

ASSESSING DELIVERY SERVICE AVAILABILITY AND ACCESSIBILITY IN
TOMPKINS COUNTY

A Professional Report

In Partial Fulfillment of the Requirements for the Degree of
Master of Regional Planning

by

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ABSTRACT

This project scrutinizes the accessibility of delivery services in Tompkins County, with particular focus on access by older adults and senior housing communities. Attention is given to pharmacies and grocery stores as a means of address access, especially in communities which lack grocery stores or pharmacies. Investigating the spatial dimensions of service accessibility, the research delves into how the geographic location of senior housing is related to access to grocery and pharmacy delivery options. The study's intent is twofold: to examine the alignment of grocery and pharmacy delivery services with senior needs and to uncover gaps where older adults may be marginalized. Employing a combination of geospatial analysis and connecting stakeholders, the project maps out the current delivery service landscape.

The practical implications of this research are direct and manifold. By pinpointing the delivery service shortcomings for older adults, the study will provide actionable insights for local governments, urban planners, and businesses to implement targeted improvements. The project's findings aim to not only foster enhanced service delivery but also contribute to the discourse on age-friendly communities. This project contributes a foundational piece in the strategic planning that aspires to an inclusive future, where the quality of life for older adults is augmented through accessible and equitable service provision.

KEY-WORDS

Age-Friendly; Delivery Services Accessibility; Grocery and Pharmacy; Mapping Analysis;

BIOGRAPHICAL SKETCH

Growing up in an extended family, I was nurtured in an environment that fostered empathy towards individuals of various ages, laying a solid foundation for my understanding of diverse perspectives and cultures. My academic journey, spanning multiple continents—from China, to Australia, and then to the United States—has allowed me to appreciate the differences and complexity of different societies.

My foray into higher education began at the University of New South Wales in Australia, where I pursued a Bachelor of Design. This experience honed my skills in visual communication and experience design, providing me with a robust interdisciplinary background. These skills have been instrumental in my urban planning endeavors, especially in striking a balance in design ethics and urban design techniques. Currently, I am advancing my education with a Master of Regional Planning at Cornell University, focusing on creating inclusive environments supportive of all age groups. I am particularly passionate about child and age-friendly urban planning and design, with my studies poised to conclude in May 2024. My projects and coursework are dedicated to shaping spaces that accommodate the unique needs of every generation, ensuring that urban development is both inclusive and equitable.

Professionally, my journey commenced in 2023 as an urban planner for the Woodhull Comprehensive Plan update, where I embraced the challenge of steering towards sustainable development. Later that year, my role with the Tompkins County Office for the Aging in Ithaca, NY, deepened my commitment to fostering inclusive urban spaces, especially for the aging population. Through meticulous data collection and analysis, I have refined my expertise in research methodologies and communication strategies, significantly enhancing planning decision-making processes. This endeavor has underscored the importance of designing urban environments that cater to the needs of our aging community members.

As I progress in my career, I am steadfast in my dedication to positively influencing urban development, championing initiatives that promote inclusivity and sustainability. My journey is a testament to the power of empathy, education, and professional development in creating spaces that enrich the lives of all community members.

ACKNOWLEDGMENTS

I extend my deepest gratitude to Professor Mildred Warner, Professor Stephan Schmidt, the Tompkins County Office for the Aging, and Xue Zhang for their invaluable support throughout my research from various perspectives.

First and foremost, I would like to express my sincere appreciation to Professor Mildred Warner. As a student bridging disciplines, the vastness of the urban planning field exceeded my expectations. Without concrete cases and practical experience, it would have been challenging to find a direction I wished to delve into over the course of two years. Therefore, I am profoundly grateful to Professor Warner for facilitating my internship opportunity at the Tompkins County Office for the Aging. This was my first formal planning experience, broadening my skills in designing data surveys and engaging with community members, and helping me solidify my focus on age-friendly initiatives. These experiences will undoubtedly be a treasure in my future career as an urban planner. I also owe a great deal of gratitude to Professor Stephan Schmidt for guiding my writing journey in the past two semesters. Thanks both of them for their invaluable advice on data collection, data visualization, and the final text of this report. Their guidance has been instrumental in continuously refining and improving my work. Additionally, my heartfelt thanks go to the Tompkins County Office for the Aging for help with the delivery survey, and Xue Zhang for the data support.

