

MATERNAL & CHILD HEALTH
EPIDEMIOLOGY
NEW JERSEY DEPARTMENT OF HEALTH

Population Perinatal Risk Index for New Jersey Municipalities— 2012 Edition

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Background

Historically the Department of Health and Senior Services has provided state funding to improve perinatal public health services in communities with the worst birth outcomes. Such efforts require a method for ranking municipalities across an array of indicators.

In 1985, the *New Jersey Infant Mortality Reduction Initiative* was launched to reduce infant mortality by reducing low birth weight and very low birth weight births, increasing the early utilization of prenatal care, and reducing the number of adolescent pregnancies. Services supported under this initiative have included grants for comprehensive prenatal care to high risk mothers at six perinatal centers; a statewide telephone hotline for prenatal and WIC referrals; increased community-based outreach and education services; and an extensive public media education and awareness campaign.

The original needs assessment included 63 municipalities with population over 30,000. These communities were rated on a score that combined fetal and infant mortality, low birthweight, poverty and teen births in a weighted sum. Scores were recompiled on a periodic basis, with little change in methodology, until 2002.

In 2002 the MCH Epidemiology Program conducted an updated needs assessment using a new *risk modeling* methodology. The new approach capitalized on three observations: [1] New Jersey communities exhibit a diverse array of demographic profiles; [2] demographic risk factors have strong effects on birth outcomes; and [3] because the adverse outcomes we track tend to have the same risk factors, municipalities tend to be equally “at risk” for all those outcomes. Thus municipalities with similar composition with regard to race, education, etc. will have similar tendencies toward higher rates of perinatal death, low birth weight, and teen pregnancy.

The perinatal risk modeling methodology increases the validity and stability of community assessments. Our outcomes of primary interest—infant death, fetal demise, low birth weight—are rare events, subject to considerable random fluctuation even in samples of moderate size. The population risk approach yields more stable estimates of risk for small area analysis, because it is less sensitive to random fluctuations in these rare events. The new approach was officially adopted by the 2008 Commissioner’s Task Force on Prenatal Care as a primary tool for targeting state grants. This 2012 edition includes further methodological improvements and birth data from 2009 through 2011.

Methods

For the current update, all births recorded by the New Jersey Office of Vital Statistics and Registration from 2009 to 2011 were included in our analysis. We analyzed 148 municipalities with 500 or more births in that three year period. For validation, a file of resident births, fetal deaths and infant deaths from 2006-08 was also constructed. See Appendix for further data file details.

The *risk modeling* procedure uses logistic regression to isolate the population component from our target outcome.¹ The procedure includes three steps:

1. A regression equation for low birthweight estimates the effect of maternal race, Hispanic origin, foreign birthplace, age, marital status and education, plus parity and non-first-trimester prenatal care for all births statewide.
2. The regression equation is used to compute expected probabilities for individual birth outcomes.
3. Averaging those probabilities for the municipality yields its *population risk index*.

Validation of the Model and Index

Exhibit 1 presents the individual-level logistic regression parameter estimates. The largest effects in the direction of low birthweight are non-Hispanic Black and Asian, age 35+, non-zero parity (previous live births) and late or no prenatal care.

Model-based predictions aggregated for communities are strongly predictive. The population risk index has a correlation of .63 with the rate of low birthweight (LBW) for the same time period, and also .63 with the perinatal mortality rate in 2006-08 (the latest available).

