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3 Sex differences in supply, payments and clinical activity of family physicians in Ontario: A
4 retrospective population-based observational study using health administrative data
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30 Word count:

31
32 Abstract: 250

33 Text: 2,482
34
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Abstract

Background: The proportion of females entering medicine has increased in recent decades. We examined sex differences in supply, payments and clinical activity among family physicians (FPs) in Ontario.

Methods: Data from FPs submitting claims to Ontario Health Insurance Plan in 1992-2018 was analyzed using linear regression and multilevel regression analyses.

Results: Total number of active FPs increased annually, 155 for females and 13 for males. In 2018 the male-to-female gap difference was 1,160.

Among males, 33% worked <1 full-time equivalent (FTE), 18% 1 FTE and 49% >1 FTE with little change over 27 years. Among females, the percentage of <1 FTE decreased (57% to 49%), 1 FTE unchanged (24%), and >1 FTE increased (19% to 27%).

Males had higher payments than females overall and in >1 FTE. For 1 FTE and <1 FTE (from 2005-2018) males and females had similar payments.

For 1 FTE FPs, females were less likely to receive payments from fee-for-service after 2004 and annually had 550 fewer number of visits and 121 fewer number of patients.

Interpretation: Yearly change in Ontario FP supply was about 10 times greater for females than males. Still the number of female FPs lagged behind males. Female FPs had proportionately fewer ≥ 1 FTE, were less likely to have fee-for-service payments, had fewer unique patients and fewer number of patient visits. Male FPs had higher payments overall, which may be attributable

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3 to a higher proportion and higher payment in >1 FTE male FPs. Health planners should be
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5 mindful of these sex differences.
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10 **Trial Registration:** Not applicable.
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14 **Key words:** Family physicians, Sex difference, Supply, Clinical activities
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Confidential

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3 Following in the footsteps of Elizabeth Blackwell, the world's first registered female doctor in
4 1849,^{1,2} more and more females continue to enter the physician work force.³ For example, in
5 1992, 22.8% of all Ontario physicians including 27.0% of family physicians (FPs) were
6 females.³ In 2013, the proportion of females increased to 37.3% for all Ontario physicians and
7 42.8% for FPs. The influx of female physicians into healthcare may bring with them distinctive
8 values and interests to their professional practices owing to differences in biology, psychology
9 and expected social roles between females and males.^{1,4} Understanding different practice patterns
10 of female and male FPs will provide important information for health workforce planning and
11 administration and health system design.
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26 Prior studies suggest that male physicians in general out-earn female physicians.⁵⁻⁷ As a
27 physician's earnings is closely related to workload, controlling the influence of varied levels of
28 physician workload makes the comparisons of physician earnings and clinical activity between
29 female and male physicians more meaningful. Using physician billing data housed at the Institute
30 for Clinical Evaluative Sciences (ICES), we examined sex differences in supply, payments and
31 clinical activity among FPs in Ontario. Physician clinical activities examined included full-time
32 equivalent (FTE, a proxy of physician workload), number of patient visits, number of unique
33 patients under care and number of visits per patient.
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46 **Methods**

47 **Setting and study design**

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49 The study setting was in Ontario, Canada where medically necessary health services are insured
50 by a single-payer, i.e. the Ontario Health Insurance Plan (OHIP). A retrospective population-
51 based observational study was conducted to achieve our study purposes.
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Data Sources and Participants

The datasets used were the OHIP physician billing database, the ICES Physician Database (IPDB) and the Registered Persons Database (RPDB). All FPs submitting claims to OHIP in 1992-2018 were included in the study. The database linkage was done by ICES analyst in ICES secured environment. Unlinkable physicians were removed by ICES analyst. De-identified data was granted to us to analyze in ICES secured environment. Information available included unidentifiable physician subject number, physician year of birth, physician sex, physician speciality, number of patient visits, number of unique patients, physician payment, if an individual physician's fee-for-service payment was greater than 50% of his/her total payment and year of claiming to OHIP. During analyses, payment data were converted to 2018 Canadian dollars.⁸ Physician's workload was measured by FTE, which was calculated using the method developed by Health Canada based on total payment and used in ICES reports.^{9,10} Each FP was allocated into one of the three FTE groups: 1 FTE (yearly payments between the 40th and 60th percentiles), <1 FTE (below the 40th percentile), and >1 FTE (above the 60th percentile).⁹

Exposure variable, outcome variables and covariates

Physician sex is the exposure variable. Yearly physician numbers, patient visits, unique patients, physician payment, proportion of payment from fee-for-service >50%, physician FTE and physician age were outcome variables. However, in analytical models some of the exposure variables were included as covariates. See details in Statistical analysis.

Statistical analysis

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3 Descriptive statistics were calculated to describe the yearly number of FPs, the yearly median
4 number of patient visits, unique patients, visits per patient, physician payments, physician age
5 and the yearly proportions of FTE. These calculations were done for total and were further
6 categorized by physician sex and FTE. We conducted univariate analyses first to assess changes
7 in trends between medians in question (or number of physicians) and the study year using linear
8 regression analyses stratified by sex. We then used linear multilevel regression models to
9 examine the association between physician sex and payment (or number of patients or visits or
10 visits per patient). All multilevel regression models included physician sex, year, sex-year
11 interaction and physician age. Models for payment also included the number of patient visits,
12 number of distinct patients seen, and number of visits per patient. While models for number of
13 patients, number of visits, and number of visits per patient also included FTE groups. Multilevel
14 models are suitable for this type of data as they allow accounting for autocorrelation within FPs.
15 We tested for different parameterizations when testing time trends and selected the model with
16 the best overall fit based on the Bayesian Information Criteria (when comparing two models the
17 model with the smallest Bayesian Information Criteria was selected). We also included
18 interaction terms between the variables sex and year to test whether the sex gap widens or
19 narrows over time. We used SAS version 9.4 to perform the analyses.

