Nimmt die Fertilität des Mannes ab?  
Is male fertility declining?

E. Nieschlag  
Centrum für Reproduktionsmedizin und Andrologie  
der Universität Münster  
WHO Kooperationszentrum für Forschung in männlicher Reproduktion
Average life expectancy at birth in Germany

(German Federal Office for Statistics 2010)

Lebenserwartung [Jahre]


38,45 44,82 48,33 59,86 62,81 66,86 70,18 76,85 82,4

35,58 77,17

Average life expectancy at birth in Germany

(German Federal Office for Statistics 2010)
Demographic development in Germany 1946 – 2006: Live births and deaths
Stagnierende Geburtenrate, dramatische Alterung, Bevölkerungsrückgang

Bericht des Statistischen Bundesamtes / „Höheres Renteneintrittsalter reicht nicht aus“

Lt. BERLIN, 6. Juni. Die Alterung und die Abnahme der Bevölkerung in Deutschland werden schwerwiegender Auswirkungen auf die Gesellschaft und die Funktionsfähigkeit der Sozialversicherungen haben, als es bisher einkalkuliert sind. Der Preis aus, daß die Geburtenrate auch in den nächsten Jahrzehnten bei dem gegenwärtigen statistischen Wert von 1,4 Geburten je Frau bleibt, auch wenn durch diverse familienpolitische Maßnahmen Änderungen erzeugt würden. Für die Annahme einer markiert, bei der Einwanderung durch einen angenommenen positiven Wanderungssaldo von 100 000, 200 000 oder 300 000 Personen.

In der jeweils mittleren Variante wird die Bevölkerung bis zum Jahr 2050 um acht
Is male fertility declining?

- Non-medical influences on reproductive behaviour
- Influence of infertility
- The impact of age
- „Sperm crisis“?
- Development of fecundity
- Conclusions
World Population Growth 1750-2150
(United Nations’ Estimate)

- Developing Countries
  - 1800: 1 Bill.
  - 1900: 2 Bill.
  - 2000: 4 Bill.
  - 2100: 10 Bill.

- Industrialized countries
  - 1800: 14 Bill.
  - 1900: 16 Bill.
  - 2000: 20 Bill.
  - 2100: 26 Bill.
RETURN OF THE POPULATION GROWTH FACTOR

Its impact upon the
millennium development goals

Report of Hearings by the
All Party Parliamentary Group on Population,
Development and Reproductive Health

January 2007

“Return of the Population Growth Factor“

The evidence is overwhelming that MDGs are difficult or impossible to achieve with the current levels of population growth in the least developed countries and regions.

Millenium Development Goals
1. Eradicate Extreme Poverty and Hunger
2. Achieve Universal Primary Education
3. Promote Gender Equality and Empower Women
4. Reduce Child Mortality
5. Improve Maternal Health
6. Combat HIV/AIDS, Malaria and other Diseases
7. Ensure Environmental Sustainability
8. Develop a Global Partnership for Development
 IsoPublic-Umfrage 2009 „Einengung der Lebensverhältnisse“
Frage 1: Ich lese Ihnen jetzt verschiedene Aussagen vor, die eine Einengung der Lebensverhältnisse zur Folge haben können. Welche davon empfinden Sie persönlich als eine Einengung?

Angaben in %
Basis: Total, n=1103

- zu viel Verkehr: 68%
- zu starke Verbetonierung und Zersiedelung der Umwelt: 67%
- zu hoher Ausländeranteil: 41%
- andere Gründe: 18%
- weise nicht / keine Angabe: 5%
Billboard on Times Square
New York
April 2010
Der wichtigste Grund für Kinderlosigkeit: Es fehlt „der“ Partner

Betreuungsmöglichkeiten von untergeordneter Bedeutung / Allensbach- und Forsa-Umfrage

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Kinderwunsch schreckt viele Männer ab

Jobsorgen: Immer mehr Paare gegen Nachwuchs

Von Dorle Neumann
Influence of father’s monthly net income on the number of children (based on 660 40 to 54 yr old men)

(„männer leben“, Bundeszentrale für gesundheitliche Aufklärung, 2004)
Percentage ART children among the total number of newborns in Germany 2002 – 2005 compared to other European countries as of 2003 (Berlin Institut, 2007)
Anzahl der Follikelpunktionen 1982 - 2008 für IVF und ICSI
Deutsches IVF-Register (DIR) Jahrbuch 2009

Anzahl der Follikelpunktionen 2008

IVF, ICSI
In Another Recession Sign, an Uptick in Vasectomies

Hesitation about expanding the family.

