

The Zip Code Ranking Project

An analysis of health factors and health outcomes by zip code in
Montgomery County, Maryland

Melissa Marcia
Raul Cruz-Cano, PhD
Chunfu Liu, ScD

County Health Rankings & Roadmaps

“The annual County Health Rankings measure vital health factors [...] revealing [a] snapshot of how health is influenced by where we live, learn, work and play. They [also] provide a starting point for change in communities.”

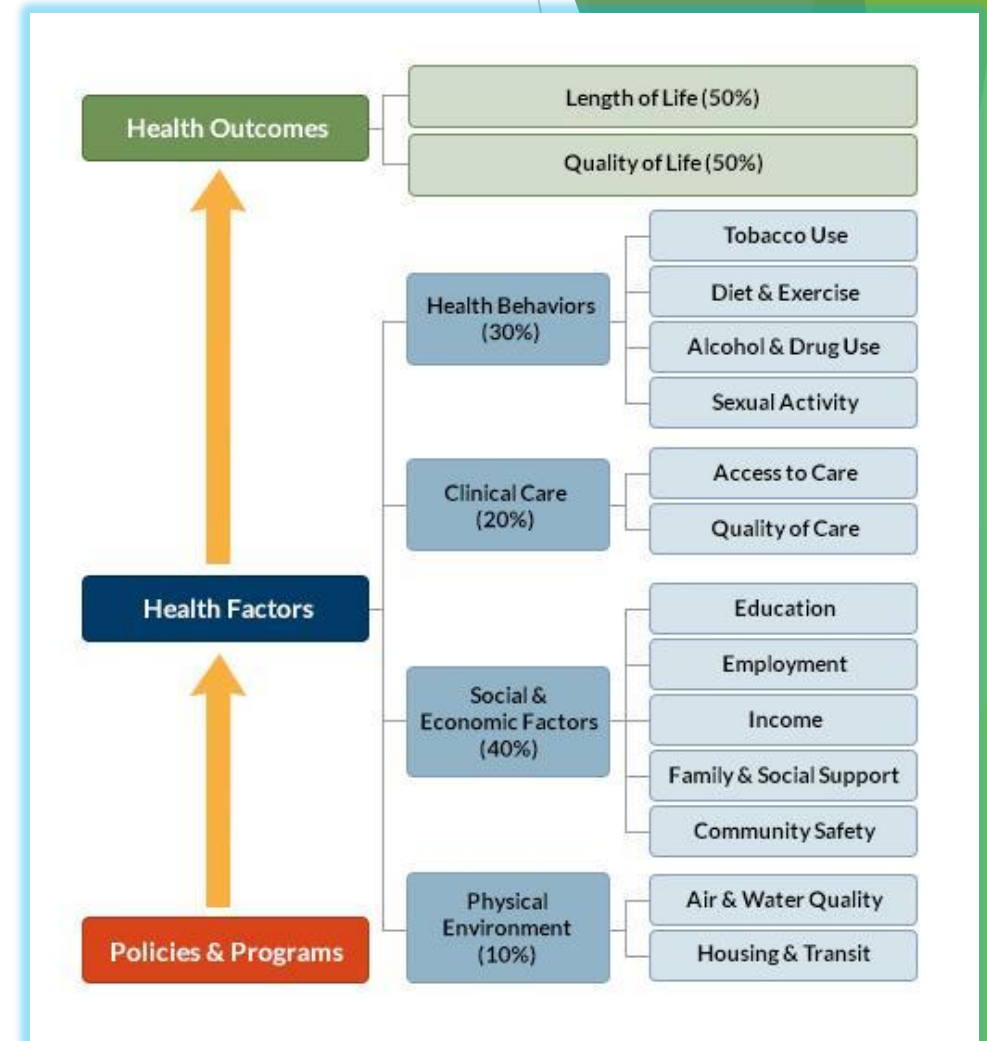
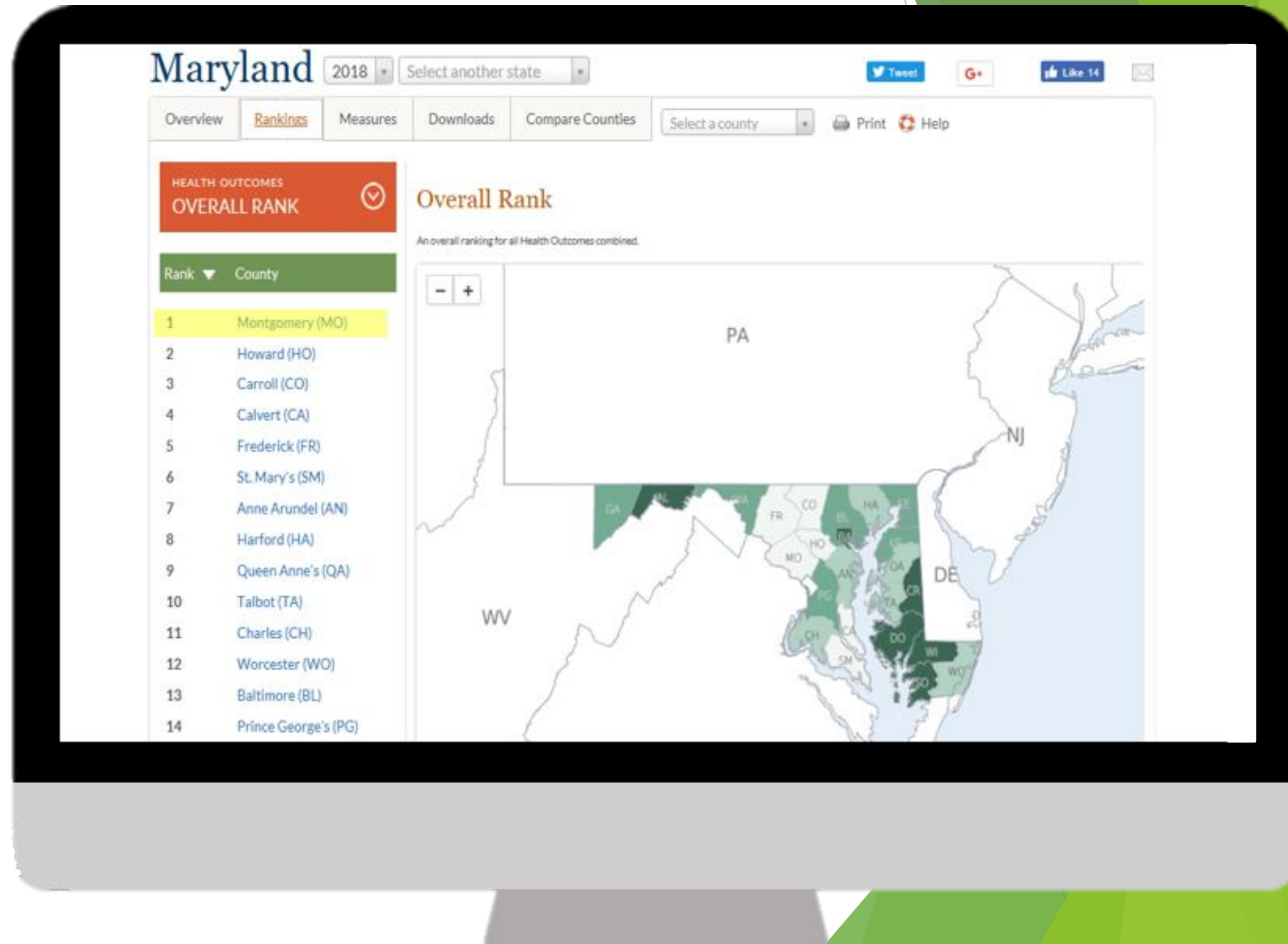


Figure 1. County Health Ranking framework/ algorithm for calculating a county's rank.

Montgomery County's Standing



Sub-County Variation

- ▶ Even within a county, there can be substantial variation in health factors and outcomes.
- ▶ Most surveillance systems don't collect zip-code level data.
- ▶ Statisticians created a new algorithm using alternative data sources to rank zip codes using a framework that was still true to the original County Health Rankings algorithm.

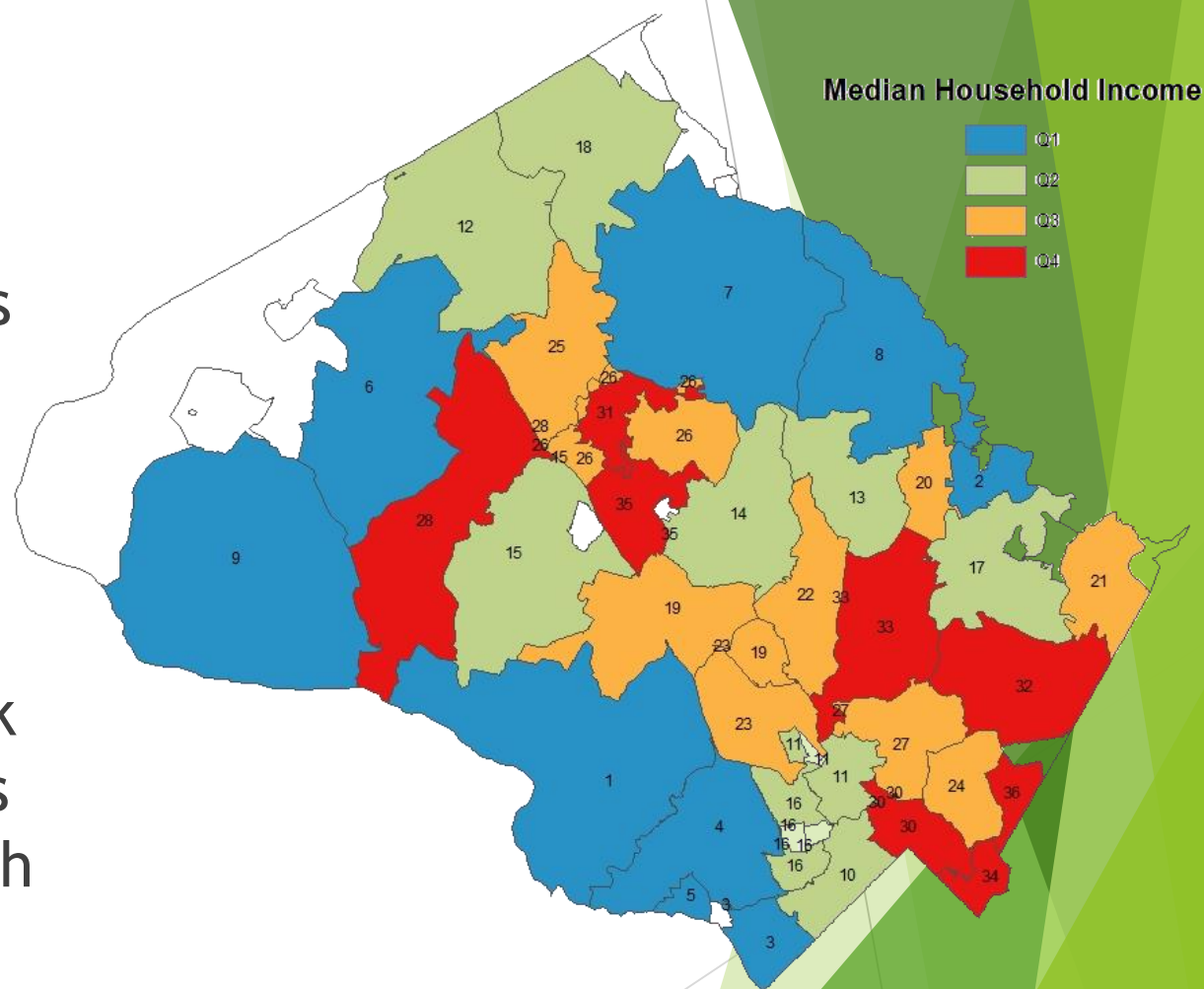


Figure 2. Sub-county Variation in Median Household Income, Montgomery County

Measures

- Under 75 mortality rate
- Years of productive life lost

- Inpatient and ER hospitalization rate
- Mental health hospitalization rate
- Low birth weight

- Sexually transmitted infection rate
- Teen birth rate

- Percent of population employed in health care
- After-hours hospitalization rate
- Hospitalizations for preventable conditions

- Population with less than a HS education
- Percent unemployment
- Percent of children living in poverty
- Median household income

- Violent injury rate
- Injury death rate

Sub-Domains

Length of life

Quality of life

Health behaviors

Clinical care

Socioeconomic factors

Physical environment

Domains

Health Outcomes

RANK

Health Factors

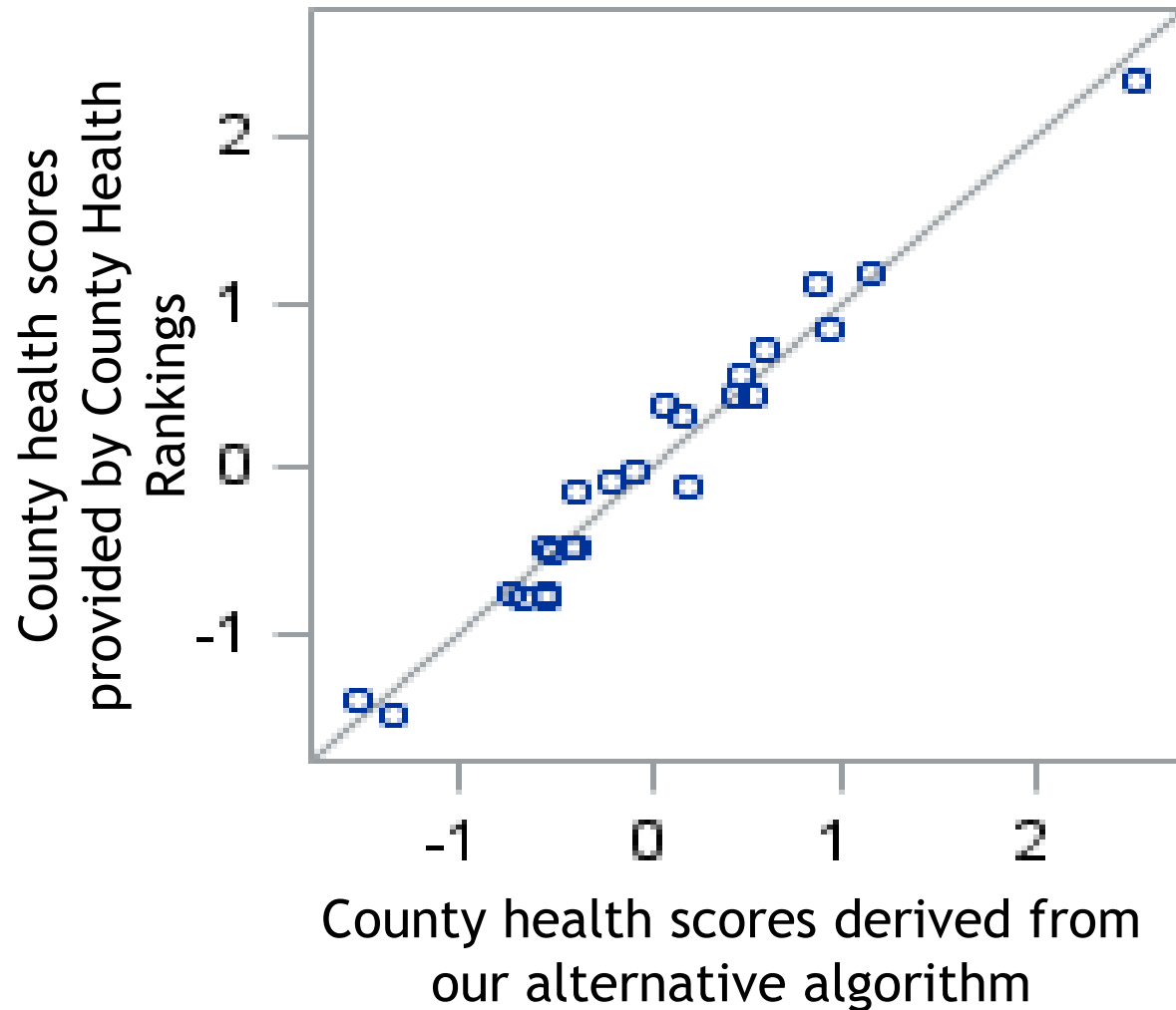


Methods

- ▶ Collected data (2014-2016) from:
 - ▶ Birth records
 - ▶ Death records
 - ▶ PRISM
 - ▶ American Community Survey
 - ▶ In-patient and out-patient hospital records
- ▶ Used principle component analysis and multiple linear regression to derive alternative algorithm
- ▶ Compared results of alternative algorithm with actual County Health Rankings scores at the county level to validate model
- ▶ Applied alternative algorithm to Montgomery County zip codes



Results — Model Accuracy



Pearson Correlation

$R = 0.983$

Conclusion: Our algorithm creates health outcome scores that are highly correlated with the scores provided by county health rankings. Our model is a good fit and accurately predicts the true health scores.

