Children’s Preparedness: An Overview

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NPHIC Call
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Objectives

- Identify how children are different from adults – and each other – physically, developmentally, and socially
- Understand how these differences create special concerns across distinct preparedness topic areas
- Identify key planning and response principles to account for children in emergency readiness
WHY IS THIS IMPORTANT?
Why is this important?

- Children (<18) are nearly 25% of the population
- Children will be affected by disasters
- Children may be disproportionately affected...
  - Haiti cholera outbreak
- Children may be specifically targeted...
  - Oklahoma City bombing
  - Beslan school siege
  - Sandy Hook elementary school shooting
Increased attention to children’s issues

- 10/11: National Biodefense Science Board (NBSB)
- 3/13: Pandemic and All-Hazards Preparedness Reauthorization Act (PAHPRA)
- 4/13: Government Accountability Office (GAO)
How are children different than adults?

- Difficulty communicating symptoms
- Underdeveloped sense of self-preservation
- More permeable skin
- Higher surface-to-mass ratio
- Higher metabolism
- Higher respiratory rate
- More active cell division
- More hand-to-mouth contacts
- Spend more time playing outside and on the ground
Infectious disease

- Children are easily exposed and can rapidly spread disease due to high personal contact rates.
- Children can be difficult to diagnose due to unusual symptoms and difficulty communicating.

Chemical agents

- Many chemical agents are more dense than air and settle at ground level
- Children are easily exposed to these agents due to their:
  - Smaller size
  - Thin skin
  - High body surface area
  - High respiratory rate
  - Location closer to the ground while crawling and playing

Mr Kerry said the dead included 426 children, and described the attack as an "inconceivable horror".
Radiological and nuclear

- Children have rapid glandular and skeletal growth, and have a higher proportion of active bone marrow than adults.
- Children are susceptible to burns, mechanical injury, and secondary infection.
- Many radionuclides have the potential to more severely affect children, including I-131, Sr-90, Cs-137.

Fushuki 2012; UNSCEAR 2013.
Blast, burn, and injury

- Thin skin and a high body surface area-to-mass ratio make children susceptible to burns.
- Children have more compliant chest walls, leading to severe internal injury without showing outward signs of injury.
Mental health considerations

- Children may have difficulty coping with traumatic events
  - 35% percent of parents nationally had children with at least 1 post-traumatic stress symptom 3-5 days after 9/11
  - 28.6% of NYC schoolchildren grades 4-12 had at least 1 anxiety/depressive disorder 6 months after 9/11
  - 14.9% of children from families in Hurricane Katrina’s path had a diagnosable mental disorder that resulted in significant impairment or decreased engagement, compared to 4-7% in communities nationally

Pfefferbaum et al, 2013.
Level of development

- Not all children are the same
- Bone growth is faster in infants and adolescents
- Infectious disease incidence can vary by age
- Behavior varies by age

UNSCEAR 2013.
PUBLIC HEALTH PREPAREDNESS CHALLENGES
Clinical management challenges

- **Triage**
  - Normal range of vital signs differ by age
  - Adult-based tools are inaccurate in children

- **Medications**
  - Children require weight-based dosing
  - Medication formulations differ
  - Countermeasure stockpiles may require different preparation or guidance

- **Equipment**
  - Need full range of sizes for pediatric care
    - Oxygen masks, catheters, endotracheal tubes
  - Adult-based devices may not work
    - Ventilators, monitors, infusion pumps
Medical countermeasure (MCM) challenges

- Children’s smaller size necessitates weight-based dosing for many MCMs, which could mean different formulations in the SNS, different dispensing guidance for public health departments, and different guidance for the public.
MCM challenges

- Children have a high number of daily close contacts
- Historically, this led to an increase in secondary vaccinia infection after smallpox vaccine

### Results from 1960’s community-wide studies

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of cases</th>
<th>% of total cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5</td>
<td>138</td>
<td>62.2%</td>
</tr>
<tr>
<td>5-19</td>
<td>40</td>
<td>18.0%</td>
</tr>
<tr>
<td>20+</td>
<td>44</td>
<td>19.8%</td>
</tr>
</tbody>
</table>

- ~62% of cases in children under 5

Neff et al, 2002.
MCM challenges

- Testing MCMs on children has serious ethical considerations
- Many MCMs are not FDA-approved for children for the indications for which they are stockpiled
- These MCMs must be administered under alternative regulatory mechanisms, such as an Emergency Use Authorization (EUA), Emergency Use Instructions (EUI), or an Investigational New Drug (IND) protocol
KEY PLANNING PRINCIPLES
Principles for children’s preparedness

- Understanding what makes children different, applying it to your planning scenario
- Include pediatric content in every activity
- Consult pediatric clinical experts when developing plans and guidance that may affect or directly pertain to pediatric populations
SUMMARY AND REVIEW
Summary

Depending on their age or level of development, children may be...

- More likely to be exposed to a pathogen, chemical, radiation source, or other hazard
- More susceptible to adverse health effects from these hazards
- Challenging to provide medical care due to their differences from adults

To prepare...

- Include pediatric considerations in planning, exercises, and materials development
Summary

- Remember...
  - Not all children are the same
  - Children are resilient
For more information

Acknowledgements

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For more information please contact Centers for Disease Control and Prevention

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The findings and conclusions in this report are those of the author and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
References