By LESLEY ALDERMAN

Last November I learned, to my great surprise, that I was pregnant. At age 47, I was not exactly trying to conceive.

My husband and I were conflicted:

Another baby — how wonderful!
Another child — how stressful!
How risky! How EXPENSIVE!

With the economy in a free fall, this seemed no time to have a baby.

When the pregnancy ended in a miscarriage at seven weeks, we were sad. But also relieved. My husband’s only half-joking response was, “It’s time for a vasectomy.”

But the recent anecdotal data, if they hold, would have a historical parallel in the Great Depression, when the birth rate fell sharply.

As this recession continues, it is understandable that more people might hesitate to expand their families. A baby born in 2008 — the latest year for which data are available — will cost middle-income parents $260,000 by the time the child reaches 17, according to the Agriculture Department. And that doesn’t include college.

In Southern California, Planned Parenthood says that compared with last year’s first quarter, requests for vasectomies were up more than 36 percent in the first three months of this year at its clinics in San Diego.

Continued on Page 6

Dr. Charles Wilson with Michael Swogger, who was laid off in January and had a vasectomy before his insurance ran out.
Use of male contraception methods in various countries
(Nieschlag, Behre Nieschlag eds. Andrology 3rd ed. Springer 2010)
Use of male contraceptive methods

Worldwide 15.4%

- None: 36.9%
- Oral contraceptives: 52.6%
- Hormonal contraceptives: 8.5%
- IUD: 15.5%
- Tubal ligation: 19.7%
- CI/PA: 7.0%
- Condom: 5.7%
- Vasectomy: 2.7%

Germany 6.1%

- None: 29.9%
- Oral contraceptives: 52.6%
- IUD: 5.3%
- Tubal ligation: 5.5%
- CI/PA: 4.5%
- Condom: 1.1%
- Vasectomy: 0.5%
**Actual versus desired family size in Germany**

Representative opinion polls among people over 16 years
(Allensbach opinion polls 32, 2043, 5053 and 5177)

- **Actual**
  - 1950: 3.2
  - 1969: 2.7
  - 1989: 2.1
  - 2004: 1.4

- **Ideal**
  - 1950: 2.2
  - 1969: 2.2
  - 1989: 1.9
  - 2004: 1.4

(Number of children per family)
Is male fertility declining?

- Non-medical influences on reproductive behaviour
- Influence of infertility
- The impact of age
- „Sperm crisis“?
- Development of fecundity
- Conclusions
Distribution of causes of infertility
(WHO worldwide survey, 1987)

- Disturbances in the female: 39%
- Disturbances in the male: 20%
- Disturbances in both partners: 26%
- No cause to be diagnosed: 15%
Frequent causes of infertility

**Male**: Idiopathic infertility, Hypogonadismus, Maldescended testes, Infections, Autoimmunity, Genetic abnormalities, Obstructions, Testicular tumours

**Female**: Idiopathic infertility, Ovarian insufficiency, Hyperprolactinemia, Polycystic ovary syndrome, Endometriosis, Uterine septs / myomas, Tubal occlusion
Clinical diagnoses in 1217 patients with azoospermia from the Institute of Reproductive Medicine, University of Münster

<table>
<thead>
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<td>Lymphomas</td>
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<tr>
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<tr>
<td>Secondary Hypogonadism</td>
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<tr>
<td>Y-Chromosomal Deletions</td>
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<tr>
<td>Sarcoma</td>
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18,3 %
Smoking by males decreases the chances for pregnancy of non-smoking women!

Is male fertility declining?

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Age distribution of parents in Germany (n=550,659) and in Japan (n=1,135,222)
(Nieschlag, Behre & Nieschlag, eds. „Andrology“ 3rd ed. Springer 2010)
Rapid increase in late childbearing
(% fertility rates realized at ages 40+, 1960-2006)
(T. Sobotka 2010)

European Union: average annual relative increase by 5% since the mid-1990s

Note: EU-25 – EU in its 2004 boundaries, ex. Bulgaria and Romania

Sources: Own computations based on Eurostat (2008), Council of Europe (2006) and data provided by national statistical offices
(Mother is working.)
Average age of parents in Sweden at birth of first children: 5 year increase from 1970 to 2009!
(Swedish Multi-Generation Register and Historical Population Register 2010)
(Compiled by Alexander Lerchl, Jacobs-University, Bremen)
Age of men and women at first marriage in Germany and of infertile patients of the Institute of Reproductive Medicine Münster at first visit.
Pablo Picasso (67 J.), Francoise Gilot (27 J.) und Sohn Claude im Jahr 1948 (später folgt Paloma)
Michael Douglas, 64, (Hollywood Star) with his wife Catherine Zeta-Jones, 39, and their children Dylan, 8, and Carys, 6.
Julio Iglesias (64) again became a father. Miranda Rijnsburger (42) delivered his fifth child. (Westf. Nachrichten 09. 05. 2007)
Jean Pütz (74)
Fernsehmoderator der „Hobbythek“
und Ehefrau
Pina Coluccia (42)
mit Julie Josephine
geb. 26.10.2010

