Facing the Challenge of Childhood Hunger: The Pediatrician’s Role

Ronald Kleinman, MD
Massachusetts General Hospital for Children
Harvard Medical School
Childhood Overweight: A Global Issue

Lancet 2011:378;804
Young children seen at Boston Medical Center who were underweight

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>12%</td>
</tr>
<tr>
<td>2008</td>
<td>14%</td>
</tr>
<tr>
<td>2009</td>
<td>14%</td>
</tr>
<tr>
<td>2010</td>
<td>18%</td>
</tr>
</tbody>
</table>

Families with young children who were malnourished

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>18%</td>
</tr>
<tr>
<td>2008</td>
<td>21%</td>
</tr>
<tr>
<td>2009</td>
<td>27%</td>
</tr>
<tr>
<td>2010</td>
<td>28%</td>
</tr>
</tbody>
</table>

NOTE: Families with children 3 and under, randomly surveyed in Boston Medical Center emergency room

SOURCE: BMC, Children’s HealthWatch

DAIGO FUJIWARA/GLOBE STAFF

Boston Globe July 28, 2011
Dying from hunger in food-exporting Argentina (6 April 2011)

“At least 10 indigenous children have died from malnutrition in north-west Argentina this year. How could this be happening in one of the world's biggest food-exporting countries? BBC Mundo's Vladimir Hernandez travelled to the indigenous Wichi community in a remote part of Salta to find out.”
1/4 children in the US live in food insecure households.

The cost of hunger to developing nations is an estimated US$430 billion per year.

It takes only 25 US cents for WFP to give a hungry schoolchild a cup of food with all the nutrition needed for the day.

The number of undernourished people worldwide is just under 1 billion – equivalent to the population of North America and Europe combined.

Hunger Map 2011

<table>
<thead>
<tr>
<th>Category</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undernourished</td>
<td>&lt;5%</td>
<td>5-9%</td>
<td>10-19%</td>
<td>20-34%</td>
<td>≥35%</td>
</tr>
<tr>
<td>Description</td>
<td>Extremely low</td>
<td>Very low</td>
<td>Moderately low</td>
<td>Moderately high</td>
<td>Very high</td>
</tr>
</tbody>
</table>

World Hunger Map
Prevalence of Food Insecurity in the United States

NEJM 363;1 July 1, 2010
Consequences of Food Insecurity

- Food Insecurity
- Hunger
- Malnutrition
- Wasting
- Stunting
The Faces of Childhood Hunger
Food Security:

The ready availability of nutritionally adequate and safe foods to an individual or household and an assured ability to acquire them in socially acceptable and sustainable ways.
Measuring Food Security: *towards a standard definition*

- USDA: Household Food Security Survey and Household Food Security Survey Short Form
- WFP: Comprehensive Food Security and Vulnerability; Analysis, Emergency Food Security Assessment
- Integrated Food Security Phase Classification (IPC): Standardized tool that aims at providing a “common currency” for classifying food security
- FAO: Data on production, imports and exports of all food commodities, along with the calorie content of each food. Data on population structure as an aggregate. This varies from country to country because of different population structures. Household survey data.
Food Insecurity:

The lack of availability, access, and utilization or use of food or the uncertainty that one will be able to do so.

Hungry children are more likely to exist in food insecure households.
Hunger:
The mental and physical condition that comes from not eating enough food due to insufficient economic, family, or community resources.
Malnutrition/Undernutrition:

A state in which the physical function of an individual is impaired to the point where he or she can no longer maintain natural bodily capacities such as growth, pregnancy, lactation, learning abilities, physical work, and resisting and recovering from disease.

http://www.wfp.org/hunger/glossary
Wasting:

A recent and severe process that has led to substantial weight loss, usually the result of starvation and/or disease.
Stunting:

An indicator of chronic malnutrition, calculated by comparing the height-for-age of a child with a reference population of well nourished and healthy children.
Consequences of Food Insecurity

- Stunting
- Food Insecurity
- Wasting
- Hunger
- Malnutrition
Food Security and Well Being

Lack of well being

Poor Nutritional Status

HUNGER

DISTRESS & ANXIETY

Adverse Family & Social Interactions

Deprivation & alienation

Lack of well being

Management Strategies

Livelihood Strategies

Economic & Social Resources

Functional Limitations

Social Context

FOOD INSECURITY: Uncertain, insufficient, or unacceptable availability, access, or utilization of food

