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Monetary Impact of National Exchange Carrier Association Tariffs on Internet Access Cost in Rural Areas

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MONETARY IMPACT OF NATIONAL EXCHANGE CARRIER ASSOCIATION TARIFFS ON INTERNET ACCESS COST IN RURAL AREAS[1]

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ABSTRACT

This study examines the monetary impact of tariffs on consumer internet access via a digital subscriber line (DSL). Historically, the Communications Act of 1934 mandated that telephony services be provided to everyone, without exclusion. With the rapid emergence of the internet, the Connect America Fund was recently implemented to ensure equal access to both voice and broadband services. Since many telephony companies have emerged as internet service providers, DSL internet service is often bundled together with a landline telephone, especially in rural areas. This study examines the total cost of such bundled DSL internet service across the classes of cities in the state of Nebraska as well as the total monetary impact. In recent years, a rapid reduction in landline telephone service subscribers has occurred. This steady decline in telephone service subscribers supports the idea that consumers typically do not want a landline. However, findings reveal that National Exchange Carrier Association tariffs enforce internet access plans which require the customer to purchase a landline telephone in order to obtain DSL internet access. Findings also reveal substantial cost differences between rural and urban populations' internet access when factoring in the cost of a required landline telephone. The study holds significant importance for community leaders, state telecommunications regulators and any entity interested in the issue rural/urban equity of internet bandwidth and cost.

Keywords: telecommunication tariff, rural digital divide, digital subscriber line, DSL, internet access cost, telecommunication regulation

INTRODUCTION

Residents in rural areas choose where they live for a multitude of reasons. A few motivating factors include solitude, more physical space, occupation, culture, possibly a scenic view, and potentially a slower pace of life. As many rural residents would contend however, it is often a significant challenge obtaining reliable, cost effective, high-speed internet access. Unlike urban residents who typically have multiple technology options and service providers to choose from for internet access, rural residents typically have very limited options or do not have a choice of service providers. They often lack the benefits of lower cost and higher bandwidth derived from competing companies or technologies for internet access. Even though a rural area may have multiple seemingly competing internet access providers available, there are often extenuating circumstances preventing or limiting actual consumer choice. For example, a remote location at a distance exceeding the technical limitations of digital subscriber line might not be a good candidate for a terrestrial wireless system due to line of site restrictions. This may leave the residence with

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the only option of high-priced satellite internet access. Not all internet delivery technologies are necessarily capable of serving all the residents in a particular geographic area (Obermier, 2018).

Typically, rural residents do have basic land line telephone service available. This access to basic service was established in the Communications Act of 1934 (47 USC §§151 et seq), which created the Federal Communication Commission (FCC). For several decades, a fundamental tenet of the FCC was to provide ubiquitous telephone service to all U.S. citizens through a concept called universal service. This funding mechanism assisted telephone companies with paying for the high cost of installing telephone lines to remote and rural customers (FCC, 2016). Funding came from a fee charged to telephone companies and ultimately, their customers.

Telephone companies have provided land line telephone services since shortly after the telephone was invented in 1876. Service expanded quickly in populated areas as society became reliant on the innovation. Because of this reliance, telephony service to the home became a basic need. Although the societal demand existed, the ability to pay for rural infrastructure required federal regulatory assistance. The concept of funding infrastructure installations in low population density areas with funds from all service subscribers, including those in high population density areas, is the underlying principle of the funding mechanism of universal service (FCC, 2018b). As yet another solution for high cost and rural areas, in many geographic areas, groups of rural residents would form cooperatives to jointly share the cost of bringing telephone services to the rural areas of the United States. Many of these cooperatives existed in areas with farming operations. They were formed in the early part of the twentieth century and had far higher telephone adoption rates than rural areas without farming operations (Kline, 2000). The creation of cooperatives essentially eliminated the profit motive of typical companies, but for-profit companies would not roll out services in rural areas due to the low or non-existent rate of return on investment. Many of those cooperatives exist to this day.

