



### Interconception & Preconception Health: Keys to Improving the Life Course Trajectory

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### Is her potential for the best health already determined?




### Smoking

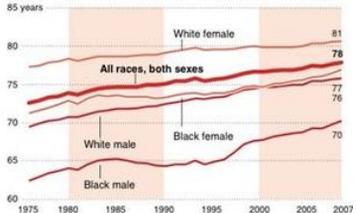



### Diethylstilbestrol "Really?"

- Synthetic non-steroidal pharmaceutical with estrogenic activity
- Widely prescribed in late 1940s -1970s to erroneously prevent miscarriage and complications of pregnancy

Risks for DES-Exposed Daughters Compared to Non-Exposed	Increased Risk
Clear-cell adenocarcinoma	40 times higher
Neonatal death	8 times higher
Pre-term delivery	4.7 times higher
Loss of 2nd trimester pregnancy	3.8 times higher
Ectopic pregnancy	3.7 times higher
Stillbirth	2.4 times higher
Infertility	2.4 times higher
Early menopause	2.4 times higher
Cervical intraepithelial neoplasia	2.3 times higher
Breast cancer	1.8 times higher
First trimester miscarriage	1.5 times higher
Pre-eclampsia	1.4 times higher

Newbold, R.R., Lessons learned from perinatal exposure to diethylstilbestrol. *Toxicol Appl Pharmacol* 2004; 199(2): p. 142-50.  
~~Reproductive and developmental consequences of prenatal exposure to DES. In: European Agency for the Safety and Health of Consumers. Late lessons from early warnings: The precautionary principle 1998-2000. Environmental Issue Report No. 22. Luxembourg: Office for Official Publications of the European Communities; 2001. p. 22/en.~~

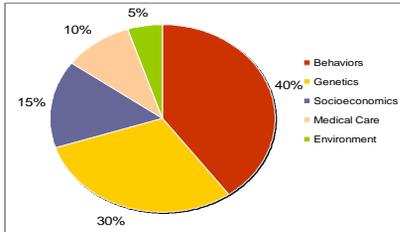
### U.S. life expectancy up

Life expectancy at birth has risen to a new high, now standing at nearly 78 years. The increase is due mainly to falling rates in almost all the leading causes of death.

U.S. life expectancy 1975-2007 (preliminary)

Year	White female	All races, both sexes	White male	Black female	Black male
1975	~75	~73	~70	~68	~65
1980	~76	~74	~71	~69	~66
1985	~77	~75	~72	~70	~67
1990	~77	~75	~72	~70	~67
1995	~77	~75	~72	~70	~67
2000	~77	~75	~72	~70	~67
2005	~77	~75	~72	~70	~67
2007	81	78	77	76	70

SOURCE: Centers for Disease Control and Prevention

### Causes of Death in the U.S.

Cause	Percentage
Behaviors	40%
Genetics	30%
Socioeconomics	15%
Medical Care	10%
Environment	5%

40% is due to health-related behaviors. Since we know that health behaviors can be changed, it follows that programs of health behavior change should be systematically incorporated into any plan for comprehensive health care

McGinnis JM, Foegle WH. Actual Causes of Death in the United States. *JAMA* 1993;270:2207-12.  
 Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual Causes of Death in the United States, 2000. *JAMA* 2004;291:1230-1245.



### What Influences Health

**Cumulative Impact**  
Psychosocial and physiological experiences and environments during early and later life accumulate to influence adult disease risk

**Critical Periods**  
Certain early life events may have strong independent effects on adult health

**Pathways**  
Early life events and environments influence later life experiences, opportunities, and health risk factors.

**Social Mobility Model**  
SES mobility across the life course impacts adult health, although the different proposed theories posit different health effects

**Lifecourse**  
Early Childhood, Adolescence, Young Adult, Midlife, Menopause

Healthy People 2020 www.healthypeople.gov  
Power C, Hertzman C. Social and biological pathways linking early life and adult disease. *Br Med Bull* 1997; 53:210-221

### What Influences Health

**Cumulative Impact**

- Stressors and exposures can accumulate over time
- Health and Function affected
- Elevated Cortisol<sup>1</sup>
- Weathering Hypothesis:<sup>2</sup>
- Allostatic Load
- Maternal exposure to the stress associated with racism is independently associated with poorer birth outcomes such as low birth weight and very low birthweight<sup>3</sup>

