



# **MEN'S REPRODUCTIVE HEALTH AND THE ENVIRONMENT: DECLINING SPERM COUNTS ARE ONLY THE TIP OF THE ICEBERG**

**Shanna H Swan, MS, PhD**



**October 29, 2020**



▼  
**Male Infertility Crisis  
in U.S. Has Experts  
Baffled**

NEWSWEEK SEPT 22, 2017



▼  
“Sperm count declined **52.4%** between 1973 and 2011 [**38 years**] among men from Western countries with no evidence of a ‘leveling off.’”



Temporal trends in sperm count: a systematic review and meta-regression analysis <sup>FREE</sup>

Hagai Levine ✉, Niels Jørgensen, Anderson Martino-Andrade, Jaime Mendiola, Dan Weksler-Derri, Irina Mindlis, Rachel Pinotti, Shanna H Swan



# Goal of 2017 meta-analysis

▶ To conduct a systematic review and meta-analysis of sperm counts published between 1981 and 2013



Niels Jørgensen  
MD, PhD



Anderson  
Martino-Andrade PhD



Jaime Mendiola  
PhD



Dan Weksler-Derri  
MD



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MPH, MA



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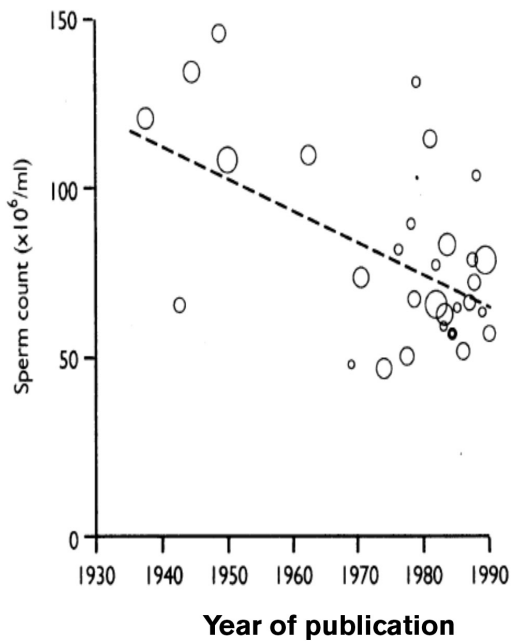


Shanna H. Swan  
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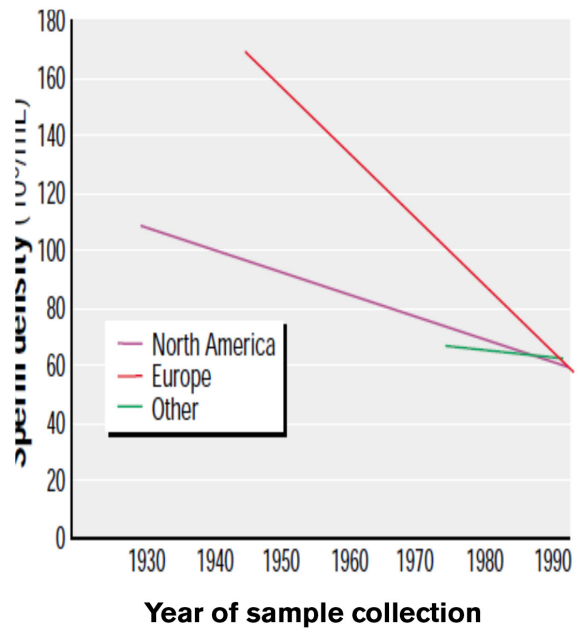


