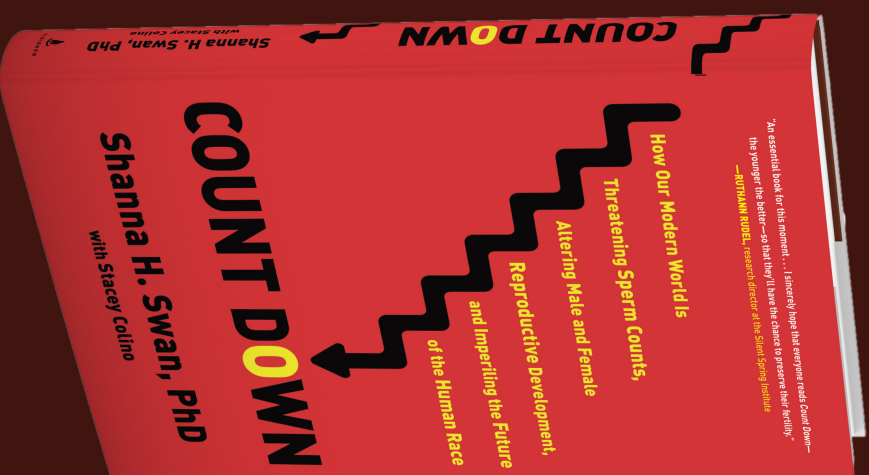


Count Down

How Our Modern World Is
Threatening Sperm Counts, Altering
Male and Female Reproductive
Development, and Imperiling the
Future of the Human Race

