

HUMAN SEMEN QUALITY IN THE NEW MILLENIUM: A MATTER OF CONCERN?

Niels Jørgensen, Ulla N. Joensen, Tina K. Jensen, Martin B. Jensen, Kristian Almstrup, Inge A. Olesen, Elisabeth Carlsen, Jørgen H. Petersen, Jorma Toppari and Niels E. Skakkebæk

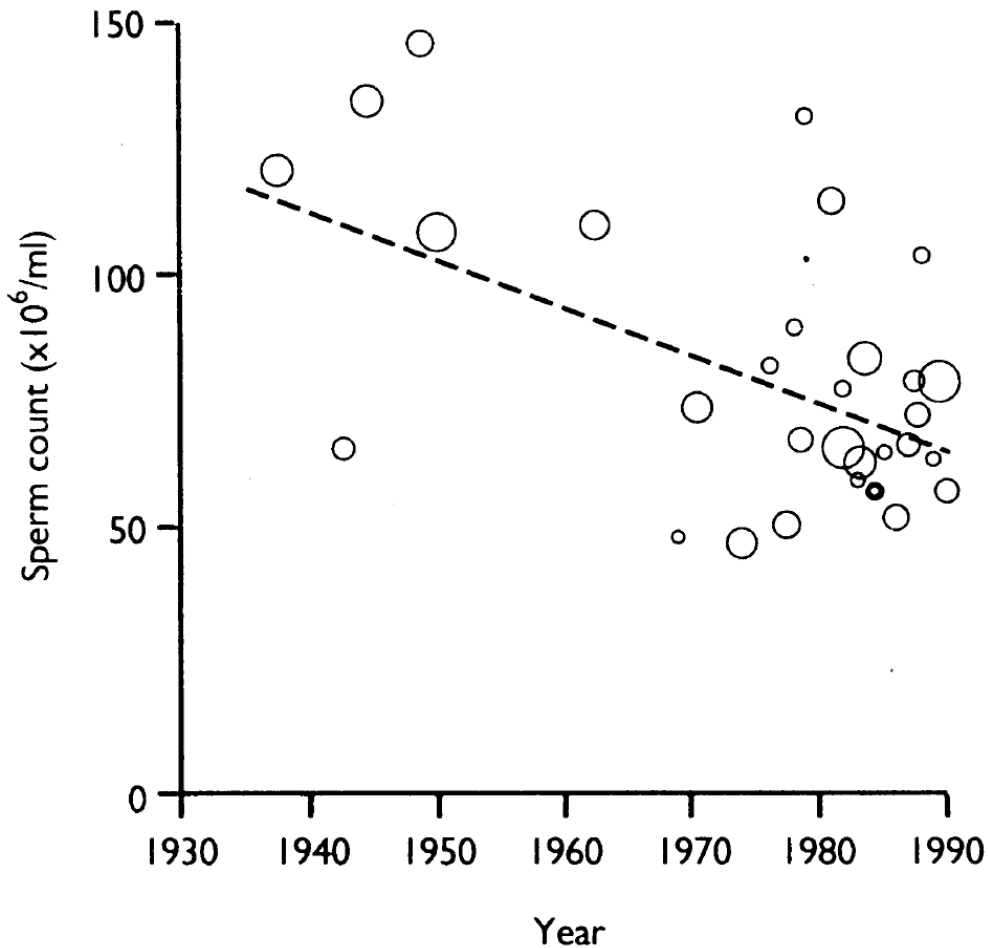


Rigshospitalet
Copenhagen
Denmark

Semen quality a matter of concern

- Lower than two-three generations ago
- In European countries
 - Only 25% have optimal semen quality
 - 20-30% at risk of prolonged waiting time to pregnancy
 - 10-15% at risk for need of fertility treatment
- Other implications
 - Marker of reduced general health status?