## ► Comparison of sperm decline analyses

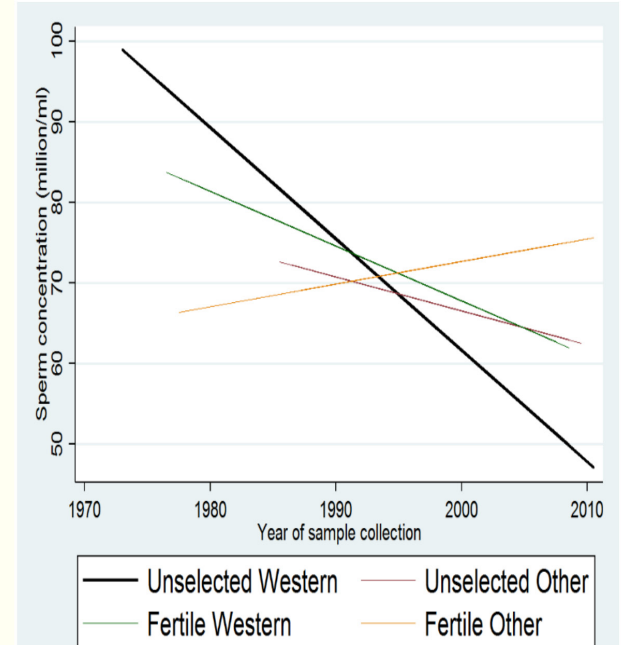
▼ CARLSEN 1992



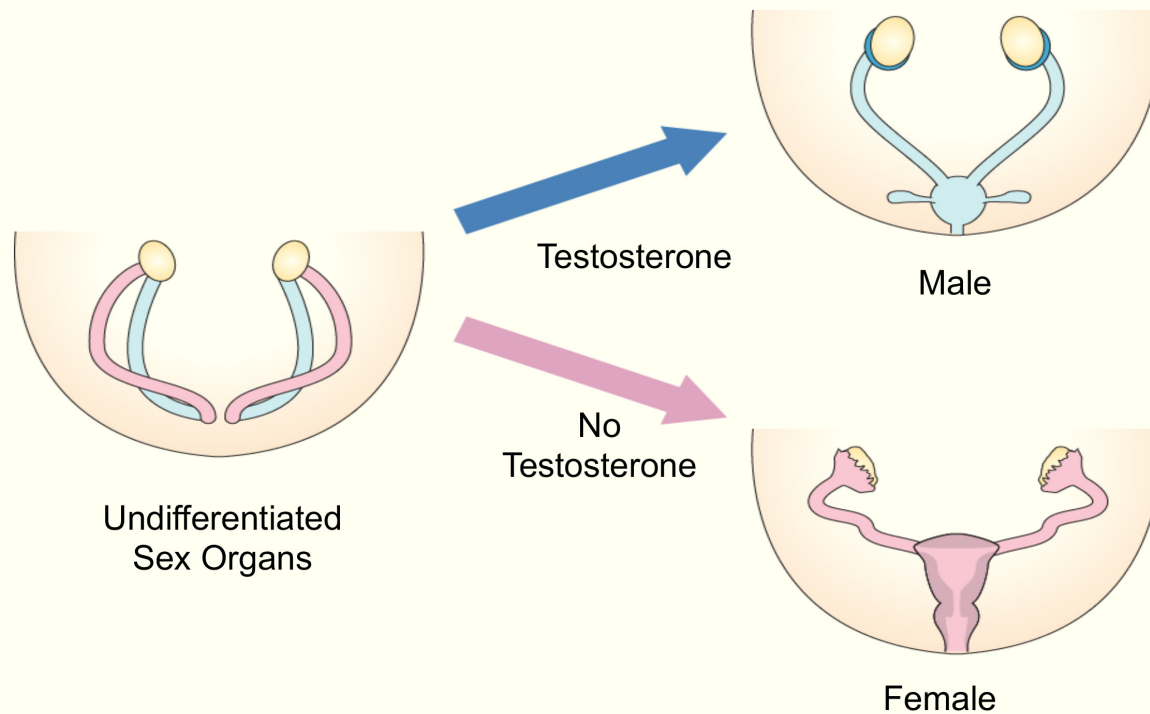
▼ SWAN 2000



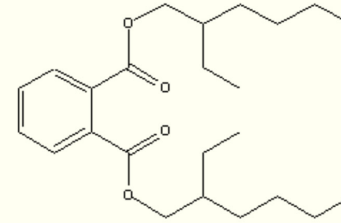
▼ LEVINE 2017



