Using population-based data and PPOR with FIMR
CityMatCH 11/14/2018

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Objectives

• What is population-based data
• Perspectives & limitations of
  – FIMR
  – Population-based data
• Perinatal Periods of Risk
  – Brief overview
  – Examples of using PPOR with FIMR
Q: What is population-based data?
A: Data that includes or represents everyone

What data sources include everyone?
Decennial Census, Vital Records

What data sources represent everyone?
Sample surveys like BRFSS, ACS, PRAMS
Limitations of population-based data

- Important pieces of the puzzle are missing from data sources
  - Motives, intentions, perceptions
  - Life course factors (previous medical events, exposure to trauma...)
  - Sensitive topics (e.g. domestic violence, drug use)
  - Systems and their impact on mom and baby
  - Actual causes are more complex than an ICD code

- Even data that is included can be wrong
  - Missing or inaccurate data elements
  - Missing cases
Limitations, continued

If the world is this

Vital records data shows us this
Limitations of FIMR Data

First, deaths are a very small subset of the population we would address with prevention activities.
Second, deaths are not a random or representative sample.

Generally a higher prevalence of risk factors.
Important reminder from the epidemiologists:

- If you want to prevent a bad outcome, you can’t intervene (after the fact) with the people who had the bad outcome.

- Instead, you work (in advance) with the people who are *AT RISK* of having the bad outcome.
A data story

<table>
<thead>
<tr>
<th></th>
<th>Infant deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwife birth attendant</td>
<td>10</td>
</tr>
<tr>
<td>All</td>
<td>60</td>
</tr>
</tbody>
</table>

Say (just pretend) we found that having a midwife birth attendant is a contributor to 10 of the 60 deaths we reviewed.

Is this a problem we should address?
Add some population data for context

Say that we know the community had 10,000 births
And we reviewed all the deaths

<table>
<thead>
<tr>
<th></th>
<th>Infant deaths</th>
<th>Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwife birth attendant</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>60</td>
<td>10,000</td>
</tr>
</tbody>
</table>

Question: How many of the births had Midwife birth attendant?

<table>
<thead>
<tr>
<th></th>
<th>Infant death</th>
<th>Birth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwife birth attendant</td>
<td>10</td>
<td>?</td>
</tr>
<tr>
<td>All</td>
<td>60</td>
<td>10,000</td>
</tr>
</tbody>
</table>

We will explore two realistic possibilities for how many of the births had a midwife attendant:

- 36% like Albuquerque
- 3% like San Antonio
How many of the births had Midwife birth attendant?

... if your city is like San Antonio, 3% of births is 300 ...

<table>
<thead>
<tr>
<th></th>
<th>Infant death</th>
<th>Birth</th>
<th>Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwife birth attendant</td>
<td>10</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>60</td>
<td>10,000</td>
<td></td>
</tr>
</tbody>
</table>

IMR = \( \frac{10 \times 1,000}{300} \)

IMR = \( \frac{60 \times 1,000}{10,000} \)
How many of the births had Midwife birth attendant?

... if your city is like San Antonio, 3% of births is 300 ...

<table>
<thead>
<tr>
<th></th>
<th>Infant death</th>
<th>Birth</th>
<th>Mortality Rate (per thousand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwife birth attendant</td>
<td>10</td>
<td>300</td>
<td>33.3</td>
</tr>
<tr>
<td>All</td>
<td>60</td>
<td>10,000</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Risk of death is HIGHER among those with Midwife birth attendant. Midwife birth attendant is either dangerous itself or is a marker for something else that’s dangerous.
How many of the births had Midwife birth attendant?

... if your city is like Albuquerque, 36% of births is 3,600...

<table>
<thead>
<tr>
<th>Midwife birth attendant</th>
<th>Infant death</th>
<th>Birth</th>
<th>Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>3,600</td>
<td>2.8</td>
</tr>
<tr>
<td>All</td>
<td>60</td>
<td>10,000</td>
<td>6.0</td>
</tr>
</tbody>
</table>

2.8 = \frac{10 \times 1,000}{3,600}

The risk of death is LOWER among those with Midwife birth attendant. Perhaps another factor is more influential than “other birth attendant” in the cases we reviewed.
Different conclusions based on population prevalence of a risk factor, no difference in death data

Caution: Interpret in light of other evidence.
If your local data tells you that smoking does NOT contribute, don’t believe it. There is overwhelming evidence that it does.
Each information source is one window into reality.

• FIMR sees all the complexity, depth and reality for the case it reviews.
• Population data adds breadth
Some general uses of population-based data

- Assess risk
- Assess preventability
- Estimate maximum potential impact
- Estimate expected impact of intervention
- Plan to measure change
Perinatal Periods of Risk Approach
The 6 Stages

1. Assure Community and Analytic **Readiness**
2. Conduct **Analytic** Phases of PPOR
3. **Develop** Strategic Actions for Targeted Prevention
4. Strengthen Existing and/or **Launch** New Prevention Initiatives
5. **Monitor** and Evaluate Approach
6. **Sustain** Stakeholder Investment and Political Will
The Four Periods of Risk

- **Fetal Death**: Birth weight 500-1499 g
- **Neonatal Care**: Birth weight 1500+ g
- **Post-neonatal**: Maternal Health/ Prematurity

- **Infant Health**: Maternal Care
- **Newborn Care**: Neonatal Care

**Age at Death**

**Birth weight**

- 500-1499 g
- 1500+ g
Each period of risk is associated with its own set of risk and prevention factors.

