

# ENDOCRINE DISRUPTION: ARE MALES AT RISK?

Theo Colborn, Ph.D.

TEDX

**“The first 38 weeks of human life spent in the allegedly protected environment of the amniotic sac are medically more eventful and more fraught with danger than the next 38 years in the lifespan of most human individuals.”**

Dr. Ian Donald

# “Disease Mongering” for Profit



washingtonpost.com

# **Male Bass Across Region Found to Be Bearing Eggs**

## **Pollution Concerns Arise In Drinking-Water Source**

By David A. Fahrenthold

Washington Post Staff Writer

Wednesday, September 6, 2006; A01



Seeking an alternative to the *bris*  
Why some Jews reject circumcision  
IT'S NO LONGER JUST A MEDICAL DEBATE, GLOBE LIFE

GREATER TORONTO EDITION | TUESDAY, MAY 22, 2007

MAINLY SUNNY, HIGH 19 LOW 9

# THE GLOBE AND MAIL

CANADA'S NATIONAL NEWSPAPER



## **HORMONE POLLUTION**

# **Estrogen threatens minnow manhood**

**Released into an Ontario lake as an experiment,  
tiny amounts of the hormone wreak havoc on male  
fish**

MARTIN MITTELSTAEDT  
ENVIRONMENT REPORTER

May 22, 2007

Mike Keefe THE DENVER POST 03/13/08





# Human Reproductive Tissues in which Endocrine Disruptors Have Been Detected

<b>amniotic fluid</b>	<b>Bradman <i>et al.</i> (2003); Foster <i>et al.</i> (2000)</b>
<b>blood serum</b>	<b>Brock <i>et al.</i> (1998)</b>
<b>blood, maternal blood, umbilical cord placenta</b>	<b>Dorea <i>et al.</i> (2001); Saxena <i>et al.</i> (1983); Siddiqui <i>et al.</i> (2003); Simonetti <i>et al.</i> (2001)</b>
<b>breast milk</b>	<b>Dorea <i>et al.</i> (2001); Schinas <i>et al.</i> (2000); Polder <i>et al.</i> (2003)</b>
<b>colostrum</b>	<b>Waliszewski <i>et al.</i> (2002)</b>
<b>meconium</b>	<b>Whyatt and Barr (2001)</b>
<b>ovarian follicular fluid</b>	<b>Jarrell <i>et al.</i> (1993)</b>
<b>semen</b>	<b>Arbuckle <i>et al.</i> (1999); Swan <i>et al.</i> (2003b)</b>
<b>urine</b>	<b>Coronado <i>et al.</i> (2004); Curl <i>et al.</i> (2003)</b>

# Hypothalamus

Pineal body

# Hippocampus

# Pituitary

Parathyroid gland

# Thyroid

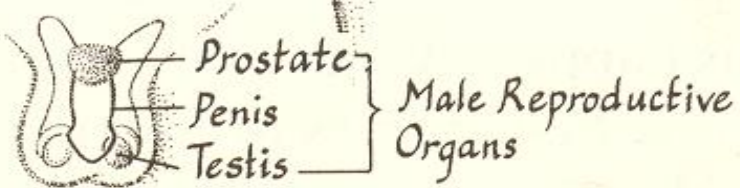
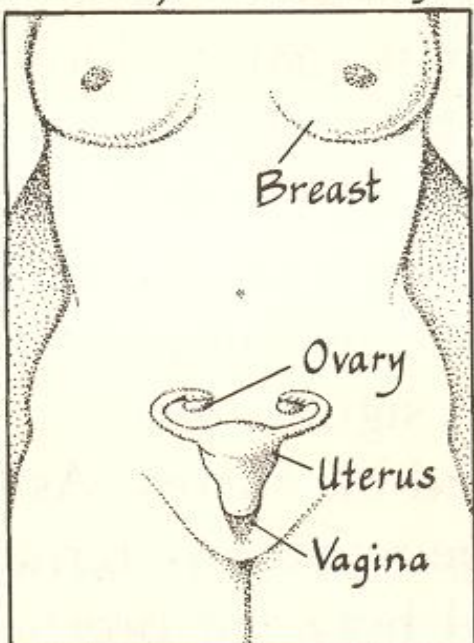
Thymus gland