SHANNA H SWAN, PHD



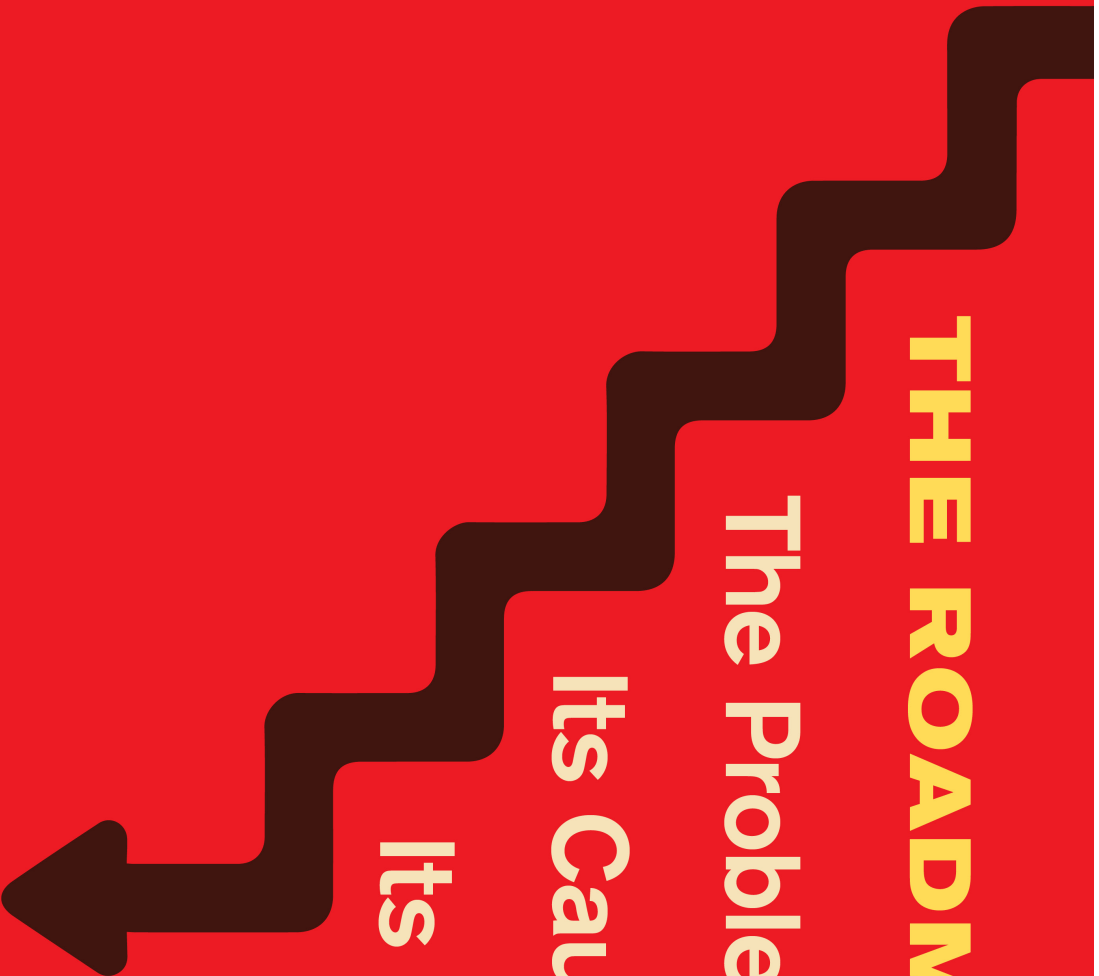
THE ROADMAP

The Problem

Its Causes

Its Consequences

Its Solutions



THE ROADMAP

The Problem

Its Causes

Its Consequences

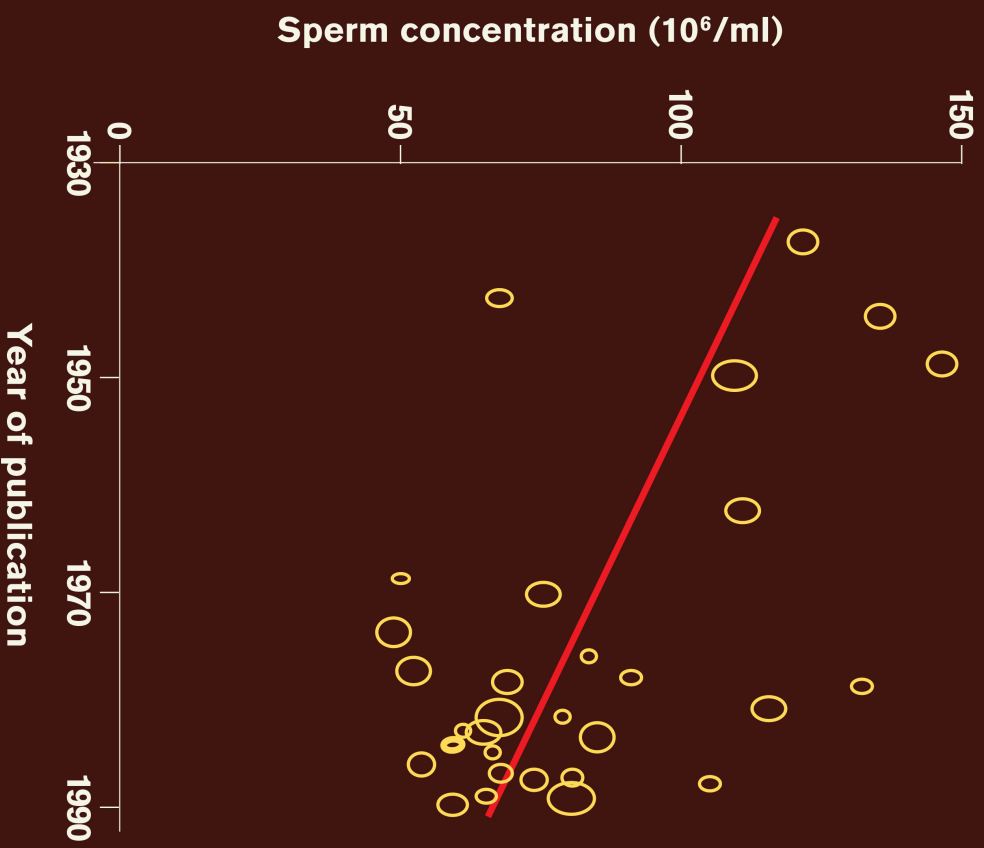
Its Solutions



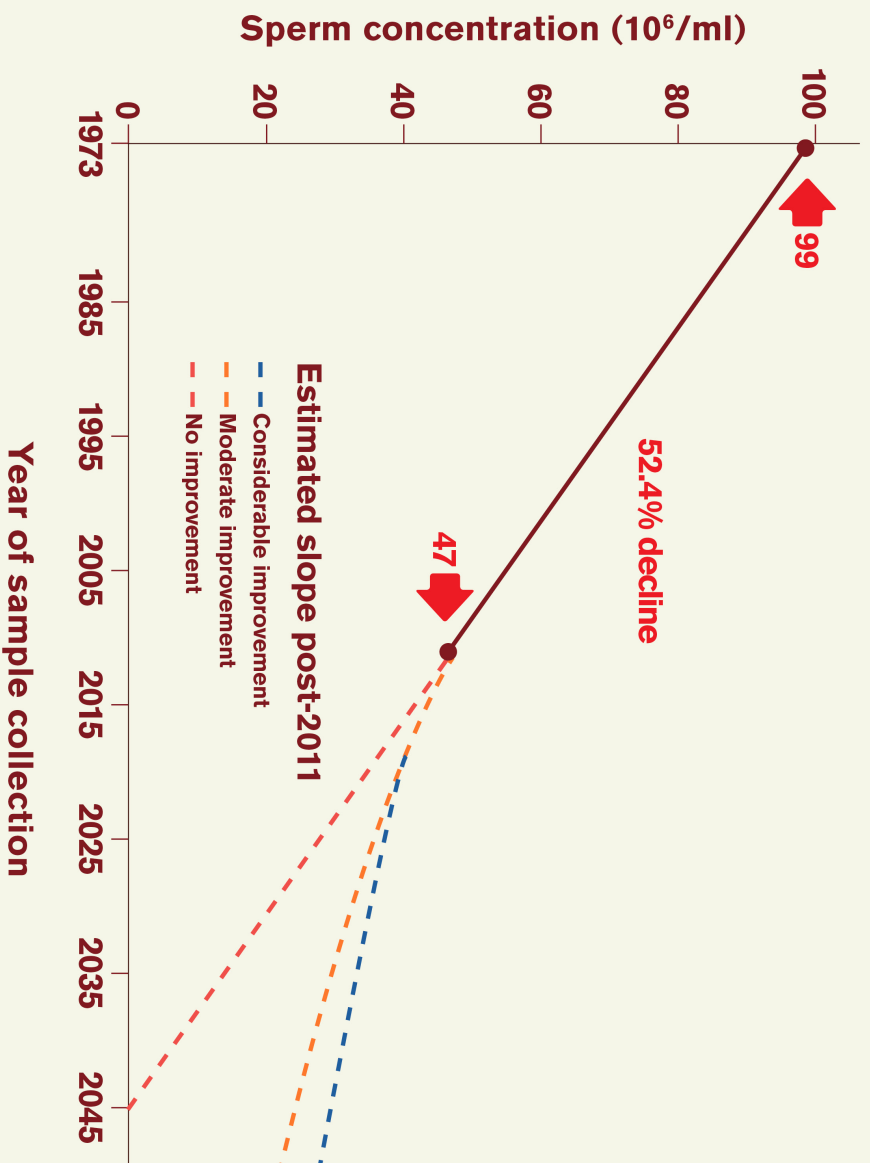


“There has
been a genuine
decline in
semen quality
over the past
50 years”

CARLSEN ET AL, 1992



Sperm Decline in Western Countries



LEVINE ET AL 2017, GRAPH: GRANTHAM FOUNDATION

Newsweek.

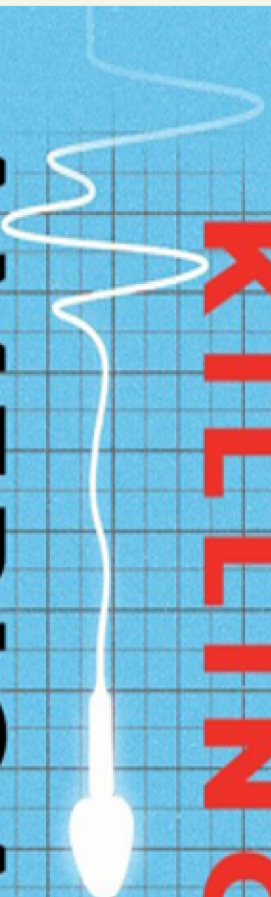
09.22.2017

WHO'S

KILLING

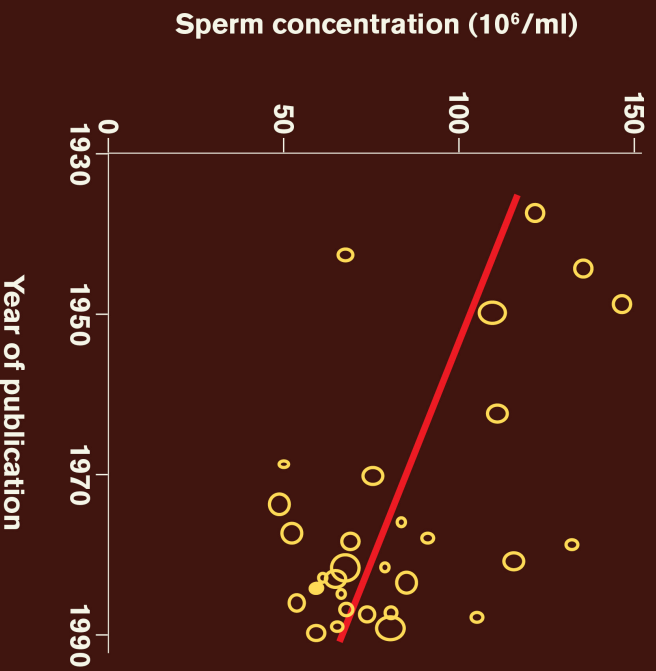
AMERICA'S

S PERM?