Mit ihnen freut sich ihr bereits 11jähriger Sohn.
Was der 51jährige erste Sohn des Vaters denkt, wird nicht berichtet.
Semen parameters in younger (20-37 yrs) and older (60-88 yrs) healthy men

(Nieschlag et al. J Clin Endocr Metab 55,676; 1982)

- Sperm concentration (mill/ml)
- Progressive motility (%)
- Ejaculate volume (ml)

* P < 0.05
CASA determined sperm motility in 90 healthy men 22-80 yrs old
(Sloter et al. Hum Reprod 21; 2868-2875, 2006)
Number of Sertoli cells and germinal cells (spermatogonia, spermatocytes, spermatozoa) per tubule according to age

(Dakouane et al. Fertil Steril 83; 923-928, 2005)
Time-to-pregnancy (TTP) in women under < 25 years (n=638) in relation to the men‘s age.

(Hassan & Killick, Fertil. Steril. 79, Suppl. 3, 1520, 2003)
Raw weekly hazard of spontaneous abortion according to gestational age, when the man was either < or > 35 years, among 3,280 Californian women < 30 years followed prospectively in 1990-1991.

Genetic abnormalities and advanced paternal age

Numerical chromosomal abnormalities:
- Aneuploidies only slightly increased.
  (Trisomie 13, 18 and 21, 45X0, 47XXY)

Structural chromosomal abnormalities:
- Slight increase in sperm, but not in fetuses or neonates.

Genetic mutations:
- Incidence of autosomal dominant diseases increases (e.g. achondroplasia, polyposis coli, hemophilia, neurofibromatosis).
- Abortions > 20 weeks increase.

FB 125E
Reproductive outcome rates (%) in 1023 couples using donor eggs (< 35 years) grouped according to male age (Frattarelli et al. Fertil Steril 90: 97 – 103, 2008)
Reproductive outcome rates (%) in 1023 couples using donor eggs (< 35 years) grouped according to male age

(Frattarelli et al Fertil Steril 90: 97 – 103, 2008)
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„Evidence for decreasing quality of semen during past 50 years“
The review by Carlsen et al. (1992) has been heavily criticised.

- The 61 studies are extremely heterogeneous (Lerchl and Nieschlag 1996).
- Abstinence time not properly recorded, no quality control of semen analysis
- Time trend analysis is only possible after 1970: increasing trend in sperm counts (Olsen et al. 1995)
- When median instead of mean values: no significant declining trend (Handelsman 2001)
- No differentiation between geographical and temporal differences
The Carlsen study triggered 27 major studies coming from different parts of the world (compiled from review of Fisch 2008 by te Velde)

- No decline or increase of one or more of the 3 sperm quality measures - concentration, motility, morphology - in 16 studies.

- Ambiguous results of the 3 sperm quality measures - in 5 studies

- Unambiguous decline of the 3 sperm quality measures, in 6 studies from different regions in the world.
Differences of semen quality among fertile men from 8 French regions

(Cecos, Auger et al. Hum Reprod. 12; 740, 1997)
Geographic distribution of mean sperm concentrations of 329 military conscripts from different regions of Switzerland (Crausaz et al Chimia 62: 395-400, 2008)

Of 19,000 men asked 642 (3.4%) participated and 329 could be allocated geographically.
Relationship between testicular volume, abstinence time and total sperm number in 30,965 ejaculates from 11,062 men.

QuaDeGA 4th trial: Sperm concentration results from 94 participating laboratories

Concentration (10^6/ml)

Sample B

Sample A

0 1 0 2 0 3 0 4 0 5

0 10 20 30 40 50
<table>
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<tbody>
<tr>
<td>Semen volume (ml)</td>
<td>-</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Total sperm count (mill)</td>
<td>-</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td></td>
</tr>
<tr>
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<td>20</td>
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<td></td>
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<tr>
<td>Progr. motility (a+b) (%)</td>
<td>60</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td>Vitality (%)</td>
<td>-</td>
<td>50</td>
<td>75</td>
<td>75</td>
<td>-</td>
</tr>
<tr>
<td>Normal forms (%)</td>
<td>80*</td>
<td>50</td>
<td>30</td>
<td>(15)</td>
<td>-</td>
</tr>
</tbody>
</table>

