

## University of Groningen

### Exploring concomitant pelvic floor symptoms in community-dwelling females and males

Knol-de Vries, Grietje E; Malmberg, G G Alec; Notenboom-Nas, Françoise J M; Voortman, Danny B H; de Groot, Anouk; Dekker, Janny H; van Koeveringe, Gommert A; Leusink, Peter; Bosch, Marlies; Slieker-Ten Hove, Marijke C Ph

*Published in:*  
Neurourology and urodynamics

*DOI:*  
[10.1002/nau.25020](https://doi.org/10.1002/nau.25020)

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2022

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Knol-de Vries, G. E., Malmberg, G. G. A., Notenboom-Nas, F. J. M., Voortman, D. B. H., de Groot, A., Dekker, J. H., van Koeveringe, G. A., Leusink, P., Bosch, M., Slieker-Ten Hove, M. C. P., Keuken, D. G., & Blanker, M. H. (2022). Exploring concomitant pelvic floor symptoms in community-dwelling females and males. *Neurourology and urodynamics*, 41(8), 1770-1780. <https://doi.org/10.1002/nau.25020>

#### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).










The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

#### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

# Exploring concomitant pelvic floor symptoms in community-dwelling females and males

Grietje E. Knol-de Vries PhD<sup>1</sup>  | G. G. Alec Malmberg MD<sup>2</sup>  |  
 Françoise J. M. Notenboom-Nas MSc<sup>1</sup>  | Danny B. H. Voortman MD<sup>1</sup> |  
 Anouk de Groot BSc<sup>1</sup> | Janny H. Dekker MD, PhD<sup>1</sup>  |  
 Gommert A. van Koeveringe MD, PhD<sup>3</sup>  | Peter Leusink MD, PhD<sup>4</sup>  |  
 Marlies Bosch<sup>5</sup> | Marijke C. Ph. Slieker-ten Hove PhD<sup>1</sup>  |  
 Debby G. Keuken PhD<sup>6</sup>  | Marco H. Blanker MD, PhD<sup>1</sup> 

<sup>1</sup>Department of General Practice and Elderly Care Medicine, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands

<sup>2</sup>Department of Obstetrics and Gynecology, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands

<sup>3</sup>Department of Urology, Maastricht University Medical Center, Maastricht, The Netherlands

<sup>4</sup>Praktijk de Huisarts, Gouda, The Netherlands

<sup>5</sup>Patient Organization Foundation Bekkenbodem4All (Pelvicfloor4All), Tiel, The Netherlands

<sup>6</sup>Netherlands Society of Cardiology, Utrecht, The Netherlands

## Correspondence

Grietje E. Knol-de Vries, PhD,  
 Department of General Practice and Elderly Care Medicine, University Medical Center Groningen, University of Groningen, FA21, PO Box 196, 9700 AD Groningen, The Netherlands.  
 Email: [g.e.de.vries@umcg.nl](mailto:g.e.de.vries@umcg.nl)

## Funding information

ZonMw

## Abstract

**Objectives:** Researchers and clinicians tend to focus on one pelvic floor symptom (PFS) at the time. However, the pelvic floor acts as one functional unit, increasing the likelihood of concurrent PFS in patients with pelvic floor dysfunction. There is also a paucity of literature on the prevalence of concomitant PFS, especially in males. Therefore, we explored the occurrence of concomitant PFS in community-dwelling males and females.

**Materials and Methods:** This prospective observational population-based cohort study included males and females aged  $\geq 16$  years from a single Dutch municipality. Participants completed validated questionnaires on lower urinary tract symptoms (LUTS), defecation problems, sexual dysfunction, pelvic pain, and pelvic organ prolapse. Medical general practitioner records were examined. Furthermore, a randomly selected group of non-responders aged  $< 80$  years received a short questionnaire, to study response bias.

**Results:** We invited 11 724 people, among which 839 females and 566 males completed the questionnaires. Of the female participants, 286 (34.1%) reported no PFS, and 251 (29.9%) reported two or more PFS. The most prevalent PFS clusters in females were sexual dysfunction and pelvic pain, sexual dysfunction and defecation problems, LUTS and defecation problems, and LUTS, defecation problems, and pelvic pain. Of the male participants, 212 (37.5%) reported no PFS, and 191 (33.7%) reported two or more PFS. The most prevalent clusters in males were sexual dysfunction and LUTS, defecation problems and LUTS, and sexual dysfunction, LUTS, and defecation problems.

Grietje E. Knol-de Vries and G. G. Alec Malmberg are co-first authors.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2022 The Authors. *Neurourology and Urodynamics* published by Wiley Periodicals LLC.

**Conclusion:** A considerable overlap existed between PFS, with differences in PFS clusters between females and males. Of note, females reported pelvic pain more than males. We conclude that healthcare providers should address all PFS in males and females.

**KEYWORDS**

concomitant conditions, general population, pelvic floor disorders, pelvic floor symptoms

## 1 | INTRODUCTION

The pelvic floor is a complex neuromyofascial unit that plays key roles in sexuality, the passage and storage of urine and feces, and the support of the pelvic organs.<sup>1</sup> Dysfunction of the pelvic floor musculature may lead to pelvic floor symptoms (PFS), which can be divided into five domains<sup>2</sup>: lower urinary tract symptoms (LUTS; e.g., urinary incontinence [UI], urgency, voiding dysfunction), defecation problems (e.g., fecal incontinence, constipation, obstructed defecation), sexual problems (e.g., dyspareunia, erectile dysfunction, ejaculation problems), pelvic pain, and in females, pelvic organ prolapse (POP). These PFS are associated with decreased well-being and quality of life,<sup>3</sup> and although they can occur at any point, their incidence increases with age. Given that average life expectancy is rising, the worldwide burden of PFS is expected to increase significantly.

