

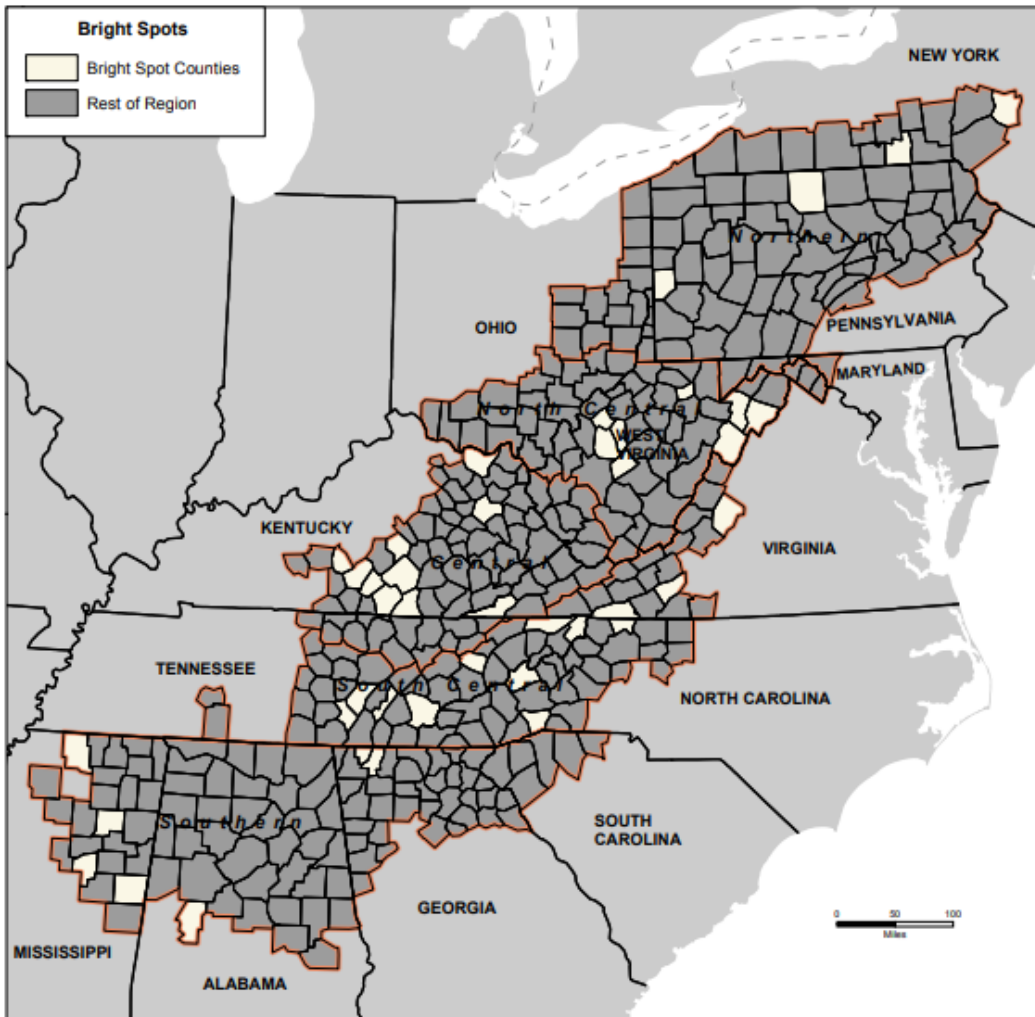
Appalachian “Bright Spots” and COVID-19

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What is a “Bright Spot”?

In 2018, a multi-part health research project, “Creating a Culture of Health in Appalachia: Disparities and Bright Spots”, sponsored by the Robert Wood Johnson Foundation (RWJF) and the Appalachian Regional Commission (ARC), explored health issues in Appalachia¹. The project used a regression analysis to score each of the Appalachian Region’s 420 counties on a cross-section of health indicators. The analysis identified “Bright Spots,” 42 counties with better-than-expected outcomes, given their characteristics and resource levels. The following brief entails findings from a small research project that looked at the impact of the COVID Pandemic on these Bright Spot counties.