## ▶ Reproductive development depends on hormonal input



► **What can interfere with testosterone levels?**

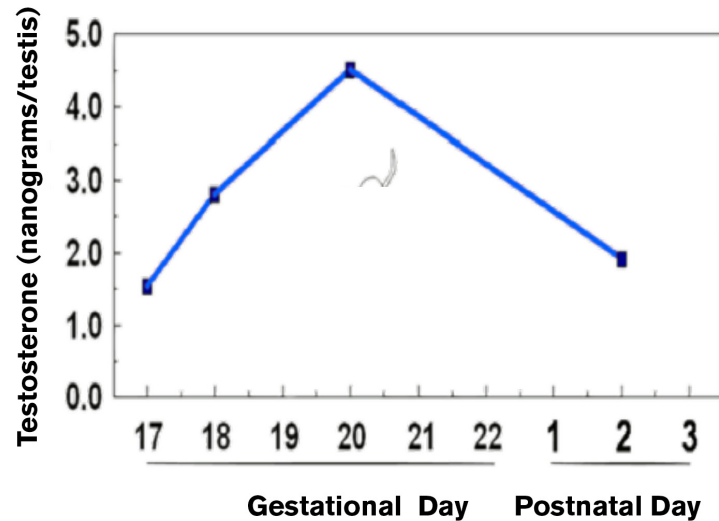




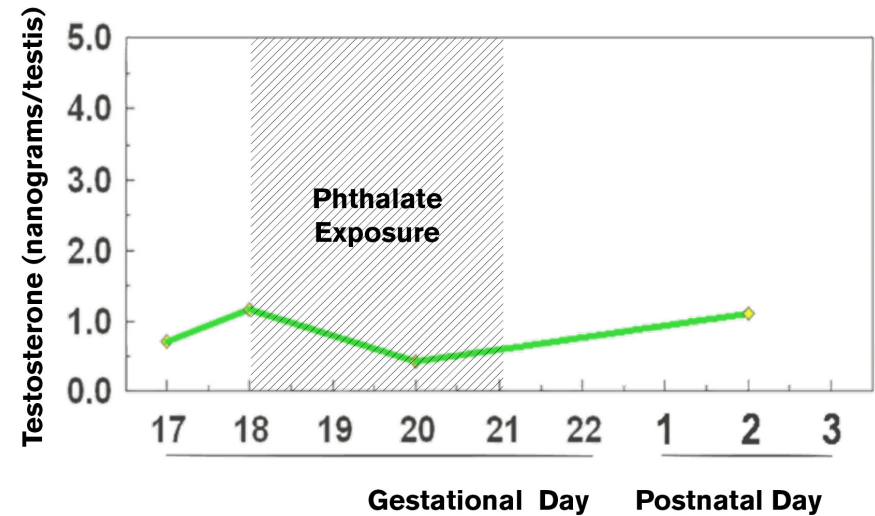
# ▶ Phthalate exposure during days 18-21 of gestation blocks the testosterone surge in rats



