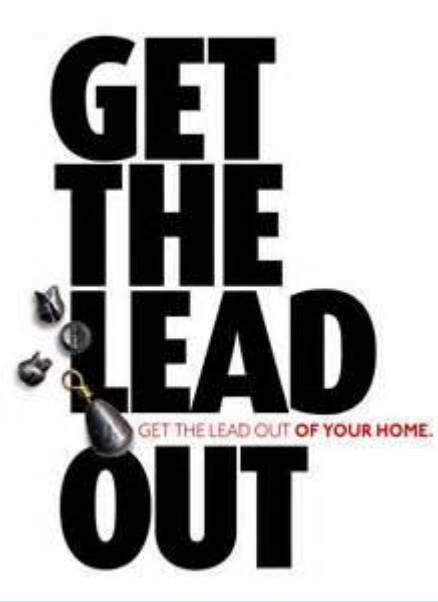
Lead Poisoning The Silent Thief: The Need for Resiliency Partnerships for Children?



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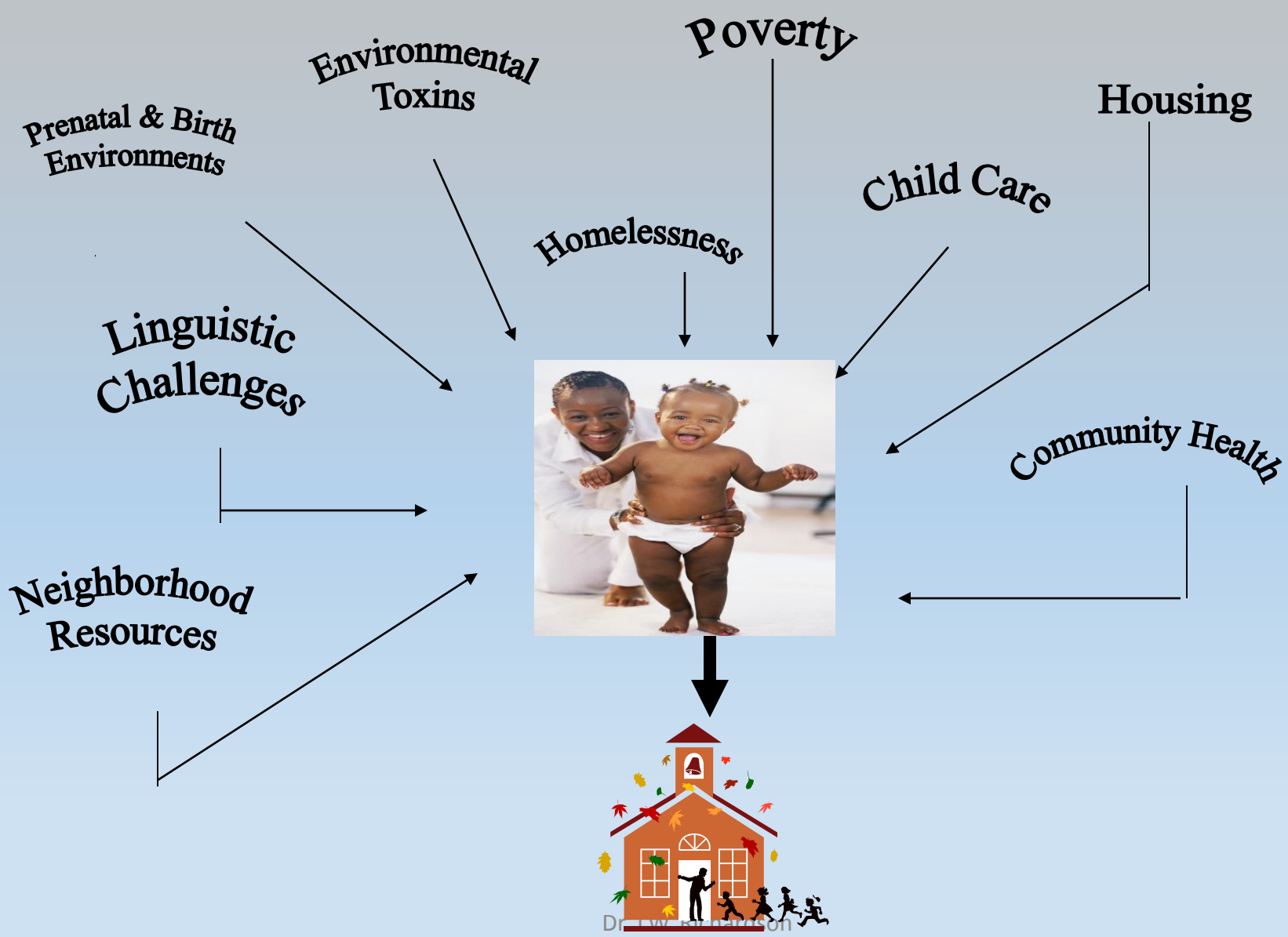
Educational Risk & Social Determinants of Health

Risk tends to refer to any factor or combination of factors that interfere with optimal development.