Figure 1—Map of Bright Spot Counties in Appalachia



Source: *Identifying Bright Spots in Appalachian Health: Statistical Analysis.*²

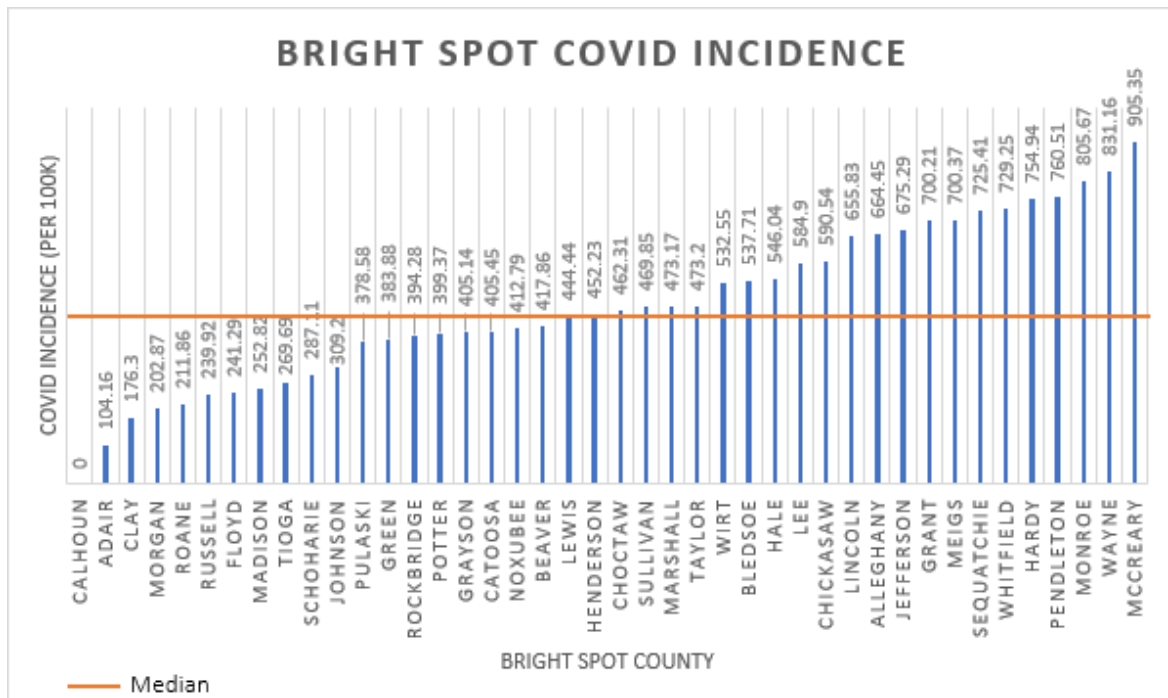
How is COVID Affecting Bright Spots?

When compared, Bright Spots tended to have lower COVID Incidence per 100,000 population than other Appalachian counties. At the end of 2020, Bright Spot counties were 34.8 percent less likely to have above median COVID incidence than their other Appalachian counterparts (OR: 0.652)³. Metropolitan Bright Spots fared better than their non-metropolitan counterparts.

Analysis

Figure 2 below shows COVID incidence among the Bright Spots. Incidence was measured as the total reported new COVID cases or deaths, over a 7-day period, per 100,000 population, providing a “snapshot” of county COVID health status⁴. Due to the left-skewed distribution, we found it more appropriate to use the median COVID incidence (457.3 cases per 100,000 population) as our measure of central tendency. Median COVID incidence of all 420 Appalachian counties was 484.5 cases per 100,000 population.