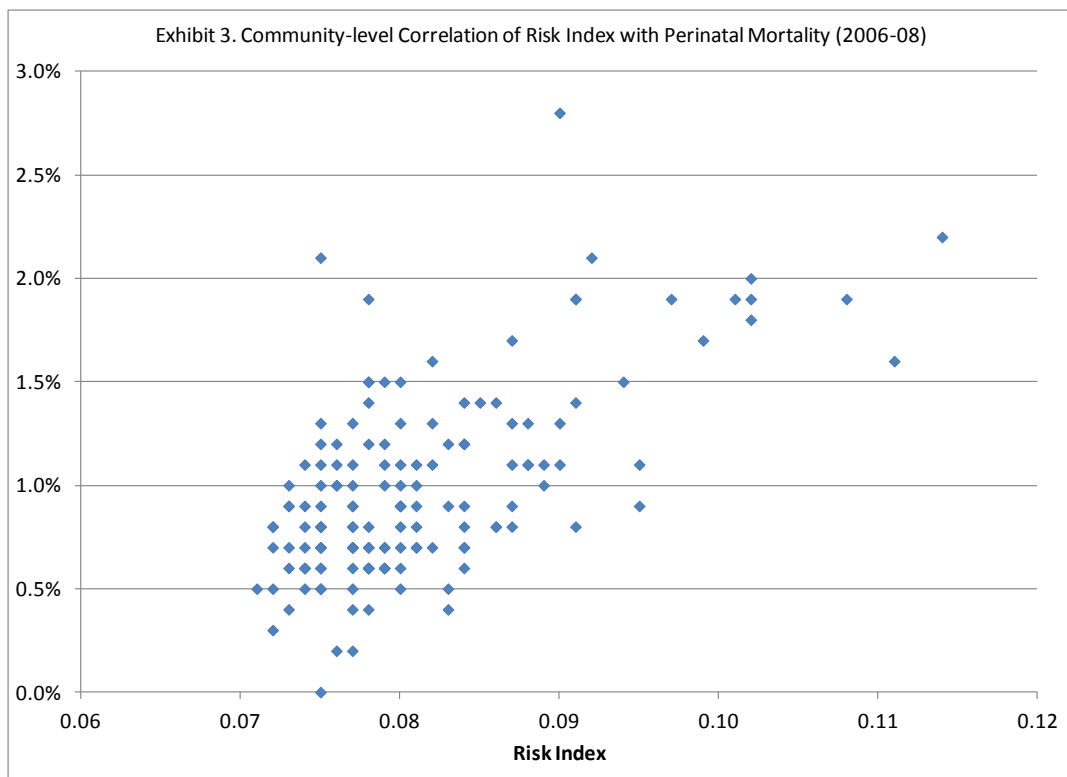
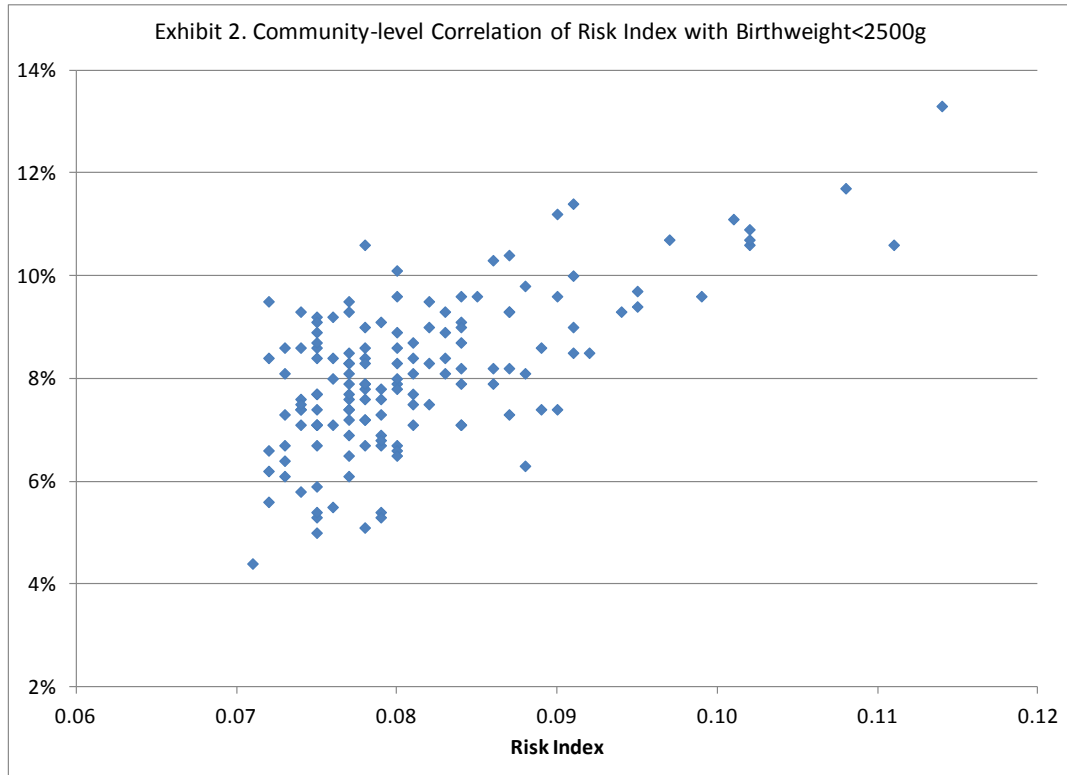
The 30 highest risk communities in our assessment had a minimum score of .087. Those communities had a mean LBW rate of 9.6% and mean perinatal mortality of 1.5%. (The means for all 148 assessed communities were 8.1% and 1.0%, respectively.)

