Landscape for Perinatal Regionalization: a Geospatial View of Perinatal Critical Care in the United States, 2010-2013

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Note: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of CDC. (CS119098)
BACKGROUND
What is perinatal regionalization...
Perinatal regionalization is a comprehensive, coordinated and geographically structured system of designating where infants should be born to assure risk-appropriate perinatal care is available for all mothers and infants.

Why do we need a regional system...
Many hospitals deliver babies; very few can provide specialized care capable of handling critically ill mothers, or neonates with complex congenital disorders or supporting those who were just born too soon—aka risk-appropriate care.

Risk-appropriate care...
Care in a setting where specialized care is readily available if needed to reduce the chances of death or permanent disability
• Basis for defining levels of care
History...
Infant mortality is often used as an indicator to measure the health and well-being of a nation

Historic focus for reduction of infant mortality has been on neonatal care – advances in medicine & technology – rather than maternal care.

The same is true for regionalization efforts. Regionalization for NICUs has progressed further than that of OB units.

Current perinatal services and levels of care...
Perinatal services exist today as a dyad of maternal and neonatal care; level of care are defined separately for maternal and neonatal care.

Where implemented, regional systems are designed, designated, and managed at the state level usually by state health departments, or in some states by hospital networks or non-profit, professional groups.

Much disparity exists between states in perinatal levels of care and implementation of perinatal regionalization.
Current perinatal concerns...

**Infant mortality** – slowly decreasing overall but
- The US still lags behind most industrialized nations
- There are still significant racial/ethnic differences
- Recent studies show an increase in death rates of very low and extremely low birth weight infants

And,

**Maternal mortality** - recent increase in maternal mortality rate
- From 7.2 per 100,000 births in 1987 to 18.5 in 2013
Current national initiative…
Collaborative Improvement & Innovation Network to Reduce Infant Mortality (COIIN); Public/private initiative lead by HRSA; 5 priority areas with workgroups; Perinatal regionalization workgroup

Purpose of this study…
Take a spatial look at perinatal regionalization in the US as it is implemented today, and provide a:
• Visual and analytic overview of existing critical care hospital resources and staff,
• Basis for planning meaningful and sustainable regionalization of these resources.

Questions…
• Are there spatial differences in regional distributions of the population and critical care resources? Does the population have access? Are there racial/ethnic gaps?
• Are resources for neonatal and maternal care equivalent and coordinated?
• Are the appropriate medical subspecialists available and do their locations coincide with hospital locations?
METHODS
Sources of data

US Census 2010 – block groups of WRA population by race/ethnic groups and spatial layers
American Hospital Association (AHA) database – Maternal levels of care and hospital locations
American Academy of Pediatrics (AAP) database – Neonatal levels of care and hospital locations
Nation Provider Index (NPI) database – Critical care subspecialists and practice office locations

Software used
ArcGIS – GIS and spatial analysis
SAS – Data linkage and manipulation

Visual and analytic methods
Spatial interpolation to visualize the population
Zonal analysis of the population to the resources
Proximity analysis of the 2 services and subspecialists
Data were analyzed from 3 perspectives…

• **Access** of women of reproductive age (WRA) population and subpopulations to critical care perinatal hospitals with Level III-IV facilities

• Number, **spatial distribution** and relationship of the 2 critical care services to each other within a locality

• Number, spatial distribution and **relationship** of critical subspecialists to hospitals with the corresponding critical care perinatal units
Population : Services
Population density of woman age 15-44 years by race/ethnicity, United States, 2010

Population density
- <1
- 1
- 2-5
- 6-10
- 11-50
- > 50

*Women per square mile*
Illustration of 50 mile buffers around hospitals with Level III perinatal services

Table:

<table>
<thead>
<tr>
<th>Hospital</th>
<th>State</th>
<th>Buffer</th>
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</thead>
<tbody>
<tr>
<td>OB units N=599</td>
<td></td>
<td></td>
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<tr>
<td>NIC units N=848</td>
<td></td>
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</tbody>
</table>

- Hospital
- State
- Buffer
Access to Hospitals with Level III Neonatal Services by Race/Ethnicity, HHS Regions and State, 2012

[Bar charts showing access rates by race/ethnicity for different states and regions.]