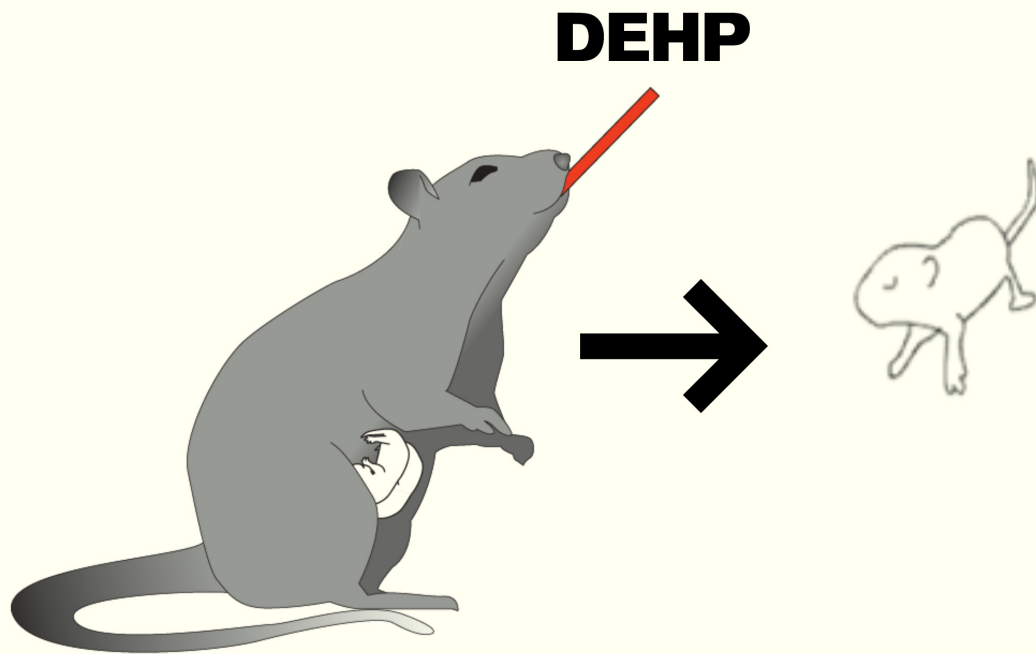
## ▼ UNEXPOSED MOM



## ▼ MOM WITH PHTHALATES



PARKS ET AL. 2000 TOXICOL. SCI., 58:339



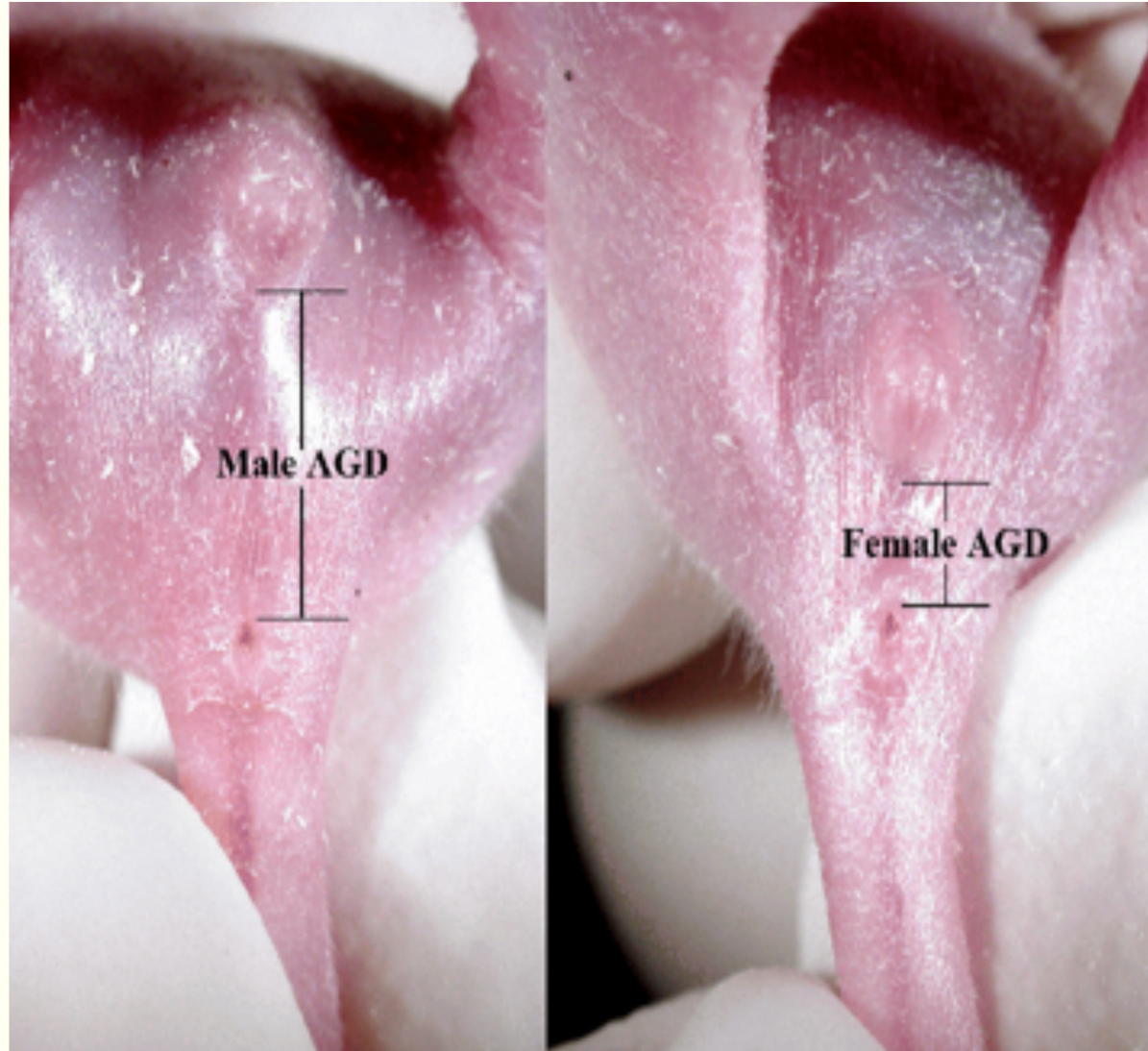
## ▶ Phthalate Syndrome

**Males:**

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