Exhibits 2 and 3 graphically depict the relationships between the population risk index and LBW and mortality. As expected, there is considerable variation not captured by the population model.

Exhibit 1. Regression Model Parameters (adjusted odds ratios, 1.000=reference)

White, US-born, not Hispanic	ref
Black, US-born, not Hispanic	1.92
Hispanic, US-born	1.06
Hispanic, Foreign-born	0.88
Asian, not Hispanic	1.33
Other foreign-born	1.16
birth interval < 2 years	1.02
unmarried	1.13
<18 years old	1.08
<High School (but age 18+)	1.03
High School grad	1.08
college	ref
35+ years old	1.34
PNC 3 rd trimester, or none	1.38

¹ The previous implementation (2008) used four other outcomes: infant mortality, perinatal (fetal+neonatal) mortality, late prenatal care, and births to teens. The results were so strongly correlated that low birthweight was chosen as the sole target outcome. Late prenatal care and teen maternal age were included in the predictive model, thus taking a place in the population component.



Appendix: Data Sources and Measures

Official birth certificate, fetal death certificate and linked birth-infant death files produced by the Center for Health Statistics were analyzed. A total of 316,070 live births from 2009 to 2011, and 2,383 fetal deaths and 1,668 neonatal deaths from 2006 to 2008, were included for our analysis.

Definition of Outcome/MCH Indicator Variables

- Neonatal Mortality: Death during the first 27 days after birth.
- Fetal Mortality: Non-elective fetal demise after 20 or more weeks of gestation.
- Perinatal Mortality Rate: Fetal deaths (20 or more weeks of gestation) plus infant deaths (0-27 days after birth) per every 100 neonates (fetal deaths plus live births). *Not used in the population risk index, only for validation.*
- Low Birth Weight (LBW): Birthweight of less than 2500 grams.
- Teen birth: Births to women aged less than 18 years.
- First Trimester Prenatal care: Deliveries with prenatal care that started during the first three months of pregnancy.
- No prenatal care in the first or second trimester: later or none at all.
- Volume estimate: New in this edition, it is the product of the risk index and the number of births. It represents the expected number of LBW infants according to the model, and is additive for any group of communities.

Perinatal Population Risk Index -- 2012 Edition

				All births	Risk index	volume estimate	BW <2500g	perinatal mortality 2006-08
0724	East Orange City	ESSEX	prev	2,814	11.40%	320.8	13.3%	2.2%
0379	Willingboro Township	BURLINGTON	prev	1,003	11.10%	111.3	10.6%	1.6%
0736	Irvington Township	ESSEX	prev	2,769	10.80%	299.1	11.7%	1.9%
0417	Camden City	CAMDEN	prev	4,690	10.20%	478.4	10.6%	1.8%
0756	Newark City	ESSEX	prev	12,970	10.20%	1322.9	10.7%	2.0%
1306	Asbury Park City	MONMOUTH	prev	872	10.20%	88.9	10.9%	1.9%
1155	Trenton City	MERCER	prev	4,752	10.10%	480.0	11.1%	1.9%
0108	Atlantic City	ATLANTIC	prev	2,198	9.90%	217.6	9.6%	1.7%
0768	Orange City	ESSEX	prev	1,615	9.70%	156.7	10.7%	1.9%
1364	Neptune Township	MONMOUTH	prev	934	9.50%	88.7	9.7%	0.9%
2056	Roselle Borough	UNION	prev	817	9.50%	77.6	9.4%	1.1%
2024	Hillside Township	UNION	prev	742	9.40%	69.7	9.3%	1.5%
0172	Pleasantville City	ATLANTIC	prev	1,079	9.20%	99.3	8.5%	2.1%
0455	Pennsauken Township	CAMDEN	prev	1,323	9.10%	120.4	8.5%	1.9%
0473	Winslow Township	CAMDEN	0	1,535	9.10%	139.7	10.0%	0.8%
0605	Bridgeton City	CUMBERLAND	prev	2,100	9.10%	191.1	9.0%	1.4%
0655	Millville City	CUMBERLAND	prev	1,458	9.10%	132.7	11.4%	1.9%
0311	Burlington City	BURLINGTON	0	542	9.00%	48.8	7.4%	2.8%
0445	Lindenwold Borough	CAMDEN	prev	955	9.0%	86.0	11.2%	1.1%
0930	Jersey City	HUDSON	prev	10,485	9.0%	943.7	9.6%	1.3%
0824	Glassboro Borough	GLOUCESTER	prev	622	8.9%	55.4	7.4%	1.1%
2048	Plainfield City	UNION	prev	2,562	8.9%	228.0	8.6%	1.0%
0313	Burlington Township	BURLINGTON	0	586	8.8%	51.6	6.3%	1.1%
0744	Maplewood Township	ESSEX	0	770	8.8%	67.8	8.1%	1.3%
1640	Paterson City	PASSAIC	prev	7,981	8.8%	702.3	9.8%	1.1%
0752	Montclair Township	ESSEX	0	892	8.7%	77.6	7.3%	1.1%
1110	Ewing Township	MERCER	0	841	8.7%	73.2	10.4%	1.3%
1206	Carteret Borough	MIDDLESEX	0	852	8.7%	74.1	8.2%	0.9%
2032	Linden City	UNION	0	1,332	8.7%	115.9	9.3%	1.7%
2052	Rahway City	UNION	0	942	8.7%	82.0	9.3%	0.8%
1251	Piscataway Township	MIDDLESEX	0	1,766	8.6%	151.9	7.9%	0.8%