This acknowledgment encapsulates my gratitude for the collective wisdom, support, and resources generously shared with me. These contributions have not only enriched my academic journey but have also laid a strong foundation for my future endeavors in urban planning.

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INTRODUCTION

In the post-pandemic era, Tompkins County faces both challenges and opportunities in enhancing service delivery for its aging population. On one hand, the COVID-19 pandemic has brought to the forefront the critical need of older adults for accessible and efficient service delivery systems. Despite overcoming the crisis through the collaborative efforts of major institutions, “grassroots volunteers, and informal food distribution networks” (Xu, 2020), the situation has exposed the current food and medication service networks' lack of resilience. Today, both pharmacies and grocery stores are predominantly clustered within the Town of Ithaca, with sparse distribution in the edge areas. This centralized placement results in limited immediate access for residents who live in the more rural communities such as Lansing, Groton, Danby, Newfield, Enfield and Caroline. The delivery range for most pharmacies and grocery stores extends approximately 5 to 10 miles from their physical locations. This has potentially narrowed the accessibility for residents beyond these bounds, but the requirement for a prescription, additional delivery charges, or minimum purchase amounts, which may not be feasible for all customers. These constraints pose potential issues for the county's more isolated regions, where residents might face challenges in obtaining necessary groceries and medications. Particularly at risk are the elderly, particularly those with mobility impairments.

The importance of grocery stores and pharmacies to rural areas has been highlighted by the COVID-19. The concept of food deserts, as discussed by Choi (2022), mentions the struggle of older adults to access fresh fruits and vegetables. Particularly for older adults relying on a healthy diet to manage chronic diseases, reduction in the ability to obtain essential nutrients will potentially lead to deteriorating health. Additionally, due to transportation and mobility limitations, older adults might find it difficult to access pharmacies located far from their home, which makes it more difficult for them to obtain necessary medications, especially when diabetes and obesity is an existing issue in the rural areas of Tompkins county (Zhang & Warner, 2021). Therefore, for older adults, grocery stores and pharmacies are more than just retail outlets; they are fundamental pillars of community health and well-being, representing a lifeline. The food insecurity and challenge of getting prescriptions and over-

the-counter medications (Cameron, 2020) that older adults experienced during the COVID-19 pandemic have left important lessons. These experiences highlight the future of delivery services as a visible path toward an age-friendly community. Defining the current location and service coverage of grocery stores and pharmacies is the first step. In this report I examine the existing delivery service range in Tompkins County, with special concern on its overlap with the older adults. I argue that through strategic interventions and adaptive strategies, there is significant potential to supplement and augment these services, thereby substantially improving the quality of life for older residents. My analysis will not only highlight the present state of these services but will also propose actionable recommendations to address the gaps and enhance service accessibility for this demographic.

Providing more comprehensive services to older adults now requires fresh considerations within the context of today's society. Facing an accelerated digital transformation of services, the isolating impacts of the COVID-19 pandemic, and the exposed shortcomings and strengths of regions in crisis response, these factors create a broader backdrop for our current discussions on the availability of services in remote areas and the enhancement of provision. The recent survey conducted by Zeng, Wang, and Xu (2023) on the utilization of delivery services by older adults revealed that out of 197 respondents, a significant 71% do not get a chance to utilize third-party delivery services. The predominant reasons cited for this non-usage are the lack of service in rural regions and concerns about the precision of deliveries. To address these issues, the respondents recommended broadening the reach of delivery services, with a particular emphasis on ensuring access in rural areas. Moreover, according to the Age Friendly Action Plan and Report by COFA in 2022, Tompkins County has been proactive in adapting to the needs of an aging population, including innovative food distribution methods and a focus on cross-sector collaboration. This is very important in addressing food insecurity, such as connecting with FoodNet Meals on Wheels and Gadabout (the paratransit provider) to provide meals and delivery (Zhang & Warner, 2021, p27). But most older adults purchase their food and medicine independently. There is an opportunity to accelerate the digital transformation of services with delivery services. The shift towards online platforms and digital services presents a unique opportunity to bridge