SDOH are the conditions in which people are born, grow, live, work and age, including the health system. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels, which are themselves influenced by policy choices. (WHO, 2008)

(Richardson, 2008)


Poverty
Environmental Toxins
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Lead Poisoning the Silent Thief

Each year in the United States 310,000 1- to 5-year-old kids are found to have unsafe levels of lead in their blood

Approximately 500,000 U.S. children aged 1-5 years with blood lead levels above 5 micrograms of lead per deciliter of blood, the reference level at which CDC recommends public health actions be initiated.

http://kidshealth.org/parent/medical/brain/lead_poisoning.html

An Old Problem With Burgeoning Consequences

1. **Lead and juvenile delinquency**; K.N. Dietrich et al. (2001)
2. **Lead and ADD /ADHD**; Needleman & Bellinger (1991)
3. **Lead and Dyslexia**; Ferguson et al. (1997)
4. **Lead and Autism**; Landrigan et al. (2002)

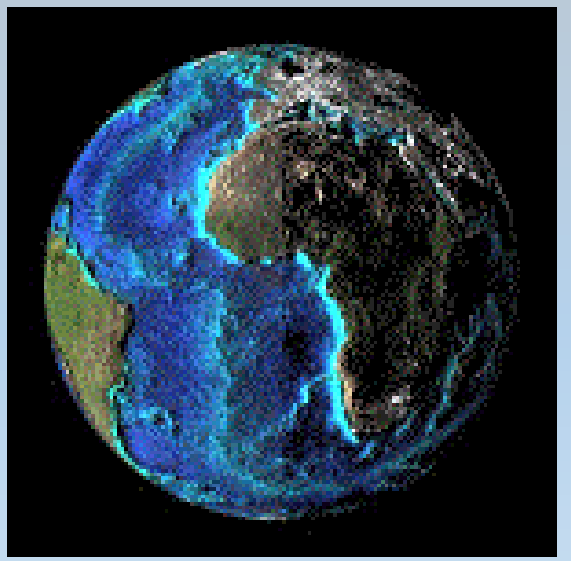
http://www.bing.com/images/search?q=lead+poisoning+and+pictures&go=&qs=bs&form=QBIR

International Lead Poisoning Concerns

1. Australia -Water

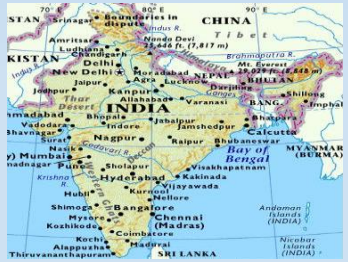
"Will that be leaded or unleaded coffee sir?"

A study conducted in Perth on water collected from water boilers, urns and coffee and cappuccino machines from restaurants, offices, workplaces and schools, found that 67% of the samples contained excessive levels of lead. The probable source of the contamination was brass components in contact with hot water



2. Haina, Dominican Republic – Battery Recycling Plant

3. Paniput, India – Textile Dye Industry



What is Lead and Who Is Most At-Risk?

- **Lead is a ubiquitous and a non-essential metal.**
- **Every person on the planet is at risk, but children are most vulnerable**
- **Particularly affects young children and infants (up to 6 years old)**
- **Found at high levels in urban and industrial areas**
- **Lead induced neurological damage is permanent and irreversible**
- **Deposits on soil and water and harms animals and fish**

There are 3 principal risk factors for childhood lead poisoned. JAMA

- Age
- Year of Housing and Exposure
- Race and Ethnicity

Sources and Effects

- **HOUSE PAINTS:** Prior to 1950, lead-based paint was used on the inside and outside of most homes. In 1977, federal regulations virtually eliminated lead from paint for general use. But homes built prior to 1977 are likely to contain lead-based paint.
- **SOIL:** Soil near heavily-used streets may contain lead because lead used to be used in gasoline. Lead in the soil can also come from local smelting plants and contribute to high levels of lead in household dust.

- **DRINKING WATER:** Lead may get into drinking water when materials used in plumbing materials, such as pipes, lead-based solders, brass and chrome plated faucets, begin to corrode.
- **OTHERS:** Lead has recently been found in some plastic mini-blinds and vertical blinds which were manufactured in other countries. In addition, lead may be present in old toys, some imported toys, lead-glazed or lead-painted pottery, leaded crystal, and some inks, plasters, hobby and sports materials (such as artists' paints, ammunition, stained glass treatments, or lead sinkers used in fishing).