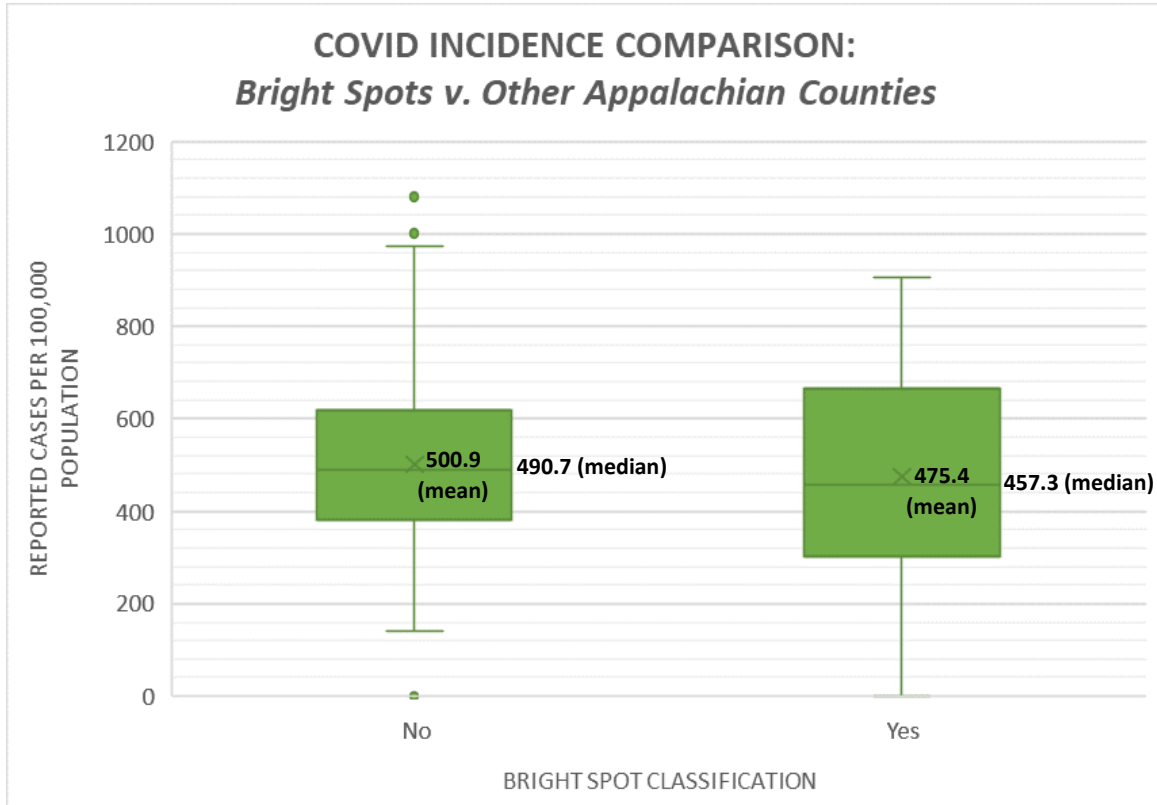
Figure 2—Bright Spot Coronavirus Incidence per 100,000 Population, 12.24.2020-12.31.2020



Source: CDC COVID Data Tracker.⁴

Comparison of COVID Incidence in the 42 Bright Spots to the remaining 378 Appalachian counties, showed COVID Incidence among Non-Bright Spot Counties is more widely distributed (Fig.3). Also, as demonstrated by the box plots, average and median COVID Incidence among these counties is higher than among the Bright Spot counties. Bright Spot counties were 34.8 percent less likely to have above median COVID incidence than their other Appalachian counterparts. Again, these Bright Spots behaved true to their classification.

