Pediatric Pandemic Network

From PPN Learn Curriculum: Pediatric Considerations in Disasters for Resource-Constrained and Rural Settings

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Module 2: Preventive Medicine in Humanitarian Emergencies

Transcript

Now we're going to get into the nitty-gritty of how you do an assessment—especially how you measure impact.

If you're a clinician, what are the vital signs we get on all patients? Respiratory rate, blood pressure, pulse. We're always concerned about the ABCs—Airway, Breathing, and Circulation (Cardiac). These vital signs give us a sense of whether the patient is stable. If the patient is not stable, the first priority is to prevent them from dying and to stabilize them. They may need cardiac compression and full resuscitation, or they may be in shock or about to herniate. Vital signs are the first line in identifying that there's a problem.

The same principle applies to population health. We use rates—disease rates—to compare the realities of different communities and to evaluate success over time.

A rate is the number of persons with a disease or condition, divided by an even number of people at risk, over a specified time. We usually express this as deaths per 1,000 people, per 100,000 people, or per 10,000 people. This allows us to compare one area with another fairly.

For example, with COVID, if you simply compared the raw number of new cases, Texas would always look much worse than Colorado because Texas has far more people. Instead, we look at cases per 10,000 or per 1,000 people. That gives a much more accurate picture.

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It is critical to define the numerator and denominator precisely when calculating a rate. The numerator requires uniform criteria to define a case. With COVID deaths, for instance, are we counting only people for whom COVID was the direct cause of death, or everyone who tested positive regardless of the actual cause (such as a heart attack or car accident)? Different definitions produce very different numbers.

The denominator must clearly define the population at risk. Sometimes it's the total population; sometimes it's only the susceptible population. For example, you might compare the risk of hospitalization from COVID in unvaccinated people versus those who received two doses of the vaccine. In that case, the risk was about 30 times higher for the unvaccinated.

Incidence Rate: The number of defined new cases in a given time period (day, week, month, or year) per population at risk.

Prevalence Rate: The proportion of defined cases present in a population at a given time, usually expressed as a percentage.

Example: In a school, prevalence would tell you what percentage of children tested positive for COVID over the past month. Incidence would tell you how many new cases occurred in the last week.

Here's a practical example: Two towns reported cases of diarrhea. Town A had 304 cases; Town B had 1,054 cases. Without population size, you can't tell which has the bigger problem.

Town A had 1,597 children under five → rate = 304 / 1,597 × 10,000 = 19.04 per 10,000.

Town B had 12,818 children under five → rate = 1,054 / 12,818 × 10,000 = 822 per 10,000.

Even though Town B had far more total cases, Town A actually had a much higher rate and therefore a more serious problem. This seems simple, but media reports and even some officials often overlook the importance of using proper rates.

Rapid Needs Assessment

A lot of the following examples come from Hurricane Stan in Guatemala, which I experienced while working with Edwin Asturias about 15 years ago. The

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hurricane destroyed roads, cut electricity, knocked out communications, and caused massive mudslides in difficult mountainous terrain. It was very hard to know what was happening on the ground.

As a consultant helping to organize the emergency response, my first recommendation to the Guatemalan Ministry of Health was: Do not assume—send a team to conduct a rapid needs assessment. If you don't know what's really going on, your assumptions about what is needed are likely to be wrong.

A rapid needs assessment should include:

• Demographics: How many people are affected? Break down by sex, age groups (under 5, 5–15, over 15), and identify vulnerable groups (children, pregnant/breastfeeding women, elderly, disabled, injured).

• Pre-disaster situation: What was the baseline health status? What were the malnutrition rates? Immunization coverage? Prevalent diseases? What was the healthcare infrastructure like (hospitals, clinics, etc.)?

• Post-disaster impact: Mortality and morbidity caused by the emergency itself, plus current emergency needs.

