

Shanghai Birth Cohort



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Environmental Pollution: a prominent issue



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Global Mercury Emission

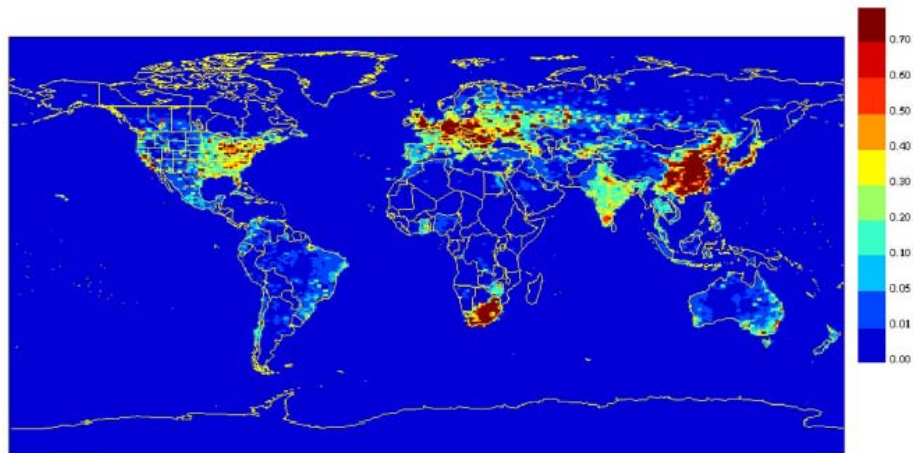


Fig. 1. Global anthropogenic emissions (tons/year).

Dastoor & Larocque, 2004



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China accounts for 1/4 of global mercury emission

Table 5. Global emissions of total mercury from major anthropogenic sources (Mg yr^{-1}).

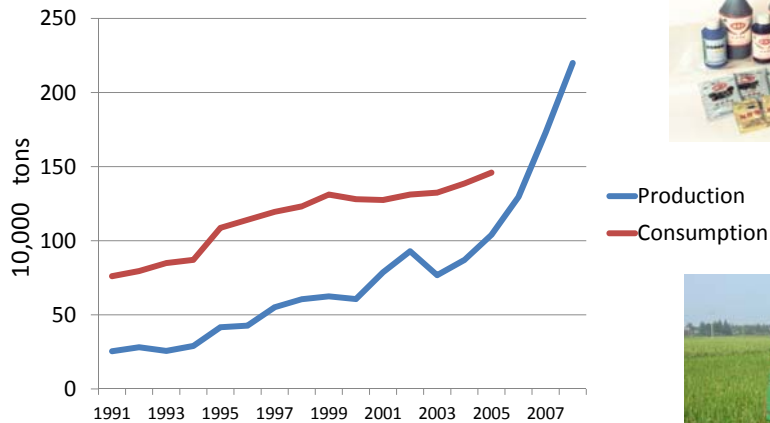
	SC ^a	NFMP	PISP	CP	CSP	MP	GP	WD	O	T	Reference year	Reference ^b
S. Africa	32.6	0.3	1.3	3.8	0.0	0.0	0.3	0.6	1.3	40.2	2004	(1)
China	268.0	203.3	8.9	35.0	0.0	27.5	44.7	14.1	7.6	609.1	2003	(2)
India	124.6	15.5	4.6	4.7	6.2	0.0	0.5	77.4	7.5	240.9	2004	(3)
Australia	2.2	11.6	0.8	0.9	0.0	0.0	0.3	0.2	0.6	16.6	2005	(4)
Europe	76.6	18.7	0.0	18.8	6.3	0.0	0.0	10.1	14.7	145.2	2005	(5)
Russia	46.0	5.2	2.6	3.9	2.8	0.0	4.3	3.5	1.5	69.8	2005	(5)
N. America	65.2	34.7	12.8	15.1	10.3	0.0	0.0	13.0	1.7	152.8	2005	(6)
S. America	8.0	13.6	1.8	6.4	2.2	0.0	16.2	0.0	1.5	49.7	2005	(5)
Total	623.2	302.9	32.8	88.6	27.8	27.5	66.3	118.9	36.4	1324.3		
Rest of the world	186.8	7.1	10.4	147.1	135.1	22.5	333.7	68.5	28.2	939.4	2006	(7)
Total	810.0	310.0	43.2	235.7	162.9	50.0	400.4	187.4	64.6	2319.7 ^c		

Pirrone et al. Atmos Chem Phys 2010;10:5951-64.



