

1 **Global disparities and underserved populations in fecal microbiota transplantation**
2 **research**

3 Scott W. Olesen PhD^{1*}, Pratik Panchal MD¹, Justin Chen PhD¹, Shrish Budree MD¹, Majdi
4 Osman MD¹

5

6 1 OpenBiome, Cambridge, Massachusetts, USA

7 * Correspondence: OpenBiome, 2067 Massachusetts Ave, Cambridge, MA 02140, USA;
8 solesen@openbiome.org

9

10 Fecal microbiota transplantation (FMT) is recommended therapy for recurrent *Clostridioides*
11 *difficile* infection (CDI) in adult and pediatric patients (1) and is being explored as treatment for a
12 growing range of microbiome-mediated diseases (2). While microbiome-based therapies could
13 play a key role in global health (3,4), global FMT research remains inequitably distributed.

14

15 To explore the distribution of access to FMT research by geography and patient age, we
16 searched the World Health Organization's International Clinical Trials Registry Platform (ICTRP;
17 <http://apps.who.int/trialsearch/>) (5), which aggregates 17 registries, including 1 African and 1
18 South American registry, using search terms "FMT", "f(a)ecal bacteriotherapy", "flora
19 transplant*", "f(a)ecal transplant*", "f(a)ecal microbiota transplant*", and "intestinal microbiota
20 transplant*" in December 2019.

21

22 We identified 384 clinical studies involving FMT. Between 2010 and 2019, the number of studies
23 grew, and the disease indications being explored diversified (Figure 1a). In 2013, 21 studies,
24 most (17/21) studying CDI or inflammatory bowel disease (IBD), were registered. In 2017, 76
25 trials were registered, but less than a third (24/76) studied CDI or IBD. Most studies were small

26 (median enrollment target 35 patients, interquartile range 20 to 60) and early phase (81%
27 [170/209] were phase I or II).

28
29 Most studies were registered in North America, Western Europe, and East Asia (Figure 1b).
30 Twenty-seven percent (98/367) had a site in the US and 24% (84/367) had a site in China. Only
31 1 study had a site in Africa. None had a site in South America. Most studies (71% [271/384])
32 were registered on ClinicalTrials.gov, with another 10% (38/384) in the Chinese Clinical Trial
33 Registry, 8% (30/384) in the Japan Primary Registries Network, and 12% (45/384) in all other
34 registries combined.

35
36 Most studies focused on adults. Only 6% of trials (24/384) included very young participants
37 (under 5 years old), and only another 11% (44/384) included young adults (6 and 17 years old).
38 Most studies with very young participants targeted CDI, IBD, or the gut-brain axis (88% [21/24])
39 and were concentrated in North America (54% [13/24]). However, young adult studies, half of
40 which (22/44) targeted IBD, were concentrated in Asia (64% [28/44]).

41
42 While the landscape of FMT research has diversified in terms of indications, FMT research
43 remains focused on adult populations in high-income countries, with IBD research in China as a
44 notable exception. Researchers should urgently address barriers to more inclusive FMT trials
45 and broaden access to experimental microbiome therapies for children and populations in low-
46 and middle-income countries (3,4).

47

48 **Acknowledgements**

49 We thank William Pettee, Audrey Abend, Sally Kim, Stacy Kahn, and Madison Weatherly for
50 contributions and helpful conversations.