Sub-Domain Scores

Length of life

Quality of life

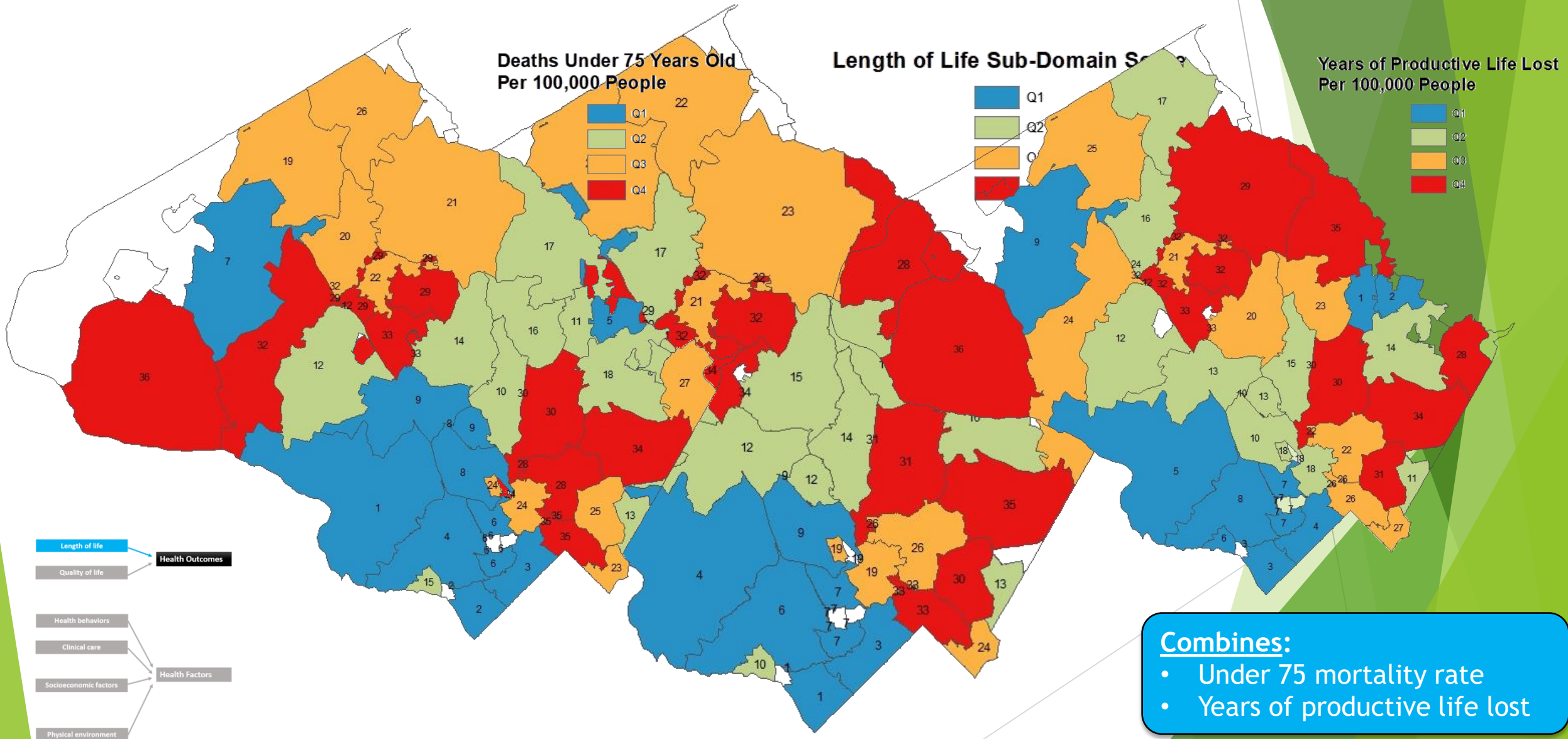
Health behaviors

Clinical care

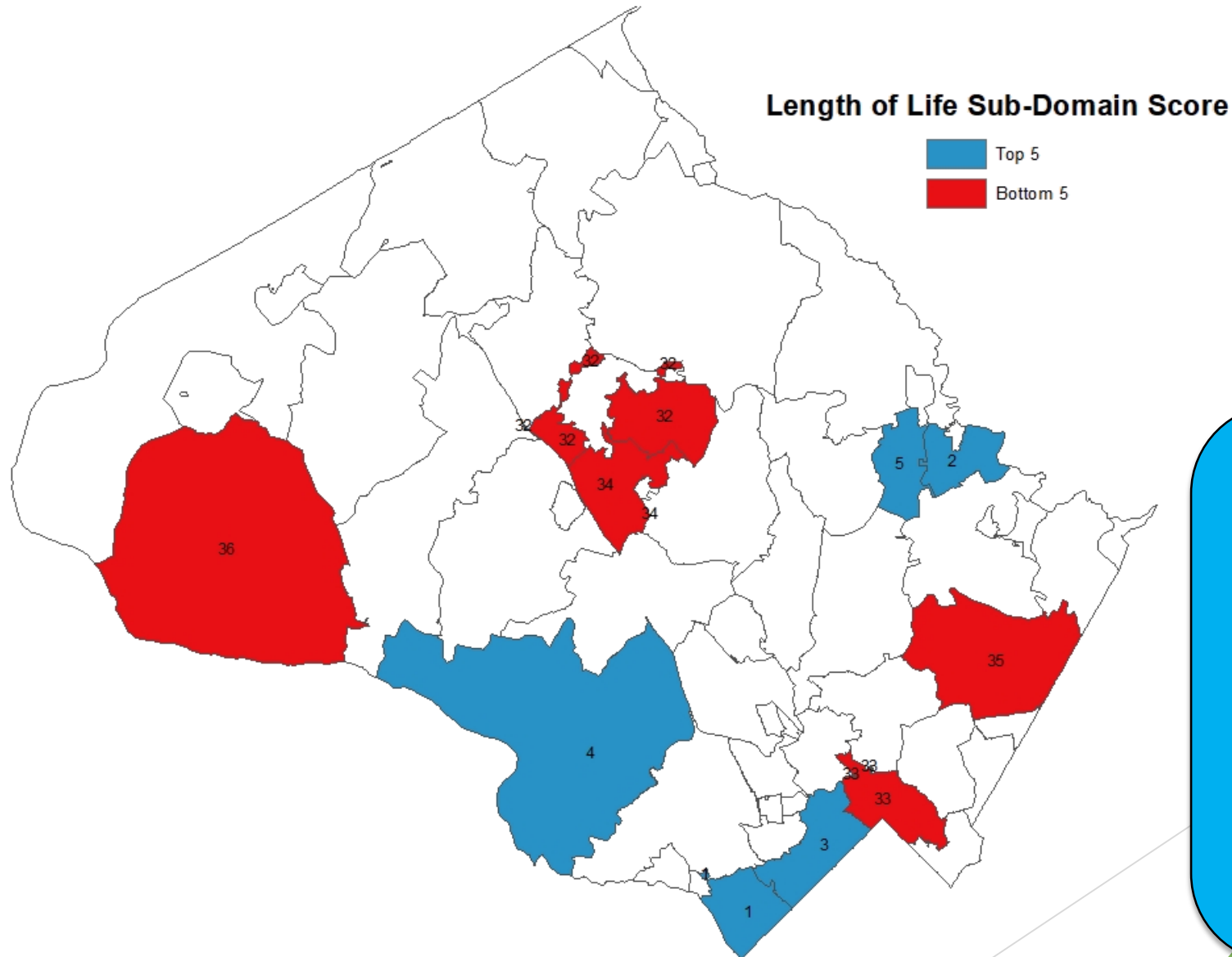
Socioeconomic

Physical environment

Results — Length of Life



Results — Length of Life

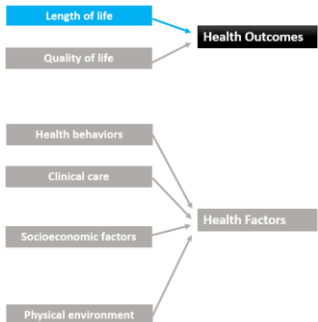


Top 5 Zip Codes

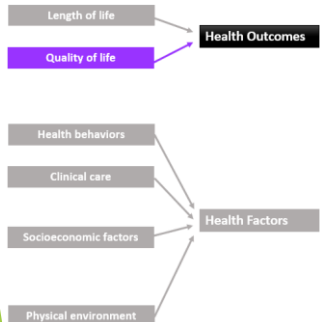
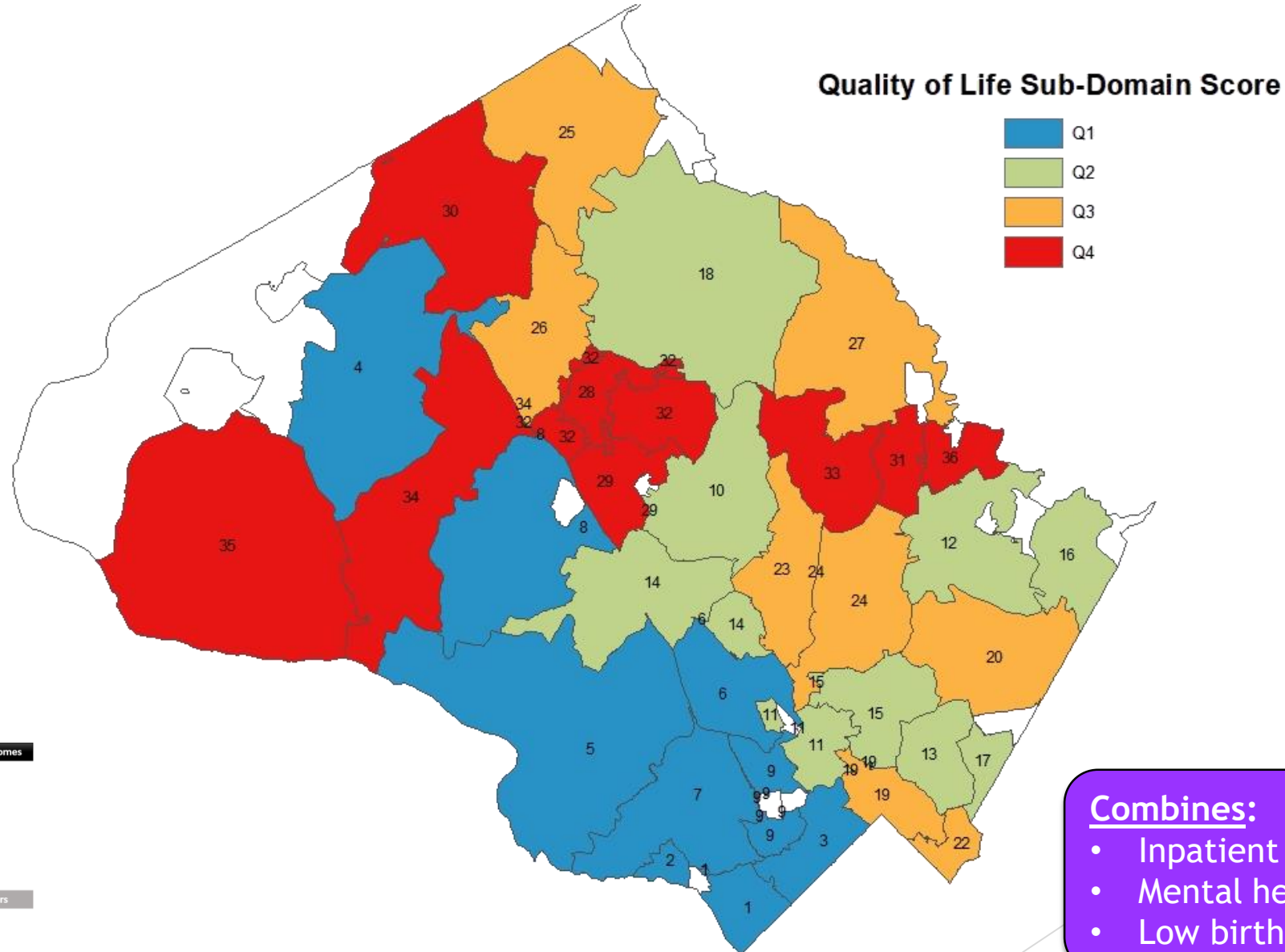
1. 20816 - Bethesda
2. 20861 - Ashton
3. 20815 - Chevy Chase
4. 20854 - Potomac
5. 20860 - Sandy Spring

Bottom 5 Zip Codes

32. 20879 - Montgomery Village
33. 20910 - Silver Spring
34. 20877 - Gaithersburg
35. 20904 - Colesville
36. 20837 - Poolesville



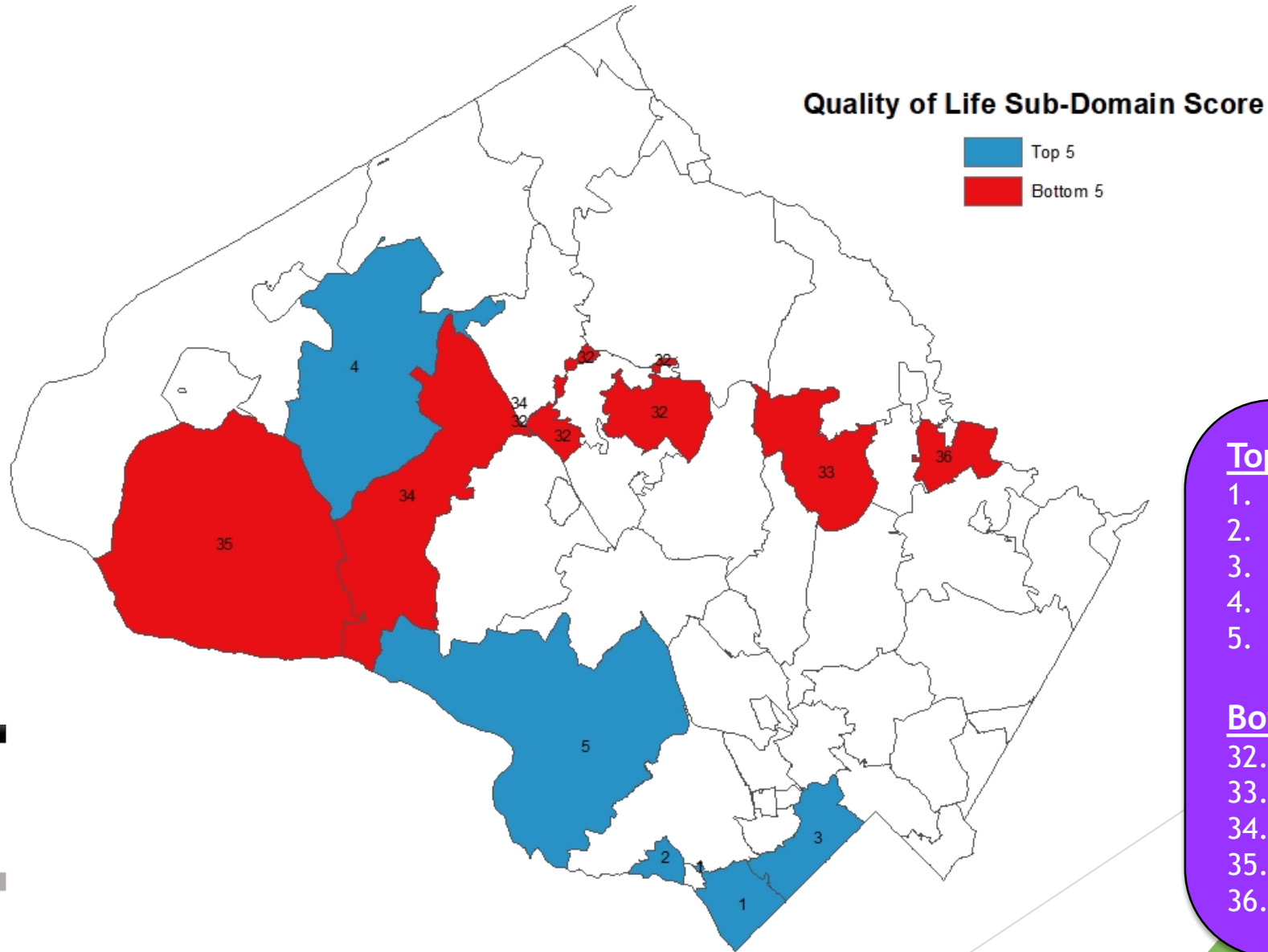
Results — Quality of Life



Combines:

- Inpatient and ER hospitalization rate
- Mental health hospitalization rate
- Low birth weight

Results — Quality of Life

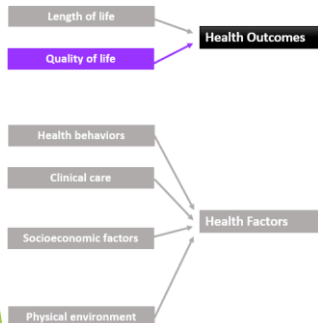


Top 5 Zip Codes

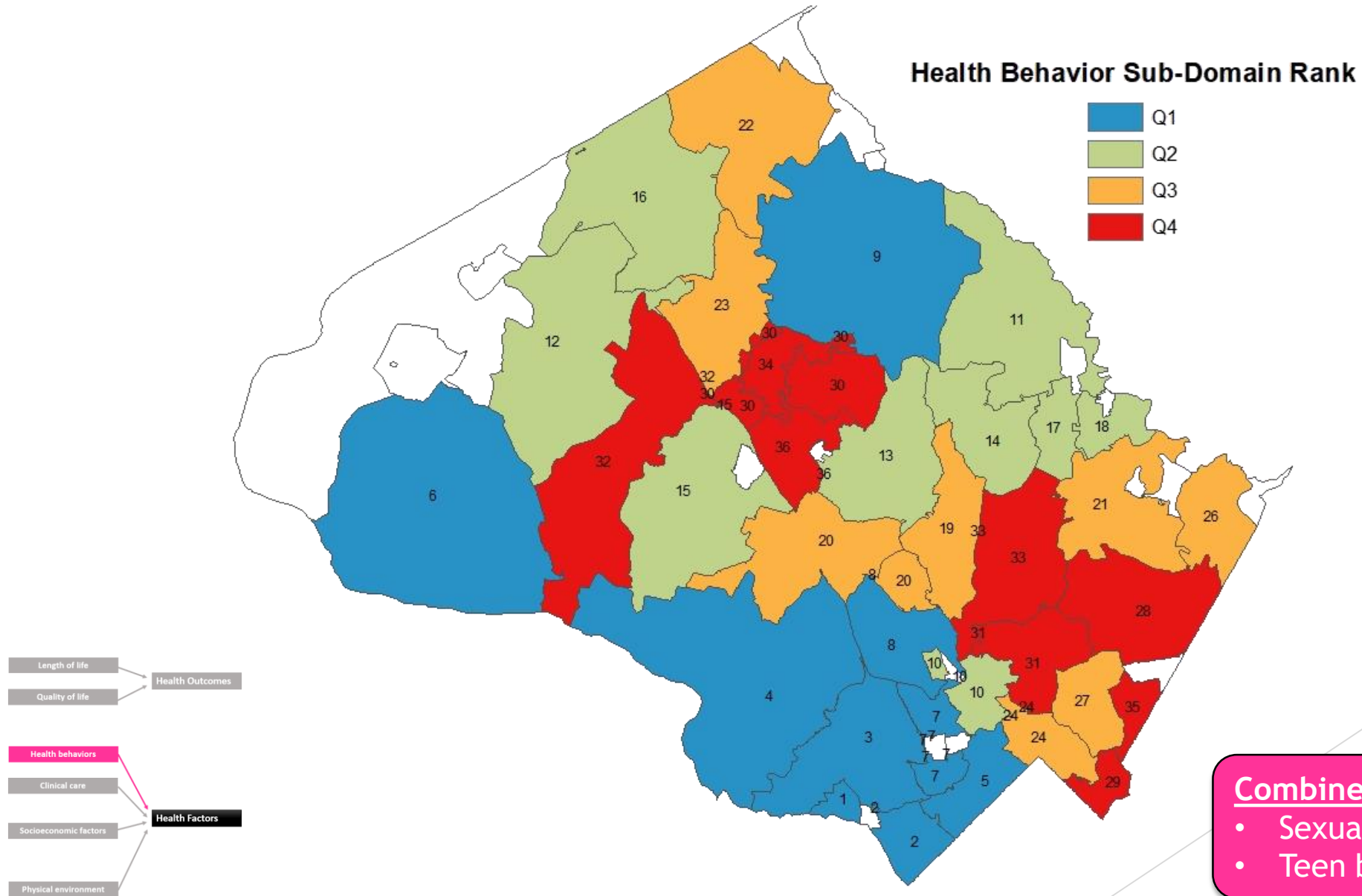
1. 20816 - Bethesda
2. 20818 - Cabin John
3. 20815 - Chevy Chase
4. 20841 - Boyds
5. 20854 - Potomac

Bottom 5 Zip Codes

32. 20879 - Montgomery Village
33. 20832 - Olney
34. 20874 - Germantown
35. 20837 - Poolesville
36. 20861 - Ashton



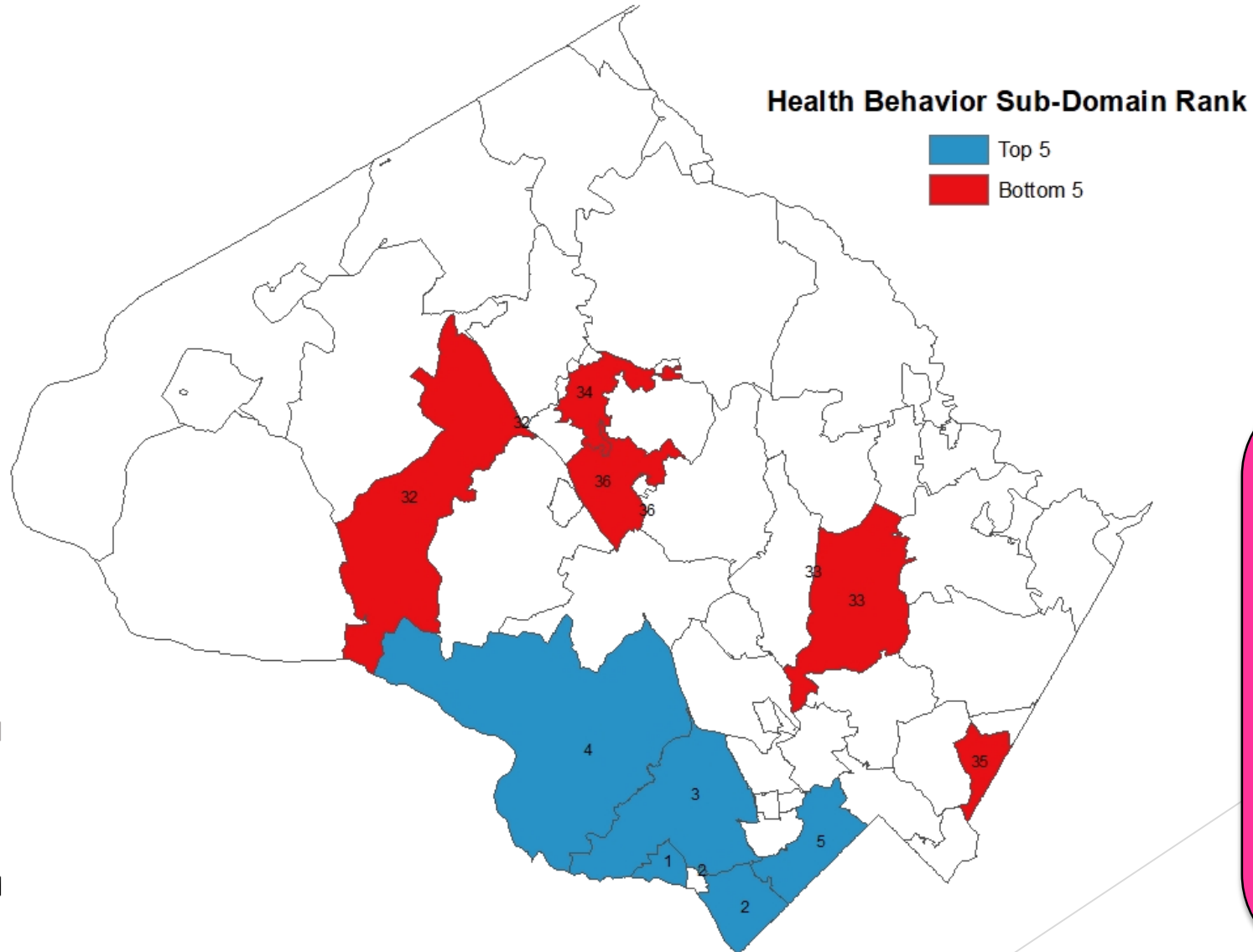
Results — Health Behaviors



Combines:

