



**Inequalities in research funding for women scientists:
systematic analysis of UK investments in global infectious
disease research 1997–2010**

| | |
|------------------------------------|---|
| Journal: | <i>BMJ Open</i> |
| Manuscript ID: | bmjopen-2013-003362 |
| Article Type: | Research |
| Date Submitted by the Author: | 07-Jun-2013 |
| Complete List of Authors: | Head, Michael; University College London, Infection & Population Health Fitchett, Joseph; London School of Hygiene & Tropical Medicine, Cooke, Mary; University College London, Wurie, Fatima; University College London, Atun, Rifat; Imperial College London, |
| Primary Subject Heading: | Infectious diseases |
| Secondary Subject Heading: | Global health |
| Keywords: | INFECTIOUS DISEASES, PUBLIC HEALTH, STATISTICS & RESEARCH METHODS, VIROLOGY, PARASITOLOGY, MYCOLOGY |
| | |

SCHOLARONE™
Manuscripts

1
2
3 **Inequalities in research funding for women scientists: systematic analysis of UK**
4
5 **investments in global infectious disease research 1997–2010**
6
7
8
9

10 Michael G Head^a, Joseph R Fitchett^b, Mary K Cooke^a, Fatima B Wurie^a, Rifat Atun^{c*}
11

12
13 a University College London, Research Department of Infection and Population Health, UCL
14 Royal Free Campus, Rowland Hill Street, London, NW3 2PF
15
16

17
18 b London School of Hygiene & Tropical Medicine, Keppel Street, London, WC1E 7HT
19

20
21 c Imperial College Business School and the Faculty of Medicine, Imperial College London,
22 South Kensington Campus, London SW7 2AZ
23
24
25
26
27

28
29 *Corresponding Author
30
31
32

33
34 Number of Words: **3 758**
35
36
37

38 **Keywords** – gender, funding, research, women, inequality
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Abstract

Objectives: Women are under-represented in biomedical science. Funding awarded to UK institutions for all infectious disease research from 1997 to 2010 was investigated, across disease categories and along the research and development continuum.

Design: Systematic analysis

Methods: Data was obtained from several sources for infectious disease research for the period 1997-2010 and each study assigned to - disease categories; type of science (pre-clinical, phases I, II or III, product development, implementation research); categories of funding organisation. Fold differences and statistical analysis were used to compare total investment, study numbers, mean grant, and median grant between men and women according to disease system, specific infection and funding organisation.

Results: 325,922 studies were screened and 6052 studies included in the final analysis, comprising 4357 grants (72.0%) awarded to men and 1695 grants (28.0%) awarded to women, totalling £2.274 billion. Of this, men received £1.786 billion (78.5%) and women £488 million (21.5%). The median value of award was greater for men (£179 389; IQR £59146–£371 977) than women (£125 556; IQR £30 982–£261 834).

Awards were greater for male PIs across all infectious disease systems, excepting neurological infections and sexually transmitted infections. The proportion of total funding awarded to women ranged from 14.3% in 1998 to 26.8% in 2009 (mean 21.4%); and was lowest for pre-clinical research at 18.2% (£285.5 million of £1.573 billion) and highest for operational research at 30.9% (£151.4 million of £489.7 million).

Conclusions: There are clear and consistent disparities in funding received by men and women principal investigators. Women have fewer funded studies and receive less funding in absolute and in relative terms. The median funding awarded are lower for women across

1
2
3 most infectious disease areas, by funder, and type of science funded along the R&D
4 pipeline. The disparities remain broadly unchanged over the 14-year study period.
5
6
7
8

9 **Article summary**

10 Article focus

- 11 • Our aim was to investigate the distribution of funding across infectious disease
12 research by gender of principal investigator, and to identify any disparities between
13 genders.
14
15
16
17
18
19
20
21
22
23
24
25

26 Key messages

- 27 • There are clear and consistent disparities in funding received by men and women
28 principal investigators.
29
30
31
32
- 33 • Total funding and the median award is typically greater in male PIs than female PIs
34
- 35 • Worryingly, these disparities remain consistent over the time period of our analysis
36 (1997-2010)
37
38
39

40 Strengths and limitations of this study

- 41 • This is the first study to present data to such a great level of detail and quantifying
42 the results with statistical analysis adds rigour.
43
44
45
- 46 • Our results add further evidence to previous work highlighting inequalities around
47 gender, and can be used to enhance the debate on furthering the numbers and
48 career paths of women in science
49
50
51
- 52 • Weaknesses include being unable to assess the success and failure rates by gender
53 and we also lacked data on the academic ranking of principal investigators and were
54 hence unable to adjust for levels of seniority across both genders.
55
56
57
58
59
60

Introduction

Women are under-represented in biomedical science, with a limited number of studies suggesting inequalities and discriminatory practices in the United Kingdom (UK), United States of America (US) and the European Union (EU) as a whole.

Yet, few studies have systematically explored the extent of these inequalities in relation to women in science. Women make up 50% of EU student population and 45% of doctoral students, but only one third of career researchers are women – a figure that is lower for senior positions.¹ In 1997 an analysis of the Swedish Medical Research Council suggested that peer-reviewers could not judge scientific merit independent of gender and noted the clear discrimination against women researchers.²

A number of UK studies have raised concerns on the position of women in biomedical science. In 2001, a Wellcome Trust survey, concluded that although women were as successful as men in securing funding for biomedical research, they were less likely to apply for grant funds because of their status in scientific institutions and the level of support they received.³ An analysis of Wellcome Trust awards in 2000-08 revealed a significant gender difference in the amount of funding awarded, even after adjusting for the seniority of the principal investigator, with conclusion “the most likely explanation for the difference in amounts awarded to women and men is that women are systematically less ambitious in the amounts of funding requested in their grant applications.”⁴ Although, in 2011, around 44% of academics in UK universities were women, only 39% of senior lecturers and 19% of professors were women.⁵

A number of studies from US have shown that women in science are disadvantaged compared to men.⁶⁻⁸ In 2012, a study which asked faculty from research-intensive US

1
2
3 universities to rate equally qualified man and woman applicant for a laboratory manager,
4 found that the male applicant was rated significantly more competent and employable by
5 both male and female faculty.⁹
6
7
8
9

10
11
12 The low numbers of women in science and the reasons for this anomaly is a concern for
13 scientists and policy makers. Although the UK Medical Research Council (MRC) has a
14 gender equality scheme that briefly states gender equality is reflected in agreements with
15 research organisations receiving MRC funding, it is not clear how this scheme is
16 implemented.¹⁰
17
18
19
20
21
22
23

24
25 While a number of initiatives have aimed to increase the numbers of women involved in
26 science, there are no affirmative actions or binding policies in the UK or Europe to
27 definitively ensure women are better represented in science. Indeed, some initiatives aimed
28 at increasing women in science have been criticised. For example, in 2012, the European
29 Commission campaign targeting 13-18 year-old secondary school students¹¹ was widely
30 criticised and described as an insult to women in science.^{12,13} The offending video clip was
31 removed from the EU campaign website. The effects of campaigns attempting to raise the
32 profile of women in science^{14,15} have not been assessed.
33
34
35
36
37
38
39
40
41
42
43

44 We have systematically analysed research funding awarded to UK institutions for all
45 infectious disease research, for the 14-year period from 1997 to 2010¹⁶ In this study we
46 examine with trends over time the distribution of funding awarded to men and women
47 principal investigators (PIs) across specific infections, in investigation categories, and along
48 the research and development (R&D) continuum, extending from pre-clinical to clinical and
49 operational research.
50
51
52
53
54
55
56
57
58
59
60

Methods

We obtained data from several sources for infectious disease research studies where funding was awarded between 1997 and 2010. We identified 325,922 studies for screening. We assigned each study to primary disease categories. We briefly outline the methodology for the categorisation of disease areas and classification of the funding sources, elaborated in detail elsewhere.¹⁶ Figure 1 shows the sources of data and the numbers of studies at each stage of screening to reach the final set of studies for detailed analysis.

Figure 1. Methodology flow chart

Within each category, we documented topic-specific subsections, including specific pathogen or disease. We allocated studies to one of four categories along the R&D continuum: pre-clinical; phases I, II or III; product development; and operational research, and to one of the 26 categories for funding organisations.

Where the PI was named, we assigned them to men or women categories. The studies where only an initial was available for the forename were assigned as “unclear” if we were unable to establish the PIs gender from a review of the literature and publicly available publications.

Reference to sexually transmitted infections excludes HIV. Neglected tropical diseases were categorised according to classification used by the World Health Organization (WHO) (http://www.who.int/neglected_diseases/diseases/en). Antimicrobial resistance includes

1
2
3 antibacterial, antiviral, antifungal and antiparasitic studies. No private sector funding was
4 included in this analysis due to limited publicly available data.
5
6
7
8
9

10 We converted grants awarded in a currency other than pounds sterling to UK pounds using
11 the mean exchange rate in the year of the award. We adjusted grant funding amounts for
12 inflation and reported in 2010 UK pounds.
13
14
15
16
17
18

19 We excluded studies not immediately relevant to infection, veterinary infectious disease
20 research studies (unless there was a zoonotic component) those exploring the use of viral
21 vectors to investigate non-communicable diseases, grants for symposia or meetings, or
22 studies with UK contributions (e.g. as a collaborator), but the funding was awarded to a non-
23 UK institution. Unfunded studies were excluded.
24
25
26
27
28
29
30
31

32 We used Microsoft Excel versions 2000 and 2007 to categorise studies. Where needed, data
33 were exported into Microsoft Access (versions 2000 and 2007) and specific keyword queries
34 used to select precise sections of the data for analysis. We used Stata (version 11.0) for
35 statistical analysis and to generate figures.
36
37
38
39
40
41
42

43 We used fold differences to compare total investment, number of studies, mean grant, and
44 median grant between men and women according to disease system, specific infection and
45 funding organisation.
46
47
48
49
50
51

52 We used nonparametric Mann-Whitney rank-sum test to assess the distribution of funding by
53 gender. Nonparametric K-sample test on equality of medians was applied to compare the
54 median funding by gender, and reported as a chi-squared statistic without Yates' correction
55
56
57
58
59
60

1
2
3 for continuity. Nonparametric Wilcoxon signed-rank test was applied when comparing
4
5 matched data, such as time trends by gender. The significance for all tests was defined at
6
7 the 5% level (two-sided $P=0.05$).
8
9

10 11 12 13 14 **Results**

15
16
17 We identified 6165 studies from the 325,922 studies screened that were suitable for
18
19 inclusion in our analysis. Of these, we were unable to ascertain the gender of principal
20
21 investigator for 30 studies (0.5%). We excluded 83 studies (1.3%) funded by the Bill and
22
23 Melinda Gates Foundation (Gates Foundation) (38 studies; 0.6%) and the UK Department
24
25 for International Development (DFID) (22 studies; 0.4%), accounting for £321.2 million
26
27 (12.3% of total) that did not specify the PIs name or gender. We included 6052 studies in the
28
29 final analysis, comprising 4357 grants (72.0%) awarded to men and 1695 grants (28.0%)
30
31 awarded to women, totalling £2.274 billion. Of this, £1.786 billion (78.5%) were awarded to
32
33 men and £488 million (21.5%) awarded to women.
34
35

36
37
38 The median value of grant funding was greater for men (£179 389; IQR £59146–£371 977)
39
40 than for women (£125 556; IQR £30 982–£261 834). Similarly, mean value of the grant
41
42 funding was greater for men (£409 910; SD £840 087) than for women (£288 011; SD £704
43
44 474). Figure 2 shows the distribution of the total investments and median funding awarded to
45
46 PIs by gender over time.
47
48

49
50
51 *Figure 2a. Total investment over time awarded to male and female principal investigators*

52
53
54 *Figure 2b Median investment over time awarded to male and female principal investigators*
55
56
57
58
59
60

Infectious disease system

Table 1A (web appendix 1) shows the total investment, total numbers of studies, mean grant funding, median grant funding and fold differences in funding according to 9 disease systems and by gender of PI. We identified no infectious disease system where women led the majority of research efforts or were awarded the majority of funding. Median funding awards were greater for male PIs across all infectious disease systems, with the exception of neurological infections and sexually transmitted infections.

Greatest levels of funding awarded to men and to women were for research into respiratory infections and HIV. Men received a total of £312.1 million for research into respiratory infections compared with £84.4 million for women, a 3.70 fold difference, and a total of £290.8 million for HIV research compared with £79.7 million for women, a 3.65 fold difference.

The largest difference between total funding for men and for women were with gastrointestinal infections (5.65 fold difference) where women received only 15.0% of the total investment (£37.0 million) and spearheaded 18.9% (149) of the studies and neurological infections (4.22 fold difference). Smallest difference between total funding for men and for women were with research into sexually transmitted infections (1.90 fold difference) where women received 35.0% (£45.4 million) of the total funding and spearheaded 49.0% (182) of the studies.

Mean funding for grants were significantly greater for men (£409 910; SD £840 087) than for women (£288 011; SD £704 474). The differences were statistically significant ($P > 0.01$) for gastrointestinal infections (men £328 021; SD £458 720) (women £248 615; SD £433 176),

1
2
3 for haematological infections (men £417 889; SD £914 626) (women £306 126; SD £819
4 910), and for HIV (men £649 216; SD £1 550 920) (women £278 505; SD £545 657).

5
6
7
8
9
10 Median funding for grants showed a similar pattern with significantly greater grant funding for
11 men (£179 389; IQR £59 146–£371 977) than women (£125 556; IQR £30 983–£261 835).
12 Differences were statistically significant ($P > 0.05$) for gastrointestinal infections (men £208
13 369; IQR £78 852–£357 771) (women £155 066; IQR £43 637–£305 928), for hepatic
14 infections (men £118 638; IQR £41 342–£269 629) (women £68 620; IQR £26 720–£221
15 952), and for HIV (men £163 462; IQR £39 153–£511 800) (women £114 272; IQR £29 880–
16 £305 339).
17
18
19
20
21
22
23

24 25 26 27 **Specific Infections**

28
29 Table 1B (web appendix 1) shows total investment, total numbers of studies, mean grant
30 funding, median grant funding and fold differences in funding according to specific infection
31 by gender.
32
33
34

35
36 Men received significantly higher levels of total research funding, spearheaded greater
37 numbers of studies, and were awarded greater median and mean funding for grants for
38 malaria ($P = 0.01$), HIV ($P = 0.01$) and influenza ($P = 0.04$).
39
40
41
42
43
44

45 Major differences between total funding for men and for women were with research into
46 candida (47.75 fold difference), rotavirus (33.65 fold difference), campylobacter (24.33 fold
47 difference) and norovirus (23.33 fold difference). Smallest differences between total funding
48 for men and women were for research into dengue (1.07 fold difference) and leishmaniasis
49 (1.55 fold difference). Women received greater total funding than men for research into
50 leprosy (0.09 fold difference), diphtheria (0.18 fold difference), chlamydia (0.36 fold
51 difference), syphilis (0.37 fold difference), and varicella zoster (0.54 fold difference).
52
53
54
55
56
57
58
59
60

1
2
3
4
5 Differences in mean grant funding was statistically significant ($P > 0.05$) for malaria research
6
7 (men £590 422; SD £1 324 909) (women £318 054; SD £726 872), for influenza (men £616
8
9 643; SD £881 493) (women £387 186; SD £489 997), for respiratory syncytial virus (men
10
11 £485 283; SD £539 396) (women £187 931; SD £268 412), and for HIV (men £649 216; SD
12
13 £1 550 920) (women £278 505; SD £545 657).
14
15

16
17
18 Differences in median grant funding were statistically significant ($P > 0.05$) for malaria
19
20 research (men £209 646; IQR £63 826–£529 610) (women £143 358; IQR £42 754–£314
21
22 524), for hepatitis C (men £124 797; IQR £42 475–£289 293) (women £67 265; IQR £29
23
24 880–£233 467), for influenza (men £348 730; IQR £213 601–£668 561) (women £200 787;
25
26 IQR £124 210–£398 191), for herpes simplex virus (men £119 295; IQR £40 009–£446 395)
27
28 (women £309 610; IQR £147 885–£439 305), and for HIV (men £163 462; IQR £39 153–
29
30 £511 800) (women £114 272; IQR £29 880–£305 339).
31
32
33
34
35

36 Figure 3 shows the proportion of total funding awarded to principal investigators by gender
37
38 over time and a breakdown of investment by research pipeline. The proportion of the total
39
40 funding awarded to women ranged from a low of 14.3% in 1998 to a high of 26.8% in 2009,
41
42 with a mean of 21.4% for the period studied. The proportion of funding was lowest for pre-
43
44 clinical research at 18.2% (£285.5 million of £1.573 billion total) and highest for operational
45
46 research at 30.9% (£151.4 million of £489.7 million). The funding for clinical (Phase I, II and
47
48 III) research was 29.9% (£25.5 of £85.2) and for product development amounted to 20.4%
49
50 (£25.8 million of £126.6 million).
51
52

53 *Figure 3a. Proportion of investment over time awarded to male and female principal*
54 *investigators*
55
56
57
58
59
60

1
2
3 *Figure 3b. Total investment by research pipeline awarded to male and female principal*
4 *investigators*
5
6
7
8
9

10 **Funding organisation**

11
12 Table 2 (web appendix 2) shows in detail the total investment, total numbers of studies,
13 mean grant funding, median grant funding and fold differences in funding according to
14 funding organisation and by gender.
15
16
17
18
19

20
21 Public funding organisations invested a total of £1·025 billion in research led by men
22 (78·6%) and £279·8 in research led by women (21·4%). Greatest levels of funding awarded
23 to men and to women were by the Wellcome Trust and the UK MRC. Major differences
24 between funding awarded to men and to women PIs were by the BBSRC, with a 6·12 fold
25 difference. Smallest differences between funding awarded to men and to women were by the
26 UK Government funding streams such as the National Institute for Health Research, with a
27 1·66 fold difference. Mean grant funding from public funding organisations were significantly
28 greater for men at £595 361 (SD £1 080 718) than for women at £448 414 (SD £814 979).
29 Differences were also statistically significant ($P > 0.01$) for UK MRC grants with men at £751
30 413 (SD £1 020 748) and women at £544 427 (SD £884 442), and for UK Government
31 grants with men at £208 828 (SD £492 519) and women at £182 907 (SD £619 889).
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

47 Median grant funding from public funding organisations had a similar pattern with
48 significantly greater grant funding for men at £272 452 (IQR £138 322–£572 529) and
49 women at £213 718 (IQR £92 880–£402 917). Differences were also statistically significant
50 ($P > 0.05$) for UK MRC grants with men at £404 615 (IQR £ 210 068–£811 860) and women
51 at £286 679 (£178 182–£468 998), and for UK Government grants with men at £129 660
52 (IQR £23 761–£207 320) and women at £59 976 (IQR £12 564–£157 053).
53
54
55
56
57
58
59
60

1
2
3
4
5 Philanthropic funding organisations invested a total of £691·7 million in research led by men
6
7 (78·8%) and £185·9 million in research led by women (21·2%).
8
9

10
11
12 Mean grant funding from philanthropic funding organisations were significantly greater for
13
14 men at £338 396 (SD £695 025) than for women at £242 014 (SD £711 420). Differences
15
16 were also statistically significant ($P > 0.01$) for Wellcome Trust grants with men receiving
17
18 £393 652 (SD £723 549) and women £230 168 (SD £362 836), and for other charitable
19
20 funding organisations with men receiving £211 190 (SD £454 108) and women £271 842
21
22 (SD £1 208 852).
23
24

25
26
27 Median grants from philanthropic funding organisations showed a similar pattern with
28
29 significantly greater grant funding for men at £153 653 (IQR £58 589 – £302 774) and
30
31 women at £114 173 (IQR £42 658 – £222 842). Differences were also statistically significant
32
33 ($P > 0.05$) for Wellcome Trust grants with men receiving £191 461 (IQR £74 759 – £362
34
35 424) and women £137 241 (IQR £54 019 – £250 723), and for other charitable funding
36
37 organisations with men receiving £91 991 (IQR £36 429 – £172 497) and women £76 058
38
39 (IQR £17 279 – £150 727).
40
41
42
43
44

45
46 Figure 4 shows the association between funding organisation and total investment and
47
48 median funding by gender. The MRC awarded the highest median amount in grants to
49
50 women (£286 679; IQR £178 182–£468 998), but the median funding amount in grants for
51
52 men were 1·41 fold higher than that awarded to women (£404 615; IQR £210 068–£811
53
54 860). European Commission awarded the highest mean grants to women at £923 364 (SD
55
56 £1 316 016) however mean funding amount in grants for men were 1·44 fold higher at £1325
57
58 149 (SD £2 409 860) than that for women.
59
60

1
2
3 *Figure 4a. Association between funding organisation and total investment by gender*
4

5 *Figure 4b. Association between funding organisation and median award by gender*
6
7
8
9

10 *Time trend*
11

12
13 Table 3 (web appendix 3) shows in detail the trends in funding over time from 1997 to 2010
14 by gender of principal investigators, with amounts and relative proportions each year of
15 funding. Mean annual funding received was greater by men at £127·6 million (SD £48·7
16 million) than women at £34·9 million (SD £13·4 million). Proportions of annual funding
17 received by men ranged from 73.2% to 85.7%, with a mean of 78.6%.
18
19
20
21
22
23

24
25
26 Proportions of annual funding received by women ranged from 14.3% to 26.8% with a mean
27 of 21.4%. The largest annual funding received by men was £245·7 million in 2000, and the
28 smallest at £64·2 million in 1997. The largest annual funding received by women was £59·6
29 million in 2002, with the smallest at £13·1 million in 1998.
30
31
32
33

34
35
36
37 Over the 14-year study period, the proportion of investment awarded to women each year
38 remains relatively unchanged with a mean of 21·4% of total (range 14·3%–26·8%; £13·1
39 million to £59·6 million)). Figure 5 shows the funding trends over time and fold differences in
40 total investments by gender. Absolute difference in the funding amounts in the grants
41 awarded to men and women ranges between £47·9 million and £190·1 million, with a mean
42 difference of £92·7 million (SD £38·3 million). Fold difference in grant funding for men and
43 women ranged from 2·74 to 5·97, with a mean fold difference of 3·66.
44
45
46
47
48
49
50
51

52 *Figure 5a. Total investment and trend over time, by gender*
53

54 *Figure 5b. Fold difference of investment over time, by gender*
55
56
57
58
59
60

Discussion

We present the first, detailed and systematic analysis of the investments in infectious disease research by gender for the 14-year period 1997-2010. We identified 6165 studies funded by public and philanthropic funding organisations, with total research investment of £2.6 billion.

We quantify the differences in research funding awarded by gender, to show these to be substantial. The analysis shows clear and consistent disparities between men and women principal investigators, with lower funding in terms of the total investment, the number of funded studies, the median funding awarded and the mean funding awarded across most of the infectious disease areas funded. The analysis reveals consistent disparities, with women receiving less funding in absolute amounts and in relative terms, by funder and the type of science funded along the R&D pipeline. Analysis of the funding trends by year reveals that the disparities persist over time.

We show large disparities in median funding amounts for men and women researchers in investments by the European Commission and the MRC. Such differences were much less apparent when comparing funding from the Department of Health and BBSRC, although the BBSRC awarded 86% of funding to men. The BBSRC almost entirely funds pre-clinical research,¹⁶ and this matches the increased proportions of pre-clinical studies being led by male principal investigators.

Our findings, the most detailed to date, provide new evidence to show that women in science working in the area of infectious disease research are clearly disadvantaged. Our findings confirm the concerns raised in the published literature on the subject.^{4,9,15,17} Disparities that

1
2
3 are more marked at senior levels of academia need to be investigated to explain and
4
5 account for the observed differences.
6
7
8
9

10 The precise reasons why the median awards across most infectious disease conditions
11
12 should be significantly less for women principal investigators cannot be deduced from the
13
14 available data. The next step may be to investigate success rates by gender to assess how
15
16 many women are applying. Some studies have suggested that women were systematically
17
18 less ambitious in the amounts of funding requested in their grant applications when
19
20 compared with men who are equivalently ranked academically, and that relatively simple
21
22 mentoring programmes could at least partially overcome this anomaly.⁴ However, there is
23
24 no evidence supporting the assertions. Others have suggested that systems which ensure PI
25
26 anonymity during review of grant funding submissions may help reduce subtle gender
27
28 biases⁹, though in practice this approach would be challenging as the experience of the PI is
29
30 a key factor when considering suitability of request for research support. However, evidence
31
32 on effective interventions to address barriers for women scientists are lacking.¹⁷ Women of
33
34 child-bearing age are being disadvantaged in some areas of employment, even though in
35
36 relation to scientific endeavour productivity as measured by published outputs is not
37
38 significantly different between women with and without children.¹⁸
39
40
41
42

43 *Study limitations*

44
45
46 Our analysis has several limitations. We rely on the accuracy of the original data from the
47
48 funding organisations and as described elsewhere we have excluded data from industry as
49
50 the publicly available data are incomplete.¹⁶
51
52
53
54

55 In the period analysed, we were not able to find data on the number of men and women PIs
56
57 requesting financial support for research agencies from the funding sources studies. Hence,
58
59
60

1
2
3 we were unable to assess the success and failure rates by gender. We also did not have
4 complete data on gender of co-applicants for each study or on the proportion of awards
5 made to clinical and non-clinical researchers. The proportion of doctors registered in the UK
6 favours men (56.8%as of January 2013) over women,¹⁹ but the proportion of those carrying
7 out research appears to be unknown. Understanding the distribution of researchers is critical
8 to understanding the research landscape.
9
10
11
12
13
14

15
16
17
18 We lacked data on the academic ranking of principal investigators and were hence unable to
19 adjust for levels of seniority across both genders. We were unable to get data on gender
20 from the Gates Foundation and DFID and hence were unable to clarify the gender of a small
21 proportion of investigators, though we believe these limitations are not likely to change the
22 conclusions of the study.
23
24
25
26
27
28
29
30
31
32

33
34 Notwithstanding these limitations, our study provides a systematic analysis of the unequal
35 distribution of investments in infectious disease research by gender. We demonstrate that in
36 the UK there are clear and unacceptable disparities in the number of women at the level of
37 principal investigator in infectious disease research.
38
39
40
41
42
43
44

45 Although earlier studies have discussed possible solutions, including mentoring programmes
46 and advertising campaigns, none have systematically explored the reasons why such
47 inequalities persist. Hence, without an understanding of the reasons for the observed
48 inequalities, the proposed solutions are not very meaningful. Research is needed to
49 elucidate an understanding of the factors that can explain the observed disparities.
50
51
52
53
54
55
56
57
58
59
60

1
2
3 There is no evidence that women and men researchers are not equally able, hence, other
4 factors are likely to be at play to explain the unacceptable disparities in research funding
5 between men and women, which have persisted over the 14-year study period. We strongly
6 urge policy makers, funders and scientists to urgently investigate the factors leading to the
7 observed disparities and develop policies developed to address them, in order to ensure
8 that, as in all walks of life, women are appropriately supported and equally valued in
9 scientific endeavour.
10
11
12
13
14
15
16
17
18
19
20
21
22

23 **Funding**

24
25 This research received no specific grant from any funding agency in the public, commercial
26 or not-for-profit sectors
27
28

29 **Author contribution**

30
31
32 MGH designed the study with input from RA and JF and collated the dataset. JRF, FW and
33 MKC checked and refined the dataset. JRF undertook data analysis and created the graphs
34 and figures with input from MGH and RA. MGH, JRF, and RA interpreted the data and wrote
35 the first draft. MGH, JRF, and RA refined the analysis and paper with input from MKC and
36 FBW. All authors reviewed and approved the final version. RA is guarantor of the paper.
37
38
39
40
41
42

43 **Competing interests**

44
45 RA has received research funding from the UK Medical Research Council, the UK National
46 Institute for Health Research, UK CRC, UK EPSRC, the UK Department for International
47 Development and the UK Department of Health. RA is a member of the UL Medical
48 Research Council Global Health Group. MGH works for the Infectious Disease Research
49 Network, which has supported this work and is funded by the UK Department of Health. JRF
50 has received funds from the Wellcome Trust and is a steering group member for the
51 Infectious Disease Research Network. MKC has received funding from the Medical
52
53
54
55
56
57
58
59
60

1
2
3 Research Council and the Bill & Melinda Gates Foundation. FBW has received funds from
4
5 UCLH Charitable Foundation.
6

7 **Acknowledgements**

8
9
10 We thank Jennifer Harris and Raidah Haider for their input and assistance, and acknowledge
11
12 the assistance of the research and development funding agencies for provision of data.
13

14 **Data-sharing statement**

15
16
17 All gender data is available with this submission. Further data relating to the Research
18
19 Investments project can be found at www.researchinvestments.org or by contacting the
20
21 corresponding author.
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

- 1 More women in senior positions. Key to economic stability and growth. European Commission, Luxembourg, 2010.
- 2 Wenneras C, Wold A. Nepotism and sexism in peer-review. *Nature* 1997; **387**: 341–3.
- 3 Blake M, La Valle I. Who applies for research funding? Key factors shaping funding application behaviour among women and men in British higher education institutions. London, 2000.
- 4 Bedi G, Van Dam NT, Munafo M. Gender inequality in awarded research grants. *Lancet* 2012; **380**: 474.
- 5 Fitzpatrick S. A Survey of Staffing Levels of Medical Clinical Academics in UK Medical Schools as at 31 July 2011. London, 2012
http://www.medschools.ac.uk/Publications/Documents/MS_Clinical_Academic_Staff_Survey_310711.pdf.
- 6 Burrelli J. Thirty-Three Years of Women in S&E Faculty Positions - US National Science Foundation. Arlington, 2008 <http://www.nsf.gov/statistics/infbrief/nsf08308/>.
- 7 Lincoln AE, Pincus SH, Leboy PS. Scholars' awards go mainly to men. *Nature* 2011; **469**: 472.
- 8 Pohlhaus JR, Jiang H, Sutton J. Sex differences in career development awardees' subsequent grant attainment. *Annals of internal medicine* 2010; **152**: 616–7; author reply 617.
- 9 Moss-Racusin CA, Dovidio JF, Brescoll VL, Graham MJ, Handelsman J. Science faculty's subtle gender biases favor male students. *Proceedings of the National Academy of Sciences of the United States of America* 2012; **109**: 16474–9.

- 1
2
3 10 Medical Research Council. MRC Gender Equality Scheme.
4
5 2007.<http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC003655>
6
7 (accessed 21 Dec 2012).
8
9
- 10 11 European Commission. About this site- Science: It's a girl thing! 2012.[http://science-](http://science-girl-thing.eu/en/about-this-site)
11
12 [girl-thing.eu/en/about-this-site](http://science-girl-thing.eu/en/about-this-site) (accessed 29 Nov 2012).
13
14
- 15 12 Gill M. "Science, it's a girl thing!" says EU Commission, holding lipstick and bunsen
16
17 burner. *New Statesman*. 2012.[http://www.newstatesman.com/blogs/martha-](http://www.newstatesman.com/blogs/martha-gill/2012/06/science-its-girl-thing-says-eu-commission-holding-lipstick-and-bunsen-burn)
18
19 [gill/2012/06/science-its-girl-thing-says-eu-commission-holding-lipstick-and-bunsen-](http://www.newstatesman.com/blogs/martha-gill/2012/06/science-its-girl-thing-says-eu-commission-holding-lipstick-and-bunsen-burn)
20
21 [burn](http://www.newstatesman.com/blogs/martha-gill/2012/06/science-its-girl-thing-says-eu-commission-holding-lipstick-and-bunsen-burn) (accessed 29 Nov 2012).
22
23
- 24 13 Swain F. Science: It's a girl thing. Excuse me while I die inside. – SciencePunk.
25
26 ScienceBlogs. 2012.[http://scienceblogs.com/sciencepunk/2012/06/22/science-its-a-](http://scienceblogs.com/sciencepunk/2012/06/22/science-its-a-girl-thing-excuse-me-while-i-die-inside/)
27
28 [girl-thing-excuse-me-while-i-die-inside/](http://scienceblogs.com/sciencepunk/2012/06/22/science-its-a-girl-thing-excuse-me-while-i-die-inside/) (accessed 29 Nov 2012).
29
30
- 31 14 Yong E. Edit-a-thon gets women scientists into Wikipedia. *Nature*.
32
33 2012.[http://www.nature.com/news/edit-a-thon-gets-women-scientists-into-wikipedia-](http://www.nature.com/news/edit-a-thon-gets-women-scientists-into-wikipedia-1.11636)
34
35 [1.11636](http://www.nature.com/news/edit-a-thon-gets-women-scientists-into-wikipedia-1.11636) (accessed 29 Nov 2012).
36
37
- 38 15 Donald A. Throw off the cloak of invisibility. *Nature* 2012; **490**: 447.
39
40
- 41 16 Head MG, Fitchett JR, Cooke MK, Wurie FB, Hayward AC, Atun R. UK investments in
42
43 global infectious disease research 1997-2010: a case study. *The Lancet infectious*
44
45 *diseases* 2012.[http://www.thelancet.com/journals/a/article/PIIS1473-3099\(12\)70261-](http://www.thelancet.com/journals/a/article/PIIS1473-3099(12)70261-X/fulltext)
46
47 [X/fulltext](http://www.thelancet.com/journals/a/article/PIIS1473-3099(12)70261-X/fulltext) (accessed 17 Nov 2012).
48
49
- 50 17 Ceci SJ, Williams WM. Understanding current causes of women's
51
52 underrepresentation in science. *Proceedings of the National Academy of Sciences of*
53
54 *the United States of America* 2011; **108**: 3157–62.
55
56
57
58
59
60

- 1
2
3 18 Fox MF. Gender, Family Characteristics, and Publication Productivity among
4
5 Scientists. *Social Studies of Science* 2005; **35**: 131–50.
6
7
8 19 List of Registered Medical Practitioners - statistics. General Medical Council.
9
10 http://www.gmc-uk.org/doctors/register/search_stats.asp (accessed 26 Jan 2013).
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

325,922 studies screened

- 170,452 National Research Register
- 25,113 European Commission
- 7,513 Bill & Melinda Gates Foundation
- 14,660 Wellcome Trust
- 1,074 Health Technology Assessment
- 6,346 ESRC
- 30 Health Infection Society
- 1,583 British Heart Foundation
- 266 Action Medical Research
- 27 National Institute for Health Research
- 24 British HIV Association
- 150 British Lung Foundation
- 65 British Society for Antimicrobial Chemotherapy
- 98,619 National Institute for Health

4,240 studies provided to authors by :

- 2,016 Medical Research Council
- 321 BBRSC
- 55 Meningitis UK
- 272 Meningitis Research Foundation
- 747 Association of Medical Research Charities
- 52 Department for International Development
- 547 Cancer Research UK
- 60 Chief Scientist's Office, Scotland
- 41 Health Protection Agency
- 34 Northern Ireland R&D office
- 95 directly from researchers

314,867 studies excluded:

- not infection-related
- veterinary studies
- non-UK host recipient

9,750 studies eligible for detailed review

3585 studies excluded from analysis:

- unfunded studies
- Industry funded

6165 studies eligible for initial analysis

6052 studies included in gender analysis (4357 studies with male PI, 1,695 studies with female PI)

30 studies excluded as unable to identify gender of principal investigator (PI)
83 studies excluded to due to PI data

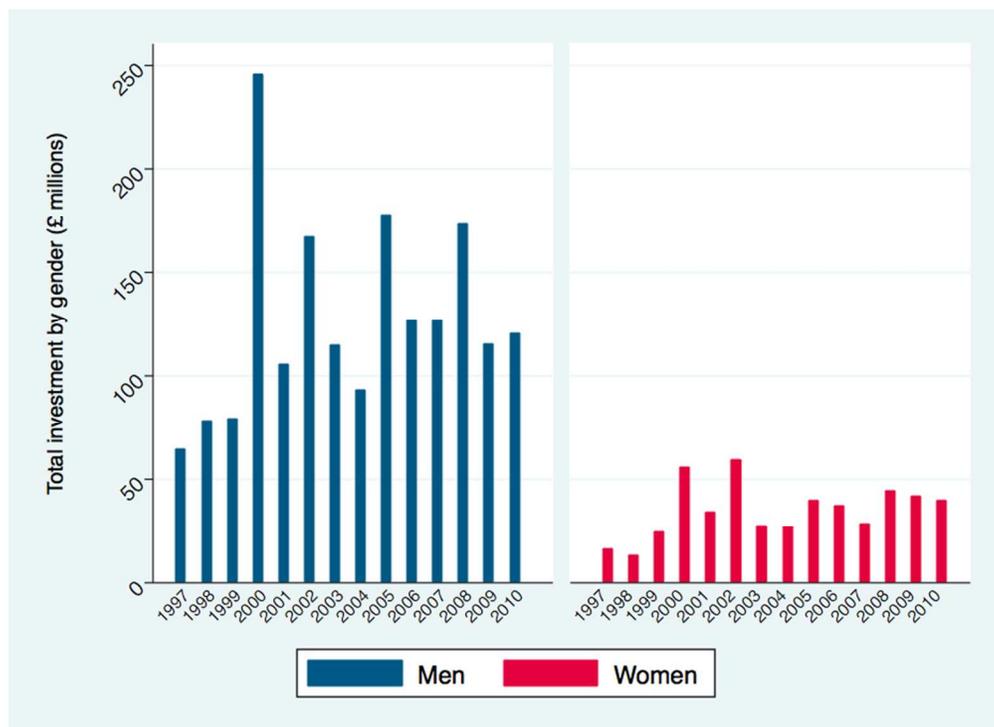


Figure 2a. Total investment over time awarded to male and female principal investigators
329x239mm (72 x 72 DPI)

View only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

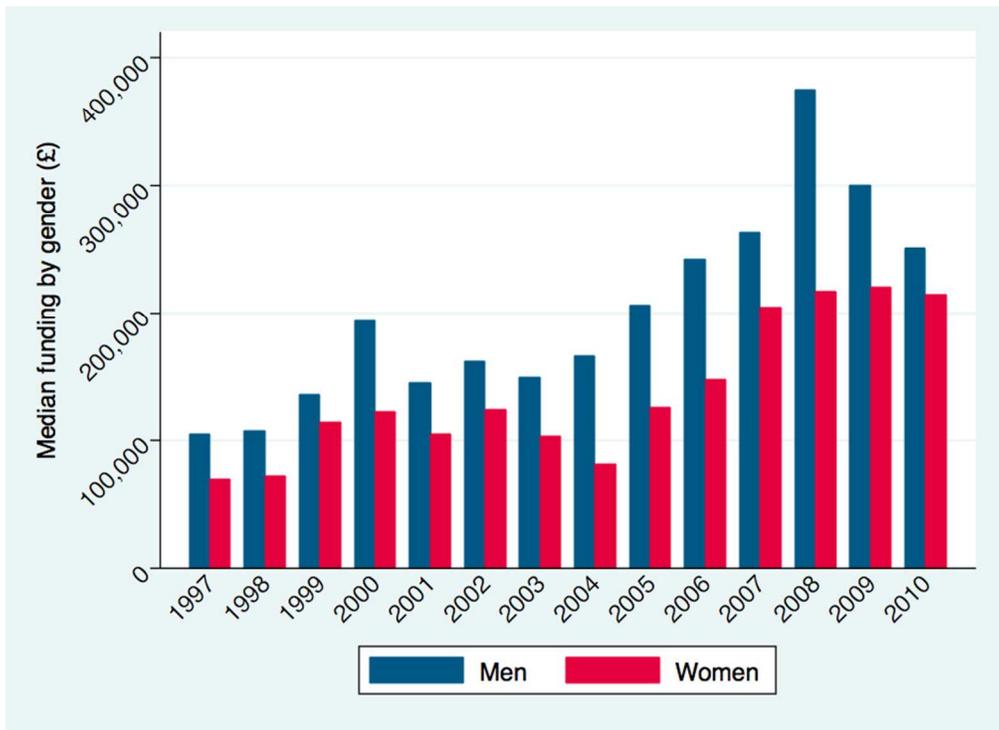


Figure 2b Median investment over time awarded to male and female principal investigators
329x239mm (72 x 72 DPI)

View only

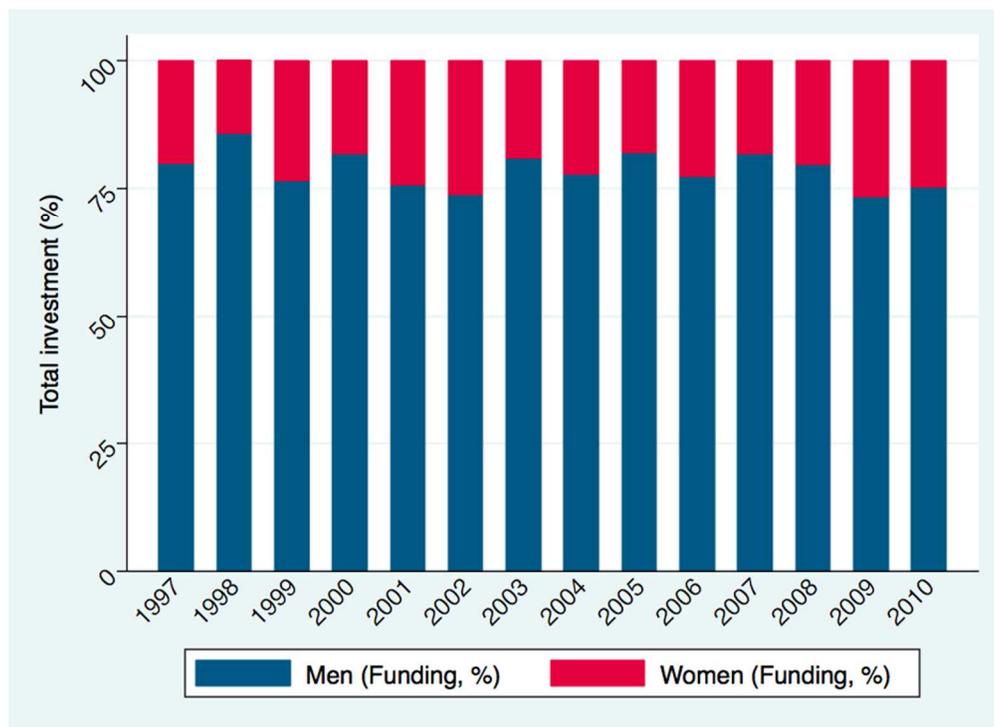
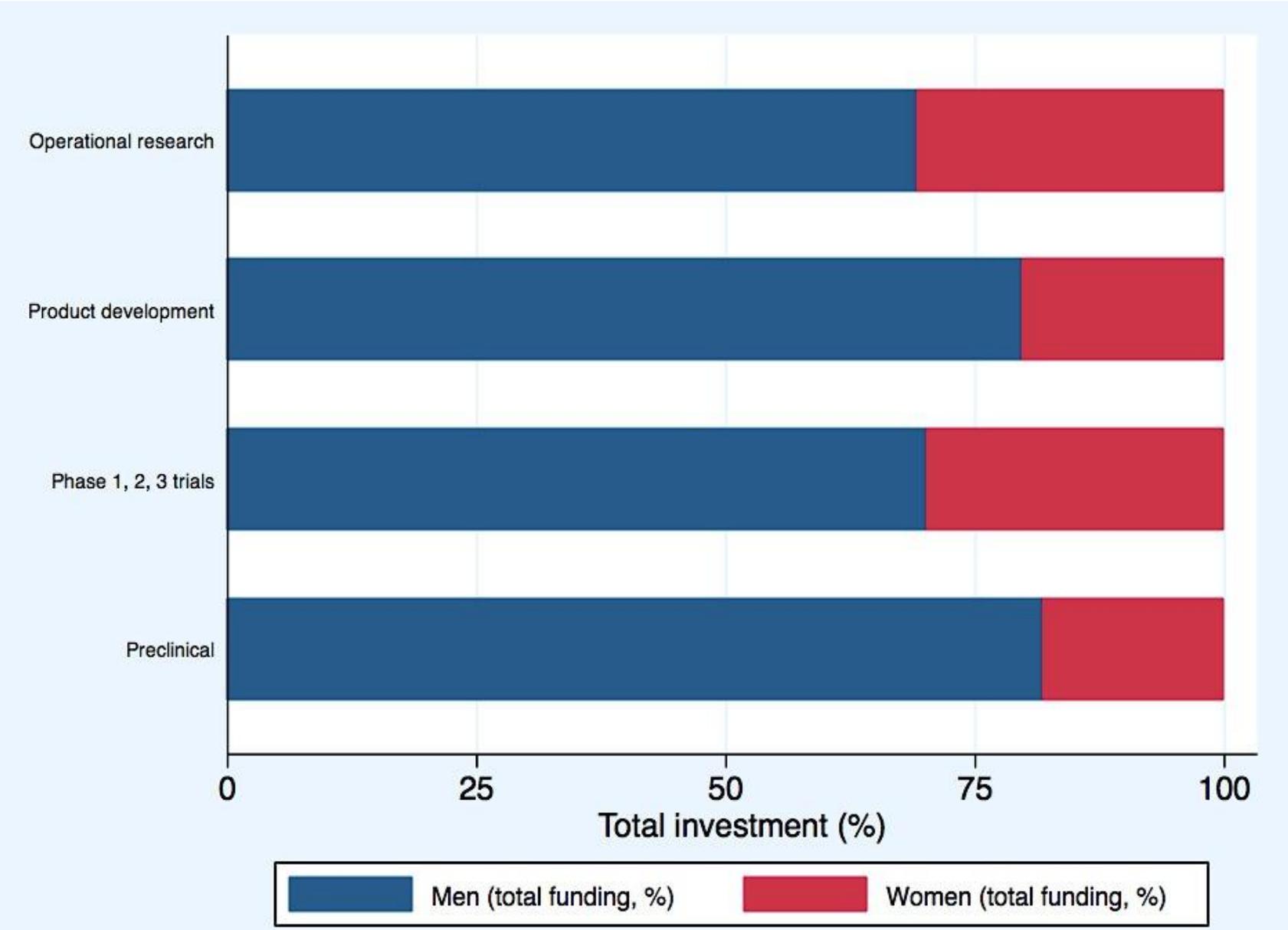