20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 **Ethics approval**

43 This study was approved by the University Health Network Research Ethics Review Board.

44 45 46 47 48 49 **Results**

50 The total number of active FPs was 10,370 in 1992, and increased 38% to 14,329 in 2018 (Figure
51 1). A large increase was seen in females, with an average yearly increase of 155. For males, the
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3 yearly number of FPs remained stable, with a yearly increase of 13. In spite of the significant
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5 increase in female FPs, male FPs still outnumbered female FPs in 2018, with a male-to-female
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7 gap difference of 1,160.
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12 Among male FPs, 33% worked <1 FTE, 18% 1 FTE and 49% >1 FTE. The percentage of <1
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14 FTE was stable for male FPs over the 27 years (Figure 2) while the percentage of 1 FTE
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16 decreased 2% (19% to 17%) and the percentage of >1 FTE increased 4% (47% to 51%). Among
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18 females, the percentage of <1 FTE decreased 8% (57% to 49%), while the percentage of >1 FTE
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20 increased 8% (19% to 27%) (Figure 2). The percentage of 1 FTE female FPs remained at 24%
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22 over the 27 years.
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28 Overall female FPs were younger than male FPs by 8 years (median 43 vs 51 years). When
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30 comparing age by FTE for each of the sexes, male FPs were of similar age to the overall median
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32 age (51 years) for each of the FTEs (52 vs 50 vs 50 for <1, 1 and >1 FTE respectively).
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34 However, female FPs were younger in the <1 FTE group (41 years) and older in the >1 FTE (46
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36 years) versus the overall female FP median age (43 years). For the 1 FTE group, female FP's age
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38 (43 years) was the same as the overall median.
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44 The yearly median payment by sex and FTE is shown in Figure 3. For both females and males in
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46 Figure 3A, median payments increased slightly from 1992 to 2003; from 2004 to 2013, the
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48 increase was larger. Notably, in any given year the overall median payment was higher for males
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50 compared to females (Figure 3A). However, by FTE the sex payment differences varied. For <1
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52 FTE, female FPs had higher payments compared to males from 1992 to 2004 and from 2005-
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3 2018 the payments were similar between the sexes (Figure 3B). For 1 FTE, payments were
4 similar between the sexes for the entire study period. For >1 FTE, male FPs had higher payments
5 and the payment gap increased from 2005 to 2018 (Figure 3D).
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12 To compare female and male FPs with similar workload, we focused on results of clinical
13 activities at 1 FTE. For 1 FTE female and male FPs, the yearly median number of visits was less
14 for female versus male FPs by on average 428 fewer for the period 1992-2004, 663 fewer for the
15 period 2005-2018 and 550 fewer for the entire period 1992-2018 (Figure 4). The median number
16 of unique patients seen by female and male FPs per year was similar for the period of 1992-1999
17 and was 157 fewer yearly for females than males for the period of 2000-2018 (Figure 4B).
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26 Overall females had 121 fewer yearly patients for the period of 1992-2018. The yearly number of
27 visits per patient was similar for both female and male 1 FTE FPs (Figure 4C).
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33 The proportion of FPs with >50% of payment from fee-for-service is shown in Figure 5. In
34 particular, among 1 FTE FPs (Figure 5C), this proportion was very similar between sexes for
35 years 1992-2004; after 2004, this proportion was higher in males versus females, with an
36 increasing gap for the period from 2005 to 2018.
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44 When the effects of covariates (detailed in Figure 6 legend) were controlled for in the multilevel
45 regression model, female FPs had higher payments in years from 1992-2004 but lower payments
46 from 2005-2018 (Figure 6A). However, fewer number of patients and fewer number of visits in
47 female versus male FPs seen in the univariate analyses (4A and 4C) still held true (Figure 6B and
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3 6C). For number of visits per patient, female FPs consistently had a greater number than male
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5 FPs (Figure 6D). This is different from the results of the univariate analysis (Figure 4C).
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10 **Interpretation**

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12 This study reports that Ontario FP supply has increased in the past three decades due primarily to
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14 an increase in the number of female FPs. In spite of the large female increase, the number of
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16 female FPs still fell behind males in 2018. Female FPs seem to organize and manage their
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18 practices in three distinctive ways compared with male FPs. Firstly, overall less than half of
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20 female FPs were ≥ 1 FTE compared to about 2/3 of male FPs. However, among female FPs, the
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22 percentage of >1 FTE has increased over time. This change suggests that although the workload
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24 of female FPs, as measured by FTE, is overall less than that of male FPs, female FPs have
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26 gradually increased their clinical activities over time. Secondly, female FPs were less likely to
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28 have payment from fee-for-service in recent years. Thirdly, for 1 FTE FPs, female FPs had fewer
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30 number of patients and fewer number of visits than male FPs. We believe these observed sex
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32 differences may reflect government policy changes toward females, physicians' individual
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34 choice, expected gender characteristics and gender roles in society.
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42 Our findings of less female FPs working ≥ 1 FTE are in accord with existing studies that reported
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44 female physicians work fewer hours than male physicians.¹¹⁻¹³ The median age of <1 FTE female
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46 FPs was younger than the overall median age of females. The lower proportion of ≥ 1 FTE
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48 female FPs is thus most likely due to the competing demands related to childcare and household
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50 management.^{1,4,12,14} It was reported that 20% of female physicians spent 41+ hours per week as
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52 the primary caregiver versus 6% of male physicians.¹⁴ Female physicians with children spent on
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3 average 8.5 more hours per week on household activities and child care than male
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5 physicians.^{12,15,16} These social norm data demonstrated that on average many families and
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7 societies rely on females' contributions. It is interesting that the >1 FTE female FPs tended to be
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9 older (median 46 years) suggesting that as children age, female FPs may have more time for their
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11 careers. Clinically, female physicians are perceived to be less arrogant, more empathetic,
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13 associated with a range of higher quality of care indicators (e.g. delivering more preventive
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15 services and fewer emergency room visits), and are preferred by both female and male patients to
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17 be their care providers.¹⁷⁻²² However, given female physicians' family and household roles and
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19 responsibilities, it is unrealistic to expect female physicians to maintain the same levels of
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21 clinical workload as their male counterparts unless female physicians with families have strong
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23 support systems. Otherwise, female physicians may have to sacrifice their personal and family
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25 life as has been reported with significantly higher rates of not having children, divorce or never
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27 married status compared with male physicians.²³

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35 Physicians' payment and clinic activities are directly correlated, with more patient services
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37 typically translating into increased payments. As more male FPs were ≥ 1 FTE than female FPs,
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39 the overall payment would be expected to be higher for male versus female FPs. This is clearly
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41 demonstrated in Figure 3 where the sex gap in payments no longer existed in the <1 FTE (for
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43 more recent years) and 1 FTE groups, indicating that the overall sex gap in payments was related
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45 to sex differences in both payments and proportions in the >1 FTE group. It has long been
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47 believed that the fee-for-service model favours specialty groups that perform procedures, rather
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49 than practitioners who provide consulting services, such as FPs.⁹ Recognizing this, governments
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51 have created incentives of alternate payment plans for FPs and other groups of physicians to
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3 encourage patient enrollment, improve comprehensive care and after-hours services and motivate
4 medical graduates to enter into family medicine since 1998.⁹ Therefore, prior to 2000, the
5 majority of female and male FPs were paid through fee-for-service.^{9,10} By 2010, more than two-
6 thirds of Ontario's FPs belonged to one of the non-fee-for-service payment models, with the
7 model of Family Health Organizations being most popular.⁹ Our results in Figure 5 for 1 FTE
8 showed that the proportion with >50% of payment from fee-for-service was lower (35% in recent
9 years) in females than males (50%). One potential explanation is the alternate payment plans are
10 mostly team-based practice and females may like more team-based versus solo practice owing to
11 their more collaborative and interactive tendency and approach.^{1,4,24} Another possible
12 explanation is FPs who have practices that focus on specific aspects of care (e.g. sports medicine,
13 palliative care) remain in fee-for-service and more male FPs provide these specific types of
14 care.^{25,26}

