Accounting for Disaster Related Chemical Contamination

Chemical Release Sources during Disasters
Human Health Effects: Pesticides & Children
Social Work Research, Practice, Education

Disaster Planning, Management and Relief: New Responsibilities for Social Work Education,
CSWE/IASSW/NACASSW January 2007
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Natural Disasters and Chemical Releases

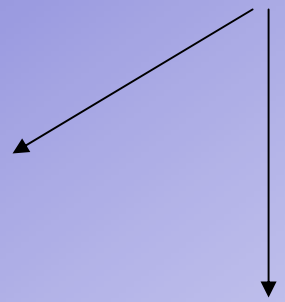
Direct Releases

Drought: Airborne chloride, ammonia

Forest fires: Dioxin, particulate matter

Volcanic Eruption: Silica, carbon monoxide

Indirect Releases



Intentional Releases

Pesticides sprayed after floods

Chlorine water treatment after floods

Unintentional Releases (na-tech)

Petroleum products leaking from holding tanks, pipes

Asbestos fibers from collapsed buildings

Industrial/commercial facilities

(refineries, labs, dry cleaners, home stores, grocers, medical facilities)

Landfills, toxic waste dumps, Superfund sites

Cars and other vehicles,

Agribusiness/farms, residences

Adapted from Young et al, 2004)

Chemical Releases from Natural Disasters

Brazil*	1995	Flood	Fertilizer plant ammonia cloud
Honduras	1998	Hurricane Mitch	300-400 barrels of pesticides and other chemicals, Barrio of Istoca
Canada*	1980	Drought	Airborne sulfate, chloride, magnesium, phosphorus, ammonia
Indonesia*	1997	Wildfires	Ozone, carbon monoxide, nitrogen dioxide, particulate matter
Netherlands Belgium France	1993	Flood, River Meuse	Cadmium, copper, zinc, lead, pesticides, PAHs
Ukraine	1992	Wildfire	Radioactive cesium releases from forest ground cover, post-Chernobyl
Turkey	2000	Earthquake	Major refinery fire, chemical plant toxic release
USA	1989	Earthquake	Labs, hospitals, hair salons, drug stores, food processing plants, restaurants, homes

A Sampling of Hurricane Katrina Chemical Releases in Flood Water and Soil Sediment

Jefferson/St. Bernard:
>2,000 gasoline stations
>100,000 submerged cars

Plaquemines/St. Bernard:
40-80 oil spills from facilities and pipelines
193,000 barrels of oil/petrochemicals

Louisiana: 500 sewage plants damaged/destroyed
170 sources of leaking hydrocarbons & natural gas

Arsenic:
St. Bernard: >31x U.S. EPA cleanup level

Polyaromatic hydrocarbons (PAHs):
Bywater landfill: .5 – 20x U.S. EPA cleanup level (NRDC)

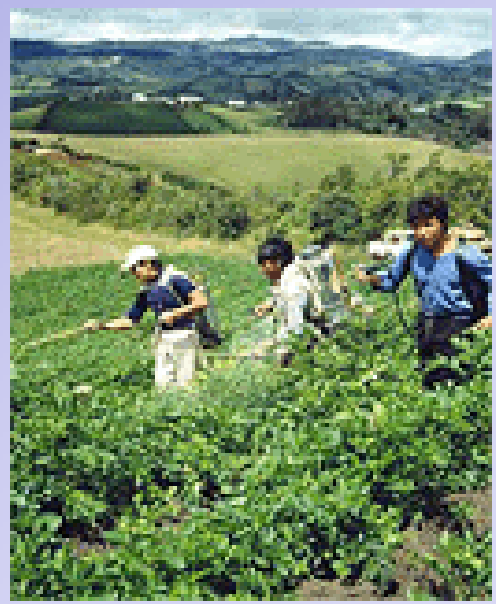
Banned Pesticides:
Mid-City: 2x –7x U.S. EPA cleanup level (NRDC)

Pesticides Worldwide

- The United Nations Food and Agriculture Organization estimates there are 500,000 tons of obsolete pesticides worldwide – 120,000 tons of these are in Africa (2002)
- In the U.S.A, over a billion pounds of pesticides are used yearly, including about 76 million pounds in homes

- In West Africa,150,000 children apply pesticides in cocoa production

- ½ of Cambodian farmers surveyed by the UN Food and Agriculture Organization allow their children to spray crops with pesticides (2002)



Pesticides & Children's Well-being

- **Pesticides are associated with childhood illness:**
  - Asthma, other respiratory illness
  - Brain tumors, leukemia, other cancers
  - Endocrine and immune system disorders
  - Developmental disabilities
- **Pesticides are also associated with:**
  - Female and male reproductive system damage
  - Genetic and chromosomal mutation
  - Birth defects, miscarriages
  - Nervous system damage

http://www.epa.gov; http://www.niehs.gov; http://www.cehn.org; http://utyeah.utk.edu

