK

[186]Leeds Teaching Hospitals NHS Trust St James's University Hospital, UK

[187]West Suffolk NHS Foundation Trust West Suffolk Hospital, UK

[188]Airedale NHS Foundation Trust Airedale General Hospital, UK

[189]East Suffolk and North Essex NHS Foundation Trust Colchester General Hospital, UK

[190]Northampton General Hospital NHS Trust Northampton General Hospital, UK

[191]Bolton NHS Foundation Trust Royal Bolton Hospital, UK

[192]Barking, Havering & Redbridge University Hospitals NHS Trust, King George Hospital & Queen's Hospital, UK

[193]Harrogate and District NHS Foundation Trust Harrogate District Hospital, UK

[194]Yeovil District Hospital NHS Foundation Trust Yeovil District Hospital, UK

[195]Brighton and Sussex University Hospitals NHS Trust Royal Sussex County Hospital, UK

[196]Wrightington, Wigan & Leigh NHS Foundation Trust Royal Albert Edward Infirmary, UK

[197]Royal Wolverhampton NHS Trust New Cross Hospital, UK

[198]Liverpool University Hospitals NHS Foundation Trust Royal Liverpool and Broadgreen University Hospital, UK

[199]Northern Devon Healthcare NHS Trust North Devon District Hospital, UK

[200]East Sussex Healthcare NHS Trust Eastbourne District General Hospital, UK

[201]Weston Area Health NHS Trust Weston General Hospital, UK

[202]Norfolk and Norwich University Hospitals NHS Foundation Trust Norfolk and Norwich University Hospital, UK

[203]Mid Yorkshire Hospitals NHS Trust Pinderfields General Hospital, UK

[204]Kettering General Hospital NHS Foundation Trust Kettering General Hospital, UK

[205]Torbay and South Devon NHS Foundation Trust Torbay Hospital, UK

[206]Kingston Hospital NHS Foundation Trust Kingston Hospital, UK

[207]Taunton & Somerset NHS Foundation Trust Musgrove Park Hospital, UK

[208]The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust Queen Elizabeth Hospital, King's Lynn, UK

[209]Isle of Wight NHS Trust St Mary's Hospital, UK

[210]Imperial College Healthcare NHS Trust St Mary's Hospital, UK

[211]Medway NHS Foundation Trust Medway Maritime Hospital, UK

[212]Department of Pediatrics, University of North Carolina, Chapel Hill, NC, USA

[213]Immunology Institute, Icahn School of Medicine at Mount Sinai, New York, NY, USA

[214]Division of Gastroenterology, University of Pennsylvania, Philadelphia PA, USA

[215]Center for Clinical Epidemiology and Biostatistics, University of Pennsylvania, Philadelphia, PA, USA

[216]Department of Biostatistics and Epidemiology, University of Pennsylvania, Philadelphia, PA, USA

[217]Advocate Aurora Health Care, Milwaukee, Wisconsin, USA

[218]Division of Gastroenterology, University of Michigan, Ann Arbor, MI, USA

[219]Indiana University Hospital, Indianapolis, IN, USA

[220]Department of Internal Medicine, Division of Digestive Diseases, University of Cincinnati College of Medicine, Cincinnati, OH, USA

[221]Medical College of Wisconsin, Milwaukee, WI, USA

[222]Department of Medicine, University of Wisconsin School of Medicine and Public Health, Madison, WI, USA

[223]Department of Medicine, Division of Gastroenterology and Hepatology, University of Maryland School of Medicine, Baltimore, MD, USA

[224]Baylor University Medical Center, Dallas, Texas, USA

[225]Inflammatory Bowel Diseases Center, Division of Gastroenterology, Department of Medicine, Washington University School of Medicine, St. Louis, MO, USA

[226]Brigham and Women's Hospital, Boston, MA, USA

[227]Vanderbilt University Medical Center, Nashville, TN, USA

[228]Division of Gastroenterology, Baylor College of Medicine, Houston, TX, USA

[229]Department of Medicine, Advocate Aurora Health Care, Grafton, WI, USA

[230]Division of Gastroenterology & Hepatology, Mayo Clinic, Rochester, MN, USA

[231]University of Cincinnati, Cincinnati, OH, USA

[232]Department of Medicine, Division of Gastroenterology, Vanderbilt University Medical Center, Nashville, TN, USA

[233]Division of Gastroenterology, Hepatology and Endoscopy, Department of Medicine, Brigham and Women's Hospital & Harvard Medical School, Boston, MA, USA

[234]Division of Gastroenterology, Hepatology and Nutrition, Department of Pediatrics. Boston Children's Hospital & Harvard Medical School, Boston, MA, USA

[235]Division of Gastroenterology and Hepatology

[236]Great Western Hospitals NHS Foundation Trust Western General Hospital, UK

[237]NHS Tayside Trust Ninewells Hospital, UK