The Degradation of Service on the National Intercity Bus Network, 2016 – 2021

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I. INTRODUCTION

The national network of intercity bus schedules sold on the booking platform maintained by Greyhound Lines, used both by consumers and many ticket agents, offers travelers connections over a coordinated network of routes. The network encompasses a wide variety of connecting hubs and is supported by extensive interline and terminal sharing arrangements.

This paper explores the extent of service decline quality on the network has since 2016. It measures the approximate reduction in service and details the increased duration of trips on the national intercity bus network as a result of schedule cuts instituted before and during the COVID-19 pandemic. Our research measures the changing duration, number of stops, and other route characteristics between 2016 to 2021 by drawing upon schedule data from 186 routes in which customers have no viable scheduled ground transportation options other than the intercity bus network. This paper uses these results to inform our exploration of the implications of the degradation of service for populations that depend on the network, including low income travelers, immigrants, and those who choose (or prefer) not to drive.

II. BACKGROUND ON NATIONAL INTERCITY BUS NETWORK

The national network of intercity bus schedules on the booking platform maintained by Greyhound Lines offers travelers convenient connections over a coordinated network of routes encompassing a wide variety of transfer points [6, 17, 18]. Each independent bus line listed on the platform apportions revenues based on interline agreements. The carriers involved use a common terminal at nearly all points at which passengers must make transfers [6]. Examples of small and mid-size bus lines that are part of this national network are Baron's Bus, Burlington Trailways, Greyhound, Indian Trails, Jefferson Lines, Martz Trailways, Miller Transportation, New York Trailways, and Peter Pan.

The platform, which is used to power greyhound.com and other booking sites, dynamically builds itineraries using the schedules of more than 20 carriers. It allows passengers to book bus trips with multiple stops on a single ticket. As an example, consider a trip from Columbus, Ohio to Des Moines, Iowa. That trip typically involves traveling by Greyhound to Chicago and then transferring to a Burlington Trailways bus for the remainder of the journey. Passengers have a guaranteed connection, meaning the bus lines involved are obligated to "re-accommodate" them if they are unable to make the transfer due to a late arriving or canceled bus- similar to the protocol airlines follow for flights. Bus companies usually do not offer services typically afforded to airline passengers that miss connections due to carrier issues such as meals or hotel rooms. These benefits are a rarity for bus passengers, but passengers missing bus connections are able to catch a later departure at no additional cost.

In 2018 and 2019, the importance of this national network became evident as thousands of immigrants purchased (or were provided) tickets using the website to provide them passage between the

Texas/Mexico border areas and interior points throughout the country. Thousands traveled from El Paso, Texas; Phoenix, Arizona; and other cities near the border to locations throughout the country [14]. Many of these journeys included trips that required multiple connections across various bus lines within the network. Many travelers were brought to bus stations by nonprofit or government personnel while others arrived on their own with cash in hand [14].. At the station, they could purchase tickets to reach family and friends living in almost any city with more than a few thousand residents in the contiguous United States.

The network was gradually diminishing in size even before the COVID-19 pandemic. Diminished demand related to the pandemic brought more severe service cuts. Many carriers are now operating 40% or fewer scheduled busses than they did before the crisis [6]. However, before the pandemic bus ridership had already decreased to levels too low to support service on many routes [5].

A variety of factors were likely responsible for the weakening demand, including i) low gasoline pricing and rising car ownership; ii) perceptions that bus travel was undesirable or unsafe, an image that in some instances was due to problems in neighborhoods where bus stations are located; iii) loss of market share to express city-to-city operators not sold on the Greyhound booking platform, such as Flixbus, Megabus, OurBus, and RedCoach; and iv) lack of state or federal policies and financial support to assure a healthy mix of ground travel options between metropolitan areas.

It is important to note that while there are explicit federal policies to aid the development of rail corridors and airports, no substantive policies are in place for the creation of a balanced transportation system of bus and rail service (specifically for bus services) between major cities. This problem was explored in the 2014 Transportation Research Board report, *Interregional Travel: A New Perspective for Policy Making [16].* That report points specifically to the absence of policies and institutions that focus on multimodal transportation options.

