

# Gauging the Digital Readiness of Nebraska Households

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Prepared by  
**Roberto Gallardo, Ph.D.**  
**Charlotte Narjes**  
**Rebecca Vogt**

Purdue Center for Regional Development  
University of Nebraska-Lincoln  
University of Nebraska-Lincoln



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## Contents

|  |    |
|--|----|
| Executive Summary  | 3  |
| Introduction   | 4  |
| Methodology  | 5  |
| Table 1. List of Organizations Sharing Survey Information  | 5  |
| Table 2. Socioeconomic Characteristics State of Nebraska and Survey Sample                         | 6  |
| Results  | 7  |
| Socioeconomic Characteristics  | 7  |
| Table 3. Digital Readiness Responses by County Type  | 7  |
| Table 4. Percent Responses by Age Groups   | 7  |
| Table 5. Percent Responses by Educational Attainment   | 8  |
| Table 6. Percent Responses by Household Income   | 8  |
| Table 7. Percent Responses by Race/Ethnicity and County Type                                       | 8  |
| Table 8. Percent Responses by Occupation and County Type   | 9  |
| Table 9. Percent Responses with Children in the Household by County Type                           | 9  |
| Table 10. Percent Responses Inside or Outside City Limits by County Type                           | 10 |
| Device & Internet Access   | 10 |
| Figure 1. Device Performance by County Type, Poorly or Very Poorly (Percentage)                    | 10 |
| Figure 2. Device Non-Ownership by County Type (Percentage)   | 11 |
| Figure 3. Number of Days without Internet by County Type (Percentage)                              | 12 |
| Figure 4. Number of Days with Smartphone Issues by County Type (Percentage)                        | 12 |
| Figure 5. Device Used to Connect to the Internet at Least Once Monthly by County Type (Percentage) | 13 |
| Figure 6. Percent of Time Accessing the Internet by Location and County Type (Average Percentage)  | 14 |
| Figure 7. Responses Reporting 50% or More of Mobile Data to Access the Internet by County Type     | 15 |
| Figure 8. Device & Internet Access Scores by County Type   | 16 |
| Digital Resourcefulness & Utilization  | 17 |
| Figure 9. Digital Resourcefulness by County Type, Somewhat/Very Well (Percentage)                  | 17 |
| Figure 10. Rarely/Never Responses by County Type (Percentage)                                      | 18 |
| Figure 11. At least Once Monthly Interactions of Households by County Type (Percentage)            | 19 |
| Figure 12. Percent Responses Using Internet Applications at Least Once Monthly by County Type      | 20 |
| Figure 13. Percent Responses Using Internet Applications at Least Once Monthly by County Type      | 21 |

|  |    |
|--|----|
| Figure 14. Percent Need to Learn Responses by County Type                                    | 22 |
| Figure 15. Average Internet Use by Frequency by County Type                                  | 23 |
| Figure 16. Average Internet Utilization Score by County Type                                 | 24 |
| Figure 17. Average Internet Utilization Score by Type and County Type                        | 25 |
| Figure 18. Digital Readiness & Utilization Scores by County Type                             | 26 |
| Internet Benefits & Impacts  | 27 |
| Figure 19. Percent Responses Earning Money Online by Selling by County Type                  | 27 |
| Figure 20. Percent Responses Earning Money Online by Freelance or Online Gigs by County Type | 28 |
| Figure 21. Percent Responses Earning Money Online by Rentals by County Type                  | 28 |
| Figure 22. Percent Responses Saving Money Online by Bargains & Coupons by County Type        | 29 |
| Figure 23. Percent Responses Saving Money Online by Price Matching by County Type            | 30 |
| Figure 24. Percent Responses Saving Money Online by Driving Less by County Type              | 30 |
| Figure 25. Percent Responses Saving Money Online on Health Insurance by County Type          | 31 |
| Figure 26. Percent Responses Saving Money Online on Health Care by County Type               | 31 |
| Figure 27. Percent Responses Regarding Promotions Due to Online Activities by County Type    | 32 |
| Figure 28. Percent Responses Regarding Jobs Due to Online Activities by County Type          | 33 |
| Figure 29. Internet Benefits & Impact Scores by County Type                                  | 34 |
| Conclusions  | 35 |
| Figure 30. DIA, DRU, IBI, & DRI Scores by County Type  | 36 |
| Appendix A   | 38 |
| Appendix B   | 41 |
| Figure A2.1. DIA, DRU, IBI, & DRI Scores by County Type                                      | 41 |
| Figure A2.2. DIA, DRU, IBI, & DRI Scores by Household Income                                 | 41 |
| Figure A2.3. DIA, DRU, IBI, & DRI Scores by Educational Attainment                           | 42 |
| Figure A2.4. DIA, DRU, IBI, & DRI Scores by Age Groups                                       | 42 |
| Figure A2.5. DIA, DRU, IBI, & DRI Scores by Occupations                                      | 43 |
| Figure A2.6. DIA, DRU, IBI, & DRI Scores by Households with Children                         | 43 |
| Figure A2.7. DIA, DRU, IBI, & DRI Scores by Mobile Data Use                                  | 44 |
| Figure A2.8. DIA, DRU, IBI, & DRI Scores by City Limit Status                                | 44 |
| Table A2.1. Ordinal Bivariate Crosstab Results   | 45 |

## Executive Summary

As the socioeconomic landscape continues to change, communities seeking to adapt and prosper in this digital age need to be digital ready. While research on the impact of internet is increasing every day, there is very limited information beyond a few national studies on how internet is actually used. A better understanding of the digital readiness level—beyond the dominant yes/no internet availability discussion—among Nebraska households has implications for community, economic, and workforce development as well as quality of life.

For this reason, this study attempts to gauge digital readiness among Nebraska households by calculating a digital readiness index (DRI) score. An online household survey was distributed during April and May of 2018 gathering data on the following: device & internet access, digital resourcefulness & utilization, and internet benefits & impact. Some key takeaways include:

1. There is a device & internet access divide between metropolitan and rural Nebraska households. Efforts need to be made to reduce this divide by expanding broadband availability and device ownership throughout the state, especially in rural areas. Despite this divide, rural households utilized as frequently or more the internet compared to their metropolitan counterparts albeit relying at a higher rate on smartphones, mobile data and libraries.
2. No significant difference between urban and rural households regarding digital resourcefulness & utilization exists. However, there is ample room to maximize the technology's impact, especially regarding internet benefits and impact. Three-quarters of Nebraska households did not earn money online by selling, freelancing, or renting. Furthermore, on average Nebraska households utilized the internet in eleven out of twenty-five different ways.
3. The difference in digital readiness index scores was higher among age, income, educational attainment, and presence of children groups than county type. This supports national research<sup>1</sup> where older, lower income and lower educational attainment are found to make a higher share of non-internet users. Those that used mobile data 50 percent or more of the time had a larger difference in scores than county type. On the adoption and use front, rather than focusing on a metro-rural divide, issue should focus on age, income and occupational differences.
4. The digital readiness level of Nebraska households is shy of half its potential—as measured by this study. More importantly, this level is very similar regardless of county type. Efforts need to be made to ensure Nebraska households are at their maximum regarding their digital readiness in order to reap the benefits of this evolving digital age. Additional efforts should be made to ensure older, less educated households in occupations not conducive to improve digital skills and adoption receive the proper training to benefit from this technology as well. This digital readiness can be improved by designing and implementing statewide educational/training efforts. Greater use of some applications, such as telehealth and telework, may also require broader changes within industries and organizations.

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<sup>1</sup> <http://www.pewresearch.org/fact-tank/2018/03/05/some-americans-dont-use-the-internet-who-are-they/>

## Introduction

As the socioeconomic landscape continues to change, communities seeking to adapt and prosper in this digital age need to be digital ready. Research on the impact of internet is increasing every day. For example, the Brookings Institution found that two-thirds of new jobs generated between 2010 and 2016 required medium to high digital skills<sup>2</sup>. Furthermore, research is increasingly finding a positive impact of broadband on economic development, civic engagement, agriculture, and education<sup>3</sup>. Lastly, the internet availability gap between urban and rural is well documented as well<sup>4</sup>. However, there is very limited information on how internet is actually used beyond national studies<sup>5</sup>.

What we know today about digital readiness is that it is affected not only by digital infrastructure but also by digital skills and use. In other words, the breadth and depth of digital technology use is a key missing component to gauge digital readiness. While setting in stone the definition of digital readiness is a moving target and beyond the scope of this study, the reality is that lack of digital infrastructure and skills have a negative impact on any community's ability to thrive today.

For this reason, this study attempts to gauge digital readiness among Nebraska households by calculating a digital readiness index (DRI) score. An online household survey was distributed during April and May of 2018 in Nebraska gathering data on the following: device & internet access, digital resourcefulness and utilization, and internet benefits and impact.

This report consists of five sections (including the introduction and the appendices). The methodology section describes in detail how the survey was implemented and the weighting process to resemble the state's population distribution. The results section discusses in depth the findings of the survey including socioeconomic characteristics, device & internet access, digital resourcefulness and utilization and internet benefits & impact. The concluding section offers key takeaways moving forward as well as some study limitations. Lastly, the appendices provide more information on additional statistical analyses as well as a detailed explanation on how the digital readiness index score was calculated.

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<sup>2</sup> <https://www.brookings.edu/research/digitalization-and-the-american-workforce/>

<sup>3</sup> <https://pcrd.purdue.edu/files/media/Broadbands-Impact-Final.pdf>

<sup>4</sup> <https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2018-broadband-deployment-report>

<sup>5</sup> Two Pew Research studies have dealt into this topic at the national level. One was completed in 2011 (<http://www.pewinternet.org/2011/08/09/search-and-email-still-top-the-list-of-most-popular-online-activities/>) and the other in 2016 (<http://www.pewinternet.org/2016/09/20/digital-readiness-gaps/>).

## Methodology

The research design and online survey instrument were reviewed and approved by the Purdue University Institutional Review Board (IRB) in the spring of 2018. The research design focused only on an online delivery using the survey platform Qualtrics precisely because the objective was to gauge digital readiness among households using the internet. No paper surveys were distributed<sup>6</sup>. The online survey was distributed through email lists, social media, and electronic newsletters. Multiple audiences received the survey with help from several organizations (see Table 1). The actual response rate was not calculated since the exact number of households reached is unknown.

Table 1. List of Organizations Sharing Survey Information

|  |   |
|--|---|
| University of Nebraska Extension                                     | Nebraska Community Foundation   |
| Nebraska Public Service Commission                                   | League of Nebraska Municipalities                                     |
| Nebraska Library Commission  | AIM Institute   |
| Rural Futures Institute  | Nebraska Department of Economic Development                           |
| Center for Rural Affairs and Nebraska Telecommunications Association | Nebraska Health Care Association                                      |
| Nebraska Educational Technology Association                          | Nebraska Office of the CIO/Nebraska Information Technology Commission |

The online survey was sent in multiple waves starting on April 10, 2018 through April 30, 2018. At this time, a preliminary analysis of responses was conducted. Since twenty-five counties out of the ninety-three had either zero or one response, an additional push was conducted targeting these counties until May 24, 2018. This push included emailing local Extension educators so they could in turn distribute the survey. In the end, only six counties had no responses plus an additional twelve having only one response resulting in 80.7 percent of Nebraska counties with two or more responses.

The total number of responses was 756. However, three responses were removed from the database since they were responses from outside the state based on the latitude and longitude coordinates resulting in 753 valid responses. While there were multiple responses with the same IP address, it was difficult to discern if they were actually from the same household. Therefore, there was no way to identify and remove duplicate household responses, if there were any.

The sample was weighted by socioeconomic characteristics using SPSS 24 software. As shown in Table 2, less educated, lower income households, and younger households were significantly underrepresented. According to the 2012-2016 ACS dataset, 36.5 percent of Nebraska residents ages 25 and over had high school or less education compared to only 3.3 percent in the sample. Likewise, 31.4 percent of Nebraska households reported an income of less than \$35,000 compared to 8.1 percent in the sample.

For these reasons, the sample was weighted by educational attainment, household income, and age groups to align to Nebraska's population distribution. As shown in Table 1, after applying the weight 36.7 percent of responses had high school or less education, much closer to the state's 36.5 percent. Same for lower income households and younger households. After the weight was applied, the sample size (n) changed slightly, more so for the household income category, but overall remained close to the 753 valid responses. Therefore, no further weights were applied to adjust the n size.

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<sup>6</sup> The concept of "digital ready" refers to how the technology is being utilized, not who is online and who is not.

Table 2. Socioeconomic Characteristics State of Nebraska and Survey Sample

| <b>Nebraska</b>               | <b>Population</b> | <b>Sample</b> | <b>Weight</b> | <b>Sample Weighted</b> |
|-------------------------------|-------------------|---------------|---------------|------------------------|
| <b>Educational Attainment</b> |                   |               |               |                        |
| High school or less           | 0.365             | 0.033         | 11.063        | 0.367                  |
| Associates or some college    | 0.361             | 0.204         | 1.770         | 0.381                  |
| Bachelor's or more            | 0.274             | 0.763         | 0.359         | 0.252                  |
| n                             |                   | 750           |               | 755                    |
| <b>Household Income</b>       |                   |               |               |                        |
| Less than \$35,000            | 0.314             | 0.081         | 3.873         | 0.313                  |
| \$35,000-\$49,999             | 0.144             | 0.102         | 1.410         | 0.166                  |
| \$50,000-\$74,999             | 0.198             | 0.260         | 0.761         | 0.183                  |
| \$75,000-\$99,999             | 0.131             | 0.206         | 0.635         | 0.148                  |
| \$100,000 or more             | 0.214             | 0.351         | 0.609         | 0.190                  |
| n                             |                   | 727           |               | 690                    |
| <b>Age Groups</b>             |                   |               |               |                        |
| 18-24                         | 0.135             | 0.019         | 7.090         | 0.136                  |
| 25-34                         | 0.179             | 0.141         | 1.266         | 0.179                  |
| 35-44                         | 0.160             | 0.200         | 0.799         | 0.159                  |
| 45-64                         | 0.335             | 0.478         | 0.700         | 0.334                  |
| 65 or older                   | 0.192             | 0.162         | 1.186         | 0.192                  |
|                               |                   | 745           |               | 750                    |

Source: 2012-2016 ACS Census

Lastly, according to the 2012-2016 ACS Survey, household income was defined for 741,581 households in Nebraska. On the other hand, the valid sample size was 753, or a little over 10 percent. Based on these figures, the margin of error (MOE) with a 95 percent confidence level was 3.6 percent.

## Results

### Socioeconomic Characteristics

In order to conduct a metro versus nonmetro analysis of the responses, efforts were made to gather responses from multiple county types<sup>7</sup>. Table 3 shows the number of responses by county type. Metropolitan counties accounted for a third or 33.6 percent of responses while nonmetropolitan counties accounted for two-thirds or 66.4 percent of responses. Further, rural counties accounted for 40.6 percent of total responses while small city counties accounted for one-fourth or 25.8 percent.

Table 3. Digital Readiness Responses by County Type

| Type         | No. of responses | Percent total |
|--------------|------------------|---------------|
| Metropolitan | 253              | 33.6          |
| Small City   | 194              | 25.8          |
| Rural        | 306              | 40.6          |
| Total        | 753              |               |

Source: 2018 PCRD Household Internet Utilization Survey

As shown in Table 4, a little more than one-fifth of respondents in noncore or rural counties were ages 18 to 24 compared to 10.5 percent in metropolitan counties. On the other hand, small city counties had very few respondents ages 18 to 24. Overall, one-third of responses were ages 45 to 64 while almost one-fifth were ages 65 and over.

Table 4. Percent Responses by Age Groups

| Age Groups  | Sample | Metropolitan | Small City | Rural |
|-------------|--------|--------------|------------|-------|
| 18-24       | 13.7   | 10.5         | 2.0        | 21.0  |
| 25-34       | 18.0   | 24.8         | 18.3       | 15.2  |
| 35-44       | 16.0   | 18.3         | 15.3       | 15.4  |
| 45-64       | 33.3   | 33.3         | 41.6       | 29.0  |
| 65 or older | 19.0   | 13.1         | 22.8       | 19.4  |
| n           | 751    | 153          | 202        | 396   |

Source: 2018 PCRD Household Internet Utilization Survey

Regarding educational attainment, Table 5 shows that almost half or 46 percent of responses in metropolitan counties had a bachelor's or more compared to less than one-fifth or 18.7 percent in noncore counties. On the other hand, 43.6 percent of respondents in rural counties had high school or less compared to only 12.4 percent in metropolitan counties. In other words, respondents in metropolitan counties were more educated compared to those in rural counties.

<sup>7</sup> Typology utilized was the 2013 Office of Management & Budget core-based typology. County type includes metropolitan, micropolitan or small city, and noncore or rural. Metropolitan counties have an urban "core" of 50,000 or more or at least 25 percent of their labor force commutes to a neighboring metropolitan county. Micropolitan or small city counties have an urban core between 10,000 and 49,999 people or 25 percent or more of their labor force commutes to a neighboring micropolitan county. Noncore or rural counties do not have an urban core of at least 10,000 people or less than 25 percent of their labor force commutes to a neighboring metropolitan or micropolitan county.



Table 5. Percent Responses by Educational Attainment

| <b>Educational Attainment</b> | <b>Sample</b> | <b>Metropolitan</b> | <b>Small City</b> | <b>Rural</b> |
|-------------------------------|---------------|---------------------|-------------------|--------------|
| High School or less           | 36.7          | 12.4                | 41.3              | 43.6         |
| Associates or some college    | 38.0          | 41.2                | 36.3              | 37.7         |
| Bachelor's or more            | 25.3          | 46.4                | 22.4              | 18.7         |
| n                             | 755           | 153                 | 201               | 401          |

Source: 2018 PCRD Household Internet Utilization Survey

Similarly, as shown in Table 6 metropolitan counties had higher household incomes compared to noncore counties. About 35.8 percent of responses in metropolitan counties had household incomes of \$100,000 or more compared to only 14.9 percent in noncore counties. Small city counties had the largest share—39.3 percent—of respondents with an income less than \$35,000 annually.

Table 6. Percent Responses by Household Income

| <b>Income Categories</b> | <b>Sample</b> | <b>Metropolitan</b> | <b>Small City</b> | <b>Rural</b> |
|--------------------------|---------------|---------------------|-------------------|--------------|
| Less than \$35,000       | 31.3          | 23.8                | 39.3              | 30.1         |
| \$35,000-\$49,999        | 16.5          | 9.3                 | 8.4               | 24.1         |
| \$50,000-\$74,999        | 18.4          | 17.9                | 15.7              | 20.1         |
| \$75,000-\$99,999        | 14.9          | 13.2                | 23.6              | 10.9         |
| \$100,000 or more        | 19.0          | 35.8                | 13.1              | 14.9         |
| n                        | 691           | 151                 | 191               | 349          |

Source: 2018 PCRD Household Internet Utilization Survey

On race/ethnicity, the majority of respondents were white as shown in Table 7 (the share of white non-Hispanic in the state was of 80.3 percent). Metropolitan counties had the largest share of minorities with 9.1 percent. Since survey questions did not distinguish between race and Hispanic/non-Hispanic, it was not possible to weight the sample.

