



ACTIVITY RESTRICTION (AR) IN PREGNANCY

- prevention of preterm birth

Bed rest

Immobilisation

Rest

Bed confinement

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What is known about strict AR in pregnancy?

- Inconclusive evidence - treatment efficiency unknown
- Many demonstrated adverse side effects
- Costly both in individual terms and on a broader societal level



Standard definition of Activity Restriction

Light (LAR)

Two hours or less continuous rest, in bed or in the sitting position during waking hours, and no lifting of > 10lb.

Moderate (mAR)

> 2 hours but < 8 hours continuous rest during waking hours with no household chores and no lifting. Health-related visits are allowed

Strict (sAR)

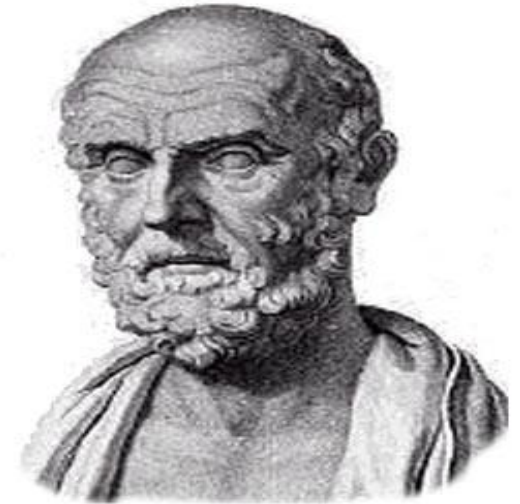
Confinement to their dwelling except for health-related visits. Rest in the sitting or supine position the entire day. No household chores and no lifting.

Hippocrates

5th century B.C.

Hippocratic Corpus

Observational and anatomical studies



ΗΙΠΠΟΚΡΑΤΗΣ

- Rest as soon as there is pain
- Too much rest is deteriorating physical strength
- Any change much in excess of the moderate, is harmful



John Hilton

Anatomist and Surgeon

1805-1878

- Professor of Anatomy and Surgeon
- Charter Fellow of The Royal College of Surgeons College,
- Surgeon-Extraordinary to Queen Victoria (appointed in 1871)

- 1860-62 series of lectures on Rest and Pain
- The basis for his classic: "On Rest and Pain"¹
published in 1863

Ref. Clin Orthop Relat Res. 2009 September; 467(9): 2208-2209. Published online 2009 June 12. doi: [10.1007/s11999-009-0927-2](https://doi.org/10.1007/s11999-009-0927-2)

1. Hilton J. *On The Influence of Mechanical and Physiological Rest in the Treatment of Accidents and Surgical diseases, and the Diagnostic Value of Pain.* London, England: Bell and Daldy; 1863.



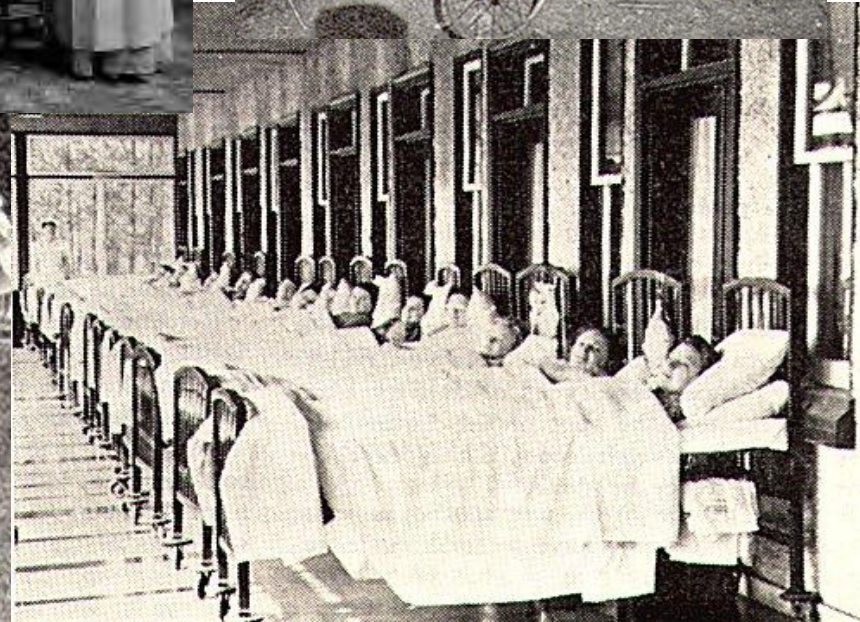
Observation: immobilization heals broken bones and big wounds

