The 7th International Consultation on Incontinence

2021

The Epidemiology of Urinary Incontinence and other Lower Urinary Tract Symptoms (LUTS), Pelvic Organ Prolapse (POP) and Anal Incontinence

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Epidemiology

Prevalence data
Risk factors
Data on disease progression, longitudinal studies
Prediction modelling
Genetic epidemiology
Worldwide estimates on current
and future prevalence

Enuresis and Incontinence in children

- **Revised document reflecting refinement and current knowledge on pediatric LUT function** - *The Standardization of Terminology of Lower Urinary Tract Function in Children and Adolescents: Update Report from the Standardization Committee of the International Children's Continence Society Austin PF et al Neurourology and Urodynamics 35:471-478 (2016)*

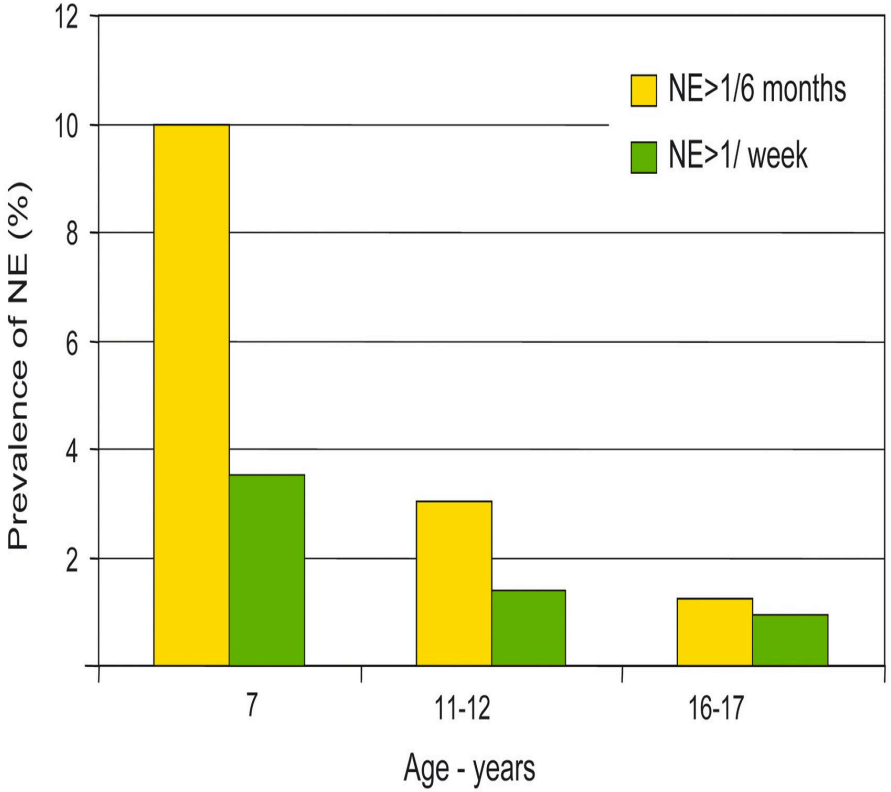
- **New publications demonstrating obesity as a risk factor for LUTS in children –**

  Nocturnal enuresis in obese children: a nation-wide epidemiological study from China. Zhang A et al. Scientific Reports 2019 Jun 10;9(1):8414.

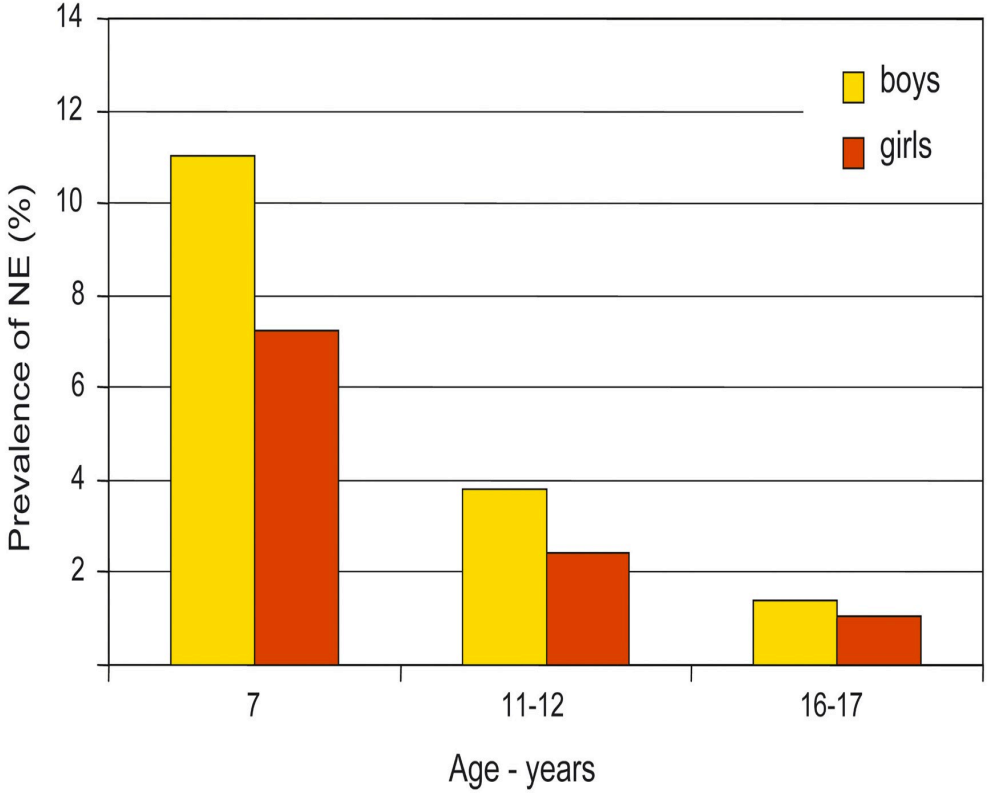
  Prevalence of nocturia and fecal and urinary incontinence and the association to childhood obesity: a study of 6803 Danish school children. Warner TC et al. J Pediatr Urol 2019 May;15(3):225.e1-225.e8