Poor Dietary intake

Poor Nutritional Status
Malnutrition and Childhood Mortality

• 9.7 million children under five die each year in developing countries

• Malnutrition contributes to the death of over 5 million of these children
Diarrheal Disease and Malnutrition

• Diarrheal illnesses predispose children to malnutrition and growth shortfalls

• Malnutrition predisposes children to diarrheal illnesses
Vitamin and Mineral Deficiencies

Half of children suffering vitamin and mineral deficiencies are suffering from multiple deficiencies
Vitamin A Deficiency

- Associated with blindness, susceptibility to disease, and higher mortality rates
- Kills over 1 million infants each year
- Severe vitamin A deficiency may result in decreased intestinal absorptive area
Vitamin A Deficiency in Children Under 5
Iodine Deficiency

- 1.9 billion people are at risk of iodine deficiency.
- In pregnancy results in approximately 20 million mentally impaired babies a year.
- The greatest single cause of mental retardation and brain damage.
Iron Deficiency

- Causes the death of over 50,000 young women a year during pregnancy and childbirth

- Impairs the mental development of 40-60% of children in developing countries

- “50% of all children under two in Argentina are suffering from iron deficiency, despite the fact that this country is the world’s fourth-biggest exporter of beef. The high proportion of children with iron deficiency climbs to 70% among the poor” Jan. 30, 2003(IPS)
Prevalence of Anaemia Amongst Young Children in Argentina (Santa Fe 2003)
Zinc Deficiency

- Contributes to growth failure and weakened immunity in young children
- Results in some 800,000 child deaths per year
- Children treated with zinc have reductions in the duration of acute and persistent diarrhea
Hunger: An Often Invisible Health Crisis
Hungers Impact on Physical Health

- Higher rates of iron deficiency anemia
- Frequent headaches and stomach aches
- Increased odds of being hospitalized
- Risk of overweight in some children, particularly girls
Impact on Children’s Mental Health and Development

- Worse developmental outcomes
- Psychosocial, behavioral, and attention problems
- Depressive and suicidal symptoms in adolescents
Impact on Children’s Education

- Impaired mental proficiency and impaired functioning
- Increased prevalence of behavioral, emotional, and academic problems.
- Lower math scores and greater likelihood to have to repeat a grade.
- Increased rates of hyperactivity, absences, and tardiness
• Family and child resources
  – Poverty status
  – Race-ethnicity
  – Family head education
  – Family head employed
  – Family head marital status
  – Number of family moves
  – Regular source of health care

➢ Food insufficiency
  ➢ Family food insufficiency

• Environmental risk
  – Lead exposure
  – Crowding

• Past nutrition, health and social risk
  – Mother’s age at child’s birth
  – Low birth weight
  – Prenatal smoke exposure
  – Birth complications
  – Ever attended child care
  – Height

• Health status
Relationship between Number of Risk Factors and Cognitive and Academic Outcomes: 6- to 11-year-old Children

Block Design
Digit Span
Reading
Arithmetic

Score

Number of Risk Factors

Functional Consequences of Hunger/Food Insecurity for Children

- 204, 6-14 year olds
- Hunger survey administered to parent; modified survey to child at baseline and 6 months later
- Psychosocial/behavioral assessments of child by parent, teacher and child
Measures

- Child Behavior Checklist (*Parent*)
- Child Depression Inventory (*Child*)
- Connors’ Teacher Rating Scale (*Teacher*)
- Children’s Global Assessment Scale (*Clinician*)
- Grades and Absences (*School Records*)
Findings

- 73% exact agreement on hunger survey between parent and child at baseline
- 75% complete agreement between parent hunger scores at baseline and follow-up
- Excellent stability of hunger survey findings over 6 months (.56)
Findings
(N=204)

Days Absent*
Days Tardy*

* = p<.05

| Status       | Days Absent | Days Tardy
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Hungry (8%)</td>
<td>5.2</td>
<td>1.8</td>
</tr>
<tr>
<td>At Risk (28%)</td>
<td>3.2</td>
<td>1</td>
</tr>
<tr>
<td>Not Hungry</td>
<td>2.3</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Findings

Hungry (8%)
- Psychosocial Screen (PSC)**: 66.3
- Global Activity*: 71.5
- Child Behavior Checklist**: 56.8
- CTRS**: 21.5