The FCC has extended the benefits of universal service that once enhanced the deployment of the telephone, to that of internet access through the Connect America Fund (FCC, 2018c). The Connect America Fund, helping to fund the rollout of "advanced services" by the FCC, is designed to ensure consumers in rural, insular, and high cost areas have access to both broadband and voice services at reasonably comparable rates to the access available in urban areas. The reasonably comparable cost and bandwidth requirement between urban and rural areas was stated by Congress in the Telecommunications Act of 1996 (47 USC §254 (b)(3)). Insular areas are territories not part of the States or Federal districts (US Dept of the Interior, 2018). They are typically small islands in the Caribbean and the Pacific Ocean.

Telephone system infrastructure was first assembled using copper wires extended to every home from a common location called the central office. As internet access began, the technology of digital subscriber line (DSL) was invented to capitalize on these existing copper wires. Digital subscriber line (DSL) service provides internet access through a technology that transmits both the telephone and the internet signals on the same set of electrical transmission wires originally put in place for basic telephone service (FCC, 2014). The two services can be provided to customers independently, but are typically sold to customers in rural areas as a package. Companies that have specialized in providing telephone services have also become internet service providers, since they typically own much of the critical telecommunications infrastructure required for connections to

the internet. This is particularly the case in rural areas, due to the high cost of competing infrastructure deployment.

Telephone companies have a long history of being mandated to report their service offerings through tariffs. A tariff is a list of the services and rates a customer must pay for those services (FCC, n.d.). Tariffs were mandated by government agencies early in American history to help protect consumers of freight services from unscrupulous business practices in the railroad industry. Tariffs were adopted by the Federal Communication Commission as a means to both protect customers and ensure legally recognized telephone monopolies could earn a reasonable profit. The filing and management of tariffs can be a significant challenge for small companies, and most small rural telecommunication carriers are members of the National Exchange Carrier Association (NECA). NECA files tariffs with the FCC on behalf of its member companies. Due to tariff restrictions of companies providing landline voice services, telephone companies that have become internet service providers and still offer landline telephone services are typically required to charge the customer for a telephone line along with digital subscriber line internet access. The tariff pricing matrix and bandwidth allocations are found in NECA Tariff No. 5 (NECA, 2019b).

With a significant percentage of rural areas having access to the internet via digital subscriber line, and NECA member companies structuring tariffs requiring customers to pay for a telephone line, internet customers find themselves paying for a landline telephone they may or may not want. Urban residents typically have multiple sources to access the internet, allowing them to drop their landline phone in favor of mobile cellular phones. However, many rural residents are forced into a landline telephone ownership. This grossly inflates the actual cost of internet for rural customers compared to urban customers. For example, a comparison between customers in Aurora and Lincoln, Nebraska, found that customers in Lincoln purchasing a download rate of 100 Mbps internet access via a fiber optic cable service pay as little as sixty-five cents per Mbps with no landline telephone service requirement. On the other hand, customers in the small town of Aurora pay $12.02 per Mbps for 7Mbps DSL service, when the cost of the required telephone is factored in. This example stands in stark contrast to the intended desire of Congress in the Telecommunications Act of 1996 for equitable rates of cost and bandwidth between rural and urban areas.

The purpose of this study was to examine the monetary impact of the National Exchange Carrier Association tariffs on internet access in rural areas, to understand the prevalence of "naked DSL" or "dry loop" service offerings (i.e. DSL internet access without the tariffed phone line), to determine the consumer cost of DSL when the required telephone line is considered as a factor, and to examine the rural/urban differences in cost for DSL access with the required telephone line.

LITERATURE REVIEW

Hoffman, Kalsbeek, and Novak (1996) analyzed a CommerceNet/Nielsen Internet Demographic Survey and determined that 28.8 million people, approximately 11% of the population in the United States had access to the relatively new communication medium of the internet in 1995. Mobile cellular telephone, also a relatively new technology in 1995, had a subscriber base of only 33.79 million people as reported by the Cellular Telephone Industry Association (CTIA) and the International Telecommunications Union (ITU) (Kim & Litman, 1999). In 2018, The Global Economy reported 404.58 million mobile phone subscribers.