Nocturnal Enuresis

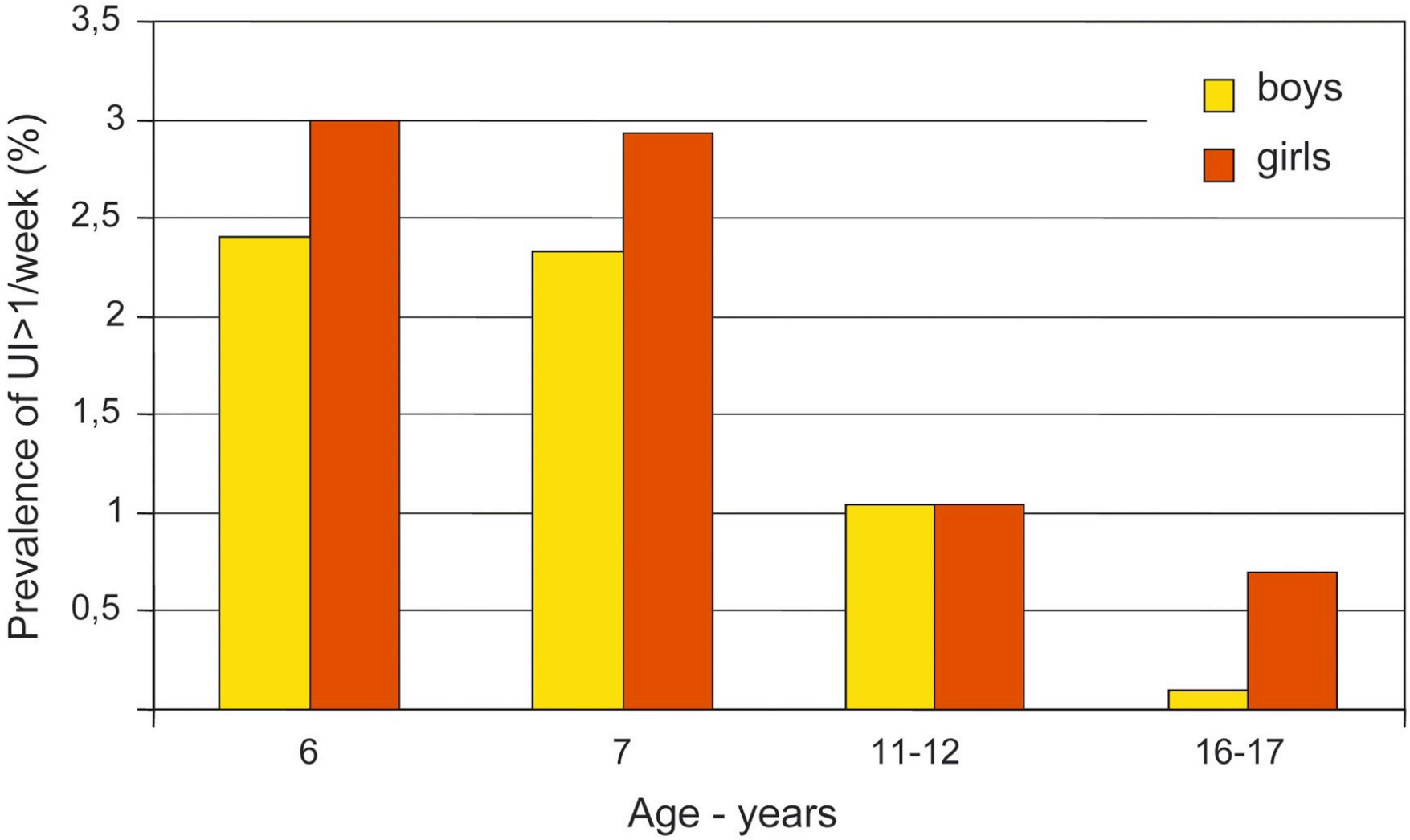
Prevalence of nocturnal enuresis (NE) grouped according to frequency of enuretic episodes and age (meta-analysis)



Prevalence of nocturnal enuresis (NE) grouped according to sex and age (meta-analysis)



Prevalence of daytime UI (>1 episode/week) by age and gender. Data are from: age 6 years, 7 years, 11-12 years and 16-17 years



Urinary Incontinence

- Large variation in the estimated prevalence of UI even after talking into account differences in definitions, ascertainment techniques and demographic characteristics

  Women (any UI or at least once last 12 months) 5-69%

  Men 1-39%

  In general twice as common in women than men
- Recent prospective studies have provided much needed data on the incidence of new UI and the natural history of UI (progression, regression and resolution)
- Data from Twin studies suggests that there is a substantial genetic component to UI, especially stress urinary incontinence (SUI)

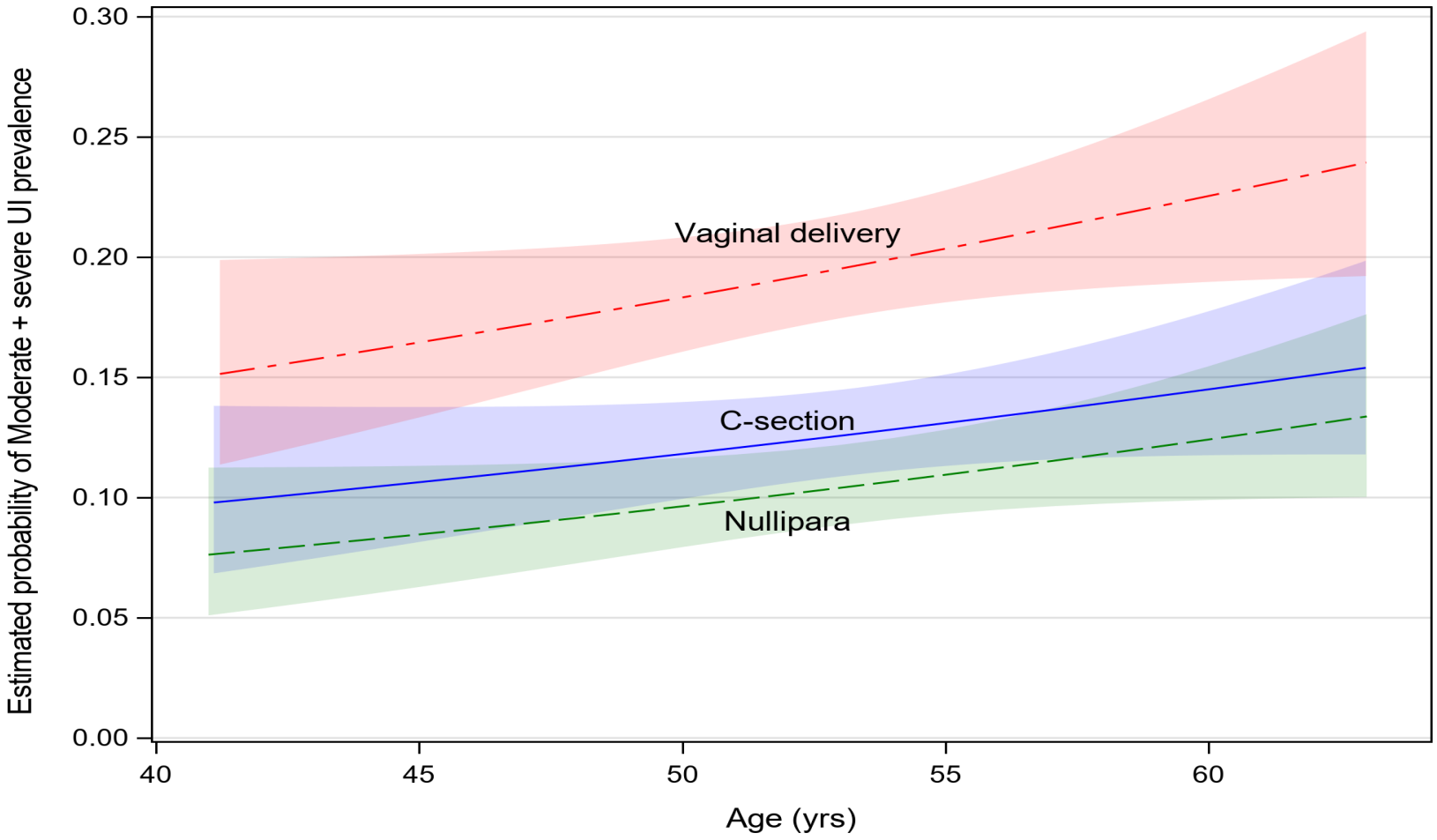
Urinary Incontinence

Risk factors - Women

- Pregnancy and vaginal delivery are significant risk factors, strength of association diminishes with age
- Contrary to previous popular belief menopuse *per se* does not appear to be a risk factor for UI
- Conflicting evidence regarding hysterectomy; remission/ de novo. Subtotal/total, uterine size, delivery mode
- Diabetes mellitus is a risk factor in most studies
- Additional evidence has now established oral estrogen and body mass as important modifiable risk factors for UI
- Loss of cognitive function, separated from physical function and other factors may not be a risk factor for UI, but rather increases the impact of UI
- Smoking, diet, depression, UTI´s and exercise have not been established as risk factors