Table 7. Percent Responses by Race/Ethnicity and County Type

| <b>Race/Ethnicities</b> | <b>Sample</b> | <b>Metropolitan</b> | <b>Small City</b> | <b>Rural</b> |
|-------------------------|---------------|---------------------|-------------------|--------------|
| White                   | 92.5          | 90.9                | 94.8              | 92.0         |
| Black                   | 0.1           | 0.6                 | 0.0               | 0.0          |
| Asian                   | 0.8           | 2.6                 | 0.5               | 0.3          |
| Hispanic                | 1.5           | 3.9                 | 0.5               | 1.0          |
| Native American         | 2.8           | 0.0                 | 1.6               | 4.5          |
| Other                   | 2.3           | 1.9                 | 2.6               | 2.3          |
| n                       | 746           | 154                 | 193               | 399          |

Source: 2018 PCRD Household Internet Utilization Survey

As shown in Table 8, the majority of respondents reported working in the management, professional, or education occupations with 50.3 percent of responses. Since the occupational categories do not reflect the ACS dataset categories, rather the Nebraska Rural Poll<sup>8</sup> categories, it was not possible to adjust the occupations to reflect the distribution of the population.

However, an attempt was made to group 2012-2016 ACS census occupation categories to reflect the survey occupations. Based on this, the following were overrepresented from most to least: agriculture; management, professional or education; and healthcare support or public safety occupations. On the other hand, the following were underrepresented, from most to least: production, transportation, and warehousing; construction, installation, and maintenance; food services or personal care; and sales or office support occupations. No data was available for government, retired, and other occupations.

Table 8. Percent Responses by Occupation and County Type

| Occupations                             | Sample | Metropolitan | Small City | Rural |
|---|--------|--------------|------------|-------|
| Management, professional or education   | 50.3   | 69.9         | 43.3       | 46.4  |
| Sales or office support                 | 14.0   | 10.5         | 16.9       | 13.9  |
| Construction, installation, maintenance | 2.5    | 8.5          | 2.5        | 0.2   |
| Production, transportation, warehousing | 0.7    | 0.7          | 1.0        | 0.5   |
| Agriculture                             | 5.0    | 3.3          | 7.5        | 4.5   |
| Food services or personal care          | 2.9    | 0.0          | 10.9       | 0.0   |
| Healthcare support or public safety     | 4.5    | 0.7          | 2.0        | 7.2   |
| Government                              | 0.5    | 0.0          | 1.5        | 0.2   |
| Retired                                 | 6.6    | 3.3          | 6.5        | 7.9   |
| Other                                   | 12.9   | 3.3          | 8.0        | 19.1  |
| n                                       | 757    | 153          | 201        | 403   |

Source: 2018 PCRD Household Internet Utilization Survey

Table 9 shows that 34.8 percent of respondents reported children in the household. This is pretty close to the 31.7 percent reported by the 2011-2016 ACS. Rural counties had the highest share with 38.4 percent, followed by metropolitan counties with 36.4 percent.

Table 9. Percent Responses with Children in the Household by County Type

| Households with Children | Sample | Metropolitan | Small City | Rural |
|--------------------------|--------|--------------|------------|-------|
| Yes                      | 34.8   | 36.4         | 26.4       | 38.4  |
| No                       | 65.2   | 63.6         | 73.6       | 61.6  |
| n                        | 756    | 154          | 201        | 401   |

Source: 2018 PCRD Household Internet Utilization Survey

Lastly, Table 10 shows that almost three-quarters or 74.2 percent of respondents lived inside city limits. Small city counties had the highest share with 82.7 percent while metropolitan and rural had almost the same share with 71.2 and 71.1 percent respectively.

<sup>8</sup> The Nebraska Rural Poll is an annual survey conducted by the [UNL Department of Agricultural Economics](#) in partnership with the [NU Rural Futures Institute](#) and [Nebraska Extension](#).

Table 10. Percent Responses Inside or Outside City Limits by County Type

| City Limits | Sample | Metropolitan | Small City | Rural |
|-------------|--------|--------------|------------|-------|
| Inside      | 74.2   | 71.2         | 82.7       | 71.1  |
| Outside     | 25.8   | 28.8         | 17.3       | 28.9  |
| n           | 757    | 153          | 202        | 402   |

Source: 2018 PCRD Household Internet Utilization Survey

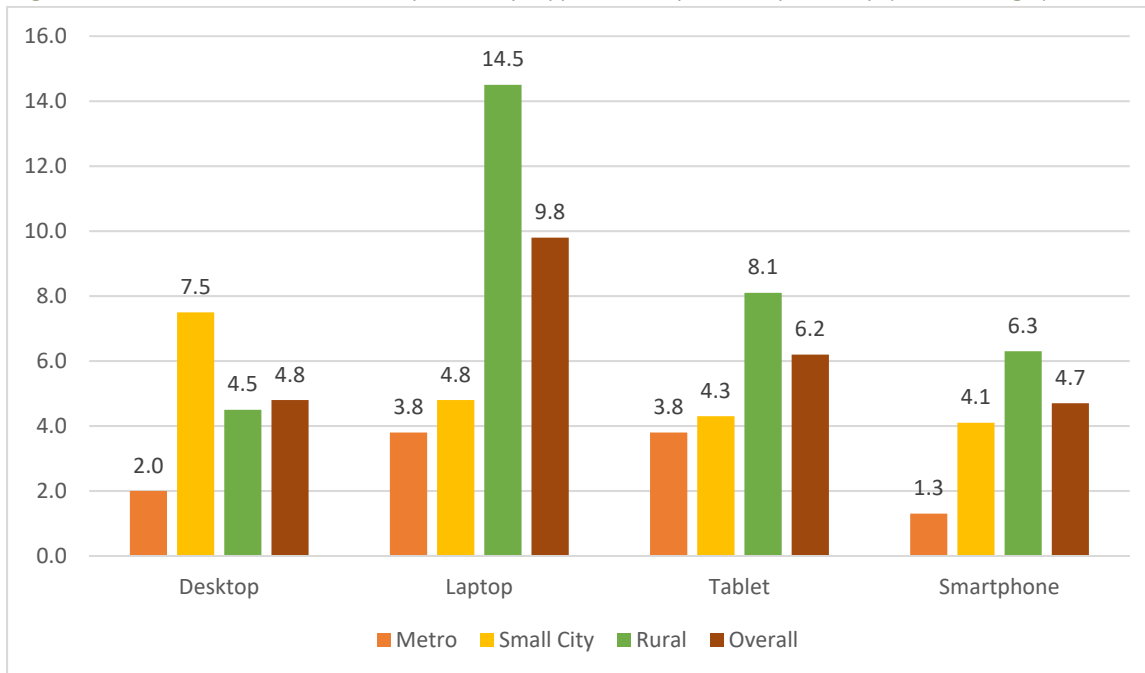
To summarize, responses from small city and rural counties accounted for two-thirds of the sample. Survey responses slightly overrepresented whites and those working in certain occupations. However, the sample does closely reflect the state’s characteristics regarding educational attainment, household income, age groups, and presence of children in the household.

### Device & Internet Access

To better grasp the digital divide—specifically internet and device access—beyond a binary yes/no, the survey asked multiple questions including: the functionality of devices, length of time during which there was no access to either devices or internet service, percent of time accessing the internet by location, and devices used and frequency to access the internet.

When participants responded on device ownership and overall performance over the past year, Figure 1 shows clearly that the share of devices that performed poorly or very poorly was higher in small city and rural counties compared to metropolitan counties, except for desktops. The good news is that less than 10 percent of respondents reported any device working poorly or very poorly regardless of county type. Overall, laptop devices performed the poorest over the past year followed by tablets, desktops, and smartphones.

Figure 1. Device Performance by County Type, Poorly or Very Poorly (Percentage)

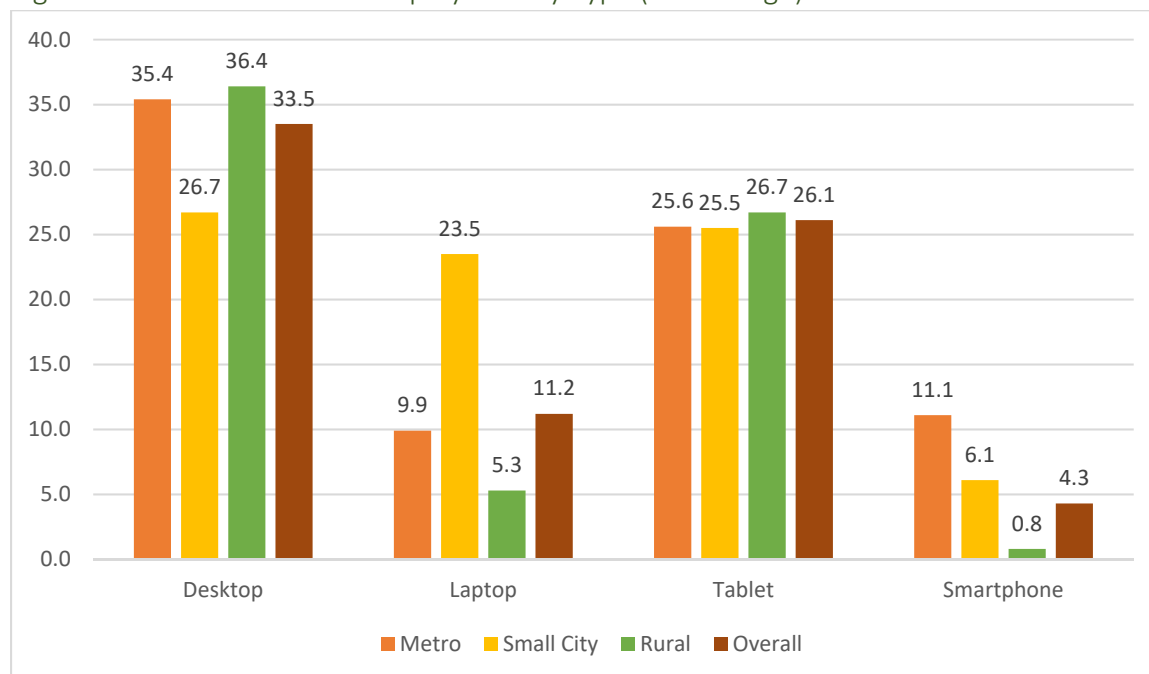


Source: 2018 PCRD Household Internet Utilization Survey

Figure 2 shows that a little more than a third of rural county respondents reported not owning a desktop compared to a little more than one-fourth of their metropolitan counterparts. Laptops were the preferred device over desktops for rural counties in Nebraska. Interestingly, the non-ownership of smartphones was significantly lower (0.8 percent) in rural counties. The main implication of this is that an overwhelming majority of rural Nebraska households own a smartphone, more so than tablets and desktops. While the smartphone does provide connectivity, it does result in some limitations when completing homework and/or applying for jobs.

When all is said and done, roughly one-third of Nebraska households reported not owning a desktop; about one-fourth not owning a tablet; a little more than ten percent not owning a laptop; and less than five percent not owning a smartphone.

Figure 2. Device Non-Ownership by County Type (Percentage)



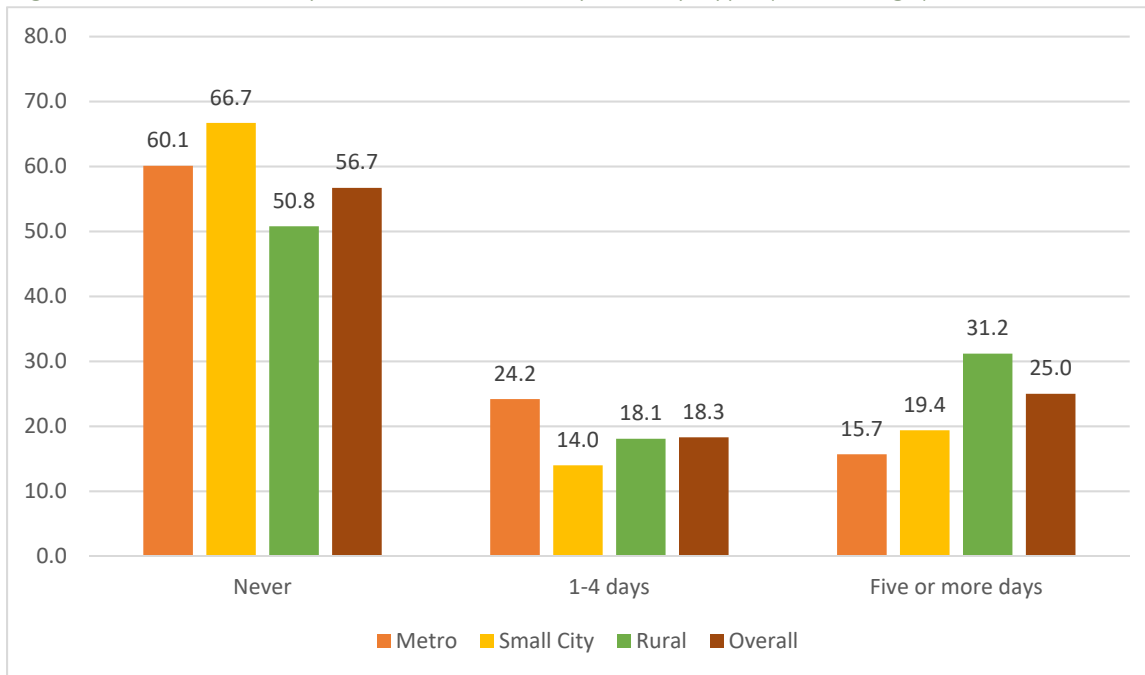
Source: 2018 PCRD Household Internet Utilization Survey

Participants were also asked the number of days they were without a device or internet due to unpaid bills, broken devices, running out of minutes/data, or other problems. Figure 3 shows the results when asked about internet.

Overall, a little more than half or 56.7 percent of Nebraska households reported never having an issue with internet over the past year while one-fourth reported being without internet for five or more days. Moreover, 60 percent of metropolitan households reported no issues with internet over the past year compared to 66 percent of small city households and almost 51 percent of rural households.

On the other hand, almost a third or 31.2 percent of rural households reported having issues with internet for five or more days compared to 15.7 percent in metropolitan counties. This is another facet of the digital divide, where service is available but for multiple reasons households remain disconnected.

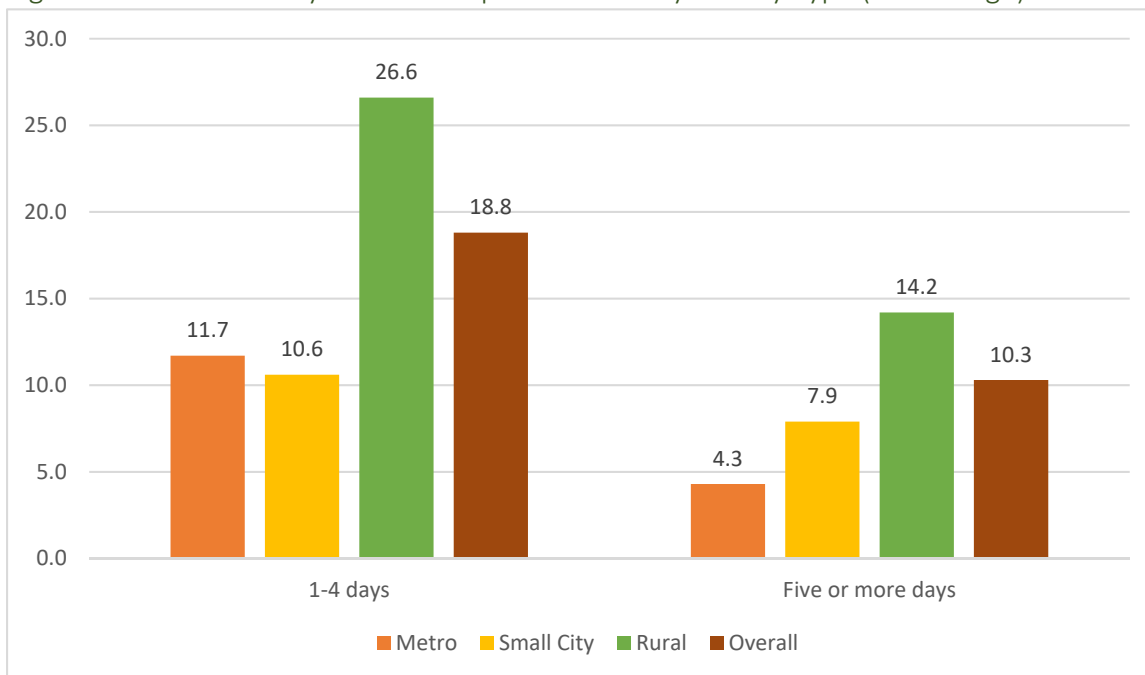
Figure 3. Number of Days without Internet by County Type (Percentage)



Source: 2018 PCRD Household Internet Utilization Survey

Regarding devices, Figure 4 shows the length of issues with smartphones, the device with the highest ownership rate. Overall, 70 percent of Nebraska households reported having no issues with their smartphones over the past year. However, a little over a quarter or 26.6 percent of rural households reported having smartphone issues for 1 to 4 days while 14.2 percent for more than five days.

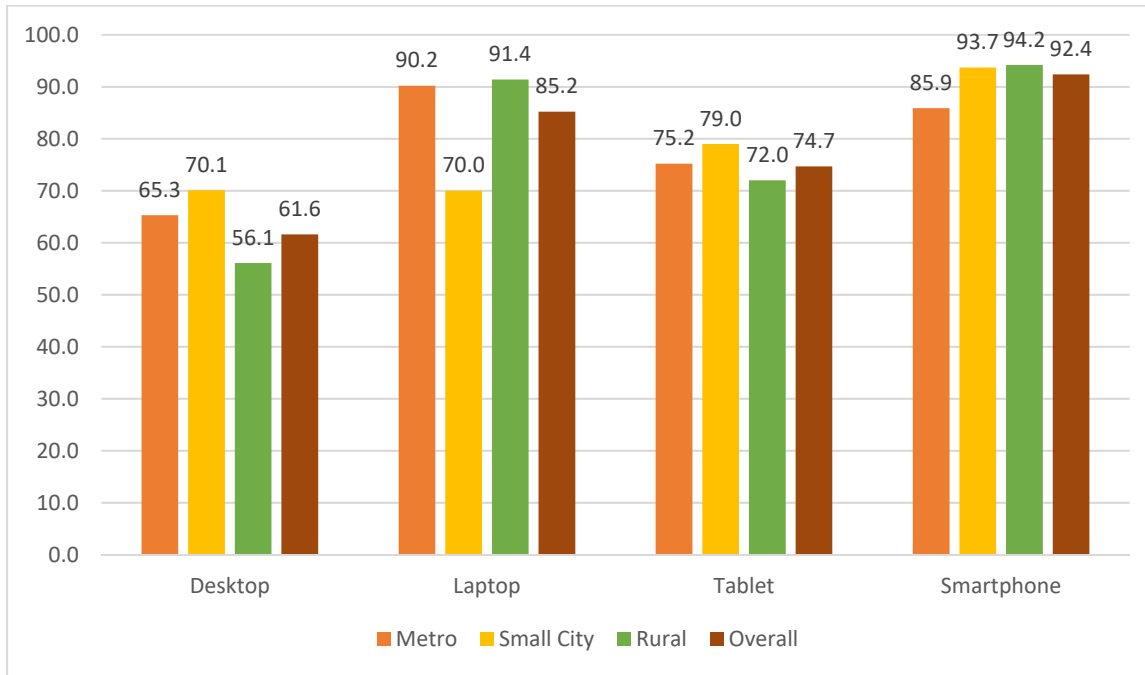
Figure 4. Number of Days with Smartphone Issues by County Type (Percentage)



Source: 2018 PCRD Household Internet Utilization Survey

As expected, the vast majority of Nebraska households used a smartphone to connect to the internet at least once monthly, regardless of county type. Not surprising, the highest share was among rural households with 94.2 percent as shown in Figure 5. Metropolitan households did use a laptop (90.2 percent) a bit more frequently than smartphones (85.9 percent). The least utilized device was the desktop, except in small city counties.