The different pelvic floor muscles act as one functional unit, increasing the likelihood that pelvic floor dysfunction will lead to the co-occurrence of different PFS.<sup>4</sup> In a recent scoping review, we have shown that literature on the prevalence of concomitant PFS is scarce, especially in males.<sup>5</sup> Indeed, case studies have reported the prevalence of PFS in males, either using specific cohorts (e.g., postprostatectomy<sup>6</sup>) or focusing on sexual problems and LUTS (either together or in isolation).<sup>5</sup> In females, pelvic pain and sexual dysfunction are rarely studied in combination, with the most focus being on the more prevalent UI, fecal incontinence, and POP.<sup>5</sup> Likewise, many physicians treating both males and females in daily practice tend to focus on one PFS domain or on the most bothersome symptom only. Gaining insight into the occurrence of concomitant PFS is important in both females and males because these patients may need different treatment approaches to those with single PFS, not least because interacting symptoms may jeopardize improvement or recovery.<sup>7,8</sup>

This study primarily aimed to explore the occurrence of concomitant PFS in community-dwelling males and females.

## 2 | MATERIALS AND METHODS

### 2.1 | Study design

We conducted a prospective observational population-based cohort study in a Dutch municipality, applying a mixed-methods approach that combined quantitative and qualitative elements (Figure 1). The study was performed in close collaboration with all general practitioners (GPs) in the study region to ensure knowledge of the cohort (all Dutch inhabitants are registered with a GP). Supporting Information: A describes the procedures in detail.

### 2.2 | Participants

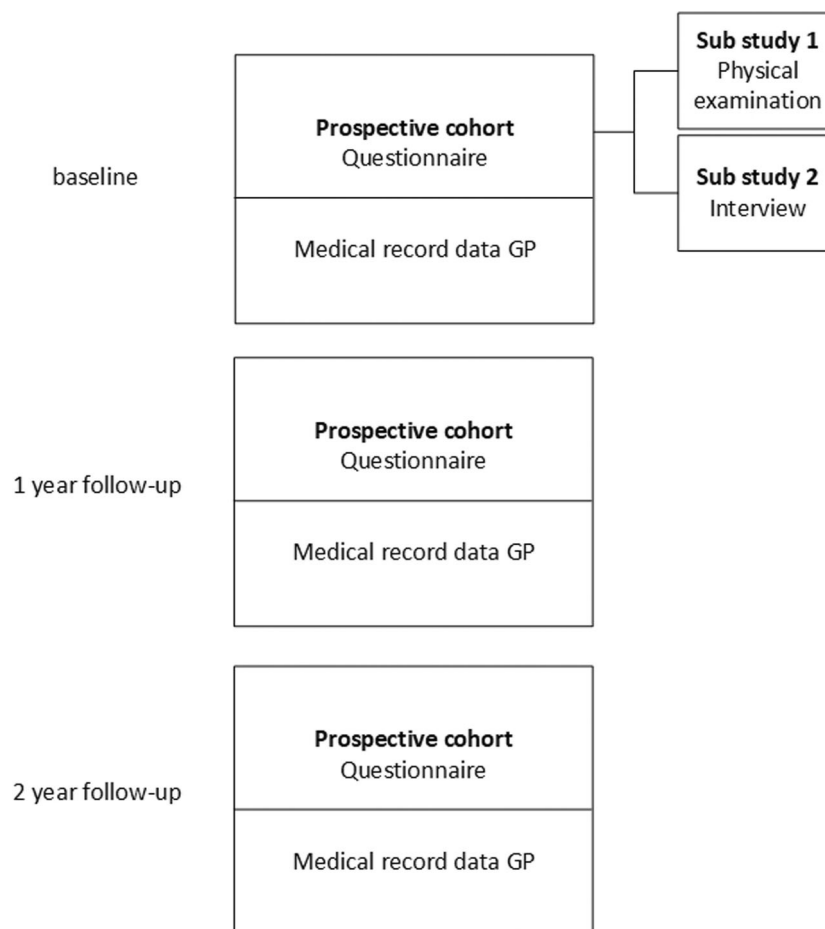
Community-dwelling males and females aged 16 years or older and living in the Dutch municipality of Coevorden were eligible to take part. We excluded anyone with a terminal illness, cognitive impairment (e.g., dementia) or current psychological condition precluding informed consent, or whom the GP considered unsuitable or too ill to participate. Eligible subjects received a personal letter from their general practice in May 2019 inviting them to take part and return a signed informed consent form to the study team (using a prestamped and pre-labeled envelope). We considered nonresponders those who had not returned a signed consent form after one postal reminder.

### 2.3 | Data collection

#### 2.3.1 | PFS questionnaires

Participants either received a paper version of the questionnaire or an e-mail with a link to complete the questionnaire online based on personal preference. Those who did not complete the questionnaire received several reminders (online = 3; paper = 1). Those not responding to these reminders and not answering any

**FIGURE 1** Study design. GP, general practitioners.



questions were considered dropouts. We included several validated questionnaires with additional questions (Supporting Information: B). In the absence of clear cutoff values for most questionnaires, we defined the five PFS domains as follows:

- 1) *LUTS*: the upper quartile of the International Consultation on Incontinence Modular Questionnaire (ICIQ)-male LUTS (ICIQ-MLUTS,<sup>9</sup> scores  $\geq 9$ ) and the ICIQ-female LUTS<sup>9</sup> (score  $\geq 11$ ).
- 2) *Defecation problems*: the upper quartile of the combined Wexner incontinence and constipation scores, based on the Groningen Defecation and Fecal Continence questionnaire, specifically Category 1 (defecation pattern), Categories 2 and 3 (fecal constipation), and Category 4 (fecal continence).<sup>10</sup> We considered defecation problems to be present with scores  $\geq 6$  for males and  $\geq 10$  for females.
- 3) *Sexual dysfunction*: Assessed in sexually active participants using the POP/Incontinence Sexual Questionnaire, International Urogynecological Association-revised,<sup>11</sup> and one item on sexual problems from the Sexual Health in the Netherlands questionnaire.<sup>12</sup>
- 4) *POP*: We considered prolapse to be present if a woman answered yes to four out of six items of the Pelvic Organ Prolapse Distress Inventory 6.<sup>13</sup>
- 5) *Pelvic pain*: A questionnaire, constructed specifically for the study, included the following items: pain in specific pelvic floor areas (yes/no), severity of pain (on a numeric rating scale of 0–10), presence of pain in time, and the origin/cause of pain. The presence of pain in the pelvic region (yes) was defined as having pelvic pain.