the gap in service accessibility and engage more small businesses. Creating more chances for communication, coordination and innovation for cross-agency collaboration (Xu, 2020, p11), will benefit public health services and allow for community and planner engagement (Zhang & Warner, 2021).

At the same time, the pandemic has “significantly accelerated digital transformation across various sectors” (World Economic Forum, 2021). The induced isolation during COVID-19 and the subsequent increase in reliance on online services have underscored the crucial role of online services (direct-to-consumer ecommerce platforms) in modern infrastructure. This transformation has been especially impactful for senior populations, who are at a unique crossroads of increased health risks and potential “digital isolation”(Nash, n.d.). The readiness of such infrastructure to meet the needs of older adults has become a measure of societal resilience in the face of public health risks (Nash, n.d.). For older adults, whether to have accessibility to critical services may become a matter of health equity, inadvertently perpetuating health disparities (Zhang & Warner, 2021). According to the U.S. Census, in Tompkins County older adults constitute 16.4% of the community, and this number will continue to increase (Tompkins County Office for the Aging, 2023). The pandemic has magnified existing vulnerabilities and catalyzed an urgent reevaluation of service accessibility for the older adults, especially concerning essential needs such as groceries and pharmacies.

In light of these considerations, this study seeks to critically examine and improve the accessibility of delivery services from grocery stores and pharmacies in Tompkins County, with an emphasis on areas at the periphery and older adults. By updating and analyzing location data and delivery ranges, marking the areas that have trouble accessing delivery services from the geographic perspective. I aspire to pave the way for strategic enhancements that reconcile the equitable coverage of service digitalization with the pressing need for age-friendly access to services. The report will also delve into the methodology employed in this study including the location and services information of grocery and pharmacies, through interviews and use of GIS, etc. I will present an analysis of the collected data, and explore the research findings, and provide a comprehensive overview of the current state of delivery service infrastructure in Tompkins County. This work may

serve as a foundational element in building a resilient, age-friendly and health-equitable community for the future.

LITERATURE REVIEW

The nexus between geography and health is profoundly illustrated by the critical role access to essential services, such as grocery stores and pharmacies, plays in determining health outcomes. Across the United States, a stark divide exists between urban centers, where such services are readily available, and rural or marginalized areas, which grapple with being designated as food or pharmacy deserts. This disparity poses significant challenges, particularly for vulnerable groups like older adults, and is exacerbated by shifts in consumer behavior towards e-commerce and the evolving demographic landscape. As I delve into these issues, my discussion will underscore the urgent need for innovative, collaborative approaches to ensure equitable access to health-promoting resources, thereby fostering healthier communities in the face of geographical and socioeconomic barriers.

Geography matters in terms of the determinants of health. There is a positive correlation between grocery store density, direct farm sales, and health outcomes (Ahern, Brown & Dukas, 2011). In the United States fresh food is largely concentrated in densely populated urban centers. According to the USDA, about 13.5 million households live in food deserts (Miller, 2022), which means the grocery and essential foods are over 10 miles away from where they live. 87% of counties exhibit high rates of food insecurity (INDUSTRY PRESS RELEASE, 2023). In terms of New York State, the food insecurity rate is just close to the U.S average (Miller, 2022). Furthermore, in Tompkins County, the trend of the grocery store becoming more concentrated in the urban areas has also been confirmed through the updated data in this report. Limited access to fresh foods can lead to increased disease rates in marginalized areas, which pose significant challenges for the older adults.