Figure 5. Device Used to Connect to the Internet at Least Once Monthly by County Type (Percentage)

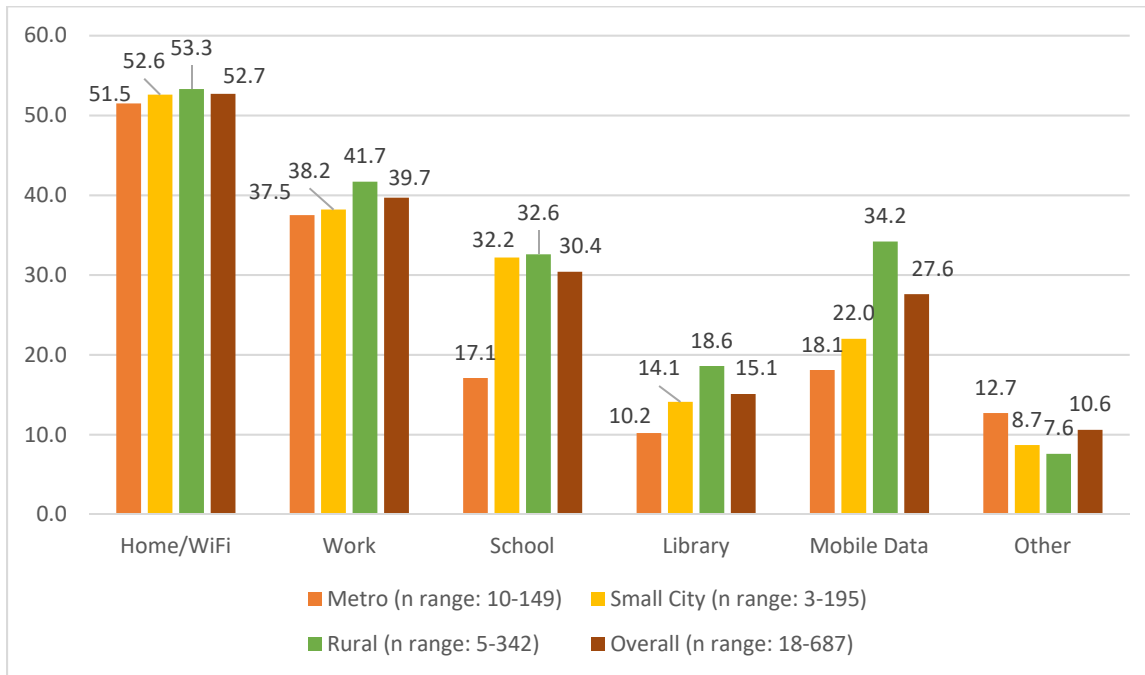


Source: 2018 PCRD Household Internet Utilization Survey

Lastly regarding the digital divide, the survey asked what percent of time was used to connect to the internet by location. Figure 6 shows that, at least half of the time, respondents connected to the internet at home regardless of county type.

Other interesting findings are worth discussing as well. Note that rural households reported connecting to the internet at a higher rate compared to metropolitan and small city households from the library (with an average 18.6 percent of the time) and utilizing mobile data (with an average 34.2 percent of the time). This is not surprising given that rural households also reported using the smartphone at a higher rate to connect to the internet (see Figure 5). Moreover, this highlights the importance of libraries as gateways to the internet in rural communities.

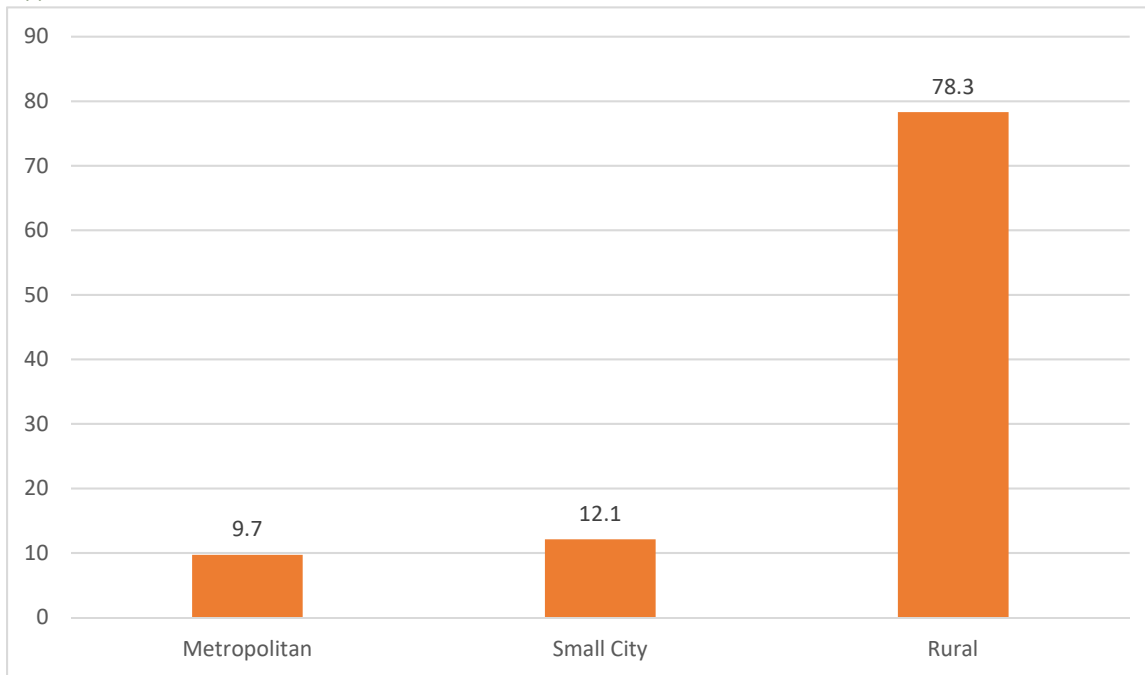
Figure 6. Percent of Time Accessing the Internet by Location and County Type (Average Percentage)



Source: 2018 PCRD Household Internet Utilization Survey

Related to the well-documented internet access disparity between metro and rural, Figure 7 shows the breakdown by county types of those that responded using mobile data 50 percent or more of the time to connect to the internet over the past year (n=73). While less than 10 percent were in metropolitan counties, almost 80 percent were in rural counties.

Figure 7. Responses Reporting 50% or More of Mobile Data to Access the Internet by County Type



Source: 2018 PCRD Household Internet Utilization Survey; n = 73

To summarize, there is a more complex digital divide between urban and rural households in Nebraska beyond the well-documented yes/no internet availability. Rural households experienced longer down times regarding internet service and dealing with device issues, specifically smartphones. They also have a lower desktop and laptop ownership rate (compared to metropolitan households only; they have a higher laptop ownership compared to small city counties) but a much higher smartphone ownership rate (99.2 percent).

Moreover, rural households spent roughly the same amount of time accessing the internet from home as their metro and small city counterparts. Important to note however, is that rural households did spend more time on average accessing the internet in libraries and relying on their mobile data compared to their metro and small city counterparts, hinting slightly at the well-known internet availability disparity. In fact, out of those responding using mobile data to access the internet for 50 percent or more of the time, almost 80 percent were in rural counties.

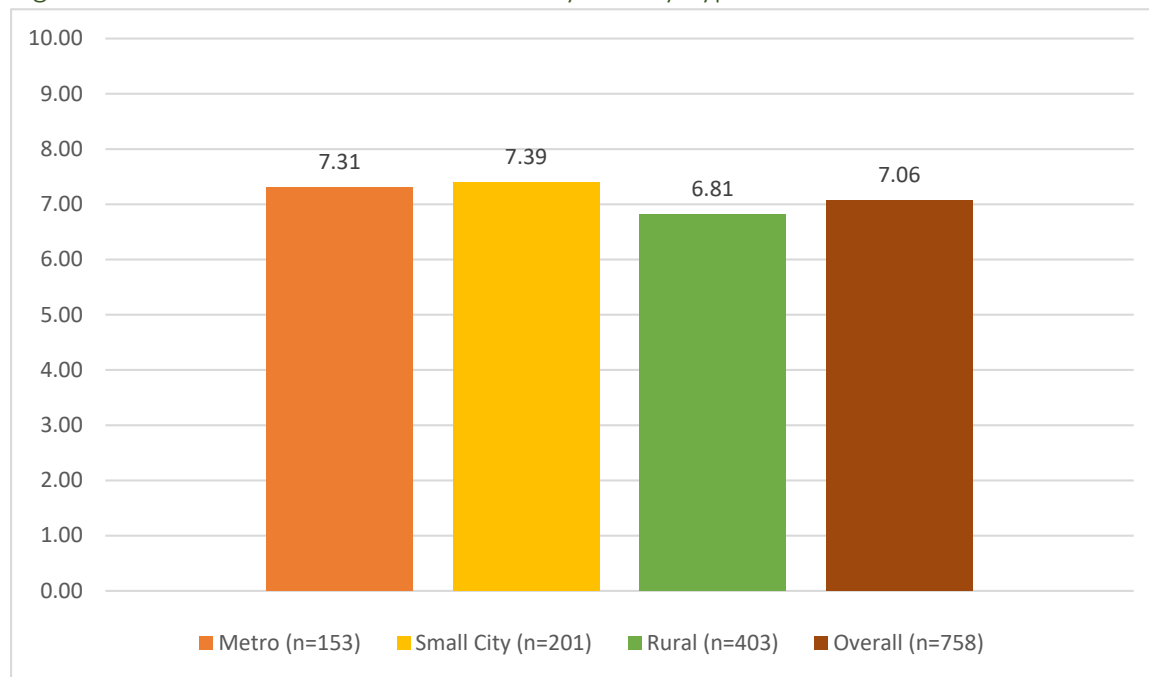
On the other hand, rural households do access the internet as frequently, or more, compared to their metropolitan and small city counties. For example (not shown), 90.8 percent of rural households reported using their smartphones to access the internet at least once daily, compared to 81.3 percent in metropolitan and 80.9 in small city counties.



However, the story changes slightly when looking at all these variables together. An overall device & internet access (DIA) score was calculated including device ownership & performance, duration of device & internet down time, locations used to connect to the internet (including mobile data) and variety of devices and frequency when connecting to the internet<sup>9</sup>. The resulting DIA score was normalized ranging from zero (minimum) to ten (maximum) for easier interpretation. A higher score denotes a more diverse and frequency device use, less performance issues, and shorter periods without access to devices or internet.

Figure 8 shows the average score by county type and overall. The mean DIA score was highest among small city households followed closely by metropolitan households. On average, rural households had the lowest score. While the numerical average DIA score difference between metropolitan and rural households is not large (less than one percentage point) it is in fact, statistically significant<sup>10</sup>. Overall, the average DIA score was seven, above the median of five, implying as a whole Nebraska households are on the upper half of digital readiness regarding these factors.

Figure 8. Device & Internet Access Scores by County Type



Source: 2018 PCRD Household Internet Utilization Survey

Next, a deeper look is taken at the digital divide between metropolitan and rural Nebraska households by gauging their level of digital resourcefulness and internet utilization. This, coupled to the device and internet service divide discussed in this section, should provide more hints towards answering the research question: are Nebraska households digital ready.

<sup>9</sup> Refer to Appendix A for more information on how this score was calculated.

<sup>10</sup> A one-way ANOVA Tukey post hoc test was conducted.

## Digital Resourcefulness & Utilization

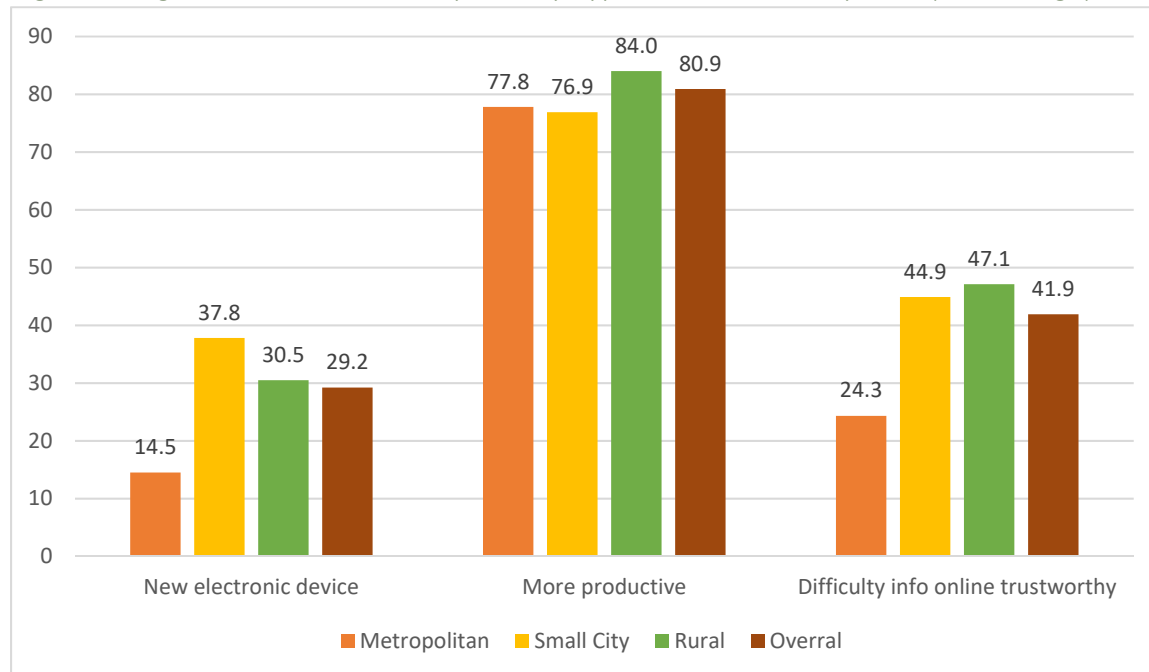
The previous section identified differences between metro and rural households in Nebraska regarding access to and functionality of devices, locations to access the internet, and internet down time. Now we focus on digital resourcefulness and internet utilization.

To answer these questions, digital resourcefulness is measured. Some of the questions for this section were obtained from a 2016 Pew Research report that found that more than half of U.S. adults felt unprepared, traditional learners, or reluctant regarding digital preparedness<sup>11</sup>.

Figure 9 shows the responses to some of the questions used in the Pew study. These included help with new electronic devices, increased productivity because of electronic information devices, and finding it difficult to know whether the information found online is trustworthy.

As shown, the majority of respondents agreed their productivity increased thanks to electronic devices regardless of county type. On the other hand, the share of small city and rural county responses needing help when setting up or using a new electronic device was higher compared to metropolitan counties. About 47 percent of rural respondents found it difficult to know whether information online is trustworthy compared to one-quarter of metropolitan respondents.

Figure 9. Digital Resourcefulness by County Type, Somewhat/Very Well (Percentage)



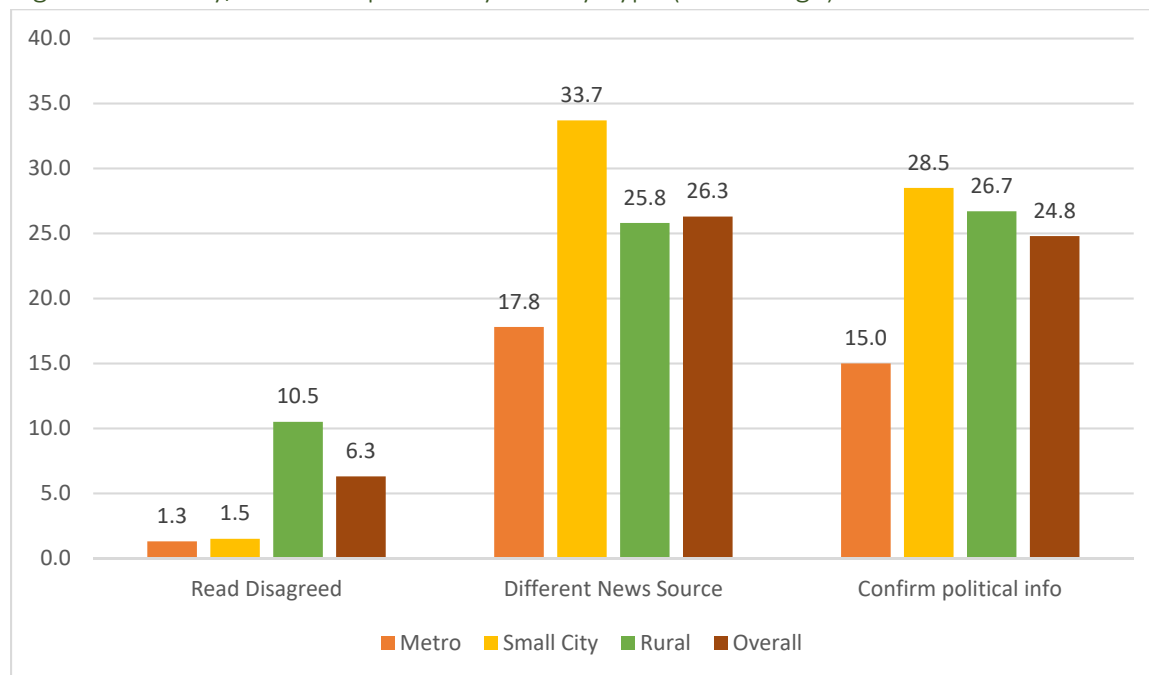
Source: 2018 PCRD Household Internet Utilization Survey

<sup>11</sup> Digital Readiness Gaps: <http://www.pewinternet.org/2016/09/20/digital-readiness-gaps/>

Another proxy to digital resourcefulness is the ability to minimize or avoid what are known as online echo chambers. An online echo chamber, specifically a political one, is understood as a situation where only certain ideas, information, and beliefs are shared<sup>12</sup>. A way to minimize or escape these online echo chambers is to consume diverse political content. A higher interest in politics as well as the ability to successfully search, find, trust, compare, and consume diverse political content requires an above average level of digital resourcefulness. Figure 10 portrays the results to some of the questions used in an echo chamber study (refer to footnote #10). Note that only rarely/never responses are shown.

Overall, Nebraska households did read material they disagreed with since only 6.3 percent responded they rarely or never did that over the past year. Regarding checking different news source from what is normally read, one-quarter or 26.3 percent of households rarely or never did this with small city respondents having the highest share, at one-third. Lastly, roughly one-quarter of Nebraska households said they rarely or never tried to confirm political information by searching online for another source over the past year. On this item, small city responses had the highest share as well.