- Sexually transmitted infection rate
- Teen birth rate

Results — Health Behaviors

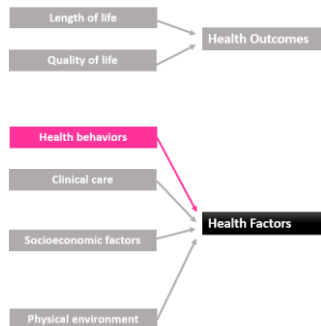


Top 5 Zip Codes

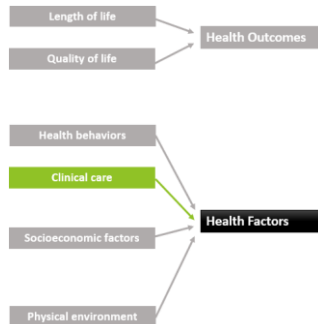
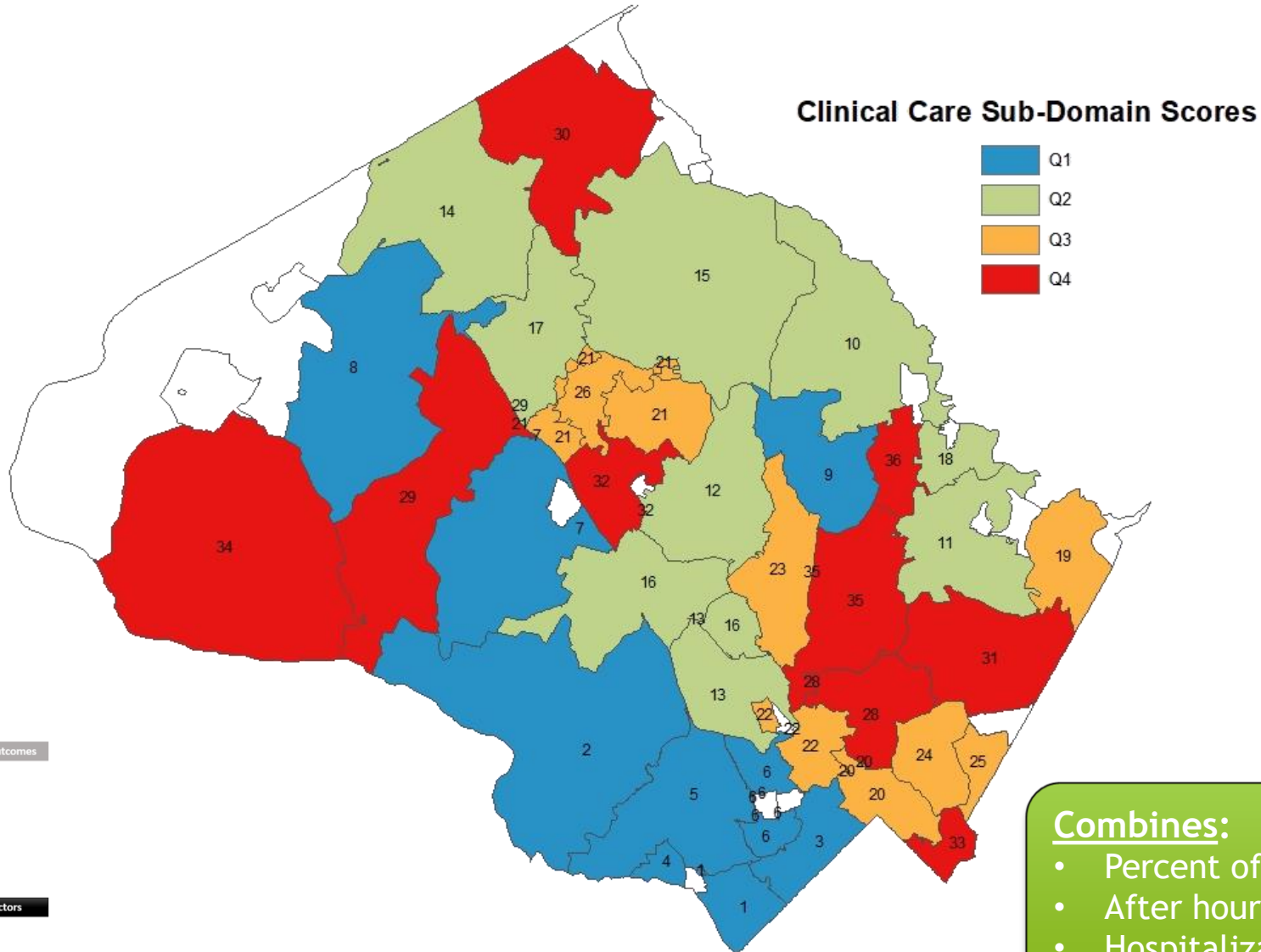
1. 20818 - Cabin John
2. 20816 - Bethesda
3. 20817 - West Bethesda
4. 20854 - Potomac
5. 20815 - Chevy Chase

Bottom 5 Zip Codes

32. 20874 - Germantown
33. 20906 - Aspen Hill
34. 20886 - Montgomery Village
35. 20903 - Silver Spring
36. 20877 - Gaithersburg



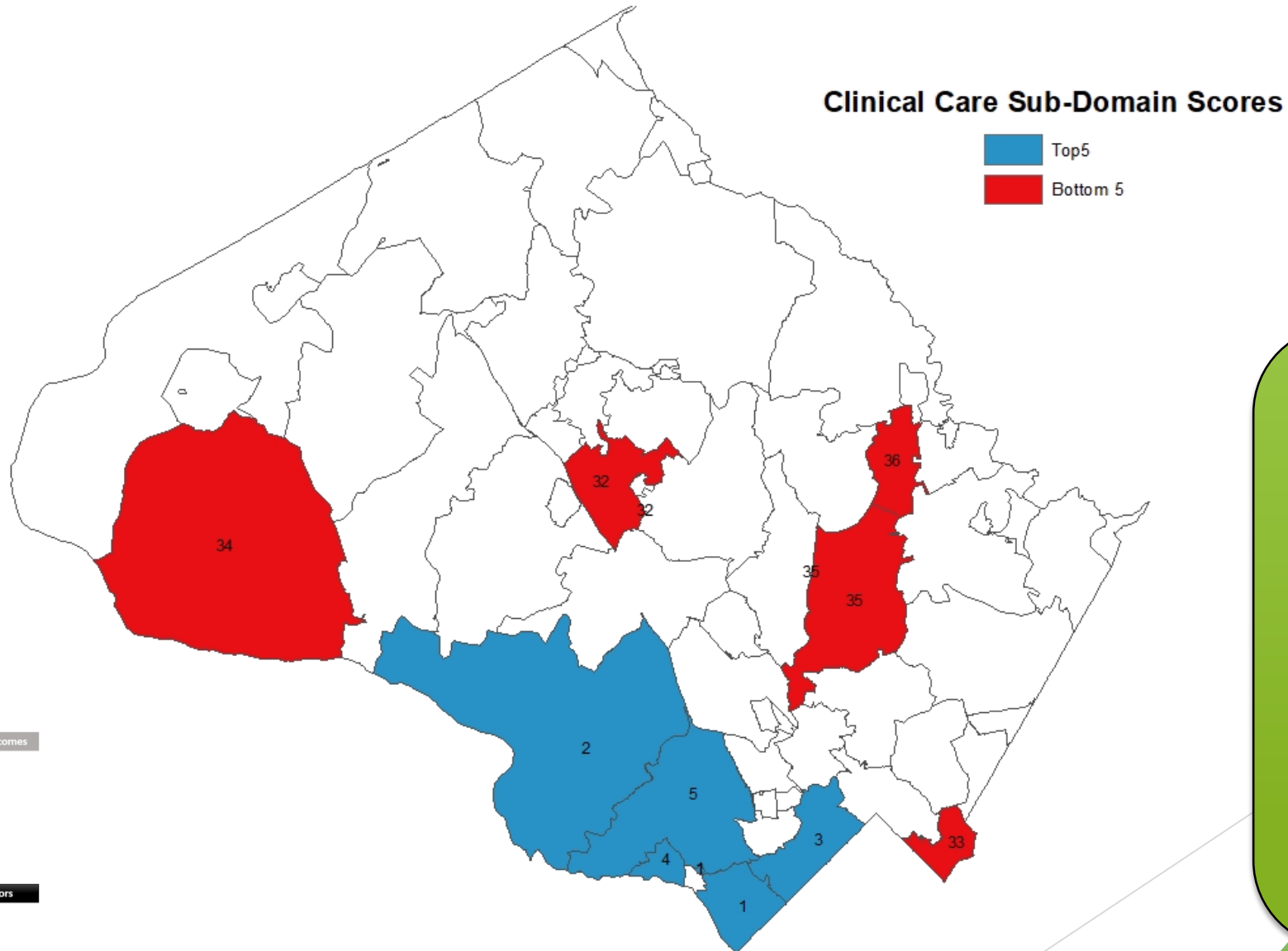
Results — Clinical Care Factors



Combines:

- Percent of population employed in healthcare
- After hours emergency department visits
- Hospitalizations for preventable conditions

Results — Clinical Care Factors

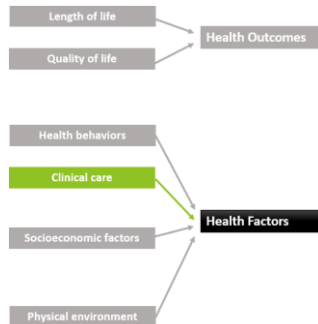


Top 5 Zip Codes

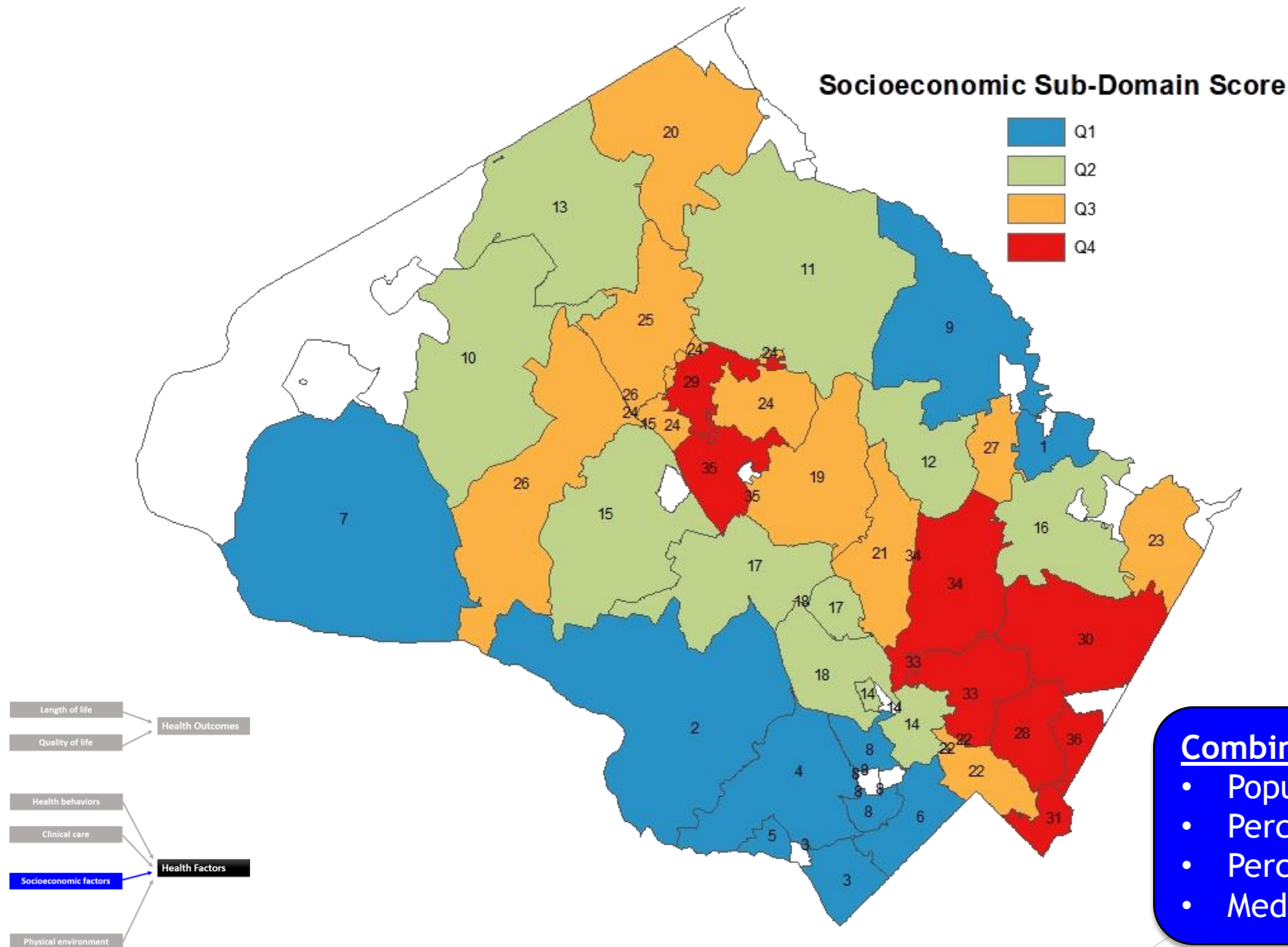
1. 20816 - Bethesda
2. 20854 - Potomac
3. 20815 - Chevy Chase
4. 20818 - Cabin John
5. 20817 - West Bethesda

Bottom 5 Zip Codes

38. 20877 - Gaithersburg
39. 20912 - Takoma Park
40. 20837 - Poolesville
41. 20906 - Aspen Hill
42. 20860 - Sandy Spring



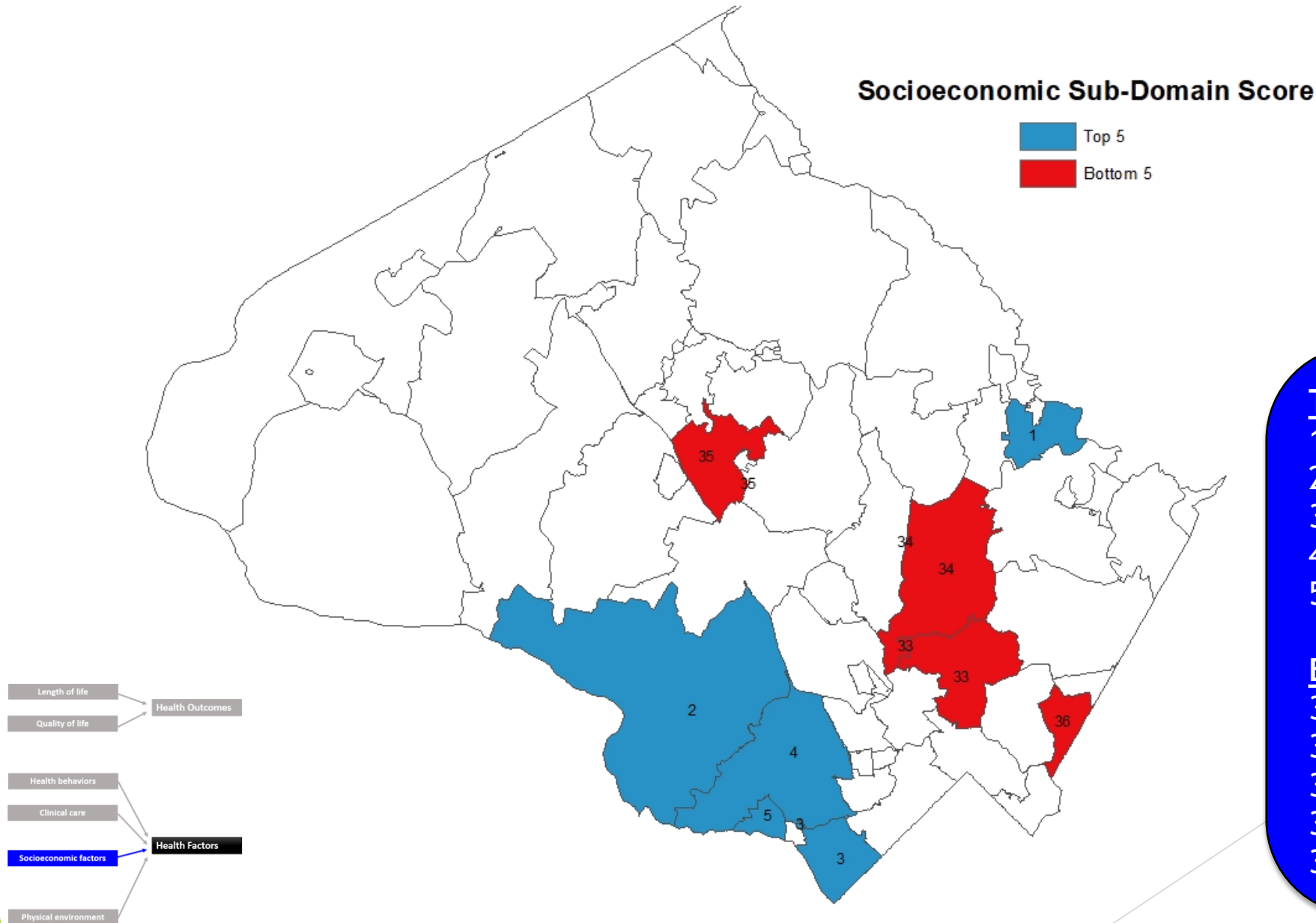
Results — Socioeconomic Factors



Combines:

- Population with less than a HS education
- Percent unemployment
- Percent of children living in poverty
- Median household income

Results — Socioeconomic Factors



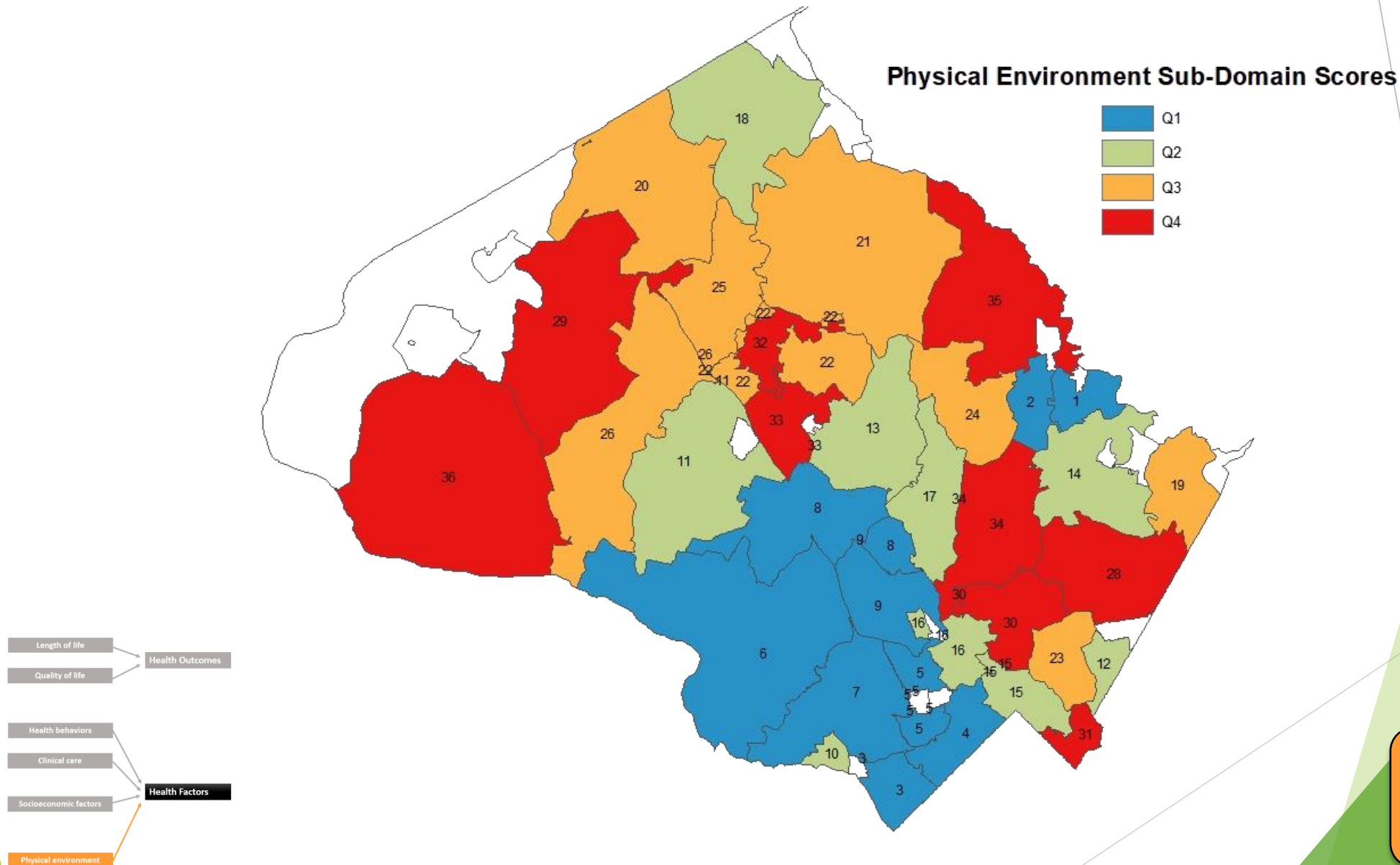
Top 5 Zip Codes

1. 20861 - Ashton
2. 20854 - Potomac
3. 20816 - Bethesda
4. 20817 - West Bethesda
5. 20818 - Cabin John