*48-98
Frequency histograms of semen analysis data from fathers, the general population and men screened for normozoospermia

(cooper et al. hum reprod update 16: 231 – 245, 2010)

- Fathers TPP <12 mths
- Fathers TTP unknown
- Normozoospermic men
- Men from general population
### Lower limits of normal and lower reference limits for semen parameters according to WHO Manual, 1st – 5th edition

<table>
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<tr>
<td>Semen volume (ml)</td>
<td>-</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>1.5 (1.4 - 1.7)</td>
</tr>
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<td>Total sperm count (mill)</td>
<td>-</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>39 (33 - 46)</td>
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<td>Sperm conc. (mill/ml)</td>
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<td>Progr. motility (a+b) (%)</td>
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<tr>
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<td>75</td>
<td>75</td>
<td>58 (55 - 63)</td>
</tr>
<tr>
<td>Normal forms (%)</td>
<td>80*</td>
<td>50</td>
<td>30</td>
<td>(15)</td>
<td>4 (3 - 4)</td>
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*48-98
Declining Worldwide Sperm Counts: Disproving a Myth

Harry Fisch, MD
Columbia University, New York, NY, USA

Far from being a worldwide and well-proved phenomenon, declines in semen quality are, at best, a highly local phenomenon with an unknown cause and, at worst, a collective artifact.
Sperm counts in semen of farm animals 1932-1995.

(Setchell, Int. J. Androl. 20; 209, 1997)
Is male fertility declining?

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Trends in fertility in Great Britain 1961 – 93, adjusted for mother’s age and smoking status, based on time to pregnancy (TTP) of 1540 cases.

Significant decline of infertility in the USA 1985 – 2002
Trends in 12-month infertility among married women aged 15 – 44 years 1985 2002
Human fertility does not decline: evidence from Sweden

Infertility as defined by TTP > 12 months dropped from 1983 to 1993 from 12.7 % to 8.3 %, based on 401,653 primiparous women in Sweden.
### Time to pregnancy, 1-year infertility rate and lifetime infertility prevalence: measures of fecundity in population studies comparing past and present  (compiled by te Velde, 2010)

<table>
<thead>
<tr>
<th>Author</th>
<th>Outcome measure</th>
<th>Method</th>
<th>Period or birth cohort</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joffe 2000 UK</td>
<td>Time to pregnancy</td>
<td>Interview survey</td>
<td>Period 1961-1993</td>
<td>Fecundity improved</td>
</tr>
<tr>
<td>Jensen et al. 2005 DK</td>
<td>1-year infertility</td>
<td>Interview survey</td>
<td>Birth cohorts 1931-1952</td>
<td>Fecundity improved</td>
</tr>
<tr>
<td>Stephen and Chandra 2006 USA</td>
<td>1-year infertility</td>
<td>Interview survey</td>
<td>Period 1965-2002</td>
<td>Fecundity improved</td>
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<tr>
<td>Oakly et al. 2008 UK</td>
<td>Lifetime infertility prevalence</td>
<td>Postal questionnaire survey</td>
<td>Birth cohorts 1945 - 1962</td>
<td>Remained unchanged</td>
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The positive and negative trends having an impact on population fecundity

Positive trends

• Less smoking
• Safer sex and better treatment for STDs
• More fertility awareness and knowledge
• Stricter regulations on reproduction-toxic chemicals
• Wider availability of ART

Negative trends

• The growing obesity pandemic
• Availability of effective contraception
• Environmental pollutants?
• Increasing postponement of first childbirth and decreasing male and female fertility with increasing age
Fertility and aging: do reproductive-aged Canadian women know what they need to know?  

Although most of 360 undergraduate women at the University of British Columbia were aware that fertility declines with age, they significantly overestimated the chance of pregnancy at all ages and were not conscious of the steep rate of fertility decline over 35 years.
“To counteract Europe’s demographic crisis ESHRE should forge its links with the EU and make public with authority the simple message that delaying pregnancy beyond the age of 35 increases the risk of infertility”

“However, large-scale public education campaigns are beyond the resources and remit of ESHRE.”
Demographic development in Germany 1946 – 2006:
Live births and deaths
Demographic development in Germany 1946 – 2006:
Live births, deaths and total population
Demographic development in Germany 1946 – 2006:
Live births, deaths and total population

23 % of these children have at least one foreign parent

„The fundamental reason we still do not know whether fecundity is declining is the lack of a surveillance system comprising
- total sperm counts
- time-to pregnancy
- (infertility incidence and pattern)
in representative populations.“
The End