The Zip Code Ranking Project

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

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“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.”
Montgomery County’s Standing
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
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

Combines:
- Under 75 mortality rate
- Years of productive life lost
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
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
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
Top 5 Zip Codes
1. 20861 - Ashton
2. 20860 - Sandy Spring
3. 20816 - Bethesda
4. 20815 - Chevy Chase
5. 20814 - Bethesda

Bottom 5 Zip Codes
32. 20886 - Montgomery Village
33. 20877 - Gaithersburg
34. 20906 - Aspen Hill
35. 20833 - Brookeville
36. 20837 - Poolesville
Domain Scores and Overall Rank
Results — Health Factor Domain Scores

Combines 4 sub-domains:
- Health Behaviors
- Clinical Care
- Socioeconomic Factors
- Physical Environment
Results — Health Factor Domain Scores

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- Health Behaviors
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Results — Health Factor Domain Scores

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Bottom 5 Zip Codes
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33. 20902 - Wheaton
34. 20906 - Aspen Hill
35. 20877 - Gaithersburg
36. 20903 - Silver Spring
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

Considers all 6 sub-domains:
- Length of Life
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- Health Behaviors
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- Socioeconomic Factors
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Results — Overall Rank

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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 looks at zip codes across the state of Maryland.
- Looks at health holistically and considers how non-medical factors affect health.

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.
<table>
<thead>
<tr>
<th>Rank</th>
<th>Zip Code</th>
<th>Location</th>
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<tbody>
<tr>
<td>1</td>
<td>20816</td>
<td>Bethesda</td>
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<td>Bethesda/Chevy Chase</td>
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<td>Gaithersburg (Old Town)</td>
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<td>20837</td>
<td>Poolesville</td>
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INDIVIDUAL MEASURES FOLLOW
Range: 104 – 290 deaths / 100,000 people

Montgomery County: 184 deaths / 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
Range: 2.4% - 9.3%
Montgomery County: 7.3%
Range: 765 – 2,836 hospitalizations / 100,000 people
Montgomery County: 1,774 hospitalizations / 100,000 people
Range: 41.1 – 407.1 STIs per 100,000 people
Montgomery County: 271.6 STIs per 100,000 people
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
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
Range: 129.6 – 1,544.6 preventable hospitalizations / 100,000

Montgomery County: 675.9 preventable hospitalizations / 100,000
Range: 0% – 20.1% of children live in poverty

Montgomery County: 8.5% of children live in poverty
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
Montgomery County: 34.8 deaths / 100,000 people
Range: 17.9 – 248.7 violent injury hospitalizations / 100,000 people
Montgomery County: 157 violent injury hospitalizations / 100,000 people