Poison Center-based Monitoring and Surveillance of the Health Impacts of the Gulf Oil Spill on Children

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Disclaimer

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Learning Objectives for Continuing Education

* Describe potential effects of concern following exposure to a large oil spill
* Describe reported effects following the Deepwater Horizon oil spill in the Gulf of Mexico in 2010
* Describe the characteristics of the individuals at the highest risk of acute effects

Summary

* Clinical effects previously attributed
* Surveillance principles and strategies
* State-based approaches
* Poison Center based approaches
* Findings to date

Deepwater Horizon Oil Spill

- **Tuesday April 20, 2010**

  Explosion occurred on British Petroleum's (BP's) Deepwater Horizon oil rig in the Gulf of Mexico

Location of the *Deepwater Horizon* on April 20, 2010

* 52 miles southeast of the Louisiana Port of Venice

- **Over 11,000 tons of oil were leaking into the Gulf of Mexico per day[1]**
- **Ultimately, >4.9M gallons of oil and 77K gallons of dispersant released**

1 http://www.noaanews.noaa.gov/stories2012/20120109_dwhflowrate.html
Images from http://en.wikipedia.org/wiki/Deepwater_Horizon_oil_spill

Impact of the Deep Water Horizon Oil Spill

* After well rupture occurred, attempts made to predict health effects of the spill on people
* Previous oil spills offer limited guidance
* Impacts could be direct or indirect:
  * Direct- through contact with the oil and/or its constituents
  * Indirect- through contact with contaminated food, drinking water, and environment

Substances of Potential Concern

* Crude oil
* VOC's and semi-volatiles (e.g., PAH compounds) evaporating from crude oil
* Products of combustion
* Dispersants
* Cleanup compounds
* Others

See also http://www.bt.cdc.gov/gulfoilspill2010/pdf/chemical_constituents_table.pdf

Health and safety concerns related to air, food, and water

- Air
  - Contaminants
    - may include ozone, fine particulate matter, and hydrogen sulfide
  - Source
    - Burning oil
  - Effects
    - May cause irritation of the eyes, nose, throat, and skin
    - People with asthma or other lung diseases may be more sensitive to these effects.
- Food
  - Bioaccumulation in food chain
  - Drinking water
- Aquifer contamination

Human Health Effects of Exposure to Crude Oil

Literature

- 38 large oil spills (>10 tons) have been reported world-wide
- 7 of these occurred from 1989-2003 and have epidemiological data on human health effects
  - Acute and chronic health effects studied in occupational and non- occupational populations
  - Summary of health effects published by *Aguilera et al, 2010*

Aguilera F, Mendez J, Pasaro E, Laffon B. Review on the effects of exposure to spilled oils on human health. J Appl Toxicology 2010; 30: 291-301

Human Health Effects of Exposure to Crude Oil - Studies

* Types of Studies
  * Cross- sectional studies
  * Observational Surveys
  * Questionnaires

Human Health Effects of Exposure to Crude Oil- Previously Observed

* Constitutional
* Head/ Eyes/ Ears/ Nose/ Throat (HEENT)
* Respiratory
* Musculoskeletal
* Psychological

Human Health Effects after Exposure to Crude Oil

* **Carcinogenicity and Genotoxicity**

- Potential genotoxicity risk in the consumption of shellfish and seafood from oil-polluted areas
- Some bio-markers in sea life associated with genotoxicity or DNA damage were abnormal
- Unknown significance and predictive value in the later development of cancer

Aguilera F, Mendez J, Pasaro E, Laffon B. Review on the effects of exposure to spilled oils on human health. J Appl Toxicology 2010; 30: 291-301

Image from http://blog.statefoodsafety.com/page/3/

Governmental Desire to Protect the Public Health

* In order to intervene appropriately, need to know what to do
* Necessary steps should be driven by outcomes of concern- but it's unclear what these are
* Therefore, a desire to have ongoing information about effects occurring

Gathering Data

* Surveillance
  * *def.* - "observing a person, object, or situation closely"
* Direct
  * Contacting those at risk to determine their status
  * Obtaining samples directly from the situation
* Indirect
  * Monitoring health status indicators
* Short-term *vs.* long term

