Introduction to Perinatal Periods of Risk (PPOR) Webinar

April 23, 2020

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Agenda

Housekeeping	Tess Pritchard, TA & Support Center
Welcome	Kenn Harris, TA & Support Center
Introduction to PPOR	Carol Gilbert, M.S., CityMatCH
Q&A	All
TA & Support Center Announcements	Kenn Harris

Meeting Logistics

Please note the following:

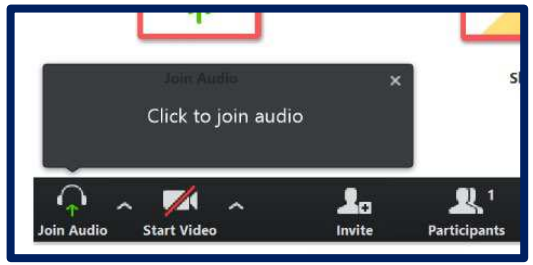
This session is being recorded, and will be archived for future viewing.

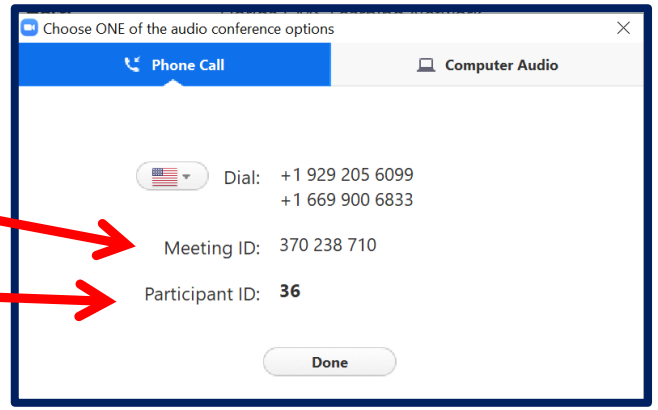
All participants are muted upon entry. We ask that you remain muted to limit background noise.

Members are encouraged to participate in the discussion by typing your comment/asking questions using the chat box.

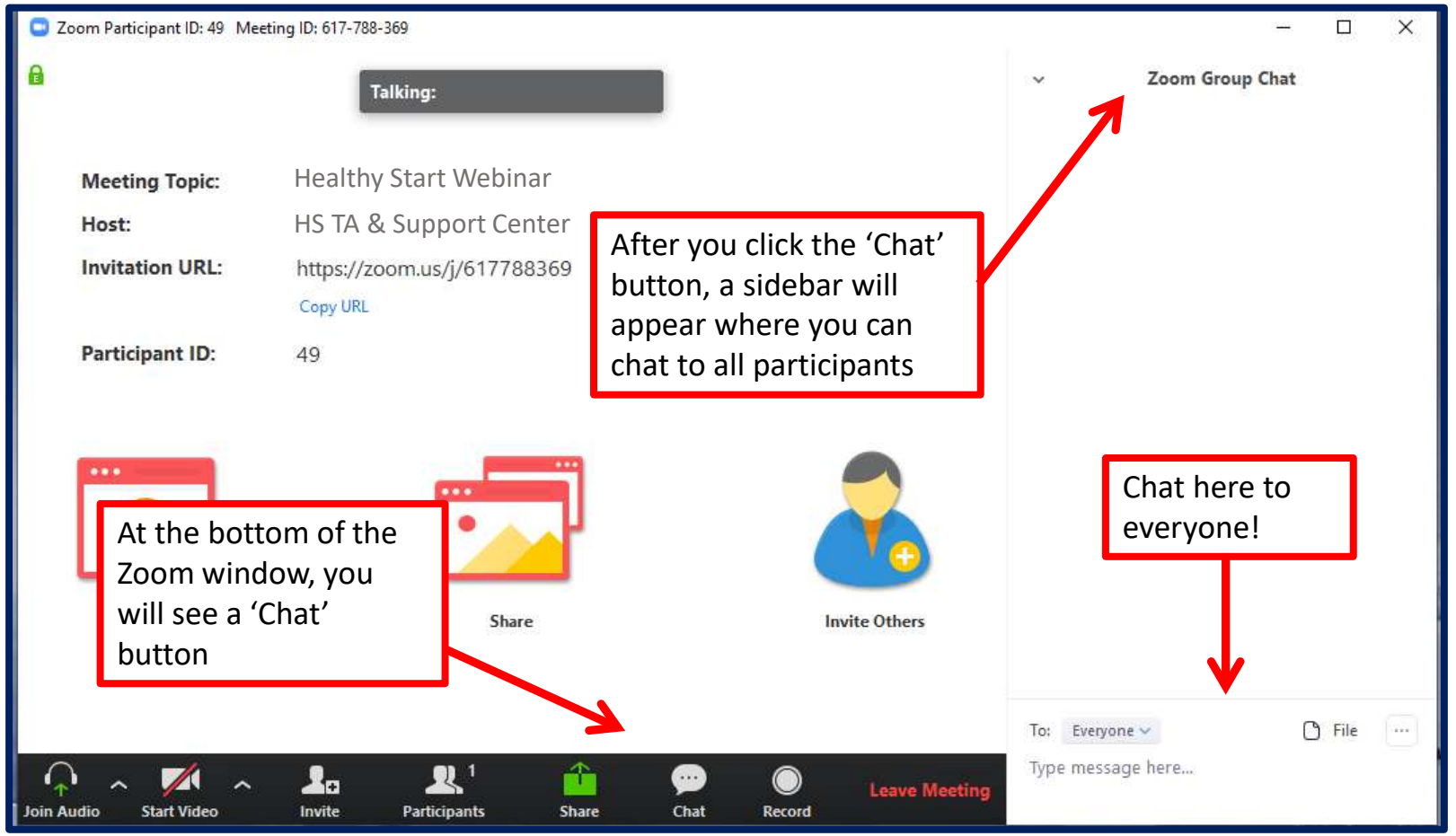
Connecting to the Audio Conference

- Join Zoom Meeting by **clicking Zoom Meeting link** & launching the Zoom application
- An audio conference box will appear
  - If you do not see the box click the **'Join Audio' button**
- From the audio conference box: Select to **"Phone Call"** or **"Computer Audio"**
- If using the phone:
  - dial the number next to "Dial"
  - You will be prompted to enter the **"Meeting ID"**
  - Then you will be prompted to enter the **"Participant ID"**





Ways to Participate: Chat



Welcome

Kenn Harris
Healthy Start TA & Support Center

Perinatal Periods of Risk PPOR

Communities using vital records data to investigate and address high infant mortality rates in cities and counties

For Healthy Start, April 2020

Carol Gilbert, MS
CityMatCH

Where can PPOR be used?

PPOR analysis is a *quantitative*, population based approach, so "N" matters.

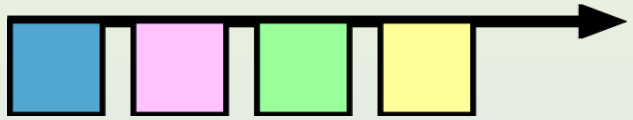
Whole communities *and every subpopulation* need 60 or more infant deaths in at most a five year period (prefer 200 for the full analysis)

IMR	N Births for 60 deaths	N Births for 200 deaths
5	12,000	40,000
10	6,000	20,000

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



Example places that use PPOR

Medium-sized cities and counties

Subpopulations of large cities

- -Black
- -High school or less education
- -Redlining neighborhoods*

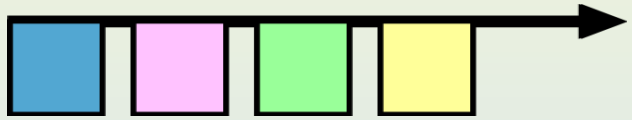
Similar subpopulations in several counties or neighborhoods, combined

*if vital records data are geocoded

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



"Rules" for combining/aggregating

Statistical calculations are based on the assumption of "independent and identically distributed units" .

People are *never* that, so we are *always* stretching the assumptions by combining families, neighborhoods, ancestral origins, social classes, counties, etc.

PPOR works best if the study population shares health systems and so, potentially shares solutions.

citymatch

HEALTHY start TA & SUPPORT CENTER

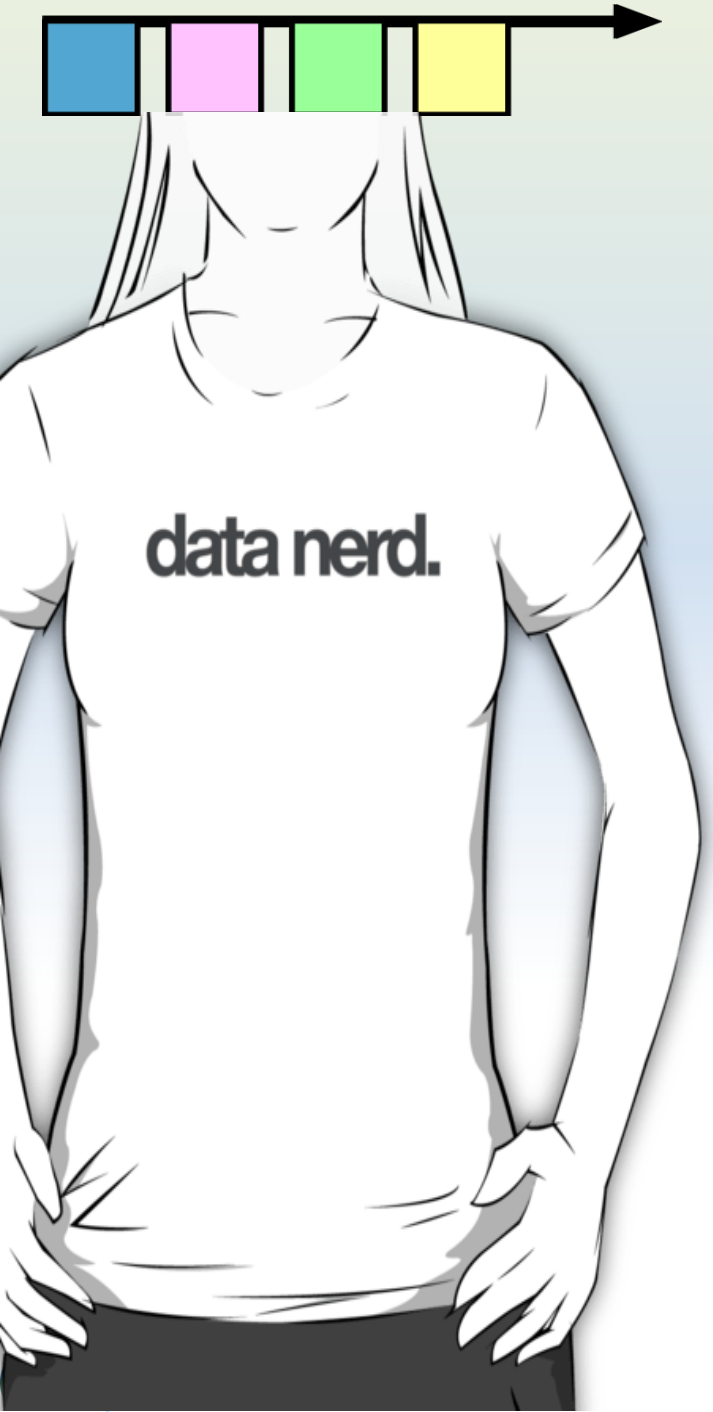
NICHQ National Institute for Children's Health Quality

Poll

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



What resources are required?