# Adrenal

Kidney

# Pancreas

Female Reproductive Organs

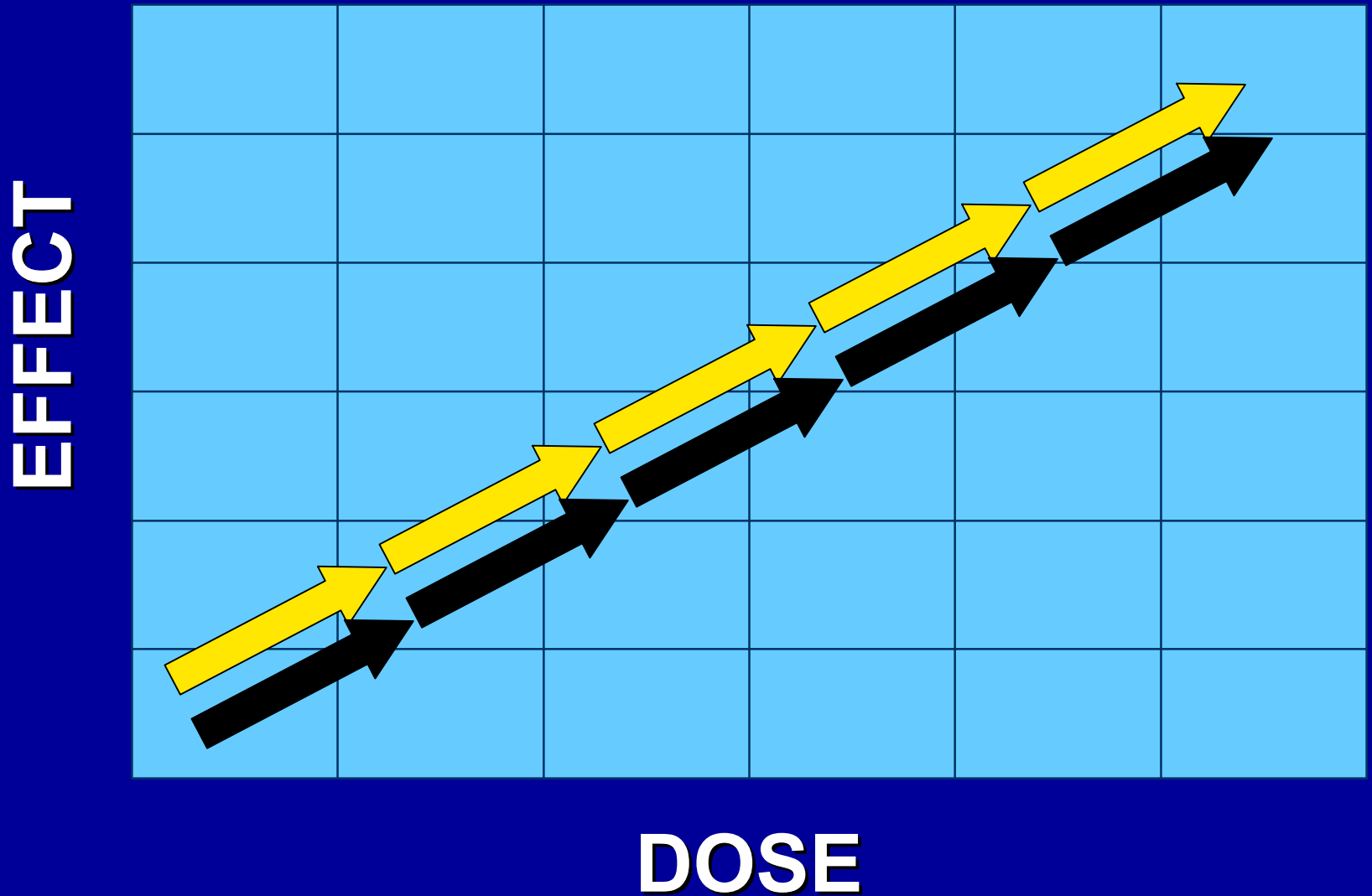




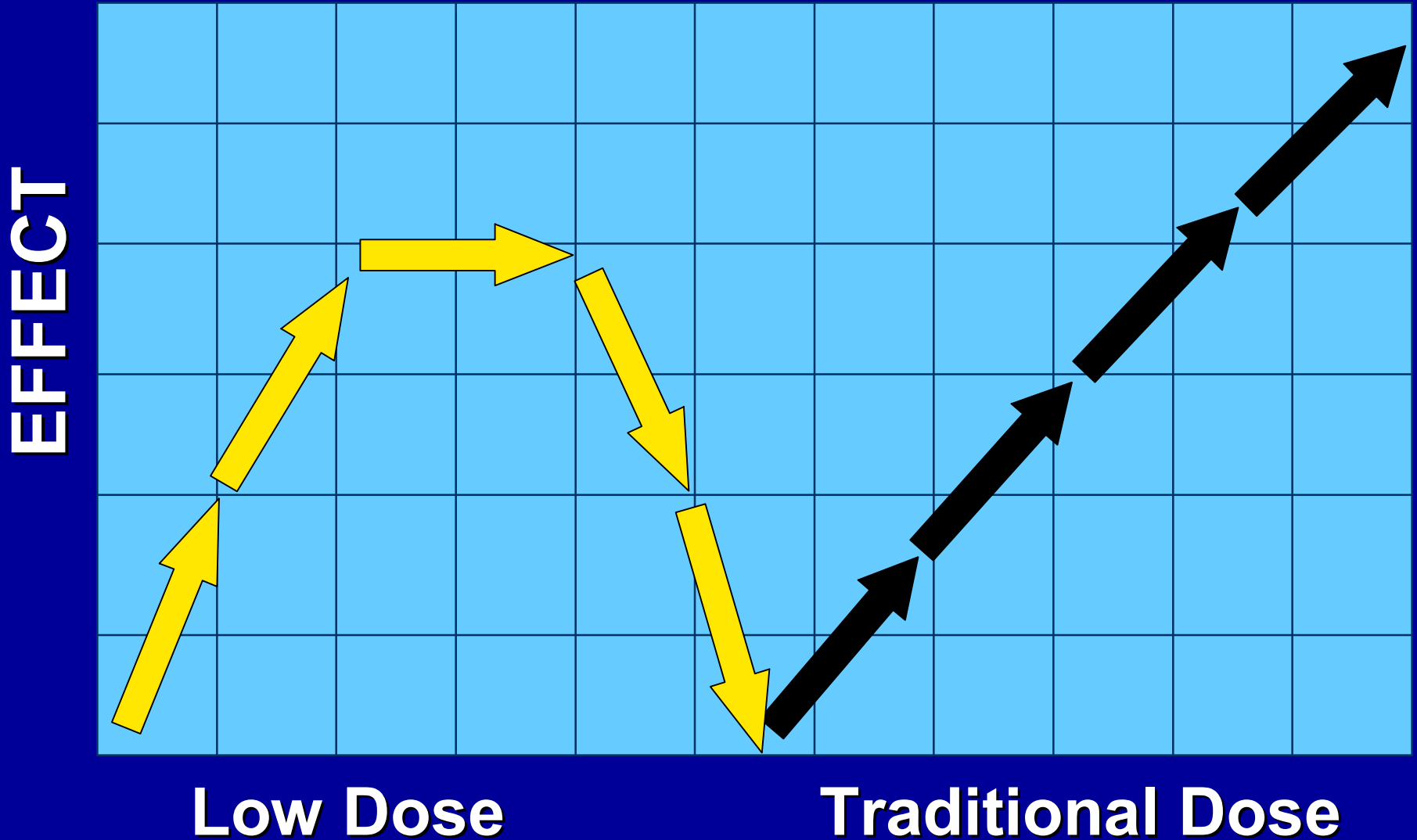
# Increased Prevalence of Human Disorders Since 1970s

- ADHD
- Autism
- Learning Disabilities
- Asthma
- Juvenile Cancer
- Juvenile Diabetes
- Juvenile Delinquency
- Juvenile Violence
- Autoimmune Diseases
- Cryptorchidism
- Hypospadias
- Endometriosis
- Obesity
- Osteoporosis
- Early Testicular Cancer/Mortality
- Male Dysgenesis Syndrome
- Breast Cancer
- Prostate Cancer
- Parkinson's Disease
- Alzheimer's Dementia

“The dose makes the poison”