Environmental monitoring

* US EPA environmental monitoring conducted daily at affected sites
  * Air quality
  * Beach sand contents
  * Water quality
    * Drinking water
    * Ocean water safety for bathing

Monitoring of seafood from permitted fishing areas

* Fishing permitted in less impacted areas
* Seafood quality monitored by FDA
* Declared safe for consumption based on estimated levels of consumption
* No evidence of short term effects noted
* Subsequent analyses by some scientists believe that estimated level of consumption and measured values inadequately protected pregnant women

Rotkin-Ellman M, Wong KK, Solomon GM. Seafood Contamination After the BP **Gulf Oil** Spill and Risks to Vulnerable Populations: A Critique of the FDA Risk Assessment. Environ Health Perspect 2012; 157-161.

Monitoring Physical Health Status

* State public health monitoring systems
* US Poison Centers maintain the only real-time data collection system
  * National Poison Data System (NPDS), reports on more than 4,000,000 calls to the US poison centers annually
  * Calls generally handled by the poison center serving the caller's location
* ED records sampled by various programs, but reports traditionally delayed weeks to months

Surveillance for Human Illness related to the Oil Spill

State-based Surveillance

* AL, FL, LA and MS are using systems to track oil spill-related health effects
* Related to occupational or non-occupational exposure
* Sources include ED's, urgent care facilities, and PC's for evaluation

http://emergency.cdc.gov/gulfoilspill2010/2010gulfoilspill/health_surveillance.asp

Surveillance for Human Illness related to the Oil Spill

Example of State-based Surveillance

- Florida ESSENCE is one such state surveillance system
  - Electronic Surveillance System for Early Notification of Community-based Epidemic
  - For more information about ESSENCE: http://www.doh.state.fl.us/Disease_ctrl/epi/Acute/systems.html
- Two sources of data
  - ED patients around the state
  - Data from Poison Centers
  - Looks for symptoms related to exposure
  - Observes trends

http://emergency.cdc.gov/gulfoilspill2010/2010gulfoilspill/surveillance_FL.asp

Why Poison Centers?

* People generally utilize behaviors in an unusual situation similar to those they usually use
* Poison Centers have ongoing national toll-free number widely publicized
* Given that people often call poison centers with toxicology concerns, it is expected that they would call Poison Centers with questions about toxic effects of oil and chemicals involved in cleanup

NPDS as a surveillance mechanism

* All 57 US poison centers report data to the National Poison Data System (NPDS) every few minutes
* NPDS has automated and manual outbreak-recognition tools running constantly in the background
* NPDS surveillance data already available to CDC NCEH
* NPDS has standardized definitions of exposures, symptoms, and outcomes
* NPDS definitions utilized by all 57 US poison centers
* For more information, see http://www.aapcc.org

