HEAT OR EAT: CHILDREN'S HEALTH WATCH

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Has documented that she has no relevant financial relationships to disclose or conflicts of interest to resolve.

How Did I Get Here?



Boston City Hospital: 1989-92



Seasonal temperature variation and low weight-for-age (N=11,118)



Public Policies and Economic Conditions are Written on the Bodies of Babies

NB. Photos removed for privacy reasons

Children's HealthWatch



Collect data *in five urban, safety-net hospitals*



Produce scientific research that is original and timely



Share evidence with state and national partners to inform policy choices

Fuel Poverty reflects Energy Cost as Percent of Income

Energy Insecurity reflects household's reported experience

Energy Insecurity

• Energy Secure (0)

- Home is adequately heated/cooled with proper devices and no turn off notices
- Moderate energy insecurity (1)
 - Threatened turn off of utilities because of non payment
- Severe energy insecurity (2)
 - Gas or electricity turned off or oil not delivered because of non payment
 - Home was not heated or cooled <a>1 day or was heated or cooled with unsafe methods (i.e. cooking stove)

Child Outcome Definitions

- Health/ Hospitalizations
- Overweight or Underweight
- Developmental Risk

Household Outcomes: Food Insecurity

Limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways

Source: USDA

Household Outcomes: Housing Insecurity

 Severe housing insecurity is having to move two or more time in the past year

Children's Health Watch: Energy Insecurity, and Young Children's Health

- Energy Insecurity associated with increased adjusted odds of
 - Food Insecurity
 - More than 2 moves
 - Fair or poor health
 - Lifetime Hospitalizations
 - Developmental Risk

Cook et. al. 2008

Biologic Plausibility

- Hazards from attempted adaptations to inadequate cooling or heating
- Impact of cold or heat stress on body proportions and caloric expenditure



HEAT AND HUMIDITY



Hot, Damp Conditions Exacerbate Atopic Dermatitis

Langan (2000)



FOOD BORNE ILLNESS





Heat Waves and Falls from Windows



Hazards of Cold Weather and Unsafe Heating

Size:



G.Varnagys, Dec 2010, www.flickr.com/photos/gintaras_v/5236146529

Causes of Death after Termination of Electricity: Medical Examiner

- Hypothermia
- Hyperthermia
- Carbon Monoxide poisoning
- Fire
- Electrocution
 - Stoppacher (2008)



Cold Sensitive Medical Conditions

- Asthma
- Sickle Cell Disease
- Neonatal Apnea
- Slowed Gastric Emptying
- Cardiovascular Mortality

Alternate Heat Sources Associated with Infant Cough and Wheeze

- Wood Stoves
- Kerosene Heaters
- Gas Space Heater
- Gas Stoves
 - Triche (2002)



BODY PROPORTIONS AND CALORIC EXPENDITURE

Why Should Cold Stress Correlate with Underweight?

- Cold exposure increases output of noradrenaline and thyroxine mobilizing free fatty acids
- Children's high surface to mass ratio increases heat loss in cold environment
- Nutritional wasting increases surface to mass ratio

PREGNANCY



"Women Should Keep Themselves Warm in Mid Pregnancy"

- Birth weight in Northern Ireland 1971-86
- Term infants born late spring and summer lighter than those born in winter, effect mediated by mean daily maximum temperature during 2nd trimester
- Seasonal variation in birth weight may be result of exposure to low winter temperatures in midgestation

Murray et. al. Obstet Gynecol 2000

Seasonal Patterns of Preterm Birth in London, USA, and Japan

- In London 1988-2000 10% increase in preterm births in the winter
- In Japan and US two peaks winter and summer
- In Japan highest in north in winter and south in summer
- Heat waves associated with oligohydramnios
 SJ Lee et. al. BJOG, 2006

Can We Fix It?



Low Income Home Energy Assistance Program (LIHEAP)

Children's HealthWatch: Low Income Home Energy Assistance Program (LIHEAP)

Compared to young children in eligible families who do not receive LIHEAP, those who do are:

- 20% less likely to be underweight for age or length and
- 30% less likely to require admission on the day of visiting a hospital emergency room.

Frank et al. *Pediatrics*, Nov 2006

Where Do We Go Next?



Directions for Future Research?

- Does Fuel Poverty exert incremental adverse effects on health outcomes above those expected from poverty alone?
- Can you identify pre/post differences in health outcomes after weatherization at household or population level? No information for infants/young children

Directions for Future Research?

Directions for Future Research?

- Is birth weight/gestational duration a useful outcome for weatherization (vital statistics)
- Could you do a randomized trial of weatherization among families with children with known temperature sensitive medical conditions like sickle cell or asthma?
- ALL THIS WILL TAKE LARGE SAMPLES

CHILDREN'S HealthWatch



www.childrenshealthwatch.org

Boston Medical Center New Hospital: Old Problems



Housing Insecurity

• Stable housing (0)

- <2 moves in last year</p>
- No crowding or doubling up
- Moderate housing insecurity (1)
 - <2 moves in last year
 - Crowded and/or doubled up
- Severe housing insecurity (2)
 - <u>></u>2 moves in last year
 - Either with/without crowding/doubling up

Effects of Housing Insecurity

Compared to children in families that are stably housed, children in families who are housing insecure are more likely to be:

- Food Insecure
- In poor health
- At risk for developmental delays (if housing insecurity severe)
- Lower weight for age z score (if housing insecurity severe)

Outcome Definitions

- Child Health Fair/Poor
- Past Hospitalizations (Age Controlled)
 ⇒Caregiver report of previous number of child

hospitalizations, <u>></u>1 vs. none

 Admit at Emergency Department (ED) visit

⇒Admitted to hospital after visit to ED on day of interview, Yes/No 3 sites only

Outcomes

- Nutritional Risk Anthropometry
 - At risk underweight weight/age less than 5th percentile, weight/length less than 10th percentile
 - At risk overweight weight/age more than 95th percentile or weight/length greater than the 90th percentile or BMI>85th percentile children >24 months

Outcomes

- Parents' Evaluations of Developmental Status (PEDS) 10 item parent report of concerns in:
 - -Cognition
 - -Expressive and receptive language
 - -Fine and gross motor
 - -Behavior and social-emotional
 - -Self help
 - -"Other concerns"

Scored as at risk/not at risk (Glascoe, 1998)