Hypothesis: immobilization as therapeutic treatment will presumably heal other systems in the body.

- The context of the recommendation of rest was misunderstood
- The bed was raised to the pinnacle of medical therapeutic aid at that time

Ref: *Sandler H, Vernikos J. Inactivity: Physiological effects. Academic Press 1986.
Browse NL. The Physiology and Pathology of Bed Rest. CC Thomas Books. 1965.

AR as treatment for any illness





Pioneer research on AR 1855-1929

- Beigel 1855, Johansson, 1898
 - Day and night temp. curves, excretion of urine, carbon dioxide and nitrogen in respectively 1 and 4 healthy males, after a short period of rest
- Campell and Webster, 1921
 - Day and night urine with cycles of nitrogen excretion in a 28-year-old male having been activity restricted for 5 days
- Cuthbertson, 1929
 - Metabolic effects of immobilization
 - 5 males, aged 19 to 40 years, and 2 females, aged 19 to 37 years

Is prolonged sAR beneficial ?

- Clinical observations during World War II of immediate ambulation after injury
- Bone fracture treated with sAR
 - obs. ↑ excretion of calcium and nitrogen
 - same obs. in healthy men on sAR





Entry into space age Research on sAR

- Physiological changes expected in space with removal of gravity
- Bed rest and immobilization best method to simulate weightlessness on earth

NASA research

Adverse effects of sAR

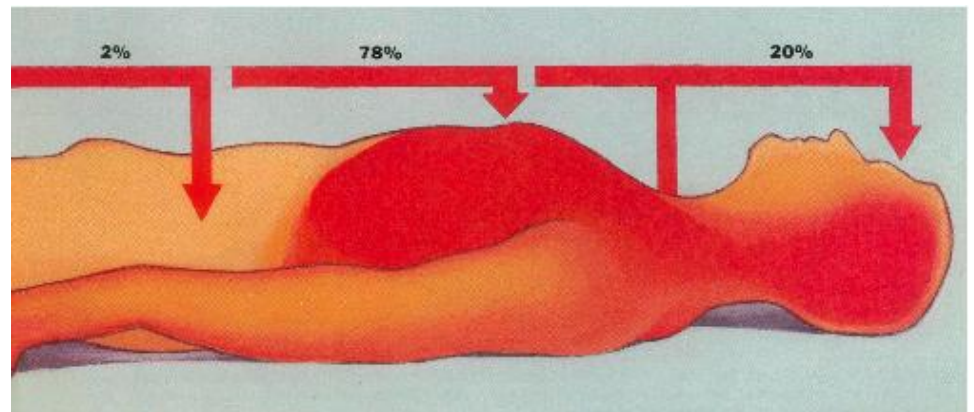
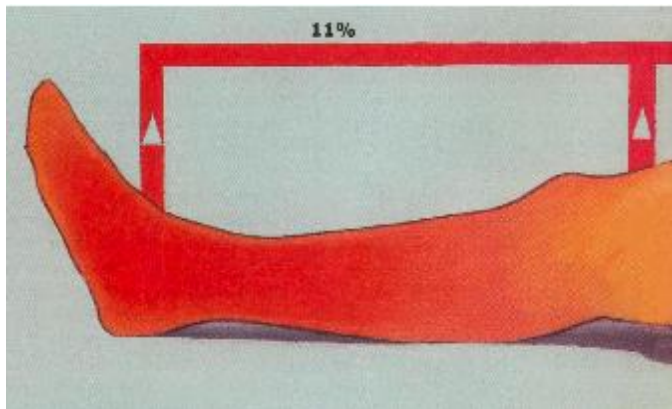
- Cardiovascular and -pulmonary systems
- Musculoskeletal
- Hematologic and Metabolic
- Gastrointestinal tract and renal functions
- Endocrine and immune systems
- Psychological functions