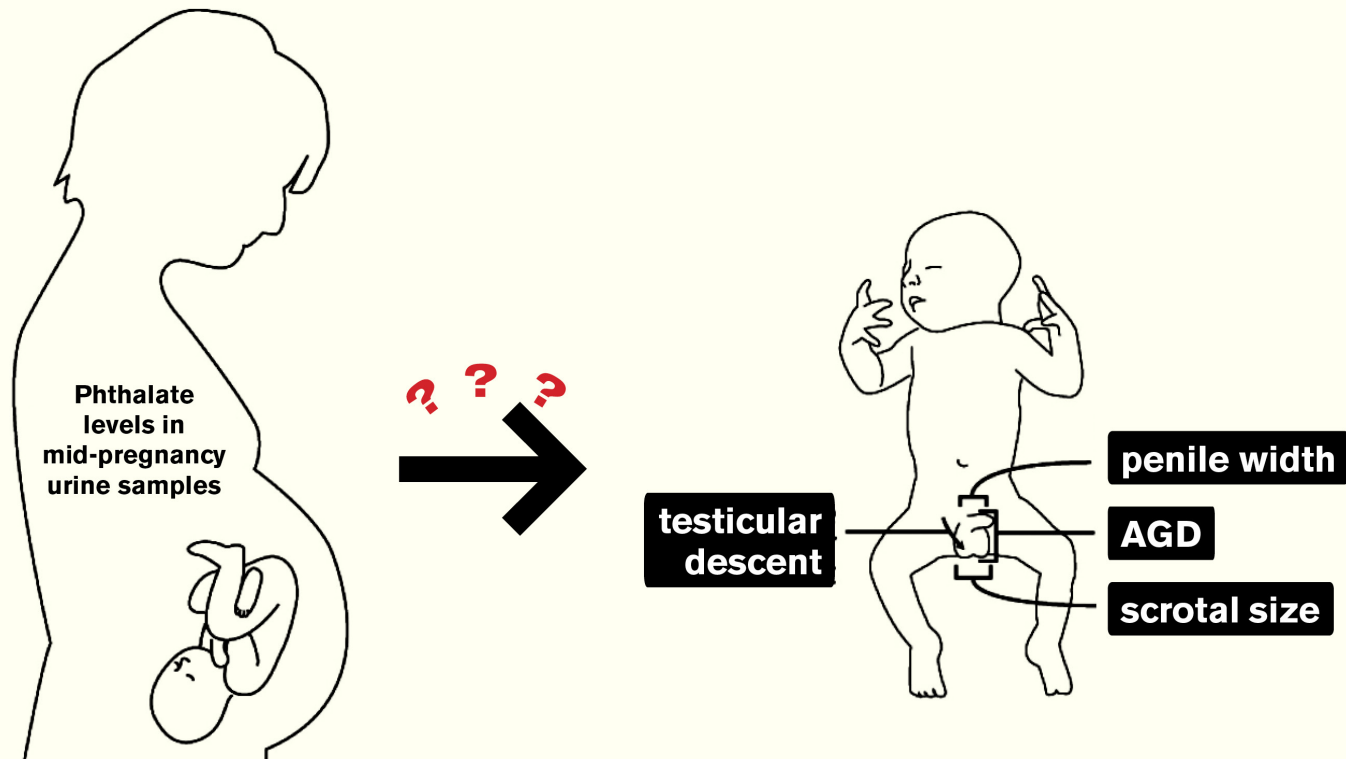
▼  
**Male Anogenital distance (AGD)**

- 50%-100% longer in males
- Reflects androgen exposure during fetal development
- Sex differences in rodent AGD known since 1912
- Not used to detect human toxicity till 2005