Bottom 5 Zip Codes

32. 20851 - Rockville/Twinbrook
33. 20902 - Wheaton
34. 20906 - Aspen Hill
35. 20877 - Gaithersburg
36. 20903 - Silver Spring

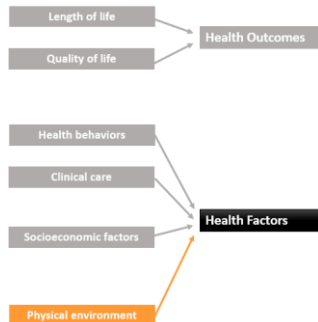
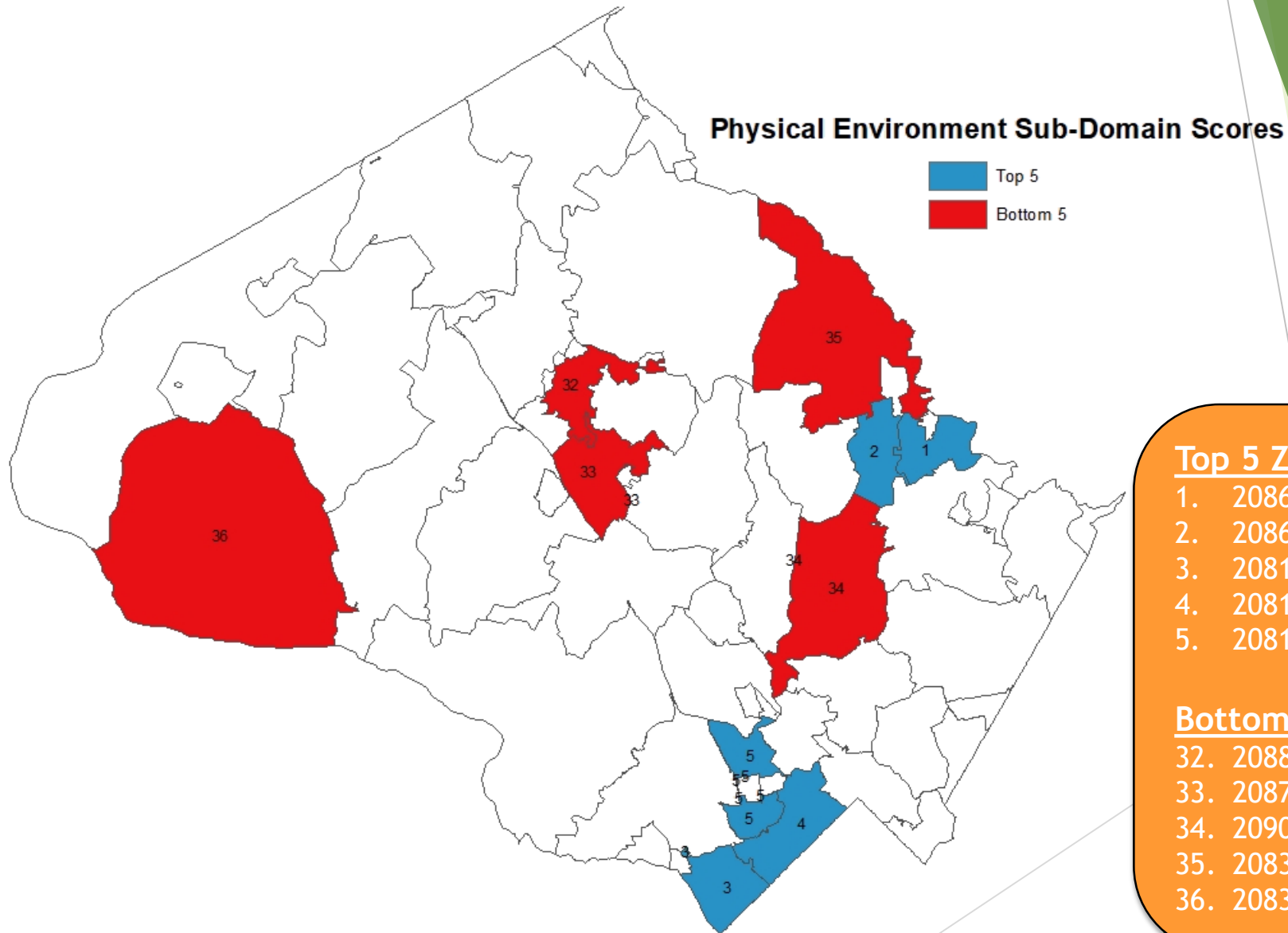
Results — Physical Environment



Combines:

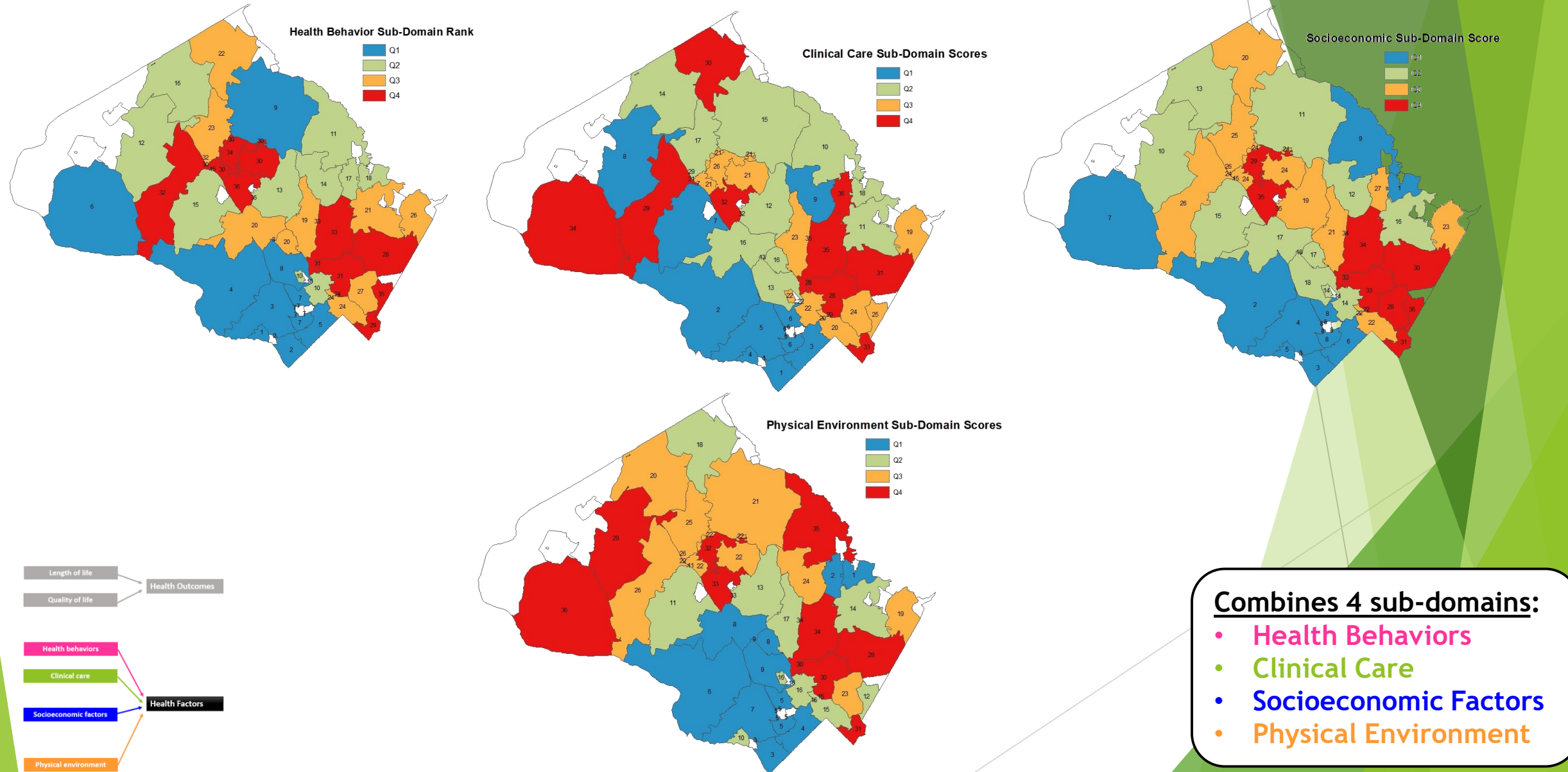
- Violent injury rate
- Injury death rate

Results — Physical Environment

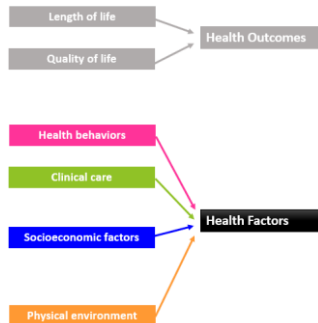
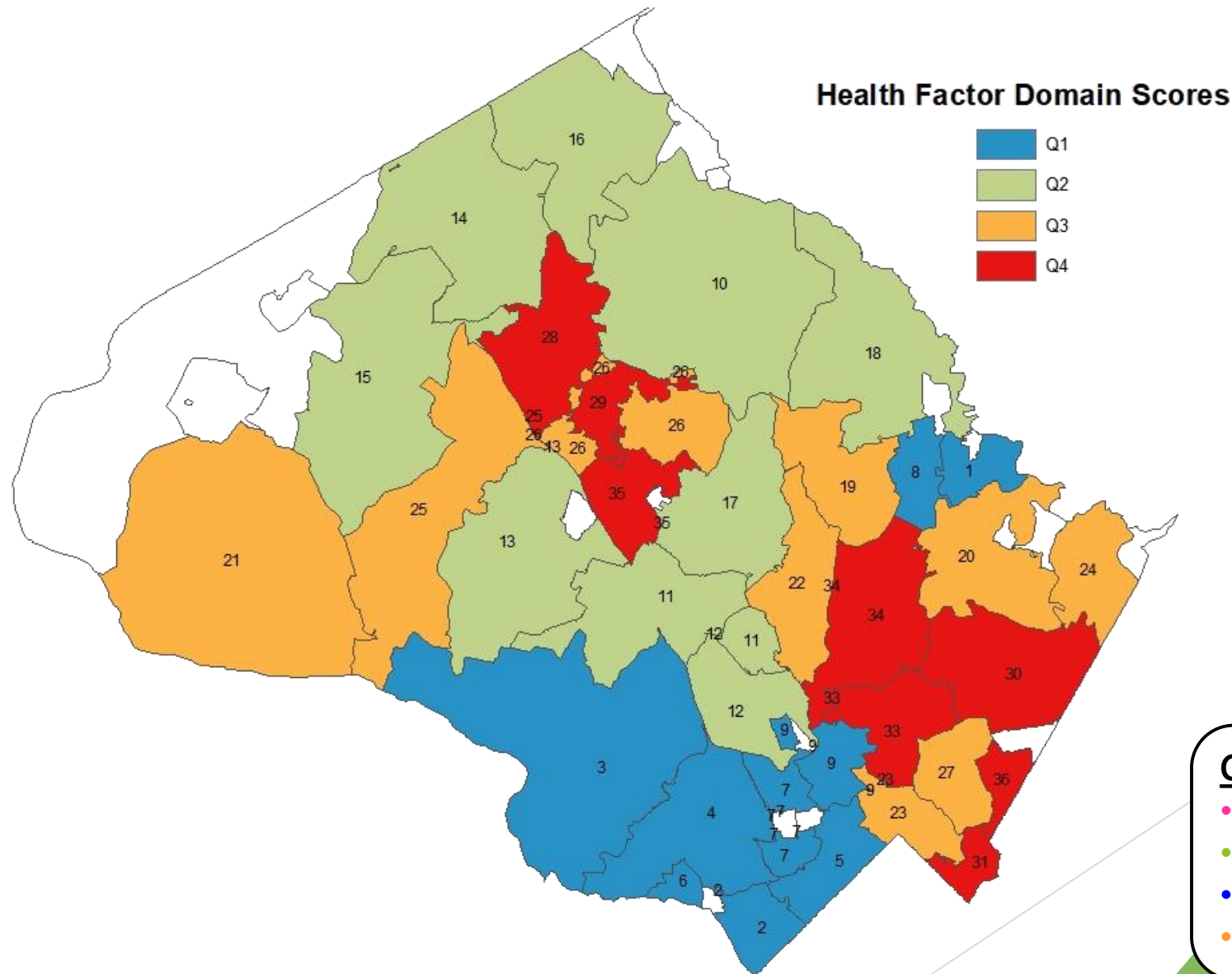


Domain Scores and Overall Rank

Results — Health Factor Domain Scores



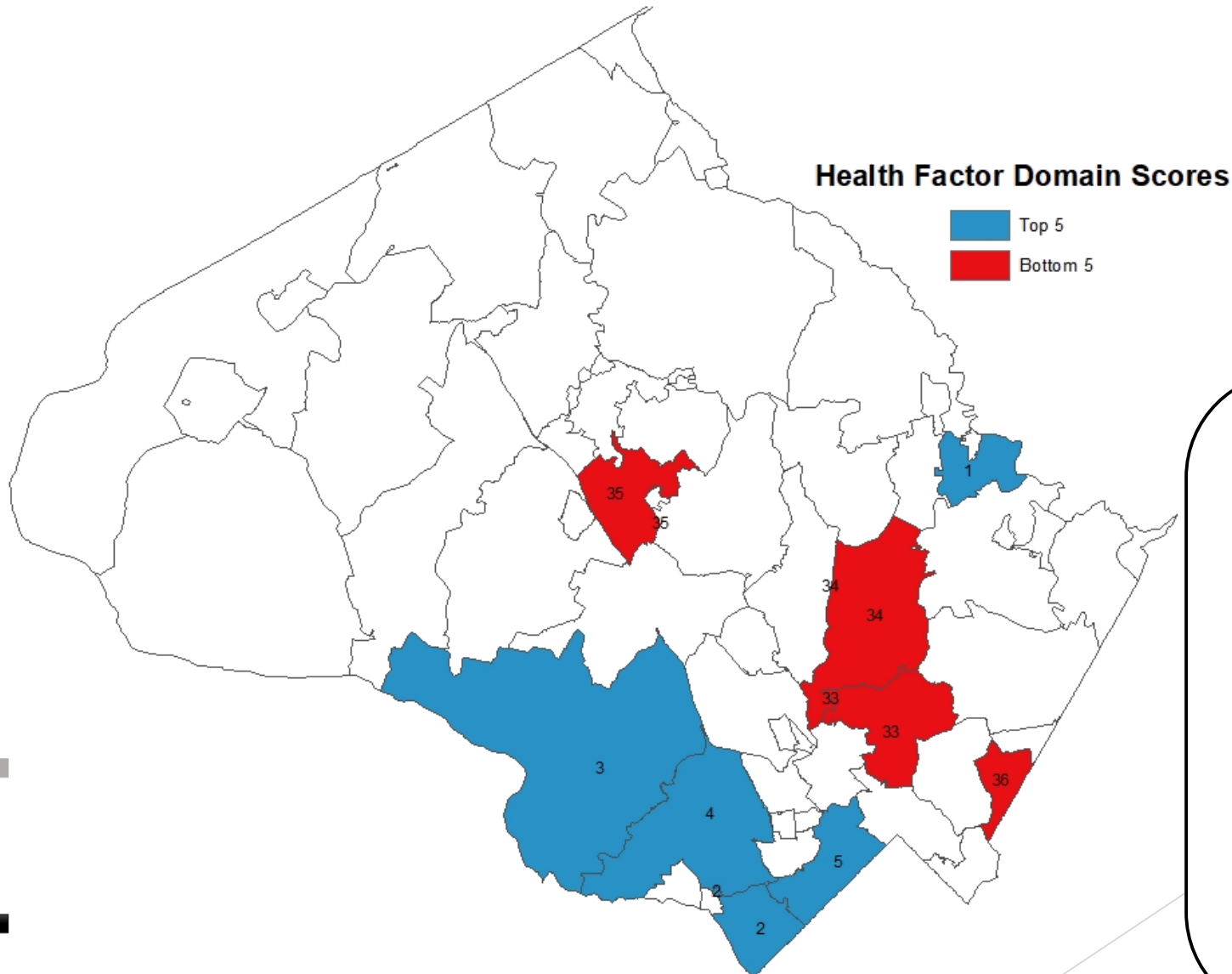
Results — Health Factor Domain Scores



Combines 4 sub-domains:

- Health Behaviors
- Clinical Care
- Socioeconomic Factors
- Physical Environment

Results — Health Factor Domain Scores

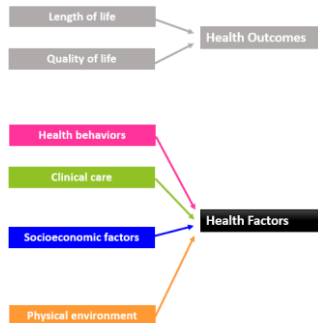


Top 5 Zip Codes

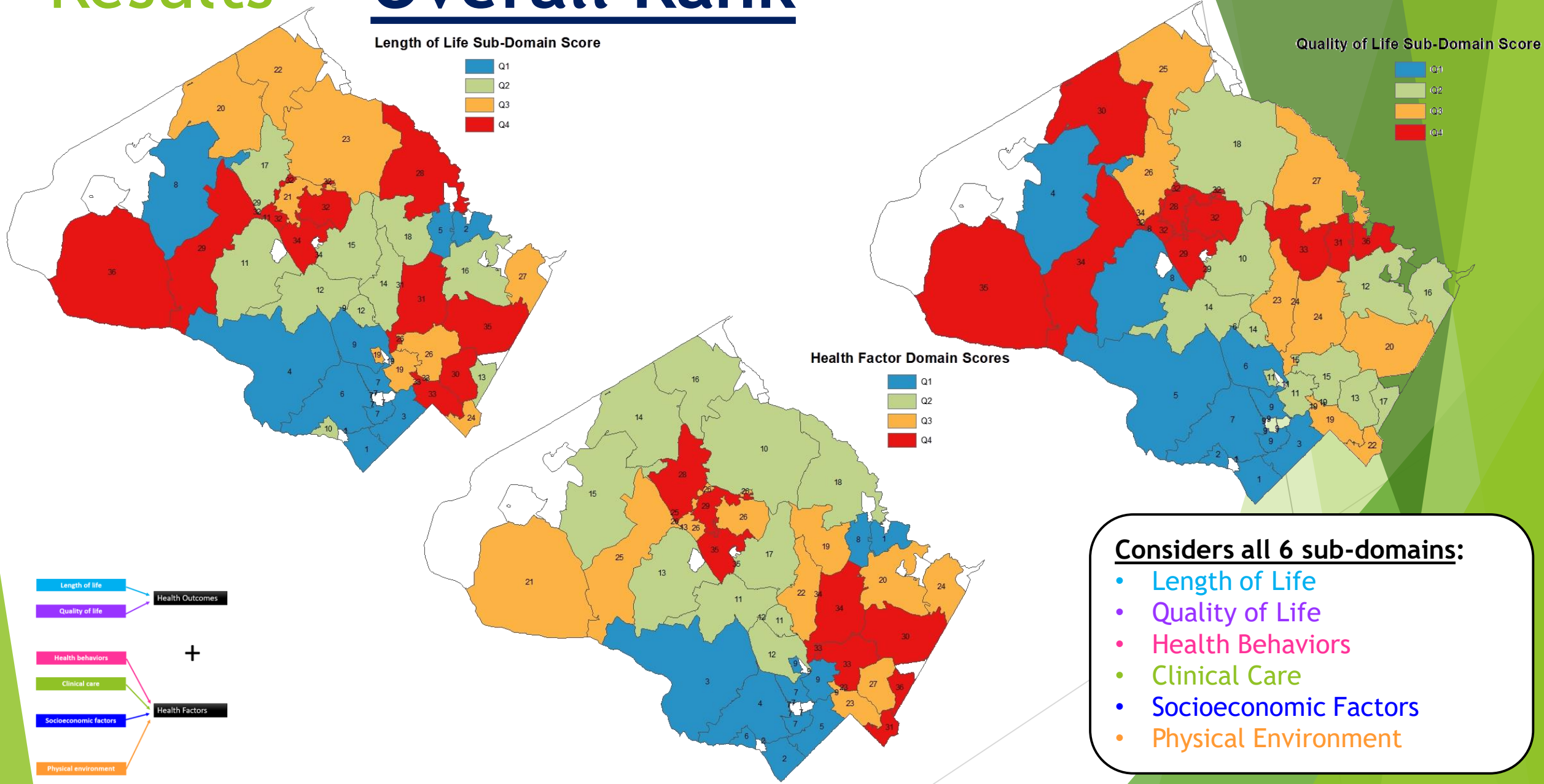
1. 20861 - Ashton
2. 20816 - Bethesda
3. 20854 - Potomac
4. 20817 - West Bethesda
5. 20815 - Chevy Chase