Ref. Rubin 1988, Sandler et al 1986, Fregly et al 1996.



Physiology of strict bed rest

- <24 hours sAR: shift in distribution of the total blood volume → ↑diuresis to reduce the increased blood volume in the thorax, neck and head
- ↑ excretion of sodium, chloride, potassium
- ↓ stroke volume and cardiac output,
- ↑ blood pressure at brachial artery





Astro

NASA teaches Obstetrics

- Serious complications from antenatal sAR :

Deep Vein Thrombosis¹

- prevalence DVT 15,6/1000
- Control group: 0,8/1000
- Very significant difference ($p < 0,0015$)

Bone Demineralization²

- OR 6,5 95% CI 2,2-18,9, very significant risk ($p > 0,001$)



Side effects of sAR in pregnancy

- Physical deconditioning, muscle ache and weakness, headache, shortness of breath, indigestion, obstipation, weight loss
- Dizziness, loss of appetite, fatigue, difficulty concentrating, sleep changes
- Increased stress, depression, anxiety, worries, boredom, loneliness, feelings of loss

RCT Reviews of treatment effect of AR



- Insufficient evidence to draw a conclusion on the recommendation of sAR
 - preventing miscarriage (2 trials / n=84)¹
 - singleton pregnancies* (1 trial/ n=422)²
 - multiple pregnancies* (7 trials / n=713)³
- *for preventing preterm birth

Ref: ¹Aleman A, Althabe F, Belizán JM, Bergel E. Bed rest during pregnancy for preventing miscarriage. Cochrane Database of Systematic Reviews 2005, Issue 2. ²Sosa C, Althabe F, Belizán JM, Bergel E. Bed rest in singleton pregnancies for preventing preterm birth. Cochrane Database of Systematic Reviews 2004, Issue 1. ³Crowther CA, Han S. Hospitalisation and bed rest for multiple pregnancy. Cochrane Database of Systematic Reviews 2010, Issue 7.

Recommendations for sAR

- Mail-baised survey, 2007¹
- 814 US obstetricians of 1812 active members of Soceity for Maternal-Fetal Medicine
- 71% would recommend sAR for threatening preterm birth (GA26)
- 87% would recommend sAR for PPRM (GA26) even thought the majority associated sAR with minimal / no benefit
- 18% pregnant women are recommended sAR ≥ 1 week each year ²

Ref. ¹Fox NS, Gelber SE, Kalish RB, et al. The recommendation for bed rest in the setting of arrested preterm labor and premature rupture of membranes. Am J Obstet Gynecol 2009;200:165.e1-165.e6.

²Goldenberg RL, Bronstein J, Cutter GR, Andrews WW, Mennemeyer ST. Bed Rest in Pregnancy. Obstet Gynecol.1994;84:131-6

The Danish AR Study

A pregnant woman with brown hair is lying on her side on a white hospital bed. She is wearing a light pink hospital gown. Her right hand is resting on her pregnant belly. She appears to be resting or sleeping. The background is a plain white wall.