Both internet access and cell phone usage were very limited in 1995 when compared to today's standards. The Pew Research Center reports that 89% of Americans actively used the Internet in 2018, and the CTIA reports that wireless devices including mobile cellular reached a saturation point of 1.2 devices for every person in the country with over 400 million active devices in the United States (Pew Research Center, 2018a). The Pew Research Center reported that 95% of Americans currently own a cellphone and 77% of those are smart phones (2018b). According to Brogan in the US Telecom's *2018 Industry Metrics and Trends* report, mobile broadband internet access is growing rapidly, far exceeding the number of new fixed broadband internet connections, and consumers are choosing services with increasingly higher speeds. They also report that some rural areas are being increasingly served by fixed wireless access, but there is a notable gap in serving high cost rural areas with broadband access (Brogan, 2018). From a historical perspective, a mere eight years ago, 52% of adults in the United States used the internet, but only 1% of those users had broadband internet access (Pew, 2018a).

The landline telephone was a necessity back in 1996. Belinfante reports that in 1996 there were a total of 101.3 million households in America and 93.9% of those households had a telephone. This percentage had actually increased from 91.4% in 1983 when there were only 85.8 million households (Belinfante, 1997). However, in less than twenty years' time from 1996, the landline telephone became far less important to the American consumer. A National Center for Health Statistics study found in 2018 that 55.2% of all adults lived in a household with only wireless telephones and don't have a traditional land-line telephone (Blumberg & Luke, 2018). In 2006, Blumberg and Luke revealed 2.8% of adults lived in a household with only wireless service. They also found that as age increases, the percentage of adults living in a wireless-only household decreases. In Nebraska, the Nebraska Public Service Commission (NPSC) reported 989,431 telephone access lines in 1997 (NPSC, 1998). In the NPSC 2018 legislative report, the number of access lines had dropped to 620,087 a reduction of 37% in 20 years (NPSC, 2018). Those individuals dropping their landline telephones have presumably elected to use cellular phones. The NPSC further reports that upwards of 67% of Nebraskans are wireless-only cellphone consumers (NPSC, 2018). On a somewhat humorous note, yet reflecting consumer sentiment, the CTIA reports that consumers would much rather give up chocolate, television, or coffee than give up their smartphone. And, on a more serious note for economic development, the CTIA further reports that when consumers are seeking a new place to live, they value reliable wireless access above good schools, affordable housing, and good commute times (2018).

In 2014, 86% of Nebraska households had internet access, with the majority of those without internet access residing in nonmetropolitan areas (Vogt, Byers, Hancock, Narjes, & Terry, 2014). Referring to Figure 1, cable was reported as the highest used medium when accessing the internet, while 14% reported having no internet access at all. According to Zickuhr (2013), 15% of American adults do not use the internet, which closely matches the findings for Nebraska. Of this percentage of offline adults (non-internet users), Figure 2 depicts the reasons behind these choices. In regard to subscribers that do not have a high-speed or broadband connection, over half (53%) in Nebraska cite that broadband services are too expensive as a primary reason for not subscribing. While the majority of internet users in Nebraska are very or somewhat satisfied with reliability, speed, and customer service, over half are somewhat or very dissatisfied with the cost of their internet service (Vogt, et al., 2014). Rural internet users express higher dissatisfaction with the types of internet services in their area than do their urban internet user peers (Vogt, et al., 2014).