Figure 10. Rarely/Never Responses by County Type (Percentage)



Source: 2018 PCRD Household Internet Utilization Survey

Based on these two metrics related to digital resourcefulness there is a difference between metropolitan and rural Nebraska counties. Small city counties were twice as likely as metropolitan counties to need help with new electronic devices (37.8 versus 14.5 percent), rarely or never check different news source from what is normally read (33.7 versus 17.8 percent), and rarely or never confirm political information by searching online for another source (28.5 versus 15 percent). Likewise, rural households were almost twice as likely as metropolitan counties to find it difficult to trust online

<sup>12</sup> Dubois, E. and Blank, G. (2018). The echo chamber is overstated: the moderating effect of political interest and diverse media. *Information, Communication & Society*, 21(5), 729-745. Retrieved from <https://www.tandfonline.com/doi/abs/10.1080/1369118X.2018.1428656>

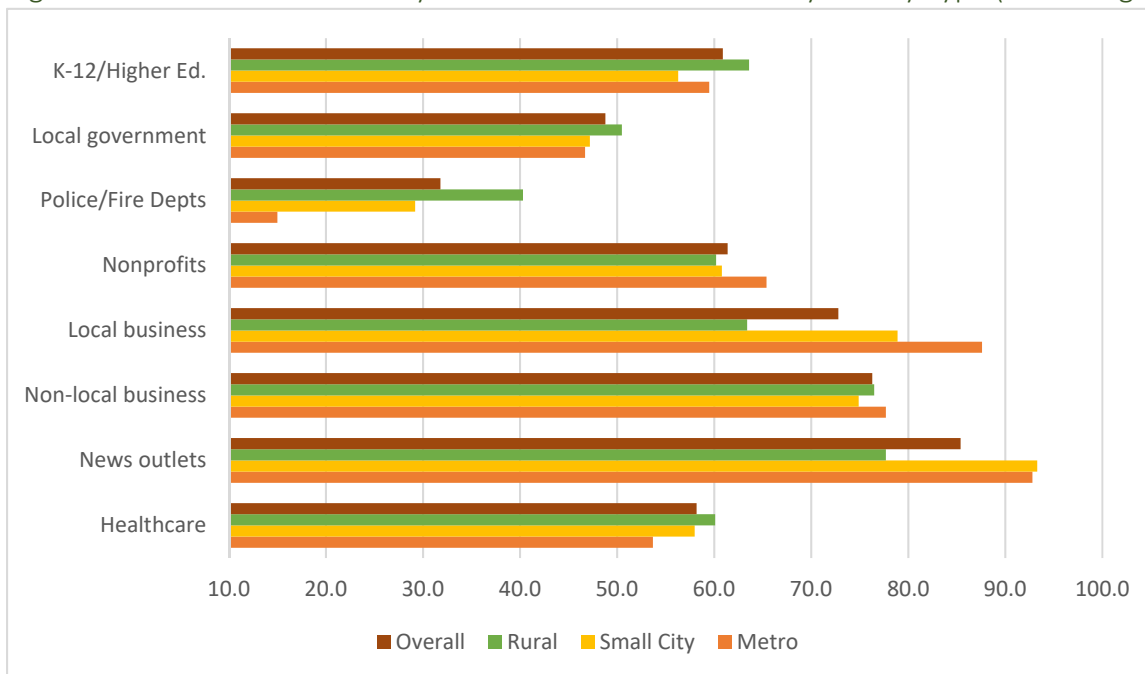
information (47.1 versus 24.3 percent) and almost ten times more likely to rarely or never read material they disagreed with (10.5 versus 1.3 percent).

In addition to digital resourcefulness, internet utilization is analyzed next, including with whom Nebraska households interact with digitally. Figure 11 displays the share of Nebraska households by county type interacting at least once monthly with multiple community actors over the past year.

As shown, 85.4 percent of Nebraska households reported interacting with news outlets at least once monthly, the highest share among community actors listed. The main difference between metropolitan and rural is visible when interacting with local businesses (those within 50 miles of the household). About 87.6 percent of metropolitan households interacted with local businesses compared to 72.8 percent of rural households and 78.9 percent of small city households.

In other words, a higher share of rural households interacted digitally at least once monthly with K-12/Higher education, local government, healthcare, and police/fire departments while metropolitan households interacted more with local businesses and non-local businesses (more than 50 miles from household). The fact that rural households interacted more with non-local businesses could be due to local businesses not offering what they are looking for or because local businesses do not have an online presence. More research could further explain this finding.

Figure 11. At Least Once Monthly Interactions of Households by County Type (Percentage)



Source: 2018 PCRD Household Internet Utilization Survey

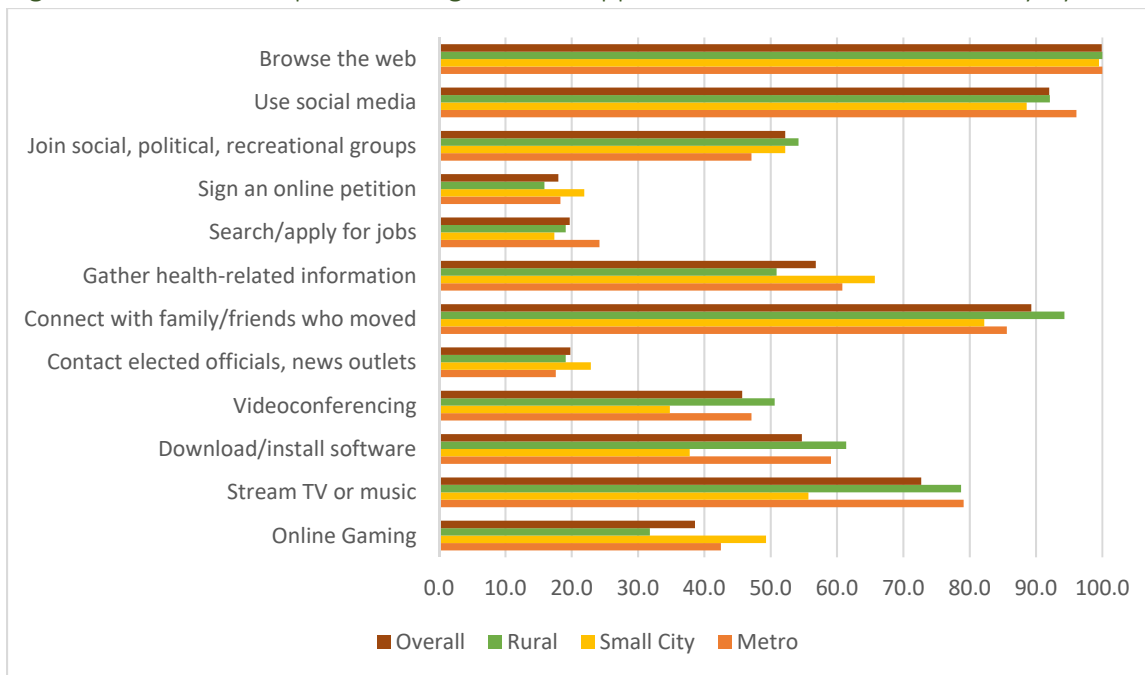
What about how the internet is used? The survey identified twenty-five uses of the technology and asked respondents to share if they or anybody in their household used the internet in this capacity over the past year at least once daily, once weekly, once monthly, annually, would love to but did not know how, or never/not interested.

The twenty-five uses of internet listed on the survey were divided into two groups. The first group, shown in Figure 12, includes more “basic” internet uses ranging from browsing the web to online gaming. Note that virtually all respondents, regardless of county type, used the internet at least once monthly to browse the web and close behind was to use social media. Metropolitan households used the internet slightly more to stream TV or music (followed close behind by rural) compared to small city households.

On the other hand, a higher share of rural households used the internet at least once monthly to join social, political, recreational groups, connect with family that moved, videoconferencing, and downloading/installing software compared to metropolitan and small city households.

Overall, more than half of Nebraska households, regardless of county type, used the internet at least once monthly to browse the web, use social media, gather health-related information, connect with family/friends that moved and stream TV or music. On the other hand, less than 30 percent of respondents, regardless of county type, used the internet to sign an online petition, search/apply for jobs, and contact elected officials and news outlets to express an opinion.

Figure 12. Percent Responses Using Internet Applications at Least Once Monthly by County Type

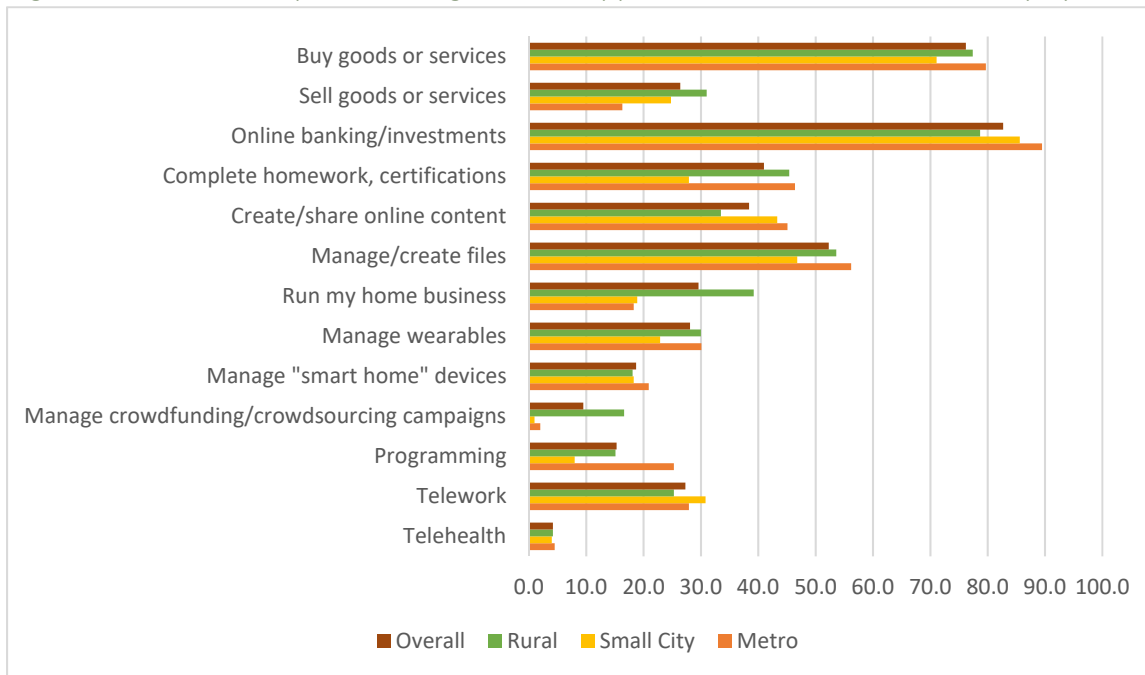


Source: 2018 PCRD Household Internet Utilization Survey

The second group of internet uses, shown in Figure 13, consists of more “advanced” uses ranging from buying and selling online to telework and telehealth. For these uses, metropolitan households had a higher share for buying goods or services online, online banking/investments, complete homework or certifications, create/share online content, manage/create files, programming, and telehealth. Rural households on the other hand outperformed metropolitan households when selling goods and services online, running home businesses, and managing crowdfunding/crowdsourcing campaigns.

Overall, more than 70 percent of Nebraska households, regardless of county type, used the internet at least once monthly to buy goods or services and online banking/investment.

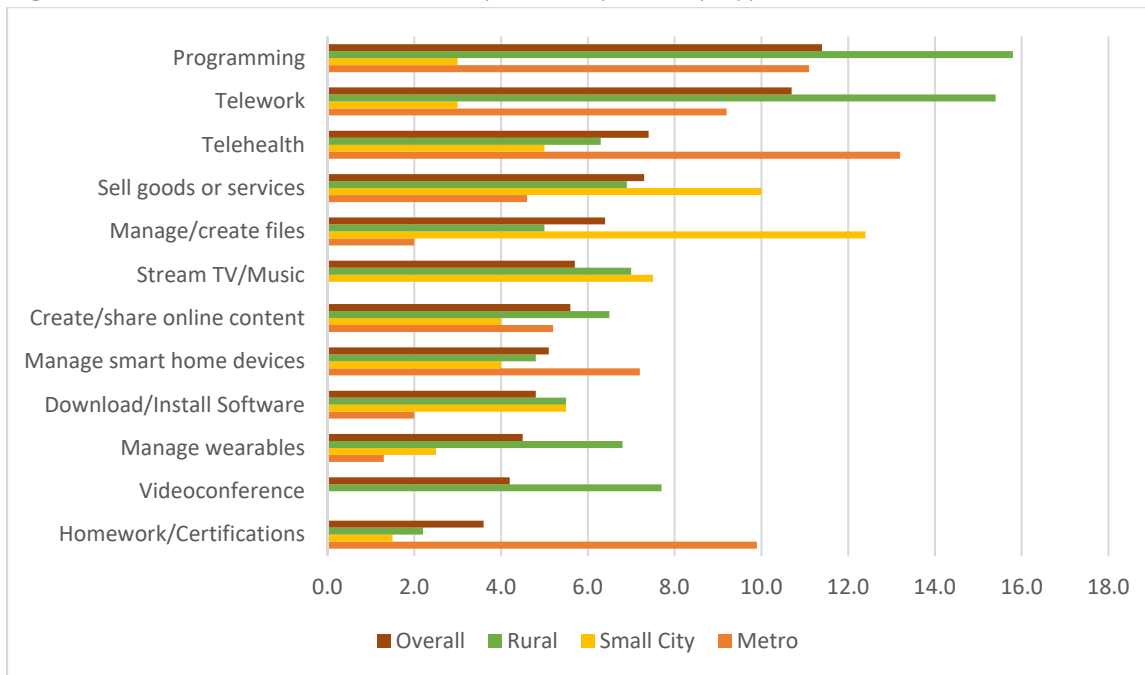
Figure 13. Percent Responses Using Internet Applications at Least Once Monthly by County Type



Source: 2018 PCRD Household Internet Utilization Survey

Respondents were also asked to share which internet uses they would be more interested to learn more. Figure 14 shows the percent of responses indicating a need to learn by county type sorted in descending order. Note how rural households were interested to learn about telework, programming, managing wearables, and videoconferencing while metropolitan households were interested to learn more about telehealth, managing smart home devices, and completing homework/certifications online.

Figure 14. Percent Need to Learn Responses by County Type



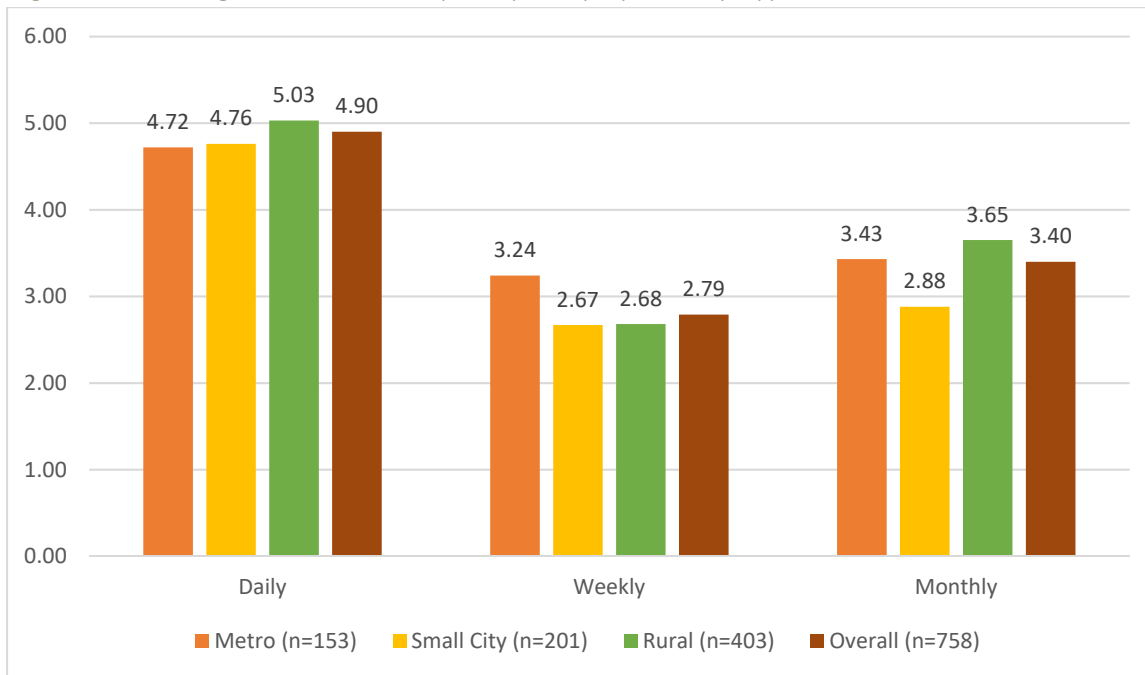
Source: 2018 PCRD Household Internet Utilization Survey

Regarding geography and frequency of use, Figure 15 shows the average internet uses. Overall, Nebraska households on average utilized the internet in 4.9 different ways daily compared to 2.8 weekly and almost 3.4 monthly. There is no statistically significant difference on average daily use between county types although rural did have a slightly higher average daily uses of the technology. There is however a statistically significant difference on weekly and monthly use between metropolitan and rural households, where metropolitan had a slightly higher use compared to rural in weekly uses while rural had a higher average monthly use compared to metropolitan households<sup>13</sup>.

While there may not be a big difference between metropolitan and rural counties, do remember that the survey provided a list of twenty-five internet uses. Average daily use, shy of five, is one-fifth of the total number of internet uses listed, while weekly and monthly use is lower. This opens the door for educational/training efforts to show households more internet uses.

<sup>13</sup> Conducted a one-way ANOVA using a Tukey post hoc test.

Figure 15. Average Internet Use by Frequency by County Type



Source: 2018 PCRD Household Internet Utilization Survey

In order to provide more information regarding household internet utilization, an Internet Utilization Score or IUS was calculated. The IUS added up the different internet uses reported by households at least once monthly (includes at least once daily and weekly). Therefore, and since the survey listed twenty-five uses of the internet, the IUS ranges from zero to twenty-five. A higher score denotes a more diverse usage of the technology.

Figure 16 shows the average IUS by county type. Overall, Nebraska households on average utilized the internet in eleven different ways at least once monthly. Small city households had a lower average IUS compared to metropolitan and rural households. Surprisingly, there was not much difference between metropolitan households and rural households.

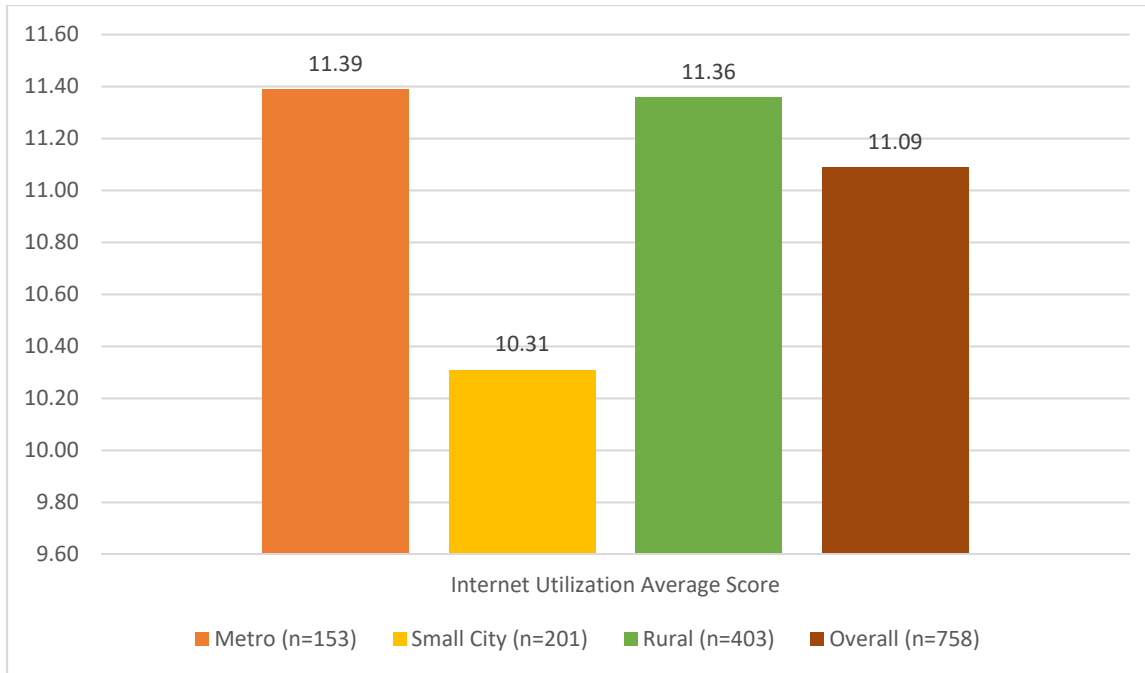
In fact, there is no statistical difference between the average IUS for metropolitan and rural counties<sup>14</sup>. There is a statistically significant difference between metropolitan and small city household as well as rural and small city households. The difference between small city and rural households is stronger.

