

# Health and Energy, Making the Connections

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NYSERDA LIFE Statewide Conference  
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**LIFE**

Low-Income Forum on Energy

CENTER  
BOSTON  
MEDICAL

EXCEPTIONAL CARE. WITHOUT EXCEPTION.



School of Medicine

Children's HealthWatch (Previously the Children's Sentinel Nutrition Assessment Program – C-SNAP) is:

A research center made up of a national network of clinicians and public health specialists for research in multiple pediatric settings on the effect of U.S. social policy on young, low-income children's health and nutrition.

Research sites in:

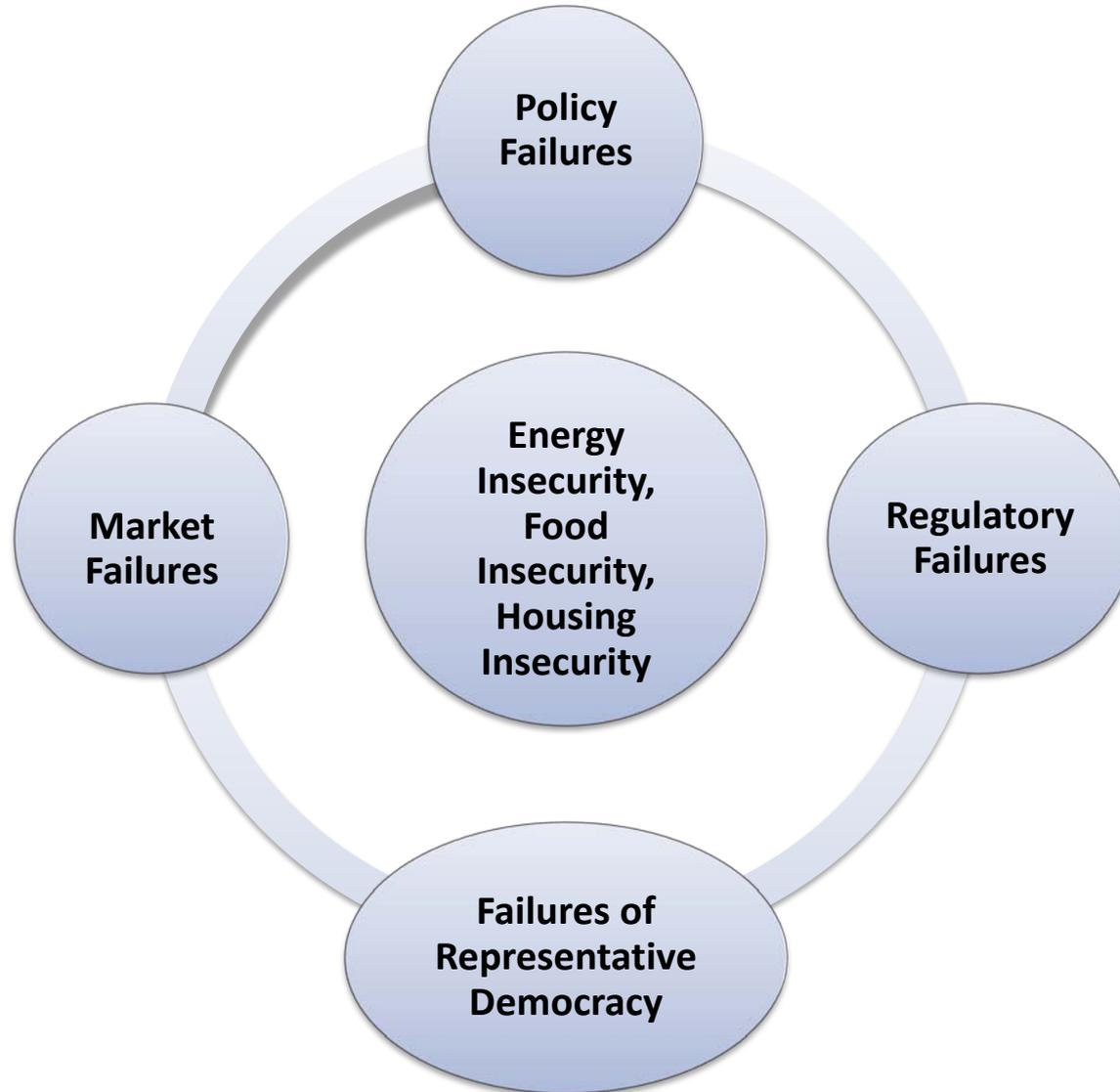
**Little Rock, AR, Boston, MA, Baltimore, MD,  
Minneapolis, MN, Philadelphia, PA (Active)  
Los Angeles, CA, Washington, D.C. (Inactive)**

**[www.childrenshealthwatch.org](http://www.childrenshealthwatch.org)**

## Overview

- 1. What kind of Legacy do we want to leave? Why do we care about child health and development?**
- 2. Energy insecurity, food insecurity and housing insecurity are systemic conditions that threaten our future prosperity.**
- 3. How is energy insecurity related to adverse health outcomes?**
- 4. What are the impacts of those adverse outcomes?**
  - Impacts of “toxic stress” on children’s cognitive development and long-term health
- 5. Toward Solutions: The need for investment in effective social infrastructures**

# **Energy insecurity, food insecurity and housing insecurity are results of systemic failures, not individuals' failures**



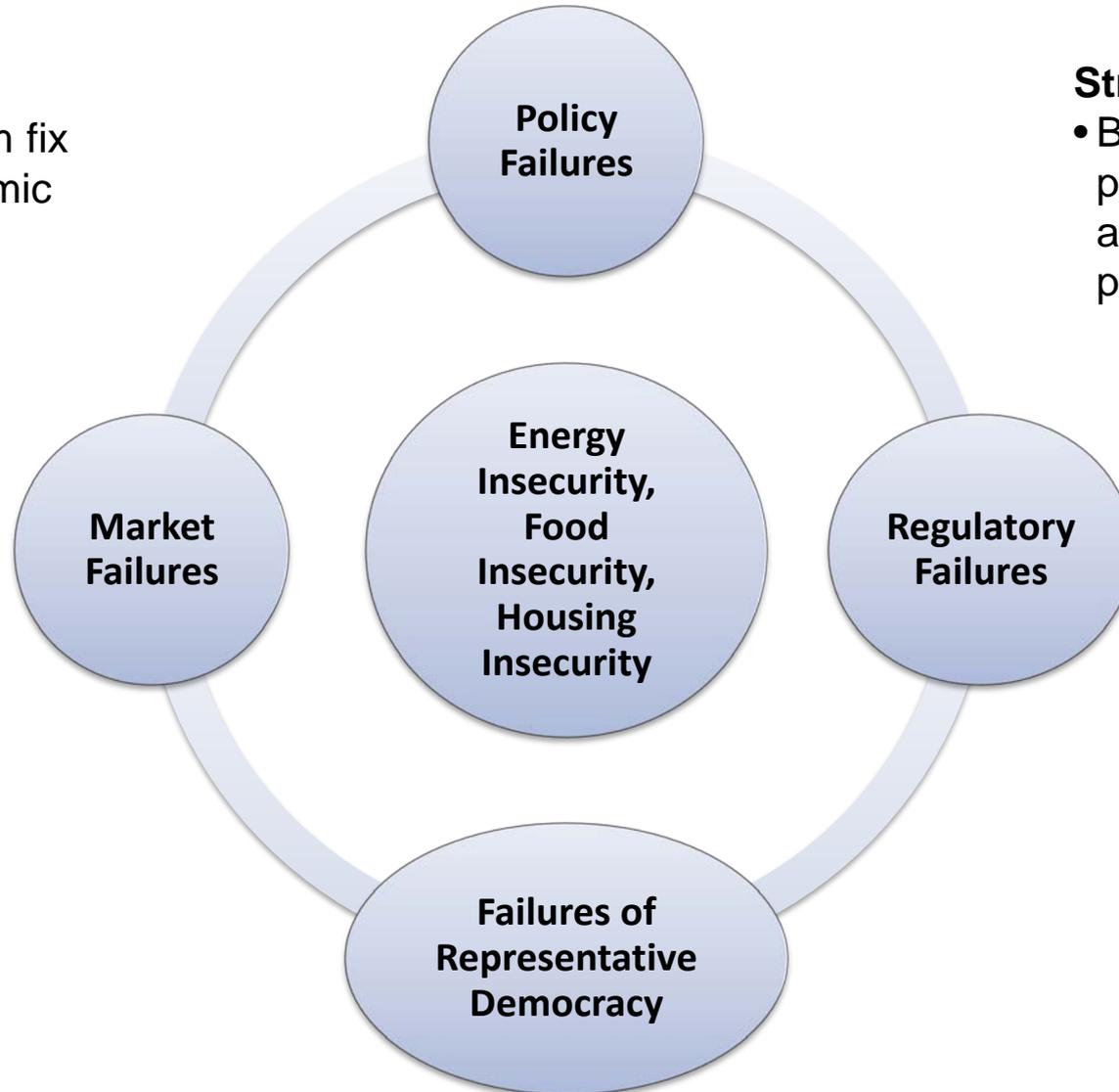
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## Weaknesses

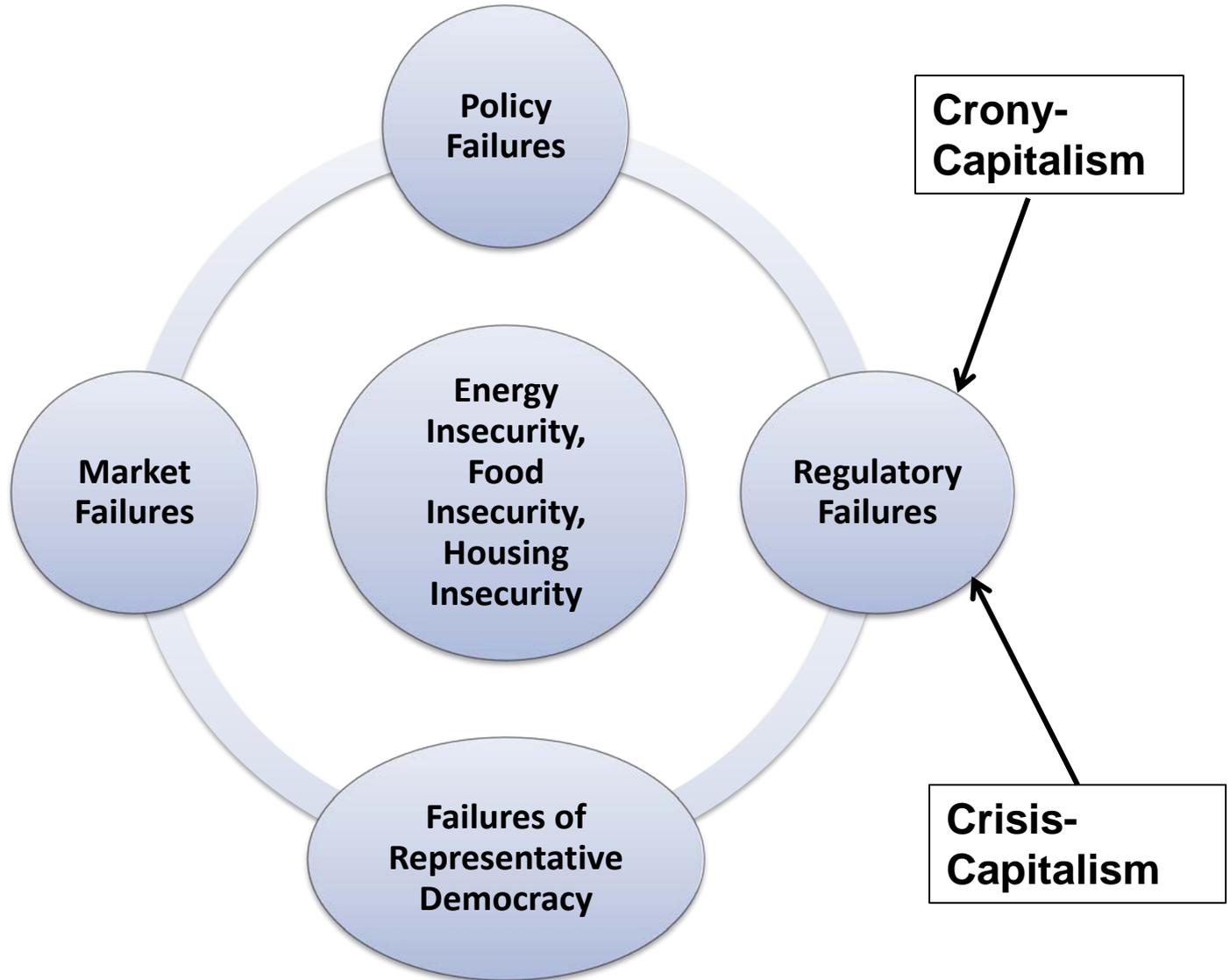
- No short-term fix for the systemic problems