Acute and chronic symptoms

- **Acute exposure symptoms may include:**
  - Organophosphates, carbamates:
    - nausea, abdominal pain, restlessness, muscle twitches, weakness, sweating and salivation, convulsions, dizziness, headache, blurred vision, anxiety, confusion
  - Organochlorines:
    - tremors, slurred speech, weakness, lethargy, seizures, nausea, vomiting
  - Pyrethrum, Pyrethroids:
    - allergic reactions such as contact dermatitis, asthma, poor coordination, dizziness, headache, nausea, diarrhea.
- **Chronic exposure:** headaches, visual problems, irritability, depression, fatigue, concentration and memory problems, Multiple Chemical Sensitivity (MCS)

http://www.epa.gov; http://www.niehs.gov; http://www.cehn.org; http://utyeah.utk.edu

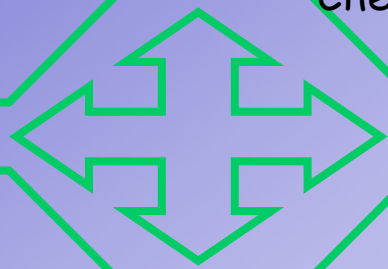
Measurement and other Research Issues

Chemical Detection

Sufficient samples collected?
Samples tested for which chemicals?
Technology sufficient?
Data collected in which disaster phase?
Pre-disaster comparative data?

Human Health Effects

Risk <> exposure <> harm
Chemical specific
Synergistic
Short <> long term
Child <> adult
Shifting dose response levels
Chemical <> other disaster-responses



Data Interpretation

Traditional risk assessment <> Precautionary
Political and Social Constructions

Remediation Efforts

Competing economic interests
($ to remediate <> $ to rebuild)
Competing social interests
(quest for pre-disaster status)

Some SW Practice Implications

Individuals and Families

Include chemical risk<>exposure<>harm factors
In health, mental health, home assessment & intervention
With health disparities, vulnerable populations

Communities

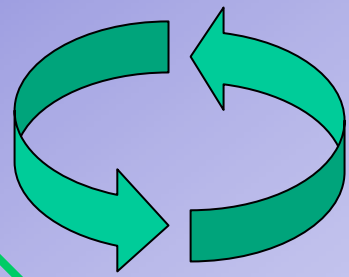
Raise the ethical social worker's voice
Use community mapping, participatory processes
Form new interdisciplinary collaborations
Bring social work expertise to disaster management systems, across all disaster management phases
Local <<<>>> International

Policies

Advocate for preventive clean water, air, soil, food regulations
Examine environmental policies as child and social welfare policies

Some SW Education Implications

Theory/Perspective
Disaster management
Sustainable development
Precautionary Principle
Interdisciplinary work



"Research Translation"/Data
Chemical classes, sources
Organics (mold, mildew, bacteria)
Known, suspected health effects
Vulnerable populations, differential risk
Types of natural, technological disaster
Disaster management resources, plans

Experiential Learning/Practica
New approaches <> familiar settings
Traditional approaches <> new settings
New approaches <> new settings

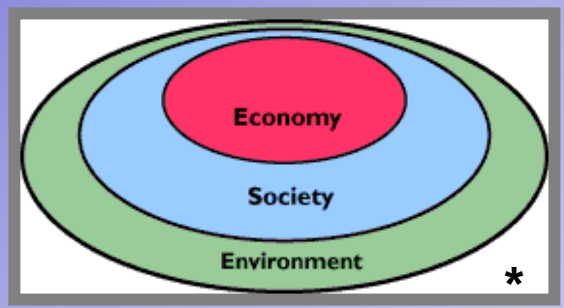
Sustainability

(PERSON-IN-ENVIRONMENT)

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs“

(World Commission on Environment and Development, 1987)

EQUITY



ECONOMY

ENVIRONMENT

“Dumping disposable waste among disposable people to generate disposable income”

J. Martin-Brown, 1992

* M. Hart at http://www.sustainablemeasures.com

Precautionary Principle
"How Little Harm is Possible?