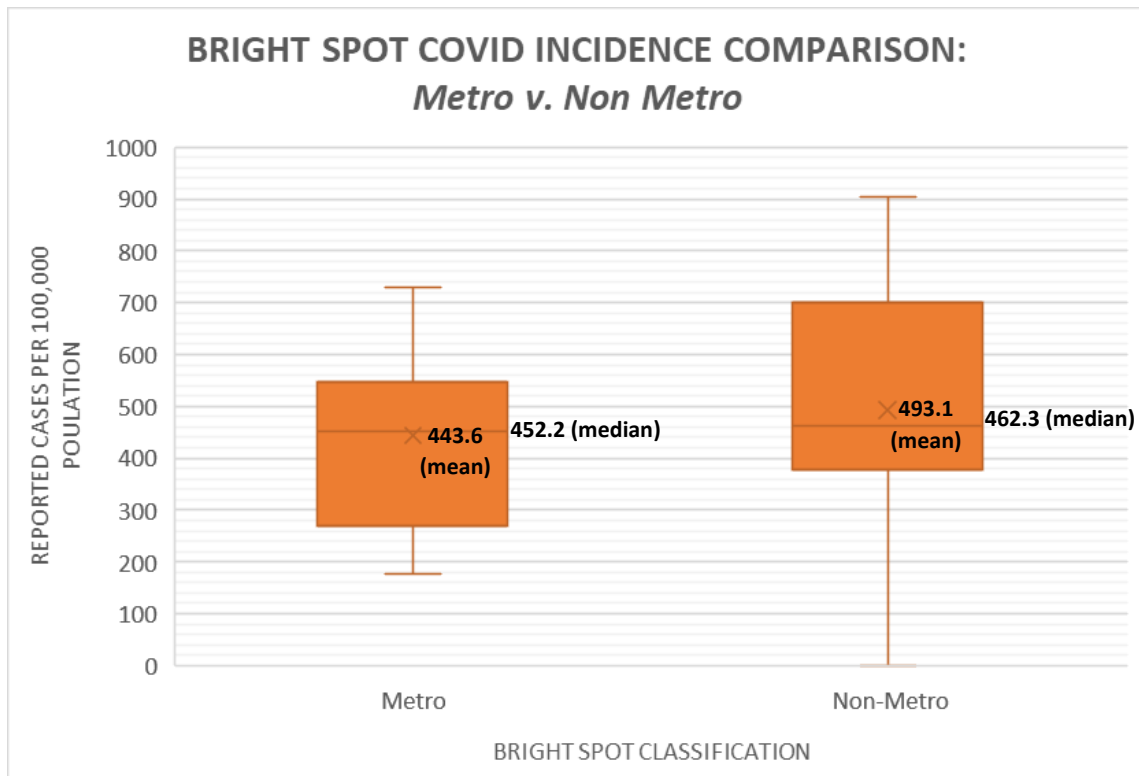
Figure 3—COVID Incidence Comparison, Bright Spots v. Other Appalachian Counties



Sources: Identifying Bright Spots in Appalachian Health: Statistical Analysis, Appendix C, Table 14: Euclidean Distances: Appalachian Counties to Best Bright Spot Match, and CDC COVID Data Tracker⁴.

Among the Bright Spots, metropolitan counties outperformed nonmetropolitan counties. Metropolitan Bright Spot counties were 18.7 percent less likely to have above median COVID incidence than non-metropolitan Bright Spot Counties (OR: 0.813). COVID Incidence in non-metropolitan Bright Spots has a wider range, from 0 to 905.4 cases per 100,000, and a larger mean (Fig.4). This may reflect metropolitan counties’ access to more resources, such as internet and transportation.

Figure 4— Bright Spot COVID Incidence Comparison, Metropolitan v. Non-Metropolitan Counties