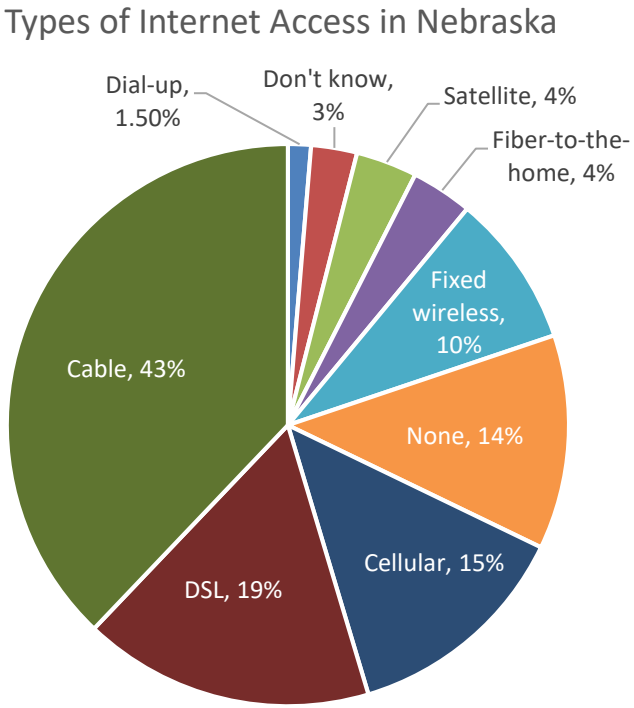

Figure 1. Different medium types in Nebraska when accessing the internet. Readapted from Table 1 in Vogt, et al. (2014).

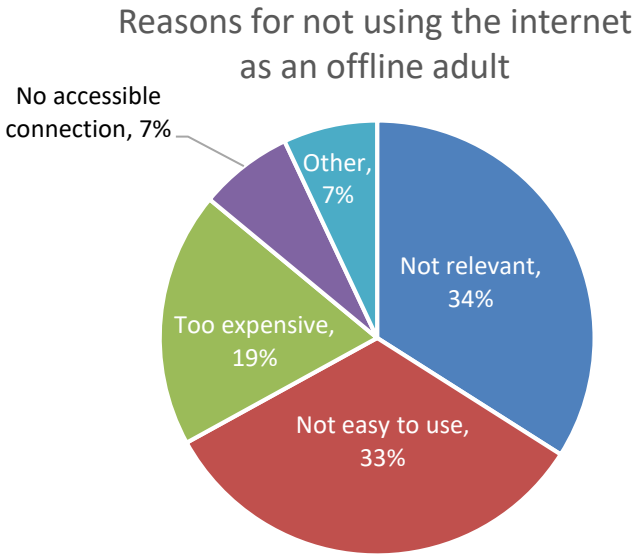

Figure 2. Reasons for not using the internet in the United States. Readapted from Zickuhr (2016).

As outlined by Racster (1985), the National Exchange Carrier Association (NECA) was created by the Federal Communications Commission as a result of the divestiture of AT&T in 1984. Prior to divestiture, AT&T was the predominant long distance carrier and would reimburse local exchange carriers (local telephone companies) for terminating long distance telephone calls to the customer premise. When multiple long distance companies were forced into competition due to the divestiture of AT&T, a centralized organization was needed to collect and redistribute local access charges as part of the FCC's universal service policies. Today, NECA still serves typically small and rural telephone companies by filing required tariffs with the Federal Communication Commission on behalf of member companies. Those tariffs specifically define the technology service offerings of a digital subscriber line, the speeds and price by which it can be offered to a customer among all other aspects of landline telephone and internet access (NECA, 2019). As of December 31, 2017, there are forty incumbent local exchange carriers in Nebraska (Nebraska Public Service Commission [NPSC], 2018). According to NECA membership lists, there are forty Nebraska incumbent local exchange carriers with membership in the National Exchange Carrier Association (NECA, 2019a). As of December 31, 2017 there are a total of 105 competitive local exchange carriers in Nebraska (NPSC, 2018). These companies are not members of NECA and not subject to the member tariff filings.

Internet service providers (ISP) that started and grew from outside the telephone industry are not encumbered to charge their customers based on NECA tariff rates. They have the ability to create a business model selling internet access without the complex regulatory oversight required of traditional telephone companies. However, if they sell telephone services they are subject to regulatory oversight for those services. If available, these service providers are an attractive option for consumers because of the ability to purchase internet access without a required telephone line. Availability of these providers is typically in dense population areas. These areas have been found to have significantly lower cost of internet access than rural areas (Obermier, 2018).

In a state-wide study of Nebraska, Obermier (2018, p. 152) found that "One of the most striking findings is that consumers of 4 Mbps/1 Mbps digital subscriber line services in the combined village, second, and first class communities in Nebraska pay on average 170% more per Mbps than do consumers of 4 Mbps/1 Mbps digital subscriber line services in the combined metropolitan and primary classes." This finding is in stark contrast to the intent of comparable services and rates between urban and rural customers as detailed by Congress in the Telecommunications Act of 1996.