Evidence for decreasing quality of semen during past 50 years

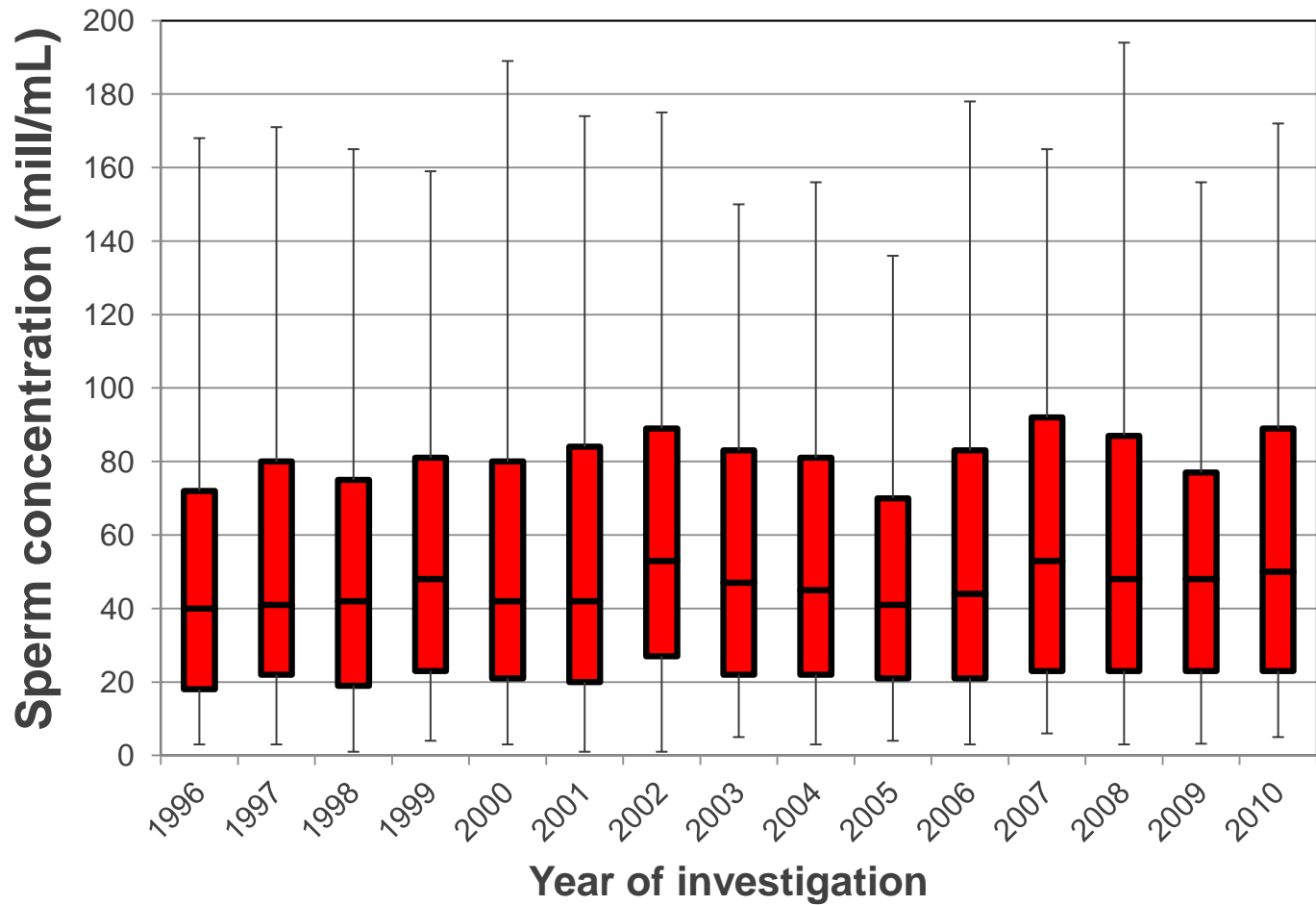


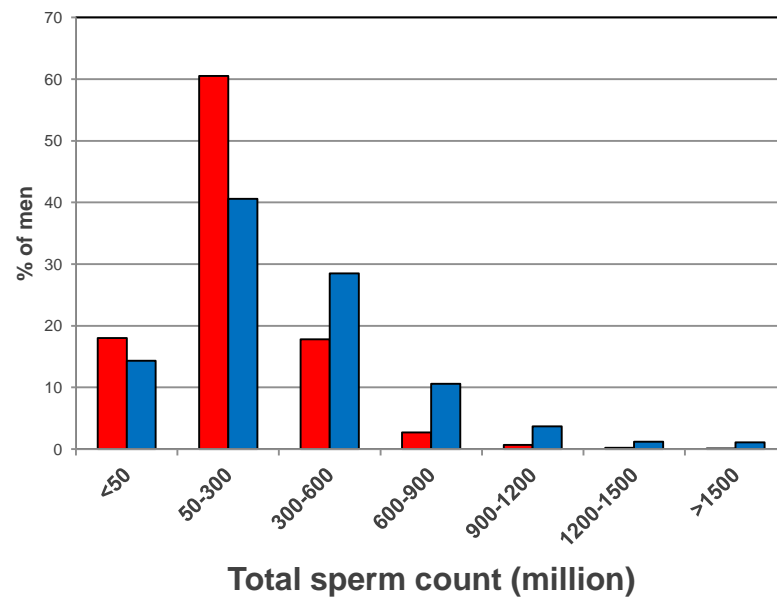
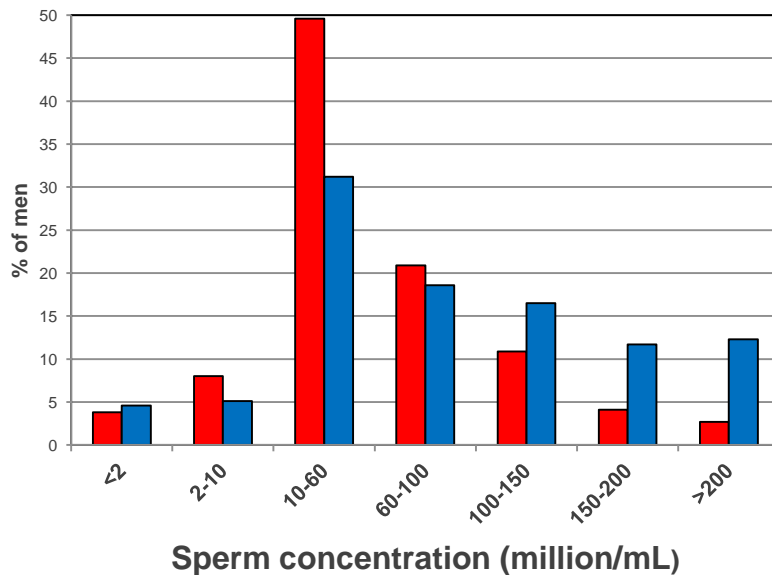
Historical data

- Mainly European and US
- 50% decrease in 50 yrs