Bottom 5 Zip Codes

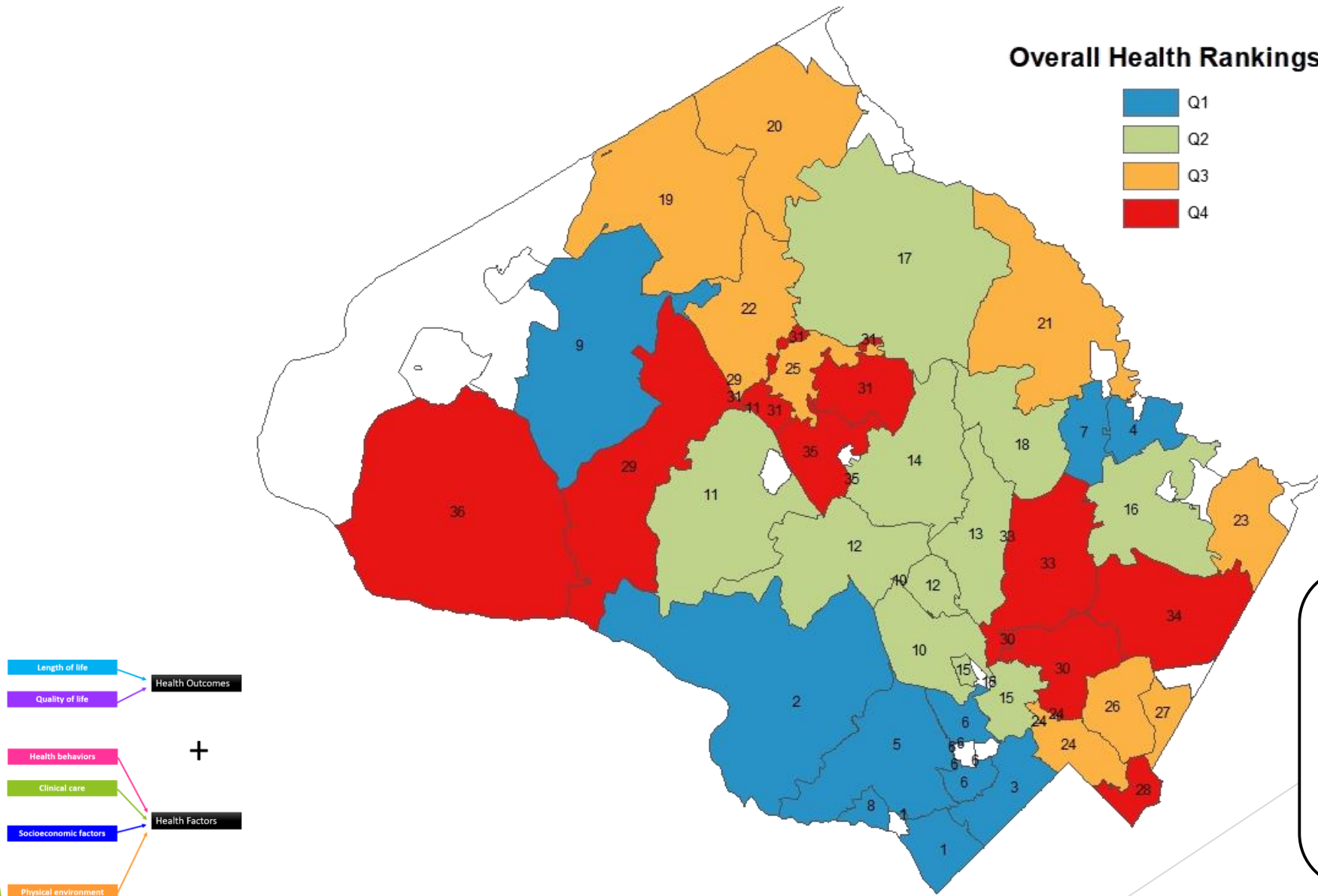
32. 20851 - Rockville/Twinbrook
33. 20902 - Wheaton
34. 20906 - Aspen Hill
35. 20877 - Gaithersburg
36. 20903 - Silver Spring



Results — Overall Rank



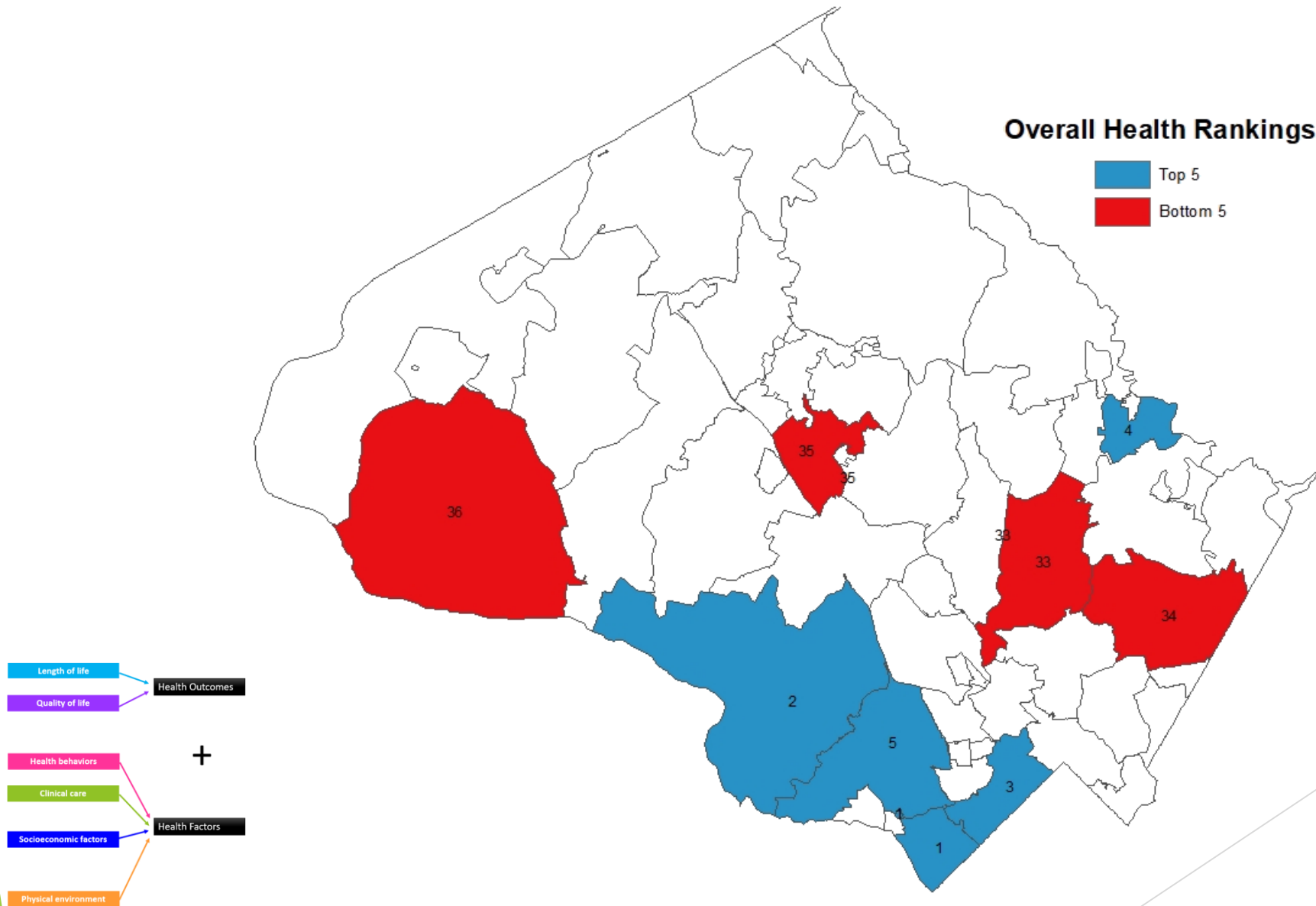
Results — Overall Rank



Considers all 6 sub-domains:

- Length of Life
- Quality of Life
- Health Behaviors
- Clinical Care
- Socioeconomic Factors
- Physical Environment

Results — Overall Rank



Top 5 Zip Codes

1. 20816 - Bethesda
2. 20854 - Potomac
3. 20815 - Chevy Chase
4. 20861 - Ashton
5. 20817 - West Bethesda

Bottom 5 Zip Codes

32. 20851 - Rockville/Twinbrook
33. 20906 - Aspen Hill
34. 20904 - Colesville
35. 20877 - Gaithersburg
36. 20837 - Poolesville

Study Strengths

- ▶ Follows the validated methodology provided by Nagasako *et al.**
- ▶ Provides multi-level analysis.
- ▶ Secondary data analysis did not require additional data collection.
- ▶ Analysis could be expanded to look at zip codes across the state of Maryland.
- ▶ Looks at health holistically and considers how non-medical factors affect health.

* Nagasako E, *et al.* Measuring Subcounty Differences in Population Health Using Hospital and Census-Derived Data Sets: The Missouri ZIP Health Rankings Project. *J Public Health Manag Pract.* 2018 Jul/Aug;24(4):340-349

Study Limitations

- ▶ Limited measure selection and data availability
- ▶ High mobility between zip codes
- ▶ Some domains, particularly quality of life, clinical care, and health behaviors, are not significant predictors of rank

Conclusion and Next Steps

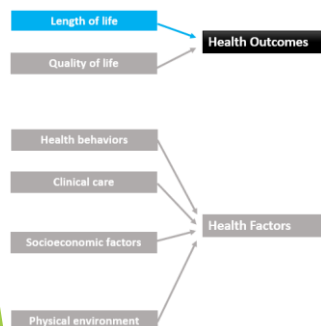
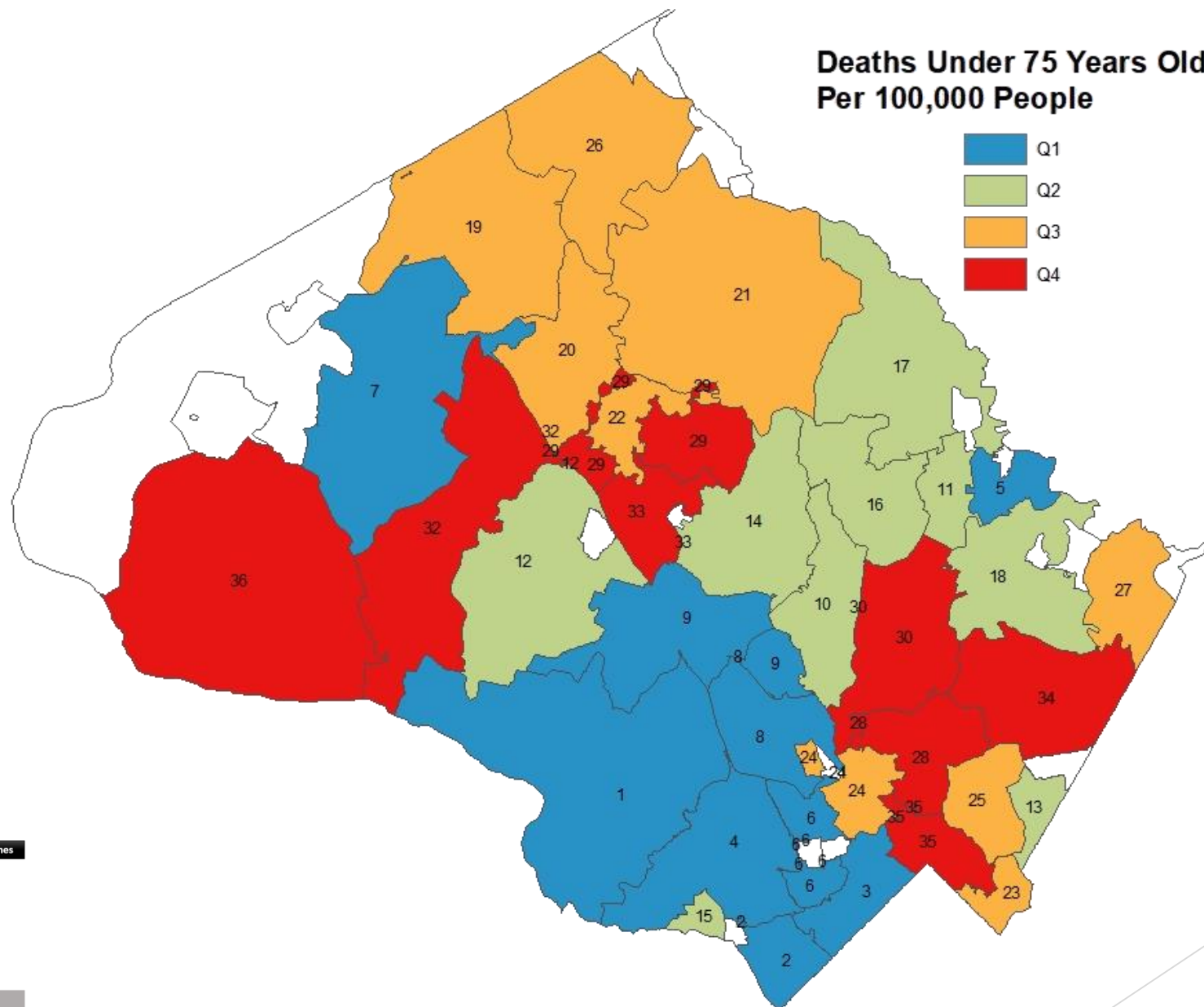
- ▶ Results are consistent with our knowledge of Montgomery County's state of health.
- ▶ Socioeconomic and physical environment factors were the strongest contributors to the health factor domain scores.
- ▶ The health factor domain score and length of life subdomain scores were the strongest contributors to the overall rank.
- ▶ This analysis can inform targeted resource allocation to improve health in 'hot spots' around the county.

So how does your zip code rank?

1. 20816 - Bethesda
2. 20854 - Potomac
3. 20815 - Bethesda/Chevy Chase
4. 20861 - Ashton
5. 20817 - West Bethesda
6. 20814 - Bethesda
7. 20860 - Sandy Spring
8. 20818 - Cabin John
9. 20841 - Boyds
10. 20852 - North Bethesda
11. 20878 - Darnestown
12. 20850 - Rockville
13. 20853 - Rockville
14. 20855 - Derwood
15. 20895 - Kensington
16. 20905 - Colesville/Silver Spring
17. 20882 - Laytonsville
18. 20832 - Olney
19. 20871 - Clarksburg
20. 20872 - Damascus
21. 20833 - Brookeville
22. 20876 - Germantown/Clarksburg
23. 20866 - Burtonsville
24. 20910 - Silver Spring (Downtown)
25. 20886 - Montgomery Village
26. 20901 - Silver Spring
27. 20903 - Silver Spring
28. 20912 - Takoma Park
29. 20874 - Germantown
30. 20902 - Wheaton
31. 20879 - Gaithersburg
32. 20851 - Rockville/Twinbrook
33. 20906 - Aspen Hill
34. 20904 - Colesville/Silver Spring
35. 20877 - Gaithersburg (Old Town)
36. 20837 - Poolesville

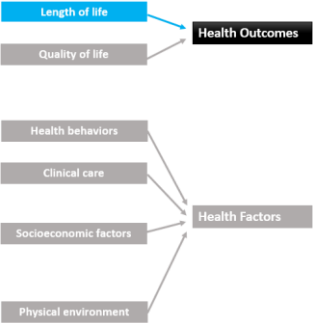
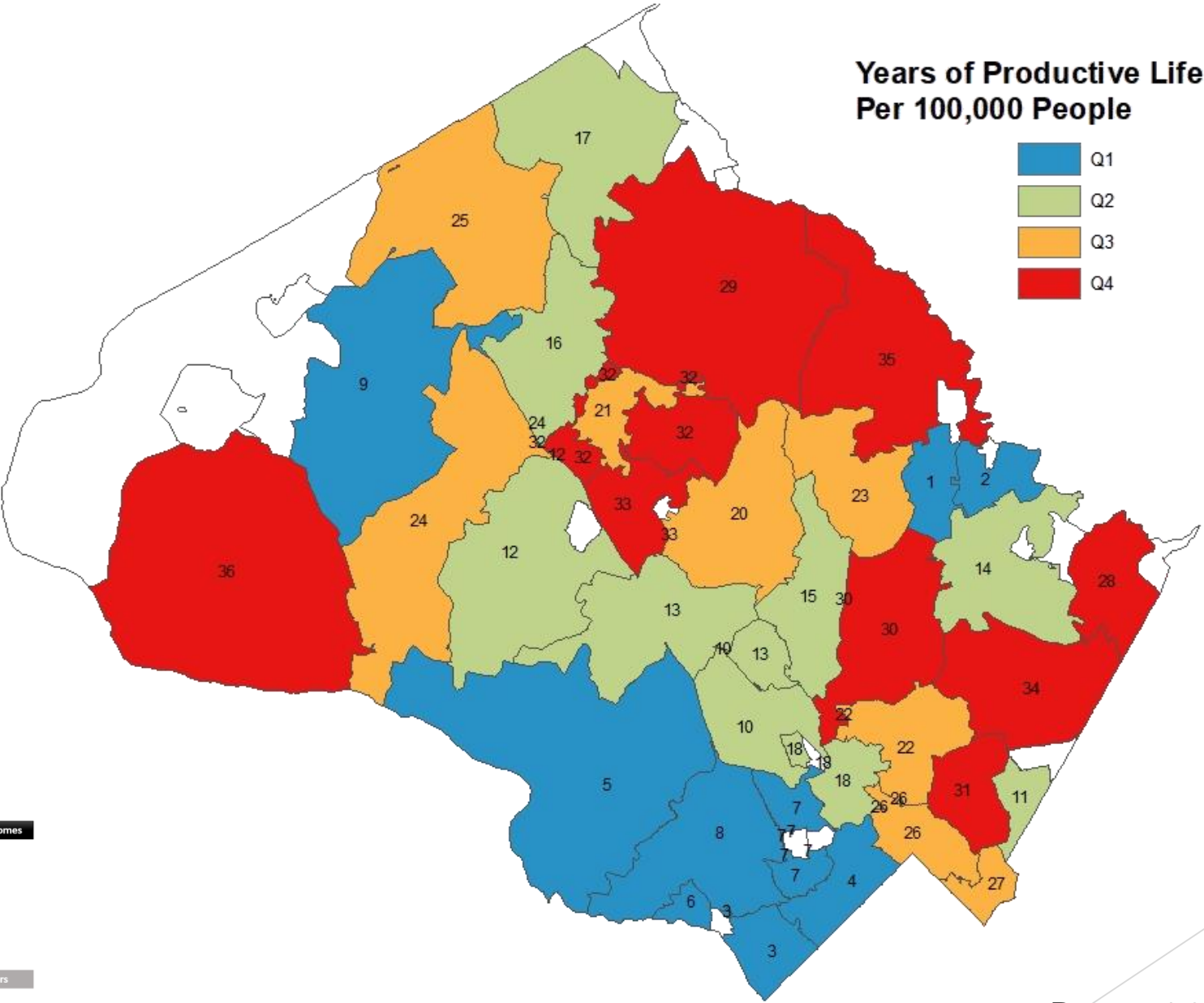
**INDIVIDUAL
MEASURES
FOLLOW**