You need the raw vital records data files – the electronic records that have information on each individual *birth, infant death, and fetal death*.

And you need someone who can work with that data

HEALTHY start TA & SUPPORT CENTER NICHQ National Institute for Children's Health Quality

PPOR is not rocket science

It is not rocket science, but with thousands of records, a program like SAS is helpful for manipulating the datasets. Familiarity with vital records data is a plus.

With ideal data readiness, the full analysis can take a week or two. However it should be done in stages, with community input.

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

PPOR needs a group of stakeholders

that must include voices of the people who live in the community being studied.

- Start with an existing group
- Add expertise and resources as needed

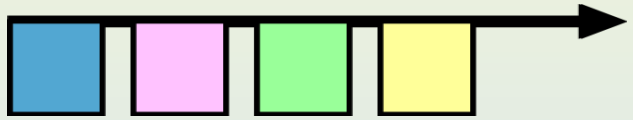
citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Answer in the Chat Box

Does you stakeholder group include community voices?

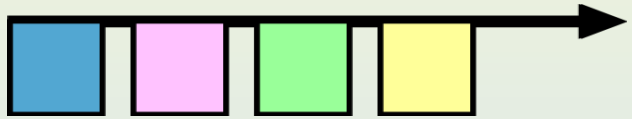


What does PPOR analysis provide?

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



1. **Community "ownership" of data**
   - We physically have possession of the records of our community's births, deaths and fetal deaths
   - We can question the assumptions and decide which assumptions are acceptable
   - We can pursue the answers to our questions using vital records data and other information sources
   - We can freely investigate data quality problems and work to improve them

citymatch

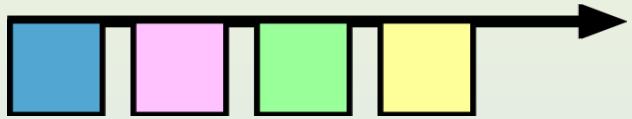
HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Answer in the Chat Box

Does your stakeholder group discuss or use data?

If yes, how?



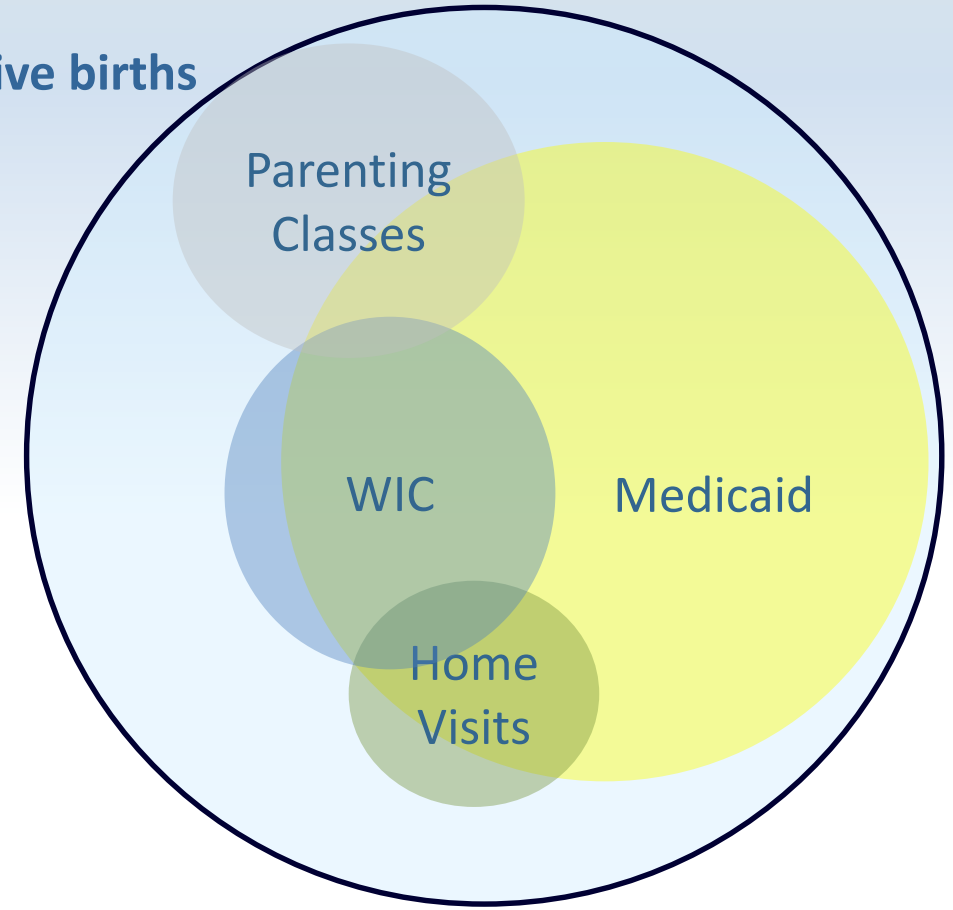
Questions communities have asked:

- How do we want to classify a baby whose mother checks both “Native American” and “Black”?
- If the parents immigrated to the US is that important?
- Should the father’s race/ethnicity be considered?
- How many fathers do not appear on the birth certificate? Why might this be?
- Who fills out the death certificate if the parents don’t read & write English?
- Why are many fetal deaths missing birthweight, and how does this affect our findings?

PPOR provides…

2. A whole-population perspective

which can be very different from a program perspective

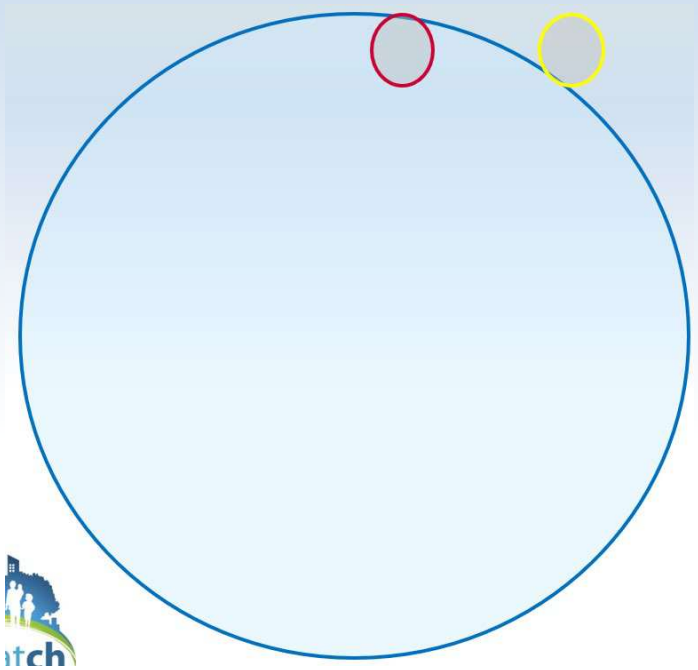


citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

A whole-population perspective is also different from a "deaths only" perspective



Live births

Infant Deaths

Fetal Deaths

This is approximately "to scale" for IMR=10

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

PPOR provides…

3. a. A LONG LIST of known causes of infant mortality that do NOT appear to explain *EXCESS* mortality in *THIS* population.

Example community findings:

-Smoking and multiples cause of infant mortality, but our study population has a low rates of those risk factors.

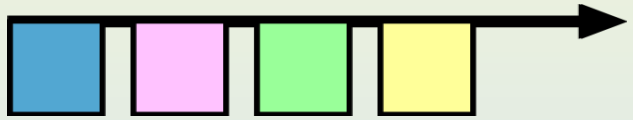
-Teen pregnancy is often targeted, but we have few teen births, and they have better birth outcomes

-Neither prevalence of birth defects or survival of infants with birth defects are important contributors to excess mortality in our community

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



3. b. SHORT LISTS of known causes of *EXCESS* infant mortality (preventable deaths) that are *MOST IMPORTANT IN THIS* population.

Example:

Too many very low birthweight births (VLBW) account for 63% of our excess mortality.

The most important factors associated with VLBW are

-low educational attainment

-father not being on birth certificate

-previous preterm birth

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

PPOR provides…

4. Often, PPOR helps to justify addressing

non-clinical factors

-low educational attainment

-marital status, teen parenting

-Medicaid for delivery

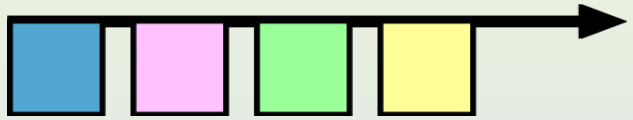
-neighborhood (if geocoded)

health care access issues

-previous preterm birth

-short birth spacing

-late prenatal care



4. **In many communities, PPOR findings indicate that PREVENTION of prematurity rather than HEALTH CARE for newborns will reduce disparities.**

In some communities, this has aligned with the perceptions of pediatricians and neonatologists who became powerful allies in non-clinical prevention efforts.