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33 When both female and male FPs work at the same 1 FTE level, we found female FPs had
34 significantly fewer number of patient visits and fewer number of patients than male FPs,
35 particularly for the period of 2000-2018 (Figure 4A and 4B). When the confounding effects of
36 age and FTE were controlled for in multilevel regression analyses, female FPs had more visits
37 per patient than male FPs (Figure 6D). These findings are consistent with reports that female FPs
38 spend more time with their patients and having a tendency to provide continuity of care.²⁷⁻²⁹

49 **Limitations**

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51 Study limitations are OHIP billings do not include uninsured services, Worker's Compensation,
52 third-party payers, leadership roles and research funding. In addition, physician workload was
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3 measured through the distribution of total payment, not direct measure of working hours.
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5 Furthermore, the study reported quantity, not quality, of clinical activities. Finally, this study
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7 focused only on females and males and did not consider other physician characteristics including
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9 family size, geographic location, socioeconomic status, ethnicity background, immigration status
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11 and those with disabilities. Future studies with direct measure of physician working hours and
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13 qualitative assessment of clinical activities between sexes are needed.
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19 **Conclusion**

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21 FP supply in Ontario increased in recent decades, dominated by an increase in female FPs.
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23 Despite this, in 2018 the number of female FPs still fell behind male FPs. Female FPs had lower
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25 OHIP payments overall and in the >1 FTE group compared to males, were proportionately more
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27 likely to be <1 FTE and were less likely to be ≥ 1 FTE, however this gap has decreased over time.
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29 In the 1 FTE group, female FPs were less likely to receive payment from fee-for-service, had
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31 fewer number of visits and fewer number of patients. Health administrators and planners should
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33 be mindful of the changing demographic of FPs and distinctive features between female and
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35 male FPs in their clinical activities. Further studies into the determinants of these differences are
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37 warranted.
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Acknowledgment

This study contracted ICES Data & Analytic Services (DAS) and used de-identified data from the ICES Data Repository, which is managed by ICES with support from its funders and partners: Canada's Strategy for Patient-Oriented Research (SPOR), the Ontario SPOR Support Unit, the Canadian Institutes of Health Research and the Government of Ontario. The opinions, results and conclusions reported are those of the authors. No endorsement by ICES or any of its funders or partners is intended or should be inferred.

Data sharing agreement

The dataset from this study is held securely in coded form at the Institute for Clinical Evaluative Sciences (ICES). While data sharing agreements prohibit ICES from making the dataset publicly available, access may be granted to those who meet prespecified criteria for confidential access, available at www.ices.on.ca/DAS. The full dataset creation plan and underlying analytic code are available from the authors upon request, understanding that the computer programs may rely upon coding templates or macros that are unique to ICES and are therefore either inaccessible or may require modification.

Contributors

All authors contributed to the concept and design of the study; data gathering, and interpretation; and preparing the manuscript for submission. Data analyses were done by Dr. Canizares.

Figure legends

Figure 1. The number of active family physicians in Ontario, Canada from 1992 to 2018 by sex.

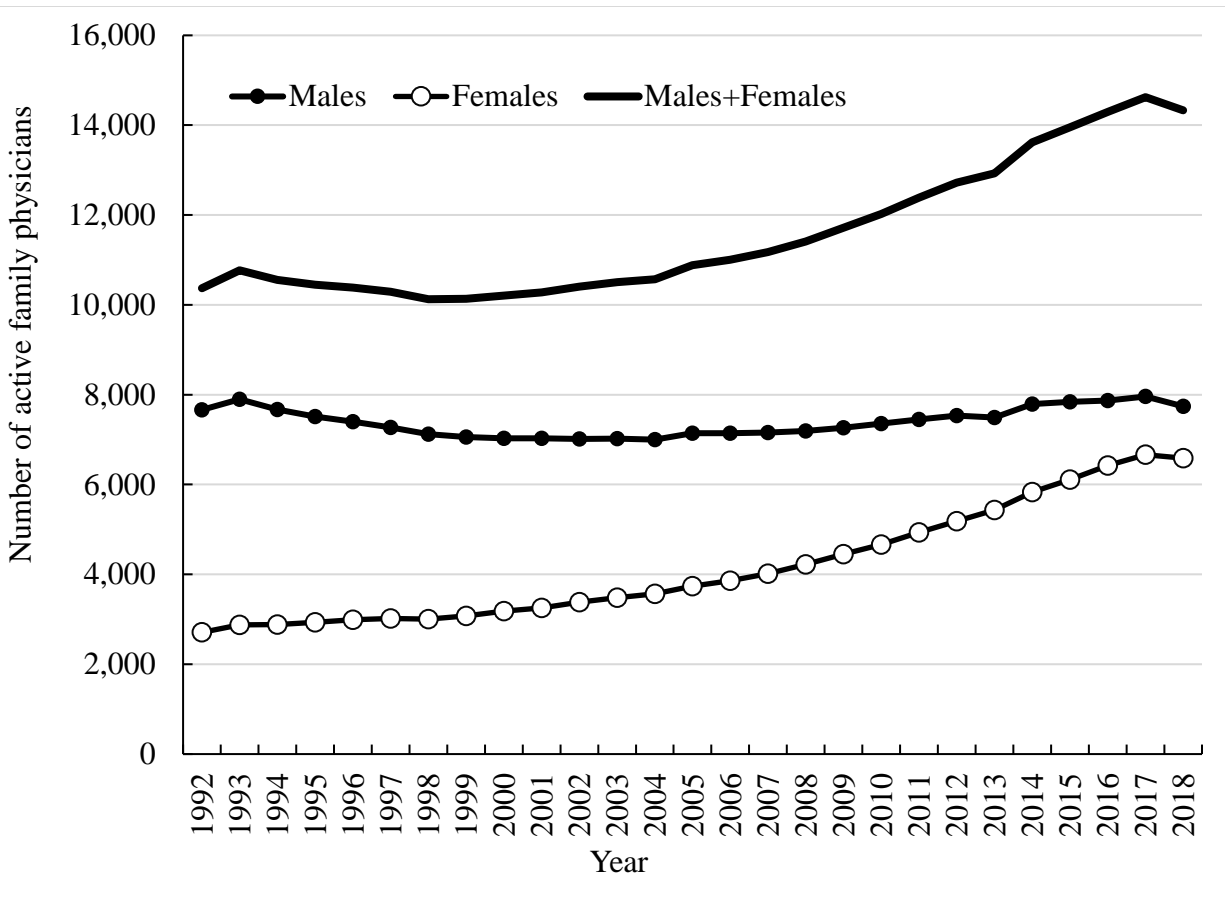
Figure 2. The proportion of full-time equivalent (FTE) male and female family physicians in Ontario from 1992 to 2018