Sources and Effects Continued
Health and Environmental Impacts of Lead

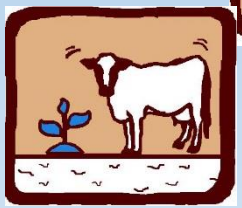
People, animals, and fish are mainly exposed to **lead** by breathing and ingesting it in food, water, soil, or dust. Lead accumulates in the blood, bones, muscles, and fat. Infants and young children are especially sensitive to even low levels of lead.

- **Damages organs** - Lead causes damage to the kidneys, liver, brain and nerves, and other organs. Exposure to lead may also lead to osteoporosis (brittle bone disease) and reproductive disorders

- **Affects the brain and nerves** - Excessive exposure to lead causes seizures, mental retardation, behavioral disorders, memory problems, and mood changes. Low levels of lead damage the brain and nerves in fetuses and young children, resulting in learning deficits and lowered IQ.

- **Affects the heart and blood** - Lead exposure causes high blood pressure and increases heart disease, especially in men. Lead exposure may also lead to anemia, or *weak blood.*

- **Affects animals and plants** - Wild and domestic animals can ingest lead while grazing. They experience the same kind of effects as people who are exposed to lead. Low concentrations of lead can slow down vegetation growth near industrial facilities.



- **Affects fish** - Lead can enter water systems through runoff and from sewage and industrial waste streams. Elevated levels of lead in the water can cause reproductive damage in some aquatic life and cause blood and neurological changes in fish and other animals that live there.

Symptoms of Lead Poisoning

- **headaches**
- **muscle and joint weakness or pain**
- **excessive tiredness or lethargy**
- **behavioral problems or irritability**
- **difficulty concentrating**
- **loss of appetite**
- **pica**
- **metallic taste in the mouth**
- **abdominal pain, nausea or vomiting**
- **constipation**

http://www.bing.com/images/search?q=children+and+sick+and+pictures&go=&qs=bs&form=QBIR

Educational Consequences of Low-Level Lead Exposure

Visual-motor and visual-spatial integration problems at 24 months from prenatal exposure
Reading difficulties or reading disabilities in lower grades
Negative influence of low economic class promoting endurance of lead induced deficits
Lower IQ scores, speech and language processing, attention deficits
Need for special academic services and higher failure rate in fifth grade
Behavior problems in school
Seven times more likely to drop out of high school, lower class standing; higher absenteeism, lower vocabulary and grammatical reasoning scores, higher incidence of reading disabilities, poorer eye-hand coordination and reaction time
Males are more likely to suffer enduring intellectual and behavioral symptoms associated with lead poisoning than females

J.W. Richardson (2007)

Proactive: Lead Poisoning Classifications and Recommended Treatment

Class	BLL ug/dL	Action
I	<9	▪Re-screen at recommended intervals
IIA	10 - 14	▪If this level is prevalent in the community, community intervention is recommended. ▪Provide follow-up testing ▪Refer child to for social services if necessary
IIB	15 - 19	▪Test for iron deficiency, assess home environment to determine if abatement is indicated ▪Family Lead Education (diet and environment)
IIII	20 - 44	▪Complete medical evaluation of child (the suggested battery of tests). Pinpoint lead source and abate or encapsulate lead ▪Environmental investigation ▪Family lead education (diet and environment) ▪Neurodevelopmental monitoring
IV	45 - 69	▪Begin medical treatment (chelation therapy) and household evaluation within 48 hours. ▪Follow up blood tests 7 - 21 days after treatment. Children should not be released from the hospital until lead safe housing is secured. ▪Family Lead Education (diet and environment) ▪Complete neurological exam ▪Environmental investigation
V	>70	▪Immediately begin medical treatment and housing evaluation and lead removal or encapsulation. ▪Follow up blood tests 7 - 21 days after treatment. Children should not be released from the hospital until lead safe housing is secured.

Richardson (2005)

Diagnosis and Treatment Protocols

- **Diagnosis**
  - Finger prick
  - Venous
  - Dentin
- **Treatment**
  - Repeat Screening and home remediation
  - Parental Education (cleaning protocols, nutrition)
  - Chelation therapy. In this treatment, you take a medication that binds with the lead so that it's excreted in your urine. (lead levels greater than 45 mcg/dL)
  - EDTA therapy. Doctors treat lead levels greater than 45 mcg/dL of blood with a chemical called ethylenediaminetetraacetic acid (EDTA).

Findings From a US Study: Housing

- Housing authorities are faced with directives that conflict thus decreasing Title X implementation effectiveness.

- Landlords can choose not to accept the funds provided under Title X without fear of repercussions.

- The only recourse tenants have against noncompliant landlords is litigation, which is expensive, time-consuming and which does nothing to decrease the exposure level of a child already lead poisoned.