At Risk (28%)
- Psychosocial Screen (PSC)**: 72.2
- Global Activity*: 56.3
- Child Behavior Checklist**: 51.7
- CTRS**: 18.9

Not Hungry
- Psychosocial Screen (PSC)**: 73.4
- Global Activity*: 48.8
- Child Behavior Checklist**: 53.5
- CTRS**: 14.4

* = p<.05
** = p<.001
*** = p<.0001
Influence of Nutrition on Cognitive and Behavioral Development

- Research supports that children who are hungry
  - Are less able to distinguish among similar images, show increased errors and have slower memory recall
  - Score lower in math
  - More often to repeat a grade
  - Exhibit behavioral, emotional and academic problems
  - More often hyperactive, absent and tardy
  - Score lower on cognitive tests when they miss breakfast
  - More often to receive special education services or mental health counseling
World Food Program: Feeding the Hungry

- Serves 90 million beneficiaries
- Operates in 73 different countries
- Distributes 3.7 million tons of food annually
Standard Food Basket

• Staples such as wheat flour or rice
• Lentils, chickpeas, or other pulses
• Vegetable oil (fortified with vitamin A and D)
• Iodized salt
• Sugar
Emergency Rations and Supplements
School cafeterias are the frontline for fostering a healthy lifestyle for children.

- Arne Duncan, US Secretary of Education
WFP School Programs

- Provide 17 million vulnerable school children in developing countries with a basic nutritious meal.

- Provide take-home rations for girls to encourage families to send their daughters to school: a sack of rice and a can of cooking oil for families who send their daughter to school.
Cognitive, Nutrition and Behavioral Associations with School Breakfast Consumption

- At baseline, assess relationship between:
  - hunger
  - nutritional risk
  - breakfast consumption, academics and behavior

- After offering universal school breakfast, assess relationship between changes in:
  - nutrition and breakfast consumption
  - academic/psychosocial outcomes

*Boston Schools/Project Bread*
Methods: *(baseline and post USBP)*

- Interview students and assess
  - nutrition *(24-hour dietary recall)*
  - hunger *(CCHIP survey)*
  - behavior *(PSC, 35 item checklist)*

- School records
  - grades, attendance, tardiness
  - school breakfast participation

- Interview parents and staff
  - demographics, child behavior, satisfaction with USBP
Baseline

(N=97)

• Age in years (range=8-12) 9.9
• Grade in school (range=4-6) 5.3
  – Female 59%
  – Minority 94%
    • African-American 57%
    • Hispanic 29%
    • Asian-American/Other 8%
• Single parent family 55%
Baseline Nutritional Risk

Nutrients < 50% RDA

- Calcium: 26%
- Iron: 24%
- Vitamin A: 23%
- Zinc: 18%
- Vitamin B6: 11%
- Vitamin B12: 9%
- Folate: 7%
- Vitamin C: 5%

- 2+ nutrients < 50%: 29%
- Kcal < 1500: 28%
- 2+ nutrients and/or Kcal < 1500: 33%
Baseline
Nutritional Risk by Hunger/Breakfast

- School Breakfast Rate: OK (N=65) at 36%, At Risk (N=32) at 16%*
- Home/School Breakfast Often: OK (N=65) at 77%, At Risk (N=32) at 31%***
- % Hungry (Child Rpt): At Risk (N=32) at 0.5%, OK (N=65) at 1.2%*

*p = p< .05
**p = p< .01
***p = p< .001
Baseline
Child Functioning by Nutritional Risk

<table>
<thead>
<tr>
<th></th>
<th>OK</th>
<th>At Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math Grade Average</td>
<td>2.6***</td>
<td>1.8***</td>
</tr>
<tr>
<td>Overall Grade Pt Average</td>
<td>2.8***</td>
<td>2.1***</td>
</tr>
<tr>
<td>Days Absent</td>
<td>6.6</td>
<td>10.5*</td>
</tr>
<tr>
<td>Days Tardy</td>
<td>1.9</td>
<td>5.1*</td>
</tr>
<tr>
<td>Psych Symptoms (Parent Rpt)</td>
<td>18.8%**</td>
<td>11.9%</td>
</tr>
<tr>
<td>Psych Symptoms (Child Rpt)</td>
<td>18.2%</td>
<td>22.9%*</td>
</tr>
</tbody>
</table>

* = p < .05
** = p < .01
*** = p < .001
Change from Baseline to End of Year
Change in Nutritional Risk by Change in Breakfast Consumption, Hunger