## Strengths

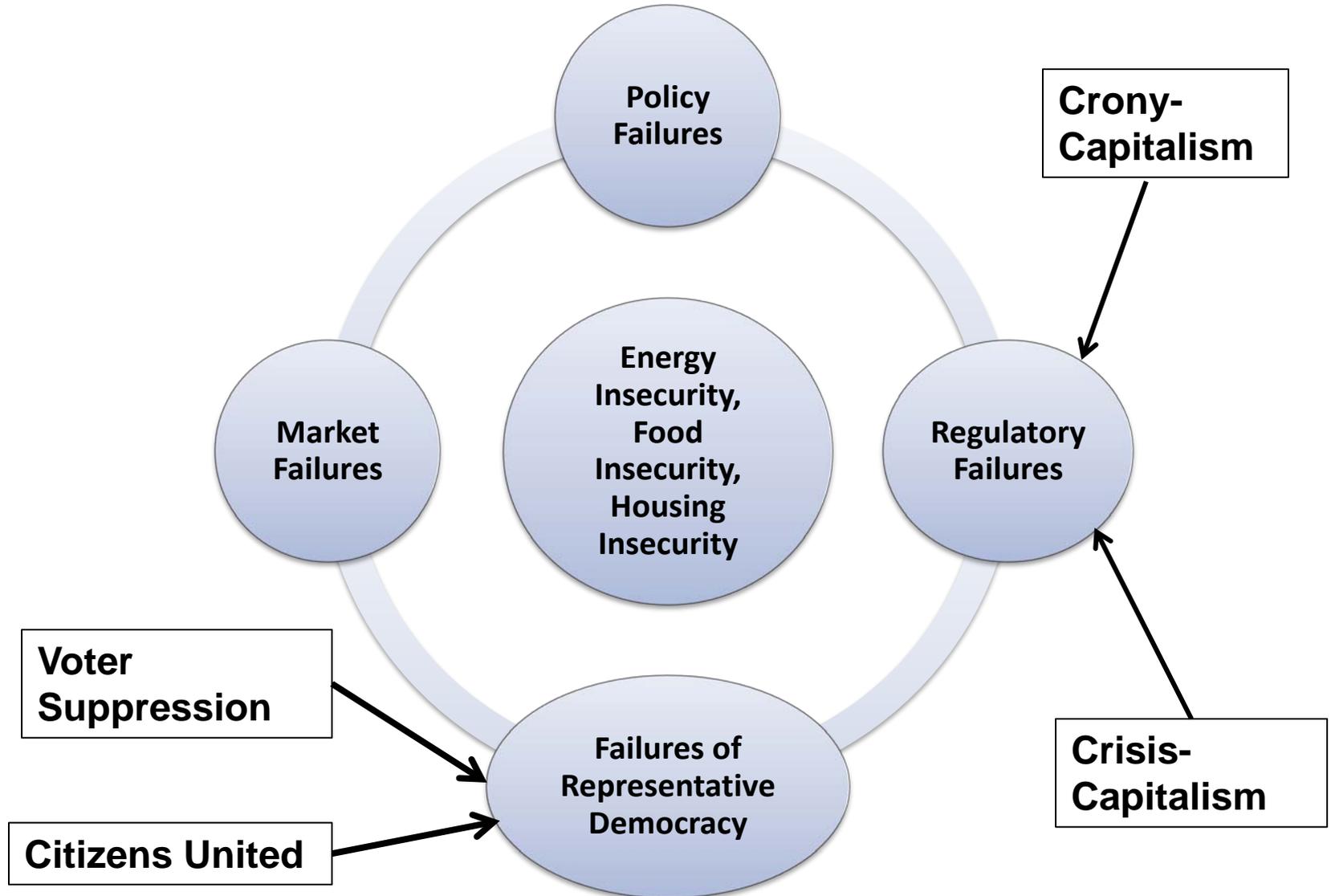
- But systemic problems are amenable to policy solutions



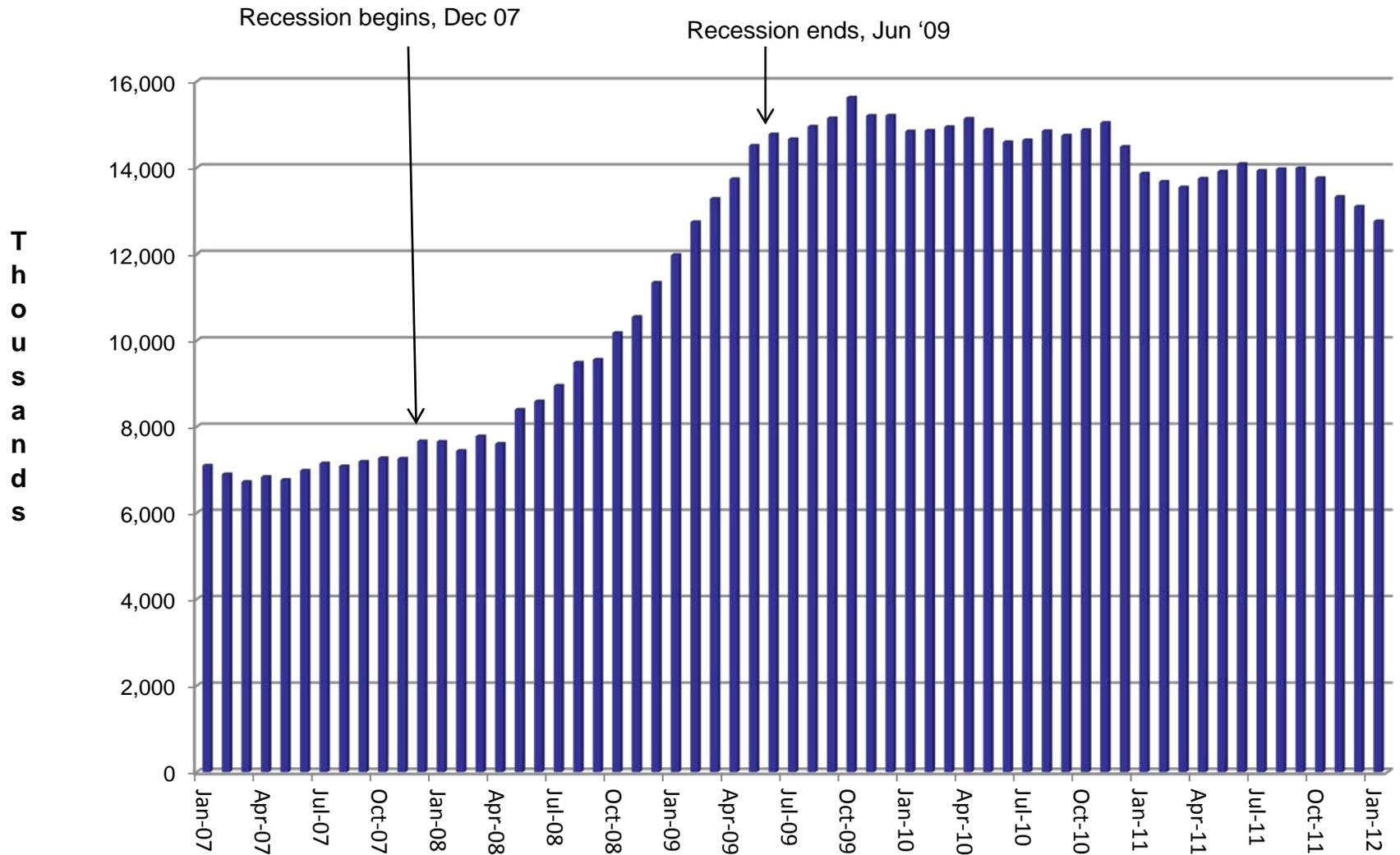
# Energy insecurity, food insecurity and housing insecurity are results of systemic failures, not individuals' failures



# Energy insecurity, food insecurity and housing insecurity are results of systemic failures, not individuals' failures



# Number Unemployed per Month, US Labor Force Ages 16 years and Above; Seasonally Adjusted



Source: US Bureau of Labor Statistics

## Prevalence of Food Insecurity by Race/Ethnicity, All Adults and Children, 2010

	Total Food Insecure	
	Number	Percent
<b>Adults</b>	<b>32,624,000</b>	<b>14.2</b>
Latino	8,214,000	25.7
Non-Latino Black	6,319,000	24.3
Non-Latino White	16,321,000	10.4
<b>All Children &lt; 18 years</b>	<b>16,208,000</b>	<b>21.6</b>
Latino	5,117,000	32.5
Non-Latino Black	3,675,000	34.8
Non-Latino White	6,498,000	14.9
<b>All People</b>	<b>48,832,000</b>	<b>16.1</b>

Source: Coleman-Jensen A, Nord M, Andrews M, Carlson S. Household Food Security in the U.S., 2010, Statistical Supplement, September 2011.