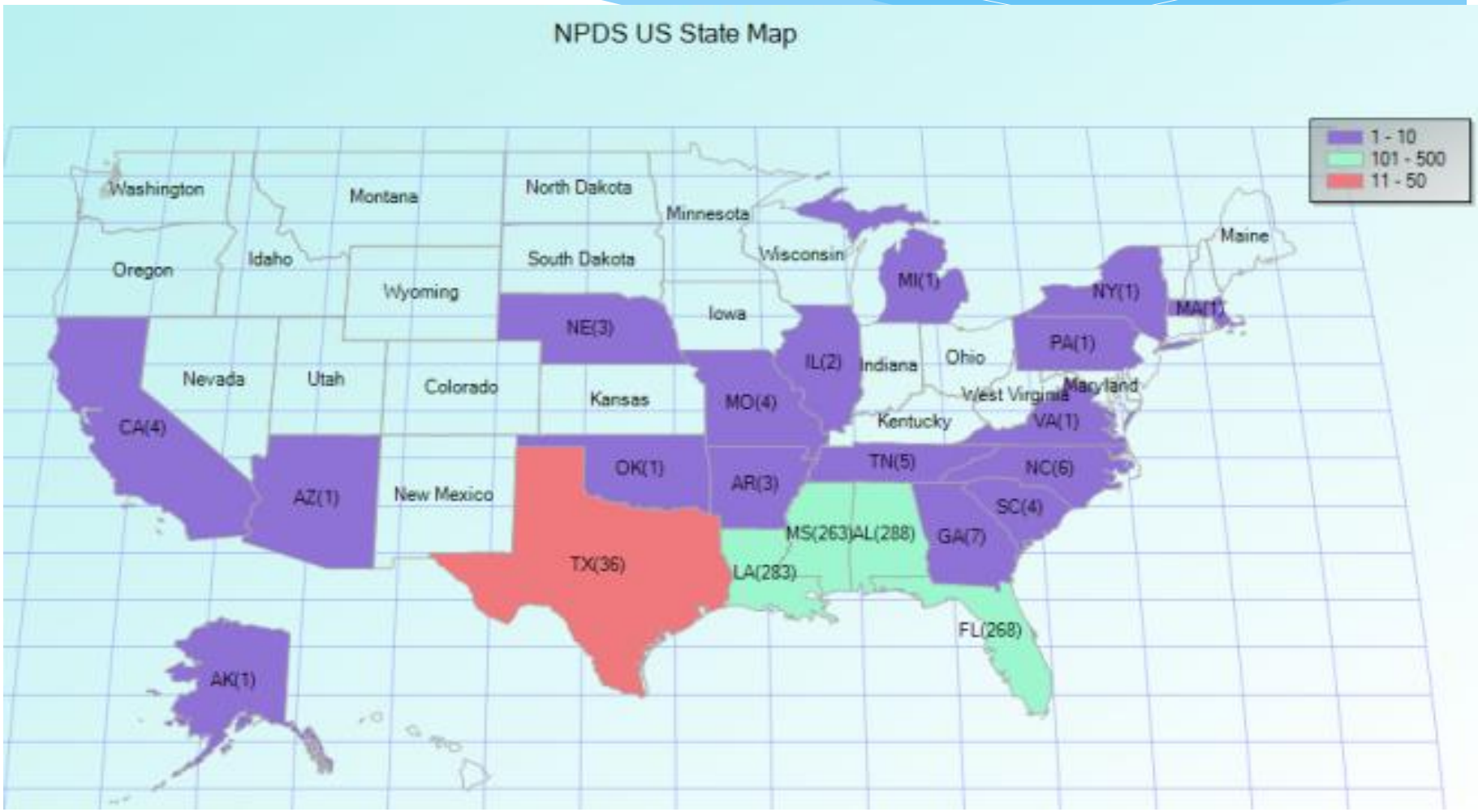
NPDS Limitations

* Record of telephone calls
* Voluntary reporting system, so cases may go unreported and therefore unnoticed
* Usually unvalidated by lab or medical record data