Older adults experiencing food insecurity typically lack adequate intake of vitamins and minerals (Zarei, M, et al., 2021). They face higher risks of hypertension, diabetes (Zarei, M, et al., 2021), and cardiometabolic risk (Da Silva Miguel, E et al., 2020), especially for those who have chronic diseases and disability (Jackson, Branscum, Tang, & Smit, 2019). In fact,

the issue of food insecurity and its consequences has affected approximately 17.4 million households in the United States (Zarei, M, et al., 2021), with a notable increase in food insecurity from 5.5% to 12.4% over a decade (Leung & Wolfson, 2021). Looking at Tompkins county, with an increased number of individuals and families seeking help from Food pantries and distribution centers (Fichter, 2023), nearly 12000 residents struggle to access regular nutrition (Tompkins Food Future, 2022). The local government has clearly recognized the impact that problems with the dietary system can have on health, as the local public health aims to optimize access by increasing food security to prevent chronic diseases (Tompkins County Whole Health, 2022).

Similarly, "pharmacy deserts" (Gregg & Peiser, 2023) become a growing concern, as disparities in access to needed medications are recognized. The National Association of Boards of Pharmacy (2023) reports a troubling trend of labor shortages, affecting 67% of pharmacies and leading to reduced operating hours, further restricting people's access to medications. Rural, independent pharmacies are particularly struggling to stay afloat. From 2003 to 2021, there has been a 9.8% decrease in pharmacies outside core areas of the United States, indicating a clear decline in accessibility (Rural Health Information Hub, n.d.). From the local perspective, Tompkins County during the pandemic revealed both strengths and weaknesses in regional pharmacy access. Several pharmacies instituted delivery for the first time during the pandemic. Despite an overall decrease of pharmacy stores, the pharmacies outside urban centers did not experience closures. Although their delivery range was still limited, it provided some security for more residents in outlying areas.

Furthermore, due to various restrictions during the COVID-19 pandemic, the acceleration of digital transformation has become a general phenomenon and generated lasting momentum, which to some extent, has influenced people's consumption habits. Today, despite the resumption of normal operations in physical stores, a survey of 1,424 respondents from Canada, US and Germany showed that as many as 42.2% of people will continue to engage in frequent online shopping (Shaw, Eschenbrenner, & Baier, 2022). In just the first year of the pandemic, e-commerce in the United States increased by 25% (Morell, 2022). Specifically, in the food service industry, the food delivery market grew by more than 52% during this period (Morell, 2022). In Tompkins county, During COVID-19, there is an

expansion in use of third-parties delivery services and some pharmacies start offering delivery services, but these services do not reach most rural areas. (Zhang & Warner, 2021) On the other hand, the elderly population also began to embrace online services during this pandemic experience; in a recent sample survey of Tompkins seniors, about 29% of older adults started to personally explore and use food delivery service apps (Zeng, Wang & Xu 2023). These demonstrate the reciprocal relationship between technology and consumers, where each shape and adapts to the other (Morell, 2022). From an urban planner's perspective, fostering an environment where services could be accessed by more people not only aids economic development but also enhances the overall quality of life by providing more accessible and personalized services to the community. Supporting such an online services transition is not about breaking the traditional service model but opening up new options of services for more groups. This is not only progressive but necessary in an increasingly digital world where adaptability is key to sustainability.