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1836	Franklin Township	SOMERSET	0	2,509	8.6%	215.8	8.2%	0.8%
2076	Union Township	UNION	0	1,798	8.6%	154.6	10.3%	1.4%
0222	Englewood City	BERGEN	prev	937	8.5%	79.6	9.6%	1.4%
0227	Fort Lee Borough	BERGEN	0	865	8.4%	72.7	7.1%	0.7%
0680	Vineland City	CUMBERLAND	prev	2,432	8.4%	204.3	9.1%	1.2%
0788	West Orange Township	ESSEX	0	1,588	8.4%	133.4	9.6%	0.8%
1245	North Brunswick Town	MIDDLESEX	0	1,760	8.4%	147.8	8.7%	0.7%
1254	Plainsboro Township	MIDDLESEX	0	837	8.4%	70.3	7.1%	1.2%
1257	Edison Township	MIDDLESEX	0	4,066	8.4%	341.5	9.0%	0.9%
1266	South Brunswick Town	MIDDLESEX	0	1,073	8.4%	90.1	7.9%	0.6%
2012	Elizabeth City	UNION	prev	6,169	8.4%	518.2	8.2%	1.4%
0144	Hamilton Township	ATLANTIC	0	990	8.3%	82.2	8.4%	1.2%
0266	Palisades Park Borou	BERGEN	0	695	8.3%	57.7	8.1%	0.5%
0708	Bloomfield Township	ESSEX	0	1,707	8.3%	141.7	8.9%	0.9%
1165	West Windsor Townshi	MERCER	0	653	8.3%	54.2	9.3%	0.4%
0140	Galloway Township	ATLANTIC	0	984	8.2%	80.7	9.0%	0.7%
0234	Hackensack City	BERGEN	0	1,879	8.2%	154.1	9.5%	1.6%
0361	Pemberton Township	BURLINGTON	prev	845	8.2%	69.3	8.3%	1.3%
1348	Long Branch City	MONMOUTH	prev	1,525	8.2%	125.1	7.5%	1.1%
0286	Teaneck Township	BERGEN	0	1,159	8.1%	93.9	8.7%	1.0%
0431	Gloucester Township	CAMDEN	0	1,511	8.1%	122.4	7.1%	0.8%
1135	Lawrence Township	MERCER	0	1,025	8.1%	83.0	7.5%	0.7%
1242	New Brunswick City	MIDDLESEX	prev	3,021	8.1%	244.7	7.7%	1.1%
1260	Sayreville Borough	MIDDLESEX	0	1,664	8.1%	134.8	8.4%	0.9%
1278	Woodbridge Township	MIDDLESEX	0	3,585	8.1%	290.4	8.1%	0.7%
0128	Egg Harbor Township	ATLANTIC	0	1,483	8.0%	118.6	7.9%	1.3%
0469	Voorhees Township	CAMDEN	0	684	8.0%	54.7	6.7%	1.0%
0530	Middle Township	CAPE MAY	0	619	8.0%	49.5	6.6%	0.5%
0905	Bayonne City	HUDSON	0	2,148	8.0%	171.8	9.6%	0.9%
0945	Secaucus Town	HUDSON	0	552	8.0%	44.2	10.1%	0.9%
1230	Metuchen Borough	MIDDLESEX	0	515	8.0%	41.2	8.6%	0.6%