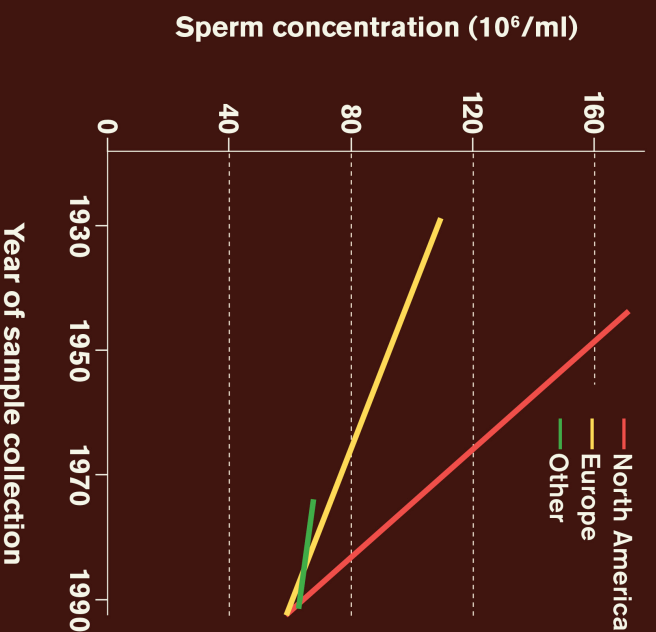


Sperm Decline in Three Analyses

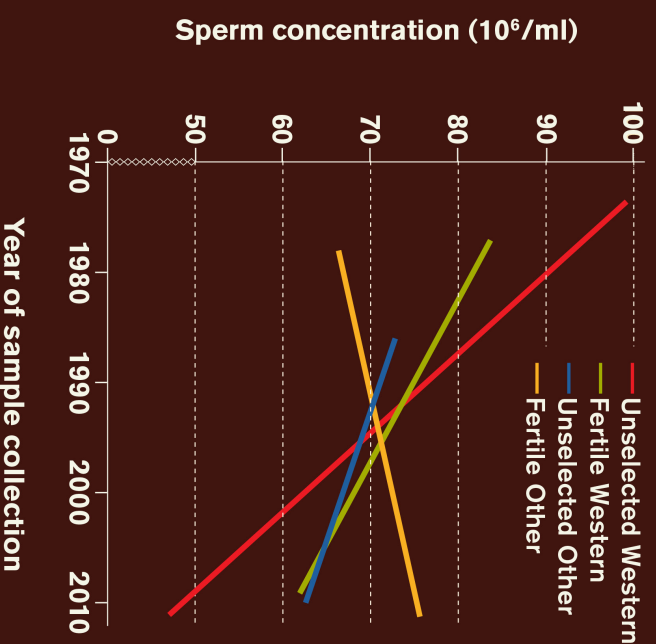
CARLSEN ET AL 1992



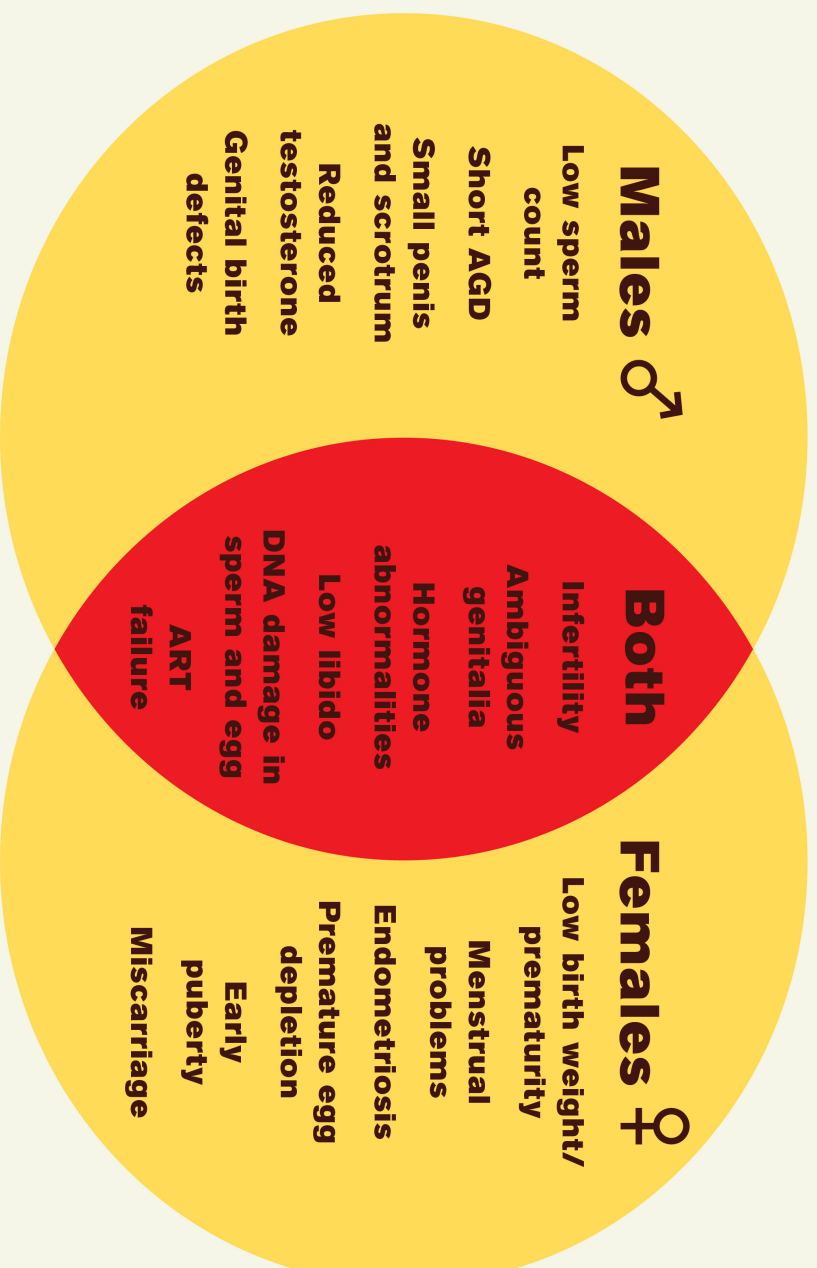
SWAN ET AL 2000



LEVINE ET AL 2017



Reproductive Problems in Men and Women

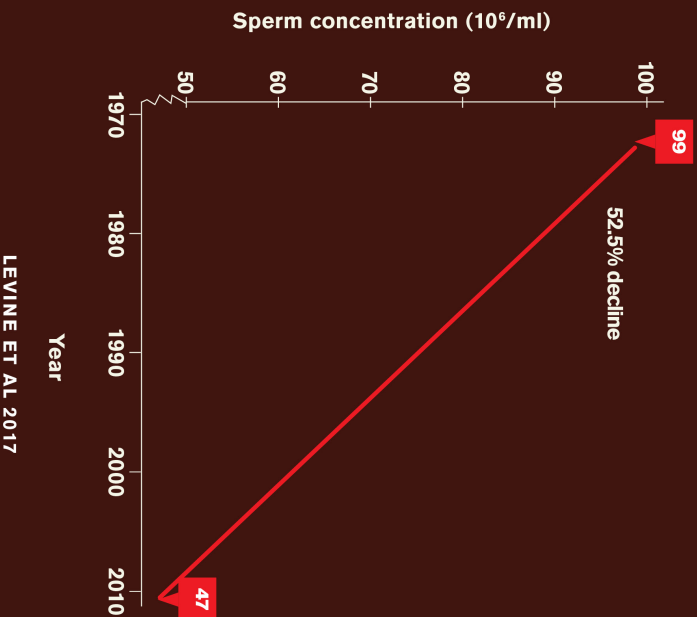


Reproductive Problems in Men and Women

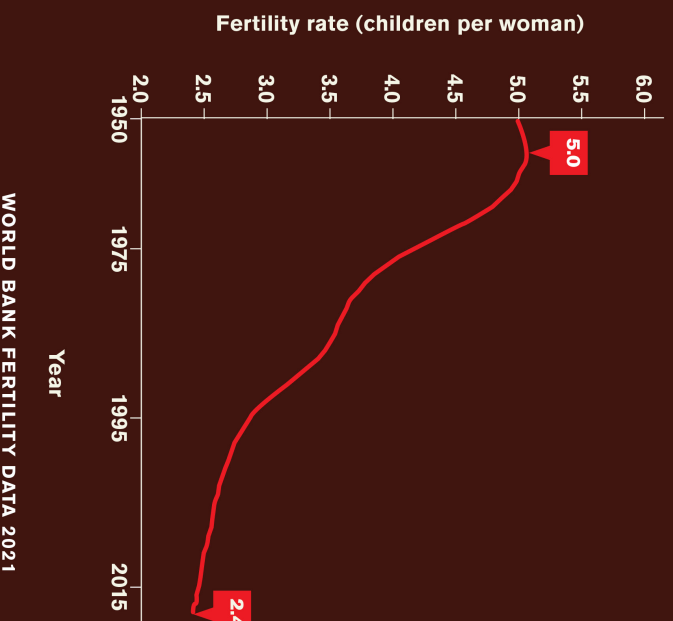


The 1% Effect

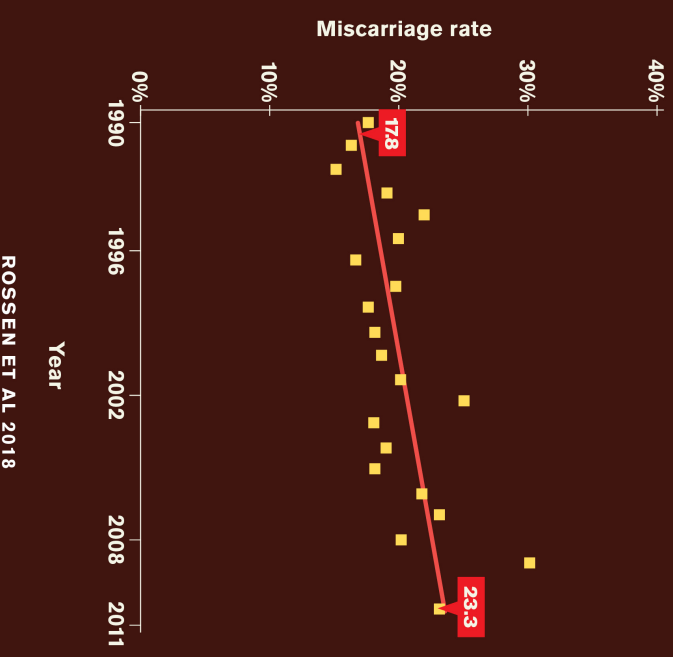
Sperm Decline