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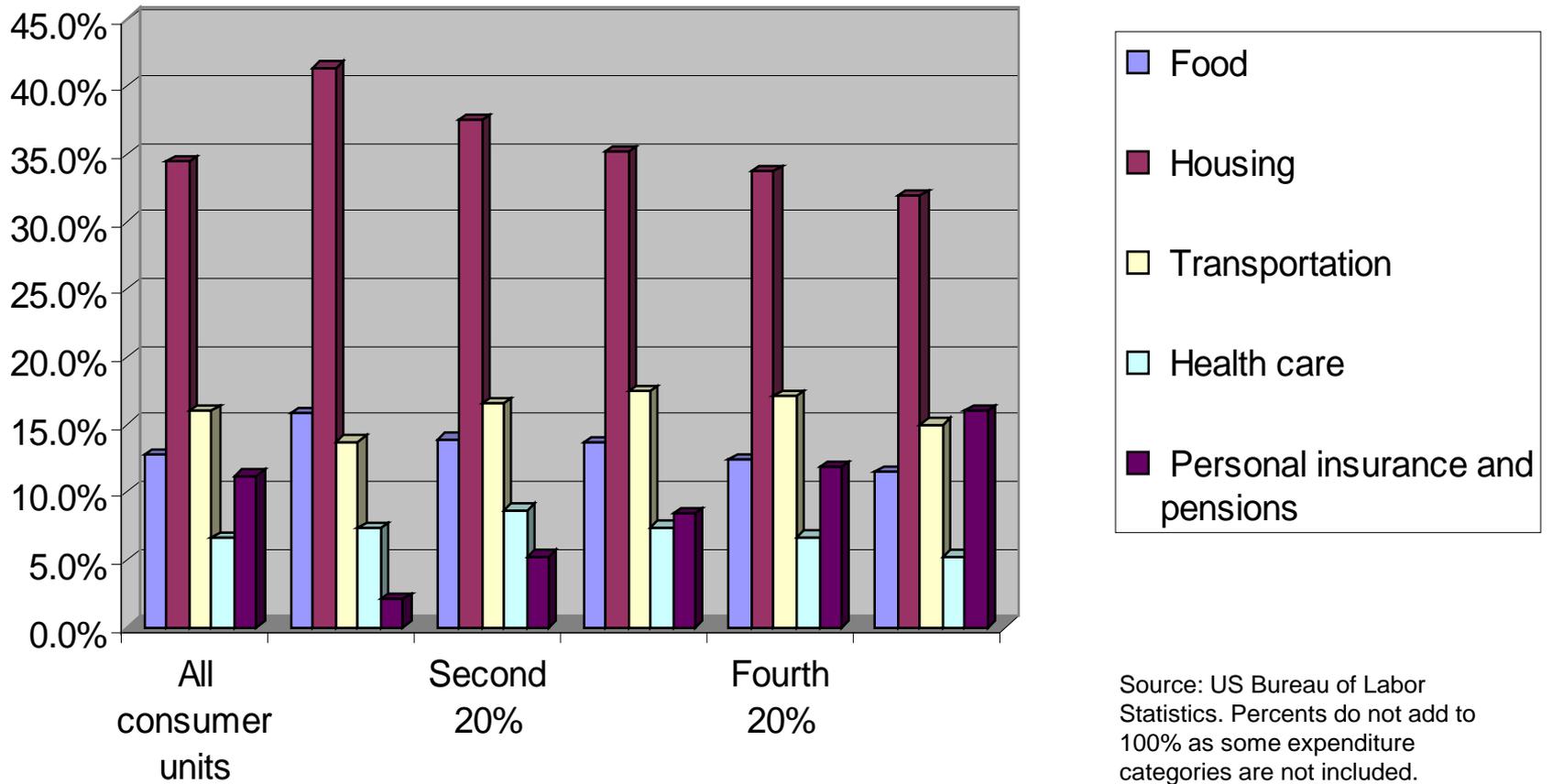
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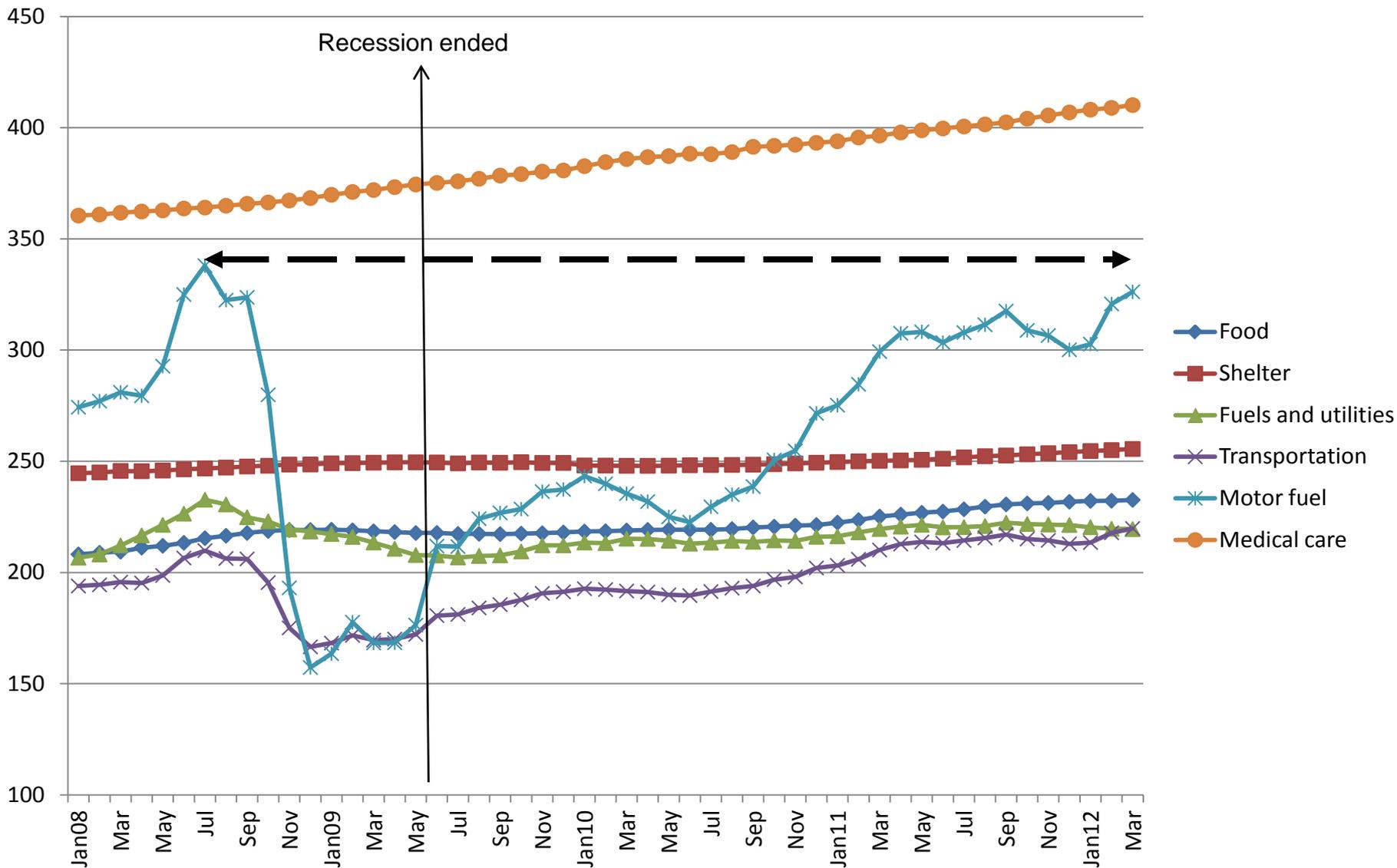
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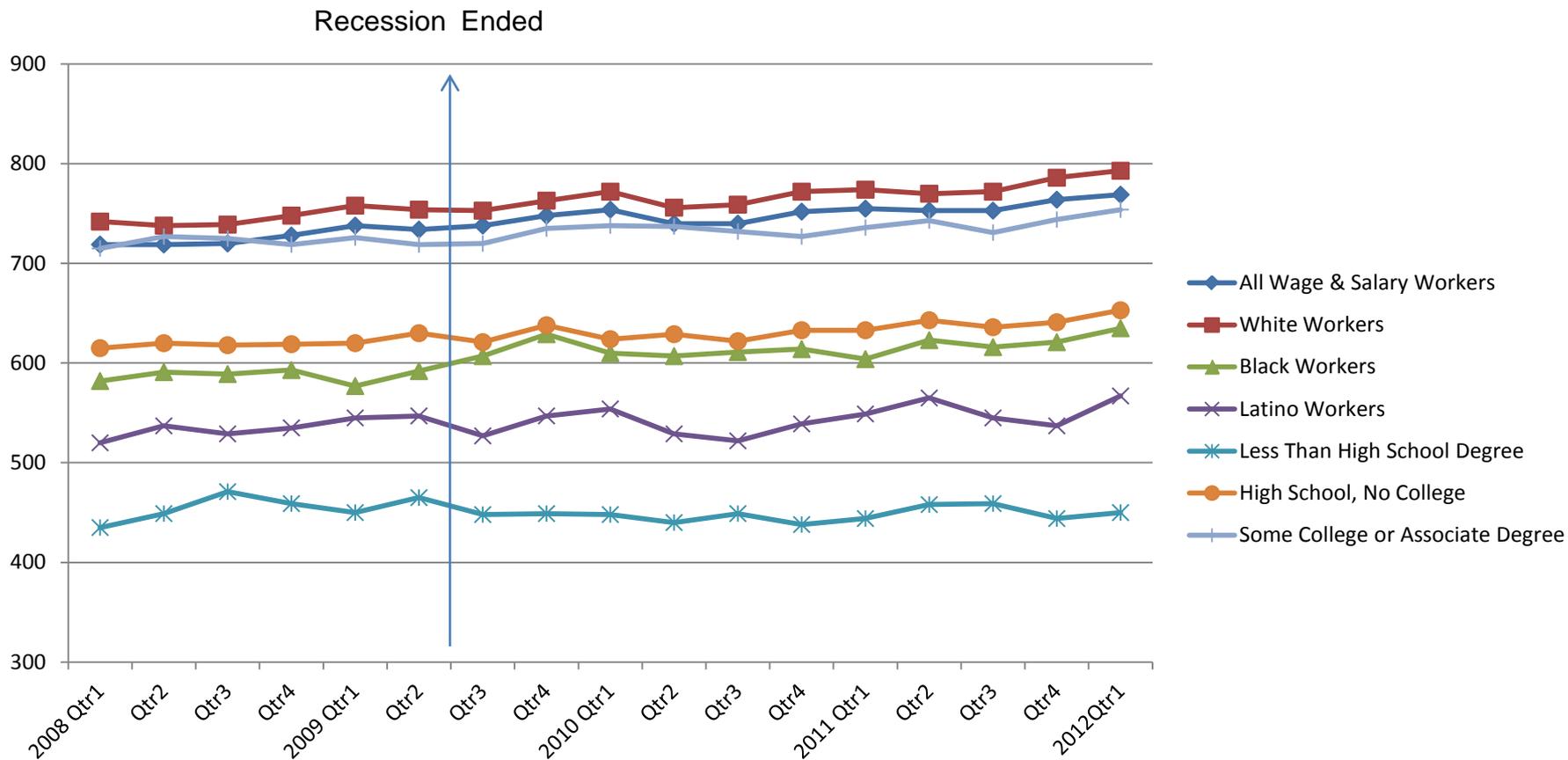
## Shares of Total Average Expenditures for Select Major Categories By Income Quintile, 2010



