

An aerial, black and white photograph of Philadelphia, Pennsylvania, showing a dense urban grid and the Schuylkill River winding through the city. The river flows from the top center towards the bottom left. A large body of water is visible on the right side of the image.

The Transformation of Access to Maternity Care in Philadelphia

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An aerial, black and white photograph of Philadelphia, showing a dense grid of streets and buildings. A river is visible on the right side of the image. The text is overlaid on this background.

Background Information

13 out of the 19 Maternity wards in Philadelphia have ceased operation between 1998-2008.

The number of births to Philadelphia Mothers has not declined during this time period.

An aerial photograph of Philadelphia, Pennsylvania, showing a dense urban grid. A semi-transparent grid is overlaid on the city, with a central vertical line and several horizontal lines. The grid is centered on the city's main thoroughfare, likely Center City. The background is a grayscale aerial view of the city, showing streets, buildings, and the Schuylkill River on the right side.

Purpose and Methods

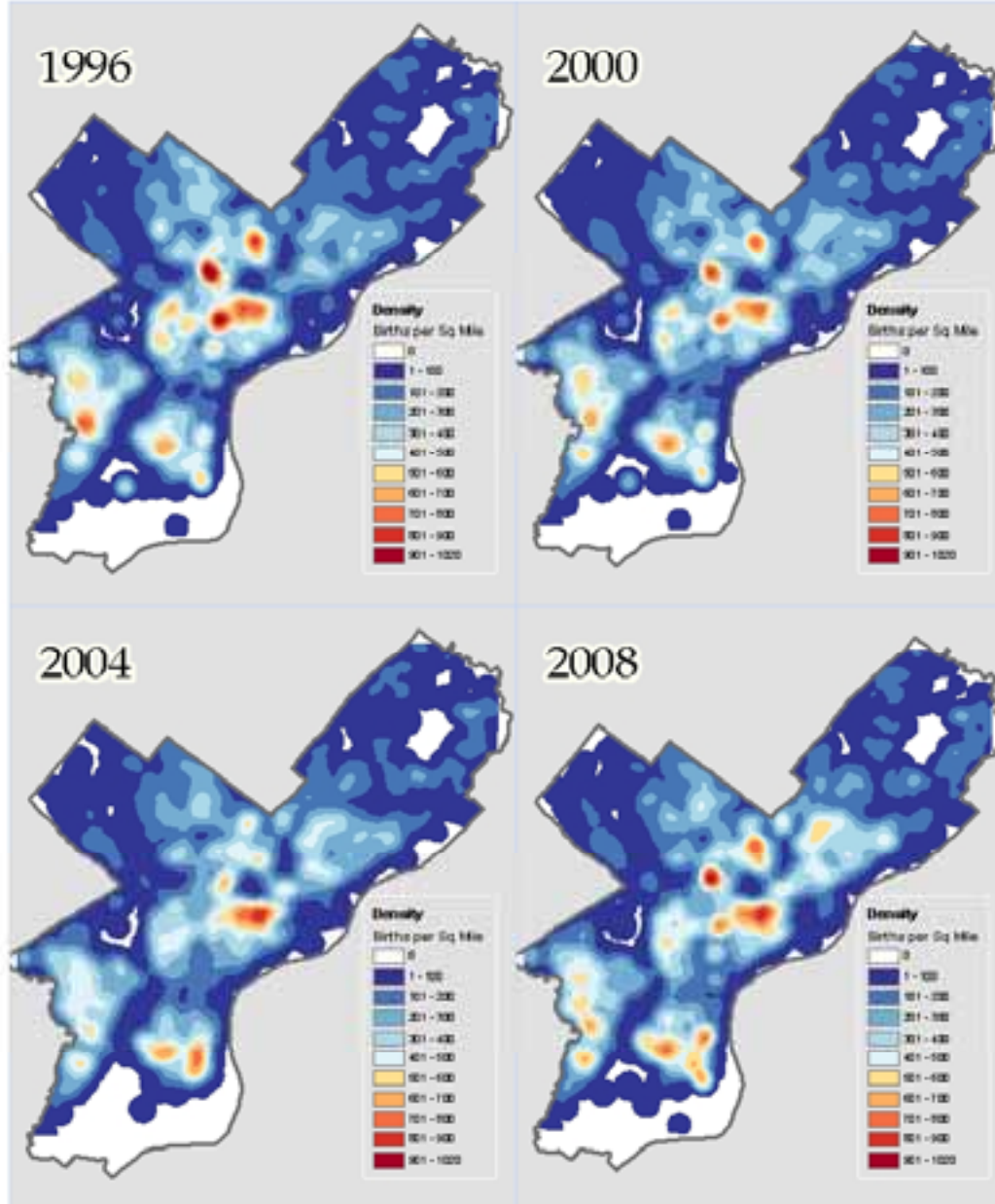
Use a variety of GIS tools to Explore the effects of these Closures on Philadelphia Mothers and other area Hospitals