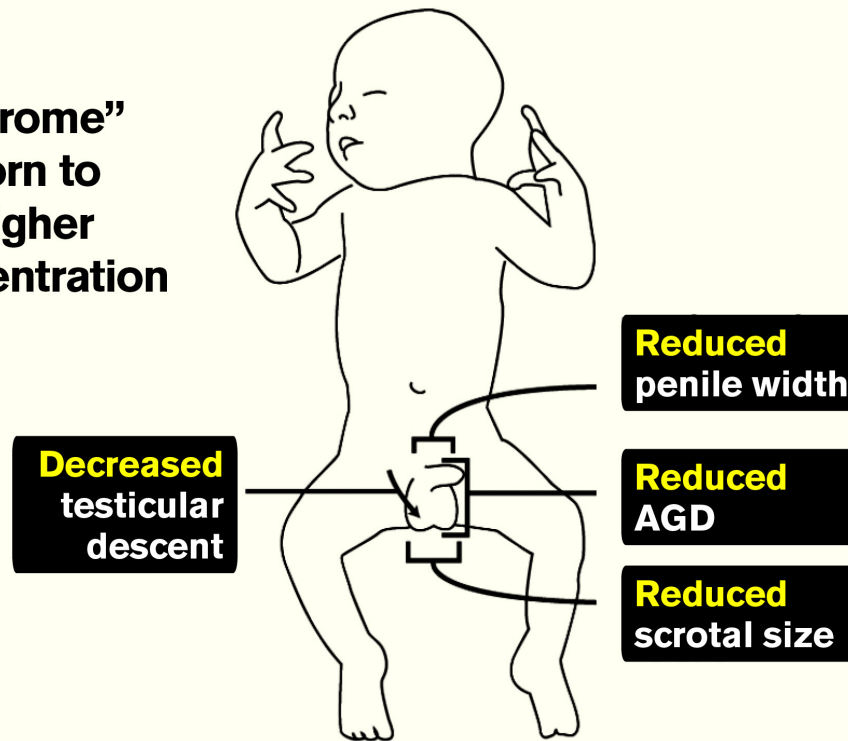


► **Hypothesis: Prenatal phthalate levels in moms of boys (but not girls) is linked to altered genital development**



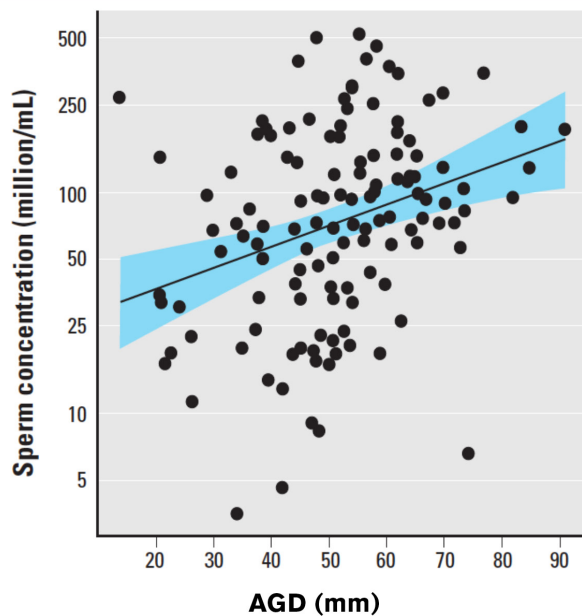
► **We found the “phthalate syndrome” in male infants in two pregnancy cohorts**