**Critical Periods**

**Pathways**

**Social Mobility Model**

**Lifecourse**  
Early Childhood, Adolescence, Young Adult, Midlife, Menopause

Healthy People 2020 www.healthypeople.gov  
LU & Hailon, 2003  
Collins, David, Handler, Wall & Andes, 2004; Mustillo, et al., 2004  
Power C, Hertzman C. Social and biological pathways linking early life and adult disease. *Br Med Bull* 1997; 53:210-221  
Geronimus 1992, 1996

### Cumulative Impact: Allostatic Load

❖ Physiological consequences of chronic exposure to fluctuating or heightened neural or neuroendocrine response from repeated or chronic stress

❖ Over time, the overexposure to neural, endocrine, and immune stress mediators can have adverse effects on various organ systems, leading to disease.

Individual differences (genes, development, experience) → Perceived stress (stressors, appraisals) → Behavioral responses (fight or flight, personal behavior - diet, smoking, drinking, exercise) → Physiologic responses → Adaptation

Allostatic Load

McEwen and Stellar in 1993

### Adverse Childhood Experiences (ACE) study

- 9,508 Kaiser-Permanente adults
- 7 categories of childhood exposure
  - Abuse: psychological, physical, sexual
  - Dysfunction: substance abuse, mental illness, domestic violence, criminality
- 10 health risk factors
  - Smoking, obesity, inactivity, depressed mood, suicide attempts, alcoholism, drug abuse, parenteral drug abuse, >50 sexual partners, history of STDs.
- Disease conditions:
  - Ischemic heart disease, cancer, stroke, COPD, diabetes, hepatitis, skeletal fractures, general health rating

Felitti V, Anda R et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. *Am J Prev Med* 1998;14:245-258.

Mother, Father → Genetic and epigenetic inheritance → Developmental plasticity (mediated by epigenetic and morphological changes) → Predicted sparse environment, Predicted average environment, Predicted rich environment → Adult phenotype

Intergenerational nongenomic effects

From Gluckman et al NEJM 2008

### What Influences Health

**Cumulative Impact**

- Experiences and exposures during development
- Influence the function of systems or organs in a way that later may determine health or disease
- Stressors and exposures can accumulate over time

**Critical Periods**

**Pathways**

**Social Mobility Model**

**Lifecourse**  
Early Childhood, Adolescence, Young Adult, Midlife, Menopause

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### On the right path?

**Life course Trajectory**

**Pediatric Growth Chart**

Adapted from Nordio S. 1978. Needs in Child and Maternal Care. Rational Utilization and Social-Medical Resources. *Rivista Italiana di Pediatria* 4:3-20.

### Life Course Key Concepts

- Today's experiences and exposures influence tomorrow's health. (Timeline)
- Health trajectories are particularly affected during critical or sensitive periods. (Timing)
- The broader community environment—biologic, physical, and social—strongly affects the capacity to be healthy. (Environment)
- While genetic make-up offers both protective and risk factors for disease conditions, inequality in health reflects more than genetics and personal choice. (Equity)

<http://mchb.hrsa.gov/lifecourse/rethinkingmchlifecourse.pdf>

### Life Course Theory

White

African American

Adapted from Lu MC, Hillon N. Racial and ethnic disparities in birth outcomes: a life-course perspective. *Maternal and Child Health Journal* 2003; 7:13-30.

### Barker Hypothesis

Based on medical archives from Preston, Hertfordshire, and Sheffield, England

↔ 16,000 men and women born in Hertfordshire, 1911- 1930

↔ Fetal under-nutrition: Associated with Adult Obesity, CVD, Type II DM

↔ 2 fold increase in coronary heart disease from largest to smallest birth weight

↔ Impaired GT increased from 14% to 40%

Barker DJP. Mothers, Babies and Health in Later Life. Churchill Livingstone, 1990

