Female Inventors and Inventions*

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Abstract

Does who invents matter for what gets invented? In this paper, we investigate whether female inventors are more likely to generate inventions that benefit women. We link all US biomedical patents from 1975 through 2014 to MeSH terms and disease incidence estimates. We find that patents with women inventors are 20% more likely to focus on female diseases and conditions. Consistent with the idea that women researchers choose to innovate for women, we find that this linkage holds within disease topics and is stronger when a woman is a solo inventor or the team lead. Female solo inventors are nearly 40% more likely to focus on female health outcomes than men. The female inventor-invention linkage holds across time, does not appear to crowd out research on female topics by men, and holds when we control for variation in the demand for female-focused inventions. This suggest increasing the number of women inventors might result in more inventions that benefit women. Overall, our findings highlight the possibility that biased labor-markets engender biased product-markets.

Introduction

For many years, biomedical research ignored and downplayed issues relating to women's health. Funding disproportionately went to diseases and medical conditions that affect men. Research on diseases and conditions that affect both sexes relied heavily on male animals for research and men for clinical trials (Barlow, 2018; Leprince-Ringuet, 2018; Johnson, 2019). Many commentators link this discrepancy to the under-representation of women in biomedical research fields (Ding et al., 2006; Bell et al., 2018). Demographic groups differ in their awareness of and exposure to diseases and medical conditions. Those differences in exposure shape their research interests and priorities—and scientists' pre-existing preferences strongly predict their future research agendas (Merton, 1973;

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Azoulay et al., 2017; Myers, 2018). Add more female researchers, the argument goes, and there will be more innovations that help women.

Yet adding women researchers need not close this gap. Research scientists rarely have complete control over their research topics, and if women spend their time on teams with prior research agendas, they may just reproduce the existing structure of knowledge and invention. In this regard, research labs may mirror other organizational settings, where women managers often make decisions comparable to their male colleagues (Srivastava and Sherman, 2015).

The call to add more women may also seem unduly pessimistic. Male researchers can and do study diseases and other medical conditions that mostly affect women. Innovations related to women's health have become more common in recent years, while female representation in the life sciences has grown (Office of Research on Women's Health, 2016). We need not assume that this relationship is causal, and the gender of a researcher has no necessary link to any gendered impact of their research. Nonetheless, we have no shortage of anecdotes about how a heavily male scientific community tended to overlook issues that affected half the population, but not them (Schiebinger, 2008). Even if male scientists pay more attention to diseases and conditions that predominantly affect women than they did in the past, an influx of female inventors into biomedicine may still move the needle farther.

In this paper, we study the relationship between the gender of inventors and their invention. We concentrate on patented biomedical inventions filed between 1976 and 2010. We assemble data on the composition of the population of inventors and on the content of their inventions. To measure whether patents are differentially related to gender-specific diseases or conditions, we use the National Library of Medicine's Medical Text Indexer to generate Medical Subject Heading (MeSH) terms for each patent (Boudreau et al., 2016). The MeSH ontology includes terms for gender and for gender-specific diseases. The size of the corpus of inventions lets us adjust for heterogeneity in biomedical patent sub-categories, as well as for secular changes in the share of women doing research in different patent categories over time.

We find strong correlations between women inventors and biomedical inventions targeting diseases or conditions that disproportionately affect women, what we henceforth call female-focused inventions. Research teams with women are 19 percent more likely to produce patents that focus on women. This finding holds across time periods and research categories. The effect is strongest,

a 26 percent increase, when female researchers lead their teams, which jibes with the idea of such inventors having more control over their research agendas.

Since the 1970s, the share of biomedical patents with women inventors has increased from about 12 to 35 percent. Over this same period, the proportion of female-focused patents has also increased, from roughly 9.5 to 13.5 percent (See Figure 1). Our results imply that nearly half of this increase comes from patents with women inventors, and that this half is driven by research teams led by women. We also present evidence that this increase in female-focused inventions does not just reflect the substitution of female for male researchers in these fields, and that women's greater representation has not appeared to slow innovation on diseases or conditions that disproportionately affect men. In medicine, greater representation has not been a zero-sum game.

[Figure 1 about here.]

Prior work has highlighted how gender bias in STEM fields limits the career trajectories of female scientists, reduces research productivity, and may harm economic growth (Lerchenmueller and Sorenson, 2018; Bell et al., 2018; Hsieh et al., 2019). Our findings suggest another consequence of this bias: fewer innovations that could help women. Research and development may not be optimally allocated across genders given the historical under-representation of women in invention, though additional work is needed to conclusively establish this pattern. More broadly, our results suggest that the benefits of inventions, new products, and novel services can be shaped by the demography of who invents them.

Discrimination and innovation

Commentators have often documented a dearth of research on diseases and conditions that disproportionately affect women. Well into the 1980s, for example, research into breast cancer lagged behind other cancers with much lower incidence rates (Lukong, 2017). Women suffer adverse reactions from pharmaceuticals at higher rates than men but were rarely included in clinical trials (Kim et al., 2010; Mandavilli, 2019). Heart disease was long characterized as a male disease, and research focused on changes that occur in male patients. As a result, for many years women were wrongly diagnosed (Khonje, 2017). Journalists and researchers have documented similar inequities

in the commercialization and approval of medicines and treatments. The most notorious example is probably the Japanese government's fast-tracked approval of Viagra in 1999, even as modern low-dose birth control pills had languished in the approval process for more than a decade (Wudunn, 1999); but other examples are not hard to find. Among medical researchers, the idea that women's health has received less attention than it should is non-controversial (Office of Research on Women's Health, 2016).

Within innovation research, this question has received much less attention. Innovation researchers have not ignored gender, far from it; but the lion's share of their attention has gone to the productivity and labor-market outcomes of male and female inventors, rather than to the content of their inventions as such (Long and Fox, 1995; Azoulay et al., 2017; Kahn and Ginther, 2017). For example, it is generally accepted that discrimination reduces the overall level of innovation in a society. If creative ideas require familiarity with a research frontier but cannot be forced, then socioeconomic inequality denies many people the necessary conditions to invent. The overall effect is to squander creative potential—the "Lost Einsteins" problem.[1] Such work is quite clear on how inequality lands differently on different groups. For example, Bell et al. (2018) note how women are more likely to patent in a specific technology sub-class when female inventors in their childhood area were likely to patent in that sub-class. The focus in such work, though, is on the types of inventors more than on the types of inventions. Innovation patterns may be gender-specific, but that in itself cannot tell us who an invention's beneficiaries are likely to be.

Male and female researchers have also differed in their productivity and their career outcomes. Women inventors have produced patents at lower rates than men. This could be because they entered the disciplines later and thus have less experience on average with the process of commercialization (Murray and Graham, 2007). The patent office appears less likely to grant patent protection to equivalent inventions produced by women (Jensen et al., 2018). Women are underrepresented at the higher levels of management in many research organizations, which means they have less control over their research agendas and fewer resources to mobilize in support of them (Lerchenmueller and Sorenson, 2018). Another possibility is that women have done different types of research than men, and those areas may either be harder to invent or harder to patent in. But

[1] Bell et al. (2018) deserve credit for introducing this phrase to academic work, but at least a nod of priority should go to Pat Cadigan, who in her 1986 short story "Pretty Boy Crossover" has a character wonder "[H]ow many Einsteins have died of hunger and thirst under a hot African sun."

this last possibility has not been studied as much (Murray and Graham, 2007).

We think one reason this last possibility has been under-studied is that most innovation research tries to compare "same quality" inventions (e.g., Ferguson and Carnabuci (2017), Jensen et al. (2018), Marx and Hsu (2019), Kolev et al. (2019)). Arguments about productivity or merit rely on apples-to-apples comparisons of inventions. Yet such comparisons rule out studying differences in the *types* of inventions that different inventors produce.

We argue that diversity of inventors is correlated with diversity of inventions. We want to bound this argument, though. Not all inventions are, or can be, gendered. Inventor diversity should matter more when the potential impacts of an invention correlate with that dimension of diversity. When inventions target the human body, for example, the physical differences between groups can loom larger than in many other fields. Medicine is thus a good site for studying "gendered research" (Nielsen et al., 2017). In other contexts it can be relevant to focus on traits like nationality or inventors' socioeconomic backgrounds, where those traits correlate with the perceived need for different inventions (e.g., Falcioni (2011)).

We argue that women researchers might want to produce different inventions than male researchers. But it does not follow automatically that women *will* produce different inventions. The literature we have discussed so far rarely factors in the organizational context in which research happens. We think a parallel can be drawn to research into whether increasing women's share of management positions in private firms would improve hiring and promotion chances for other women. That research has found mixed results. While some women seem to mentor or advocate for their female subordinates, others have seemed to be "cogs in the machine," evaluating other women as their male colleagues do, if not more harshly (Srivastava and Sherman, 2015). Often it is only when women achieve a level of critical mass in leadership positions that fundamental changes in organizational routines can be observed (Konrad et al., 2008; Torchia et al., 2011). This threshold difference is often explained in terms of selection bias. In environments that have historically favored men over women, the women most likely to be advanced are those that share, or at least do not dispute, the prevailing norms and attitudes. Even where women do not share the attitudes of men, they may still operate in organizations whose evaluation criteria or decision rules favor men.[2]

[2]Formalization is often touted for its ability to reduce individual discretion around decisions and thus limit the exercise of bias. Yet if the rules that are formalized are themselves biased in their impact, they may limit the ability of even committed change agents to alter organizational practices (Kalev, 2014).

Changing such organizational practices often requires the contributions of multiple individuals with the inclination and authority to make such changes.

The same points can hold in research. Women's representation in the life sciences has increased, but like all new scientists they enter organizations at the lower levels. Women scientists were relatively younger and had less job tenure than male scientists for the last generation, reflecting their historic quasi-exclusion from the disciplines (Long and Fox, 1995; Lerchenmueller and Sorenson, 2018). Younger and less experienced scientists have less authority to set their research agendas. Thus it is possible that, as women became researchers in the life sciences, they had few opportunities to work on diseases and conditions affecting women, whatever their inclinations. At a minimum, this suggests that women would have more influence on their types of inventions when they hold more senior research positions.

Based on these lines of argument, we state three hypotheses. The first is simply that there is a relationship between a researcher's gender and the gender focus of their inventions:

Hypothesis 1 *Patents with a female inventor are more likely to target diseases or conditions that disproportionately affect women.*

Second, because research takes place in organizational contexts where women have historically been under-represented, that relationship should be stronger when women are in positions that give them more control over the direction of their research:

Hypothesis 2 *The effect associated with hypothesis 1 is stronger when the lead inventor is a woman.*

Both of the first two hypotheses are formulated cross-sectionally. We think this is appropriate, but they can miss the larger point that changes over time in the female share of inventors should in turn affect the share of inventions that are female-focused. This is not automatic; male researchers could substitute away from such work as women take up the mantle, leaving the aggregate impact unchanged or even reduced. Thus we also propose to test the relationship between these aggregates over time:

Hypothesis 3 *An increase in women inventors has led to an increase in female-focused inventions.*

Data and variables

Our data come from three sources. For inventions, we draw on the USPTO and NBER patent data files. We focus on the universe of "Drugs and Medical" patents (Patent Category 3) filed from 1976 through 2010.[3] This comprises 441,580 inventions. To classify patents by the disease or condition they target, we draw on the National Library of Medicine's Medical Text Indexer (Aronson et al., 2004), which generates Medical Subject Headings, or MeSH terms, for a given body of text. Our final source of data is the Global Burden of Disease database, developed by the Institute for Health Metrics and Evaluation, which we use to measure incidence among men and women for various diseases. The strength of our analysis turns on the strength of our links across these data sources, so we discuss these in some detail.

Researcher gender: For each patent, we classify inventors' gender using a dictionary-matching process. We followed the approach that Jensen et al. (2018) describe in the supplement to their article. We differed slightly in the data sources for our dictionary, which we detail in appendix A. We used a similarly conservative approach, assigning gender only when the name in question mapped to male or female at least 95 percent of the time it appeared in our dictionaries. With this method, we identify the gender of at least one inventor on 98 percent of patents; we identify the gender of the entire team on 80 percent, and we identify the gender of the lead inventor on 92 percent. We treat the first author listed on a patent as the lead inventor. This is necessarily a proxy but one that follows practice in other innovation studies.[4]

Female focus of innovation: We operationalize the gendered impact of patents in four ways. First, to identify if the patent represents a medical advance that particularly benefits women, we passed the first 2,500 characters of each patent's title, abstract, and summary through the National Library of Medicine's Medical Text Indexer (MTI).[5] The MTI returns a scored set of Medical

[3] As of writing, the NBER patent data covers patents granted through 2015. Since approval can take years, the dataset only includes patents filed in 2014 that were approved within one year, within two years for 2013, and so on. The vast majority of patents are approved in under four years. Thus we drop all patents filed after 2010 to ensure that our sample reflects the population of eventually granted patents for any given filing year. That said, our results are essentially unchanged if we include the post-2010 patent data.

[4] After we began this project, the USPTO published a gender assignment for each inventor (`http://patentsview.org/download`). Our classification results are correlated with the USPTO's above .98, and our findings are unchanged when we use their measure.

[5] The MTI allows up to 10,000 characters of input text, but we found that its algorithm was much more likely to return errors when the input text approached this length. After trial and error, we found that limiting the text to 2,500 characters produced virtually no errors. Using just the title and abstract yields similar findings. We use the default MTI settings for non-Medline text, and we output MeSH terms from the 2018 edition.

Subject Headings that are likely to characterize the research described in the input text. We were able to obtain MeSH terms for 441,475, or 99.7%, of our patents. Among these terms are so-called "check tags," or meta-descriptions, of the input text. The MTI scores these like other terms. We focus on whether the MTI applies the MeSH check tags "Male" or "Female" to the patent's text. These check tags receive special attention when human reviewers map medical research onto the MeSH ontology, precisely because gender is a salient branching point when searching for related research. Within the MeSH ontology, the MeSH heading "Male" (Unique ID D008297) is applied when any research covers "male organs, diseases, physiologic processes, genetics, etc.; do not confuse with MEN as a social, cultural, political, economic force." Similarly, the MeSH heading "Female" (Unique ID D005260) is applied when any research covers "female organs, diseases, physiologic processes, genetics, etc.; do not confuse with WOMEN as a social, cultural, political, economic force." These terms give us a binary indicator whether the patent is more or less likely to be male- or female-focused.[6]

Because the MTI's purpose is to help medical researchers discover related work, its default results are "greedy," suggesting hundreds of potentially related (but low-scored) terms. We discard the least-related MeSH terms (those scored 0 or -1) and keep at most 25 of the remainder. Truncating the list rules out estimation bias from secular change in patents' scope.[7] Our results are unchanged if we just use the top 10 MeSH terms. For robustness, our second operationalization is to fit models where the dependent variable is whether the MTI returns "Female" or "Male" as the *first* ranked MeSH term. Such patents should focus unequivocally on gendered conditions.

In our analyses, we compare "Female" to "Male" to test whether our findings support hypothesis 1. We hypothesize that female inventors are more likely to invent for women, not that female inventors do more gendered research overall (Nielsen et al., 2017). If for example women inventors worked on more "applied" inventions, those closer to physical treatment than to basic research, then the patients' gender might be more relevant to their patents. In this case women would be

[6]To confirm that our results are not an artifact of the MTI's indexing system, we also assigned gender to patents using a keyword-classification technique. We present this, and the comparable results from it, in appendix B.