Data

- **1996 - 2008 Geocoded Birth Records of all Philadelphia Residents (Phila. Dept of Health).**
- **Detailed Data on Area Hospitals: Open and Closed**
- **Socioeconomic Data by Census Tract: 2000 and 2009 Estimates**
- **Birth Complication Data (2005) Low Birth Weight and Preterm Birth Rates**

Density of Births of Philadelphia Residents 1996 - 2008

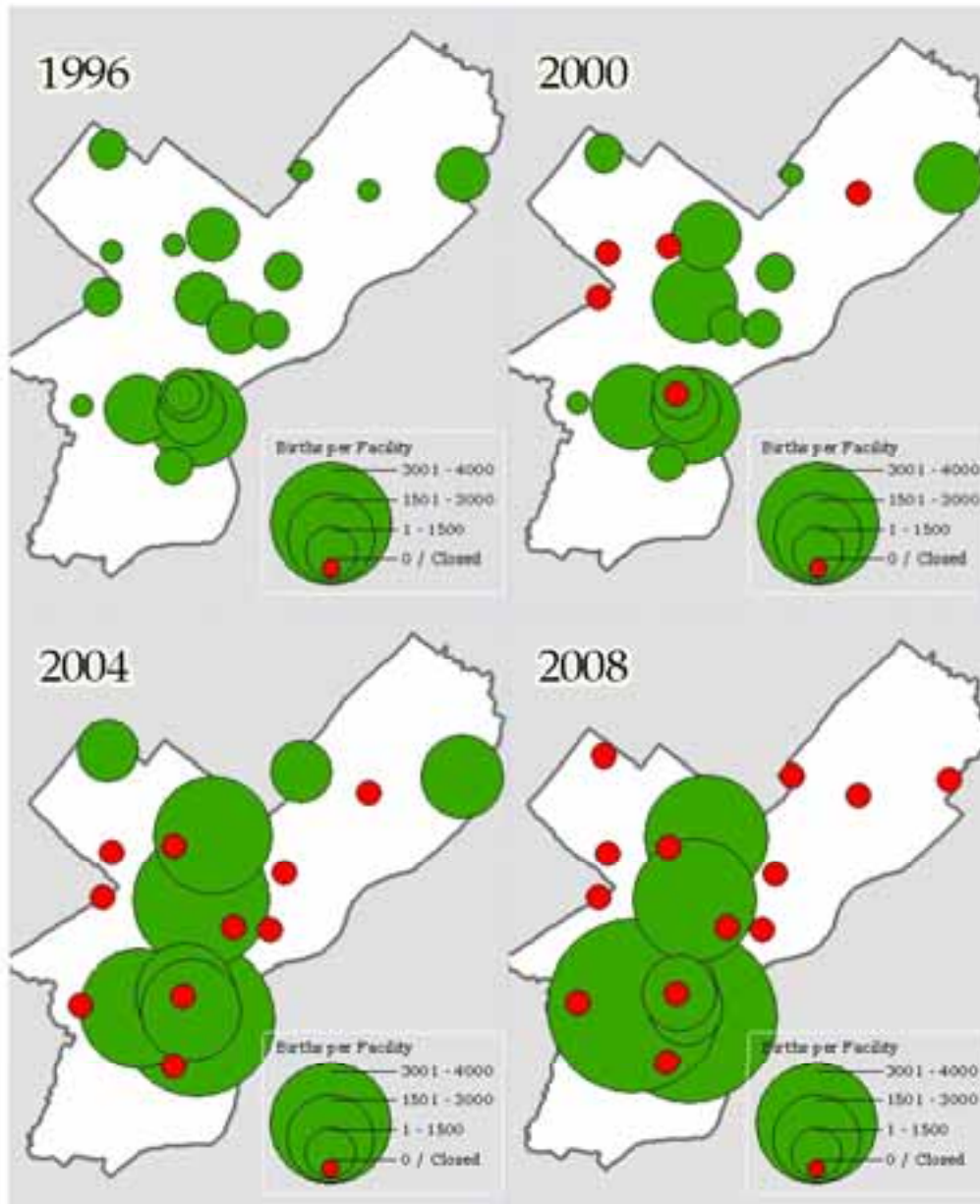


Birth Density in Philadelphia 1996-2008

The location of
densest areas of
Births moves
slightly over the
years.