# Trends in Prices for Selected Categories of Expenditures, Jan 2008 – Mar 2012

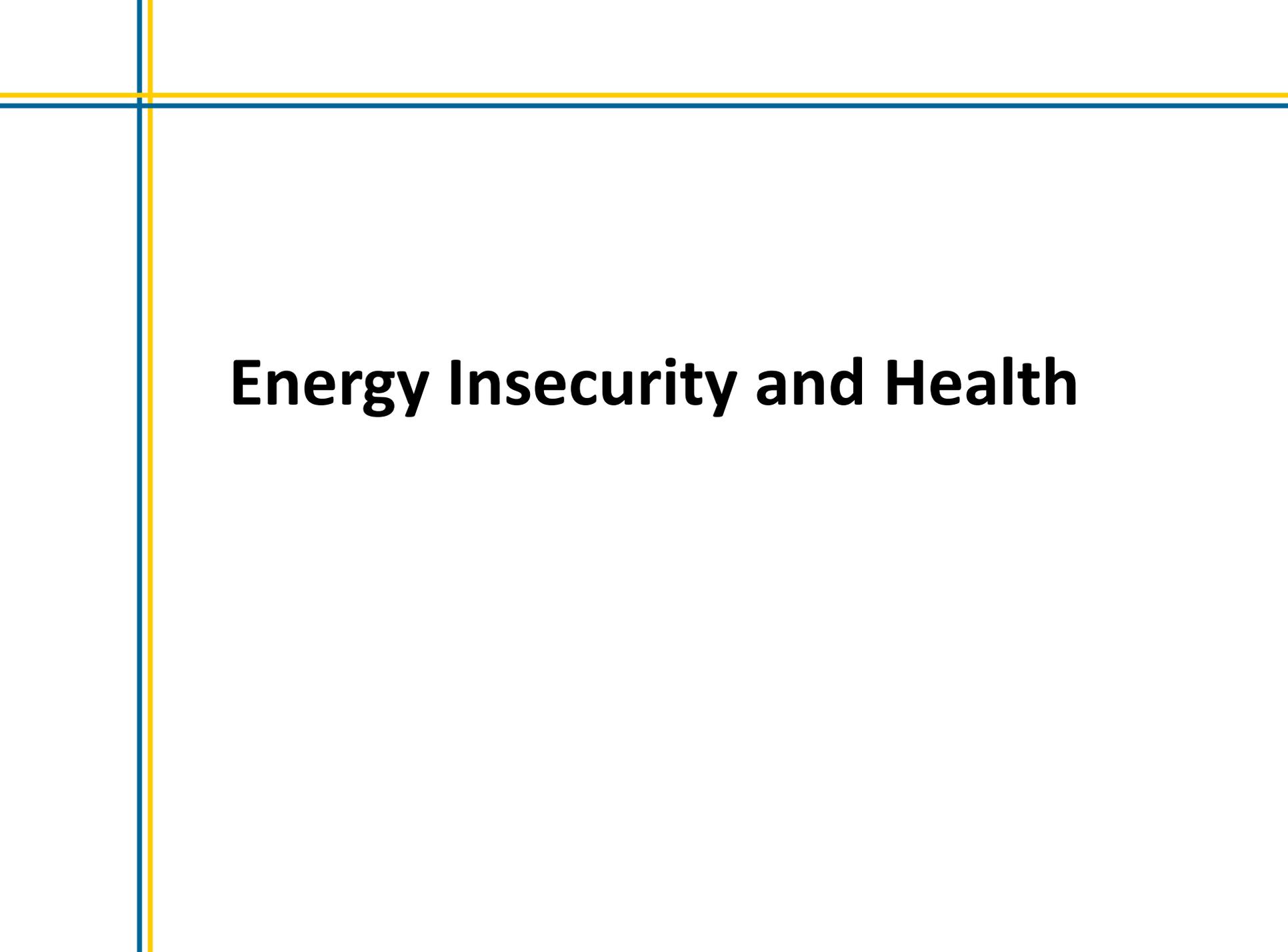


# Trends in Weekly Earnings By Characteristics of Workers, Jan 2008 – Mar 2012



# Trends in Annual Employment Cost Change By Bargaining Status of Workers, 2001 – 2012





# **Energy Insecurity and Health**

# ***Extreme Temperatures Stress the Body***

- **Cold:** Chill, discomfort, frostbite, **hypothermia**
  - ✓ House fires, carbon-monoxide poisoning, unsafe travel conditions, power outages, floods after snow & ice melt, food insecurity
- **Heat:** Sunburn, heat rash, heat edema, dehydration, syncope, heat cramps, heat exhaustion, **heat stroke**
  - ✓ Power outages, food spoilage, vector-borne disease, food insecurity

## **Those most at risk for cold and heat problems are:**

- ***Infants and young children***
- ***The elderly***
- Overweight people
- Homeless
- Those who work/exercise inside/outside in the heat or cold
- People who are ill or taking medicines

## Seasonal Variation in Wt/Age in a Pediatric Emergency Room: An Early Heat or Eat Study

Exposure	Subjects	Outcome	Results	P Value
Presenting during 3 mos. following the coldest month of the year	Children ages 6-24 months presenting at Boston City Hospital ED	% of Children With Wt/Age Below the 5 <sup>th</sup> Percentile	A significant increase in prevalence of low Wt/Age followed the coldest month	
<b>July 1989-June 1990</b>	Min Mean Temp=21.7F	Mean =9.6% for next 3 Mos.	Mean =6.6% for Rest of Yr.	P = 0.002
<b>July 1990-June 1991</b>	Min Mean Temp=29.4F	Mean =8.3% for next 3 Mos.	Mean =6.5% for Rest of Yr.	P = 0.049
<b>July 1991-June 1992</b>	Min Mean Temp=31.0F	Mean =8.4% for next 3 Mos.	Mean =6.6% for Rest of Yr.	P = 0.064

Source: Frank DA, et al. Seasonal Variation in Weight-for-Age in a Pediatric Emergency Room. Public Health Reports, July/August 1996, 111:366-371.

## Heat or Eat? Cold-Weather Shocks and Nutrition in Poor American Families

A study reported in 2003 used Consumer Expenditure Survey (CEX) and National Health and Nutrition Examination Survey (NHANES) data to compare food expenditures by “poor” and “non-poor” households during exceptionally cold months, finding:

- Both poor and non-poor households increased fuel expenditures in response to unusually cold weather (by \$37 and \$53 on average respectively, in 1982-84 dollars).
- Poor families also reduced food expenditures by roughly the same amount as their increase in fuel expenditures, whereas richer families just increased food expenditures.
- Poor parents and their children spend less on and eat less food during cold-weather budgetary shocks.

Source: Bhattacharya J, DeLiere T, Haider S, Currie J. Heat or Eat? Cold Weather Shocks and Nutrition in Poor American Families. *Am J Public Health*. 2003;93:1149–1154.

## LIHEAP Protects Children from Adverse Effects of Energy Insecurity

Outcome	Does Not Receive LIHEAP (n=5925)	Receives LIHEAP (n=1149)	P Value
Mean Wt/Age Z-Score	-0.333	0.076	P = 0.01
At Nutritional Risk for Growth Problems	1.23	1.00	P = 0.05
Acute Hospital Admission	1.32	1.00	P = 0.05

Source: Frank, et al. Heat or Eat: The Low Income Energy Assistance Program and Nutritional Risk Among Children Less Than 3 Years of Age. Pediatrics, Nov 2006, 118(5):e1293-e1302.

## Seasonal Variation in Food Insecurity is Associated with Heating and Cooling Costs among Low-Income Elderly Americans

- ◆ In high-cooling states, the odds of food insecurity with hunger for poor elderly-only households were 27% higher in the summer than in the winter (***cool or eat***).
- ◆ In high-heating states the pattern was reversed for such households; the odds of food insecurity with hunger were 43% lower in the summer (***heat or eat***).

Source: Nord M, Kantor LS. Seasonal variation in food insecurity is associated with heating and cooling costs among low-income elderly Americans. J Nutr, November 2006. 136:2939-2944.

# The Children's HealthWatch Ordinal Energy Insecurity Indicator

- ◆ Derived from four questions in the Children's HealthWatch survey interview questionnaire

- Low
- Severity ↑
1. In the last year, has the [gas/electricity] company sent you a letter threatening to shut off the [gas/electricity] in the house for not paying bills?
  2. In the last year, has the [gas/electric/oil] company [shut off/refused to deliver] the [gas/electricity/oil] for not paying bills?
  3. In the last year, have you ever used a cooking stove to heat the [house/apartment]?
  4. In the last year, were there days that the home was not [heated/cooled] because you couldn't pay the bills?
- High

## Adjusted Logistic Regression Results: Energy Security as Predictor, Household and Child Food Security as Outcomes

Outcomes	Energy Secure (n=6,385; 66%)	Moderate Energy Insecurity: Shutoff Threatened (n=1,043; 11%)	Severe Energy Insecurity: Heat with Cooking Stove/Shutoff/ Unheated/cooled Days (n=2,293; 23%)	P value
Household Food Insecurity (yes/no)	1.00	2.37 (1.78, 3.16) P < 0.01	3.06 (2.46, 3.81) P < 0.01	P < 0.01
Child Food Insecurity (yes/no)	1.00	1.79 (1.13, 2.72) P < 0.01	3.46 (2.56, 4.67) P < 0.01	P < 0.01

Controlling for Site, mother's age, race, marital status, education level, depressive symptoms, US-born, employment, housing subsidy; child's low birthweight status, breastfeeding, type of insurance, age, WIC participation.

Source: Cook JT, Frank DA, Casey PH, et al. A Brief Indicator of Household Energy Security: Associations with Food Security, Child Health, and Child Development in US Infants and Toddlers. *Pediatrics*, 2008, Oct, 122(4):e867-e875.