Barker, et al Clin Sci 1998; 115:118

### Thrifty Phenotype Hypothesis

Haugen et al (2005) *Circulation Res* 96:12-14

Hales and Barker *Diabetologica* 1992; 35: 595

### What happens inside matters outside

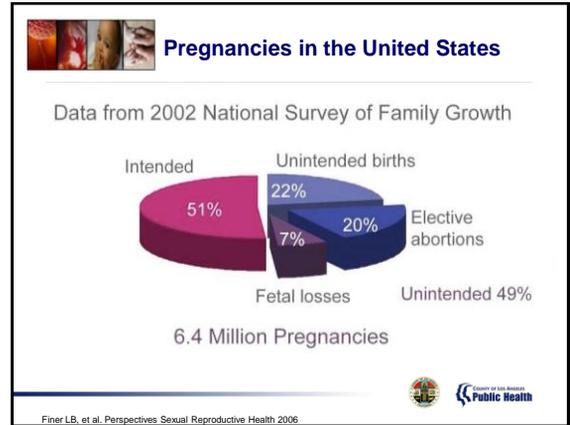
- Antenatal stress associated with:
  - Quebec Ice Storm -1998 - loss of electricity & water for up to 5 weeks
  - Children had lower Mental Development Index scores
  - Lower language development scores
  - These held when controlling for Ob complications, birth weight , post partum depression (LaPlante et al, 2004)

### Chinese Famine Rate of Schizophrenia

Year of birth	Adjusted risk	P
1959	0.89 (0.78-1.03)	0.13
1960	2.30 (1.99-2.65)	<0.001
1961	1.93 (1.68-2.23)	<0.001
1962	0.95 (0.87-1.04)	0.28

Proportion of familial cases unchanged (17-18%)

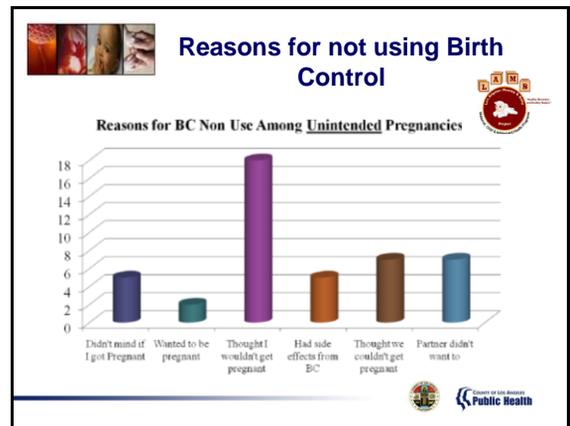
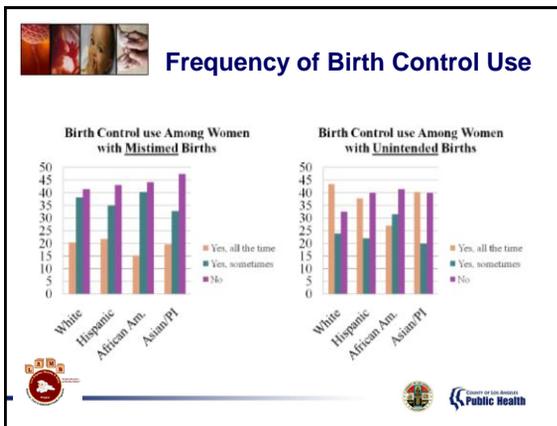
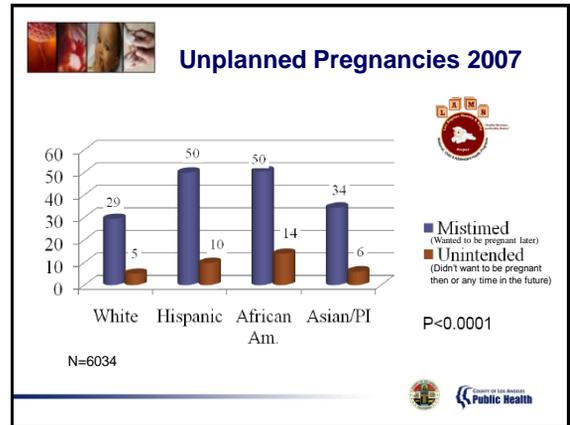
St. Clair, et al. JAMA 2005; 294:557