**Increased School Breakfast**
- 13% Same/Worse
- 55% Decreased

**Decreased Hunger (Child Rpt)**
- -11% Decreased
- 88%*

* = p < .01
** = p < .001
Change from Baseline: Changes in Functioning by Change in Nutritional Risk

- **Math Grade Average**
  - Same/Worse: 0.1
  - Decreased: 0.6**

- **Days Absent**
  - Same/Worse: 0.9
  - Decreased: -3*

- **Psych Symptoms (Child Rpt)**
  - Same/Worse: -1.2
  - Decreased: -3.2**

* = p < .05
** = p < .01
Summary of Findings

• More than one-third of students were hungry or at risk for hunger
• Hungry students: poorer grades/more symptoms of behavioral/emotional problems
• More likely to have low intake of 2 or more critical nutrients
Summary of Findings: After School Breakfast Program Implemented

- More than 2/3 children who were hungry or at risk increased their breakfast participation
  - Improved nutrient intake
  - Better math grades
  - Fewer school absences and tardiness
  - Decreased emotional/behavioral problems

- High satisfaction
  - 73% of all respondents
  - 100% of parents
  - 94% of staff
Summary: First Systematic Review of School Feeding

- 18 Randomized studies (9 lower income)

- Children fed at school:
  - Gained .39 -.71kg more over 11-19 months
  - Gained more in height
  - Attended school 4-6 days more/year (lower income)
  - Improved math scores
  - Improved short-term cognitive tasks

Kristjansson EA et al
Cochrane Library CD004676. 2006
Summary

- Cognition is affected by nutritional status throughout childhood and adolescence as the central nervous system develops.
- Internal and external environmental factors, including behaviors, health and socio-economic status, interact with nutritional status to determine a child’s ability to learn and function.
- School feeding programs offer the opportunity to reduce the risk of adverse external environmental factors, support good nutrition and encourage a healthy lifestyle.
So what can pediatricians do?

• Screen for the presence of child hunger in your patients and families.

• Provide information on nutrition assistance programs and ‘refer’ children to resources.

• Be knowledgeable about the available resources in your community.

• Advocate for policy interventions to eliminate problems of poverty and food insecurity, which pose an unacceptable but remediable risk to children.

• Promote nutrition education and physical activity in public school systems.
Screen your patients

• Hunger is often hidden, even in families in which other indicators of poverty are evident.

• Parents may be embarrassed to admit that they are not able to provide adequate food for their children.
Screening Tools for Researchers

- Household Food Security Survey: USDA 18-item survey used to monitor national food-security status annually and considered the gold standard in research.

- Household Food Security Survey Short Form: a shorter 6-item version with excellent sensitivity and good specificity.

- Community Childhood Hungry Identification Project Survey: an 8-item survey that characterizes families and children as hungry, at risk for hunger, or not hungry based on parental reports.
For the busy Pediatrician:  
a two question screening tool

- Yes/No: Within the past 12 months we worried whether our food would run out before we got money to buy more.

- Yes/No: Within the past 12 months the food we bought just didn’t last and we didn’t have money to get more.
For the *really* busy pediatric physician: a single question screening tool

In the past month, was there any day when you or anyone in your family went hungry because you did not have enough money for food?
### Percent of households by food security status and participation in selected Federal and community food assistance programs, 2008