Figure 3. Median yearly payment of family physicians in Ontario, Canada from 1992 to 2018 by sex and full-time equivalent (FTE). A. Overall. B. <1 FTE. C. 1 FTE. D. >1 FTE

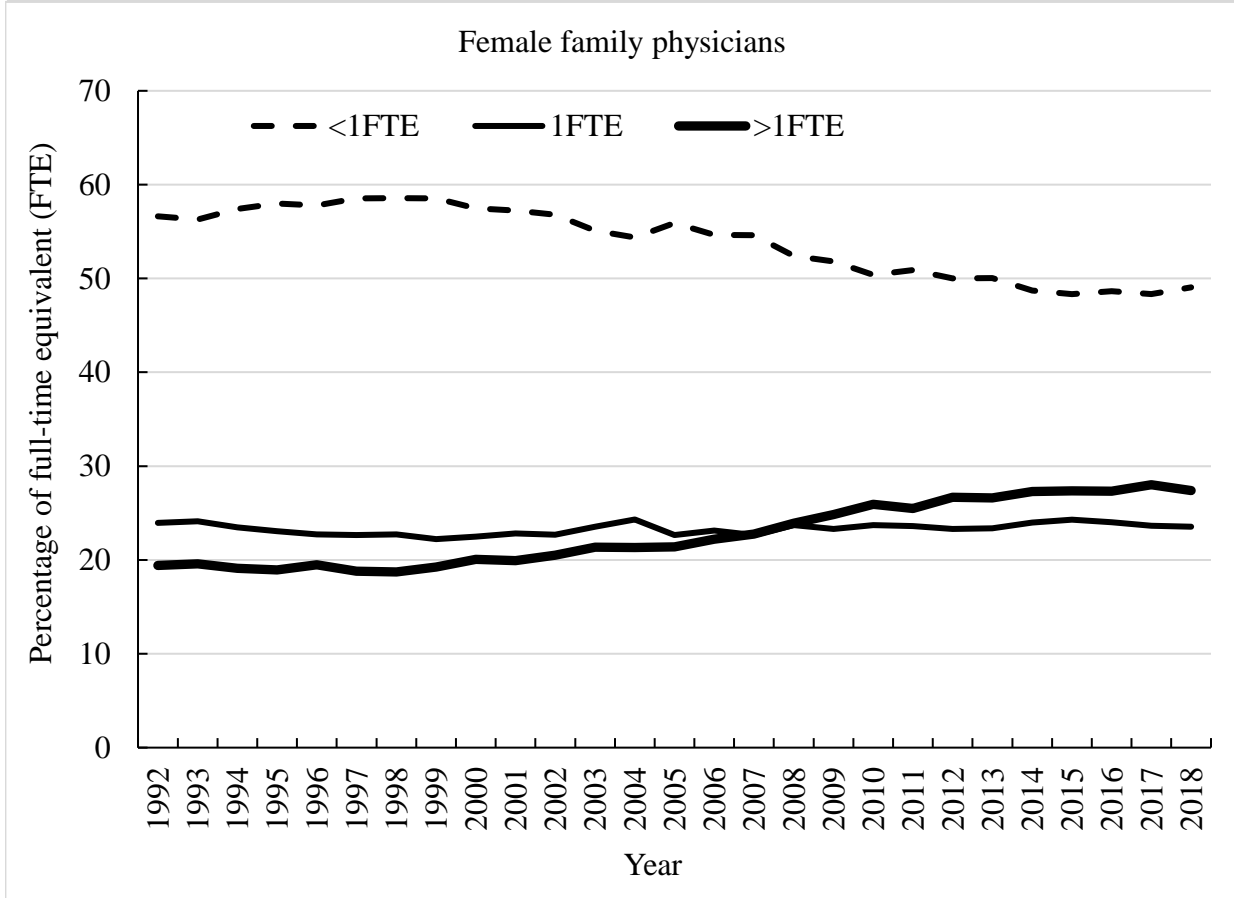
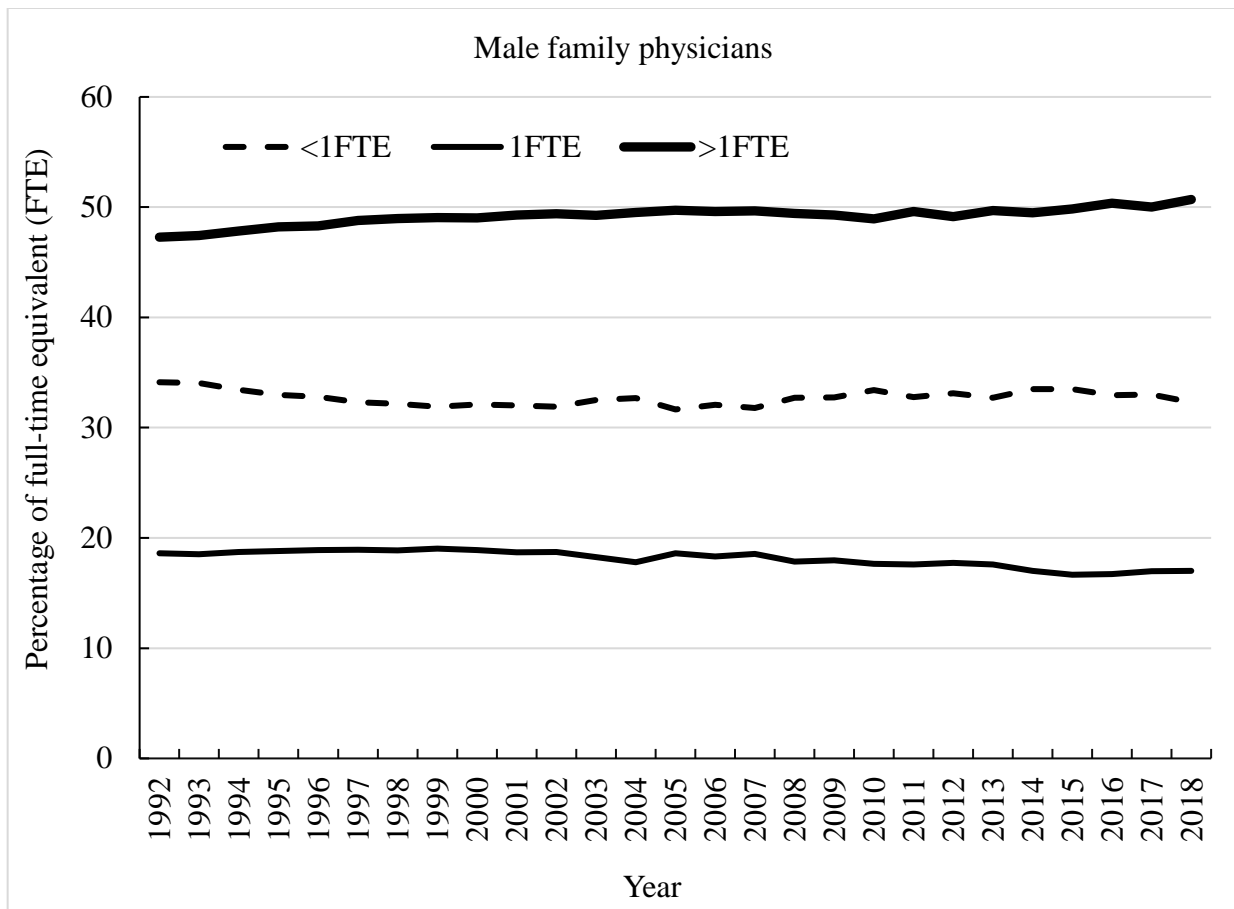
Figure 4. A. Yearly median number of visits, B. Median number of patients and C. Median number of visits per patient for 1 full-time equivalent (FTE) family physicians in Ontario, Canada by sex.