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1269	South Plainfield Bor	MIDDLESEX	0	707	8.0%	56.6	6.5%	1.1%
1458	Parsippany-Troy Hill	MORRIS	0	1,567	8.0%	125.4	8.9%	0.7%
1808	Bernards Township	SOMERSET	0	612	8.0%	49.0	7.8%	0.9%
1860	North Plainfield Bor	SOMERSET	0	949	8.0%	75.9	8.0%	0.8%
1876	Somerville Borough	SOMERSET	0	507	8.0%	40.6	8.3%	1.5%
0341	Maple Shade Township	BURLINGTON	0	681	7.9%	53.8	6.9%	1.5%
0704	Belleville Township	ESSEX	0	1,346	7.9%	106.3	9.1%	1.2%
0844	Monroe Township	GLOUCESTER	0	1,175	7.9%	92.8	7.3%	0.7%
1239	Monroe Township	MIDDLESEX	0	730	7.9%	57.7	7.6%	0.6%
1272	South River Borough	MIDDLESEX	0	611	7.9%	48.3	5.4%	0.7%
1332	Freehold Borough	MONMOUTH	0	825	7.9%	65.2	5.3%	1.1%
1464	Randolph Township	MORRIS	0	672	7.9%	53.1	6.7%	0.6%
1635	Passaic City	PASSAIC	prev	4,147	7.9%	327.6	6.8%	1.0%
1824	Bridgewater Township	SOMERSET	0	1,135	7.9%	89.7	7.8%	0.6%
0217	Elmwood Park Borough	BERGEN	0	657	7.8%	51.2	7.6%	0.7%
0230	Garfield City	BERGEN	0	1,194	7.8%	93.1	7.8%	1.4%
0351	Mount Laurel Townshi	BURLINGTON	0	1,176	7.8%	91.7	7.2%	0.4%
0425	Cherry Hill Township	CAMDEN	0	1,632	7.8%	127.3	6.7%	0.6%
0740	Livingston Township	ESSEX	0	644	7.8%	50.2	10.6%	1.2%
1115	Hamilton Township	MERCER	0	2,604	7.8%	203.1	7.9%	1.5%
1215	East Brunswick Towns	MIDDLESEX	0	1,096	7.8%	85.5	8.4%	0.8%
1227	Old Bridge Township	MIDDLESEX	0	1,444	7.8%	112.6	9.0%	0.6%
1263	South Amboy City	MIDDLESEX	0	511	7.8%	39.9	7.2%	1.9%
1354	Marlboro Township	MONMOUTH	0	733	7.8%	57.2	7.9%	0.6%
1356	Matawan Borough	MONMOUTH	0	615	7.8%	48.0	8.6%	0.7%
1366	Ocean Township	MONMOUTH	0	746	7.8%	58.2	8.3%	0.6%
1372	Red Bank Borough	MONMOUTH	0	789	7.8%	61.5	5.1%	1.5%
0204	Bergenfield Borough	BERGEN	0	798	7.7%	61.4	6.1%	0.2%
0209	Cliffside Park Borou	BERGEN	0	752	7.7%	57.9	7.6%	0.5%
0245	Lodi Borough	BERGEN	0	857	7.7%	66.0	9.3%	0.9%
0273	Ridgewood Village	BERGEN	0	557	7.7%	42.9	8.1%	1.3%