The effect of childbirth on urinary incontinence – a matched cohort study in women aged 40-64 years

Gyhagen M, Åkervall S, Molin M, Milsom I.
Am J Obstet Gynecol. 2019 ;221(4):322.e1-322.e17.



Urinary Incontinence

Risk factors- Men

- Increasing age
- Lower urinary tract symptoms (LUTS)
- Infections
- Functional and cognitive impairment
- Neurological disorders
- Prostatectomy

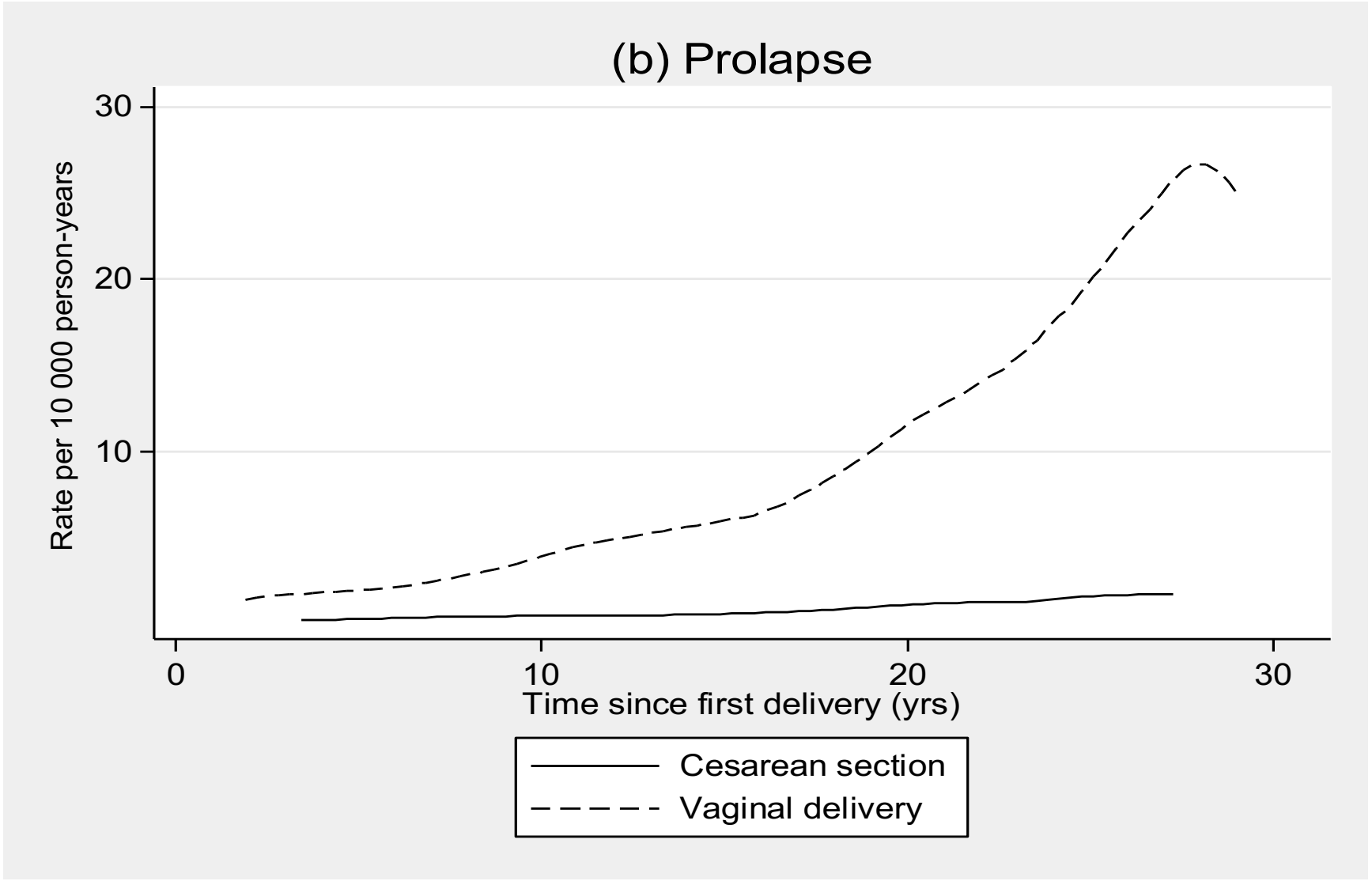
Pelvic organ prolapse (POP)

Summary

- **Prevalence (based on a mass bulging in the vagina) 5 - 15%**
- **Childbirth is associated with an increased risk for POP later in life**
- **Increasing number of children increases risk**
- **Caesarean section prevents the development of POP**
- **A number of studies suggest that hystertectomy and other pelvic surgery increases the risk of POP**
- **Need for studies evaluating specific obstetric events**

Rate of pelvic organ prolapse surgery in relation to mode of delivery and time from first childbirth

(Leijonhufvud et al. Am J Obstet Gynecol 2011;204(1):70.e1-7)



Pelvic Floor Disorders (PFDs)

Pelvic Organ Prolapse (5-15%)
Urinary incontinence (30-60%)
Fecal incontinence (11-15%)

Any form of pelvic floor disorder 46%

Common problems affecting millions of women throughout the world

Negative effect on:

Quality of life and Working ability

Sporting activities and Sexual activity

Global costs high

Life-time risk of POP or UI surgery

The lifetime risk of undergoing POP surgery alone has been reported to vary between 5 and 19%.[1] The highest life time risk for POP surgery,19%, has been reported from Western Australia[2]

De Boer[3] et al. estimated that 20.2% of Dutch women would undergo POP or continence surgery before 85 years of age

Wu et al.[4] estimated a similar rate of intervention in the United States

1. Haya et al. Am J Obstet Gynecol 2015 (E-pub)
2. Smith et al. Obstet Gynecol 2010;116:1096-1100
3. de Boer et al. Eur J Obstet Gynecol Reprod Biol 2011;158:343-349
4. Wu et al Obstet Gynecol 2014;123:1201-1216

Prediction modelling

UR-CHOICE – Can we provide mothers-to-be with information about the risk of future pelvic floor dysfunction (PFD)?