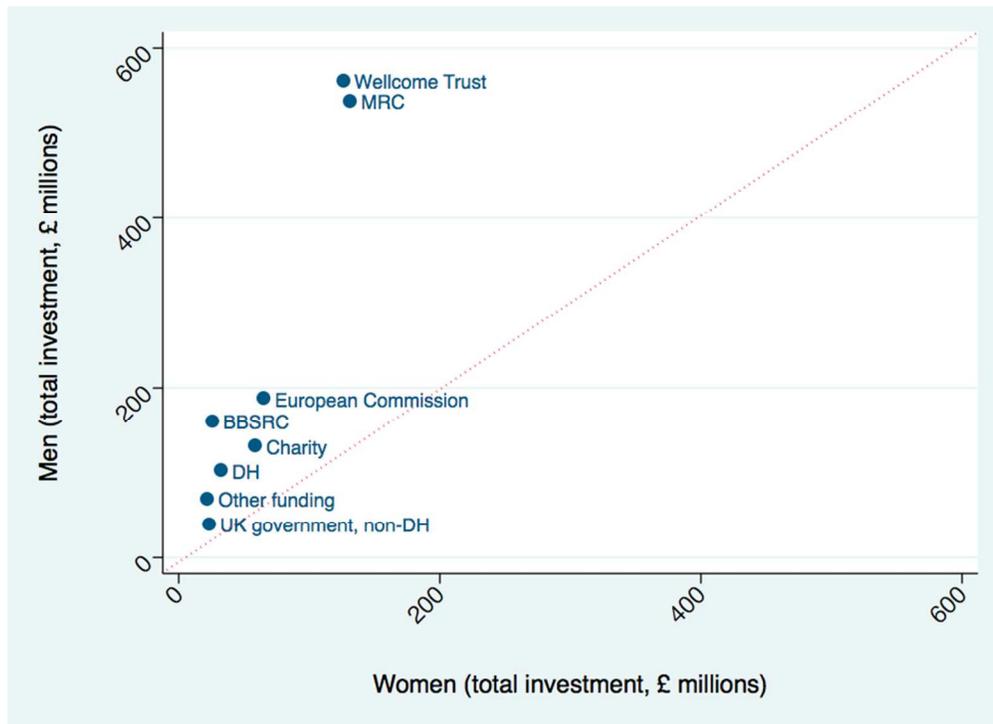
Figure 3a. Proportion of investment over time awarded to male and female principal investigators
329x239mm (72 x 72 DPI)

View only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43



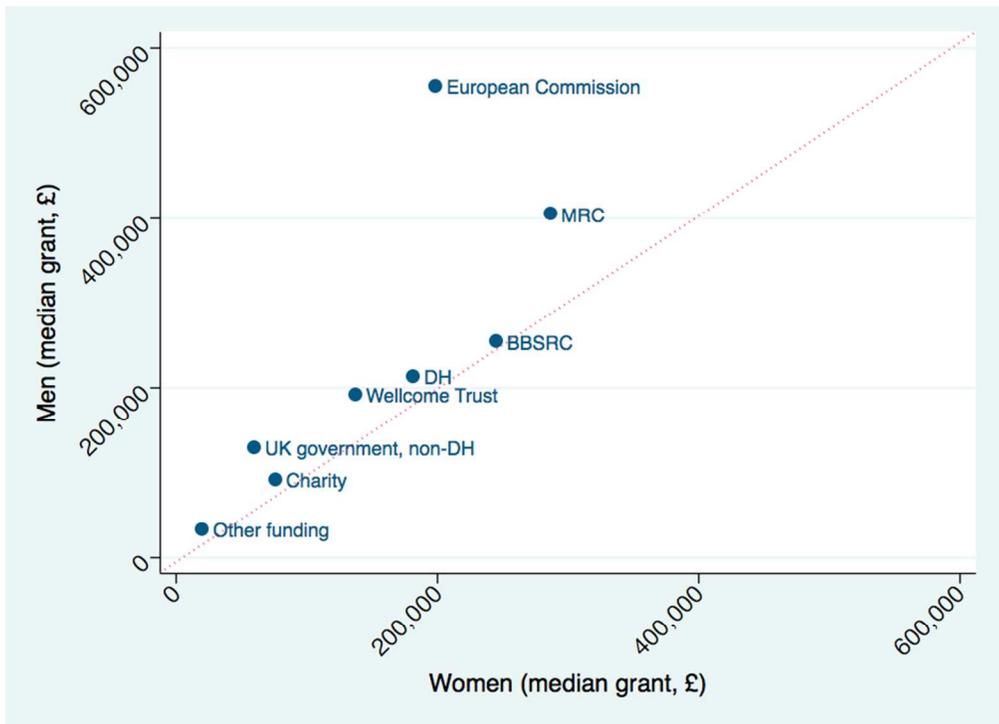
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



329x239mm (72 x 72 DPI)

view only

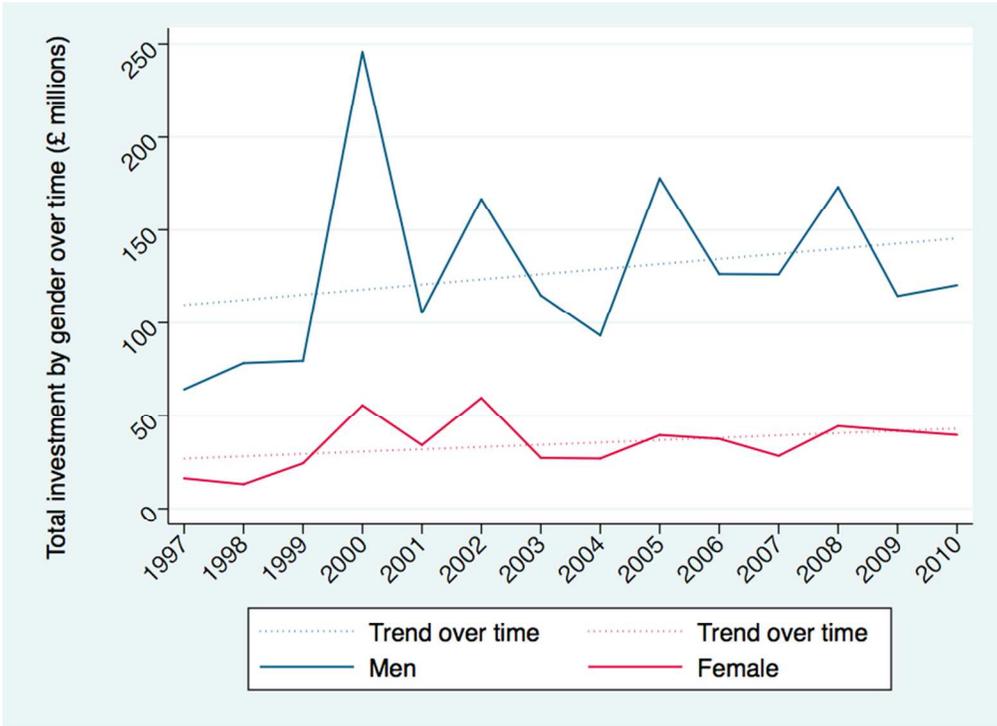
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



329x239mm (72 x 72 DPI)

View only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



329x239mm (72 x 72 DPI)

view only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

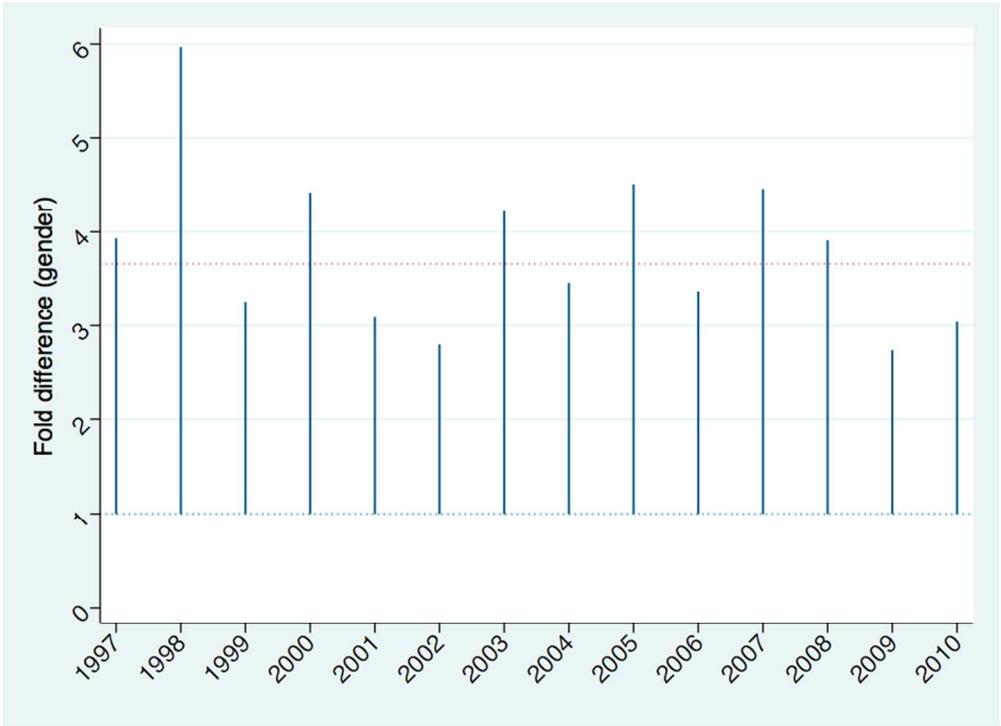


Figure 5b. Fold difference of investment over time, by gender
329x239mm (72 x 72 DPI)

View only

| Disease system | Investment (total); £ (%) | Investment (male); £ (%) | Investment (female); £ (%) | Fold differenc | Studies (total); n | Studies (male); £ (%) | Studies (female); n (%) | Fold differenc | Mean grant (total); £ | Mean grant (male); £ | Mean grant (female); £ | Fold differenc | P | Median grant (total); £ (IQR) | Median grant (male); £ | Median grant (female); £ | Fold differenc | Chi-square | P |
|----------------------------------|---------------------------|--------------------------|----------------------------|----------------|--------------------|-----------------------|-------------------------|----------------|-----------------------|----------------------|------------------------|----------------|------|-------------------------------|------------------------|--------------------------|----------------|------------|------|
| 1 Gastrointestinal infections | 248,971,849 | 209,315,616 | 37,043,642 | 5.65 | 799 | 638 | 149 | 4.28 | 315,154 | 328,081 | 248,615 | 1.32 | 0.01 | 199,043 | 208,369 | 155,066 | 1.34 | 6.87 | 0.01 |
| 2 | 9.6% | 85.0% | 15.0% | | 12.9% | 81.1% | 18.9% | | 457,988 | 458,720 | 433,176 | | | 721,37-351,372 | 78,852-357,771 | 143,637-305,928 | | | |
| 3 Haematological infections | 413,489,870 | 225,660,012 | 56,021,079 | 4.03 | 742 | 540 | 183 | 2.95 | 557,264 | 417,889 | 306,126 | 1.37 | 0.01 | 157,280 | 160,655 | 121,353 | 1.32 | 3.15 | 0.08 |
| 4 | 15.9% | 80.1% | 19.9% | | 12.0% | 74.7% | 25.3% | | 2,179,537 | 914,626 | 819,910 | | | 157,280-362,727 | 54,244-366,796 | 32,207- 271,883 | | | |
| 5 Hepatic infections | 73,965,716 | 57,998,793 | 15,618,661 | 3.71 | 322 | 229 | 90 | 2.54 | 229,707 | 253,270 | 173,541 | 1.46 | 0.07 | 114,621 | 118,638 | 68,620 | 1.73 | 3.82 | 0.05 |
| 6 | 2.8% | 78.8% | 21.2% | | 5.2% | 71.8% | 28.2% | | 375,988 | 418,392 | 237,165 | | | 40,076-244,293 | 41,342-269,626 | 26,270-221,952 | | | |
| 7 Neglected tropical diseases | 229,606,965 | 118,477,812 | 37,747,437 | 3.14 | 392 | 280 | 105 | 2.67 | 564,145 | 418,439 | 406,270 | 1.03 | 0.28 | 249,458 | 257,736 | 199,648 | 1.29 | 0.82 | 0.36 |
| 8 | 8.8% | 75.8% | 24.2% | | 6.4% | 72.7% | 27.3% | | 2,104,383 | 509,169 | 667,547 | | | 91,196-451,453 | 82,786-429,781 | 107,474-413,242 | | | |
| 9 Parasitological infections | 101,885,586 | 79,281,163 | 18,779,321 | 4.22 | 339 | 268 | 67 | 4.00 | 300,548 | 295,825 | 280,288 | 1.06 | 0.67 | 155,404 | 153,724 | 166,514 | 0.92 | 0.19 | 0.66 |
| 10 | 3.9% | 80.8% | 19.2% | | 5.5% | 80.0% | 20.0% | | 463,870 | 474,995 | 329,198 | | | 64,434-334,128 | 64,702-298,666 | 33,886-399,971 | | | |
| 11 Ocular infections | 7,407,218 | 5,788,089 | 1,619,129 | 3.57 | 36 | 24 | 12 | 2.00 | 205,756 | 241,170 | 134,927 | 1.79 | 0.92 | 120,849 | 146,169 | 102,901 | 1.42 | 0.00 | 1.00 |
| 12 | 0.3% | 78.1% | 21.9% | | 0.6% | 66.7% | 33.3% | | 280,206 | 327,354 | 132,475 | | | 7,860-293,837 | 6,344-348,501 | 23,666-232,501 | | | |
| 13 Respiratory infections | 418,838,875 | 312,055,217 | 84,436,423 | 3.70 | 1,190 | 897 | 272 | 3.30 | 351,375 | 347,888 | 310,428 | 1.12 | 0.13 | 158,966 | 165,813 | 142,281 | 1.17 | 1.87 | 0.17 |
| 14 | 16.1% | 78.7% | 21.3% | | 19.3% | 76.7% | 23.3% | | 661,990 | 624,555 | 558,282 | | | 50,203-342,049 | 56,715-344,512 | 36,236-311,548 | | | |
| 15 Sexually-transmitted infectio | 138,616,211 | 86,016,584 | 45,352,512 | 1.90 | 380 | 190 | 182 | 1.04 | 366,710 | 452,719 | 249,190 | 1.82 | 0.34 | 94,790 | 93,495 | 101,785 | 0.92 | 0.17 | 0.68 |
| 16 | 5.3% | 65.5% | 34.5% | | 6.2% | 51.1% | 48.9% | | 958,450 | 1,142,638 | 647,494 | | | 15,332-241,505 | 18,389-257,444 | 14,480-204,559 | | | |
| 17 HIV | 477,555,690 | 290,848,557 | 79,652,343 | 3.65 | 760 | 448 | 286 | 1.57 | 625,073 | 649,216 | 278,505 | 2.33 | 0.01 | 147,404 | 163,462 | 114,272 | 1.43 | 3.87 | 0.05 |
| 18 | 18.4% | 78.5% | 21.5% | | 12.3% | 61.0% | 39.0% | | 2,276,762 | 1,550,920 | 545,657 | | | 37,195-395,644 | 39,153-511,800 | 29,880-305,339 | | | |
| 19 Overall | 2,599,985,851 | 1,785,979,172 | 488,178,602 | 3.66 | 6,170 | 4,357 | 1,695 | 2.57 | 421,733 | 409,910 | 288,011 | 1.42 | 0.01 | 158,055 | 179,389 | 125,556 | 1.43 | 74.40 | 0.01 |
| 20 | | 78.53% | 21.47% | | | 71.99% | 28.01% | | 1,315,935 | 840,087 | 704,474 | | | 49,490-352,699 | 59,146-371,977 | 30,983-261,835 | | | |

| Specific infection | Investment (total); £ (%) | Investment (male); £ (%) | Investment (female); £ (%) | Fold differenc | Studies (total); n | Studies (male); £ | Studies (female); n | Fold differenc | Mean grant (total); £ | Mean grant (male); £ | Mean grant (female); £ | Fold differenc | P | Median grant (total); £ (IQR) | Median grant (male); £ (IQR) | Median grant (female); £ | Fold differenc | Chi-square | P | |
|------------------------------------|------------------------------------|--------------------------|----------------------------|----------------|--------------------|-------------------|---------------------|----------------|-----------------------|----------------------|------------------------|----------------|------|-------------------------------|------------------------------|--------------------------|-----------------|------------|------|------|
| <i>Gastrointestinal infections</i> | | | | | | | | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | |
| 3 | Campylobacter | 24,116,021 | 23,164,038 | 951,983 | 24.33 | 87 | 80 | 7 | 11.43 | 277,196 | 289,551 | 135,998 | 2.13 | 0.13 | 221,532 | 228,164 | 49,000 | 4.66 | 1.32 | 0.25 |
| 4 | | #VALUE! | 96.1% | 3.9% | | 2.2% | 92.0% | 8.0% | | 408,655 | 421,925 | 156,276 | | | 90,341-311,497 | 92,885-311,530 | 3,435-305,928 | | | |
| 5 | Clostridium | 29,751,310 | 31,657,635 | 2,361,459 | 13.41 | 72 | 58 | 15 | 3.87 | 453,647 | 524,175 | 157,431 | 3.33 | 0.07 | 204,389 | 218,177 | 80,431 | 2.71 | 2.06 | 0.15 |
| 6 | | #VALUE! | 93.1% | 6.9% | | 1.8% | 79.5% | 20.5% | | 796,207 | 868,222 | 178,916 | | | 42,630-415,635 | 49,750-451,158 | 8,256-316,326 | | | |
| 7 | E. coli | 25,589,407 | 23,913,566 | 2,392,586 | 9.99 | 106 | 95 | 12 | 7.92 | 245,852 | 251,722 | 199,382 | 1.26 | 0.16 | 206,784 | 217,705 | 132,232 | 1.65 | 3.25 | 0.07 |
| 8 | | #VALUE! | 90.9% | 9.1% | | 2.7% | 88.8% | 11.2% | | 209,792 | 212,046 | 192,964 | | | 117,440-329,159 | 132,815-331,037 | 84,455-262,238 | | | |
| 9 | Helicobacter | 15,109,554 | 12,488,366 | 2,617,778 | 4.77 | 101 | 78 | 22 | 3.55 | 149,600 | 160,107 | 118,990 | 1.35 | 0.64 | 83,986 | 87,694 | 83,533 | 1.05 | 0.00 | 1.00 |
| 10 | | #VALUE! | 82.7% | 17.3% | | 2.6% | 78.0% | 22.0% | | 214,832 | 232,566 | 138,013 | | | 11,555-187,678 | 11,555-191,570 | 11,647-187,678 | | | |
| 11 | Norovirus | 5,102,250 | 4,892,527 | 209,723 | 23.33 | 12 | 10 | 2 | 5.00 | 425,188 | 489,253 | 104,861 | 4.67 | 0.28 | 200,621 | 265,972 | 104,861 | 2.54 | 2.40 | 0.12 |
| 12 | | #VALUE! | 95.9% | 4.1% | | 0.3% | 83.3% | 16.7% | | 568,372 | 604,564 | 133,320 | | | 91,363-435,732 | 93,571-496,514 | 10,590-199,133 | | | |
| 13 | Rotavirus | 5,883,445 | 6,004,983 | 178,450 | 33.65 | 18 | 17 | 2 | 8.50 | 325,444 | 353,234 | 89,225 | 3.96 | 0.23 | 164,690 | 179,066 | 89,225 | 2.01 | 2.01 | 0.16 |
| 14 | | #VALUE! | 97.1% | 2.9% | | 0.5% | 89.5% | 10.5% | | 414,279 | 429,739 | 98,723 | | | 114,718-299,988 | 134,988-299,988 | 19,417-159,033 | | | |
| 15 | Salmonella | 55,716,287 | 48,902,187 | 6,814,100 | 7.18 | 145 | 123 | 22 | 5.59 | 384,250 | 397,579 | 309,732 | 1.28 | 0.95 | 256,185 | 258,483 | 255,602 | 1.01 | 0.18 | 0.67 |
| 16 | | #VALUE! | 87.8% | 12.2% | | 3.7% | 84.8% | 15.2% | | 474,060 | 500,122 | 284,742 | | | 132,107-431,762 | 109,210-440,900 | 155,066-361,873 | | | |
| 17 | Shigella | 3,292,442 | 2,270,191 | 1,022,251 | 2.22 | 9 | 6 | 3 | 2.00 | 365,827 | 378,365 | 340,750 | 1.11 | 1.00 | 211,456 | 214,819 | 211,456 | 1.02 | 0.23 | 0.64 |
| 18 | | #VALUE! | 69.0% | 31.0% | | 0.2% | 66.7% | 33.3% | | 335,500 | 374,690 | 312,800 | | | 134,251-658,278 | 134,251-658,278 | 113,326-697,470 | | | |
| 19 | <i>Haematological infections</i> | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | |
| 21 | EBV | 45,310,414 | 36,908,000 | 7,692,800 | 4.80 | 147 | 115 | 31 | 3.71 | 305,485 | 320,939 | 248,155 | 1.29 | 0.36 | 156,697 | 158,107 | 154,947 | 1.02 | 0.04 | 0.84 |
| 22 | | #VALUE! | 82.8% | 17.2% | | 3.7% | 78.8% | 21.2% | | 430,746 | 459,332 | 301,211 | | | 49,657-364,013 | 65,350-364,013 | 12,342-364,199 | | | |
| 23 | Listeria | 4,751,097 | 3,146,834 | 1,731,229 | 1.82 | 10 | 8 | 3 | 2.67 | 443,460 | 393,354 | 577,076 | 0.68 | 0.41 | 239,595 | 236,570 | 605,470 | 0.39 | 0.75 | 0.39 |
| 24 | | #VALUE! | 64.5% | 35.5% | | 0.3% | 72.7% | 27.3% | | 353,486 | 359,163 | 369,384 | | | 126,966-705,717 | 113,867-634,775 | 194,315-931,444 | | | |
| 25 | Malaria | 346,180,494 | 211,961,339 | 40,710,857 | 5.21 | 501 | 359 | 128 | 2.80 | 700,143 | 590,422 | 318,054 | 1.86 | 0.01 | 203,348 | 209,646 | 143,358 | 1.46 | 4.13 | 0.04 |
| 26 | | #VALUE! | 83.9% | 16.1% | | 12.7% | 73.7% | 26.3% | | 2,283,790 | 1,324,909 | 726,872 | | | 59,122-500,817 | 63,826-529,610 | 42,754-314,524 | | | |
| 27 | <i>Hepatic infections</i> | | | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | | | | |
| 29 | MV | 28,369,415 | 26,102,458 | 1,911,586 | 13.65 | 68 | 55 | 12 | 4.58 | 417,197 | 474,590 | 159,299 | 2.98 | 0.06 | 188,607 | 201,658 | 107,488 | 1.88 | 1.48 | 0.22 |
| 30 | | #VALUE! | 93.2% | 6.8% | | 1.7% | 82.1% | 17.9% | | 656,508 | 714,181 | 178,655 | | | 100,221-392,186 | 116,516-608,024 | 23,605-223,834 | | | |
| 31 | Hepatitis B | 11,768,095 | 7,512,333 | 4,215,080 | 1.78 | 68 | 45 | 22 | 2.05 | 173,060 | 166,941 | 191,595 | 0.87 | 0.89 | 65,624 | 68,646 | 52,873 | 1.30 | 0.19 | 0.66 |
| 32 | | #VALUE! | 64.1% | 35.9% | | 1.7% | 67.2% | 32.8% | | 287,576 | 294,644 | 284,042 | | | 19,659-209,501 | 19,615-202,317 | 19,703-221,952 | | | |
| 33 | Hepatitis C | 59,727,829 | 47,621,165 | 11,799,084 | 4.04 | 235 | 167 | 66 | 2.53 | 254,161 | 285,157 | 178,774 | 1.60 | 0.07 | 116,883 | 124,797 | 67,265 | 1.86 | 5.22 | 0.02 |
| 34 | | #VALUE! | 80.1% | 19.9% | | 5.9% | 71.7% | 28.3% | | 418,722 | 469,807 | 242,710 | | | 41,342-269,629 | 42,475-289,293 | 29,880-233,467 | | | |
| 35 | <i>Neglected tropical diseases</i> | | | | | | | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | | | | | | | | |
| 37 | African trypanosomiasis | 48,082,259 | 34,546,175 | 4,478,699 | 7.71 | 116 | 61 | 13 | 4.69 | 563,175 | 566,331 | 344,515 | 1.64 | 0.54 | 262,145 | 256,771 | 265,009 | 0.97 | 0.09 | 0.76 |
| 38 | | #VALUE! | 88.5% | 11.5% | | 2.9% | 82.4% | 17.6% | | 1,139,333 | 1,227,091 | 408,381 | | | 151,883-466,918 | 155,868-455,554 | 119,521-406,701 | | | |
| 39 | Chagas disease | 3,448,856 | 4,675,712 | 250,535 | 18.66 | 15 | 17 | 1 | 17.00 | 273,680 | 275,042 | 250,535 | 1.10 | 0.77 | 215,639 | 215,530 | 250,535 | 0.86 | 1.06 | 0.30 |
| 40 | | #VALUE! | 94.9% | 5.1% | | 0.4% | 94.4% | 5.6% | | 207,903 | 214,219 | | | | 163,472-350,741 | 163,472-350,741 | | | | |
| 41 | Dengue | 43,742,101 | 5,251,615 | 4,924,187 | 1.07 | 28 | 13 | 13 | 1.00 | 1,511,059 | 403,970 | 378,784 | 1.07 | 0.32 | 269,824 | 378,745 | 199,648 | 1.90 | 0.15 | 0.70 |
| 42 | | #VALUE! | 51.6% | 48.4% | | 0.7% | 50.0% | 50.0% | | 5,899,700 | 336,526 | 504,639 | | | 107,474-530,125 | 148,612-515,075 | 69,518-361,828 | | | |
| 43 | Helminths | 47,026,454 | 39,675,624 | 14,701,767 | 2.70 | 114 | 104 | 43 | 2.42 | 452,438 | 381,496 | 341,902 | 1.12 | 0.87 | 233,772 | 235,696 | 215,206 | 1.10 | 0.24 | 0.62 |
| 44 | | #VALUE! | 73.0% | 27.0% | | 2.9% | 70.7% | 29.3% | | 1,112,173 | 464,792 | 414,897 | | | 82,786-386,182 | 67,614-383,928 | 126,942-358,645 | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|----|---------------|---------------------------------|-------------|-------------|------------|--------|-------|-----|------------|-----------|-----------|-----------|---------|-------|--------------------|-------------------|-----------------|---------|-------|------|------|
| 1 | Leishmaniasis | 36,027,609 | 25,384,994 | 16,332,809 | 1.55 | 75 | 50 | 26 | 1.92 | 536,433 | 507,700 | 628,185 | 0.81 | 0.53 | 289,354 | 320,800 | 229,548 | 1.40 | 2.10 | 0.15 | |
| 2 | #VALUE! | 60.8% | 39.2% | | 1.9% | 65.8% | 34.2% | | 797,514 | 579,922 | 1,127,441 | | | | 91,196-518,477 | 80,166-518,477 | 131,221-573,851 | | | | |
| 3 | 2 | Leprosy | 623,080 | 49,229 | 573,851 | 0.09 | 2 | 1 | 1 | 1.00 | 311,540 | 49,229 | 573,851 | 0.09 | 0.32 | 311,540 | 49,229 | 573,851 | 0.09 | 2.00 | 0.16 |
| 4 | #VALUE! | 7.9% | 92.1% | | 0.1% | 50.0% | 50.0% | | 370,963 | | | | | | 49,229-573,851 | | | | | | |
| 5 | 4 | Lymphatic filariasis | 51,112,541 | 1,802,818 | 317,909 | 5.67 | 16 | 3 | 2 | 1.50 | 6,723,245 | 600,939 | 158,954 | 3.78 | 0.25 | 551,459 | 551,459 | 158,954 | 3.47 | 2.22 | 0.14 |
| 6 | #VALUE! | 85.0% | 15.0% | | 0.4% | 60.0% | 40.0% | | 12,112,993 | 426,007 | 127,226 | | | | 201,834-12,844,013 | 201,834-1,049,526 | 68,992-248,917 | | | | |
| 7 | 7 | Onchocerciasis | 1,338,978 | 1,317,029 | 380,594 | 3.46 | 4 | 2 | 3 | 0.67 | 339,525 | 658,515 | 126,865 | 5.19 | 0.25 | 35,769 | 658,515 | 21,359 | 30.83 | 0.14 | 0.71 |
| 8 | #VALUE! | 77.6% | 22.4% | | 0.1% | 40.0% | 60.0% | | 546,719 | 880,696 | 200,996 | | | | 21,359-358,645 | 35,769-1,281,261 | 590-358,645 | | | | |
| 9 | 9 | Schistosomiasis | 38,677,801 | 11,068,267 | 2,686,364 | 4.12 | 46 | 32 | 12 | 2.67 | 867,572 | 345,883 | 223,864 | 1.55 | 0.60 | 197,557 | 216,603 | 165,622 | 1.31 | 0.46 | 0.50 |
| 10 | #VALUE! | 80.5% | 19.5% | | 1.2% | 72.7% | 27.3% | | 3,825,582 | 467,692 | 252,854 | | | | 59,912-361,947 | 61,878-356,186 | 46,460-318,519 | | | | |
| 11 | 11 | Trachoma | 3,718,572 | 3,718,572 | 0 | | 3 | 2 | 0 | | 1,859,286 | 1,859,286 | | | 1,859,286 | 1,859,286 | | | | | |
| 12 | #VALUE! | 100.0% | 0.0% | | 0.1% | 100.0% | 0.0% | | 1,768,466 | 1,768,466 | | | | | 608,792-3,109,780 | 60,879-3,109,780 | | | | | |
| 13 | 13 | Neurological infections | | | | | | | | | | | | | | | | | | | |
| 14 | 14 | Meningitis | 54,078,664 | 42,305,152 | 9,347,473 | 4.53 | 223 | 183 | 38 | 4.82 | 243,434 | 231,176 | 245,986 | 0.94 | 0.59 | 146,153 | 137,694 | 155,670 | 0.88 | 1.21 | 0.27 |
| 15 | #VALUE! | 81.9% | 18.1% | | 5.6% | 82.8% | 17.2% | | 355,892 | 332,118 | 297,867 | | | | 66,895-228,405 | 66,895-222,767 | 33,886-369,244 | | | | |
| 16 | 16 | Polio | 1,189,984 | 729,017 | 11,069 | 65.86 | 4 | 3 | 1 | 3.00 | 185,021 | 243,006 | 11,069 | 21.95 | 0.18 | 164,849 | 236,812 | 11,069 | 21.40 | 1.33 | 0.25 |
| 17 | #VALUE! | 98.5% | 1.5% | | 0.1% | 75.0% | 25.0% | | 170,640 | 153,310 | | | | | 51,977-318,065 | 92,886-399,318 | | | | | |
| 18 | 18 | Stanus | 5,108,068 | 5,108,068 | 0 | | 5 | 5 | 0 | | 1,021,614 | 1,021,614 | | | 231,879 | 231,879 | | | | | |
| 19 | #VALUE! | 100.0% | 0.0% | | 0.1% | 100.0% | 0.0% | | 1,819,723 | 1,819,723 | | | | | 200,112-395,050 | 200,112-395,050 | | | | | |
| 20 | 20 | Respiratory infections | | | | | | | | | | | | | | | | | | | |
| 21 | 21 | Diphtheria | 139,863 | 21,624 | 118,239 | 0.18 | 2 | 1 | 1 | 1.00 | 69,931 | 21,624 | 118,239 | 0.18 | 0.32 | 69,931 | 21,624 | 118,239 | 0.18 | 2.00 | 0.16 |
| 22 | #VALUE! | 15.5% | 84.5% | | 0.1% | 50.0% | 50.0% | | 68,317 | | | | | | 21,624-118,239 | | | | | | |
| 23 | 23 | Influenza | 79,763,001 | 68,447,401 | 11,615,587 | 5.89 | 140 | 111 | 30 | 3.70 | 567,823 | 616,643 | 387,186 | 1.59 | 0.04 | 299,988 | 348,730 | 200,787 | 1.74 | 4.06 | 0.04 |
| 24 | #VALUE! | 85.5% | 14.5% | | 3.5% | 78.7% | 21.3% | | 818,009 | 881,493 | 489,997 | | | | 159,841-656,509 | 213,601-668,561 | 124,210-398,191 | | | | |
| 25 | 25 | Measles | 2,597,677 | 3,827,746 | 646,169 | 5.92 | 9 | 7 | 3 | 2.33 | 416,179 | 546,821 | 215,390 | 2.54 | 0.57 | 284,882 | 662,131 | 261,846 | 2.53 | 0.48 | 0.49 |
| 26 | #VALUE! | 85.6% | 14.4% | | 0.2% | 70.0% | 30.0% | | 403,740 | 481,360 | 122,549 | | | | 67,471-683,714 | 58,538-893,212 | 76,405-307,919 | | | | |
| 27 | 27 | Certussis | 2,432,158 | 2,432,158 | 0 | | 9 | 9 | 0 | | 270,240 | 270,240 | | | 299,840 | 299,840 | | | | | |
| 28 | #VALUE! | 100.0% | 0.0% | | 0.2% | 100.0% | 0.0% | | 246,165 | 246,165 | | | | | 37,151-452,939 | 37,151-452,939 | | | | | |
| 29 | 29 | HSV | 16,899,738 | 14,073,205 | 2,818,964 | 4.99 | 45 | 29 | 15 | 1.93 | 375,550 | 485,283 | 187,931 | 3.96 | 0.05 | 184,292 | 223,517 | 149,828 | 1.49 | 2.53 | 0.11 |
| 30 | #VALUE! | 83.3% | 16.7% | | 1.1% | 65.9% | 34.1% | | 480,715 | 539,396 | 268,412 | | | | 56,431-498,006 | 64,191-638,823 | 22,277-199,329 | | | | |
| 31 | 31 | Tuberculosis | 148,801,691 | 99,451,331 | 37,578,889 | 2.65 | 327 | 225 | 94 | 2.39 | 472,083 | 442,006 | 399,775 | 1.11 | 0.39 | 190,467 | 190,657 | 170,542 | 1.12 | 0.21 | 0.65 |
| 32 | #VALUE! | 72.6% | 27.4% | | 8.3% | 70.5% | 29.5% | | 930,157 | 825,956 | 742,928 | | | | 69,899-421,992 | 74,747-416,236 | 37,034-401,346 | | | | |
| 33 | 33 | Sexually-transmitted infections | | | | | | | | | | | | | | | | | | | |
| 34 | 34 | Chlamydia | 21,702,378 | 5,753,740 | 15,936,845 | 0.36 | 112 | 43 | 68 | 0.63 | 193,771 | 133,808 | 234,365 | 0.57 | 0.71 | 50,469 | 52,258 | 52,318 | 1.00 | 0.01 | 0.91 |
| 35 | #VALUE! | 26.5% | 73.5% | | 2.8% | 38.7% | 61.3% | | 561,173 | 197,759 | 701,950 | | | | 10,298-174,939 | 14,885-174,644 | 6,003-175,234 | | | | |
| 36 | 36 | Gonorrhoea | 948,399 | 669,866 | 278,532 | 2.40 | 18 | 9 | 9 | 1.00 | 52,689 | 74,430 | 30,948 | 2.40 | 0.51 | 7,548 | 8,149 | 6,525 | 1.25 | 0.22 | 0.64 |
| 37 | #VALUE! | 70.6% | 29.4% | | 0.5% | 50.0% | 50.0% | | 81,648 | 104,267 | 47,232 | | | | 1,820-54,145 | 6,471-150,196 | 1,820-40,986 | | | | |
| 38 | 38 | HIV | 460,547,457 | 290,848,557 | 79,652,343 | 3.65 | 760 | 448 | 286 | 1.57 | 625,073 | 649,216 | 278,505 | 2.33 | 0.01 | 147,404 | 163,462 | 114,272 | 1.43 | 3.87 | 0.05 |
| 39 | #VALUE! | 78.5% | 21.5% | | 19.2% | 61.0% | 39.0% | | 2,276,762 | 1,550,920 | 545,657 | | | | 37,195-395,644 | 39,153-511,800 | 29,880-305,339 | | | | |
| 40 | 40 | HPV | 57,795,110 | 42,592,795 | 9,393,693 | 4.53 | 150 | 88 | 56 | 1.57 | 355,514 | 484,009 | 167,745 | 2.89 | 0.30 | 92,143 | 103,966 | 82,325 | 1.26 | 0.47 | 0.49 |
| 41 | #VALUE! | 81.9% | 18.1% | | 3.8% | 61.1% | 38.9% | | 849,406 | 1,042,481 | 360,400 | | | | 30,079-220,559 | 29,742-264,540 | 32,566-171,377 | | | | |
| 42 | 42 | HSV | 22,063,300 | 15,472,470 | 6,536,189 | 2.37 | 48 | 28 | 19 | 1.47 | 459,652 | 552,588 | 344,010 | 1.61 | 0.19 | 202,564 | 119,295 | 309,610 | 0.39 | 4.85 | 0.03 |

| | | | | | | | | | | | | | | | | | | | | |
|----|---------------------------|---------------|---------------|-------------|---------|-------|---------|---------|---------|-----------|---------|---------|-------|-----------------|----------------|-----------------|-----------------|------|-------|------|
| 1 | | #VALUE! | 70.3% | 29.7% | | 1.2% | 59.6% | 40.4% | | 720,790 | 908,183 | 287,596 | | 52,597-421,960 | 40,009-446,395 | 147,885-439,305 | | | | |
| 2 | Syphilis | 1,061,560 | 286,117 | 775,444 | 0.37 | 5 | 2 | 3 | 0.67 | 212,312 | 143,058 | 258,481 | 0.55 | 0.56 | 207,346 | 143,058 | 207,346 | 0.69 | 0.14 | 0.71 |
| 3 | | #VALUE! | 27.0% | 73.0% | | 0.1% | 40.0% | 60.0% | | 152,848 | 122,822 | 176,603 | | 113,088-229,907 | 56,210-229,907 | 113,088-455,010 | | | | |
| 4 | Other infections | | | | | | | | | | | | | | | | | | | |
| 5 | Aspergillus | 4,853,858 | 4,482,101 | 371,757 | 12.06 | 26 | 24 | 2 | 12.00 | 186,687 | 186,754 | 185,879 | 1.00 | 1.00 | 47,948 | 47,948 | 185,879 | 0.26 | 0.00 | 1.00 |
| 6 | | #VALUE! | 92.3% | 7.7% | | 0.7% | 92.3% | 7.7% | | 420,903 | 435,756 | 248,298 | | | 19,703-157,829 | 20,890-135,113 | 10,306-361,451 | | | |
| 7 | Candida | 1,219,072 | 1,194,064 | 25,008 | 47.75 | 8 | 6 | 2 | 3.00 | 152,384 | 199,011 | 12,504 | 15.92 | 0.18 | 28,518 | 72,375 | 12,504 | 5.79 | 2.67 | 0.10 |
| 8 | | #VALUE! | 97.9% | 2.1% | | 0.2% | 75.0% | 25.0% | | 262,390 | 293,075 | 17,226 | | | 10,508-188,568 | 17,076-264,740 | 324-24,684 | | | |
| 9 | Pseudomonas | 6,473,237 | 6,096,633 | 376,604 | 16.19 | 43 | 39 | 4 | 9.75 | 150,540 | 156,324 | 94,151 | 1.66 | 0.90 | 81,793 | 81,793 | 79,244 | 1.03 | 0.00 | 0.96 |
| 10 | | #VALUE! | 94.2% | 5.8% | | 1.1% | 90.7% | 9.3% | | 175,911 | 182,442 | 83,286 | | | 11,204-253,337 | 11,108-253,459 | 27,396-160,906 | | | |
| 11 | VZV | 4,186,583 | 1,472,968 | 2,713,615 | 0.54 | 20 | 9 | 11 | 0.82 | 209,329 | 163,663 | 246,692 | 0.66 | 0.21 | 145,505 | 47,343 | 161,033 | 0.29 | 0.20 | 0.65 |
| 12 | | #VALUE! | 35.2% | 64.8% | | 0.5% | 45.0% | 55.0% | | 261,063 | 250,869 | 275,194 | | | 46,117-227,502 | 26,213-147,593 | 105,632-233,537 | | | |
| 13 | Total specific infections | #VALUE! | #VALUE! | #VALUE! | #VALUE! | 3,953 | #VALUE! | #VALUE! | #VALUE! | | | | | | 158,055 | | | | | |
| 14 | Overall | 2,599,985,851 | 1,785,979,172 | 488,178,602 | 3.66 | 6,170 | 4,357 | 1,695 | 2.57 | 421,733 | 409,910 | 288,011 | 1.42 | 0.01 | 49,490-352,699 | 179,389 | 125,556 | 1.43 | 74.40 | 0.01 |
| 15 | | | 78.53% | 21.47% | | | 71.99% | 28.01% | | 1,315,935 | 840,087 | 704,474 | | | | | | | | |

| Funder | Investment (total); £ (%) | Investment (male); £ (%) | Investment (female); £ (%) | FOU difference | Studies (total); n (%) | Studies (male); £ (%) | Studies (female); n (%) | FOU difference | Mean grant (total); £ (SD) | Mean grant (male); £ (SD) | Mean grant (female); £ (SD) | FOU difference | P | Median grant (total); £ (IQR) | Median grant (male); £ (IQR) | Median grant (female); £ (IQR) | FOU difference | Chi-square | P |
|------------------------------------|---------------------------|--------------------------|----------------------------|----------------|------------------------|-----------------------|-------------------------|----------------|----------------------------|---------------------------|-----------------------------|----------------|------|-------------------------------|------------------------------|--------------------------------|----------------|------------|------|
| 1 Public funding | 1,393,972,967 | 1,025,211,218 | 279,810,244 | 3.66 | 1,082 | 1,722 | 624 | 2.76 | 588,503 | 595,361 | 448,414 | 1.17 | 0.01 | 255,992 | 272,452 | 213,718 | 1.27 | 29.38 | 0.01 |
| 2 | 53.6% | 78.6% | 21.4% | | 17.6% | 73.4% | 26.6% | | 1,447,668 | 1,080,718 | 814,979 | | | 127,167-529,610 | 138,322- 572,529 | 92,880-402,917 | | | |
| 3 | | | | | | | | | | | | | | | | | | | |
| 4 BSRC | 186,268,429 | 160,120,540 | 26,147,889 | 6.12 | 578 | 485 | 93 | 5.22 | 322,264 | 330,145 | 281,160 | 1.17 | 0.78 | 253,398 | 253,498 | 244,972 | 1.03 | 0.12 | 0.73 |
| 5 | 7.2% | 86.0% | 14.0% | | 9.4% | 83.9% | 16.1% | | 361,565 | 383,963 | 205,593 | | | 169,787-365,159 | 176,763-363,830 | 149,828-371,577 | | | |
| 6 DFID | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | |
| 9 H | 134,961,745 | 101,933,746 | 32,757,325 | 3.11 | 285 | 194 | 89 | 2.18 | 473,550 | 525,432 | 368,060 | 1.43 | 0.37 | 203,544 | 213,107 | 181,697 | 1.17 | 0.36 | 0.55 |
| 10 | 5.2% | 75.7% | 24.3% | | 4.6% | 68.6% | 31.4% | | 846,024 | 968,640 | 482,041 | | | 72,628-514,066 | 72,627-542,097 | 65,015-383,886 | | | |
| 11 European Commission | 255,015,533 | 186,846,015 | 65,558,847 | 2.85 | 219 | 141 | 71 | 1.99 | 1,164,454 | 1,325,149 | 923,364 | 1.44 | 0.58 | 439,762 | 555,497 | 199,133 | 2.79 | 3.58 | 0.06 |
| 12 | 9.8% | 74.0% | 26.0% | | 3.6% | 66.5% | 33.5% | | 2,084,358 | 2,409,860 | 1,316,016 | | | 127,419-1,454,94 | 123,042-1,504,88 | 134,621-1,449,403 | | | |
| 13 MRC | 672,895,698 | 537,260,180 | 131,751,245 | 4.08 | 962 | 715 | 242 | 2.95 | 699,476 | 751,413 | 544,427 | 1.38 | 0.01 | 366,479 | 404,615 | 286,679 | 1.41 | 18.44 | 0.01 |
| 14 | 25.9% | 80.3% | 19.7% | | 15.6% | 74.7% | 25.3% | | 993,012 | 1,020,748 | 884,442 | | | 199,287-713,178 | 210,068-811,860 | 178,182-468,998 | | | |
| 15 UK government, non- | 144,831,562 | 39,050,737 | 23,594,939 | 1.66 | 237 | 187 | 129 | 1.45 | 452,898 | 208,828 | 182,907 | 1.14 | 0.01 | 110,178 | 129,660 | 59,976 | 2.16 | 3.79 | 0.05 |
| 16 | 5.6% | 62.3% | 37.7% | | 3.8% | 59.2% | 40.8% | | 2,811,384 | 492,519 | 619,889 | | | 19,073-206,784 | 23,761- 207,320 | 12,564-157,053 | | | |
| 17 | | | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | | | |
| 19 Philanthropy | 1,108,966,983 | 691,680,388 | 185,866,898 | 3.72 | 2,879 | 2,044 | 768 | 2.66 | 383,601 | 338,396 | 242,014 | 1.40 | 0.01 | 146,060 | 153,653 | 114,173 | 1.35 | 23.28 | 0.01 |
| 20 | 42.7% | 78.8% | 21.2% | | 46.7% | 72.7% | 27.3% | | 1,377,079 | 659,025 | 711,420 | | | 52,433-286,518 | 58,589-302,774 | 42,658-222,842 | | | |
| 21 Bill & Melinda Gates Foundation | 220,923,242 | | | | 39 | | | | 5,664,699 | | | | | 1,488,432 | | | | | |
| 22 | 8.5% | | | | 0.6% | | | | 8,966,093 | | | | | 628,545-5,576,863 | | | | | |
| 23 Charity | 199,703,382 | 130,726,509 | 58,989,705 | 2.22 | 855 | 619 | 217 | 2.85 | 227,332 | 211,190 | 271,842 | 0.78 | 0.01 | 87,318 | 91,991 | 76,058 | 1.21 | 5.23 | 0.02 |
| 24 | 7.7% | 68.9% | 31.1% | | 13.9% | 74.0% | 26.0% | | 730,057 | 454,108 | 1,208,852 | | | 27,616-167,829 | 36,429-172,497 | 17,279-150,727 | | | |
| 25 Wellcome Trust | 688,340,359 | 560,953,880 | 126,592,102 | 4.43 | 1,985 | 1,425 | 550 | 2.59 | 346,818 | 393,652 | 230,168 | 1.71 | 0.01 | 168,434 | 191,461 | 137,241 | 1.40 | 39.83 | 0.01 |
| 26 | 26.5% | 81.6% | 18.4% | | 32.2% | 72.2% | 27.8% | | 646,625 | 723,549 | 362,836 | | | 66,419-335,557 | 74,759-362,424 | 54,019-250,723 | | | |
| 27 | | | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | | | | | | |
| 30 Other funding | 103,542,992 | 69,087,566 | 22,501,460 | 3.07 | 1,010 | 591 | 303 | 1.95 | 103,683 | 116,899 | 74,262 | 1.57 | 0.01 | 28,626 | 32,557 | 20,373 | 1.60 | 4.80 | 0.03 |
| 31 | 4.0% | 75.4% | 24.6% | | 16.4% | 66.1% | 33.9% | | 273,102 | 309,358 | 154,373 | | | 6,282-105,082 | 7,225-113,479 | 4,408-79,809 | | | |
| 32 | | | | | | | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | | | | | | | |
| 34 Overall | 2,599,985,851 | 1,785,979,172 | 488,178,602 | 3.66 | 6,165 | 4,357 | 1,695 | 2.57 | 421,733 | 409,910 | 288,011 | 1.42 | 0.01 | 158,055 | 179,389 | 125,556 | 1.43 | 74.40 | 0.01 |
| 35 | | 78.5% | 21.5% | | | 72.0% | 28.0% | | 1,315,935 | 840,087 | 704,474 | | | 49,490-352,699 | 59,146-371,977 | 30,983-261,835 | | | |
| 36 | | | | | | | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | | | | | | | | |

| Year | Investment (male); £ | Change from previous year (male); £ | Fold difference (male) | P | Change over 1997 (male); £ | Fold difference (male) | P | Investment (female); £ | Change from previous year (female); £ | Fold difference (female) | P | Change over 1997 (female); £ | Fold difference (female) | P | Investment (male); % | Investment (female); % | Absolute difference (gender) | Fold difference (gender) |
|---------------|----------------------|-------------------------------------|------------------------|------|----------------------------|------------------------|------|------------------------|---------------------------------------|--------------------------|------|------------------------------|--------------------------|------|----------------------|------------------------|------------------------------|--------------------------|
| 1997 | 64,158,003 | | | | | | | 16,305,109 | | | | | | | 79.7% | 20.3% | 47,852,894 | 3.93 |
| 1998 | 78,287,824 | 14,129,821 | 1.22 | 0.57 | 14,129,821 | 1.22 | 0.57 | 13,110,597 | -3,194,512 | 0.80 | 0.90 | -3,194,512 | 0.80 | 0.90 | 85.7% | 14.3% | 65,177,227 | 5.97 |
| 1999 | 79,477,324 | 1,189,500 | 1.02 | 0.37 | 15,319,321 | 1.24 | 0.14 | 24,366,507 | 11,255,911 | 1.86 | 0.79 | 8,061,398 | 1.49 | 0.88 | 76.5% | 23.5% | 55,110,816 | 3.26 |
| 2000 | 245,740,477 | 166,263,153 | 3.09 | 0.00 | 181,582,474 | 3.83 | 0.01 | 55,636,657 | 31,270,150 | 2.28 | 0.01 | 39,331,548 | 3.41 | 0.01 | 81.5% | 18.5% | 190,103,820 | 4.42 |
| 2001 | 105,423,252 | -140,317,225 | 0.43 | 0.09 | 41,265,248 | 1.64 | 0.01 | 34,133,067 | -21,503,591 | 0.61 | 0.23 | 17,827,958 | 2.09 | 0.01 | 75.5% | 24.5% | 71,290,185 | 3.09 |
| 2002 | 166,695,481 | 61,272,230 | 1.58 | 0.89 | 102,537,478 | 2.60 | 0.01 | 59,568,874 | 25,435,807 | 1.75 | 0.41 | 43,263,765 | 3.65 | 0.01 | 73.7% | 26.3% | 107,126,607 | 2.80 |
| 2003 | 114,827,602 | -51,867,880 | 0.69 | 0.03 | 50,669,599 | 1.79 | 0.50 | 27,241,313 | -32,327,560 | 0.46 | 0.14 | 10,936,204 | 1.67 | 0.05 | 80.8% | 19.2% | 87,586,288 | 4.22 |
| 2004 | 93,129,587 | -21,698,015 | 0.81 | 0.09 | 28,971,584 | 1.45 | 0.30 | 26,908,997 | -332,316 | 0.99 | 0.91 | 10,603,888 | 1.65 | 0.04 | 77.6% | 22.4% | 66,220,590 | 3.46 |
| 2005 | 177,791,995 | 84,662,408 | 1.91 | 0.03 | 113,633,992 | 2.77 | 0.26 | 39,460,786 | 12,551,789 | 1.47 | 0.60 | 23,155,677 | 2.42 | 0.01 | 81.8% | 18.2% | 138,331,209 | 4.51 |
| 2006 | 126,329,085 | -51,462,910 | 0.71 | 0.60 | 62,171,082 | 1.97 | 0.54 | 37,473,263 | -1,987,522 | 0.95 | 0.35 | 21,168,154 | 2.30 | 0.03 | 77.1% | 22.9% | 88,855,822 | 3.37 |
| 2007 | 126,144,324 | -184,761 | 1.00 | 0.03 | 61,986,320 | 1.97 | 0.12 | 28,293,204 | -9,180,059 | 0.76 | 0.01 | 11,988,095 | 1.74 | 0.48 | 81.7% | 18.3% | 97,851,119 | 4.46 |
| 2008 | 173,132,770 | 46,988,446 | 1.37 | 0.07 | 108,974,767 | 2.70 | 0.01 | 44,307,821 | 16,014,617 | 1.57 | 0.70 | 28,002,712 | 2.72 | 0.73 | 79.6% | 20.4% | 128,824,949 | 3.91 |
| 2009 | 114,490,290 | -58,642,480 | 0.66 | 0.12 | 50,332,287 | 1.78 | 0.01 | 41,820,953 | -2,486,868 | 0.94 | 0.03 | 25,515,844 | 2.56 | 0.01 | 73.2% | 26.8% | 72,669,337 | 2.74 |
| 2010 | 120,351,159 | 5,860,868 | 1.05 | 0.33 | 56,193,155 | 1.88 | 0.01 | 39,551,453 | -2,269,500 | 0.95 | 0.56 | 23,246,344 | 2.43 | 0.06 | 75.3% | 24.7% | 80,799,705 | 3.04 |
| Mean | 127,569,941 | 4,322,550 | | | 68,289,779 | | | 34,869,900 | 1,788,180 | | | ##### | | | 78.6% | 21.4% | 92,700,041 | |
| SD | 48,770,855 | 76,214,220 | | | 47,073,847 | | | 13,365,475 | 17,657,139 | | | ##### | | | | | 38,264,674 | |
| Total Gender | 1,785,979,172 | | | | | | | 488,178,602 | | | | | | | | | 1,297,800,569 | 3.66 |
| Total Overall | 2,599,985,851 | | | | | | | | | | | | | | | | | |



**Disparities in research funding for women scientists:
systematic analysis of UK investments in global infectious
disease research 1997–2010**

| | |
|------------------------------------|---|
| Journal: | <i>BMJ Open</i> |
| Manuscript ID: | bmjopen-2013-003362.R1 |
| Article Type: | Research |
| Date Submitted by the Author: | 22-Aug-2013 |
| Complete List of Authors: | Head, Michael; University College London, Infection & Population Health Fitchett, Joseph; London School of Hygiene & Tropical Medicine, Cooke, Mary; University College London, Wurie, Fatima; University College London, Atun, Rifat; Imperial College London, |
| Primary Subject Heading: | Infectious diseases |
| Secondary Subject Heading: | Global health |
| Keywords: | INFECTIOUS DISEASES, PUBLIC HEALTH, STATISTICS & RESEARCH METHODS, VIROLOGY, PARASITOLOGY, MYCOLOGY |
| | |

SCHOLARONE™
Manuscripts

1
2
3 **Disparities in research funding for women scientists: systematic analysis of UK**
4 **investments in global infectious disease research 1997–2010**
5
6
7
8
9

10 Michael G Head^{a*}, Joseph R Fitchett^b, Mary K Cooke^a, Fatima B Wurie^a, Rifat Atun^c

11
12
13 a University College London, Research Department of Infection and Population Health, UCL
14 Royal Free Campus, Rowland Hill Street, London, NW3 2PF
15
16

17
18 b London School of Hygiene & Tropical Medicine, Keppel Street, London, WC1E 7HT
19

20
21 c Imperial College London, South Kensington Campus, London SW7 2AZ and Harvard
22 School of Public Health, Harvard University, Boston, USA
23
24
25
26
27

28
29 *Corresponding Author
30
31
32

33
34 Number of Words: **3 758**
35
36
37

38 **Keywords** – gender, funding, research, women,
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Abstract

Objectives: There has not previously been a systematic analysis exploring gender disparities in awards for research funding. We investigated funding awards to UK institutions for all infectious disease research from 1997 to 2010, across disease categories and along the research and development continuum.

Design: Systematic analysis

Methods: Data were obtained from several sources for awards from the period 1997-2010 and each study assigned to - disease categories; type of science (pre-clinical, phases I-III trials, product development, implementation research); categories of funding organisation. Fold differences and statistical analysis were used to compare total investment, study numbers, mean grant, and median grant between men and women.

Results: 6052 studies were included in the final analysis, comprising 4357 grants (72.0%) awarded to men and 1695 grants (28.0%) awarded to women, totalling £2.274 billion. Of this, men received £1.786 billion (78.5%) and women £488 million (21.5%). The median value of award was greater for men (£179 389; IQR £59146–£371 977) than women (£125 556; IQR £30 982–£261 834).

Awards were greater for male PIs across all infectious disease systems, excepting neurological infections and sexually transmitted infections. The proportion of total funding awarded to women ranged from 14.3% in 1998 to 26.8% in 2009 (mean 21.4%), and was lowest for pre-clinical research at 18.2% (£285.5 million of £1.573 billion) and highest for operational research at 30.9% (£151.4 million of £489.7 million).

Conclusions: There are consistent disparities in funding received by men and women principal investigators: women have fewer funded studies and receive less funding in absolute and in relative terms; the median funding awarded to women is lower across most

1
2
3 infectious disease areas, by funder, and type of science. These disparities remain broadly
4
5 unchanged over the 14-year study period.
6
7
8

9 **Article summary**

10 Article focus

- 11 • We explore the distribution of funding across infectious disease research by the
12 gender of principal investigator to identify any disparities in funding received by men
13 and women researchers in the UK.
14
15
16
17
18
19
20
21
22
23
24
25

26 Key messages

- 27 • There are consistent disparities in funding received by men and women principal
28 investigators (PIs) in infectious disease research funded in the UK.
29
30
31
32 • Total funding and the median award across most disease areas and type of science
33 is typically greater in male PIs than female PIs
34
35
36
37 • These disparities remain consistent over the time period of analysis (1997-2010)
38
39

40 Strengths and limitations of this study

- 41 • This is the first study to present detailed data and rigorously quantify funding
42 disparities between men and women researchers in infectious disease research in
43 the UK.
44
45
46
47 • Our results provides new and additional evidence on disparities on funding for men
48 and women researchers highlighted in earlier studies and provides a case for new
49 research explain the source of these disparities, especially given government
50 commitments to increase the number of women in science
51
52
53
54
55
56
57
58
59
60

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
- We were unable to assess the success and failure rates by gender and thus cannot comment on the extent of inequalities or bias. As we could not access data on the academic ranking of principal investigators, we were hence unable to adjust for levels of seniority across both genders.

For peer review only

Introduction

Women are under-represented in biomedical science, yet few studies have systematically explored the extent and reasons for the observed disparities between men and women scientists. Women comprise 50% of the EU student population and 45% of doctoral students, but only one third of career researchers are women – a figure that is lower for senior positions.[1]

In 2001, a Wellcome Trust survey concluded that although women were as successful as men in securing funding for biomedical research, they were less likely to apply for grant funds because of their status in scientific institutions and the level of support they received.[2] An analysis of Wellcome Trust awards in 2000-08 revealed a significant gender difference in the amount of funding awarded, even after adjusting for the seniority of the principal investigator, concluding “the most likely explanation for the difference in amounts awarded to women and men is that women are systematically less ambitious in the amounts of funding requested in their grant applications.”[3] In 2011, around 44% of academics in UK universities were women, yet only 39% of senior lecturers and 19% of professors were women.[4] Furthermore, a number of studies from the US have shown that women in science are disadvantaged compared to men.[5–7]

The low numbers of women in science and the reasons for this anomaly is a concern for scientists and policy makers. Although the UK Medical Research Council (MRC) has a gender equality scheme, which briefly states gender equality is reflected in agreements with research organisations receiving MRC funding, it is not clear how the scheme is implemented.[8]

1
2
3 While several initiatives have aimed to increase the numbers of women involved in science,
4 there are no affirmative actions or binding policies in the UK or Europe to definitively ensure
5 women are better represented in science. Indeed, some initiatives aimed at increasing
6 women in science have been criticised. For example, in 2012, the European Commission
7 campaign targeting 13-18 year-old secondary school students[9] was rebuked and described
8 as an insult to women in science[10][11], with the offending video clip removed from the EU
9 campaign website. The effects of campaigns aimed at raising the profile of women in
10 science[12,13] have not been assessed.

11
12 We have previously undertaken a systematic analysis of research funding awarded to UK
13 institutions for all infectious disease research, for the 14-year period from 1997 to 2010.[14]
14 Here, we use the dataset gathered for this earlier study to examine trends over time, the
15 distribution of funding awarded to men and women principal investigators (PIs) across
16 specific infections, funder categories, and along the research and development (R&D)
17 continuum, extending from pre-clinical to clinical and operational research.

38 39 **Methods**

40
41 We obtained data from several sources for infectious disease research studies where
42 funding was awarded between 1997 and 2010. The methods for the original study are
43 elaborated in detail elsewhere,[14] and summarised here. We identified 325,922 studies for
44 screening that covered all areas of disease from several funders, and filtered these to
45 identify funding for infectious diseases where the lead institution was in the UK in the period
46 and the year of award 1997-2010. We obtained data from publicly available sources and
47 directly from the funders. We did not include private sector funding in the analysis, as
48 pharmaceutical sector data were not publicly available. Figure 1 shows the sources of data
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 and the numbers of studies included and excluded at each stage of screening to reach the
4
5 final set of studies for detailed analysis.
6
7
8
9

10 *Figure 1. Methodology flow chart for filtering studies firstly by infectious disease and then by*
11 *gender*
12
13

14
15
16
17 Data collection and cleaning took place alongside routine duties between 2006 and 2011,
18 primarily by MGH and assisted by JRF, MKC and FBW. Funding records could feasibly be
19 obtained going back to 1997, hence the decision to cover awards during 1997-2010. We
20 assigned each study to primary disease categories, and within each category, we
21 documented topic-specific subsections, including specific pathogen or disease. We allocated
22 studies to one of four categories along the R&D continuum: pre-clinical; phases I, II or III;
23 product development; and operational research, and to one of the 26 categories for funding
24 organisations.
25
26
27
28
29
30
31
32

33
34
35
36 Where the PI was named, we assigned them to men or women categories. The studies
37 where only an initial was available for the forename were assigned as “unclear” if we were
38 unable to establish the PIs gender from a review of the literature, institutional websites or
39 publicly available publications and documents.
40
41
42
43
44
45
46

47 Reference to sexually transmitted infections excludes HIV. Neglected tropical diseases were
48 categorised according to classification used by the World Health Organization (WHO)
49 (http://www.who.int/neglected_diseases/diseases/en). Antimicrobial resistance includes
50 antibacterial, antiviral, antifungal and antiparasitic studies.
51
52
53
54
55
56
57
58
59
60

1
2
3 We converted grants awarded in a currency other than pounds sterling to UK pounds using
4 the mean exchange rate in the year of the award. We adjusted grant funding amounts for
5 inflation and reported in 2010 UK pounds.
6
7
8
9

10
11
12 As well as excluding studies not immediately relevant to infection, we excluded unfunded
13 studies, veterinary infectious disease research studies (unless there was a zoonotic
14 component), those exploring the use of viral vectors to investigate non-communicable
15 diseases, grants for symposia or meetings, or studies with UK contributions (e.g. as a
16 collaborator), but the funding was awarded to a non-UK institution.
17
18
19
20
21
22
23
24

25 We used Microsoft Excel versions 2000 and 2007 to categorise studies. Where needed, data
26 were exported into Microsoft Access (versions 2000 and 2007) and specific keyword queries
27 used to select precise sections of the data for analysis. We used Stata (version 11.0) for
28 statistical analysis and to generate figures.
29
30
31
32
33
34
35

36 We used fold differences to compare total investment, number of studies, mean grant, and
37 median grant between men and women according to disease system, specific infection and
38 funding organisation.
39
40
41
42
43
44

45 We used nonparametric Mann-Whitney rank-sum test to assess the distribution of funding by
46 gender. Nonparametric K-sample test on equality of medians was applied to compare the
47 median funding by gender, and reported as a chi-squared statistic without Yates' correction
48 for continuity. Nonparametric Wilcoxon signed-rank test was applied when comparing
49 matched data, such as time trends by gender. The significance for all tests was defined at
50 the 5% level (two-sided $P=0.05$).
51
52
53
54
55
56
57
58
59
60

1
2
3 We present disparities between gender and do not attempt to investigate or imply bias or
4
5 inequalities as we could not access data on unsuccessful grant applications.
6
7
8
9
10

11 12 **Results**

13
14 We identified 6165 studies from the 325,922 studies screened that were suitable for
15
16 inclusion in our analysis. Of these, we were unable to ascertain the gender of principal
17
18 investigator for 30 studies (0.5%). We excluded 83 studies (1.3%) that did not specify the PIs
19
20 name or gender – these were funded by the Bill and Melinda Gates Foundation (Gates
21
22 Foundation) (38 studies; 0.6%) and the UK Department for International Development
23
24 (DFID) (22 studies; 0.4%), accounting for £321.2 million (12.3% of the total). We included
25
26 6052 studies in the final analysis, comprising 4357 grants (72.0%) awarded to men and 1695
27
28 grants (28.0%) awarded to women, totalling £2.274 billion, of which £1.786 billion (78.5%)
29
30 were awarded to men and £488 million (21.5%) awarded to women.
31
32
33
34
35

36 The median value of grant funding was greater for men (£179 389; IQR £59146–£371 977)
37
38 than for women (£125 556; IQR £30 982–£261 834). Similarly, mean value of the grant
39
40 funding was greater for men (£409 910; SD £840 087) than for women (£288 011; SD £704
41
42 474). Figure 2 shows the distribution of the total investments and median funding awarded to
43
44 PIs by gender over time.
45
46
47
48

49 *Figure 2a. Total investment over time awarded to male and female principal investigators*

50
51
52 *Figure 2b Median investment over time awarded to male and female principal investigators*
53
54
55

56 57 **Infectious disease system** 58 59 60

1
2
3 Table 1A (web appendix 1) shows the total investment, total numbers of studies, mean grant
4 funding, median grant funding and fold differences in funding according to nine disease
5 systems and by gender of PI. We identified no infectious disease system where women led
6 the majority of research efforts or were awarded the majority of funding. Median funding
7 awards were greater for male PIs across all infectious disease systems, with the exception
8 of neurological infections and sexually transmitted infections.
9
10
11
12
13
14
15
16
17

18 Greatest levels of funding awarded to men and to women were for research into respiratory
19 infections and HIV. Men received a total of £312.1 million for research into respiratory
20 infections compared with £84.4 million for women – a 3.70 fold difference – and a total of
21 £290.8 million for HIV research compared with £79.7 million for women – a 3.65 fold
22 difference.
23
24
25
26
27
28
29
30

31 The largest difference between total funding for men and for women was with
32 gastrointestinal infections (5.65 fold difference) where women received only 15.0% of the
33 total investment (£37.0 million) and spearheaded 18.9% (149) of the studies and
34 neurological infections (4.22 fold difference). Smallest difference between total funding for
35 men and for women was in research into sexually transmitted infections (1.90 fold
36 difference), where women received 35.0% (£45.4 million) of the total funding and led 49.0%
37 (182) of the studies.
38
39
40
41
42
43
44
45
46
47

48 Mean funding for grants was significantly greater for men (£409 910; SD £840 087) than for
49 women (£288 011; SD £704 474). The differences in median funding were statistically
50 significant ($P > 0.01$) for gastrointestinal infections (men £328 021; SD £458 720) (women
51 £248 615; SD £433 176), for haematological infections (men £417 889; SD £914 626)
52
53
54
55
56
57
58
59
60

(women £306 126; SD £819 910), and for HIV (men £649 216; SD £1 550 920) (women £278 505; SD £545 657).

Median funding for grants showed a similar pattern, with significantly greater grant funding for men (£179 389; IQR £59 146–£371 977) than women (£125 556; IQR £30 983–£261 835). Differences in median funding were statistically significant ($P > 0.05$) for gastrointestinal infections (men £208 369; IQR £78 852–£357 771) (women £155 066; IQR £43 637–£305 928), for hepatic infections (men £118 638; IQR £41 342–£269 629) (women £68 620; IQR £26 720–£221 952), and for HIV (men £163 462; IQR £39 153–£511 800) (women £114 272; IQR £29 880–£305 339).

Specific Infections

Table 1B (web appendix 1) shows total investment, total numbers of studies, mean grant funding, median grant funding and fold differences in funding according to specific infection by gender.

Men received significantly higher levels of total research funding, spearheaded greater numbers of studies, and were awarded greater median and mean funding for grants for malaria ($P = 0.01$), HIV ($P = 0.01$) and influenza ($P = 0.04$).

Major differences between total funding for men and for women were observed for research into candida (47.75 fold difference), rotavirus (33.65 fold difference), campylobacter (24.33 fold difference) and norovirus (23.33 fold difference). Smallest differences between total funding for men and women were for research into dengue (1.07 fold difference) and leishmaniasis (1.55 fold difference). Women received greater total funding than men for research into leprosy (0.09 fold difference), diphtheria (0.18 fold difference), chlamydia (0.36 fold difference), syphilis (0.37 fold difference), and varicella zoster (0.54 fold difference).

1
2
3
4
5 Differences in mean grant funding were statistically significant ($P > 0.05$) for malaria
6 research (men £590 422; SD £1 324 909) (women £318 054; SD £726 872), for influenza
7 (men £616 643; SD £881 493) (women £387 186; SD £489 997), for respiratory syncytial
8 virus (men £485 283; SD £539 396) (women £187 931; SD £268 412), and for HIV (men
9 £649 216; SD £1 550 920) (women £278 505; SD £545 657).
10
11
12
13
14
15

16
17
18 Differences in median grant funding were statistically significant ($P > 0.05$) for malaria
19 research (men £209 646; IQR £63 826–£529 610) (women £143 358; IQR £42 754–£314
20 524), for hepatitis C (men £124 797; IQR £42 475–£289 293) (women £67 265; IQR £29
21 880–£233 467), for influenza (men £348 730; IQR £213 601–£668 561) (women £200 787;
22 IQR £124 210–£398 191), for herpes simplex virus (men £119 295; IQR £40 009–£446 395)
23 (women £309 610; IQR £147 885–£439 305), and for HIV (men £163 462; IQR £39 153–
24 £511 800) (women £114 272; IQR £29 880–£305 339).
25
26
27
28
29
30
31
32
33
34
35

36 Figure 3 shows the proportion of total funding awarded to principal investigators by gender
37 over time and a breakdown of investment by research pipeline. The proportion of the total
38 funding awarded to women ranged from 14.3% (in 1998) to 26.8% (in 2009), with a mean
39 proportion of 21.4% for the period studied. The proportion of funding was lowest for pre-
40 clinical research at 18.2% (£285.5 million of £1.573 billion total) and highest for operational
41 research at 30.9% (£151.4 million of £489.7 million). The funding for clinical (Phase I, II and
42 III) research was 29.9% (£25.5 of £85.2) and for product development amounted to 20.4%
43 (£25.8 million of £126.6 million).
44
45
46
47
48
49
50
51
52
53
54

55 *Figure 3a. Proportion of investment over time awarded to male and female principal*
56 *investigators*
57
58
59
60

1
2
3 *Figure 3b. Total investment by research pipeline awarded to male and female principal*
4 *investigators*
5
6
7
8
9

10 **Funding organisation**

11
12 Table 2 (web appendix 2) shows in detail the total investment, total numbers of studies,
13 mean grant funding, median grant funding and fold differences in funding according to
14 funding organisation and by gender.
15
16
17
18
19

20
21 Public funding organisations invested a total of £1.025 billion in research led by men (78.6%)
22 and £279.8 in research led by women (21.4%). Greatest levels of funding awarded to men
23 and to women were by the Wellcome Trust and the UK MRC. Major differences between
24 funding awarded to men and to women PIs were by the BBSRC, with a 6.12 fold difference.
25 Smallest differences between funding awarded to men and to women were by the UK
26 Government funding streams such as the National Institute for Health Research, with a 1.66
27 fold difference. Mean grant funding from public funding organisations were significantly
28 greater for men at £595 361 (SD £1 080 718) than for women at £448 414 (SD £814 979).
29 Differences were also statistically significant ($P > 0.01$) for UK MRC grants with men at £751
30 413 (SD £1 020 748) and women at £544 427 (SD £884 442), and for UK Government
31 grants with men at £208 828 (SD £492 519) and women at £182 907 (SD £619 889).
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

47 Median grant funding from public funding organisations had a similar pattern with
48 significantly greater grant funding for men at £272 452 (IQR £138 322–£572 529) and
49 women at £213 718 (IQR £92 880–£402 917). Differences were also statistically significant
50 ($P > 0.05$) for UK MRC grants with men at £404 615 (IQR £ 210 068–£811 860) and women
51 at £286 679 (£178 182–£468 998), and for UK Government grants with men at £129 660
52 (IQR £23 761–£207 320) and women at £59 976 (IQR £12 564–£157 053).
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Philanthropic funding organisations invested a total of £691.7 million in research led by men (78.8%) and £185.9 million in research led by women (21.2%).

Mean grant funding from philanthropic funding organisations were significantly greater for men at £338 396 (SD £695 025) than for women at £242 014 (SD £711 420). Differences were also statistically significant ($P > 0.01$) for Wellcome Trust grants with men receiving £393 652 (SD £723 549) and women £230 168 (SD £362 836), and for other charitable funding organisations with men receiving £211 190 (SD £454 108) and women £271 842 (SD £1 208 852).

Median grants from philanthropic funding organisations showed a similar pattern with significantly greater grant funding for men at £153 653 (IQR £58 589 – £302 774) and women at £114 173 (IQR £42 658 – £222 842). Differences were also statistically significant ($P > 0.05$) for Wellcome Trust grants with men receiving £191 461 (IQR £74 759 – £362 424) and women £137 241 (IQR £54 019 – £250 723), and for other charitable funding organisations with men receiving £91 991 (IQR £36 429 – £172 497) and women £76 058 (IQR £17 279 – £150 727).

Figure 4 shows the association between funding organisation and total investment and median funding by gender. The MRC awarded the highest median amount in grants to women (£286 679; IQR £178 182–£468 998), but the median funding amount in grants for men were 1.41 fold higher than that awarded to women (£404 615; IQR £210 068–£811 860). European Commission awarded the highest mean grants to women at £923 364 (SD £1 316 016) however mean funding amount in grants for men were 1.44 fold higher at £1325 149 (SD £2 409 860) than that for women.

1
2
3 *Figure 4a. Association between funding organisation and total investment by gender*
4

5 *Figure 4b. Association between funding organisation and median award by gender*
6
7
8
9

10 *Time trend*
11

12
13 Table 3 (web appendix 3) shows in detail the trends in funding over time from 1997 to 2010
14 by gender of principal investigators, with amounts and relative proportions each year of
15 funding. Mean annual funding received was greater by men at £127.6 million (SD £48.7
16 million) than women at £34.9 million (SD £13.4 million). Proportions of annual funding
17 received by men ranged from 73.2% to 85.7%, with a mean of 78.6%.
18
19
20
21
22
23

24
25
26 Proportions of annual funding received by women ranged from 14.3% to 26.8% with a mean
27 of 21.4%. The largest annual funding received by men was £245.7 million in 2000, and the
28 smallest at £64.2 million in 1997. The largest annual funding received by women was £59.6
29 million in 2002, with the smallest at £13.1 million in 1998.
30
31
32
33
34
35
36

37 Over the 14-year study period, the proportion of investment awarded to women each year
38 remains relatively unchanged with a mean of 21.4% of total (range 14.3%–26.8%; £13.1
39 million to £59.6 million). Figure 5 shows the funding trends over time and fold differences in
40 total investments by gender. Absolute difference in the funding amounts in the grants
41 awarded to men and women ranges between £47.9 million and £190.1 million, with a mean
42 difference of £92.7 million (SD £38.3 million). Fold difference in grant funding for men and
43 women ranged from 2.74 to 5.97, with a mean fold difference of 3.66.
44
45
46
47
48
49
50
51

52 *Figure 5a. Total investment and trend over time, by gender*
53

54 *Figure 5b. Fold difference of investment over time, by gender*
55
56
57
58
59
60

Discussion

We present the first detailed and systematic analysis by gender of investments in infectious disease research in the UK for the 14-year period 1997-2010. We identified 6165 studies funded by public and philanthropic funding organisations, with total research investment of £2.6 billion.

We quantified the differences in research funding awarded by gender to show these to be substantial. The analysis shows clear and consistent disparities between men and women principal investigators, with lower funding in terms of the total investment, the number of funded studies, the median funding awarded and the mean funding awarded across most of the infectious disease areas funded. Women received less funding in absolute amounts and in relative terms, by funder and the type of science funded along the R&D pipeline. These disparities in funding between men and women persist over time.

We show large disparities in median funding amounts for men and women researchers in investments by the European Commission and the MRC. Such differences were much less apparent when comparing funding from the Department of Health and BBSRC, although the BBSRC awarded 86% of funding to men. The BBSRC almost entirely funds pre-clinical research,[14] and this matches the increased proportions of pre-clinical studies being led by male principal investigators.

Our findings in infectious disease research, the most detailed to date, provide new evidence on disparities between men and women researchers, to reinforce the concerns raised in earlier studies.[4,15,16] Disparities that are more marked at senior levels of academia need to be investigated to explain and account for the observed differences.

1
2
3 The reasons why the median awards across most infectious disease conditions should be
4 significantly less for women principal investigators cannot be deduced from the available
5 data. The next step may be to investigate success rates by gender to assess how many
6 women are applying, and what proportion of the initial request for funding is actually
7 allocated.
8
9
10
11
12

13
14
15
16 There have been suggestions that women are systematically less ambitious in the amounts
17 of funding requested in their grant applications when compared with men who are
18 equivalently ranked academically, and that relatively simple mentoring programmes could at
19 least partially overcome this anomaly.[3] However, there is no evidence supporting these
20 assertions. Others have suggested that systems which ensure PI anonymity during review of
21 grant funding submissions may help reduce the presence of any subtle gender biases[17],
22 though in practice this approach would be challenging as the experience of the PI is a key
23 factor when considering suitability of request for research support. However, evidence on
24 effective interventions to address barriers for women scientists are lacking.[16] Women of
25 child-bearing age are being disadvantaged in some areas of employment, even though in
26 relation to scientific endeavour, productivity as measured by published outputs is not
27 significantly different between women with and without children.[15]
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43

44 *Study limitations*

45
46 Our analysis has several limitations. We rely on the accuracy of the original data from the
47 funding organisations and as described elsewhere we have excluded data from the private
48 sector as the publicly available data are incomplete.[14]
49
50
51
52
53
54

55 In the period analysed, we were not able to find data on the number of men and women PIs
56 requesting financial support for research agencies from the funding sources studies. Hence,
57
58
59
60

1
2
3 we were unable to assess the success and failure rates by gender. We also did not have
4 complete data on the amount of funding initially requested, the gender of co-applicants for
5 each study, the total pool of researchers in each disease area and within each type of
6 science, or the proportion of awards made to clinical and non-clinical researchers, all of
7 which would be useful pieces of information in developing a clearer picture of the reasons for
8 the presented differences. The proportion of doctors registered in the UK favours men
9 (56.8% as of January 2013) over women,[18] but the proportion of those carrying out
10 research appears to be unknown. Understanding the distribution of researchers is critical to
11 understanding the research landscape.
12
13
14
15
16
17
18
19
20
21
22
23

24 We lacked data on the academic ranking of principal investigators and were hence unable to
25 adjust for levels of seniority across both genders. We were unable to get data on gender
26 from the Gates Foundation and DFID and hence were unable to clarify the gender of a small
27 proportion of investigators, though we believe this limitation is not likely to change the
28 conclusions of the study. Our analysis focuses on infectious disease research, and analysis
29 of other areas of scientific research would be needed if these disparities persisted for all
30 research areas.
31
32
33
34
35
36
37
38
39
40
41
42

43 **Conclusions**

44 Notwithstanding limitations, our systematic analysis shows unequal distribution of
45 investments in infectious disease research for men and women. There are fewer women
46 receiving funding as principal investigators in infectious disease research, with fewer studies
47 funded with lower funding amounts when successful.
48
49
50
51
52
53
54

55 Although earlier studies have discussed possible solutions, including mentoring programmes
56 and advertising campaigns, none have systematically explored the reasons why such
57
58
59
60

1
2
3 differences persist. Hence, without an understanding of the reasons for the observed
4 disparities, the proposed solutions are not very meaningful. There is no evidence that
5 women and men researchers are not equally able, hence, other factors are likely to be at
6 play to explain the observed disparities which have persisted over the 14-year study period.
7 Research is needed to elucidate an understanding of the factors that can explain the
8 observed disparities. We strongly urge policy makers, funders and scientists to urgently
9 investigate the factors leading to the observed disparities and develop policies developed to
10 address them, in order to ensure that women are appropriately supported in scientific
11 endeavour.
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26

27 **Funding**

28
29 This research received no specific grant from any funding agency in the public, commercial
30 or not-for-profit sectors
31
32
33
34
35

36 **Author contribution**

37
38 MGH designed the study with input from RA and JF and collated the dataset. JRF, FW and
39 MKC checked and refined the dataset. JRF undertook data analysis and created the graphs
40 and figures with input from MGH and RA. MGH, JRF, and RA interpreted the data and wrote
41 the first draft. MGH, JRF, and RA refined the analysis and paper with input from MKC and
42 FBW. All authors reviewed and approved the final version. MH is guarantor of the paper.
43
44
45
46
47
48

49 **Competing interests**

50
51
52 RA has received research funding from the UK Medical Research Council, the UK National
53 Institute for Health Research, UK CRC, UK EPSRC, the UK Department for International
54 Development and the UK Department of Health. RA is a member of the UL Medical
55
56
57
58
59
60

1
2
3 Research Council Global Health Group. MGH works for the Infectious Disease Research
4 Network, which has supported this work and is funded by the UK Department of Health. JRF
5 has received funds from the Wellcome Trust and is a steering group member for the
6 Infectious Disease Research Network. MKC has received funding from the Medical
7 Research Council and the Bill & Melinda Gates Foundation. FBW has received funds from
8 UCLH Charitable Foundation.

15 **Acknowledgements**

16
17
18 We thank Jennifer Harris and Raidah Haider for their input and assistance, and acknowledge
19 the assistance of the research and development funding agencies for provision of data.

22 **Data-sharing statement**

23
24
25 All gender data is available with this submission. Further data relating to the Research
26 Investments project can be found at www.researchinvestments.org or by contacting the
27 corresponding author.
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

- 1 More women in senior positions. Key to economic stability and growth. European Commission, Luxembourg: 2010.
- 2 Blake M, La Valle I. Who applies for research funding? Key factors shaping funding application behaviour among women and men in British higher education institutions. London: 2000.
- 3 Bedi G, Van Dam NT, Munafo M. Gender inequality in awarded research grants. *Lancet* 2012;**380**:474.
- 4 Fitzpatrick S. A Survey of Staffing Levels of Medical Clinical Academics in UK Medical Schools as at 31 July 2011. London: 2012. http://www.medschools.ac.uk/Publications/Documents/MS_Clinical_Academic_Staff_Survey_310711.pdf (date accessed 22 August 2013)
- 5 Burrelli J. Thirty-Three Years of Women in S&E Faculty Positions - US National Science Foundation. Arlington: 2008. <http://www.nsf.gov/statistics/infbrief/nsf08308/> (date accessed 22 August 2013)
- 6 Lincoln AE, Pincus SH, Leboy PS. Scholars' awards go mainly to men. *Nature* 2011;**469**:472.
- 7 Pohlhaus JR, Jiang H, Sutton J. Sex differences in career development awardees' subsequent grant attainment. *Annals of internal medicine* 2010;**152**:616–7; author reply 617.
- 8 Medical Research Council. MRC Gender Equality Scheme. 2007. <http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC003655> (date accessed 22 August 2013).
- 9 European Commission. About this site- Science: It's a girl thing! 2012. <http://science-girl-thing.eu/en/about-this-site> (date accessed 22 August 2013)
- 10 Gill M. "Science, it's a girl thing!" says EU Commission, holding lipstick and bunsen burner. *New Statesman*. 2012. <http://www.newstatesman.com/blogs/martha-gill/2012/06/science-its-girl-thing-says-eu-commission-holding-lipstick-and-bunsen-burn> (date accessed 22 August 2013).
- 11 Swain F. Science: It's a girl thing. Excuse me while I die inside. – SciencePunk. *ScienceBlogs*. 2012. <http://scienceblogs.com/sciencepunk/2012/06/22/science-its-a-girl-thing-excuse-me-while-i-die-inside/> (date accessed 22 August 2013)
- 12 Yong E. Edit-a-thon gets women scientists into Wikipedia. *Nature*. 2012. <http://www.nature.com/news/edit-a-thon-gets-women-scientists-into-wikipedia-1.11636> (date accessed 22 August 2013)
- 13 Donald A. Throw off the cloak of invisibility. *Nature* 2012;**490**:447. <http://www.nature.com/news/throw-off-the-cloak-of-invisibility-1.11638> (date accessed 22 August 2013).

- 1
2
3 14 Head MG, Fitchett JR, Cooke MK, *et al.* UK investments in global infectious disease
4 research 1997-2010: a case study. *The Lancet infectious diseases* Published Online
5 First: 7 November 2012.
6
7 15 Fox MF. Gender, Family Characteristics, and Publication Productivity among
8 Scientists. *Social Studies of Science* 2005;**35**:131–50.
9
10 16 Ceci SJ, Williams WM. Understanding current causes of women's
11 underrepresentation in science. *Proceedings of the National Academy of Sciences of*
12 *the United States of America* 2011;**108**:3157–62.
13
14 17 Moss-Racusin CA, Dovidio JF, Brescoll VL, *et al.* Science faculty's subtle gender
15 biases favor male students. *Proceedings of the National Academy of Sciences of the*
16 *United States of America* 2012;**109**:16474–9.
17
18 18 List of Registered Medical Practitioners - statistics. General Medical Council.
19 http://www.gmc-uk.org/doctors/register/search_stats.asp (date accessed 22 August
20 2013).
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 **Inequalities-Disparities in research funding for women scientists: systematic analysis**
8 **of UK investments in global infectious disease research 1997–2010**
9

10
11
12
13 Michael G Head^{a*}, Joseph R Fitchett^b, Mary K Cooke^a, Fatima B Wurie^a, Rifat Atun^{c*}
14

15
16 a University College London, Research Department of Infection and Population Health, UCL
17 Royal Free Campus, Rowland Hill Street, London, NW3 2PF
18

19
20 b London School of Hygiene & Tropical Medicine, Keppel Street, London, WC1E 7HT
21

22
23 c Imperial College London, South Kensington Campus, London SW7 2AZ and Harvard
24 School of Public Health, Harvard University, Boston, USA~~Imperial College Business School~~
25 ~~and the Faculty of Medicine, Imperial College London, South Kensington Campus, London~~
26 ~~SW7-2AZ~~
27
28
29
30
31

32
33 *Corresponding Author
34
35
36

37 Number of Words: **3 758**
38
39

40
41 **Keywords** – gender, funding, research, women, ~~inequality~~
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Abstract

Objectives: ~~Women are under-represented in biomedical science. Funding awarded to UK institutions for all infectious disease research from 1997 to 2010 was investigated, across disease categories and along the research and development continuum. There has not previously been a systematic analysis exploring gender disparities in awards for gender against research funding awards. Using an existing dataset, We investigated funding awards to UK institutions for all infectious disease research from 1997 to 2010 were investigated, across disease categories and along the research and development continuum. There was no attempt to investigate bias.~~

Design: Systematic analysis

Methods: Data ~~was~~ were obtained from several sources for ~~infectious disease research for awards from~~ the period 1997-2010 and each study assigned to - disease categories; type of science (pre-clinical, phases I, II or III trials, product development, implementation research); categories of funding organisation. Fold differences and statistical analysis were used to compare total investment, study numbers, mean grant, and median grant between men and women ~~according to disease system, specific infection and funding organisation.~~

Results: ~~325,922 studies were screened and~~ 6052 studies were included in the final analysis, comprising 4357 grants (72.0%) awarded to men and 1695 grants (28.0%) awarded to women, totalling £2.274 billion. Of this, men received £1.786 billion (78.5%) and women £488 million (21.5%). The median value of award was greater for men (£179 389; IQR £59 146–£371 977) than women (£125 556; IQR £30 982–£261 834).

Awards were greater for male PIs across all infectious disease systems, excepting neurological infections and sexually transmitted infections. The proportion of total funding awarded to women ranged from 14.3% in 1998 to 26.8% in 2009 (mean 21.4%); and was

Comment [MGH1]: I think this sentence, although a tad irregular, is worth including in the abstract. Reinforces in the mind of the reader what the paper cannot do.

1
2
3
4
5
6
7 lowest for pre-clinical research at 18.2% (£285.5 million of £1.573 billion) and highest for
8 operational research at 30.9% (£151.4 million of £489.7 million).
9

10
11
12 Conclusions: There are ~~clear and~~ consistent disparities in funding received by men and
13 women principal investigators. ~~Women~~ women have fewer funded studies and receive less
14 funding in absolute and in relative terms. ~~The~~ the median funding awarded ~~are lower for to~~
15 women ~~is lower~~ across most infectious disease areas, by funder, and type of science ~~funded~~
16 ~~along the R&D pipeline~~. These ~~se~~ disparities remain broadly unchanged over the 14-year study
17 period.
18
19
20
21
22
23
24

25 Article summary

26 Article focus

- 27
28
29
30
31
32 • ~~Our aim was to~~ We ~~investigate explore~~ the distribution of funding across infectious
33 disease research by ~~the~~ gender of principal investigator, ~~and~~ to identify any
34 disparities ~~in funding received by men and women between genders researchers in~~
35 ~~the UK~~.
36
37
38
39
40

41 Key messages

- 42
43
44 • ~~In~~ There are ~~clear and~~ consistent disparities in funding received by men and women
45 principal investigators ~~in infectious disease research (PIs) funded in the UK~~.
46
47 • Total funding and the median award ~~across most disease areas and type of science~~
48 is typically greater in male PIs than female PIs
49
50 • ~~Worryingly, these~~ These ~~disparities~~ remain consistent over the time period of ~~our~~
51 analysis (1997-2010)
52
53
54
55
56
57
58
59
60

Strengths and limitations of this study

- This is the first study to present [detailed data](#) [and rigorously quantify on these funding disparities between men and women researchers in infectious disease research to such a great level of in the UK detail and quantifying the results with statistical analysis adds rigour.](#)
- Our results [provides new and additional evidence on disparities on funding for men and women researchers highlighted in earlier studies and add further evidence to previous work highlighting inequalities differences around gender, and can be used to enhance provides a case for the new research explain the source of these disparities, especially given government commitments debate on furthering the numbers and to increase the number of career paths of women in science](#)
- ~~Weaknesses include being~~ [We were](#) unable to assess the success and failure rates by gender [and thus we cannot comment on true the extent of inequalities or bias.](#)
~~As and~~ [we also lacked could not access](#) data on the academic ranking of principal investigators, [we and](#) were hence unable to adjust for levels of seniority across both genders.