World total fertility rate



Miscarriage Rate



THE ROADMAP

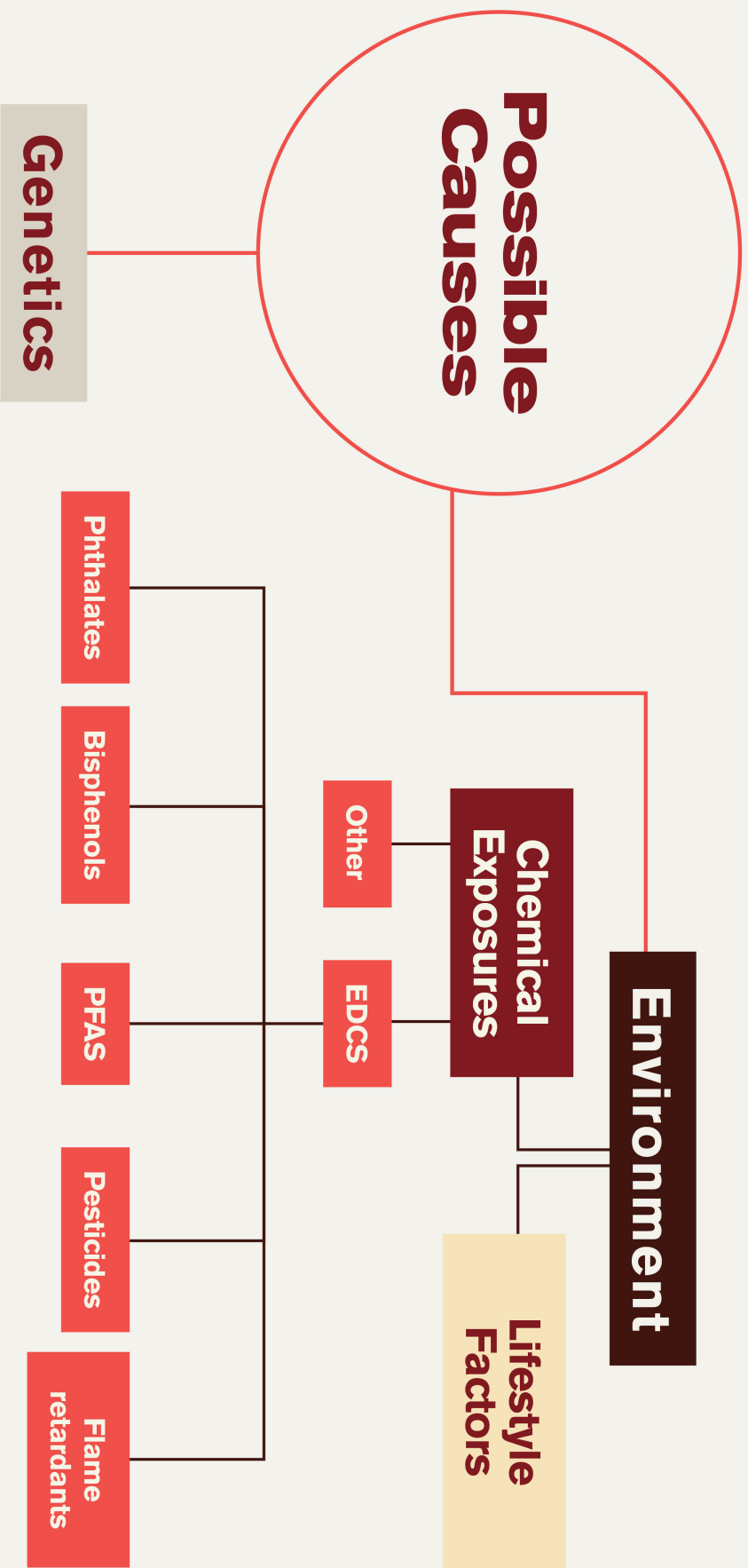
The Problem

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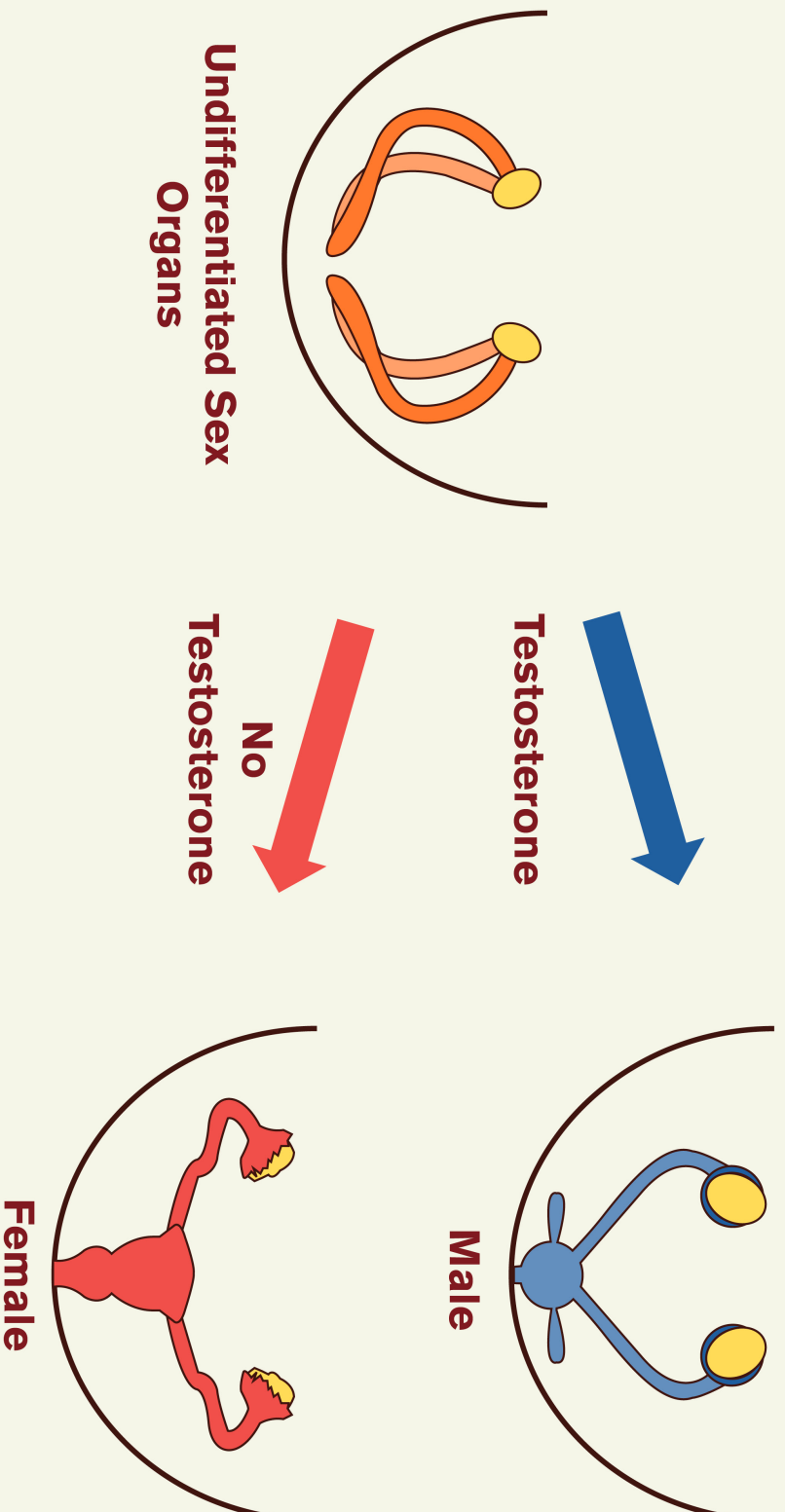
Its Solutions





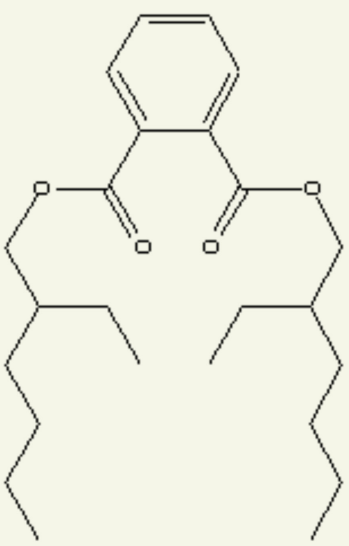


Reproductive development depends on hormonal input

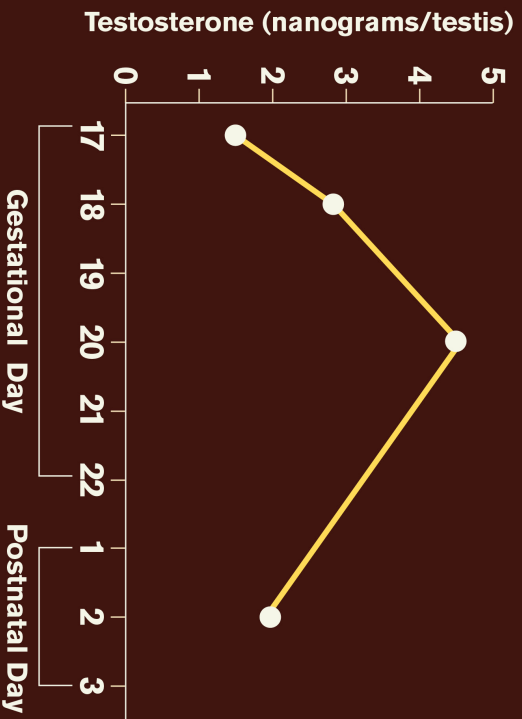




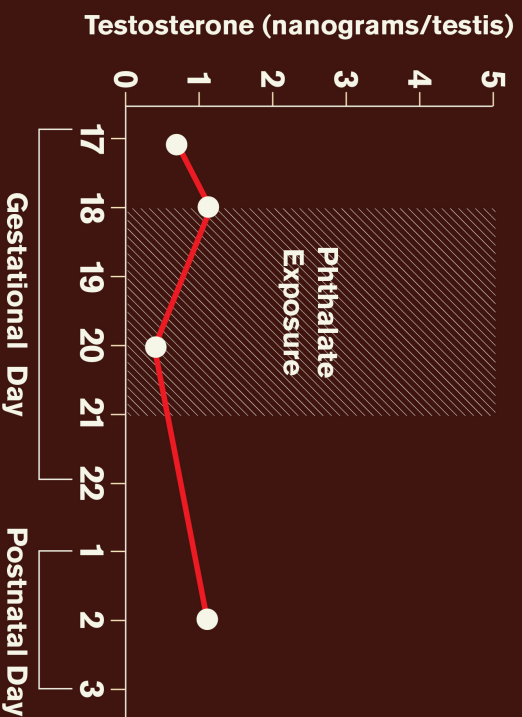
What can interfere with testosterone levels?