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Pesticides Production and Use increased in China



Ministry of Agriculture of China (stats.gov.cn)
Proc Intl Acad Ecol Environ Sci 2011;1:125-44.

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上海优生儿童队列
Shanghai Birth Cohort

Impact on Pregnancy Outcomes

Miscarriage

- Lead, arsenic
- DDT/DDE
- MCPA
- Ethylene oxide
- Drinking water DBPs
- Chlorinated solvents



Fetal Growth Restriction

- Lead
- DDT/DDE
- Smoking, passive smoking
- Drinking water disinfection by-products (DBPs)
- Drinking water nitrate



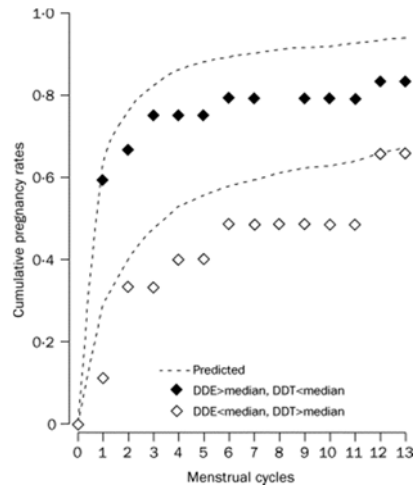
Preterm Birth

- Lead
- DDT/DDE
- Smoking
- Passive smoking
- Air pollution

Wigle et al. J Toxicol Environ Health, part B, 2008;11:373-517.

上海优生儿童队列
Shanghai Birth Cohort

Maternal DDT level and fertility rate in daughters



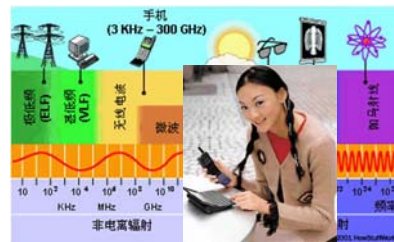
Cohn BA et al. Lancet 2003;361:2205-6.



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Emerging Exposures

Flame retardants



Electronic waves

Plastic additives
PFOS(A)
Triclosan

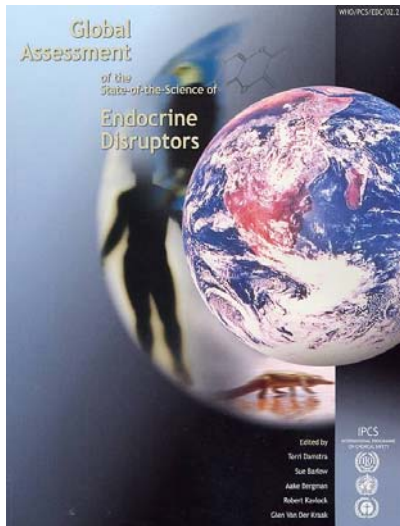


Formaldehyde, flame retardants

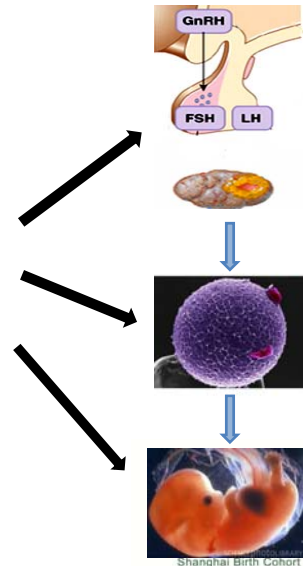


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Environmental endocrine disruptors have serious impact

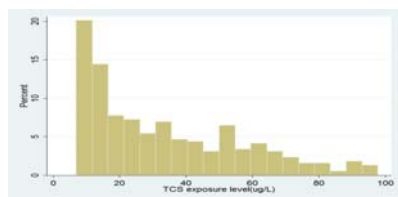
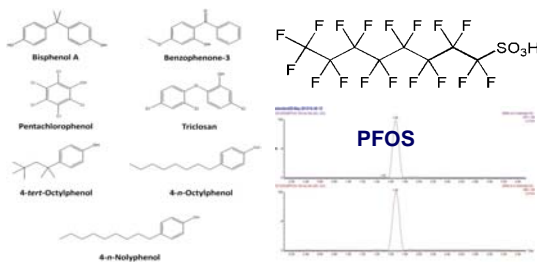