- Take precautionary action *before* scientific certainty (minimize harm)
- Set goals
- Seek out, evaluate options (maximize information/science)
- Shift burden of proof to proponent
- Maximize democratic decision-flow

- **Ozone Layer Protocol (1987)**
- **European Communities Commission (2000)**
- **San Francisco City/County USA (2003)**
  - Integrated Pest Management, Organic Agriculture
  - Product Bans/Phaseouts (e.g., arsenic-treated wood
  - Less Toxic Purchasing (pre-tested, clean products; known ingredients)
  - Green Buildings (pollution prevention, energy efficiency)

http://www.sehn.org; http://www.sfgov.org

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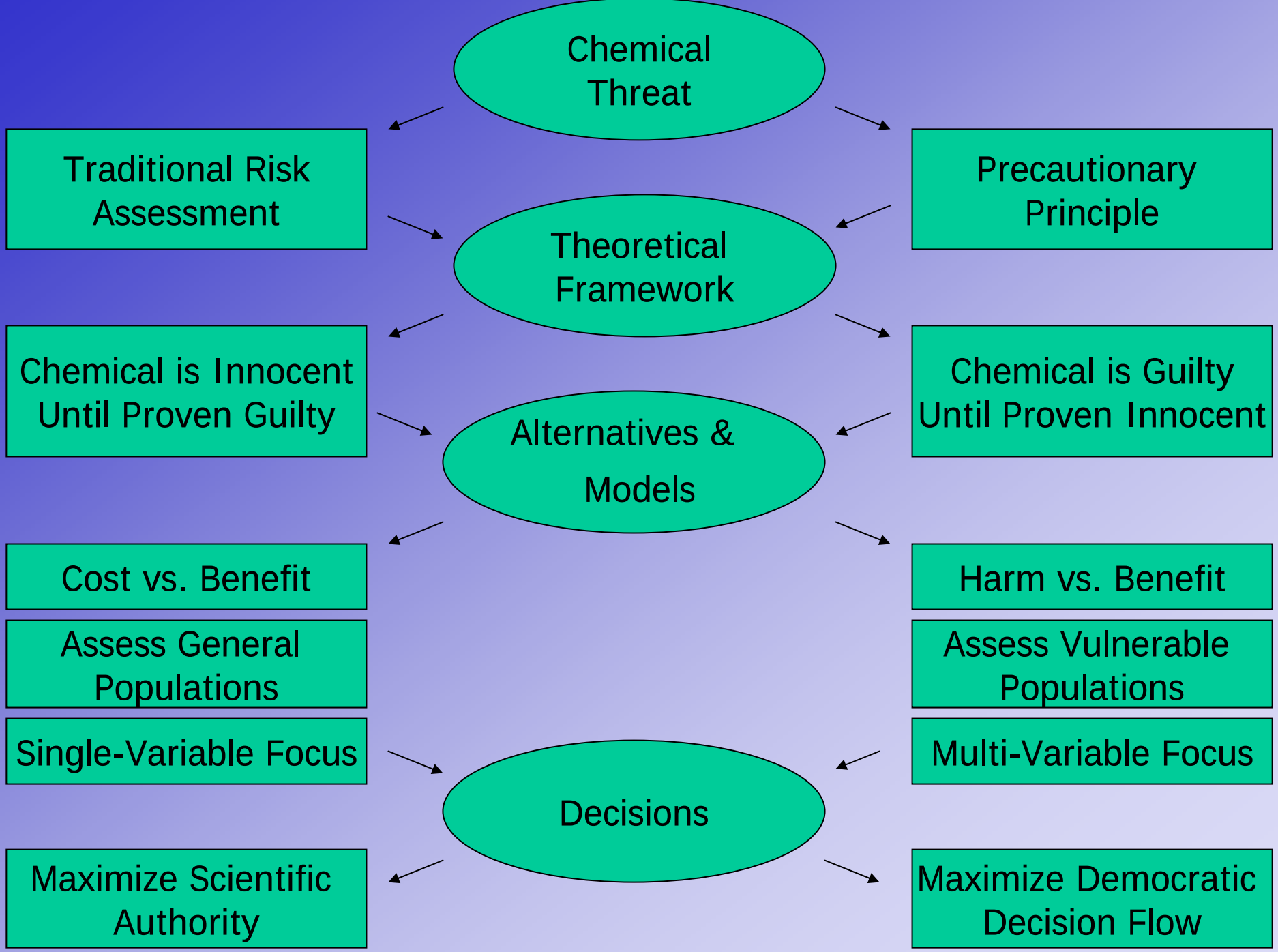
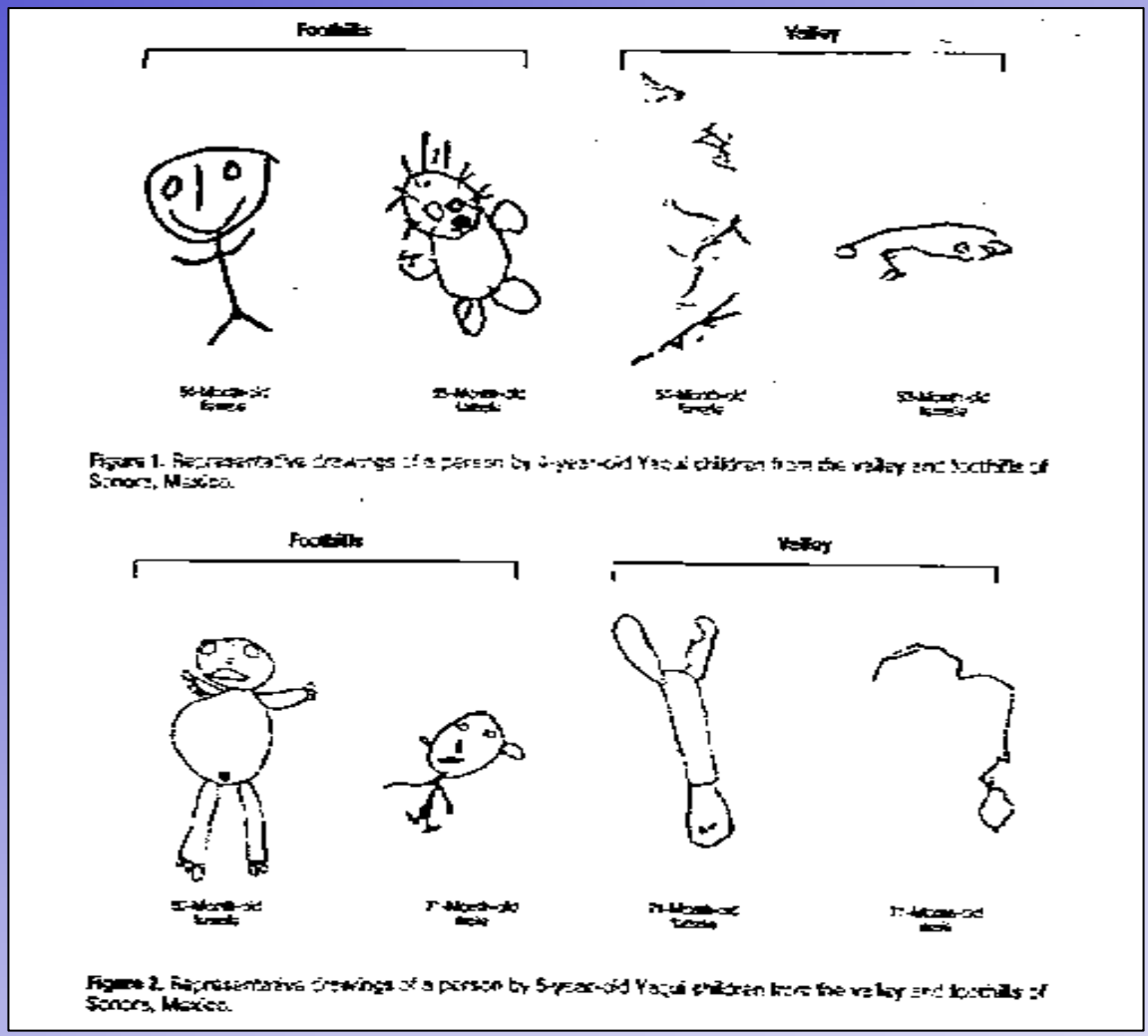