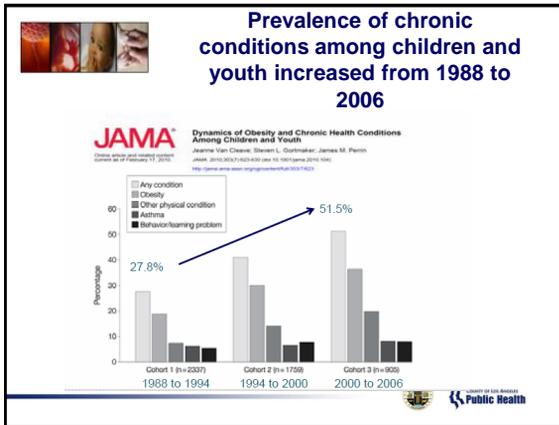
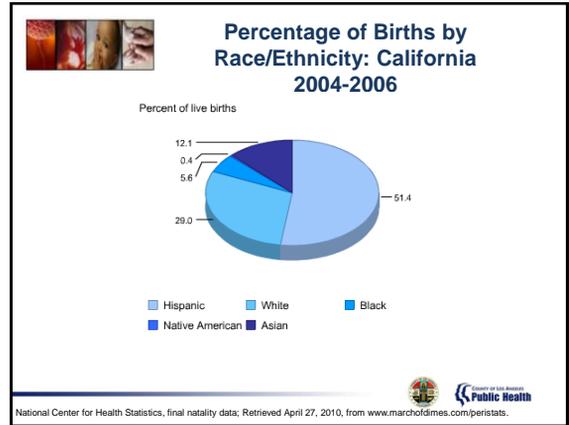
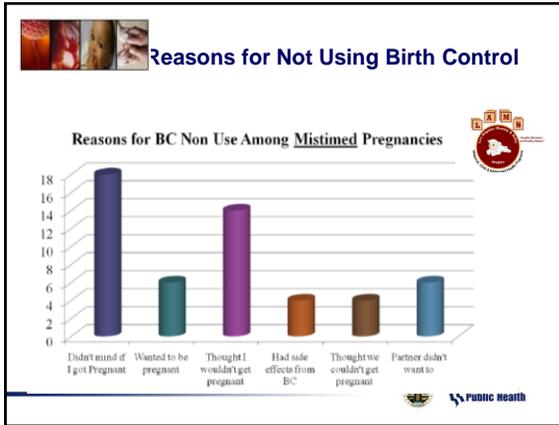


### The Impact of Unintended Pregnancies: Prenatal and Perinatal Risks

- ❖ Inadequate or delayed initiation of prenatal care
- ❖ Smoking/drinking/substance use during pregnancy
- ❖ Prematurity
- ❖ Low birth weight
- ❖ Reduced likelihood of breastfeeding

Brown, SS. The best intentions: unintended pregnancy and the well-being of children and families. Washington, DC: National Academy Press, 1995.





### Chronic Disease in Women Los Angeles County

	Health Equity 2010 Target	Los Angeles County	Los Angeles County Women	Latina	White	African-American	Asian/Pacific Islander
<b>INCIDENCE/PREVALENCE</b>							
<b>Heart Disease</b>							
• Percent of adults diagnosed with heart disease*	N/A	8.8	8.8	8.8	8.1	8.3	3.4*
• Percent of adults at risk for heart disease*	N/A	36.1	36.2	37.7	35.5	42.2	27.2
<b>Diabetes*</b>							
• Percent of adults diagnosed with diabetes	2.5	8.1	8.3	10.1	6.9	11.5	7.8
<b>Hypertension*</b>							
• Percent of adults diagnosed with hypertension	14.0*	23.4	23.3	21.8	25.0	30.4	15.9
<b>Cholesterol*</b>							
• Percent of adults diagnosed with high cholesterol	17.0*	23.7	24.8	24.3	26.8	21.4	19.7
<b>Asthma*</b>							
• Percent of adults diagnosed with current asthma	N/A	8.5	8.2	8.8	10.4	11.3	5.1
<b>Arthritis*</b>							
• Percent of adults diagnosed with arthritis	N/A	18.1	19.8	18.9	20.6	22.2	14.2
<b>Depression*</b>							
• Percent of adults diagnosed with depression	N/A	12.9	16.1	16.1	18.4	17.5	8.2

Source: Los Angeles County Department of Public Health, Office of Women's Health, Health Indicators for Women in Los Angeles County: Highlighting Disparities by Ethnicity and Insurance Status, May 2007.

### World Health Assembly

(May 2004)

"A life-course perspective is essential for the prevention and control of non-communicable diseases.

This approach starts with maternal health and prenatal nutrition, pregnancy outcomes, exclusive breastfeeding for six months, and child and adolescent health; reaches children at schools, adults at worksites and other settings, and the elderly; and encourages a healthy diet and regular physical activity from youth into old age."