Carlsen et al: BMJ, 1992

← 45 mill/mL →
 ← 43 mill/mL → ← 45 mill/mL → ← 48 mill/mL →

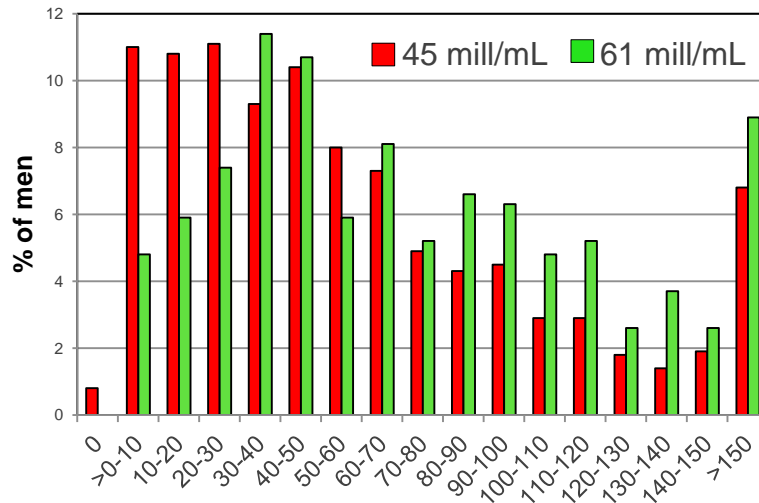




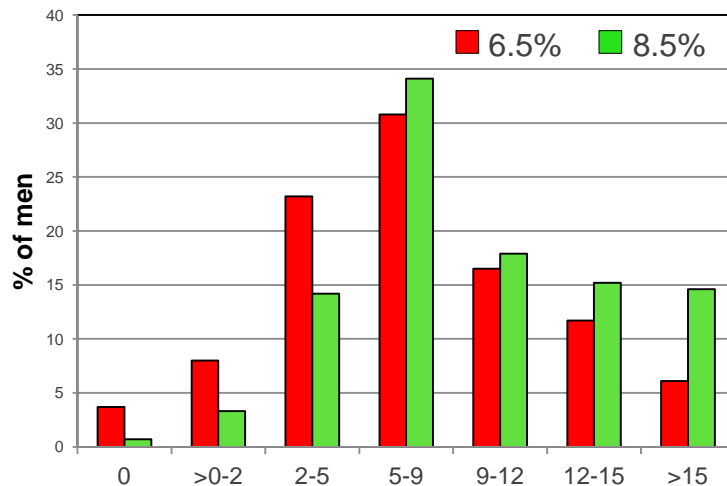
■ Men from infertile couples (1940-1943)

■ Men from general population (1996-2010)