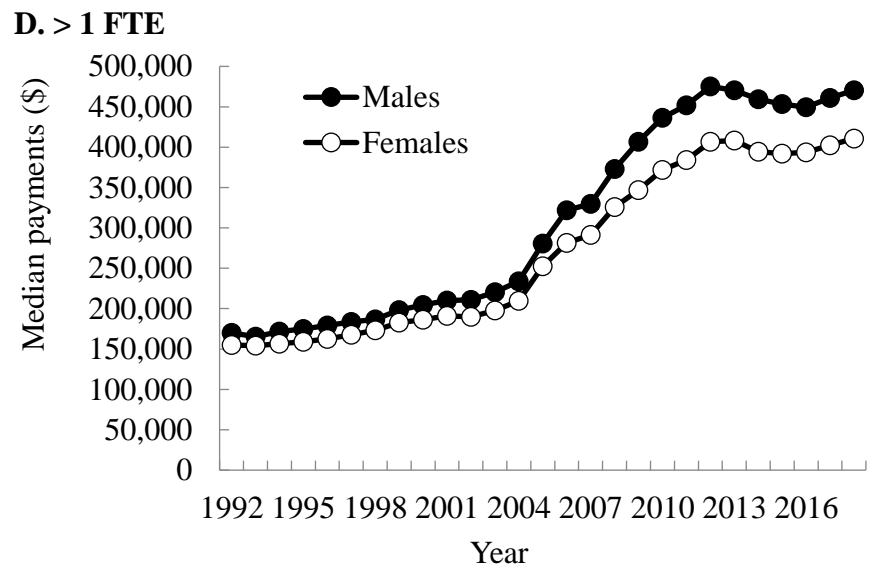
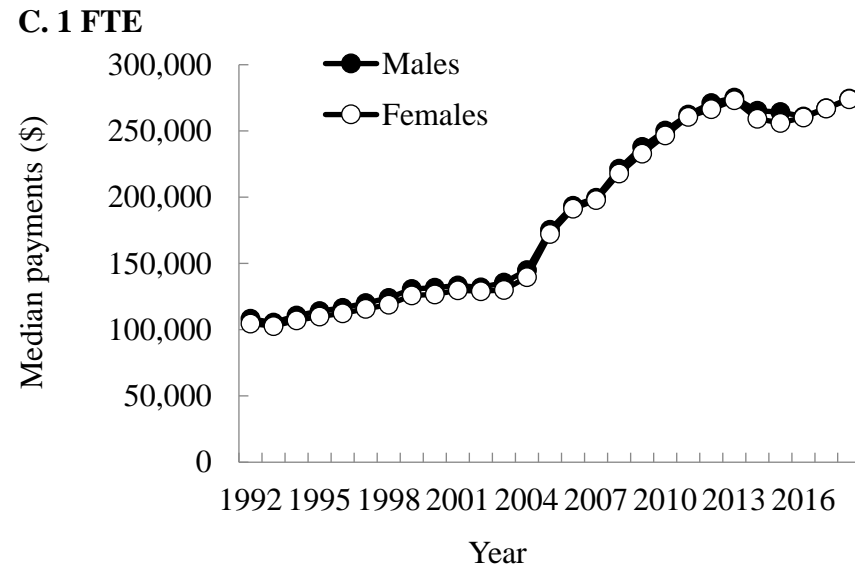
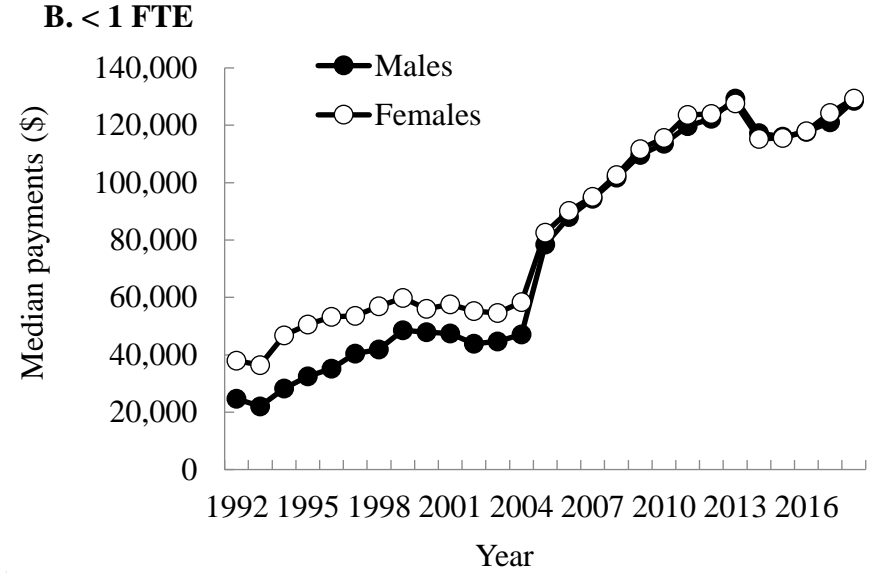
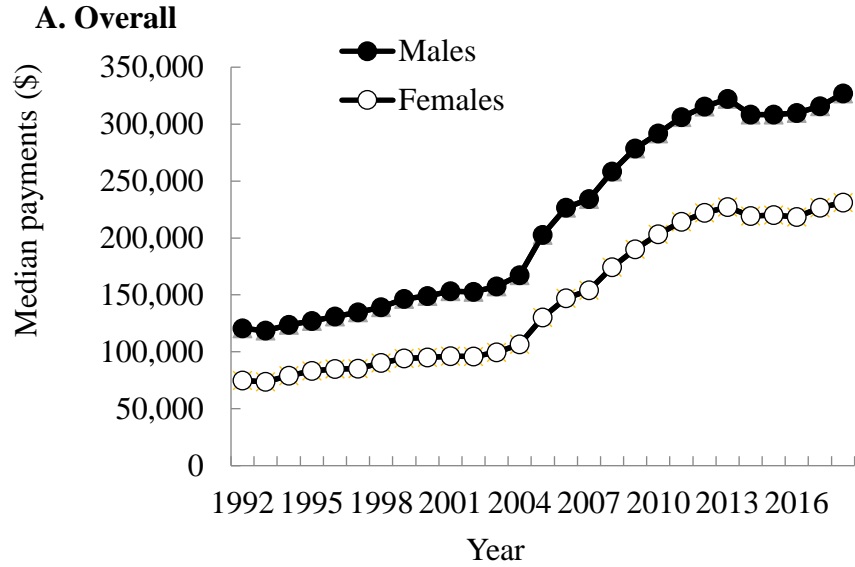
Figure 5. Yearly proportion of family physicians with >50% of payment from fee-for-service (FFS) in Ontario by full-time equivalent (FTE).