The pandemic compounded the challenges that have contributed to the erosion of bus traffic. Bus travel bookings ended 2020 at around 16% of the previous year's volume in the Northeast and 24 – 35% of the previous year in other parts of the country [6].

III. METHODOLOGY

Analysis of the intercity bus network's performance included the following data collection tasks, each drawing upon separate sources of information.

Task one: The study team utilized the *Russell's Motor Coach Guide*, a compendium of bus schedules, to estimate the degree to which bus lines encompassing the national network sold on the Greyhound CRS reduced schedules from January 2016 to February 2020 [13]. February 2020 was the last month before public health related movement restrictions were implemented in areas throughout the United States. We used the schedules of ten carriers, including Greyhound, to tally the number of daily schedules

operated on the 2nd Friday of several months. (A schedule is typically associated with a distinct schedule number and often involves multiple stops, akin to a numbered airline flight).

Task two: The study team evaluated changes in travel time on specified routes between 2016 and 2021. This task encompassed collecting information for 186 routes on the U.S. Mainland in which the national intercity bus network offers the only scheduled ground travel option available and does not require "mixing modes" (such as transferring from train to bus). We recorded the shortest trip duration option available on greyhound.com departing between 7 a.m. and 8 p.m. on Friday, January 29, 2021. We also documented the number of transfers, stops, and fares for those selected routes.

Each of the 186 routes in our sample:

1. Links two metropolitan regions with populations greater than 500,000 each. The sample excludes rural routes and small town service, focusing instead on travel between urban regions.

2. Involves a trip between 150 – 400 miles, based on highway miles. The sample looks only at trips involving travel distance in which bus travel, based on previous research, is considered competitive [16].

3. Lacks other scheduled ground travel alternatives, such as direct express coach (e.g., Megabus) or Amtrak service. Some of the routes have Amtrak Thruway service, which combines bus and train travel. This service was not considered in the analysis.

All of the routes in the sample can be comfortably driven in between three and eight hours, including allowances for brief stops. Examples of routes in the sample are Cleveland, OH – Scranton, PA; Kansas City, MO – Wichita, KS; and Las Vegas, NV – Bakersfield, CA.

We compared the results for trips on Friday, January 29, 2021, with a Chaddick Institute data set assembled in May 2016 that had identical information. This earlier data set was specifically compiled to identify routes in which the national bus network offered the only scheduled ground transportation option. This allowed for systematic comparisons of trip duration for two different points in time.

IV. Findings

The results of our analyses illustrate a clear reduction in service reflected in both the amount of service provided and travel times in the years leading up to and during the pandemic when compared to those of 2015.

1. Reduction in service on the national network before the pandemic.

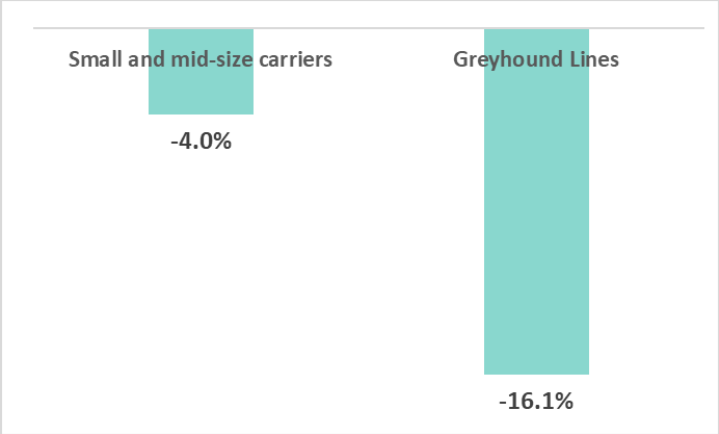
The number of daily Greyhound operations (schedules) fell by approximately 16% from February 2016 to February 2020. The mid-size and smaller carriers we evaluated reduced schedules by about 4% over the same period (Figure 1). This trend is illustrated by the diminishing size of the *Russell's Guide*, the

aforementioned compilation of timetables comprised heavily of bus lines selling tickets on the national network [13]. Although wide variation exists among the smaller carriers, these results make it clear that the system was diminishing before the pandemic. One limitation of our estimate is that it does not consider the number of "extra sections" certain carriers operate, which can be considerable during holidays. However, the effects of these "extra sections" on our computed results appear to be small.