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

PPOR provides…

5. PPOR can be a force for consensus among multiple partners with different preconceived notions and their own agendas

- every baby is included
- data is continuously produced
- in general, results are reliable and

its broad conclusions are undeniable

- **Helps align multiple community efforts**
- **Helps "make the case" to funders & policy-makers**

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

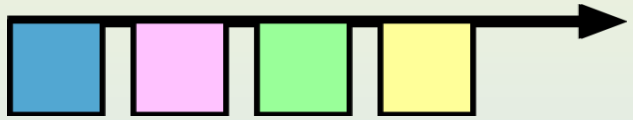
Limitations of PPOR

1. Needs large numbers of deaths, a large geographic area
2. Time investment
   - -obtaining data, doing analysis
   - -teaching all stakeholders
   - -learning from all stakeholders
3. Data quality problems cause bias (missing birthweight or maternal characteristics)
4. Vital records have only a few pieces of information – known causes

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

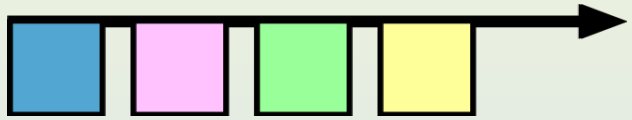


What is PPOR, and how does it work?

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



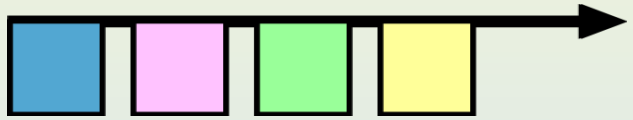
Roots of PPOR

- From the “Periods of Risk” model developed by Dr. Brian McCarthy with CDC/World Health Organization, and used in developing countries
- Adapted for US Cities by a CityMatCH Practice Collaborative, led by Magda Peck of CityMatCH and Bill Sappenfield who was then a CDC assignee, at CityMatCH
- Widely used at the local level, and by many states. Recommended by MCHB for Title V and Healthy Start planning
- Analysis methods are based on standard epi principles
- The approach relies on community involvement for impact

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



What's different about PPOR analysis?

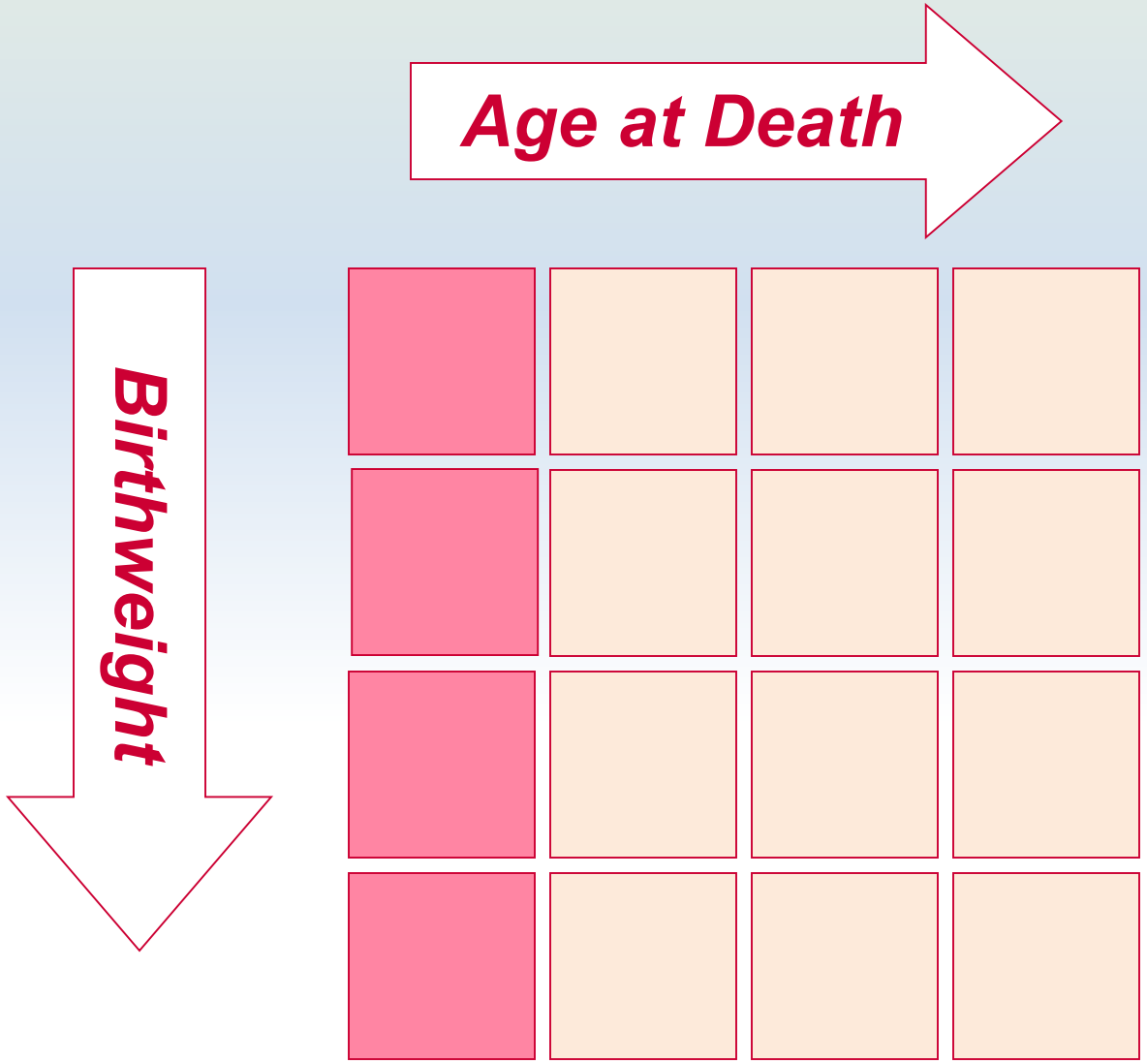
1. Using fetal death data
2. Dividing mortality into four periods of risk
3. Using a reference group to estimate preventability

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

WHO Risk Period Analysis
Examines deaths in two dimensions



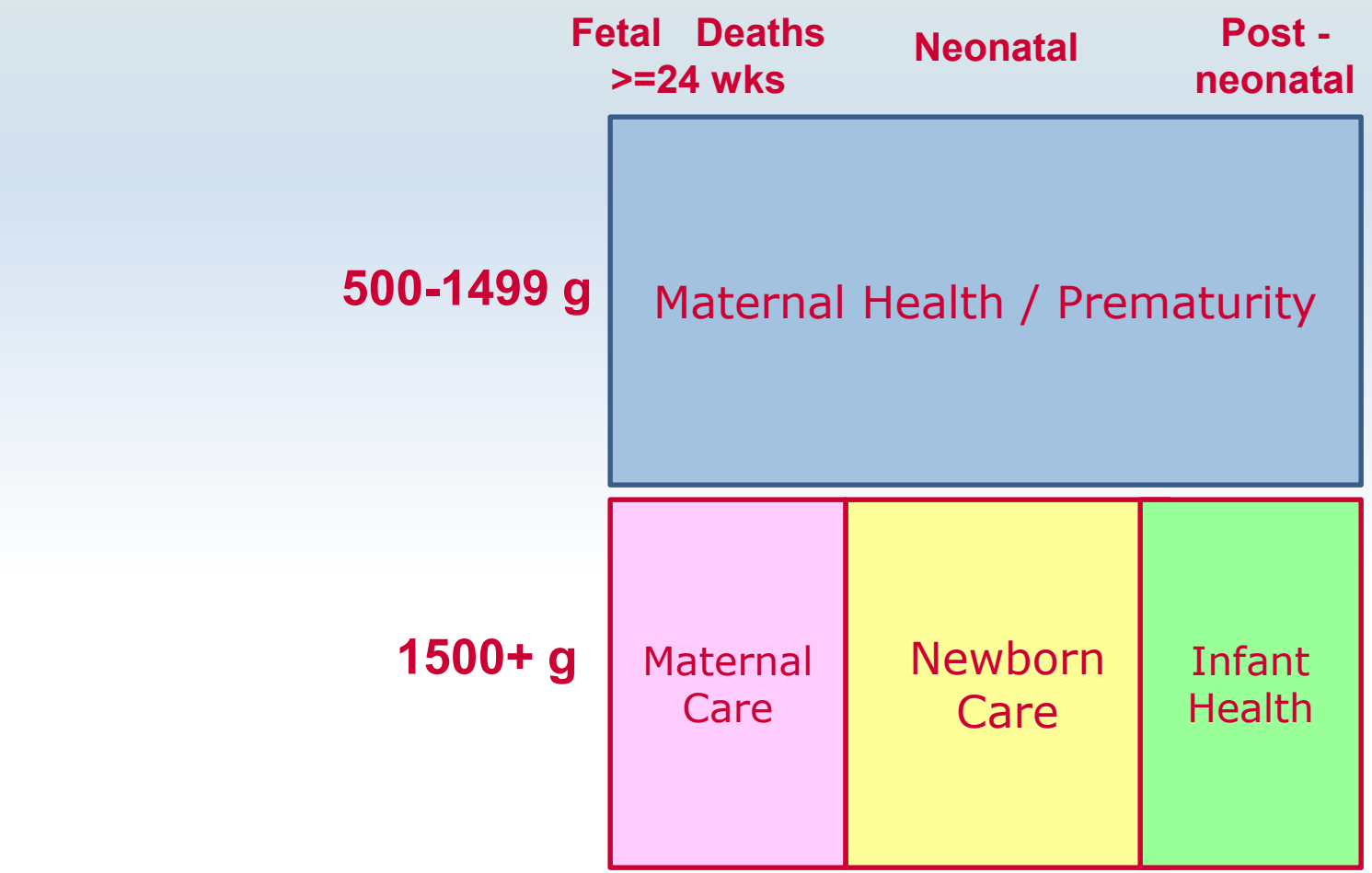
Expert opinion and cluster analyses were used to combine boxes with similar causes of death and risk factors

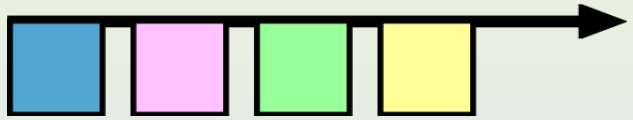
	Fetal Deaths	Early Neonatal	Late Neonatal	Post-neonatal
Extremely Low Birthweight 500-999 g				
Very Low Birthweight 1,000-1,499 g				
Low Birthweight 1,500-2,499 g				
Normal Birthweight 2,500 + g				

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Four Perinatal Periods of Risk were named to suggest prevention areas





The dividing lines had been chosen so deaths in the same period of risk had similar PROBLEMS:

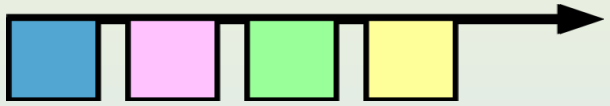
- Causes of death
- Maternal risk factors

…which means they also had similar SOLUTIONS.