Again, the highest IUS is less than half of all the internet uses listed. In other words, based on the survey's internet use list, Nebraska households—regardless of county type—are utilizing the technology at less than half of the potential identified in this study.

<sup>14</sup> Conducted a one-way ANOVA using a Tukey post hoc test.



Figure 16. Average Internet Utilization Score by County Type

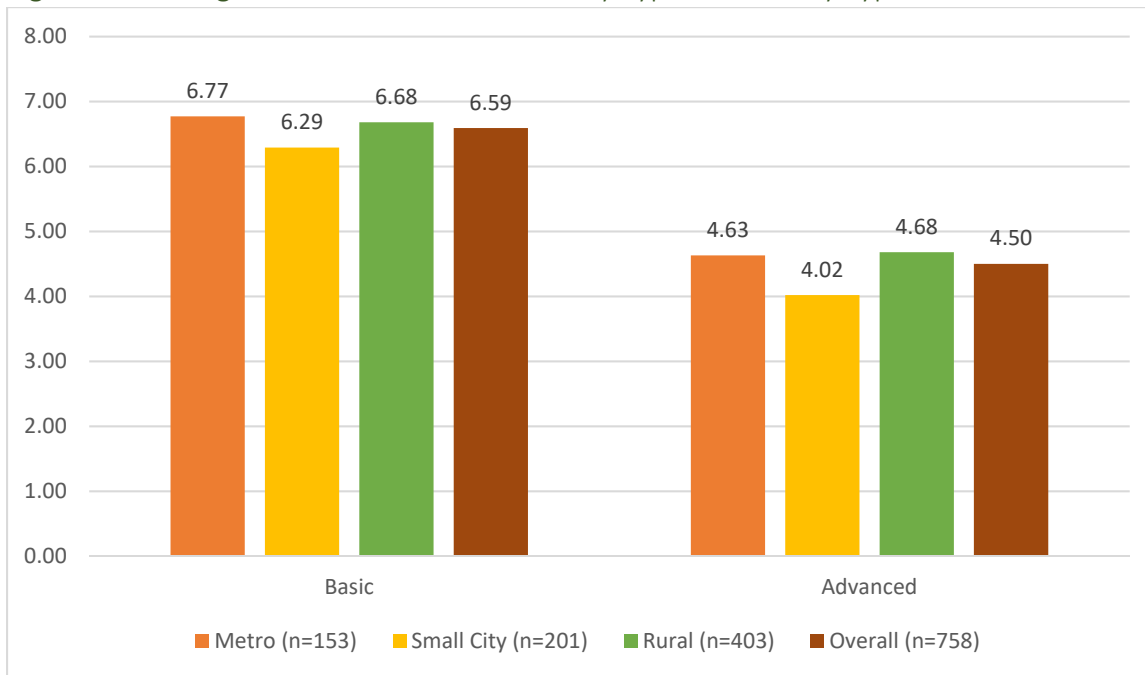


Source: 2018 PCRD Household Internet Utilization Survey

An IUS was also calculated looking at the “basic” uses (twelve) and “advanced” uses (thirteen) at least once monthly by county type as shown in Figure 17. As expected, the average number of ways the internet was used for basic functions was higher compared to the average advanced uses, generally six average basic uses versus four average advanced uses. There is, again, no statistically significant difference between county types regarding the basic IUS<sup>15</sup>. A statistical significant difference does exist however between small city and rural households regarding the average advanced IUS, but not between metropolitan and rural households. In other words, there is no statistically significant difference in the level of basic or advanced internet uses between metropolitan and rural counties.

<sup>15</sup> Conducted a one-way ANOVA using a Tukey post hoc test.

Figure 17. Average Internet Utilization Score by Type and County Type



Source: 2018 PCRD Household Internet Utilization Survey

Based on these results, there is a difference between metropolitan and rural households regarding digital resourcefulness and utilization. Small city and rural households were more likely to need help with new electronic devices as well as knowing if information online was trustworthy compared to metropolitan households. Likewise, small city and rural households were less likely to read materials they disagreed with, access different news source from what is normally read, and try to confirm political information by searching online for another source.

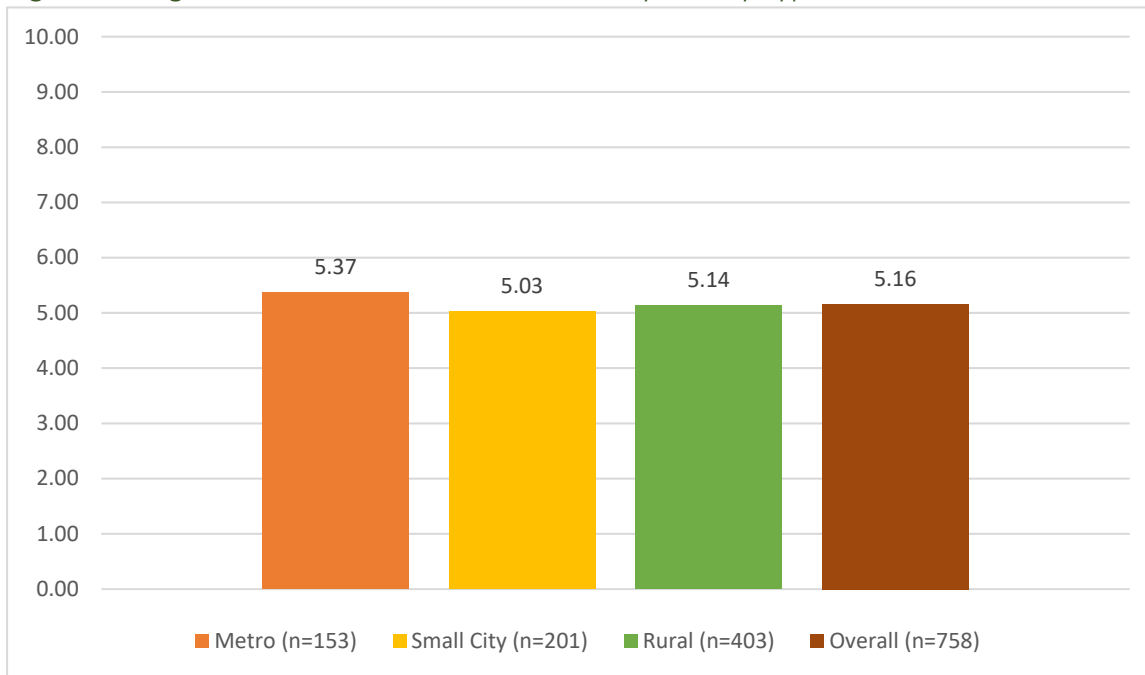
On the other hand, there is no significant difference concerning internet use between metropolitan and rural households. Both metropolitan and rural households use the internet frequently and in multiple ways. However, on average Nebraska households utilized the internet at least once monthly for less than half of the potential uses listed in the survey.

Moreover, the story remains the same when looking at all these variables together. An overall digital resourcefulness & utilization (DRU) score was calculated including help with new electronic devices, perception of productivity, trustworthiness of online information, consumption of a variety of online information, frequency and diversity of online interactions with multiple community anchor institutions and diverse internet use and frequency<sup>16</sup>. The resulting DRU score was normalized ranging from zero (minimum) to ten (maximum) for easier interpretation. A higher score denotes a higher digital resourcefulness and utilization based on the factors discussed.

<sup>16</sup> Refer to Appendix A for more information on how this score was calculated.

Figure 18 shows the average score by county type and overall. The mean DRU score was slightly highest among metropolitan households compared to small city and rural households. Note how the difference between county types is not large. More importantly, only the difference between metropolitan and small city households was statistically significant<sup>17</sup>. Overall, the average DRU score was around five or slightly higher than the median. This means Nebraskan households have ample room to improve their digital resourcefulness and utilization capabilities.

Figure 18. Digital Readiness & Utilization Scores by County Type



Source: 2018 PCRD Household Internet Utilization Survey

Metropolitan and rural Nebraska households differ significantly regarding device and internet access yet their resourcefulness and utilization do not. Do these trends, pulling in different directions, affect internet benefits and impacts? The next section discusses internet benefits & impacts.

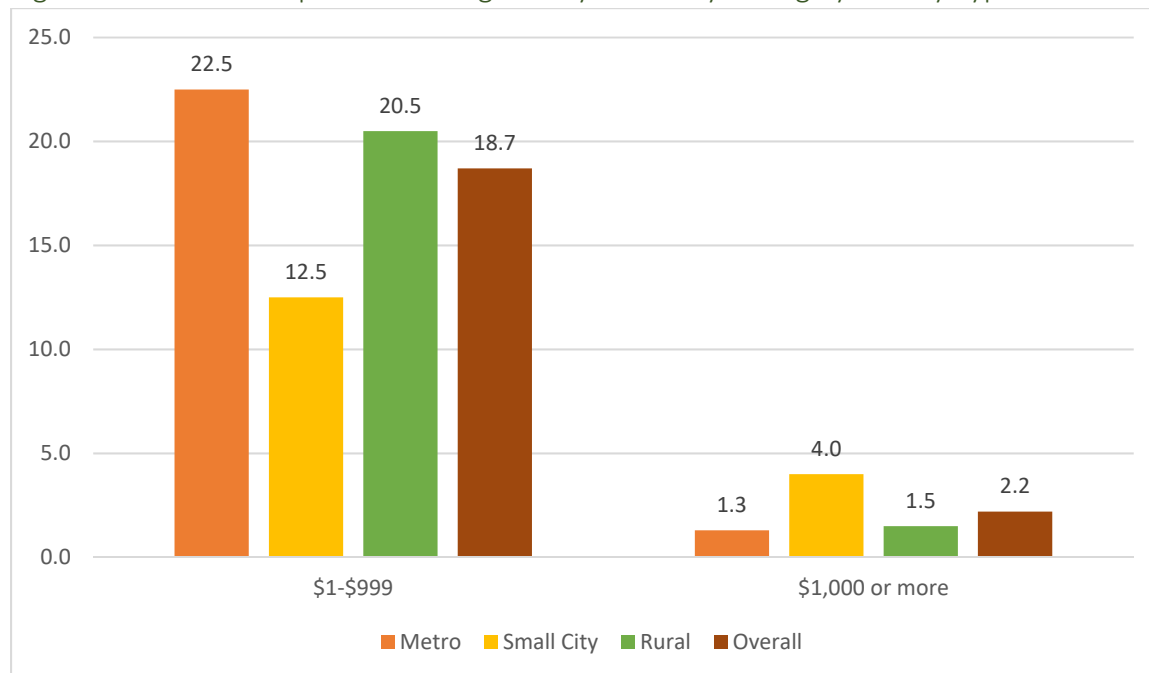
<sup>17</sup> A one-way ANOVA Tukey post hoc test was conducted.

## Internet Benefits & Impacts

This last section focuses on direct impacts of internet utilization on Nebraska households. The previous two sections focused on device & internet service and internet resourcefulness & utilization and highlighted any differences between metropolitan and rural Nebraska households. This analysis has provided a richer understanding of this complex issue. This section will further contribute to the understanding of the breadth and depth of the digital divide in Nebraska by diving deeper into the impacts the technology has on Nebraska households.

Survey participants were asked to respond on online activities that earned them money. Figure 19 shows that almost 21 percent or one-fifth of respondents reported earning money by selling on the internet. A higher share of metropolitan households (22.5 percent) reported earnings less than \$1,000 over the past year, while small city households (four percent) reported a higher share regarding earnings of \$1,000 or more. Granted, the overall percentages are significantly smaller as the earnings reported increased.

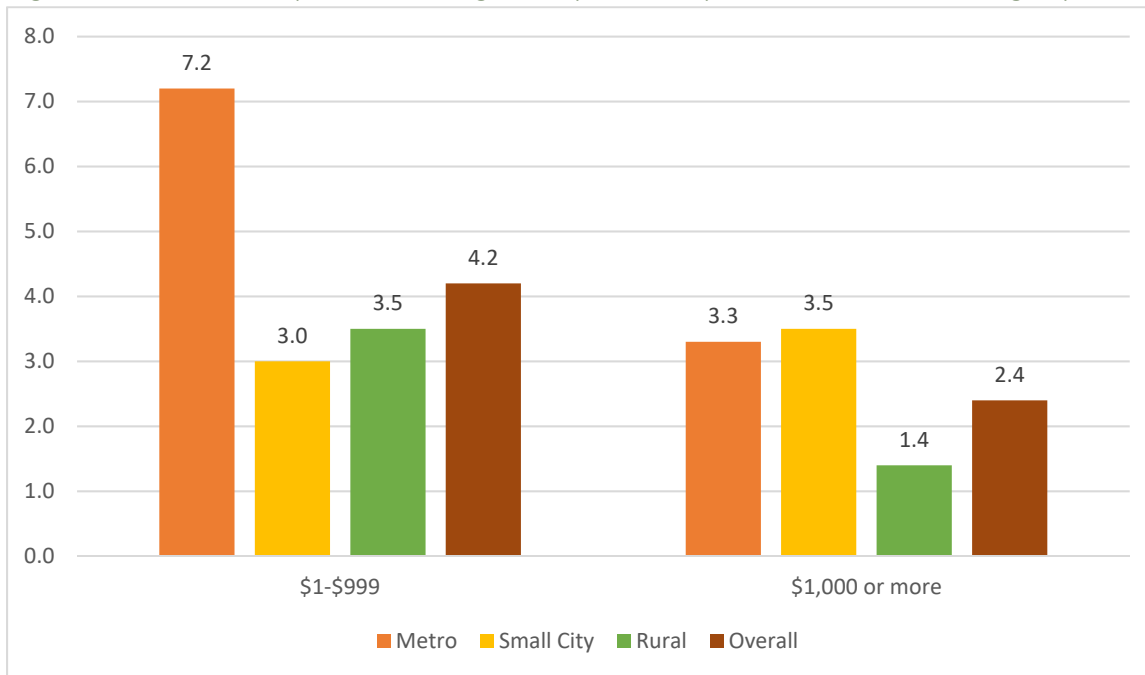
Figure 19. Percent Responses Earning Money Online by Selling by County Type



Source: 2018 PCRD Household Internet Utilization Survey

In addition to earnings selling online, survey asked about earning money by conducting freelance or gig work. As shown in Figure 20, less than five percent of Nebraska households reported earning between \$1 and \$999 dollars conducting this activity versus 2.4 percent earning \$1,000 or more over the past year. Considering that this type of activity requires specific skills somewhat more complex than simply selling online, it was expected that the percentage of households benefitting from these activities would be less compared to those selling online. Metropolitan households were twice as likely to earn money conducting these online activities compared to rural households (10.5 percent versus 4.9 percent).

Figure 20. Percent Responses Earning Money Online by Freelance or Online Gigs by County Type



Source: 2018 PCRD Household Internet Utilization Survey

The last category regarding earning money online included rentals through platforms like Airbnb, VRBO, etc. Figure 21 shows that only three percent of Nebraska households reported earning money conducting this activity over the past year. However, small city households were more likely to earn money through this activity compared to metropolitan and rural households.

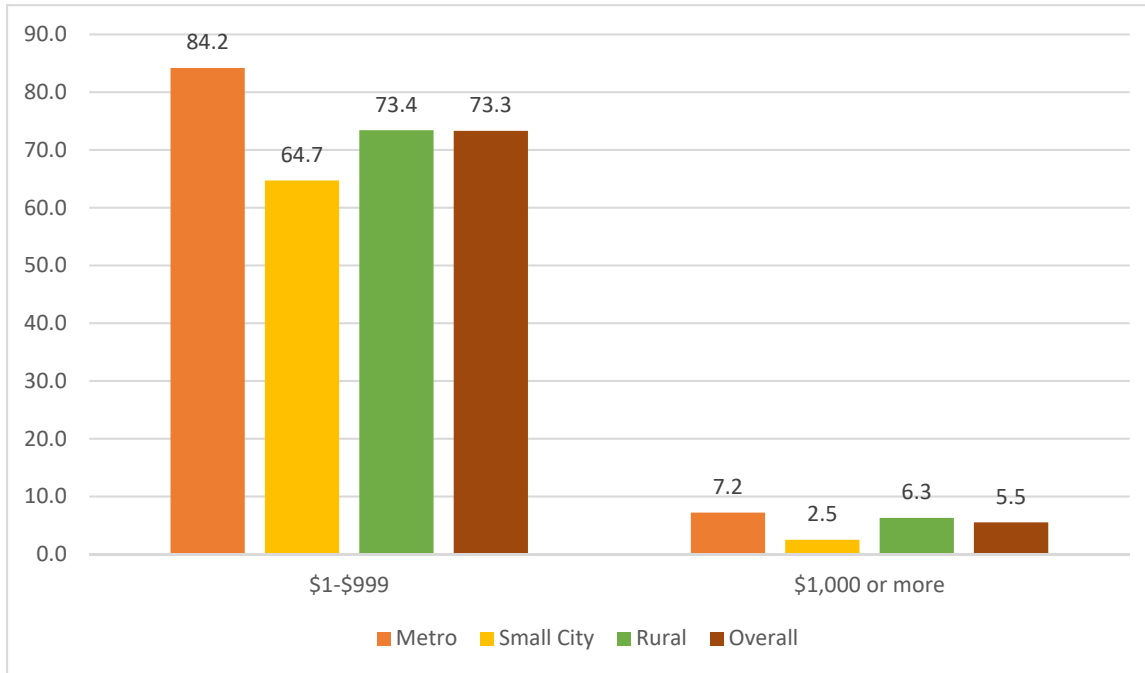
Figure 21. Percent Responses Earning Money Online by Rentals by County Type



Source: 2018 PCRD Household Internet Utilization Survey

The survey also asked about saving money online by conducting multiple activities. Figure 22 shows that more than three-quarters of Nebraska households saved money online by using bargains and coupons. This activity benefitted Nebraska households regardless of county type.