To see if this study is representative of the study population, we used two approaches: a survey among nonresponders and an evaluation of the GP medical record data.

### 2.3.2 | Survey among nonresponders

A randomly selected group of non-responders aged 16–80 years received a short survey, containing questions about age, sex, and education level, as well as LUTS, defecation problems, sexual problems, pelvic pain, POP (in females), help-seeking behavior, and impact on daily functioning (numeric rating scale, 0–10). We considered those who completed this short survey to be partial responders.

### 2.3.3 | GP medical record data

Dutch GPs keep electronic medical records, and for each registered patient, we could extract the following data: PFS consultations, diagnostic tests, and diagnoses based on International Classification of Primary Care (ICPC) codes, treatment, and referrals, together with the health care provider's sex. Software developed for the Academic General Practitioner Development Network of the University Medical Center Groningen enabled data dumps from the computer systems of participating practices. The medical record review covered a time scale from 4 years before the baseline measurement to the end of the follow-up period in the cohort.

The medical record data of participants were matched by a trusted third party (ZorgTTP) and were combined with the questionnaire data. Combining the pseudonymized medical records from all registered patients in general practices (except those who refused data sharing) with the participation status allowed cohort participants to be compared with the general population of the municipality. Supporting Information: C details the specific ICPC codes used.

## 2.4 | Statistics

First, to test the representativity of participants to the general population, we compared comorbidity (e.g., cardiovascular disease, psychological disorders, asthma, chronic obstructive pulmonary disease, and diabetes mellitus) and PFS (e.g., LUTS, defecation problems, sexual dysfunction, pelvic pain, and prolapse) derived from the electronic medical records, using logistic regression analysis and correcting for age. We compared participants and partial responders by age, sex, and PFS comorbidity based on questionnaire responses.

Defecation problems and pelvic pain were compared between female and male participants because the same questionnaires were used for both groups. We compared between-group differences (participants vs. the general population, participants vs. partial responders, and female vs. male participants) using independent Student *t*-tests or

Mann–Whitney *U* tests for variables with skewed distributions, or the  $\chi^2$  test, as appropriate. For males and females with PFS, we also calculated the prevalence of concomitant symptoms and presented the data for each main symptom in Sankey diagrams. Each diagram starts with the male or female subgroup with the specific PFS, and the data are ranked according to the largest overlap between symptoms.

## 3 | RESULTS

### 3.1 | Participants

Of the 11 724 people invited, 1691 (14.4%; 997 females and 694 males) returned the informed consent form. Among these, 839 females and 566 males completed all PFS parts of the questionnaire (full responders). Out of 973 nonresponders, who received the short survey, 83 females and 50 males completed all PFS parts (i.e., partial responders). Medical record data from GPs were available for 766 of the 839 females and 528 of the 566 males who had complete PFS data (Figure 2).

### 3.2 | Comparing participants and the general population

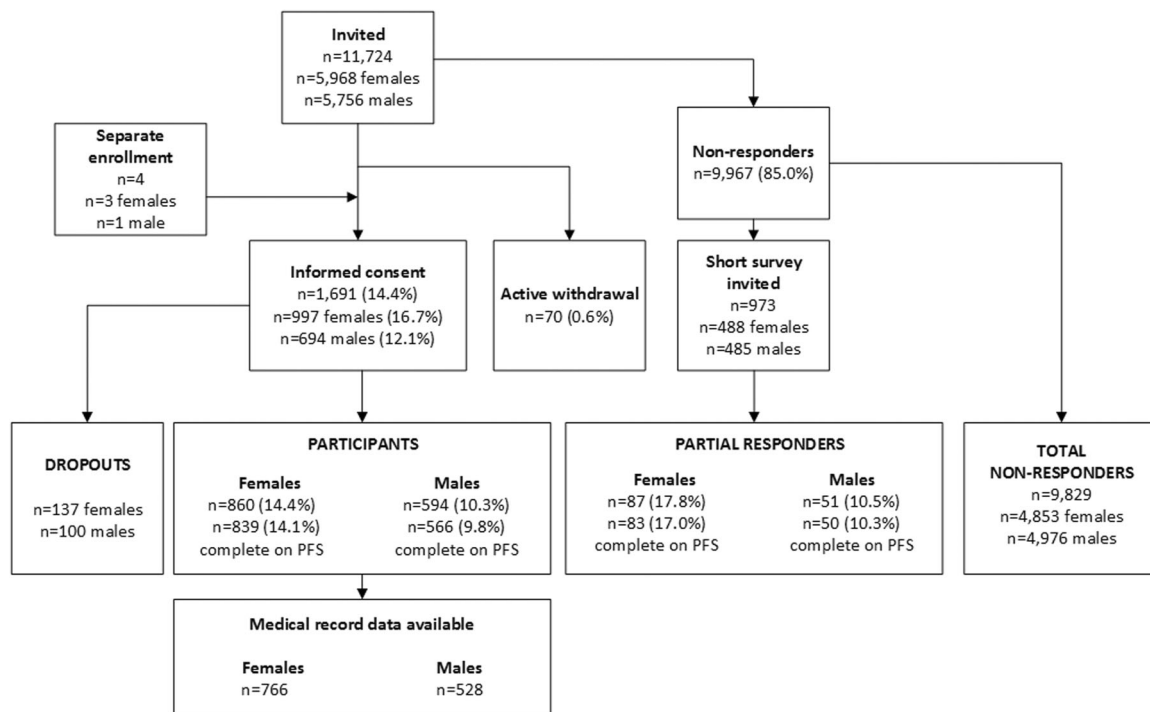
Table 1 presents the baseline characteristics of the participants in comparison to the general population. Participants were significantly older than the general population. Comorbid conditions did not significantly differ, except for diabetes mellitus in males (less prevalent in participants), LUTS in males and females (more prevalent in participants), and POP in females (more prevalent in participants).

### 3.3 | Comparing participants and partial responders

Participants and partial responders did not significantly differ by age (Table 2). The median number of PFS domains was higher in female participants (1.0, interquartile range [IQR]: 0–2) than partial responders (1.0, IQR: 0–1;  $p = 0.02$ ), but did not differ between male participants (1.0, IQR: 0–2) and partial responders (0.5, IQR: 0–2;  $p = 0.23$ ).