Unexposed mom

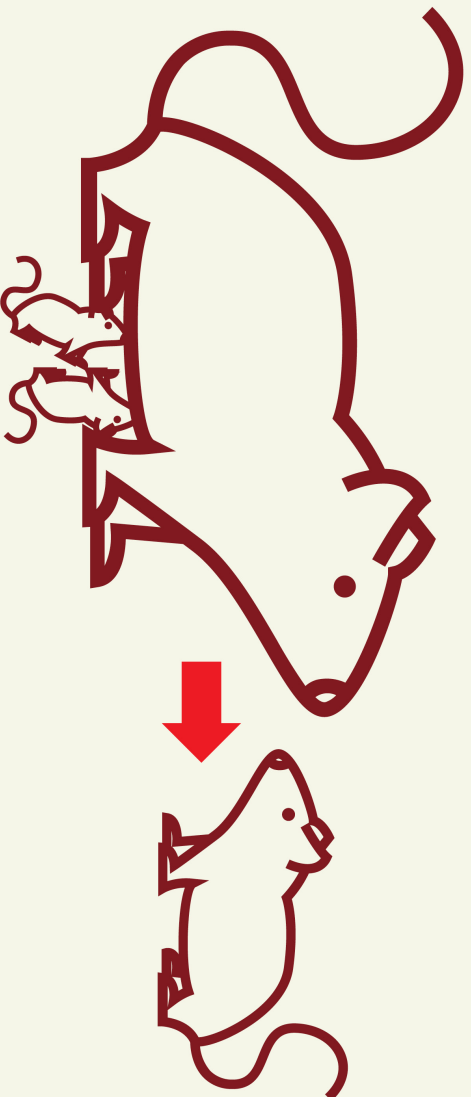


Mom with Phthalates



PARKS ET AL. 2000 TOXICOL. SCI

DEHP



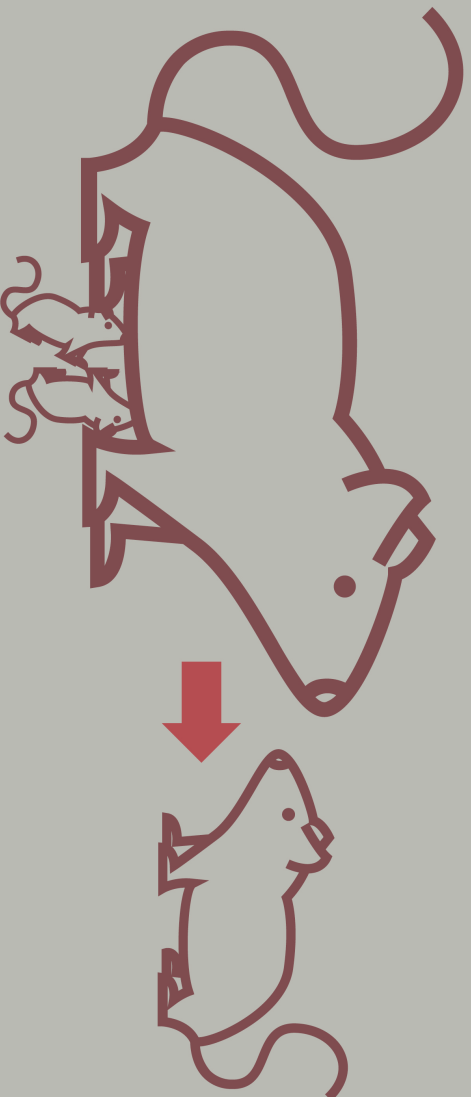
Phthalate Syndrome

- Smaller penis
- Malformed penis
- Undescended testicles
- Shortened AGD

FOSTER 2005 INTERNATIONAL JOURNAL OF ANDROLOGY

DEHP

Phthalate Syndrome

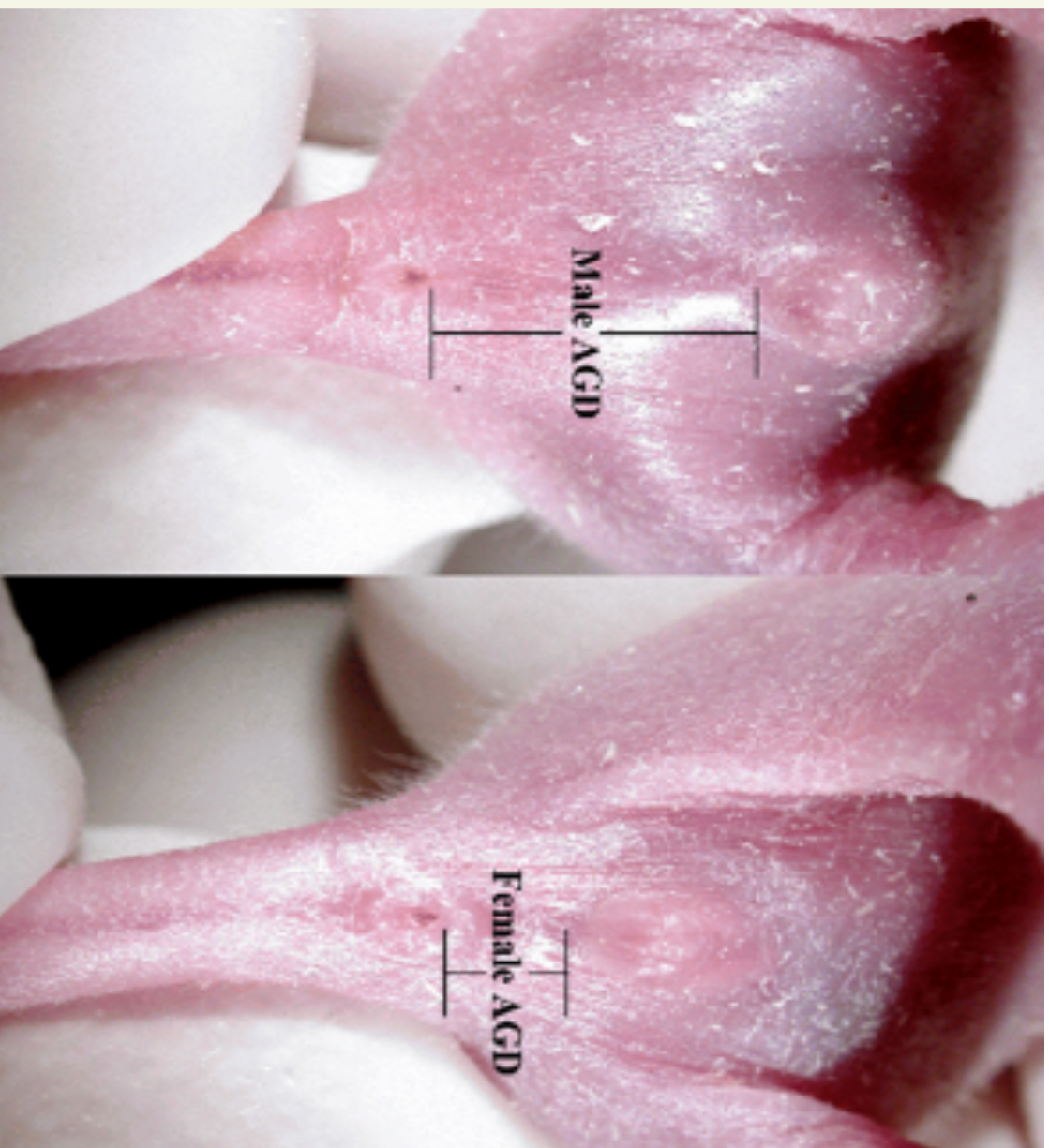


- Smaller penis
- Malformed penis
- Undescended testicles
- **Shortened AGD**

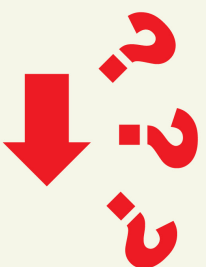
FOSTER 2005 INTERNATIONAL JOURNAL OF ANDROLOGY

Anogenital distance (AGD): A reflection of fetal androgen

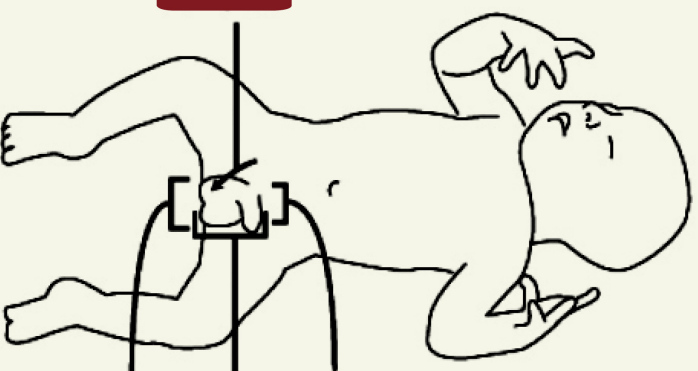
- 50%-100% longer in males than females
- Rodent data on AGD published in 1912
- Used in animal toxicity testing since 1998