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0808	Deptford Township	GLOUCESTER	0	723	7.7%	55.7	9.5%	0.6%
0880	West Deptford Townsh	GLOUCESTER	0	562	7.7%	43.3	8.5%	0.8%
1105	East Windsor Townshi	MERCER	0	903	7.7%	69.5	6.9%	1.0%
1248	Perth Amboy City	MIDDLESEX	prev	2,589	7.7%	199.4	7.7%	1.1%
1454	Mount Olive Township	MORRIS	0	863	7.7%	66.5	8.3%	0.7%
1472	Roxbury Township	MORRIS	0	663	7.7%	51.1	8.3%	0.7%
1610	Clifton City	PASSAIC	0	3,160	7.7%	243.3	7.9%	0.9%
1844	Hillsborough Townshi	SOMERSET	0	1,190	7.7%	91.6	7.4%	0.7%
2064	Scotch Plains Townsh	UNION	0	802	7.7%	61.8	7.2%	0.7%
2072	Summit City	UNION	0	760	7.7%	58.5	7.4%	0.8%
2080	Westfield Town	UNION	0	828	7.7%	63.8	6.5%	0.4%
0247	Mahwah Township	BERGEN	0	531	7.6%	40.4	9.2%	1.0%
0920	Harrison Town	HUDSON	0	567	7.6%	43.1	5.5%	0.2%
1367	Tinton Falls Borough	MONMOUTH	0	545	7.6%	41.4	8.4%	1.1%
1446	Morristown Town	MORRIS	0	1,223	7.6%	92.9	8.0%	1.2%
1670	Wayne Township	PASSAIC	0	1,228	7.6%	93.3	7.1%	1.0%
0225	Fair Lawn Borough	BERGEN	0	834	7.5%	62.6	7.7%	0.8%
0246	Lyndhurst Borough	BERGEN	0	666	7.5%	50.0	9.2%	0.5%
0321	Delran Township	BURLINGTON	0	619	7.5%	46.4	5.3%	1.0%
0327	Evesham Township	BURLINGTON	0	1,294	7.5%	97.1	8.6%	0.9%
0525	Lower Township	CAPE MAY	0	576	7.5%	43.2	5.9%	2.1%
0764	Nutley Township	ESSEX	0	907	7.5%	68.0	8.4%	0.6%
0840	Mantua Township	GLOUCESTER	0	516	7.5%	38.7	7.4%	0.0%
0872	Washington Township	GLOUCESTER	0	991	7.5%	74.3	8.7%	0.5%
1333	Freehold Township	MONMOUTH	0	836	7.5%	62.7	7.7%	1.1%
1350	Manalapan Township	MONMOUTH	0	876	7.5%	65.7	7.1%	0.7%
1418	Dover Town	MORRIS	0	892	7.5%	66.9	5.0%	1.2%
1428	Jefferson Township	MORRIS	0	566	7.5%	42.5	6.7%	1.3%
1470	Rockaway Township	MORRIS	0	550	7.5%	41.3	7.1%	0.6%
1514	Dover Township	OCEAN	0	2,830	7.5%	212.3	8.9%	0.8%
1524	Jackson Township	OCEAN	0	1,430	7.5%	107.3	9.1%	0.8%

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1568	Barnegat Township	OCEAN	0	621	7.5%	46.6	7.1%	0.7%
2068	Springfield Township	UNION	0	523	7.5%	39.2	5.4%	0.7%
0148	Hammonton Town	ATLANTIC	0	651	7.4%	48.2	5.8%	1.1%
0925	Hoboken City	HUDSON	0	1,876	7.4%	138.8	7.4%	0.6%
0935	Kearny Town	HUDSON	0	1,289	7.4%	95.4	7.4%	0.5%
1338	Howell Township	MONMOUTH	0	1,189	7.4%	88.0	7.6%	0.6%
1512	Brick Township	OCEAN	0	2,057	7.4%	152.2	7.1%	0.7%
1675	West Milford Townshi	PASSAIC	0	691	7.4%	51.1	9.3%	0.6%
1816	Bound Brook Borough	SOMERSET	0	538	7.4%	39.8	8.6%	0.9%
2008	Cranford Township	UNION	0	628	7.4%	46.5	7.5%	0.8%
0940	North Bergen Townshi	HUDSON	0	2,160	7.3%	157.7	7.3%	0.7%
0950	Union City	HUDSON	0	3,036	7.3%	221.6	6.4%	1.0%
0960	West New York Town	HUDSON	0	2,206	7.3%	161.0	6.1%	0.9%
1358	Middletown Township	MONMOUTH	0	1,589	7.3%	116.0	6.7%	0.4%
1510	Berkeley Township	OCEAN	0	639	7.3%	46.6	8.1%	0.9%
1550	Point Pleasant Borou	OCEAN	0	533	7.3%	38.9	8.6%	0.6%
0226	Fairview Borough	BERGEN	0	565	7.2%	40.7	6.2%	0.8%
1526	Lacey Township	OCEAN	0	774	7.2%	55.7	6.6%	0.8%
1534	Little Egg Harbor To	OCEAN	0	504	7.2%	36.3	5.6%	0.5%
1562	Stafford Township	OCEAN	0	652	7.2%	46.9	9.5%	0.7%
1620	Hawthorne Borough	PASSAIC	0	621	7.2%	44.7	8.4%	0.3%
1530	Lakewood Township	OCEAN	0	11,006	7.1%	781.4	4.4%	0.5%