Several disparities still clearly exist as telephone users are increasingly dropping their landline telephones in favor of cellular phones. Rural areas are still suffering from a form of digital divide in that many rural customers cannot drop their landline telephones. These rural customers are paying significantly more for internet access than their urban counterparts, and many customers of DSL internet access are being required to purchase telephone services they may not need or want. In addition, the choice of internet access providers in rural areas is very limited. To examine these disparities listed, this study will attempt to seek insight into the following research questions.

- What are the factors and the prevalence of "naked DSL" or "dry loop" internet access offered by telecommunications carriers in Nebraska?

- What is the average cost per Mbps for digital subscriber line internet access when factoring in the added cost of a required telephone line, and how does this compare across classes of cities in Nebraska?

- What is the overall state-wide monetary impact on digital subscriber line customers paying for a required telephone line?

METHODOLOGY

This study examined the factors, prevalence, and cost structure of digital subscriber line internet access in a rural Midwestern state. We determined the list of telecommunications providers from the Nebraska Public Service Commission (NPSC, 2018) annual report to the legislature. The telecommunications providers were then broken down by class of city (Table 1), which is a measure used in the state of Nebraska to classify population sizes of communities. In Nebraska, only two cities (e.g. Lincoln and Omaha) meet the standards of metropolitan and primary class in Table 1. These cities also meet the United States Census Bureau standards of urbanized areas (UAs) classification with 50,000 or more people (US Census Bureau, 2010). To the west of Lincoln and Omaha, the state has a handful of first class cities (e.g. Kearney, Grand Island, Hastings, Columbus, North Platte), which would be very similar to urban clusters (UCs) defined by the US Census Bureau (UCs defined as between 2,500 to 50,000 in population). The rest of the classifications (second class and village) are considered rural for the purposes of this study.

Table 1
Class of city in the State of Nebraska

Class of city	Nebraska population size[1]	Reclassified Federal population size[2]
Metropolitan	300,000 or more people	UA
Primary Class	100,000 < > 299,999	UA
First Class	5,000 < > 99,999	UC
Second Class	800 < > 4,999	No federal classification, Rural
Village	100 < > 799	No federal classification, Rural

[1]Adapted table from Nebraska Dept of Economic Development (2014).
[2]Adapted table from United States Census Bureau (2010).

FINDINGS AND ANALYSIS

What are the factors and the prevalence of "naked DSL" or "dry loop" internet access offered by telecommunications carriers in Nebraska?

The factors found to impact a carrier's offerings of internet access methods involved the carrier's status as either an incumbent local exchange carrier or competitive local exchange carrier and NECA membership. All forty Nebraska incumbent local exchange carriers are members of NECA. No competitive local exchange carriers were found to be members of NECA. Member carriers are required to follow the customer rate schedules in NECA Tariff No. 5. These complex rate schedules define the rates companies charge customers for their services. Regarding prevalence of dry loop DSL, we found that customers are allowed to purchase stand-alone internet

access (i.e. "dry loop" without telephone service), but they are then charged a different rate that is higher than their internet access cost when coupled with telephone service. This rate is not consistent, which becomes problematic to quantify. The extent to which customers opt for a dry loop and higher cost internet access without telephone service was not a focus of this study, but a realization this situation exists warrants further examination.

For the purpose of this study, only ILECs that were members of NECA were used. After analysis, this study found that 95% of all service providers sampled providing DSL were NECA members. Therefore, all results in the following analysis *could* make the appropriate assumption that these households were paying for telephone service and DSL, as this would be the most economic offering per household.

What is the average cost per Mbps for digital subscriber line internet access when factoring in the added cost of a required telephone line, and how does this compare across classes of cities in Nebraska?