Wilson D, Dornan J, Milsom I, Freeman R. Int Urogynecol J 2014;25:;1449-1452

Evidence that the following factors are associated with future PFD

U - Presence or absence of antenatal UI

R - Race/Ethnicity

C - Childbearing started at what age

H - Height of mother

O - Overweight? (mothers BMI)

I - Inheritance (family history)

C - Children (number of children desired)

E - Estimated fetal weight

Hypothesis has been suggested and is being tested to establish if these physical features of the Mother and the Baby can be scored and used to determine the most suitable route of delivery

Prediction modelling based on epidemiological data

Study population based on data from 2 longitudinal, prospective cohorts

1. **Swedish Pregnancy, Obesity and Pelvic Floor Study (SwePOP)**
   - **Only Primiparous women delivered 1985-1988 (n = 9423)**
   - **Swedish Medical Birth Register data**
   - **Linked to Postal Questionnaire 20 years after delivery**
2. **ProLong study from UK/New Zealand**
   - **All deliveries w/n 12 months (1993-94)**
   - **7883 participated 3 months after index birth**
   - **Aberdeen (UK), Birmingham (UK), Dunedin (New Zealand)**
   - **Followed up to 12 years after delivery**

Gyhagen M, Bullarbo M, Nielsen T, Milsom I. BJOG. 2013;120(2):144-51
MacArthur C, Glazener C, Lancashire R, Herbison P, Wilson D, BJOG. 2011 ;118(8):1001-7.

Prediction modelling based on epidemiological data

- Models provided valid individualized risk estimates for the development of PFDs 12-20 years after delivery.
- The models in this analysis provide similar discrimination to other predictive models currently used in clinical practice whose concordance index generally range from 0.6 to 0.8 including widely-used models such as the National Cancer Institute Gail model for prediction of Breast Cancer risk (concordance index 0.59) and the Framingham Cardiovascular Risk Model (concordance index 0.72).

Predicting risk of pelvic floor disorders 12 and 20 years after delivery.
Jelovsek JE, Chagin K, Gyhagen M, Hagen S, Wilson D, Kattan MW, Elders A, Barber MD, Areskoug B, MacArthur C, Milsom I.
Am J Obstet Gynecol. 2018 Feb;218(2):222.e1-222.e19.

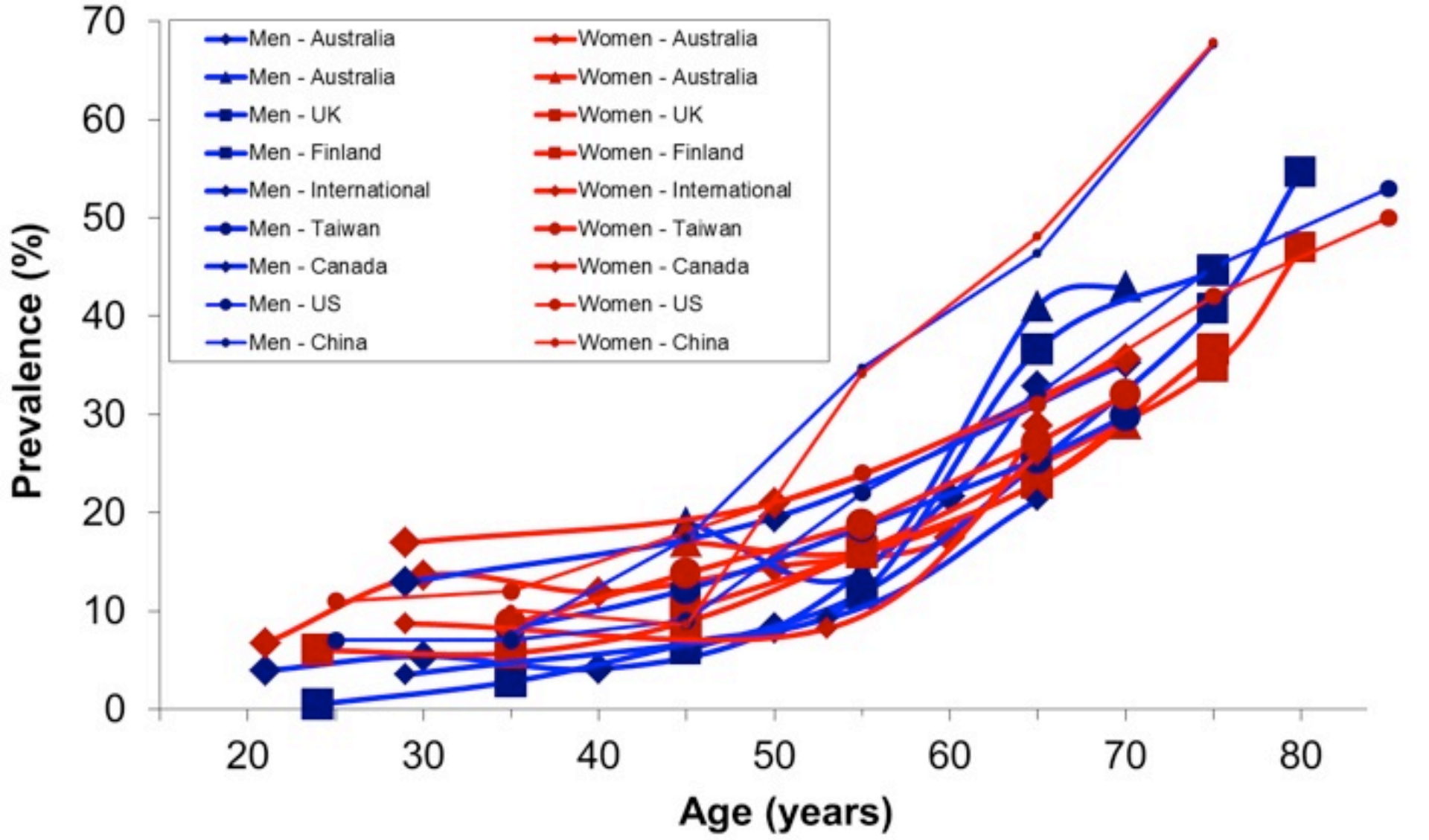
Overactive bladder (OAB)

- Urgency and UUI, the cornerstone symptoms of OAB, may be the most troubling LUTS at the population and individual level, respectively (Agarwal *Eur Urol* 2014)
- Typical prevalence estimates have varied between 10-20%
  - However, when considering symptom bother, prevalence is ~50% of these estimates (Milsom et al *BJU Int* 2001; Irwin et al *Eur Urol* 2008; Coyne et al *BJU Int* 2009; Vaughan et al *Eur Urol* 2011)
- OAB increases with age, but is dynamic
  - In a population-based study, 8% of women had OAB at baseline. Of those without OAB at baseline, 20% had OAB 16 yrs later. Of those with OAB at baseline, 42% did not have OAB at 16 yrs. Of all women, 26% had OAB at 16 yrs (Wennberg et al *Eur Urol* 2009)
  - Similar patterns found for men in another study (Malmsten et al *Eur Urol* 2010)
- Risk factors of OAB symptoms not well known but include: female gender, smoking, BPH, pelvic organ prolapse, anxiety