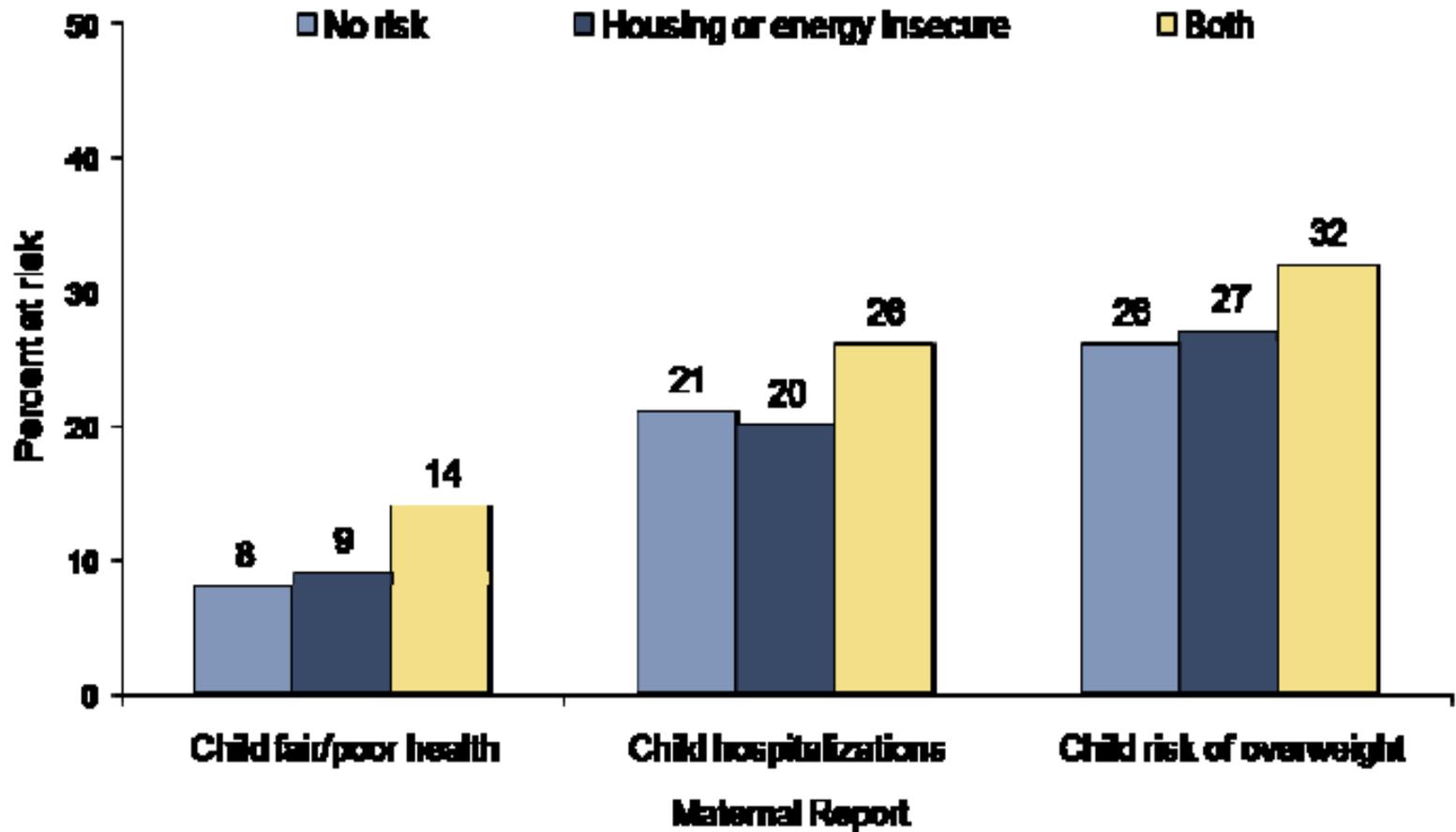
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Child Health Fair/poor	1.00	1.34 (1.08, 1.68) P = 0.01	1.36 (1.15, 1.61) P < 0.01	P < 0.01
Hospitalized Since Birth (yes/no)	1.00	1.22 (1.03, 1.45) P = 0.02	1.02 (0.89, 1.17) P = 0.74	P = 0.07
PEDS Significant Concerns	1.00	1.00 (0.71, 1.41) P = 0.99	1.82 (1.38, 2.39) P < 0.01	P < 0.01

Controlling for Site, mother's age, race, marital status, education level, depressive symptoms, US-born, employment, housing subsidy; child's low birthweight status, breastfeeding, type of insurance, age, WIC participation.

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## Percent of children at risk for health outcomes by hardship status



Source: Merry BC, Quigg AM, Oberlander SE, Candelaria MC, Jones LL, Black, MB. Stable Housing and utilities: Keeping Baltimore's Babies Healthy. Report developed in collaboration with The Baltimore City Health Department's Healthy Homes Division and Dr. Madeleine Shea, Assistant Commissioner for Healthy Homes. Sept 2009

**TABLE 3** Cumulative Hardship Category and Study Outcomes (*N* = 7141)

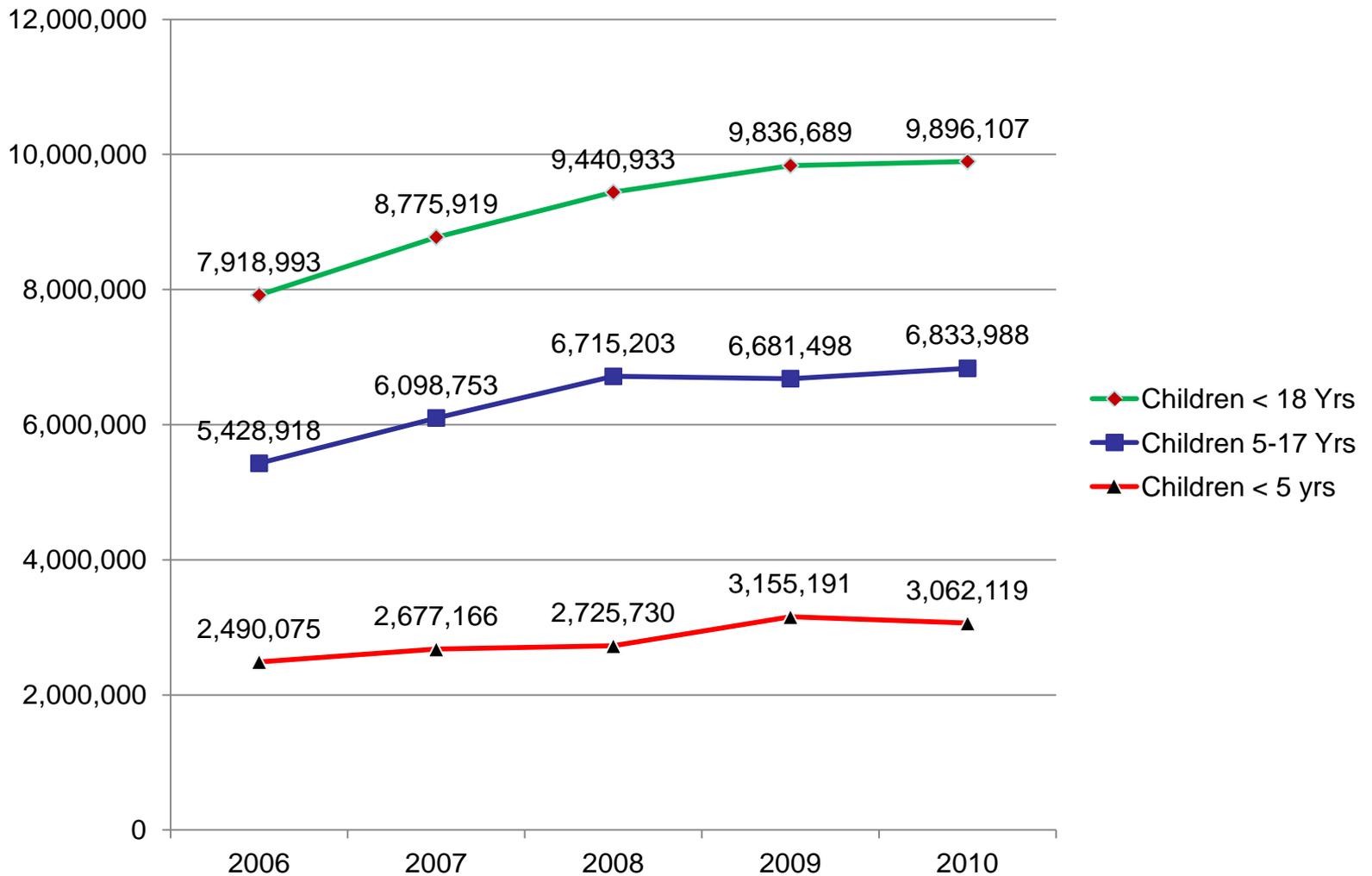
Outcomes	AOR (95% CI)		
	Severe vs No Hardship	Severe vs Moderate Hardship	Moderate vs No Hardship
Well child	0.65 (0.51–0.83)	0.74 (0.50–0.93)	0.89 (0.79–0.99)
<i>P</i>	<.001	.01	.03
Hospitalizations	1.18 (0.92–1.51)	1.24 (0.98–1.57)	0.95 (0.84–1.07)
<i>P</i>	.21	.08	.37
At developmental risk on PEDS	2.20 (1.66–2.93)	1.80 (1.38–2.34)	1.21 (1.03–1.42)
<i>P</i>	<.0001	<.0001	.02
Child health fair or poor	1.77 (1.30–2.41)	1.60 (1.20–2.13)	1.10 (0.92–1.30)
<i>P</i>	<.001	.002	.29
At risk of underweight <sup>a</sup>	0.90 (0.64–1.25)	1.03 (0.75–1.42)	0.88 (0.76–1.02)
<i>P</i>	.51	.86	.10
Overweight <sup>b</sup>	1.15 (0.86–1.54)	0.95 (0.72–1.26)	1.20 (1.04–1.38)
<i>P</i>	.36	.73	.01

Sample size reflects those without missing data for hospitalizations, at risk of underweight, overweight, child health, and PEDs as all these variables make up the well-child outcome. Private insurance has been excluded in all analysis and children are >4 months of age. Adjusted for site, race/ethnicity, us born mother vs. immigrant, marital status, education, child gender, child's age, mother's age, caregiver employment, breastfeeding, LBW, maternal depression, and number of children ≤17 years in the household.

<sup>a</sup> At risk of underweight was defined as weight for age of <5th percentile or weight for height of <10th percentile.

<sup>b</sup> Overweight was defined as weight for length of >95th percentile for children <24 months of age and BMI for age of ≥85th percentile for children ≥24 months of age. If length data were not available (25.6% of sample), then weight for age of =95th percentile was used as a proxy measure.

## Number of Children in Marginally Food Secure Households by Age Group, 2006-2010



## Associations of Food Insecurity and Marginal Food Security With Child and Maternal Health Outcomes and Hardships

Outcomes	Food Insecure (≥3 items endorsed) (n=6,422)	Marginal Food Security (n=4,544)	High Food Security (n=17,482)
<b>Child Health Fair/Poor</b>	1.84 (1.69, 2.02)	1.21 (1.10, 1.34)	1.00
<b>Hospitalized Since Birth</b>	1.26 (1.17, 1.36)	1.12 (1.03, 1.21)	1.00
<b>At Risk Underweight<sup>^</sup></b>	0.94 (0.86, 1.03)	0.91 (0.82, 1.00)	1.00
<b>Overweight*</b>	1.03 (0.94, 1.13)	0.94 (0.85, 1.04)	1.00
<b>PEDS –Significant Development Concerns <i>Age&gt;4 months; n=9,270</i></b>	2.01 (1.74, 2.33)	1.38 (1.17, 1.63)	1.00
<b>Mother Health Fair/Poor</b>	2.48 (2.29, 2.70)	1.41 (1.29, 1.56)	1.00
<b>Maternal Depression</b>	3.29 (3.05, 3.55)	1.80 (1.66, 1.96)	1.00
<b>Housing Insecurity</b>	1.63 (1.52, 1.74)	1.22 (1.13, 1.31)	1.00
<b>Energy Insecurity</b>	4.14 (3.81, 4.52)	2.43 (2.22, 2.67)	1.00

# Why Does this All Matter?

## **New Research and Knowledge On Food Insecurity's Impacts on Child Health & Development**

- New findings from genetics, neuroscience, developmental psychology and the economics of human capital formation are converging to indicate:
- Early experience and gene-environment interactions affect the architecture of the maturing brain, (0-3 yrs)
  - Positive stress (short term, quickly relieved) can be growth producing and generally beneficial, (0-3 yrs)
  - Tolerable stress (moderate, short-lived) (0-3 yrs)
  - **Toxic stress (inescapable, acute or chronic)** harms the brain architecture of developing children, associated with serious later disease (0-6 yrs)

# What is Toxic Stress?

**Toxic stress response** can occur when a child experiences strong, frequent, and/or prolonged adversity—such as:

- Physical or emotional abuse, chronic neglect, caregiver substance abuse or mental illness, exposure to violence, and/or the accumulated burdens of family economic hardship—without adequate adult support.
- This kind of prolonged activation of the stress response systems
  - can disrupt the development of brain architecture and other organ systems, and
  - increase the risk for stress-related disease and cognitive impairment, well into the adult years.