Figure 6. Predicted values obtained from multilevel regression models. Models for payment (A) included sex, year, sex-year interaction, physician age, number of patient visits, number of distinct patients seen and number of visits per patient. Models for patients (B), visits (C) and visits per patient (D) included sex, year, sex-year interaction, physician age and physician full-time equivalent. Values were estimated with variables at their mean values.

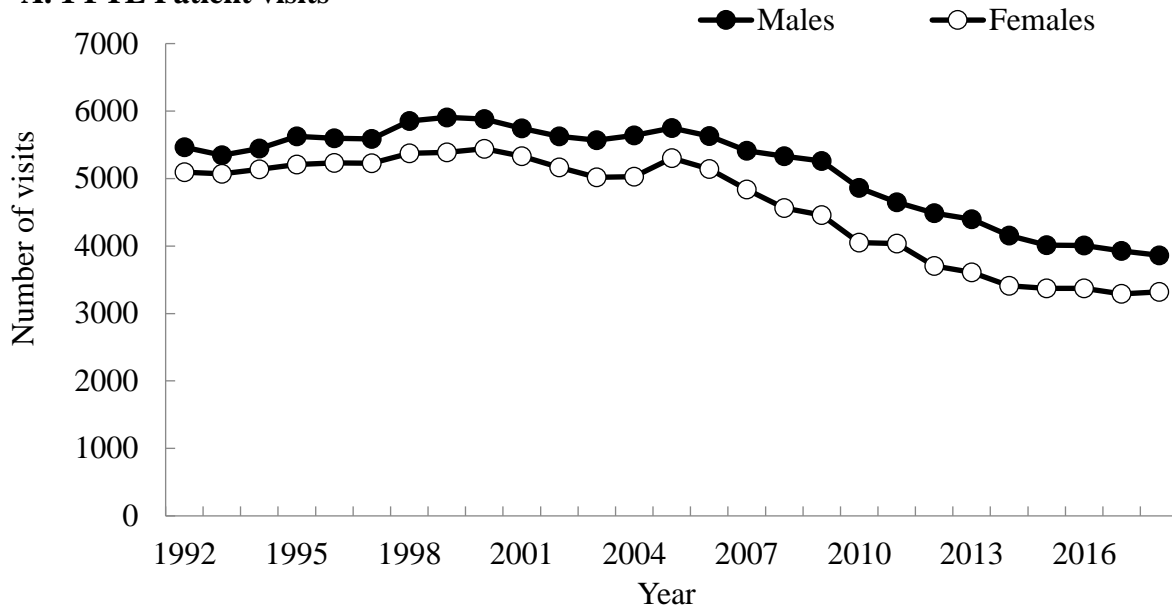


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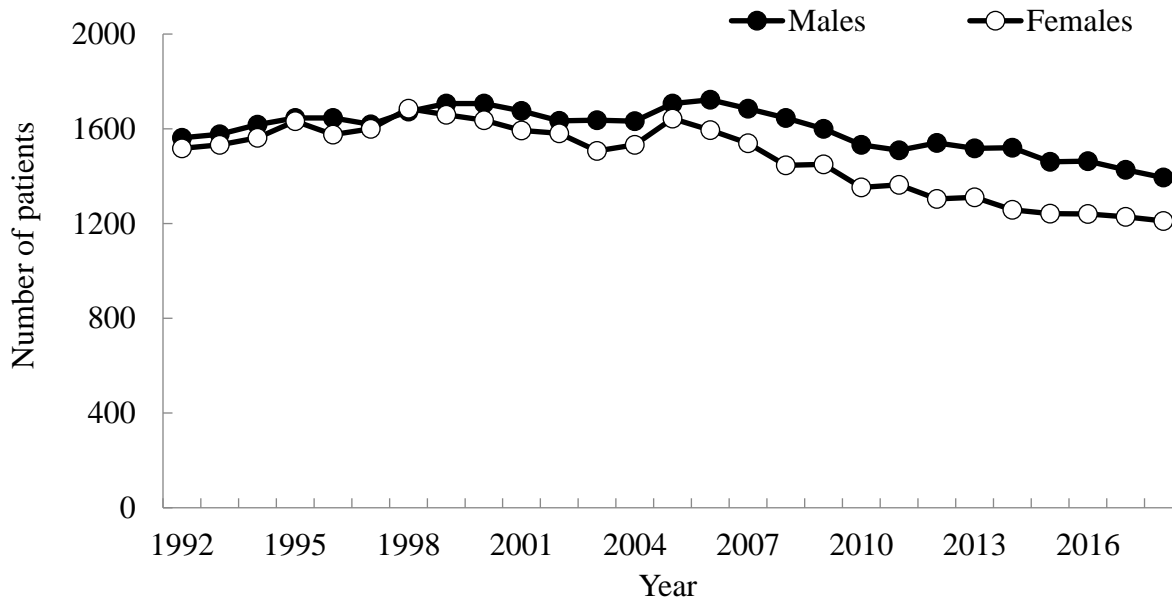