Nocturia

- One of the most common and bothersome LUTS with similar overall prevalence in both genders (Agarwal *Eur Urol* 2014; Bosch & Weiss *J Urol* 2010)
- Nocturia fluctuates, increases with age (Pesonen *Eur Urol* 2016)
  - In any given year 0.4% of adults aged <40 yr, 3% aged 40–59 yr, and 12% aged ≥60 yr will develop nocturia
  - Overall 12% of those with nocturia will improve
- Nocturia associated with decreased quality of life (Tikkinen *Eur Urol* 2010; Kupelian *Eur Urol* 2012) and possibly with modestly increased risk of death, falls and fractures (Fan *Int J Cardiol* 2015; Noguchi *Aging Male* 2016; Temml *Neurourol Urodyn* 2009; Nakagawa *J Urol* 2010)
- Risk factors include conditions of the urinary tract, but also systemic conditions: BPH, OAB, nocturnal polyuria, obesity, sleep apnea, and postmenopause

Prevalence of at least two voids per night grouped by age and sex in population-based studies with wide age-range



Kari Tikkinen 2012

Global prevalence and economic burden of urgency urinary incontinence – a systematic review

Milsom et al. European Urology 2014;65:79-95

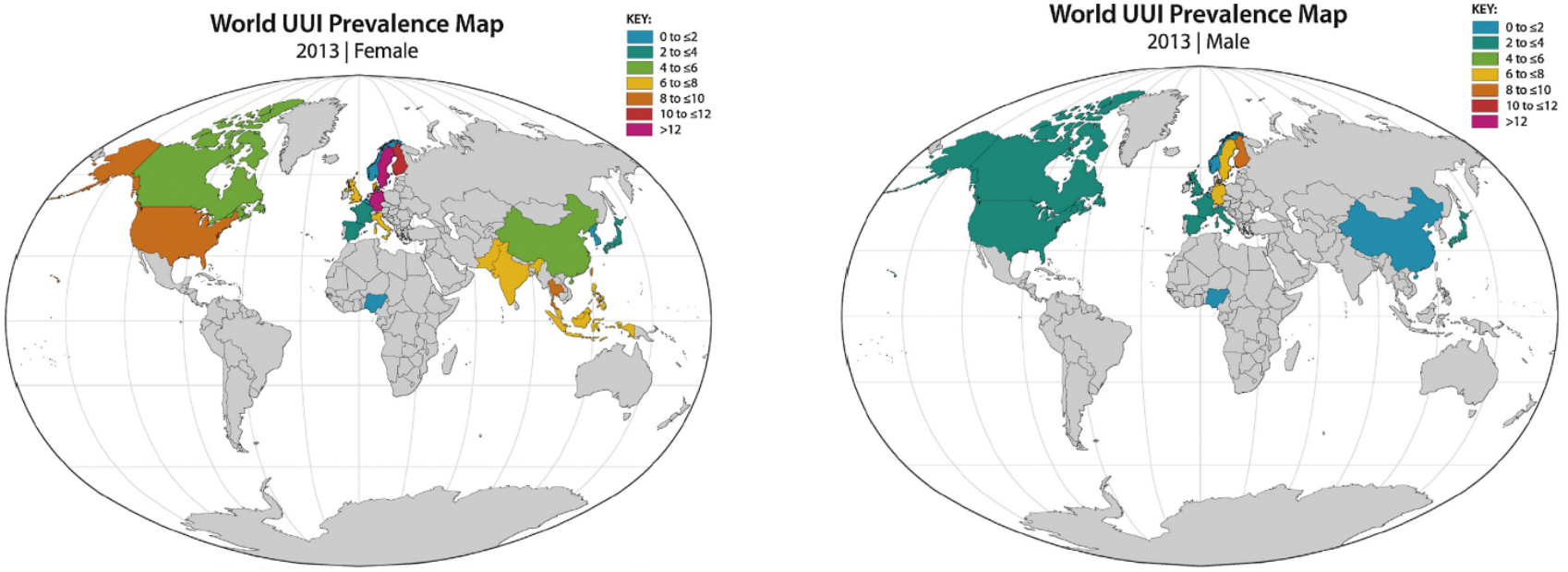


Fig. 3 – World map illustrating urgency urinary incontinence (UUI) prevalence rates for adult men and women. Prevalence rates reported in each captured study were adjusted for the current age distribution of the country's population obtained from the International Data Base of the US Census Bureau [64]. Age-adjusted prevalence rates were averaged when more than one study had been performed in a single country. For studies that reported separate rates for UUI, mixed urinary incontinence (MUI), and stress urinary incontinence, the UUI prevalence rate was calculated based on the sum of UUI and MUI rates.

Data on disease progression, longitudiunal studies

- Literature on incidence and remission of UI is still scarce in particular among men
- Annual incidence rates of UI in women ranged from 2-11%
- Rates of complete remission of UI ranged from 0 to 13%
- Annual incidence rate OAB 4-6%
- Annual remission rate OAB 2-3%
- Annual incidence of prolapse surgery 0.16-0.2%
- Estimated life time cumulative risk for prolapse surgery has been reported to be 5-19%