Urinary
phthalate
metabolites



testicular
descent



penile width

AGD

scrotal size

We confirmed this hypothesis in two human studies (2005 & 2015)

- Prenatal phthalate exposure causes the phthalate syndrome in human males
- Phthalates are (antiandrogenic) endocrine disruptors
- AGD is a marker of fetal androgen exposure

Research | Children's Health

Decrease in Anogenital Distance among Male Infants with Prenatal Phthalate Exposure

Shanna H. Swan,¹ Katharina M. Main,² Fan Liu,³ Sara L. Stewart,³ Robin L. Kruse,³ Antonia M. Calafata,³ Catherine S. Mao,⁵ J. Bruce Redmon,⁶ Christine L. Terrand,⁷ Shannon Sullivan,⁸ J. Lynn Teague,⁹ and the Study for Future Families Research Team *

¹Department of Obstetrics and Gynecology, University of Rochester, Rochester, Minnesota, USA; ²Department of Growth and Reproduction, University of Copenhagen, Copenhagen, Denmark; ³Department of Family and Community Medicine, University of

Human Reproduction, Vol.0, No.0 pp. 1–10, 2015

doi: 10.1093/humrep/deu363

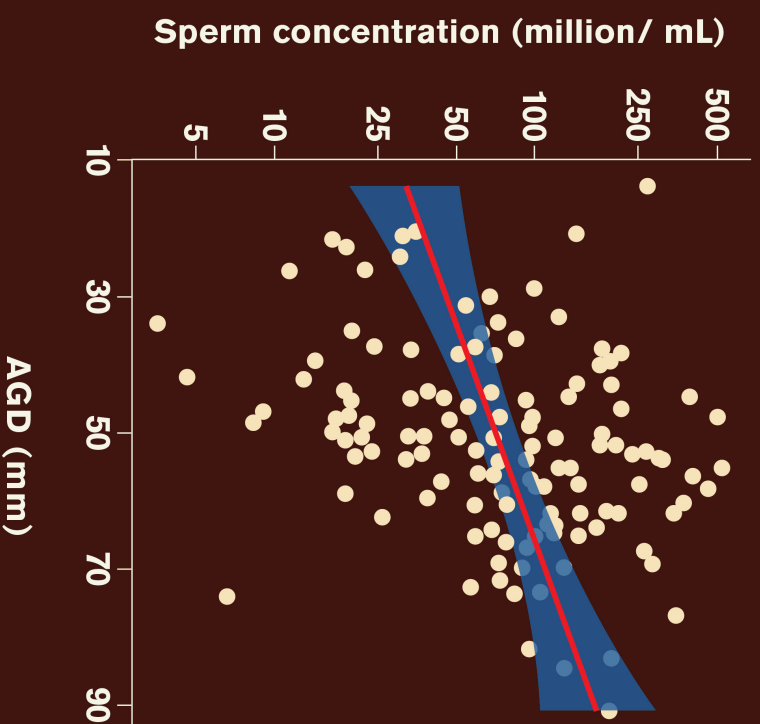
human
reproduction

ORIGINAL ARTICLE *Reproductive epidemiology*

First trimester phthalate exposure and anogenital distance in newborns

S.H. Swan^{1,*}, S. Sathyanarayana^{2,3}, E.S. Barrett⁴, S. Janssen⁵, F. Liu¹,
R.H.N. Nuyven⁶ and J.B. Redmon⁷ the TIDES Study Team

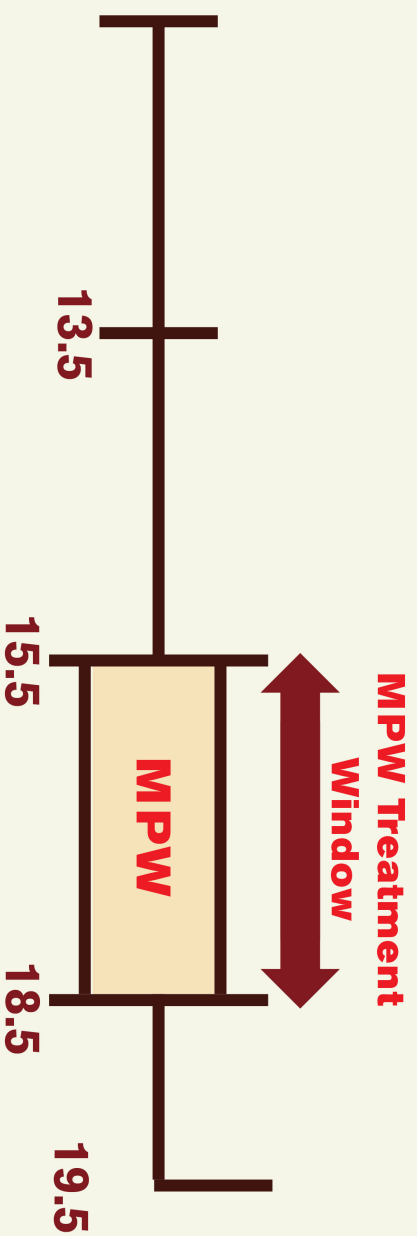
Shorter AGD is associated with lower sperm count