[7]If patents tend to match to more MeSH terms over time, the chances of their matching the "Female" or "Male" tags increase mechanically. Arguably, a secular increase in matching terms could by itself explain the increase in female-focused inventions. We do not think that matches in the 26th and greater terms are substantive, though. The match score for such terms is quite low, and estimating our models with the full list of matched terms produces substantively identical results to those estimated with list truncation, though the noisiness of low-score terms introduces substantial measurement error.

more likely to be on patents that are tagged "Female" but also more likely to be on patents tagged "Male." By measuring each gender independently, we can test for this alternative possibility.

Third, for a still-finer-grained measure of who benefits from a given invention, we focus on highly gendered disease-level differences. Most MeSH terms are organized into a mutually exclusive, parent-child ontological tree (the check tags sit outside this tree). At the top level are general categories, e.g., Anatomy [A], Organisms [B], Diseases [C], and Chemicals and Drugs [D]. Within diseases there are more focused disease classes, such as these:

- Respiratory Tract Diseases [C08]
- Otorhinolaryngologic Diseases [C09]
- Nervous System Diseases [C10]
- Eye Diseases [C11]
- Male Urogenital Diseases [C12]
- Female Urogenital Diseases and Pregnancy Complications [C13]
- Cardiovascular Diseases [C14]
- Hemic and Lymphatic Diseases [C15]

We concentrate on branches C12 and C13. If patents match to the MeSH heading C12, or any term farther down the tree (e.g., Azoospermia [C12.294.365.700.380]), we classify the patent as impacting "Male" diseases. We do the same with C13 to generate a "Female" disease measure. In results, we refer to this outcome variable as Male or Female"Disease MeSH."[8]

Our fourth and and final measure of the gender focus of inventions tries to capture variation in the potential health benefits of these inventions for men and women. To do this, we link patents to health-outcomes data from the Institute for Health Metrics and Evaluation's Global Burden of Disease (GBD) database. Specifically, we build a crosswalk between the MTI's disease MeSH terms (those in category "C") and the GBD's "disease causes." For example, we link the MeSH term "Peripheral artery disease" [C14.907.617.671] to the GBD cause "Peripheral Arterial Disease." Our

[8]Analyses at the disease level are examples where truncating the list of MeSH terms returned by the MTI becomes particularly important. Consider the MeSH term "endometriosis." This condition involves the abnormal growth of cellular tissue like that which normally lines the uterus in other parts of the body, such as the fallopian tubes or ovaries. Because endometriosis is a condition of the female reproductive organs, its presence as a MeSH term will flag a patent as being in disease class C13. Yet the MTI often suggests it as a low-scored MeSH term for any text where the "endo–" prefix occurs, producing many false positives. Ignoring such low-scored terms and focusing on the top 25 avoids this issue.

crosswalk is consistent with respect to the MeSH ontology; that is, if a parent disease matches to a GBD cause then any of its children will also match to that disease cause.[9] Using this crosswalk, we then assign each patent its matching GBD disease causes. In our data, 68% of patents match to at least one MeSH disease term, and of those, 78% match to one or more GBD causes (2.8 on average). We measure differences in potential health benefits for each patent using the GBD's estimates of female and male incidence (I.e, the number of new cases reported each year) for each matched disease in the year the patent application was filed. The GBD data begins in 1990, so we use the 1990 incidence for pre-1990 patents. We log incidence (plus 1) to account for its skewed distribution and for the zero counts that newly discovered diseases have in some years. We refer to this measure in models as "Logged Female Incidence"and "Logged Male Incidence."

Controls: In most of our models, we include a battery of fixed effects to adjust for unobserved heterogeneity across patents. Including *sub-category* fixed effects is important because male and female scientists may sort into different research areas. The biomedical sub-categories we use are Drugs, Surgery & Instruments, Biotechnology, and Miscellaneous Drugs and Medical. These sub-categories may in turn have different patenting rates. Including *year* fixed effects is important to disentangle any effect of greater female representation from the secular increase both in women inventors and in the number of female-focused inventions. For example, if in 1990 there were a breakthrough in surgical methods for female anatomy then we would see both more women on patents and more "Female" patents, even if women were no more likely that year to focus on female diseases and conditions. We also think it is important to control for *team size* because when a patent has more inventors it is more likely to have a woman associated with it. Accounting for this bias is especially important because prior research has shown that patent-team size and breadth have grown over time (Wuchty et al., 2007; Hall et al., 2001). We use a series of fixed effects for categories of team size because the team-size distribution is fairly "lumpy," and we have no reason to think this effect is linear.

We have raised the possibility that male and female inventors sort into different research areas. Including sub-category fixed effects helps us adjust for such sorting, but it can give the impression that any differences we find are a between-disease or -condition phenomenon. Within particular research areas, though, women may still focus on topics that have particular bearing for women.

[9]We report our crosswalk in Appendix C.

We can leverage the hierarchical structure of the MeSH terms to investigate this. In analyses where we look for within-disease effects of female researchers, we also include fixed effects for diseases. It is possible to include these alongside patent sub-category fixed effects because MeSH disease categories do not nest inside USPTO technology categories. Inventions can target multiple diseases, so for these models we use patent-disease rather than patent observations and cluster standard errors by patent.

Table 1 presents summary statistics for the variables we use in our analyses.

[Table 1 about here.]

Results

We begin by plotting trends in female inventors and inventions. Figure 1 showed that the share of biomedical patents with at least one female assignee has risen over time. In the late 1970s, female inventors appear on about 12% of patents. By 1995, that share had increased to about 25%, though afterward the rate of progress appeared to slow. By 2010, the share had risen to 35%. There has been a meaningful shift in who invents.

In Figure 1 we can see the percentage of female-focused inventions has roughly mirrored this trend. In the late 1970s, roughly 9.5% of biomedical patents focused on women. Over the next two decades this saw a marked increase. By 1995, the share was roughly 12%, and again growth slowed, rising to about 13% in 2010. The increase in female-focused innovation is marked even when compared with the increase in male-focused innovation. Further, and consistent with the idea that male researchers might have overlooked inventions that benefit women, the gap between the two has closed over time. There has been a meaningful shift in what is invented.

To unpack these trends, Table 2 tests hypothesis 1: do women researchers tend to work on patents that target female diseases and conditions? The two panels of the table show models with the same independent variables and type of dependent variable, differing by whether the dependent variables are "Female" or "Male" measures. Thus model 1A regresses whether a patent matches to the "Female" MeSH term on whether the patent has a female inventor, while model 1B regresses whether a patent matches to the "Male" MeSH term on whether the patent has a female inventor. Both models include fixed effects for patent sub-category, year, and team size.

[Table 2 about here.]

It appears that women inventors do invent for women. Model 1A shows that patents with female inventors are 2.5 percentage points more likely to be tagged with the "Female" MeSH term. We include as a summary statistic the mean of the dependent variable in these models, to simplify comparing coefficient magnitudes. Given the female base rate of 12.8 percentage points, this translates into a $(12.8 + 2.5)/12.8 = 19.5\%$ increase, which is substantial. By comparison, model 1B shows that patents with female inventors are only 0.4 percentage points more likely to be tagged with the "Male" MeSH term. This too can be compared to the term's baseline rate to imply a $(13.3 + .4)/13.3 = 3\%$ increase.[10] Female inventors are not simply associated with more gendered research (Nielsen et al., 2017). Their associated patents disproportionately target diseases and conditions that affect women.

The difference is even more pronounced when we examine patents where "Female" or "Male" is the highest-scored MeSH term. Model 2A shows that female researchers' associated work is 19% more likely to have "Female" as the top associated MeSH term, but no more likely to have "Male" as the top term than all-male teams'. We find similar if slightly smaller associations if we focus on inventions that target strongly gendered diseases and conditions. Model 3 shows that patents with female inventors are 17% more likely to address female urogenital diseases or pregnancy-related complications, but are no more likely to address male urogenital diseases than all-male teams' patents.

Model 4 comes at this question another way, by asking whether female inventors are more likely to patent in disease areas with higher incidence among women. Here we use patent-GBD cause-level data, which is why the number of observations increases; we cluster standard errors by patent. Model 4A shows that patents with female inventors focus on diseases and conditions that, on average, have 8% higher incidence among women. Model 4B shows that the same patents focus on diseases and conditions that have only 2.5% higher incidence among men, and this last result is not significant. This too suggests that female inventors focus more on women's-health issues.

To test hypothesis 2, we contrast the effects of having a female lead inventor on a patent with the effects of having a female inventor in a non-lead position (the omitted group in such models is

[10] In all models that compare coefficients across men and women, the differences between the coefficients are significant at $p < .01$ unless otherwise mentioned.

an all-male team). Table 3 reports these models. Its structure is parallel to Table 2. Model 1A demonstrates that separating leads from non-leads is significant: while female non-leads raise the probability of a patent's matching to the "Female" MeSH term by 14%, a female lead raises it by 27%. A female lead's effect on patents' matching to the "Male" MeSH term is also larger, but only by 5%. What is more, non-lead female inventors are not associated with any greater likelihood of patents matching to the "Male" term. A similar pattern is visible across models 2 and 3. In all these models, the differences between the female lead and female non-lead coefficients are significant at $p < .05$. In model 4A, the effect of a female lead inventor on patents' disease incidence is 10%, which is larger than female non-leads', but not significantly higher than the pooled effect in Table 2. All of this supports hypothesis 2, suggesting that female inventors are more likely to work on innovations that affect women's health when they have more control over their own research. In addition to supporting this hypothesis, such results should ease suspicion that the greater presence of female researchers and the increase in female-focused inventions is spurious. Even when we control for the secular increase in women researchers, as here, women's greater organizational authority goes hand in hand with increased attention to advances that target women.

[Table 3 about here.]

The models in Tables 2 and 3 control for a battery of fixed effects; we think that those effects are themselves interesting to explore. Tables 4, 5, and 6 present models akin to those in model 1A of table 3, estimated on sub-samples of the data defined by the various fixed effects.[11] Table 4 shows that the effect of female leads is significant and substantial across all biomedical patent sub-categories, save for the small biotech group.[12] Table 5 demonstrates that the largest effects of female inventors are observed in the earliest time period, 1976–1985. This is consistent with mechanisms like differential sorting and differential selection (Ferguson and Carnabuci, 2017). When discrimination against women researchers is stronger, the average ability of female inventors conditional on observation is likely to be higher. There are also more unexplored avenues for research on

[11] Table 5 presents ten-year time periods for simplicity, but when we include year fixed effects elsewhere we use individual years.

[12] Table 4 also shows that Simpson's Paradox (Simpson, 1951) is alive and well in these data. The effects of female inventors are largest in Surgery & Instruments, where women inventors are more rarely found on patents than they are in the Drugs sub-category. Thus if you pool observations across sub-categories then there appears to be a negative relationship between female inventors and inventions' matching to the "Female" MeSH term, even though there is a positive relationship within each sub-category.

women's health issues in earlier periods. Table 6 meanwhile demonstrates that the relationship is strongest among solo inventors, which further supports the idea that effect sizes here vary directly with female researcher autonomy.

[Table 4 about here.]

[Table 5 about here.]

[Table 6 about here.]

Together, Tables 2 through 6 imply that there is some relationship between the presence of female researchers and the increase in female-focused inventions. Hypotheses 1 and 2 are supported.

We now turn to assessing hypothesis 3, which is that the increase in women inventors has led to an increase in female-focused inventions. It is important to underline that the results presented thus far do not show this. One way to interpret these results is in terms of sorting by inventors. These results would be consistent with female researchers' being more active in a handful of research areas, like breast cancer or reproductive health. Male researchers meanwhile may have moved out of these areas to focus on other topics. This could leave the overall thrust of research and innovation unchanged. Alternatively, female inventors could be more attentive to specific aspects of diseases or conditions that differentially affect women, including within diseases that are not traditionally thought of as gendered. For example, the incidence of diabetes is similar for men and women around the world (Vos et al., 2012), but gestational diabetes (the third major form alongside type-I and type-II) is unique to pregnant women. Similarly, blood-clot-related strokes are equally common among men and women, but clot formation in the legs is more common in women than in men (Vos et al., 2012). If female inventors tend to pay more attention to diseases and conditions that affect women then we would see such effects within arbitrarily defined disease categories rather than just across them.

To test this idea, in Table 7 we study all patents with disease classifications that run at least four levels deep in the MTI's ontological tree. The tactic here is to first fit models on these patents without disease fixed effects and then phase in fixed effects for increasingly fine-grained levels of the ontology. (We cluster standard errors in these models by patent.) We know there will be an effect like that seen in the first model, where we include no disease fixed effects, because this model

essentially reproduces model 1A of table 3. This effect though is equally compatible with high-level sorting and with its absence.

The next four models bring in the more fine-grained fixed effects. Level 1 includes 25 top-level disease categories, such as Viruses [C02], Neoplasms [C04], and Cardiovascular Diseases [C14]. These are quite broad; for example, neoplasms covers all cancers. Level 2 has 245 categories in our data. These are roughly comparable to the GBD disease causes, save for cancers. They include things like Heart Diseases [C14.280] and Vascular Diseases [C14.907]. Level 3 has 1,125 categories, such as Cardiac Arrhythmias [C14.280.067], Pericarditis [C14.280.720] and Rheumatic Heart Disease [C14.280.874]. In level 4 our data have 1,571 categories, distinguishing between conditions like Atrial Fibrillation [C14.280.067.198] and Atrial Flutter [C14.280.067.248]. We think that by the time we have reached level 4 in this tree, we are no longer talking about broad disease or condition areas that vary by gender but instead have entered the penetralia of many specialized research domains.

In each of these models, the effect of female inventors remains significant. The reduction in the Female Lead Inventor coefficient magnitude across the five models suggests that, at most, about one third of the association can be explained by sorting, even between level-4 disease categories. The rest stems from differences in patents within these categories. This is evidence against high-level sorting.

[Table 7 about here.]

It is important for us to show the results in table 7 because they demonstrate that the effects we have found previously come from female inventors active in many domains, not just a few. This in turn is important for testing whether the rise of women inventors has increased innovation output above what would have happened otherwise. How much do women researchers' female-focused innovations substitute for innovation on male-focused or gender-neutral innovations? Without a counterfactual world where women were blocked from entering biomedical research, we cannot answer this definitively. However, since we know there is variation in impact within disease categories and since we know that there is variation in women's activity across disease categories, we should be able to leverage this variation to test for substitution within disease categories.[13]

[13]Our approach, comparing variation across diseases to proxy for demand, is well established. See Acemoglu and Linn (2004), Dubois et al. (2015), and Lichtenberg (2018) for three relatively recent examples.

In Table 8, we test for substitution by examining how female researchers' presence in research on a disease affects the *number* of female patents targeting that disease. For these analyses we use disease-year observations and cluster standard errors by disease. Model 1 controls for the year and for the size of the disease area; model 2 also controls for the specific MeSH disease terms matched to the patent. In both models, the effect of *lead* female researchers is positive and significant. On the other hand, the effect of female non-leads is not. (The difference between significance and non-significance here is significant.) The pattern is telling: it is reasonable to argue that female inventors in non-lead positions could be doing work that would otherwise be done by men, such that the level of innovation output in those areas remains unchanged. But more female lead inventors implies more female-focused inventions. There also appears to be some persistence to this effect. Model 3 shows that the past level of female activity in a research field is positively associated with the level of female-focused inventions, even when controlling for the present level of activity. At least at more senior levels, women's increased participation is not a zero-sum game. Figure 2 displays these results as binned scatterplots, but using percentages instead of logged counts to ease interpretation. We find the same pattern of results. Areas with an additional 10 percentage points of female lead inventors have 0.5% more female patents. We find no evidence that more women non-lead inventors leads to more female-focused inventions.