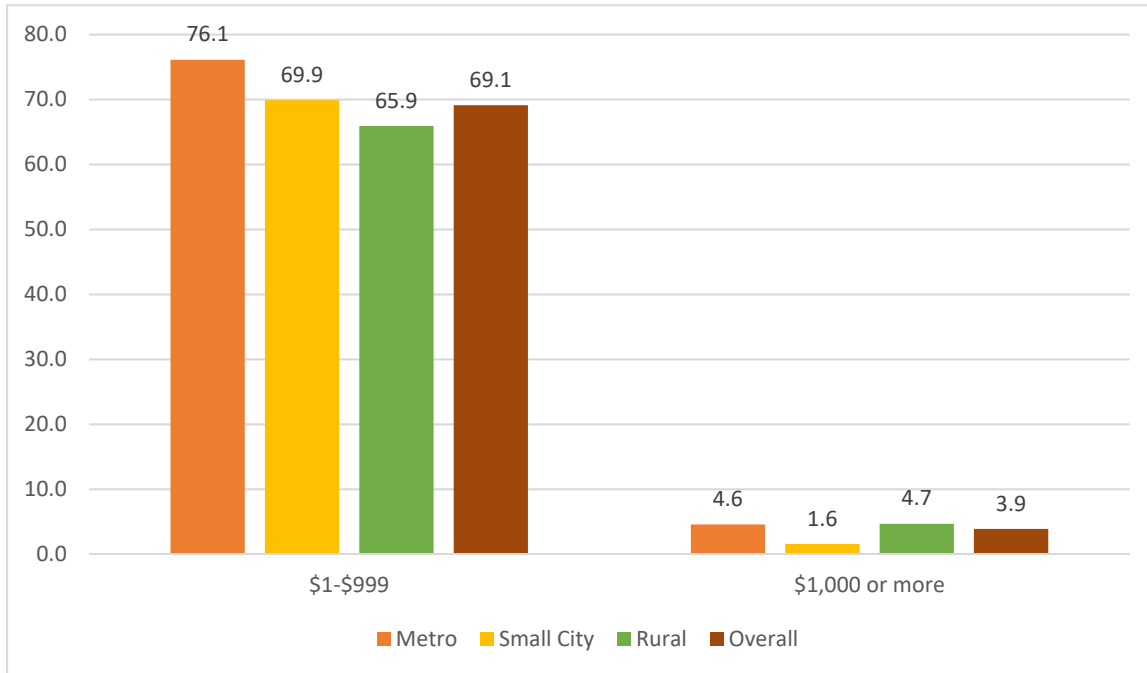
Figure 22. Percent Responses Saving Money Online by Bargains & Coupons by County Type



Source: 2018 PCRD Household Internet Utilization Survey

Likewise, Figure 23 shows that a little less than three-quarters of Nebraska households also saved money online by price matching over the past year. Interesting to note is that among those households saving less than \$1,000 dollars, rural households' share was ten percentage points lower than metropolitan households.

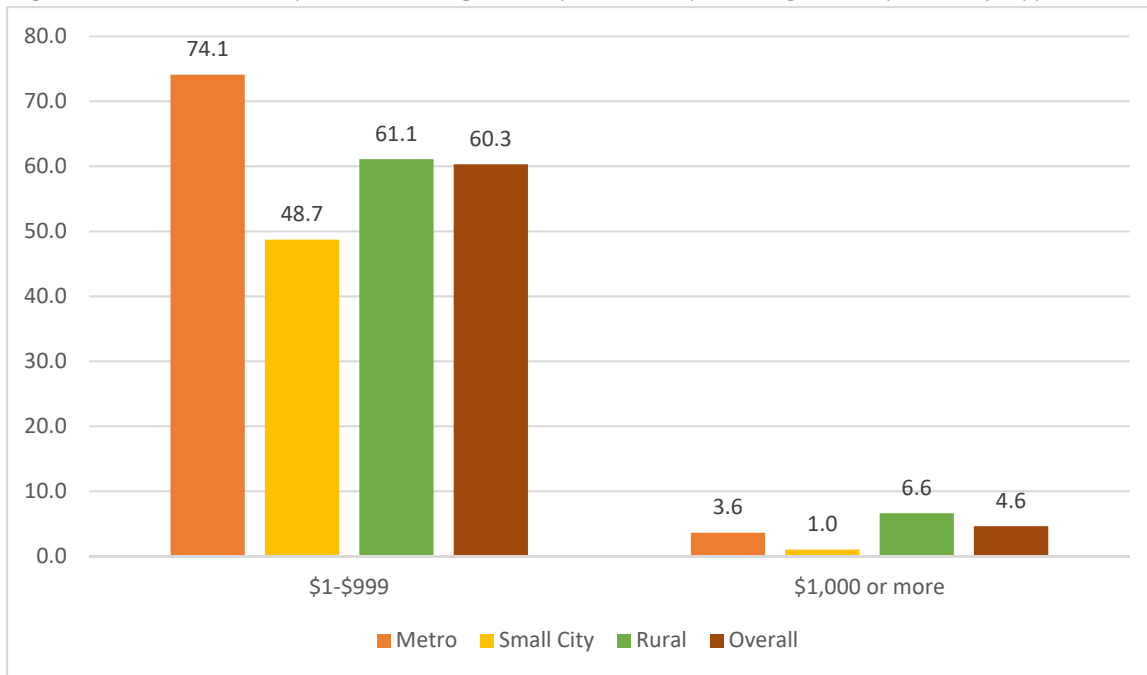
Figure 23. Percent Responses Saving Money Online by Price Matching by County Type



Source: 2018 PCRD Household Internet Utilization Survey

Nebraska households also saved money thanks to the internet by driving less as shown in Figure 24. Almost three-quarters of metropolitan households saved less than \$1,000 dollars compared to 61 percent of rural households. However, when saving \$1,000 dollars or more, the share of rural households was almost double the share of metropolitan households (6.6 percent versus 3.6 percent).

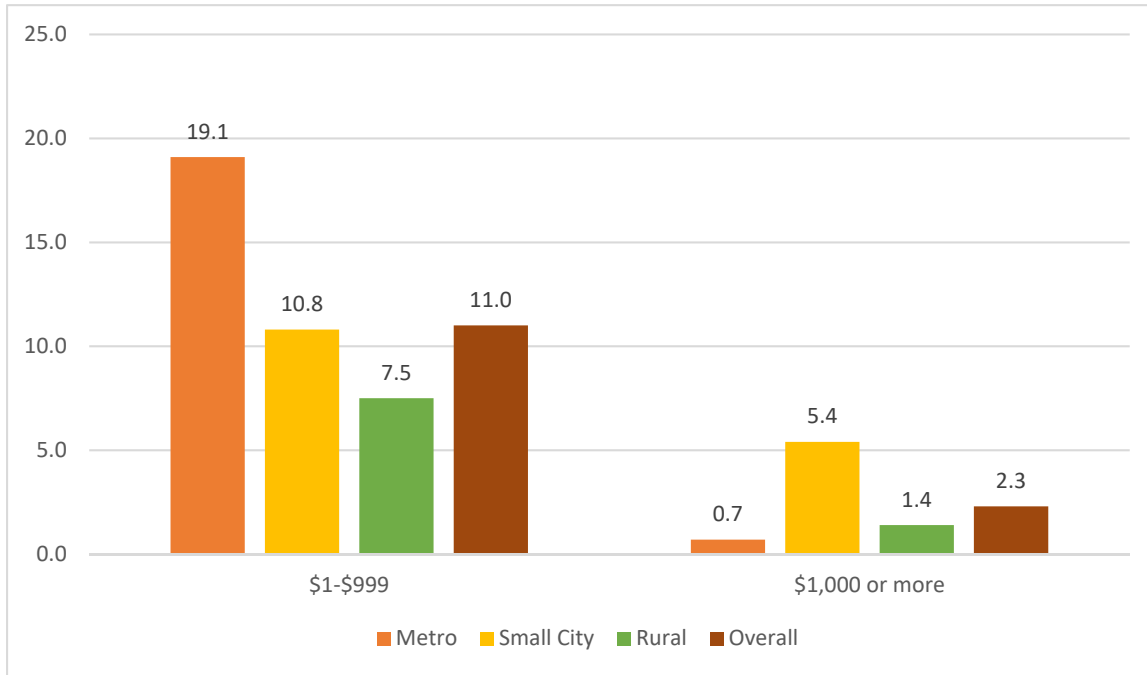
Figure 24. Percent Responses Saving Money Online by Driving Less by County Type



Source: 2018 PCRD Household Internet Utilization Survey

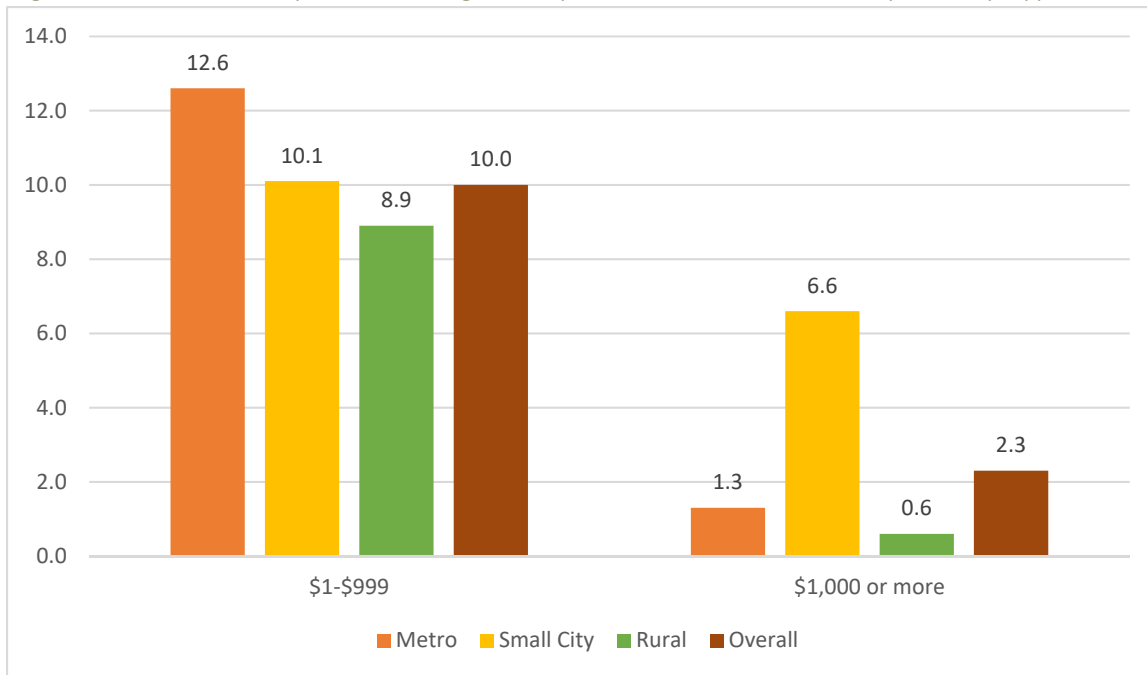
Lastly, on the saving categories, less than 15 percent of Nebraska households saved money by using the internet regarding health insurance and health care as shown in Figure 25-26. Interestingly, a higher share of small city households saved \$1,000 or more on health insurance and healthcare compared to metro and rural households. More research is needed to unravel this finding.

Figure 25. Percent Responses Saving Money Online on Health Insurance by County Type



Source: 2018 PCRD Household Internet Utilization Survey

Figure 26. Percent Responses Saving Money Online on Health Care by County Type

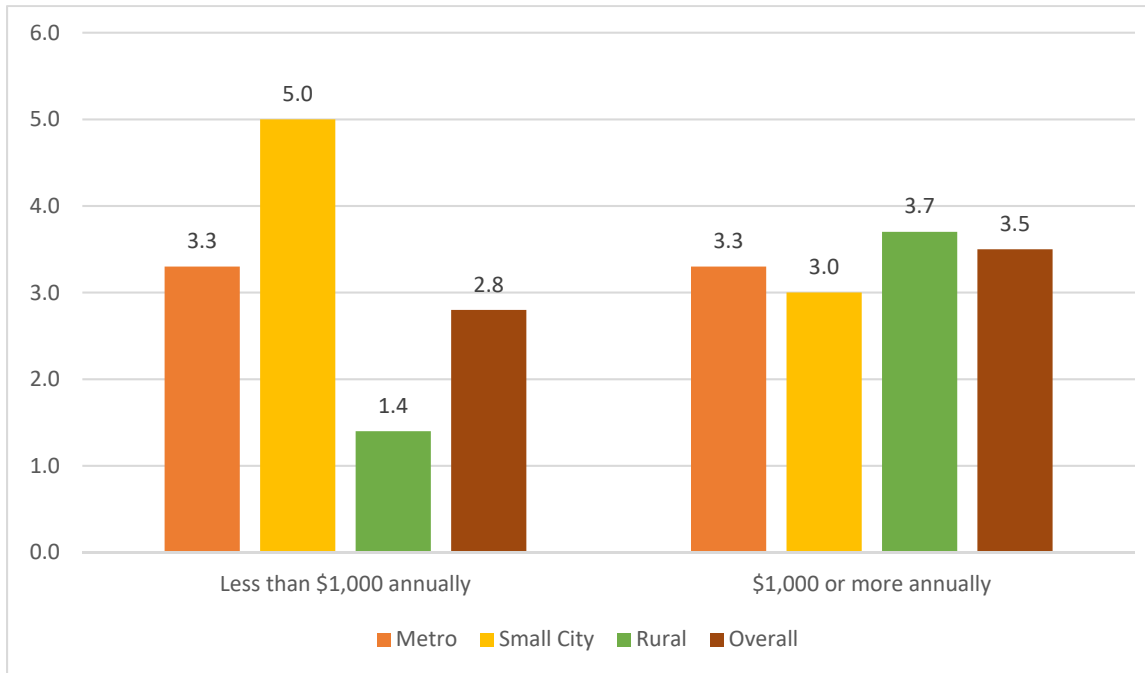


Source: 2018 PCRD Household Internet Utilization Survey



To wrap-up this section, the survey looked at promotions and jobs secured due to internet use. Figure 27 shows that 6.3 percent of Nebraska households benefitted from promotions due to online educational credentials and courses, with more than half of this share obtaining promotions resulting in salary increases of \$1,000 or more annually. Note also that the share of small city households obtaining promotions resulting in salary increases of less than \$1,000 annually was almost five times higher than the rural share (five percent versus 1.4 percent). On the other hand, the share of rural households was highest when obtaining promotion resulting in salary increases of \$1,000 or more annually.

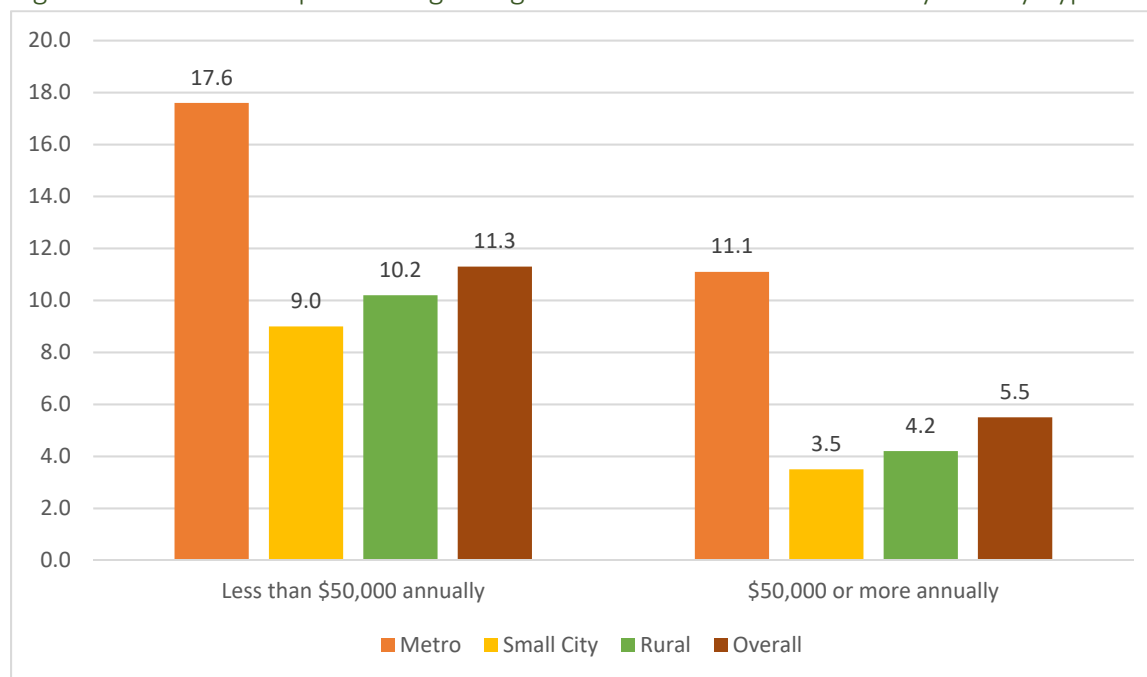
Figure 27. Percent Responses Regarding Promotions Due to Online Activities by County Type



Source: 2018 PCRD Household Internet Utilization Survey

Further, a little more than 17 percent of Nebraska households reported securing jobs due to online searches and applications as shown in Figure 28. Metropolitan households had the highest share of securing jobs paying less than \$50,000 annually and \$50,000 or more with 17.6 percent and 11.1 percent respectively. In fact, the metropolitan share of households securing a \$50,000 or more job online was more than double the rural household share (11.1 percent versus 4.2 percent).

Figure 28. Percent Responses Regarding Jobs Due to Online Activities by County Type



Source: 2018 PCRD Household Internet Utilization Survey

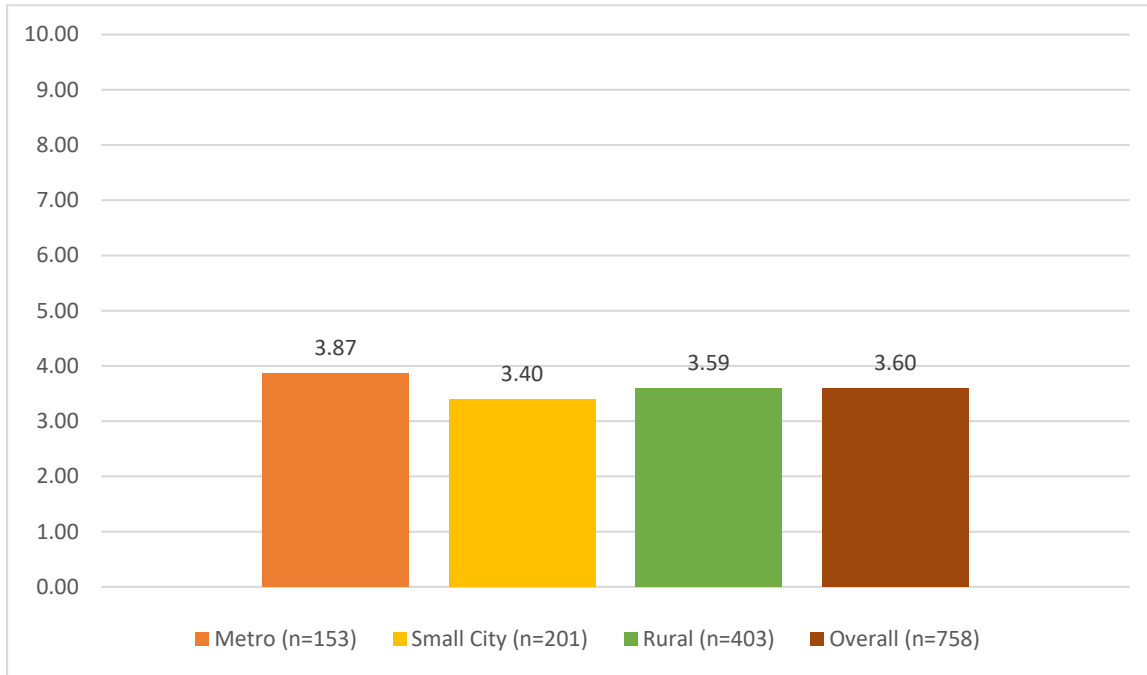
Moreover, the story remains the same when looking at all these variables together. An overall internet benefits & impact (IBI) score was calculated including type and level of earnings and savings as well as promotions and jobs secured with income changes<sup>18</sup>. The resulting IBI score was normalized ranging from zero (minimum) to ten (maximum) for easier interpretation. A higher score denotes a higher internet benefit and impact based on the factors discussed.