Jørgensen et al: BMJ Open, 2012

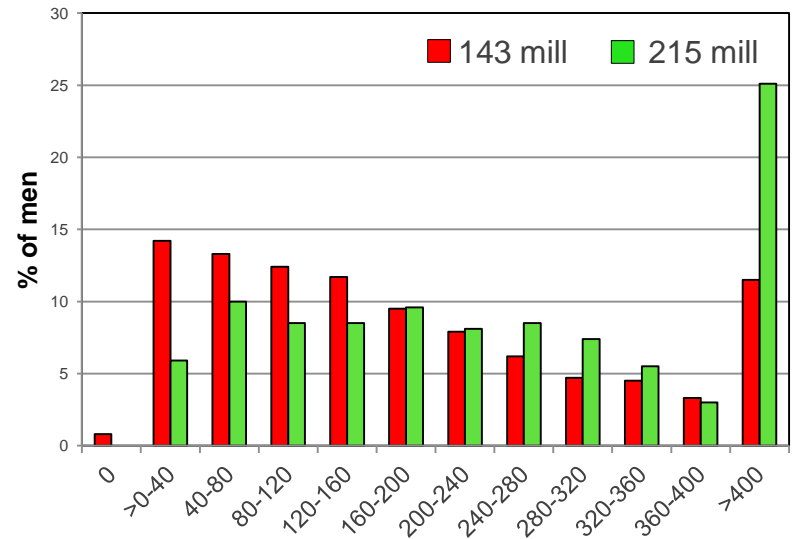


Sperm concentration (million/mL)



Morphologically normal spermatozoa (%)

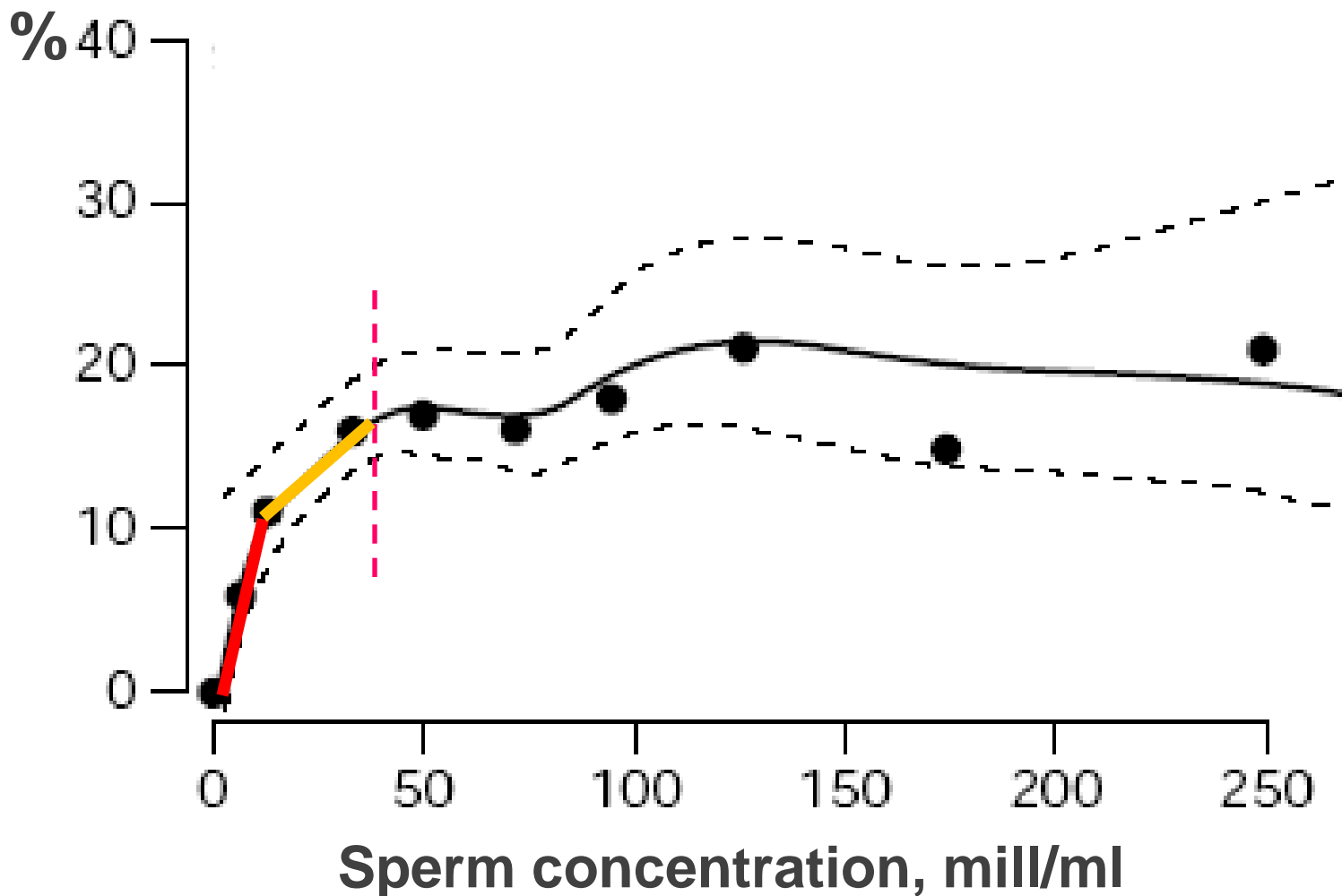
Men from the general population (1996-2010)
Fertile men (1996-1998)