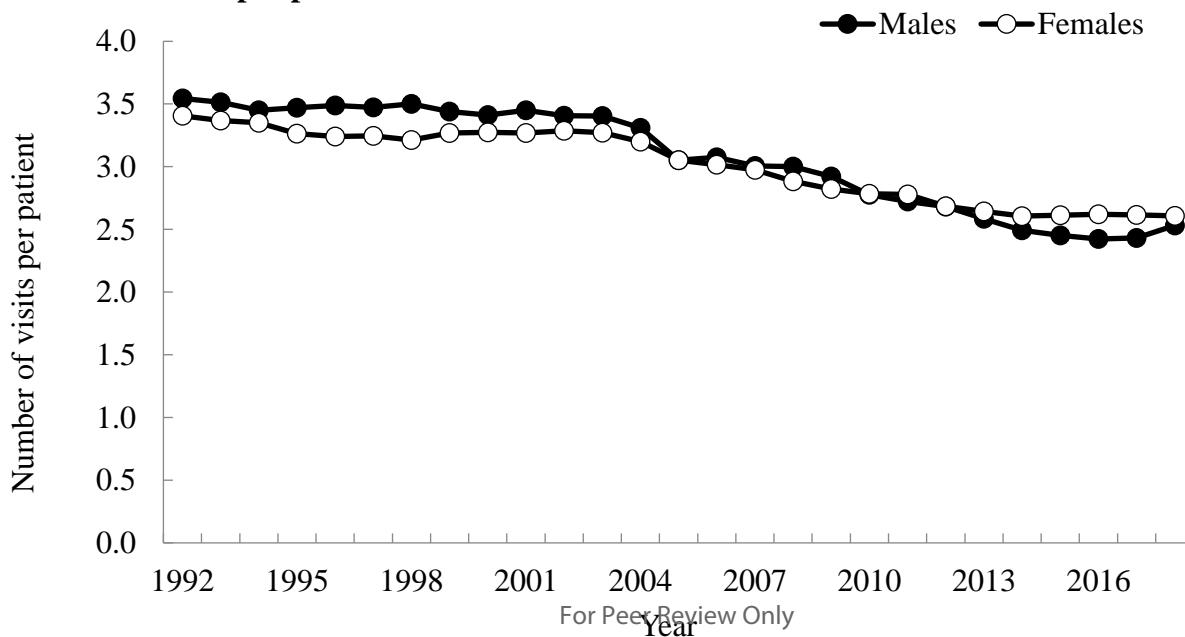
A. 1 FTE Patient visits

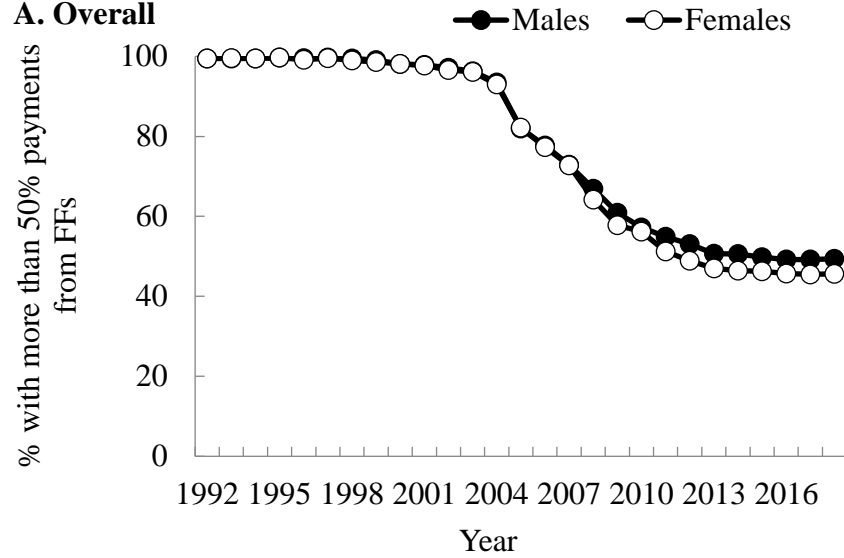
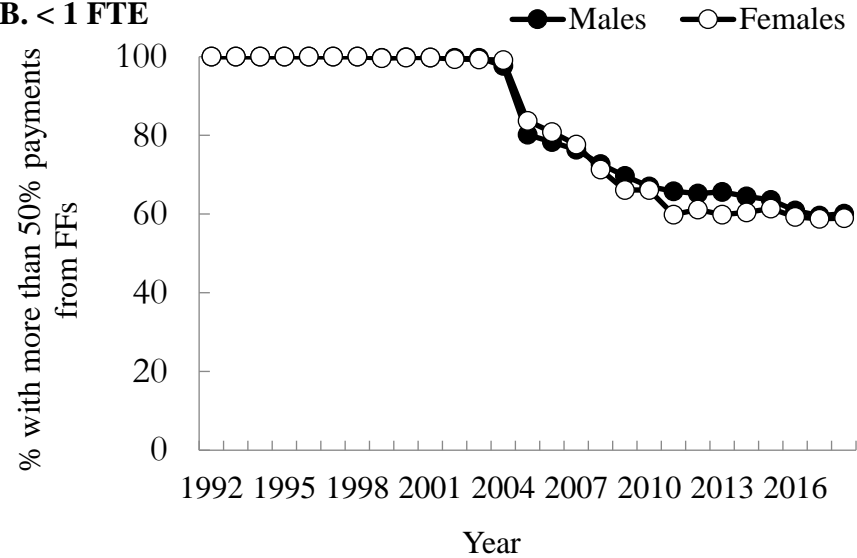
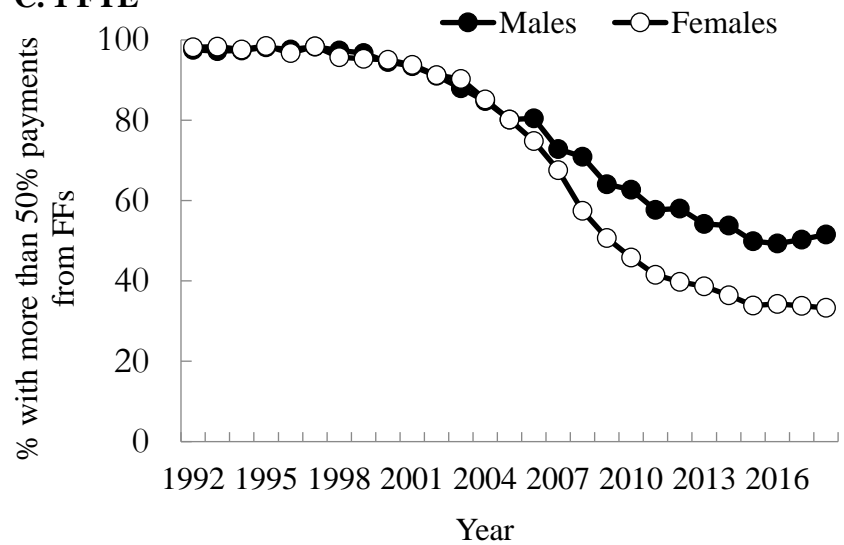
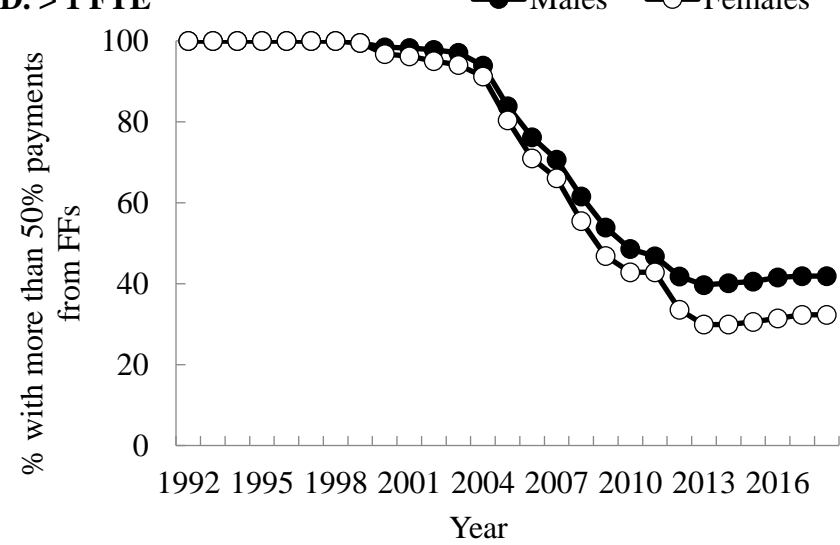