Looking ahead, the importance of the location and accessibility of grocery stores and pharmacies is set to increase, influenced by the aging U.S. population and a trend towards seniors relocating to more remote areas. By 2050, the number of Americans aged 65 and over is projected to grow from 58 million to 82 million, increasing its share of the total population by 6% (Mather & Scommegna, 2024). Moreover, as of the end of 2021, more than 20% of the U.S. rural population was 65 years or older, for the first time in U.S. census history. (Davis, Rupasingha, Cromartie, & Sanders, 2022). Since the onset of the pandemic, rural areas have seen an increase in net migration. It also shows in Tompkins County, with a slight increase in housing in outlying areas compared to pre-pandemic levels, which indicates a future rise in service demand outside urban centers. At this juncture, cross-agency collaboration in Tompkins County (Xu, 2020) will be crucial. A stable and sustainable service network, built through close cooperation between the public sector, businesses and planners, will help people with adaptation to future challenges.

These insights underscore the integral role of grocery stores and pharmacies as essential services. As pandemic-related support policies diminish and inflation exacerbates, challenges in accessing fresh food and medications at the county-level, especially for peripheral residents, are likely to intensify. Research on the service delivery's network's

scope and resilience can be an important step for the county to create age-friendly communities by mitigating these insecurities.

METHODOLOGY

The methodology of analyzing current delivery services availability and accessibility encompassed a comprehensive multi-stage process. I started with the meticulous collection and validation of data, followed by a phase of data preprocessing, the refinement of attribute tables, and the detailed classification of the accumulated data. Finally I present Instructive visual data, that helps us see which areas are seeking for services improvement. The focal point of this research was to examine the current distribution of older adults within Tompkins County, alongside an in-depth analysis of the locations and delivery data pertaining to pharmacies and grocery stores.

The research began by enhancing the subsidized senior housing location map obtained from Xue (Zhang & Warner, 2021), checked with senior housing data on the Tompkins County Office for the Aging website, employing a combination of Google Maps and Geographic Information Systems (GIS) to integrate market rate senior housing including newly developed senior housing areas. Contrary to the original map's method of representing housing with points, the updated map utilized GIS to depict the specific areas occupied by designated senior housing (create polygon features according to each housing community), thereby enriching the data's precision. Moreover, the study expanded upon the original dataset provided by Professor Mildred Warner's team (Zhang & Warner, 2021), which encompassed the baseline location data of pharmacies and grocery stores in Tompkins County prior to this research. The investigation aimed to verify the current existence of these stores, their locations, and to supplement this with delivery-related data, including whether the businesses offer delivery services, their partnerships with third-party platforms, and their delivery radius (in miles or driving distance).

The data collection and update methodology were segmented into three pivotal steps. The first step involved utilizing Google Maps to search for store information, as it typically provides detailed records of store locations and real-time satellite imagery, with some stores

updating their operational status, delivery services, and partnerships on their Google pages. The second step entailed visiting store websites, as many groceries and pharmacies in Tompkins County are either large chain stores or local farm-to-table brands, which often have their websites. This allowed for further verification of data pertinent to the study's objectives. The third and most crucial step involved direct interviews, including phone calls to businesses, inquiries through website customer service, and interactions with delivery personnel during service use, as well as visits to nearby stores. These three steps were progressively interconnected. In the phase of website searches and interview cycles, I further subdivided the investigation into delivery information, including direct delivery by the businesses, collaboration with third-party platforms, and mail delivery (some pharmacies offer mail services that do not guarantee same-day delivery). These different forms of delivery services were scrutinized for their reach. Especially the direct communication involved in the third step, ensured continual updating of the data (as some businesses were adjusting their delivery ranges), significantly enhancing the data's accuracy.