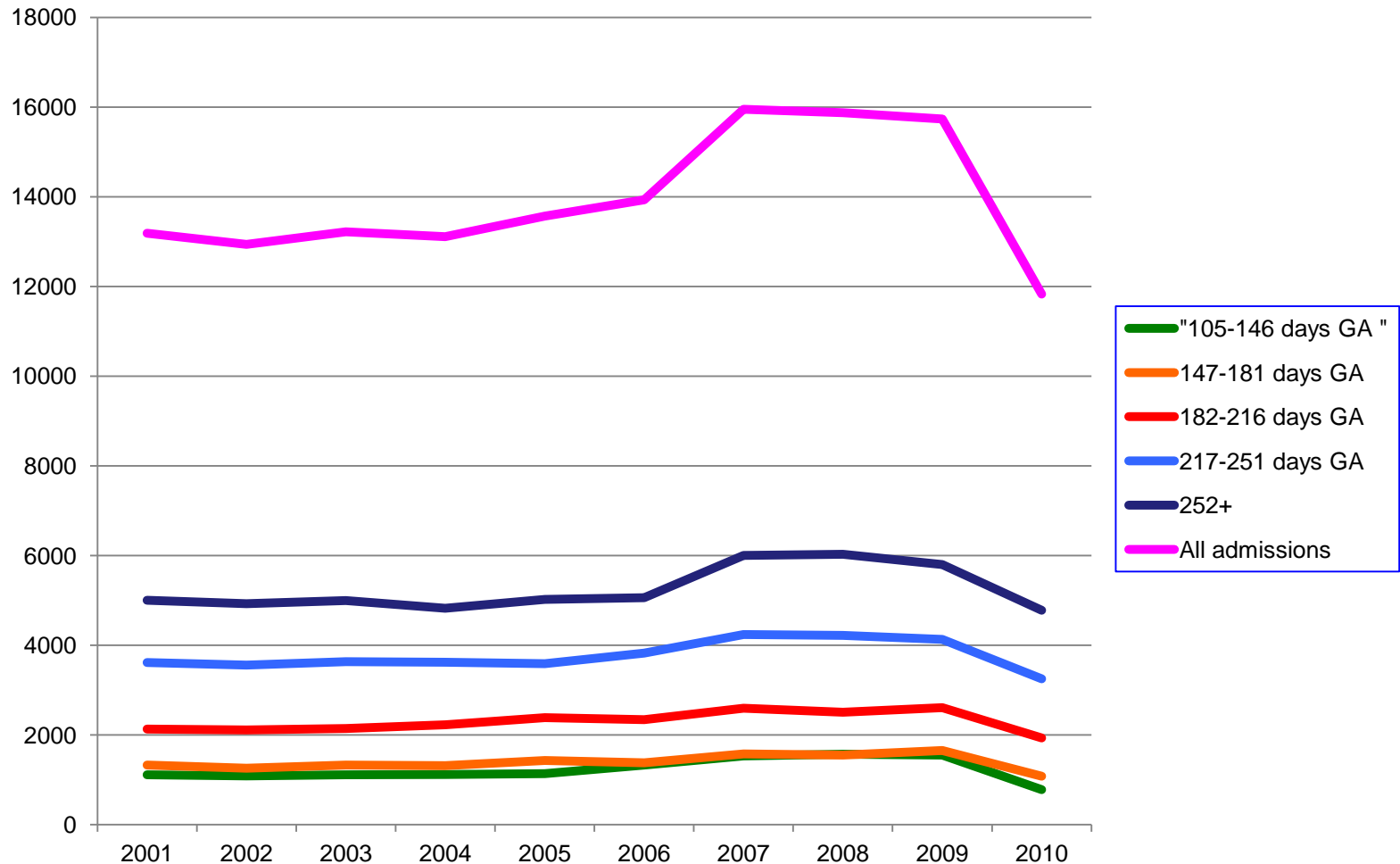
- The extent and significance of inpatient activity restriction in pregnant women being hospitalized in Denmark with threatening preterm birth.
- Four substudies all with the aim of describing the extent and significance of antenatal activity restriction