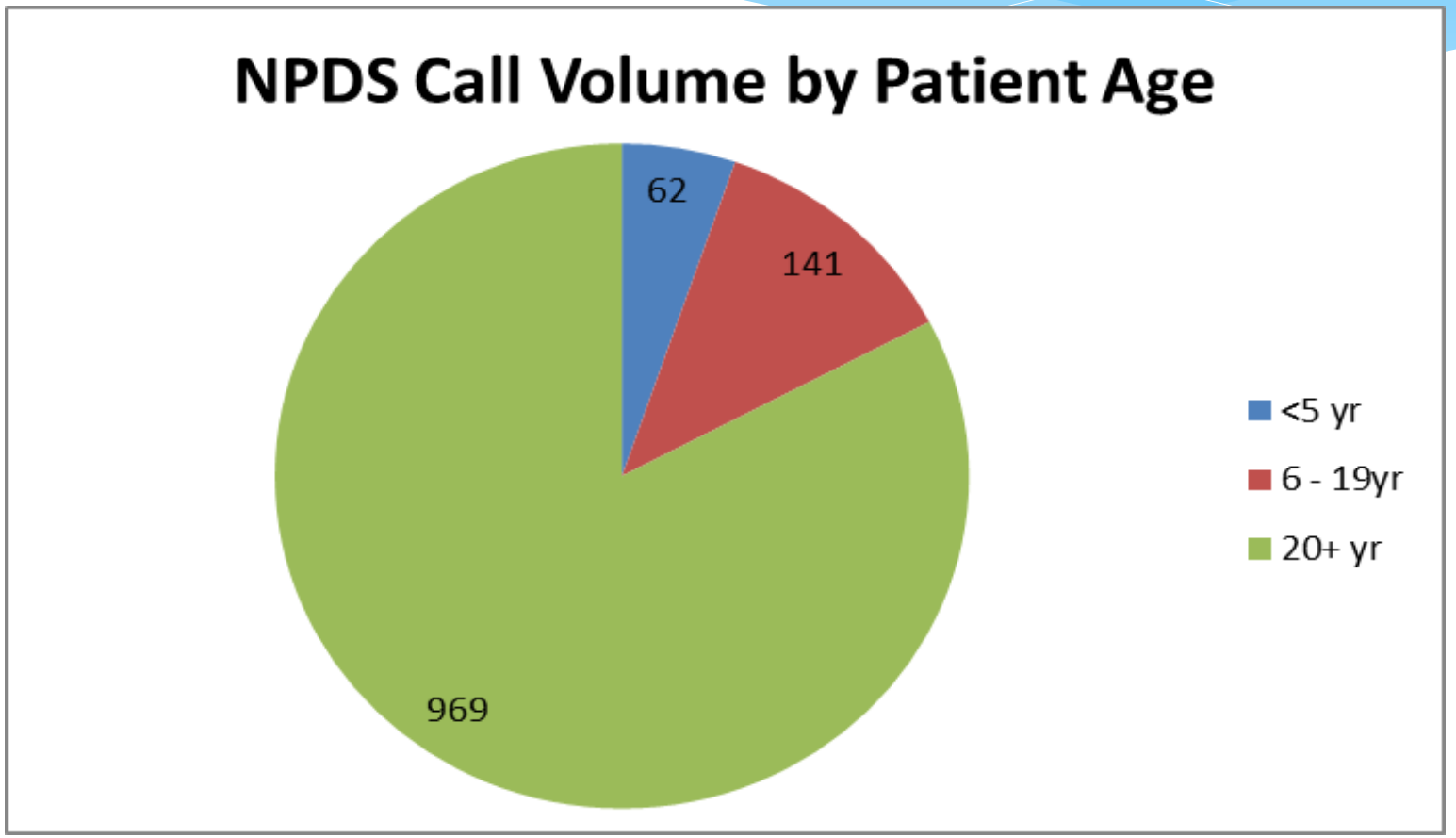
Poison center surveillance of Gulf Oil Spill

* Calls expected to go to regional poison center
* BP Corp already has contract for additional services with one specific poison center (Rocky Mountain)
  * Data from BP-driven calls also collected in NPDS in standard format

NPDS Reports by State of Caller



NPDS Gulf Oil Calls 2010



NPDS Reported Outcomes of Oil Spill Exposures– All Ages

Result Type	***n***
No effect	82
Minor effect	590
Moderate effect	150
Major effect	5
Death	1
No more than minimal effects expected	232
Unable to follow	59
Unrelated effect	80
Total	1,199

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NPDS- Gulf Oil Spill 2010 Pediatric Outcomes

Result Type	<5 yr	6 - 19yr
No effect	7	13
Minor effect	38	66
Moderate effect	3	18
Major effect	0	0
Death	0	0
No more than minimal effects expected	10	35
Unable to follow	2	4
Unrelated effect	2	5
Total	62	141