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



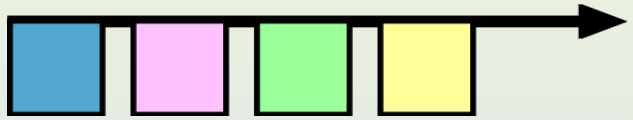
Each period of risk is associated with its own set of risk and prevention factors

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.

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



PPOR Has Two Analytic Phases

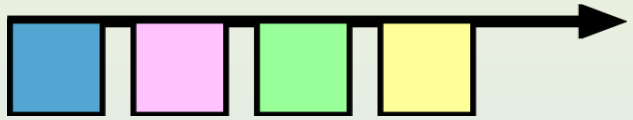
Phase 1

- Calculates period-specific mortality rates in the study population
- Compares these with rates in a reference population
- To identify the periods of risk that contribute most to “excess mortality” or preventable deaths.

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



Phase 2 (three steps)

1. Identify the most important causes of excess mortality
2. Examine risk factors for those causes, by comparing the study and reference populations
3. Estimate potential impact of risk factors

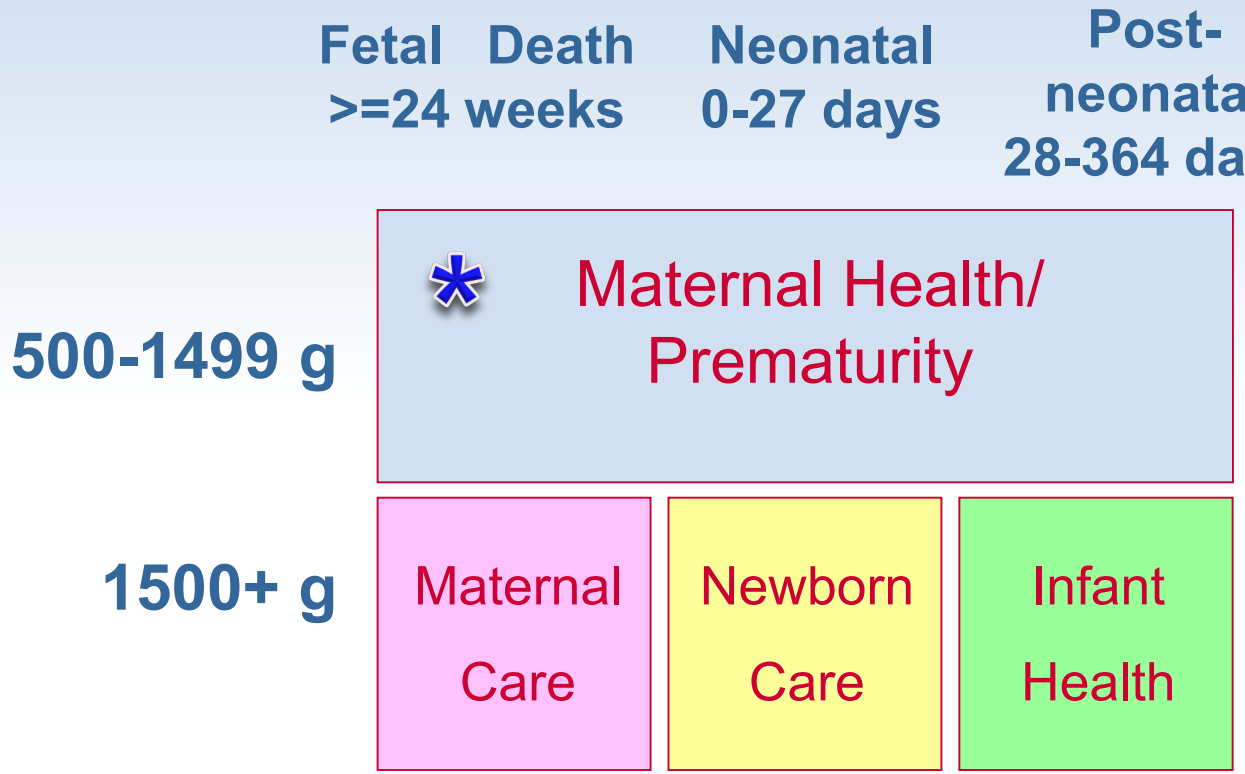
citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

SORT the Fetal and Infant Deaths

Example: boy born weighing 820 grams died at 22 days old



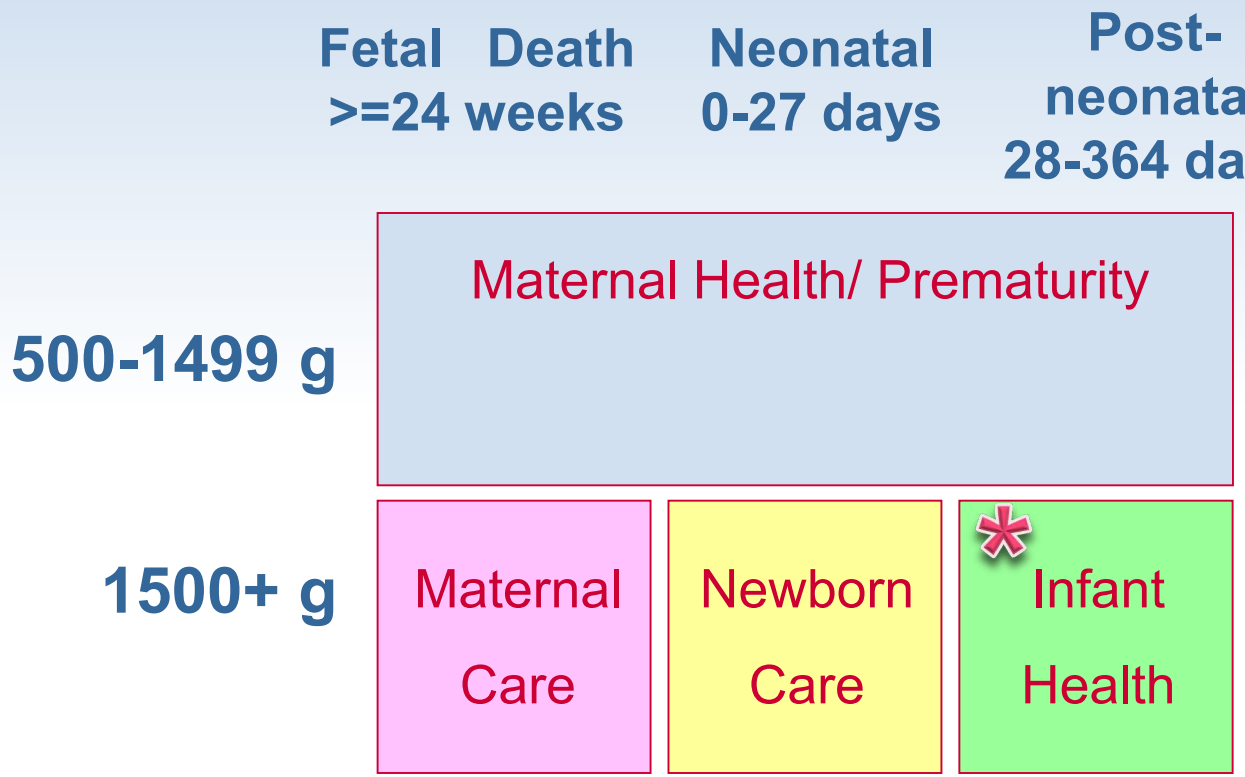
citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

SORT the Fetal and Infant Deaths

Example: Girl, born at 1820 grams, died at 37 days of age



citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

PPOR Map of Fetal and Infant Deaths

Urban County

97
Maternal Health/ Prematurity

48
Maternal Care

44
Newborn Care

47
Infant Health

To make fair comparisons we need to know how many pregnancies there were altogether.

There were 23,282 fetal deaths and live births.

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

To make fair comparisons, Urban County calculated mortality rates

To calculate mortality rates

Urban County divided each count by the number of live births and fetal deaths 23,282 then multiplied by 1,000

97
Maternal Health/ Prematurity

(97 deaths ÷ 23,282 × 1,000 = 4.2 **)

48 Maternal Care	**44** Newborn Care	**47** Infant Health

****INTERPRETATION :**
There were 4.2 deaths for every 1,000 live births and fetal deaths.

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Urban County PPOR map

97
Maternal Health/ Prematurity
(4.2)

48 Maternal Care **(2.1)**	**44** Newborn Care **(1.9)**	**47** Infant Health **(2.0)**

Overall number 97 + 48 + 44 + 47 = 236

Overall rate 4.2 + 2.1 + 1.9 + 2.0 = 10.1

citymatch

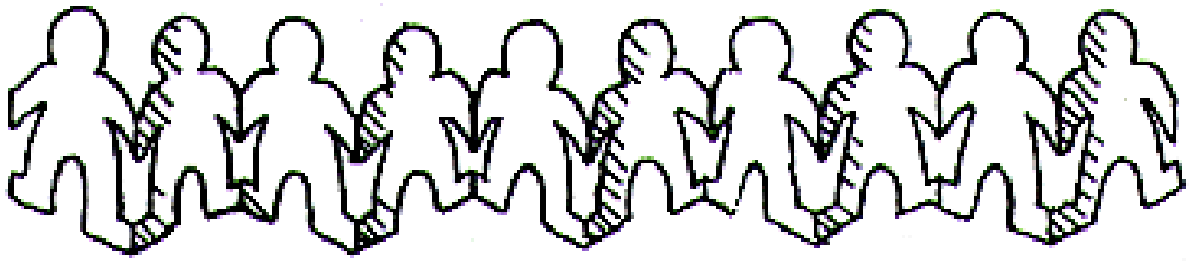
HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Next, we need to know "What rates can we *expect* to see in each Period of Risk?"