Total sperm count (million)

Jørgensen et al: BMJ Open, 2012

Probability of pregnancy within one menstrual cycle



Bonde et al.: Lancet, 1998.

4,867 men from Copenhagen area in Denmark

Results compatible with decrease since early 1940's

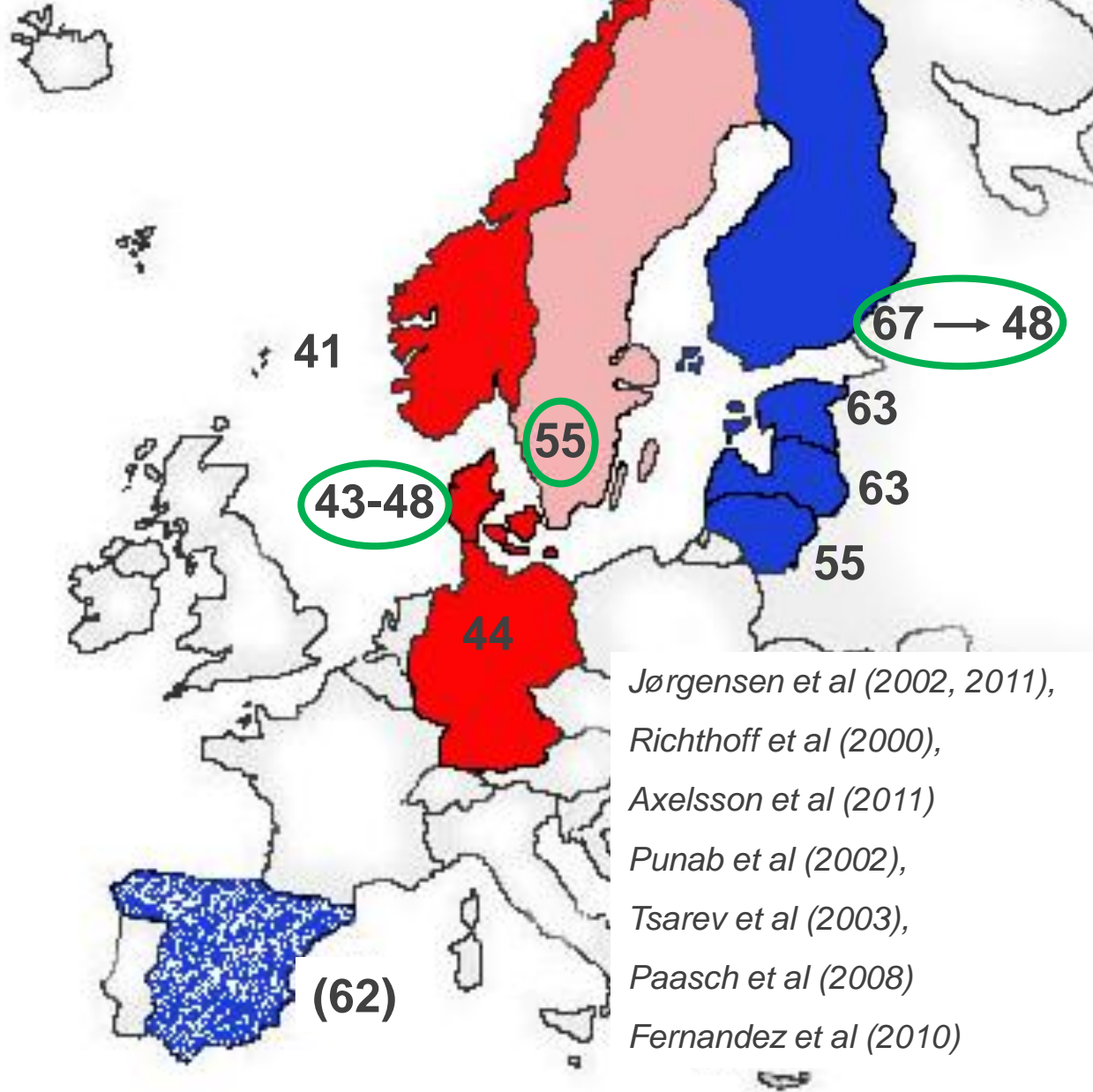
Slight increase in sperm concentration and total sperm count 1996-2010