Source: Center on the Developing Child, Harvard University ;  
[http://developingchild.harvard.edu/topics/science\\_of\\_early\\_childhood/toxic\\_stress\\_response/](http://developingchild.harvard.edu/topics/science_of_early_childhood/toxic_stress_response/)

# Can Childhood Energy, Food and Housing Insecurity Become or Exacerbate Toxic Stress?

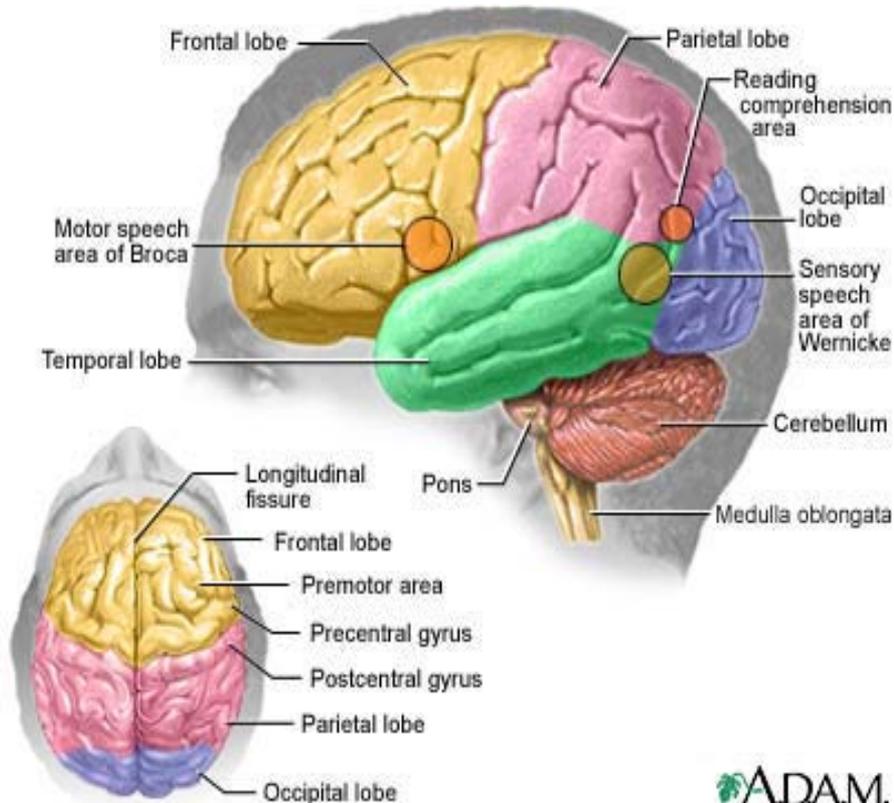
**Toxic stress response** can occur when a child experiences strong, frequent, and/or prolonged adversity—such as:

- The accumulated burdens of family economic hardship—without adequate adult support.
- *Homeostasis versus allostasis*
- Allostatic load

## **But what if adults in the child's life lack sufficient resources to provide "adequate adult support"?**

- **What if the child is one of the 6.3 million children under 6 years old living in families in poverty? I.e., with an annual income of \$22,113 (family of four with two children).**
- **What if the child is one of the 9.0 million children in families with children under 6 years old that are food insecure?**
- **Can the child avoid toxic stress?**

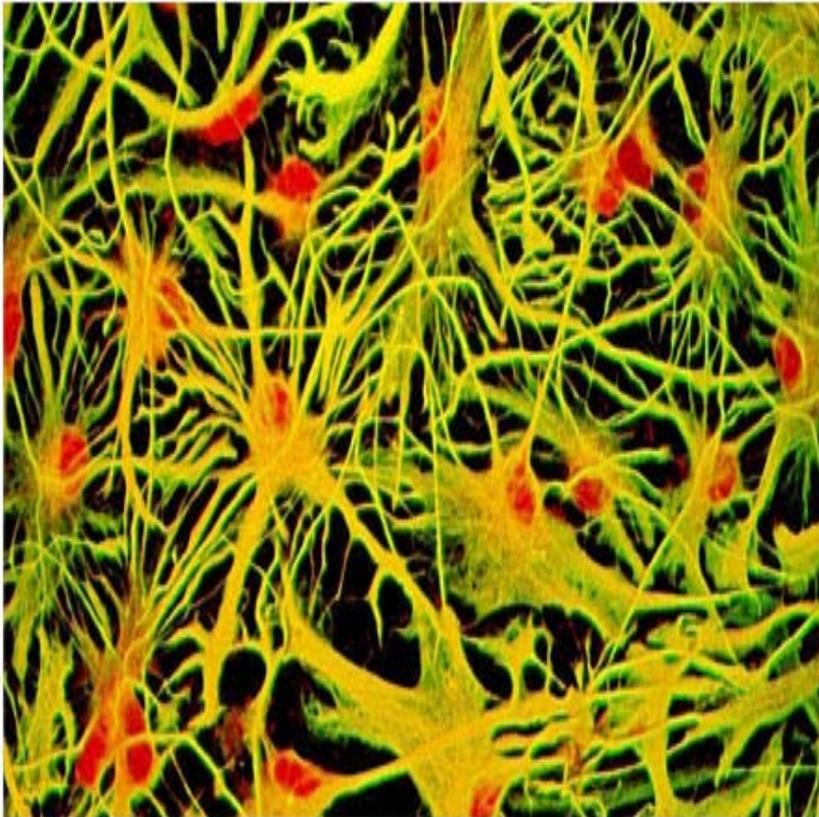
# Brain architecture is laid down during the first three years of life



Brain architecture is influenced by many factors, involving both nutritional and non-nutritional pathways.

The first 3 years of life are the most critical for brain and CNS growth and development, and can shape a person's entire life.

## Brain architecture is physical structure, interconnections, & neural networks

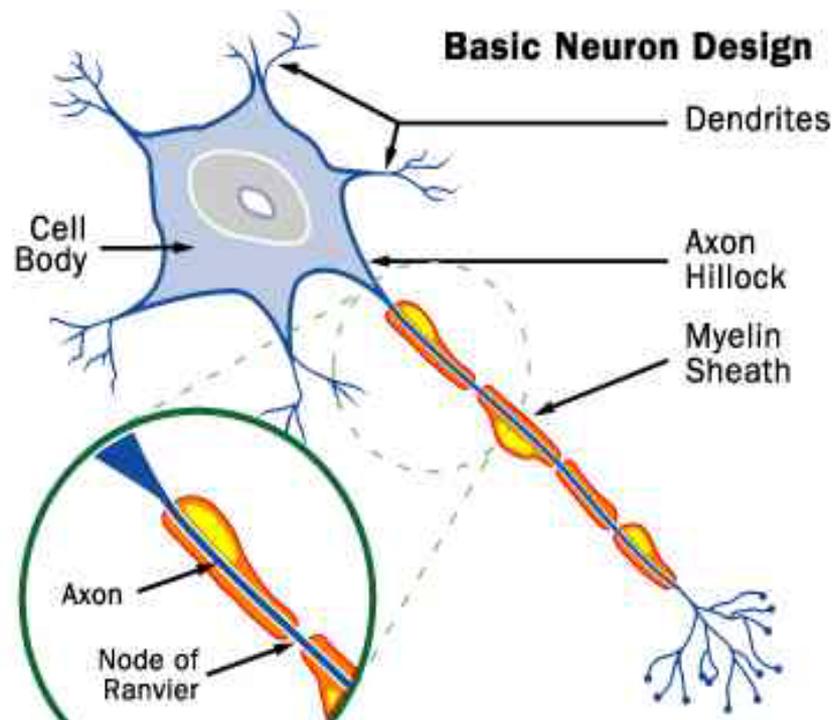


Brain “architecture” is physical structure, and interconnections. There are about 100 billion cells in the brain.

Brain architecture is influenced by many factors, including many associated with “toxic stress” related to poverty, energy insecurity, food insecurity and housing insecurity.

**The first 3 years of life are the most critical for “laying down” the brain architecture.**

# Brain architecture is laid down during the first three years of life

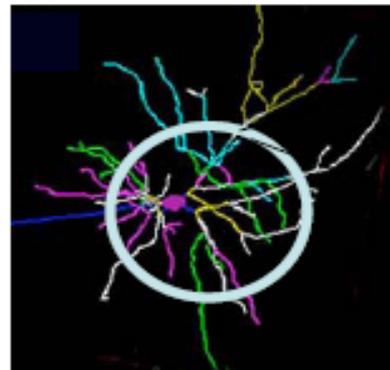


- Brain architecture is determined by the number of cells, their degree of elaboration, or “completeness,” and how they are inter-connected.
- Brain architecture can be harmed by gross damage to cells, by inhibition of healthy elaboration, and by limited connections.