Genetic Epidemiology

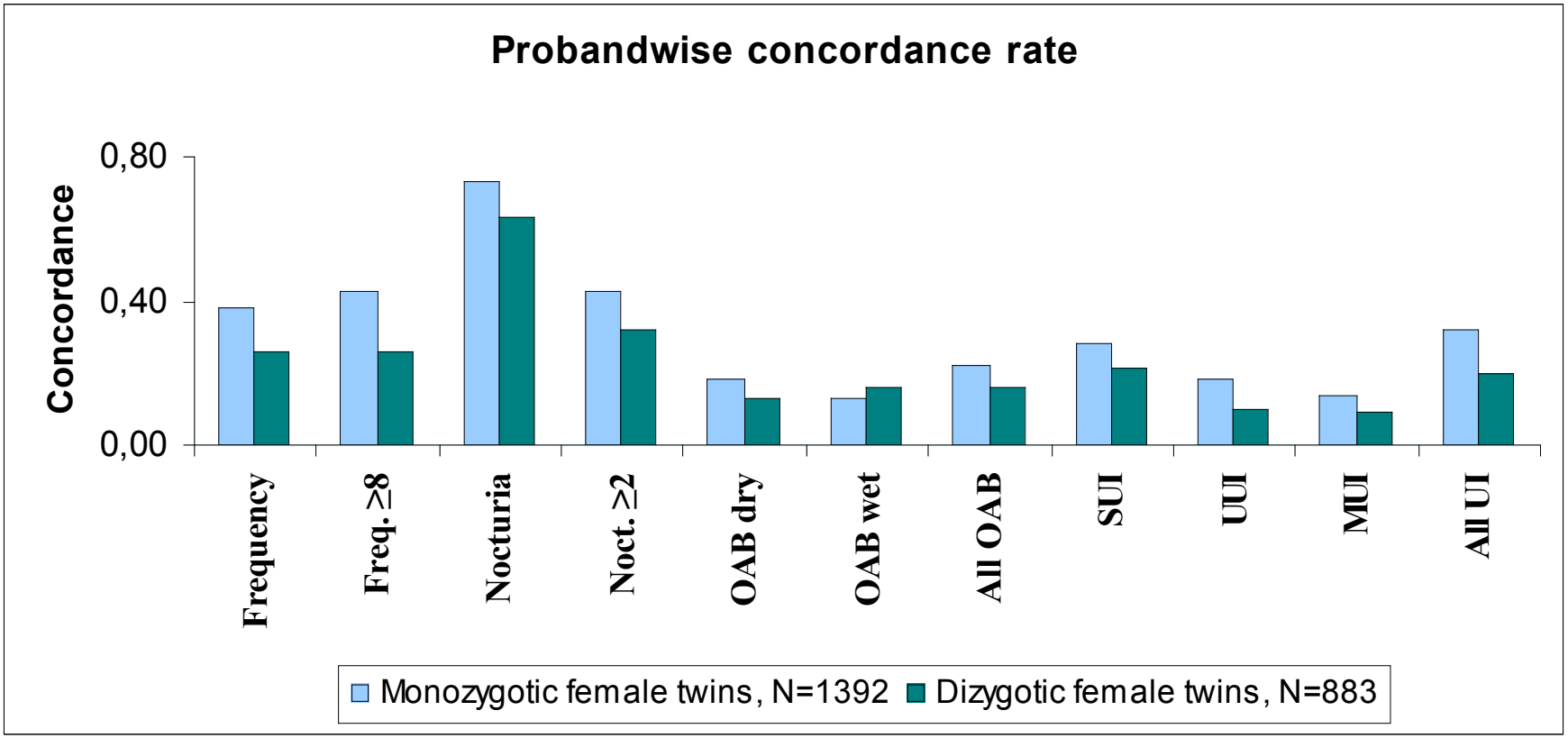
- **Familial transmission of UI well documented**
- **Less evidence for familial transmission of POP**
- **Difficult to differentiate between heritability and non-inherited (environmental factors) in the family environment**
- **Ethnic and racial differences for UI and POP well documented**
- **Twin Studies**

  By comparing monozygotic female twins with identical genotype, and dizogytic female twins who on average share 50 percent of their segregating genes, the relative proportions of phenotypic variance resulting from genetic and environmental factors can be estimated.

  A genetic influence is suggested if monzygotic twins are more concordant for the disease than dizygotic twins whereas evidence for environmental effects comes from monozygotic twins who are discordant for the disease.
- **Candidate genes, e.g. polymorhism of Collagen Type I**

Genetic Influences Are Important for Most But Not All Lower Urinary Tract Symptoms: A Population-Based Survey in a Cohort of Adult Swedish Twins

Anna-Lena Wennberg[a], *Daniel Altman*[b,c], *Cecilia Lundholm*[b], *Åsa Klint*[b], *Anastasia Iliadou*[b], *Ralph Peeker*[d], *Magnus Fall*[d], *Nancy L. Pedersen*[b], *Ian Milsom*[a,*]



Eur Urol. 2011;59:1032-8

Fecal Incontinence (FI)

Fecal incontinence more common after vaginal delivery compared to caesarean section.

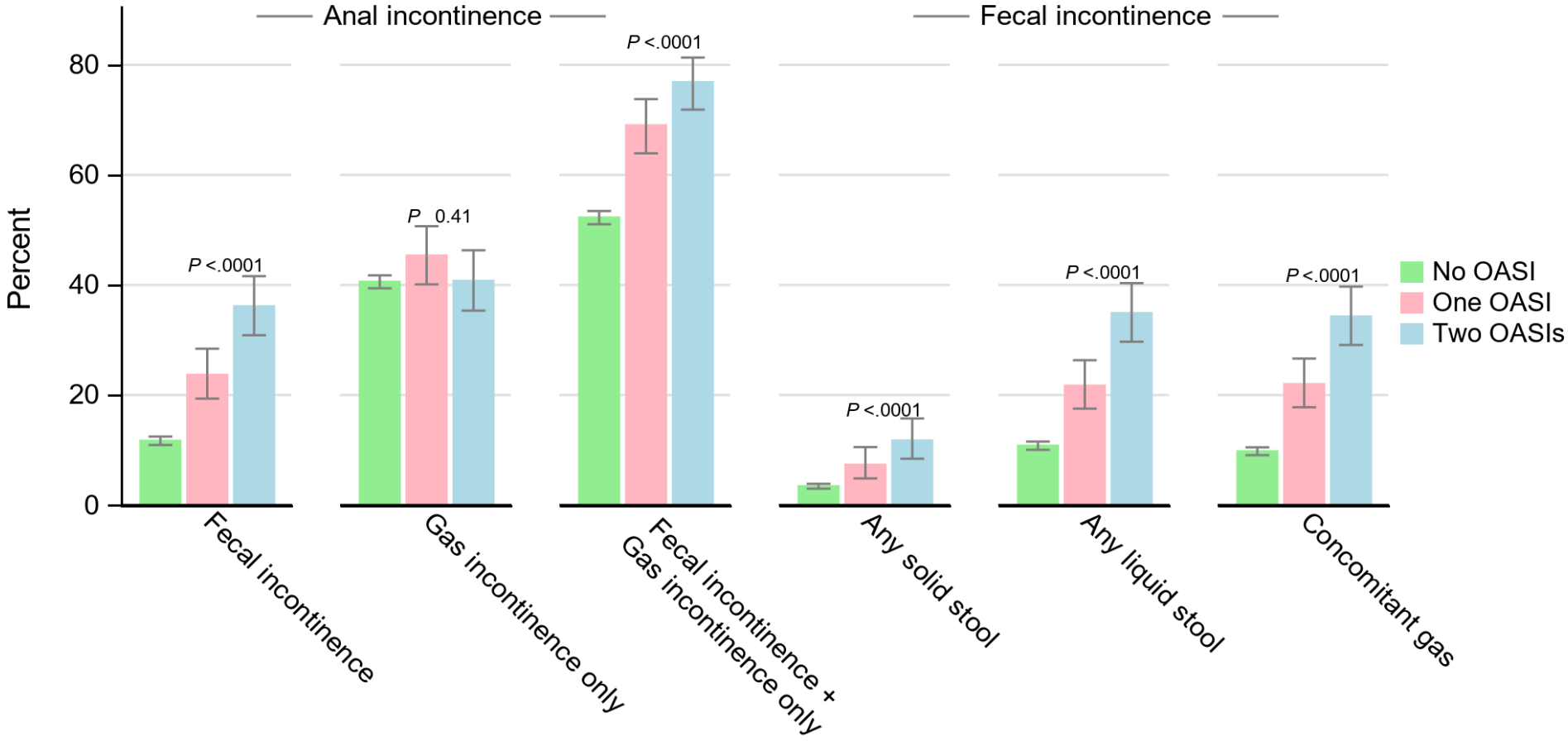
Strongly related to OASI

Obesity is perhaps the most modifiable risk factor

As populations age, co-morbid disease becomes a significant component of FI risk, e.g. Surgery, neurological diseases and stroke