The Density of
Births in
Philadelphia
Remains the
Same.

Patient Growth of Philadelphia OB Facilities 1996 - 2008



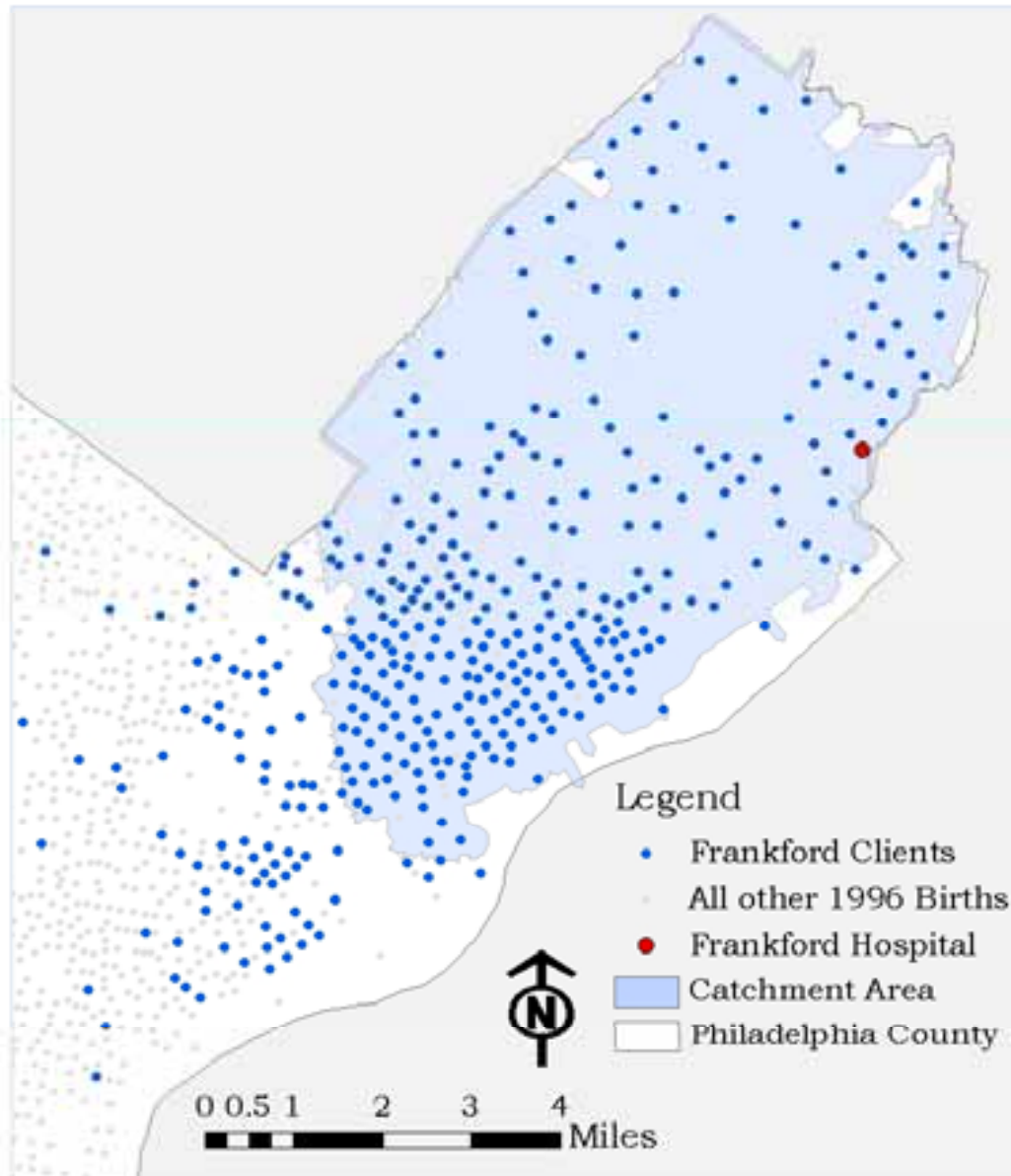
**Growth of
Facilities in
Philadelphia
1996-2008**