Deaths Under 75 Years Old Per 100,000 People

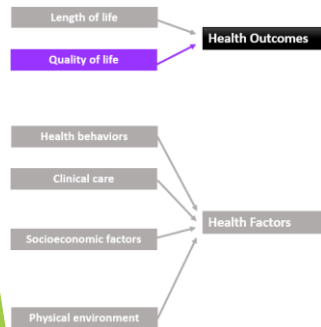
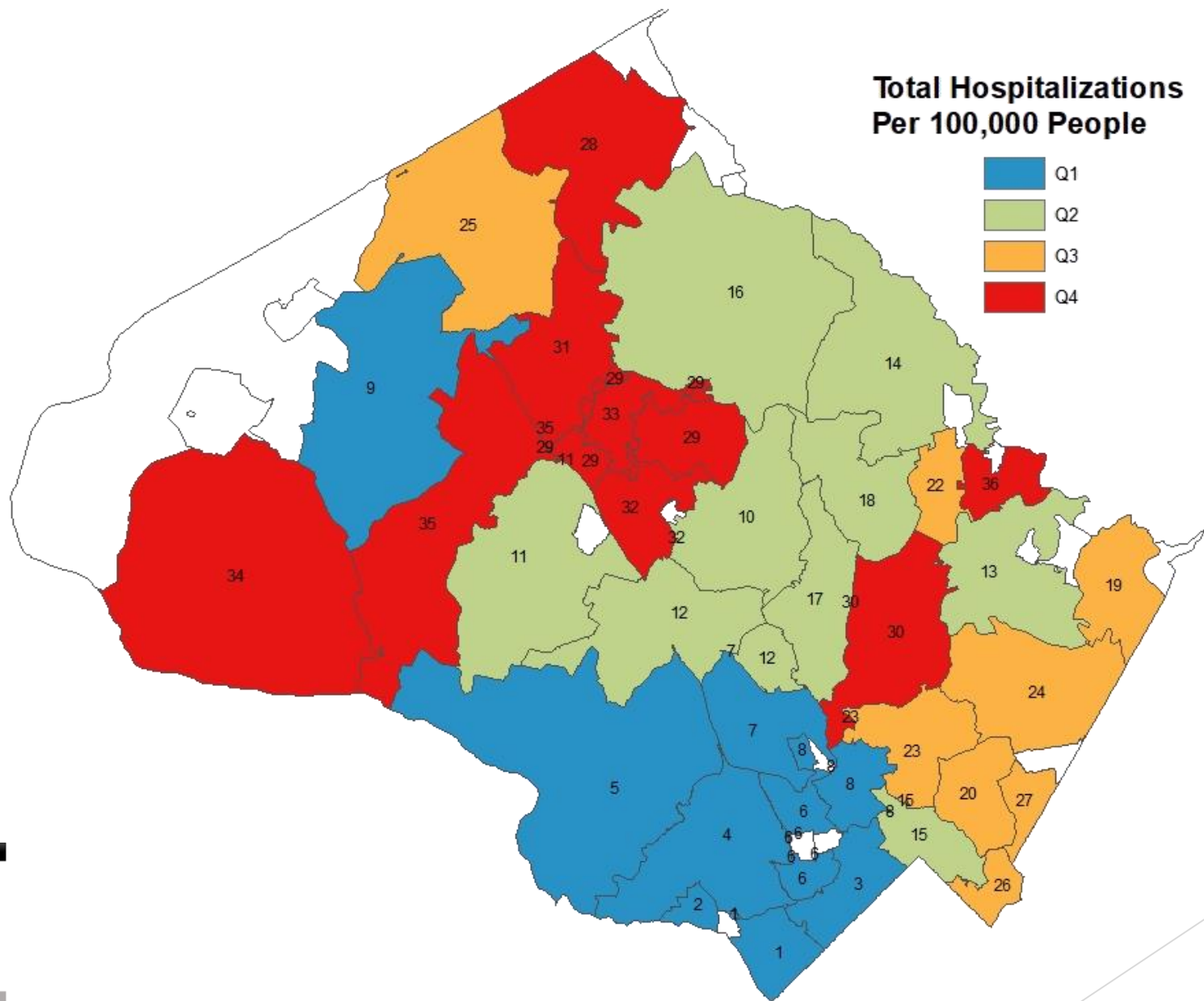


Range: 104 – 290 deaths / 100,000 people
Montgomery County: 184 deaths / 100,000 people

Years of Productive Life Lost
Per 100,000 People

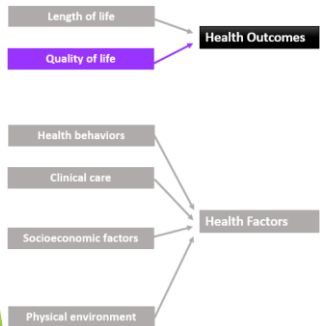
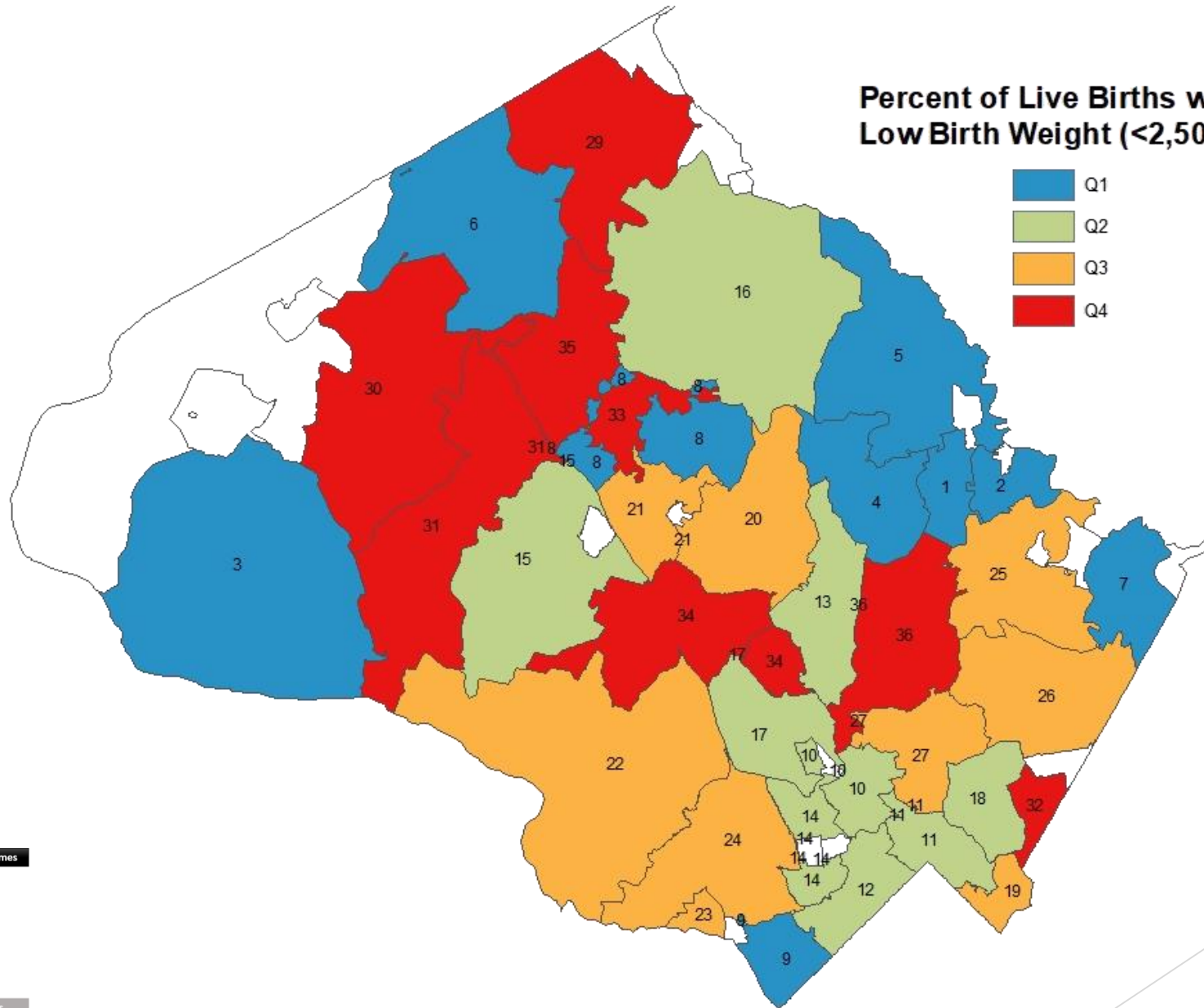
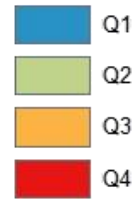


Range: 1,225 – 6,740 years / 100,000 people
Montgomery County: 3,735 years / 100,000 people



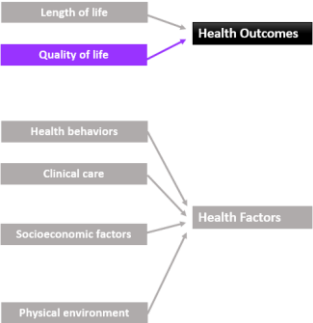
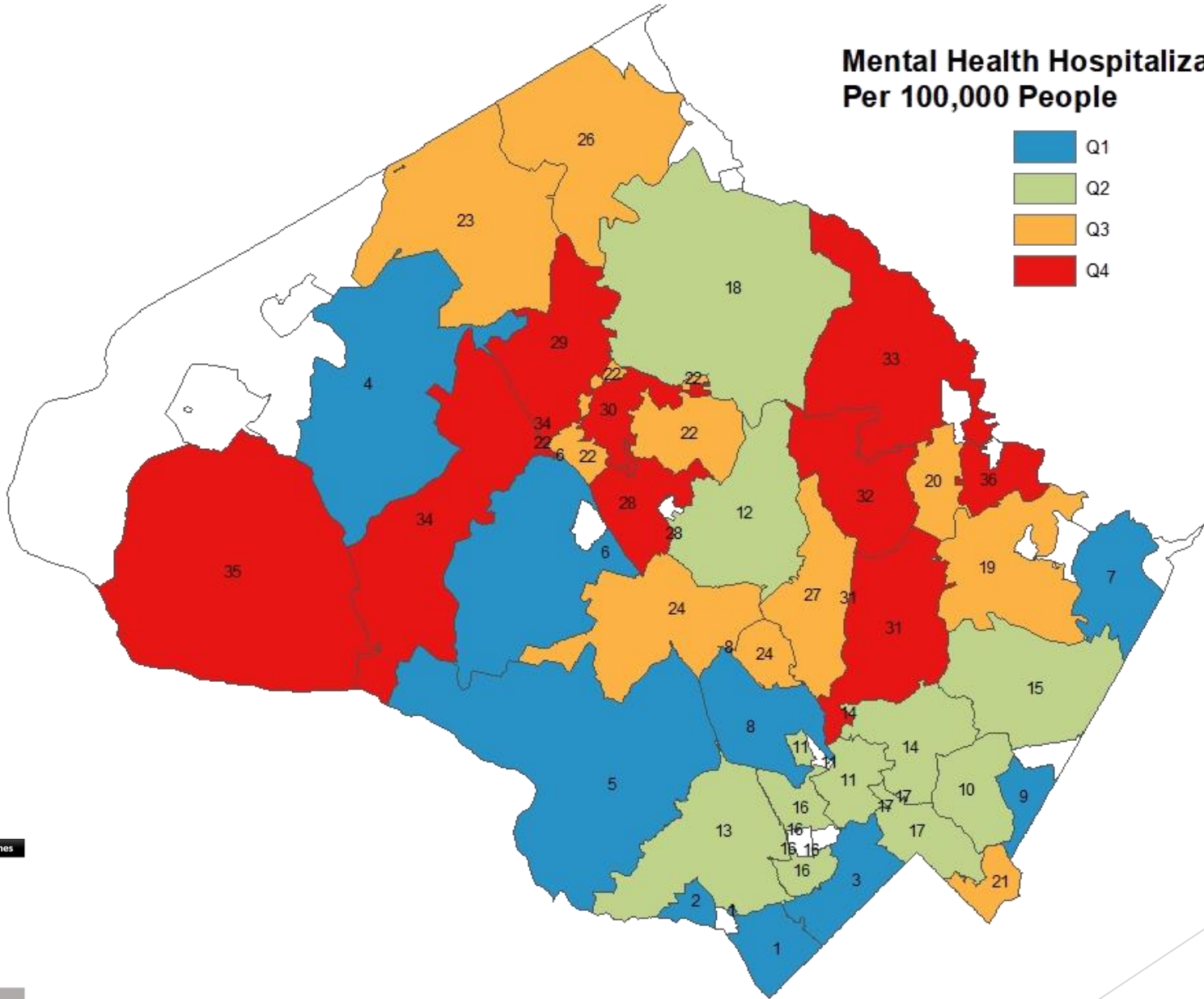
Range: 6,975 – 52,370 hospitalizations / 100,000 people
Montgomery County: 29,851 hospitalizations / 100,000 people

Percent of Live Births with Low Birth Weight (<2,500 g)



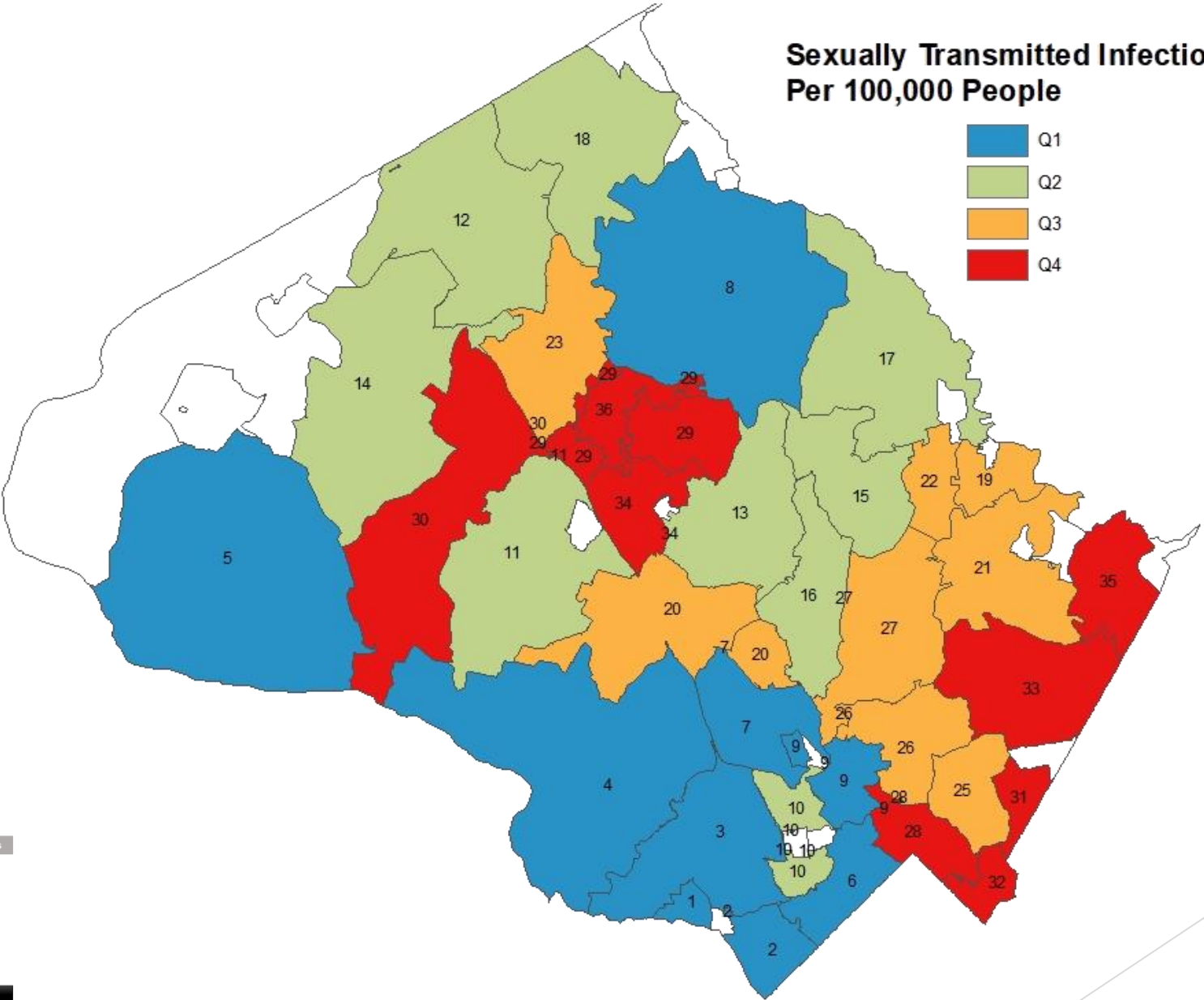
Range: 2.4% - 9.3%
Montgomery County: 7.3%

Mental Health Hospitalizations
Per 100,000 People

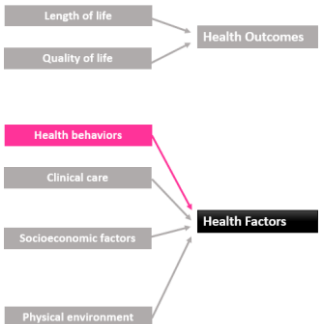


Range: 765 – 2,836 hospitalizations / 100,000 people
Montgomery County: 1,774 hospitalizations / 100,000 people

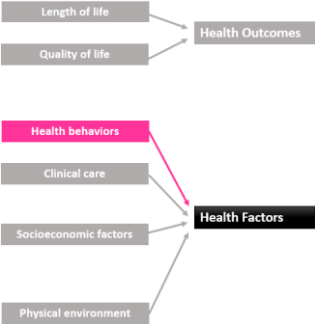
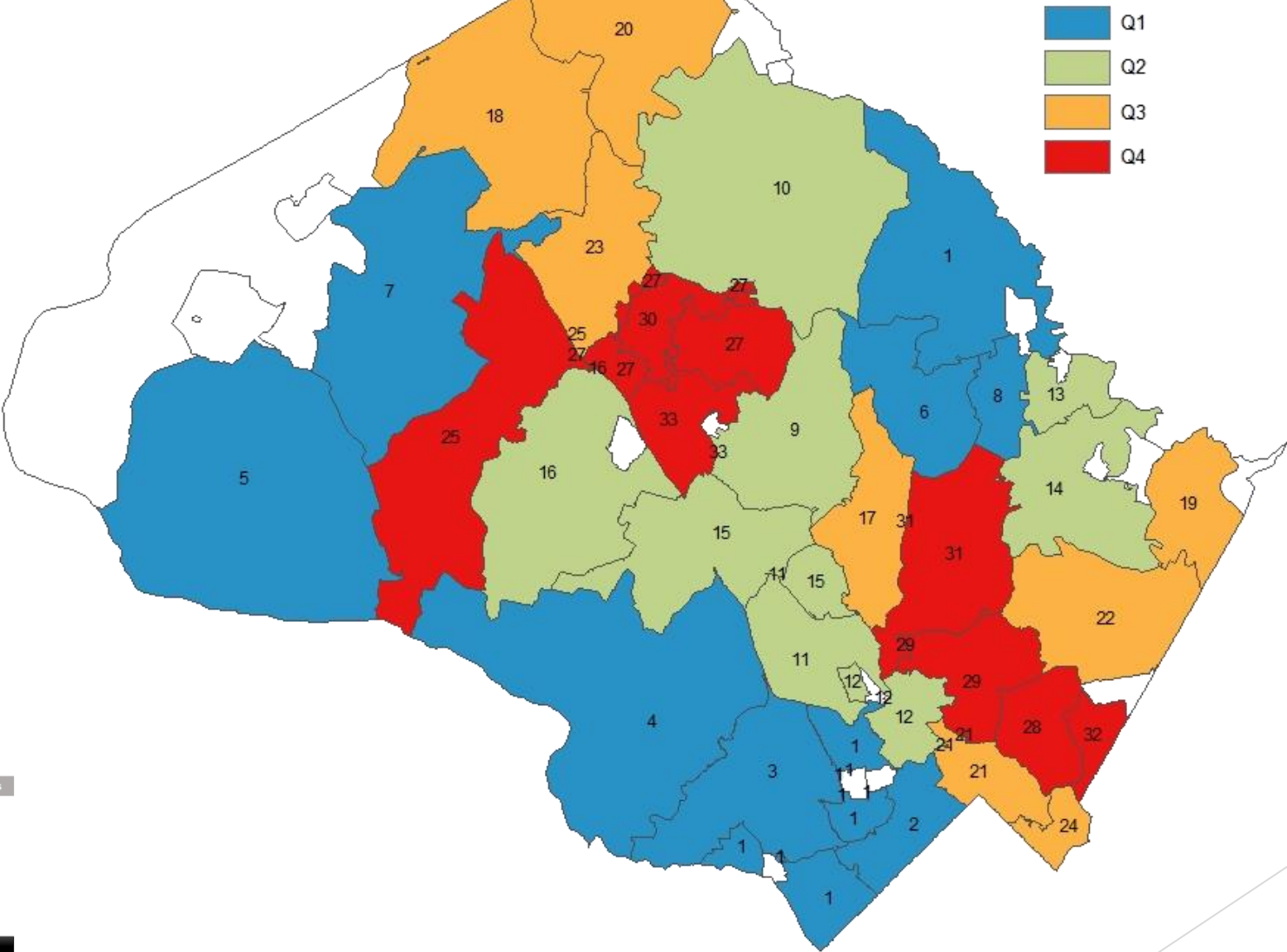
**Sexually Transmitted Infections
Per 100,000 People**