The Danish AR Study

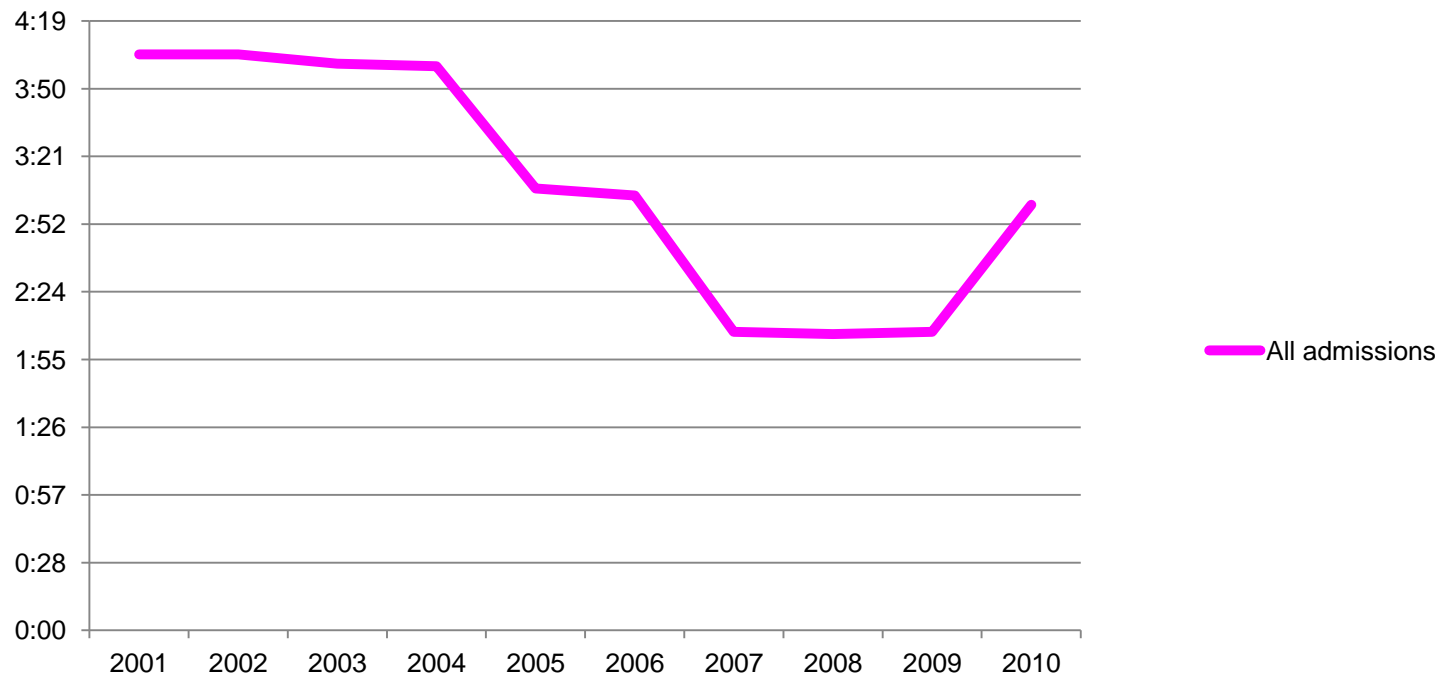
A pregnant woman with brown hair is lying on her side on a white surface, possibly a bed. She is wearing a light pink tank top and has her hands resting on her belly. The background is a soft, out-of-focus white.

- Descriptive population register based study
- Data provided from the National Board of Health
- Occurrence, variations and indications
- Admissions in Denmark > 3 days before birth during pregnancy from 15th gestational week