[Table 8 about here.]

[Figure 2 about here.]

We cannot make direct causal claims based on these results. The ideal setup for doing so would involve an exogenous shock to the supply of female inventors, which we do not have. We can begin to approximate this, though, by controlling for changes in demand, which we attempt in Table 9. Our approach is to use the rate of innovation in one biomedical patent domain as a proxy for time-varying shifts in demand for innovation in another. This will not capture all time-varying sources of demand, but if female inventors simply sort into areas that demand female-focused inventions, then adjusting for shifts in demand should weaken the female inventor-invention link. We use the logged number of patents in Surgery & Instruments to capture shifts in demand for innovation in Drugs. The logic for using increases in Surgery & Instruments to proxy for demand in Drugs,

rather than vice versa, is that there has been far less increase in female participation in invention in Surgery & Instruments. We show this in Figure 3; the share of patents in Surgery & Instruments with female leads in particular has hardly changed at all since the late 1970s. By contrast, using Drugs to proxy for demand for innovation in Surgery & Instruments would tangle together changes in demand and changes in supply. After accounting for year and disease fixed effects, we find a positive correlation ($\rho = .25$) between the number of female focused surgery patents and drug patents in a disease area. Figure 4 shows a binned scatter plot with each point representing 2% quantiles (e.g., 50 buckets). We use these tight quantiles to check if especially large shocks appear across both disease and surgery patents. Indeed, they do. The demand for female focused surgical inventions appears to also capture the demand for female focused drug inventions, especially in the tails of the distribution.

[Figure 3 about here.]

[Figure 4 about here.]

Therefore in model 1 of Table 9 we replicate model 2 of Table 8, including fixed effects for year, disease category size and MeSH disease area, but using the logged count of female focused patents in Drugs rather than the logged count in biomedical patents generally.[14] In model 2 of Table 9, we include the logged number of patents in Surgery & Instruments. This is a positive and significant predictor of the number of female-focused inventions in Drugs, suggesting that it can proxy for demand for innovation in Drugs, but the estimated coefficient for the logged number of female inventors in Drugs remains virtually unchanged. Stronger still is the test in model 3, where we separately control for the logged number of female-focused patents in Surgery & Instruments. Consistent with Figure 4, its effect is significant and nearly double the size, while the effect of Surgery & Instrument patents that are not focused on women becomes tiny and non-significant. Model 3 removes the effect attenuation that pooling their measurement in model 2 might have introduced. Yet even here, the effect of female inventors' presence remains all but unchanged.

[Table 9 about here.]

[14]The models in Table 9 are fitted on slightly more observations than those in Table 8 because two of the 1,300 disease classes were missing data that prevented us from building Table 8's five-year cumulative measures.

These analyses do not make an open-and-shut case for causality, but they put bounds around the case for spurious correlation. Such a case must involve confounders that co-vary closely with female inventor activity, across time, types of research, and contemporary levels of activity in each research sub-domain; yet independently of any similar such confounding with female activity in Surgery & Instrument research. Within those bounds, we are willing to claim support for hypothesis 3.

To bring this analysis full circle, it is worth considering the results in Table 9 in light of Figure 1. Tables 8 and 9 are log-log models, which means the coefficients can be interpreted as elasticities. Figure 1 shows that the raw increase in the share of innovation done by women was about 25 percentage points from 1976 to 2010. Model 3 of Table 9 shows an elasticity of .076, which would imply a change in the number of female-focused inventions on the order of $25 \times .076 = 1.9$ percentage points. Figure 1 also shows that the share of female-focused biomedical inventions increased by a bit more than 4 percentage points over the same period. Clearly, male researchers have grown more cognizant of and attentive to specific issues affecting women's health over the last generation. Yet we think it is reasonable in light of these analyses to say that nearly half of the increased attention to such issues can be traced to the growing presence of women in biomedical research.

Discussion and conclusion

We have studied whether, in biomedicine, adding women inventors increases innovation aimed at women. The answer appears to be yes. We classified the universe of "Drugs and Medical" patents issued between 1976 and 2010 by whether they target a particular gender, using several different techniques. We check whether the National Library of Medicine's Medical Text Indexer tags the invention as "Male" or "Female"; whether that tag is the first response the indexer gives; whether the patent refers explicitly to male- or female-focused diseases; and whether the disease on which it focuses has greater incidence among men or women. We find an association between female inventors and female inventions. The association is stronger when a woman is the lead inventor on a patent. We can rule out unobserved heterogeneity on several dimensions, including over time and between different technological sub-categories. And while there is not an exogenous change in women's participation in the sciences in these data, our results are also robust to proxying for changes in demand for such innovations.

We do not need to lean too hard on why this association is stronger when a woman is in a leadership role. It could be that productive female researchers are steered toward such work by their colleagues or the organizations in which they work. Nonetheless, their presence seems to have contributed materially toward the growth of research into female-specific diseases and medical conditions over the last generation. Nor have women simply replaced men who would have done the same work. Where lead inventors are concerned at least, more women has meant more innovation in the aggregate.

We see several ways that future research could try to disentangle supply from demand in explaining this shift. One, obviously, involves identifying shocks to the supply of female inventors. The admission of women into previously all-male schools would not be a good choice, because it is likely that the same political environment that encouraged gender integration also encouraged greater attention to women's health. More fruitful would be a policy reform like the Post-9/11 GI Bill,[15] which lets active service personnel transfer their educational benefits to spouses or dependents. Any impact of such legislation would only just begin to appear at the end of our data series, but this could be a promising avenue to follow in the future. A second way to disentangle supply and demand would be to separately consider researchers in corporate and university environments. In principle, university researchers have greater (though not total) freedom in their research topics. To the extent that this association owes more to the supply of female inventors than to the demand for female-focused research, the association should be stronger among university researchers.

We think our findings are interesting in their own right, but they also have several implications. The first is that bias against women researchers has not just affected the course of their careers (Ding et al., 2006; Carnabuci and Diószegi, 2015; Lerchenmueller and Sorenson, 2018). In medicine, at least, it has also shaped the population of inventions. Finding a relationship between the entry of women and the increase in female-focused innovation makes it hard to argue that these advances could not have been made earlier because of fundamental scientific constraints. Roads that once were not taken have since been trod.

An immediate question that this raises for future research is, what has the effect been of these inventions? Measuring the impact in the world (as opposed to future patent citations) of a patent is notoriously difficult. Here we have presented some evidence leveraging the Global Burden of

[15] `https://www.benefits.va.gov/gibill/post911_gibill.asp`

Disease database to show that female researchers seem to work on diseases and conditions that affect more women. We do not think that all inventions focused on a specific disease or condition have the same affect, but weighting inventions by incidence gives us a sense of the potential effect of this shift. More work needs to be done to improve the quality of crosswalks between databases like the USTPO's and the IHME's GBD dataset, but we think the possible findings would be more than worthwhile.

Research has long documented that, compared to global incidence, there is not enough commercialized innovation on tropical diseases and severe conditions that affect small populations (Trouiller et al., 2002; Evans et al., 2014). Much attention has been paid to how we can design policies and re-jig incentives to make innovators focus on these (Kremer, 2002). While similar, our pattern of findings is conceptually distinct. We do not argue that the potential market for female-focused innovations is too small. On the contrary, female and male patients are largely equal market opportunities. Instead, we argue that social norms and biases pushed male innovators to overlook promising female-focused inventions. This product-market bias deserves more attention, in biomedicine specifically and in product markets more generally. This research suggests the general utility of looking at the content of products or inventions. The perennial challenge is to find comparable weighting schemes for such comparisons, but the potential reward is the ability to trace bias in labor markets through to bias in product markets. This is of interest beyond just innovation research.

Another implication of this work applies to research on the affects of diversity on group and firm performance (Williams and O'Reilly, 1998; van Knippenberg and Schippers, 2007; Østergaard et al., 2011). Over the last two decades, much of that work has shifted from studying variation in ethnic or sexual differences *per se* in groups and teams, instead focusing on how variety in experience, risk-taking, and other cognitive or personality traits drive group outcomes. The relationship between diversity and productivity was always assumed to be indirect: differences in ideas and worldviews are correlated with different backgrounds. In a divided society, teams assembled from across those divides will try more approaches on any given problem, and thus be more productive. This can all be true, and yet what can be lost in that shift is whether there are relationships between the types of outputs produced and the dimensions of group diversity.

One can go farther with this point. If diversity can change or increase the scope of innovations,

should we be so concerned about the raw rate of innovation? Is faster innovation on a well-studied topic always preferable to a lower rate of innovation on an otherwise neglected topic? And if topics and thus rates vary by groups, should we apply identical evaluation criteria to their work? This raises more questions than we can answer with our data, but it opens for consideration what incentives researchers face and why the entry of a new group of researchers may not by itself shift the direction of research.

A similar point can be made about research on the labor-market outcomes of inventors. As we discussed, most of this work has tried whenever possible to control for patent content and quality. This means making comparisons within types of patents. But it is possible that decisions about which types of research to do also affect men and women's careers (Ding et al., 2006). We do not have employment or career information for the inventors in our data, but it would be fascinating to track inventors through their selection of topics as well as through their production of patents. Even if such work could not separate selection effects from treatment effects, it would be useful to know the relative share of variance in wages or promotions explained.

In conclusion, we hope that this study shows the benefit of trying to characterize the types of male and female inventors' inventions, not only for the explicit policy question but also for its implications for how we do innovation research. There is much still to be done before we can say definitively whether and how changes in the composition of the inventor pool can shape the direction of invention. Yet even these results are sufficient to support the idea that past discrimination probably cost us a few generations of "Lost Einsteins." Though, given the topic, perhaps we should rue our "Lost Curies" just as bitterly?

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Table 1: Summary Statistics

	Mean	Median	SD	Min	Max	N
Female Inventor	0.27	0	0.45	0	1	441,475
Female Lead Inventor	0.10	0	0.30	0	1	441,475
Female Non-Lead Inventor	0.17	0	0.38	0	1	441,475
Patent Team Size	2.83	2	2.12	1	32	441,475
Patent Application Year	1998.09	1999	8.36	1976	2010	441,475
Number of MeSH Terms on Patent	21.59	25	4.83	1	25	441,475
Number of Diseases linked to Patent	2.20	1	2.66	0	24	441,475
Drug Patent	0.55	1	0.50	0	1	441,475
Surgery and Inst. Patent	0.35	0	0.48	0	1	441,475
Biotech Patent	0.03	0	0.16	0	1	441,475
Misc. Patent	0.08	0	0.26	0	1	441,475
Patent Has Female MeSH	0.13	0	0.33	0	1	441,475
Patent Has Female MeSH (Top MeSH)	0.08	0	0.28	0	1	441,475
Patent Has Female Disease MeSH	0.02	0	0.15	0	1	441,475
Logged Female Incidence	11.85	14	6.04	0	18	233,930
Patent Has Male MeSH	0.13	0	0.34	0	1	441,475
Patent Has Male MeSH (Top MeSH)	0.09	0	0.29	0	1	441,475
Patent Has Male Disease MeSH	0.03	0	0.18	0	1	441,475
Logged Male Incidence	11.59	15	6.09	0	18	233,930

Table 2: Female-invented patents focus on female diseases and conditions

Panel A: Female-focused Inventions	(1A) Female MeSH	(2A) Female Top MeSH	(3A) Female Disease MeSH	(4A) Logged Female Incidence
Female Inventor	0.025***	0.016***	0.004***	0.079***
	(0.001)	(0.001)	(0.001)	(0.018)
Mean of D.V.	0.128	0.083	0.024	11.907
Subcategory FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Team size FEs	Yes	Yes	Yes	Yes
Panel B: Male-focused Inventions	(1B) Male MeSH	(2B) Male Top MeSH	(3B) Male Disease MeSH	(4B) Logged Male Incidence
Female Inventor	0.004***	0.000	-0.001	0.025
	(0.001)	(0.001)	(0.001)	(0.019)
Mean of D.V.	0.133	0.094	0.034	11.581
Subcategory FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Team size FEs	Yes	Yes	Yes	Yes
Observations	441,475	441,475	441,475	657,672

Patent-level regressions in the first three columns with robust standard errors in parentheses.

Model 4 uses patent-disease observations with 216,317 patents. Standard errors are clustered by patent.

We add one to the logged variables before taking logs. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: The female inventor–invention link is stronger when the lead inventor is female

Panel A:	(1A)	(2A)	(3A)	(4A)
Female-focused Inventions	Female MeSH	Female Top MeSH	Female Disease MeSH	Logged Female Incidence
Female Lead Inventor	0.034***	0.022***	0.007***	0.103***
	(0.002)	(0.002)	(0.001)	(0.025)
Female Non-Lead Inventor	0.018***	0.012***	0.002*	0.062**
	(0.001)	(0.001)	(0.001)	(0.022)
Mean of D.V.	0.128	0.083	0.024	11.907
Subcategory FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Team size FEs	Yes	Yes	Yes	Yes
Panel B:	(1B)	(2B)	(3B)	(4B)
Male-focused Inventions	Male MeSH	Male Top MeSH	Male Disease MeSH	Logged Male Incidence
Female Lead Inventor	0.007***	0.000	-0.002	-0.002
	(0.002)	(0.001)	(0.001)	(0.027)
Female Non-Lead Inventor	0.002	0.000	0.000	0.043
	(0.001)	(0.001)	(0.001)	(0.023)
Mean of D.V.	0.133	0.094	0.034	11.581
Subcategory FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Team size FEs	Yes	Yes	Yes	Yes
Observations	441,475	441,475	441,475	657,672

Patent-level regressions in the first three columns with robust standard errors in parentheses.

Model 4 uses patent-disease observations with 216,317 patents. Standard errors are clustered by patent.