B. 1 FTE Unique patients



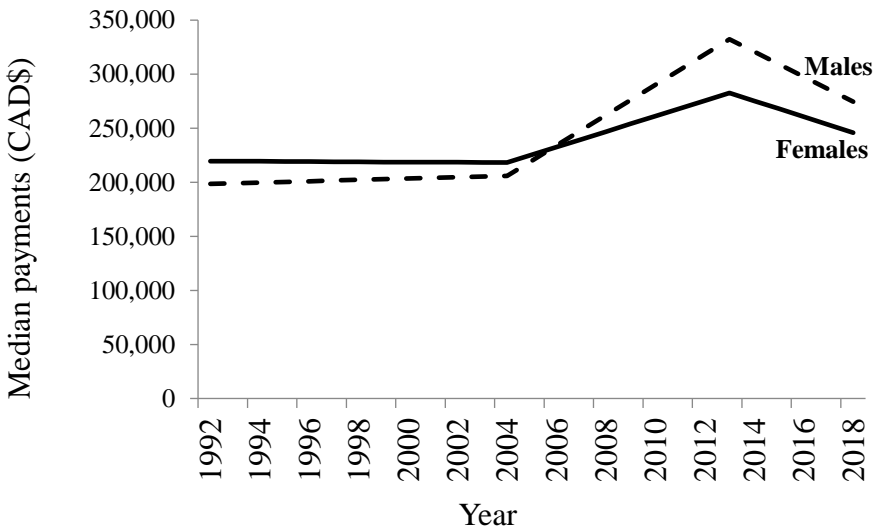
C. 1 FTE Visits per patient



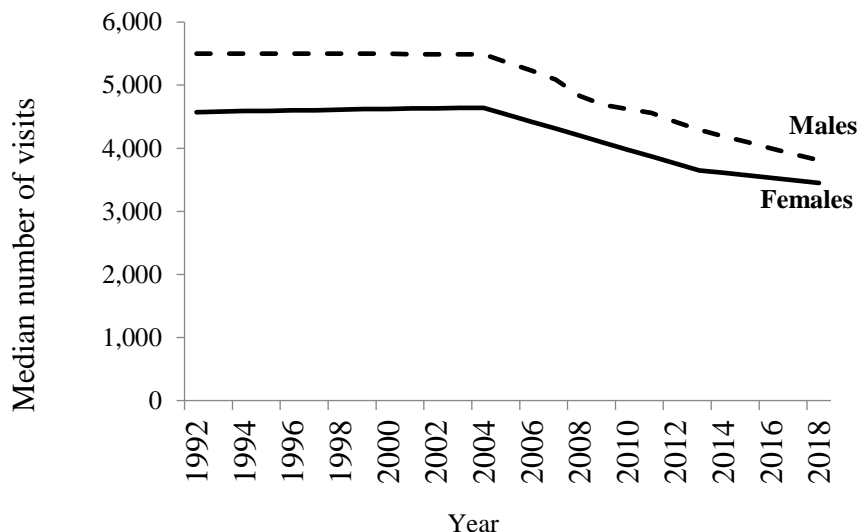
A. Overall**B. < 1 FTE****C. 1 FTE****D. > 1 FTE**

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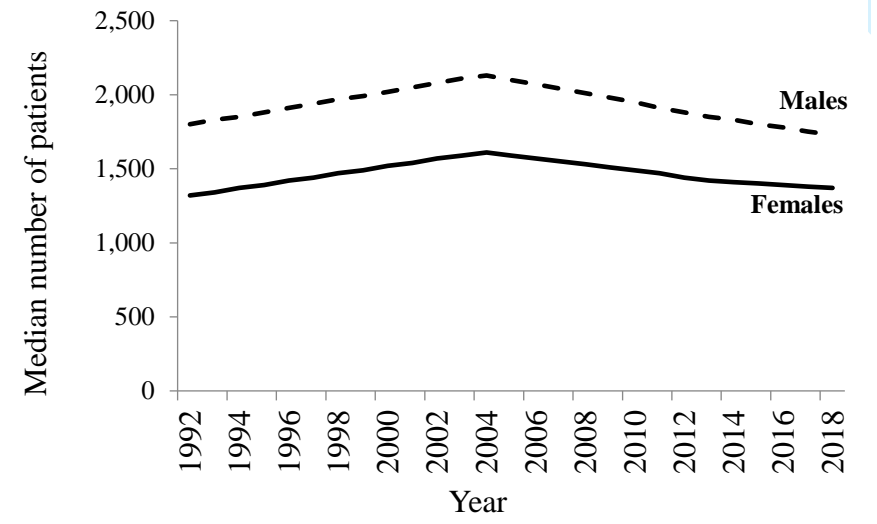
A. Physician payments



B. Number of visits



C. Number of patients



D. Number of visits per patient