**The Remaining
facilities have had
the task of
absorbing extra
Births after the
closures**

Percent Growth of Facilities in Philadelphia 1996-2008

Philadelphia Hospital	Births Per Year of Philadelphia Residents													Percent Change from 1996 to 2008
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	
Albert Einstein Hospital	1,390	1,464	1,909	1,834	1,960	1,992	1,903	2,280	2,229	2,115	2,405	2,671	2,720	95.68%
Hospital of the University of PA	1,969	1,984	2,188	2,447	2,495	2,414	2,675	2,782	2,428	2,506	2,593	2,858	3,360	70.64%
Temple University Hospital	1,448	1,731	1,934	2,093	2,156	2,604	2,482	2,540	2,556	2,492	2,506	2,728	2,412	66.57%
Pennsylvania Hospital	2,635	2,566	2,414	2,697	2,766	2,886	2,911	3,031	3,366	3,265	3,664	3,911	3,906	48.24%
Hahnemann Hospital	1,343	413	0	250	1,365	1,283	1,643	1,904	1,900	1,871	1,824	1,943	1,754	30.60%
Thomas Jefferson Hospital	1,514	1,517	1,667	1,442	1,519	1,463	1,657	1,698	1,598	1,673	1,822	1,817	1,785	17.90%
Chestnut Hill Hospital	576	585	612	595	836	813	794	770	728	795	784	844	602	4.51%
Parkview Hospital	874	887	856	820	839	1,046	1,123	552	0	0	0	0	0	-100.00%
Methodist Hospital	840	842	783	794	847	809	370	0	0	0	0	0	0	-100.00%
Northeastern Hospital	803	716	669	637	639	707	760	0	0	0	0	0	0	-100.00%
Episcopal Hospital	1,309	1,217	1,144	1,046	900	49	0	0	0	0	0	0	0	-100.00%
Germantown Hospital	428	271	0	0	0	0	0	0	0	0	0	0	0	-100.00%
Roxborough Hospital	164	177	144	95	0	0	0	0	0	0	0	0	0	-100.00%
City Avenue Hospital	651	1,704	2,154	1,463	0	0	0	0	0	0	0	0	0	-100.00%
Mercy Hospital of Philadelphia	341	289	257	268	257	216	166	81	0	0	0	0	0	-100.00%
Medical College of PA	927	532	0	0	0	0	0	0	0	0	0	0	0	-100.00%
Frankford Hospital	1,364	1,395	1,579	1,647	1,626	1,466	1,346	1,173	1,183	1,112	321	0	0	-100.00%
Jeanes Hospital	463	413	462	499	474	445	571	646	697	887	1,177	498	0	-100.00%
Nazareth Hospital	354	101	52	0	0	0	0	0	0	0	0	0	0	-100.00%
Total Births at Philadelphia Hospitals	19,393	18,804	18,824	18,627	18,679	18,193	18,401	17,457	16,685	16,716	17,096	17,270	16,539	-14.72%