Chemical Threat
Traditional Risk Assessment
Precautionary Principle
Theoretical Framework
Chemical is Innocent Until Proven Guilty
Chemical is Guilty Until Proven Innocent
Alternatives & Models
Cost vs. Benefit
Harm vs. Benefit
Assess General Populations
Assess Vulnerable Populations
Single-Variable Focus
Multi-Variable Focus
Decisions
Maximize Scientific Authority
Maximize Democratic Decision Flow

Children, Pesticides, and Developmental Disabilities

Positive correlations among:

- Agricultural pesticides and neurodevelopment problems (Eskanazi et al., 1999)
- Dioxin and hyperactivity, attention deficit hyperactivity disorder (ADHD), IQ (National Environment Trust, 2000)
- Parental exposure to dioxin and congenital cataracts (Garry et al., 2002)
- Parent occupation applying pesticides and birth defects (Garry et al., 2002)

Yaqui (Mexico) children's drawings Low (Foothills) vs. High (Valley) Pesticide Use (Guillette et al., 1998)



Children, Pesticides, and Endocrine Disruption

- **Positive correlations for adults and animals:**
  - Pyrethroid compounds and breast cancer cells in humans (Go et al., 1999)
  - Vinclozolin and reduced sperm count in male rats (U.S. EPA, 2000)
  - Difocol and abnormally small alligator penises (Guillette et al., 1994)
- **Suspected correlations for children:**
  - Persistent organic pollutants and early puberty (Damstra, 2002)

Children, Pesticides, and Cancer

Positive correlations among:

- Organophosphates, pyrethroids and leukemia (Zahm & Ward, 1998)
- Aldrin, dieldrin and colorectal cancer (Jorgenson, 2001)
- Agricultural pesticides and Ewing's sarcoma, other childhood brain cancers (Valery, 2002)