# Inverted U-Shaped Curve Agonist



**Timing and/or  
stage of  
development is  
as critical as  
dose**

**1940's: WWII -- fire retardants, pesticides, resins, plastics – derived from fossil fuels**

**1950's:  
Indoor exposure  
begins to exceed  
outdoor exposure**



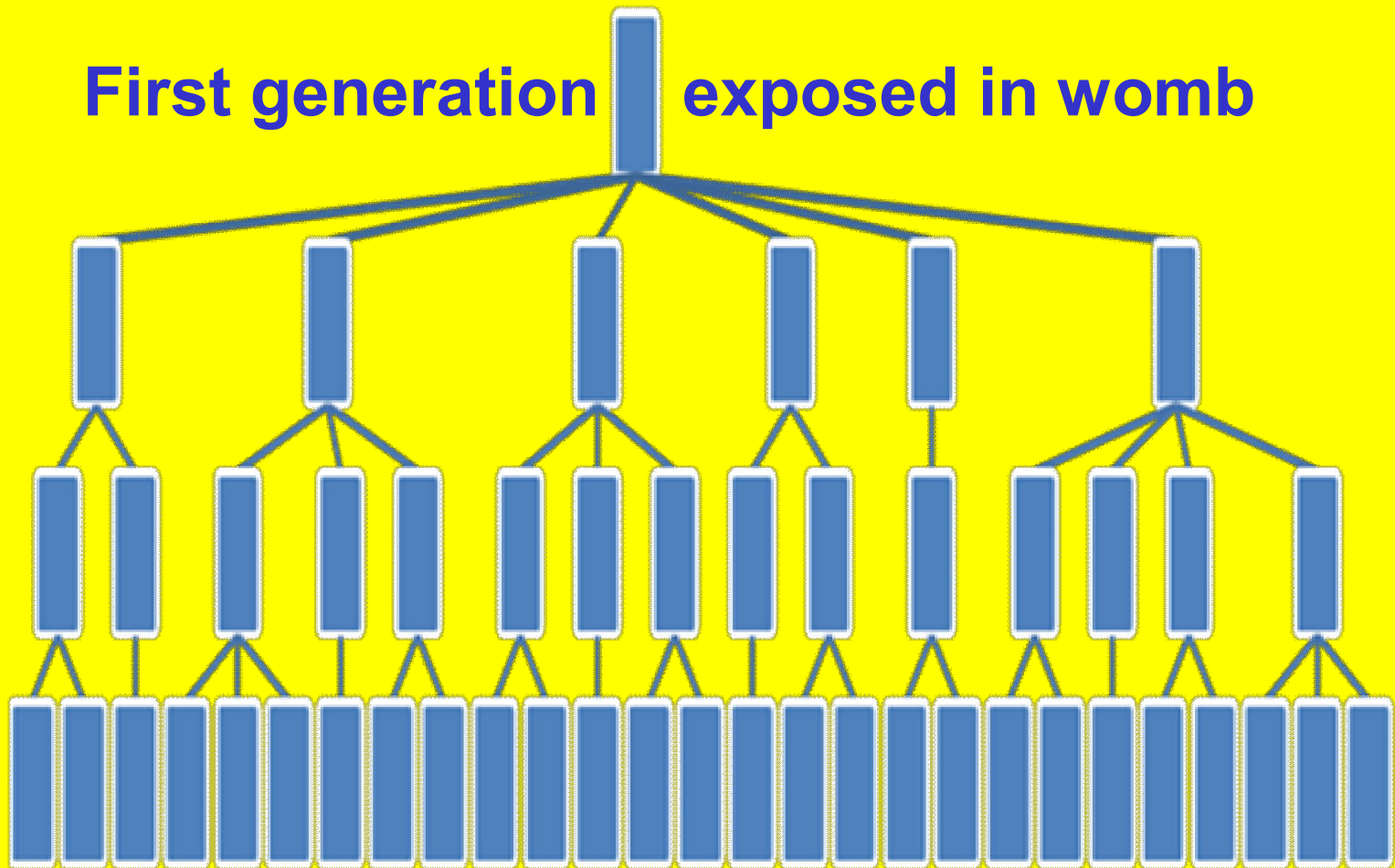
1950's

**First generation exposed in womb**

1970's

1990's

2010's

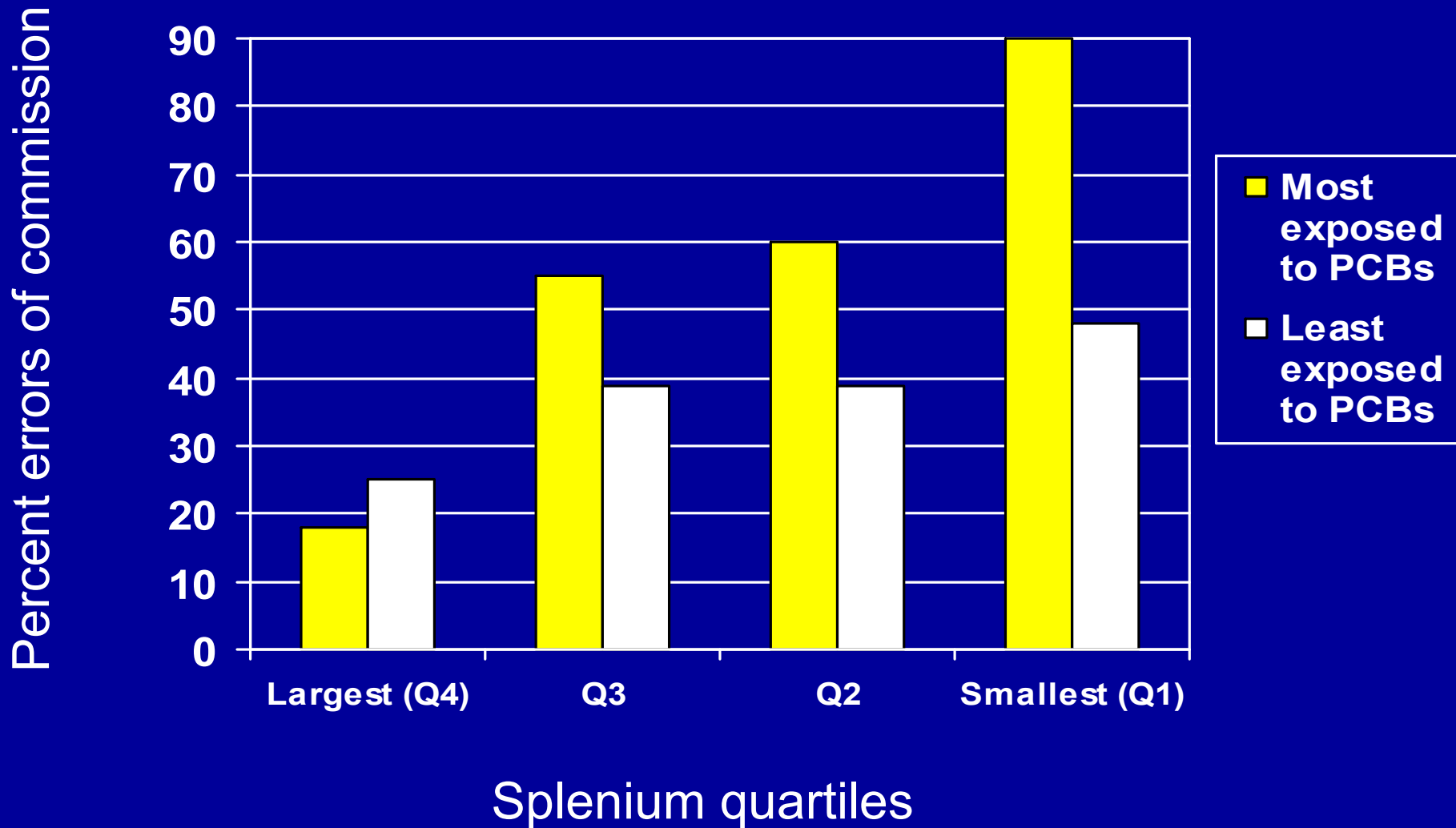


**4<sup>th</sup> generation - great, great grandchildren**



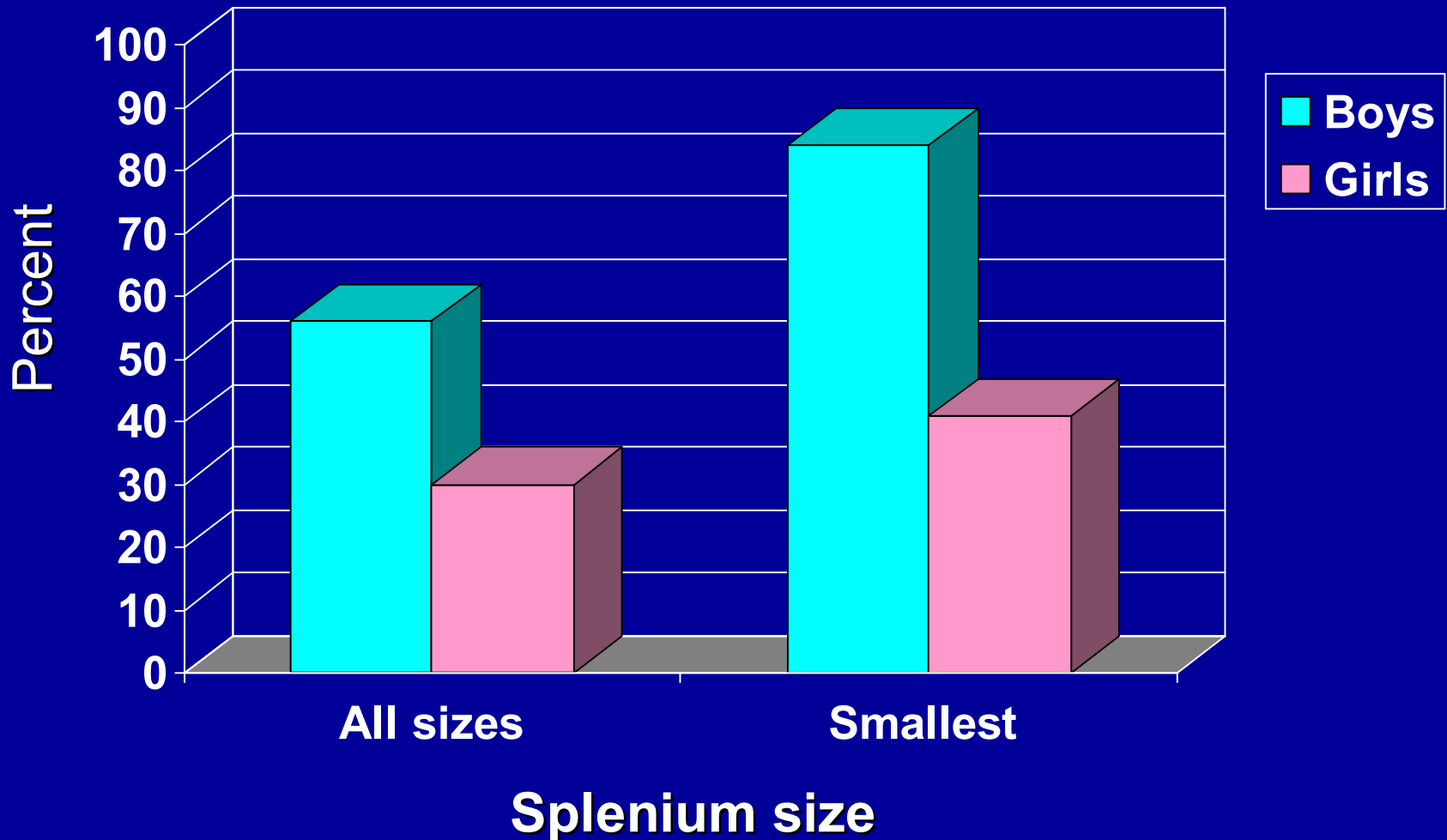