- Widely used with high quantity
- Hard to degrade and excrete
- Long-term, low dose exposure may have cumulative effects



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Pregnant women are widely exposed



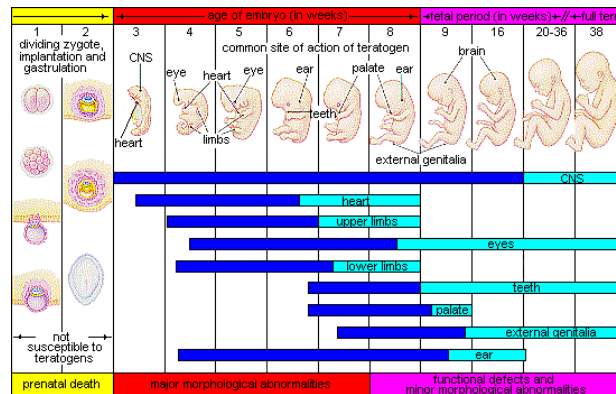
chemicals ^a	selected percentiles			
	50th	75th	90th	95th
Bisphenol A (双酚)	0.60	1.19	2.14	2.87
Pentachlorophenol	0.57	1.41	3.42	4.91
Benzophenol-3	0.39	0.84	2.32	4.16
4-tert-octylphenol	0.23	0.38	0.97	1.92
4-n-octylphenol	0.08	0.27	0.68	1.31
4-n-nonylphenol	0.06	0.16	0.34	0.59
2,3,4-trichlorophenol	0.19	0.41	0.69	1.39
2,4,5-trichlorophenol	0.17	0.28	0.77	1.03
Sum(Trichlorophenol) ^f	0.01	0.03	0.05	0.09
	0.01	0.02	0.05	0.10
	0.01	0.02	0.08	0.11
	0.01	0.02	0.06	0.10
	0.17	0.44	0.89	1.55
	0.16	0.27	0.70	1.02
	0.10	0.22	0.30	0.44
	0.12	0.38	0.73	1.34
	0.34	0.68	1.20	2.06
	0.35	0.68	1.36	2.09

Toxicol Sci, 2011

上海优生儿童队列
Shanghai Birth Cohort

Environmental insults in early life can be damaging

- ▣ Fetus undergoes rapid growth and development
- ▣ Organs, systems and detoxification functions are immature

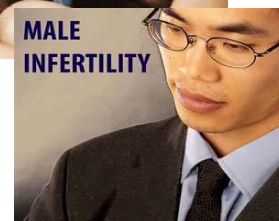
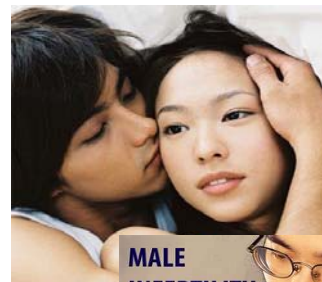


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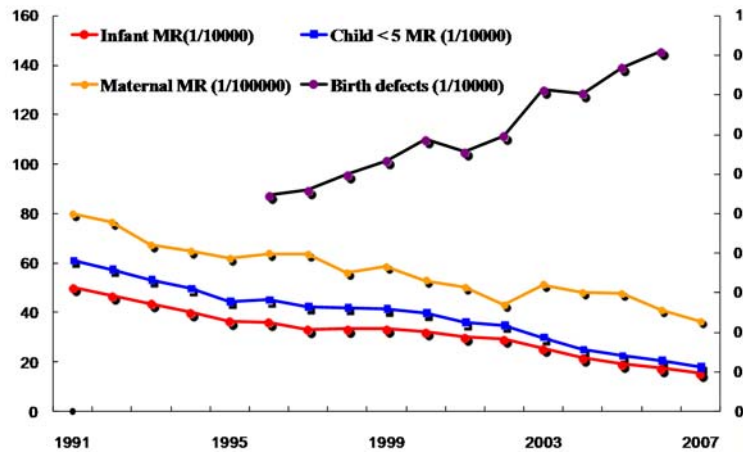