- HUD strongly encouraged the use of minority contractors to renovate houses. There are several factors that made maintenance of contractors a challenge:
  - Specialized licensing is required to renovate lead hazardous properties.
  - Insurance companies require a $5,000 up front rider to insure contractors doing lead work.
  - Many minority contractors are not familiar with the strict guidelines that govern the bidding process.
  - Majority contractors have no incentive to bid on small renovation jobs when they can work on much larger projects that yield higher profits.

J.W. Richardson (2007)

Findings From a US Study: Health

- Lead induced damage is irreversible.
- Many health professionals that regularly treat children under the age of six are not familiar with CDC guidelines that prescribe ages for lead screening and subsequent treatment.
- The level of lead poisoning that triggers chelation therapy is not consistent.
- The symptoms of lead poisoning mimic other childhood disorders and can be easily misdiagnosed.

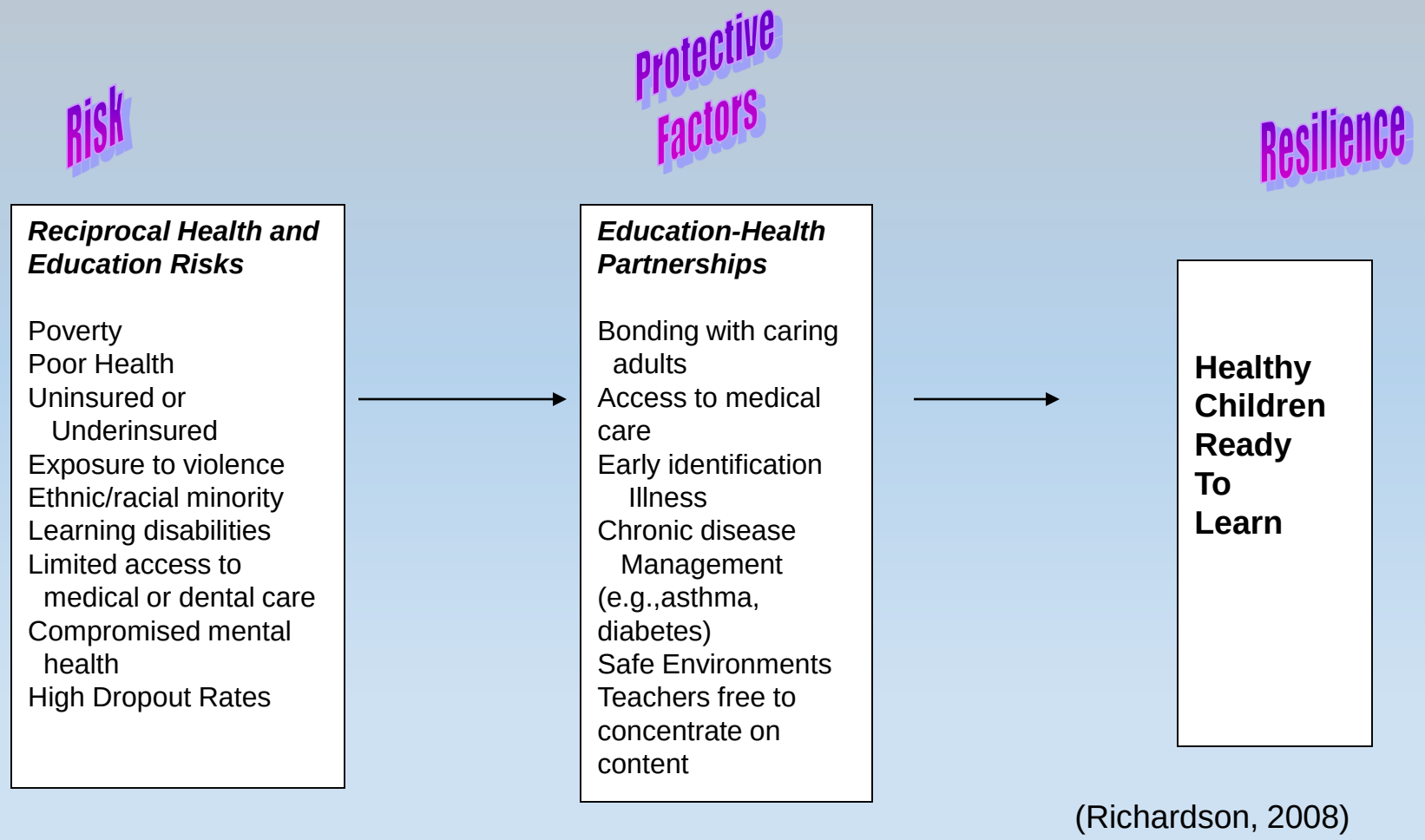
J.W. Richardson (2007)