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

Defined by maternal demographics, not health characteristics.



citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

The Reference Group is about Justice

Community stakeholders choose the reference group.

- Their underlying assumption is that if the reference group can have low mortality, our study group should be able to reach that goal.

- The status quo is not acceptable.

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Poll

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Examples of Reference Groups

- *Black mothers age 20-34 with at least a bachelor's degree, residing in your state at the time of their baby's birth*
- *White non-Hispanic women over the age of 19 who had at least one year of education past high school and resided in your county when their baby was born*
- *White mothers age 20-39 who resided in affluent neighborhoods at the time of the birth*

citymatch

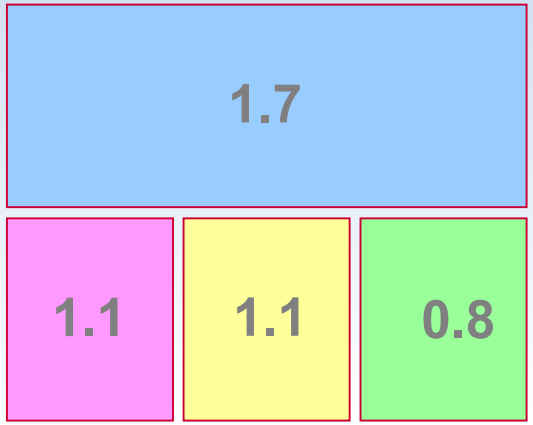
HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Urban County stakeholders chose a state reference group 2008-2012

- Defined by ***maternal*** characteristics

- 20-34 years of age
- 16 or more years of education
- Non-Hispanic white women
- Residents of the state at the time of baby's birth



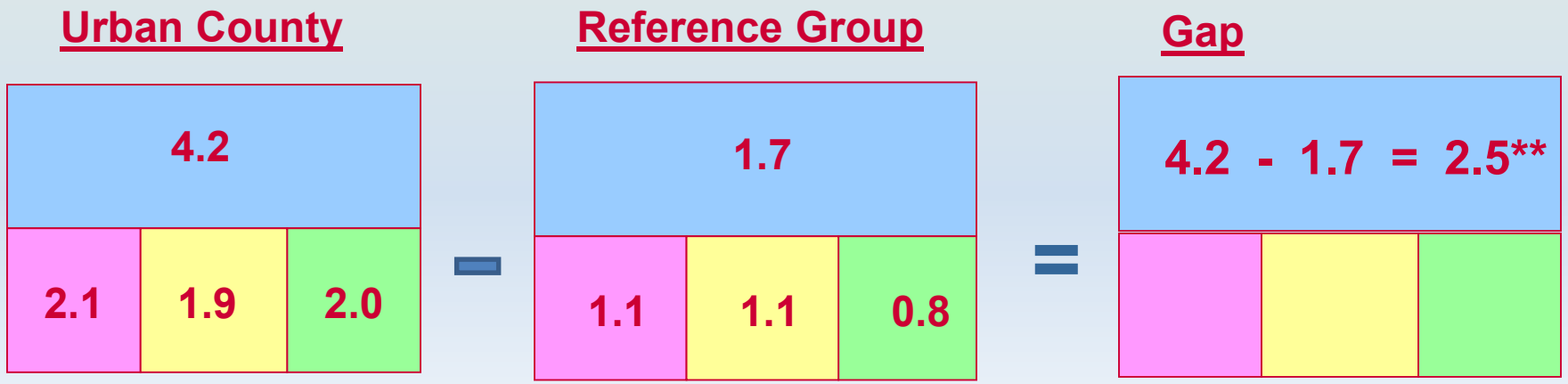
Total Fetal-Infant Mortality Rate = 4.7

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

They compared the study and reference populations by subtracting rates in each period of risk



****INTERPRETATION:**

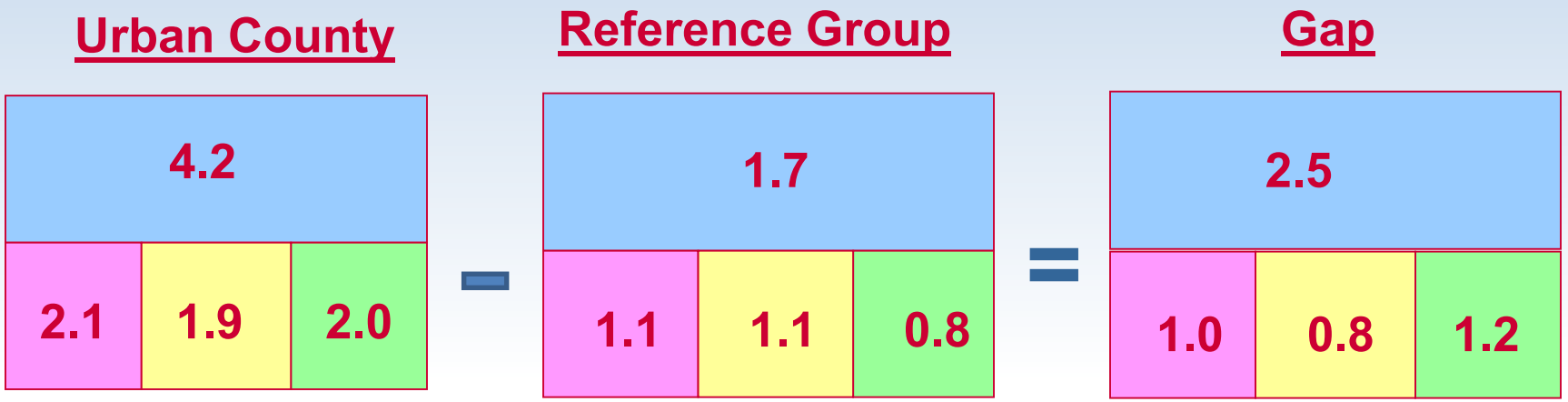
2.5 *excess deaths* for every 1,000 live births and fetal deaths

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

The difference between rates, or the "gap", represents "excess mortality" and it means that some of the deaths were preventable.



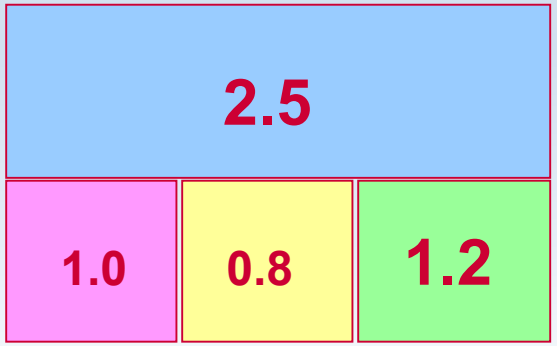
citymatch

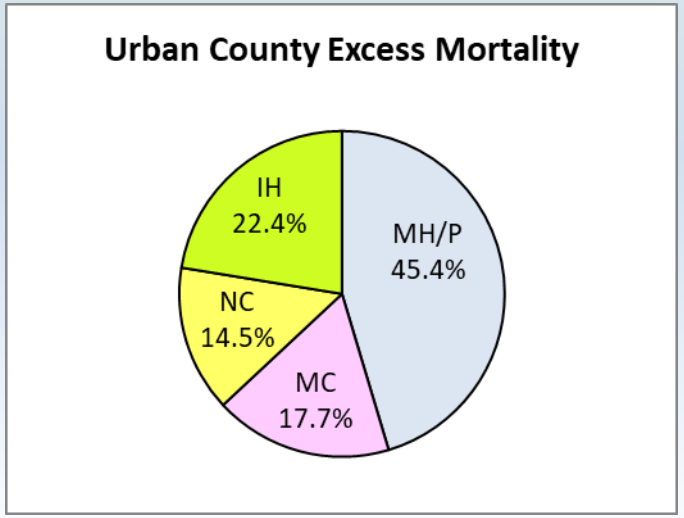
HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Two periods of risk accounted for 68% of their excess mortality.

Gap, Excess Mortality, Preventable Deaths



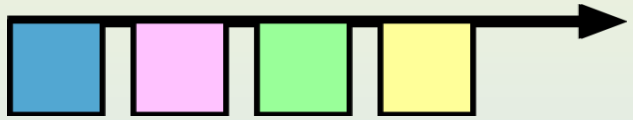


The second phase of the Urban County investigation focused on these two periods.

