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# Oregon Community Internet Access Report

https://github.com/ethanheine/community-internet-access

## Introduction

Access to high-speed internet has become a necessity in modern society. It facilitates remote work and learning, enables online business and entertainment, and connects individuals and communities across geographic boundaries. However, not all areas have equal access to this critical resource. In this revamped landscape since COVID-19, people rely on stable internet connectivity to either join meetings with coworkers remotely or deliver daily classroom experiences via Zoom. Potential disruptions and connectivity issues threaten to undermine the effectiveness of a remote workplace or classroom. As such, access to stable and fast internet has emerged as a critical measure of inequality in our society. Rural areas in particular often face challenges when it comes to internet connectivity. These disparities can have significant consequences, both for individuals who lack reliable access to the internet and for communities as a whole.

To better understand the extent of this issue, this report will analyze data on internet access in Oregon counties, with a focus on rural vs. urban areas. The results reveal inequalities in internet performance, with rural populations disproportionately affected by poor-quality internet. In fact, rural Oregon counties experienced median download speeds of less than 25 Mbps, leading to slow streaming, downloading, browsing, and poor connections on video conferencing.

The implications of these findings are significant, highlighting the urgent need to address disparities in internet access and quality to ensure similar access to all citizens of all communities.

**Data and Methods**

For this project, I utilized a few sources of data to analyze internet access and connectivity in Oregon. I first needed to obtain data that describes internet speeds and access, which can tend to be difficult as internet service providers (ISPs) do not always provide open access to their true data. Instead, data relating to internet performance in this project comes from Ookla, a company that offers online internet speed tests. Ookla collects data from millions of users around the world who use its speed testing tool and aggregate this data to provide comprehensive insights into internet performance across different locations and service providers. Ookla's data was extremely useful in providing detailed information for this topic, as their data is easily available to the public through the company's GitHub repository. The data from Ookla are presented in survey areas at the 1x1 km level, in squares or 'tiles.

Accounting for hundreds of millions of speed tests, Ookla's data covers the entire globe, but I wanted to focus solely on the state of Oregon in this analysis. To filter this data, I imported the downloaded shapefile into a Jupyter Notebook as a GeoDataFrame using the Python library Geopandas. This data was parsed to only include Oregon, as I performed a spatial join between the dataset and an Oregon county boundary shapefile obtained through the US Census Bureau. I also matched the tiles to their respective census tracts, which is a detailed geographic area for analyzing population characteristics and trends.

In addition to the Ookla speed test data, I used data from the National Telecommunications and Information Administration's (NTIA) publicly available map of

broadband need indicators. This map provides a comprehensive overview of broadband access and availability across the United States. The map allows users to view broadband availability data at the county and census tract levels and provides information on the percentage of households with access to broadband at different speeds. This resource used data from the American Community Survey (ACS), Ookla, Measurement Lab (M-Lab), and a few others. Data used in the map is publicly available via a CSV file that provides county and census tract level data. In order to filter the data to only include Oregon and calculate statistics on internet speeds in different communities I downloaded the CSV file and imported it into a Jupyter Notebook file.

To analyze the data from the NTIA map, I used the following Python libraries in my analysis: Geopandas, Pandas, and Matplotlib. I first needed to obtain county data from the Census Bureau and filter the counties to only include Oregon. Next, I imported the NTIA CSV file containing internet speed data and ACS information on the county level. This dataset included a state column, so I was able to filter the counties down to Oregon counties. In order to merge the county data from the Census with the NTIA data, I used the Pandas merge tool and matched the two datasets using county FIPS codes. Finally, to get geographic information about the dataset, I converted the data frame into a geodataframe using the newly added 'geometry' column. I also went ahead and downloaded the NTIA CSV file containing data on the census tract level, in which I merged it with the Oregon tract data using similar steps as the county level. Using these two geodataframes for county level and census tract level data on internet connectivity and performance, I was able to calculate statistics and create map visualizations of the data.

After gathering statistics on this data, I wanted to add data that indicated whether these counties were in urban or rural communities. I found the best source of this data was from the

US Department of Agriculture (USDA), where they provide a XLS document of 'Rural-Urban Continuum Codes'. This dataset lists every county in the United States and assigns it a number from 1 through 9 to indicate its community type. For example, a number assigned 1 through 3 indicates that it is a metropolitan county, while a number assigned 8 or 9 indicates a completely rural area. I converted this file into a CSV and imported it into the notebook, where I filtered the data to only Oregon counties. I cleaned the data to create matching county FIPS codes columns to merge the datasets on internet information at the county level and the rural urban codes. By merging the two datasets, I was able to add the rural urban codes to the counties geodataframe. Using this new data, I was able to filter to include only urban/metropolitan areas, as well as filter to include only rural counties.

The various data sources and methods used in this analysis helped produce statistics and visualizations to better understand internet access and connectivity in Oregon. In the following section, I will present the findings and discuss the implications of these results for to improve internet access and connectivity in the state of Oregon.