### 3.4 | Comparing female and male participants

Of the participants, 286 females (34.1%) and 212 males (37.5%) reported no PFS. Females had a higher combined Wexner score (median 6.0, IQR: 3.0–10.0) than males



**FIGURE 2** Flowchart showing the amount of invitations, total number of received informed consent forms, total numbers of filled-in questionnaires, and availability of medical record data (for participants). PFS, pelvic floor symptoms.

(3.0, IQR: 2.0–6.0;  $p < 0.001$ ). Female participants also had more complaints of pelvic pain than male participants ( $p < 0.001$ ).

### 3.5 | Concomitant PFS

In total, 251 (29.9%) females and 191 (33.7%) males reported two or more concurrent PFS.

Of the 596 sexually active females, 283 (47.5%) reported sexual dysfunction, with almost half of this reporting no other PFS (Figure 3A). The most frequent concomitant PFS in this group was pelvic pain (31%), followed by defecation problems (29%), with or without another PFS. Moreover, 14% had at least three concomitant PFS (sexual dysfunction, pelvic pain, and defecation problems) with or without another PFS; the largest groups comprised sexual dysfunction with pelvic pain ( $n = 35$ , 12.4%) or with defecation problems ( $n = 33$ , 11.7%; Figure 3A, the right end of the figure).

One-third (34%) of females with LUTS reported no other PFS (Figure 3B). Defecation problems (41%) were the most frequent concomitant PFS in those with LUTS, either with or without pelvic pain, sexual dysfunction, and POP. Concomitant LUTS and pelvic pain were present in 38%. The most prevalent clusters were LUTS with defecation problems ( $n = 29$ , 13.5%) or LUTS with

defecation problems and pelvic pain ( $n = 26$ , 12.1%) (Figure 3B).

Defecation problems and pelvic pain symptoms frequently co-occurred, with 43% of females reporting defecation problems also experiencing pelvic pain, either with or without other PFS. Among the females with defecation problems, 42% also experienced LUTS with or without another PFS (Figure 3C).

Pelvic pain overlapped considerably with other PFS domains, with these women also experiencing defecation problems (45%), sexual dysfunction (43%), and LUTS (40%), with or without other PFS (Figure 3D). It was notable that POP was only reported in combination with other types of PFS ( $n = 14$ , 1.7%). Finally, about 9% reported PFS in four domains (i.e., LUTS, defecation problems, sexual dysfunction, and pelvic pain, Figure 3B–D) and three females reported PFS in all five domains.

Of the 436 sexually active males, 202 (46.3%) reported sexual dysfunction, of whom 37.1% reported no concomitant PFS and 41% reported concomitant LUTS, with or without defecation problems and/or pelvic pain. Many experienced both sexual dysfunction and LUTS ( $n = 40$ , 19.8%; Figure 4A).

Among those with LUTS, 22.7% reported no concomitant PFS (Figure 4B) and approximately half reported concomitant defecation problems (47%) or sexual



**TABLE 1** Comparing comorbidities at baseline among participants of the study and population based on International Classification of Primary Care codes described in GP medical record data

	% Yes (with 95% CI)		OR (95% CI) (adjusted for age in years)
	Participants (all PFS) <i>n</i> = 766	Population <i>n</i> = 5268	
<b>Females <i>n</i> = 6034</b>			
Age (years), mean ± SD	57.5 ± 15.8	50.3 ± 19.9*	
Cardiovascular disease	32.9 (29.6–36.2)	25.6 (24.4–26.7)	1.05 (0.87–1.26)
Psychological disorders	4.6 (3.1–6.1)	5.9 (5.3–6.6)	0.80 (0.56–1.15)
Lung disease (asthma/COPD)	8.5 (6.5–10.5)	7.9 (7.2–8.6)	0.95 (0.72–1.25)
Diabetes mellitus type I and II	9.4 (7.3–11.5)	8.4 (7.6–9.1)	0.93 (0.71–1.21)
LUTS	11.1 (8.9–13.3)	8.0 (7.3–8.8)	<b>1.29 (1.00–1.65)</b>
Defecation problems	8.4 (6.4–10.3)	7.4 (6.7–8.2)	1.00 (0.76–1.32)
Sexual dysfunction	1.4 (0.6–2.3)	1.4 (1.1–1.7)	1.66 (0.86–3.21)
Pelvic pain	18.3 (15.5–21.0)	17.8 (16.8–18.8)	1.08 (0.89–1.32)
Prolapse	4.3 (2.9–5.8)	2.0 (1.6–2.4)	<b>1.91 (1.28–2.86)</b>
	<b>Participants</b>	<b>Population</b>	
<b>Males <i>n</i> = 6047</b>	<b>(all PFS) <i>n</i> = 528</b>	<b><i>n</i> = 5519</b>	
Age (years), mean ± SD	62.2 ± 13.3	47.7 ± 18.8*	
Cardiovascular disease	39.8 (35.6–44.0)	22.6 (21.5–23.8)	1.03 (0.84–1.26)
Psychological disorders	1.7 (0.6–2.8)	3.3 (2.8–3.8)	0.53 (0.27–1.05)
Lung disease (asthma/COPD)	7.6 (5.3–9.8)	6.1 (5.5–6.8)	0.85 (0.60–1.20)
Diabetes mellitus type I and II	12.5 (9.7–15.3)	9.8 (9.0–10.6)	<b>0.71 (0.53–0.94)</b>
LUTS	16.7 (13.5–19.9)	7.2 (6.6–7.9)	<b>1.51 (1.17–1.96)</b>
Defecation problems	5.1 (3.2–7.0)	4.6 (4.0–5.1)	0.72 (0.48–1.10)
Sexual dysfunction	3.0 (1.6–4.5)	1.4 (1.1–1.7)	1.56 (0.90–2.73)
Pelvic pain	10.0 (7.5–12.6)	8.5 (7.7–9.2)	1.07 (0.79–1.46)

Note: Comorbidities are based on ICPC codes described in HIS systems between March 1st, 2018 and May 16th, 2019.