- All
- Black
- Hispanic
Access to Hospitals with Level III Obstetric Services by Race/Ethnicity, HHS Regions by State, 2012

[Bar chart showing the percentage of hospitals with Level III Obstetric Services by race/ethnicity and HHS region for all states in 2012.]
50 mile zones around hospitals with Level III OB and/or NIC units, United States, 2012
Obstetrics : NICU
Hospitals with Level III OB or NIC units by Urbanization, United States, 2012

NIC units

Level III units located in CBSAs
OB = 94.5%
NICU = 100%

Level III units located in urbanized areas
OB = 97.7%
NICU = 100%

Level III units located in micropolitan
OB = 95.3%
NICU = 99.3%

Hospital
Urbanized area
Metropolitan
Micropolitan
State boundary

OB units

Level III units located in urbanized areas
OB = 95.3%
NICU = 99.3%

Level III units located in CBSAs
OB = 94.5%
NICU = 100%

Level III units located in CBSAs or an urbanized area
OB = 97.7%
NICU = 100%
10 mile zones around hospitals with Level III OB and/or NIC units, United States, 2012

OB and NIC are same facility (or very close <0.25 mile)
- OB = 66.9%
- NICU = 49.2%

Level III units located within 10 miles of complementary service
- OB:NICU = 82.1%
- NICU:OB = 80.0%

Level III units located within 10 miles of same type service
- OB:OB = 60.6%
- NICU:NICU = 76.8%
Service : Subspecialist
Critical care perinatal hospitals overlaid with office location of perinatal subspecialists, United States, 2013

- Subspecialists who are within 10 miles of Level III Facility
  - MFM = 90.3%  Neonat = 96.7%

- Level III facilities with subspecialist within 10 miles *
  - OB = 74.0%  NICU = 95.6%

- Level III facilities with multiple subspecialist within 10 miles *
  - OB = 87.6% (excluding none)
  - NICU = 95.4% (excluding none)

- Level III facilities with multiple subspecialist within 10 miles *
  - OB = 64.8% (including none)
  - NICU = 91.3% (including none)

* Statistically significant
Limitations...

- Data years do not match exactly
  - Population = 2010
  - Level of care = 2011
  - Subspecialists = 2013

- Difference in quality of level of care definitions
  - AAP vs. AHA

- HI and AK included in the analysis, but regionalization issues are much different

- Measuring access is more than just distance and availability – economics, transportation, culture, politics
What does all this mean?
Excess morbidity and mortality may occur in pregnant women and newborns when specialized perinatal care is fragmented or unavailable.

This study identifies several gaps and inequalities in the perinatal care dyad with respect to specialized care.

Summary of gaps and inequalities

Number inequalities
- More hospitals with critical care neonatal units than maternal units
- More Neonatologists than Maternal-Fetal Medicine Specialists (MFM)
- More OB units without MFM nearby
- Fewer OB units have multiple MFMs nearby
- More NIC units without OB unit nearby

Gaps in services
- Critical care services are located in urbanized areas.
  - Slightly more so for NIC than OB units. This may indicate a difference in the way services are delivered
  - Implications for states with large rural areas
- Some differences in access for racial/ethnic subpopulations
- Areas of the country where women have access to either neonatal or maternal critical care but not both
**PH Challenges...**

- Implement perinatal regional systems with standardized levels of care in all states
  - Develop methods for assessing level of care for both neonatal and maternal services at the hospital level; consider annual or bi-annual assessments due to dynamic nature of hospital capabilities and staff
  - Assure maternal and neonatal critical care is coordinated where available with access to both services
  - Assure access to critical care for rural population
  - Make levels of care and regionalization a professional rather than regulatory standard; designed, designated, and managed by professional agencies at the state level; public-private partnership
- Adjust focus of programs to prevent infant mortality to include maternal care
- Education of population in the need and process of regionalized perinatal care and what that means for them
- Address political and other barriers to regionalization that exist in some places such as reimbursement inequalities for higher level of care at the local level

**Realites...**

- Economics vs. population needs
- Regional systems may be different in different states
- Desire of most women to deliver close to home; resistance to regional advise
- Issues will be resolved at the local level
- Will require public-private partnership including payors
Questions?

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