Only 23% had sperm concentration >40 mill/ml AND $>9\%$ morphologically normal spermatozoa

Approx. 15% had a sperm concentration that indicate a high risk of needing future fertility treatment, and another 27% will be at risk of a prolonged waiting time to pregnancy

Normal young men

Sperm conc. (mill/ml)



Semen quality studies

Decrease in Finnish men (and maybe also in French)

Geographical differences, lowest levels in Norway, Denmark, Germany (and maybe Switzerland)

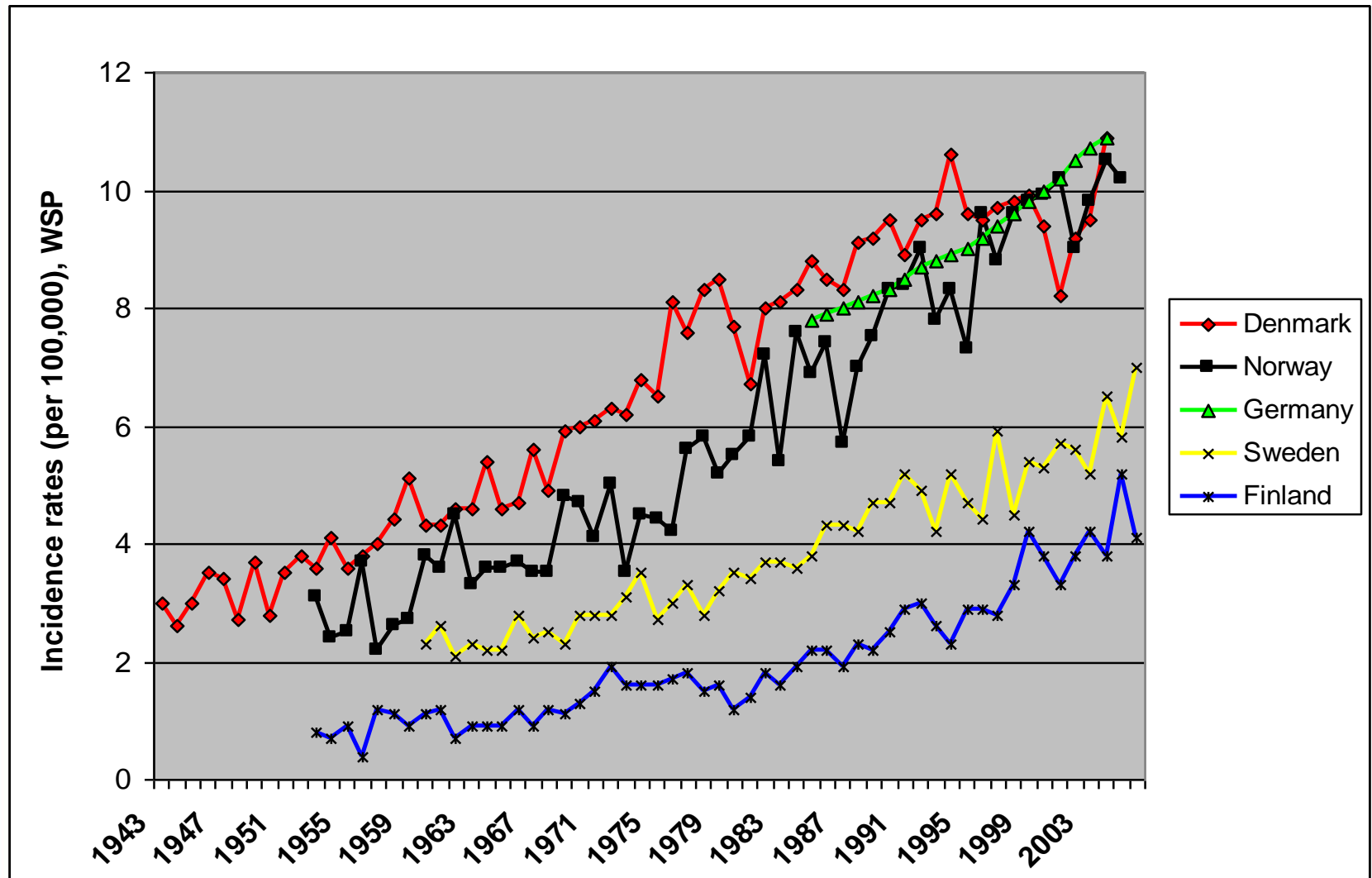
High frequency of men with low sperm counts in all (investigated) European countries

Many men at risk of impaired fertility

Also low among young Americans?

Other male genital health problems

Testicular Cancer

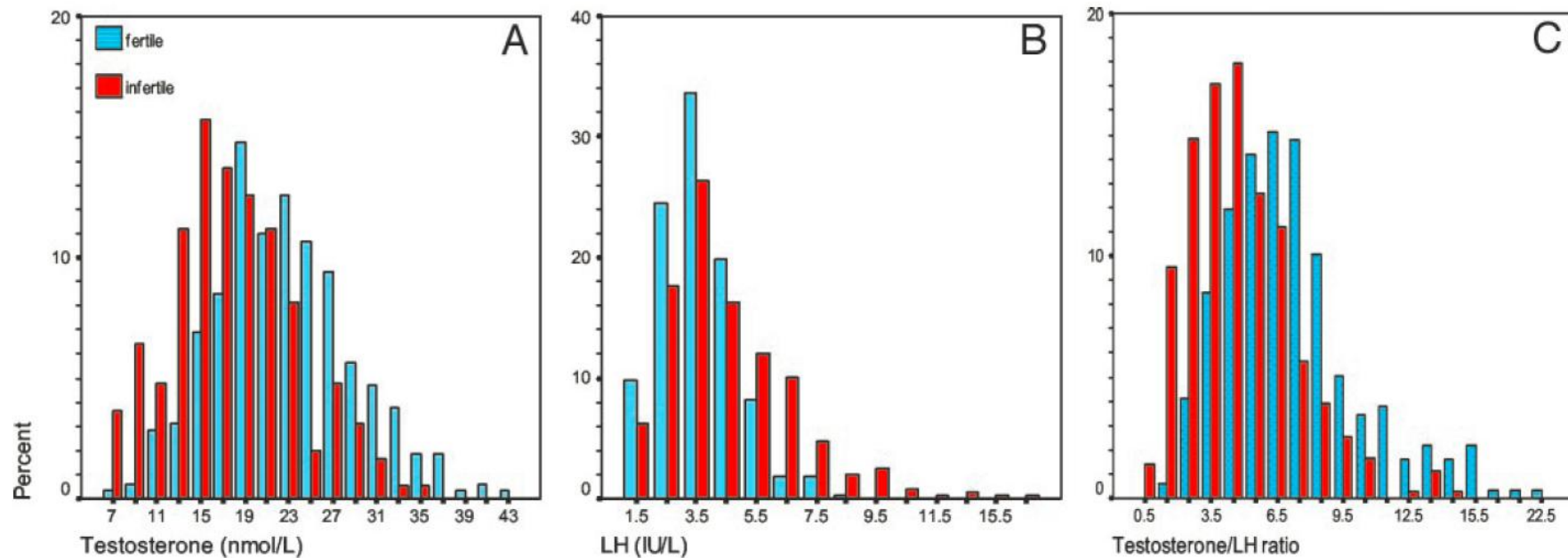


"Association of Nordic Cancer Registries" and "Cancer in Germany"

J Clin Endocrinol Metab, July 2004, 89(7):3161–3167

Impaired Leydig Cell Function in Infertile Men: A Study of 357 Idiopathic Infertile Men and 318 Proven Fertile Controls