Cognitive and ADL impairmet are associated with fecal incontinence impairment

Anal (AI) and Fecal Incontinence (FI)



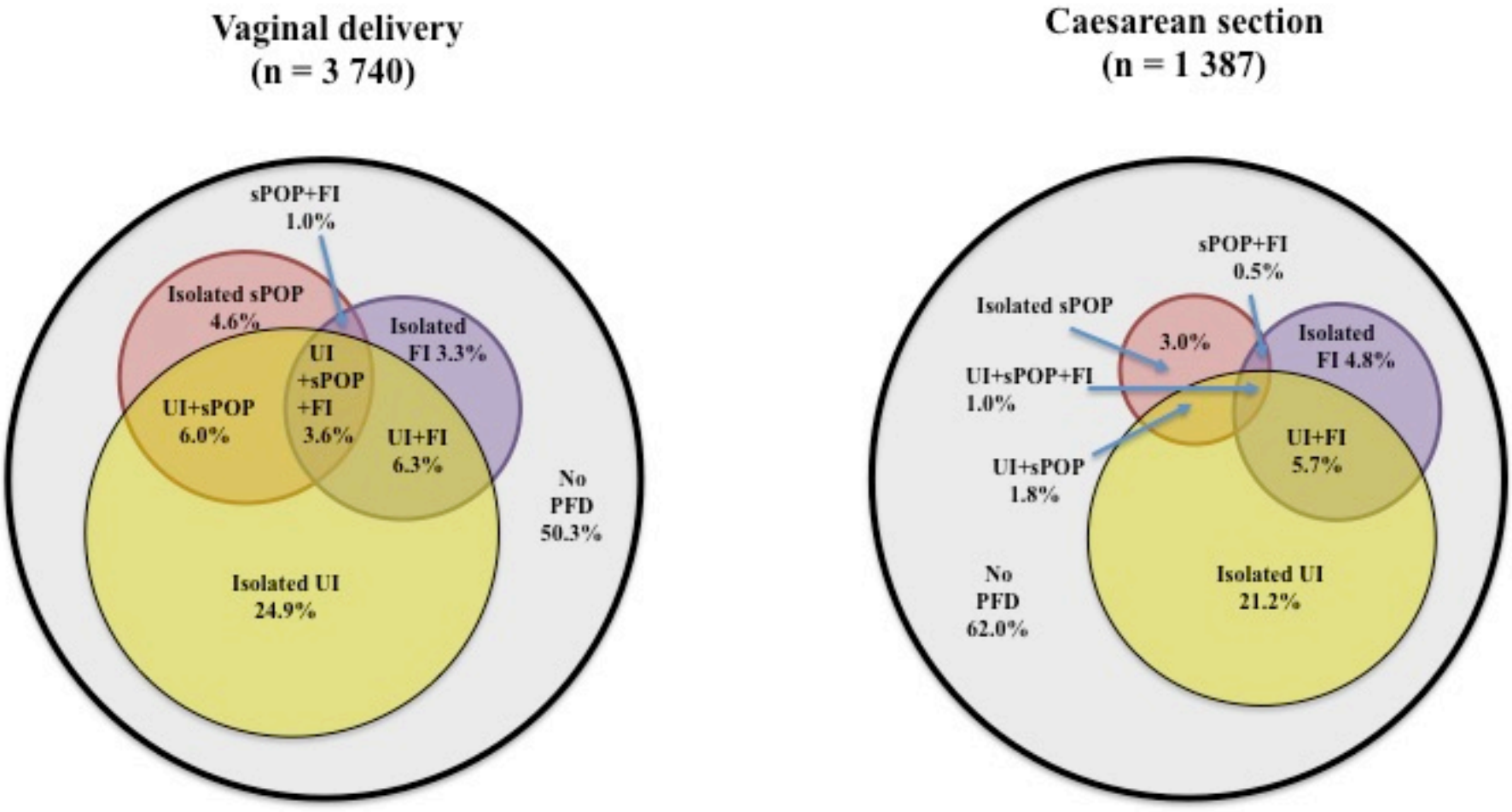
Symptoms of fecal incontinence two decades after no, one or two obstetrical anal sphincter injuries.
Nilsson IEK, Åkervall S, Molin M, Milsom I, Gyhagen M.
Am J Obstet Gynecol 2021;224(3):276.e1-276.e23.

Anal and Fecal Incontinence

Summary

- **Anal (AI) and urinary incontinence commonly co-exist particularly in the elderly and nursing home patients**
- **Prevalence increases with age but present in all groups varying from 1.5% in children to > 50% in nursing home residents**
- **AI is almost as common in men as in women**
- **Fecal incontinence more common after vaginal delivery compared to caesarean section.**
- **Strongly related to OASI**
- **Obesity is perhaps the most modifiable risk factor**
- **As populations age, co-morbid disease becomes a significant component of FI risk, e.g. Surgery, neurological diseases and stroke**
- **Cognitive and ADL impairmet are associated with fecal incontinence impairment**

Clustering of pelvic floor disorders 20 years after one vaginal or one caesarean birth



Gyhagen et al. Int Urogynecol J 2015 26:1115-1121

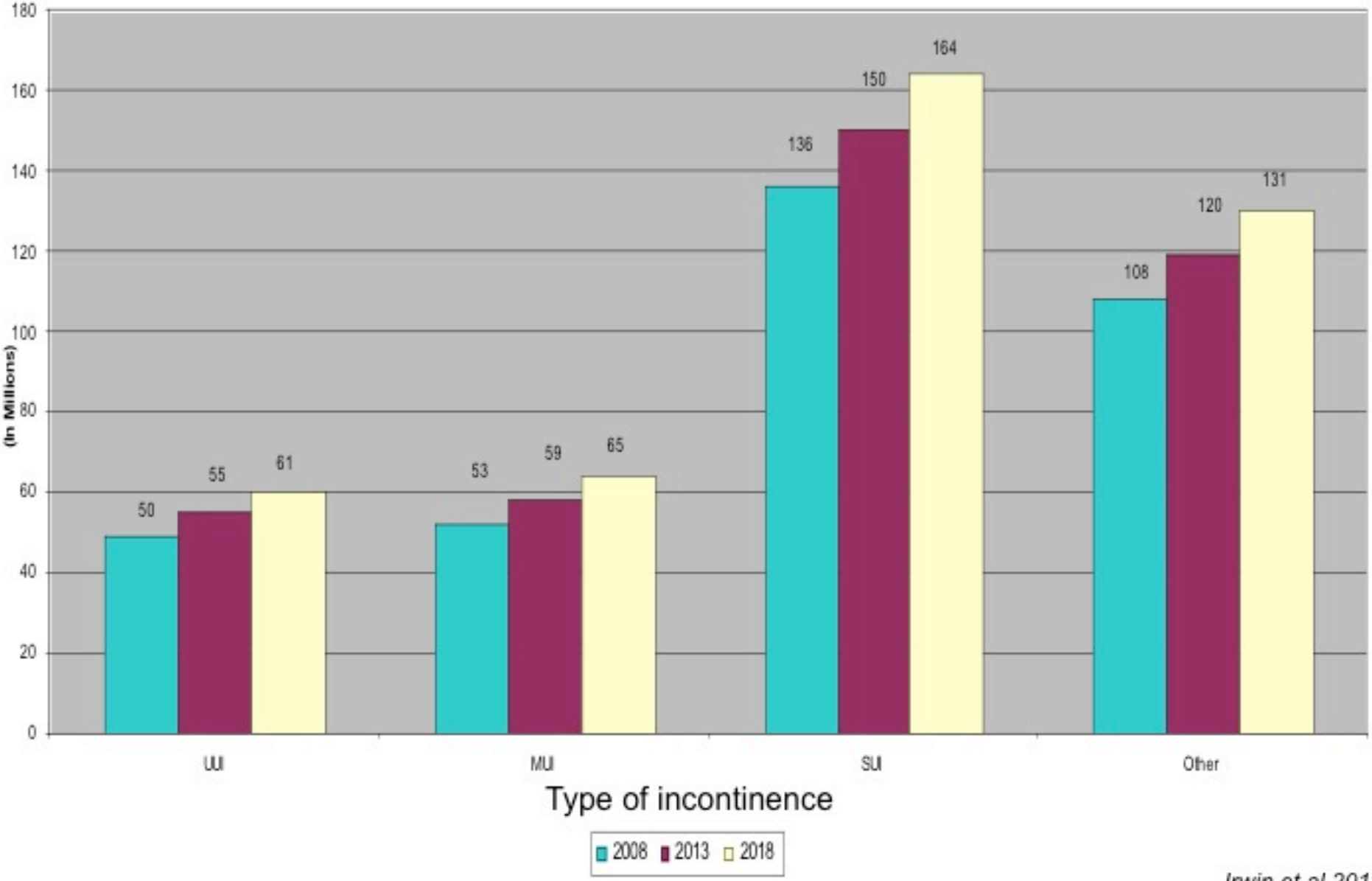
Worldwide prevalence estimates of lower urinary tract symptoms, overactive bladder, urinary incontinence and bladder outlet obstruction