We add one to the logged variables before taking logs. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Decomposition of female-inventor effect by patent sub-categories

	Drugs	Surgery & Inst.	Biotech	Misc.
Female Lead Inventor	0.022***	0.065***	-0.004	0.030***
	(0.002)	(0.004)	(0.006)	(0.008)
Female Non-Lead Inventor	0.012***	0.041***	-0.011	0.006
	(0.002)	(0.004)	(0.006)	(0.008)
Mean of D.V.	0.105	0.170	0.055	0.123
Mean of Female Lead	0.126	0.065	0.133	0.059
Mean of Female Non-Lead	0.244	0.085	0.186	0.065
Year FEs	Yes	Yes	Yes	Yes
Team size FEs	Yes	Yes	Yes	Yes
Observations	242,594	153,088	12,243	33,539

Patent-level regressions. Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Decomposition of female-inventor effect by time periods

	1976–1985	1986–1995	1996–2005	2006–2010
Female Lead Inventor	0.051***	0.031***	0.028***	0.040***
	(0.007)	(0.004)	(0.003)	(0.004)
Female Non-Lead Inventor	0.016**	0.013***	0.018***	0.019***
	(0.005)	(0.003)	(0.002)	(0.003)
Mean of D.V.	0.098	0.117	0.134	0.139
Mean of Female Lead	0.050	0.082	0.111	0.118
Mean of Female Non-Lead	0.076	0.139	0.190	0.223
Subcategory FEs	Yes	Yes	Yes	Yes
Team size FEs	Yes	Yes	Yes	Yes
Observations	43,511	104,399	198,175	95,383

Patent-level regressions. Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Decomposition of female-inventor effect by team size

	One	Two	Three	Four+
Female Lead Inventor	0.051***	0.027***	0.026***	0.029***
	(0.004)	(0.004)	(0.004)	(0.003)
Female Non-Lead Inventor		0.021***	0.011***	0.016***
		(0.003)	(0.003)	(0.002)
Mean of D.V.	0.149	0.129	0.118	0.109
Mean of Female Lead	0.077	0.102	0.110	0.116
Mean of Female Non-Lead		0.110	0.211	0.403
Subcategory FEs	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes
Observations	132,141	111,567	78,959	118,809

Patent-level regressions. Robust standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: The female inventor-inventions link occurs both between and within diseases

MeSH-tree level FEs	None	Level 1	Level 2	Level 3	Level 4
Female Lead Inventor	0.053***	0.048***	0.049***	0.041***	0.038***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
Female Non-Lead Inventor	0.021***	0.020***	0.020***	0.018***	0.018***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Subcategory FEs	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	Yes	Yes	Yes	Yes
Team size FEs	Yes	Yes	Yes	Yes	Yes
Observations	221,740	221,740	221,736	221,728	221,716

Patent-disease-level regressions with 130,239 patents. Standard errors, clustered by patent, in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: Female inventors do not crowd out innovation in diseases

Dependent Variable:			
Logged Female Patents in MeSH Disease Category	(1)	(2)	(3)
Logged Patents with Female Lead Inventor	0.113***	0.061***	0.056***
	(0.019)	(0.012)	(0.011)
— 5-Year Cumulative Lag			0.030***
			(0.006)
Logged Patents with Female Non-Lead Inventor	-0.006	-0.006	-0.009
	(0.013)	(0.010)	(0.010)
— 5-Year Cumulative Lag			-0.007
			(0.005)
Year FEs	Yes	Yes	Yes
Category size FEs	Yes	Yes	Yes
MeSH Disease FEs	No	Yes	Yes
Observations	54,873	54,873	54,873

Disease-year regressions. Standard errors, clustered by disease, in parentheses.

We add one to the logged variables before taking logs. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: Female inventors do not crowd out innovation in Drugs: Proxying for Drug demand with Surgery & Instruments

Dependent Variable:			
Logged Female Drug Patents in MeSH Disease Category	(1)	(2)	(3)
Logged Drug Patents with Lead Female Inventor	0.078***	0.077***	0.076***
	(0.013)	(0.013)	(0.013)
Logged Drug Patents with Non-Lead Female Inventor	-0.004	-0.005	-0.005
	(0.012)	(0.012)	(0.012)
Logged Surgery Patents		0.037***	-0.001
		(0.008)	(0.008)
Logged Female Surgery Patents			0.075***
			(0.013)
Year FEs	Yes	Yes	Yes
Disease Category Size FEs	Yes	Yes	Yes
MeSH Disease FEs	Yes	Yes	Yes
Observations	54,919	54,919	54,919

Disease-year regressions. Standard errors, clustered by disease, in parentheses.

We add one to the logged variables before taking logs. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

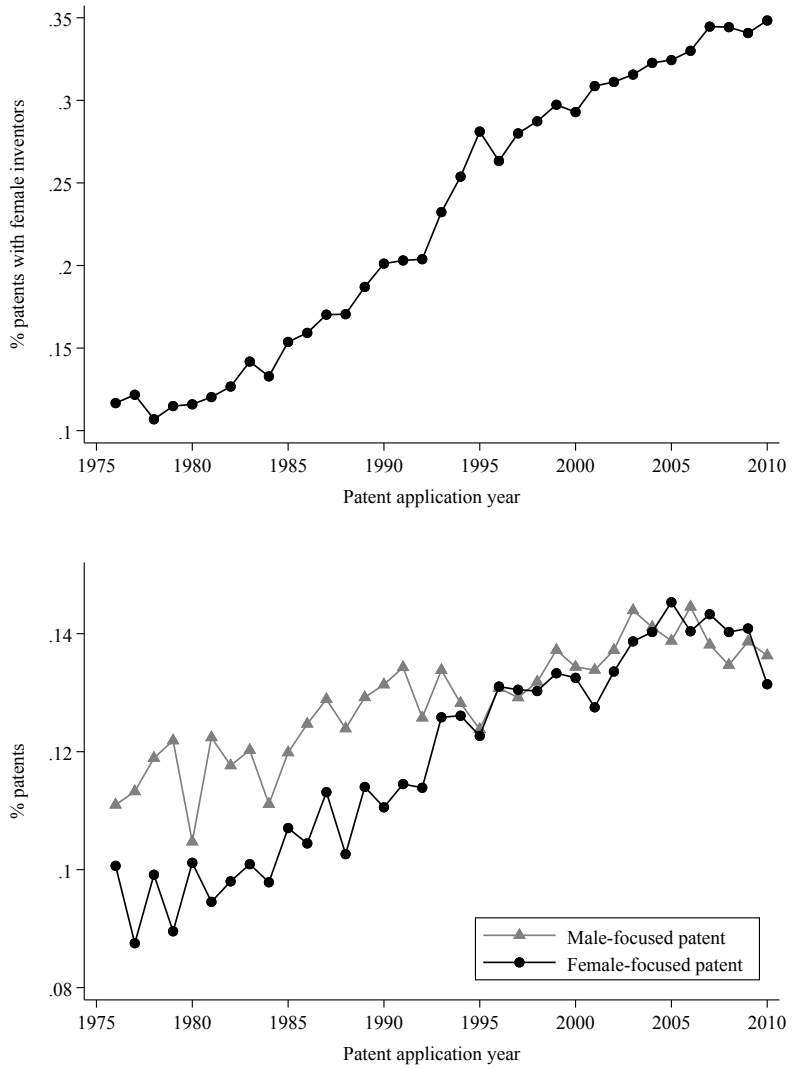

Figure 1: Female inventors and female-focused inventions over time. Data on inventor gender comes from dictionary-match analysis of inventor names from the USPTO. Data on the gender focus (if any) of patents comes from passing patent text through the National Library of Medicine's Medical Text Indexer. A patent is coded male- or female-focused if the MTI returns "Male" or "Female" as one of its top Medical Subject Headings.

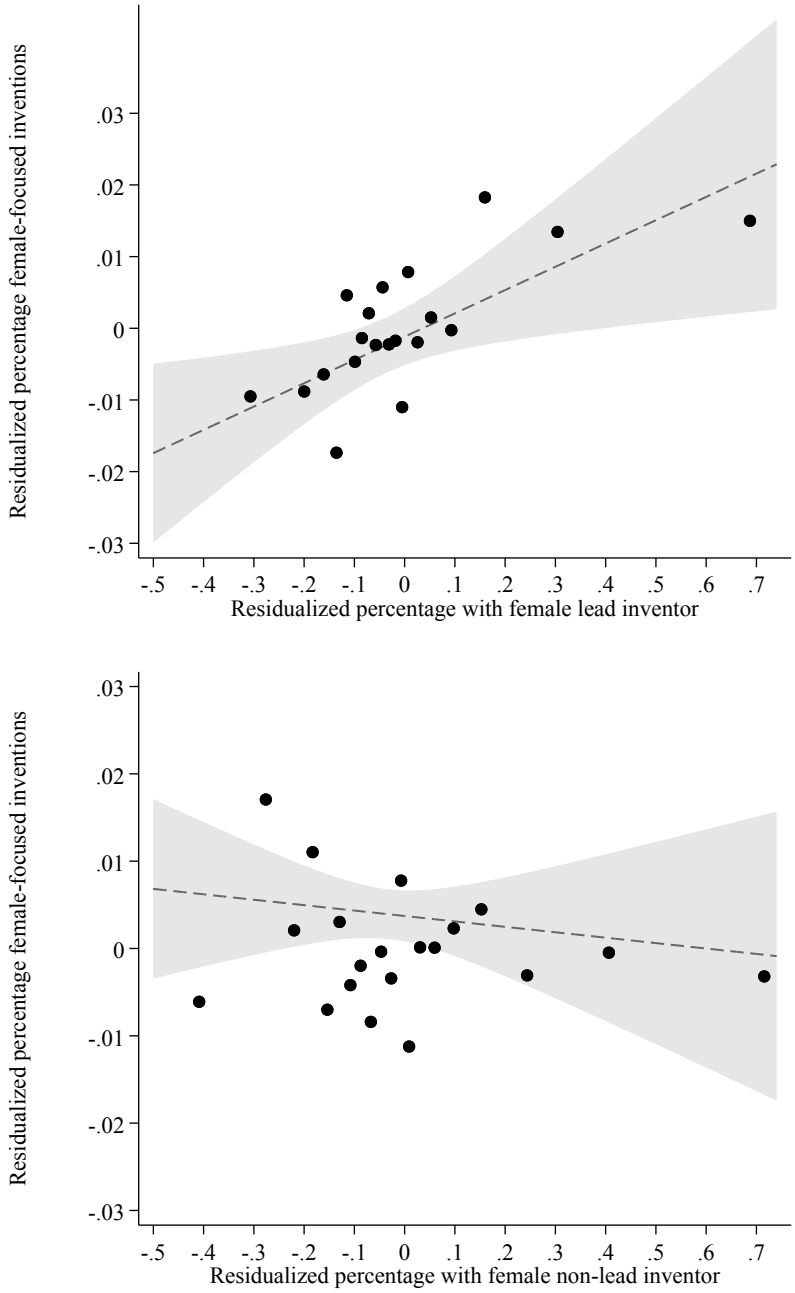

Figure 2: More female lead inventors means more female-focused inventions. The top figure shows that disease areas with more lead female inventors have more female-focused inventions. The bottom figure shows that more non-lead female inventors have neither more nor fewer. In both figures, the axes show the residualized estimates after taking into account application-year, disease-area, and disease-category-size fixed effects. The top figure controls for the percentage of non-lead female inventors and the bottom controls for the percentage of lead female inventors. The regression lines account for these fixed effects and controls. The gray shaded area shows the 95% confidence intervals. The error terms are clustered by disease. Negative percentages are possible because the estimates are residualized.

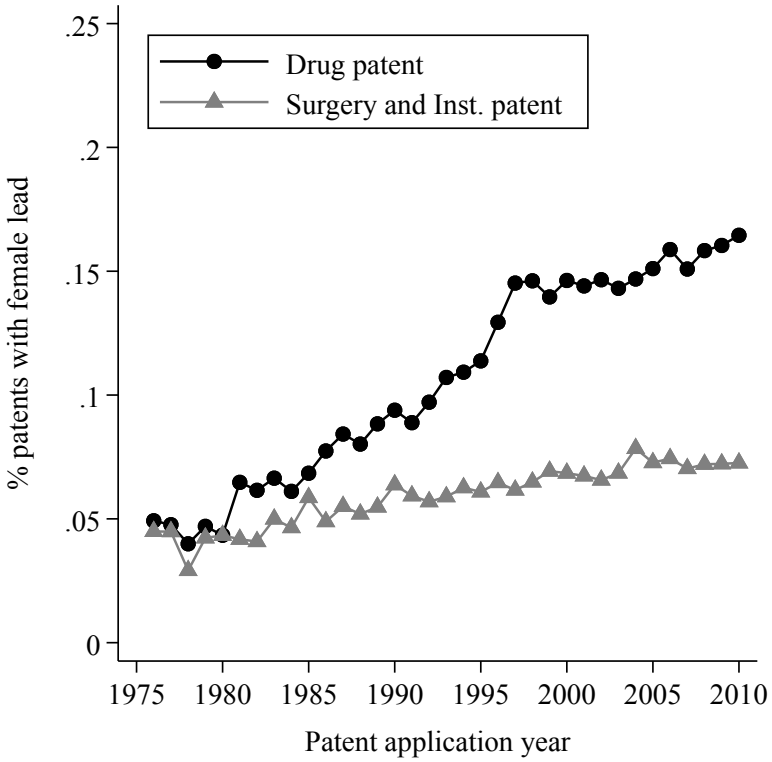

Figure 3: The percent of patents with a female lead has increased dramatically in Drugs research from 1976 to 2010 while remaining nearly flat in Surgery & Instruments research.

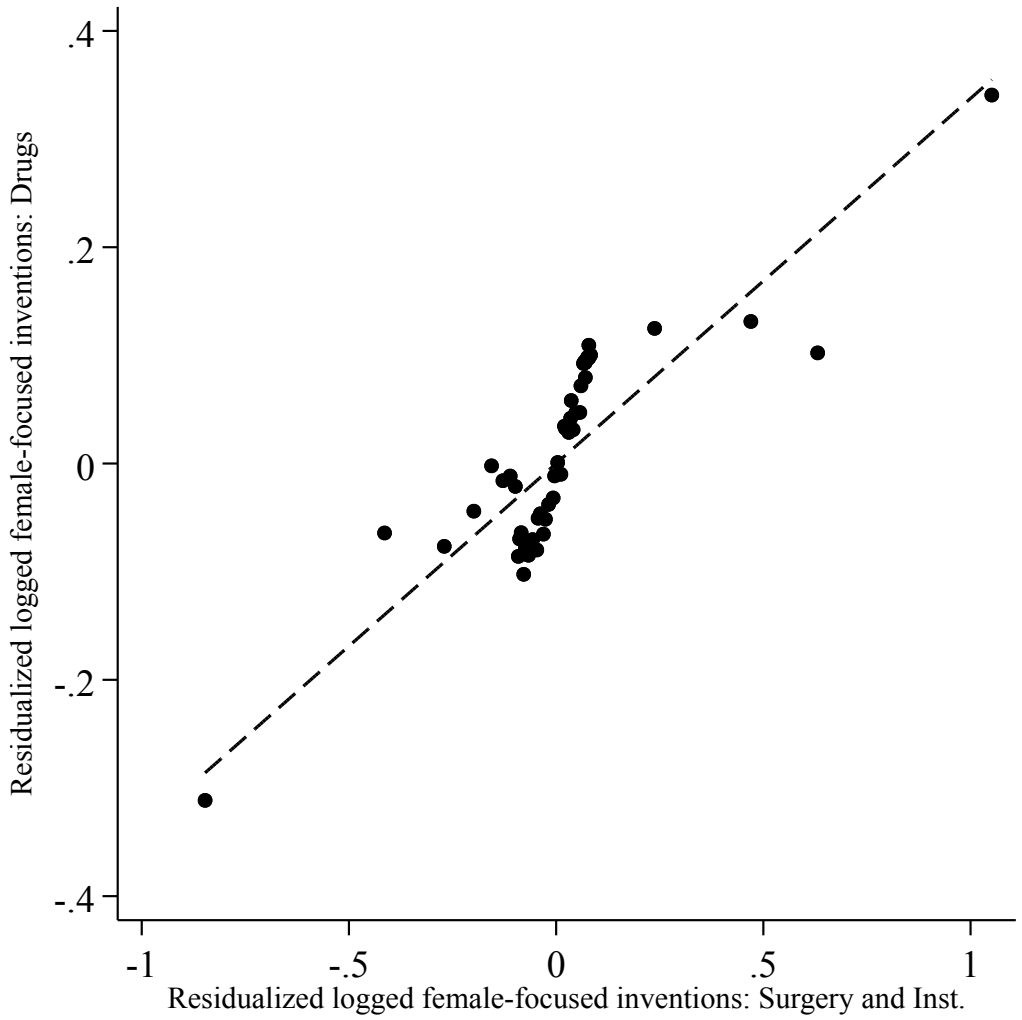

Figure 4: Disease areas with more female-focused Surgical & Instrument inventions also have more female-focused Drug inventions, even after controlling for year and disease fixed effects. This suggests that shifts in the demand for female-focused research in Surgery & Instruments proxy for shifts in demand for female-focused Drug research. Each point represents a 2% quantile and each axis shows the residualized logged counts after accounting for year and disease fixed effects. The dashed line represents the correlation coefficient of .25.