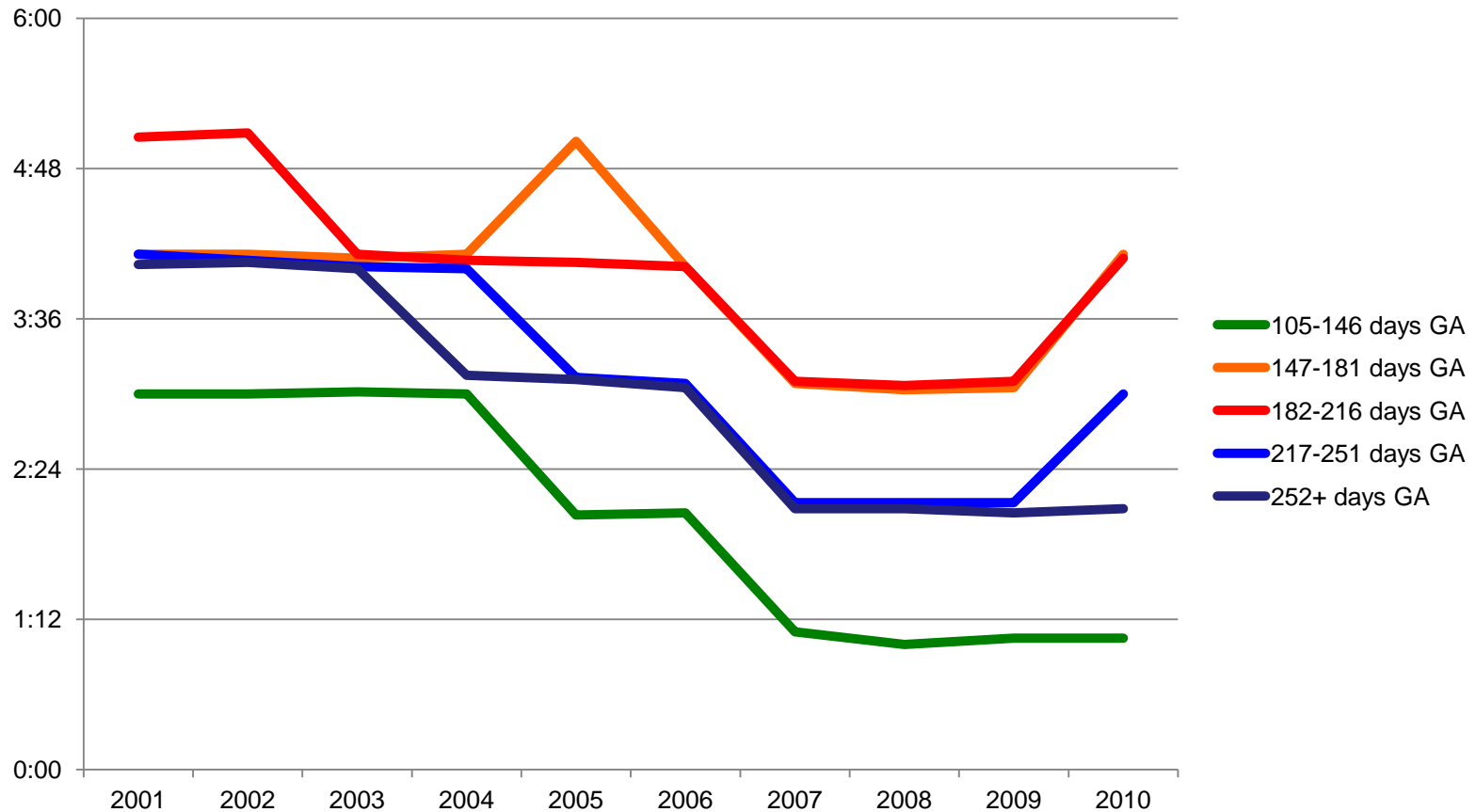
Admissions of pregnant women being hospitalized due to an obstetric issue in Denmark