Within the first 24 hours, you need to assemble a multi-disciplinary team. This should include doctors, nurses, surgeons (especially important in earthquakes due to crush injuries, amputations, and risk of kidney failure from rhabdomyolysis), nephrologists (for dialysis needs), psychologists for trauma care, social workers, logisticians, water and sanitation experts, and transportation/flight specialists.

Key Needs in a Disaster

Water

You cannot live without water.

• Minimum for survival: 3–4 liters per person per day.

• For full needs (bathing, cooking, cleaning): 15–20 liters per person per day.

Initially, quantity matters more than quality to prevent immediate death, but improving water quality is critical to prevent disease outbreaks (diarrhea, cholera).

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Methods of purification include settling, sand filtration, bulk chlorination, or reverse osmosis (used by the military). Individual boiling or chlorination by families is unreliable. Centralized systems work better, but families still need clean containers to collect and store the water.

Shelter

• Minimum space per person: 3.5–4 square meters.

• For all needs (cooking, sanitation, recreation): about 30 square meters per person.

Shelter must be acceptable and accessible to the local community, or people won't use it. In Guatemala, many people were reluctant to leave the area where they had lost family members, even if their homes were destroyed.

Sanitation and Hygiene

In floods, latrines and shallow wells often become contaminated. You need one latrine for every 20 people, located 6–15 meters from dwellings. Latrines must be acceptable to the community, separated by gender, child-friendly, and secure (especially for women).

Feces are a concentrated source of pathogens. The introduction of a new pathogen (as happened when Nepalese troops brought cholera to Haiti) into a population with disrupted sanitation can cause explosive waterborne epidemics. Keeping fecal matter away from water and food supplies is essential.

Food

Minimum: 2,100 kilocalories per person per day.

Food must be culturally acceptable. Distribution must ensure that vulnerable groups—especially pregnant/breastfeeding women, single mothers, the elderly, and disabled—can actually access it. They often cannot compete in chaotic distributions.

The acute malnutrition rate in children under five is the best "canary in the coal mine" indicator of a nutrition crisis. It can be measured quickly using mid-upper arm circumference (MUAC) through random, cluster, or exhaustive sampling.

Environmental and Safety Issues

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• Contamination of air, water, or land (e.g., Chernobyl radiation, Flint lead pipes).

• Risk of flash floods or mudslides after fires (e.g., Glenwood Canyon).

• Unsafe buildings after earthquakes.

• Smoke and air pollution from wildfires, which significantly increase heart disease and respiratory deaths.

• Slope and altitude issues: displacement from high to low areas can expose people to new vector-borne diseases (malaria, dengue) for which they have no immunity.

Security

A rapid needs assessment team cannot operate effectively without adequate security. After the earthquake in Pisco, Peru, response was delayed because teams were afraid to enter the area due to lack of security.

Transportation and Communications

Damaged roads may require off-road vehicles, helicopters, or alternative routes. Reliable communication (satellite phones, radios) is essential for coordination.

Health Data

Collect critical information on deaths, significant morbidity, early warning signals (even a single case of cholera or measles), underlying malnutrition, malaria, dengue, and serious trauma (to determine need for dialysis or surgical capacity).

Crude Mortality Rate (CMR) – Key thresholds to remember:

• Overall population: < 1 per 10,000 per day is acceptable.

• Children under 5: < 2 per 10,000 per day is acceptable.

Rates above these levels indicate a high-risk emergency requiring immediate action.

The leading causes of death in disasters are usually trauma, diarrheal diseases, other communicable diseases, and malnutrition (which greatly worsens

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outcomes). Children under five often account for a disproportionately high percentage of deaths.

In the Guatemala example, the team's recommendations included:

• Set up field hospitals and medical tents (since local hospitals were overwhelmed).

• Arrange transport of critical patients to hospitals outside the area.

• Provide mental health services and counseling.

• Establish security.

• Mobilize military resources to clear roads, reestablish the electric grid, and distribute fuel—with security.

If you're not on the ground, it's very hard to know exactly what to do. A proper rapid needs assessment is essential.

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