Source: University of California, Los Angeles, Center for Population Research and Program on Population and Family Change. Retrieved April 27, 2010, from www.marchofdimes.com/peristats.

### Interconception Care

❖ care for women between pregnancies

❖ may prevent recurrence of some poor pregnancy outcomes

A woman who had a baby affected by neural tube defect, her recurrence risk during the next pregnancy can be reduced in half by taking 4 mg of folic acid daily starting at least one month prior to the pregnancy (CDC 1991).

Source: Centers for Disease Control and Prevention, National Center on Birth Defects and Developmental Disabilities.

Source: University of California, Los Angeles, Center for Population Research and Program on Population and Family Change. Retrieved April 27, 2010, from www.marchofdimes.com/peristats.

## Preconception Care

Can improve preexisting conditions that adversely affect pregnancy and birth outcomes

Risk Factor	Major Birth Defects	Preconceptional Interventions
Maternal phenylketonuria (PKU)	Mental retardation, Microcephaly	Dietary restriction
Ethanol	Fetal alcohol syndrome, Mental retardation	Cessation of alcohol use prior to pregnancy
Cocaine	Congenital urogenital anomalies	Cessation of cocaine use prior to pregnancy
Diabetes mellitus	Neural tube defects, Cardiac anomalies	Screening & control of blood sugar
Rubella	Mental retardation, Congenital deafness, Congenital cataracts	Rubella vaccination prior to pregnancy
Accutane	Central nervous system & Cardiac defects, Craniofacial defects	Cessation of use prior to pregnancy
ACE inhibitors	Renal disease	Change in anti-hypertensive therapy
Fragile X syndrome	Mental retardation	Genetic screening & counseling
Cystic fibrosis	Lung disease	Genetic screening & counseling

Alan Guttmacher Institute 1993.

## Interconception Guidelines

Every Woman California.

- Alcohol Algorithm
- Domestic Violence Algorithm
- Hepatitis Algorithm
- Oral Contraception Algorithm
- Pregnancy Birth Algorithm
- Substance Use Algorithm
- Thyroid Disorder Algorithm
- Anemia Algorithm
- Gestational Diabetes Algorithm
- HIV Algorithm
- Postpartum Depression Algorithm
- Prior Cesarean Section Algorithm
- Syphilis Algorithm
- Tobacco Use Algorithm
- Chronic Hypertension Algorithm
- Gonorrhea & Chlamydia Algorithm
- Migraine Algorithm
- Precocious Puberty Algorithm
- Secure Algorithm
- Thrombocytopenia Algorithm
- Vaccinations Algorithm

## Developmental Origins of Adult Health and Disease Hypothesis

From McMillen & Robinson 2005

## Chance to Alter Outcome in Maternal Mortality

Clinical Causes of Death	Chance to Alter Outcome				Total
	Strong/Good (N)	%Strong/Good	Some (N)	None (N)	
Obstetric hemorrhage	7	70%	2	1	10
Sepsis/Infection	5	63%	3	0	8
Preeclampsia/eclampsia	9	60%	6	0	15
Deep vein thrombosis/pulmonary embolism	3	37%	4	1	8
Cardiomyopathy and other cardiovascular causes	5	29%	12	2	19
Amniotic fluid embolism	0	0	12	2	14
All other causes of death*	7	32%	8	7	22
<b>TOTAL</b>	<b>36</b>	<b>38%</b>	<b>47</b>	<b>13</b>	<b>96**</b>

From California Pregnancy-Associated Mortality Review: Report from 2002 and 2003 Maternal Death Reviews. Sacramento: California Department of Public Health, Maternal Child and Adolescent Health Division; 2011.

## Newsroom

### Affordable Care Act Rules on Expanding Access to Preventive Services for Women

- Prevention benefits without co-pays, co-insurance or deductibles
- Plans that start on or after August 1, 2012

- Well-woman visits
- Gestational diabetes screening
- HPV DNA testing for women 30 years and older
- STI counseling
- HIV screening and counseling
- FDA-approved contraception methods /counseling
- Breastfeeding support, supplies & counseling
- Domestic violence screening & counseling

## U.S. Medical Eligibility Criteria for Contraceptive Use, 2010

Adapted from the World Health Organization Medical Eligibility Criteria for Contraceptive Use, 4th ed.

http://www.cdc.gov/mmwr/pdf/rr/r59e0528.pdf