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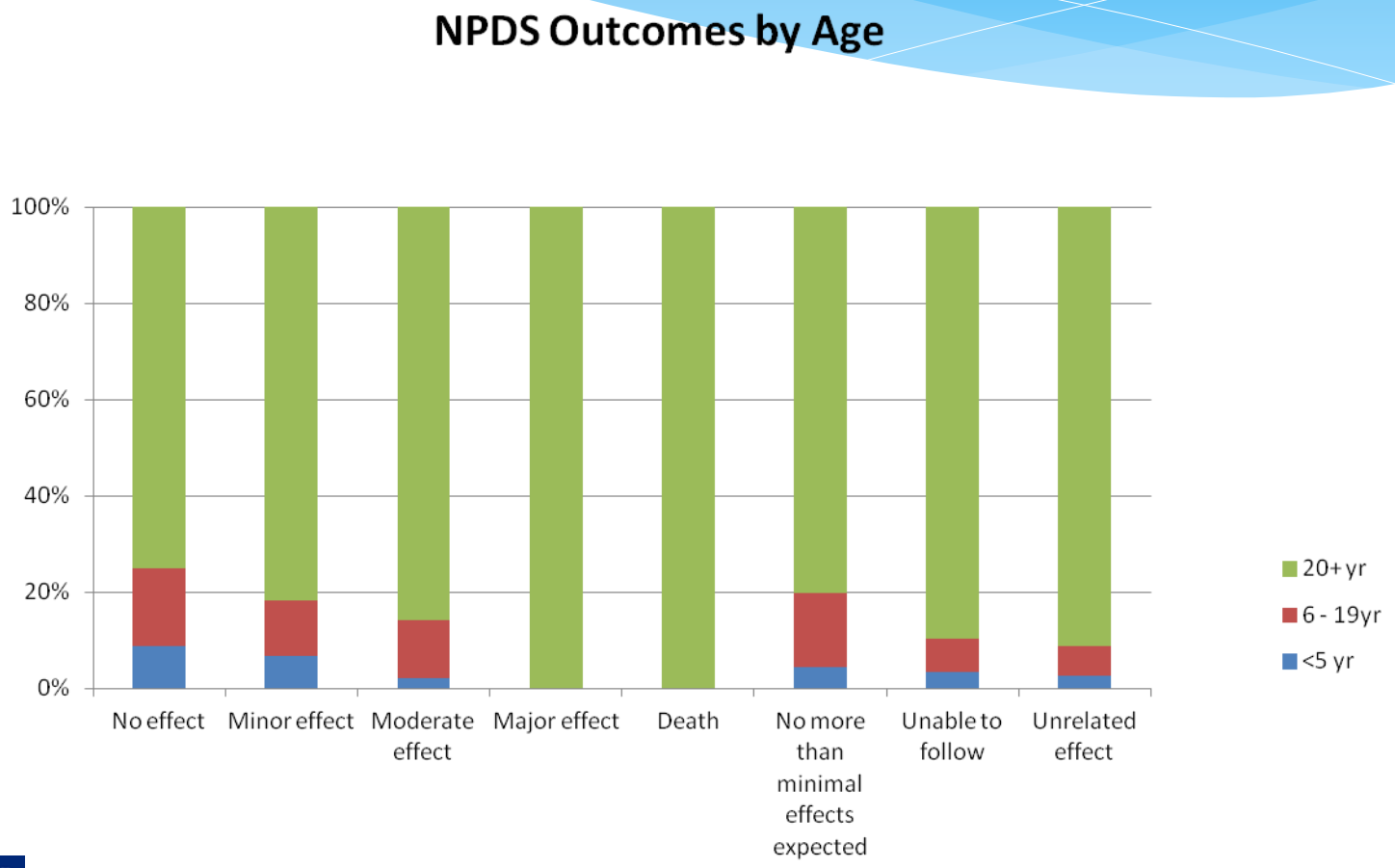
NPDS – Gulf Oil Spill Calls 2010



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Reports to Poison Centers

* Most reported exposures were inhalation and dermal
* Symptoms most commonly reported to Poison Centers:
  * Headache
  * Nausea/ vomiting/ diarrhea
  * Throat irritation
  * Eye irritation/ pain
  * Cough
  * Dizziness

Federal and State Based Surveillance

* Exclusionary zones for swimming and fishing revised periodically based on environmental sampling results
* No trends observed to date
* Food safety continues to be maintained
* NIEHS has funded several ongoing projects.
  * www.niehs.nih.gov/

Conclusions

* Immediate health effects of Deepwater Horizon Gulf Oil Spill on children appear to be minimal
* Most severe effects impacted cleanup workers
  * Dehydration, reduced respiratory function
* Environmental effects continue to be addressed
* Long term health effects remain to be evaluated
* Psycho-social effects not ascertained in this surveillance strategy

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Disclaimer

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Affiliation / Financial Interest	Organization
Consultant regarding potential health effects of contaminated former industrial sites	ExxonMobil Corp