Introduction

Women are under-represented in biomedical science, ~~with a limited number of studies suggesting inequalities and discriminatory practices in the United Kingdom (UK), United States of America (US) and the European Union (EU) as a whole.~~

~~Yet,~~ few studies have systematically explored the extent ~~and reasons for of the observed these inequalities disparities between men and women scientists in relation to women in science.~~ Women ~~make up~~ comprise 50% of ~~the~~ EU student population and 45% of doctoral students, but only one third of career researchers are women – a figure that is lower for senior positions.[1]

~~In 1997 an analysis of the Swedish Medical Research Council suggested that peer-reviewers could not judge scientific merit independent of gender and noted the clear discrimination against women researchers.~~²

~~A number of UK studies have raised concerns on the position of women in biomedical science.~~ In 2001, a Wellcome Trust survey, concluded that although women were as successful as men in securing funding for biomedical research, they were less likely to apply for grant funds because of their status in scientific institutions and the level of support they received.[2] An analysis of Wellcome Trust awards in 2000-08 revealed a significant gender difference in the amount of funding awarded, even after adjusting for the seniority of the principal investigator, ~~with conclusion concluding~~ “the most likely explanation for the difference in amounts awarded to women and men is that women are systematically less ambitious in the amounts of funding requested in their grant applications.”[3] ~~Although, in~~ 2011, around 44% of academics in UK universities were women, ~~yet~~ only 39% of senior lecturers and 19% of professors were women.[4] ~~Furthermore,~~

1
2
3
4
5
6
7
8
9 A number of studies from the US have shown that women in science are disadvantaged
10 compared to men.[5–7] ~~In 2012, a study which asked faculty from research intensive US~~
11 ~~universities to rate equally qualified man and woman applicant for a laboratory manager,~~
12 ~~found that the male applicant was rated significantly more competent and employable by~~
13 ~~both male and female faculty.~~⁹

14
15
16
17
18
19
20 The low numbers of women in science and the reasons for this anomaly is a concern for
21 scientists and policy makers. Although the UK Medical Research Council (MRC) has a
22 gender equality scheme, which briefly states gender equality is reflected in agreements with
23 research organisations receiving MRC funding, it is not clear how ~~this the~~ scheme is
24 implemented.[8]

25
26
27
28
29
30
31 While ~~a number of several~~ initiatives have aimed to increase the numbers of women involved
32 in science, there are no affirmative actions or binding policies in the UK or Europe to
33 definitively ensure women are better represented in science. Indeed, some initiatives aimed
34 at increasing women in science have been criticised. For example, in 2012, the European
35 Commission campaign targeting 13-18 year-old secondary school students[9] was widely
36 criticised-rebuked and described as an insult to women in science-[10][11], with The the
37 offending video clip was removed from the EU campaign website. The effects of campaigns
38 attempting-aimed at to raiseing the profile of women in science[12,13] have not been
39 assessed.

40
41
42
43
44
45
46
47
48
49
50 We have previously previously undertaken a carried out an analysis tracking investments in
51 infectious disease research whereby we have systematically analysed analysis of research
52 funding awarded to UK institutions for all infectious disease research, for the 14-year period
53
54
55
56
57
58
59
60

Formatted: Tab stops: 2.72", Left

1
2
3
4
5
6
7 from 1997 to 2010.[14] ~~In this study~~Here, we ~~use information from this the dataset gathered~~
8 ~~for this earlier study and to~~ examine with trends over time the distribution of funding awarded
9 to men and women principal investigators (PIs) across specific infections, ~~in investigation~~
10 ~~funder~~ categories, and along the research and development (R&D) continuum, extending
11 from pre-clinical to clinical and operational research.
12
13
14
15

20 Methods

21
22 We obtained data from several sources for infectious disease research studies where
23 funding was awarded between 1997 and 2010. ~~The methods for the original study are~~
24 ~~elaborated in detail elsewhere.~~[14] ~~and in summarised here.~~ We ~~–We~~ identified 325,922
25 studies for screening ~~that covered all areas of disease from several funders, and filtered~~
26 ~~these according to our primary interest of to identify funding for being related to infectious~~
27 ~~diseases where the lead institution was in the UK in the period, and plus the year of award~~
28 ~~(1997-2010. We obtained data from publicly available sources and directly from the funders.~~
29 ~~) and the lead institution being in the UK.~~ We assigned each study to primary disease
30 categories. We briefly outline the methodology for the categorisation of disease areas and
31 classification of the funding sources, ~~elaborated in detail elsewhere.~~¹⁶ ~~No open access~~We
32 ~~did not include private sector funding was included in the original analysis, as this data was~~
33 ~~clearly under representative of the pharmaceutical sector data were not publicly available~~
34 ~~a whole.~~ Figure 1 shows the sources of data ~~(the databases searched and where funders~~
35 ~~provided us with information directly)~~ and the numbers of studies ~~included and excluded~~ at
36 each stage of screening to reach the final set of studies for detailed analysis.
37
38
39
40
41
42
43
44
45
46
47
48
49
50

51 *Figure 1. Methodology flow chart ~~for filtering studies firstly by infectious disease and then by~~*
52 *~~gender~~*
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9 Data collection and cleaning took place alongside routine duties between 2006 and 2011,
10 primarily by MGH and assisted by JRF, MKC and FBW. Funding records could feasibly be
11 obtained going back to 1997, hence the decision to cover awards during 1997-2010. We
12 assigned each study to primary disease categories, and Wwithin each category, we
13
14 documented topic-specific subsections, including specific pathogen or disease. We allocated
15
16 studies to one of four categories along the R&D continuum: pre-clinical; phases I, II or III;
17
18 product development; and operational research, and to one of the 26 categories for funding
19
20 organisations.
21
22
23
24

25
26 Where the PI was named, we assigned them to men or women categories. The studies
27
28 where only an initial was available for the forename were assigned as “unclear” if we were
29
30 unable to establish the PIs gender from a review of the literature, institutional websites or
31 and publicly available publications and documents.
32
33
34

35
36 Reference to sexually transmitted infections excludes HIV. Neglected tropical diseases were
37
38 categorised according to classification used by the World Health Organization (WHO)
39
40 (http://www.who.int/neglected_diseases/diseases/en). Antimicrobial resistance includes
41
42 antibacterial, antiviral, antifungal and antiparasitic studies. ~~No private sector funding was~~
43 ~~included in this analysis due to limited publicly available data.~~
44
45

46
47 We converted grants awarded in a currency other than pounds sterling to UK pounds using
48
49 the mean exchange rate in the year of the award. We adjusted grant funding amounts for
50
51 inflation and reported in 2010 UK pounds.
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 ~~We As well as~~ ~~excludinged~~ studies not immediately relevant to infection, we further
8 exclusions in the original study includedexcluded unfunded studies. veterinary infectious
9 disease research studies (unless there was a zoonotic component), those exploring the use
10 of viral vectors to investigate non-communicable diseases, grants for symposia or meetings,
11 or studies with UK contributions (e.g. as a collaborator), but the funding was awarded to a
12 non-UK institution. ~~Unfunded studies were excluded.~~
13
14
15
16
17
18
19

20 We used Microsoft Excel versions 2000 and 2007 to categorise studies. Where needed, data
21 were exported into Microsoft Access (versions 2000 and 2007) and specific keyword queries
22 used to select precise sections of the data for analysis. We used Stata (version 11.0) for
23 statistical analysis and to generate figures.
24
25
26
27
28

29 We used fold differences to compare total investment, number of studies, mean grant, and
30 median grant between men and women according to disease system, specific infection and
31 funding organisation.
32
33
34
35
36

37 We used nonparametric Mann-Whitney rank-sum test to assess the distribution of funding by
38 gender. Nonparametric K-sample test on equality of medians was applied to compare the
39 median funding by gender, and reported as a chi-squared statistic without Yates' correction
40 for continuity. Nonparametric Wilcoxon signed-rank test was applied when comparing
41 matched data, such as time trends by gender. The significance for all tests was defined at
42 the 5% level (two-sided $P=0.05$).
43
44
45
46
47

48 We present disparities between gender and do not attempt to investigate or imply bias or
49 inequalities as we could not access data on unsuccessful grant applications.
50
51
52
53
54
55
56
57
58
59
60

Results

We identified 6165 studies from the 325,922 studies screened that were suitable for inclusion in our analysis. Of these, we were unable to ascertain the gender of principal investigator for 30 studies (0.5%). We excluded 83 studies (1.3%) that did not specify the PIs name or gender – these were funded by the Bill and Melinda Gates Foundation (Gates Foundation) (38 studies; 0.6%) and the UK Department for International Development (DFID) (22 studies; 0.4%), accounting for £321.2 million (12.3% of the total) that did not specify the PIs name or gender. We included 6052 studies in the final analysis, comprising 4357 grants (72.0%) awarded to men and 1695 grants (28.0%) awarded to women, totalling £2.274 billion, of which – Of this, £1.786 billion (78.5%) were awarded to men and £488 million (21.5%) awarded to women.

The median value of grant funding was greater for men (£179 389; IQR £59146–£371 977) than for women (£125 556; IQR £30 982–£261 834). Similarly, mean value of the grant funding was greater for men (£409 910; SD £840 087) than for women (£288 011; SD £704 474). Figure 2 shows the distribution of the total investments and median funding awarded to PIs by gender over time.

Figure 2a. Total investment over time awarded to male and female principal investigators

Figure 2b Median investment over time awarded to male and female principal investigators

Infectious disease system

Table 1A (web appendix 1) shows the total investment, total numbers of studies, mean grant funding, median grant funding and fold differences in funding according to 9 disease

1
2
3
4
5
6
7 systems and by gender of PI. We identified no infectious disease system where women led
8 the majority of research efforts or were awarded the majority of funding. Median funding
9 awards were greater for male PIs across all infectious disease systems, with the exception
10 of neurological infections and sexually transmitted infections.
11
12
13

14
15
16 Greatest levels of funding awarded to men and to women were for research into respiratory
17 infections and HIV. Men received a total of £312.1 million for research into respiratory
18 infections compared with £84.4 million for women, a 3.70 fold difference, and a total
19 of £290.8 million for HIV research compared with £79.7 million for women, a 3.65 fold
20 difference.
21
22
23
24

25
26
27 The largest difference between total funding for men and for women were was with
28 gastrointestinal infections (5.65 fold difference) where women received only 15.0% of the
29 total investment (£37.0 million) and spearheaded 18.9% (149) of the studies and
30 neurological infections (4.22 fold difference). Smallest difference between total funding for
31 men and for women were was with in research into sexually transmitted infections (1.90 fold
32 difference), where women received 35.0% (£45.4 million) of the total funding, and
33 spearheaded led 49.0% (182) of the studies.
34
35
36
37
38
39
40
41

42
43 Mean funding for grants were was significantly greater for men (£409 910; SD £840 087)
44 than for women (£288 011; SD £704 474). The differences in median funding were
45 statistically significant ($P > 0.01$) for gastrointestinal infections (men £328 021; SD £458 720)
46 (women £248 615; SD £433 176), for haematological infections (men £417 889; SD £914
47 626) (women £306 126; SD £819 910), and for HIV (men £649 216; SD £1 550 920) (women
48 £278 505; SD £545 657).
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 Median funding for grants showed a similar pattern, with significantly greater grant funding
8 for men (£179 389; IQR £59 146–£371 977) than women (£125 556; IQR £30 983–£261
9 835). Differences [in median funding](#) were statistically significant ($P > 0.05$) for
10 gastrointestinal infections (men £208 369; IQR £78 852–£357 771) (women £155 066; IQR
11 £43 637–£305 928), for hepatic infections (men £118 638; IQR £41 342–£269 629) (women
12 £68 620; IQR £26 720–£221 952), and for HIV (men £163 462; IQR £39 153–£511 800)
13 (women £114 272; IQR £29 880–£305 339).
14
15
16
17
18
19

20 21 **Specific Infections**

22
23 Table 1B (web appendix 1) shows total investment, total numbers of studies, mean grant
24 funding, median grant funding and fold differences in funding according to specific infection
25 by gender.
26
27
28

29 Men received significantly higher levels of total research funding, spearheaded greater
30 numbers of studies, and were awarded greater median and mean funding for grants for
31 malaria ($P = 0.01$), HIV ($P = 0.01$) and influenza ($P = 0.04$).
32
33
34
35
36

37 Major differences between total funding for men and for women were ~~with-observed for~~
38 research into candida (47.75 fold difference), rotavirus (33.65 fold difference),
39 campylobacter (24.33 fold difference) and norovirus (23.33 fold difference). Smallest
40 differences between total funding for men and women were for research into dengue (1.07
41 fold difference) and leishmaniasis (1.55 fold difference). Women received greater total
42 funding than men for research into leprosy (0.09 fold difference), diphtheria (0.18 fold
43 difference), chlamydia (0.36 fold difference), syphilis (0.37 fold difference), and varicella
44 zoster (0.54 fold difference).
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 Differences in mean grant funding ~~was~~were statistically significant ($P > 0.05$) for malaria
8 research (men £590 422; SD £1 324 909) (women £318 054; SD £726 872), for influenza
9 (men £616 643; SD £881 493) (women £387 186; SD £489 997), for respiratory syncytial
10 virus (men £485 283; SD £539 396) (women £187 931; SD £268 412), and for HIV (men
11 £649 216; SD £1 550 920) (women £278 505; SD £545 657).
12
13
14
15

16
17
18 Differences in median grant funding were statistically significant ($P > 0.05$) for malaria
19 research (men £209 646; IQR £63 826–£529 610) (women £143 358; IQR £42 754–£314
20 524), for hepatitis C (men £124 797; IQR £42 475–£289 293) (women £67 265; IQR £29
21 880–£233 467), for influenza (men £348 730; IQR £213 601–£668 561) (women £200 787;
22 IQR £124 210–£398 191), for herpes simplex virus (men £119 295; IQR £40 009–£446 395)
23 (women £309 610; IQR £147 885–£439 305), and for HIV (men £163 462; IQR £39 153–
24 £511 800) (women £114 272; IQR £29 880–£305 339).
25
26
27
28
29
30
31
32

33 Figure 3 shows the proportion of total funding awarded to principal investigators by gender
34 over time and a breakdown of investment by research pipeline. The proportion of the total
35 funding awarded to women ranged from ~~a low of 14.3%~~ (in 1998) to ~~a high of 26.8%~~ (in
36 2009), with a mean proportion of 21.4% for the period studied. The proportion of funding
37 was lowest for pre-clinical research at 18.2% (£285.5 million of £1.573 billion total) and
38 highest for operational research at 30.9% (£151.4 million of £489.7 million). The funding
39 for clinical (Phase I, II and III) research was 29.9% (£25.5 of £85.2) and for product
40 development amounted to 20.4% (£25.8 million of £126.6 million).
41
42
43
44
45
46
47
48
49

50 *Figure 3a. Proportion of investment over time awarded to male and female principal*
51 *investigators*
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 *Figure 3b. Total investment by research pipeline awarded to male and female principal*
8 *investigators*
9

10 11 12 13 **Funding organisation**

14
15 Table 2 (web appendix 2) shows in detail the total investment, total numbers of studies,
16 mean grant funding, median grant funding and fold differences in funding according to
17 funding organisation and by gender.
18
19

20
21
22
23 Public funding organisations invested a total of £1.025 billion in research led by men
24 (78.6%) and £279.8 in research led by women (21.4%). Greatest levels of funding
25 awarded to men and to women were by the Wellcome Trust and the UK MRC. Major
26 differences between funding awarded to men and to women PIs were by the BBSRC, with a
27 6.12 fold difference. Smallest differences between funding awarded to men and to women
28 were by the UK Government funding streams such as the National Institute for Health
29 Research, with a 1.66 fold difference. Mean grant funding from public funding organisations
30 were significantly greater for men at £595 361 (SD £1 080 718) than for women at £448 414
31 (SD £814 979). Differences were also statistically significant ($P > 0.01$) for UK MRC grants
32 with men at £751 413 (SD £1 020 748) and women at £544 427 (SD £884 442), and for UK
33 Government grants with men at £208 828 (SD £492 519) and women at £182 907 (SD £619
34 889).
35
36
37
38
39
40
41
42
43
44

45
46 Median grant funding from public funding organisations had a similar pattern with
47 significantly greater grant funding for men at £272 452 (IQR £138 322–£572 529) and
48 women at £213 718 (IQR £92 880–£402 917). Differences were also statistically significant
49 ($P > 0.05$) for UK MRC grants with men at £404 615 (IQR £ 210 068–£811 860) and women
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 at £286 679 (£178 182–£468 998), and for UK Government grants with men at £129 660
8 (IQR £23 761–£207 320) and women at £59 976 (IQR £12 564–£157 053).
9

10
11
12
13 Philanthropic funding organisations invested a total of £691.7 million in research led by men
14 (78.8%) and £185.9 million in research led by women (21.2%).
15
16

17
18
19 Mean grant funding from philanthropic funding organisations were significantly greater for
20 men at £338 396 (SD £695 025) than for women at £242 014 (SD £711 420). Differences
21 were also statistically significant ($P > 0.01$) for Wellcome Trust grants with men receiving
22 £393 652 (SD £723 549) and women £230 168 (SD £362 836), and for other charitable
23 funding organisations with men receiving £211 190 (SD £454 108) and women £271 842
24 (SD £1 208 852).
25
26
27
28

29
30
31
32 Median grants from philanthropic funding organisations showed a similar pattern with
33 significantly greater grant funding for men at £153 653 (IQR £58 589 – £302 774) and
34 women at £114 173 (IQR £42 658 – £222 842). Differences were also statistically significant
35 ($P > 0.05$) for Wellcome Trust grants with men receiving £191 461 (IQR £74 759 – £362
36 424) and women £137 241 (IQR £54 019 – £250 723), and for other charitable funding
37 organisations with men receiving £91 991 (IQR £36 429 – £172 497) and women £76 058
38 (IQR £17 279 – £150 727).
39
40
41
42
43
44
45

46
47 Figure 4 shows the association between funding organisation and total investment and
48 median funding by gender. The MRC awarded the highest median amount in grants to
49 women (£286 679; IQR £178 182–£468 998), but the median funding amount in grants for
50 men were 1.41 fold higher than that awarded to women (£404 615; IQR £210 068–£811
51 860). European Commission awarded the highest mean grants to women at £923 364 (SD
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 £1 316 016) however mean funding amount in grants for men were 1.44 fold higher at
8 £1325 149 (SD £2 409 860) than that for women.
9

10 *Figure 4a. Association between funding organisation and total investment by gender*

11
12 *Figure 4b. Association between funding organisation and median award by gender*

13
14
15
16
17 *Time trend*

18
19 Table 3 (web appendix 3) shows in detail the trends in funding over time from 1997 to 2010
20 by gender of principal investigators, with amounts and relative proportions each year of
21 funding. Mean annual funding received was greater by men at £127.6 million (SD £48.7
22 million) than women at £34.9 million (SD £13.4 million). Proportions of annual funding
23 received by men ranged from 73.2% to 85.7%, with a mean of 78.6%.
24
25
26
27

28
29 Proportions of annual funding received by women ranged from 14.3% to 26.8% with a mean
30 of 21.4%. The largest annual funding received by men was £245.7 million in 2000, and the
31 smallest at £64.2 million in 1997. The largest annual funding received by women was £59.6
32 million in 2002, with the smallest at £13.1 million in 1998.
33
34
35
36
37

38
39 Over the 14-year study period, the proportion of investment awarded to women each year
40 remains relatively unchanged with a mean of 21.4% of total (range 14.3%–26.8%; £13.1
41 million to £59.6 million). Figure 5 shows the funding trends over time and fold differences in
42 total investments by gender. Absolute difference in the funding amounts in the grants
43 awarded to men and women ranges between £47.9 million and £190.1 million, with a mean
44 difference of £92.7 million (SD £38.3 million). Fold difference in grant funding for men and
45 women ranged from 2.74 to 5.97, with a mean fold difference of 3.66.
46
47
48
49
50
51
52

53 *Figure 5a. Total investment and trend over time, by gender*
54
55
56
57
58
59
60

1
2
3
4
5
6
7 *Figure 5b. Fold difference of investment over time, by gender*
8
9

10 11 **Discussion**

12
13 We present the first, detailed and systematic analysis [by gender](#) of ~~the~~ investments in
14 infectious disease research [in the UK by gender](#) for the 14-year period 1997-2010. We
15 identified 6165 studies funded by public and philanthropic funding organisations, with total
16 research investment of £2.6 billion.
17
18

19
20
21
22 We ~~quantify~~ [quantified](#) the differences in research funding awarded by gender, to show
23 these to be substantial. The analysis shows clear and consistent disparities between men
24 and women principal investigators, with lower funding in terms of the total investment, the
25 number of funded studies, the median funding awarded and the mean funding awarded
26 across most of the infectious disease areas funded. ~~The analysis reveals consistent~~
27 ~~disparities, with~~ [W](#) women ~~receiving~~ [received](#) less funding in absolute amounts and in relative
28 terms, by funder and the type of science funded along the R&D pipeline. ~~Analysis of the~~
29 ~~funding trends by year reveals that the~~ [These](#) disparities [in funding between men and women](#)
30 persist over time.
31
32
33
34
35
36
37
38
39
40

41 We show large disparities in median funding amounts for men and women researchers in
42 investments by the European Commission and the MRC. Such differences were much less
43 apparent when comparing funding from the Department of Health and BBSRC, although the
44 BBSRC awarded 86% of funding to men. The BBSRC almost entirely funds pre-clinical
45 research,[14] and this matches the increased proportions of pre-clinical studies being led by
46 male principal investigators.
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 Our findings [in infectious disease research](#), the most detailed to date, provide new evidence
8 ~~to show that there are on~~ [disparities between men and](#) women ~~reserachers in leading studies~~
9 ~~in infectious disease research, to reinforce science working in the area of infectious disease~~
10 ~~research are clearly disadvantaged. Our findings confirm~~ the concerns raised ~~in the~~
11 ~~published in earlier studies literature on the subject.~~ [4, 15, 16]^{4,9,15,17} Disparities that are more
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Field Code Changed

The ~~precise~~ reasons why the median awards across most infectious disease conditions should be significantly less for women principal investigators cannot be deduced from the available data. The next step may be to investigate success rates by gender to assess how many women are applying, ~~and what proportion of the initial request for funding is actually allocated.~~

~~Some studies have suggested~~ ~~There have been suggestions~~ that women ~~were are~~ systematically less ambitious in the amounts of funding requested in their grant applications when compared with men who are equivalently ranked academically, and that relatively simple mentoring programmes could at least partially overcomes this anomaly.[3] However, there is no evidence supporting these ~~se~~ assertions. Others have suggested that systems which ensure PI anonymity during review of grant funding submissions may help reduce ~~the presence of any~~ subtle gender biases[17], though in practice this approach would be challenging as the experience of the PI is a key factor when considering suitability of request for research support. However, evidence on effective interventions to address barriers for women scientists are lacking.[16] Women of child-bearing age are being disadvantaged in some areas of employment, even though in relation to scientific endeavour, productivity as measured by published outputs is not significantly different between women with and without children.[15]

Study limitations

Our analysis has several limitations. We rely on the accuracy of the original data from the funding organisations and as described elsewhere we have excluded data from ~~industry the private sector~~ as the publicly available data are incomplete.[14]

In the period analysed, we were not able to find data on the number of men and women PIs requesting financial support for research agencies from the funding sources studies. Hence, we were unable to assess the success and failure rates by gender. We also did not have complete data on ~~the amount of funding initially requested, the~~ gender of co-applicants for each study, ~~the total pool of researchers in each disease area and within each type of science,~~ or ~~on~~ the proportion of awards made to clinical and non-clinical researchers, ~~all of which would be useful pieces of information in building up~~ developing a clearer picture of the ~~reasons for the presented differences.~~ The proportion of doctors registered in the UK favours men (56.8% as of January 2013) over women,[18] but the proportion of those carrying out research appears to be unknown. Understanding the distribution of researchers is critical to understanding the research landscape.

We lacked data on the academic ranking of principal investigators and were hence unable to adjust for levels of seniority across both genders. We were unable to get data on gender from the Gates Foundation and DFID and hence were unable to clarify the gender of a small proportion of investigators, though we believe ~~these this~~ limitations ~~are is~~ not likely to change the conclusions of the study. ~~Our analysis focuses solely on infectious disease research, and similarly analysis of exploring other areas of scientific research would be interesting to see be needed if these disparities persisted for all research areas.-~~

Conclusions

Notwithstanding ~~these~~ limitations, our ~~study provides a~~ systematic analysis ~~shows of the~~ unequal distribution of investments in infectious disease research ~~by gender. We demonstrate that in the UK there are clear and unacceptable disparities in the number of for men and women. There are fewer~~ women ~~receiving funding at the~~ level of principal investigators in infectious disease research, ~~with fewer studies funded with lower funding amounts when successful.~~

Although earlier studies have discussed possible solutions, including mentoring programmes and advertising campaigns, none have systematically explored the reasons why such ~~inequalities differences~~ persist. Hence, without an understanding of the reasons for the observed ~~inequalities disparities~~, the proposed solutions are not very meaningful. ~~Research is needed to elucidate an understanding of the factors that can explain the observed disparities.~~

There is no evidence that women and men researchers are not equally able, hence, other factors are likely to be at play to explain the ~~observed unacceptable~~ disparities ~~in research funding between men and women~~, which have persisted over the 14-year study period. ~~Research is needed to elucidate an understanding of the factors that can explain the observed disparities.~~ We strongly urge policy makers, funders and scientists to urgently investigate the factors leading to the observed disparities and develop policies developed to address them, in order to ensure that, ~~as in all walks of life,~~ women are appropriately supported ~~and equally valued~~ in scientific endeavour.

Funding

1
2
3
4
5
6
7 This research received no specific grant from any funding agency in the public, commercial
8 or not-for-profit sectors
9

10 11 12 **Author contribution**

13
14 MGH designed the study with input from RA and JF and collated the dataset. JRF, FW and
15 MKC checked and refined the dataset. JRF undertook data analysis and created the graphs
16 and figures with input from MGH and RA. MGH, JRF, and RA interpreted the data and wrote
17 the first draft. MGH, JRF, and RA refined the analysis and paper with input from MKC and
18 FBW. All authors reviewed and approved the final version. RA-MH is guarantor of the paper.
19
20
21
22
23

24 **Competing interests**

25
26 RA has received research funding from the UK Medical Research Council, the UK National
27 Institute for Health Research, UK CRC, UK EPSCRC, the UK Department for International
28 Development and the UK Department of Health. RA is a member of the UL Medical
29 Research Council Global Health Group. MGH works for the Infectious Disease Research
30 Network, which has supported this work and is funded by the UK Department of Health. JRF
31 has received funds from the Wellcome Trust and is a steering group member for the
32 Infectious Disease Research Network. MKC has received funding from the Medical
33 Research Council and the Bill & Melinda Gates Foundation. FBW has received funds from
34 UCLH Charitable Foundation.
35
36
37
38
39
40
41

42 **Acknowledgements**

43
44 We thank Jennifer Harris and Raidah Haider for their input and assistance, and acknowledge
45 the assistance of the research and development funding agencies for provision of data.
46
47

48 **Data-sharing statement**

49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 All gender data is available with this submission. Further data relating to the Research
8 Investments project can be found at www.researchinvestments.org or by contacting the
9 corresponding author.
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

For peer review only

References

- 1 More women in senior positions. Key to economic stability and growth. European Commission, Luxembourg: 2010.
- 2 Blake M, La Valle I. Who applies for research funding? Key factors shaping funding application behaviour among women and men in British higher education institutions. London: 2000.
- 3 Bedi G, Van Dam NT, Munafo M. Gender inequality in awarded research grants. *Lancet* 2012;**380**:474.[http://www.thelancet.com/journals/a/article/PIIS0140-6736\(12\)61292-6/fulltext](http://www.thelancet.com/journals/a/article/PIIS0140-6736(12)61292-6/fulltext) (accessed 29 Nov2012).
- 4 Fitzpatrick S. A Survey of Staffing Levels of Medical Clinical Academics in UK Medical Schools as at 31 July 2011. London: 2012.
http://www.medschools.ac.uk/Publications/Documents/MS_Clinical_Academic_Staff_Survey_310711.pdf
- 5 Burrelli J. Thirty-Three Years of Women in S&E Faculty Positions - US National Science Foundation. Arlington: 2008. <http://www.nsf.gov/statistics/infbrief/nsf08308/>
- 6 Lincoln AE, Pincus SH, Leboy PS. Scholars' awards go mainly to men. *Nature* 2011;**469**:472.<http://www.ncbi.nlm.nih.gov/pubmed/21270876> (accessed 25 Jan2013).
- 7 Pohlhaus JR, Jiang H, Sutton J. Sex differences in career development awardees' subsequent grant attainment. *Annals of internal medicine* 2010;**152**:616–7; author reply 617.<http://www.ncbi.nlm.nih.gov/pubmed/20439584> (accessed 25 Jan2013).
- 8 Medical Research Council. MRC Gender Equality Scheme. 2007.<http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC003655> (accessed 21 Dec2012).
- 9 European Commission. About this site- Science: It's a girl thing! 2012.<http://science-girl-thing.eu/en/about-this-site> (accessed 29 Nov2012).
- 10 Gill M. "Science, it's a girl thing!" says EU Commission, holding lipstick and bunsen burner. *New Statesman*. 2012.<http://www.newstatesman.com/blogs/martha-gill/2012/06/science-its-girl-thing-says-eu-commission-holding-lipstick-and-bunsen-burner> (accessed 29 Nov2012).
- 11 Swain F. Science: It's a girl thing. Excuse me while I die inside. – SciencePunk. *ScienceBlogs*. 2012.<http://scienceblogs.com/sciencepunk/2012/06/22/science-its-a-girl-thing-excuse-me-while-i-die-inside/> (accessed 29 Nov2012).
- 12 Yong E. Edit-a-thon gets women scientists into Wikipedia. *Nature*. 2012.<http://www.nature.com/news/edit-a-thon-gets-women-scientists-into-wikipedia-1.11636> (accessed 29 Nov2012).
- 13 Donald A. Throw off the cloak of invisibility. *Nature* 2012;**490**:447.<http://www.nature.com/news/throw-off-the-cloak-of-invisibility-1.11638> (accessed 29 Nov2012).

- 1
2
3
4
5
6
7 14 Head MG, Fitchett JR, Cooke MK, *et al.* UK investments in global infectious disease
8 research 1997-2010: a case study. *The Lancet infectious diseases* Published Online
9 First: 7 November 2012. [http://www.thelancet.com/journals/a/article/PIIS1473-](http://www.thelancet.com/journals/a/article/PIIS1473-3099(12)70261-X/fulltext)
10 [3099\(12\)70261-X/fulltext](http://www.thelancet.com/journals/a/article/PIIS1473-3099(12)70261-X/fulltext) (accessed 17 Nov2012).
- 11 15 Fox MF. Gender, Family Characteristics, and Publication Productivity among
12 Scientists. *Social Studies of Science* 2005;**35**:131–
13 50. <http://sss.sagepub.com/content/35/1/131.short> (accessed 29 Nov2012).
- 14 16 Ceci SJ, Williams WM. Understanding current causes of women's
15 underrepresentation in science. *Proceedings of the National Academy of Sciences of*
16 *the United States of America* 2011;**108**:3157–
17 62. <http://www.pnas.org/content/early/2011/02/02/1014871108> (accessed 1 Nov2012).
- 18 17 Moss-Racusin CA, Dovidio JF, Brescoll VL, *et al.* Science faculty's subtle gender
19 biases favor male students. *Proceedings of the National Academy of Sciences of the*
20 *United States of America* 2012;**109**:16474–
21 9. [http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3478626&tool=pmcentrez](http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3478626&tool=pmcentrez&rendertype=abstract)
22 [&rendertype=abstract](http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3478626&tool=pmcentrez&rendertype=abstract) (accessed 25 Oct2012).
- 23 18 List of Registered Medical Practitioners - statistics. General Medical Council.
24 http://www.gmc-uk.org/doctors/register/search_stats.asp (accessed 26 Jan2013).
- 25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

325,922 studies screened

- 170,452 National Research Register
- 25,113 European Commission
- 7,513 Bill & Melinda Gates Foundation
- 14,660 Wellcome Trust
- 1,074 Health Technology Assessment
- 6,346 ESRC
- 30 Health Infection Society
- 1,583 British Heart Foundation
- 266 Action Medical Research
- 27 National Institute for Health Research
- 24 British HIV Association
- 150 British Lung Foundation
- 65 British Society for Antimicrobial Chemotherapy
- 98,619 National Institute for Health

4,240 studies provided to authors by :

- 2,016 Medical Research Council
- 321 BBRSC
- 55 Meningitis UK
- 272 Meningitis Research Foundation
- 747 Association of Medical Research Charities
- 52 Department for International Development
- 547 Cancer Research UK
- 60 Chief Scientist's Office, Scotland
- 41 Health Protection Agency
- 34 Northern Ireland R&D office
- 95 directly from researchers

314,867 studies excluded:

- not infection-related
- veterinary studies
- non-UK host recipient

9,750 studies eligible for detailed review

3585 studies excluded from analysis:

- unfunded studies
- Industry funded

6165 studies eligible for initial analysis

6052 studies included in gender analysis (4357 studies with male PI, 1,695 studies with female PI)

30 studies excluded as unable to identify gender of principal investigator (PI)
83 studies excluded to due to PI data

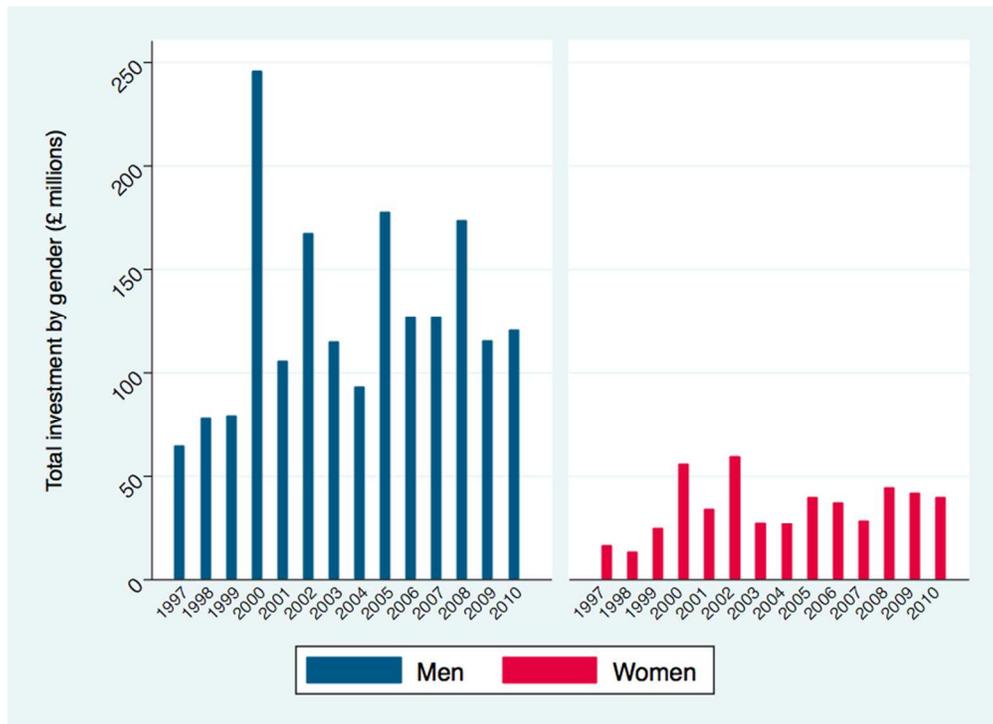


Figure 2a. Total investment over time awarded to male and female principal investigators
329x239mm (72 x 72 DPI)

View only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

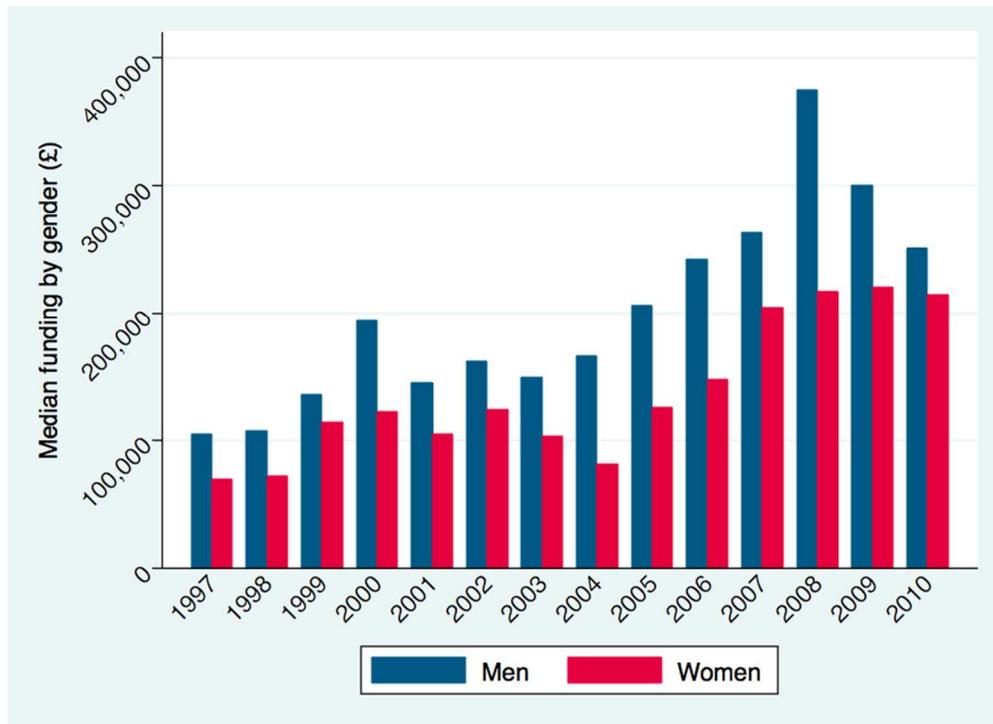


Figure 2b Median investment over time awarded to male and female principal investigators
329x239mm (72 x 72 DPI)

View only

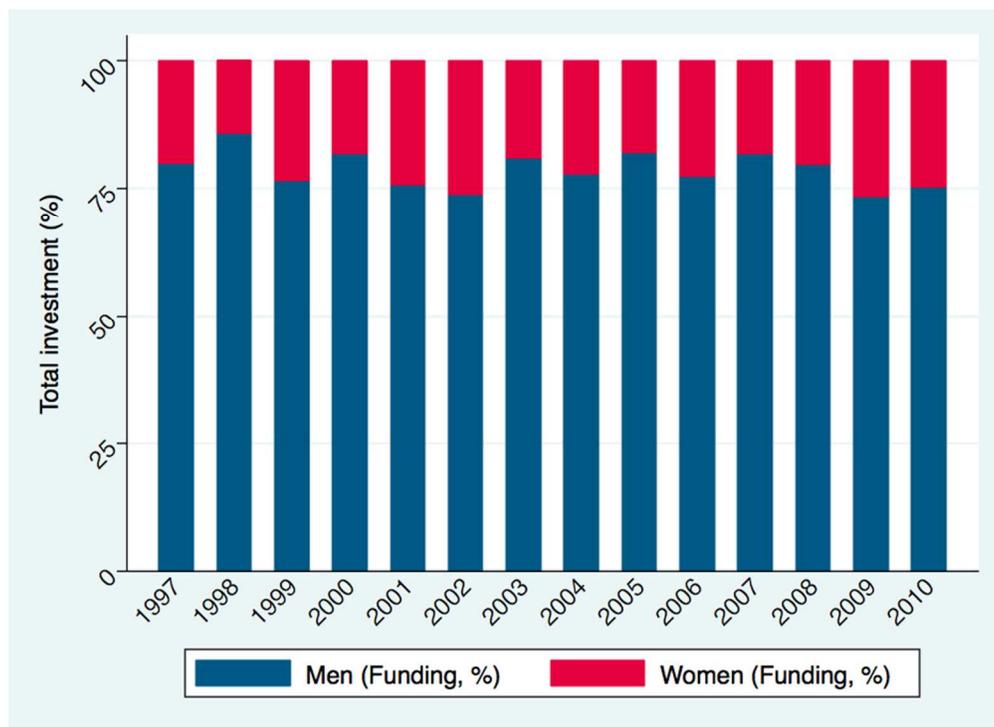
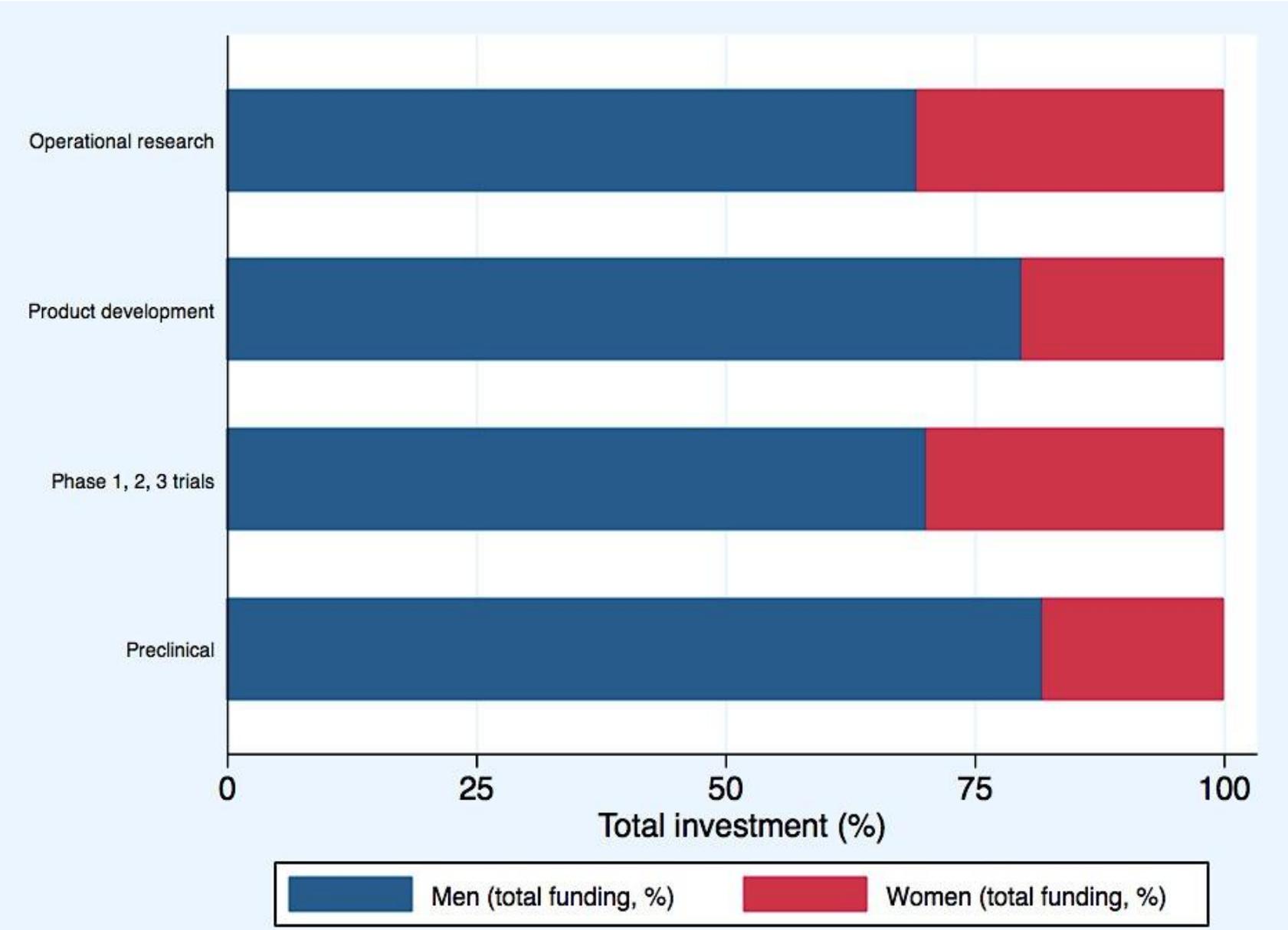