FIGURE 1: Reduction in Daily Schedules

2016– early 2020

Changes in daily bus operations in the five years leading up to the pandemic



A review of schedules in the *Russell's Guide* could not be used to accurately measure the decreased number of daily operations during the pandemic due to widening disparities between services listed in published timetables and the services that were actually provided. At the time of our data collection, published timetables were no longer an accurate portrayal of actual service offerings due to the sudden and frequently fluctuating service changes created by the pandemic. At this point, the most accurate means of measuring the service that a carrier currently provides requires looking at the options presented on the carriers' respective reservation web sites. However, the format in which this information is presented makes a full enumeration of schedules exceedingly difficult.

2. Changing Duration of Trips. The duration of trips on the intercity bus network has lengthened markedly between 2016 and January 2021. The median length of a trip on the 186 routes we evaluated increased by nearly an hour between 2016 and 2021 (Table 1). Trip duration is now two hours longer in 2021 on more than a quarter (26%) of these routes due to the need to make more stops with longer wait times at transfer points. As previously noted, the sample consists of routes in which there is no direct express coach or Amtrak service, making the network the only scheduled ground travel option.

The mean travel time on these routes rose from 6 hours 14 minutes (433.5 minutes) to 7 hours 26 minutes (506.2 minutes), an increase of 72.7 minutes. That represents a 16.8% increase over the less than five-year period we evaluated (Table 1). The median travel time rose by 55 minutes (12.8%). The increases were partly due to an increasing number of stops, which (when transfer points are included)

rose from an average of 4.9 to 5.5 (12.6%), as well as the need for passengers to make more transfers between bus lines.

The number of routes with more than six stops rose from 47 to 55 (17.0%). The number of routes in which travel time exceeded ten hours more than doubled from 21 to 50 (a 138% increase). The number of routes requiring more than 15 hours of travel—a length nearly all passengers with other options would consider unacceptable—rose from 2 to 10. These changes likely make bus travel too slow or tedious to be considered a workable option for many travelers.

TABLE 1: Degradation of Intercity Bus Service on 186 Routes without Daily Express Coach or Amtrak Service

Schedule Comparisons 2016 versus 2021, Routes 150 - 400 miles

	2016	2020	CHANGE	% CHANGE
Mean travel time (minutes)	433.5	506.2	72.7	17%
Median travel time (minutes)	430	485	55	13%
Average number of stops	4.9	5.5	0.6	13%
Number of routes > 10 hours	21	50	29	138%
Number of routes > 6 stops	47	55	8	17%

A frequency distribution of routes based on changing trip duration appears in Figure 2. About one in six routes (14.5%) had a travel time improvement of 15 minutes or more. However, more than four times as many routes (56.9%) had travel time degradation in this range. The deterioration of service is even more significant on roughly four in ten routes (40.8%), in which travel times grew by an hour or more. On a quarter of routes (25.3%), travel time increased by two hours or more. Finally, 35 routes (19%) experienced travel time increases of three hours or more (Table 2).

The largest trip duration increase occurred in the Jacksonville – Ft. Myers, FL route. Travel time on this route grew from 10 hours 20 minutes to more than 22 hours due to the lack of viable connections. Raleigh, NC – Knoxville, TN saw travel time increase from 8 hours 20 minutes to more than 18 hours. Among the routes that had travel time *improvements* were Raleigh, NC – Charleston, WV and Nashville, TN – Little Rock, AR. In both cases, travel times dropped by two hours and 55 minutes.