<table>
<thead>
<tr>
<th>Category</th>
<th>Food secure</th>
<th>All</th>
<th>With low food security</th>
<th>With very low food security</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income less than 130 percent of poverty line:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Received SNAP&lt;sup&gt;1&lt;/sup&gt; benefits previous 12 months</td>
<td>43.8</td>
<td>56.2</td>
<td>30.6</td>
<td>25.7</td>
</tr>
<tr>
<td>Received SNAP&lt;sup&gt;1&lt;/sup&gt; benefits all 12 months</td>
<td>47.0</td>
<td>53.0</td>
<td>29.1</td>
<td>24.0</td>
</tr>
<tr>
<td>Received SNAP&lt;sup&gt;1&lt;/sup&gt; benefits 1 to 11 months</td>
<td>39.3</td>
<td>60.7</td>
<td>32.6</td>
<td>28.0</td>
</tr>
<tr>
<td>Did not receive SNAP&lt;sup&gt;1&lt;/sup&gt; benefits previous 12 months</td>
<td>69.5</td>
<td>30.5</td>
<td>17.1</td>
<td>13.4</td>
</tr>
<tr>
<td>Income less than 185 percent of poverty line; school-age children in household:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Received free or reduced-price school lunch previous 30 days</td>
<td>50.6</td>
<td>49.4</td>
<td>31.1</td>
<td>18.3</td>
</tr>
<tr>
<td>Did not receive free or reduced-price school lunch previous 30 days</td>
<td>68.8</td>
<td>31.2</td>
<td>19.8</td>
<td>11.4</td>
</tr>
<tr>
<td>Income less than 185 percent of poverty line; children under age 5 in household:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Received WIC previous 30 days</td>
<td>54.3</td>
<td>45.7</td>
<td>30.7</td>
<td>15.0</td>
</tr>
<tr>
<td>Did not receive WIC previous 30 days</td>
<td>61.2</td>
<td>38.8</td>
<td>27.7</td>
<td>11.1</td>
</tr>
<tr>
<td>Income less than 185 percent of poverty line:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Received emergency food from food pantry previous 12 months</td>
<td>30.2</td>
<td>69.8</td>
<td>31.7</td>
<td>38.1</td>
</tr>
<tr>
<td>Did not receive emergency food from food pantry previous 12 months</td>
<td>71.3</td>
<td>28.7</td>
<td>17.5</td>
<td>11.2</td>
</tr>
<tr>
<td>Ate meal at emergency kitchen previous 12 months</td>
<td>25.9</td>
<td>74.1</td>
<td>24.4</td>
<td>49.7</td>
</tr>
<tr>
<td>Did not eat meal at emergency kitchen previous 12 months</td>
<td>67.0</td>
<td>33.0</td>
<td>19.1</td>
<td>13.9</td>
</tr>
</tbody>
</table>

<sup>1</sup>SNAP (Supplemental Nutrition Assistance Program) is the new name for the Food Stamp Program, effective as of October 2008.

Refer your patients to available programs

- Hungry families underused all types of food assistance programs.

- Only 60 percent of adults eligible for food stamps nationally use them.

- Only 44.6 percent of children eligible for a free or reduced-price school breakfast receive one.

- Only 7.2 percent of kids eligible for summer food programs participate in them.
Barriers to Ending Hunger

• Conflicting government priorities
• Conflicting health priorities
• Global increase in food prices
Global Advocacy

- Improve the nutritional content of food donations
- Engage local, small-scale farmers in hunger relief efforts
- Put more income in the hands of women
- Community gardens: Farm to school
- School feeding programs
Those who care........
A Few Global Partners

www.wfp.org
www.unicef.org
www.who.int
www.gcnf.org
www.actionagainsthunger.org
www.foodbanking.org
www.micronutrient.org
If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health. 

*Hippocrates*
Underweight:

Measured by comparing the weight-for-age of a child with a reference population of well-nourished and healthy children.
Stages of Malnutrition

Mild malnutrition:
- reduced physical activity
- lowered rates of growth

Moderate malnutrition:
- more reductions in activity
- greater impact on growth rates
- signs of wasting
- some biochemical abnormalities

Severe Malnutrition:
- all linear growth ceases
- physical activity curtailed
- marked body wasting
- clinical signs of malnutrition
Assessing Nutritional Status in Children:

Anthropometry:
- Height
- Weight
- Head circumference
- Mid-upper arm circumference

Clinical signs of malnutrition:
- Body wasting
- Hair and skin changes
- Edema

Biochemical indicators:
- Reduced serum albumin
- Iron deficiency and anemia
Know where can your patients and families go for help.

Massachusetts Department of Transitional Assistance
http://www.mass.gov/?pageID=eohhs2agencylanding&L=4&L0=Home&L1=Government&L2=Departments+and+Divisions&L3=Department+of+Transitional+Assistance&sid=Eeohhs2

Online resource for applying for SNAP:
http://www.gettingfoodstamps.org/

DTA SNAP Outreach Centers:
http://www.mass.gov/?pageID=eohhs2modulechunk&L=4&L0=Home&L1=Government&L2=Departments+and+Divisions&L3=Department+of+Transitional+Assistance&sid=Eeohhs2&b=terminalcontent&f=dda_g_new_fs_outreach_centers&csid=Eeohhs2

Project Bread FoodSource Hotline:
http://www.projectbread.org/site/PageServer?pagename=help_foodsourcehotline

Project Bread Resource Guide: