KIDS IN THE COUNTRY…….AND WE'RE NOT TALKING GOATS

Environmental Issues in Children Living in Rural Areas

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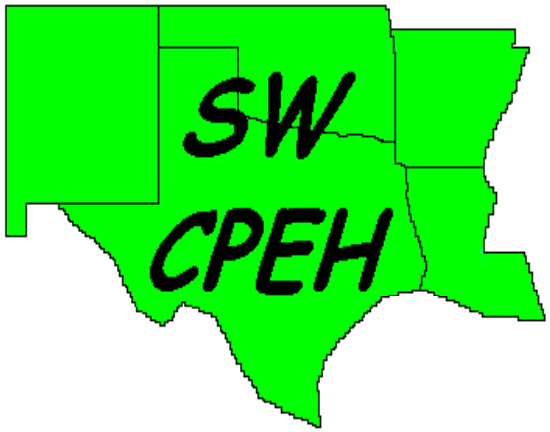
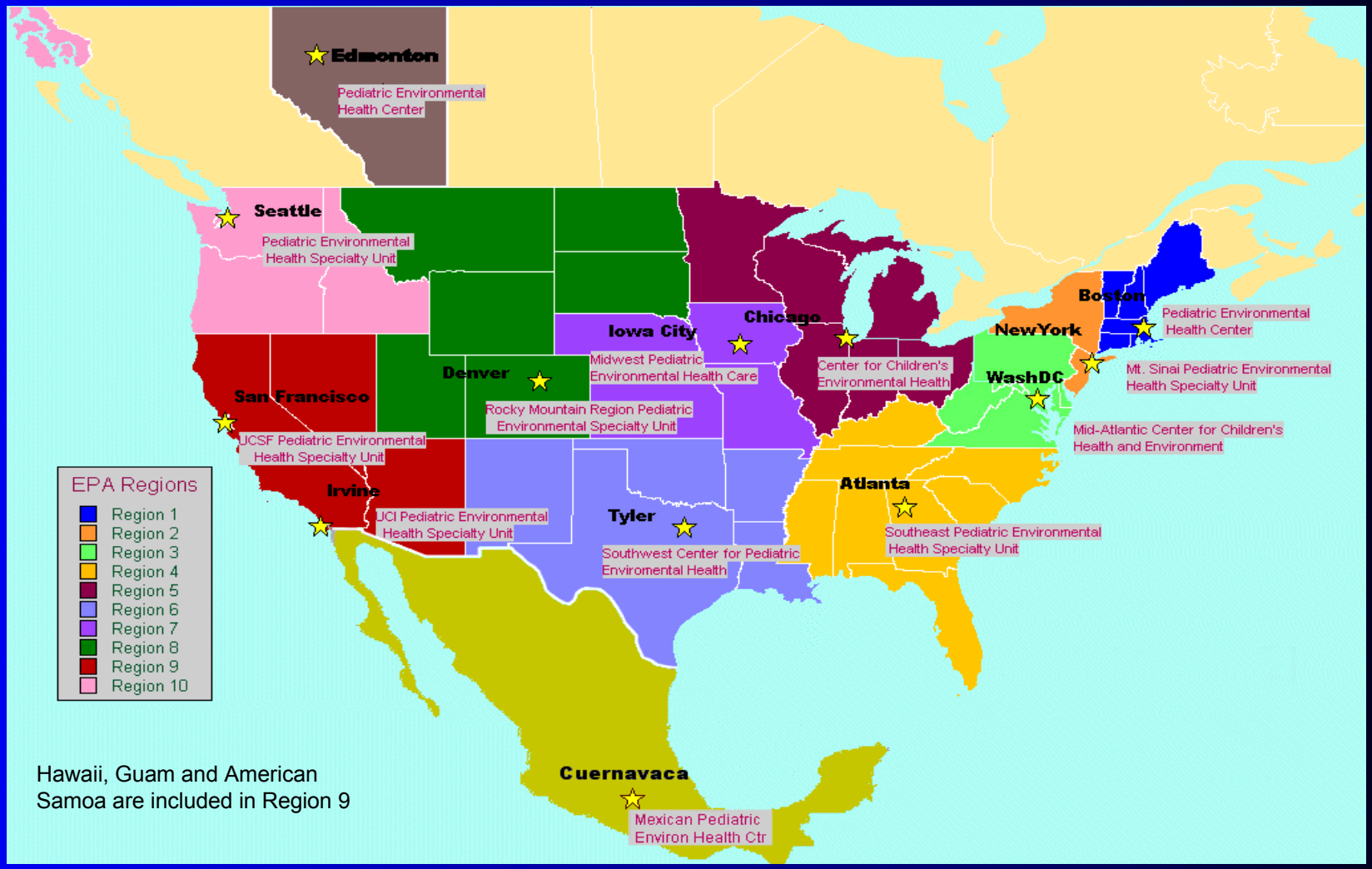


Southwest Center

Pediatric Environmental Health

Locations of Pediatric Environmental Health Specialty Units



Hawaii, Guam and American Samoa are included in Region 9

The University of Texas Health Center at Tyler

Children vs Adults

- Consume more food and water
  - Caloric consumption is 2½ X greater
  - Ingest more dust and soil
- Resting respiratory rate 2X greater
- Skin surface area/body weight is 2X greater
- Longer potential lifetime for exposure
- Immature livers and kidneys for elimination of toxins

FETUS

- Rapid cell growth creates susceptibility to damage
- Preconception exposure (Pb, PCBs)
- Placenta – not complete filter (DES,ETS,Hg)

NEWBORN

- Decreased metabolism & excretion
- GI tract highly permeable
- Skin highly permeable (i.e. methemoglobin-emia, hexachlorophene, lindane, DEET)

INFANT AND TODDLER

- ORAL
  - Normal exploratory behavior
  - Diet
- RESPIRATORY
  - Increased because of metabolic needs

PRESCHOOL AND SCHOOL-AGE CHILD

- Exploration of the "neighborhood"
  - School
  - Home
  - Playground
- Importance of past exposures – delayed effects

ADOLESCENT

- Route of absorption same as adult
- Sensitive reproductive system
- Occupational exposure
- Risk taking behavior
- Physical strength vs maturity level

FAIR LABOR STANDARDS ACT

- ≥ 14 y/o may work on farm unlimited hours outside school hours
- < 12 y/o may work on farm with consent of parents
- < 16 y/o prohibited from working with hazardous substances, but are not considered hazardous
- Children of farmers can work on family farm at any age
- Other industries - <18 are forbidden to work in hazardous conditions

ASTHMA

- 3 times greater in adults exposed to agricultural dusts
- Exposures include molds and pollens, dusts in silos and barns,silica from soil,animal dander
- Farm is home, playground, and workplace

ASTHMA
RURAL VS URBAN

			Airway Hyperreactivity (%)		Asthma (%)	
Location	**n**	**Age (years)**	**Urban**	**Rural**	**Urban**	**Rural**
South Africa	1375	6-9			**3.17**	**.014**
Australia	170	8-12	**22.0**	**21.3**		
Australia	915	5-18			**20.6**	**22.4**
Kenya	1172	8-17			**9.3**	**2.5**
Iran	400	5-11			**0.5**	**4.5**

ASTHMA MORBIDITY

- Genetics
- Recurrent airway inflammation mediated by environmental exposure
  - Persistent airway hyper-responsiveness
  - Development of chronic airway disease
- Role of anti-inflammatory medications
- Barriers to health care

BARRIERS


HEALTH CARE
INSURANCE
GEOGRAPHICAL DISTANCE
PROVIDER SHORTAGE

PESTICIDES

- 2 y/o boy died after playing near flattened storage drums of toxaphene
- Bro & sis died after playing in a swing made from a burlap sack contaminated with parathion
- 4 y/o played with a bag of parathion stored in barn – admitted near death
- 1 ½ y/o poisoned with Demeton by exposure to father's shoes

CLOTHING EXPOSURE (CALIFORNIA)

- 20% exposed workers shower or change clothes after work
- Only ½ receive training on how to handle pesticides
- Contamination of car and home

Wilk, V. Health Hazards to Children in Agriculture, *Am J Ind Med, 1993*

DOES WASHING HELP?

- Use hot water
- Sorting laundry
- Neb. – parathion
  - after 10 washings, 34% remained (enough to kill insects)
  - 40-90% sort laundry
  - 25-50% use hot water
  - Most did not clean washer between loads of laundry

- Laughlin, J *Laundering Pesticide Contaminated Clothing,* U of Nebraska

OUTSIDE IN

- Pesticides tracked in can accumulate
- Pesticides outdoors are broken down by sun,rain, and soil microbes
- Pesticides indoors accumulate and persist for many years
- Hazard to small children
- Iowa – atrazine in all houses of farm families compared to 4% of non-farm (1997)
- Simcox et al. (1995) higher [OP] in agricultural homes compared to reference

CHILDREN IN THE FIELDS

"The first field we visited could have been mistaken for a day care center. There were many small children in the field with their parents. Some were sitting in the dirt, just being near their families. Some were picking strawberries just like their parents and older siblings. We saw a baby stroller which was advanced a few feet occasionally to keep up with the progress of the picking. The families were together, but there wasn't much joy. At 12 cents a pound for the straw-berries, minus room and board costs, this "day care center" was a part of survival"

- Scott Pike, *Testimonies from the Fields,* Woodburn, OR, 1997

The Spraying Fields

- Lack of appropriate day care
- Over – spray
- Work in newly sprayed fields

WHY SHOULD WE WORRY?

- Disproportionate exposure
  - Greater intake of food, water, air / kilogram
  - Narrower food choices
  - Hand-to-mouth behavior
- Inability to detoxify and eliminate chemicals
- Bodies still growing and developing
- Longer lifetime to develop complications

HEALTH HAZARDS OF PESTICIDES

"Late in the afternoon of April 1, 1990, a 3 year old girl playing in front of her trailer home In California's San Joaquin Valley suddenly lost control of her body and began foaming at the mouth. By the time the girl arrived at the local emergency room, she was near death. She recovered eventually.

A report filed with the California Department of Pesticide Regulation concluded the child had been poisoned by aldicarb, a highly toxic that works the same way on people as it does on bugs – like nerve gas. Somebody had parked a tractor with pesticide material on it right in front of the play area" – Matt Crenson, *Associated Press,* December 9 1997

THE MISDIAGNOSIS

- Review of medical records of 20 severely poisoned infants transferred to major medical center
- 16/20 misdiagnosed at time of transfer (brain hemorrhage, head trauma, DKA, severe gastroenteritis, pneumonia, whooping cough)
- 5 patients – household application of pesticide
- 1 patient – mowing recently sprayed lawn

Zweiner,R *Organophosphate and Carbamate Poisoning in Infants and Children,* Pediatrics, 1988

MORE EFFECTS

NEUROLOGIC

MEXICO-2 FARMING COMMUNITIES

Heavy pesticide use –

poor hand-eye coordination, short-term memory impairment, difficulty drawing

Little/no pesticide use

Less aggressive and anti-social behavior

CANCER

NO SPECIFIC LINK TO A PARTICULAR PESTICIDE

LEUKEMIA

NEUROBLASTOMA

WILM'S TUMOR

SARCOMAS

NON-HODGKIN'S LYMPHOMA

BRAIN CANCER

PESTICIDE USE IS ON THE RISE

- California (1991-1995)
  - General use up 31%
  - Use of potential human carcinogens up 129%
  - Use of neurotoxic pesticides up 52%
- California the only state with required reporting
- Less than 3% farms inspected/year

NEW YORK STATE SURVEY

(50 FARM WORKER CHILDREN)

- 10% < 18 YEARS OLD HAD MIXED AND APPLIED PESTICIDES
- 40% HAD WORKED IN FIELDS STILL WET WITH PESTICIDES
- 40% HAD BEEN SPRAYED BY CROP DUSTERS OR BY DRIFT
- 15% HAD SYMPTOMS CONSISTENT WITH ORGANOPHOSPHATE POISONING BUT HAD NOT SOUGHT MEDICAL ATTENTION

MINNESOTA CHILDREN'S PESTICIDE EXPOSURE STUDY

- Homes of children 3-13 years old
- 308 households
- No significant differences in residential pesticides stored or used between urban and non-urban households

Adgate, J, *Pesticide Storage and Use Patterns in Minnesota Households with Children,* J EAEE, 1999.

A ‘LEAD’LE GOOD NEWS

Study of association of soil lead concentration and blood lead levels in children living in metropolitan New Orleans and in rural LaFourche parish.

A ‘LEAD’LE GOOD NEWS

Table 1. Frequencies of census tracts exhibiting median blood lead concentrations for children <6 years old in metropolitan New Orleans and Lafourche Parish, Louisiana

Blood lead (µg/dl)	New Orleans		Lafourche	
	Number	Percent	Number	Percent
<5	25	16.2	16	84.2
5–9	72	46.8	3	15.8
10–14	50	32.5	0	0.0
15–19	6	3.9	0	0.0
20–24	0	0.0	0	0.0
≥25	1	0.6	0	0.0
Total	154	100.0	19	100.0

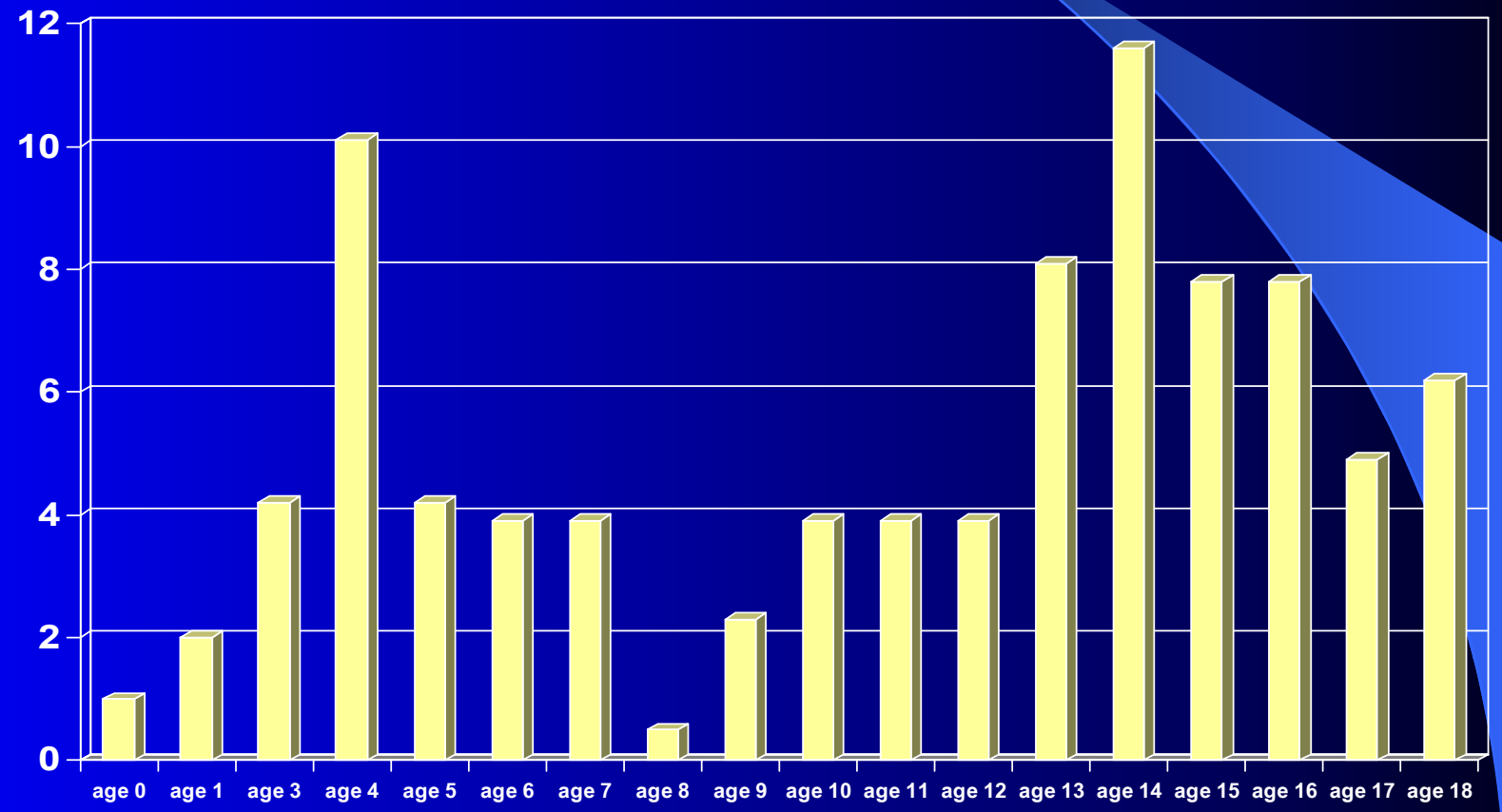
Table 2. Frequency of census tracts exhibiting various ranges of median soil lead concentrations within metropolitan New Orleans and Lafourche Parish, Louisiana

Soil lead (µg/g)	New Orleans		Lafourche	
	Number	Percent	Number	Percent
<25	8	5.2	10	52.6
25–49	15	9.7	6	31.6
50–99	23	14.9	3	15.8
100–199	30	19.5	0	0.0
200–399	34	22.1	0	0.0
400–599	23	14.9	0	0.0
600–799	12	7.8	0	0.0
800–999	6	3.9	0	0.0
≥1000	3	2.0	0	0.0
Total	154	100.0	19	100.0

Environmental Health Perspectives, 105:9, Sept. 1997

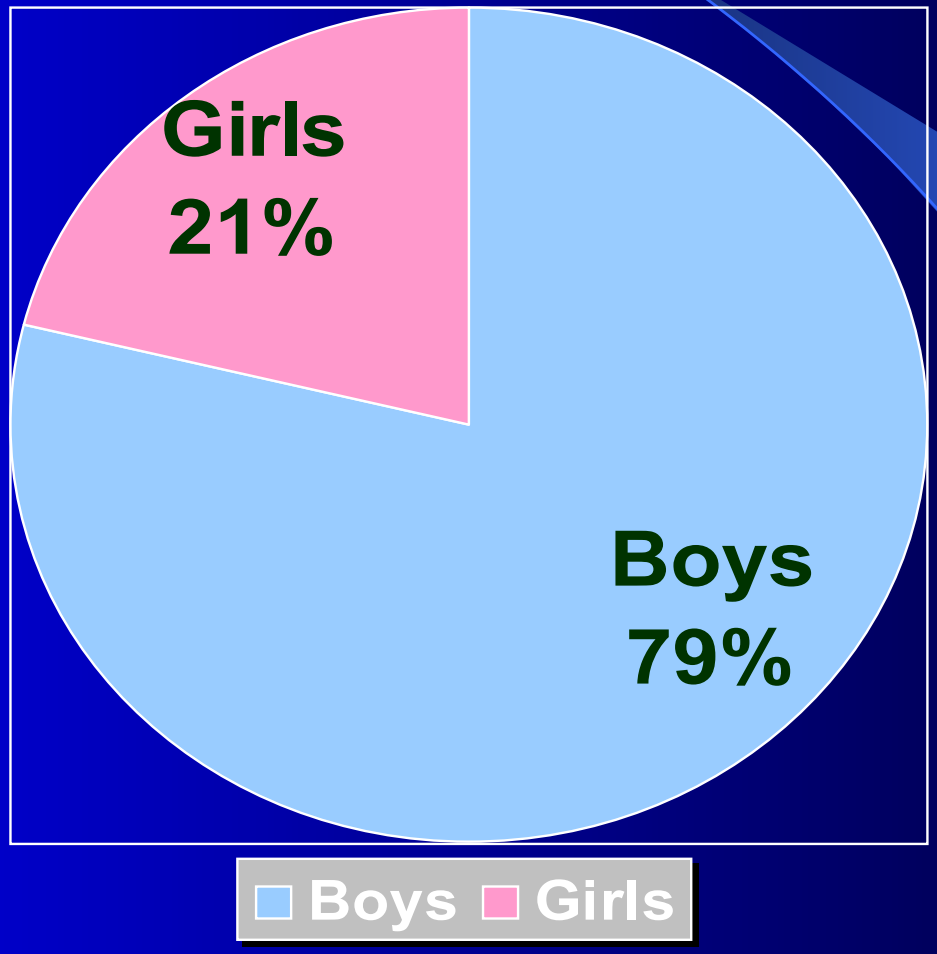
HARVEST OF HARM

Percent of Childhood Farm Injuries by Age



Wisconsin Medical Journal, Dec. 2000

Gender Differences in Childhood Rural Injuries



Wisconsin Medical Journal, Dec. 2000

Relative frequency of agents involved in farm injuries in children

Agent	Relative Frequency
Machinery	++++
Tractors	++++
Tillage Equipment	++
Combine	+
Balers	+
Wagons	+++
Elevators/conveyors/augers	++
ATV/motorbikes	++
Forklifts	+
Animals	+++
Cows	++
Horses	+++
Structures (barns, buildings, silos)	++
Chemicals (pesticides and cleaners)	+
Water (drownings)	++
++++Very frequent +++Frequent	++Occasional +Infrequent but reported

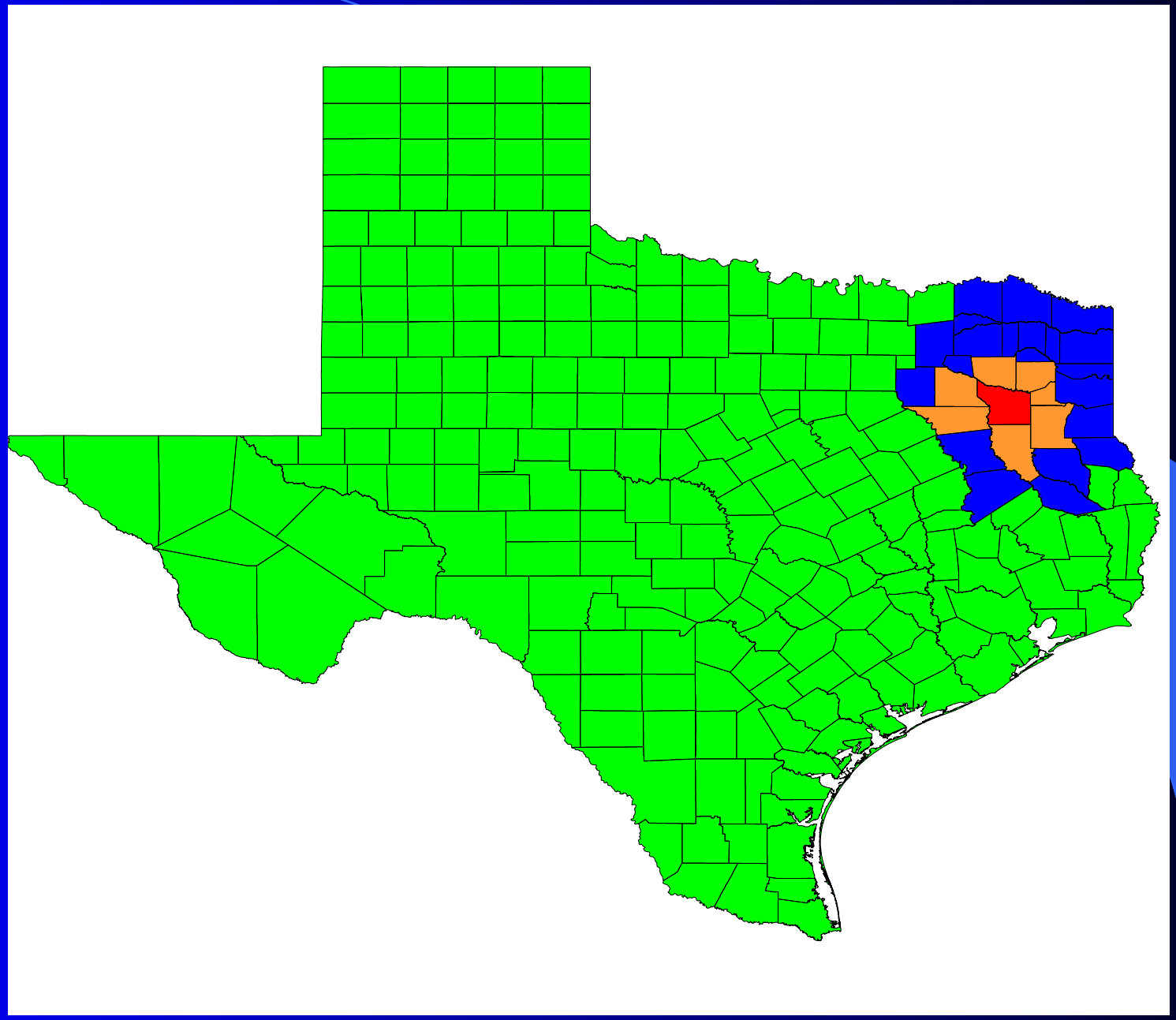
Wisonconsin Medical Journal, Dec. 2000

WISCONSIN FARMERS

- 1,255 farmers surveyed
- ? What influenced their decision to put < 14 y/o at risk
- Reasons not well understood
  - Bonding time > risk
  - Need to supervise child > risk
  - Gain work experience > risk
  - Strong work ethic and self-confidence > risk

WISCONSIN FARMERS

- Lack of supervision
  - Proximity of children to equipment
  - Parents distracted by their work
  - Operator fatigue, esp during harvest
- Children given tasks inappropriate for their age
- Financial stresses (older equipment, child labor)



SMITH COUNTY CHILD FATALITY REVIEW BOARD

- Smith County exceeds all of Texas counties
- 21 deaths over 6 months
- 12 were injury related and could have been prevented
  - 11 were traffic related
    - 7 were not wearing seat belts

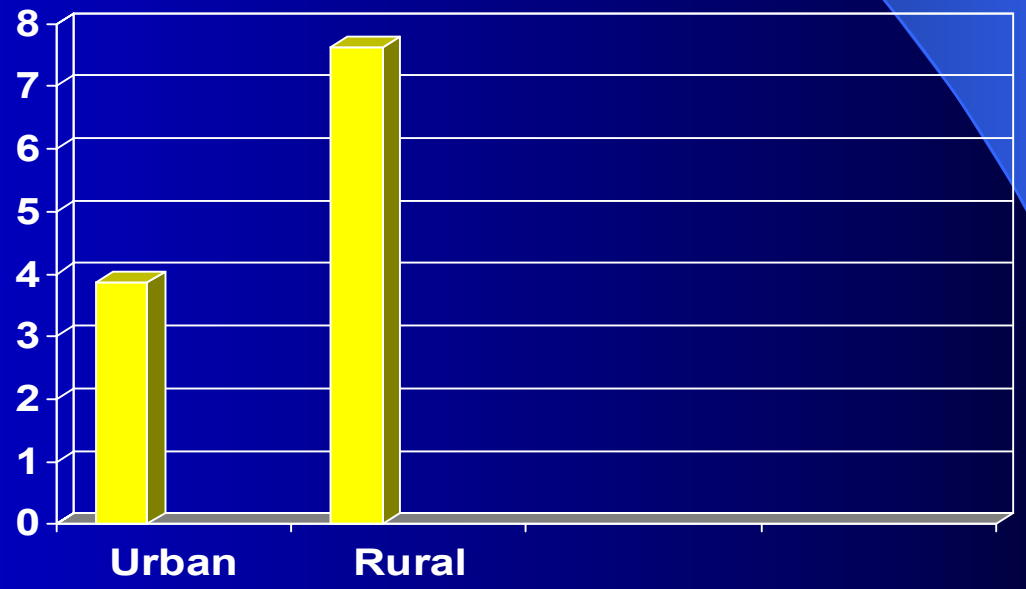
IOWA STUDY

- 2250 junior high and high school students
- 54% used seat belts in front seat
- 15% used seat belt in back seat
- Less likely to use helmets

Shootman, M, *AJPH*, Nov, 1993

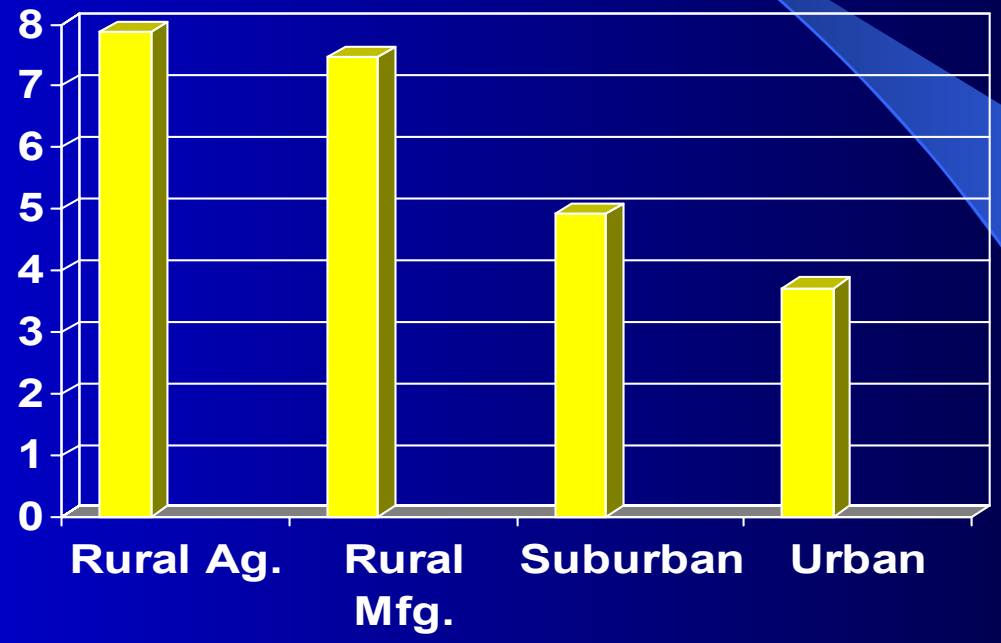
Urban and rural child passenger mortality rates In Alabama

1978-1989. Z=4.48 P<0.001. Mortality rate per 100,000



Pediatric Emergency Care,1994

Child passenger mortality rates by urban & rural strata in Alabama



Pediatric Emergency Care, 1994

ADDED RISKS

- Poorer road conditions
- Excessive speed used on roads without traffic
- Allowable speed may be in excess of safe speed
- Delayed access to pediatric trauma care

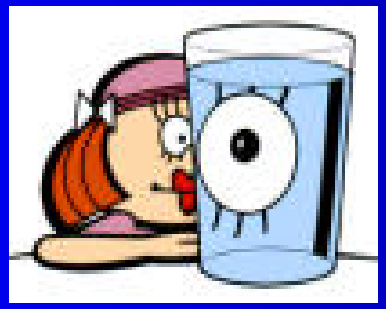
TRAUMA (MVA)

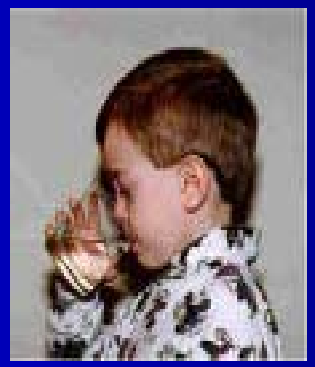
- 1/3 of population resides in rural area but contributes 57% of death after MVA
- Rural trauma pediatric deaths (1995) 87% do not survive to reach a hospital
- Death rate following trauma is inversely related to the population density

OTHER INJURIES

- Review of rural vs urban Colorado children between 1980 – 1988
- MVA statistically elevated
- Firearms – more involved
  - Unintentional deaths in > 4 yr old
  - Homicide deaths in <5 yr old
- Drownings
  - Significantly increased in <4 yr old
  - Occurred in natural bodies of water and drainage ditches

RURAL WATER QUALITY





- Domestic wells susceptible to contamination
- EPA estimates
  - Nitrate levels
  - Pesticide levels
- Hand dug wells unfit for drinking
- Poor resources of small utility companies

FLY ME TO THE MOON

- N. Carolina – 8% used no septic tank or public sewer
- Septic tanks

  - 81-93% use in rural counties

  - Need maintenance

  - Potential for contamination of ground and surface water

Davis, T, *Environmental Conditions in N. Carolina,* NCMJ, 1993

ADVOCACY – RURAL HEALTH

ADVOCACY - HEALTH

- Medically underserved – eligible for grants and programs
- Shortages of health care pros – now using more PAs and NPs
- Fewer rural hospitals
- Geographic barriers
- Continuity of care

CRITICAL ACCESS HOSPITAL PROGRAM

- Created in 1997 under Balanced Budget Act
- Provides acute care beds, lab and radiology and emergency services
- Suggest EMS be allowed to administer more aggressive therapy

Saving lives and reducing injuries

Reducing economic costs associated with MDA

Changing behavior in Texas

ADVOCACY - PESTICIDES

- Food Quality Protection Act
- Phase out most harmful pesticides
- Affordable day care
- Research/reporting
- Integrated Pest Management (IPM)


JOHN DEERE
790

ADVOCACY - FARM INJURY

- Tasks appropriate for developmental age
- Day care away from work setting
- Training to professionals to recognize and counsel at - risk families
- Revision of child labor laws
- Expand programs geared for youth
- Enhance training of rescue/emergency personnel

ADVOCACY - WATER

- Local governments require local drillers to install wells so that groundwater is protected and that well is located a safe distance from contamination
- Testing of water for biologic or chemical contamination

RURAL VS URBAN

RURAL

- Resistant to change
- Traditional
- Informal community networks
- Personal networks
- Concrete thinkers
- Self-reliant

URBAN

- More reliant on scientific method
- Embrace change
- Abstract thinkers
- Believe in the authority of the state













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