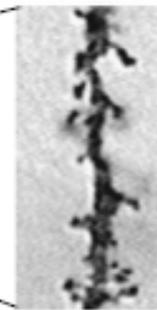
# Brain architecture is harmed by “toxic” stress

## Persistent Stress Changes Brain Architecture

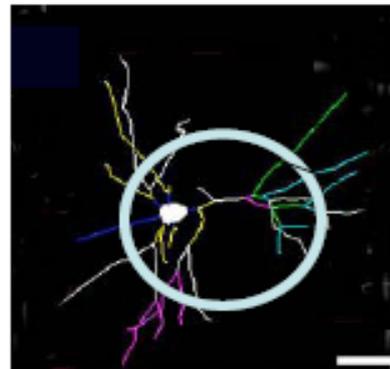
Normal



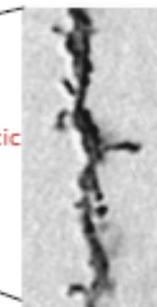
Typical -  
neuron with many  
connections



Chronic  
stress



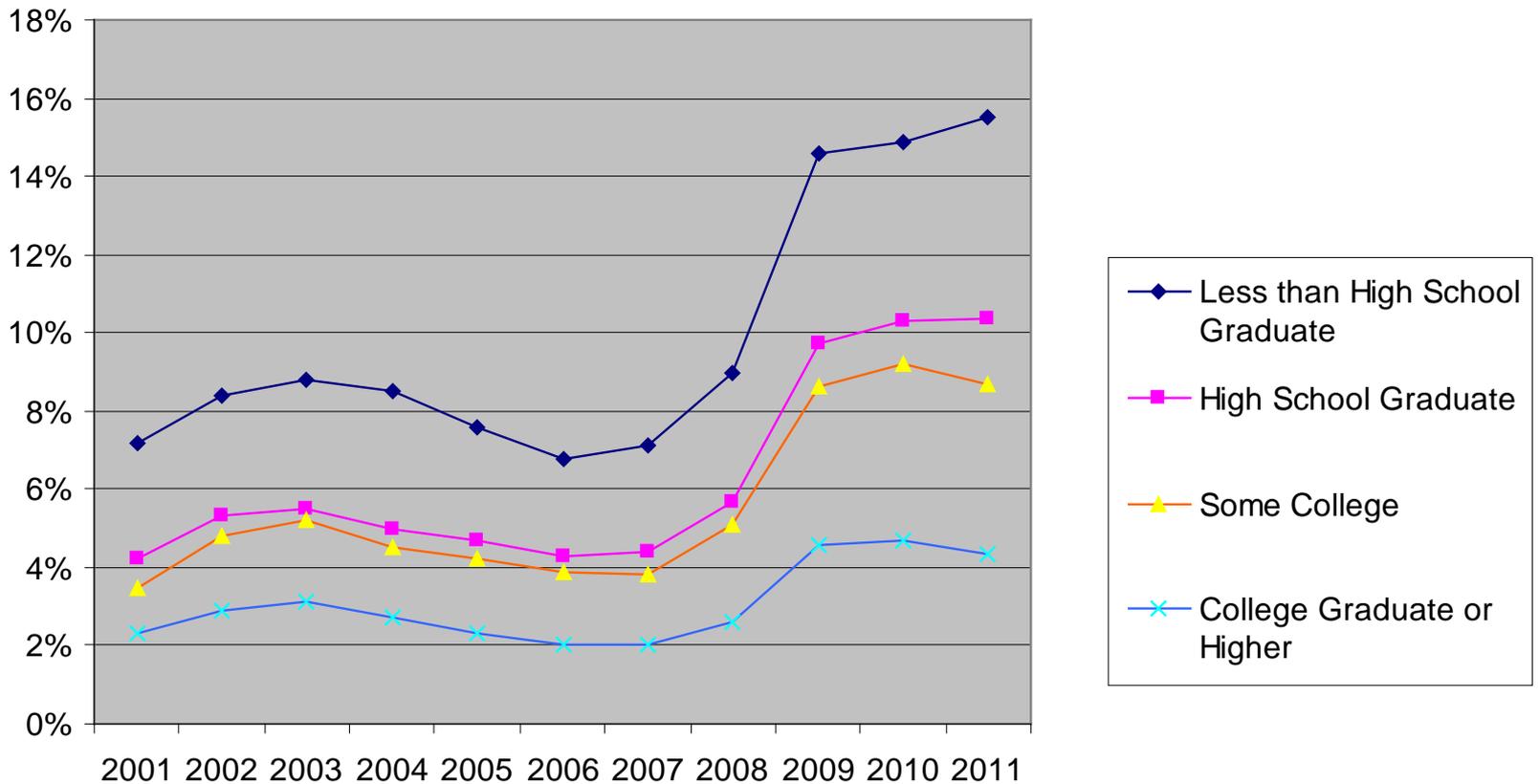
Neuron damaged by toxic  
stress - fewer  
connections



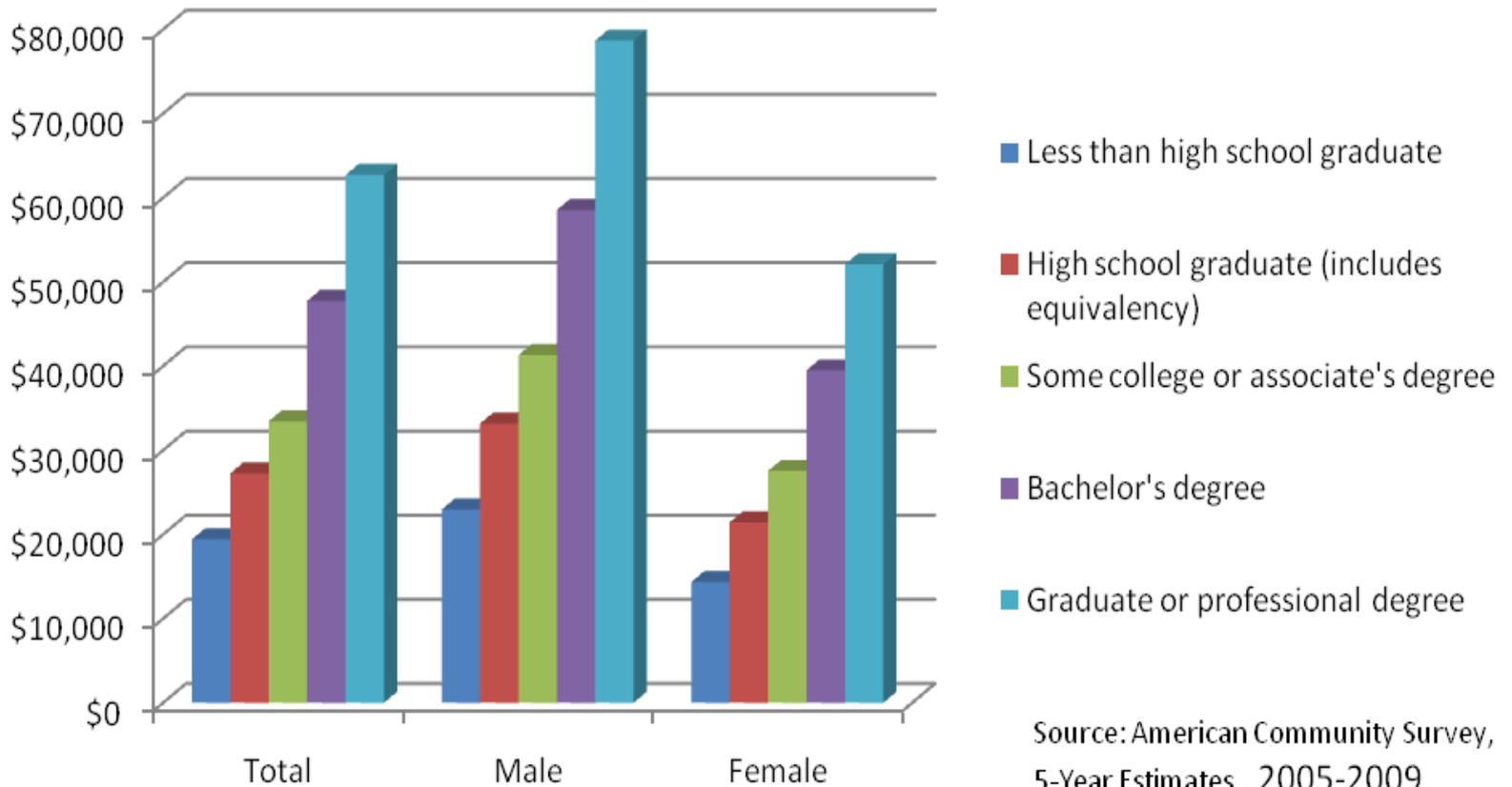
Prefrontal Cortex and  
Hippocampus

# Why Impacts of Energy Insecurity on Child Development and Health Matter

## National Unemployment Rate, Persons Ages 25 Years and Above by Education Level Attained



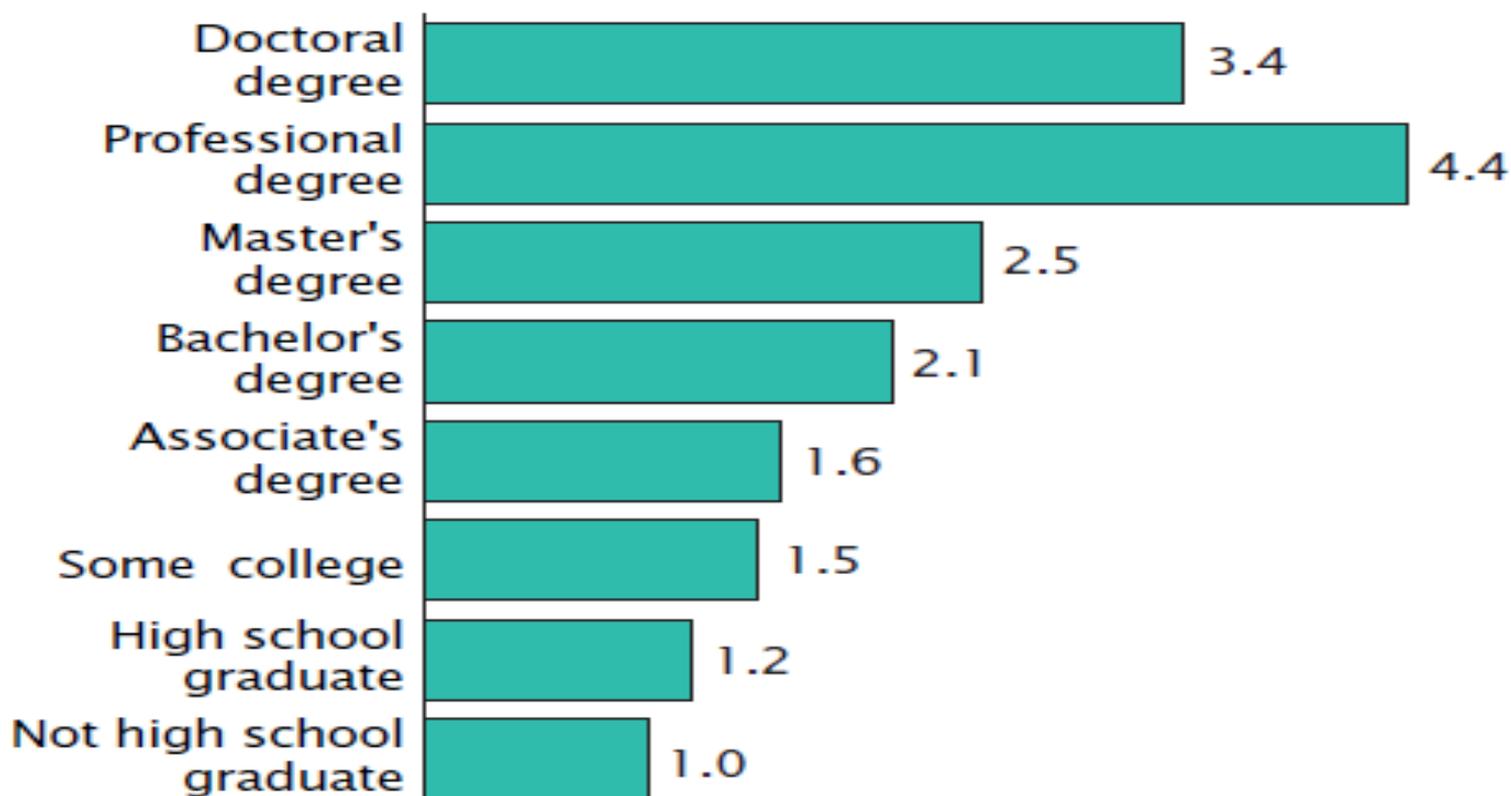
## Median Earnings in Past Year, By Educational Attainment Level (In 2009 Inflation-Adjusted Dollars)