- **Maternal Health/Prematurity**
  - Chronic disease, health behaviors, perinatal care, etc.

- **Maternal Care**
  - Prenatal care, high risk referral, obstetric care, etc.

- **Newborn Care**
  - Perinatal management, neonatal care, pediatric surgery, etc.

- **Infant Health**
  - Sleep-related deaths, injuries, infections, etc.
PPOR Analytic Steps

1. Sort the deaths into the four periods of risk, count them, calculate a rate for each period (divide by births)
2. Estimate preventable mortality using the reference group
3. In-depth investigation of period(s) of risk with the most preventable mortality
1. PPOR first analysis step (sort the deaths into periods)

- **500-1499 g (VLBW)**
  - Fetal Death: 94
  - Neonatal Death: 185
  - Post-Neonatal Death: 88

- **1500g and up**
  - Fetal Death: 58
  - Neonatal Death: 88
1. PPOR first analysis step (Calculate Rates)

Period rates add up to overall rate:

5.7 + 2.9 + 1.8 + 2.7 = 13.1

Overall rate = 421 x 1,000 ÷ 32,445
= 13.1
What rates should we expect to see in each period of risk?

• PPOR answers this question using a reference group, a real population of mothers that experience the best outcomes—low fetal and infant mortality rates.

A typical reference group includes NH white women, 20 or more years of age, with a college education.
Example reference group rates

<table>
<thead>
<tr>
<th>Reference Group</th>
<th>Maternal Health/ Prematurity</th>
<th>Maternal Care</th>
<th>Newborn Care</th>
<th>Infant Health</th>
<th>Fetal-Infant Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.8</td>
<td>1.2</td>
<td>0.9</td>
<td>0.7</td>
<td>4.7</td>
</tr>
</tbody>
</table>

- Mortality above these rates is considered preventable
  - underlying justice assumption
  - population-based way to assess preventability
PPOR Steps

1. Sort the deaths into the four periods of risk, count them, calculate a rate for each period (divide by births)

2. Compare your population’s rates to the reference group’s rates using . . . SUBTRACTION
## Estimating Preventable Mortality

<table>
<thead>
<tr>
<th></th>
<th>Maternal Health/Prematurity</th>
<th>Maternal Care</th>
<th>Newborn Care</th>
<th>Infant Health</th>
<th>Fetal-Infant Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH Black</td>
<td>5.7</td>
<td>2.9</td>
<td>1.8</td>
<td>2.7</td>
<td>13.1</td>
</tr>
<tr>
<td>Reference Group</td>
<td>1.8</td>
<td>1.2</td>
<td>0.9</td>
<td>0.7</td>
<td>4.7</td>
</tr>
<tr>
<td>Excess Mortality Rate</td>
<td>3.9</td>
<td>0.7</td>
<td>0.9</td>
<td>2.0</td>
<td>8.4</td>
</tr>
</tbody>
</table>

By Subtraction
Results of Phase 1 “excess mortality” by period of risk

- **Excess Mortality Rate**
  - Maternal Health/Prematurity: 3.9
  - Maternal Care: 0.7
  - Newborn Care: 0.9
  - Infant Health: 2.0
  - Fetal-Infant Mortality: 8.4

- **Pie Chart**:
  - MH/P Birthweight Distribution: 46%
  - Infant Health: 23%
  - Maternal Care: 20%
  - Newborn Care: 11%

![Pie Chart Diagram](image-url)
3. In-depth investigation “Phase 2 analysis”

- Periods of risk with the highest excess mortality are investigated to determine causes and areas for prevention. (Analysis plan depends on which risk period.)
  
  - Identify the most important **probable causes** for excess mortality
  - Examine the **risk factors for those causes** (compare study and reference populations)
  - Estimate the potential **impact** of risk factors
3. Initial findings divide blue and green periods of risk each into two major causes:

- Maternal Care (larger stillborns): 20%
- Newborn Care: 10%
- Infant Health SUID: 18%
- Infant Health Other: 7%
- MH/P too many VLBW births: 39%
- MH/P low survival among VLBW births: 6%
3. Causes of the “excess” VLBW births

• Analytic steps focus on determining which of the known causes of being born very low birth weight are most likely to be causing the PREVENTABLE very low birthweight births that are occurring in our community.

• Based on
  – Our own birth certificate data
  – Published scientific research
Example PPOR analysis endpoint

• Short list of known causes of preventable very low birthweight births that ARE important in this community
  • Hypertension
  • Obesity
  • Unmarried

• Long list of known causes that do NOT seem to explain this community’s excess mortality (e.g. prenatal care, plurality, previous preterm birth, delivery method, quality of NICU, birth defects, medical attendant, poverty...)

How might FIMR add information to our investigation?

• Do the deaths we reviewed tell a story of late diagnosis or untreated hypertension? Pre-eclampsia? Is there a system problem such as uninsurance, late prenatal care, missing interconception care?

• What is the reality of the recording of “unmarried” on birth certificates? Based on deaths, do unmarried women usually have a stable partner? Do they have a lack social support or stable housing?
How might PPOR data inform our FIMR process?

• Should our Case Review Team focus for a time on very low birth weight births? On mothers with hypertension? Unmarried mothers?

• Should the CRT or the CAT do a more in-depth investigation of marital status to search for root causes?
PPOR and FIMR can fit together well!

• Each can inform the other
• Both can inform our action to prevent fetal and infant deaths