Irwin DE, Kopp ZS, Agatep B, Milsom I, Abrams P
BJU Int. 2011 Nov;108(9):1459-71

- The EPIC study[1] was a population based study that estimated the prevalence of UI, OAB and other LUTS among men and women from five countries using the 2002 ICS definitions
- To estimate[2] the current and future worldwide number of individuals with LUTS, OAB and UI, the age- and gender-specific prevalence rates from the the results from the EPIC study were applied to the worldwide over 20 year old population (4.2 billion) with males and females stratified into five-year age groups (20-24 to 80+) to estimate the current and future worldwide number of individuals with LUTS, OAB and UI, and the age- and gender-specific prevalence rates
- Projected population estimates for all worldwide regions are based on the United States Census Bureau International Database (IDB)[3]

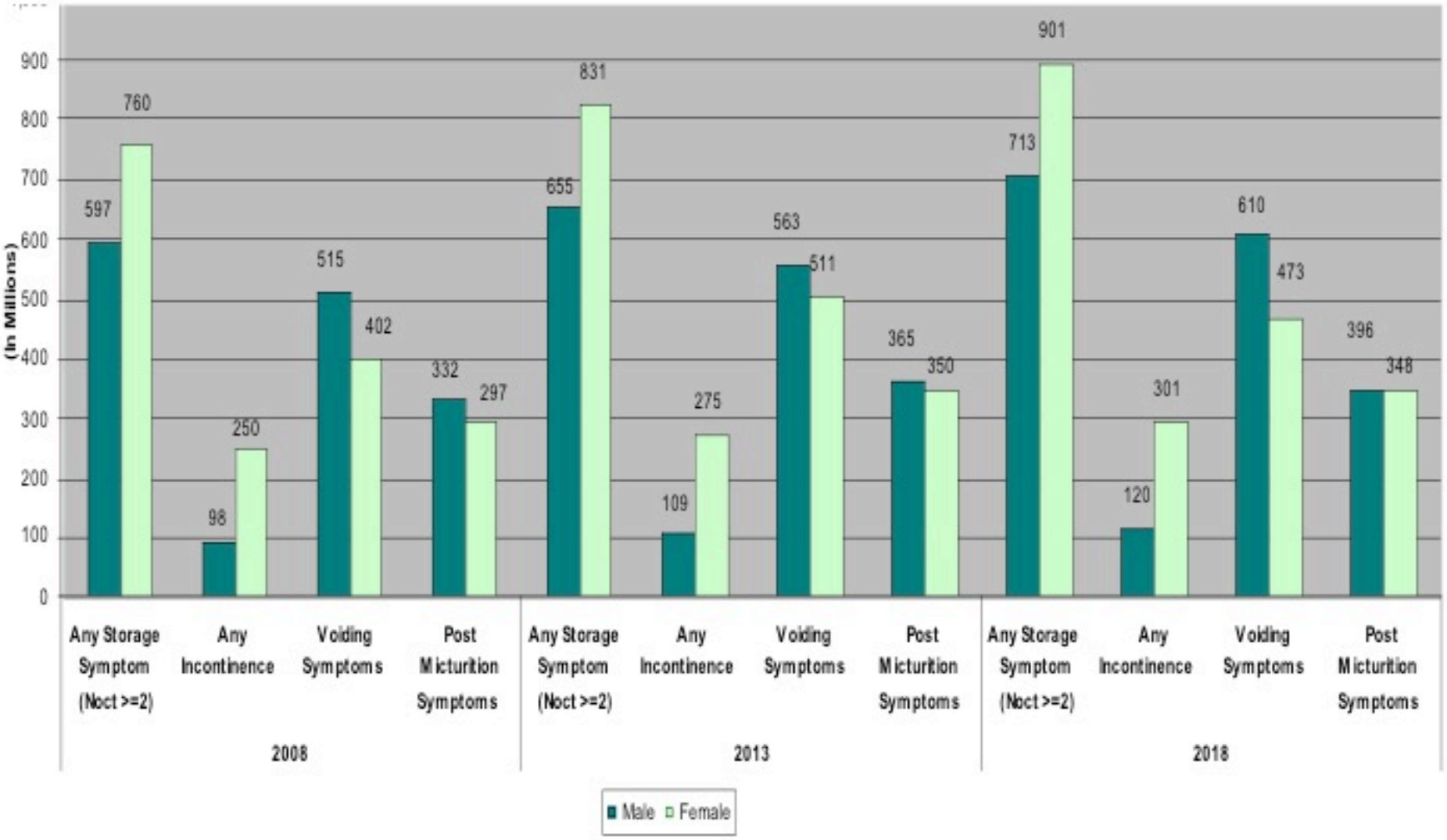
1.Irwin DE et al. Eur Urol 2006;50:1306-1315
2. Irwin et al. BJU Int. 2011;108:1459-71
3. US Census Bureau, International Data Base. Data updated 3-27-2008. Retrieved April 14 2008. http://www.census.gov/ipc/www/idb/.

Estimated number of individuals with UI 2008, 2013 and 2018 Grouped according to type of incontinence



Irwin et al 2011

Estimated number of individuals with LUTS 2008, 2013 and 2018 grouped according to gender



Irwin et al 2011