First, we determined the average cost of a telephone line from the Nebraska Public Service Commission's *2016 Annual Report to the Legislature* (2016). Within this report, the NPSC lists all carriers and their customer fees for local telephone service. When analyzing this list, we determined the average cost to be $19.67 for the telephone base cost, excluding fees. All customers also pay for federal subscriber line charges, 911 access fees, federal and state universal service charges, federal and state taxes, and the telecommunications relay charge along with their base telephone line rate. Some customers also pay for additional fees like local city taxes, federal access recovery charges (ARC), and extended area service (EAS) fees, which bump the overall fee cost up further. Since these fees are variable and are not charged to every customer, these fees are left off of the calculation in Equation (1), creating a conservative percentage. With the exception of 911 access fees, all of these telephone fees remain a fairly static percentage of the base telephone cost (Table 2). Calculating the fees as a percentage of the average base telephone rate yields a statewide average cost of $32.33 for the total telephone average service cost (Equation (1), Table 2).

Table 2
Percentage of fees calculated against base telephone rate

	Fee % or amount	**Avg cost***
State and federal taxes[1]	static rate	$1.67
Federal subscriber line charge[2]	static rate	$6.50
Federal universal service[3]	41% × 25% (variable)	$2.02
State universal service[4]	static rate	$1.75
Telecom relay charge[5]	static rate	$0.02
911 access fees[6]	average	$0.70
Total	64.36%	$12.66

*This is based on the average telephone base cost of $19.67.

[1]State and federal taxes are based on the universal federal excise rate (3%) and state rate (5.5%).

[2]Federal subscriber line charge is a flat fee of $6.50 nationwide (FCC, 2019).

[3]Federal universal service fee is highly variable and changes quarterly. The rate in the table is based on the FCC's 2019 Q4 rate and separations interstate percentage. Assuming 41% interstate from FCC 2019 fact sheet: ($19.67 × 41% × 25% = $2.02) (FCC, 2019; FCC, 2020).

[4]State universal service fee is a flat rate of $1.75 (Lichtenberg, 2019).

[5]Static rate that is reconfigured every year (Lichtenberg, 2019).

[6]911 access fee rate is the average of all 911 rates in the state (NPSC, 2018).

$$baseTelephone + (percentfees * baseTelephone) = totalTelephoneCost \text{ (Equation 1)}$$

$$\$19.67 + (64.36\% * \$19.67) = \$32.33$$

In order to find DSL rates for the state, we used a sample of n=30 providers for each class of city. However, since only one city per class of Metropolitan and Primary exists, we sampled all service providers within the Lincoln and Omaha areas. In the case of First Class, only 30 First Class cities exist in the entire state, so all cities in this class were examined. In the other two classes, n=30 cities were randomly sampled per class. After obtaining the list of providers, the naked DSL rates and costs were obtained by visiting each provider's website and then making a phone call to obtain each sample rate and cost. The sample rates and costs obtained were for the naked DSL service. No media bundling packages (e.g. bundling of TV services with internet) were considered in order to provide a clean comparison between each class. The naked DSL rates obtained were provided without telephone service costs or fees.

Ninety-five percent of all DSL internet service providers sampled were NECA members, and as such, bundled the telephone and DSL together at a lower rate (as mentioned in research question #1). The other five percent of service providers sampled that were non-NECA members were considered outliers to this study and were not included in the calculations. As such, further calculations (Tables 3 & 4) are based on the naked DSL rate with the addition of the average telephone service cost found previously of $19.67. This amount was then divided by Megabits per second (Mbps) to find an average download speed of DSL plus telephone service as in Equation (2). In order to provide a straight across comparison, the federal broadband rate of 4 Mbps download and 1 Mbps upload (4/1) was used. Only a very small percentage of DSL providers could achieve the newest federal standard of 25Mbps download and 3 Mbps upload (25/3); thus, the 4/1 rate was used as this could be universally achieved by all surveyed.