Catchment Area of Frankford Hospital and 1996 Facility Births

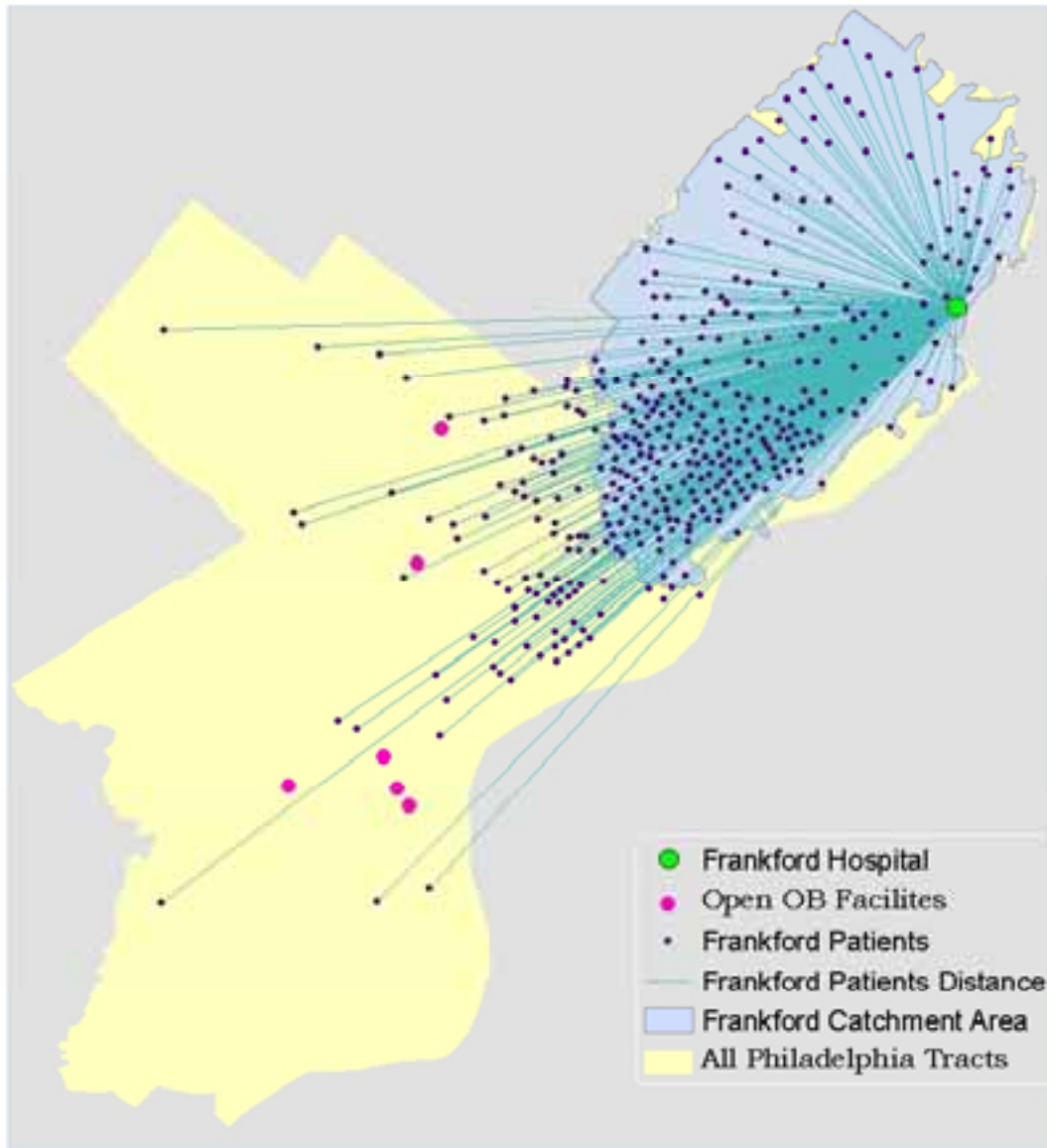


Determination of Catchment Areas

**Each Catchment
area is the
geographical area
where 85-90% of
that facility's
patients live.**

**Tool: Network
Analyst**

Euclidian Distance Traveled by all Phila. Patients of Frankford Hospital



Distance Traveled by Patients

Measures the Euclidean Distance Traveled by All Phila. Patients to Phila. Facilities.

Tool: Point Distance

Before Closures:
Avg Dist 2.80 Miles
After Closures:
Avg Dist 3.24 Miles

Limitations.

Philadelphia Hospital	2004-2005 Occupancy Rate for OB Care
Hospital of the University of PA	107.30%
Temple University Hospital	99.20%
Albert Einstein Hospital	95.70%
Hahnemann Hospital	86.20%
Pennsylvania Hospital	85.30%
Thomas Jefferson Hospital	66.20%
Jeanes Hospital	56.60%
Northeastern Hospital	54.90%
Chestnut Hill Hospital	46.10%
Parkview Hospital	Closed
Methodist Hospital	Closed
Episcopal Hospital	Closed
Germantown Hospital	Closed
Roxborough Hospital	Closed
City Avenue Hospital	Closed
Mercy Hospital of Philadelphia	Closed
Medical College of PA	Closed
Frankford Hospital	Closed
Nazareth Hospital	Closed

Rate of Capacity 2004-2005

**Exploring Issues of
Overcapacity that
have the potential
to create
complications in
Philadelphia.**

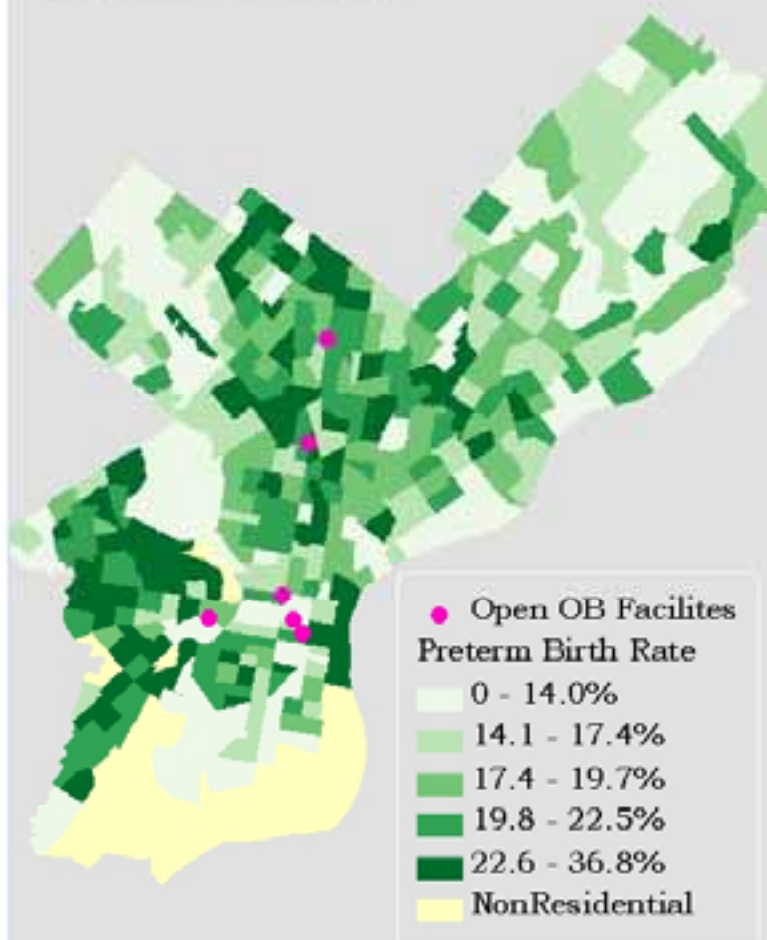
**Recommendation:
Never to Exceed
75% Capacity**