Findings From a US Study: Education

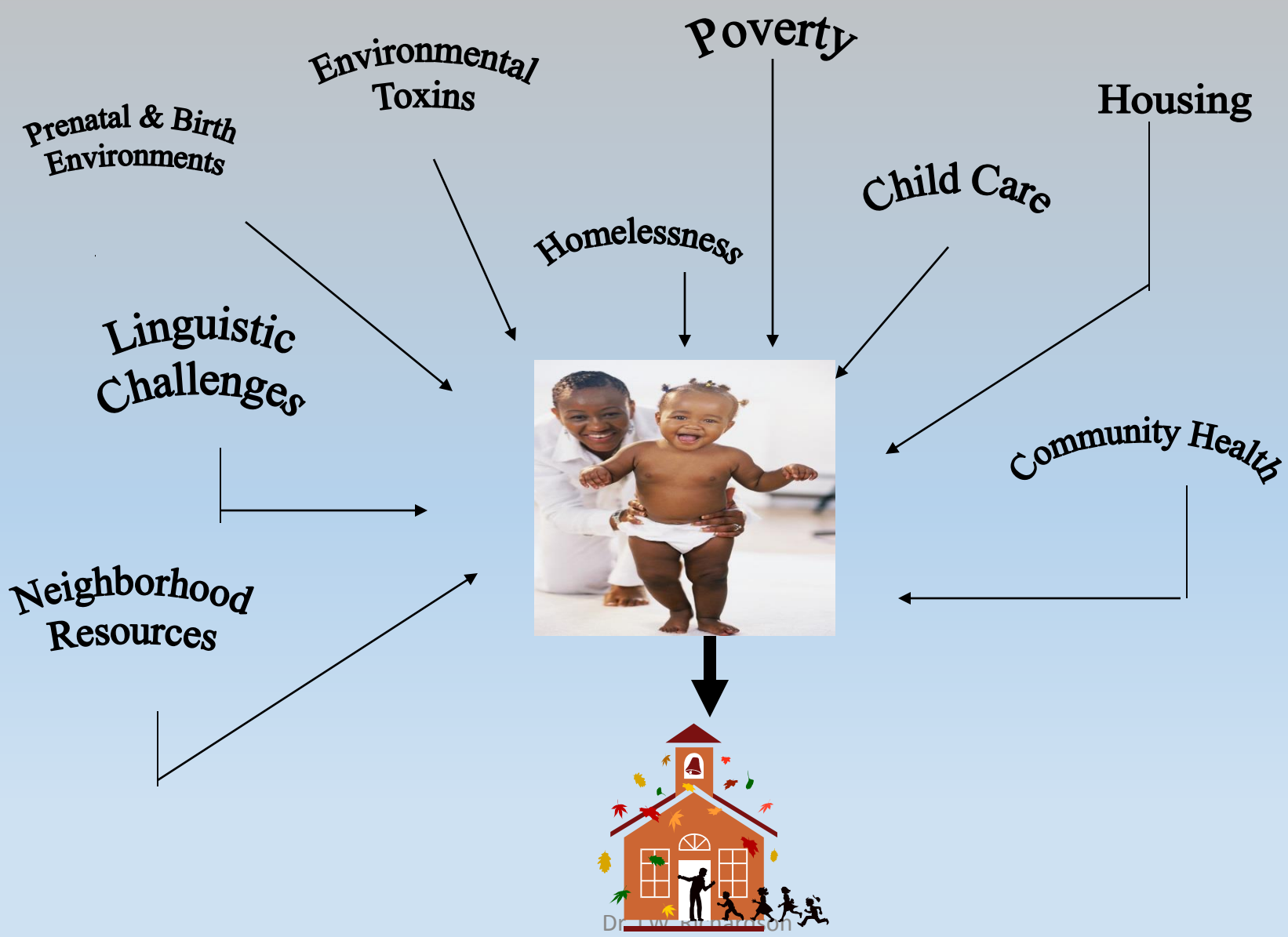
- Virtually no information is available outlining pedagogical strategies that are helpful when teaching lead poisoned students.
- Even in a city where programs designed to reduce lead exposure have existed for over 20 years, school personnel are largely ignorant of the relationship between lead poisoning and childhood behavior and academic potential.
- Lead's influence on cognitive potential spans the educational continuum.
- The minimal information that does exist to guide teaching suggests that techniques that are useful for ADHD children and strategies that appeal to multiple learning styles (visual, auditory, kinesthetic learners) work well for lead poisoned children.