Medical record data were available for *n* = 766 of the 839 females and *n* = 528 of the 566 males, who had complete PFS data.

OR adjusted for age (years), significant outcomes are given in bold.

Abbreviations: CI, confidence interval; COPD, chronic obstructive pulmonary disease; HIS (Dutch: Huisarts Informatie Systeem; GP, general practitioner; ICPC, International Classification of Primary Care; LUTS, lower urinary tract symptoms; OR, odds ratio; PFS, pelvic floor symptoms.

\**p* < 0.001.

dysfunction (47%) (either with or without other PFS domains; Figure 4B). Likewise, 52% of all males who reported defecation problems had concomitant LUTS, with or without sexual dysfunction and/or pelvic pain. The most prevalent cluster was defecation problems with LUTS (*n* = 29, 18.2%; Figure 4C).

Pelvic pain was reported by 88 males and overlapped considerably with other PFS domains (84.1%), with 33% reporting concomitant defecation problems and LUTS (Figure 4D). Around 20% of males experienced concomitant sexual dysfunction, LUTS, and defecation problems (Figure 4A–C), while 11 reported having PFS in all four domains.

## 4 | DISCUSSION

In this study of concomitant PFS in females and males, considerable overlap existed between symptoms in the general population. As such, this study adds important information to the scarce number of studies on this topic.<sup>5</sup>

In female participants, we showed that sexual dysfunction and pelvic pain, sexual dysfunction and defecation problems, LUTS and defecation problems, and LUTS with defecation problems and pelvic pain were the most prevalent PFS clusters. To date, research into female PFS has typically focused on the co-occurrence of

TABLE 2 Baseline characteristics of participants and partial responders based on the questionnaire

	Females		Males	
	Participants <i>n</i> = 839	Partial responders <i>n</i> = 83	Participants <i>n</i> = 566	Partial responders <i>n</i> = 50
Age, mean ± SD	57.0 ± 16.0	53.8 ± 16.5	62.1 ± 13.7	60.4 ± 14.1
Age categories, % ( <i>n</i> )				
Age (16–35)	11.6 (97)	14.5 (12)	4.2 (24)	6.0 (3)
Age (35–55)	27.4 (230)	27.7 (23)	20.1 (114)	24.0 (12)
Age (55–75)	47.9 (402)	48.2 (40)	59.2 (335)	52.0 (26)
Age (>75)	13.1 (110)	9.6 (8)	16.4 (93)	18.0 (9)
Pelvic floor symptoms (PFS), % yes (with 95% confidence interval) <sup>a</sup>				
LUTS	25.6 (22.7–28.6)	30.1 (20.3–40.0)	31.1 (27.3–34.9)	38.0 (24.6–51.5)
Defecation problems	25.4 (22.4–28.3)	15.7 (7.8–23.5)	28.1 (24.4–31.8)	12.0 (3.0–21.0)
Sexual dysfunction <sup>b</sup>	47.5 (43.5–51.5)	11.0 (4.2–17.7)	46.3 (41.7–51.0)	20.0 (8.9–31.1)
Pelvic pain	24.3 (21.4–27.2)	24.1 (14.9–33.3)	15.5 (12.6–18.5)	28.0 (15.6–40.5)
Prolapse	1.7 (0.8–2.5)	10.8 (4.2–17.5)	na	na
Number of PFS domains, % (with 95% confidence interval)				
0	34.1 (30.9–37.3)	49.4 (38.6–60.2)	37.5 (33.5–41.4)	50.0 (36.1–63.9)
1	36.0 (32.8–39.2)	27.7 (18.1–37.3)	28.8 (25.1–32.5)	22.0 (10.5–33.5)
2	18.6 (16.0–21.2)	10.8 (4.2–17.5)	21.6 (18.2–24.9)	12.0 (3.0–21.0)
3	8.1 (6.3–10.0)	8.4 (2.5–14.4)	10.2 (7.8–12.8)	12.0 (3.0–21.0)
4	2.9 (1.7–4.0)	1.2 (0.0–3.6)	1.9 (0.8–3.1)	4.0 (0.0–9.4)
5	0.4 (0.0–0.8)	2.4 (0.0–5.7)	–	–

Abbreviations: LUTS, lower urinary tract symptoms; na, not applicable.

<sup>a</sup>PFS based on questionnaire (for participants) and survey among initial nonresponders (for partial responders).

<sup>b</sup>Sexual dysfunction was assessed in the sexually active males (*n* = 436) and females (*n* = 596), and female partial responders (*n* = 82).

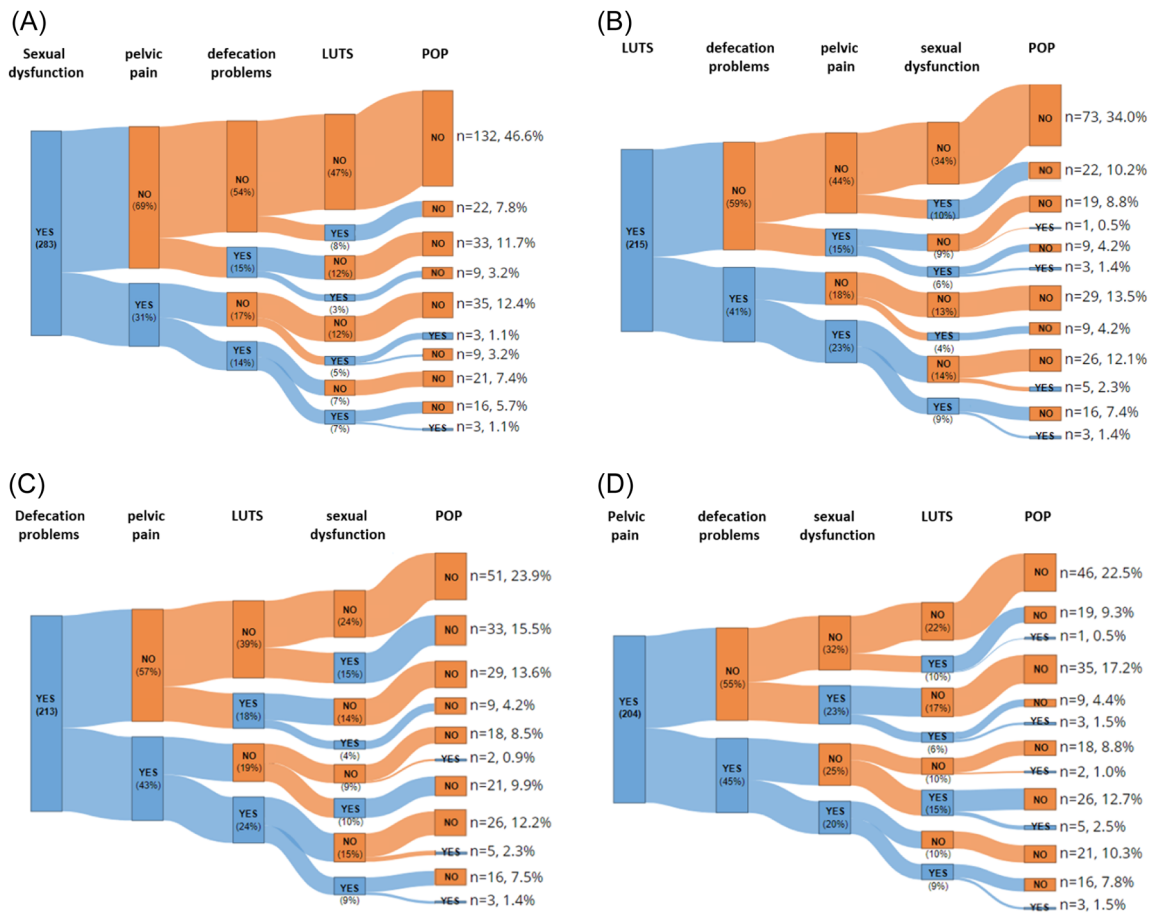
LUTS and defecation problems, especially double incontinence, either or not in combination with POP.<sup>5</sup> Our findings that LUTS and defecation problems co-occur support the high prevalence found elsewhere.<sup>14,15</sup> MacLennan et al.<sup>16</sup> found that at least two pelvic floor problems (stress or urgency UI, flatus or fecal incontinence, POP) were reported by 21.9% of women, with 8.7% experiencing three or more types. In the National Health and Nutrition Examination Survey, Nygaard et al.<sup>17</sup> also addressed those PFS, but did not report details of the prevalence of concomitant PFS. Notably, other PFS were not taken into consideration in those studies. This highlights the finding that sexual dysfunction and pelvic pain are rarely studied in combination with other PFS.<sup>5</sup> The Boston Area Community Health Survey, also illustrated the large overlap between LUTS and pelvic pain in both females and males.<sup>18</sup>

In male participants, sexual dysfunction, LUTS, and defecation problems frequently co-occurred, in agreement with known prevalence data and the current focus in male PFS research.<sup>19</sup> In the large population-based survey of Donnelly et al.,<sup>19</sup> the co-occurrence of LUTS, bowel dysfunction, and sexual dysfunction was 2.1% in males older than 60 years. This lower percentage could well be explained by differences in the used questionnaires and cut-off values.<sup>19</sup>

Most scientific attention on male PFS has focused on LUTS and sexual problems,<sup>5,20</sup> with scarce data available on concomitant PFS and pelvic pain.<sup>18</sup> We found that pelvic pain in males rarely manifests as a single symptom, with almost 85% experiencing concomitant PFS (almost one in three with defecation problems and one in four with LUTS).

Although males and females can present with the same PFS, key anatomical, hormonal, neuromuscular,





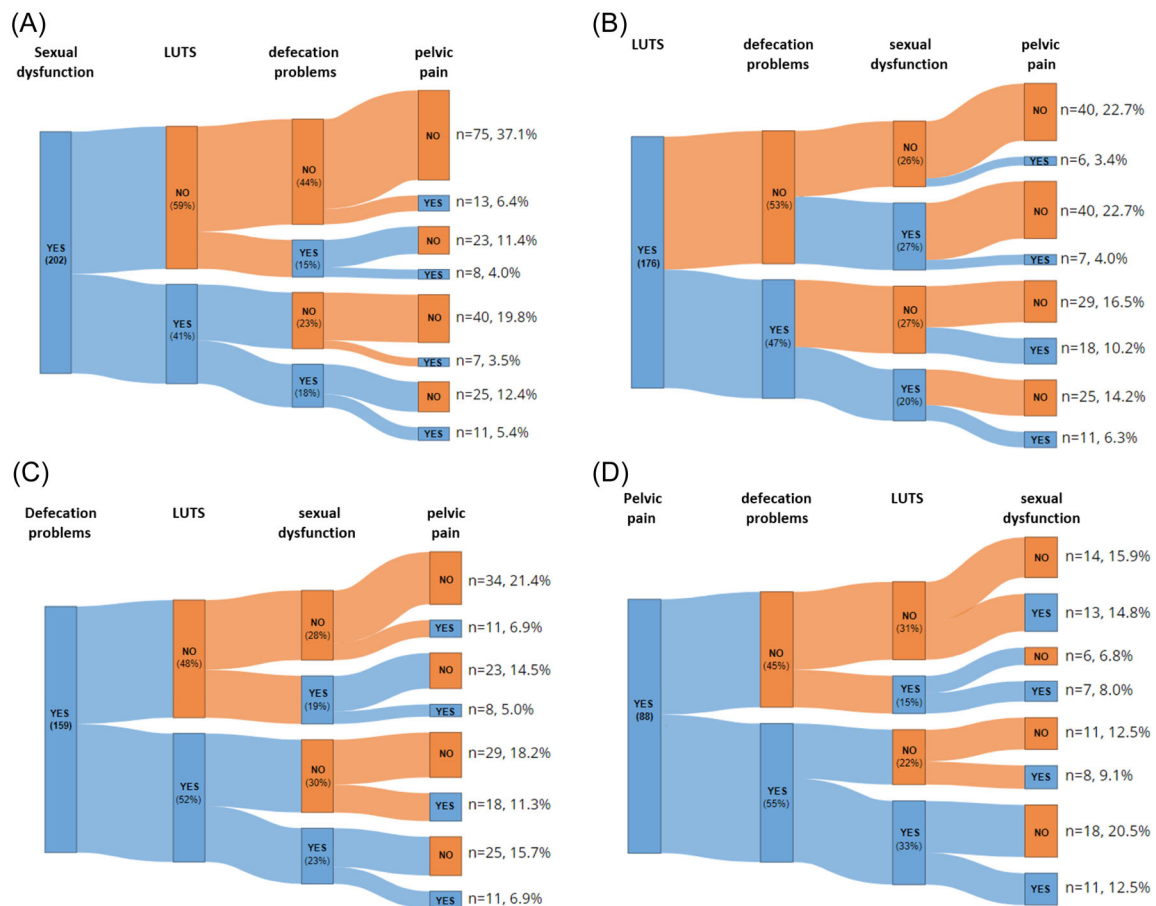
**FIGURE 3** Sankey diagrams of concomitant pelvic floor domains in female participants. (A) Sexual dysfunction. (B) Lower urinary tract symptoms (LUTS). (C) Defecation problems. (D) Pelvic pain. *Note:* Each diagram starts with the subgroup of females with the specific PFS. Data were ranked according to the largest overlap between symptoms. For example: (A) starts with  $n = 283$  (of the 596 sexually active) females having sexual dysfunction, of which 69% experience no pelvic pain (in red) and 31% do experience pelvic pain (in blue), and so forth. The overlap between sexual dysfunction and pelvic pain was the largest, followed by sexual dysfunction and defecation problems, sexual dysfunction and LUTS, and sexual dysfunction and POP. POP, pelvic organ prolapse.

and behavioral differences exist that result in sex and gender differences in those symptoms.<sup>21–23</sup> We found that more females than males reported pelvic pain. This finding is well known in the literature and may be explained by differences in the neuroimmune system or how sex hormones influence nociceptive systems.<sup>24</sup> Despite these differences, we also found similarities between males and females, with sexual dysfunction notable for being the largest PFS group in both females and males, followed closely by LUTS and defecation problems.

This large cohort study benefited from the use of validated questionnaires to assess all pelvic floor domains, which both males and females completed at a single point, and the inclusion of a general adult population from a single Dutch city. These offer a solid basis from which we could gain accurate

insights and conduct in-depth analysis in this and future research. However, the study also has limitations. First, the low response rate limits generalizability (external validity). Second, our participants were older than the nonresponders and the total population. Given that the incidence of PFS increases with age, participants likely experienced more PFS than the total population. Despite this, we only observed this expected difference for LUTS and POP when comparing data from medical records.

Third, an important consideration is the use of arbitrary questionnaire cutoff values in the absence of established values. Defining sexual dysfunction and pelvic pain as present when one or more symptoms occurred, together with the relatively low scores for LUTS and defecation problems (despite using the highest quartiles), could have led to higher



**FIGURE 4** Sankey diagrams of concomitant pelvic floor domains in male participants. (A) Sexual dysfunction. (B) Lower urinary tract symptoms (LUTS). (C) Defecation problems. (D) Pelvic pain. *Note:* Each diagram starts with the subgroup of males with the specific PFS. Data were ranked according to the largest overlap between symptoms. For example, (A) starts with  $n = 202$  (of the 436 sexually active) males having sexual dysfunction, of which 59% experience no LUTS (in red) and 41% do experience LUTS (in blue), and so forth. The overlap between sexual dysfunction and LUTS was the largest, followed by sexual dysfunction and defecation problems, and sexual dysfunction and pelvic pain. PFS, pelvic floor symptoms.

numbers of those PFS. Together with the response bias, we are reluctant to present prevalence rates for the individual PFS in the general population. However, this liberal approach allowed us to find relations and overlap between PFS when few symptoms occurred. Choosing stricter, but similarly arbitrary, cutoff values may have failed to show these associations.

Next, although we did assess possible confounders and risk factors for developing PFS (e.g., vaginal delivery, heavy work, surgery, and comorbidities), we did not adjust for those factors in the current work because our main goal was only to explore concomitant symptoms. Finally, the cross-sectional nature of this survey also limits our ability to draw conclusions on causal associations. Longitudinal studies are needed to clarify these potential associations.

## 5 | CONCLUSION

This study in a general Dutch population revealed not only a large overlap between different PFS but also a difference in PFS clusters between females and males. Sexual dysfunction frequently co-occurred with pelvic pain and defecation problems in females, whereas sexual dysfunction, LUTS, and defecation problems frequently co-occurred in males. Females also reported pelvic pain more than males. These results indicate that clinicians and researchers should have a greater awareness of concomitant PFS and that health care providers should consider all PFS when assessing patients.

## ACKNOWLEDGMENTS

The authors would like to thank Henriëtte Westers for her assistance in data collection. Dr Robert Sykes

([www.doctored.org.uk](http://www.doctored.org.uk)) provided editorial services for the final drafts of this manuscript. This study was funded by ZonMw (Gender and Health 849200004).

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.


## ETHICS STATEMENT

The study was approved by the local medical ethical committee (University Medical Center Groningen: METc2018/601). All participants provided written informed consent.

## ORCID

Grietje E. Knol-de Vries  <http://orcid.org/0000-0002-7833-5260>


G. G. Alec Malmberg  <http://orcid.org/0000-0001-7145-6185>

Françoise J. M. Notenboom-Nas  <http://orcid.org/0000-0003-3861-5820>

Janny H. Dekker  <http://orcid.org/0000-0001-5005-9324>

Gommert A. van Koevinge  <http://orcid.org/0000-0003-2328-8265>

Peter Leusink  <http://orcid.org/0000-0002-0696-4228>

Marijke C. Ph. Sliker-ten Hove  <http://orcid.org/0000-0001-9516-8372>

Debby G. Keuken  <http://orcid.org/0000-0001-9040-7063>

Marco H. Blanker  <http://orcid.org/0000-0002-1086-8730>

## REFERENCES

1. Frawley H, Shelly B, Morin M, et al. An International Continence Society (ICS) report on the terminology for pelvic floor muscle assessment. *NeuroUrol Urodyn.* 2021;40(5):1217-1260. doi:10.1002/nau.24658
2. Messelink B, Benson T, Berghmans B, et al. Standardization of terminology of pelvic floor muscle function and dysfunction: report from the pelvic floor clinical assessment group of the International Continence Society. *NeuroUrol Urodyn.* 2005;24(4):374-380. doi:10.1002/nau.20144
3. Pierce H, Perry L, Chiarelli P, Gallagher R. A systematic review of prevalence and impact of symptoms of pelvic floor dysfunction in identified workforce groups. *J Adv Nurs.* 2016;72(8):1718-1734. doi:10.1111/jan.12909
4. Padoa A, McLean L, Morin M, Vandyken C. "The overactive pelvic floor (OPF) and sexual dysfunction" part 1: pathophysiology of OPF and its impact on the sexual response. *sex. Med Rev.* 2021;9(1):64-75. doi:10.1016/j.sxmr.2020.02.002
5. Knol-de Vries GE, Blanker MH. Prevalence of co-existing pelvic floor disorders: a scoping review in males and females. *Continence.* 2022;2. <https://www.sciencedirect.com/journal/continence/vol/2/suppl/C>
6. Bates TS, Wright MP, Gillatt DA. Prevalence and impact of incontinence and impotence following total prostatectomy assessed anonymously by the ICS-male questionnaire. *Eur Urol.* 1998;33(2):165-169. doi:10.1159/000019549
7. Berghmans B, Nieman F, Leue C, Weemhoff M, Breukink S, van Koevinge G. Prevalence and triage of first contact pelvic floor dysfunction complaints in male patients referred to a pelvic care centre. *NeuroUrol Urodyn.* 2016;35(4):487-491. doi:10.1002/nau.22733
8. Berghmans B, Nieman F, Leue C, Weemhoff M, Breukink S, van Koevinge G. Prevalence and triage of first-contact complaints on pelvic floor dysfunctions in female patients at a pelvic care centre. *NeuroUrol Urodyn.* 2016;35(4):503-508. doi:10.1002/nau.22739
9. Bristol Urological Institute, 2014–2022. The International Consultation on Incontinence Questionnaire-ICIQ modules. Accessed February 2, 2022. <https://iciq.net/iciq-modules>
10. Meinds RJ, Timmerman MEW, van Meegdenburg MM, Trzpis M, Broens PMA. Reproducibility, feasibility and validity of the Groningen Defecation and Fecal Continence questionnaires. *Scand J Gastroenterol.* 2018;53(7):790-796. doi:10.1080/00365521.2018.1465993
11. Rockwood TH, Constantine ML, Adegoke O, et al. The PISQ-IR: considerations in scale scoring and development. *Int Urogynecol J.* 2013;24(7):1105-1122. doi:10.1007/s00192-012-2037-z
12. Seksuele Gezondheid in Nederland 2017. Accessed February 2, 2022. <https://rutgers.nl/onderzoeken/seksuele-gezondheid-in-nederland/>
13. Utomo E, Blok BF, Steensma AB, Korfage IJ. Validation of the pelvic floor distress inventory (PFDI-20) and pelvic floor impact questionnaire (PFIQ-7) in a Dutch population. *Int Urogynecol J.* 2014;25(4):531-544. doi:10.1007/s00192-013-2263-z
14. Matthews CA. Risk factors for urinary, fecal, or double incontinence in women. *Curr Opin Obstet Gynecol.* 2014;26(5):393-397. doi:10.1097/GCO.0000000000000094
15. Sliker-ten Hove MC, Pool-Goudzwaard AL, Eijkemans MJ, Steegers-Theunissen RP, Burger CW, Vierhout ME. Prevalence of double incontinence, risks and influence on quality of life in a general female population. *NeuroUrol Urodyn.* 2010;29(4):545-550. doi:10.1002/nau.20760
16. MacLennan AH, Taylor AW, Wilson DH, Wilson D. The prevalence of pelvic floor disorders and their relationship to gender, age, parity and mode of delivery. *BJOG.* 2000;107(12):1460-1470. doi:10.1111/j.1471-0528.2000.tb11669.x
17. Nygaard I, Barber MD, Burgio KL. Prevalence of symptomatic pelvic floor disorders in US women. *JAMA.* 2008;300(11):1311-1316. doi:10.1001/jama.300.11.1311
18. Barry MJ, Link CL, McNaughton-Collins MF, McKinlay JB. Overlap of different urological symptom complexes in a racially and ethnically diverse, community-based population of men and women. *BJU Int.* 2008;101(1):45-51. doi:10.1111/j.1464-410X.2007.07191.x
19. Donnelly DW, Donnelly C, Kearney T, et al. Urinary, bowel and sexual health in older men from Northern Ireland. *BJU Int.* 2018;122(5):845-857. doi:10.1111/bju.14182

20. De Nunzio C, Roehrborn CG, Andersson KE, McVary KT. Erectile dysfunction and lower urinary tract symptoms. *Eur Urol Focus*. 2017;3(4-5):352-363. doi:10.1016/j.euf.2017.11.004
21. Abelson B, Sun D, Que L, et al. Sex differences in lower urinary tract biology and physiology. *Biol Sex Differ*. 2018;9(1):45-48. doi:10.1186/s13293-018-0204-8
22. Bauer RM, Huebner W. Gender differences in bladder control: from babies to elderly. *World J Urol*. 2013;31(5):1081-1085. doi:10.1007/s00345-013-1132-1
23. Lakhoo J, Khatri G, Elsayed RF, et al. MRI of the Male pelvic floor. *Radiographics*. 2019;39(7):2003-2022. doi:10.1148/rg.2019190064
24. Sorge RE, Totsch SK. Sex differences in pain. *J Neurosci Res*. 2017;95(6):1271-1281. doi:10.1002/jnr.23841

## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Knol-de Vries GE, Malmberg GGA, Notenboom-Nas FJM, et al. Exploring concomitant pelvic floor symptoms in community-dwelling females and males. *NeuroUrol Urodyn*. 2022;1-11. doi:10.1002/nau.25020