Data: Jennifer
Kolker, Drexel

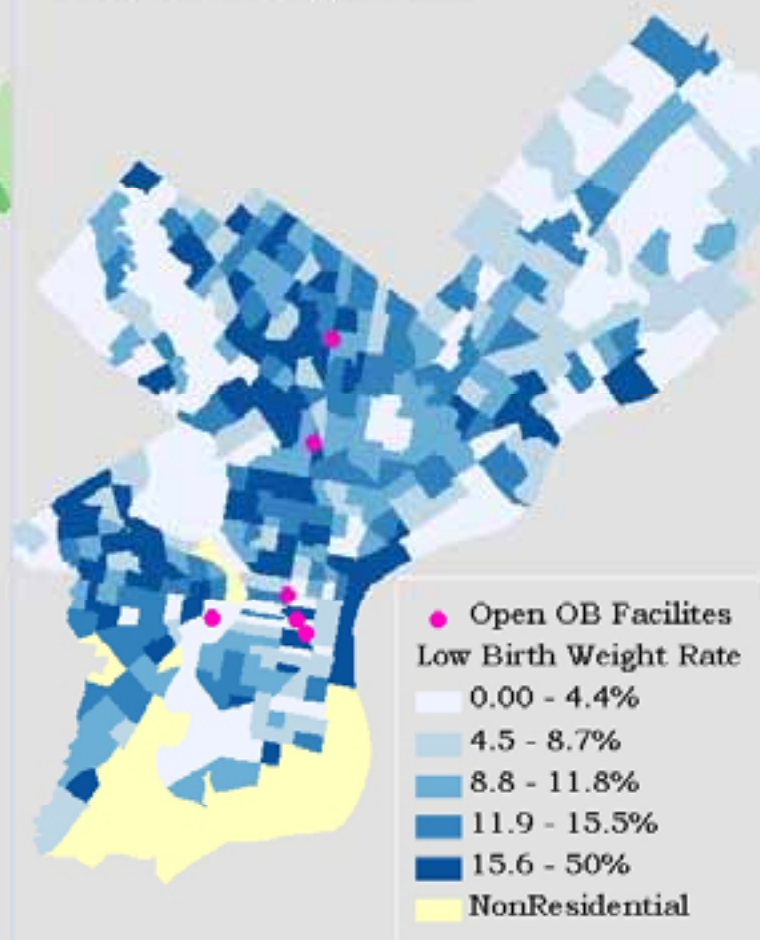
OLS Regression of Distance from a Facility and Rate of Birth Complications. Result: Insignificant