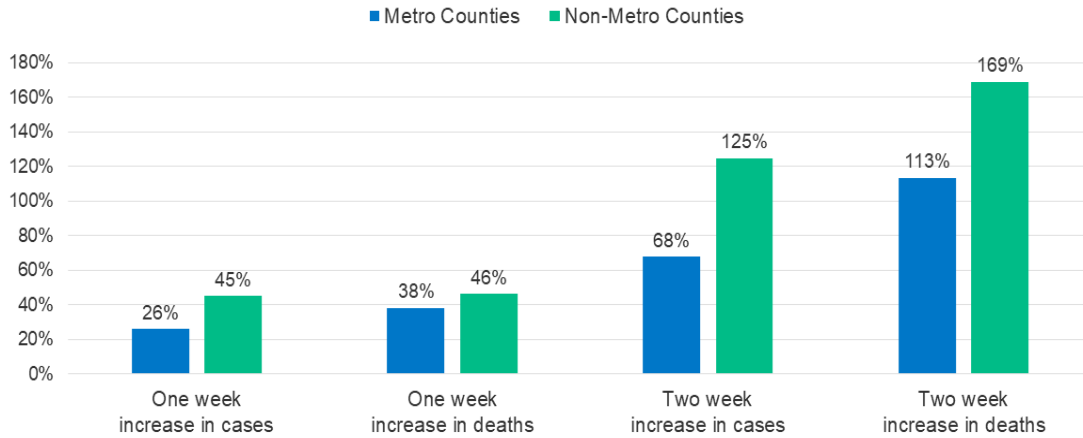


Source: CDC COVID Data Tracker.⁴

Bright Spot counties with above median COVID incidence were 2.2 times more likely to have above median population density than Bright Spot counties with below median COVID incidence (OR: 2.20). A study done by a researcher at the Johns Hopkins Bloomberg School of Public Health suggests population density is not linked to higher COVID infection rates⁵. In fact, the study found population “dense areas were associated with lower COVID death rates⁵.” While population *density* is not directly linked to COVID infection rates, the Johns Hopkins study submits the larger the *absolute population* in a metropolitan area, the higher incidence of infection. Population size, however, was not associated with COVID incidence in the Bright Spot Counties ($r^2= 0$).

National statistics for metropolitan and non-metropolitan counties were slightly different. According to a report from the Kaiser Family Foundation, as of May 14, 2020, Coronavirus Cases and Deaths in non-metropolitan counties were increasing faster than metropolitan counties nationwide (Fig.5)⁶. However, the reported difference in number of COVID deaths per case was the opposite. There were more deaths per case in metropolitan than non-metropolitan counties (4.2% in comparison to 3.8%)⁶. This is principally due to variances in COVID infection rates⁶.

Figure 5—Rate of Increase in Coronavirus Cases and Deaths Nationwide, May 14, 2020



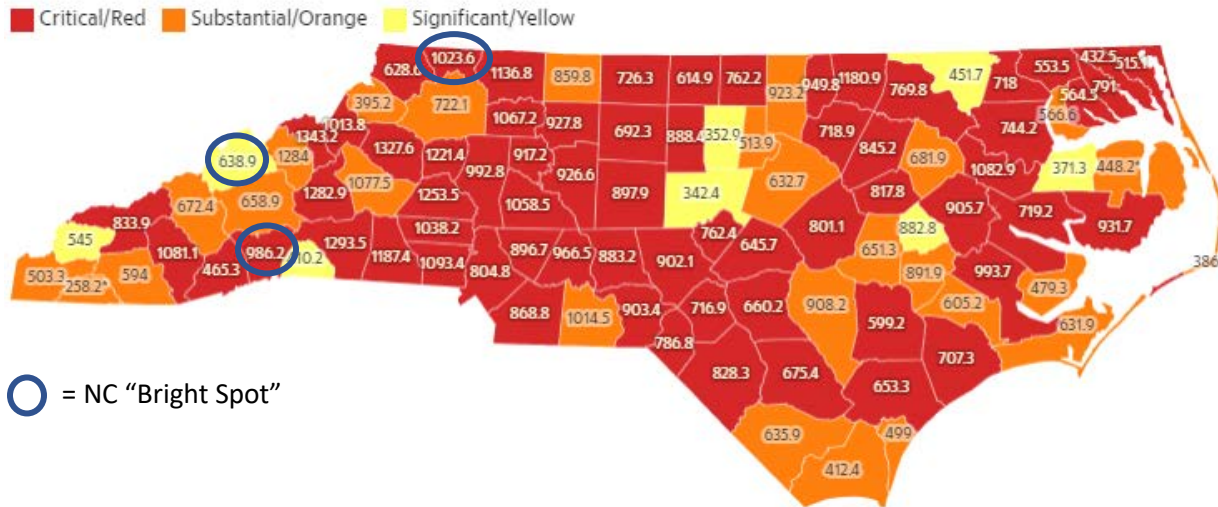
Note: Data are as of May 14, 2020. COVID cases and deaths not assigned to a county are excluded.

Source: Center for Systems Science and Engineering (CSSE) at Johns Hopkins University, US Census Bureau, Federal Office of Rural Health Policy. Reported by the Kaiser Family Foundation⁶.

North Carolina Comparison

North Carolina uses a three-color map system to rank county COVID risk. Figure 6 shows a December 2020 map listing 65 critical, or “red”, counties that had 200 new COVID cases per 100,000 people in a two-week span.

Figure 6—COVID-19 County Alert System, Originally Published by NC DHHS 12.22.2020



Note: The number displayed is the case rate per 100,000 population for the time period between December 5, 2020 and December 18, 2020.