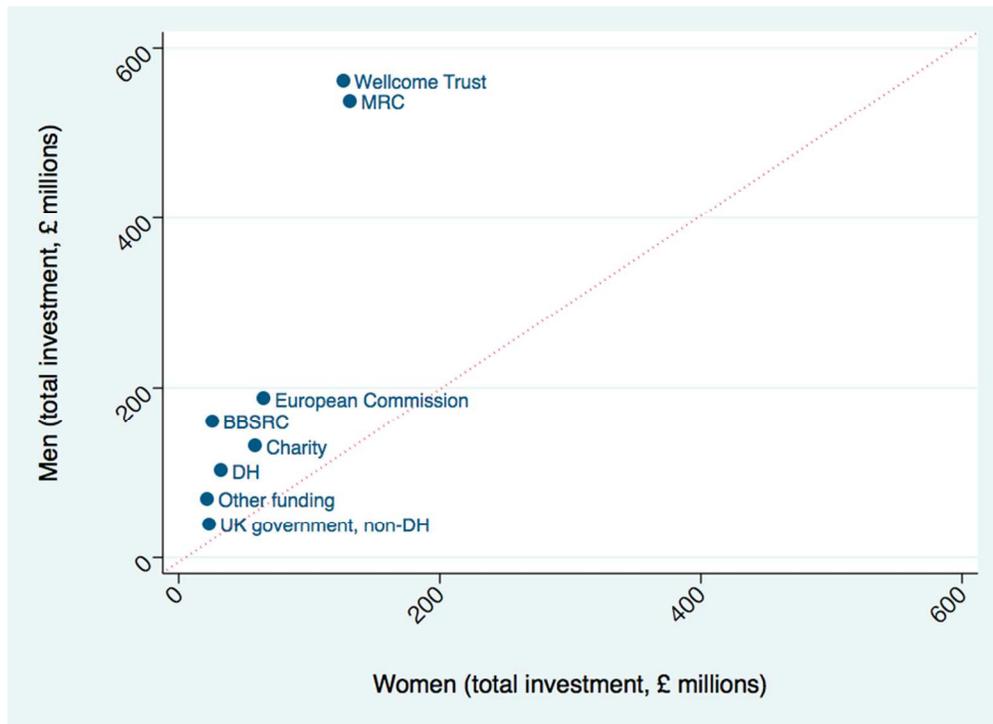
Figure 3a. Proportion of investment over time awarded to male and female principal investigators
329x239mm (72 x 72 DPI)

View only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43



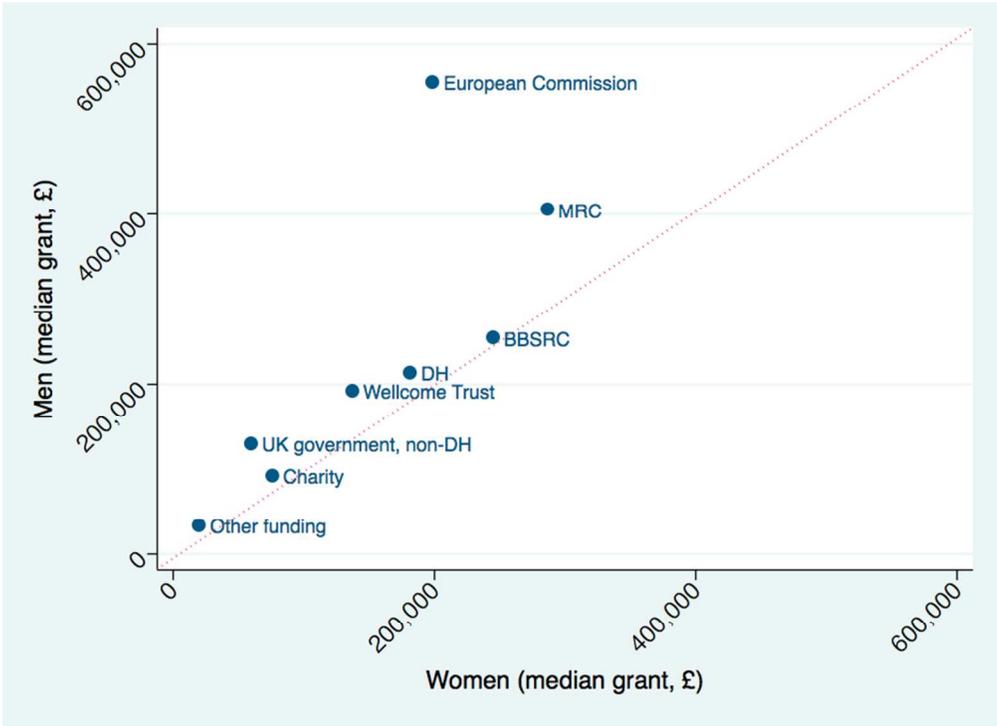
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



329x239mm (72 x 72 DPI)

view only

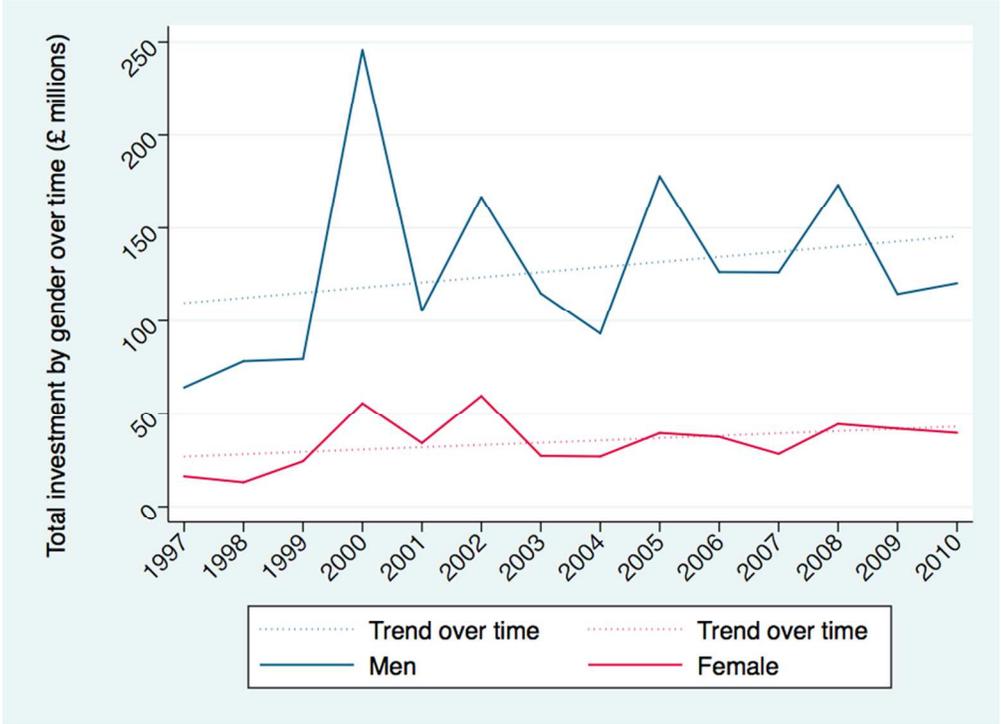
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



329x239mm (72 x 72 DPI)

view only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



329x239mm (72 x 72 DPI)

View only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

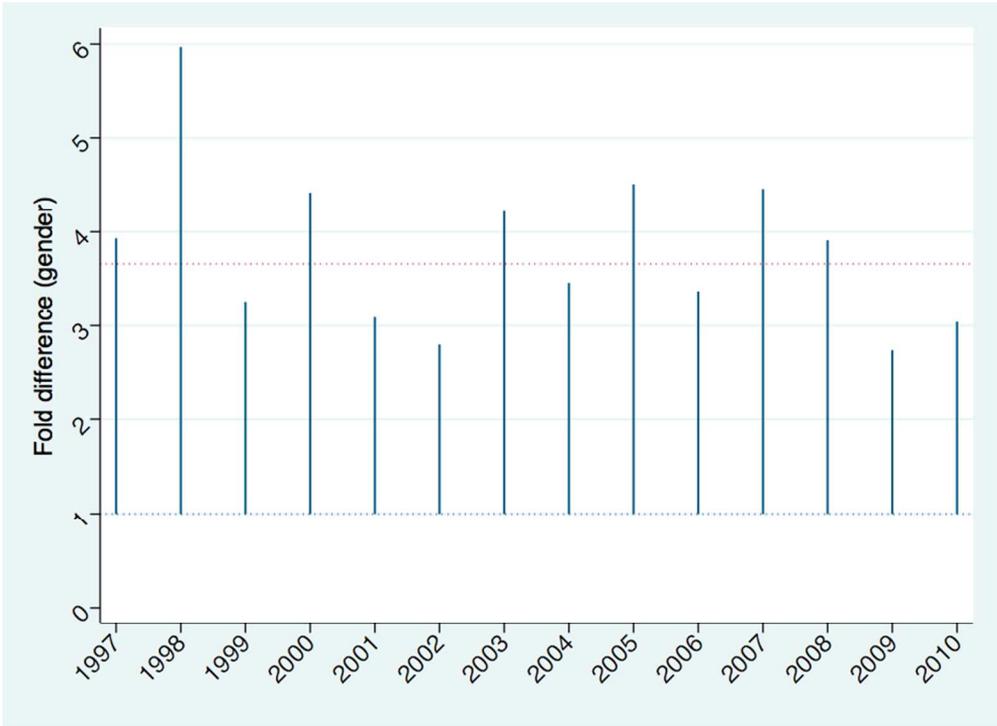


Figure 5b. Fold difference of investment over time, by gender
329x239mm (72 x 72 DPI)

View only

| Disease system | Investment (total); £ (%) | Investment (male); £ (%) | Investment (female); £ (%) | Fold differenc | Studies (total); n | Studies (male); £ | Studies (female); n | Fold differenc | Mean grant (total); £ | Mean grant (male); £ | Mean grant (female); £ | Fold differenc | P | Median grant (total); £ (IQR) | Median grant (male); £ | Median grant (female); £ | Fold differenc | Chi-square | P |
|----------------------------------|---------------------------|--------------------------|----------------------------|----------------|--------------------|-------------------|---------------------|----------------|-----------------------|----------------------|------------------------|----------------|------|-------------------------------|------------------------|--------------------------|----------------|------------|------|
| 1 Gastrointestinal infections | 248,971,849 | 209,315,616 | 37,043,642 | 5.65 | 799 | 638 | 149 | 4.28 | 315,154 | 328,081 | 248,615 | 1.32 | 0.01 | 199,043 | 208,369 | 155,066 | 1.34 | 6.87 | 0.01 |
| 2 | 9.6% | 85.0% | 15.0% | | 12.9% | 81.1% | 18.9% | | 457,988 | 458,720 | 433,176 | | | 721,37-351,372 | 78,852-357,771 | 143,637-305,928 | | | |
| 3 Haematological infections | 413,489,870 | 225,660,012 | 56,021,079 | 4.03 | 742 | 540 | 183 | 2.95 | 557,264 | 417,889 | 306,126 | 1.37 | 0.01 | 157,280 | 160,655 | 121,353 | 1.32 | 3.15 | 0.08 |
| 4 | 15.9% | 80.1% | 19.9% | | 12.0% | 74.7% | 25.3% | | 2,179,537 | 914,626 | 819,910 | | | 157,280-362,727 | 54,244-366,796 | 32,207- 271,883 | | | |
| 5 Hepatic infections | 73,965,716 | 57,998,793 | 15,618,661 | 3.71 | 322 | 229 | 90 | 2.54 | 229,707 | 253,270 | 173,541 | 1.46 | 0.07 | 114,621 | 118,638 | 68,620 | 1.73 | 3.82 | 0.05 |
| 6 | 2.8% | 78.8% | 21.2% | | 5.2% | 71.8% | 28.2% | | 375,988 | 418,392 | 237,165 | | | 40,076-244,293 | 41,342-269,626 | 26,270-221,952 | | | |
| 7 Neglected tropical diseases | 229,606,965 | 118,477,812 | 37,747,437 | 3.14 | 392 | 280 | 105 | 2.67 | 564,145 | 418,439 | 406,270 | 1.03 | 0.28 | 249,458 | 257,736 | 199,648 | 1.29 | 0.82 | 0.36 |
| 8 | 8.8% | 75.8% | 24.2% | | 6.4% | 72.7% | 27.3% | | 2,104,383 | 509,169 | 667,547 | | | 91,196-451,453 | 82,786-429,781 | 107,474-413,242 | | | |
| 9 Parasitological infections | 101,885,586 | 79,281,163 | 18,779,321 | 4.22 | 339 | 268 | 67 | 4.00 | 300,548 | 295,825 | 280,288 | 1.06 | 0.67 | 155,404 | 153,724 | 166,514 | 0.92 | 0.19 | 0.66 |
| 10 | 3.9% | 80.8% | 19.2% | | 5.5% | 80.0% | 20.0% | | 463,870 | 474,995 | 329,198 | | | 64,434-334,128 | 64,702-298,666 | 33,886-399,971 | | | |
| 11 Ocular infections | 7,407,218 | 5,788,089 | 1,619,129 | 3.57 | 36 | 24 | 12 | 2.00 | 205,756 | 241,170 | 134,927 | 1.79 | 0.92 | 120,849 | 146,169 | 102,901 | 1.42 | 0.00 | 1.00 |
| 12 | 0.3% | 78.1% | 21.9% | | 0.6% | 66.7% | 33.3% | | 280,206 | 327,354 | 132,475 | | | 7,860-293,837 | 6,344-348,501 | 23,666-232,501 | | | |
| 13 Respiratory infections | 418,838,875 | 312,055,217 | 84,436,423 | 3.70 | 1,190 | 897 | 272 | 3.30 | 351,375 | 347,888 | 310,428 | 1.12 | 0.13 | 158,966 | 165,813 | 142,281 | 1.17 | 1.87 | 0.17 |
| 14 | 16.1% | 78.7% | 21.3% | | 19.3% | 76.7% | 23.3% | | 661,990 | 624,555 | 558,282 | | | 50,203-342,049 | 56,715-344,512 | 36,236-311,548 | | | |
| 15 Sexually-transmitted infectio | 138,616,211 | 86,016,584 | 45,352,512 | 1.90 | 380 | 190 | 182 | 1.04 | 366,710 | 452,719 | 249,190 | 1.82 | 0.34 | 94,790 | 93,495 | 101,785 | 0.92 | 0.17 | 0.68 |
| 16 | 5.3% | 65.5% | 34.5% | | 6.2% | 51.1% | 48.9% | | 958,450 | 1,142,638 | 647,494 | | | 15,332-241,505 | 18,389-257,444 | 14,480-204,559 | | | |
| 17 HIV | 477,555,690 | 290,848,557 | 79,652,343 | 3.65 | 760 | 448 | 286 | 1.57 | 625,073 | 649,216 | 278,505 | 2.33 | 0.01 | 147,404 | 163,462 | 114,272 | 1.43 | 3.87 | 0.05 |
| 18 | 18.4% | 78.5% | 21.5% | | 12.3% | 61.0% | 39.0% | | 2,276,762 | 1,550,920 | 545,657 | | | 37,195-395,644 | 39,153-511,800 | 29,880-305,339 | | | |
| 19 Overall | 2,599,985,851 | 1,785,979,172 | 488,178,602 | 3.66 | 6,170 | 4,357 | 1,695 | 2.57 | 421,733 | 409,910 | 288,011 | 1.42 | 0.01 | 158,055 | 179,389 | 125,556 | 1.43 | 74.40 | 0.01 |
| 20 | | 78.53% | 21.47% | | | 71.99% | 28.01% | | 1,315,935 | 840,087 | 704,474 | | | 49,490-352,699 | 59,146-371,977 | 30,983-261,835 | | | |

| Specific infection | Investment (total); £ (%) | Investment (male); £ (%) | Investment (female); £ (%) | Fold differenc | Studies (total); n | Studies (male); £ | Studies (female); n | Fold differenc | Mean grant (total); £ | Mean grant (male); £ | Mean grant (female); £ | Fold differenc | P | Median grant (total); £ (IQR) | Median grant (male); £ (IQR) | Median grant (female); £ | Fold differenc | Chi-square | P | |
|------------------------------------|------------------------------------|--------------------------|----------------------------|----------------|--------------------|-------------------|---------------------|----------------|-----------------------|----------------------|------------------------|----------------|------|-------------------------------|------------------------------|--------------------------|-----------------|------------|------|------|
| <i>Gastrointestinal infections</i> | | | | | | | | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | |
| 3 | Campylobacter | 24,116,021 | 23,164,038 | 951,983 | 24.33 | 87 | 80 | 7 | 11.43 | 277,196 | 289,551 | 135,998 | 2.13 | 0.13 | 221,532 | 228,164 | 49,000 | 4.66 | 1.32 | 0.25 |
| 4 | | #VALUE! | 96.1% | 3.9% | | 2.2% | 92.0% | 8.0% | | 408,655 | 421,925 | 156,276 | | | 90,341-311,497 | 92,885-311,530 | 3,435-305,928 | | | |
| 5 | Clostridium | 29,751,310 | 31,657,635 | 2,361,459 | 13.41 | 72 | 58 | 15 | 3.87 | 453,647 | 524,175 | 157,431 | 3.33 | 0.07 | 204,389 | 218,177 | 80,431 | 2.71 | 2.06 | 0.15 |
| 6 | | #VALUE! | 93.1% | 6.9% | | 1.8% | 79.5% | 20.5% | | 796,207 | 868,222 | 178,916 | | | 42,630-415,635 | 49,750-451,158 | 8,256-316,326 | | | |
| 7 | E. coli | 25,589,407 | 23,913,566 | 2,392,586 | 9.99 | 106 | 95 | 12 | 7.92 | 245,852 | 251,722 | 199,382 | 1.26 | 0.16 | 206,784 | 217,705 | 132,232 | 1.65 | 3.25 | 0.07 |
| 8 | | #VALUE! | 90.9% | 9.1% | | 2.7% | 88.8% | 11.2% | | 209,792 | 212,046 | 192,964 | | | 117,440-329,159 | 132,815-331,037 | 84,455-262,238 | | | |
| 9 | Helicobacter | 15,109,554 | 12,488,366 | 2,617,778 | 4.77 | 101 | 78 | 22 | 3.55 | 149,600 | 160,107 | 118,990 | 1.35 | 0.64 | 83,986 | 87,694 | 83,533 | 1.05 | 0.00 | 1.00 |
| 10 | | #VALUE! | 82.7% | 17.3% | | 2.6% | 78.0% | 22.0% | | 214,832 | 232,566 | 138,013 | | | 11,555-187,678 | 11,555-191,570 | 11,647-187,678 | | | |
| 11 | Norovirus | 5,102,250 | 4,892,527 | 209,723 | 23.33 | 12 | 10 | 2 | 5.00 | 425,188 | 489,253 | 104,861 | 4.67 | 0.28 | 200,621 | 265,972 | 104,861 | 2.54 | 2.40 | 0.12 |
| 12 | | #VALUE! | 95.9% | 4.1% | | 0.3% | 83.3% | 16.7% | | 568,372 | 604,564 | 133,320 | | | 91,363-435,732 | 93,571-496,514 | 10,590-199,133 | | | |
| 13 | Rotavirus | 5,883,445 | 6,004,983 | 178,450 | 33.65 | 18 | 17 | 2 | 8.50 | 325,444 | 353,234 | 89,225 | 3.96 | 0.23 | 164,690 | 179,066 | 89,225 | 2.01 | 2.01 | 0.16 |
| 14 | | #VALUE! | 97.1% | 2.9% | | 0.5% | 89.5% | 10.5% | | 414,279 | 429,739 | 98,723 | | | 114,718-299,988 | 134,988-299,988 | 19,417-159,033 | | | |
| 15 | Salmonella | 55,716,287 | 48,902,187 | 6,814,100 | 7.18 | 145 | 123 | 22 | 5.59 | 384,250 | 397,579 | 309,732 | 1.28 | 0.95 | 256,185 | 258,483 | 255,602 | 1.01 | 0.18 | 0.67 |
| 16 | | #VALUE! | 87.8% | 12.2% | | 3.7% | 84.8% | 15.2% | | 474,060 | 500,122 | 284,742 | | | 132,107-431,762 | 109,210-440,900 | 155,066-361,873 | | | |
| 17 | Shigella | 3,292,442 | 2,270,191 | 1,022,251 | 2.22 | 9 | 6 | 3 | 2.00 | 365,827 | 378,365 | 340,750 | 1.11 | 1.00 | 211,456 | 214,819 | 211,456 | 1.02 | 0.23 | 0.64 |
| 18 | | #VALUE! | 69.0% | 31.0% | | 0.2% | 66.7% | 33.3% | | 335,500 | 374,690 | 312,800 | | | 134,251-658,278 | 134,251-658,278 | 113,326-697,470 | | | |
| 19 | <i>Haematological infections</i> | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | |
| 21 | EBV | 45,310,414 | 36,908,000 | 7,692,800 | 4.80 | 147 | 115 | 31 | 3.71 | 305,485 | 320,939 | 248,155 | 1.29 | 0.36 | 156,697 | 158,107 | 154,947 | 1.02 | 0.04 | 0.84 |
| 22 | | #VALUE! | 82.8% | 17.2% | | 3.7% | 78.8% | 21.2% | | 430,746 | 459,332 | 301,211 | | | 49,657-364,013 | 65,350-364,013 | 12,342-364,199 | | | |
| 23 | Listeria | 4,751,097 | 3,146,834 | 1,731,229 | 1.82 | 10 | 8 | 3 | 2.67 | 443,460 | 393,354 | 577,076 | 0.68 | 0.41 | 239,595 | 236,570 | 605,470 | 0.39 | 0.75 | 0.39 |
| 24 | | #VALUE! | 64.5% | 35.5% | | 0.3% | 72.7% | 27.3% | | 353,486 | 359,163 | 369,384 | | | 126,966-705,717 | 113,867-634,775 | 194,315-931,444 | | | |
| 25 | Malaria | 346,180,494 | 211,961,339 | 40,710,857 | 5.21 | 501 | 359 | 128 | 2.80 | 700,143 | 590,422 | 318,054 | 1.86 | 0.01 | 203,348 | 209,646 | 143,358 | 1.46 | 4.13 | 0.04 |
| 26 | | #VALUE! | 83.9% | 16.1% | | 12.7% | 73.7% | 26.3% | | 2,283,790 | 1,324,909 | 726,872 | | | 59,122-500,817 | 63,826-529,610 | 42,754-314,524 | | | |
| 27 | <i>Hepatic infections</i> | | | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | | | | |
| 29 | CMV | 28,369,415 | 26,102,458 | 1,911,586 | 13.65 | 68 | 55 | 12 | 4.58 | 417,197 | 474,590 | 159,299 | 2.98 | 0.06 | 188,607 | 201,658 | 107,488 | 1.88 | 1.48 | 0.22 |
| 30 | | #VALUE! | 93.2% | 6.8% | | 1.7% | 82.1% | 17.9% | | 656,508 | 714,181 | 178,655 | | | 100,221-392,186 | 116,516-608,024 | 23,605-223,834 | | | |
| 31 | Hepatitis B | 11,768,095 | 7,512,333 | 4,215,080 | 1.78 | 68 | 45 | 22 | 2.05 | 173,060 | 166,941 | 191,595 | 0.87 | 0.89 | 65,624 | 68,646 | 52,873 | 1.30 | 0.19 | 0.66 |
| 32 | | #VALUE! | 64.1% | 35.9% | | 1.7% | 67.2% | 32.8% | | 287,576 | 294,644 | 284,042 | | | 19,659-209,501 | 19,615-202,317 | 19,703-221,952 | | | |
| 33 | Hepatitis C | 59,727,829 | 47,621,165 | 11,799,084 | 4.04 | 235 | 167 | 66 | 2.53 | 254,161 | 285,157 | 178,774 | 1.60 | 0.07 | 116,883 | 124,797 | 67,265 | 1.86 | 5.22 | 0.02 |
| 34 | | #VALUE! | 80.1% | 19.9% | | 5.9% | 71.7% | 28.3% | | 418,722 | 469,807 | 242,710 | | | 41,342-269,629 | 42,475-289,293 | 29,880-233,467 | | | |
| 35 | <i>Neglected tropical diseases</i> | | | | | | | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | | | | | | | | |
| 37 | African trypanosomiasis | 48,082,259 | 34,546,175 | 4,478,699 | 7.71 | 116 | 61 | 13 | 4.69 | 563,175 | 566,331 | 344,515 | 1.64 | 0.54 | 262,145 | 256,771 | 265,009 | 0.97 | 0.09 | 0.76 |
| 38 | | #VALUE! | 88.5% | 11.5% | | 2.9% | 82.4% | 17.6% | | 1,139,333 | 1,227,091 | 408,381 | | | 151,883-466,918 | 155,868-455,554 | 119,521-406,701 | | | |
| 39 | Chagas disease | 3,448,856 | 4,675,712 | 250,535 | 18.66 | 15 | 17 | 1 | 17.00 | 273,680 | 275,042 | 250,535 | 1.10 | 0.77 | 215,639 | 215,530 | 250,535 | 0.86 | 1.06 | 0.30 |
| 40 | | #VALUE! | 94.9% | 5.1% | | 0.4% | 94.4% | 5.6% | | 207,903 | 214,219 | | | | 163,472-350,741 | 163,472-350,741 | | | | |
| 41 | Dengue | 43,742,101 | 5,251,615 | 4,924,187 | 1.07 | 28 | 13 | 13 | 1.00 | 1,511,059 | 403,970 | 378,784 | 1.07 | 0.32 | 269,824 | 378,745 | 199,648 | 1.90 | 0.15 | 0.70 |
| 42 | | #VALUE! | 51.6% | 48.4% | | 0.7% | 50.0% | 50.0% | | 5,899,700 | 336,526 | 504,639 | | | 107,474-530,125 | 148,612-515,075 | 69,518-361,828 | | | |
| 43 | Helminths | 47,026,454 | 39,675,624 | 14,701,767 | 2.70 | 114 | 104 | 43 | 2.42 | 452,438 | 381,496 | 341,902 | 1.12 | 0.87 | 233,772 | 235,696 | 215,206 | 1.10 | 0.24 | 0.62 |
| 44 | | #VALUE! | 73.0% | 27.0% | | 2.9% | 70.7% | 29.3% | | 1,112,173 | 464,792 | 414,897 | | | 82,786-386,182 | 67,614-383,928 | 126,942-358,645 | | | |
| 45 | | | | | | | | | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|----|---------------|---------------------------------|-------------|-------------|------------|--------|-------|-----|------------|-----------|-----------|-----------|---------|-------|--------------------|-------------------|-----------------|---------|-------|------|------|
| 1 | Leishmaniasis | 36,027,609 | 25,384,994 | 16,332,809 | 1.55 | 75 | 50 | 26 | 1.92 | 536,433 | 507,700 | 628,185 | 0.81 | 0.53 | 289,354 | 320,800 | 229,548 | 1.40 | 2.10 | 0.15 | |
| 2 | #VALUE! | 60.8% | 39.2% | | 1.9% | 65.8% | 34.2% | | 797,514 | 579,922 | 1,127,441 | | | | 91,196-518,477 | 80,166-518,477 | 131,221-573,851 | | | | |
| 3 | 2 | Leprosy | 623,080 | 49,229 | 573,851 | 0.09 | 2 | 1 | 1 | 1.00 | 311,540 | 49,229 | 573,851 | 0.09 | 0.32 | 311,540 | 49,229 | 573,851 | 0.09 | 2.00 | 0.16 |
| 4 | #VALUE! | 7.9% | 92.1% | | 0.1% | 50.0% | 50.0% | | 370,963 | | | | | | 49,229-573,851 | | | | | | |
| 5 | 4 | Lymphatic filariasis | 51,112,541 | 1,802,818 | 317,909 | 5.67 | 16 | 3 | 2 | 1.50 | 6,723,245 | 600,939 | 158,954 | 3.78 | 0.25 | 551,459 | 551,459 | 158,954 | 3.47 | 2.22 | 0.14 |
| 6 | #VALUE! | 85.0% | 15.0% | | 0.4% | 60.0% | 40.0% | | 12,112,993 | 426,007 | 127,226 | | | | 201,834-12,844,013 | 201,834-1,049,526 | 68,992-248,917 | | | | |
| 7 | 7 | Onchocerciasis | 1,338,978 | 1,317,029 | 380,594 | 3.46 | 4 | 2 | 3 | 0.67 | 339,525 | 658,515 | 126,865 | 5.19 | 0.25 | 35,769 | 658,515 | 21,359 | 30.83 | 0.14 | 0.71 |
| 8 | #VALUE! | 77.6% | 22.4% | | 0.1% | 40.0% | 60.0% | | 546,719 | 880,696 | 200,996 | | | | 21,359-358,645 | 35,769-1,281,261 | 590-358,645 | | | | |
| 9 | 9 | Schistosomiasis | 38,677,801 | 11,068,267 | 2,686,364 | 4.12 | 46 | 32 | 12 | 2.67 | 867,572 | 345,883 | 223,864 | 1.55 | 0.60 | 197,557 | 216,603 | 165,622 | 1.31 | 0.46 | 0.50 |
| 10 | #VALUE! | 80.5% | 19.5% | | 1.2% | 72.7% | 27.3% | | 3,825,582 | 467,692 | 252,854 | | | | 59,912-361,947 | 61,878-356,186 | 46,460-318,519 | | | | |
| 11 | 11 | Trachoma | 3,718,572 | 3,718,572 | 0 | | 3 | 2 | 0 | | 1,859,286 | 1,859,286 | | | 1,859,286 | 1,859,286 | | | | | |
| 12 | #VALUE! | 100.0% | 0.0% | | 0.1% | 100.0% | 0.0% | | 1,768,466 | 1,768,466 | | | | | 608,792-3,109,780 | 60,879-3,109,780 | | | | | |
| 13 | 13 | Neurological infections | | | | | | | | | | | | | | | | | | | |
| 14 | 14 | Meningitis | 54,078,664 | 42,305,152 | 9,347,473 | 4.53 | 223 | 183 | 38 | 4.82 | 243,434 | 231,176 | 245,986 | 0.94 | 0.59 | 146,153 | 137,694 | 155,670 | 0.88 | 1.21 | 0.27 |
| 15 | #VALUE! | 81.9% | 18.1% | | 5.6% | 82.8% | 17.2% | | 355,892 | 332,118 | 297,867 | | | | 66,895-228,405 | 66,895-222,767 | 33,886-369,244 | | | | |
| 16 | 16 | Polio | 1,189,984 | 729,017 | 11,069 | 65.86 | 4 | 3 | 1 | 3.00 | 185,021 | 243,006 | 11,069 | 21.95 | 0.18 | 164,849 | 236,812 | 11,069 | 21.40 | 1.33 | 0.25 |
| 17 | #VALUE! | 98.5% | 1.5% | | 0.1% | 75.0% | 25.0% | | 170,640 | 153,310 | | | | | 51,977-318,065 | 92,886-399,318 | | | | | |
| 18 | 18 | Stanus | 5,108,068 | 5,108,068 | 0 | | 5 | 5 | 0 | | 1,021,614 | 1,021,614 | | | 231,879 | 231,879 | | | | | |
| 19 | #VALUE! | 100.0% | 0.0% | | 0.1% | 100.0% | 0.0% | | 1,819,723 | 1,819,723 | | | | | 200,112-395,050 | 200,112-395,050 | | | | | |
| 20 | 20 | Respiratory infections | | | | | | | | | | | | | | | | | | | |
| 21 | 21 | Diphtheria | 139,863 | 21,624 | 118,239 | 0.18 | 2 | 1 | 1 | 1.00 | 69,931 | 21,624 | 118,239 | 0.18 | 0.32 | 69,931 | 21,624 | 118,239 | 0.18 | 2.00 | 0.16 |
| 22 | #VALUE! | 15.5% | 84.5% | | 0.1% | 50.0% | 50.0% | | 68,317 | | | | | | 21,624-118,239 | | | | | | |
| 23 | 23 | Influenza | 79,763,001 | 68,447,401 | 11,615,587 | 5.89 | 140 | 111 | 30 | 3.70 | 567,823 | 616,643 | 387,186 | 1.59 | 0.04 | 299,988 | 348,730 | 200,787 | 1.74 | 4.06 | 0.04 |
| 24 | #VALUE! | 85.5% | 14.5% | | 3.5% | 78.7% | 21.3% | | 818,009 | 881,493 | 489,997 | | | | 159,841-656,509 | 213,601-668,561 | 124,210-398,191 | | | | |
| 25 | 25 | Measles | 2,597,677 | 3,827,746 | 646,169 | 5.92 | 9 | 7 | 3 | 2.33 | 416,179 | 546,821 | 215,390 | 2.54 | 0.57 | 284,882 | 662,131 | 261,846 | 2.53 | 0.48 | 0.49 |
| 26 | #VALUE! | 85.6% | 14.4% | | 0.2% | 70.0% | 30.0% | | 403,740 | 481,360 | 122,549 | | | | 67,471-683,714 | 58,538-893,212 | 76,405-307,919 | | | | |
| 27 | 27 | Cough | 2,432,158 | 2,432,158 | 0 | | 9 | 9 | 0 | | 270,240 | 270,240 | | | 299,840 | 299,840 | | | | | |
| 28 | #VALUE! | 100.0% | 0.0% | | 0.2% | 100.0% | 0.0% | | 246,165 | 246,165 | | | | | 37,151-452,939 | 37,151-452,939 | | | | | |
| 29 | 29 | RSV | 16,899,738 | 14,073,205 | 2,818,964 | 4.99 | 45 | 29 | 15 | 1.93 | 375,550 | 485,283 | 187,931 | 3.96 | 0.05 | 184,292 | 223,517 | 149,828 | 1.49 | 2.53 | 0.11 |
| 30 | #VALUE! | 83.3% | 16.7% | | 1.1% | 65.9% | 34.1% | | 480,715 | 539,396 | 268,412 | | | | 56,431-498,006 | 64,191-638,823 | 22,277-199,329 | | | | |
| 31 | 31 | Tuberculosis | 148,801,691 | 99,451,331 | 37,578,889 | 2.65 | 327 | 225 | 94 | 2.39 | 472,083 | 442,006 | 399,775 | 1.11 | 0.39 | 190,467 | 190,657 | 170,542 | 1.12 | 0.21 | 0.65 |
| 32 | #VALUE! | 72.6% | 27.4% | | 8.3% | 70.5% | 29.5% | | 930,157 | 825,956 | 742,928 | | | | 69,899-421,992 | 74,747-416,236 | 37,034-401,346 | | | | |
| 33 | 33 | Sexually-transmitted infections | | | | | | | | | | | | | | | | | | | |
| 34 | 34 | Chlamydia | 21,702,378 | 5,753,740 | 15,936,845 | 0.36 | 112 | 43 | 68 | 0.63 | 193,771 | 133,808 | 234,365 | 0.57 | 0.71 | 50,469 | 52,258 | 52,318 | 1.00 | 0.01 | 0.91 |
| 35 | #VALUE! | 26.5% | 73.5% | | 2.8% | 38.7% | 61.3% | | 561,173 | 197,759 | 701,950 | | | | 10,298-174,939 | 14,885-174,644 | 6,003-175,234 | | | | |
| 36 | 36 | Gonorrhoea | 948,399 | 669,866 | 278,532 | 2.40 | 18 | 9 | 9 | 1.00 | 52,689 | 74,430 | 30,948 | 2.40 | 0.51 | 7,548 | 8,149 | 6,525 | 1.25 | 0.22 | 0.64 |
| 37 | #VALUE! | 70.6% | 29.4% | | 0.5% | 50.0% | 50.0% | | 81,648 | 104,267 | 47,232 | | | | 1,820-54,145 | 6,471-150,196 | 1,820-40,986 | | | | |
| 38 | 38 | HIV | 460,547,457 | 290,848,557 | 79,652,343 | 3.65 | 760 | 448 | 286 | 1.57 | 625,073 | 649,216 | 278,505 | 2.33 | 0.01 | 147,404 | 163,462 | 114,272 | 1.43 | 3.87 | 0.05 |
| 39 | #VALUE! | 78.5% | 21.5% | | 19.2% | 61.0% | 39.0% | | 2,276,762 | 1,550,920 | 545,657 | | | | 37,195-395,644 | 39,153-511,800 | 29,880-305,339 | | | | |
| 40 | 40 | HPV | 57,795,110 | 42,592,795 | 9,393,693 | 4.53 | 150 | 88 | 56 | 1.57 | 355,514 | 484,009 | 167,745 | 2.89 | 0.30 | 92,143 | 103,966 | 82,325 | 1.26 | 0.47 | 0.49 |
| 41 | #VALUE! | 81.9% | 18.1% | | 3.8% | 61.1% | 38.9% | | 849,406 | 1,042,481 | 360,400 | | | | 30,079-220,559 | 29,742-264,540 | 32,566-171,377 | | | | |
| 42 | 42 | HSV | 22,063,300 | 15,472,470 | 6,536,189 | 2.37 | 48 | 28 | 19 | 1.47 | 459,652 | 552,588 | 344,010 | 1.61 | 0.19 | 202,564 | 119,295 | 309,610 | 0.39 | 4.85 | 0.03 |

| | | | | | | | | | | | | | | | | | | | | |
|----|---------------------------|---------------|---------------|-------------|---------|-------|---------|---------|---------|-----------|---------|---------|-------|-----------------|----------------|-----------------|-----------------|------|-------|------|
| 1 | | #VALUE! | 70.3% | 29.7% | | 1.2% | 59.6% | 40.4% | | 720,790 | 908,183 | 287,596 | | 52,597-421,960 | 40,009-446,395 | 147,885-439,305 | | | | |
| 2 | Syphilis | 1,061,560 | 286,117 | 775,444 | 0.37 | 5 | 2 | 3 | 0.67 | 212,312 | 143,058 | 258,481 | 0.55 | 0.56 | 207,346 | 143,058 | 207,346 | 0.69 | 0.14 | 0.71 |
| 3 | | #VALUE! | 27.0% | 73.0% | | 0.1% | 40.0% | 60.0% | | 152,848 | 122,822 | 176,603 | | 113,088-229,907 | 56,210-229,907 | 113,088-455,010 | | | | |
| 4 | Other infections | | | | | | | | | | | | | | | | | | | |
| 5 | Aspergillus | 4,853,858 | 4,482,101 | 371,757 | 12.06 | 26 | 24 | 2 | 12.00 | 186,687 | 186,754 | 185,879 | 1.00 | 1.00 | 47,948 | 47,948 | 185,879 | 0.26 | 0.00 | 1.00 |
| 6 | | #VALUE! | 92.3% | 7.7% | | 0.7% | 92.3% | 7.7% | | 420,903 | 435,756 | 248,298 | | | 19,703-157,829 | 20,890-135,113 | 10,306-361,451 | | | |
| 7 | Candida | 1,219,072 | 1,194,064 | 25,008 | 47.75 | 8 | 6 | 2 | 3.00 | 152,384 | 199,011 | 12,504 | 15.92 | 0.18 | 28,518 | 72,375 | 12,504 | 5.79 | 2.67 | 0.10 |
| 8 | | #VALUE! | 97.9% | 2.1% | | 0.2% | 75.0% | 25.0% | | 262,390 | 293,075 | 17,226 | | | 10,508-188,568 | 17,076-264,740 | 324-24,684 | | | |
| 9 | Pseudomonas | 6,473,237 | 6,096,633 | 376,604 | 16.19 | 43 | 39 | 4 | 9.75 | 150,540 | 156,324 | 94,151 | 1.66 | 0.90 | 81,793 | 81,793 | 79,244 | 1.03 | 0.00 | 0.96 |
| 10 | | #VALUE! | 94.2% | 5.8% | | 1.1% | 90.7% | 9.3% | | 175,911 | 182,442 | 83,286 | | | 11,204-253,337 | 11,108-253,459 | 27,396-160,906 | | | |
| 11 | VZV | 4,186,583 | 1,472,968 | 2,713,615 | 0.54 | 20 | 9 | 11 | 0.82 | 209,329 | 163,663 | 246,692 | 0.66 | 0.21 | 145,505 | 47,343 | 161,033 | 0.29 | 0.20 | 0.65 |
| 12 | | #VALUE! | 35.2% | 64.8% | | 0.5% | 45.0% | 55.0% | | 261,063 | 250,869 | 275,194 | | | 46,117-227,502 | 26,213-147,593 | 105,632-233,537 | | | |
| 13 | Total specific infections | #VALUE! | #VALUE! | #VALUE! | #VALUE! | 3,953 | #VALUE! | #VALUE! | #VALUE! | | | | | | 158,055 | | | | | |
| 14 | Overall | 2,599,985,851 | 1,785,979,172 | 488,178,602 | 3.66 | 6,170 | 4,357 | 1,695 | 2.57 | 421,733 | 409,910 | 288,011 | 1.42 | 0.01 | 49,490-352,699 | 179,389 | 125,556 | 1.43 | 74.40 | 0.01 |
| 15 | | | 78.53% | 21.47% | | | 71.99% | 28.01% | | 1,315,935 | 840,087 | 704,474 | | | | | | | | |

| Funder | Investment (total); £ (%) | Investment (male); £ (%) | Investment (female); £ (%) | FOU difference | Studies (total); n (%) | Studies (male); £ (%) | Studies (female); n (%) | FOU difference | Mean grant (total); £ (SD) | Mean grant (male); £ (SD) | Mean grant (female); £ (SD) | FOU difference | P | Median grant (total); £ (IQR) | Median grant (male); £ (IQR) | Median grant (female); £ (IQR) | FOU difference | Chi-square | P |
|------------------------------------|---------------------------|--------------------------|----------------------------|----------------|------------------------|-----------------------|-------------------------|----------------|----------------------------|---------------------------|-----------------------------|----------------|------|-------------------------------|------------------------------|--------------------------------|----------------|------------|------|
| 1 Public funding | 1,393,972,967 | 1,025,211,218 | 279,810,244 | 3.66 | 1,082 | 1,722 | 624 | 2.76 | 588,503 | 595,361 | 448,414 | 1.17 | 0.01 | 255,992 | 272,452 | 213,718 | 1.27 | 29.38 | 0.01 |
| 2 | 53.6% | 78.6% | 21.4% | | 17.6% | 73.4% | 26.6% | | 1,447,668 | 1,080,718 | 814,979 | | | 127,167-529,610 | 138,322- 572,529 | 92,880-402,917 | | | |
| 3 | | | | | | | | | | | | | | | | | | | |
| 4 BSRC | 186,268,429 | 160,120,540 | 26,147,889 | 6.12 | 578 | 485 | 93 | 5.22 | 322,264 | 330,145 | 281,160 | 1.17 | 0.78 | 253,398 | 253,498 | 244,972 | 1.03 | 0.12 | 0.73 |
| 5 | 7.2% | 86.0% | 14.0% | | 9.4% | 83.9% | 16.1% | | 361,565 | 383,963 | 205,593 | | | 169,787-365,159 | 176,763-363,830 | 149,828-371,577 | | | |
| 6 DFID | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | |
| 9 H | 134,961,745 | 101,933,746 | 32,757,325 | 3.11 | 285 | 194 | 89 | 2.18 | 473,550 | 525,432 | 368,060 | 1.43 | 0.37 | 203,544 | 213,107 | 181,697 | 1.17 | 0.36 | 0.55 |
| 10 | 5.2% | 75.7% | 24.3% | | 4.6% | 68.6% | 31.4% | | 846,024 | 968,640 | 482,041 | | | 72,628-514,066 | 72,627-542,097 | 65,015-383,886 | | | |
| 11 European Commission | 255,015,533 | 186,846,015 | 65,558,847 | 2.85 | 219 | 141 | 71 | 1.99 | 1,164,454 | 1,325,149 | 923,364 | 1.44 | 0.58 | 439,762 | 555,497 | 199,133 | 2.79 | 3.58 | 0.06 |
| 12 | 9.8% | 74.0% | 26.0% | | 3.6% | 66.5% | 33.5% | | 2,084,358 | 2,409,860 | 1,316,016 | | | 127,419-1,454,94 | 123,042-1,504,88 | 134,621-1,449,403 | | | |
| 13 MAC | 672,895,698 | 537,260,180 | 131,751,245 | 4.08 | 962 | 715 | 242 | 2.95 | 699,476 | 751,413 | 544,427 | 1.38 | 0.01 | 366,479 | 404,615 | 286,679 | 1.41 | 18.44 | 0.01 |
| 14 | 25.9% | 80.3% | 19.7% | | 15.6% | 74.7% | 25.3% | | 993,012 | 1,020,748 | 884,442 | | | 199,287-713,178 | 210,068-811,860 | 178,182-468,998 | | | |
| 15 UK government, non- | 144,831,562 | 39,050,737 | 23,594,939 | 1.66 | 237 | 187 | 129 | 1.45 | 452,898 | 208,828 | 182,907 | 1.14 | 0.01 | 110,178 | 129,660 | 59,976 | 2.16 | 3.79 | 0.05 |
| 16 | 5.6% | 62.3% | 37.7% | | 3.8% | 59.2% | 40.8% | | 2,811,384 | 492,519 | 619,889 | | | 19,073-206,784 | 23,761- 207,320 | 12,564-157,053 | | | |
| 17 | | | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | | | |
| 19 Philanthropy | 1,108,966,983 | 691,680,388 | 185,866,898 | 3.72 | 2,879 | 2,044 | 768 | 2.66 | 383,601 | 338,396 | 242,014 | 1.40 | 0.01 | 146,060 | 153,653 | 114,173 | 1.35 | 23.28 | 0.01 |
| 20 | 42.7% | 78.8% | 21.2% | | 46.7% | 72.7% | 27.3% | | 1,377,079 | 659,025 | 711,420 | | | 52,433-286,518 | 58,589-302,774 | 42,658-222,842 | | | |
| 21 Bill & Melinda Gates Foundation | 220,923,242 | | | | 39 | | | | 5,664,699 | | | | | 1,488,432 | | | | | |
| 22 | 8.5% | | | | 0.6% | | | | 8,966,093 | | | | | 628,545-5,576,863 | | | | | |
| 23 Charity | 199,703,382 | 130,726,509 | 58,989,705 | 2.22 | 855 | 619 | 217 | 2.85 | 227,332 | 211,190 | 271,842 | 0.78 | 0.01 | 87,318 | 91,991 | 76,058 | 1.21 | 5.23 | 0.02 |
| 24 | 7.7% | 68.9% | 31.1% | | 13.9% | 74.0% | 26.0% | | 730,057 | 454,108 | 1,208,852 | | | 27,616-167,829 | 36,429-172,497 | 17,279-150,727 | | | |
| 25 Wellcome Trust | 688,340,359 | 560,953,880 | 126,592,102 | 4.43 | 1,985 | 1,425 | 550 | 2.59 | 346,818 | 393,652 | 230,168 | 1.71 | 0.01 | 168,434 | 191,461 | 137,241 | 1.40 | 39.83 | 0.01 |
| 26 | 26.5% | 81.6% | 18.4% | | 32.2% | 72.2% | 27.8% | | 646,625 | 723,549 | 362,836 | | | 66,419-335,557 | 74,759-362,424 | 54,019-250,723 | | | |
| 27 | | | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | | | | | | |
| 30 Other funding | 103,542,992 | 69,087,566 | 22,501,460 | 3.07 | 1,010 | 591 | 303 | 1.95 | 103,683 | 116,899 | 74,262 | 1.57 | 0.01 | 28,626 | 32,557 | 20,373 | 1.60 | 4.80 | 0.03 |
| 31 | 4.0% | 75.4% | 24.6% | | 16.4% | 66.1% | 33.9% | | 273,102 | 309,358 | 154,373 | | | 6,282-105,082 | 7,225-113,479 | 4,408-79,809 | | | |
| 32 | | | | | | | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | | | | | | | |
| 34 Overall | 2,599,985,851 | 1,785,979,172 | 488,178,602 | 3.66 | 6,165 | 4,357 | 1,695 | 2.57 | 421,733 | 409,910 | 288,011 | 1.42 | 0.01 | 158,055 | 179,389 | 125,556 | 1.43 | 74.40 | 0.01 |
| 35 | | 78.5% | 21.5% | | | 72.0% | 28.0% | | 1,315,935 | 840,087 | 704,474 | | | 49,490-352,699 | 59,146-371,977 | 30,983-261,835 | | | |
| 36 | | | | | | | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | | | | | | | | |

BMJ Open

| Year | Investment (male); £ | Change from previous year (male); £ | Fold difference (male) | P | Change over 1997 (male); £ | Fold difference (male) | P | Investment (female); £ | Change from previous year (female); £ | Fold difference (female) | P | Change over 1997 (female); £ | Fold difference (female) | P | Investment (male); % | Investment (female); % | Absolute difference (gender) | Fold difference (gender) |
|---------------|----------------------|-------------------------------------|------------------------|------|----------------------------|------------------------|------|------------------------|---------------------------------------|--------------------------|------|------------------------------|--------------------------|------|----------------------|------------------------|------------------------------|--------------------------|
| 1997 | 64,158,003 | | | | | | | 16,305,109 | | | | | | | 79.7% | 20.3% | 47,852,894 | 3.93 |
| 1998 | 78,287,824 | 14,129,821 | 1.22 | 0.57 | 14,129,821 | 1.22 | 0.57 | 13,110,597 | -3,194,512 | 0.80 | 0.90 | -3,194,512 | 0.80 | 0.90 | 85.7% | 14.3% | 65,177,227 | 5.97 |
| 1999 | 79,477,324 | 1,189,500 | 1.02 | 0.37 | 15,319,321 | 1.24 | 0.14 | 24,366,507 | 11,255,911 | 1.86 | 0.79 | 8,061,398 | 1.49 | 0.88 | 76.5% | 23.5% | 55,110,816 | 3.26 |
| 2000 | 245,740,477 | 166,263,153 | 3.09 | 0.00 | 181,582,474 | 3.83 | 0.01 | 55,636,657 | 31,270,150 | 2.28 | 0.01 | 39,331,548 | 3.41 | 0.01 | 81.5% | 18.5% | 190,103,820 | 4.42 |
| 2001 | 105,423,252 | -140,317,225 | 0.43 | 0.09 | 41,265,248 | 1.64 | 0.01 | 34,133,067 | -21,503,591 | 0.61 | 0.23 | 17,827,958 | 2.09 | 0.01 | 75.5% | 24.5% | 71,290,185 | 3.09 |
| 2002 | 166,695,481 | 61,272,230 | 1.58 | 0.89 | 102,537,478 | 2.60 | 0.01 | 59,568,874 | 25,435,807 | 1.75 | 0.41 | 43,263,765 | 3.65 | 0.01 | 73.7% | 26.3% | 107,126,607 | 2.80 |
| 2003 | 114,827,602 | -51,867,880 | 0.69 | 0.03 | 50,669,599 | 1.79 | 0.50 | 27,241,313 | -32,327,560 | 0.46 | 0.14 | 10,936,204 | 1.67 | 0.05 | 80.8% | 19.2% | 87,586,288 | 4.22 |
| 2004 | 93,129,587 | -21,698,015 | 0.81 | 0.09 | 28,971,584 | 1.45 | 0.30 | 26,908,997 | -332,316 | 0.99 | 0.91 | 10,603,888 | 1.65 | 0.04 | 77.6% | 22.4% | 66,220,590 | 3.46 |
| 2005 | 177,791,995 | 84,662,408 | 1.91 | 0.03 | 113,633,992 | 2.77 | 0.26 | 39,460,786 | 12,551,789 | 1.47 | 0.60 | 23,155,677 | 2.42 | 0.01 | 81.8% | 18.2% | 138,331,209 | 4.51 |
| 2006 | 126,329,085 | -51,462,910 | 0.71 | 0.60 | 62,171,082 | 1.97 | 0.54 | 37,473,263 | -1,987,522 | 0.95 | 0.35 | 21,168,154 | 2.30 | 0.03 | 77.1% | 22.9% | 88,855,822 | 3.37 |
| 2007 | 126,144,324 | -184,761 | 1.00 | 0.03 | 61,986,320 | 1.97 | 0.12 | 28,293,204 | -9,180,059 | 0.76 | 0.01 | 11,988,095 | 1.74 | 0.48 | 81.7% | 18.3% | 97,851,119 | 4.46 |
| 2008 | 173,132,770 | 46,988,446 | 1.37 | 0.07 | 108,974,767 | 2.70 | 0.01 | 44,307,821 | 16,014,617 | 1.57 | 0.70 | 28,002,712 | 2.72 | 0.73 | 79.6% | 20.4% | 128,824,949 | 3.91 |
| 2009 | 114,490,290 | -58,642,480 | 0.66 | 0.12 | 50,332,287 | 1.78 | 0.01 | 41,820,953 | -2,486,868 | 0.94 | 0.03 | 25,515,844 | 2.56 | 0.01 | 73.2% | 26.8% | 72,669,337 | 2.74 |
| 2010 | 120,351,159 | 5,860,868 | 1.05 | 0.33 | 56,193,155 | 1.88 | 0.01 | 39,551,453 | -2,269,500 | 0.95 | 0.56 | 23,246,344 | 2.43 | 0.06 | 75.3% | 24.7% | 80,799,705 | 3.04 |
| Mean | 127,569,941 | 4,322,550 | | | 68,289,779 | | | 34,869,900 | 1,788,180 | | | ##### | | | 78.6% | 21.4% | 92,700,041 | |
| SD | 48,770,855 | 76,214,220 | | | 47,073,847 | | | 13,365,475 | 17,657,139 | | | ##### | | | | | 38,264,674 | |
| Total Gender | 1,785,979,172 | | | | | | | 488,178,602 | | | | | | | | | 1,297,800,569 | 3.66 |
| Total Overall | 2,599,985,851 | | | | | | | | | | | | | | | | | |



Differences in research funding for women scientists: a systematic comparison of UK investments in global infectious disease research 1997–2010

| | |
|---------------------------------|---|
| Journal: | <i>BMJ Open</i> |
| Manuscript ID: | bmjopen-2013-003362.R2 |
| Article Type: | Research |
| Date Submitted by the Author: | 12-Oct-2013 |
| Complete List of Authors: | Head, Michael; University College London, Infection & Population Health Fitchett, Joseph; London School of Hygiene & Tropical Medicine, Cooke, Mary; University College London, Wurie, Fatima; University College London, Atun, Rifat; Imperial College London, |
| Primary Subject Heading: | Infectious diseases |
| Secondary Subject Heading: | Global health |
| Keywords: | INFECTIOUS DISEASES, PUBLIC HEALTH, STATISTICS & RESEARCH METHODS, VIROLOGY, PARASITOLOGY, MYCOLOGY |
| | |

SCHOLARONE™
Manuscripts

1
2
3 **Differences in research funding for women scientists: a systematic comparison of UK**
4
5 **investments in global infectious disease research 1997–2010**
6
7
8
9

10 Michael G Head^{a*}, Joseph R Fitchett^b, Mary K Cooke^a, Fatima B Wurie^a, Rifat Atun^c
11

12
13 a University College London, Research Department of Infection and Population Health, UCL
14 Royal Free Campus, Rowland Hill Street, London, NW3 2PF
15
16

17
18 b London School of Hygiene & Tropical Medicine, Keppel Street, London, WC1E 7HT
19

20
21 c Imperial College London, South Kensington Campus, London SW7 2AZ and Harvard
22 School of Public Health, Harvard University, Boston, USA
23
24
25
26
27

28
29 *Corresponding Author
30
31
32

33
34 Number of Words: **3 758**
35
36
37

38 **Keywords** – gender, funding, research, women,
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Abstract

Objectives: There has not previously been a systematic comparison of awards for research funding in infectious diseases by sex. We investigated funding awards to UK institutions for all infectious disease research from 1997 to 2010, across disease categories and along the research and development continuum.

Design: Systematic comparison

Methods: Data were obtained from several sources for awards from the period 1997-2010 and each study assigned to - disease categories; type of science (pre-clinical, phases I-III trials, product development, implementation research); categories of funding organisation. Fold differences and statistical analysis were used to compare total investment, study numbers, mean grant, and median grant between men and women.

Results: 6052 studies were included in the final analysis, comprising 4357 grants (72.0%) awarded to men and 1695 grants (28.0%) awarded to women, totalling £2.274 billion. Of this, men received £1.786 billion (78.5%) and women £488 million (21.5%). The median value of award was greater for men (£179 389; IQR £59146–£371 977) than women (£125 556; IQR £30 982–£261 834).

Awards were greater for male PIs across all infectious disease systems, excepting neurological infections and sexually transmitted infections. The proportion of total funding awarded to women ranged from 14.3% in 1998 to 26.8% in 2009 (mean 21.4%), and was lowest for pre-clinical research at 18.2% (£285.5 million of £1.573 billion) and highest for operational research at 30.9% (£151.4 million of £489.7 million).

Conclusions: There are consistent differences in funding received by men and women principal investigators: women have fewer funded studies and receive less funding in absolute and in relative terms; the median funding awarded to women is lower across most

1
2
3 infectious disease areas, by funder, and type of science. These differences remain broadly
4
5 unchanged over the 14-year study period.
6
7

8 9 **Article summary**

10 11 12 13 14 Article focus

- 15
16
17 • We explore the distribution of funding across infectious disease research by the
18
19 gender of principal investigator to identify any differences in funding received by men
20
21 and women researchers in the UK.
22
23

24 25 26 Key messages

- 27
28
29 • There are consistent differences in funding received by men and women principal
30
31 investigators (PIs) in infectious disease research funded in the UK.
32
- 33
34 • Total funding and the median award across most disease areas and type of science
35
36 is typically greater in male PIs than female PIs
- 37
38 • These differences remain consistent over the time period of analysis (1997-2010)
39

40 41 42 Strengths and limitations of this study

- 43
44
45 • This is the first study to present detailed data and rigorously quantify funding
46
47 differences between men and women researchers in infectious disease research in
48
49 the UK.
- 50
51 • Our results provides new and additional evidence on differences on funding for men
52
53 and women researchers highlighted in earlier studies and provides a case for new
54
55 research to explain the source of these differences, especially given government
56
57 commitments to increase the number of women in science
58
59
60

- 1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
- We were unable to assess the success and failure rates by gender and thus cannot comment on the extent of inequalities or bias. As we could not feasibly access data on the academic ranking of principal investigators, we were hence unable to adjust for levels of seniority across both genders. A follow-up study incorporating this data would allow for more meaningful conclusions to be drawn about the nature of any possible disparities.

Introduction

Women are under-represented in biomedical science, yet few studies have systematically explored the extent and reasons for the observed differences between men and women scientists. Women comprise 50% of the EU student population and 45% of doctoral students, but only one third of career researchers are women – a figure that is lower for senior positions.[1]

In 2001, a Wellcome Trust survey concluded that although women were as successful as men in securing funding for biomedical research, they were less likely to apply for grant funds because of their status in scientific institutions and the level of support they received.[2] An analysis of Wellcome Trust awards in 2000-08 revealed a significant gender difference in the amount of funding awarded, even after adjusting for the seniority of the principal investigator, concluding “the most likely explanation for the difference in amounts awarded to women and men is that women are systematically less ambitious in the amounts of funding requested in their grant applications.”[3] In 2011, around 44% of academics in UK universities were women, yet only 39% of senior lecturers and 19% of professors were women.[4] Furthermore, a number of studies from the US have shown that women in science are disadvantaged compared to men.[5–7]

The low numbers of women in science and the reasons for this anomaly is a concern for scientists and policy makers. Although the UK Medical Research Council (MRC) has a gender equality scheme, which briefly states gender equality is reflected in agreements with research organisations receiving MRC funding, it is not clear how the scheme is implemented.[8]

1
2
3 While several initiatives have aimed to increase the numbers of women involved in science,
4 there are no affirmative actions or binding policies in the UK or Europe to definitively ensure
5 women are better represented in science. Indeed, some initiatives aimed at increasing
6 women in science have been criticised. For example, in 2012, the European Commission
7 campaign targeting 13-18 year-old secondary school students[9] was rebuked and described
8 as an insult to women in science[10][11], with the offending video clip removed from the EU
9 campaign website. The effects of campaigns aimed at raising the profile of women in
10 science[12,13] have not been assessed.

11
12 We have previously undertaken a systematic analysis of research funding awarded to UK
13 institutions for all infectious disease research, for the 14-year period from 1997 to 2010.[14]
14 Here, we use the dataset gathered for this earlier study to examine trends over time, the
15 distribution of funding awarded to men and women principal investigators (PIs) across
16 specific infections, funder categories, and along the research and development (R&D)
17 continuum, extending from pre-clinical to clinical and operational research.

38 39 **Methods**

40
41 We obtained data from several sources for infectious disease research studies where
42 funding was awarded between 1997 and 2010. The methods for the original study are
43 elaborated in detail elsewhere,[14] and summarised here. We identified 325,922 studies for
44 screening that covered all areas of disease from several funders, and filtered these to
45 identify funding for infectious diseases where the lead institution was in the UK in the period
46 and the year of award 1997-2010. We obtained data from publicly available sources and
47 directly from the funders. We did not include private sector funding in the analysis, as
48 pharmaceutical sector data were not publicly available. Figure 1 shows the sources of data
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 and the numbers of studies included and excluded at each stage of screening to reach the
4
5 final set of studies for detailed analysis.
6
7
8
9

10 *Figure 1. Methodology flow chart for filtering studies firstly by infectious disease and then by*
11 *gender*
12
13

14
15
16
17 Data collection and cleaning took place alongside routine duties between 2006 and 2011,
18 primarily by MGH and assisted by JRF, MKC and FBW. Funding records could feasibly be
19 obtained going back to 1997, hence the decision to cover awards during 1997-2010. We
20 assigned each study to primary disease categories, and within each category, we
21 documented topic-specific subsections, including specific pathogen or disease. We allocated
22 studies to one of four categories along the R&D continuum: pre-clinical; phases I, II or III;
23 product development; and operational research, and to one of the 26 categories for funding
24 organisations.
25
26
27
28
29
30
31
32
33
34
35

36 Where the PI was named, we assigned them to men or women categories. The studies
37 where only an initial was available for the forename were assigned as “unclear” if we were
38 unable to establish the PIs gender from a review of the literature, institutional websites or
39 publicly available publications and documents.
40
41
42
43
44
45
46

47 Reference to sexually transmitted infections excludes HIV. Neglected tropical diseases were
48 categorised according to classification used by the World Health Organization (WHO)
49 (http://www.who.int/neglected_diseases/diseases/en). Antimicrobial resistance includes
50 antibacterial, antiviral, antifungal and antiparasitic studies.
51
52
53
54
55
56
57
58
59
60

1
2
3 We converted grants awarded in a currency other than pounds sterling to UK pounds using
4 the mean exchange rate in the year of the award. We adjusted grant funding amounts for
5 inflation and reported in 2010 UK pounds.
6
7
8
9

10
11
12 As well as excluding studies not immediately relevant to infection, we excluded unfunded
13 studies, veterinary infectious disease research studies (unless there was a zoonotic
14 component), those exploring the use of viral vectors to investigate non-communicable
15 diseases, grants for symposia or meetings, or studies with UK contributions (e.g. as a
16 collaborator), but the funding was awarded to a non-UK institution.
17
18
19
20
21
22
23
24

25 We used Microsoft Excel versions 2000 and 2007 to categorise studies. Where needed, data
26 were exported into Microsoft Access (versions 2000 and 2007) and specific keyword queries
27 used to select precise sections of the data for analysis. We used Stata (version 11.0) for
28 statistical analysis and to generate figures.
29
30
31
32
33
34
35

36 We used fold differences to compare total investment, number of studies, mean grant, and
37 median grant between men and women according to disease system, specific infection and
38 funding organisation.
39
40
41
42
43
44

45 We used nonparametric Mann-Whitney rank-sum test to assess the distribution of funding by
46 gender. Nonparametric K-sample test on equality of medians was applied to compare the
47 median funding by gender, and reported as a chi-squared statistic without Yates' correction
48 for continuity. Nonparametric Wilcoxon signed-rank test was applied when comparing
49 matched data, such as time trends by gender. The significance for all tests was defined at
50 the 5% level (two-sided $P=0.05$).
51
52
53
54
55
56
57
58
59
60

1
2
3 We present differences between gender and do not attempt to investigate or imply bias or
4
5 inequalities as we could not access data on unsuccessful grant applications.
6
7
8
9
10

11 12 **Results**

13
14 We identified 6165 studies from the 325,922 studies screened that were suitable for
15
16 inclusion in our analysis. Of these, we were unable to ascertain the gender of principal
17
18 investigator for 30 studies (0.5%). We excluded 83 studies (1.3%) that did not specify the PIs
19
20 name or gender – these were funded by the Bill and Melinda Gates Foundation (Gates
21
22 Foundation) (38 studies; 0.6%) and the UK Department for International Development
23
24 (DFID) (22 studies; 0.4%), accounting for £321.2 million (12.3% of the total). We included
25
26 6052 studies in the final analysis, comprising 4357 grants (72.0%) awarded to men and 1695
27
28 grants (28.0%) awarded to women, totalling £2.274 billion, of which £1.786 billion (78.5%)
29
30 were awarded to men and £488 million (21.5%) awarded to women.
31
32
33
34
35

36 The median value of grant funding was greater for men (£179 389; IQR £59146–£371 977)
37
38 than for women (£125 556; IQR £30 982–£261 834). Similarly, mean value of the grant
39
40 funding was greater for men (£409 910; SD £840 087) than for women (£288 011; SD £704
41
42 474). Figure 2 shows the distribution of the total investments and median funding awarded to
43
44 PIs by gender over time.
45
46
47
48

49 *Figure 2a. Total investment over time awarded to male and female principal investigators*

50
51
52 *Figure 2b Median investment over time awarded to male and female principal investigators*
53
54
55

56 57 **Infectious disease system** 58 59 60

1
2
3 Table 1A (web appendix 1) shows the total investment, total numbers of studies, mean grant
4 funding, median grant funding and fold differences in funding according to nine disease
5 systems and by gender of PI. We identified no infectious disease system where women led
6 the majority of research efforts or were awarded the majority of funding. Median funding
7 awards were greater for male PIs across all infectious disease systems, with the exception
8 of neurological infections and sexually transmitted infections.
9
10
11
12
13
14
15
16
17

18 Greatest levels of funding awarded to men and to women were for research into respiratory
19 infections and HIV. Men received a total of £312.1 million for research into respiratory
20 infections compared with £84.4 million for women – a 3.70 fold difference – and a total of
21 £290.8 million for HIV research compared with £79.7 million for women – a 3.65 fold
22 difference.
23
24
25
26
27
28
29
30

31 The largest difference between total funding for men and for women was with
32 gastrointestinal infections (5.65 fold difference) where women received only 15.0% of the
33 total investment (£37.0 million) and spearheaded 18.9% (149) of the studies and
34 neurological infections (4.22 fold difference). Smallest difference between total funding for
35 men and for women was in research into sexually transmitted infections (1.90 fold
36 difference), where women received 35.0% (£45.4 million) of the total funding and led 49.0%
37 (182) of the studies.
38
39
40
41
42
43
44
45
46
47

48 Mean funding for grants was significantly greater for men (£409 910; SD £840 087) than for
49 women (£288 011; SD £704 474). The differences in median funding were statistically
50 significant ($P > 0.01$) for gastrointestinal infections (men £328 021; SD £458 720) (women
51 £248 615; SD £433 176), for haematological infections (men £417 889; SD £914 626)
52
53
54
55
56
57
58
59
60

(women £306 126; SD £819 910), and for HIV (men £649 216; SD £1 550 920) (women £278 505; SD £545 657).

Median funding for grants showed a similar pattern, with significantly greater grant funding for men (£179 389; IQR £59 146–£371 977) than women (£125 556; IQR £30 983–£261 835). Differences in median funding were statistically significant ($P > 0.05$) for gastrointestinal infections (men £208 369; IQR £78 852–£357 771) (women £155 066; IQR £43 637–£305 928), for hepatic infections (men £118 638; IQR £41 342–£269 629) (women £68 620; IQR £26 720–£221 952), and for HIV (men £163 462; IQR £39 153–£511 800) (women £114 272; IQR £29 880–£305 339).

Specific Infections

Table 1B (web appendix 1) shows total investment, total numbers of studies, mean grant funding, median grant funding and fold differences in funding according to specific infection by gender.

Men received significantly higher levels of total research funding, spearheaded greater numbers of studies, and were awarded greater median and mean funding for grants for malaria ($P = 0.01$), HIV ($P = 0.01$) and influenza ($P = 0.04$).

Major differences between total funding for men and for women were observed for research into candida (47.75 fold difference), rotavirus (33.65 fold difference), campylobacter (24.33 fold difference) and norovirus (23.33 fold difference). Smallest differences between total funding for men and women were for research into dengue (1.07 fold difference) and leishmaniasis (1.55 fold difference). Women received greater total funding than men for research into leprosy (0.09 fold difference), diphtheria (0.18 fold difference), chlamydia (0.36 fold difference), syphilis (0.37 fold difference), and varicella zoster (0.54 fold difference).

1
2
3
4
5 Differences in mean grant funding were statistically significant ($P > 0.05$) for malaria
6 research (men £590 422; SD £1 324 909) (women £318 054; SD £726 872), for influenza
7 (men £616 643; SD £881 493) (women £387 186; SD £489 997), for respiratory syncytial
8 virus (men £485 283; SD £539 396) (women £187 931; SD £268 412), and for HIV (men
9 £649 216; SD £1 550 920) (women £278 505; SD £545 657).
10
11
12
13
14
15

16
17
18 Differences in median grant funding were statistically significant ($P > 0.05$) for malaria
19 research (men £209 646; IQR £63 826–£529 610) (women £143 358; IQR £42 754–£314
20 524), for hepatitis C (men £124 797; IQR £42 475–£289 293) (women £67 265; IQR £29
21 880–£233 467), for influenza (men £348 730; IQR £213 601–£668 561) (women £200 787;
22 IQR £124 210–£398 191), for herpes simplex virus (men £119 295; IQR £40 009–£446 395)
23 (women £309 610; IQR £147 885–£439 305), and for HIV (men £163 462; IQR £39 153–
24 £511 800) (women £114 272; IQR £29 880–£305 339).
25
26
27
28
29
30
31
32
33
34
35

36 Figure 3 shows the proportion of total funding awarded to principal investigators by gender
37 over time and a breakdown of investment by research pipeline. The proportion of the total
38 funding awarded to women ranged from 14.3% (in 1998) to 26.8% (in 2009), with a mean
39 proportion of 21.4% for the period studied. The proportion of funding was lowest for pre-
40 clinical research at 18.2% (£285.5 million of £1.573 billion total) and highest for operational
41 research at 30.9% (£151.4 million of £489.7 million). The funding for clinical (Phase I, II and
42 III) research was 29.9% (£25.5 of £85.2) and for product development amounted to 20.4%
43 (£25.8 million of £126.6 million).
44
45
46
47
48
49
50
51
52
53
54

55 *Figure 3a. Proportion of investment over time awarded to male and female principal*
56 *investigators*
57
58
59
60

1
2
3 *Figure 3b. Total investment by research pipeline awarded to male and female principal*
4 *investigators*
5
6
7
8
9

10 **Funding organisation**

11
12 Table 2 (web appendix 2) shows in detail the total investment, total numbers of studies,
13 mean grant funding, median grant funding and fold differences in funding according to
14 funding organisation and by gender.
15
16
17
18
19
20

21 Public funding organisations invested a total of £1.025 billion in research led by men (78.6%)
22 and £279.8 in research led by women (21.4%). Greatest levels of funding awarded to men
23 and to women were by the Wellcome Trust and the UK MRC. Major differences between
24 funding awarded to men and to women PIs were by the BBSRC, with a 6.12 fold difference.
25 Smallest differences between funding awarded to men and to women were by the UK
26 Government funding streams such as the National Institute for Health Research, with a 1.66
27 fold difference. Mean grant funding from public funding organisations were significantly
28 greater for men at £595 361 (SD £1 080 718) than for women at £448 414 (SD £814 979).
29 Differences were also statistically significant ($P > 0.01$) for UK MRC grants with men at £751
30 413 (SD £1 020 748) and women at £544 427 (SD £884 442), and for UK Government
31 grants with men at £208 828 (SD £492 519) and women at £182 907 (SD £619 889).
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46

47 Median grant funding from public funding organisations had a similar pattern with
48 significantly greater grant funding for men at £272 452 (IQR £138 322–£572 529) and
49 women at £213 718 (IQR £92 880–£402 917). Differences were also statistically significant
50 ($P > 0.05$) for UK MRC grants with men at £404 615 (IQR £ 210 068–£811 860) and women
51 at £286 679 (£178 182–£468 998), and for UK Government grants with men at £129 660
52 (IQR £23 761–£207 320) and women at £59 976 (IQR £12 564–£157 053).
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Philanthropic funding organisations invested a total of £691.7 million in research led by men (78.8%) and £185.9 million in research led by women (21.2%).

Mean grant funding from philanthropic funding organisations were significantly greater for men at £338 396 (SD £695 025) than for women at £242 014 (SD £711 420). Differences were also statistically significant ($P > 0.01$) for Wellcome Trust grants with men receiving £393 652 (SD £723 549) and women £230 168 (SD £362 836), and for other charitable funding organisations with men receiving £211 190 (SD £454 108) and women £271 842 (SD £1 208 852).

Median grants from philanthropic funding organisations showed a similar pattern with significantly greater grant funding for men at £153 653 (IQR £58 589 – £302 774) and women at £114 173 (IQR £42 658 – £222 842). Differences were also statistically significant ($P > 0.05$) for Wellcome Trust grants with men receiving £191 461 (IQR £74 759 – £362 424) and women £137 241 (IQR £54 019 – £250 723), and for other charitable funding organisations with men receiving £91 991 (IQR £36 429 – £172 497) and women £76 058 (IQR £17 279 – £150 727).

Figure 4 shows the association between funding organisation and total investment and median funding by gender. The MRC awarded the highest median amount in grants to women (£286 679; IQR £178 182–£468 998), but the median funding amount in grants for men were 1.41 fold higher than that awarded to women (£404 615; IQR £210 068–£811 860). European Commission awarded the highest mean grants to women at £923 364 (SD £1 316 016) however mean funding amount in grants for men were 1.44 fold higher at £1325 149 (SD £2 409 860) than that for women.

1
2
3 *Figure 4a. Association between funding organisation and total investment by gender*

4
5 *Figure 4b. Association between funding organisation and median award by gender*

6
7
8
9
10 *Time trend*

11
12
13 Table 3 (web appendix 3) shows in detail the trends in funding over time from 1997 to 2010
14 by gender of principal investigators, with amounts and relative proportions each year of
15 funding. Mean annual funding received was greater by men at £127.6 million (SD £48.7
16 million) than women at £34.9 million (SD £13.4 million). Proportions of annual funding
17 received by men ranged from 73.2% to 85.7%, with a mean of 78.6%.

18
19
20
21
22
23
24
25
26 Proportions of annual funding received by women ranged from 14.3% to 26.8% with a mean
27 of 21.4%. The largest annual funding received by men was £245.7 million in 2000, and the
28 smallest at £64.2 million in 1997. The largest annual funding received by women was £59.6
29 million in 2002, with the smallest at £13.1 million in 1998.

30
31
32
33
34
35
36
37 Over the 14-year study period, the proportion of investment awarded to women each year
38 remains relatively unchanged with a mean of 21.4% of total (range 14.3%–26.8%; £13.1
39 million to £59.6 million). Figure 5 shows the funding trends over time and fold differences in
40 total investments by gender. Absolute difference in the funding amounts in the grants
41 awarded to men and women ranges between £47.9 million and £190.1 million, with a mean
42 difference of £92.7 million (SD £38.3 million). Fold difference in grant funding for men and
43 women ranged from 2.74 to 5.97, with a mean fold difference of 3.66.

44
45
46
47
48
49
50
51 *Figure 5a. Total investment and trend over time, by gender*

52
53
54 *Figure 5b. Fold difference of investment over time, by gender*

Discussion

We present the first detailed and systematic comparison by sex of investments in infectious disease research in the UK for the 14-year period 1997-2010. We identified 6165 studies funded by public and philanthropic funding organisations, with total research investment of £2.6 billion.

We quantified the differences in research funding awarded by gender to show these to be substantial. The analysis shows clear and consistent differences between men and women principal investigators, with lower funding in terms of the total investment, the number of funded studies, the median funding awarded and the mean funding awarded across most of the infectious disease areas funded. Women received less funding in absolute amounts and in relative terms, by funder and the type of science funded along the R&D pipeline. These differences in funding between men and women persist over time.

We show large differences in median funding amounts for men and women researchers in investments by the European Commission and the MRC. Such differences were much less apparent when comparing funding from the Department of Health and BBSRC, although the BBSRC awarded 86% of funding to men. The BBSRC almost entirely funds pre-clinical research,[14] and this matches the increased proportions of pre-clinical studies being led by male principal investigators.

Our findings in infectious disease research, the most detailed to date, provide new evidence on differences between men and women researchers, to reinforce the concerns raised in earlier studies.[4,15,16] Differences that are more marked at senior levels of academia need to be investigated to explain and account for the observed differences.

1
2
3 The reasons why the median awards across most infectious disease conditions should be
4 significantly less for women principal investigators cannot be deduced from the available
5 data. Thus, it is not possible to recommend interventions to address this phenomenon, given
6 that it is unclear if there is any bias, or precisely what mechanisms are at play. The next step
7 may be to investigate success rates by gender to assess how many women are applying,
8 and what proportion of the initial request for funding is actually allocated.
9
10
11
12
13
14
15
16
17

18 There have been suggestions that women are systematically less ambitious in the amounts
19 of funding requested in their grant applications when compared with men who are
20 equivalently ranked academically, and that relatively simple mentoring programmes could at
21 least partially overcome this anomaly.[3] However, there is no evidence supporting these
22 assertions. Others have suggested that systems which ensure PI anonymity during review of
23 grant funding submissions may help reduce the presence of any subtle gender biases[17],
24 though in practice this approach would be challenging as the experience of the PI is a key
25 factor when considering suitability of request for research support. However, evidence on
26 effective interventions to address barriers for women scientists are lacking.[16] Women of
27 child-bearing age are being disadvantaged in some areas of employment, even though in
28 relation to scientific endeavour, productivity as measured by published outputs is not
29 significantly different between women with and without children.[15]
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45

46 *Study limitations*

47
48 Our analysis has several limitations. We rely on the accuracy of the original data from the
49 funding organisations and as described elsewhere we have excluded data from the private
50 sector as the publicly available data are incomplete.[14]
51
52
53
54
55
56
57
58
59
60

1
2
3 In the period analysed, we were not able to find data on the number of men and women PIs
4 requesting financial support for research agencies from the funding sources studies. Hence,
5
6 we were unable to assess the success and failure rates by gender. We also did not have
7
8 complete data on the amount of funding initially requested, the gender of co-applicants for
9
10 each study, the total pool of researchers in each disease area and within each type of
11
12 science, or the proportion of awards made to clinical and non-clinical researchers, all of
13
14 which would be useful pieces of information in developing a clearer picture of the reasons for
15
16 the presented differences. The proportion of doctors registered in the UK favours men
17
18 (56.8% as of January 2013) over women,[18] but the proportion of those carrying out
19
20 research appears to be unknown. Understanding the distribution of researchers is critical to
21
22 understanding the research landscape.
23
24

25
26
27
28 We lacked data on the academic ranking of principal investigators and were hence unable to
29
30 adjust for levels of seniority across both genders. We were unable to get data on gender
31
32 from the Gates Foundation and DFID and hence were unable to clarify the gender of a small
33
34 proportion of investigators, though we believe this limitation is not likely to change the
35
36 conclusions of the study. Our analysis focuses on infectious disease research, and analysis
37
38 of other areas of scientific research would be needed if these differences persisted for all
39
40 research areas.
41
42

43 44 45 **Conclusions**

46
47
48 Notwithstanding limitations, our systematic analysis shows unequal distribution of
49
50 investments in infectious disease research for men and women. There are fewer women
51
52 receiving funding as principal investigators in infectious disease research, with fewer studies
53
54 funded with lower funding amounts when successful.
55
56
57
58
59
60

1
2
3 Although earlier studies have discussed possible solutions, including mentoring programmes
4 and advertising campaigns, none have systematically explored the reasons why such
5 differences persist. Hence, without an understanding of the reasons for the observed
6 differences, the proposed solutions are not very meaningful. There is no evidence that
7 women and men researchers are not equally able, hence, other factors are likely to be at
8 play to explain the observed differences which have persisted over the 14-year study period.
9 From our data, the limitations mean that we cannot explain what these mechanisms might
10 be. Research is needed to elucidate an understanding of the factors that can explain the
11 observed differences. A sub-analysis of our dataset where information on academic rank at
12 time of award is obtained would allow for more meaningful conclusions. We strongly urge
13 policy makers, funders and scientists to urgently investigate the factors leading to the
14 observed differences and develop policies developed to address them, in order to ensure
15 that women are appropriately supported in scientific endeavour.
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34

35 **Funding**

36
37 This research received no specific grant from any funding agency in the public, commercial
38 or not-for-profit sectors
39
40
41
42
43

44 **Author contribution**

45
46 MGH designed the study with input from RA and JF and collated the dataset. JRF, FW and
47 MKC checked and refined the dataset. JRF undertook data analysis and created the graphs
48 and figures with input from MGH and RA. MGH, JRF, and RA interpreted the data and wrote
49 the first draft. MGH, JRF, and RA refined the analysis and paper with input from MKC and
50 FBW. All authors reviewed and approved the final version. MH is guarantor of the paper.
51
52
53
54
55
56
57

58 **Competing interests**

1
2
3 RA has received research funding from the UK Medical Research Council, the UK National
4
5 Institute for Health Research, UK CRC, UK EPSRC, the UK Department for International
6
7 Development and the UK Department of Health. RA is a member of the UL Medical
8
9 Research Council Global Health Group. MGH works for the Infectious Disease Research
10
11 Network, which has supported this work and is funded by the UK Department of Health. JRF
12
13 has received funds from the Wellcome Trust and is a steering group member for the
14
15 Infectious Disease Research Network. MKC has received funding from the Medical
16
17 Research Council and the Bill & Melinda Gates Foundation. FBW has received funds from
18
19 UCLH Charitable Foundation.
20

21 **Acknowledgements**

22
23
24 We thank Jennifer Harris and Raidah Haider for their input and assistance, and acknowledge
25
26 the assistance of the research and development funding agencies for provision of data.
27

28 **Data-sharing statement**

29
30
31 All gender data is available with this submission. Further data relating to the Research
32
33 Investments project can be found at www.researchinvestments.org or by contacting the
34
35 corresponding author.
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

- 1 More women in senior positions. Key to economic stability and growth. European Commission, Luxembourg: 2010.
- 2 Blake M, La Valle I. Who applies for research funding? Key factors shaping funding application behaviour among women and men in British higher education institutions. London: 2000.
- 3 Bedi G, Van Dam NT, Munafo M. Gender inequality in awarded research grants. *Lancet* 2012;**380**:474.
- 4 Fitzpatrick S. A Survey of Staffing Levels of Medical Clinical Academics in UK Medical Schools as at 31 July 2011. London: 2012. http://www.medschools.ac.uk/Publications/Documents/MS_Clinical_Academic_Staff_Survey_310711.pdf (date accessed 22 August 2013)
- 5 Burrelli J. Thirty-Three Years of Women in S&E Faculty Positions - US National Science Foundation. Arlington: 2008. <http://www.nsf.gov/statistics/infbrief/nsf08308/> (date accessed 22 August 2013)
- 6 Lincoln AE, Pincus SH, Leboy PS. Scholars' awards go mainly to men. *Nature* 2011;**469**:472.
- 7 Pohlhaus JR, Jiang H, Sutton J. Sex differences in career development awardees' subsequent grant attainment. *Annals of internal medicine* 2010;**152**:616–7; author reply 617.
- 8 Medical Research Council. MRC Gender Equality Scheme. 2007. <http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC003655> (date accessed 22 August 2013).
- 9 European Commission. About this site- Science: It's a girl thing! 2012. <http://science-girl-thing.eu/en/about-this-site> (date accessed 22 August 2013)
- 10 Gill M. "Science, it's a girl thing!" says EU Commission, holding lipstick and bunsen burner. *New Statesman*. 2012. <http://www.newstatesman.com/blogs/martha-gill/2012/06/science-its-girl-thing-says-eu-commission-holding-lipstick-and-bunsen-burn> (date accessed 22 August 2013).
- 11 Swain F. Science: It's a girl thing. Excuse me while I die inside. – SciencePunk. *ScienceBlogs*. 2012. <http://scienceblogs.com/sciencepunk/2012/06/22/science-its-a-girl-thing-excuse-me-while-i-die-inside/> (date accessed 22 August 2013)
- 12 Yong E. Edit-a-thon gets women scientists into Wikipedia. *Nature*. 2012. <http://www.nature.com/news/edit-a-thon-gets-women-scientists-into-wikipedia-1.11636> (date accessed 22 August 2013)
- 13 Donald A. Throw off the cloak of invisibility. *Nature* 2012;**490**:447. <http://www.nature.com/news/throw-off-the-cloak-of-invisibility-1.11638> (date accessed 22 August 2013).

- 1
2
3 14 Head MG, Fitchett JR, Cooke MK, *et al.* UK investments in global infectious disease
4 research 1997-2010: a case study. *The Lancet infectious diseases* Published Online
5 First: 7 November 2012.
6
7 15 Fox MF. Gender, Family Characteristics, and Publication Productivity among
8 Scientists. *Social Studies of Science* 2005;**35**:131–50.
9
10 16 Ceci SJ, Williams WM. Understanding current causes of women's
11 underrepresentation in science. *Proceedings of the National Academy of Sciences of*
12 *the United States of America* 2011;**108**:3157–62.
13
14 17 Moss-Racusin CA, Dovidio JF, Brescoll VL, *et al.* Science faculty's subtle gender
15 biases favor male students. *Proceedings of the National Academy of Sciences of the*
16 *United States of America* 2012;**109**:16474–9.
17
18 18 List of Registered Medical Practitioners - statistics. General Medical Council.
19 http://www.gmc-uk.org/doctors/register/search_stats.asp (date accessed 22 August
20 2013).
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 **Disparities-Differences** in research funding for women scientists: **a** systematic
8 **analysis-of-comparison-of** UK investments in global infectious disease research 1997–
9 **2010**
10
11

12
13
14
15 Michael G Head^{a*}, Joseph R Fitchett^b, Mary K Cooke^a, Fatima B Wurie^a, Rifat Atun^c
16

17 a University College London, Research Department of Infection and Population Health, UCL
18 Royal Free Campus, Rowland Hill Street, London, NW3 2PF
19

20
21 b London School of Hygiene & Tropical Medicine, Keppel Street, London, WC1E 7HT
22

23
24 c Imperial College London, South Kensington Campus, London SW7 2AZ and Harvard
25 School of Public Health, Harvard University, Boston, USA
26
27

28
29
30
31 *Corresponding Author
32

33
34
35 Number of Words: **3 758**
36
37

38
39 **Keywords** – gender, funding, research, women,
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Abstract

Objectives: ~~There has not previously been a systematic comparison of awards for research funding in infectious diseases by sex~~~~There has not previously been a systematic analysis exploring gender disparities in awards for research funding.~~ We investigated funding awards to UK institutions for all infectious disease research from 1997 to 2010, across disease categories and along the research and development continuum.

Design: Systematic analysis

Methods: Data were obtained from several sources for awards from the period 1997-2010 and each study assigned to - disease categories; type of science (pre-clinical, phases I-III trials, product development, implementation research); categories of funding organisation. Fold differences and statistical analysis were used to compare total investment, study numbers, mean grant, and median grant between men and women.

Results: 6052 studies were included in the final analysis, comprising 4357 grants (72.0%) awarded to men and 1695 grants (28.0%) awarded to women, totalling £2.274 billion. Of this, men received £1.786 billion (78.5%) and women £488 million (21.5%). The median value of award was greater for men (£179 389; IQR £59146–£371 977) than women (£125 556; IQR £30 982–£261 834).

Awards were greater for male PIs across all infectious disease systems, excepting neurological infections and sexually transmitted infections. The proportion of total funding awarded to women ranged from 14.3% in 1998 to 26.8% in 2009 (mean 21.4%), and was lowest for pre-clinical research at 18.2% (£285.5 million of £1.573 billion) and highest for operational research at 30.9% (£151.4 million of £489.7 million).

Conclusions: There are consistent ~~disparities~~ differences in funding received by men and women principal investigators: women have fewer funded studies and receive less funding in

Formatted: Font: (Default) Arial, 11 pt

1
2
3
4
5
6
7 absolute and in relative terms; the median funding awarded to women is lower across most
8 infectious disease areas, by funder, and type of science. These disparities-differences
9
10 remain broadly unchanged over the 14-year study period.
11
12

13 14 **Article summary**

15 16 17 18 19 **Article focus**

- 20 • We explore the distribution of funding across infectious disease research by the
21 gender of principal investigator to identify any disparities-differences in funding
22 received by men and women researchers in the UK.
23
24
25
26
27

28 29 **Key messages**

- 30 • There are consistent disparities-differences in funding received by men and women
31 principal investigators (PIs) in infectious disease research funded in the UK.
32
33 • Total funding and the median award across most disease areas and type of science
34 is typically greater in male PIs than female PIs
35
36 • These disparities-differences remain consistent over the time period of analysis
37 (1997-2010)
38
39
40
41

42 43 **Strengths and limitations of this study**

- 44 • This is the first study to present detailed data and rigorously quantify funding
45 disparities-differences between men and women researchers in infectious disease
46 research in the UK.
47
48 • Our results provides new and additional evidence on disparities-differences on
49 funding for men and women researchers highlighted in earlier studies and provides a
50 case for new research to explain the source of these disparities-differences,
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 especially given government commitments to increase the number of women in
8 science
9

- 10
11
- We were unable to assess the success and failure rates by gender and thus cannot
12 comment on the extent of inequalities or bias. As we could not [feasibly](#) access data
13 on the academic ranking of principal investigators, we were hence unable to adjust
14 for levels of seniority across both genders. [A follow-up study incorporating this data](#)
15 [would allow for more meaningful conclusions to be drawn about the nature of any](#)
16 [possible disparities.](#)
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Introduction

Women are under-represented in biomedical science, yet few studies have systematically explored the extent and reasons for the observed ~~disparities~~ differences between men and women scientists. Women comprise 50% of the EU student population and 45% of doctoral students, but only one third of career researchers are women – a figure that is lower for senior positions.[1]

In 2001, a Wellcome Trust survey concluded that although women were as successful as men in securing funding for biomedical research, they were less likely to apply for grant funds because of their status in scientific institutions and the level of support they received.[2] An analysis of Wellcome Trust awards in 2000-08 revealed a significant gender difference in the amount of funding awarded, even after adjusting for the seniority of the principal investigator, concluding “the most likely explanation for the difference in amounts awarded to women and men is that women are systematically less ambitious in the amounts of funding requested in their grant applications.”[3] In 2011, around 44% of academics in UK universities were women, yet only 39% of senior lecturers and 19% of professors were women.[4] Furthermore, a number of studies from the US have shown that women in science are disadvantaged compared to men.[5–7]

The low numbers of women in science and the reasons for this anomaly is a concern for scientists and policy makers. Although the UK Medical Research Council (MRC) has a gender equality scheme, which briefly states gender equality is reflected in agreements with research organisations receiving MRC funding, it is not clear how the scheme is implemented.[8]

1
2
3
4
5
6
7 While several initiatives have aimed to increase the numbers of women involved in science,
8 there are no affirmative actions or binding policies in the UK or Europe to definitively ensure
9 women are better represented in science. Indeed, some initiatives aimed at increasing
10 women in science have been criticised. For example, in 2012, the European Commission
11 campaign targeting 13-18 year-old secondary school students[9] was rebuked and described
12 as an insult to women in science[10][11], with the offending video clip removed from the EU
13 campaign website. The effects of campaigns aimed at raising the profile of women in
14 science[12,13] have not been assessed.