J.W. Richardson (2007)

From Risk to Resilience



(Richardson, 2008)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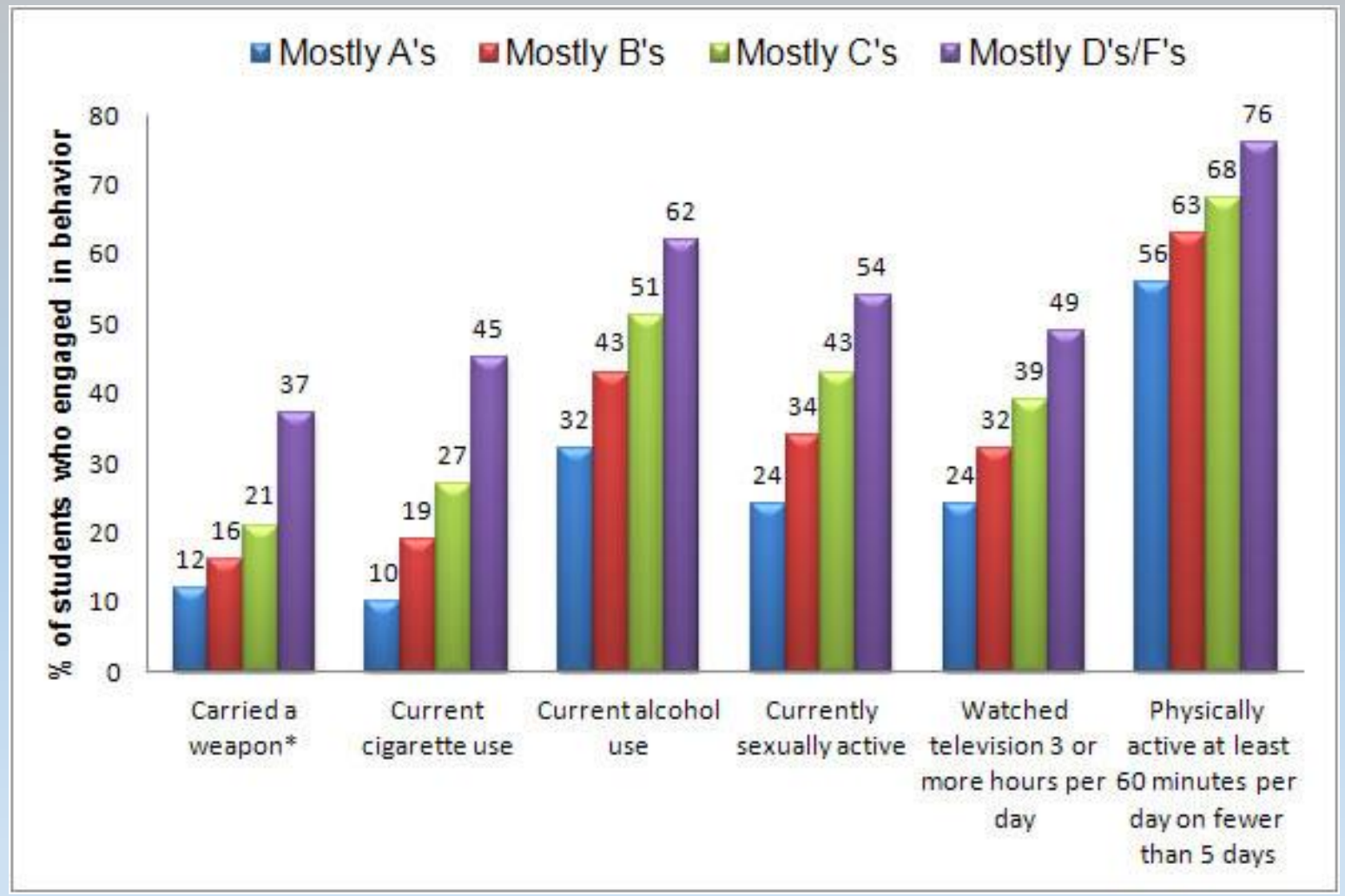
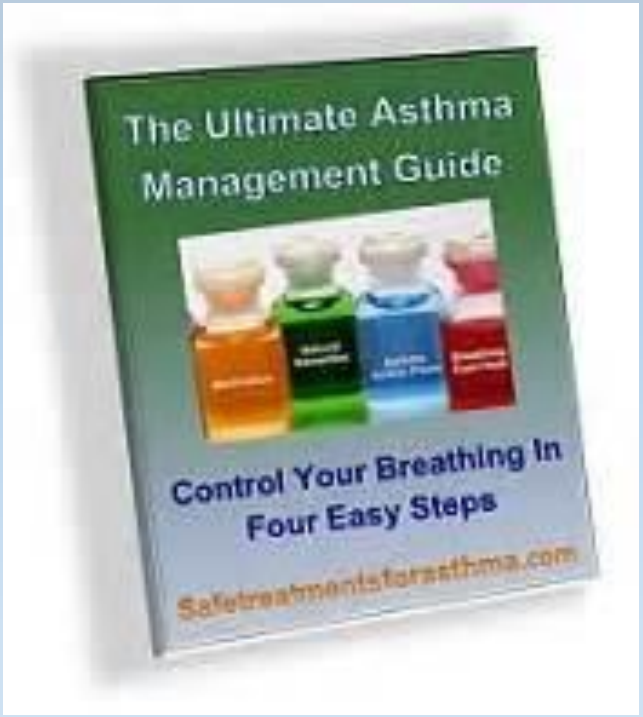
Percentage of high school students who engaged in selected risk behaviors, by type of grades earned — United States, Youth Risk Behavior Survey, 2009