MENDIOLA ET AL., 2011, ENVIRON HEALTH PERSPECT



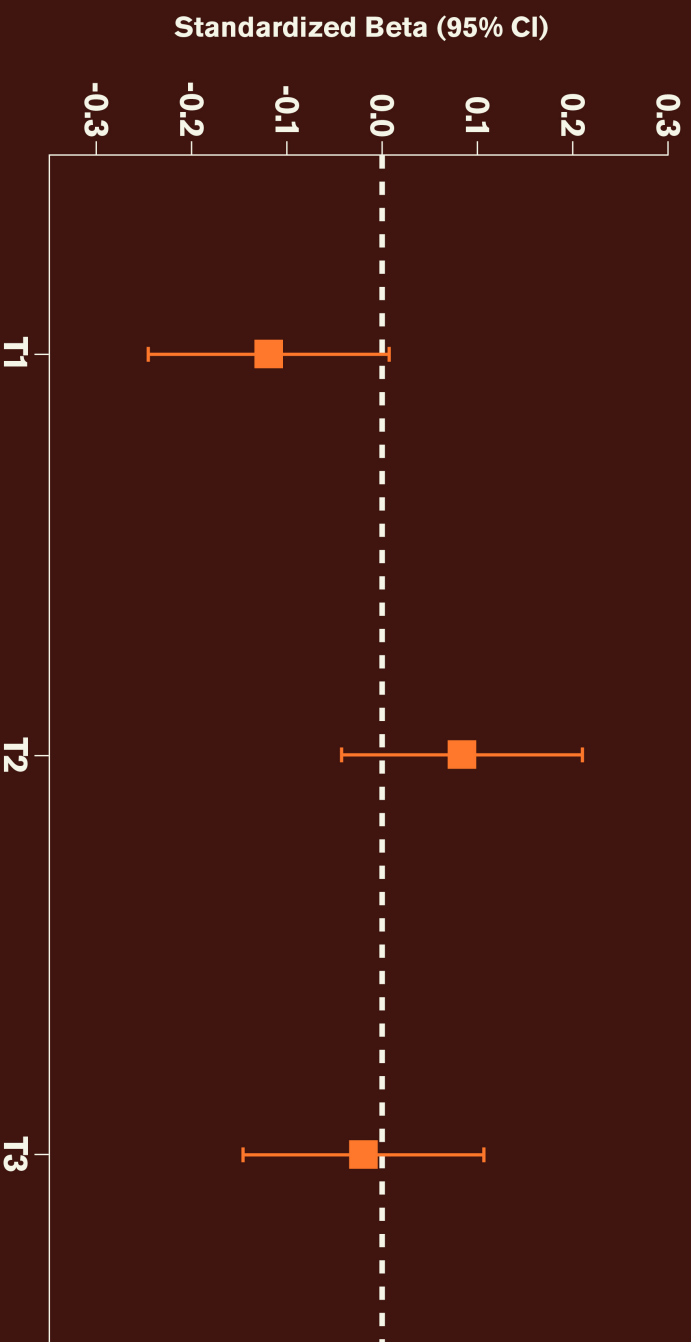
Critical window (MPW) for rodent AGD



MPW = Male Programming Window

MACLEOD ET AL 2010

Change in AGD by trimester of exposure to Σ DEHP metabolites



MARTINO ANDRADE ET AL 2017

Prenatal exposure is more important than postnatal exposure



40%

Around the time of conception

40%

During pregnancy

20%

During adulthood



THE ROADMAP

The Problem

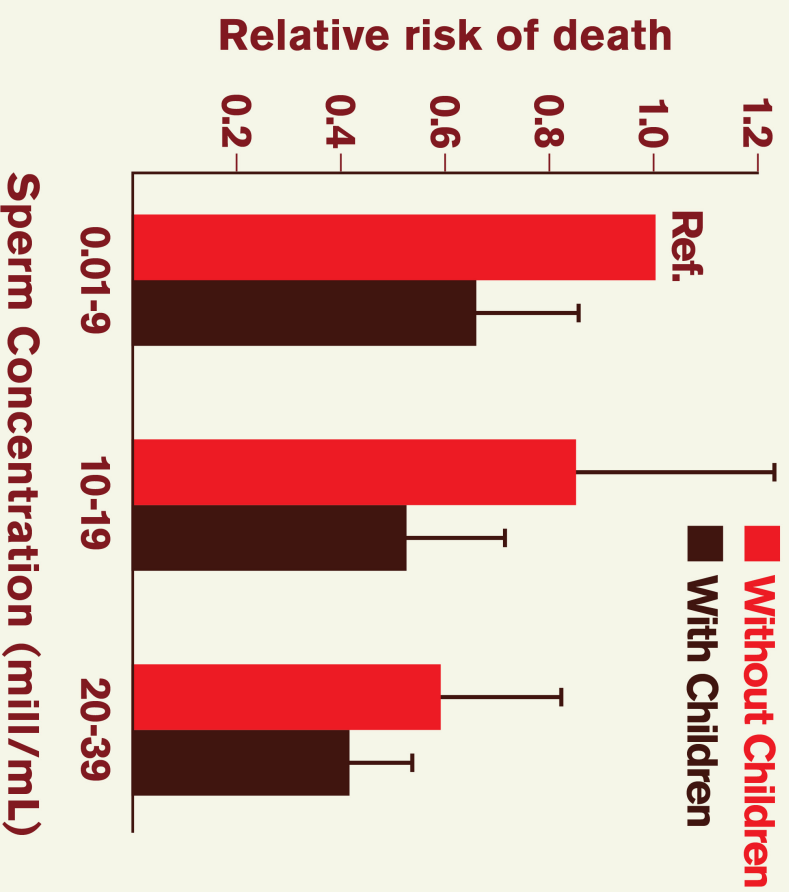
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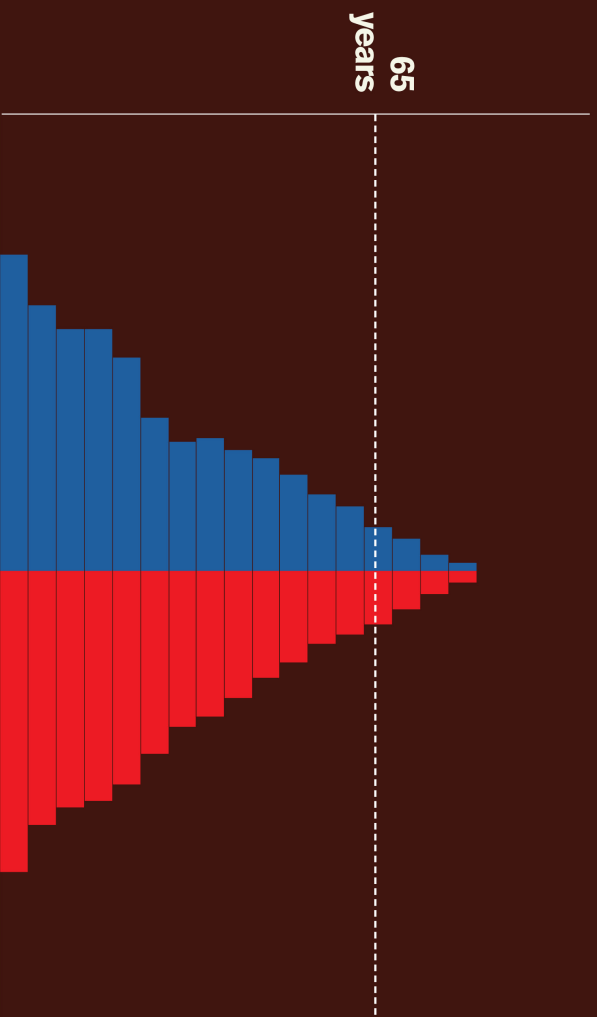
Poor reproductive health has lifelong consequences



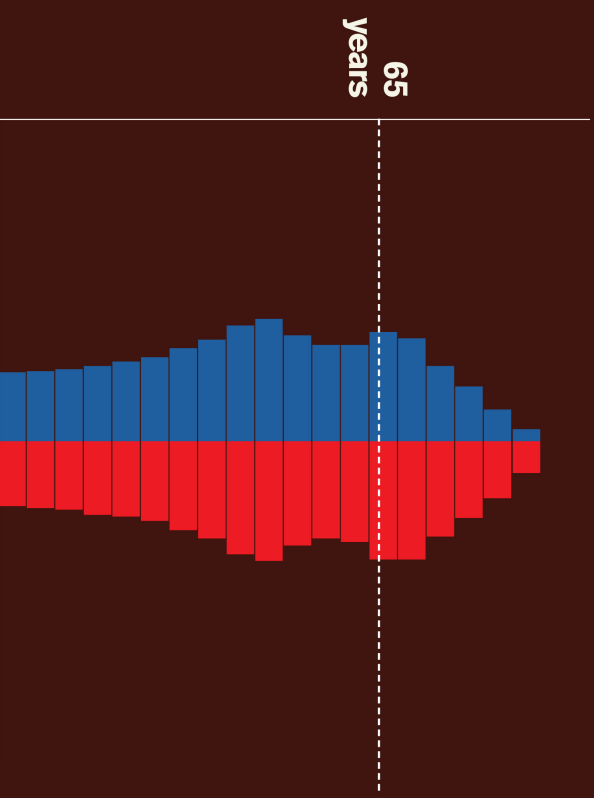
JENSEN ET AL, 2009

Population of Japan

1950
84 million

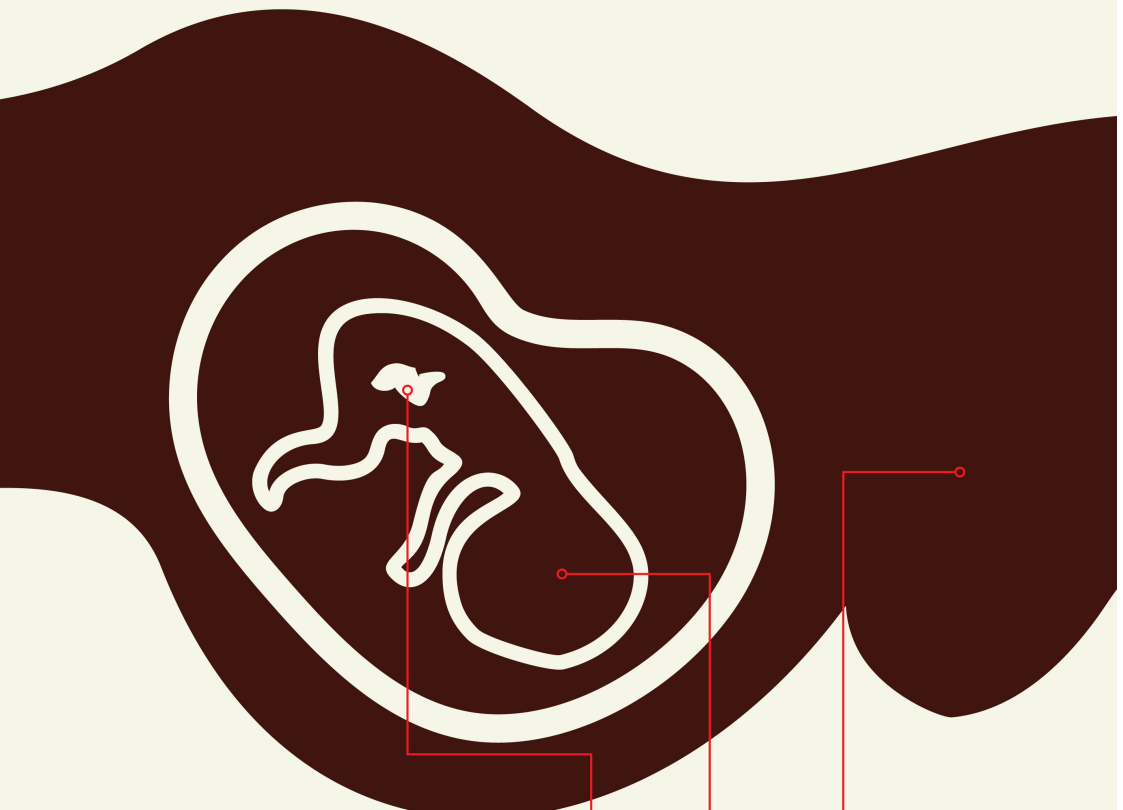


2018
126 million



WWW.THEYCNEWS.COM





Exposure

Mother (F_0)