Source: Fowler, H., 2020. “Here are the 20 North Carolina counties now in the state’s coronavirus ‘red’ zone.” *The News & Observer*. <https://www.newsobserver.com/news/coronavirus/article247376534.html>, Accessed 12.31.2020

Among the 65 “red” counties are 2 of the 3 North Carolina Bright Spots, Alleghany and Henderson Counties. These non-metropolitan counties rank 18th and 23rd for the highest number of COVID cases per 100,000 population over a 14-day period in the state⁷. However, both counties report low hospital impact⁷.

Discussion

Bright Spots' Performance

By the end of 2020, states that comprise the Appalachian region have some of the highest COVID incidence in the country. In comparison to the other 378 Appalachian counties, Bright Spots had overall lower incidence of COVID infection. Subsequent research designed to compare Bright Spots directly to proximity matched counties could assist in determining what can be learned from these healthier-than-expected communities. Also, further analysis should be conducted to determine which attributes of Bright Spot communities are associated with their COVID outcomes. Results of such analysis could be beneficial in creating disaster plans for rural communities and informing future responses to widespread health crises.

Issues in Non-metropolitan Counties

Rural counties tend to have less hospital capacity, older populations, and a higher proportion of residents with underlying health conditions⁶. Therefore, they face bigger challenges in the midst of the COVID pandemic. Nationally, non-metropolitan counties are experiencing faster occurrence of COVID infection and fatalities⁶. Jurisdictional-level analysis of COVID-incidence is critical for understanding community risk and transmission of COVID and making decisions regarding strategic health care resource allocation. This is especially important in an already underserved area, such as rural Appalachia.

True to form, non-metropolitan Bright Spot counties had higher COVID incidence than metropolitan Bright Spot counties. Literature suggests population density is not correlated with higher COVID infection rates, which may be attributed to denser counties having better developed and more accessible health systems. Divergent from the literature, Bright Spot counties with highest COVID incidence were also the most densely populated. Bright Spots with higher COVID incidence are not more populous. Thus, Bright Spot Counties' population size does not account for the deviation from the literature. It is worth noting that in-migration from workers in the Bright Spot counties was not considered in any calculations. Additional research aimed towards discovering the association between COVID incidence and population in Appalachia is needed to further explain this narrative in the context of Bright Spot counties.

¹ Marshall, J. L., Thomas, L., Lane, N. M., Holmes, G. M., et al. (2017, August). *Health Disparities in Appalachia* (Rep. No. 1). Retrieved December 31, 2020, from https://www.arc.gov/wp-content/uploads/2020/06/Health_Disparities_in_Appalachia_August_2017.pdf

² Holmes, G. M., Lane, N. M., Holding, W., Randolph, R., et al. (2018, July). *Identifying Bright Spots in Appalachian Health: Statistical Analysis* (Rep. No. 2). Retrieved December 31, 2020, from <https://www.arc.gov/wp-content/uploads/2020/06/BrightSpotsStatisticalAnalysisJuly2018.pdf>

³ Odds Ratios (“ORs”) are statistics that quantify the odds that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. ORs above 1 indicate the specified exposure is associated with higher odds of the outcome occurring. Odds ratios below 1 indicate the opposite.

⁴ CDC COVID Data Tracker, County-Level data for the time period 12.24.2020-12.31.2020, Retrieved 12.31.2020 from <https://covid.cdc.gov/covid-data-tracker/#county-view>

⁵ Kempler, C. (2020, June 18). *Urban Density Not Linked to Higher Coronavirus Infection Rates - and Is Linked to Lower COVID Death Rates*. Retrieved December 30, 2020, from <https://www.jhsph.edu/news/news-releases/2020/urban-density-not-linked-to-higher-coronavirus-infection-rates-and-is-linked-to-lower-covid-19-death-rates.html>

⁶ Rachel Fehr, J. (2020, May 21). *COVID in Rural America – Is There Cause for Concern?* Retrieved December 30, 2020, from <https://www.kff.org/coronavirus-covid-19/issue-brief/covid-19-in-rural-america-is-there-cause-for-concern/>

⁷ County Alert System. (n.d.). Data shown is for the time period 12.5.2020-12.18.2020. Retrieved December 31, 2020, from <https://covid19.ncdhhs.gov/dashboard/county-alert-system>