Birth Outcomes by Philadelphia Census Tracts in 2005

Preterm Birth Rate



Low Birth Weight Rate



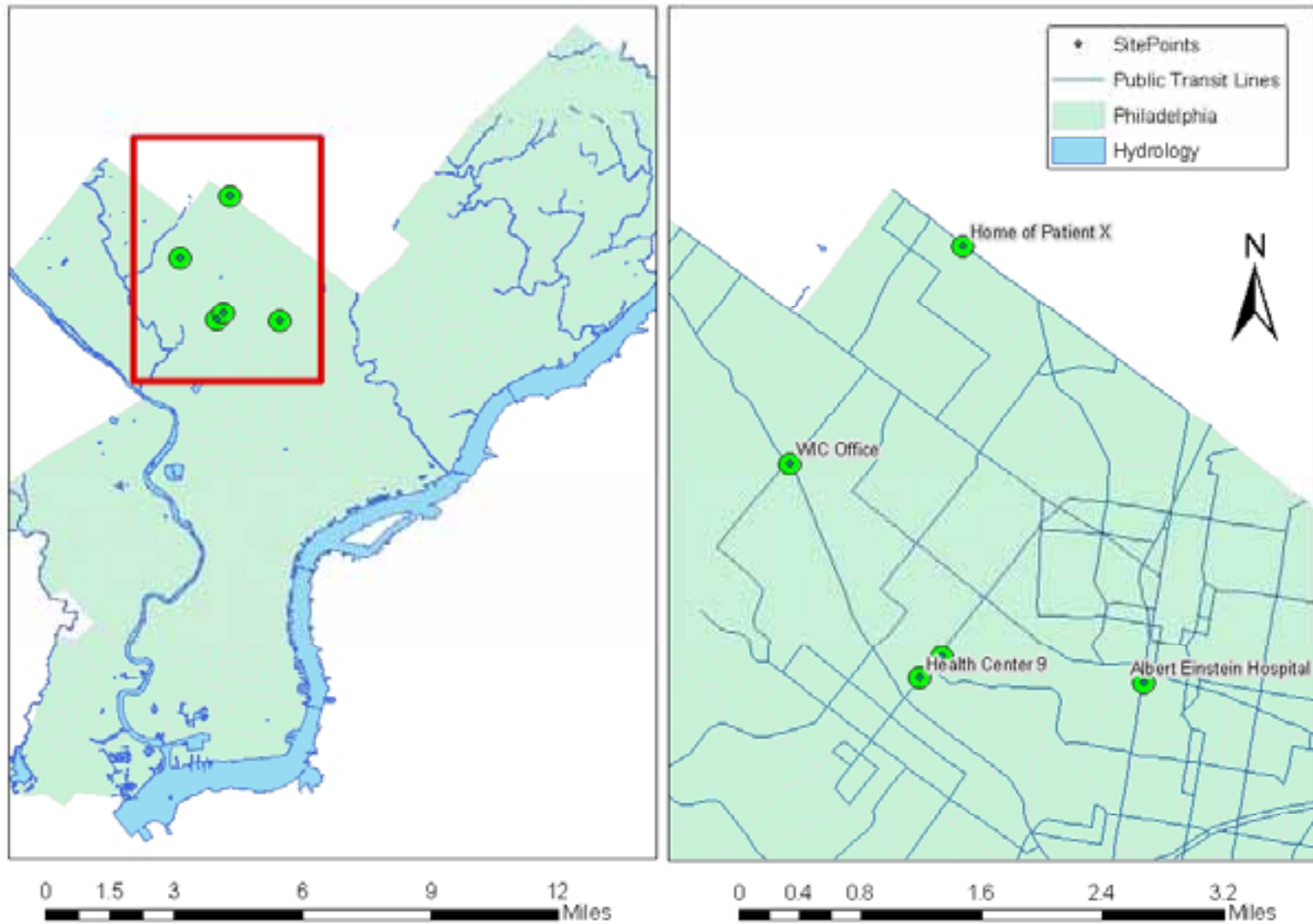


Estimation of Total Travel Distance

Model travel distance, time and cost for all recommended appointments of a hypothetical patient relying on public health clinics and resources.

Using Network Analyst, estimate the amount of travel time required for a patient to attend all recommended appointments during healthy and complicated pregnancies using only public transit routes.