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



Phase 2 has three steps; analysis plan depends on period of risk

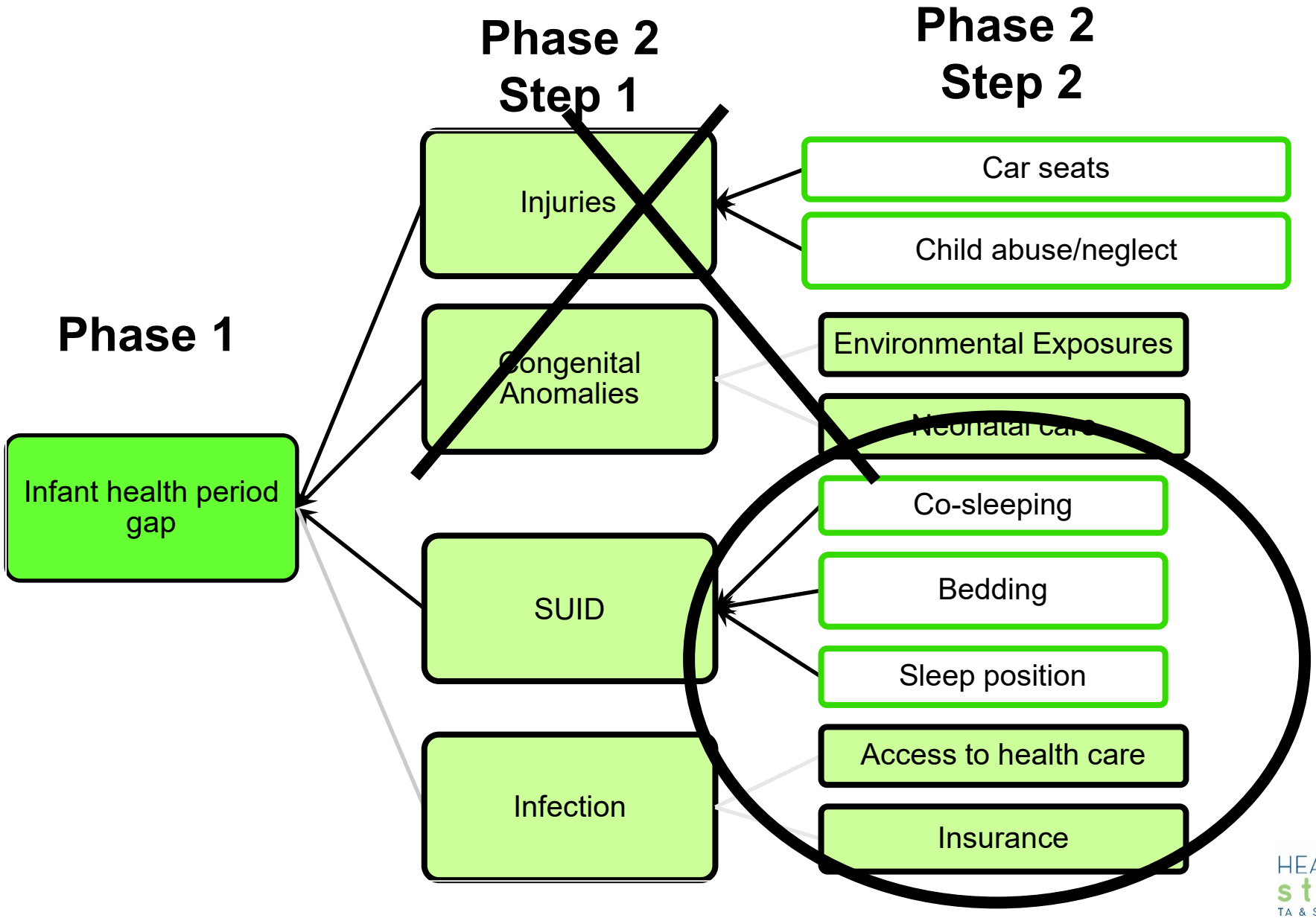
1. Identify the most important causes of excess mortality
2. Examine risk factors *for those causes*, by comparing the study and reference populations
3. Estimate potential impact of important risk factors

citymatch

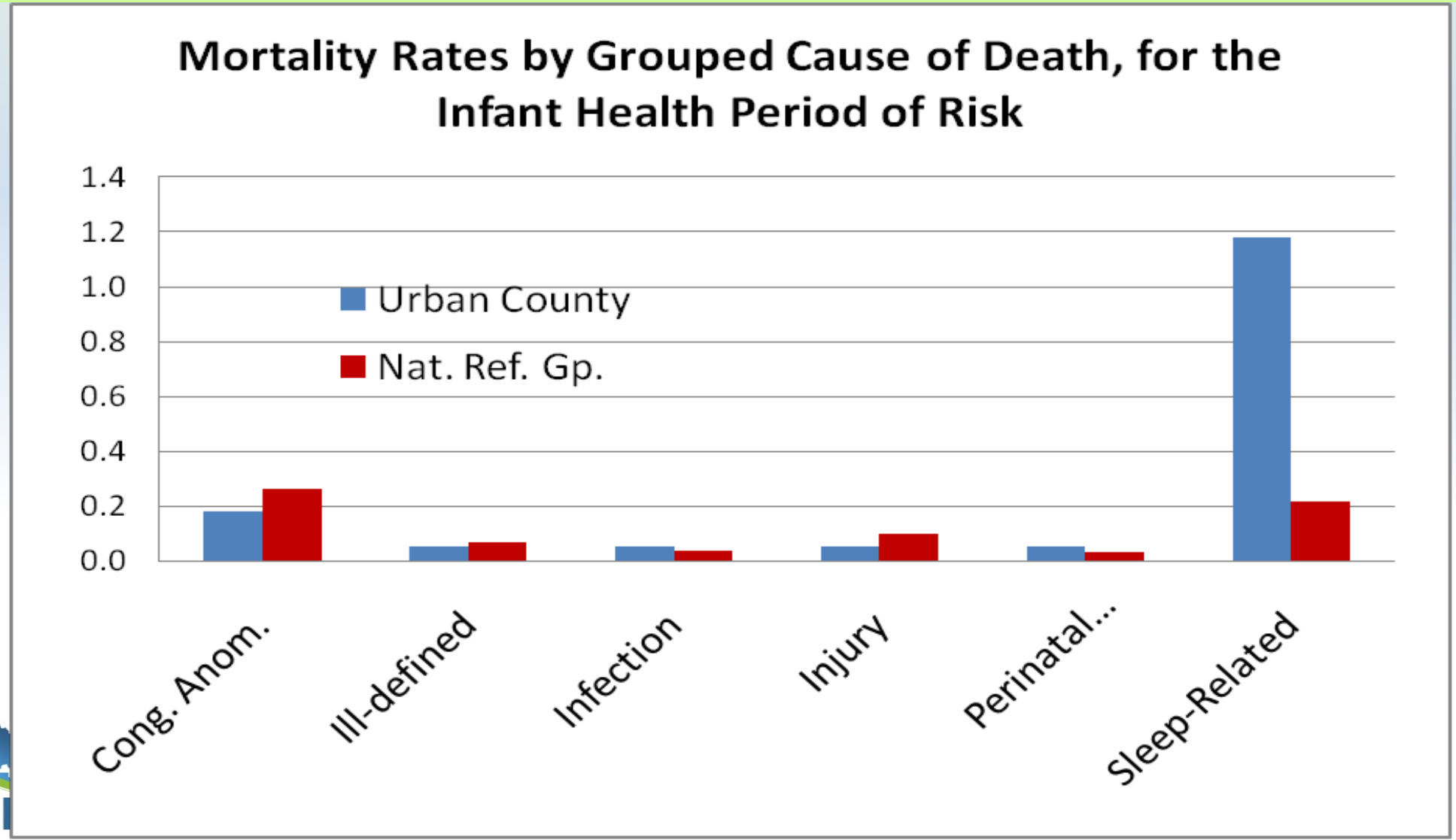
HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Schematic of PPOR Steps for the Infant Health Period

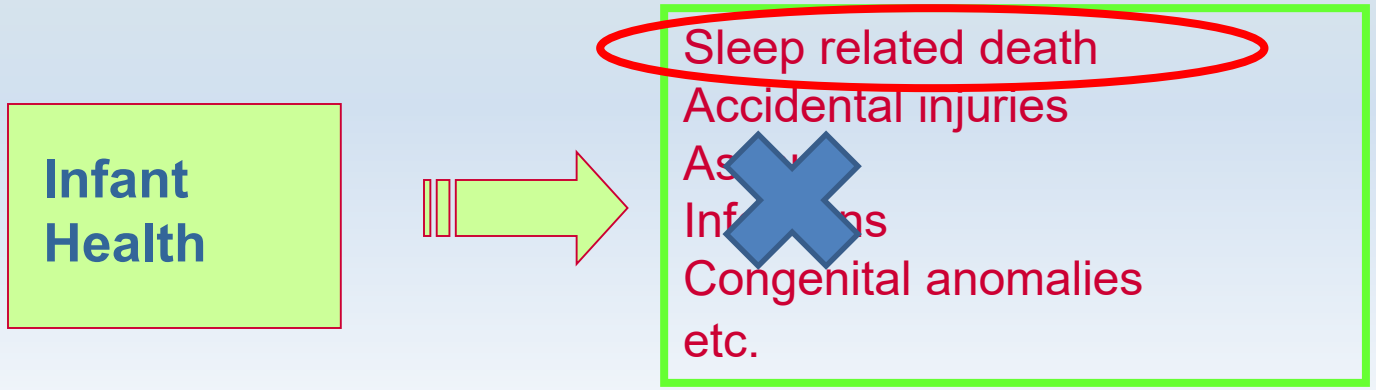


Step 1. The dozens of ICD-10 codes were grouped, and mortality rates calculated for each group in both the study and reference populations.



SUCCESS!

Urban County Stakeholders had discovered that most of their Infant Health Period excess mortality was due to sleep safety issues.



They had eliminated causes that were not large contributors to *their* infant mortality disparity and further narrowed the scope of their investigation.

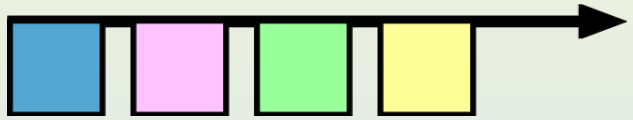
But they could do better!