A.-M. ANDERSSON, N. JØRGENSEN, L. FRYDELUND-LARSEN, E. RAJPERT-DE MEYTS, AND
N. E. SKAKKEBÆK



Semen quality

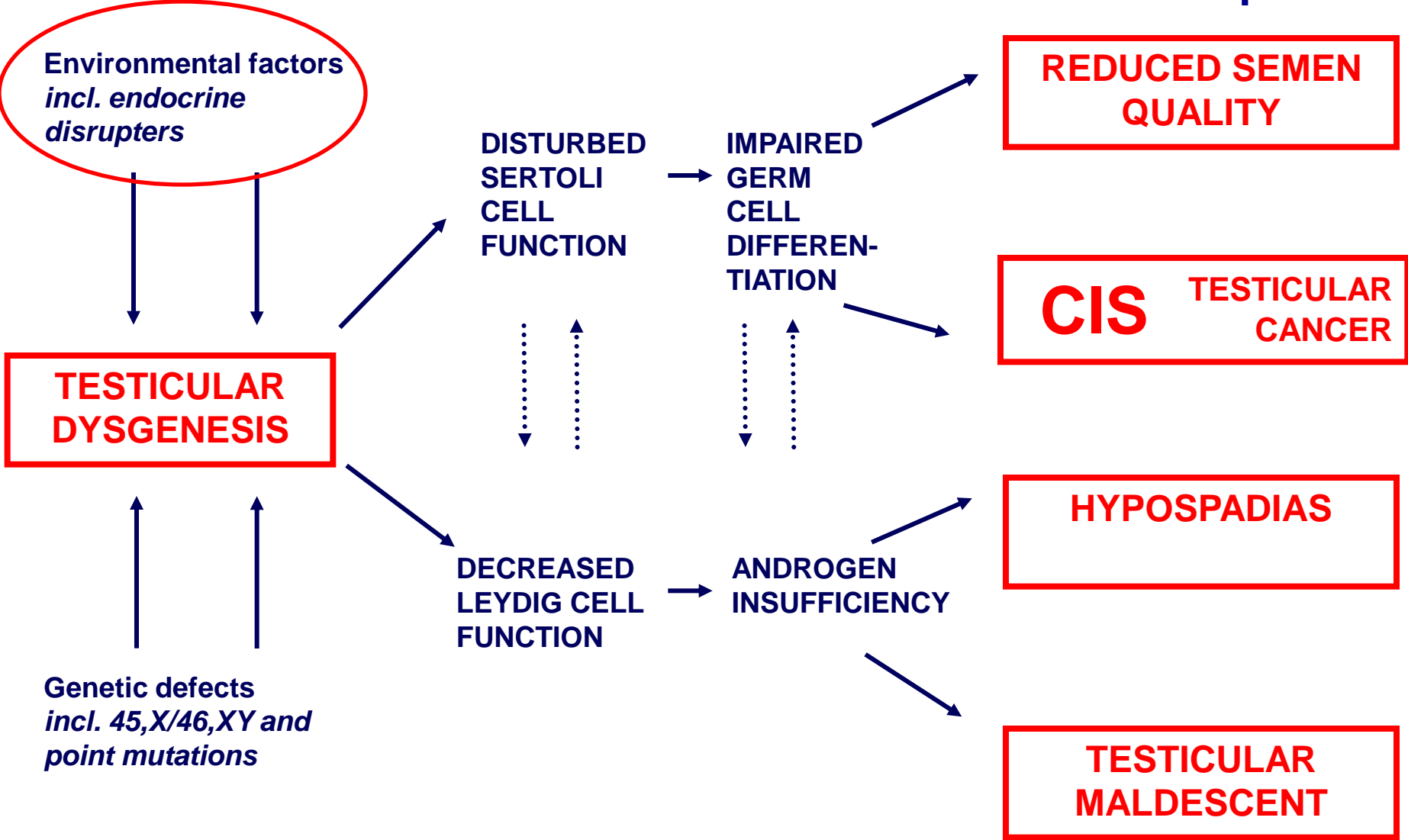
- Reduced semen quality may cause fertility problems and have an impact on fertility rates
- Semen quality is a risk factor for
 - reduced capacity for testosterone production
 - testicular cancer
 - morbidity and mortality?

Should reduced semen quality be seen as a warning of general health problems?

Testicular Dysgenesis Syndrome

Prenatal period

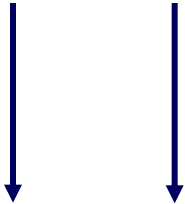
Postnatal period



Prenatal vs. adulthood exposures

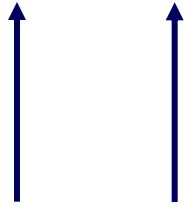
Prenatal period

Environmental factors
*incl. endocrine
disruptors*



**TESTICULAR
DYSGENESIS**

Genetic defects
*incl. 45,X/46,XY and
point mutations*



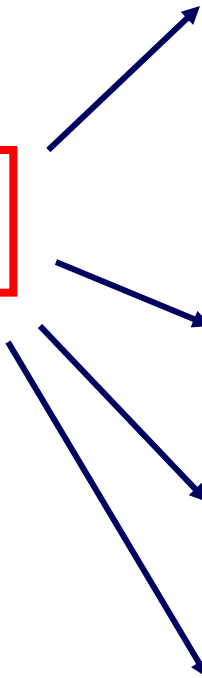
Postnatal period

**REDUCED SEMEN
QUALITY**

CIS TESTICULAR
CANCER

HYPOSPADIAS

**TESTICULAR
MALDESCENT**



Adulthood

Environmental factors
*incl. endocrine
disruptors*

?



Occupational events
(toxic events)

Chemotherapy

Irradiation



Conclusions

- Semen quality has approached levels that may impair fertility
- Testicular cancer incidence is increasing in many European countries
- Genital malformations of newborn boys have increased in some European countries
- May all be symptoms of a Testicular Dysgenesis Syndrome (TDS) of fetal origin