Worldwide Big Data Collaborations: Examples From ENIGMA, Spanning 35 Countries

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ENIGMA is a worldwide scientific alliance of 700 scientists – across 340 institutions from 35 countries – pooling their imaging, genetic, and clinical data to study 18 brain diseases (http://enigma.ini.usc.edu). By drawing on “big data”, expertise, and computing infrastructure in 35 countries, the 30 working groups in ENIGMA have performed the largest neuroimaging studies to date of major depression, schizophrenia, bipolar disorder, and obsessive-compulsive disorder, mapping disease effects on the brain, and discovering protective or adverse factors influence these disease effects. We highlight 4 major areas where worldwide collaboration in big data has helped ENIGMA and brain science: (1) vastly increased statistical power to tackle new kinds of questions – such as ENIGMA’s discovery of genetic loci that affect the brain; (2) better testing of the reproducibility and generalizability of findings, as in ENIGMA’s maps of the major mental illnesses; (3) distributed computing, which speeds discovery by harnessing computer infrastructure internationally, (4) crowd-sourcing of ideas, where novel insights are made by mathematicians, geneticists and others not previously part of the Big Data community.