Some of the results may reflect the peculiarities of schedules on the particular days for which we evaluated the schedules. Moreover, none of the routes in the sample are major travel corridors. Most major corridors continue to have (or will have after the pandemic) high quality bus service. Nevertheless, these results show why passengers who are traveling on secondary routes may now think twice before going by bus.

This schedule deterioration is detrimental to the traveler experience and could delay the pace of recovery for the intercity bus industry after the pandemic. If bus lines add back schedules in response to

strengthening demand as the pandemic eases, some of these degradations could be reversed. The likelihood of this, however, is unclear.

Figure 2: Travel Time Change from 2016 to 2021

186 secondary routes in the 100 – 525 mile range, pandemic schedules



These results illustrate the need for additional policymaker attention to the network's precarious condition. The Greyhound CRS is the only bus travel booking platform with built-in capability to connect thousands of points across the United States involving itineraries supported by comprehensive interline agreements. Many booking sites, including wanderu.com and busbud.com, rely on interfaces with greyhound.com to support many of their customer offerings. These sites have been critical to making bus travel more attractive and convenient. However, neither they, Amtrak.com, megabus.com, or any other existing booking site could fill the void if the wide array of routes sold on the Greyhound reservation system sharply diminished.

TABLE 2: Notable Routes in which Travel Times have Increased 3 hours or more

2016 to 2021, Pandemic Schedules

RANK	ORIGIN	DESTINATION	MILES	2016 TIME	2021 TIME	INCREASE IN MINUTES
1	Jacksonville, FL	Fort Myers, FL	317	10h 20m	22h 30m	730
2	Raleigh, NC	Knoxville, TN	365	8h 20m	18h 45m	625
3	Birmingham, AL	Little Rock, AR	374	9h 20m	16h 50m	450
4	Saint Louis, MO	Madison, WI	360	10h 0m	17h 15m	435
5	Pittsburgh, PA	Buffalo, NY	215	5h 45m	12h 40m	415
6	Louisville, KY	Youngstown, OH	388	9h 20m	15h 40m	380
7	San Jose, CA	Fresno, CA	152	3h 20m	9h 25m	365
8	Pittsburgh, PA	Rochester, NY	284	8h 40m	14h 25m	345
9	Philadelphia, PA	Youngstown, OH	365	8h 40m	14h 20m	340
10	Buffalo, NY	Dayton, OH	397	9h 45m	15h 10m	325
11	Orlando, FL	Fort Myers, FL	163	6h 5m	11h 30m	325
12	Nashville, TN	Greenville, SC	347	7h 50m	13h 5m	315
13	Indianapolis, IN	Knoxville, TN	361	9h 0m	14h 5m	305
14	Indianapolis, IN	Akron, OH	299	7h 0m	11h 55m	295
15	Buffalo, NY	Allentown, PA	355	9h 25m	14h 10m	285
16	Las Vegas, NV	Oxnard, CA	325	7h 25m	12h 5m	280
17	Rochester, NY	Allentown, PA	290	7h 45m	12h 25m	280
18	Cleveland, OH	Scranton, PA	377	10h 55m	15h 30m	275
19	Indianapolis, IN	Youngstown, OH	347	8h 15m	12h 40m	265
20	Kansas City, MO	Wichita, KS	200	4h 10m	8h 15m	245
21	Philadelphia, PA	Worcester, MA	273	7h 25m	11h 30m	245
22	Sacramento, CA	Oxnard, CA	391	10h 0m	14h 5m	245
23	Birmingham, AL	Columbia, SC	360	7h 0m	10h 55m	235
24	Nashville, TN	Augusta, GA	400	8h 0m	11h 55m	235
25	San Jose, CA	Bakersfield, CA	243	7h 0m	10h 45m	225
26	Las Vegas, NV	Bakersfield, CA	286	5h 55m	9h 35m	220
27	Louisville, KY	Charleston, WV	248	11h 45m	15h 20m	215
28	Cincinnati, OH	Charleston, WV	207	9h 5m	12h 35m	210
29	Birmingham, AL	Augusta, GA	294	5h 35m	9h 0m	205
30	Boston, MA	Allentown, PA	332	7h 45m	11h 10m	205
31	Kansas City, MO	Tulsa, OK	276	4h 15m	7h 40m	205
32	Norfolk, VA	Columbia, SC	385	11h 40m	15h 5m	205
33	Milwaukee, WI	Cincinnati, OH	391	10h 55m	14h 10m	195
34	Indianapolis, IN	Cleveland, OH	318	6h 40m	9h 45m	185
35	Pittsburgh, PA	Syracuse, NY	360	10h 20m	13h 25m	185