Figure 29 shows the average score by county type and overall. The mean IBI score was slightly higher among metropolitan households compared to small city and rural households. In fact, this difference is statistically significant even though it is numerically speaking very low (less than one percentage point)<sup>19</sup>. Overall however, the average IBI score was 3.6, below the median of five. This means Nebraskan households have ample room to cover to maximize the technology’s benefits and impacts.

<sup>18</sup> Refer to Appendix A for more information on how this score was calculated.

<sup>19</sup> A one-way ANOVA Tukey post hoc test was conducted.

Figure 29. Internet Benefits & Impact Scores by County Type



Source: 2018 PCRD Household Internet Utilization Survey

To wrap-up, Nebraska households can benefit even more from the technology and its applications. For example, when earning money online by selling, freelancing, or renting, three-quarters of Nebraska households missed this opportunity. These findings clearly demonstrate that the technology has tremendous potential to benefit rural communities beyond online shopping and entertainment.

## Conclusions

As internet applications continue to evolve and become more sophisticated, the potential to benefit and leverage these to improve the quality of life of Nebraskans increases. However, these benefits will not materialize if Nebraska households are not digital ready. Indeed, the digital divide is one of the most pressing issues of this century and the number one threat to community economic development.

In order to gauge the level of Nebraska households digital readiness, this study analyzed three areas comparing metropolitan and rural households: device & internet access (DIA), digital resourcefulness & utilization (DRU), and internet benefits & impacts (IBI). A score was calculated for each of these areas resulting in an overall digital readiness index (DRI) score<sup>20</sup>. All scores were normalized to a range from zero to ten for easier interpretation and accurate comparison.

Before we review the main findings, it is worth discussing the limitations of this study. First, although the survey was sent to multiple Nebraska stakeholders, a true random distribution is not guaranteed. However, the sample size of 750 responses across multiple county types does allow inferring some level of randomness. Second, a slight overrepresentation of management, professional or education and white respondents exists. However, overrepresentation of other socioeconomic characteristics were adjusted to reflect the state's distribution. Third, no paper surveys were distributed, only online, resulting in a potentially biased sample. However, this was on purpose because the intent of the study was to measure digital readiness, not if it was available, or affordable.

Overall, Nebraska households—regardless of county type—scored very similarly on the digital readiness index (DRI) as shown in Figure 30. Metropolitan households had a slightly higher score and although the difference was less than a point, this difference was statistically significant<sup>21</sup>. Note that Nebraska households scored below the median value of five (4.61), leaving room to improve digital readiness. More importantly, the differences in digital readiness scores are larger among age, income, educational attainment, presence of children and occupation groups compared to county type<sup>22</sup>.

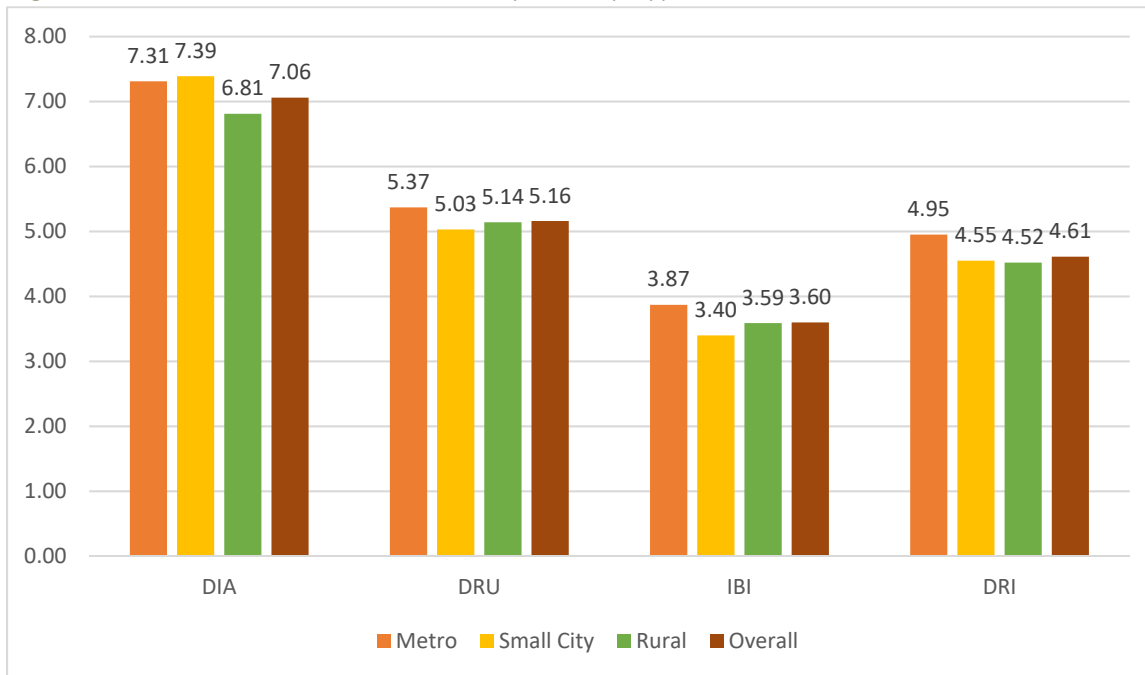
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<sup>20</sup> Refer to Appendix A for more information on how this score was calculated.

<sup>21</sup> A one-way ANOVA Tukey post hoc test was conducted.

<sup>22</sup> Refer to Appendix B for more information.

Figure 30. DIA, DRU, IBI, & DRI Scores by County Type



Source: 2018 PCRD Household Internet Utilization Survey

What exactly needs to improve? Figure 30 provides information on the areas requiring improvement as well. Regarding device & internet access (DIA), Nebraska households had on average a higher score compared to digital resourcefulness & utilization (DRU) and internet benefits & impacts (IBI).

The impact of internet on Nebraska households is visible regarding earnings, savings, promotions, and jobs. While a lower share of Nebraska households benefitted from earning money online, a much higher share saved money online regardless of county type. Regarding promotions, the shares of small city and rural households were higher compared to metropolitan. While metropolitan households benefitted more regarding using the technology to secure jobs, small city and rural households did benefit as well.

Although the device & internet access score was the highest within this digital readiness context does not mean efforts should not be made to improve this score as well. Rural households in Nebraska experienced longer down times regarding internet service and dealing with device issues. They also had a lower desktop and laptop ownership rate (compared to metropolitan households only; they have a higher laptop ownership compared to small city counties) but a much higher smartphone ownership rate (99.2 percent). While smartphones do connect to the internet, their use undermines the technology’s potential for two reasons: limited data plans and many applications are much harder to use with mobile devices and smaller screens such as writing term papers or filling out online applications.

Moreover, rural households spent roughly the same amount of time accessing the internet from home as their metro and small city counterparts. However, rural households did spend more time on average accessing the internet in libraries and relying on their mobile data compared to their metro and small city counterparts, hinting slightly at the urban-rural internet availability disparity. In fact, out of those responding using mobile data to access the internet for 50 percent or more of the time, almost 80 percent were in rural counties.

Despite this device & internet access disparity, rural households in Nebraska did access the internet as frequently, or more, compared to their metropolitan and small city counties. Furthermore, while metropolitan-rural differences were evident regarding specific digital resourcefulness measures—rural households are twice as likely to find it difficult to trust online information and almost ten times more likely to rarely or never read material they disagreed with—when factoring frequency and diversity of internet use, rural households were not behind their metropolitan counterparts. This finding—perhaps the most significant of this study—does not support the current national narrative highlighting an urban-rural divide regarding internet adoption and use<sup>23</sup>.

The good news is that these two areas—digital resourcefulness & utilization and internet benefits & impact—can and should be improved with a well-designed and implemented educational/training effort throughout the state. This effort can involve multiple statewide organizations such as cooperative extension, libraries and others to continue educating Nebraskan households and fully leverage the technology for community economic development purposes.

Some key takeaways of this study include:

1. There is a device & internet access divide between metropolitan and rural Nebraska households. Efforts need to be made to reduce this divide by expanding broadband availability and device ownership throughout the state, especially in rural areas. Despite this divide, rural households utilized as frequently or more the internet compared to their metropolitan counterparts albeit relying at a higher rate on smartphones, mobile data and libraries.
2. No significant difference between urban and rural households regarding digital resourcefulness & utilization exists. However, there is ample room to maximize the technology's impact, especially regarding internet benefits and impact. Three-quarters of Nebraska households did not earn money online by selling, freelancing, or renting. Furthermore, on average Nebraska households utilized the internet in eleven out of twenty-five different ways.
3. The difference in digital readiness index scores was higher among age, income, educational attainment, and presence of children groups than county type. This supports national research<sup>24</sup> where older, lower income and lower educational attainment are found to make a higher share of non-internet users. Those that used mobile data 50 percent or more of the time had a larger difference in scores than county type. On the adoption and use front, rather than focusing on a metro-rural divide, issue should focus on age, income and occupational differences.
4. The digital readiness level of Nebraska households is shy of half its potential—as measured by this study. More importantly, this level is very similar regardless of county type. Efforts need to be made to ensure Nebraska households are at their maximum regarding their digital readiness in order to reap the benefits of this evolving digital age. Additional efforts should be made to ensure older, less educated households in occupations not conducive to improve digital skills and adoption receive the proper training to benefit from this technology as well. This digital readiness can be improved by designing and implementing statewide educational/training efforts. Greater use of some applications, such as telehealth and telework, may also require broader changes within industries and organizations.

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<sup>23</sup> <http://www.pewresearch.org/fact-tank/2017/05/19/digital-gap-between-rural-and-nonrural-america-persists/>

<sup>24</sup> <http://www.pewresearch.org/fact-tank/2018/03/05/some-americans-dont-use-the-internet-who-are-they/>

## Appendix A

The digital readiness index (DRI) score was calculated using the following formula and then normalized to 0-10 range: device & internet access (DIA) score + digital resourcefulness & utilization (DRU) score + internet benefits & impact (IBI) score. Important to note is that because each dimension had different means and variances, z-scores rather than the actual scores were added up. Careful attention was given to assign a higher value to responses that improved digital readiness. For example, if there were performance issues with internet or a particular device (Q3), the longer the period the lower the value.

**Device & internet access (DIA) Score = Q2+Q3+Q4+Q5; maximum: 64; minimum: 4**

Q2: Which of the following devices do you own and how well did they work over the past year?

Categories: desktop, laptop, tablet, smartphone; Minimum 0; Maximum 16

Non-response = 0

Do not own = 1

Poorly/Very poorly = 2

Sufficient = 3

Well/Very well = 4

Q3: How often have you been without a device or the internet over the past year due to unpaid bills, broken devices, running out of minutes/data, or other problems?

Categories: internet, desktop, laptop, tablet, smartphone; Minimum 0; Maximum 25

Non-response = 0

More than 30 days a year = 1

8-30 days a year = 2

5-7 days a year = 3

1-4 days a year = 4

Never had problems = 5

Q4: Over the past year, roughly what percent of the time did you use the following to connect to the internet:

Categories: HomeWiFi; Minimum 0; Maximum 3

<25% = 0

25%<50% = 1

50%<75% = 2

75% or higher = 3

Q5: How often did you or anybody in your household use the following devices to access the internet over the past year?

Categories: desktop, laptop, tablet, smartphone; Minimum 0; Maximum 20

Non-response = 0

Never = 1

Once or several times per year = 2

Several times monthly/once monthly = 3

Several times weekly/once weekly = 4

Several times daily/once daily = 5

**Digital readiness & utilization (DRU) Score: Q6+Q7+Q8+Q9; maximum: 180; minimum: 0**

Q6: How often did you or anybody in your household access online information or interact digitally with the following community actors over the past year?

Categories: all (8) but other; Minimum 0; Maximum 40

Non-response = 0

Never/not interested = 1

Would love to but need to learn = 1

Once or several times per year = 2

Several times monthly/once monthly = 3

Several times weekly/once weekly = 4

Several times daily/once daily = 5

Q7: Over the past year, how well did these statements describe you ...

Categories: all (3); Minimum 0; Maximum 6

Non-response/don't know = 0

Not too well/not well at all = 1

Very well/somewhat well = 2

Q8: When looking for news or political information online, how often over the past year did you ...

Categories: all (3); Minimum 0; Maximum 9

Non-response = 0

Rarely/never = 1

Sometimes = 2

Very often/often = 3

Q9: How often and which applications did you use your internet connection for over the past year?

Consider anybody in your household.

Categories: all (25); Minimum 0; Maximum 125

Non-response = 0

Never/not interested = 1

Would love to but need to learn = 1

Once or several times per year = 2

Several times monthly/once monthly = 3

Several times weekly/once weekly = 4

Several times daily/once daily = 5



**Internet Benefits & Impacts (IBI) Score = Q10+Q11+Q12+Q13; maximum: 53; minimum: 0**

Q10: Did you or anybody in your household earn money thanks to your internet connection over the past year?

Categories: all (3) but other; Minimum 0; Maximum 15

Non-response = 0

Did not earn money = 1

\$1-\$99 = 2

\$100-\$999 = 3

\$1,000-\$4,999 = 4

\$5,000 or more = 5

Q11: Did you or anybody in your household save money thanks to your internet connection over the past year?

Categories: all (6) but other; Minimum 0; Maximum 30

Non-response = 0

Did not earn money = 1

\$1-\$99 = 2

\$100-\$999 = 3

\$1,000-\$4,999 = 4

\$5,000 or more = 5

Q12: Over the past year, did you or anybody in your household obtain a promotion thanks to educational courses completed online?

Minimum 0; Maximum: 4

Non-response = 0

No promotions obtained = 1

Yes, promotion resulted in less than \$500 increase per year in salary = 2

Yes, promotion resulted in \$500 to \$999 increase per year in salary = 3

Yes, promotion resulted in \$1,000 or more increase per year in salary = 4

Q13: Over the past year, did you or anybody in your household secure a job found and/or applied online?

Minimum 0; Maximum: 4

Non-response = 0

No jobs secured = 1

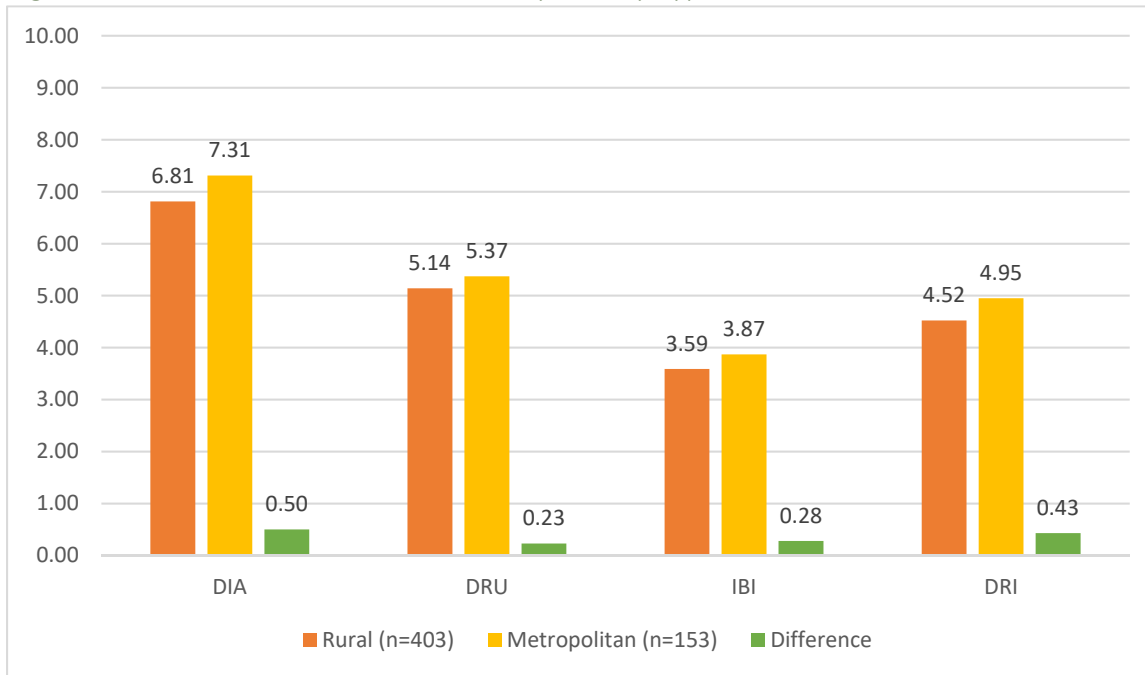
Yes, got a job paying less than \$30,000 per year = 2