15
16
17
18
19
20
21
22
23 We have previously undertaken a systematic analysis of research funding awarded to UK
24 institutions for all infectious disease research, for the 14-year period from 1997 to 2010.[14]
25 Here, we use the dataset gathered for this earlier study to examine trends over time, the
26 distribution of funding awarded to men and women principal investigators (PIs) across
27 specific infections, funder categories, and along the research and development (R&D)
28 continuum, extending from pre-clinical to clinical and operational research.

39 **Methods**

40
41 We obtained data from several sources for infectious disease research studies where
42 funding was awarded between 1997 and 2010. The methods for the original study are
43 elaborated in detail elsewhere,[14] and summarised here. We identified 325,922 studies for
44 screening that covered all areas of disease from several funders, and filtered these to
45 identify funding for infectious diseases where the lead institution was in the UK in the period
46 and the year of award 1997-2010. We obtained data from publicly available sources and
47 directly from the funders. We did not include private sector funding in the analysis, as
48 pharmaceutical sector data were not publicly available. Figure 1 shows the sources of data
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 and the numbers of studies included and excluded at each stage of screening to reach the
8 final set of studies for detailed analysis.
9

10
11
12 *Figure 1. Methodology flow chart for filtering studies firstly by infectious disease and then by*
13 *gender*
14
15

16
17
18 Data collection and cleaning took place alongside routine duties between 2006 and 2011,
19 primarily by MGH and assisted by JRF, MKC and FBW. Funding records could feasibly be
20 obtained going back to 1997, hence the decision to cover awards during 1997-2010. We
21 assigned each study to primary disease categories, and within each category, we
22 documented topic-specific subsections, including specific pathogen or disease. We allocated
23 studies to one of four categories along the R&D continuum: pre-clinical; phases I, II or III;
24 product development; and operational research, and to one of the 26 categories for funding
25 organisations.
26
27

28
29 Where the PI was named, we assigned them to men or women categories. The studies
30 where only an initial was available for the forename were assigned as “unclear” if we were
31 unable to establish the PIs gender from a review of the literature, institutional websites or
32 publicly available publications and documents.
33
34

35
36 Reference to sexually transmitted infections excludes HIV. Neglected tropical diseases were
37 categorised according to classification used by the World Health Organization (WHO)
38 (http://www.who.int/neglected_diseases/diseases/en). Antimicrobial resistance includes
39 antibacterial, antiviral, antifungal and antiparasitic studies.
40
41
42
43
44

1
2
3
4
5
6
7 We converted grants awarded in a currency other than pounds sterling to UK pounds using
8 the mean exchange rate in the year of the award. We adjusted grant funding amounts for
9 inflation and reported in 2010 UK pounds.
10

11
12
13
14 As well as excluding studies not immediately relevant to infection, we excluded unfunded
15 studies, veterinary infectious disease research studies (unless there was a zoonotic
16 component), those exploring the use of viral vectors to investigate non-communicable
17 diseases, grants for symposia or meetings, or studies with UK contributions (e.g. as a
18 collaborator), but the funding was awarded to a non-UK institution.
19
20
21
22

23
24
25
26 We used Microsoft Excel versions 2000 and 2007 to categorise studies. Where needed, data
27 were exported into Microsoft Access (versions 2000 and 2007) and specific keyword queries
28 used to select precise sections of the data for analysis. We used Stata (version 11.0) for
29 statistical analysis and to generate figures.
30
31
32

33
34
35
36 We used fold differences to compare total investment, number of studies, mean grant, and
37 median grant between men and women according to disease system, specific infection and
38 funding organisation.
39
40
41

42
43
44 We used nonparametric Mann-Whitney rank-sum test to assess the distribution of funding by
45 gender. Nonparametric K-sample test on equality of medians was applied to compare the
46 median funding by gender, and reported as a chi-squared statistic without Yates' correction
47 for continuity. Nonparametric Wilcoxon signed-rank test was applied when comparing
48 matched data, such as time trends by gender. The significance for all tests was defined at
49 the 5% level (two-sided $P=0.05$).
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 We present ~~disparities~~ differences between gender and do not attempt to investigate or
8 imply bias or inequalities as we could not access data on unsuccessful grant applications.
9

10 11 12 13 14 15 **Results**

16
17 We identified 6165 studies from the 325,922 studies screened that were suitable for
18 inclusion in our analysis. Of these, we were unable to ascertain the gender of principal
19 investigator for 30 studies (0.5%). We excluded 83 studies (1.3%) that did not specify the PIs
20 name or gender – these were funded by the Bill and Melinda Gates Foundation (Gates
21 Foundation) (38 studies; 0.6%) and the UK Department for International Development
22 (DFID) (22 studies; 0.4%), accounting for £321.2 million (12.3% of the total). We included
23 6052 studies in the final analysis, comprising 4357 grants (72.0%) awarded to men and 1695
24 grants (28.0%) awarded to women, totalling £2.274 billion, of which £1.786 billion (78.5%)
25 were awarded to men and £488 million (21.5%) awarded to women.
26
27
28
29
30
31
32
33
34
35

36 The median value of grant funding was greater for men (£179 389; IQR £59146–£371 977)
37 than for women (£125 556; IQR £30 982–£261 834). Similarly, mean value of the grant
38 funding was greater for men (£409 910; SD £840 087) than for women (£288 011; SD £704
39 474). Figure 2 shows the distribution of the total investments and median funding awarded to
40 PIs by gender over time.
41
42
43
44
45
46

47 *Figure 2a. Total investment over time awarded to male and female principal investigators*

48
49 *Figure 2b Median investment over time awarded to male and female principal investigators*
50
51
52

53 **Infectious disease system**

54
55
56
57
58
59
60

1
2
3
4
5
6
7 Table 1A (web appendix 1) shows the total investment, total numbers of studies, mean grant
8 funding, median grant funding and fold differences in funding according to nine disease
9 systems and by gender of PI. We identified no infectious disease system where women led
10 the majority of research efforts or were awarded the majority of funding. Median funding
11 awards were greater for male PIs across all infectious disease systems, with the exception
12 of neurological infections and sexually transmitted infections.
13
14
15
16
17
18
19

20 Greatest levels of funding awarded to men and to women were for research into respiratory
21 infections and HIV. Men received a total of £312.1 million for research into respiratory
22 infections compared with £84.4 million for women – a 3.70 fold difference – and a total of
23 £290.8 million for HIV research compared with £79.7 million for women – a 3.65 fold
24 difference.
25
26
27
28
29
30

31 The largest difference between total funding for men and for women was with
32 gastrointestinal infections (5.65 fold difference) where women received only 15.0% of the
33 total investment (£37.0 million) and spearheaded 18.9% (149) of the studies and
34 neurological infections (4.22 fold difference). Smallest difference between total funding for
35 men and for women was in research into sexually transmitted infections (1.90 fold
36 difference), where women received 35.0% (£45.4 million) of the total funding and led 49.0%
37 (182) of the studies.
38
39
40
41
42
43
44
45

46 Mean funding for grants was significantly greater for men (£409 910; SD £840 087) than for
47 women (£288 011; SD £704 474). The differences in median funding were statistically
48 significant ($P > 0.01$) for gastrointestinal infections (men £328 021; SD £458 720) (women
49 £248 615; SD £433 176), for haematological infections (men £417 889; SD £914 626)
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 (women £306 126; SD £819 910), and for HIV (men £649 216; SD £1 550 920) (women
8 £278 505; SD £545 657).
9

10
11
12 Median funding for grants showed a similar pattern, with significantly greater grant funding
13 for men (£179 389; IQR £59 146–£371 977) than women (£125 556; IQR £30 983–£261
14 835). Differences in median funding were statistically significant ($P > 0.05$) for
15
16 gastrointestinal infections (men £208 369; IQR £78 852–£357 771) (women £155 066; IQR
17 £43 637–£305 928), for hepatic infections (men £118 638; IQR £41 342–£269 629) (women
18 £68 620; IQR £26 720–£221 952), and for HIV (men £163 462; IQR £39 153–£511 800)
19
20 (women £114 272; IQR £29 880–£305 339).
21
22
23
24
25
26
27

28 **Specific Infections**

29
30 Table 1B (web appendix 1) shows total investment, total numbers of studies, mean grant
31 funding, median grant funding and fold differences in funding according to specific infection
32 by gender.
33
34

35 Men received significantly higher levels of total research funding, spearheaded greater
36 numbers of studies, and were awarded greater median and mean funding for grants for
37 malaria ($P = 0.01$), HIV ($P = 0.01$) and influenza ($P = 0.04$).
38
39
40
41
42

43 Major differences between total funding for men and for women were observed for research
44 into candida (47.75 fold difference), rotavirus (33.65 fold difference), campylobacter (24.33
45 fold difference) and norovirus (23.33 fold difference). Smallest differences between total
46 funding for men and women were for research into dengue (1.07 fold difference) and
47 leishmaniasis (1.55 fold difference). Women received greater total funding than men for
48 research into leprosy (0.09 fold difference), diphtheria (0.18 fold difference), chlamydia (0.36
49 fold difference), syphilis (0.37 fold difference), and varicella zoster (0.54 fold difference).
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9 Differences in mean grant funding were statistically significant ($P > 0.05$) for malaria
10 research (men £590 422; SD £1 324 909) (women £318 054; SD £726 872), for influenza
11 (men £616 643; SD £881 493) (women £387 186; SD £489 997), for respiratory syncytial
12 virus (men £485 283; SD £539 396) (women £187 931; SD £268 412), and for HIV (men
13 £649 216; SD £1 550 920) (women £278 505; SD £545 657).
14
15
16
17

18
19
20 Differences in median grant funding were statistically significant ($P > 0.05$) for malaria
21 research (men £209 646; IQR £63 826–£529 610) (women £143 358; IQR £42 754–£314
22 524), for hepatitis C (men £124 797; IQR £42 475–£289 293) (women £67 265; IQR £29
23 880–£233 467), for influenza (men £348 730; IQR £213 601–£668 561) (women £200 787;
24 IQR £124 210–£398 191), for herpes simplex virus (men £119 295; IQR £40 009–£446 395)
25 (women £309 610; IQR £147 885–£439 305), and for HIV (men £163 462; IQR £39 153–
26 £511 800) (women £114 272; IQR £29 880–£305 339).
27
28
29
30
31
32
33
34

35 Figure 3 shows the proportion of total funding awarded to principal investigators by gender
36 over time and a breakdown of investment by research pipeline. The proportion of the total
37 funding awarded to women ranged from 14.3% (in 1998) to 26.8% (in 2009), with a mean
38 proportion of 21.4% for the period studied. The proportion of funding was lowest for pre-
39 clinical research at 18.2% (£285.5 million of £1.573 billion total) and highest for operational
40 research at 30.9% (£151.4 million of £489.7 million). The funding for clinical (Phase I, II and
41 III) research was 29.9% (£25.5 of £85.2) and for product development amounted to 20.4%
42 (£25.8 million of £126.6 million).
43
44
45
46
47
48
49
50
51

52 *Figure 3a. Proportion of investment over time awarded to male and female principal*
53 *investigators*
54
55
56
57
58
59
60

1
2
3
4
5
6
7 *Figure 3b. Total investment by research pipeline awarded to male and female principal*
8 *investigators*
9

10 11 12 13 **Funding organisation**

14
15 Table 2 (web appendix 2) shows in detail the total investment, total numbers of studies,
16 mean grant funding, median grant funding and fold differences in funding according to
17 funding organisation and by gender.
18
19

20
21
22 Public funding organisations invested a total of £1.025 billion in research led by men (78.6%)
23 and £279.8 in research led by women (21.4%). Greatest levels of funding awarded to men
24 and to women were by the Wellcome Trust and the UK MRC. Major differences between
25 funding awarded to men and to women PIs were by the BBSRC, with a 6.12 fold difference.
26
27 Smallest differences between funding awarded to men and to women were by the UK
28 Government funding streams such as the National Institute for Health Research, with a 1.66
29 fold difference. Mean grant funding from public funding organisations were significantly
30 greater for men at £595 361 (SD £1 080 718) than for women at £448 414 (SD £814 979).
31
32 Differences were also statistically significant ($P > 0.01$) for UK MRC grants with men at £751
33 413 (SD £1 020 748) and women at £544 427 (SD £884 442), and for UK Government
34 grants with men at £208 828 (SD £492 519) and women at £182 907 (SD £619 889).
35
36
37
38
39
40
41
42
43
44

45 Median grant funding from public funding organisations had a similar pattern with
46 significantly greater grant funding for men at £272 452 (IQR £138 322–£572 529) and
47 women at £213 718 (IQR £92 880–£402 917). Differences were also statistically significant
48 ($P > 0.05$) for UK MRC grants with men at £404 615 (IQR £ 210 068–£811 860) and women
49 at £286 679 (£178 182–£468 998), and for UK Government grants with men at £129 660
50 (IQR £23 761–£207 320) and women at £59 976 (IQR £12 564–£157 053).
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9 Philanthropic funding organisations invested a total of £691.7 million in research led by men
10 (78.8%) and £185.9 million in research led by women (21.2%).
11

12
13
14 Mean grant funding from philanthropic funding organisations were significantly greater for
15 men at £338 396 (SD £695 025) than for women at £242 014 (SD £711 420). Differences
16 were also statistically significant ($P > 0.01$) for Wellcome Trust grants with men receiving
17 £393 652 (SD £723 549) and women £230 168 (SD £362 836), and for other charitable
18 funding organisations with men receiving £211 190 (SD £454 108) and women £271 842
19 (SD £1 208 852).
20
21
22
23
24
25

26
27
28 Median grants from philanthropic funding organisations showed a similar pattern with
29 significantly greater grant funding for men at £153 653 (IQR £58 589 – £302 774) and
30 women at £114 173 (IQR £42 658 – £222 842). Differences were also statistically significant
31 ($P > 0.05$) for Wellcome Trust grants with men receiving £191 461 (IQR £74 759 – £362
32 424) and women £137 241 (IQR £54 019 – £250 723), and for other charitable funding
33 organisations with men receiving £91 991 (IQR £36 429 – £172 497) and women £76 058
34 (IQR £17 279 – £150 727).
35
36
37
38
39
40
41
42

43 Figure 4 shows the association between funding organisation and total investment and
44 median funding by gender. The MRC awarded the highest median amount in grants to
45 women (£286 679; IQR £178 182–£468 998), but the median funding amount in grants for
46 men were 1.41 fold higher than that awarded to women (£404 615; IQR £210 068–£811
47 860). European Commission awarded the highest mean grants to women at £923 364 (SD
48 £1 316 016) however mean funding amount in grants for men were 1.44 fold higher at £1325
49 149 (SD £2 409 860) than that for women.
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 *Figure 4a. Association between funding organisation and total investment by gender*

8
9 *Figure 4b. Association between funding organisation and median award by gender*

10
11
12
13 *Time trend*

14
15 Table 3 (web appendix 3) shows in detail the trends in funding over time from 1997 to 2010
16 by gender of principal investigators, with amounts and relative proportions each year of
17 funding. Mean annual funding received was greater by men at £127.6 million (SD £48.7
18 million) than women at £34.9 million (SD £13.4 million). Proportions of annual funding
19 received by men ranged from 73.2% to 85.7%, with a mean of 78.6%.

20
21
22
23
24
25
26
27 Proportions of annual funding received by women ranged from 14.3% to 26.8% with a mean
28 of 21.4%. The largest annual funding received by men was £245.7 million in 2000, and the
29 smallest at £64.2 million in 1997. The largest annual funding received by women was £59.6
30 million in 2002, with the smallest at £13.1 million in 1998.

31
32
33
34
35
36 Over the 14-year study period, the proportion of investment awarded to women each year
37 remains relatively unchanged with a mean of 21.4% of total (range 14.3%–26.8%; £13.1
38 million to £59.6 million). Figure 5 shows the funding trends over time and fold differences in
39 total investments by gender. Absolute difference in the funding amounts in the grants
40 awarded to men and women ranges between £47.9 million and £190.1 million, with a mean
41 difference of £92.7 million (SD £38.3 million). Fold difference in grant funding for men and
42 women ranged from 2.74 to 5.97, with a mean fold difference of 3.66.

43
44
45
46
47
48
49 *Figure 5a. Total investment and trend over time, by gender*

50
51
52 *Figure 5b. Fold difference of investment over time, by gender*

Discussion

We present the first detailed and systematic analysis-comparison by gender-sex of investments in infectious disease research in the UK for the 14-year period 1997-2010. We identified 6165 studies funded by public and philanthropic funding organisations, with total research investment of £2.6 billion.

We quantified the differences in research funding awarded by gender to show these to be substantial. The analysis shows clear and consistent disparities-differences between men and women principal investigators, with lower funding in terms of the total investment, the number of funded studies, the median funding awarded and the mean funding awarded across most of the infectious disease areas funded. Women received less funding in absolute amounts and in relative terms, by funder and the type of science funded along the R&D pipeline. These disparities-differences in funding between men and women persist over time.

We show large disparities-differences in median funding amounts for men and women researchers in investments by the European Commission and the MRC. Such differences were much less apparent when comparing funding from the Department of Health and BBSRC, although the BBSRC awarded 86% of funding to men. The BBSRC almost entirely funds pre-clinical research,[14] and this matches the increased proportions of pre-clinical studies being led by male principal investigators.

Our findings in infectious disease research, the most detailed to date, provide new evidence on disparities-differences between men and women researchers, to reinforce the concerns raised in earlier studies.[4, 15, 16] Disparities-Differences that are more marked at senior

1
2
3
4
5
6
7 levels of academia need to be investigated to explain and account for the observed
8 differences.
9

10
11
12 The reasons why the median awards across most infectious disease conditions should be
13 significantly less for women principal investigators cannot be deduced from the available
14 data. Thus, it is not possible to recommend interventions to address this phenomenon, given
15 that it is unclear if there is any bias, or precisely what mechanisms are at play. The next step
16
17
18
19 may be to investigate success rates by gender to assess how many women are applying,
20 and what proportion of the initial request for funding is actually allocated.
21
22
23

24
25
26 There have been suggestions that women are systematically less ambitious in the amounts
27 of funding requested in their grant applications when compared with men who are
28 equivalently ranked academically, and that relatively simple mentoring programmes could at
29 least partially overcome this anomaly.[3] However, there is no evidence supporting these
30 assertions. Others have suggested that systems which ensure PI anonymity during review of
31 grant funding submissions may help reduce the presence of any subtle gender biases[17],
32 though in practice this approach would be challenging as the experience of the PI is a key
33 factor when considering suitability of request for research support. However, evidence on
34 effective interventions to address barriers for women scientists are lacking.[16] Women of
35 child-bearing age are being disadvantaged in some areas of employment, even though in
36 relation to scientific endeavour, productivity as measured by published outputs is not
37 significantly different between women with and without children.[15]
38
39
40
41
42
43
44
45
46
47
48

49 *Study limitations*
50
51
52
53
54
55
56
57
58
59
60

Formatted: Font: (Default) Arial, 11 pt

Formatted: Font: (Default) Arial, 11 pt

1
2
3
4
5
6
7 Our analysis has several limitations. We rely on the accuracy of the original data from the
8 funding organisations and as described elsewhere we have excluded data from the private
9 sector as the publicly available data are incomplete.[14]
10
11

12
13
14 In the period analysed, we were not able to find data on the number of men and women PIs
15 requesting financial support for research agencies from the funding sources studies. Hence,
16 we were unable to assess the success and failure rates by gender. We also did not have
17 complete data on the amount of funding initially requested, the gender of co-applicants for
18 each study, the total pool of researchers in each disease area and within each type of
19 science, or the proportion of awards made to clinical and non-clinical researchers, all of
20 which would be useful pieces of information in developing a clearer picture of the reasons for
21 the presented differences. The proportion of doctors registered in the UK favours men
22 (56.8% as of January 2013) over women,[18] but the proportion of those carrying out
23 research appears to be unknown. Understanding the distribution of researchers is critical to
24 understanding the research landscape.
25
26
27
28
29
30
31
32
33
34
35

36 We lacked data on the academic ranking of principal investigators and were hence unable to
37 adjust for levels of seniority across both genders. We were unable to get data on gender
38 from the Gates Foundation and DFID and hence were unable to clarify the gender of a small
39 proportion of investigators, though we believe this limitation is not likely to change the
40 conclusions of the study. Our analysis focuses on infectious disease research, and analysis
41 of other areas of scientific research would be needed if these ~~disparities-differences~~
42 persisted for all research areas.
43
44
45
46
47
48
49
50

51 **Conclusions**

52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7 Notwithstanding limitations, our systematic analysis shows unequal distribution of
8 investments in infectious disease research for men and women. There are fewer women
9 receiving funding as principal investigators in infectious disease research, with fewer studies
10 funded with lower funding amounts when successful.
11
12

13
14
15
16 Although earlier studies have discussed possible solutions, including mentoring programmes
17 and advertising campaigns, none have systematically explored the reasons why such
18 differences persist. Hence, without an understanding of the reasons for the observed
19 ~~disparities~~differences, the proposed solutions are not very meaningful. There is no evidence
20 that women and men researchers are not equally able, hence, other factors are likely to be
21 at play to explain the observed ~~disparities~~differences which have persisted over the 14-year
22 study period. From our data, the limitations mean that we cannot explain what these
23 mechanisms might be. Research is needed to elucidate an understanding of the factors that
24 can explain the observed ~~disparities~~differences. A sub-analysis of our dataset where
25 information on academic rank at time of award is obtained would allow for more meaningful
26 conclusions. We strongly urge policy makers, funders and scientists to urgently investigate
27 the factors leading to the observed ~~disparities~~differences and develop policies developed to
28 address them, in order to ensure that women are appropriately supported in scientific
29 endeavour.
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45

46 **Funding**

47
48 This research received no specific grant from any funding agency in the public, commercial
49 or not-for-profit sectors
50

54 **Author contribution**

55
56
57
58
59
60

1
2
3
4
5
6
7 MGH designed the study with input from RA and JF and collated the dataset. JRF, FW and
8 MKC checked and refined the dataset. JRF undertook data analysis and created the graphs
9 and figures with input from MGH and RA. MGH, JRF, and RA interpreted the data and wrote
10 the first draft. MGH, JRF, and RA refined the analysis and paper with input from MKC and
11 FBW. All authors reviewed and approved the final version. MH is guarantor of the paper.
12
13
14

15 **Competing interests**

16
17
18 RA has received research funding from the UK Medical Research Council, the UK National
19 Institute for Health Research, UK CRC, UK EPSCRC, the UK Department for International
20 Development and the UK Department of Health. RA is a member of the UL Medical
21 Research Council Global Health Group. MGH works for the Infectious Disease Research
22 Network, which has supported this work and is funded by the UK Department of Health. JRF
23 has received funds from the Wellcome Trust and is a steering group member for the
24 Infectious Disease Research Network. MKC has received funding from the Medical
25 Research Council and the Bill & Melinda Gates Foundation. FBW has received funds from
26 UCLH Charitable Foundation.
27
28
29
30
31
32
33

34 **Acknowledgements**

35
36 We thank Jennifer Harris and Raidah Haider for their input and assistance, and acknowledge
37 the assistance of the research and development funding agencies for provision of data.
38
39

40 **Data-sharing statement**

41
42 All gender data is available with this submission. Further data relating to the Research
43 Investments project can be found at www.researchinvestments.org or by contacting the
44 corresponding author.
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

- 1 More women in senior positions. Key to economic stability and growth. European Commission, Luxembourg: 2010.
- 2 Blake M, La Valle I. Who applies for research funding? Key factors shaping funding application behaviour among women and men in British higher education institutions. London: 2000.
- 3 Bedi G, Van Dam NT, Munafo M. Gender inequality in awarded research grants. *Lancet* 2012;**380**:474.
- 4 Fitzpatrick S. A Survey of Staffing Levels of Medical Clinical Academics in UK Medical Schools as at 31 July 2011. London: 2012. http://www.medschools.ac.uk/Publications/Documents/MSC_Clinical_Academic_Staff_Survey_310711.pdf (date accessed 22 August 2013)
- 5 Burrelli J. Thirty-Three Years of Women in S&E Faculty Positions - US National Science Foundation. Arlington: 2008. <http://www.nsf.gov/statistics/infbrief/nsf08308/> (date accessed 22 August 2013)
- 6 Lincoln AE, Pincus SH, Leboy PS. Scholars' awards go mainly to men. *Nature* 2011;**469**:472.
- 7 Pohlhaus JR, Jiang H, Sutton J. Sex differences in career development awardees' subsequent grant attainment. *Annals of internal medicine* 2010;**152**:616–7; author reply 617.
- 8 Medical Research Council. MRC Gender Equality Scheme. 2007. <http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC003655> (date accessed 22 August 2013).
- 9 European Commission. About this site- Science: It's a girl thing! 2012. <http://science-girl-thing.eu/en/about-this-site> (date accessed 22 August 2013)
- 10 Gill M. "Science, it's a girl thing!" says EU Commission, holding lipstick and bunsen burner. *New Statesman*. 2012. <http://www.newstatesman.com/blogs/martha-gill/2012/06/science-its-girl-thing-says-eu-commission-holding-lipstick-and-bunsen-burn> (date accessed 22 August 2013).
- 11 Swain F. Science: It's a girl thing. Excuse me while I die inside. – SciencePunk. ScienceBlogs. 2012. <http://scienceblogs.com/sciencepunk/2012/06/22/science-its-a-girl-thing-excuse-me-while-i-die-inside/> (date accessed 22 August 2013)
- 12 Yong E. Edit-a-thon gets women scientists into Wikipedia. *Nature*. 2012. <http://www.nature.com/news/edit-a-thon-gets-women-scientists-into-wikipedia-1.11636> (date accessed 22 August 2013)
- 13 Donald A. Throw off the cloak of invisibility. *Nature* 2012;**490**:447. <http://www.nature.com/news/throw-off-the-cloak-of-invisibility-1.11638> (date accessed 22 August 2013).

- 1
2
3
4
5
6
7 14 Head MG, Fitchett JR, Cooke MK, *et al.* UK investments in global infectious disease
8 research 1997-2010: a case study. *The Lancet infectious diseases* Published Online
9 First: 7 November 2012.
- 10 15 Fox MF. Gender, Family Characteristics, and Publication Productivity among
11 Scientists. *Social Studies of Science* 2005;**35**:131–50.
- 12 16 Ceci SJ, Williams WM. Understanding current causes of women's
13 underrepresentation in science. *Proceedings of the National Academy of Sciences of*
14 *the United States of America* 2011;**108**:3157–62.
- 15 17 Moss-Racusin CA, Dovidio JF, Brescoll VL, *et al.* Science faculty's subtle gender
16 biases favor male students. *Proceedings of the National Academy of Sciences of the*
17 *United States of America* 2012;**109**:16474–9.
- 18 18 List of Registered Medical Practitioners - statistics. General Medical Council.
19 http://www.gmc-uk.org/doctors/register/search_stats.asp (date accessed 22 August
20 2013).
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



Figure 1. Methodology flow chart
90x119mm (300 x 300 DPI)

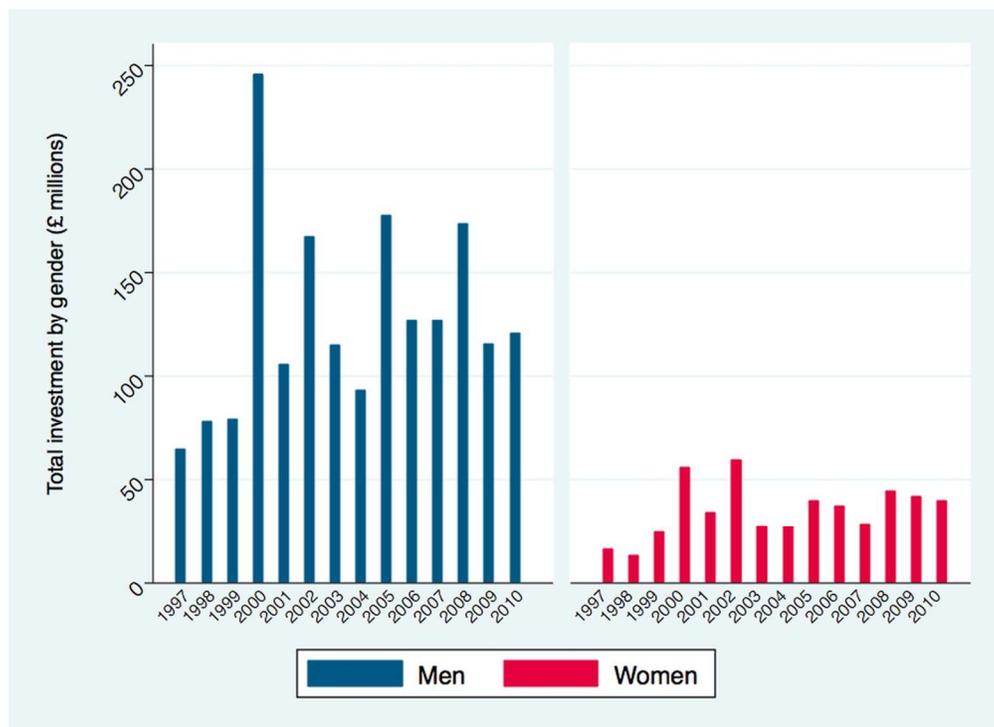


Figure 2a. Total investment over time awarded to male and female principal investigators
123x90mm (300 x 300 DPI)

View only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

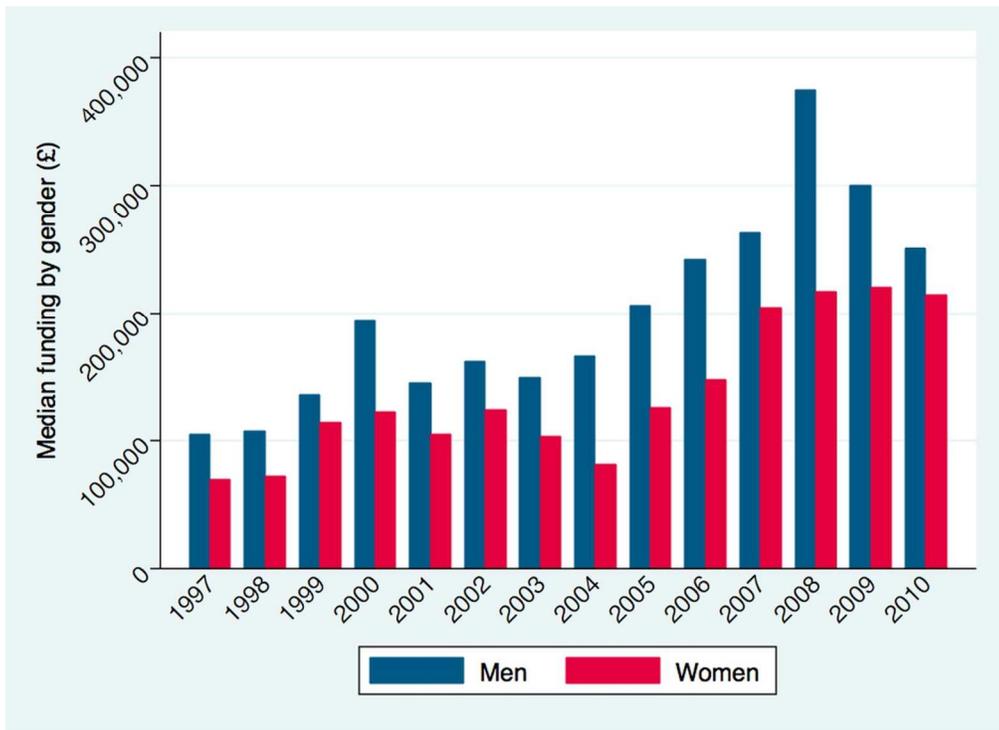


Figure 2b Median investment over time awarded to male and female principal investigators
123x90mm (300 x 300 DPI)

View only

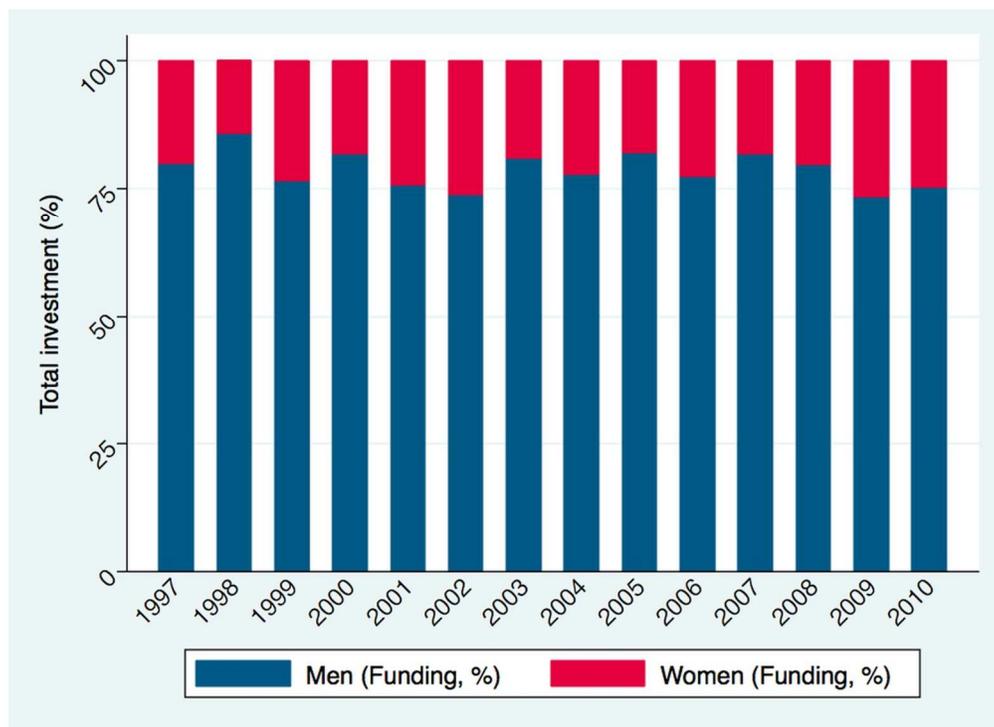
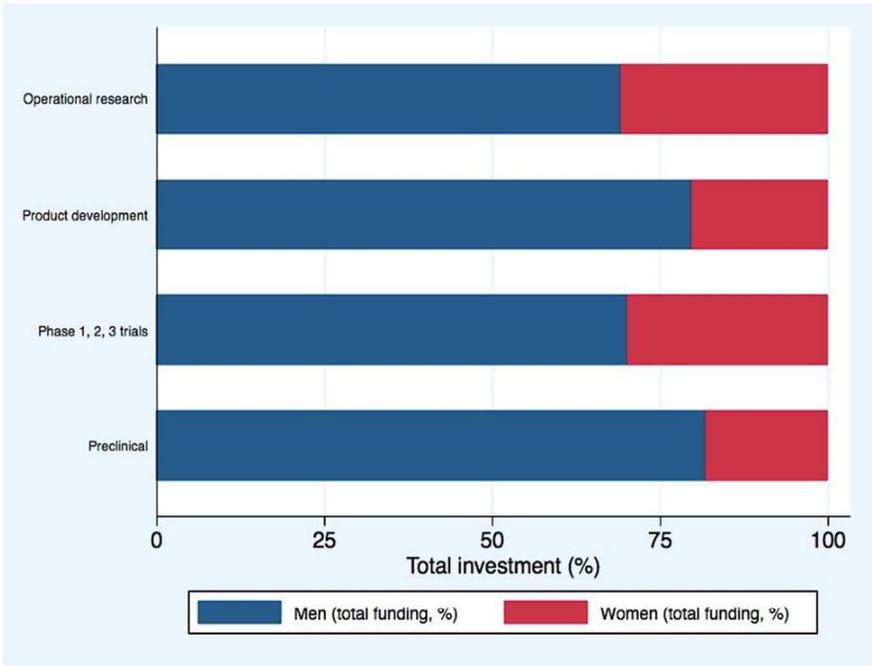


Figure 3a. Proportion of investment over time awarded to male and female principal investigators
123x90mm (300 x 300 DPI)

View only

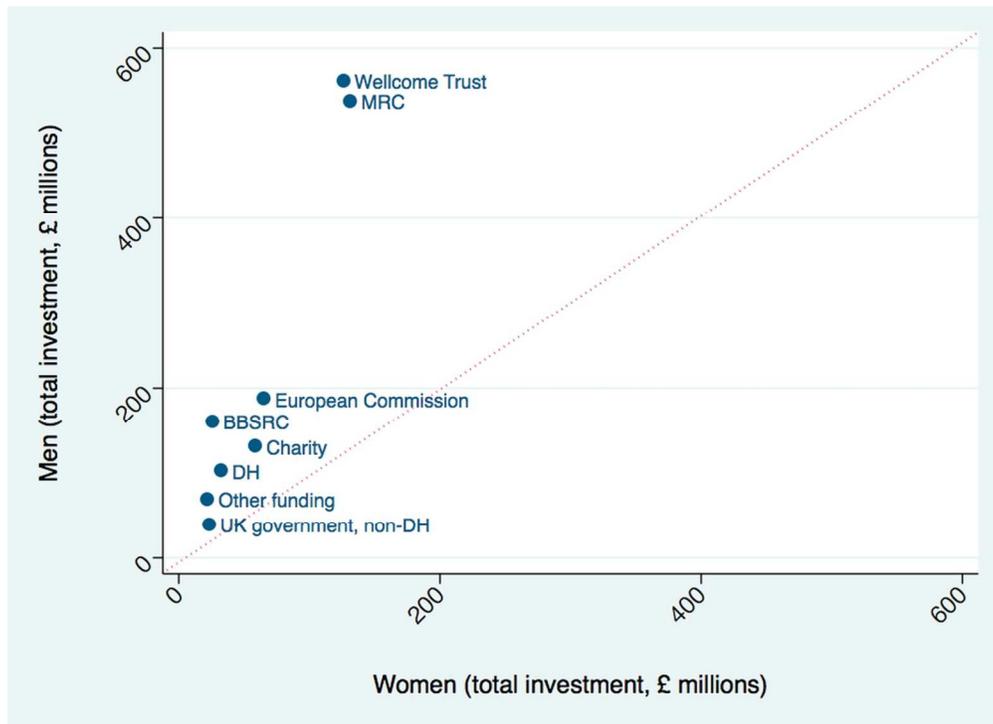
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



119x90mm (300 x 300 DPI)

Review only

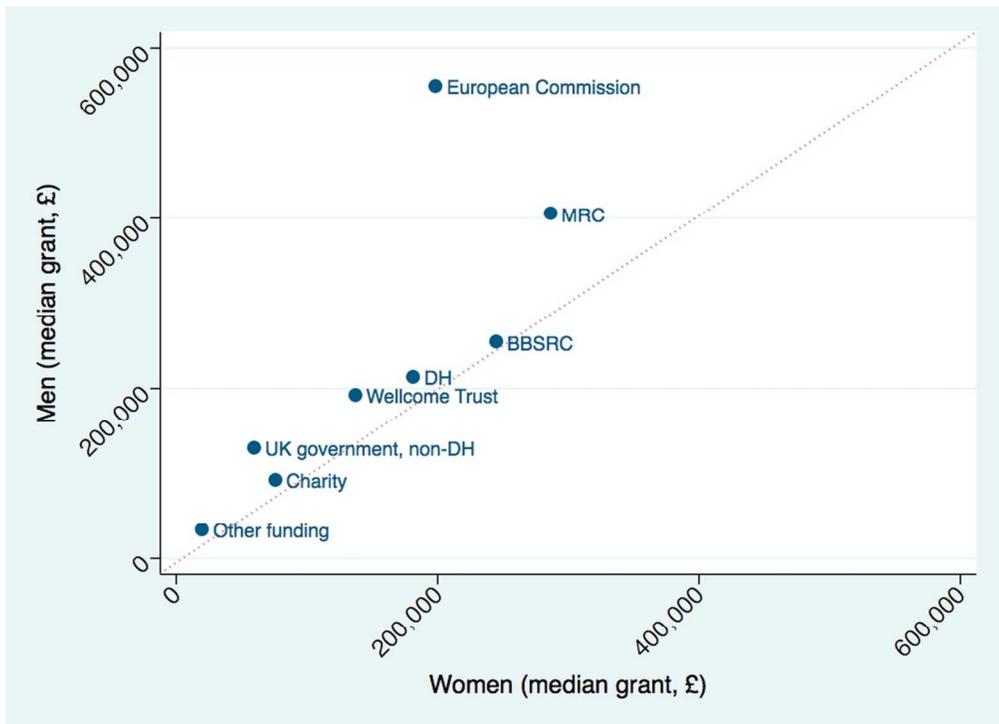
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



123x90mm (300 x 300 DPI)

view only

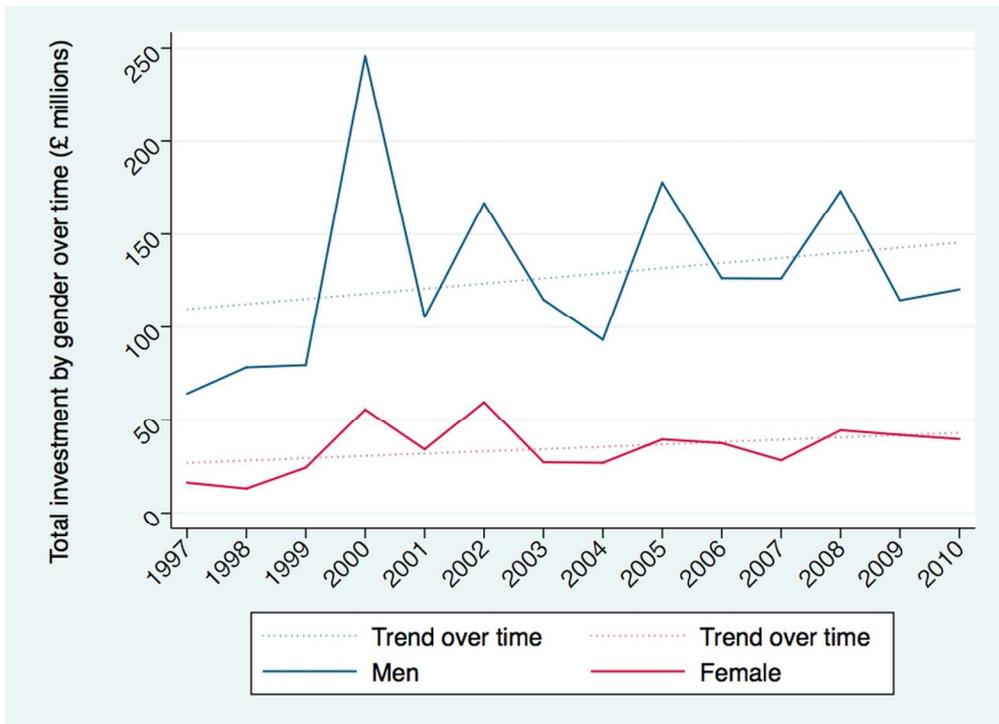
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



123x90mm (300 x 300 DPI)

View only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60



123x90mm (300 x 300 DPI)