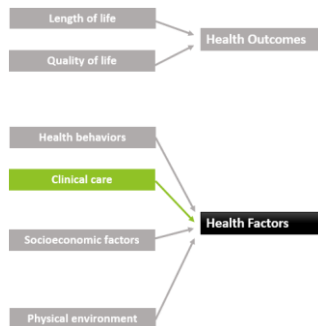
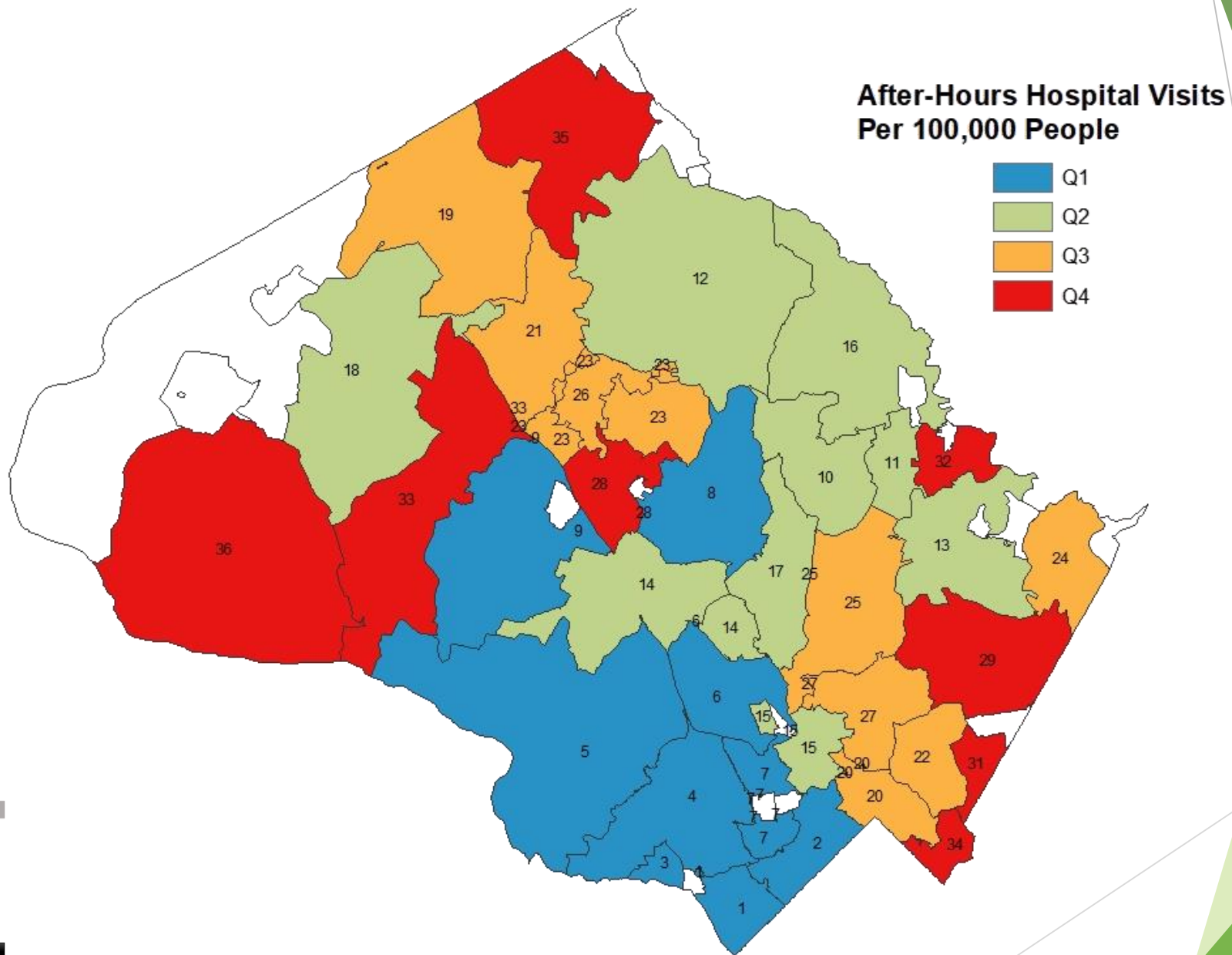
Range: 41.1 – 407.1 STIs per 100,000 people
Montgomery County: 271.6 STIs per 100,000 people



**Births to Teenage Mothers
Per 1,000 Females Aged 15-19**

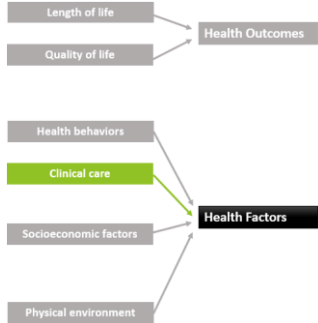
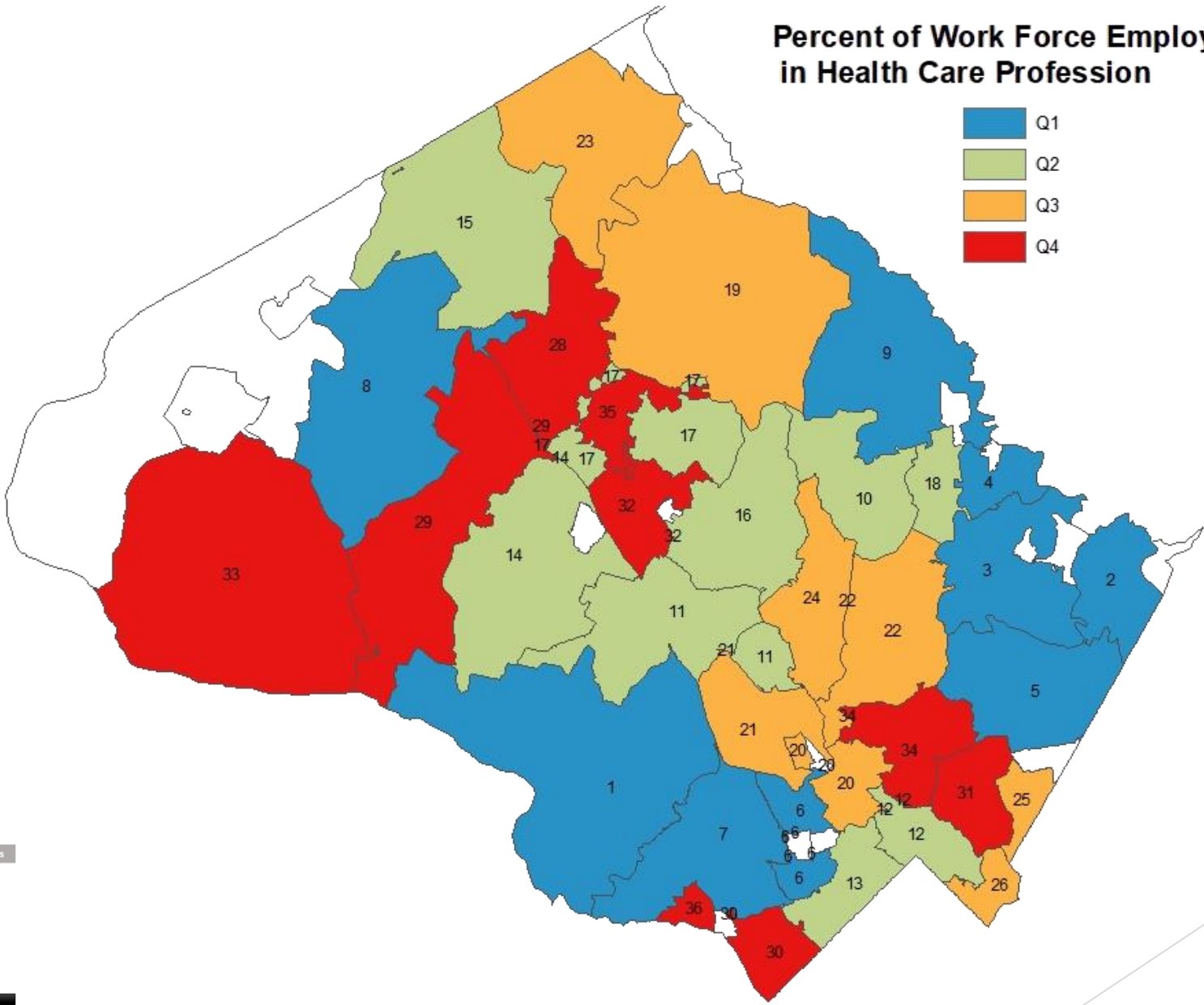


Range: 0 – 32.4 teen births / 1000 teenage girls
Montgomery County: 11.8 teen births / 1000 teenage girls



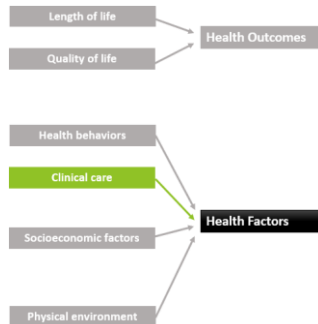
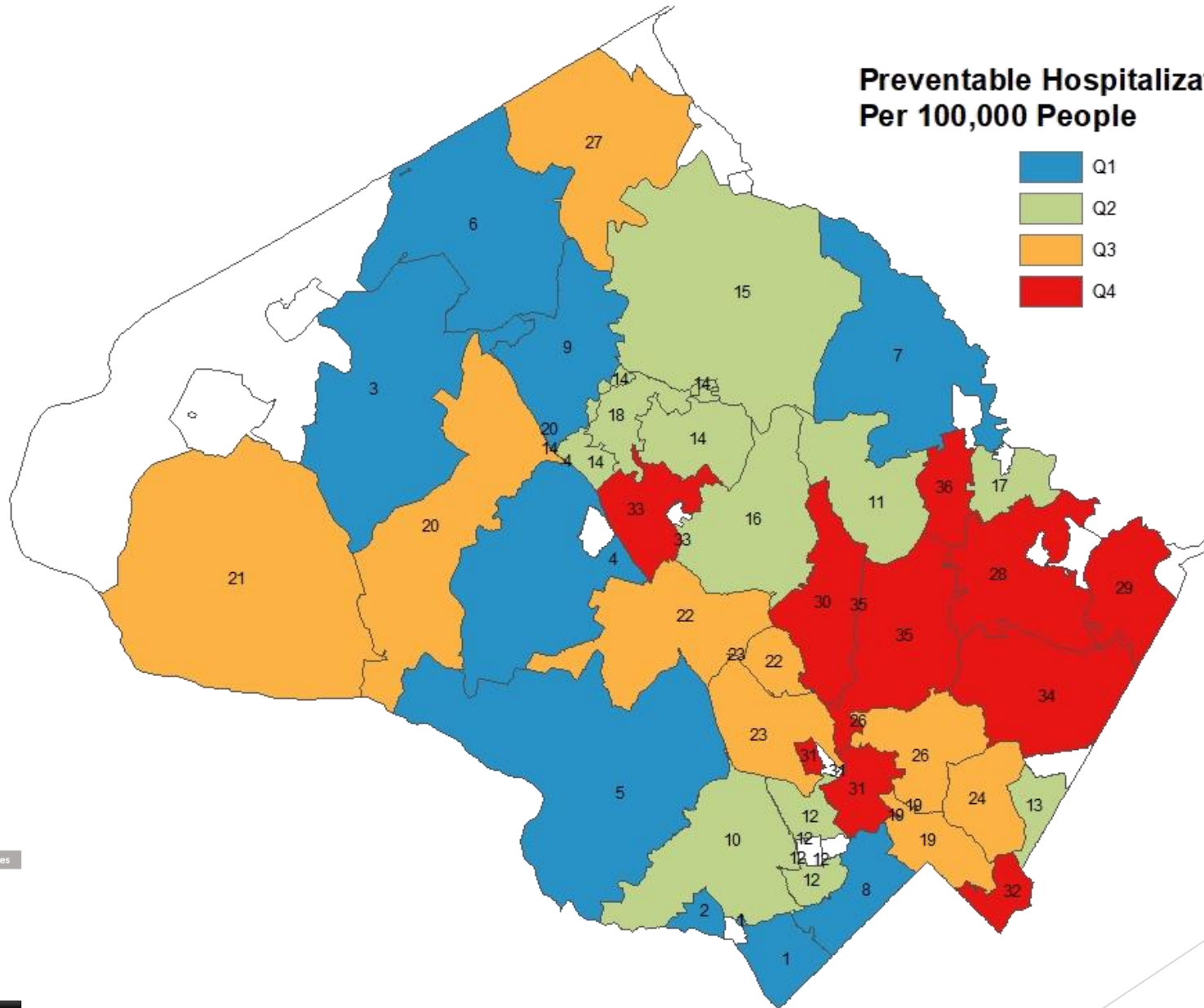
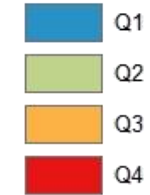
Range: 620.2 – 3,733.5 after-hours visits / 100,000 people
Montgomery County: 2,406.4 after-hours visits / 100,000 people

Percent of Work Force Employed in Health Care Profession



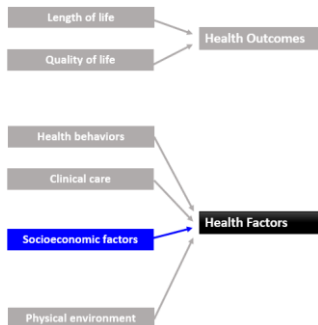
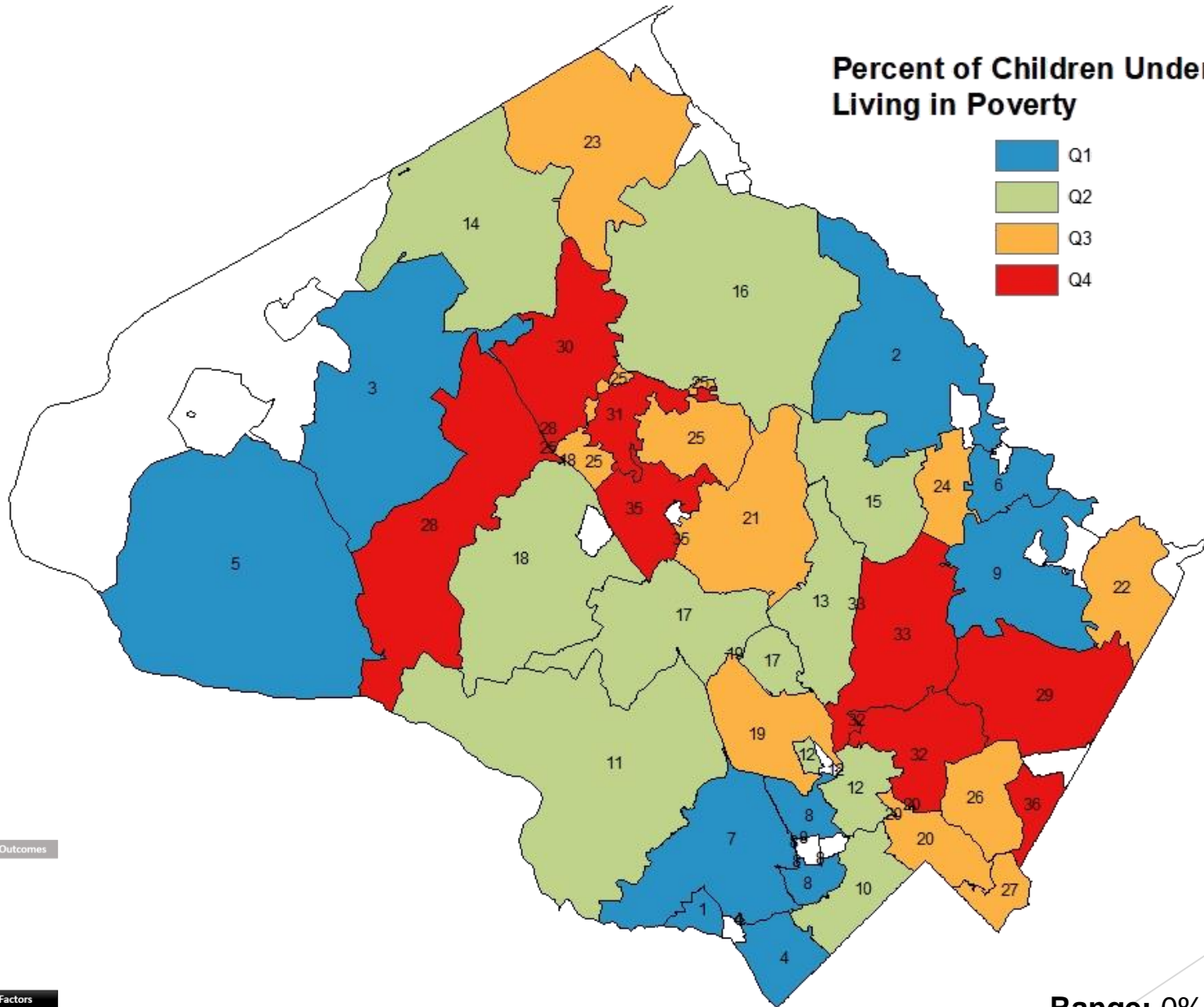
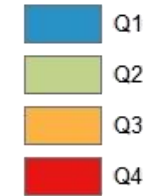
Range: 2.9% - 10.3% of work force is a health care professional
Montgomery County: 5.6% of work force is a health care professional