Selection of Patient Address and Neighborhood



Estimation of Total Travel Time & Cost

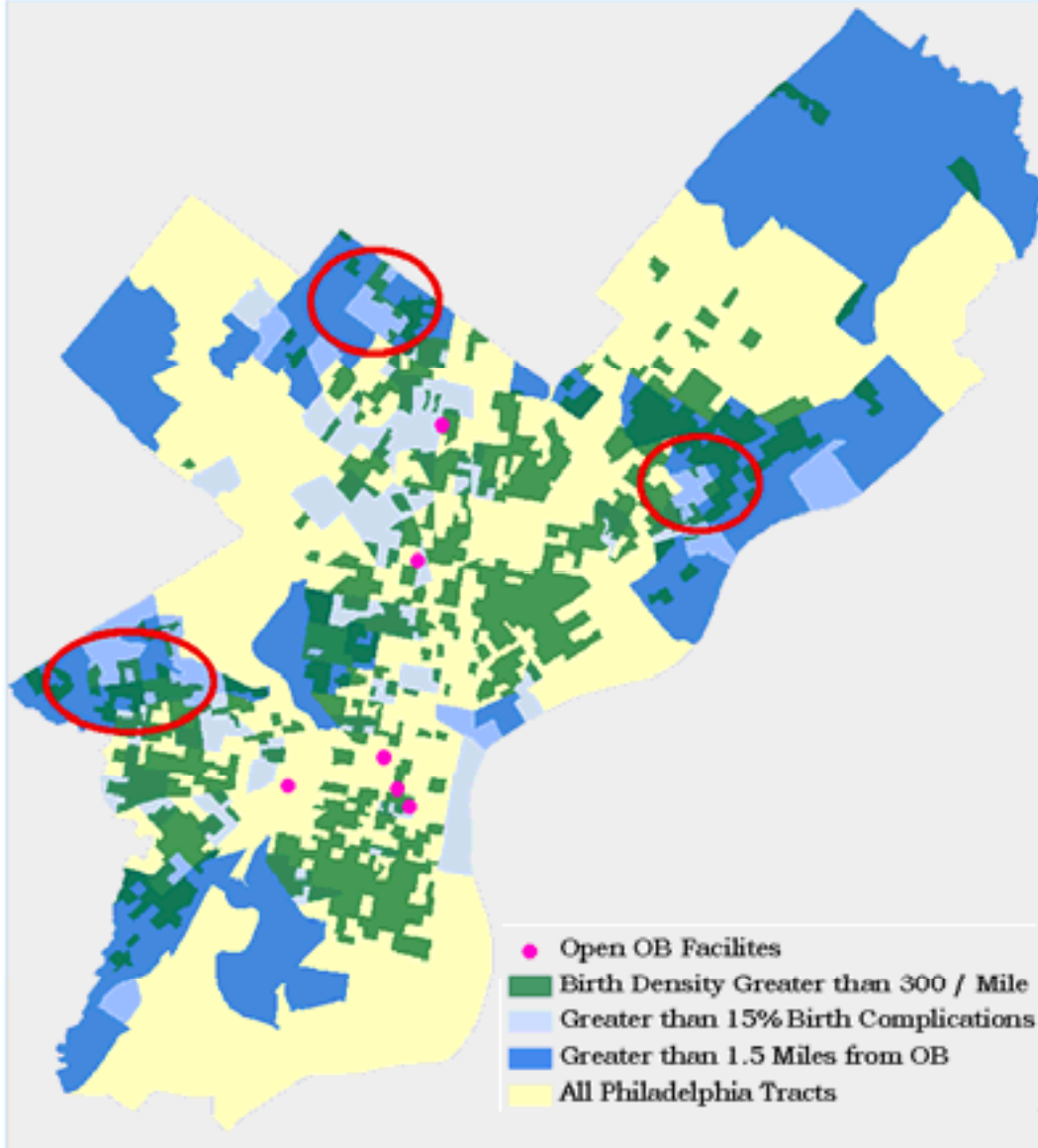
Healthy Pregnancy

Facility	Number of Visits Per Facility	Time Spent Traveling Per Facility in Minutes	Miles Travelled per Facility	Cost of Transportation per Facility
Public Assistance Office	2	116	16.8	\$5.80
WIC Office	3	54	10.8	\$8.70
Hospital: Albert Einstein	4	184	32	\$11.60
Health Center Clinic	15	810	120	\$43.50
All Facilities	25	1164	179.6	\$69.60
Total Travel Time per Pregnancy:		19 Hours and 24 Minutes		

Complicated or High Risk Pregnancy

Facility	Number of Visits Per Facility	Time Spent Traveling Per Facility	Miles Travelled per Facility	Cost of Transportation per Facility
Public Assistance Office	2	116	16.8	\$5.80
WIC Office	3	54	10.8	\$8.70
Hospital: Albert Einstein	12	552	96	\$34.80
Health Center Clinic	17	918	136	\$49.30
All Facilities	34	1640	259.6	\$98.60
Total Travel Time per Pregnancy:		27 Hours and 20 Minutes		

Recommended Locations for Total OB Care Facilities



Final Recommendations

**Establishment of
Total Care facilities
in Neighborhoods
that are at High
Risk and
Underserved**

**Criteria: High Birth
Density, Greater
than 15% birth
complications,
Greater than 1.5
Miles from OB**



Continued Study

- **Complete Dataset including 2009 Births and Regional Births**
- **Include Area Hospitals in Analysis**
- **2010 Socioeconomic Census Data**
- **Recent Birth Complication Data**
- **Reevaluate Catchment Areas for Precision**
- **Explore additional Solutions**

An aerial photograph of a city, likely New Orleans, showing a dense grid street pattern and a prominent river (the Mississippi River) winding through the center. The image is in black and white. A semi-transparent blue box with horizontal lines is overlaid on the top center of the image, containing the text "Questions?".

Questions?