Source: American Community Survey, 5-Year Estimates, 2005-2009

## Synthetic Work-Life Earnings Estimates for Full-Time, Year-Round Workers by Educational Attainment Based on 1997–1999 Work Experience

(In millions of 1999 dollars)

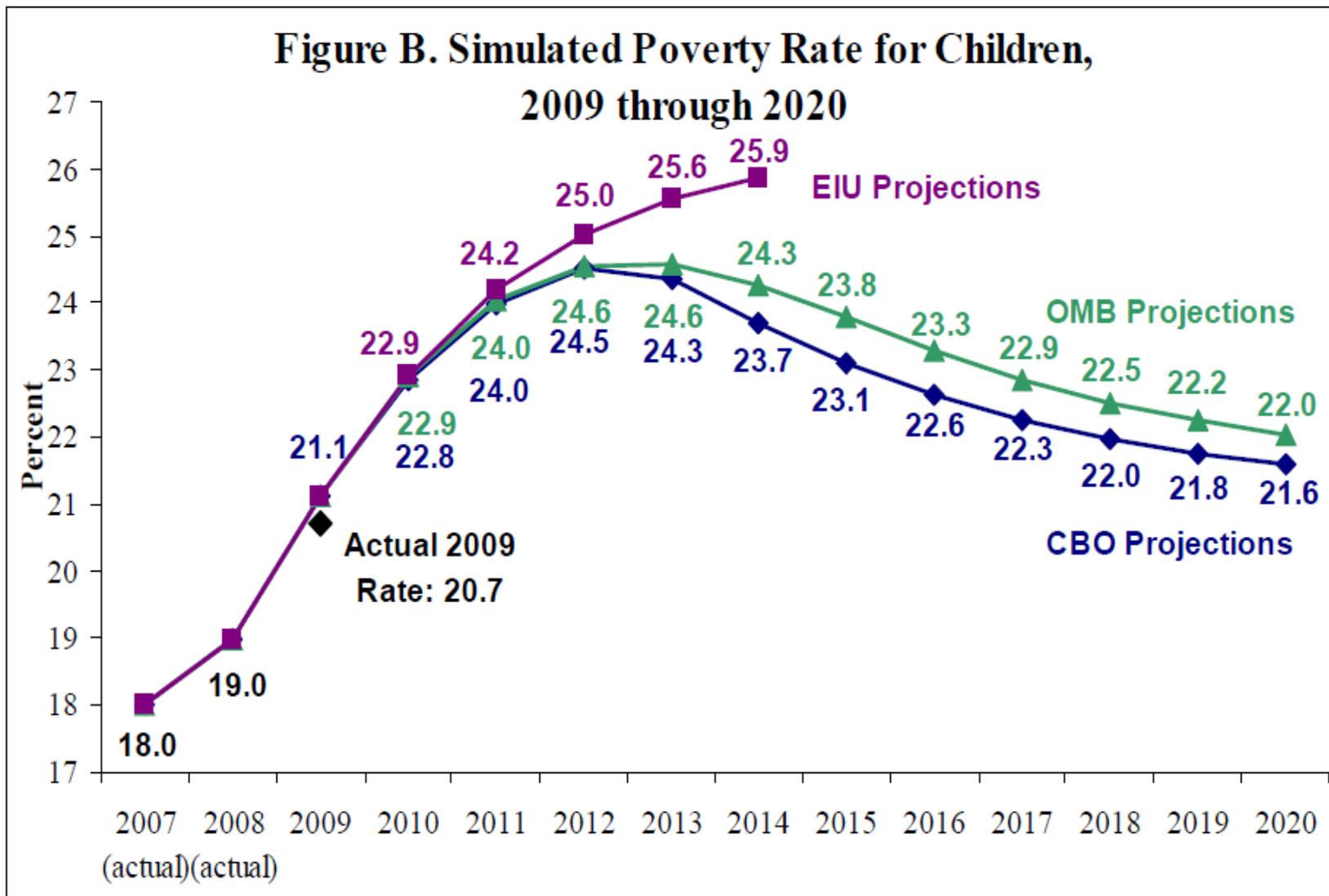


Source: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplement, 1998 to 2000.

What kind of legacy will we leave for our children, and their children, and on for seven generations?

"Albert Einstein once commented that the most fundamental question we can ever ask ourselves is whether or not the universe we live in is friendly or hostile. He hypothesized that your answer to that question would determine your destiny."

# What Kind of Legacy Are We Leaving for our Children?



# Social Infrastructures for Reducing Energy Insecurity, Food Insecurity and Housing Insecurity Work!

Unemployment and Food Insecurity in U.S. Children (< 18 yrs) in The Great Recession 2007-2010

	2007	2008	2009	2010
Annual Average Unemployment Level	7,078,000	8,924,000	14,265,000	14,825,000
Annual Average Unemployment Rate	4.6%	5.8%	9.3%	9.6%
Child Food Insecurity Level	12,435,000	16,673,000	17,197,000	16,208,000
Child Food Insecurity Prevalence	16.9%	22.5%	23.2%	21.6%

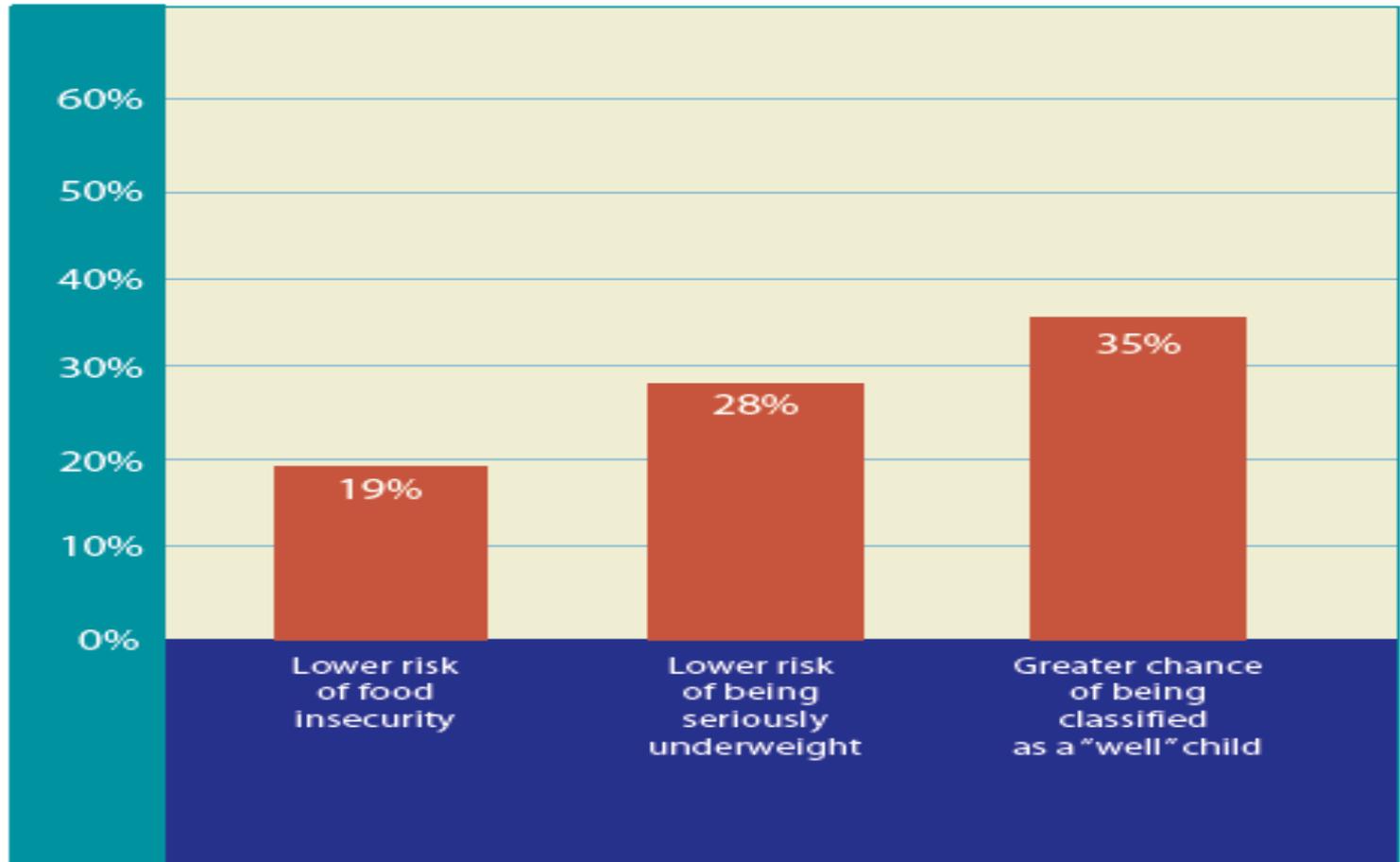
Source: Nord, et al. Food Security in the U.S., various years, USDA/ERS, and Bureau of Labor Statistics, Current Population Survey.

## LIHEAP Protects Children from Adverse Effects of Energy Insecurity

Outcome	Does Not Receive LIHEAP (n=5925)	Receives LIHEAP (n=1149)	P Value
Mean Wt/Age Z-Score	-0.333	0.076	P = 0.01
At Nutritional Risk for Growth Problems	1.23	1.00	P = 0.05
Acute Hospital Admission	1.32	1.00	P = 0.05

Source: Frank, et al. Heat or Eat: The Low Income Energy Assistance Program and Nutritional Risk Among Children Less Than 3 Years of Age. Pediatrics, Nov 2006, 118(5):e1293-e1302.

## Subsidized Housing Protects Children's Health



Source: March, EL, et al. Rx For Hunger: Affordable Housing. A report by Children's HealthWatch and the Medical Legal Partnership for Children. Dec 2009.

# Framing

1. About framing: It's normal. Everybody engages in it all the time. Frames are just structures of thought that we use every day. All words in all languages are defined in terms of frame-circuits in the brain. But, ultimately, framing is about ideas, about how we see the world, which determines how we act.
2. **It's a general principle: Unless you frame yourself, others will frame you — the media, your enemies, your competitors, your well-meaning friends.**

## Some Frames Worth Considering

1. The role of government is to protect and empower all citizens equally via The Public: public infrastructure, laws and enforcement, health, education, scientific research, protection, public lands, transportation, resources, art and culture, trade policies, safety nets, and on and on.
2. Nobody makes it purely on their own without The Public; that is, without public infrastructure, the justice system, health, education, scientific research, protections of all sorts, public lands, transportation, resources, art and culture, trade policies, safety nets,

## Some Frames Worth Considering

1. Middle-class wages have not gone up significantly in 30 years, and there is pressure to lower them. But when most people get more money, they spend it and spur the economy, making the economy and the country stronger, as well as making their individual lives better.
2. Democracy starts with citizens caring about one another and acting responsibly on that sense of care, taking responsibility both for oneself and for one's family, community, country, people in general, and the planet. A robust public is necessary for private success.

# Thank You!

<http://www.childrenshealthwatch.org/>

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