A Appendix: Dictionary sources for inventor gender assignment

- United Kingdom Intellectual Property Organization (Intellectual Property Office, 2016)

  Available https://www.gov.uk/government/publications/gender-profiles-in-worldwide-patenting-an-analysis-of-female-inventorship

  Description 102,777 unique names, of which 63,121 are female and 39,656 are male

- World Intellectual Property Organization (Martínez et al., 2016)

  Available http://www.wipo.int/publications/en/details.jsp?id=4125

  Description 289,452 unique name-gender-nationality records, of which 157,066 are female, 112,207 are male, and 20,183 are undetermined. Combines records from the US Social Security Administration and Census Bureau, the Alberta government, the UK Office for National Statistics, Statistics Sweden, Spains Instituto Nacional de Estatística, France's Institut National de la Statistique, and Denmark Statistics

- US Social Security Administration

  Available

  Description 1,924,665 names (97,310 unique), of which 1,138,293 are female (67,046 unique) and 786,372 are male (40,927 unique)

- Florida Voter Registration

  Available https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/UBIG3F

  Description 13,710,231 names (545,396 unique), of which 7,196,185 are female (368,313 unique), 6,160,967 are male (194,150 unique), and 352,075 are undetermined (56,567 unique)

- NYC Baby Names

  Available https://catalog.data.gov/dataset/most-popular-baby-names-by-sex-and-mothers-ethnic-group-new-york-city-8c742

  Description 11,345 names (3,016 unique), of which 5,806 are female (1,629 unique) and 5,539 are male (1,430 unique)

Table C1 reports the proportion of patents for which we could assign gender to all of the inventors as a function of the number of inventors listed on the patent, as well as for U.S.-based versus non-U.S.-based teams. One can readily see that our ability to identify the gender of all members of the team declines with team size. Our gender-identification algorithms also perform better among U.S.-based teams of inventors. As with many current algorithms, the majority of our non-matched records consist of Asian names.

[Table 10 about here.]

B Appendix: Patent keywords used for assigning genders

The MeSH terms assigned by the Medical Text Indexer reflect the best guess of the medical community about whether a piece of medical text is related to men or women. Like any measure, though, these male and female tags have limitations. First, they conflate patents that explicitly focus on female diseases (e.g., drugs for cervical cancer) and patents that might more tangentially impact women (e.g., drugs for lung cancer). Second, it is relatively opaque. While the MeSH indexer is regularly used in medical and social science research, its scores rely on a proprietary algorithm that might pick up unintended sources of variation. Finally, the Male/Female tags do not cleanly map to female- or male-focused diseases, making it difficult to interpret exactly how patents with "Male" and "Female" terms differ and if "Female" ("Male") patents are more likely to have health benefits for women (men).

To overcome these limitations, we supplement MeSH with a simple dictionary-based approach. We compiled a list of medical terms that only apply to men or women. We then searched the title and abstract of each patent for these terms. Patents that matched to a term in the female list were marked as "Female" patents; likewise for male terms. While this approach will overlook alternative terms, grammatical variations and a host of other linguistic complexities, it does provide us with a straightforward and transparent alternative.

Table C2 reproduces models from Tables 2 and 3, using this alternative definition of the dependent variable. The pattern of results is the same as what we obtain with the MeSH terms. We also reproduce our list of male and female keywords below.

[Table 11 about here.]

Male Terms

- Alport syndrome
- Androgenetic alopecia
- Aspermia
- Asthenozoospermia
- Azoospermia
- Azoospermic
- BPH
- Balanitis
- Balanoposthitis
- Bald
- Baldness
- Benign prostatic hypertrophy
- Bulbourethral glands
- Castration-resistant prostatic neoplasms
- Circumcised
- Circumcision
- Circumcisions
- Corpus cavernosum
- Cowper's glands
- Cremaster muscle
- Cryptorchid
- Cryptorchidism
- Cryptorchidism
- Ejaculatory duct
- Enlarged prostate
- Epididymal
- Epididymides
- Epididymis
- Epididymitis
- Erectile dysfunction
- Erectile tissue
- Foreskin
- Fournier gangrene
- Glans penis
- Gonadal dysgenesis
- Gonadoblastoma
- Haemophilia
- Hematocele
- Hematospermia
- Hemospermia
- Hydrocele
- Hypospadiac
- Hypospadias
- Impotence
- Impotent
- Infecund
- Infecundity
- Inseminate
- Insemination
- Interseminal
- Klinefelter syndrome
- Low sperm count
- Male genital tuberculosis
- Male pattern baldness
- Micropenis
- Microphallus
- Oligospermia
- Orchiectomy
- Orchiopexy
- Orchitis
- Paraphimoses
- Paraphimosis
- Paraphimotic
- Paternal
- Penes
- Penial
- Penile
- Penile cancer
- Penile induration
- Penile neoplasms
- Penis
- Penises
- Peyronie's disease
- Phimoses
- Phimosis
- Phimotic
- Premature ejaculation
- Prepuce
- Preseminal
- Priapism
- Priapismic
- Prostate
- Prostate cancer
- Prostate gland
- Prostatectomy
- Prostatic hyperplasia
- Prostatic neoplasms
- Prostatic sinus
- Prostatic sinuses
- Prostatitic
- Prostatitis
- Puboprostatic
- Puboprostatic ligament
- Scrota
- Scrotal
- Scrotum
- Scrotums
- Semen
- Seminal
- Seminal gland
- Seminal glands
- Seminal vesicle
- Seminal vesicles
- Seminality
- Seminally
- Seminoma
- Seminomas
- Seminomata
- Sertoli cell-only syndrome
- Sperm motility
- Spermatic cord torsion
- Spermatogenesis
- Spermatogenetic
- Spermatozoa
- Spermicidal
- Spermicide
- Squamous cell cancer
- Teratozoospermia
- Testes
- Testicles
- Testicular cancer
- Testicular cord
- Testicular neoplasms
- Testicular torsion
- Testis
- Testis tumor
- Testosterone
- Transrectal ultrasound
- Varicoceles
- Variococele
- Vas deferens
- Vasa deferentia
- Vasculogenic impotence
- Vasectomy
- Vasovasostomy
- Y chromosome
- Y chromosomes

Female Terms

- Aborticide
- Abortion
- Abortus
- Abruptio placentae
- Adenomyosis
- Amenorrhea
- Amenorrheal
- Amenorrheic
- Amenorrhoeal
- Amenorrhoeic
- Anovulation
- Antiestrogen
- Areola
- Areolae
- Areolar
- Areolas
- Areolate
- Areolation
- Artificial Insemination
- Bartholin's glands
- Birth
- Birth control
- Birthed
- Birthing
- Births
- Blastocyst
- Blastosphere
- Blastula
- Blastulae
- Blastular
- Blastulas
- Blastulation
- Breast
- Breast Cancer
- Breast cyst
- Breast reconstruction
- Breast-feed
- Breastfed
- Breastfeed
- Breastfeeding
- Breasts
- Breech
- Brenner tumor
- C section
- C-section

- Caesarean
- Casesarian
- Cervical
- Cervical Cancer
- Cervical canal
- Cervical cerclage
- Cervices
- Cervix
- Cervixes
- Cesarean
- Cesarean section
- Child-bearing
- Chorea gravidarum
- Chorioamnionitis
- Chorioamnionitis
- Clitoral
- Clitoral hood
- Clitoric
- Clitoridean
- Clitoridectomies
- Clitoridectomy
- Clitoris
- Colpitis
- Colposcopy
- Colpotomy
- Culdoscopy
- Diaphragm
- Diaphragms
- Dysmenorrhea
- Dysmenorrheal
- Echogenic bowel
- Eclampsia
- Eclamptic
- Ectopic pregnancies
- Ectopic pregnancy
- Embryo
- Embryonic
- Embryos
- Endocrine system
- Endocrinology
- Endometrial ablation
- Endometrial hyperplasia
- Endometrial neoplasms
- Endometrioid carcinoma
- Endometriosis
- Endometritis
- Endometrium
- Estrogen
- Estrus
- Estrus cycle
- Extrauterine pregnancy
- FGM
- Fallopian tube
- Fallopian tube neoplasms
- Fallopian tubes
- Female Genital Mutilation
- Female circumcision
- Female condom
- Female genital tuberculosis
- Fetal
- Fetal macrosomia
- Feticide
- Fetoscopy
- Fetus
- Fetuses
- Fimbria
- Fimbriae
- Fimbrial
- Foetus
- G spot
- G-spot
- GYN
- Graafian follicles
- Grafenberg spot
- Granulosa cell tumor
- Grfenberg spot
- Gynatresia
- Gynecologic
- Gynecological
- Gynecologist
- Gynecologists
- Gynecology
- HELLP syndrome
- Hematocolpos
- Hematometra
- Hereditary breast and ovarian cancer syndrome
- Hot flash
- Hot flashes
- Hot flush
- Hydrocolpos
- Hydrops fetalis
- Hymen
- Hymenal
- Hyperemesis gravidarum
- Hysterectomies
- Hysterectomy
- Hysteroscopy
- Hysterotomy
- IUD
- Impregnation
- Infibulation
- Intrauterine device
- Labia
- Labia majora
- Labia minora
- Labium
- Lactate
- Lactating
- Lactation
- Leukorrhea
- Luteoma
- Mammaplasty
- Mammary
- Mammary Gland Lobules
- Mammary gland
- Mammectomy
- Mammogram
- Mammography
- Mastectomies
- Mastectomy
- Meigs syndrome
- Menopause
- Menorrhagia
- Menses
- Menstrual
- Menstrual blood
- Menstrual cycle
- Menstruating
- Menstruation
- Metrorrhagia
- Miscarriage
- Mons pubis
- Montes pubis
- Multibirth
- Multiovulate
- Multiovulated
- Myometrium
- Nuchal cord
- Oestrus
- Oligohydramnios
- Oocyte
- Oocytes
- Oogonium
- Oophoritis
- Oosphere
- Ova
- Ovarian
- Ovarian Cancer
- Ovarian cyst
- Ovarian cysts
- Ovarian hyperstimulation sndrome
- Ovarian neoplasms
- Ovariectomy
- Ovaries
- Ovary
- Oviducal
- Oviduct
- Oviductal
- Oviducts
- Ovulate
- Ovulated
- Ovulating
- Ovulation
- Ovulatory
- Ovum
- PCOS
- Pap smear
- Pap test
- Papanicolaou test
- Parametritis
- Parovarian cyst
- Pelvic inflammatory disease
- Polycystic Ovary Syndrome
- Post-Cesarean
- Postabortion
- Postpartum hemorrhage
- Postpregnancy
- Preeclampsia
- Preeclamptic
- Pregnancies
- Pregnancy
- Pregnant
- Premature menopause
- Prenatal
- Prenatally
- Preovulatory
- Preterm birth
- Primary ovarian insufficiency
- Prophylactic mastectomy
- Pseudovaries
- Pseudovary
- Pudenda
- Pudendum
- Puerperal infection
- Pyelectasis
- Pyometra
- Radical mastectomy
- Rectovaginal fistula
- Salpingectomy
- Salpingitis
- Salpingo-oophorectomy
- Salpingostomy
- Segmental mastectomy
- Skene's glands
- Spontaneous abortion
- Squamous intraepithelial lesions of the cervix
- Stillbirth
- Subcutaneous mastectomy
- Symphysiotomy
- Thecoma
- Trachelectomy
- Trophoblastic neoplasms
- Turner syndrome
- Uterine Fibroids
- Uterine cancer
- Uterine cervical dysplasia
- Uterine cervical erosion
- Uterine cervical incompetence
- Uterine cervical neoplasms
- Uterine cervicitis
- Uterine inversion
- Uterine myomectomy
- Uterine prolapse
- Uterine retroversion
- Uterine rupture
- Uterine sinus
- Uterus
- Uteruses
- Vacuum curettage
- Vagina
- Vaginae
- Vaginal cancer
- Vaginal smears
- Vaginas
- Vaginismus
- Vaginitis
- Vasa previa
- Vesicovaginal fistula
- Vestibular bulb
- Vestibular bulbs
- Virilism
- Vulva
- Vulvae
- Vulval
- Vulvar
- Vulvar cancer
- Vulvar lichen sclerosus
- Vulvar neoplasms
- Vulvar vestibulitis
- Vulvas
- Vulvate
- Vulvectomy
- Vulviform
- Vulvitis
- Vulvodynia
- Vulvovaginal candidiasis
- Vulvovaginitis
- Wet-nurse
- Wet-nurses
- Womb

C Appendix: MeSH term / GBD disease cause crosswalk

- **GBD disease cause [MeSH code] MeSH term**
- Acne vulgaris [C17.800.030.150] Acne Vulgaris
- Acne vulgaris [C17.800.794.111] Acne Vulgaris
- Acute glomerulonephritis [C12.777.419.570.363] Glomerulonephritis
- Acute glomerulonephritis [C13.351.968.419.570.363] Glomerulonephritis
- Acute hepatitis A [C02.440.420] Hepatitis A
- Acute hepatitis A [C02.782.687.359.500] Hepatitis A
- Acute hepatitis A [C06.552.380.705.422] Hepatitis A
- Acute hepatitis B [C02.256.430.400] Hepatitis B
- Acute hepatitis B [C02.440.435] Hepatitis B
- Acute hepatitis B [C06.552.380.705.437] Hepatitis B
- Acute hepatitis C [C02.440.440] Hepatitis C
- Acute hepatitis C [C02.782.350.350] Hepatitis C
- Acute hepatitis C [C06.552.380.705.440] Hepatitis C
- Acute hepatitis E [C02.440.470] Hepatitis E
- Acute hepatitis E [C02.782.455] Hepatitis E
- Acute hepatitis E [C06.552.380.705.470] Hepatitis E
- Acute hepatitis [C06.552.380] Hepatitis
- African trypanosomiasis [C03.752.300.900.719] Trypanosomiasis, African
- African trypanosomiasis [C03.752.300.900] Trypanosomiasis
- Age-related and other hearing loss [C09.218.458.341] Hearing Loss
- Age-related and other hearing loss [C10.597.751.418.341] Hearing Loss
- Age-related and other hearing loss [C23.888.592.763.393.341] Hearing Loss
- Age-related macular degeneration [C11.768.585.439] Macular