http://www.cdc.gov/healthyyouth/health_and_academics/data.htm

A Practical Link Between Health and Education Childhood Asthma Management



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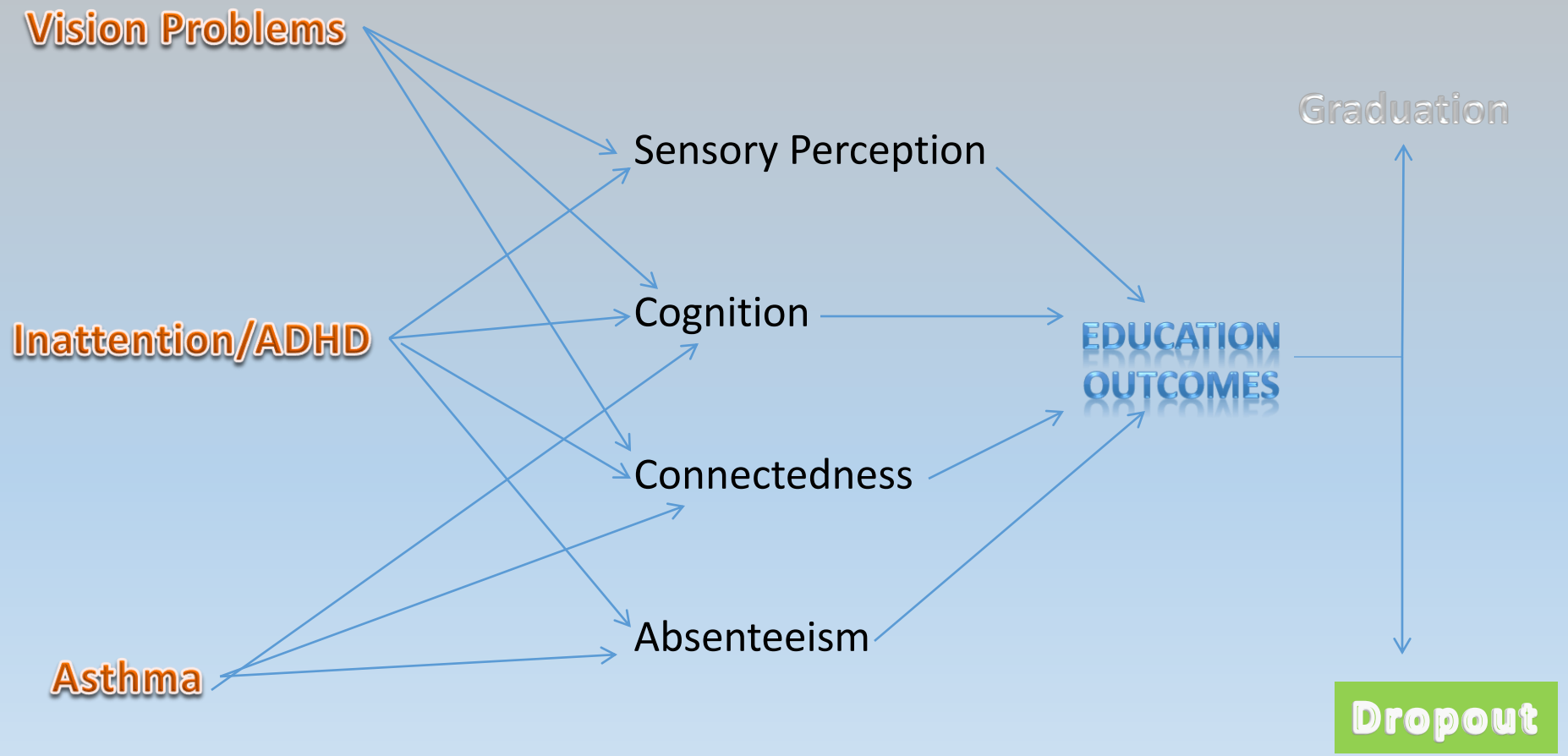
http://www.bing.com/images/search?q=Free+Asthma+Pictures&qpvt=Free+Asthma+Pictures&FORM=IQFRML#x0y680