V. Conclusion and Additional Research

Our analysis provides an evaluation of specific components of the reduction in service quality on the national bus network. It focuses only on routes between large or mid-size metropolitan regions, which excludes rural destinations. It includes only trips of 150 – 400 miles and considers only those routes that lack other scheduled ground travel alternatives, such as direct express coach (e.g., Megabus) or Amtrak service. These trips comprise only one part of the national bus network.

These results nonetheless demonstrate that the network's ability to provide potential buyers with travel options at a duration most considerable acceptable has decreased. These travelers encountered median bus travel times that increased 13% between 2016 and 2020. Many routes have experienced an increase in travel times by more than an hour. More stops, longer transfers, and fewer departure options reduce passenger volume. That reduced volume could lead to a vicious cycle of more service cuts. Although a hallmark of the system is its ability to operate largely without public subsidy, the network's declining performance is a topic worthy of additional policymaker attention.

The Coronavirus Economic Relief for Transportation Services (CERTS) Act, passed in late December 2020, provides temporary relief for the ailing intercity bus industry [6]. The $2 billion set aside mostly for motorcoach operators in the CERTS Act, is less than the $10 billion advocated for by the American Bus Association (ABA), United Motorcoach Association, and others. That being said, the funding does come at a pivotal time. It could partially close a financial gap that has left many bus lines experiencing great financial difficulty. Some operators, such as the Coach USA unit Lakefront Lines and several suburban operators have already closed. If more follow suit it could cripple mobility for vulnerable segments of society.

There appears to be an acute risk that bus lines that are currently part of the network could dramatically downsize (or even shut down entirely). This would hurt marginalized populations, immigrants relying on the system, the elderly, those living in smaller towns and cities, and those who cannot (or choose not to) drive. Additional research on the intercity bus network would help policymakers better understand the consequences of more service cuts.

Prior to the 62nd Annual Transportation Research Forum in April, the research team plans to conduct additional research to better understand how layovers are impacting a rider's overall experience. This additional analysis will focus on the following factors:

1) Identifying typical connection wait times for riders.
2) Identifying how wait times may be extended if a rider misses their connecting bus.
3) Determining typical station hours for stations that serve as common connection hubs.
4) Determining typical ticket attendant hours at stations that serve as common connection hubs.
5) Assessing the walkability surrounding stations that serve as common connection hubs to better understand a passenger's options for leaving the bus station during a layover.

Our existing analysis has shown that the prolonged wait times between connecting bus routes and the increased reliance on transfers have contributed to the increases in trip duration found among many of the trips observed in the Chaddick Institute dataset. Increased reliance on transfers may also impact bus schedules and could make riders more susceptible to missed connections within a route. The decreases in route frequency may create sizable delays for riders. The research team seeks to better understand how increased reliance on transfers and decreased route frequency impacts trip duration for some of the most commonly utilized routes within the dataset.

Additionally, we have also identified several factors that may contribute to a rider's layover experience within a station. Station hours are not consistent across all locations. We will examine the typical operation hours for stations that serve as common connectors within the existing network. Although airline passengers that miss connecting flights may be provided with hotel rooms and meals, bus passengers are typically left to find food and shelter for themselves if they have an extended layover. We will also examine the hours of operation for staffed ticket offices within stations. Ticket office staff can serve as acritical resource for passengers who may not be familiar with the bus network or for those who have missed a scheduled connection and need to find a new option. Finally, we will examine the walkability around stations that serve as common connection points to better identify a passenger's opportunities to explore or find a convenient place to eat or sleep during an extended layover.

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