Degeneration
- Alcohol use disorders [C25.775.100] Alcohol-Related Disorders
- Alcohol use disorders [F03.900.100] Alcohol-Related Disorders
- Alopecia areata [C17.800.329.937.122.147] Alopecia Areata
- Alzheimer's disease and other dementias [C10.228.140.380.100] Alzheimer Disease
- Alzheimer's disease and other dementias [C10.228.140.380] Dementia
- Alzheimer's disease and other dementias [C10.574.945.249] Alzheimer Disease
- Amphetamine use disorders [C25.775.225] Amphetamine-Related Disorders
- Amphetamine use disorders [F03.900.225] Amphetamine-Related Disorders
- Anorexia nervosa [F03.400.125] Anorexia Nervosa
- Anxiety disorders [F03.080] Anxiety Disorders
- Aortic aneurysm [C14.907.055.239] Aortic Aneurysm
- Aortic aneurysm [C14.907.109.139] Aortic Aneurysm
- Appendicitis [C01.539.463.099] Appendicitis
- Appendicitis [C06.405.205.099] Appendicitis
- Appendicitis [C06.405.469.110.207] Appendicitis
- Asbestosis [C08.381.483.581.125] Asbestosis
- Asbestosis [C08.381.520.702.125] Asbestosis
- Asbestosis [C24.800.127] Asbestosis
- Ascariasis [C03.335.508.700.100.070] Ascariasis
- Asthma [C08.127.108] Asthma
- Asthma [C08.381.495.108] Asthma
- Asthma [C08.674.095] Asthma
- Asthma [C20.543.480.680.095] Asthma
- Atrial fibrillation and flutter [C14.280.067.198] Atrial Fibrillation
- Atrial fibrillation and flutter [C14.280.067.248] Atrial Flutter
- Atrial fibrillation and flutter [C23.550.073.198] Atrial Fibrillation
- Atrial fibrillation and flutter [C23.550.073.248] Atrial Flutter
- Attention-deficit/hyperactivity disorder [F03.625.094.150] Attention Deficit Disorder with Hyperactivity
- Autism spectrum disorders [F03.625.164.113] Autism Spectrum Disorder
- Bacterial skin diseases [C01.252.825] Skin Diseases, Bacterial
- Bacterial skin diseases [C01.539.800.720] Skin Diseases, Bacterial
- Bacterial skin diseases [C17.800.838.765] Skin Diseases, Bacterial
- Benign and in situ intestinal neoplasms [C04.588.274.476.411] Intestinal Neoplasms
- Benign and in situ intestinal neoplasms [C06.301.371.411] Intestinal Neoplasms
- Benign and in situ intestinal neoplasms [C06.405.249.411] Intestinal Neoplasms
- Benign and in situ intestinal neoplasms [C06.405.469.491] Intestinal Neoplasms
- Benign prostatic hyperplasia [C12.294.565.500] Prostatic Hyperplasia
- Bipolar disorder [F03.084.500] Bipolar Disorder
- Bladder cancer [C04.588.945.947.960] Urinary Bladder Neoplasms
- Bladder cancer [C12.758.820.968] Urinary Bladder Neoplasms
- Bladder cancer [C12.777.829.813] Urinary Bladder Neoplasms
- Bladder cancer [C13.351.937.820.945] Urinary Bladder Neoplasms
- Bladder cancer [C13.351.968.829.707] Urinary Bladder Neoplasms
- Blindness and vision impairment [C10.597.751.941] Vision Disorders
- Blindness and vision impairment [C11.966] Vision Disorders
- Blindness and vision impairment [C23.888.592.763.941] Vision Disorders
- Brain and nervous system cancer [C04.588.614.250.195] Brain Neoplasms
- Brain and nervous system cancer [C04.588.614] Nervous System Neoplasms
- Brain and nervous system cancer [C10.228.140.211] Brain Neoplasms
- Brain and nervous system cancer [C10.551.240.250] Brain Neoplasms
- Brain and nervous system cancer [C10.551] Nervous System Neoplasms
- Breast cancer [C04.588.180] Breast Neoplasms
- Breast cancer [C17.800.090.500] Breast Neoplasms
- Bulimia nervosa [F03.400.250] Bulimia Nervosa
- Cannabis use disorders [C25.775.635] Marijuana Abuse
- Cannabis use disorders [F01.145.610] Marijuana Use
- Cannabis use disorders [F03.900.635] Marijuana Abuse
- Cannabis use disorders [F03.900.643] Marijuana Use
- Cardiomyopathy and myocarditis [C14.280.238.625] Myocarditis
- Cardiomyopathy and myocarditis [C14.280.238] Cardiomyopathies
- Cardiovascular diseases [C14] Cardiovascular Diseases
- Cataract [C11.510.245] Cataract
- Cellulitis [C01.539.800.130] Cellulitis
- Cellulitis [C01.539.830.200] Cellulitis
- Cellulitis [C17.300.185] Cellulitis
- Cellulitis [C23.550.470.756.200] Cellulitis
- Cervical cancer [C04.588.945.418.948.850] Uterine Cervical Neoplasms
- Cervical cancer [C13.351.500.852.593.131] Uterine Cervical Neoplasms
- Cervical cancer [C13.351.500.852.762.850] Uterine Cervical Neoplasms
- Cervical cancer [C13.351.937.418.875.850] Uterine Cervical Neoplasms
- Chagas disease [C03.752.300.900.200] Chagas Disease
- Chagas disease [C03.752.300.900.200.190] Chagas Cardiomyopathy
- Chagas disease [C14.280.238.190] Chagas Cardiomyopathy
- Chlamydial infection [C01.252.400.210.210] Chlamydia Infections
- Chlamydial infection [C01.252.810.301] Chlamydia Infections
- Chlamydial infection [C01.539.778.281.301] Chlamydia Infections
- Chlamydial infection [C12.294.668.281.301] Chlamydia Infections
- Chlamydial infection [C13.351.500.711.281.301] Chlamydia Infections
- Chronic kidney disease [C05.116.198.816.750] Chronic Kidney Disease-Mineral and Bone Disorder
- Chronic kidney disease [C12.777.419.080] Chronic Kidney Disease-Mineral and Bone Disorder
- Chronic kidney disease [C13.351.968.419.795] Chronic Kidney Disease-Mineral and Bone Disorder
- Chronic kidney disease [C18.452.104.816.750] Chronic Kidney Disease-Mineral and Bone Disorder
- Chronic kidney disease [C18.452.174.845.750] Chronic Kidney Disease-Mineral and Bone Disorder
- Chronic kidney disease [C18.654.521.500.133.770.734.750] Chronic Kidney Disease-Mineral and Bone Disorder
- Chronic kidney disease [C19.642.355.480.500] Chronic Kidney Disease-Mineral and Bone Disorder
- Chronic obstructive pulmonary disease [C08.381.495.389] Pulmonary Disease, Chronic Obstructive
- Chronic respiratory diseases [C08.618] Respiration Disorders
- Cirrhosis and other chronic liver diseases [C06.552.630] Liver Cirrhosis
- Cocaine use disorders [C25.775.300] Cocaine-Related Disorders
- Cocaine use disorders [F03.900.300] Cocaine-Related Disorders
- Colon and rectum cancer [C04.588.274.476.411.307.180] Colonic Neoplasms
- Colon and rectum cancer [C04.588.274.476.411.307.790] Rectal Neoplasms
- Colon and rectum cancer [C06.301.371.411.307.180] Colonic Neoplasms
- Colon and rectum cancer [C06.301.371.411.307.790] Rectal Neoplasms
- Colon and rectum cancer [C06.405.249.411.307.180] Colonic Neoplasms
- Colon and rectum cancer [C06.405.249.411.307.790] Rectal Neoplasms
- Colon and rectum cancer [C06.405.469.158.356.180] Colonic Neoplasms
- Colon and rectum cancer [C06.405.469.491.307.180] Colonic Neoplasms
- Colon and rectum cancer [C06.405.469.491.307.790] Rectal Neoplasms
- Colon and rectum cancer [C06.405.469.860.180.500] Rectal Neoplasms
- Conduct disorder [F03.625.094.300] Conduct Disorder
- Congenital birth defects [C16.131] Congenital Abnormalities
- Congenital heart anomalies [C14.240.400] Heart Defects, Congenital
- Congenital heart anomalies [C14.280.400] Heart Defects, Congenital
- Congenital heart anomalies [C16.131.240.400] Heart Defects, Congenital
- Congenital musculoskeletal and limb anomalies [N/A] N/A
- Cutaneous and mucocutaneous leishmaniasis [C03.752.300.500.400.385] Leishmaniasis, Mucocutaneous
- Cutaneous and mucocutaneous leishmaniasis [C03.858.560.400.385] Leishmaniasis, Mucocutaneous
- Cutaneous and mucocutaneous leishmaniasis [C17.800.838.775.560.400.385] Leishmaniasis, Mucocutaneous
- Cystic echinococcosis [C03.335.190.396.314] Echinococcosis, Hepatic
- Cystic echinococcosis [C03.335.190.396] Echinococcosis
- Cystic echinococcosis [C03.518.314] Echinococcosis, Hepatic
- Cystic echinococcosis [C04.182] Cysts
- Cystic echinococcosis [C06.552.664.272] Echinococcosis, Hepatic
- Cystic echinococcosis [C23.300.306] Cysts
- Cysticercosis [B01.050.500.500.736.215.895.775] Taenia solium
- Cysticercosis [C03.335.190.902.185] Cysticercosis
- Decubitus ulcer [C17.800.893.665] Pressure Ulcer
- Dengue [B04.820.250.350.270] Dengue Virus

- Dengue [C02.081.270] Dengue
- Dengue [C02.782.350.250.214] Dengue
- Dengue [C02.782.417.214] Dengue
- Depressive disorders [F03.600.300] Depressive Disorder
- Dermatitis [C17.800.174] Dermatitis
- Diabetes and kidney diseases [C12.777.419] Kidney Diseases
- Diabetes and kidney diseases [C13.351.968.419] Kidney Diseases
- Diabetes and kidney diseases [C18.452.394.750] Diabetes Mellitus
- Diabetes and kidney diseases [C19.246] Diabetes Mellitus
- Diabetes mellitus [C18.452.394.750] Diabetes Mellitus
- Diabetes mellitus [C19.246] Diabetes Mellitus
- Diarrheal diseases [C06.405] Gastrointestinal Diseases
- Diarrheal diseases [C23.888.821.214] Diarrhea
- Dietary iron deficiency [C15.378.071.196.300] Anemia, Iron-Deficiency
- Dietary iron deficiency [C18.452.565.100] Anemia, Iron-Deficiency
- Digestive congenital anomalies [C16.131.314] Digestive System Abnormalities
- Digestive diseases [C06] Digestive System Diseases
- Diphtheria [C01.252.410.040.246.388] Diphtheria
- Diphtheria [D20.215.894.691.263] Diphtheria Toxoid
- Down syndrome [C10.597.606.360.220] Down Syndrome
- Down syndrome [C16.131.077.327] Down Syndrome
- Down syndrome [C16.131.260.260] Down Syndrome
- Down syndrome [C16.320.180.260] Down Syndrome
- Drug use disorders [C25.775.383] Drug Overdose
- Drug use disorders [E02.319.306.500.500] Drug Overdose
- Drug-susceptible tuberculosis [N/A] N/A
- Dysthymia [F03.600.300.400] Dysthymic Disorder
- Eating disorders [F03.400] Feeding and Eating Disorders
- Ebola [B04.820.455.300.200] Ebolavirus
- Ebola [C02.782.417.415] Hemorrhagic Fever, Ebola
- Ebola [C02.782.580.250.400] Hemorrhagic Fever, Ebola
- Ectopic pregnancy [C13.703.733] Pregnancy, Ectopic
- Encephalitis [C02.182.525] Encephalitis, Viral
- Encephalitis [C02.290] Encephalitis, Viral
- Encephalitis [C10.228.140.430.520.750] Encephalitis, Viral
- Encephalitis [C10.228.140.430] Encephalitis
- Encephalitis [C10.228.228.245.340] Encephalitis, Viral
- Encephalitis [C10.228.228.399.750] Encephalitis, Viral
- Endocarditis [C14.280.282] Endocarditis
- Endocrine, metabolic, blood, and immune disorders [C15.378] Hematologic Diseases
- Endocrine, metabolic, blood, and immune disorders [C18.452] Metabolic Diseases
- Endocrine, metabolic, blood, and immune disorders [C19] Endocrine System Diseases
- Endocrine, metabolic, blood, and immune disorders [C20] Immune System Diseases
- Endometriosis [C13.351.500.163] Endometriosis
- Enteric infections [C06.405.469] Intestinal Diseases
- Epilepsy [C10.228.140.490] Epilepsy
- Esophageal cancer [C04.588.274.476.205] Esophageal Neoplasms
- Esophageal cancer [C04.588.443.353] Esophageal Neoplasms
- Esophageal cancer [C06.301.371.205] Esophageal Neoplasms
- Esophageal cancer [C06.405.117.430] Esophageal Neoplasms
- Esophageal cancer [C06.405.249.205] Esophageal Neoplasms
- Extensively drug-resistant tuberculosis [C01.252.410.040.552.846.775.500] Extensively Drug-Resistant Tuberculosis
- Female infertility [C13.351.500.365.700] Infertility, Female
- Food-borne trematodiases [C03.335.865] Trematode Infections
- Fungal skin diseases [C01.703] Mycoses
- G6PD deficiency [C15.378.071.141.150.480] Glucosephosphate Dehydrogenase Deficiency
- G6PD deficiency [C16.320.070.480] Glucosephosphate Dehydrogenase Deficiency
- G6PD deficiency [C16.320.565.202.402] Glucosephosphate Dehydrogenase Deficiency
- G6PD deficiency [C18.452.648.202.402] Glucosephosphate Dehydrogenase Deficiency
- G6PD trait [C15.378.071.141.150.480] Glucosephosphate Dehydrogenase Deficiency
- G6PD trait [C16.320.070.480] Glucosephosphate Dehydrogenase Deficiency
- G6PD trait [C16.320.565.202.402] Glucosephosphate Dehydrogenase Deficiency
- G6PD trait [C18.452.648.202.402] Glucosephosphate Dehydrogenase Deficiency
- Gallbladder and biliary diseases [C06.130.564] Gallbladder Diseases
- Gallbladder and biliary diseases [C06.130] Biliary Tract Diseases
- Gallbladder and biliary tract cancer [C04.588.274.120.401] Gallbladder Neoplasms
- Gallbladder and biliary tract cancer [C04.588.274.120] Biliary Tract Neoplasms
- Gallbladder and biliary tract cancer [C06.130.320.401] Gallbladder Neoplasms
- Gallbladder and biliary tract cancer [C06.130.320] Biliary Tract Neoplasms
- Gallbladder and biliary tract cancer [C06.130.564.401] Gallbladder Neoplasms
- Gallbladder and biliary tract cancer [C06.301.120.401] Gallbladder Neoplasms
- Gallbladder and biliary tract cancer [C06.301.120] Biliary Tract Neoplasms
- Gastritis and duodenitis [C06.405.205.462.249] Duodenitis
- Gastritis and duodenitis [C06.405.205.697] Gastritis
- Gastritis and duodenitis [C06.405.469.275.600] Duodenitis
- Gastritis and duodenitis [C06.405.469.326.750] Duodenitis
- Gastritis and duodenitis [C06.405.748.398] Gastritis
- Gastroesophageal reflux disease [C06.405.117.119.500.484] Gastroesophageal Reflux
- Genital herpes [C02.256.466.382.290] Herpes Genitalis
- Genital herpes [C02.800.801.350] Herpes Genitalis
- Genital herpes [C12.294.329] Herpes Genitalis
- Genital herpes [C13.351.500.342] Herpes Genitalis
- Genital prolapse [C13.351.500.852.833] Uterine Prolapse
- Genital prolapse [C23.300.842.624.750] Uterine Prolapse
- Glaucoma [C11.525.381] Glaucoma
- Gonococcal infection [B03.440.400.425.550.550.474] Neisseria gonorrhoeae
- Gonococcal infection [B03.660.075.525.520.400] Neisseria gonorrhoeae
- Gonococcal infection [C01.252.400.625.391] Gonorrhea
- Gonococcal infection [C01.252.810.401] Gonorrhea
- Gonococcal infection [C01.539.778.281.401] Gonorrhea
- Gonococcal infection [C12.294.668.281.401] Gonorrhea
- Gonococcal infection [C13.351.500.711.281.401] Gonorrhea
- Gout [C05.550.114.423] Gout
- Gout [C05.550.354.500] Gout
- Gout [C05.799.414] Gout
- Gout [C16.320.565.798.368] Gout
- Gout [C18.452.648.798.368] Gout
- Guinea worm disease [B01.050.500.500.294.400.937.225.250.250] Dracunculus Nematode
- Guinea worm disease [C03.335.508.700.750.299] Dracunculiasis
- Gynecological diseases [C13.351.500] Genital Diseases, Female
- H influenzae type B meningitis [B03.440.450.600.450.330.150] Haemophilus influenzae type b
- H influenzae type B meningitis [B03.660.250.550.290.330.150] Haemophilus influenzae type b
- H influenzae type B meningitis [C01.252.200.500.450] Meningitis, Haemophilus
- H influenzae type B meningitis [C01.252.400.700.433.615] Meningitis, Haemophilus
- H influenzae type B meningitis [C10.228.228.180.500.425] Meningitis, Haemophilus
- H influenzae type B meningitis [C10.228.614.280.393] Meningitis, Haemophilus
- HIV/AIDS [C02.782.815.616.400.040] Acquired Immunodeficiency Syndrome
- HIV/AIDS [C02.782.815.616.400] HIV Infections
- HIV/AIDS [C02.800.801.400.040] Acquired Immunodeficiency Syndrome
- HIV/AIDS [C02.800.801.400] HIV Infections
- HIV/AIDS [C02.839.040] Acquired Immunodeficiency Syndrome
- HIV/AIDS [C20.673.480.040] Acquired Immunodeficiency Syndrome
- HIV/AIDS [C20.673.480] HIV Infections
- HIV/AIDS and sexually transmitted infections [C01.539.778] Sexually Transmitted Diseases
- HIV/AIDS and sexually transmitted infections [C02.782.815.616.400.040] Acquired Immunodeficiency Syndrome
- HIV/AIDS and sexually transmitted infections [C02.782.815.616.400] HIV Infections
- HIV/AIDS and sexually transmitted infections [C02.800.801.400.040] Acquired Immunodeficiency Syndrome
- HIV/AIDS and sexually transmitted infections [C02.800.801.400] HIV Infections
- HIV/AIDS and sexually transmitted infections [C02.800] Sexually Transmitted Diseases
- HIV/AIDS and sexually transmitted infections [C02.839.040] Acquired Immunodeficiency Syndrome
- HIV/AIDS and sexually transmitted infections [C12.294.668] Sexually Transmitted Diseases
- HIV/AIDS and sexually transmitted infections [C13.351.500.711] Sexually Transmitted Diseases
- HIV/AIDS and sexually transmitted infections [C20.673.480.040] Acquired Immunodeficiency Syndrome
- HIV/AIDS and sexually transmitted infections [C20.673.480] HIV Infections
- Headache disorders [C10.228.140.546] Headache Disorders
- Hemoglobinopathies and hemolytic anemias [C15.378.071.141] Anemia, Hemolytic
- Hemoglobinopathies and hemolytic anemias [C15.378.420] Hemoglobinopathies
- Hemoglobinopathies and hemolytic anemias [C16.320.365] Hemoglobinopathies