Preventable Hospitalizations Per 100,000 People



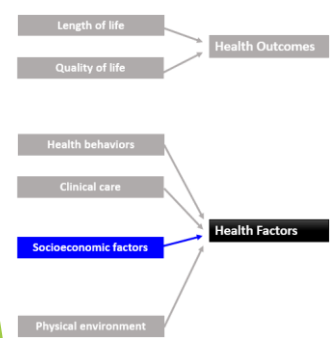
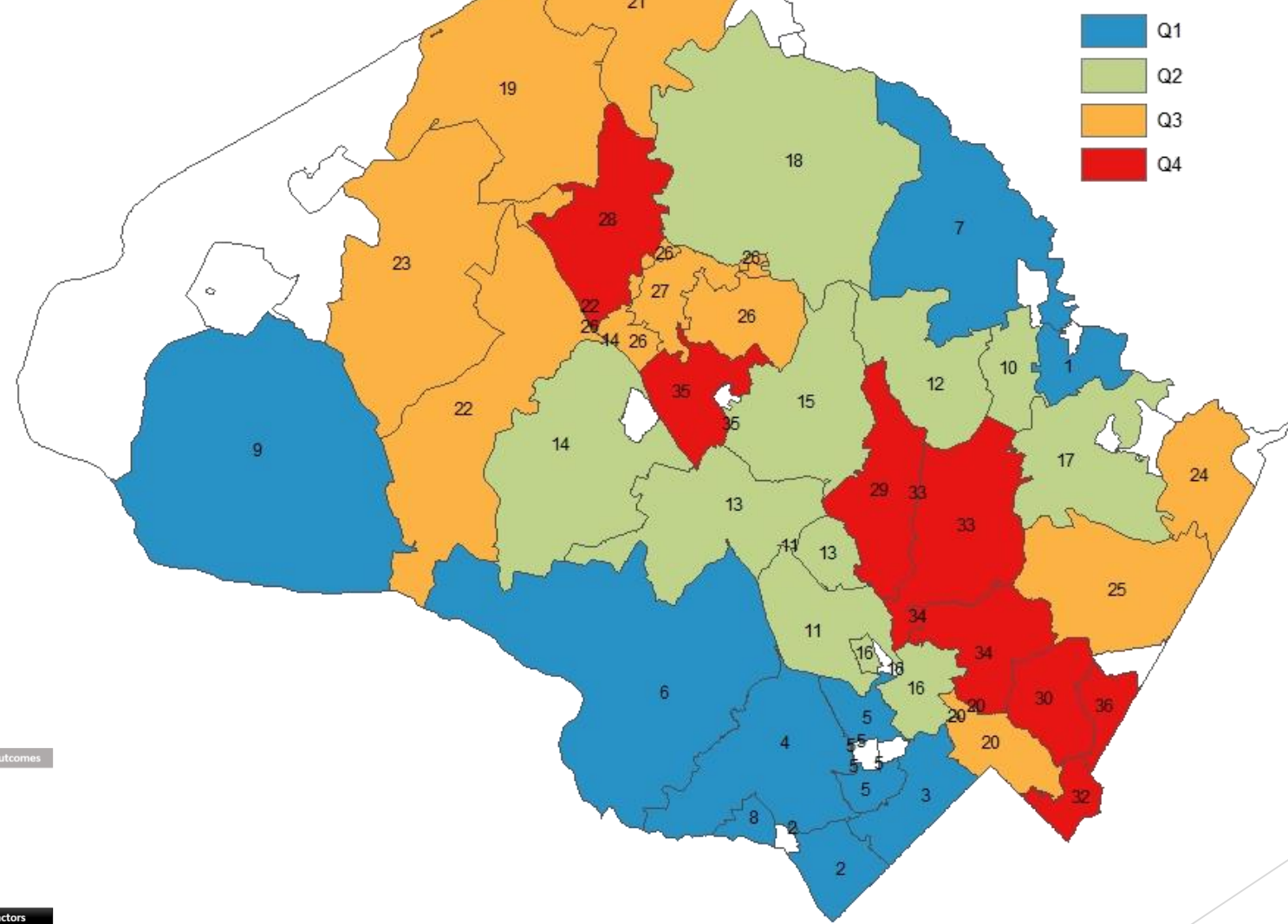
Range: 129.6 – 1,544.6 preventable hospitalizations / 100,000
Montgomery County: 675.9 preventable hospitalizations / 100,000

Percent of Children Under 18 Living in Poverty

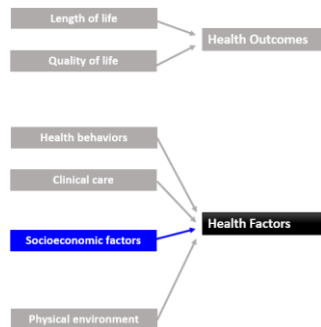
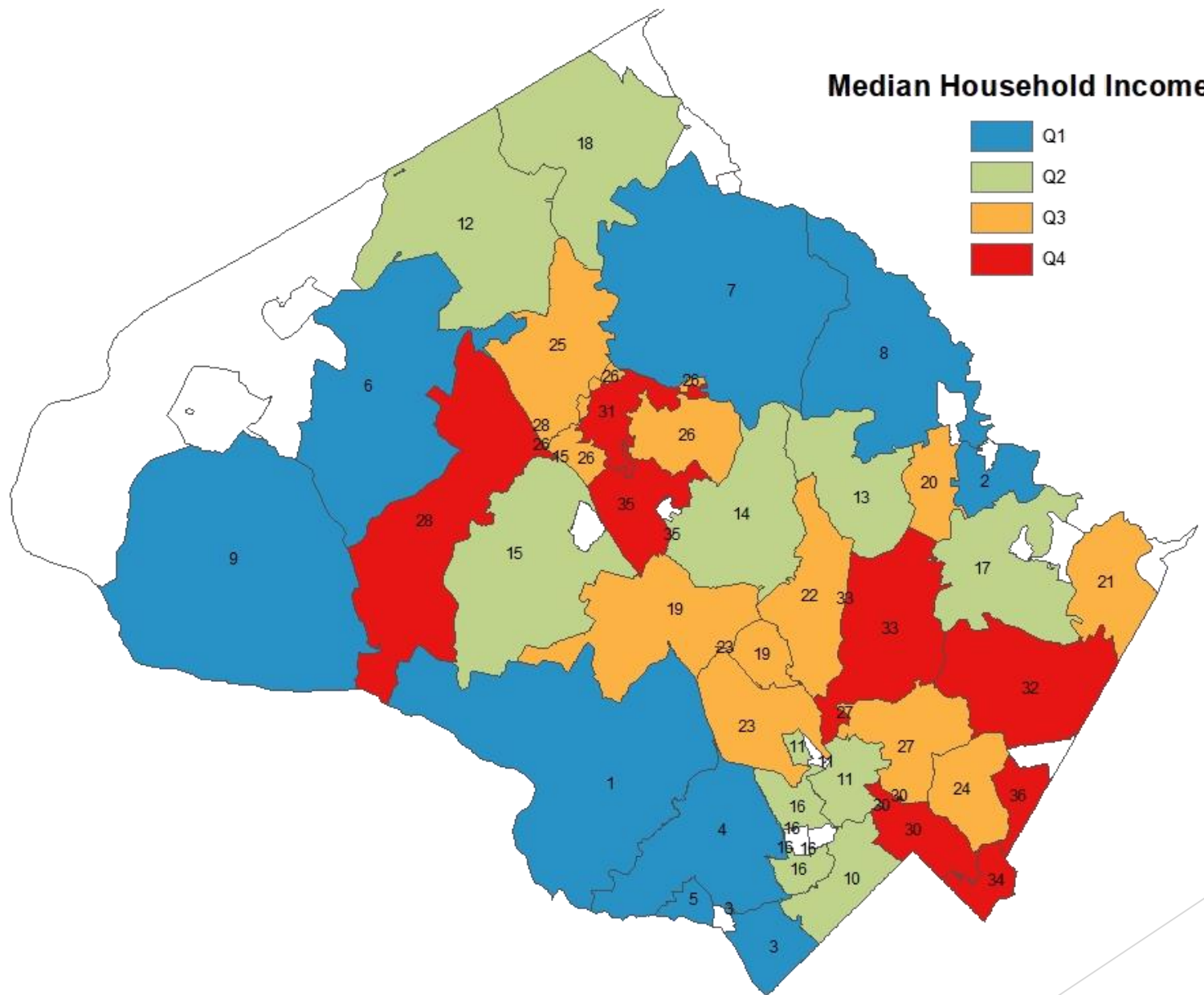


Range: 0% – 20.1% of children live in poverty
Montgomery County: 8.5% of children live in poverty

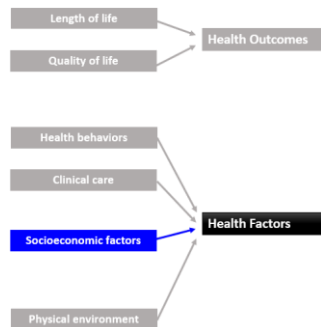
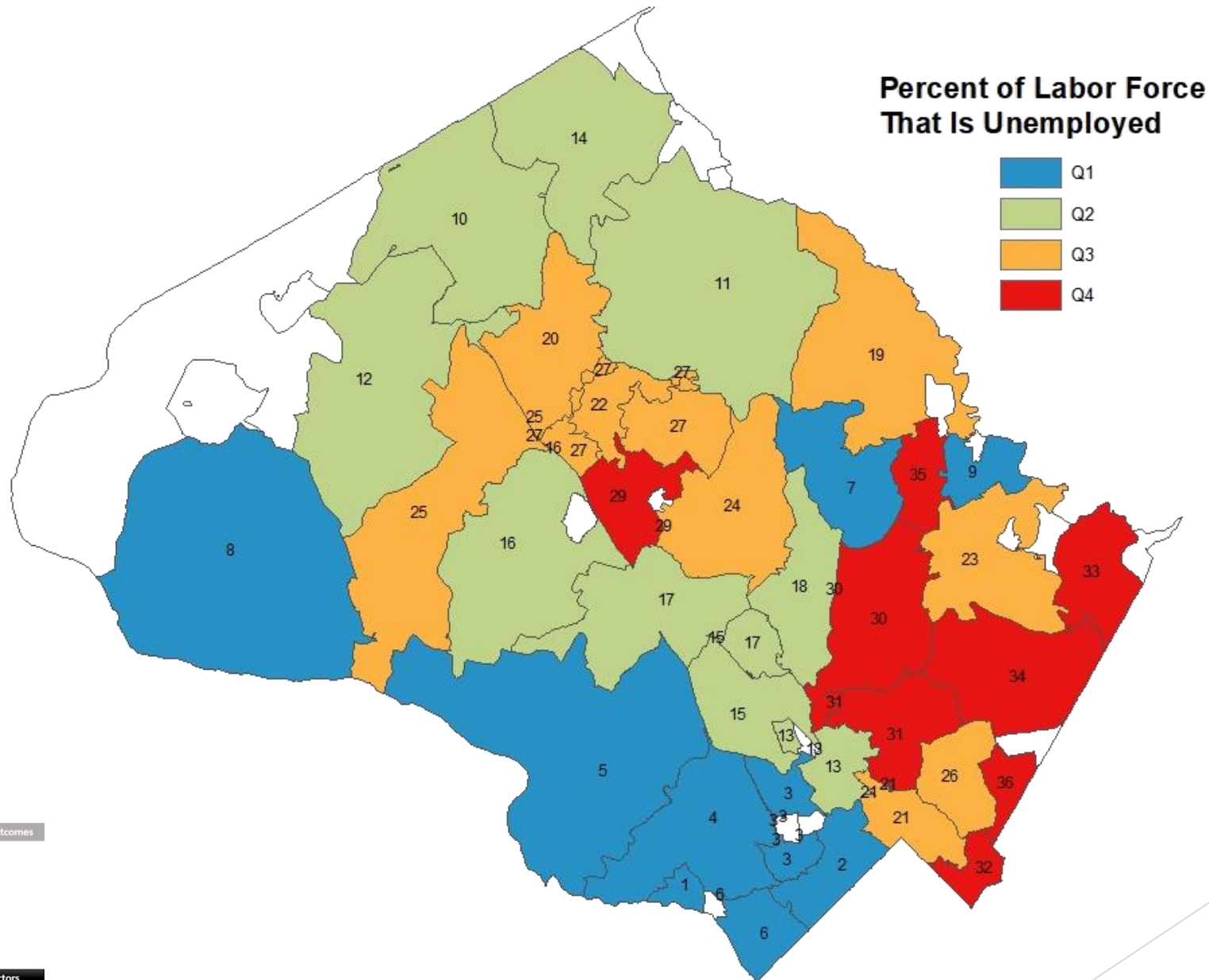
Percent of Population Over 25 Without a High School Diploma



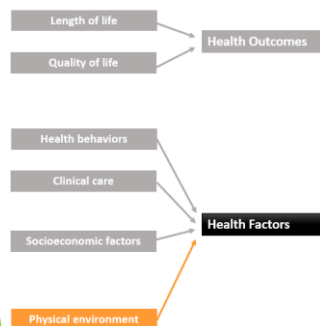
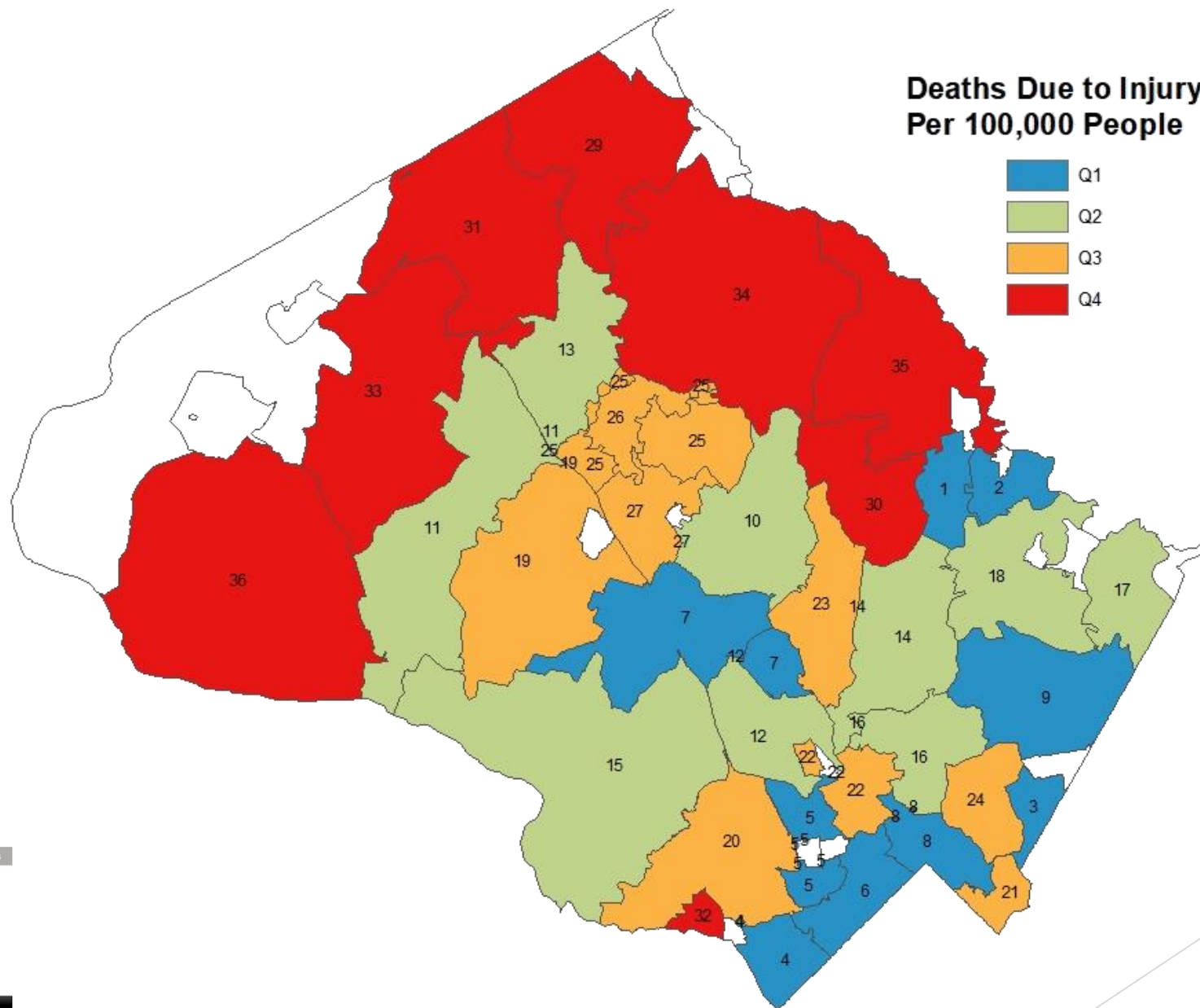
Range: 1.1% - 35.2% of adults over 25 do not have a HS diploma
Montgomery County: 8.8% of adults over 25 do not have a HS diploma



Range: \$58,946 - \$195,114 median annual household income
Montgomery County: \$99,497 median annual household income

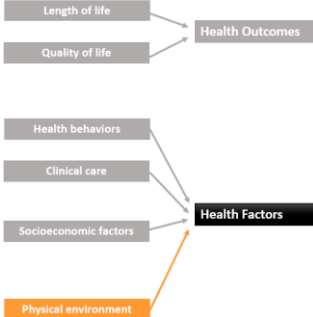
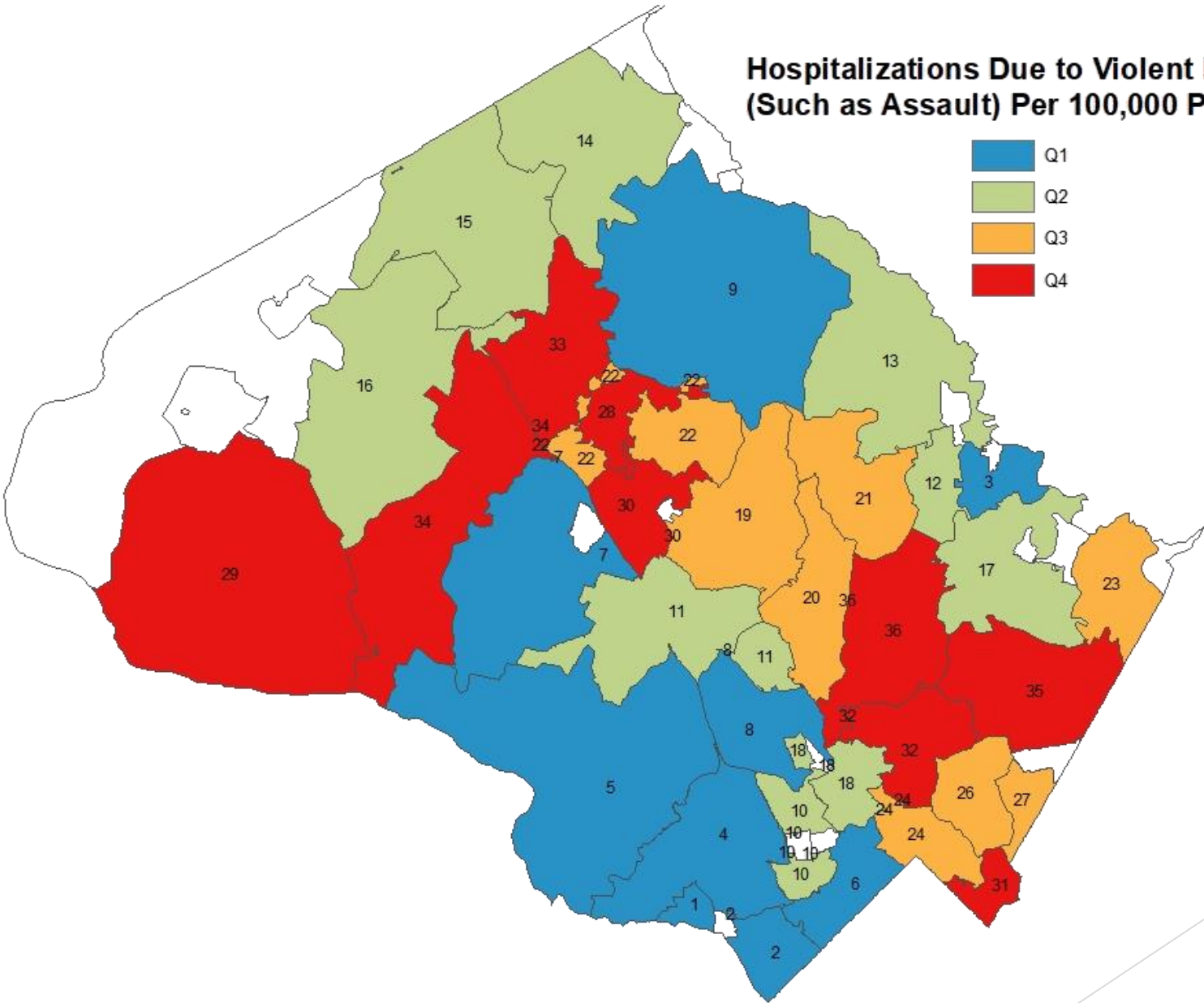


Range: 3.3% - 11.2% unemployment
Montgomery County: 6.1% unemployment



Range: 0 - 84.9 injury deaths / 100,000 people
 Montgomery County: 34.8 deaths / 100,000 people

Hospitalizations Due to Violent Injury (Such as Assault) Per 100,000 People



Range: 17.9 – 248.7 violent injury hospitalizations / 100,000 people
Montgomery County: 157 violent injury hospitalizations / 100,000 people