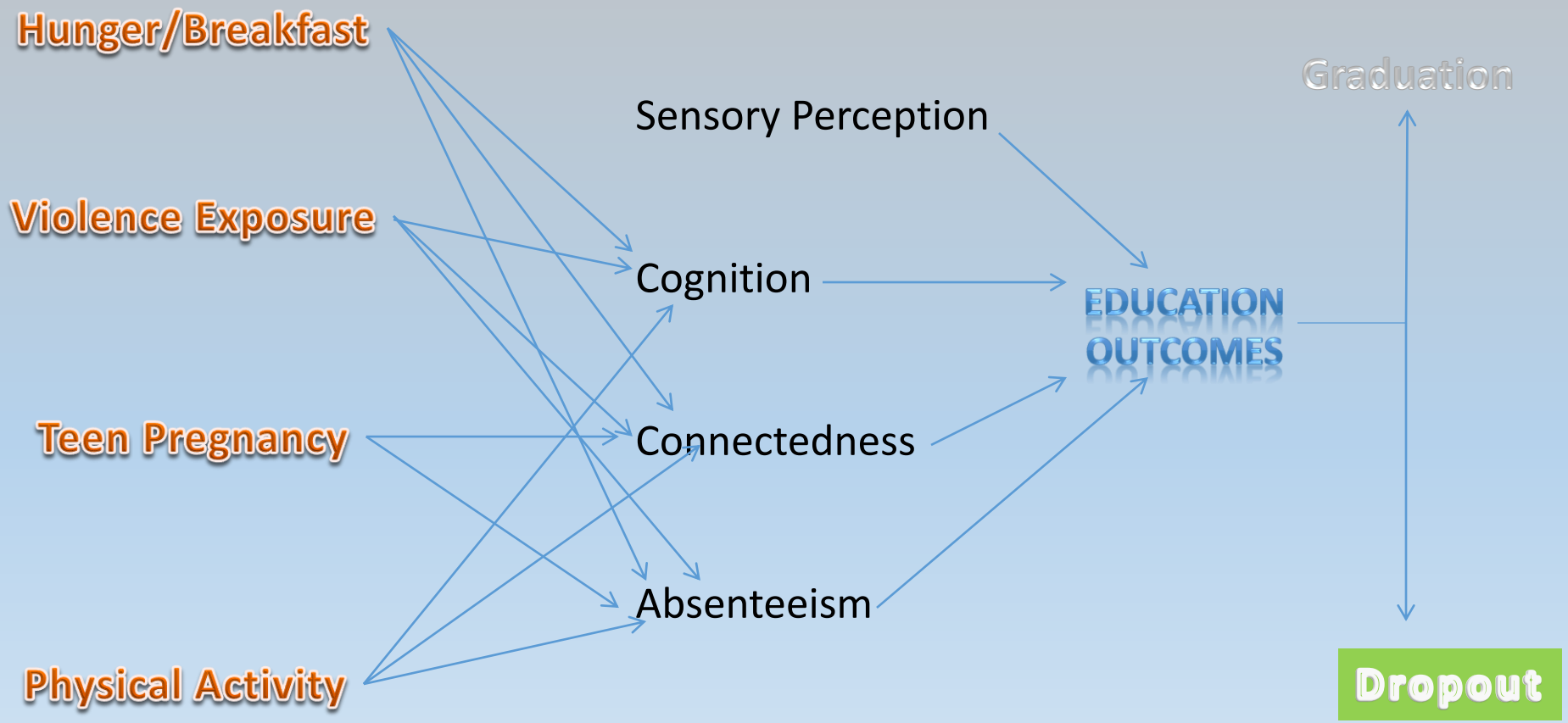
Clinical Causal Pathways



(Basch, 2010, 2011)

SDOH Causal Pathways

Educationally Relevant Health Disparities for Urban Youth



(Basch, 2010, 2011)

Connecting Professional Communities For Children

Childhood Asthma

Nationally the cause of 14 million days lost from school

3rd ranking cause of child hospitalization

Health Implications

- **Higher rates of fatalities, hospital admissions and emergency room visits for low-income and minority populations**
- **Poor mental and physical health days are more common among persons with asthma**
- **Less than 37% of kindergarteners with asthma have a written asthma plan**
- **Children ages 0-4 have the highest rate of asthma hospitalizations**

Learning Implications

- **Asthma causes approximately 65,000 school absences per year in Maine**
- **Children in fair or poor health such as those with uncontrolled asthma were six times more likely to have a learning disability and be absent 11 or more days from school**
- **Disrupted sleep caused by asthma contributes to poor school performance**
- **Asthmatic children have higher rates of grade failure than non-asthmatics**
- **Children with asthma have almost twice the rates of learning disabilities when compared with well children**

Dr. J.W. Richardson

(CDC (2007); Diette et.al, 2000; Fowler, Davenport & Garg, 2001; Halterman,et. al, 2001; Maine Child Health Survey (2002)

Thank you
Questions?