- Hemolytic disease and other neonatal jaundice [C16.614.451.500] Jaundice, Neonatal
- Hemolytic disease and other neonatal jaundice [C23.550.429.249.500] Jaundice, Neonatal
- Hodgkin lymphoma [C04.557.386.355] Hodgkin Disease
- Hodgkin lymphoma [C15.604.515.569.355] Hodgkin Disease
- Hodgkin lymphoma [C20.683.515.761.355] Hodgkin Disease
- Hookworm disease [B01.050.500.500.294.400.968.100] Ancylostomatoidea
- Hookworm disease [C03.335.508.700.775.455] Hookworm Infections
- Hypertensive heart disease [C14.907.489] Hypertension
- Idiopathic developmental intellectual disability [C10.597.606.360] Intellectual Disability
- Idiopathic developmental intellectual disability [C23.888.592.604.646] Intellectual Disability
- Idiopathic developmental intellectual disability [F01.700.687] Intellectual Disability
- Idiopathic developmental intellectual disability [F03.625.539] Intellectual Disability
- Indirect maternal deaths [C13.703.401] Maternal Death
- Indirect maternal deaths [C23.550.260.730.500] Maternal Death
- Indirect maternal deaths [I01.880.735.607.500] Maternal Death
- Inflammatory bowel disease [C06.405.205.731] Inflammatory Bowel Diseases
- Inflammatory bowel disease [C06.405.469.432] Inflammatory Bowel Diseases
- Inguinal, femoral, and abdominal hernia [C23.300.707.374.750] Hernia, Femoral
- Inguinal, femoral, and abdominal hernia [C23.300.707.374.875] Hernia, Inguinal
- Inguinal, femoral, and abdominal hernia [C23.300.707.374] Hernia, Abdominal
- Interstitial lung disease and pulmonary sarcoidosis [C08.381.483.725] Sarcoidosis, Pulmonary
- Interstitial lung disease and pulmonary sarcoidosis [C08.381.483] Lung Diseases, Interstitial
- Interstitial lung disease and pulmonary sarcoidosis [C15.604.515.827.725] Sarcoidosis, Pulmonary
- Intestinal nematode infections [C03.335.508] Nematode Infections
- Intestinal nematode infections [C03.432] Intestinal Diseases, Parasitic
- Intestinal nematode infections [C06.405.469.452] Intestinal Diseases, Parasitic
- Invasive Non-typhoidal Salmonella (iNTS) [B03.440.450.425.800] Salmonella
- Invasive Non-typhoidal Salmonella (iNTS) [B03.660.250.150.710] Salmonella
- Invasive Non-typhoidal Salmonella (iNTS) [C01.252.400.310.821] Salmonella Infections
- Iodine deficiency [N/A] N/A
- Ischemic heart disease [C14.280.647] Myocardial Ischemia
- Ischemic heart disease [C14.907.585] Myocardial Ischemia
- Kidney cancer [C04.588.945.947.535] Kidney Neoplasms
- Kidney cancer [C12.758.820.750] Kidney Neoplasms
- Kidney cancer [C12.777.419.473] Kidney Neoplasms
- Kidney cancer [C13.351.937.820.535] Kidney Neoplasms
- Kidney cancer [C13.351.968.419.473] Kidney Neoplasms
- Klinefelter syndrome [C16.131.260.830.835.500] Klinefelter Syndrome
- Klinefelter syndrome [C16.131.939.316.795.500] Klinefelter Syndrome
- Klinefelter syndrome [C16.320.180.830.835.500] Klinefelter Syndrome
- Larynx cancer [C04.588.443.665.481] Laryngeal Neoplasms
- Larynx cancer [C08.360.369] Laryngeal Neoplasms
- Larynx cancer [C08.785.481] Laryngeal Neoplasms
- Larynx cancer [C09.400.369] Laryngeal Neoplasms
- Larynx cancer [C09.647.481] Laryngeal Neoplasms
- Late maternal deaths [C13.703.401] Maternal Death
- Late maternal deaths [C23.550.260.730.500] Maternal Death
- Late maternal deaths,I01.880.735.607.500] Maternal Death
- Latent tuberculosis infection [C01.252.410.040.552.846.122] Latent Tuberculosis
- Leishmaniasis [C03.752.300.500] Leishmaniasis
- Leishmaniasis [C03.858.560] Leishmaniasis
- Leishmaniasis [C17.800.838.775.560] Leishmaniasis
- Leprosy [C01.252.410.040.552.386] Leprosy
- Leukemia [C04.557.337] Leukemia
- Lip and oral cavity cancer [C04.588.443.591.550] Lip Neoplasms
- Lip and oral cavity cancer [C04.588.443.591] Mouth Neoplasms
- Lip and oral cavity cancer [C07.465.409.640] Lip Neoplasms
- Lip and oral cavity cancer [C07.465.530.550] Lip Neoplasms
- Lip and oral cavity cancer [C07.465.530] Mouth Neoplasms
- Liver cancer [C04.588.274.623] Liver Neoplasms
- Liver cancer [C06.301.623] Liver Neoplasms
- Liver cancer [C06.552.697] Liver Neoplasms
- Low back pain [C23.888.592.612.107.400] Low Back Pain
- Lower respiratory infections [C01.539.739] Respiratory Tract Infections
- Lower respiratory infections [C08.730] Respiratory Tract Infections
- Lymphatic filariasis [C03.335.508.700.750.361.350] Elephantiasis, Filarial
- Lymphatic filariasis [C03.335.508.700.750.361] Filariasis
- Lymphatic filariasis [C15.604.496.490] Elephantiasis, Filarial
- Major depressive disorder [F03.600.300.375] Depressive Disorder, Major
- Malaria [C03.752.530] Malaria
- Male infertility [C12.294.365.700] Infertility, Male
- Malignant skin melanoma [C04.557.465.625.650.510] Melanoma
- Malignant skin melanoma [C04.557.580.625.650.510] Melanoma
- Malignant skin melanoma [C04.557.665.510] Melanoma
- Maternal abortion and miscarriage [C13.703.039] Abortion, Spontaneous
- Maternal abortion and miscarriage [C13.703.090] Abortion, Threatened
- Maternal and neonatal disorders [N/A] N/A
- Maternal deaths aggravated by HIV/AIDS [C13.703.401] Maternal Death
- Maternal deaths aggravated by HIV/AIDS [C23.550.260.730.500] Maternal Death
- Maternal deaths aggravated by HIV/AIDS [I01.880.735.607.500] Maternal Death
- Maternal disorders [C13.703] Pregnancy Complications
- Maternal hemorrhage [C13.703.420.725] Postpartum Hemorrhage
- Maternal hemorrhage [C13.703.844.700] Postpartum Hemorrhage
- Maternal hemorrhage [C23.550.414.993.850] Postpartum Hemorrhage
- Maternal hypertensive disorders [C13.703.395] Hypertension, Pregnancy-Induced
- Maternal hypertensive disorders [C14.907.489.480] Hypertension, Pregnancy-Induced
- Maternal obstructed labor and uterine rupture [C13.351.500.852.904] Uterine Rupture
- Maternal obstructed labor and uterine rupture [C13.703.420] Obstetric Labor Complications
- Maternal sepsis and other maternal infections [C01.539.674] Pregnancy Complications, Infectious
- Maternal sepsis and other maternal infections [C13.703.700] Pregnancy Complications, Infectious
- Measles [C02.782.580.600.500.500] Measles
- Meningitis [C01.252.200.500] Meningitis, Bacterial
- Meningitis [C01.703.181.500] Meningitis, Fungal
- Meningitis [C02.182.550] Meningitis, Viral
- Meningitis [C10.228.140.430.550] Meningoencephalitis
- Meningitis [C10.228.228.180.500] Meningitis, Bacterial
- Meningitis [C10.228.228.198.500] Meningitis, Fungal
- Meningitis [C10.228.228.245.500] Meningitis, Viral
- Meningitis [C10.228.228.245.550] Meningoencephalitis
- Meningitis [C10.228.228.570] Meningoencephalitis
- Meningitis [C10.228.614.220] Meningitis, Aseptic
- Meningitis [C10.228.614.280] Meningitis, Bacterial
- Meningitis [C10.228.614.300] Meningitis, Fungal
- Meningitis [C10.228.614.400] Meningitis, Viral
- Meningitis [C10.228.614.500] Meningoencephalitis
- Meningitis [C10.228.614] Meningitis
- Meningococcal meningitis [C01.252.200.500.550] Meningitis, Meningococcal
- Meningococcal meningitis [C01.252.400.625.549.449] Meningitis, Meningococcal
- Meningococcal meningitis [C10.228.228.180.500.750] Meningitis, Meningococcal
- Meningococcal meningitis [C10.228.614.280.505] Meningitis, Meningococcal
- Mental disorders [F03] Mental Disorders
- Mesothelioma [C04.557.470.035.510] Mesothelioma
- Mesothelioma [C04.557.470.660.510] Mesothelioma
- Migraine [C10.228.140.546.399.750] Migraine Disorders
- Motor neuron disease [C10.574.562] Motor Neuron Disease
- Motor neuron disease [C10.668.467] Motor Neuron Disease
- Multidrug-resistant tuberculosis without extensive drug resistance [C01.252.410.040.552.846.775] Tuberculosis, Multidrug-Resistant
- Multiple myeloma [C04.557.595.500] Multiple Myeloma
- Multiple myeloma [C14.907.454.460] Multiple Myeloma
- Multiple myeloma [C15.378.147.780.650] Multiple Myeloma
- Multiple myeloma [C15.378.463.515.460] Multiple Myeloma
- Multiple myeloma [C20.683.515.845] Multiple Myeloma
- Multiple myeloma [C20.683.780.650] Multiple Myeloma
- Multiple sclerosis [C10.114.375.500] Multiple Sclerosis
- Multiple sclerosis [C10.314.350.500] Multiple Sclerosis
- Multiple sclerosis [C20.111.258.250.500] Multiple Sclerosis
- Musculoskeletal disorders [C05] Musculoskeletal Diseases
- Myelodysplastic, myeloproliferative, and other hematopoietic neoplasms [C04.588.448] Hematologic Neoplasms
- Myelodysplastic, myeloproliferative, and other hematopoietic neoplasms [C15.378.400] Hematologic Neoplasms
- Nasopharynx cancer [C04.588.443.665.710.650] Nasopharyngeal Neoplasms
- Nasopharynx cancer [C07.550.350.650] Nasopharyngeal Neo-