Possible Impact on Reproductive Health

- ▣ In 1988, infertility rate in a national survey was 6.9%
- ▣ In 2010, primary infertility rate was 12%
《中华计划生育杂志》2011
- ▣ 40 million infertile people
2010《中国不孕不育现状调研报告》



Incidence of birth defects is increasing



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Source: 中国卫生部和中国国家统计局 2008 上海优生儿童队列



上海优生儿童队列
Shanghai Birth Cohort

Environmental impact on young life is greater



- ▣ Larger absorption area
- ▣ More food, water, air intake per body weight unit
- ▣ Higher rate of intestinal absorption
- ▣ Faster breath with mouth
- ▣ Crawl and hand-to-mouth behavior



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上海优生儿童队列
Shanghai Birth Cohort

Chemical Pollutants and Child Health

- ▣ Birth defects
- ▣ Neurological development
 - Mental retardation, autism, ADHD
- ▣ Development of immune system
 - Asthma, food allergy, atopic dermatitis
- ▣ Reproductive endocrine system
 - Sexual prematurity



Childhood Diseases in China

- ▣ Asthma survey
 - Chongqing 3.34% in 2000; 7.45% in 2010
- ▣ Between 1996 and 2006, prevalence of overweight and obesity in children aged 0 – 6 years increased 4-5 times
 - In 2006, overweight = 19.8% ; obese = 7.2%

中华儿科杂志 2008;46:179-84.



Earlier onset of menarche

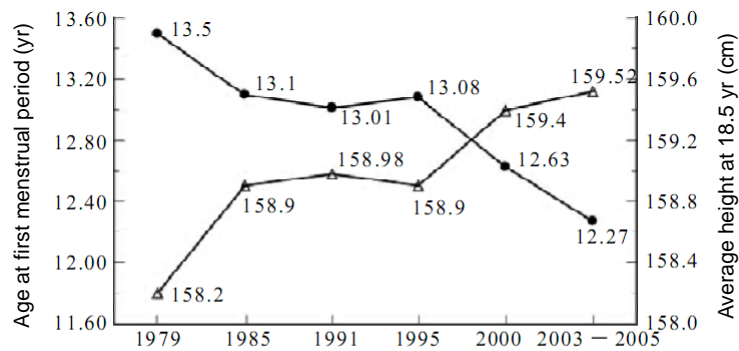


Fig.3 Changes by year in girl's age at first menstrual period and average height in adulthood in Chinese cities since 1979

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PEDIATRICS 2009;124(2):e269-e277
PEDIATRICS 中文版 2010年1月 第5卷 第1期



上海优生儿童队列
Shanghai Birth Cohort

Developmental Origins of Health and Diseases (DOHaD)



- **Pediatric diseases**
 - congenital malformation, mental retardation, asthma , autism , ADHD
- **Adulthood diseases**
 - cardiovascular disorders, diabetes, tumor, mental disorders, osteoporosis

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上海优生儿童队列
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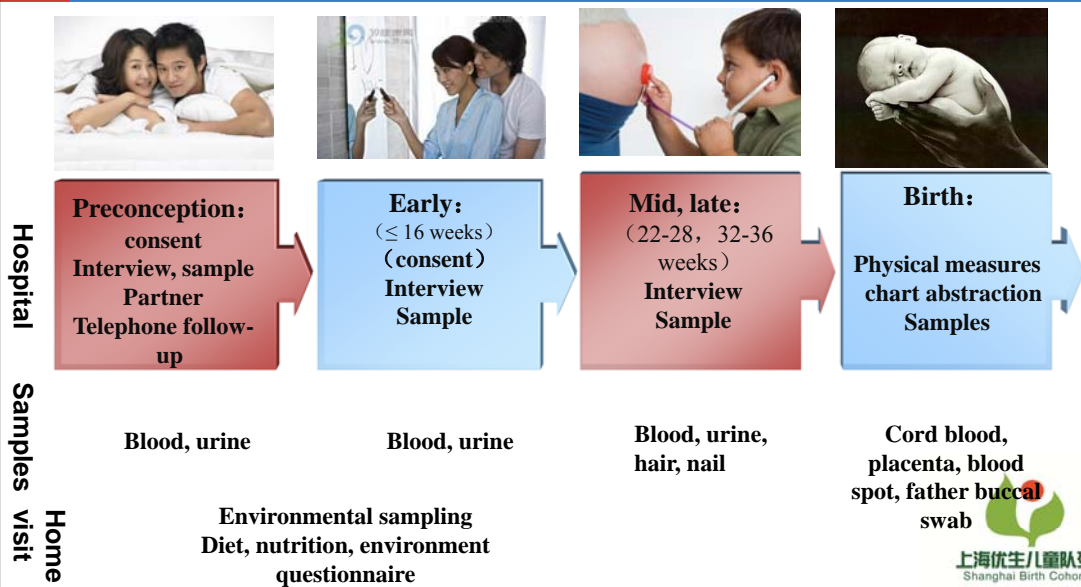
To study the effects of genetic, environmental and behavioral factors on reproductive health, pregnancy outcomes, child growth, development and risks of diseases.