51

52 **Declaration of interest**

53 We declare no competing interests.

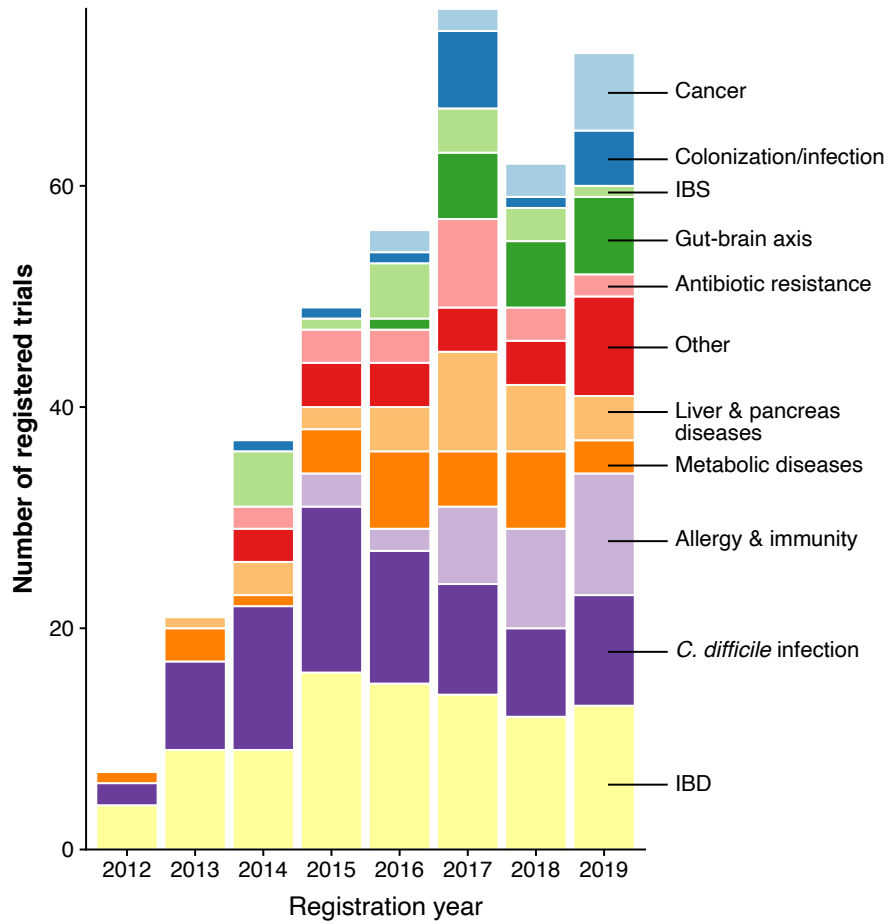
54

55 **References**

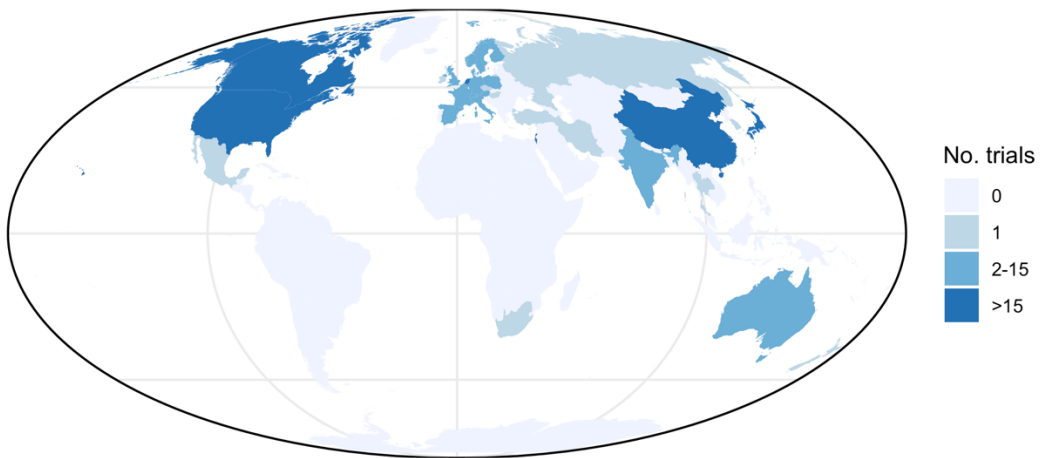
- 56 1. McDonald LC, Gerding DN, Johnson S, Bakken JS, Carroll KC, Coffin SE, et al. Clinical
57 Practice Guidelines for Clostridium difficile Infection in Adults and Children: 2017 Update
58 by the Infectious Diseases Society of America (IDSA) and Society for Healthcare
59 Epidemiology of America (SHEA). Clin Infect Dis [Internet]. 2018 Mar 19;66(7):e1–48.
60 Available from: <http://www.ncbi.nlm.nih.gov/pubmed/29462280>
- 61 2. Allegretti JR, Mullish BH, Kelly C, Fischer M. The evolution of the use of faecal microbiota
62 transplantation and emerging therapeutic indications. Vol. 394, The Lancet. Lancet
63 Publishing Group; 2019. p. 420–31.
- 64 3. Porras AM, Brito IL. The internationalization of human microbiome research. Curr Opin
65 Microbiol [Internet]. 2019 Aug;50:50–5. Available from:
66 <https://linkinghub.elsevier.com/retrieve/pii/S1369527419300505>
- 67 4. Rogers GB, Ward J, Brown A, Wesselingh SL. Inclusivity and equity in human
68 microbiome research. Lancet (London, England) [Internet]. 2019;393(10173):728–9.
69 Available from: <http://www.ncbi.nlm.nih.gov/pubmed/30799003>
- 70 5. Ghersi D, Pang T. From Mexico to Mali: four years in the history of clinical trial
71 registration. J Evid Based Med [Internet]. 2009 Feb;2(1):1–7. Available from:
72 <http://doi.wiley.com/10.1111/j.1756-5391.2009.01014.x>

73

74



75



76

77 **Figure 1.** a) FMT studies registered between 2012 and 2019. IBD: inflammatory bowel disease.

78 IBS: irritable bowel syndrome. b) Global distribution of registered FMT studies by countries.