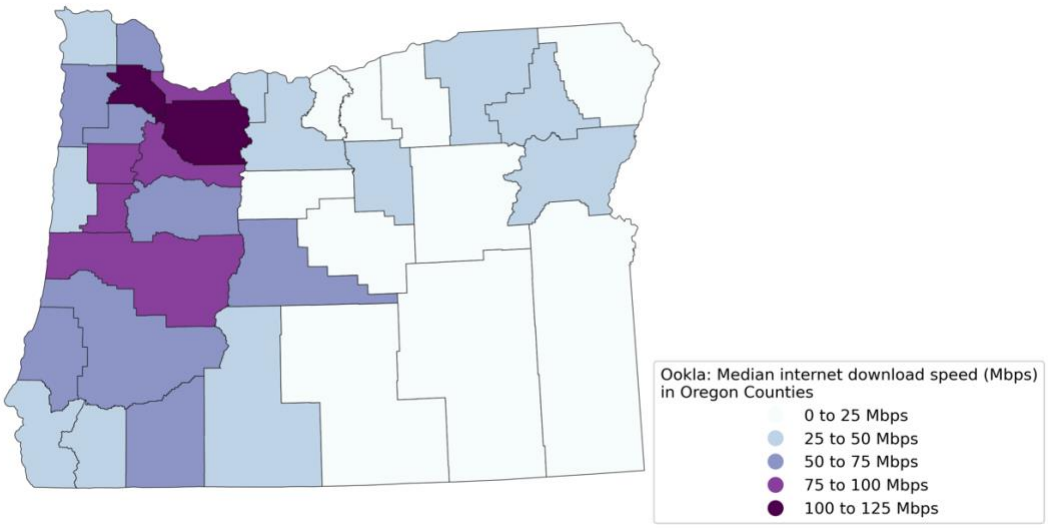
**Results**

The 36 counties in the state of Oregon had an average median download speed of 48 Mbps. Overall, this is not a bad performance speeds as the usual threshold for quality internet is 25 Mbps, but this data is skewed as it is inflated by counties with very high speeds and deflated by counties with very low speeds (below 25 Mbps threshold). The following figure shows the breakdown of counties from fastest to slowest, with their Ookla median download speed in Mbps.

| Name | Ookla Median Download Speed (Mbps) |
|---|---|
| Washington County | 107.811997 |
| Clackamas County | 101.217003 |
| Multnomah County | 99.085999 |
| Polk County | 88.588997 |
| Marion County | 84.906998 |
| Benton County | 81.684998 |
| Lane County | 77.870003 |
| Linn County | 71.089996 |
| Jackson County | 68.585999 |
| Douglas County | 65.352997 |
| Yamhill County | 65.046997 |
| Coos County | 57.354000 |
| Columbia County | 55.771000 |
| Tillamook County | 53.567001 |
| Deschutes County | 52.459999 |
| Umatilla County | 46.659000 |
| Wasco County | 44.430000 |
| Lincoln County | 43.985001 |
| Curry County | 40.606998 |
| Klamath County | 40.120998 |
| Clatsop County | 38.249001 |
| Union County | 34.307999 |
| Josephine County | 33.472000 |
| Hood River County | 32.292000 |
| Wheeler County | 31.948000 |
| Baker County | 25.309999 |
| Grant County | 22.599001 |
| Crook County | 22.476000 |
| Lake County | 22.361999 |
| Gilliam County | 22.056999 |
| Morrow County | 20.951000 |
| Sherman County | 20.372000 |
| Jefferson County | 19.301001 |
| Malheur County | 18.507999 |
| Wallowa County | 14.074000 |
| Harney County | 9.743000 |

*1 Oregon counties sorted from fastest to slowest by median download speeds (Mbps)*

Evident in the table, the data has extreme highs and lows, with Washington County, the second most populous county in Oregon, ranks first with median download speeds of 107 Mbps. At the bottom of the list, 10 counties are listed with less than the 25 Mbps threshold, with Harney County, the sixth-least populous county in Oregon, ranking at the bottom with a median download speed of 9 Mbps. Below is map of the counties, with the darker shaded counties representing the fastest internet performance.




*2 Map of Oregon counties and their median internet speeds (Mbps)*

The map above shows how many of the Eastern Oregon counties with very rural communities tend to have the lowest internet performance, often ranging below 25 Mbps. After analyzing this dataset, I added the rural-urban codes to the dataset and found the counties that are labeled as strictly rural had an average median download speed of 22 Mbps. Contrasted to the counties labeled as metropolitan, where the average median download speed is 76 Mbps.

In addition to median download speeds, the datasets also included data from the ACS, such as income-level statistics and percent of households that have no internet access. In rural areas, 16% of households do not have internet access, and 13% have an income level that is below the poverty line. While urban areas have a similar percentage of household with an income level below the poverty line of 12%, they have a much lower percentage of households with no internet access at 8%.

**Discussion/Conclusion**

These statistics show that while certain people may be in the same income demographic, their geographic location decides what kind of access they have to certain services, such as internet services where it seems to be more accessible in urban areas compared to rural areas. Then, when

we compare the performance of the internet services, we see that urban areas perform at a much better rate than the rural areas, where their download speeds are drastically faster. These results are important because they provide evidence of geographic inequality between rural and urban areas in regard to internet access and performance when the threshold is above many of the rural areas averages. The findings highlight the urgent need for action to address the digital divide and promote more equitable access to high-quality internet services across the state. This may include targeted investments in broadband infrastructure in these rural areas and efforts to improve digital literacy and technology adoption rate. Ultimately, achieving universal access to high-speed internet is critical for promoting economic growth in the digital age we are living in where everything is connected. It is essential that policymakers and other stakeholders work together to address the geographic inequalities highlighted in this report and promote a more connected future for Oregon as an example for the other rural areas in the country.