$$\frac{nakedDSL+baseTelephone}{speedMbps} \text{ (Equation 2)}$$

Table 3
Analysis of internet access cost for DSL with required telephone service

	Metro	Primary	1st class	2nd class	Village
Avg download rate for naked DSL by city class[1]	9.00	6.57	3.92	5.63	5.86
Avg cost per Mbps for naked DSL (all download speeds)	$10.20	$12.70	$20.27	$17.85	$20.20
Avg cost per Mbps for DSL with req. telephone (all download speeds)	$16.66	$20.77	$31.27	$27.49	$28.46
Avg cost per Mbps for naked DSL (broadband 4/1)[2]	$2.96	$2.83	$6.99	$8.11	$8.30
Avg cost per Mbps for DSL with req. telephone (broadband 4/1)[2]	$3.86	$4.06	$9.43	$10.54	$15.54

Avg = Average; req. = required
[1]Speed rate is Megabits per second (Mbps)
[2]Broadband 4/1 is used here as an equalizer as DSL does not universally support speeds of the new standard 25/3

Table 4
Analysis of internet access cost for DSL with required telephone service by urban and rural cities

	Urban[3]	Rural[4]
Avg download rate for naked DSL by city class[1]	6.50	5.75
Avg cost per Mbps for naked DSL (all download speeds)	$14.39	$19.03
Avg cost per Mbps for DSL with req. telephone (all download speeds)	$22.90	$27.98
Avg cost per Mbps for naked DSL (broadband 4/1)[2]	$4.26	$8.21
Avg cost per Mbps for DSL with req. telephone (broadband 4/1)[2]	$5.78	$13.04

Abbreviations used: Avg = Average; req. = required
[1]Speed rate is Megabits per second (Mbps)
[2]Broadband 4/1 is used here as an equalizer as DSL does not universally support speeds of the new standard 25/3
[3]Referring back to Table 1, urban is Metro, Primary and 1st class
[4]Referring back to Table 1, rural is 2nd class and village

When adding the cost of the required telephone service into the overall cost of internet access, and comparing that between rural and urban cities, rural residents pay 92.7% more than urban residents for naked DSL internet access categorized as broadband at 4 Mbps download and 1 Mbps upload. This becomes even more pronounced when examining DSL with the required telephone line, as rural pays 126% more than urban.

What is the overall state-wide monetary impact on digital subscriber line customers paying for a required telephone line?

The overall indirect monetary impact for this question is defined as the total estimated cost that consumers of digital subscriber line internet access pay for telephone service. Referring back to research question #1, the previously determined average monthly telephone line cost (telephone service plus fees) is annualized at $387.96 (Table 5). According to the United States Census Bureau, there were 741,581 households in Nebraska as of the last census reporting (2018). Using the findings of Vogt, et al. (2014), 19% of those households utilize digital subscriber line for their internet access in Nebraska. This reveals an annual monetary impact of over fifty-one million dollars. This is the amount of money Nebraskans are paying for the required telephone line when they purchase digital subscriber line internet access.

Table 5
Monetary impact of a required telephone line with digital subscriber line internet access

Statewide average monthly cost for telephone service including taxes and fees	$32.33
Statewide average annual cost for telephone service including taxes and fees	$387.96
Number of households in Nebraska	741,581.00
Percent of households with DSL service	19.00
Percent of service providers from sample that were NECA members*	95.00
Adjusted percent of households estimated to obtain DSL service from NECA members	18.05
Total annual statewide monetary impact of the required telephone line *totalTelephoneCost* × *(numHouseholds* × *adjustedNECA*) $387.96 × (741,581 × 18.05%)	$51,930,529.50

*Percent calculated from the data collected in this research study of internet service providers that provided DSL that were NECA members

FUTURE RESEARCH AND LIMITATIONS

In this genre of research, this is the first study to examine the overall cost and potential indirect monetary impact of tariffs when dealing with DSL and telephone service. One limitation of the study is that statistics on the number of DSL subscribers who have only a DLS-plus-telephone option available do not exist. There is also no existing data on the cost of the DSL-plus-telephone versus not having the telephone. From the researchers' own experiences, the cost of paying for DSL on its own as a rural customer can be the same price or more without the bundling package of the telephone line. Another limitation of the study is that the "rural" customer is problematic to define. The federal level defines rural as outside of any urban or city limit area. However, the accessibility of internet packages of the rural customer in proximity to that of a metropolitan area versus a village may differ dramatically. Also, rural customers may not have access to the same packages as that of village or first class customers. Future research needs to be done on the accessibility of the rural customer and the differences between rural metropolitan versus rural village.