Step 2: Examine risk factors, by comparing the study and reference populations if possible

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



Known risk factors for SUID

- From Birth Certificate: smoking, preterm birth, alcohol use, breastfeeding (protective)

- Other important factors: bed-sharing, back sleeping (protective), blankets, toys, bumper-pads in crib

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality

Step 3: Urban County estimated the impact of risk factors, and the potential impact of interventions

We can statistically estimate how many lives could potentially be saved if certain risks were reduced ***(Population Attributable Risk)***

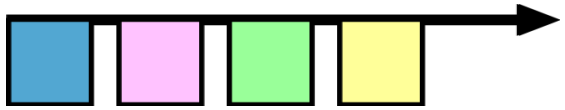
But we also need to consider:

- Which factors are modifiable?
- Do evidence-based interventions exist?
- What are our community assets, capacity, and commitment?

citymatch

HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



Maternal Health/Prematurity Period
Steps for Phase 2 Analysis

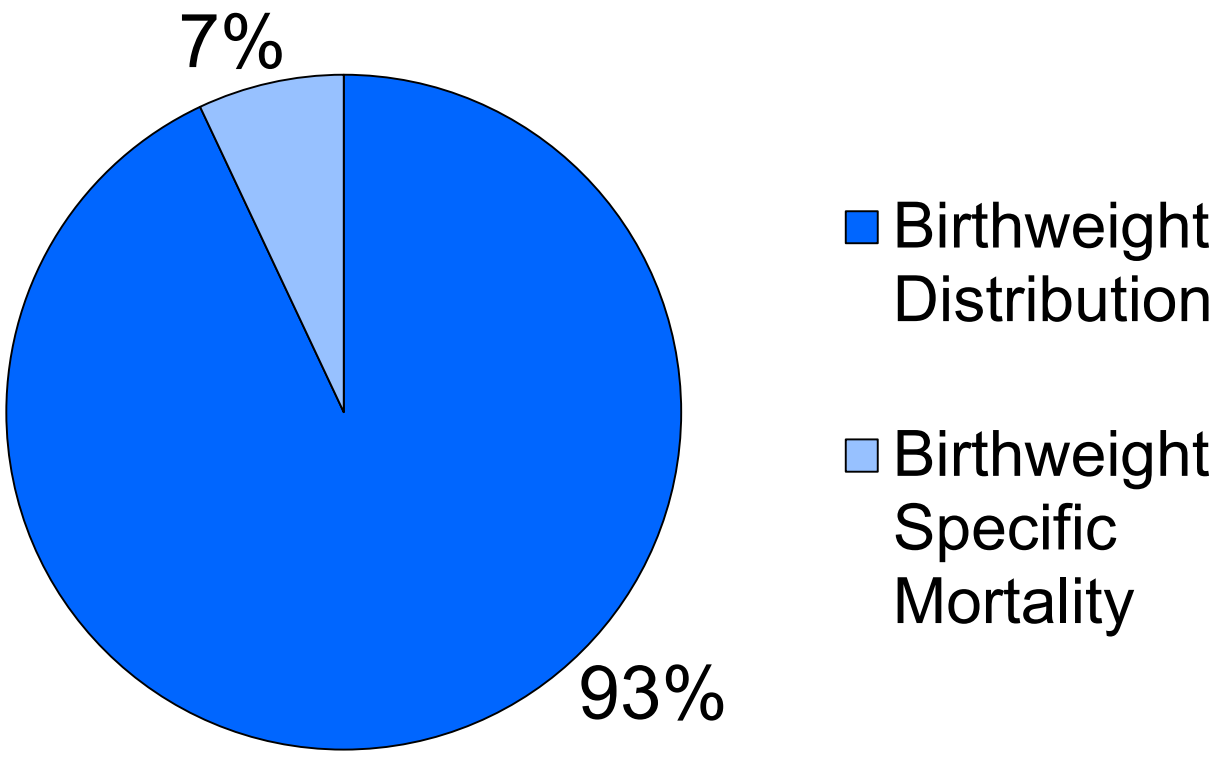
Step 1. "Causal pathway"

- What causes of death contribute the most to excess mortality in this risk period?
- Can "patterns" in mortality disparities help us understand the underlying mechanism for excess mortality in this risk period?

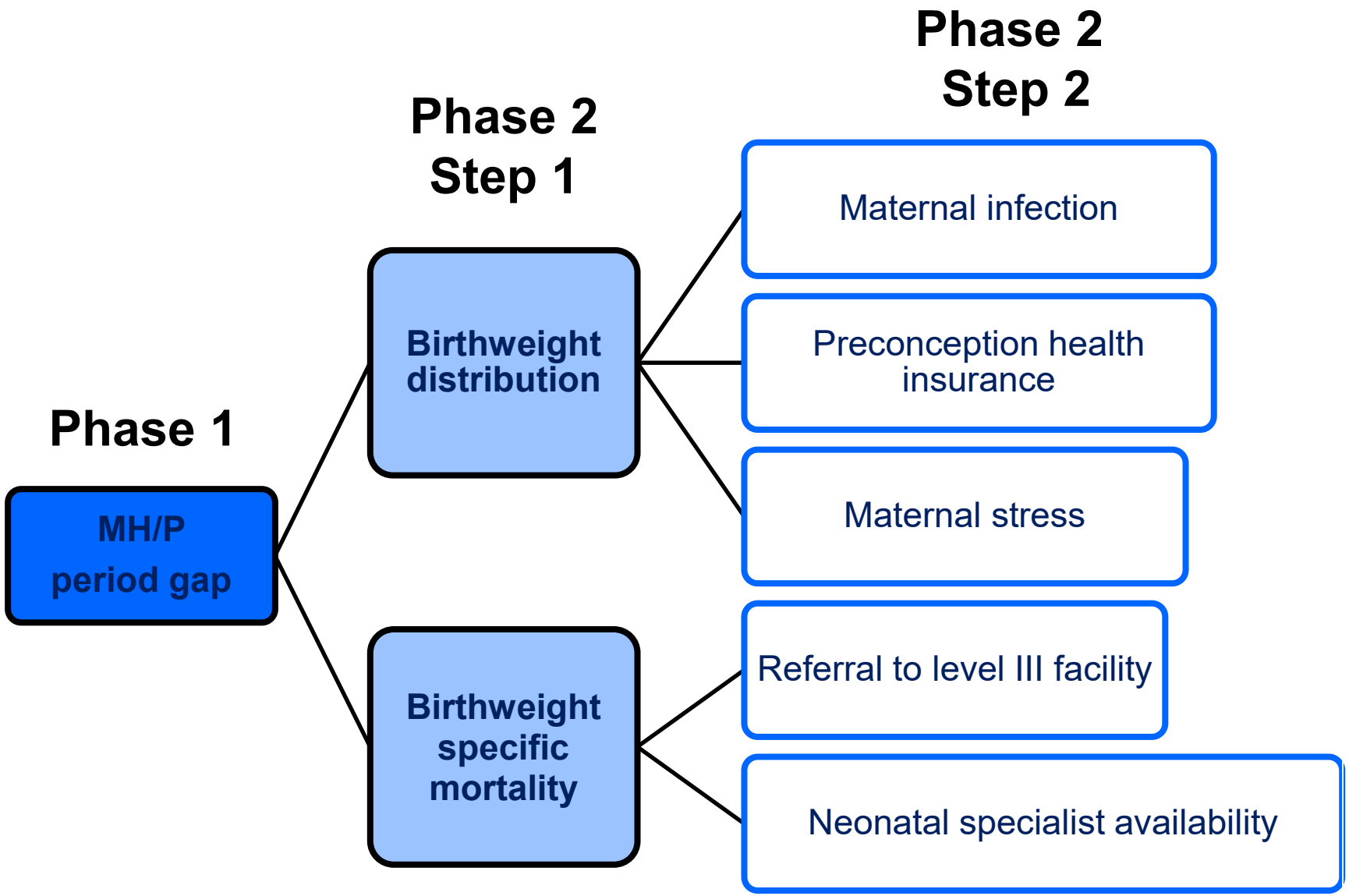
What is Kitagawa analysis?

NoNicu City	TinyBaby City
10 VLBW births	100 VLBW births
10 VLBW deaths	10 VLBW deaths
Mortality rate for a baby born VLBW in NoNicu City **is 100%**	Mortality rate for a baby born VLBW in TinyBaby City **is 10%**

In the Maternal Health/Prematurity Period, Kitagawa's formula tells us *which city we resemble, and what we need to focus on.*



Schematic for Maternal Health and Prematurity Risk Period



Phase 2 Analysis—MH/P Period
Partial list of risk factors by contributor

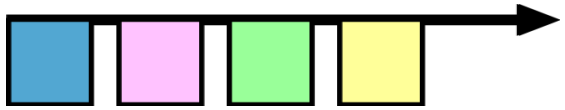
Birthweight Distribution (VLBW Births)

- Prenatal care
- Preconception care
- Parity
- Stress
- SES/Education
- Birth Interval
- Maternal HTN/Diabetes
- Etc.

Birthweight-Specific Mortality

- Gestational age
- Referral system
- Perinatal care
- NICU system
- Mat. complications
- Neonatal conditions
- Pay source
- Etc.