Yes, got a job paying \$30,000 - \$49,999 per year = 3

Yes, got a job paying \$50,000 or more per year = 4

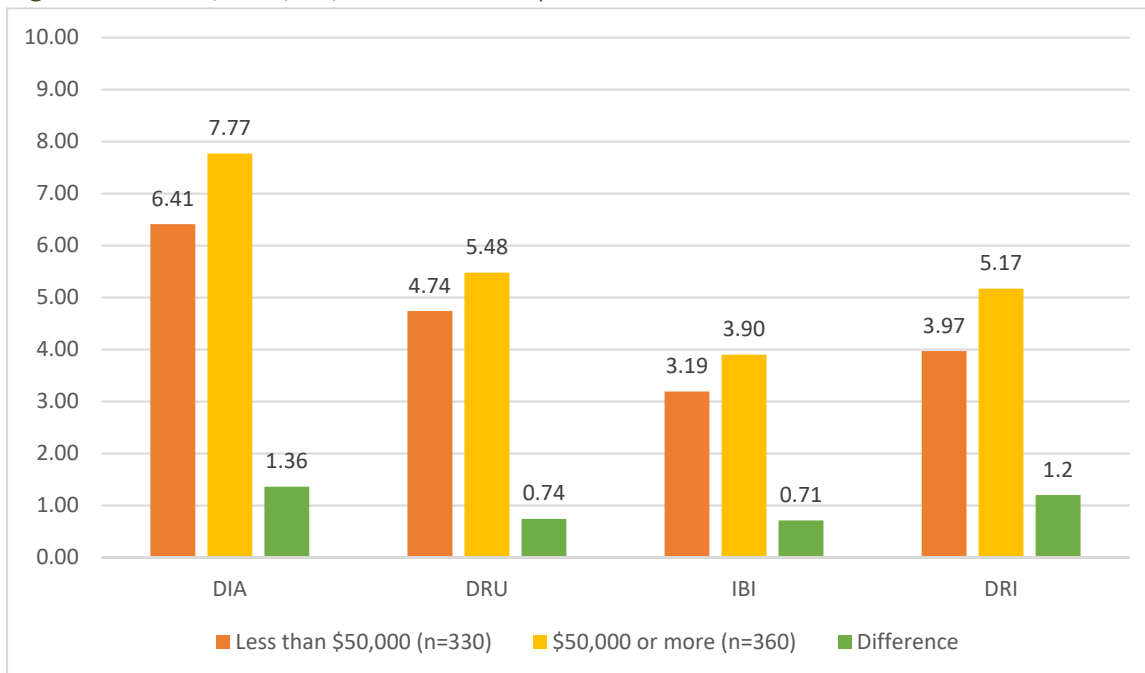
## Appendix B

Figure A2.1. DIA, DRU, IBI, & DRI Scores by County Type



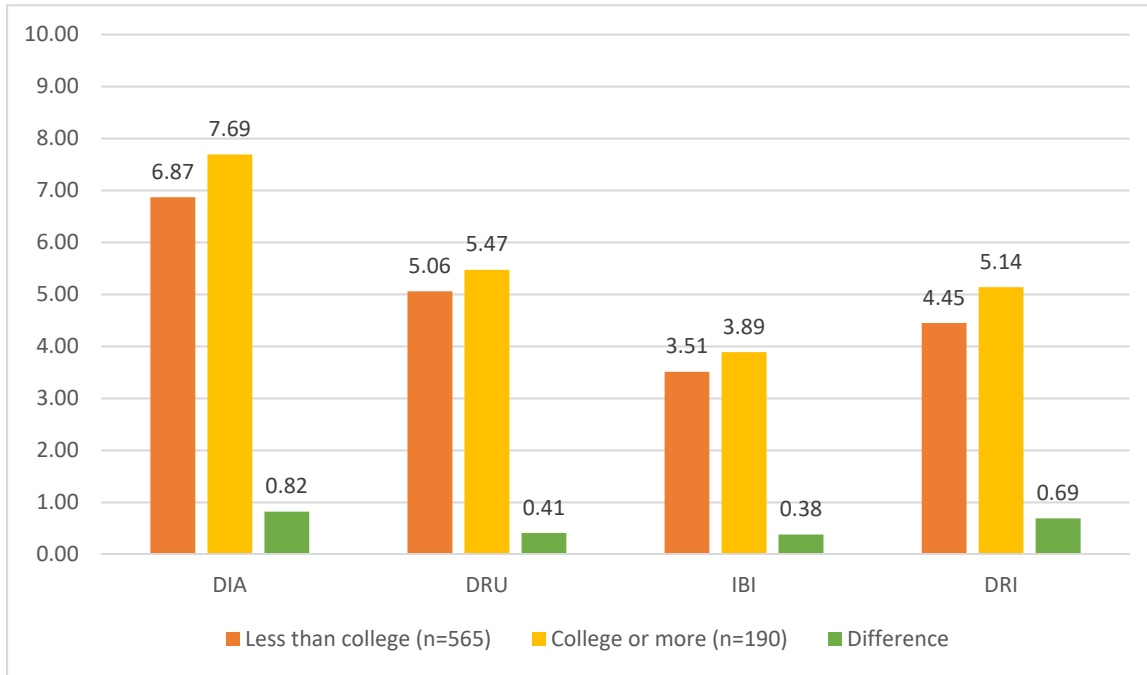
Source: 2018 PCRD Household Internet Utilization Survey

Figure A2.2. DIA, DRU, IBI, & DRI Scores by Household Income



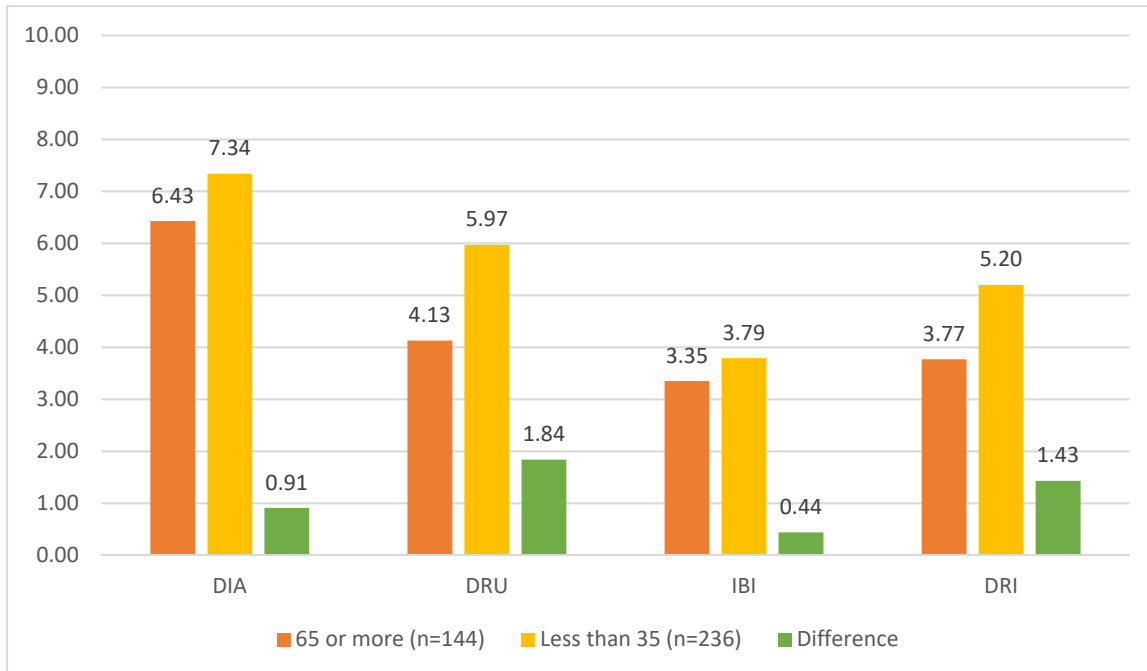
Source: 2018 PCRD Household Internet Utilization Survey

Figure A2.3. DIA, DRU, IBI, & DRI Scores by Educational Attainment



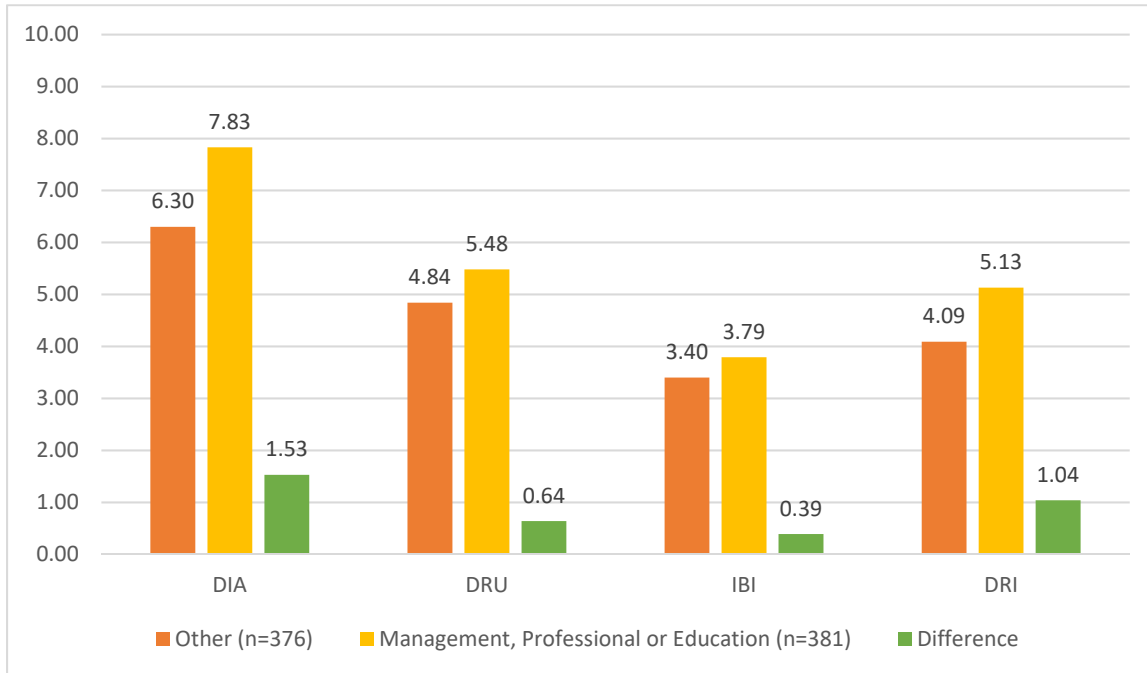
Source: 2018 PCRD Household Internet Utilization Survey

Figure A2.4. DIA, DRU, IBI, & DRI Scores by Age Groups



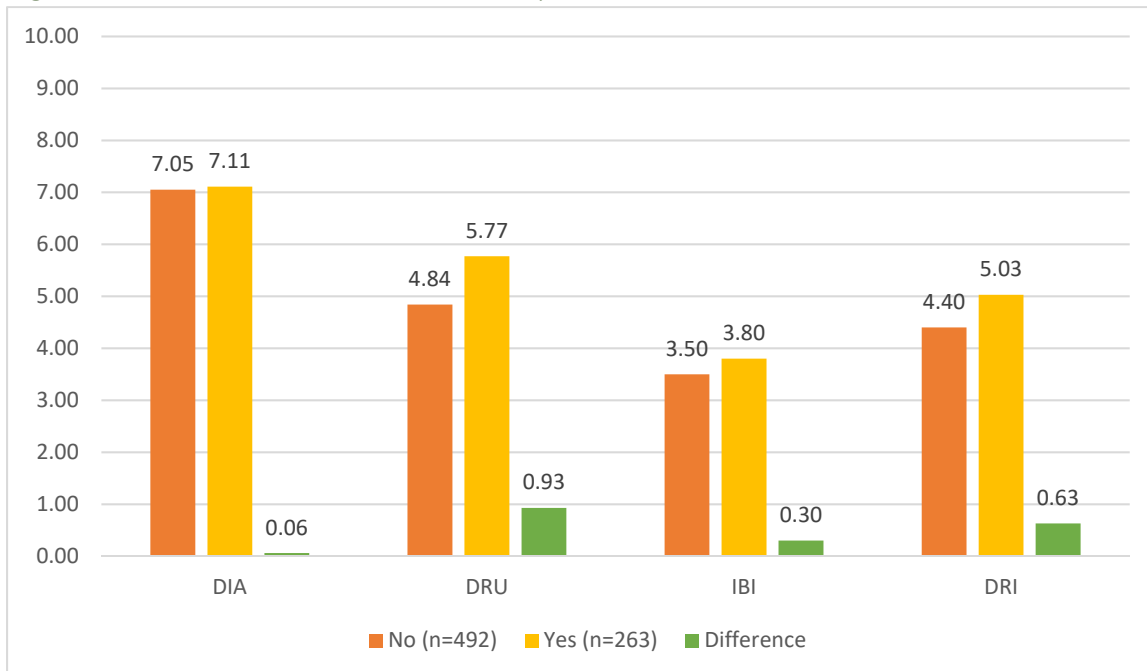
Source: 2018 PCRD Household Internet Utilization Survey

Figure A2.5. DIA, DRU, IBI, & DRI Scores by Occupations



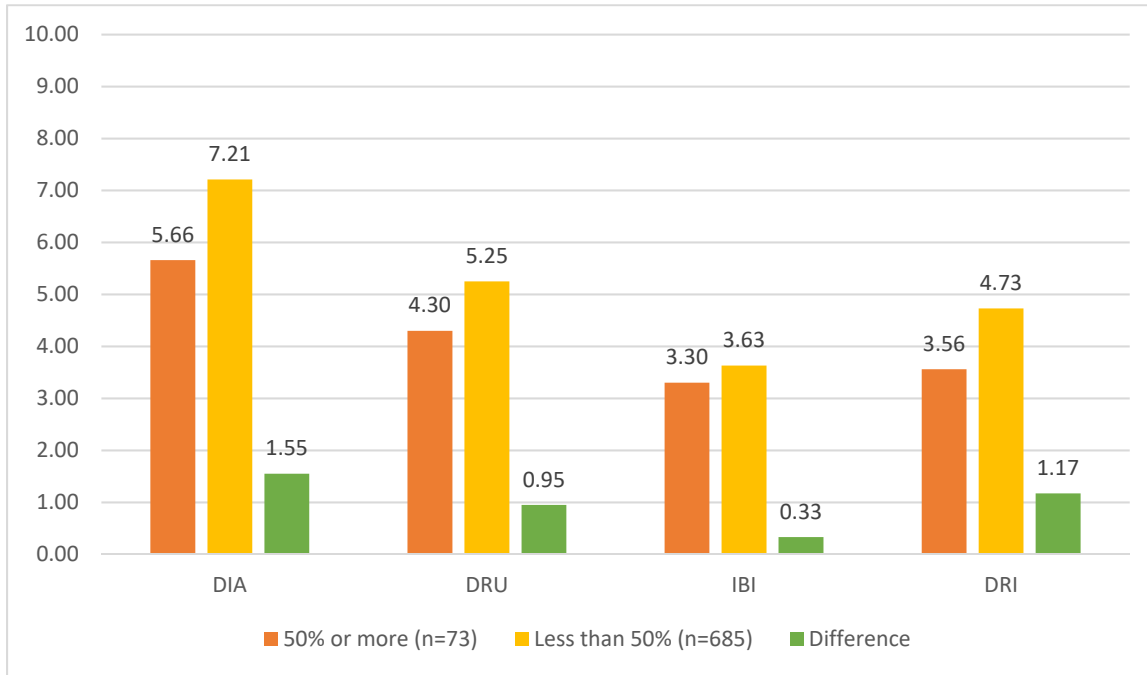
Source: 2018 PCRD Household Internet Utilization Survey

Figure A2.6. DIA, DRU, IBI, & DRI Scores by Households with Children



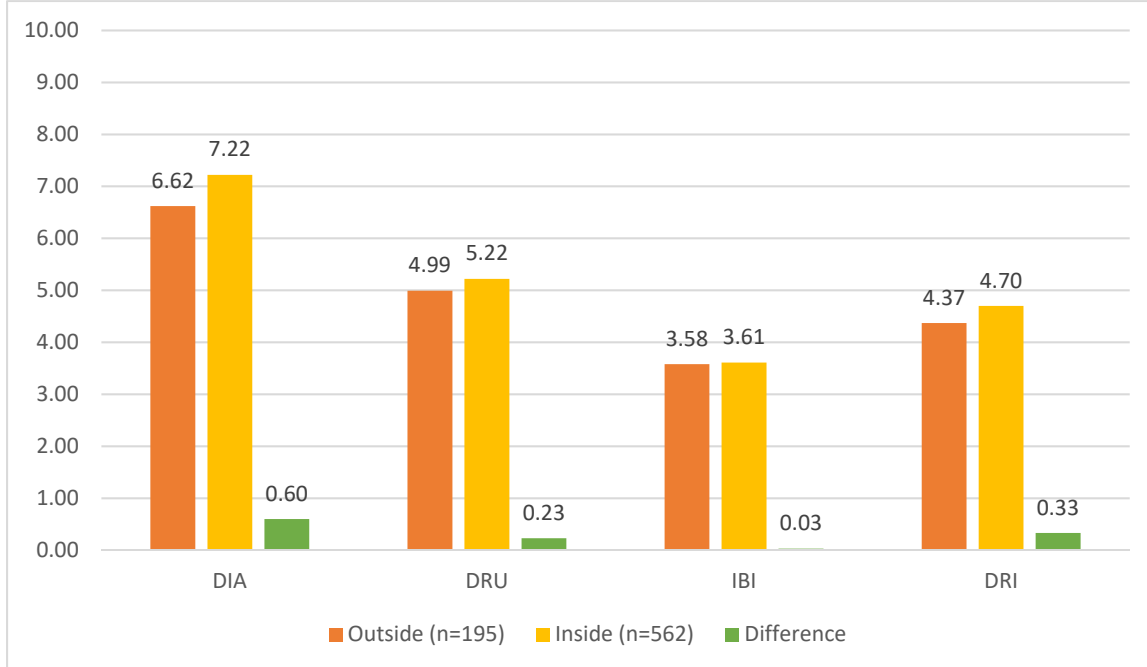
Source: 2018 PCRD Household Internet Utilization Survey

Figure A2.7. DIA, DRU, IBI, & DRI Scores by Mobile Data Use



Source: 2018 PCRD Household Internet Utilization Survey

Figure A2.8. DIA, DRU, IBI, & DRI Scores by City Limit Status



Source: 2018 PCRD Household Internet Utilization Survey

A series of statistical analyses were completed to take a deeper look at differences between the multiple scores calculated and socioeconomic characteristics, including county type and occupations. Crosstab gamma analyses were conducted since variables utilized were measured at the ordinal level. The Gamma coefficient ( $\gamma$ ) ranges from -1 to +1 where a value closer to zero indicates a weaker relationship. Results are shown in Table A2.1.

All scores calculated were grouped into three equal groups, ranging from lowest to highest and compared with the following socioeconomic characteristics. Values are shown in parenthesis.

- County type: metropolitan counties (1), small city or micropolitan counties (2) and rural or noncore counties (3).
- Household income: less than \$35,000 (1), income between \$35,000 and \$74,999 (2) and income of \$75,000 or greater (3).
- Age groups: those younger than 35 years (1), ages 35 to 64 (2) and those ages 65 or older (3).
- Educational attainment: high school degree or less (1), some college including an associate’s degree (2) and a bachelor’s degree or higher (3).
- Occupation groups: all other occupations (1), sales or office support (2) and management, professional, or educational occupations (3). Note that a higher occupational category denotes a higher likelihood work could be done remotely or more telework-friendly requiring above average digital skills.
- Digital readiness dimensions were divided into three groups ranging from lowest to highest.

As seen in Table A2.1, the variable of interest (DRI) had different statistically significant relationships with the socioeconomic characteristics analyzed. As expected, the more rural the county, the lower the DRI ( $\gamma = -0.137$ ). However, the county type coefficient was the weakest among those analyzed. The strongest was household income ( $\gamma = +0.665$ ) followed by occupation ( $\gamma = +0.509$ ). In other words the wealthier the household and the higher likelihood work could be done remotely, the higher the DRI.

Regarding the other dimensions, it is interesting to note that county type was not statistically significant when it came to digital resourcefulness & utilization and internet benefits & impact. In other words, there was no significant difference between metro and rural counties when it came to technology use and its impact. This of course implies that educational efforts should be targeted at both type of households. On the other hand, the device & internet access score difference was significant, supporting the well-documented internet availability metro-rural digital divide.

Table A2.1. Ordinal Bivariate Crosstab Results

| <b>Gamma Coefficients</b>                   | <b>County Type</b>   | <b>Household Income</b> | <b>Age Groups</b>    | <b>Occupation</b>    | <b>Ed. Attainment</b> |
|---|----------------------|-------------------------|----------------------|----------------------|-----------------------|
| Device & Internet Access (DIA)              | -0.254***<br>(n=756) | +0.416***<br>(n=690)    | +0.011<br>(n=751)    | +0.505***<br>(n=757) | +0.282***<br>(n=754)  |
| Digital Resourcefulness & Utilization (DRU) | +0.017<br>(n=758)    | +0.453***<br>(n=690)    | -0.610***<br>(n=751) | +0.265***<br>(n=758) | +0.273***<br>(n=755)  |
| Internet Benefits & Impact (IBI)            | +0.005<br>(n=758)    | +0.572***<br>(n=691)    | -0.205***<br>(n=751) | +0.179***<br>(n=757) | +0.178***<br>(n=754)  |
| Digital Readiness Index (DRI)               | -0.137***<br>(n=759) | +0.665***<br>(n=688)    | -0.318***<br>(n=751) | +0.509***<br>(n=755) | +0.309***<br>(n=754)  |