View only

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

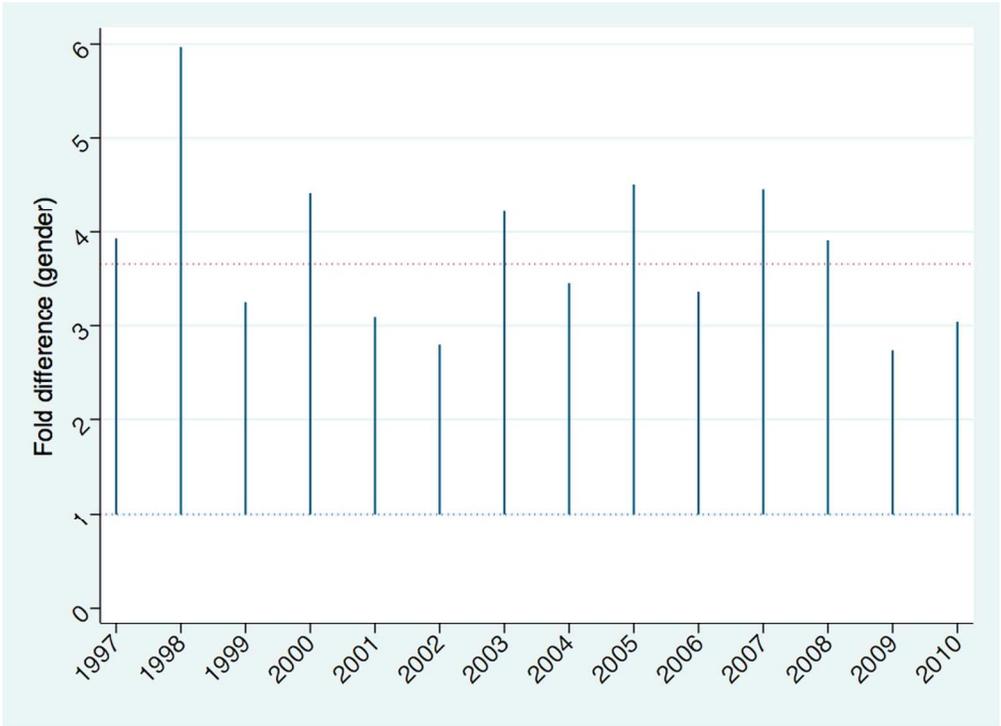


Figure 5b. Fold difference of investment over time, by gender
123x90mm (300 x 300 DPI)

| Disease system | Investment (total); £ (%) | Investment (male); £ (%) | Investment (female); £ | Fold differenc | Studies (total): n | Studies (male): £ | Studies (female): n | Fold differenc | Mean grant (total); £ | Mean grant (male); £ | Mean grant (female); £ | Fold differenc | P | Median grant (total); £ (IQR) | Median grant (male); £ | Median grant (female); £ | Fold differenc | Chi-squar | P |
|----------------------------------|---------------------------|--------------------------|------------------------|----------------|--------------------|-------------------|---------------------|----------------|-----------------------|----------------------|------------------------|----------------|------|-------------------------------|------------------------|--------------------------|----------------|-----------|------|
| 1 Gastrointestinal infections | 248,971,849 | 209,315,616 | 37,043,642 | 5.65 | 799 | 638 | 149 | 4.28 | 315,154 | 328,081 | 248,615 | 1.32 | 0.01 | 199,043 | 208,369 | 155,066 | 1.34 | 6.87 | 0.01 |
| 2 | 9.6% | 85.0% | 15.0% | | 12.9% | 81.1% | 18.9% | | 457,988 | 458,720 | 433,176 | | | 721,37-351,372 | 78,852-357,771 | 43,637-305,928 | | | |
| 3 | | | | | | | | | | | | | | | | | | | |
| 4 Haematological infections | 413,489,870 | 225,660,012 | 56,021,079 | 4.03 | 742 | 540 | 183 | 2.95 | 557,264 | 417,889 | 306,126 | 1.37 | 0.01 | 157,280 | 160,655 | 121,353 | 1.32 | 3.15 | 0.08 |
| 5 | 15.9% | 80.1% | 19.9% | | 12.0% | 74.7% | 25.3% | | 2,179,537 | 914,626 | 819,910 | | | 157,280-362,727 | 54,244-366,799 | 32,207- 271,883 | | | |
| 6 Hepatic infections | 73,965,716 | 57,998,793 | 15,618,661 | 3.71 | 322 | 229 | 90 | 2.54 | 229,707 | 253,270 | 173,541 | 1.46 | 0.07 | 114,621 | 118,638 | 68,620 | 1.73 | 3.82 | 0.05 |
| 7 | 2.8% | 78.8% | 21.2% | | 5.2% | 71.8% | 28.2% | | 375,988 | 418,392 | 237,165 | | | 40,076-244,293 | 41,342-269,629 | 26,270-221,952 | | | |
| 8 Neglected tropical diseases | 229,606,965 | 118,477,812 | 37,747,437 | 3.14 | 392 | 280 | 105 | 2.67 | 564,145 | 418,439 | 406,270 | 1.03 | 0.28 | 249,458 | 257,736 | 199,648 | 1.29 | 0.82 | 0.36 |
| 9 | 8.8% | 75.8% | 24.2% | | 6.4% | 72.7% | 27.3% | | 2,104,383 | 509,169 | 667,547 | | | 91,196-451,453 | 82,786-429,781 | 107,474-413,242 | | | |
| 10 Neurological infections | 101,885,586 | 79,281,163 | 18,779,321 | 4.22 | 339 | 268 | 67 | 4.00 | 300,548 | 295,825 | 280,288 | 1.06 | 0.67 | 155,404 | 153,724 | 166,514 | 0.92 | 0.19 | 0.66 |
| 11 | 3.9% | 80.8% | 19.2% | | 5.5% | 80.0% | 20.0% | | 463,870 | 474,995 | 329,198 | | | 64,434-334,128 | 64,702-298,669 | 33,886-399,971 | | | |
| 12 Ocular infections | 7,407,218 | 5,788,089 | 1,619,129 | 3.57 | 36 | 24 | 12 | 2.00 | 205,756 | 241,170 | 134,927 | 1.79 | 0.92 | 120,849 | 146,169 | 102,901 | 1.42 | 0.00 | 1.00 |
| 13 | 0.3% | 78.1% | 21.9% | | 0.6% | 66.7% | 33.3% | | 280,206 | 327,354 | 132,475 | | | 7,860-293,837 | 6,344-348,501 | 23,666-232,501 | | | |
| 14 Respiratory infections | 418,838,875 | 312,055,217 | 84,436,423 | 3.70 | 1,190 | 897 | 272 | 3.30 | 351,375 | 347,888 | 310,428 | 1.12 | 0.13 | 158,966 | 165,813 | 142,281 | 1.17 | 1.87 | 0.17 |
| 15 | 16.1% | 78.7% | 21.3% | | 19.3% | 76.7% | 23.3% | | 661,990 | 624,555 | 558,282 | | | 50,203-342,049 | 56,715-344,512 | 36,236-311,548 | | | |
| 16 Sexually-transmitted infectio | 138,616,211 | 86,016,584 | 45,352,512 | 1.90 | 380 | 190 | 182 | 1.04 | 366,710 | 452,719 | 249,190 | 1.82 | 0.34 | 94,790 | 93,495 | 101,785 | 0.92 | 0.17 | 0.68 |
| 17 | 5.3% | 65.5% | 34.5% | | 6.2% | 51.1% | 48.9% | | 958,450 | 1,142,638 | 647,494 | | | 15,332-241,505 | 18,389-257,441 | 14,480-204,559 | | | |
| 18 HIV | 477,555,690 | 290,848,557 | 79,652,343 | 3.65 | 760 | 448 | 286 | 1.57 | 625,073 | 649,216 | 278,505 | 2.33 | 0.01 | 147,404 | 163,462 | 114,272 | 1.43 | 3.87 | 0.05 |
| 19 | 18.4% | 78.5% | 21.5% | | 12.3% | 61.0% | 39.0% | | 2,276,762 | 1,550,920 | 545,657 | | | 37,195-395,644 | 39,153-511,800 | 29,880-305,339 | | | |
| 20 Overall | 2,599,985,851 | 1,785,979,172 | 488,178,602 | 3.66 | 6,170 | 4,357 | 1,695 | 2.57 | 421,733 | 409,910 | 288,011 | 1.42 | 0.01 | 158,055 | 179,389 | 125,556 | 1.43 | 74.40 | 0.01 |
| 21 | | 78.53% | 21.47% | | | 71.99% | 28.01% | | 1,315,935 | 840,087 | 704,474 | | | 49,490-352,699 | 59,146-371,971 | 30,983-261,835 | | | |
| 22 | | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | | | | | | | | |

| Specific infection | Investment (total): £ (%) | Investment (male): £ (%) | Investment (female): £ (%) | Fold differen | Studies (total): n | Studies (male): £ | Studies (female): n | Fold differen | Mean grant (total): £ | Mean grant (male): £ | Mean grant (female): £ | Fold differen | P | Median grant (total): £ (IQR) | Median grant (male): £ (IQR) | Median grant (female): £ | Fold differen | Chi-square | P | |
|------------------------------------|------------------------------------|--------------------------|----------------------------|---------------|--------------------|-------------------|---------------------|---------------|-----------------------|----------------------|------------------------|---------------|------|-------------------------------|------------------------------|--------------------------|-----------------|------------|------|------|
| <i>Gastrointestinal infections</i> | | | | | | | | | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | |
| 3 | Campylobacter | 24,116,021 | 23,164,038 | 951,983 | 24.33 | 87 | 80 | 7 | 11.43 | 277,196 | 289,551 | 135,998 | 2.13 | 0.13 | 221,532 | 228,164 | 49,000 | 4.66 | 1.32 | 0.25 |
| 4 | | #VALUE! | 96.1% | 3.9% | | 2.2% | 92.0% | 8.0% | | 408,655 | 421,925 | 156,276 | | | 90,341-311,497 | 92,885-311,530 | 3,435-305,928 | | | |
| 5 | Clostridium | 29,751,310 | 31,657,635 | 2,361,459 | 13.41 | 72 | 58 | 15 | 3.87 | 453,647 | 524,175 | 157,431 | 3.33 | 0.07 | 204,389 | 218,177 | 80,431 | 2.71 | 2.06 | 0.15 |
| 6 | | #VALUE! | 93.1% | 6.9% | | 1.8% | 79.5% | 20.5% | | 796,207 | 868,222 | 178,916 | | | 42,630-415,635 | 49,750-451,158 | 8,256-316,326 | | | |
| 7 | E. coli | 25,589,407 | 23,913,566 | 2,392,586 | 9.99 | 106 | 95 | 12 | 7.92 | 245,852 | 251,722 | 199,382 | 1.26 | 0.16 | 206,784 | 217,705 | 132,232 | 1.65 | 3.25 | 0.07 |
| 8 | | #VALUE! | 90.9% | 9.1% | | 2.7% | 88.8% | 11.2% | | 209,792 | 212,046 | 192,964 | | | 117,440-329,159 | 132,815-331,037 | 84,455-262,238 | | | |
| 9 | Helicobacter | 15,109,554 | 12,488,366 | 2,617,778 | 4.77 | 101 | 78 | 22 | 3.55 | 149,600 | 160,107 | 118,990 | 1.35 | 0.64 | 83,986 | 87,694 | 83,533 | 1.05 | 0.00 | 1.00 |
| 10 | | #VALUE! | 82.7% | 17.3% | | 2.6% | 78.0% | 22.0% | | 214,832 | 232,566 | 138,013 | | | 11,555-187,678 | 11,555-191,570 | 11,647-187,678 | | | |
| 11 | Norovirus | 5,102,250 | 4,892,527 | 209,723 | 23.33 | 12 | 10 | 2 | 5.00 | 425,188 | 489,253 | 104,861 | 4.67 | 0.28 | 200,621 | 265,972 | 104,861 | 2.54 | 2.40 | 0.12 |
| 12 | | #VALUE! | 95.9% | 4.1% | | 0.3% | 83.3% | 16.7% | | 568,372 | 604,564 | 133,320 | | | 91,363-435,732 | 93,571-496,514 | 10,590-199,133 | | | |
| 13 | Rotavirus | 5,883,445 | 6,004,983 | 178,450 | 33.65 | 18 | 17 | 2 | 8.50 | 325,444 | 353,234 | 89,225 | 3.96 | 0.23 | 164,690 | 179,066 | 89,225 | 2.01 | 2.01 | 0.16 |
| 14 | | #VALUE! | 97.1% | 2.9% | | 0.5% | 89.5% | 10.5% | | 414,279 | 429,739 | 98,723 | | | 114,718-299,988 | 134,988-299,988 | 19,417-159,033 | | | |
| 15 | Salmonella | 55,716,287 | 48,902,187 | 6,814,100 | 7.18 | 145 | 123 | 22 | 5.59 | 384,250 | 397,579 | 309,732 | 1.28 | 0.95 | 256,185 | 258,483 | 255,602 | 1.01 | 0.18 | 0.67 |
| 16 | | #VALUE! | 87.8% | 12.2% | | 3.7% | 84.8% | 15.2% | | 474,060 | 500,122 | 284,742 | | | 132,107-431,762 | 109,210-440,900 | 155,066-361,873 | | | |
| 17 | Shigella | 3,292,442 | 2,270,191 | 1,022,251 | 2.22 | 9 | 6 | 3 | 2.00 | 365,827 | 378,365 | 340,750 | 1.11 | 1.00 | 211,456 | 214,819 | 211,456 | 1.02 | 0.23 | 0.64 |
| 18 | | #VALUE! | 69.0% | 31.0% | | 0.2% | 66.7% | 33.3% | | 335,500 | 374,690 | 312,800 | | | 134,251-658,278 | 134,251-658,278 | 113,326-697,470 | | | |
| 19 | <i>Haematological infections</i> | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | |
| 21 | EBV | 45,310,414 | 36,908,000 | 7,692,800 | 4.80 | 147 | 115 | 31 | 3.71 | 305,485 | 320,939 | 248,155 | 1.29 | 0.36 | 156,697 | 158,107 | 154,947 | 1.02 | 0.04 | 0.84 |
| 22 | | #VALUE! | 82.8% | 17.2% | | 3.7% | 78.8% | 21.2% | | 430,746 | 459,332 | 301,211 | | | 49,657-364,013 | 65,350-364,013 | 12,342-364,199 | | | |
| 23 | Listeria | 4,751,097 | 3,146,834 | 1,731,229 | 1.82 | 10 | 8 | 3 | 2.67 | 443,460 | 393,354 | 577,076 | 0.68 | 0.41 | 239,595 | 236,570 | 605,470 | 0.39 | 0.75 | 0.39 |
| 24 | | #VALUE! | 64.5% | 35.5% | | 0.3% | 72.7% | 27.3% | | 353,486 | 359,163 | 369,384 | | | 126,966-705,717 | 113,867-634,775 | 194,315-931,444 | | | |
| 25 | Malaria | 346,180,494 | 211,961,339 | 40,710,857 | 5.21 | 501 | 359 | 128 | 2.80 | 700,143 | 590,422 | 318,054 | 1.86 | 0.01 | 203,348 | 209,646 | 143,358 | 1.46 | 4.13 | 0.04 |
| 26 | | #VALUE! | 83.9% | 16.1% | | 12.7% | 73.7% | 26.3% | | 2,283,790 | 1,324,909 | 726,872 | | | 59,122-500,817 | 63,826-529,610 | 42,754-314,524 | | | |
| 27 | <i>Hepatic infections</i> | | | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | | | | |
| 29 | CMV | 28,369,415 | 26,102,458 | 1,911,586 | 13.65 | 68 | 55 | 12 | 4.58 | 417,197 | 474,590 | 159,299 | 2.98 | 0.06 | 188,607 | 201,658 | 107,488 | 1.88 | 1.48 | 0.22 |
| 30 | | #VALUE! | 93.2% | 6.8% | | 1.7% | 82.1% | 17.9% | | 656,508 | 714,181 | 178,655 | | | 100,221-392,186 | 116,516-608,024 | 23,605-223,834 | | | |
| 31 | Hepatitis B | 11,768,095 | 7,512,333 | 4,215,080 | 1.78 | 68 | 45 | 22 | 2.05 | 173,060 | 166,941 | 191,595 | 0.87 | 0.89 | 65,624 | 68,646 | 52,873 | 1.30 | 0.19 | 0.66 |
| 32 | | #VALUE! | 64.1% | 35.9% | | 1.7% | 67.2% | 32.8% | | 287,576 | 294,644 | 284,042 | | | 19,659-209,501 | 19,615-202,317 | 19,703-221,952 | | | |
| 33 | Hepatitis C | 59,727,829 | 47,621,165 | 11,799,084 | 4.04 | 235 | 167 | 66 | 2.53 | 254,161 | 285,157 | 178,774 | 1.60 | 0.07 | 116,883 | 124,797 | 67,265 | 1.86 | 5.22 | 0.02 |
| 34 | | #VALUE! | 80.1% | 19.9% | | 5.9% | 71.7% | 28.3% | | 418,722 | 469,807 | 242,710 | | | 41,342-269,629 | 42,475-289,293 | 29,880-233,467 | | | |
| 35 | <i>Neglected tropical diseases</i> | | | | | | | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | | | | | | | | |
| 37 | African trypanosomiasis | 48,082,259 | 34,546,175 | 4,478,699 | 7.71 | 116 | 61 | 13 | 4.69 | 563,175 | 566,331 | 344,515 | 1.64 | 0.54 | 262,145 | 256,771 | 265,009 | 0.97 | 0.09 | 0.76 |
| 38 | | #VALUE! | 88.5% | 11.5% | | 2.9% | 82.4% | 17.6% | | 1,139,333 | 1,227,091 | 408,381 | | | 151,883-466,918 | 155,868-455,554 | 119,521-406,701 | | | |
| 39 | Chagas disease | 3,448,856 | 4,675,712 | 250,535 | 18.66 | 15 | 17 | 1 | 17.00 | 273,680 | 275,042 | 250,535 | 1.10 | 0.77 | 215,639 | 215,530 | 250,535 | 0.86 | 1.06 | 0.30 |
| 40 | | #VALUE! | 94.9% | 5.1% | | 0.4% | 94.4% | 5.6% | | 207,903 | 214,219 | | | | 163,472-350,741 | 163,472-350,741 | | | | |
| 41 | Dengue | 43,742,101 | 5,251,615 | 4,924,187 | 1.07 | 28 | 13 | 13 | 1.00 | 1,511,059 | 403,970 | 378,784 | 1.07 | 0.32 | 269,824 | 378,745 | 199,648 | 1.90 | 0.15 | 0.70 |
| 42 | | | | | | | | | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|----|---------------------------------|-------------|------------|------------|-------|------|--------|-------|------------|-----------|-----------|---------|-------|--------------------|-------------------|-----------------|---------|-------|------|------|
| 1 | | #VALUE! | 51.6% | 48.4% | | 0.7% | 50.0% | 50.0% | 5,899,700 | 336,526 | 504,639 | | | 107,474-530,125 | 148,612-515,075 | 69,518-361,828 | | | | |
| 2 | Helminths | 47,026,454 | 39,675,624 | 14,701,767 | 2.70 | 114 | 104 | 43 | 2.42 | 452,438 | 381,496 | 341,902 | 1.12 | 0.87 | 233,772 | 235,696 | 215,206 | 1.10 | 0.24 | 0.62 |
| 3 | | #VALUE! | 73.0% | 27.0% | | 2.9% | 70.7% | 29.3% | 1,112,173 | 464,792 | 414,897 | | | 82,786-386,182 | 67,614-383,928 | 126,942-358,645 | | | | |
| 4 | Leishmaniasis | 36,027,609 | 25,384,994 | 16,332,809 | 1.55 | 75 | 50 | 26 | 1.92 | 536,433 | 507,700 | 628,185 | 0.81 | 0.53 | 289,354 | 320,800 | 229,548 | 1.40 | 2.10 | 0.15 |
| 5 | | #VALUE! | 60.8% | 39.2% | | 1.9% | 65.8% | 34.2% | 797,514 | 579,922 | 1,127,441 | | | 91,196-518,477 | 80,166-518,477 | 131,221-573,851 | | | | |
| 6 | Leprosy | 623,080 | 49,229 | 573,851 | 0.09 | 2 | 1 | 1 | 1.00 | 311,540 | 49,229 | 573,851 | 0.09 | 0.32 | 311,540 | 49,229 | 573,851 | 0.09 | 2.00 | 0.16 |
| 7 | | #VALUE! | 7.9% | 92.1% | | 0.1% | 50.0% | 50.0% | 370,963 | | | | | 49,229-573,851 | | | | | | |
| 8 | Lymphatic filariasis | 51,112,541 | 1,802,818 | 317,909 | 5.67 | 16 | 3 | 2 | 1.50 | 6,723,245 | 600,939 | 158,954 | 3.78 | 0.25 | 551,459 | 551,459 | 158,954 | 3.47 | 2.22 | 0.14 |
| 9 | | #VALUE! | 85.0% | 15.0% | | 0.4% | 60.0% | 40.0% | 12,112,993 | 426,007 | 127,226 | | | 201,834-12,844,013 | 201,834-1,049,526 | 68,992-248,917 | | | | |
| 10 | | #VALUE! | 85.0% | 15.0% | | 0.4% | 60.0% | 40.0% | 12,112,993 | 426,007 | 127,226 | | | 201,834-12,844,013 | 201,834-1,049,526 | 68,992-248,917 | | | | |
| 11 | Onchocerciasis | 1,338,978 | 1,317,029 | 380,594 | 3.46 | 4 | 2 | 3 | 0.67 | 339,525 | 658,515 | 126,865 | 5.19 | 0.25 | 35,769 | 658,515 | 21,359 | 30.83 | 0.14 | 0.71 |
| 12 | | #VALUE! | 77.6% | 22.4% | | 0.1% | 40.0% | 60.0% | 546,719 | 880,696 | 200,996 | | | 21,359-358,645 | 35,769-1,281,261 | 590-358,645 | | | | |
| 13 | Schistosomiasis | 38,677,801 | 11,068,267 | 2,686,364 | 4.12 | 46 | 32 | 12 | 2.67 | 867,572 | 345,883 | 223,864 | 1.55 | 0.60 | 197,557 | 216,603 | 165,622 | 1.31 | 0.46 | 0.50 |
| 14 | | #VALUE! | 80.5% | 19.5% | | 1.2% | 72.7% | 27.3% | 3,825,582 | 467,692 | 252,854 | | | 59,912-361,947 | 61,878-356,186 | 46,460-318,519 | | | | |
| 15 | Trachoma | 3,718,572 | 3,718,572 | 0 | | 3 | 2 | 0 | | 1,859,286 | 1,859,286 | | | 1,859,286 | 1,859,286 | | | | | |
| 16 | | #VALUE! | 100.0% | 0.0% | | 0.1% | 100.0% | 0.0% | 1,768,466 | 1,768,466 | | | | 608,792-3,109,780 | 60,879-3,109,780 | | | | | |
| 17 | | #VALUE! | 100.0% | 0.0% | | 0.1% | 100.0% | 0.0% | 1,768,466 | 1,768,466 | | | | 608,792-3,109,780 | 60,879-3,109,780 | | | | | |
| 18 | Neurological infections | | | | | | | | | | | | | | | | | | | |
| 19 | Meningitis | 54,078,664 | 42,305,152 | 9,347,473 | 4.53 | 223 | 183 | 38 | 4.82 | 243,434 | 231,176 | 245,986 | 0.94 | 0.59 | 146,153 | 137,694 | 155,670 | 0.88 | 1.21 | 0.27 |
| 20 | | #VALUE! | 81.9% | 18.1% | | 5.6% | 82.8% | 17.2% | 355,892 | 332,118 | 297,867 | | | 66,895-228,405 | 66,895-222,767 | 33,886-369,244 | | | | |
| 21 | Polio | 1,189,984 | 729,017 | 11,069 | 65.86 | 4 | 3 | 1 | 3.00 | 185,021 | 243,006 | 11,069 | 21.95 | 0.18 | 164,849 | 236,812 | 11,069 | 21.40 | 1.33 | 0.25 |
| 22 | | #VALUE! | 98.5% | 1.5% | | 0.1% | 75.0% | 25.0% | 170,640 | 153,310 | | | | 51,977-318,065 | 92,886-399,318 | | | | | |
| 23 | Tetanus | 5,108,068 | 5,108,068 | 0 | | 5 | 5 | 0 | | 1,021,614 | 1,021,614 | | | 231,879 | 231,879 | | | | | |
| 24 | | #VALUE! | 100.0% | 0.0% | | 0.1% | 100.0% | 0.0% | 1,819,723 | 1,819,723 | | | | 200,112-395,050 | 200,112-395,050 | | | | | |
| 25 | | #VALUE! | 100.0% | 0.0% | | 0.1% | 100.0% | 0.0% | 1,819,723 | 1,819,723 | | | | 200,112-395,050 | 200,112-395,050 | | | | | |
| 26 | Respiratory infections | | | | | | | | | | | | | | | | | | | |
| 27 | Diphtheria | 139,863 | 21,624 | 118,239 | 0.18 | 2 | 1 | 1 | 1.00 | 69,931 | 21,624 | 118,239 | 0.18 | 0.32 | 69,931 | 21,624 | 118,239 | 0.18 | 2.00 | 0.16 |
| 28 | | #VALUE! | 15.5% | 84.5% | | 0.1% | 50.0% | 50.0% | 68,317 | | | | | 21,624-118,239 | | | | | | |
| 29 | Influenza | 79,763,001 | 68,447,401 | 11,615,587 | 5.89 | 140 | 111 | 30 | 3.70 | 567,823 | 616,643 | 387,186 | 1.59 | 0.04 | 299,988 | 348,730 | 200,787 | 1.74 | 4.06 | 0.04 |
| 30 | | #VALUE! | 85.5% | 14.5% | | 3.5% | 78.7% | 21.3% | 818,009 | 881,493 | 489,997 | | | 159,841-656,509 | 213,601-668,561 | 124,210-398,191 | | | | |
| 31 | Measles | 2,597,677 | 3,827,746 | 646,169 | 5.92 | 9 | 7 | 3 | 2.33 | 416,179 | 546,821 | 215,390 | 2.54 | 0.57 | 284,882 | 662,131 | 261,846 | 2.53 | 0.48 | 0.49 |
| 32 | | #VALUE! | 85.6% | 14.4% | | 0.2% | 70.0% | 30.0% | 403,740 | 481,360 | 122,549 | | | 67,471-683,714 | 58,538-893,212 | 76,405-307,919 | | | | |
| 33 | Pertussis | 2,432,158 | 2,432,158 | 0 | | 9 | 9 | 0 | | 270,240 | 270,240 | | | 299,840 | 299,840 | | | | | |
| 34 | | #VALUE! | 100.0% | 0.0% | | 0.2% | 100.0% | 0.0% | 246,165 | 246,165 | | | | 37,151-452,939 | 37,151-452,939 | | | | | |
| 35 | RSV | 16,899,738 | 14,073,205 | 2,818,964 | 4.99 | 45 | 29 | 15 | 1.93 | 375,550 | 485,283 | 187,931 | 3.96 | 0.05 | 184,292 | 223,517 | 149,828 | 1.49 | 2.53 | 0.11 |
| 36 | | #VALUE! | 83.3% | 16.7% | | 1.1% | 65.9% | 34.1% | 480,715 | 539,396 | 268,412 | | | 56,431-498,006 | 64,191-638,823 | 22,277-199,329 | | | | |
| 37 | Tuberculosis | 148,801,691 | 99,451,331 | 37,578,889 | 2.65 | 327 | 225 | 94 | 2.39 | 472,083 | 442,006 | 399,775 | 1.11 | 0.39 | 190,467 | 190,657 | 170,542 | 1.12 | 0.21 | 0.65 |
| 38 | | #VALUE! | 72.6% | 27.4% | | 8.3% | 70.5% | 29.5% | 930,157 | 825,956 | 742,928 | | | 69,899-421,992 | 74,747-416,236 | 37,034-401,346 | | | | |
| 39 | Sexually-transmitted infections | | | | | | | | | | | | | | | | | | | |
| 40 | Chlamydia | 21,702,378 | 5,753,740 | 15,936,845 | 0.36 | 112 | 43 | 68 | 0.63 | 193,771 | 133,808 | 234,365 | 0.57 | 0.71 | 50,469 | 52,258 | 52,318 | 1.00 | 0.01 | 0.91 |
| 41 | | #VALUE! | 26.5% | 73.5% | | 2.8% | 38.7% | 61.3% | 561,173 | 197,759 | 701,950 | | | 10,298-174,939 | 14,885-174,644 | 6,003-175,234 | | | | |
| 42 | | #VALUE! | 26.5% | 73.5% | | 2.8% | 38.7% | 61.3% | 561,173 | 197,759 | 701,950 | | | 10,298-174,939 | 14,885-174,644 | 6,003-175,234 | | | | |
| 43 | | #VALUE! | 26.5% | 73.5% | | 2.8% | 38.7% | 61.3% | 561,173 | 197,759 | 701,950 | | | 10,298-174,939 | 14,885-174,644 | 6,003-175,234 | | | | |
| 44 | | #VALUE! | 26.5% | 73.5% | | 2.8% | 38.7% | 61.3% | 561,173 | 197,759 | 701,950 | | | 10,298-174,939 | 14,885-174,644 | 6,003-175,234 | | | | |
| 45 | | #VALUE! | 26.5% | 73.5% | | 2.8% | 38.7% | 61.3% | 561,173 | 197,759 | 701,950 | | | 10,298-174,939 | 14,885-174,644 | 6,003-175,234 | | | | |
| 46 | | #VALUE! | 26.5% | 73.5% | | 2.8% | 38.7% | 61.3% | 561,173 | 197,759 | 701,950 | | | 10,298-174,939 | 14,885-174,644 | 6,003-175,234 | | | | |
| 47 | | #VALUE! | 26.5% | 73.5% | | 2.8% | 38.7% | 61.3% | 561,173 | 197,759 | 701,950 | | | 10,298-174,939 | 14,885-174,644 | 6,003-175,234 | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|----|---------------------------|---------------|---------------|-------------|---------|-------|---------|---------|---------|-----------|-----------|---------|-------|------|-----------------|----------------|-----------------|------|-------|------|
| 1 | Gonorrhoea | 948,399 | 669,866 | 278,532 | 2.40 | 18 | 9 | 9 | 1.00 | 52,689 | 74,430 | 30,948 | 2.40 | 0.51 | 7,548 | 8,149 | 6,525 | 1.25 | 0.22 | 0.64 |
| 2 | | #VALUE! | 70.6% | 29.4% | | 0.5% | 50.0% | 50.0% | | 81,648 | 104,267 | 47,232 | | | 1,820-54,145 | 6,471-150,196 | 1,820-40,986 | | | |
| 3 | HIV | 460,547,457 | 290,848,557 | 79,652,343 | 3.65 | 760 | 448 | 286 | 1.57 | 625,073 | 649,216 | 278,505 | 2.33 | 0.01 | 147,404 | 163,462 | 114,272 | 1.43 | 3.87 | 0.05 |
| 4 | | #VALUE! | 78.5% | 21.5% | | 19.2% | 61.0% | 39.0% | | 2,276,762 | 1,550,920 | 545,657 | | | 37,195-395,644 | 39,153-511,800 | 29,880-305,339 | | | |
| 5 | HPV | 57,795,110 | 42,592,795 | 9,393,693 | 4.53 | 150 | 88 | 56 | 1.57 | 355,514 | 484,009 | 167,745 | 2.89 | 0.30 | 92,143 | 103,966 | 82,325 | 1.26 | 0.47 | 0.49 |
| 6 | | #VALUE! | 81.9% | 18.1% | | 3.8% | 61.1% | 38.9% | | 849,406 | 1,042,481 | 360,400 | | | 30,079-220,559 | 29,742-264,540 | 32,566- 171,377 | | | |
| 7 | HSV | 22,063,300 | 15,472,470 | 6,536,189 | 2.37 | 48 | 28 | 19 | 1.47 | 459,652 | 552,588 | 344,010 | 1.61 | 0.19 | 202,564 | 119,295 | 309,610 | 0.39 | 4.85 | 0.03 |
| 8 | | #VALUE! | 70.3% | 29.7% | | 1.2% | 59.6% | 40.4% | | 720,790 | 908,183 | 287,596 | | | 52,597-421,960 | 40,009-446,395 | 147,885-439,305 | | | |
| 9 | Syphilis | 1,061,560 | 286,117 | 775,444 | 0.37 | 5 | 2 | 3 | 0.67 | 212,312 | 143,058 | 258,481 | 0.55 | 0.56 | 207,346 | 143,058 | 207,346 | 0.69 | 0.14 | 0.71 |
| 10 | | #VALUE! | 27.0% | 73.0% | | 0.1% | 40.0% | 60.0% | | 152,848 | 122,822 | 176,603 | | | 113,088-229,907 | 56,210-229,907 | 113,088-455,010 | | | |
| 11 | | | | | | | | | | | | | | | | | | | | |
| 12 | <i>Other infections</i> | | | | | | | | | | | | | | | | | | | |
| 13 | Aspergillus | 4,853,858 | 4,482,101 | 371,757 | 12.06 | 26 | 24 | 2 | 12.00 | 186,687 | 186,754 | 185,879 | 1.00 | 1.00 | 47,948 | 47,948 | 185,879 | 0.26 | 0.00 | 1.00 |
| 14 | | #VALUE! | 92.3% | 7.7% | | 0.7% | 92.3% | 7.7% | | 420,903 | 435,756 | 248,298 | | | 19,703-157,829 | 20,890-135,113 | 10,306-361,451 | | | |
| 15 | Candida | 1,219,072 | 1,194,064 | 25,008 | 47.75 | 8 | 6 | 2 | 3.00 | 152,384 | 199,011 | 12,504 | 15.92 | 0.18 | 28,518 | 72,375 | 12,504 | 5.79 | 2.67 | 0.10 |
| 16 | | #VALUE! | 97.9% | 2.1% | | 0.2% | 75.0% | 25.0% | | 262,390 | 293,075 | 17,226 | | | 10,508-188,568 | 17,076-264,740 | 324-24,684 | | | |
| 17 | Pseudomonas | 6,473,237 | 6,096,633 | 376,604 | 16.19 | 43 | 39 | 4 | 9.75 | 150,540 | 156,324 | 94,151 | 1.66 | 0.90 | 81,793 | 81,793 | 79,244 | 1.03 | 0.00 | 0.96 |
| 18 | | #VALUE! | 94.2% | 5.8% | | 1.1% | 90.7% | 9.3% | | 175,911 | 182,442 | 83,286 | | | 11,204-253,337 | 11,108-253,459 | 27,396-160,906 | | | |
| 19 | ZV | 4,186,583 | 1,472,968 | 2,713,615 | 0.54 | 20 | 9 | 11 | 0.82 | 209,329 | 163,663 | 246,692 | 0.66 | 0.21 | 145,505 | 47,343 | 161,033 | 0.29 | 0.20 | 0.65 |
| 20 | | #VALUE! | 35.2% | 64.8% | | 0.5% | 45.0% | 55.0% | | 261,063 | 250,869 | 275,194 | | | 46,117-227,502 | 26,213-147,593 | 105,632-233,537 | | | |
| 21 | | #VALUE! | #VALUE! | #VALUE! | #VALUE! | 3,953 | #VALUE! | #VALUE! | #VALUE! | | | | | | 158,055 | | | | | |
| 22 | total specific infections | | | | | | | | | | | | | | | | | | | |
| 23 | Overall | 2,599,985,851 | 1,785,979,172 | 488,178,602 | 3.66 | 6,170 | 4,357 | 1,695 | 2.57 | 421,733 | 409,910 | 288,011 | 1.42 | 0.01 | 49,490-352,699 | 179,389 | 125,556 | 1.43 | 74.40 | 0.01 |
| 24 | | | 78.53% | 21.47% | | | 71.99% | 28.01% | | 1,315,935 | 840,087 | 704,474 | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | | | | | | | | | |

| Funder | Investment (total); £ (%) | Investment (male); £ (%) | Investment (female); £ (%) | Fold differenc | Studies (total); n (%) | Studies (male); £ (%) | Studies (female); n (%) | Fold differenc | Mean grant (total); £ | Mean grant (male); £ | Mean grant (female); £ | Fold differenc | P | Median grant (total); £ (IQR) | Median grant (male); £ (IQR) | Median grant (female); £ (IQR) | Fold differenc | Chi-square | P |
|---------------------------------|---------------------------|--------------------------|----------------------------|----------------|------------------------|-----------------------|-------------------------|----------------|-----------------------|----------------------|------------------------|----------------|------|-------------------------------|------------------------------|--------------------------------|----------------|------------|------|
| Public funding | 1,393,972,967 | 1,025,211,218 | 279,810,244 | 3.66 | 1,082 | 1,722 | 624 | 2.76 | 588,503 | 595,361 | 448,414 | 1.17 | 0.01 | 255,992 | 272,452 | 213,718 | 1.27 | 29.38 | 0.01 |
| | 53.6% | 78.6% | 21.4% | | 17.6% | 73.4% | 26.6% | | 1,447,668 | 1,080,718 | 814,979 | | | 127,167-529,610 | 138,322- 572,525 | 92,880-402,917 | | | |
| BBSRC | 186,268,429 | 160,120,540 | 26,147,889 | 6.12 | 578 | 485 | 93 | 5.22 | 322,264 | 330,145 | 281,160 | 1.17 | 0.78 | 253,398 | 253,498 | 244,972 | 1.03 | 0.12 | 0.73 |
| | 7.2% | 86.0% | 14.0% | | 9.4% | 83.9% | 16.1% | | 361,565 | 383,963 | 205,593 | | | 169,787-365,159 | 176,763-363,830 | 149,828-371,577 | | | |
| DFID | | | | | | | | | | | | | | | | | | | |
| DH | 134,961,745 | 101,933,746 | 32,757,325 | 3.11 | 285 | 194 | 89 | 2.18 | 473,550 | 525,432 | 368,060 | 1.43 | 0.37 | 203,544 | 213,107 | 181,697 | 1.17 | 0.36 | 0.55 |
| | 5.2% | 75.7% | 24.3% | | 4.6% | 68.6% | 31.4% | | 846,024 | 968,640 | 482,041 | | | 72,628-514,066 | 72,627-542,097 | 65,015-383,886 | | | |
| European Commission | 255,015,533 | 186,846,015 | 65,558,847 | 2.85 | 219 | 141 | 71 | 1.99 | 1,164,454 | 1,325,149 | 923,364 | 1.44 | 0.58 | 439,762 | 555,497 | 199,133 | 2.79 | 3.58 | 0.06 |
| | 9.8% | 74.0% | 26.0% | | 3.6% | 66.5% | 33.5% | | 2,084,358 | 2,409,860 | 1,316,016 | | | 127,419-1,454,94 | 123,042-1,504,85 | 134,621-1,449,403 | | | |
| MRC | 672,895,698 | 537,260,180 | 131,751,245 | 4.08 | 962 | 715 | 242 | 2.95 | 699,476 | 751,413 | 544,427 | 1.38 | 0.01 | 366,479 | 404,615 | 286,679 | 1.41 | 18.44 | 0.01 |
| | 25.9% | 80.3% | 19.7% | | 15.6% | 74.7% | 25.3% | | 993,012 | 1,020,748 | 884,442 | | | 199,287-713,178 | 210,068-811,860 | 178,182-468,998 | | | |
| UK government, non-DH | 144,831,562 | 39,050,737 | 23,594,939 | 1.66 | 237 | 187 | 129 | 1.45 | 452,898 | 208,828 | 182,907 | 1.14 | 0.01 | 110,178 | 129,660 | 59,976 | 2.16 | 3.79 | 0.05 |
| | 5.6% | 62.3% | 37.7% | | 3.8% | 59.2% | 40.8% | | 2,811,384 | 492,519 | 619,889 | | | 19,073-206,784 | 23,761- 207,320 | 12,564-157,053 | | | |
| Philanthropy | 1,108,966,983 | 691,680,388 | 185,866,898 | 3.72 | 2,879 | 2,044 | 768 | 2.66 | 383,601 | 338,396 | 242,014 | 1.40 | 0.01 | 146,060 | 153,653 | 114,173 | 1.35 | 23.28 | 0.01 |
| | 42.7% | 78.8% | 21.2% | | 46.7% | 72.7% | 27.3% | | 1,377,079 | 659,025 | 711,420 | | | 52,433-286,518 | 58,589-302,774 | 42,658-222,842 | | | |
| Bill & Melinda Gates Foundation | 220,923,242 | | | | 39 | | | | 5,664,699 | | | | | 1,488,432 | | | | | |
| | 8.5% | | | | 0.6% | | | | 8,966,093 | | | | | 628,545-5,576,863 | | | | | |
| Charity | 199,703,382 | 130,726,509 | 58,989,705 | 2.22 | 855 | 619 | 217 | 2.85 | 227,332 | 211,190 | 271,842 | 0.78 | 0.01 | 87,318 | 91,991 | 76,058 | 1.21 | 5.23 | 0.02 |
| | 7.7% | 68.9% | 31.1% | | 13.9% | 74.0% | 26.0% | | 730,057 | 454,108 | 1,208,852 | | | 27,616-167,829 | 36,429-172,497 | 17,279-150,727 | | | |
| Wellcome Trust | 688,340,359 | 560,953,880 | 126,592,102 | 4.43 | 1,985 | 1,425 | 550 | 2.59 | 346,818 | 393,652 | 230,168 | 1.71 | 0.01 | 168,434 | 191,461 | 137,241 | 1.40 | 39.83 | 0.01 |
| | 26.5% | 81.6% | 18.4% | | 32.2% | 72.2% | 27.8% | | 646,625 | 723,549 | 362,836 | | | 66,419-335,557 | 74,759-362,424 | 54,019-250,723 | | | |
| Other funding | 103,542,992 | 69,087,566 | 22,501,460 | 3.07 | 1,010 | 591 | 303 | 1.95 | 103,683 | 116,899 | 74,262 | 1.57 | 0.01 | 28,626 | 32,557 | 20,373 | 1.60 | 4.80 | 0.03 |
| | 4.0% | 75.4% | 24.6% | | 16.4% | 66.1% | 33.9% | | 273,102 | 309,358 | 154,373 | | | 6,282-105,082 | 7,225-113,479 | 4,408-79,809 | | | |
| Overall | 2,599,985,851 | 1,785,979,172 | 488,178,602 | 3.66 | 6,165 | 4,357 | 1,695 | 2.57 | 421,733 | 409,910 | 288,011 | 1.42 | 0.01 | 158,055 | 179,389 | 125,556 | 1.43 | 74.40 | 0.01 |
| | | 78.5% | 21.5% | | | 72.0% | 28.0% | | 1,315,935 | 840,087 | 704,474 | | | 49,490-352,699 | 59,146-371,977 | 30,983-261,835 | | | |

| Year | Investment (male); £ | Change from previous year (male); £ | Fold difference (male) | P | Change over 1997 (male); £ | Fold difference (male) | P | Investment (female); £ | Change from previous year (female); £ | Fold difference (female) | P | Change over 1997 (female); £ | Fold difference (female) | P | Investment (male); % | Investment (female); % | Absolute difference (gender) | Fold difference (gender) |
|---------------|----------------------|-------------------------------------|------------------------|------|----------------------------|------------------------|------|------------------------|---------------------------------------|--------------------------|------|------------------------------|--------------------------|------|----------------------|------------------------|------------------------------|--------------------------|
| 1997 | 64,158,003 | | | | | | | 16,305,109 | | | | | | | 79.7% | 20.3% | 47,852,894 | 3.93 |
| 1998 | 78,287,824 | 14,129,821 | 1.22 | 0.57 | 14,129,821 | 1.22 | 0.57 | 13,110,597 | -3,194,512 | 0.80 | 0.90 | -3,194,512 | 0.80 | 0.90 | 85.7% | 14.3% | 65,177,227 | 5.97 |
| 1999 | 79,477,324 | 1,189,500 | 1.02 | 0.37 | 15,319,321 | 1.24 | 0.14 | 24,366,507 | 11,255,911 | 1.86 | 0.79 | 8,061,398 | 1.49 | 0.88 | 76.5% | 23.5% | 55,110,816 | 3.26 |
| 2000 | 245,740,477 | 166,263,153 | 3.09 | 0.00 | 181,582,474 | 3.83 | 0.01 | 55,636,657 | 31,270,150 | 2.28 | 0.01 | 39,331,548 | 3.41 | 0.01 | 81.5% | 18.5% | 190,103,820 | 4.42 |
| 2001 | 105,423,252 | -140,317,225 | 0.43 | 0.09 | 41,265,248 | 1.64 | 0.01 | 34,133,067 | -21,503,591 | 0.61 | 0.23 | 17,827,958 | 2.09 | 0.01 | 75.5% | 24.5% | 71,290,185 | 3.09 |
| 2002 | 166,695,481 | 61,272,230 | 1.58 | 0.89 | 102,537,478 | 2.60 | 0.01 | 59,568,874 | 25,435,807 | 1.75 | 0.41 | 43,263,765 | 3.65 | 0.01 | 73.7% | 26.3% | 107,126,607 | 2.80 |
| 2003 | 114,827,602 | -51,867,880 | 0.69 | 0.03 | 50,669,599 | 1.79 | 0.50 | 27,241,313 | -32,327,560 | 0.46 | 0.14 | 10,936,204 | 1.67 | 0.05 | 80.8% | 19.2% | 87,586,288 | 4.22 |
| 2004 | 93,129,587 | -21,698,015 | 0.81 | 0.09 | 28,971,584 | 1.45 | 0.30 | 26,908,997 | -332,316 | 0.99 | 0.91 | 10,603,888 | 1.65 | 0.04 | 77.6% | 22.4% | 66,220,590 | 3.46 |
| 2005 | 177,791,995 | 84,662,408 | 1.91 | 0.03 | 113,633,992 | 2.77 | 0.26 | 39,460,786 | 12,551,789 | 1.47 | 0.60 | 23,155,677 | 2.42 | 0.01 | 81.8% | 18.2% | 138,331,209 | 4.51 |
| 2006 | 126,329,085 | -51,462,910 | 0.71 | 0.60 | 62,171,082 | 1.97 | 0.54 | 37,473,263 | -1,987,522 | 0.95 | 0.35 | 21,168,154 | 2.30 | 0.03 | 77.1% | 22.9% | 88,855,822 | 3.37 |
| 2007 | 126,144,324 | -184,761 | 1.00 | 0.03 | 61,986,320 | 1.97 | 0.12 | 28,293,204 | -9,180,059 | 0.76 | 0.01 | 11,988,095 | 1.74 | 0.48 | 81.7% | 18.3% | 97,851,119 | 4.46 |
| 2008 | 173,132,770 | 46,988,446 | 1.37 | 0.07 | 108,974,767 | 2.70 | 0.01 | 44,307,821 | 16,014,617 | 1.57 | 0.70 | 28,002,712 | 2.72 | 0.73 | 79.6% | 20.4% | 128,824,949 | 3.91 |
| 2009 | 114,490,290 | -58,642,480 | 0.66 | 0.12 | 50,332,287 | 1.78 | 0.01 | 41,820,953 | -2,486,868 | 0.94 | 0.03 | 25,515,844 | 2.56 | 0.01 | 73.2% | 26.8% | 72,669,337 | 2.74 |
| 2010 | 120,351,159 | 5,860,868 | 1.05 | 0.33 | 56,193,155 | 1.88 | 0.01 | 39,551,453 | -2,269,500 | 0.95 | 0.56 | 23,246,344 | 2.43 | 0.06 | 75.3% | 24.7% | 80,799,705 | 3.04 |
| Mean | 127,569,941 | 4,322,550 | | | 68,289,779 | | | 34,869,900 | 1,788,180 | ##### | | ##### | | | 78.6% | 21.4% | 92,700,041 | |
| SD | 48,770,855 | 76,214,220 | | | 47,073,847 | | | 13,365,475 | 17,657,139 | ##### | | ##### | | | | | 38,264,674 | |
| Total Gender | 1,785,979,172 | | | | | | | 488,178,602 | | | | | | | | | 1,297,800,569 | 3.66 |
| Total Overall | 2,599,985,851 | | | | | | | | | | | | | | | | | |