Artist in  
Training

# Relationship between cord PCB and errors of commission as a function of splenium volume





# Percent Errors of Commission by Sex



# Prevalence of medication treatment for attention deficit-hyperactivity disorder among elementary school children in Johnston County, North Carolina.

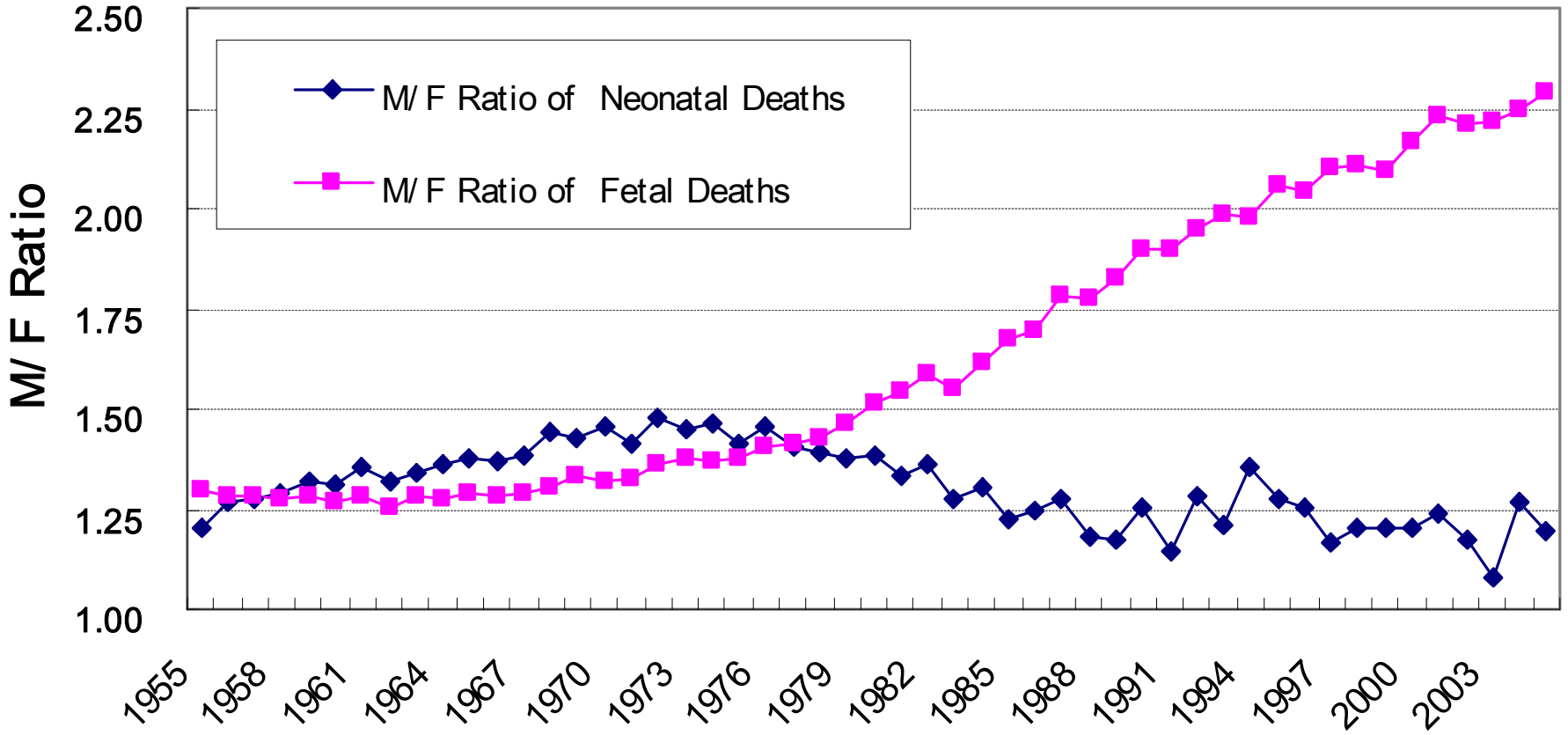
Rowland, A. S.; Umbach, D. M.; Stallone, L.; Naftel, A. J.; Bohlig, E. M., and Sandler, D. P. American Journal of Public Health. 2002; 92(2):231-234.



HEL.. LOOO?!



## M/ F Ratio of Fetal Deaths and Neonatal Deaths - from Vital Statistics of Japan-



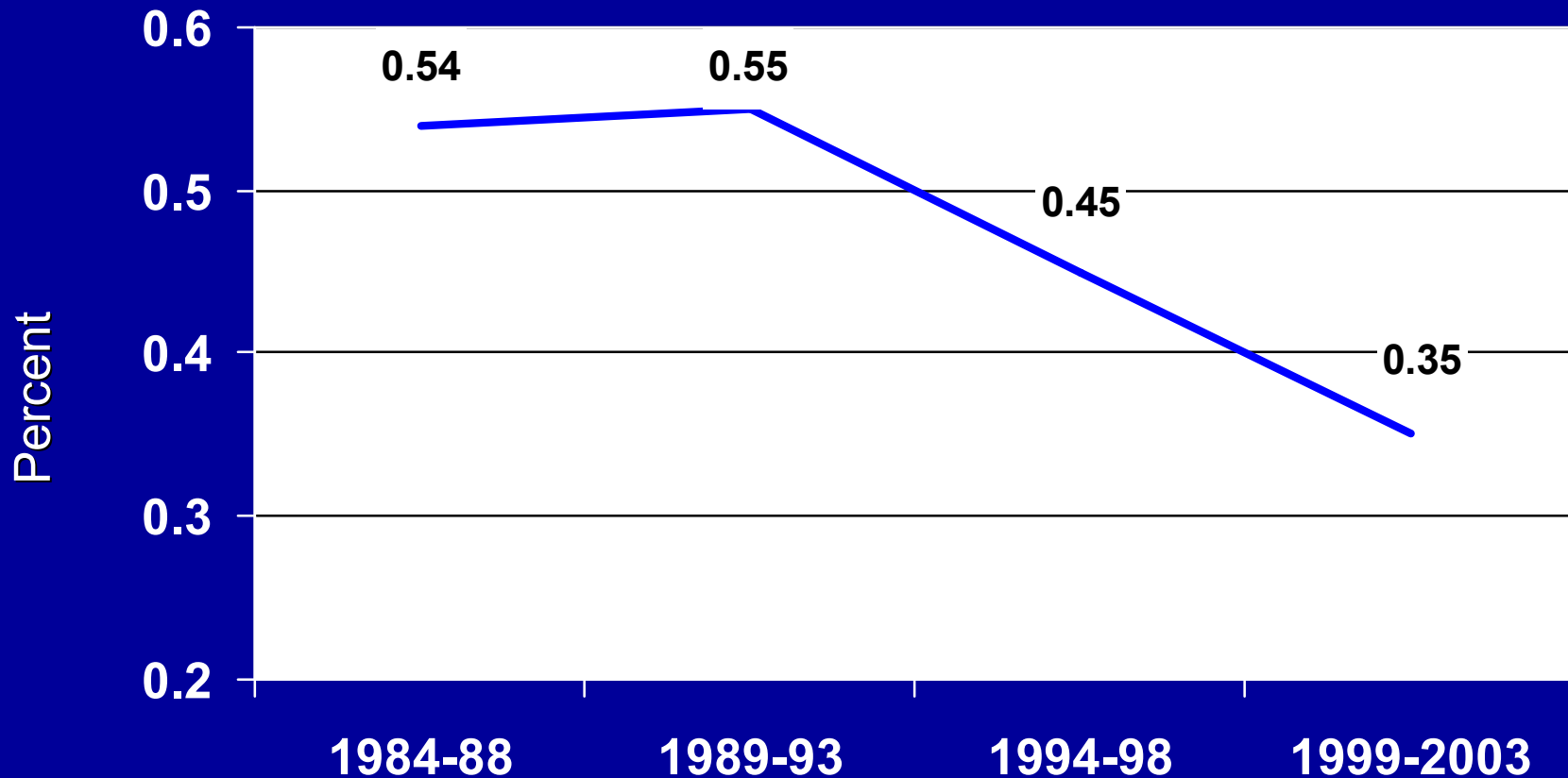
From Mizuno, 2001, NEJM; Updated by permission.

# Declining Sex Ratios in Canada

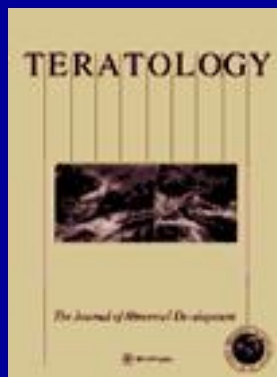


Allan, B. B.; Brant, R.; Seidel, J. E., and Jarrell, J. F.. Canadian Medical Association Journal. 1997; 156(1):37-41. ISSN: 0820-3946.

# Declining sex ratio in a First Nation community



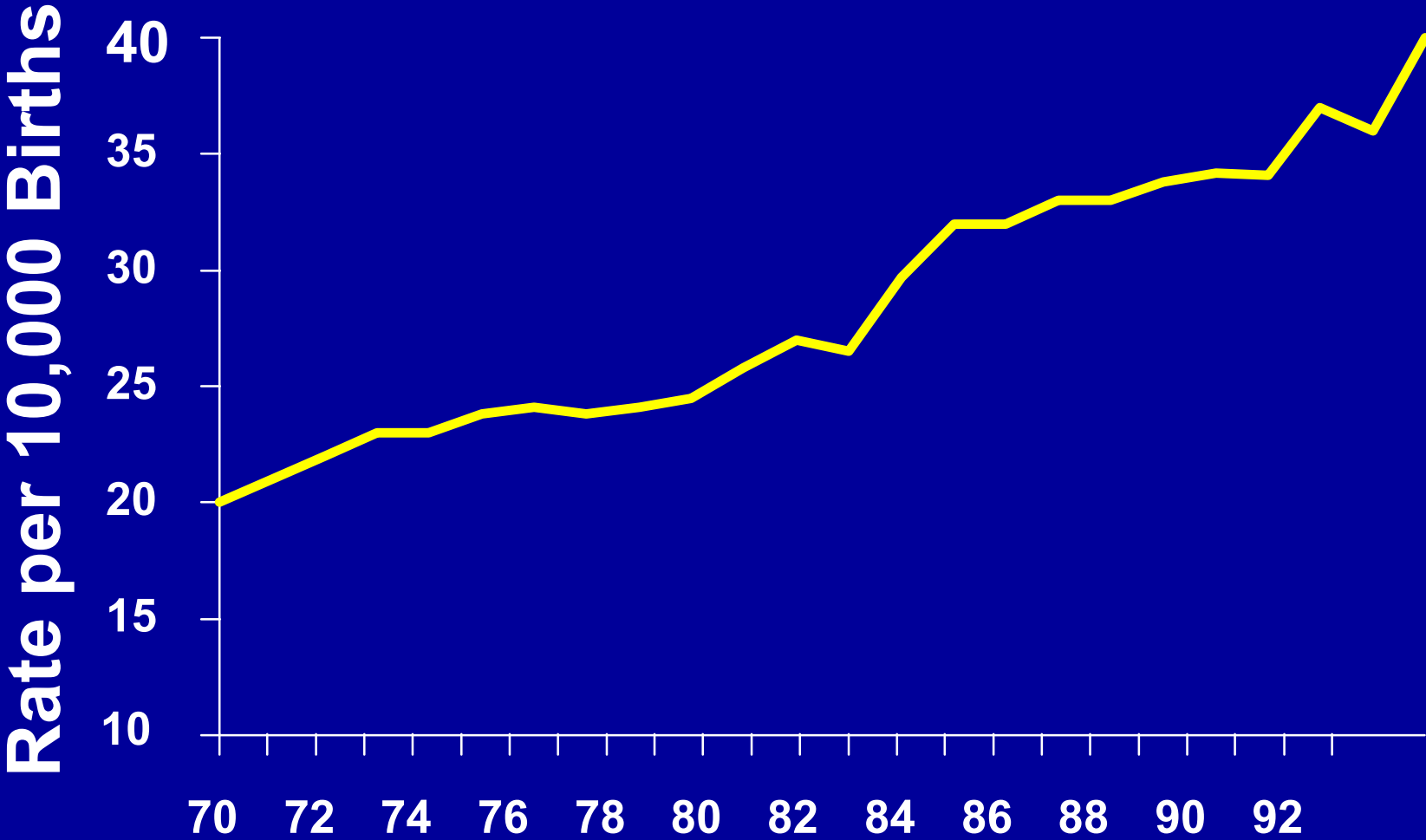
MacKenzie, C.A., Lockridge, A., and Keith, M. Declining sex ratio in a First Nation community. *Environmental Health Perspectives*. 2005; 113(10): 1295-1298.



# **Sex differences in the prevalence of human birth defects: A population-based study**

Lary, J. M. and Paulozzi, L. J. *Teratology*.  
2001; 64(5):237-251.

# HYPOSPADIAS RATES: 1970 - 1993



Year of Birth

Paulozzi et al., 1997





# Hypospadias in sons of women exposed to diethylstilbestrol *in utero*: A cohort study.

Klip, H.; Verloop, J.; van Gool, J. D.; Koster, M. E.; Burger, C. W., and van Leeuwen, F. E. Lancet. 2002; 359(9312):1102-1107.

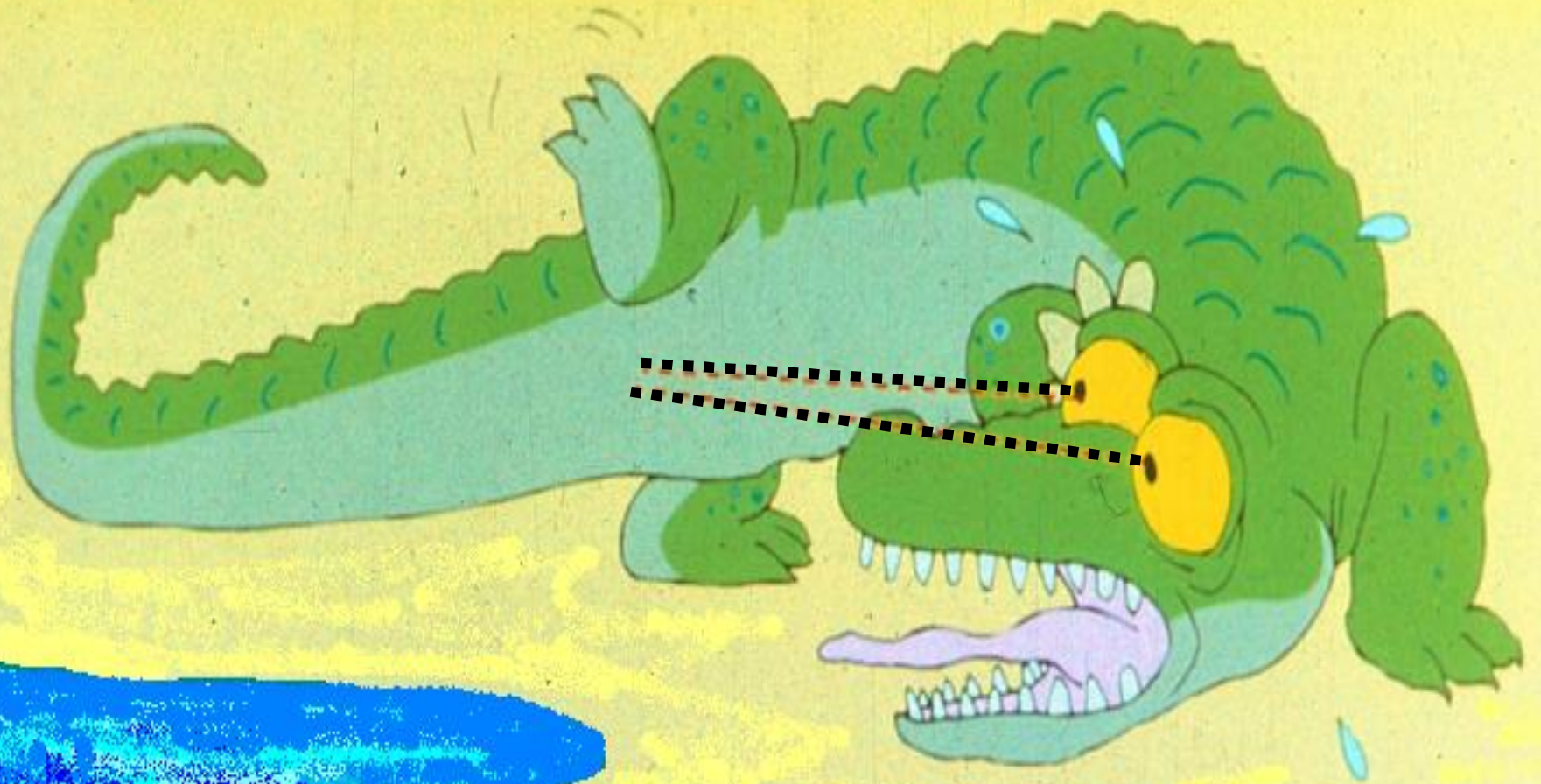
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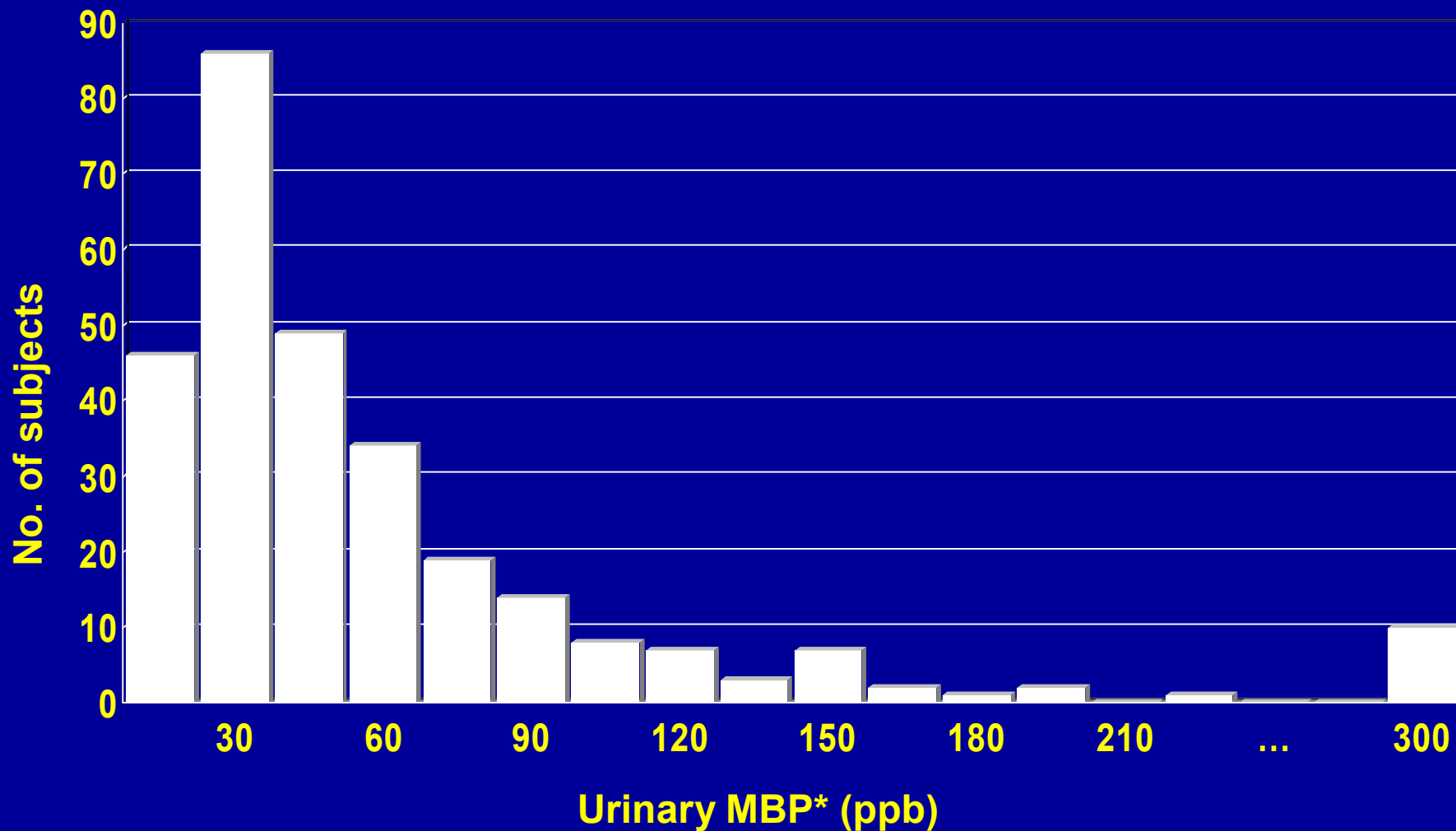






Courtesy of L. Guillette

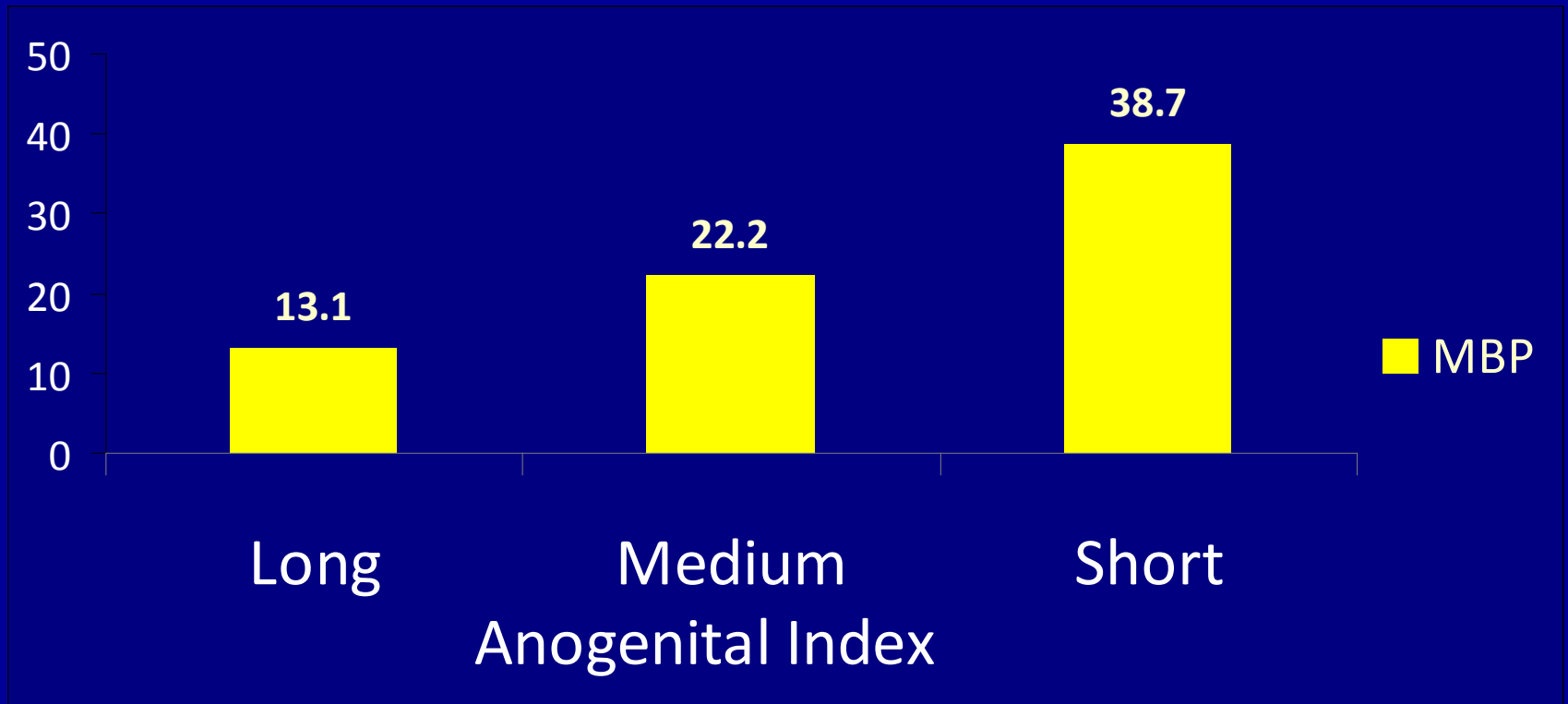
# Monobutyl Phthalate in Spot Urine Samples



\* A metabolite of dibutyl phthalate

Source: Blount, B.C. et al. 2000  
EHP 108: 979-982

# Mean phthalate (MBP) metabolite levels (ppb) by AGI category

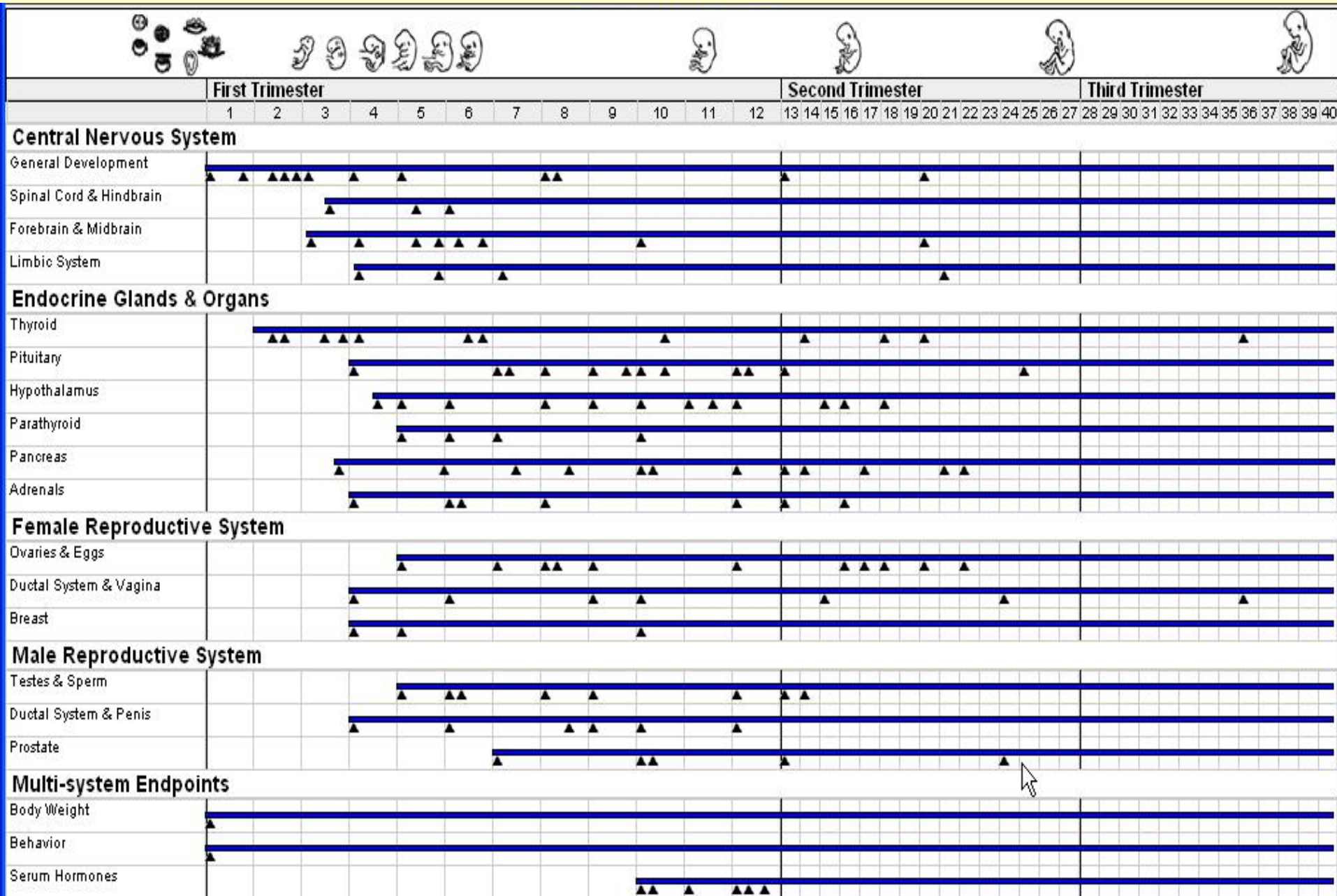




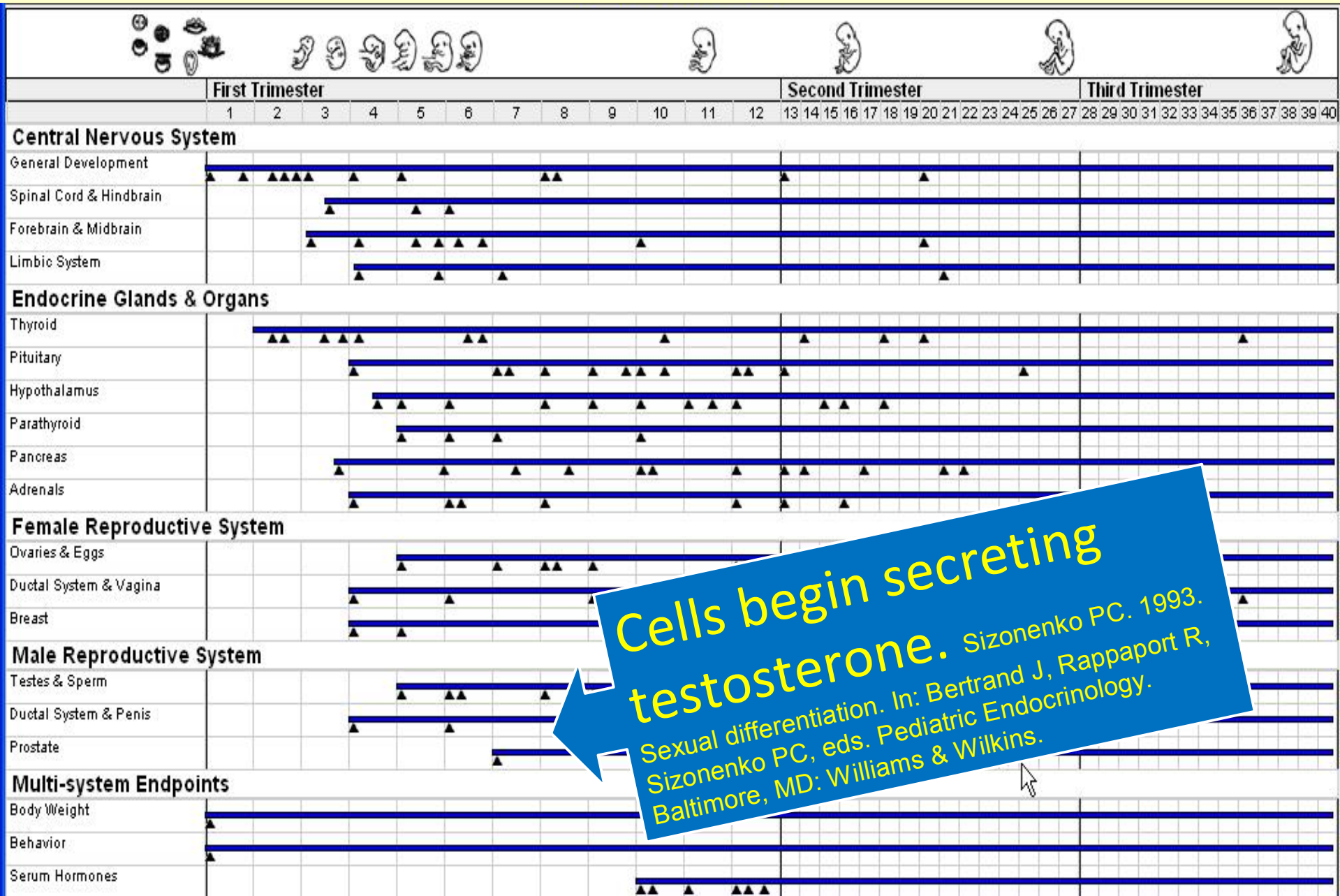
# Male Dysgenesis Syndrome

- Increased incidence of undescended testicles and hypospadias
- Decreased semen quantity and quality
- Increased incidence in testicular cancer
- Increased need for assisted reproduction

# Critical Windows of Development

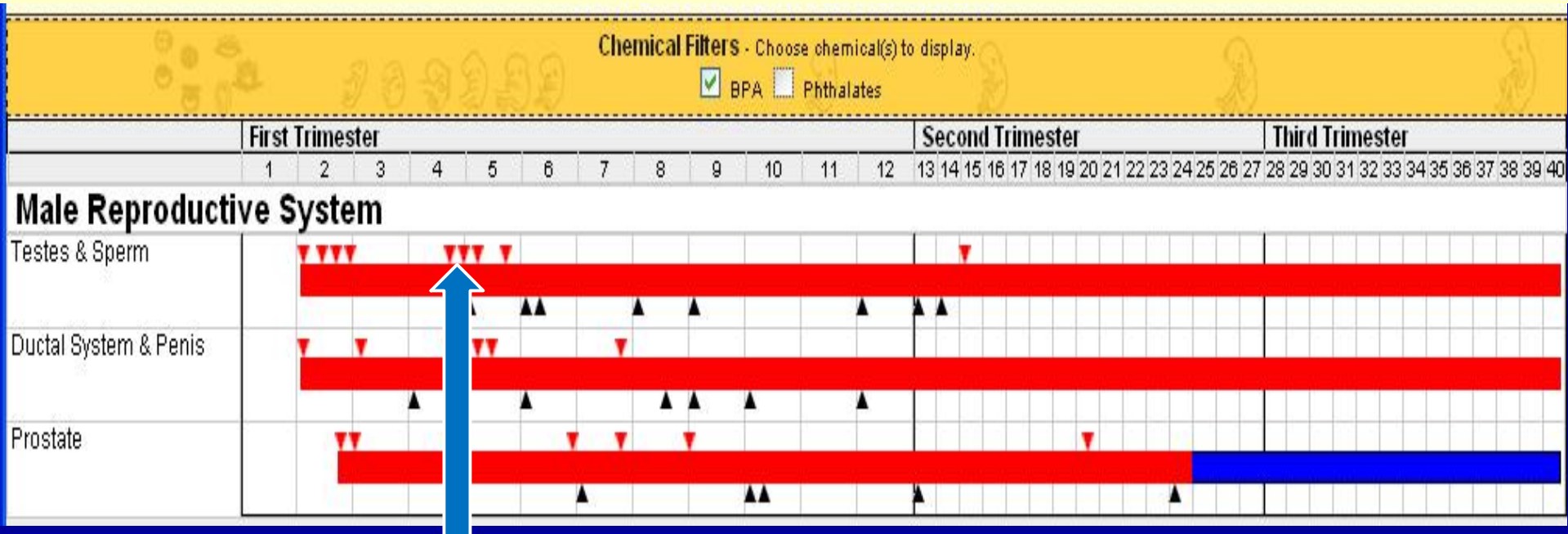


# Critical Windows of Development





# Critical Windows of Development



Decreased testes weight and rate of testosterone production in adulthood

## Study details

Subjects: Long-Evans rats

Doses tested: 2.4  $\mu\text{g}/\text{kg}$  bw/d

Chemical: BPA

Route: delivered through gavage

From gestational day 12 to 21

(comparable to human prenatal weeks 4.65 to 38)

Effects measured in adulthood (90 days of age)

Akingbemi, et al., 2004.



**Think about us – think about  
prevention!**



**Vast numbers of widely dispersed chemicals, derived from fossil fuels, could pose a more imminent threat than climate change to the survival of humans and all living organisms on earth.**





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