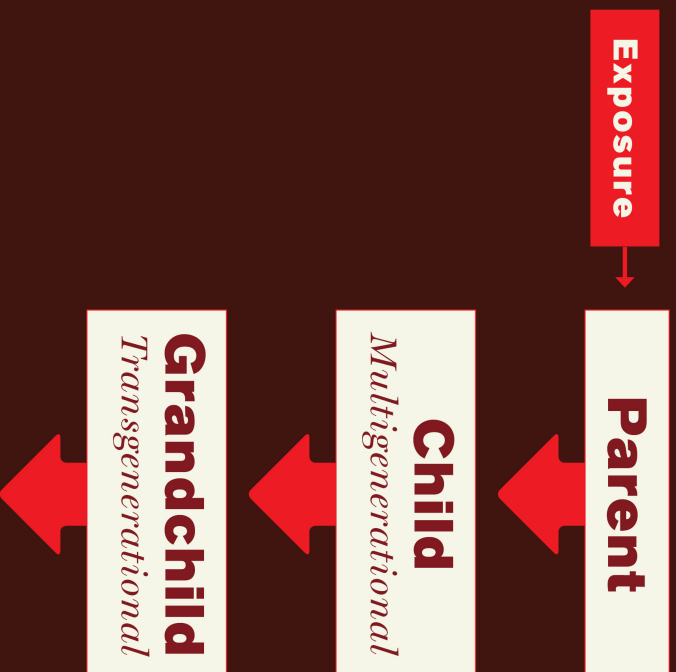
Fetus (F_1)

Reproductive cells (F_2)

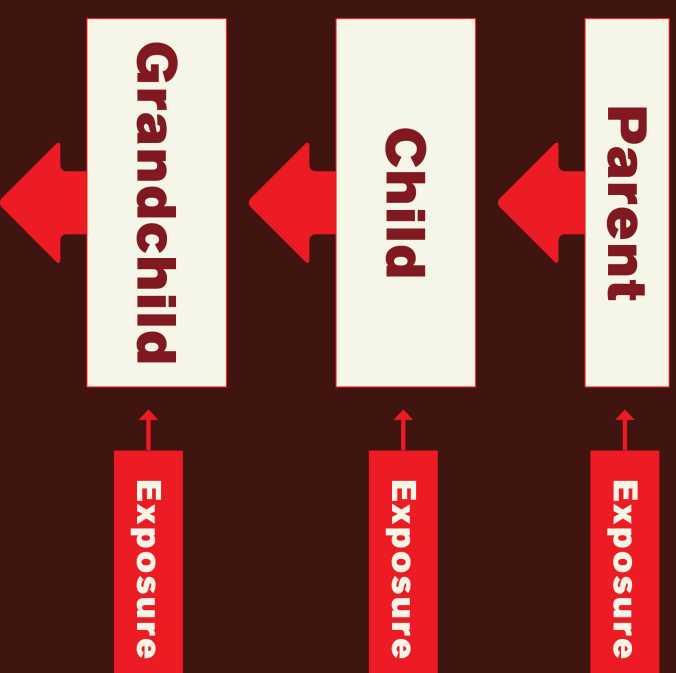


**Health effects
reported in the F_3
generation that was
not directly exposed**

Transgenerational

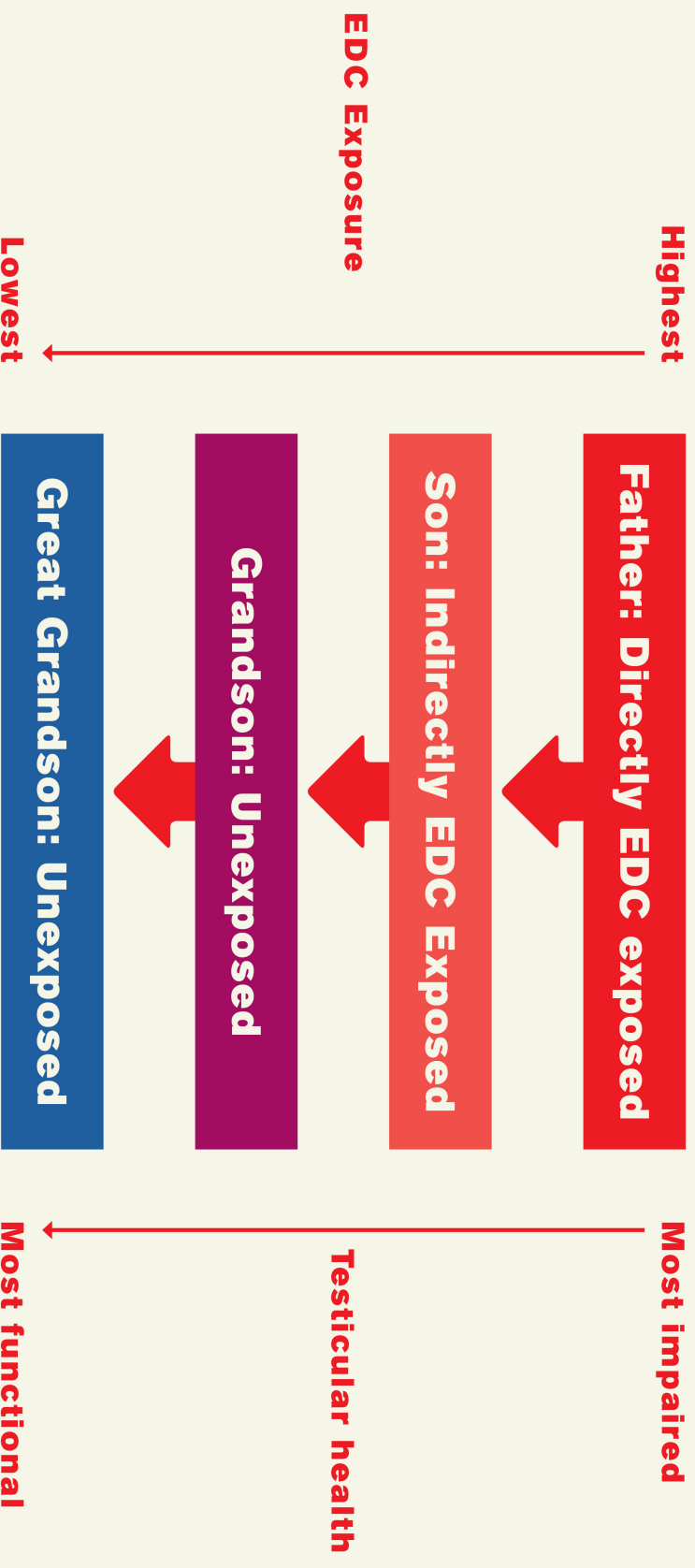


Successive



ADAPTED FROM PA HUNT

Recovery of testicular function several generations after direct exposure to an EDC



ADAPTED FROM PA HUNT

THE ROADMAP

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**Stop regrettable
substitution (swapping
one hazardous
chemical for another)**





**Only 250 of the
more than 60,000
existing chemicals
have been directly
tested by the EPA**

Shanna H Swan, PhD

Reproductive Health and the Environment



Chemicals that are:

- Hormonally active
- Cause harm at low doses
- Environmentally persistent
- Untested for toxicity



Replace

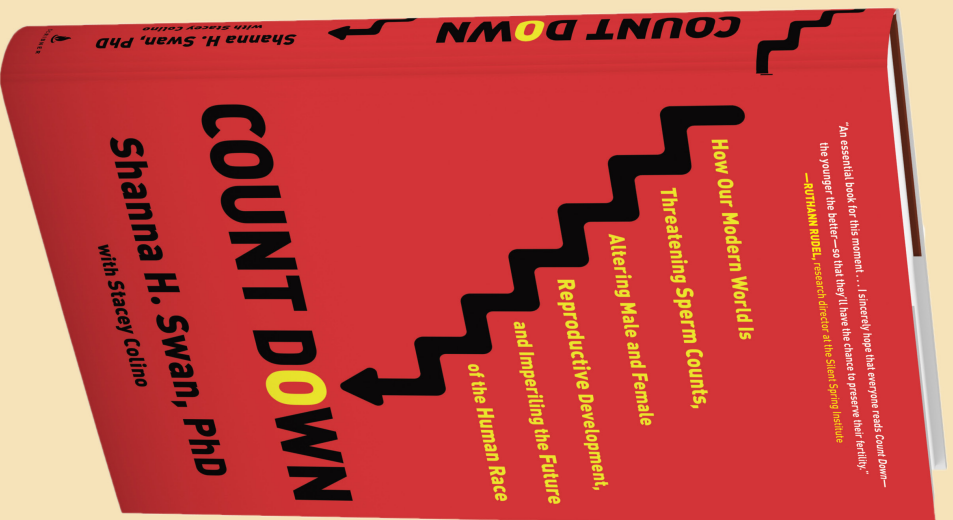
With chemicals:

- Without endocrine disrupting effects
- Free of low dose adverse effects
- Minimally environmentally persistent
- Shown to be safe prior to marketing



By assessing:

- Low dose effects
- Mixture effects
- Environmental persistence
- Risks in untested chemicals



Count Down

published by Scribner on

February 23rd

Pre-order here:

www.shannaswan.com