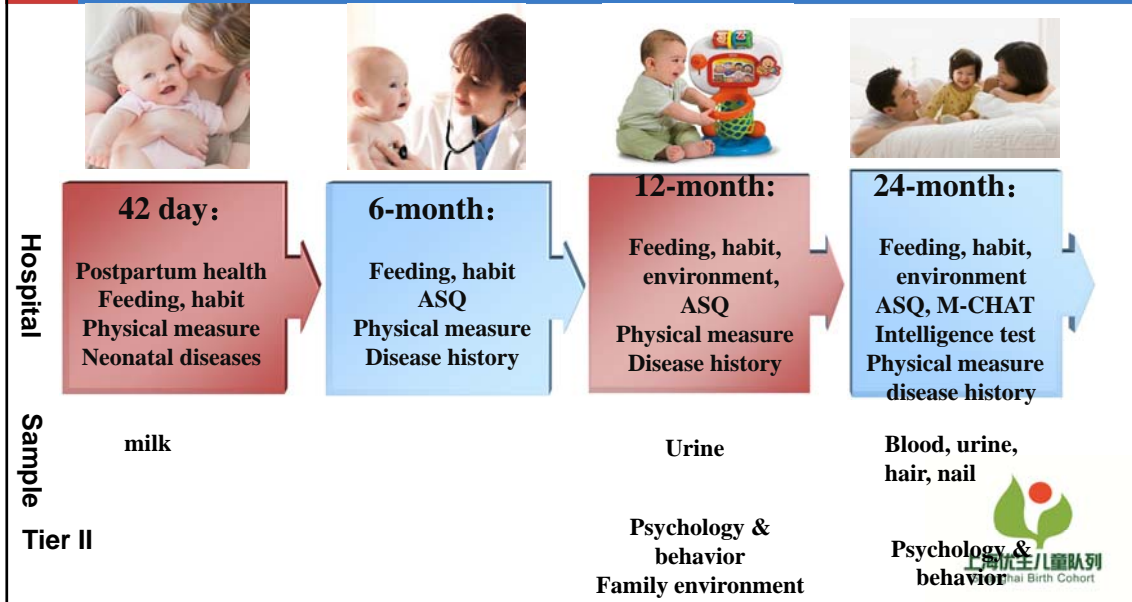
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Study Flow: pregnancy



Study Flow: child



Rigorous data and sample collection process



Phase I Timeline

- ▣ **Dec. 2012 Complete study design to 2 years old**
- ▣ **July. 2013 Start pilot study in 2 hospitals**
- ▣ **Dec. 2013 Launch the full Shanghai Birth Cohort**
- ▣ **One year for recruitment of the first 4000 women/couples**
- ▣ **Follow up to 2 years of age**

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Key scientific questions proposed

- ▣ Impacts of emerging environmental endocrine disrupters on infertility, abortion and adverse pregnancy outcomes
- ▣ Impacts of environment-gene interaction on birth defects
- ▣ Impacts of mental stress and micronutrients during pregnancy on child development and diseases
- ▣ Impacts of early life exposure to environmental pollutants on children' s neurological and mental development and allergies
- ▣ Impacts of environmental endocrine disrupters on child obesity and Child Precocious Puberty
- ▣ Impacts of early life familial and social environment on adolescent psychological and behavioral development

Provide evidence for environment and health-related policy making

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***For Healthier Future
Generations !***