Mean admission days



Mean admission days divided by pregnancy length



Admissions by diagnosis groups

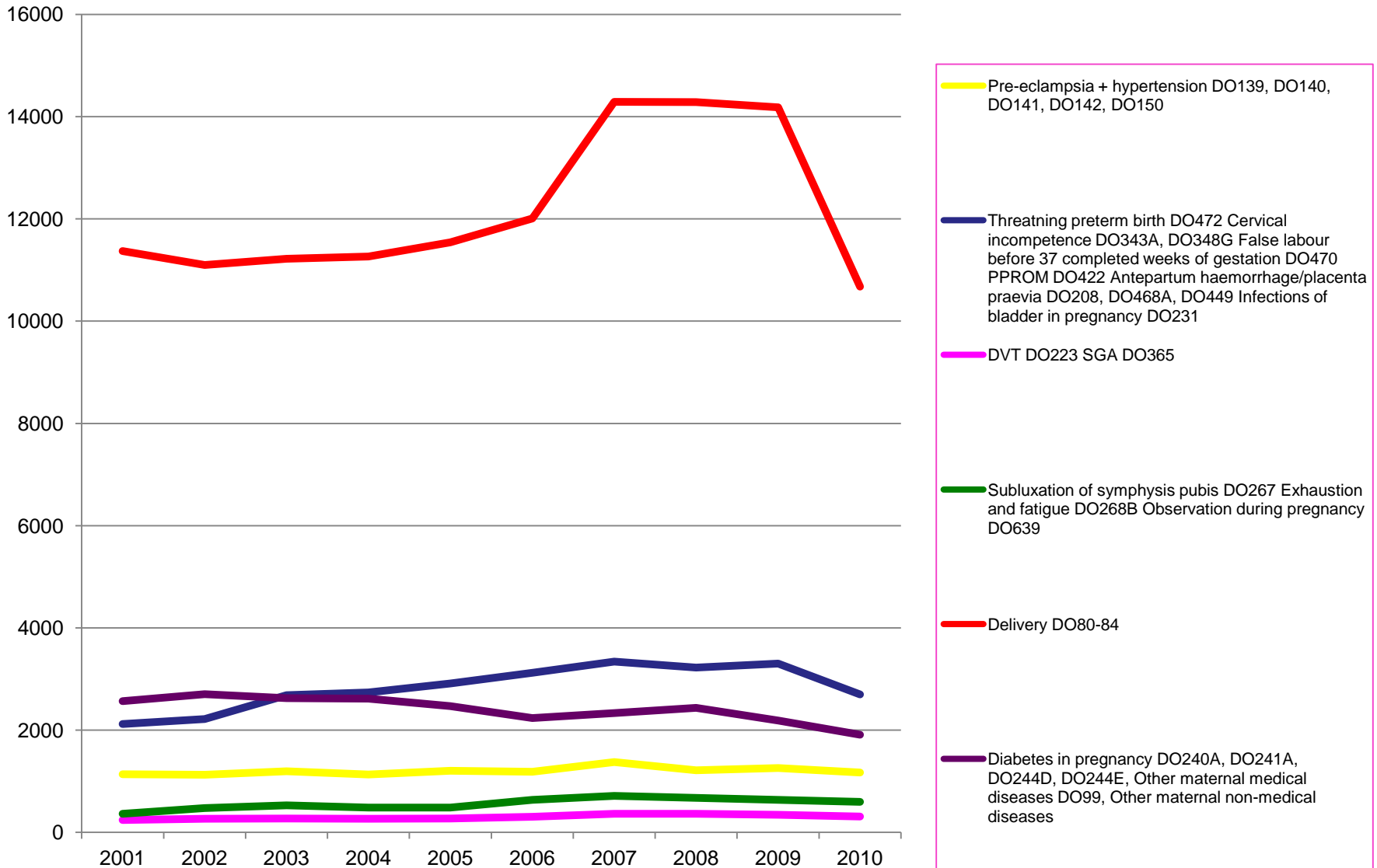




Table 2. Description of characteristics of pregnant women being hospitalized due to an obstetric issue in Denmark

[illegible]



Tabel 3. Description of birth outcomes after pregnancies with hospitalizations ≥ 3 days prior to labor due to an obstetric issue in Denmark

[illegible]



Proposal for extending The AR study to a European Context

**Occurrence, variations and indications
of admissions > 3 days before birth
in the European countries
in pregnancy from 15 gestational week**

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Thank you for your attention !