CONCLUSION

The purpose of this study was to examine the factors involved with consumers purchasing "dry loop" internet access via digital subscriber line to determine the overall cost to the consumer of internet access when a landline telephone is included with the cost of internet access, and to determine the annual monetary impact in Nebraska for those households required to purchase a landline telephone so they may receive internet access. It was determined the National Exchange Carrier Association on behalf of forty Nebraska telephone companies imposes tariffs which causes a significant increase in the cost of internet access for digital subscriber line access. Findings reveal rural residents pay 92.7% more than urban residents for naked DSL internet access categorized as broadband at 4 Mbps download and 1 Mbps upload, and rural pays 126% more than urban for DSL with the required telephone line.

Yet another realization of the study is that Nebraskans using DSL to obtain access to the internet pay $51,930,529.50 annually for a landline telephone as per NECA tariffs.

There are currently multiple efforts across the state of Nebraska to assist service providers in providing more ubiquitous and faster internet access in rural areas. Research efforts are attempting to ascertain the extent of the disparity between rural and urban household internet access. Extensive bandwidth analysis studies are being conducted for both wireless and physical connection-based methods of internet access. In fiscal year 2017-2018, the Nebraska Public Service Commission paid out $19.7 million in high cost support funding to Nebraska telecommunications carriers through the Nebraska Universal Service Fund high cost program. Additionally, the Nebraska Public Service Commission paid $16.6 million specifically for broadband support to thirty-five local exchange carriers (NPSC, 2018). The NPSC directly acknowledges what is widely understood: the cost to provide service in rural sparsely populated areas is high.

There is no question that rural areas need cost comparable broadband access that is just as fast as urban areas. Farms and the vast economic infrastructure including consumer households that support a rural economy are in increasing need of reasonably priced high bandwidth internet

access. Production agriculture including animal husbandry requires real time data collection abilities that are made possible by high speed internet connections. The companies and workforce also require high speed internet access if they are to live and work in rural areas. Recent work at home requirements due to the COVID-19 virus also exemplifies the critical nature of this essential service for both rural and urban residents.

The Nebraska Legislature created the Nebraska Internet Enhancement Fund in 2001 to help build out infrastructure for higher speed internet access in rural areas. During 2017 and 2018, four NIEF grants were awarded in rural areas totaling $150,000 (NPSC, 2018). In addition, the United States Department of Agriculture has several grant and loan programs to assist rural areas with the rollout of new broadband services (U.S. Department of Agriculture, n.d.). Unfortunately, however, the Federal Communications Commission found in 2016 that internet access capability was not being deployed to all Americans in a reasonable and timely fashion, and more than 39% of rural residents compared to 4% of urban residents lack access to advanced telecommunications capability. This lack of access has a direct inability of small businesses to successfully compete as directly acknowledged by the FCC (FCC, 2016). This situation was re-confirmed in the more recent Broadband Deployment Report with an admission by the FCC that the deployment of advanced telecommunications capability has indeed slowed dramatically (FCC, 2018a). They further report that upwards of 30.7% of Americans in rural areas compared to 2.1% of Americans in urban areas lack access to 25 Mbps download / 3Mbps upload internet access speeds through fixed terrestrial methods (FCC, 2018a).

In order to start serving rural areas, detailed quantitative internet throughput data needs to be collected from the customers' perspective in the home and small business enterprise. For decades, Nebraskans have benefitted from a ubiquitous public power grid, which by many measures has been the envy of other states. The power grid in Nebraska reaches all residents in the state. In order to obtain such quantitative data on a statistical scale, this public power service might provide an excellent point for distribution of data collection devices to analyze quantitative internet throughput data from the customer site. The need for rural Nebraskans to get connected to the internet can be compared to nearly a century ago when Nebraskans needed access to electricity. For rural areas in Nebraska to remain viable places for workers to live, for small businesses to thrive, and for the agriculture community to compete, it is absolutely essential rural Nebraskans receive internet access comparable to the rest of society.

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