Poll

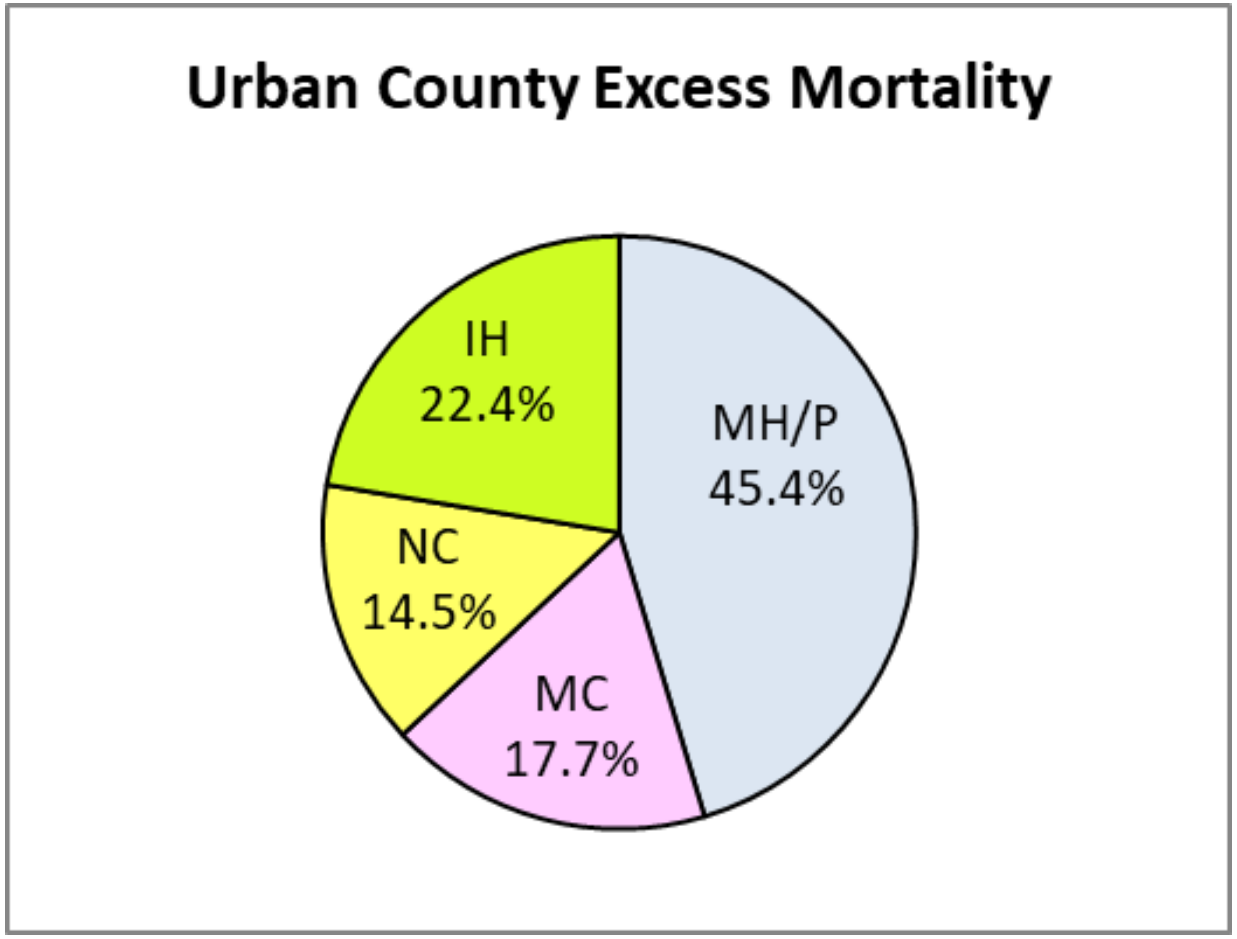


Phase 2 Analysis Strategy

- Eliminate from consideration risk and preventive factors that are unlikely to be contributing
- Find and target known factors that are likely to be contributing

Urban county story

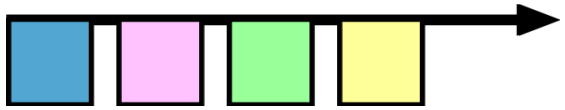
Phase 1 divided total excess Into four periods.



Phase 2 step 1 divided two of them into two parts

15% of total excess mortality Is due to SUID (sleep-related infant deaths)

40.1% of total excess mortality Is due to birthweight distribution In the blue box – “too many very preterm births”



. . . continued

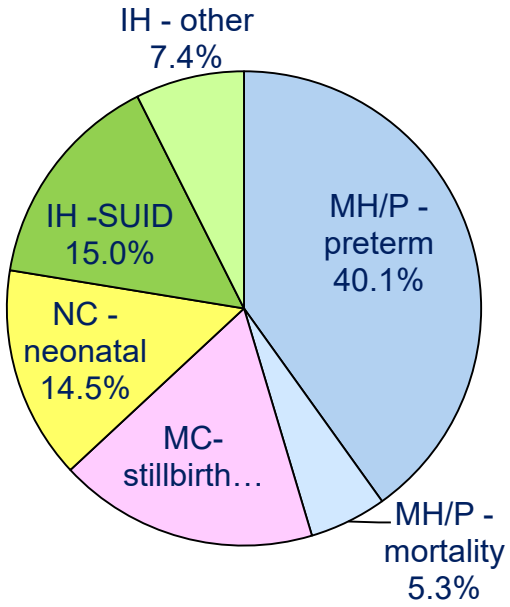
The community started with existing systems and they could mobilize for safe sleep.

- Added safe sleep education to
  - Doula training
  - Home visiting
  - Community center activities
- Partnered with state to engage hospitals
- Renewed safe sleep PSA campaign

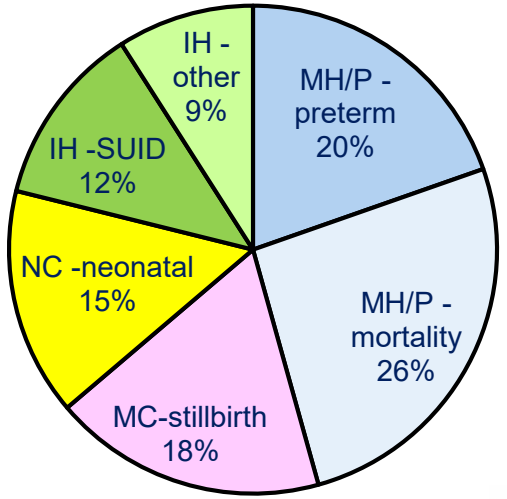
...continued

A second Kitagawa analysis found an important difference between the US-born and foreign-born Black populations: **the VLBW infants of immigrants mothers were less likely to survive their first year**. For that group, improving survival of preterm infants was also prioritized.

African American Excess Mortality



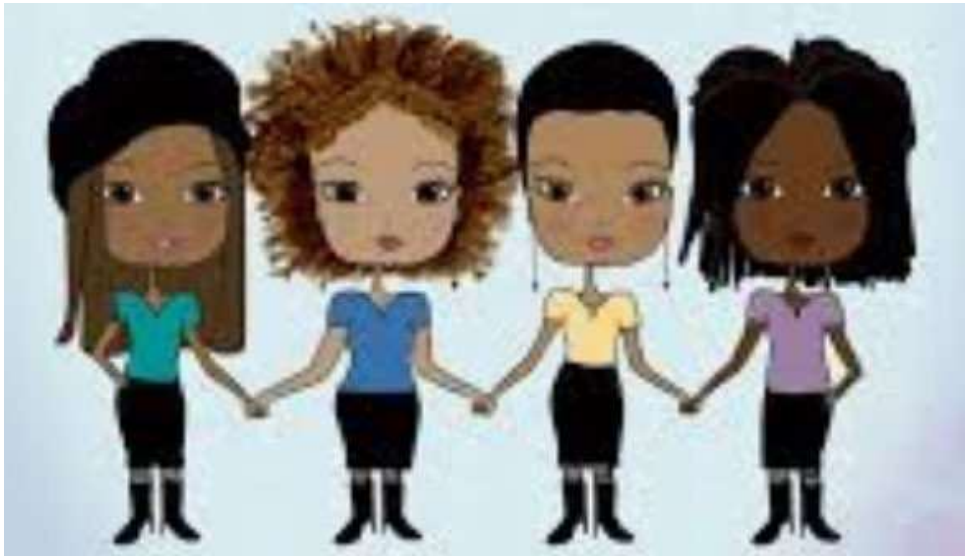
Foreign Born African Americans Excess Mortality

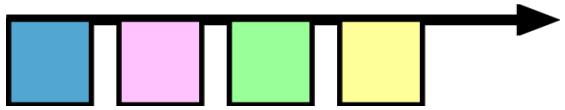


HEALTHY start TA & SUPPORT CENTER NICHQ National Institute for Children's Health Quality

Among US-born Blacks, Rates of hypertension, diabetes, asthma, and obesity were high and were strongly associated with very preterm birth.

These indicated to the community that chronic diseases needed to be addressed in this population even before pregnancy, and perhaps throughout the life course.





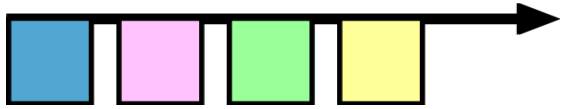
...continued

PPOR provided evidence that social factors were at play:

1. Within the Black population, educational attainment and marital status were associated with preterm birth. The community felt that both of these were proxies for social class.
2. A model including all factors measured in the birth certificate did not fully account for the VLBW disparity.

Research points to stress over the life course, and underlying structural racism as causes of poor preconception health.

MCH leadership prioritized safe and affordable housing.



What we covered today

Where can PPOR be used

- What you need to do PPOR
- Benefits, limitations
- Phase one principles and analysis
- Phase 2 – very lightly
- Use with community members, community assets, previously existing research findings, other information sources

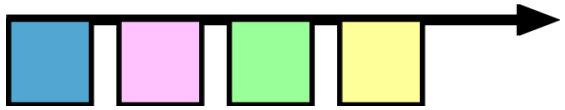
Answer in the Chat Box

Is there anything you wish we had covered more of in today's webinar?

citymatch

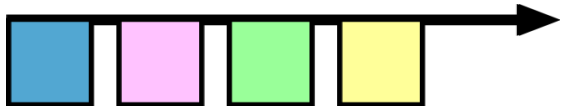
HEALTHY start TA & SUPPORT CENTER

NICHQ National Institute for Children's Health Quality



Not covered

- **Data quality problems**
  - Assessing
  - Estimating their impact
  - Work-arounds
- **Phase 2 details**
  - Analytic methods
  - Use of other sources of data & information

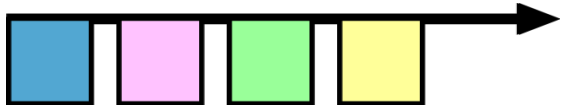


Suite of methods articles

Perinatal periods of risk: a community approach for using data to improve women and infants' health. Peck MG, Sappenfield WM, Skala J. Matern Child Health J. 2010 Nov;14(6):864-74. doi: 10.1007/s10995-010-0626-3. PMID: 20602162

Perinatal periods of risk: analytic preparation and phase 1 analytic methods for investigating feto-infant mortality. Sappenfield WM, Peck MG, Gilbert CS, Haynatzka VR, Bryant T 3rd. Matern Child Health J. 2010 Nov;14(6):838-50. doi: 10.1007/s10995-010-0625-4. PMID: 20563881

Perinatal periods of risk: phase 2 analytic methods for further investigating feto-infant mortality. Sappenfield WM, Peck MG, Gilbert CS, Haynatzka VR, Bryant T 3rd. Matern Child Health J. 2010 Nov;14(6):851-63. doi: 10.1007/s10995-010-0624-5. PMID: 20559697



Help from CityMatCH

- Slide sets with details
- Technical assistance

  cgilbert@unmc.edu (me, Carol Gilbert)

  lynne.le@unmc.edu (my colleague Lynne Le)

- Networking assistance (we can connect you with other communities that do PPOR)

HEALTHY start

Q&A

NICHQ
National Institute for Children's Health Quality

HEALTHY start

TA & Support Center Announcements

NICHQ
National Institute for Children's Health Quality

HEALTHY start

Thank you!

Questions?
Email the
TA & Support Center at
healthystart@nichq.org

NICHQ
National Institute for Children's Health Quality