plasms
- Nasopharynx cancer [C07.550.745.650] Nasopharyngeal Neoplasms
- Nasopharynx cancer [C09.647.710.650] Nasopharyngeal Neoplasms
- Nasopharynx cancer [C09.775.350.650] Nasopharyngeal Neoplasms
- Nasopharynx cancer [C09.775.549.650] Nasopharyngeal Neoplasms
- Near vision loss [C11.744.786] Presbyopia
- Neck pain [C23.888.592.612.553] Neck Pain
- Neglected tropical diseases and malaria [N/A] N/A
- Neonatal disorders [C16.614] Infant, Newborn, Diseases
- Neonatal disorders [C16] Congenital, Hereditary, and Neonatal Diseases and Abnormalities
- Neonatal encephalopathy due to birth asphyxia and trauma [C16.614.092] Asphyxia Neonatorum
- Neonatal preterm birth [C13.703.420.491.500] Premature Birth
- Neonatal sepsis and other neonatal infections [C01.539.757.580] Neonatal Sepsis
- Neonatal sepsis and other neonatal infections [C16.614.627] Neonatal Sepsis
- Neonatal sepsis and other neonatal infections [C23.550.470.790.500.470] Neonatal Sepsis
- Neoplasms [C04] Neoplasms
- Neural tube defects [C10.500.680] Neural Tube Defects
- Neural tube defects [C16.131.666.680] Neural Tube Defects
- Neurological disorders [C10] Nervous System Diseases
- Non-Hodgkin lymphoma [C04.557.386.480] Lymphoma, Non-Hodgkin
- Non-Hodgkin lymphoma [C15.604.515.569.480] Lymphoma, Non-Hodgkin
- Non-Hodgkin lymphoma [C20.683.515.761.480] Lymphoma, Non-Hodgkin
- Non-melanoma skin cancer [C04.588.805] Skin Neoplasms
- Non-melanoma skin cancer [C17.800.882] Skin Neoplasms
- Non-rheumatic valvular heart disease [C14.280.484] Heart Valve Diseases
- Nutritional deficiencies [C18.654.521] Malnutrition
- Onchocerciasis [C03.335.508.700.750.361.699] Onchocerciasis
- Onchocerciasis [C03.858.650] Onchocerciasis
- Onchocerciasis [C17.800.838.775.690] Onchocerciasis
- Opioid use disorders [C25.775.675] Opioid-Related Disorders
- Opioid use disorders [F03.900.675] Opioid-Related Disorders
- Oral disorders [C07.793] Tooth Diseases
- Orofacial clefts [N/A] N/A
- Osteoarthritis [C05.550.114.606] Osteoarthritis
- Osteoarthritis [C05.799.613] Osteoarthritis
- Other chromosomal abnormalities [C16.131.260] Chromosome Disorders
- Other chromosomal abnormalities [C16.320.180] Chromosome Disorders
- Other non-communicable diseases [N/A] N/A
- Other pharynx cancer [C04.588.443.665.710] Pharyngeal Neoplasms
- Other pharynx cancer [C07.550.745] Pharyngeal Neoplasms
- Other pharynx cancer [C09.647.710] Pharyngeal Neoplasms
- Other pharynx cancer [C09.775.549] Pharyngeal Neoplasms
- Otitis media [C09.218.705.663] Otitis Media
- Ovarian cancer [C04.588.322.455] Ovarian Neoplasms
- Ovarian cancer [C13.351.500.056.630.705] Ovarian Neoplasms
- Ovarian cancer [C13.351.937.418.685] Ovarian Neoplasms
- Ovarian cancer [C19.344.410] Ovarian Neoplasms
- Ovarian cancer [C19.391.630.705] Ovarian Neoplasms
- Pancreatic cancer [C04.588.274.761] Pancreatic Neoplasms
- Pancreatic cancer [C04.588.322.475] Pancreatic Neoplasms
- Pancreatic cancer [C06.301.761] Pancreatic Neoplasms
- Pancreatic cancer [C06.689.667] Pancreatic Neoplasms
- Pancreatic cancer [C19.344.421] Pancreatic Neoplasms
- Pancreatitis [C06.689.750] Pancreatitis
- Paralytic ileus and intestinal obstruction [C06.405.469.531.492.500] Intestinal Pseudo-Obstruction
- Paralytic ileus and intestinal obstruction [C06.405.469.531] Intestinal Obstruction
- Paratyphoid fever [C01.252.400.310.821.438] Paratyphoid Fever
- Parkinson's disease [C10.228.140.079.862.500] Parkinson Disease
- Parkinson's disease [C10.228.662.600.400] Parkinson Disease
- Parkinson's disease [C10.574.812] Parkinson Disease
- Peptic ulcer disease [C06.405.469.275.800] Peptic Ulcer
- Peptic ulcer disease [C06.405.748.586] Peptic Ulcer
- Peripheral artery disease [C14.907.137.126.307.500] Peripheral Arterial Disease
- Peripheral artery disease [C14.907.617.671] Peripheral Arterial Disease
- Pneumococcal meningitis [C01.252.200.500.600] Meningitis, Pneumococcal
- Pneumococcal meningitis [C01.252.410.890.670.595] Meningitis, Pneumococcal
- Pneumococcal meningitis [C10.228.228.180.500.875] Meningitis, Pneumococcal
- Pneumococcal meningitis [C10.228.614.280.560] Meningitis, Pneumococcal
- Pneumoconiosis [C08.381.483.581] Pneumoconiosis
- Pneumoconiosis [C08.381.520.702] Pneumoconiosis
- Pneumoconiosis [C24.800] Pneumoconiosis
- Polycystic ovarian syndrome [C04.182.612.765] Polycystic Ovary Syndrome
- Polycystic ovarian syndrome [C13.351.500.056.630.580.765] Polycystic Ovary Syndrome
- Polycystic ovarian syndrome [C19.391.630.580.765] Polycystic Ovary Syndrome
- Premenstrual syndrome [C23.550.568.968] Premenstrual Syndrome
- Prostate cancer [C04.588.945.440.770] Prostatic Neoplasms
- Prostate cancer [C12.294.260.750] Prostatic Neoplasms
- Prostate cancer [C12.294.565.625] Prostatic Neoplasms
- Prostate cancer [C12.758.409.750] Prostatic Neoplasms
- Protein-energy malnutrition [C18.654.521.500.708.626] Protein-Energy Malnutrition
- Pruritus [C17.800.685] Pruritus
- Pruritus [C23.888.885.625] Pruritus
- Psoriasis [C17.800.859.675] Psoriasis
- Pyoderma [C17.800.695] Pyoderma
- Rabies [B04.820.455.750.500.700] Rabies virus
- Rabies [C02.782.580.830.750] Rabies
- Refraction disorders [C11.744] Refractive Errors
- Respiratory infections and tuberculosis [C01.252.410.040.552.846] Tuberculosis
- Respiratory infections and tuberculosis [C01.539.739] Respiratory Tract Infections
- Respiratory infections and tuberculosis [C08.730] Respiratory Tract Infections
- Rheumatic heart disease [C01.252.410.890.731.649] Rheumatic Heart Disease
- Rheumatic heart disease [C14.280.874] Rheumatic Heart Disease
- Rheumatoid arthritis [C05.550.114.154] Arthritis, Rheumatoid
- Rheumatoid arthritis [C05.799.114] Arthritis, Rheumatoid
- Rheumatoid arthritis [C17.300.775.099] Arthritis, Rheumatoid
- Rheumatoid arthritis [C20.111.199] Arthritis, Rheumatoid
- Scabies [C03.858.211.480.708] Scabies
- Scabies [C17.800.838.775.800] Scabies
- Schistosomiasis [C03.335.865.859] Schistosomiasis
- Schizophrenia [F03.700.750] Schizophrenia
- Schizophrenia [F04.824] Schizophrenic Psychology
- Sense organ diseases [C10.597.751] Sensation Disorders
- Sense organ diseases [C23.888.592.763] Sensation Disorders
- Sickle cell disorders [C15.378.071.141.150.150] Anemia, Sickle Cell
- Sickle cell disorders [C15.378.420.155] Anemia, Sickle Cell
- Sickle cell disorders [C16.320.070.150] Anemia, Sickle Cell
- Sickle cell disorders [C16.320.365.155] Anemia, Sickle Cell
- Sickle cell trait [C15.378.071.141.150.150.670] Sickle Cell Trait
- Sickle cell trait [C15.378.420.155.668] Sickle Cell Trait
- Sickle cell trait [C16.320.070.150.670] Sickle Cell Trait
- Sickle cell trait [C16.320.365.155.668] Sickle Cell Trait
- Silicosis [C08.381.483.581.760] Silicosis
- Silicosis [C08.381.520.702.760] Silicosis
- Silicosis [C24.800.834] Silicosis
- Skin and subcutaneous diseases [C17.800] Skin Diseases
- Stomach cancer [C04.588.274.476.767] Stomach Neoplasms
- Stomach cancer [C06.301.371.767] Stomach Neoplasms
- Stomach cancer [C06.405.249.767] Stomach Neoplasms
- Stomach cancer [C06.405.748.789] Stomach Neoplasms
- Stroke [C10.228.140.300.775] Stroke
- Stroke [C14.907.253.855] Stroke
- Substance use disorders [C25.775] Substance-Related Disorders
- Substance use disorders [F03.900] Substance-Related Disorders
- Sudden infant death syndrome [C23.550.260.322.625] Sudden Infant Death
- Sudden infant death syndrome [C23.550.260.657.500] Sudden Infant Death
- Syphilis [C01.252.400.840.744] Syphilis
- Syphilis [C01.252.810.859] Syphilis
- Syphilis [C01.252.847.840.744] Syphilis
- Syphilis [C01.539.778.281.859] Syphilis
- Syphilis [C12.294.668.281.859] Syphilis
- Syphilis [C13.351.500.711.281.859] Syphilis
- Tension-type headache [C10.228.140.546.399.875] Tension-Type Headache
- Testicular cancer [C04.588.322.762] Testicular Neoplasms
- Testicular cancer [C04.588.945.440.915] Testicular Neoplasms
- Testicular cancer [C12.294.260.937] Testicular Neoplasms
- Testicular cancer [C12.758.409.937] Testicular Neoplasms
- Testicular cancer [C19.344.762] Testicular Neoplasms
- Testicular cancer [C19.391.829.782] Testicular Neoplasms
- Tetanus [C01.252.410.222.864] Tetanus
- Tetanus [D20.215.894.691.824] Tetanus Toxoid
- Thalassemias [C15.378.071.141.150.875] Thalassemia
- Thalassemias [C15.378.420.826] Thalassemia
- Thalassemias [C16.320.070.875] Thalassemia
- Thalassemias [C16.320.365.826] Thalassemia
- Thalassemias trait [C15.378.071.141.150.875.150] beta-

Thalassemia
- Thalassemias trait [C15.378.420.826.150] beta-Thalassemia
- Thalassemias trait [C16.320.070.875.150] beta-Thalassemia
- Thalassemias trait [C16.320.365.826.150] beta-Thalassemia
- Thyroid cancer [C04.588.322.894] Thyroid Neoplasms
- Thyroid cancer [C04.588.443.915] Thyroid Neoplasms
- Thyroid cancer [C19.344.894] Thyroid Neoplasms
- Thyroid cancer [C19.874.788] Thyroid Neoplasms
- Tracheal, bronchus, and lung cancer [C04.588.443.925] Tracheal Neoplasms
- Tracheal, bronchus, and lung cancer [C04.588.894.797.520.109] Bronchial Neoplasms
- Tracheal, bronchus, and lung cancer [C04.588.894.797.520] Lung Neoplasms
- Tracheal, bronchus, and lung cancer [C04.588.894.797.760] Tracheal Neoplasms
- Tracheal, bronchus, and lung cancer [C08.127.265] Bronchial Neoplasms
- Tracheal, bronchus, and lung cancer [C08.381.540] Lung Neoplasms
- Tracheal, bronchus, and lung cancer [C08.785.520.100] Bronchial Neoplasms
- Tracheal, bronchus, and lung cancer [C08.785.520] Lung Neoplasms
- Tracheal, bronchus, and lung cancer [C08.785.760] Tracheal Neoplasms
- Tracheal, bronchus, and lung cancer [C08.907.563] Tracheal Neoplasms
- Trachoma [C01.252.354.225.800] Trachoma
- Trachoma [C01.252.400.210.210.800] Trachoma
- Trachoma [C01.539.375.354.220.800] Trachoma
- Trachoma [C11.187.183.220.889] Trachoma
- Trachoma [C11.204.813] Trachoma
- Trachoma [C11.294.354.220.800] Trachoma
- Trichomoniasis [B01.630.800.808.717] Trichomonas vaginalis
- Trichomoniasis [C03.752.890] Trichomonas Infections
- Trichuriasis [C03.335.508.100.275.895] Trichuriasis
- Tuberculosis [C01.252.410.040.552.846] Tuberculosis
- Turner syndrome [C16.131.240.400.970] Turner Syndrome
- Turner syndrome [C16.131.260.830.835.750] Turner Syndrome
- Turner syndrome [C16.131.939.316.309.872] Turner Syndrome
- Turner syndrome [C16.131.939.316.795.750] Turner Syndrome
- Turner syndrome [C16.320.180.830.835.750] Turner Syndrome
- Typhoid and paratyphoid [C01.252.400.310.821.438] Paratyphoid Fever
- Typhoid and paratyphoid [C01.252.400.310.821.873] Typhoid Fever
- Typhoid fever [C01.252.400.310.821.873] Typhoid Fever
- Upper digestive system diseases [N/A] N/A
- Upper respiratory infections [C01.539.739] Respiratory Tract Infections
- Upper respiratory infections [C08.730] Respiratory Tract Infections
- Urinary diseases and male infertility [C12.294.365.700] Infertility, Male
- Urinary diseases and male infertility [C12.777] Urologic Diseases
- Urinary diseases and male infertility [C13.351.968] Urologic Diseases
- Urinary tract infections [C01.539.895] Urinary Tract Infections
- Urinary tract infections [C12.777.892] Urinary Tract Infections
- Urinary tract infections [C13.351.968.892] Urinary Tract Infections
- Urogenital congenital anomalies [C16.131.939] Urogenital Abnormalities
- Urolithiasis [C12.777.967] Urolithiasis
- Urolithiasis [C13.351.968.967] Urolithiasis
- Urticaria [C17.800.862.945] Urticaria
- Urticaria [C20.543.480.904] Urticaria
- Uterine cancer [C04.588.945.418.948] Uterine Neoplasms
- Uterine cancer [C13.351.500.852.762] Uterine Neoplasms
- Uterine cancer [C13.351.937.418.875] Uterine Neoplasms
- Uterine fibroids [C04.557.450.590.450] Leiomyoma
- Varicella and herpes zoster [B04.280.382.100.900.460] Herpesvirus 3] Human
- Varicella and herpes zoster [C02.256.466.930.250] Chickenpox
- Varicella and herpes zoster [C02.256.466.930.750] Herpes Zoster
- Vascular intestinal disorders [C14.907] Vascular Diseases
- Viral skin diseases [C02.825] Skin Diseases, Viral
- Viral skin diseases [C17.800.838.790] Skin Diseases, Viral
- Visceral leishmaniasis [C03.752.300.500.510] Leishmaniasis, Visceral
- Vitamin A deficiency [C18.654.521.500.133.628] Vitamin A Deficiency
- Whooping cough [C01.252.400.143.740] Whooping Cough
- Whooping cough [C01.539.739.969] Whooping Cough
- Whooping cough [C08.730.969] Whooping Cough
- Yellow fever [B04.820.250.350.990] Yellow fever virus
- Yellow fever [C02.081.980] Yellow Fever
- Yellow fever [C02.782.350.250.980] Yellow Fever
- Yellow fever [C02.782.417.881] Yellow Fever
- Zika virus [B04.820.250.350.995] Zika Virus
- Zika virus [C02.081.990] Zika Virus Infection
- Zika virus [C02.782.350.250.990] Zika Virus Infection

Table C1: Gender-identification success rates, by team size and geographic location

Inventor count	Non-US teams	US teams
1	0.800	0.908
2	0.690	0.819
3	0.605	0.744
4	0.539	0.677
5	0.491	0.615
6	0.460	0.559
7	0.426	0.495
8	0.371	0.468
9	0.324	0.467
10	0.279	0.398
> 10	0.308	0.387

Table C2: Female-invented patents focus on female diseases and conditions, and the effect is stronger when the lead inventor is female: alternate operationalization using keywords

Panel A:	(1A)	(2A)
	Female	Female
Female-focused Inventions	Disease MeSH	Disease MeSH
Female Inventor	0.004***	
	(0.001)	
Female Lead Inventor		0.007***
		(0.001)
Female Non-Lead Inventor		0.002*
		(0.001)
Mean of D.V.	0.024	0.024
Subcategory FEs	Yes	Yes
Year FEs	Yes	Yes
Team size FEs	Yes	Yes
Panel B:	(1B)	(2B)
	Male	Male
Male-focused Inventions	Disease MeSH	Disease MeSH
Female Inventor	-0.001	
	(0.001)	
Female Lead Inventor		-0.002
		(0.001)
Female Non-Lead Inventor		0.000
		(0.001)
Mean of D.V.	0.034	0.034
Subcategory FEs	Yes	Yes
Year FEs	Yes	Yes
Team size FEs	Yes	Yes
Observations	441,475	441,475

Patent-disease-level regressions. Standard errors are clustered by patent.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$