**“Phthalate syndrome”  
seen in boys born to  
mothers with higher  
phthalate concentration**

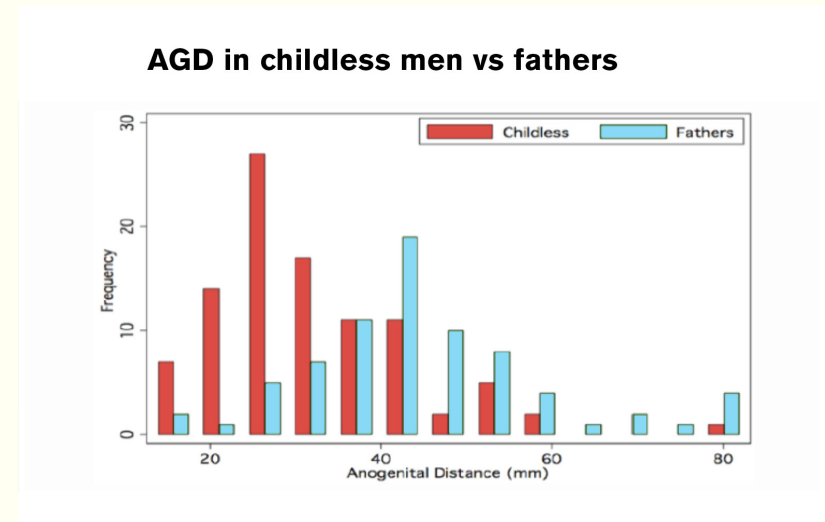


SWAN ET AL 2005, 2008, 2015

► In adults, shorter AGD is associated with lower sperm counts and greater infertility



MENDIOLA ET AL., 2011, ENVIRON HEALTH PERSPECT.



EISENBERG ET AL 2011



## ▶ **Bottom Line**

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- Sperm count is declining 1% per year in Western countries
- Phthalate exposure in early pregnancy causes the phthalate syndrome in humans
- Men with low sperm count have shorter AGD
- It's not just phthalates: BPA, dioxins, PCBs, etc., also impair male reproductive function

## ▶ **Warning: Data limitations**

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- Most published studies of semen quality are from western countries
- Within western countries, most studies are in white/non-Hispanic men
- Many EDC exposures are higher in non-white and Hispanic populations
- Studies of male reproductive function in minority and non-Western populations are badly needed

## ► **What needs to be done?**

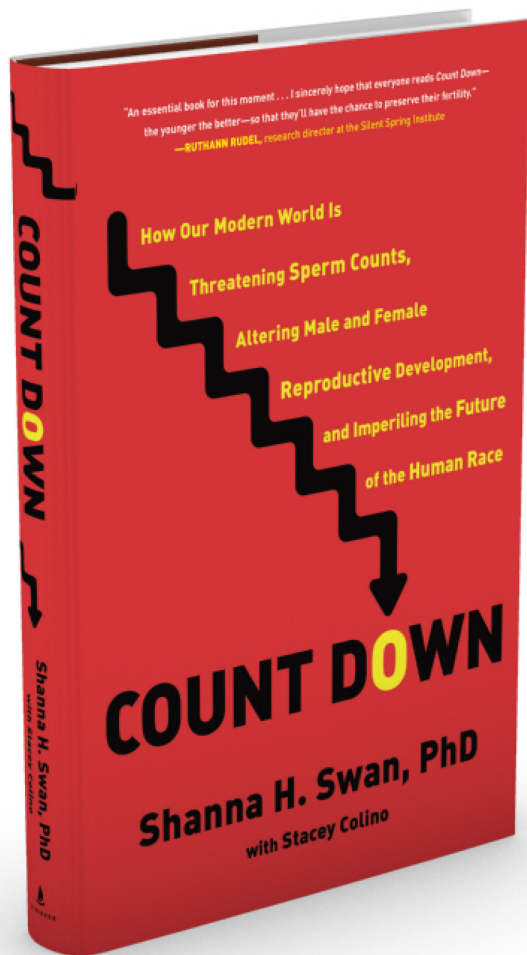
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To protect our reproductive health:

- **M**onitor reproductive health endpoints (as is done for cancer surveillance)
- **A**dvance the creation of safe alternatives to hazardous chemicals
- **D**evelop testing protocols that protect human and environmental health
- **E**ducate regulators, health care professionals and consumers about EDC risks

These changes have to be **MADE!**





# ***Count Down***

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