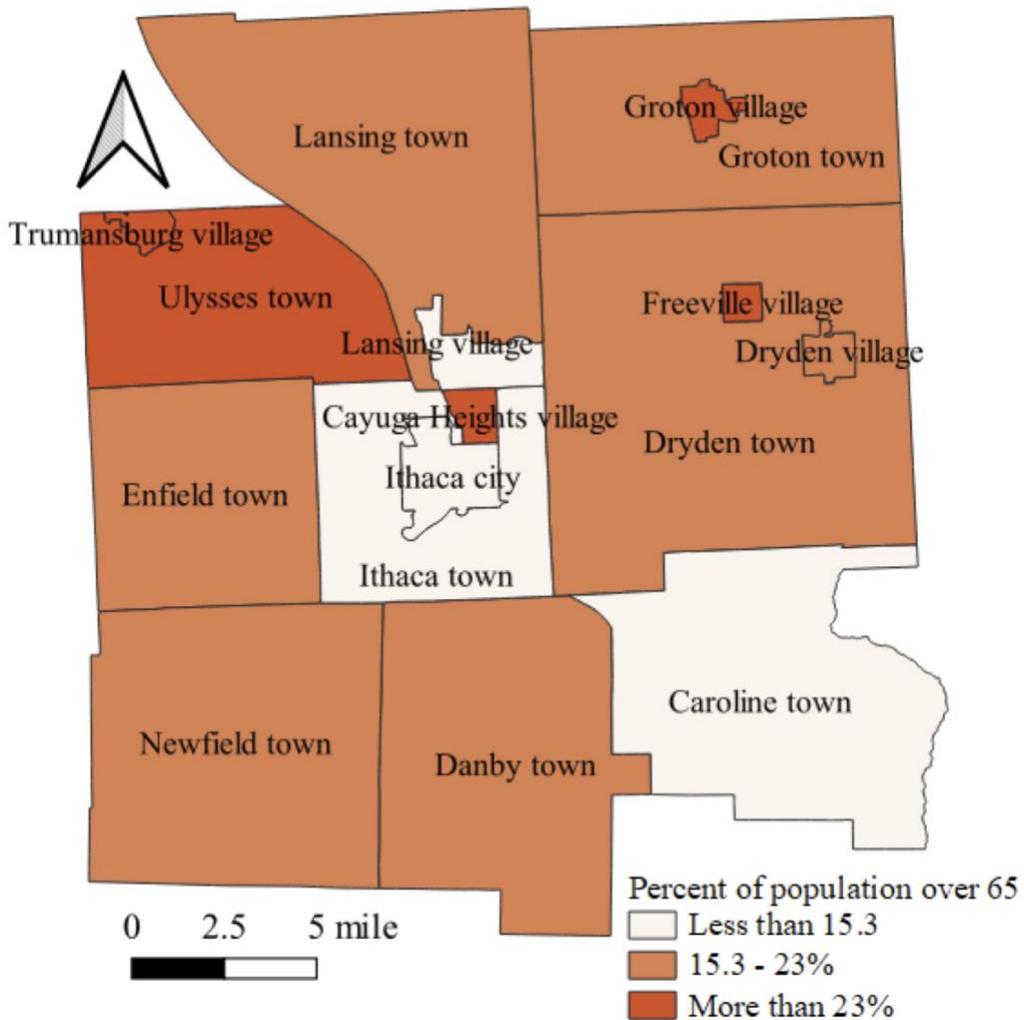
Furthermore, the collected data underwent a process of categorization, integration, and processing. The updated location coordinates of businesses were imported into GIS to create a new location map, which served as a basis for visually representing delivery ranges using the buffer method, to identify areas inaccessible to services. In terms of all the delivery information, the table chart was chosen for its ability to present important data more intuitively and compare the delivery differences between each business.

Finally, through comparative data analysis, maps with guiding significance were produced. For example, overlaying the delivery range maps of businesses with the locations of senior residences highlighted which older adults' living areas were isolated from the current delivery network. The entire data collection process spanned from June 2023 to March 2024. Through these varied methods of investigation, the study aimed to present the most current, comprehensive, and accurate delivery data, laying a strong foundation for future improvements in the service industry and aging community within Tompkins County.

DELIVERY SERVICE NEEDS & AVAILABILITY

Analyzing the two aspects of needs and availability, will give us an insight of Tompkins County's service progress from an age friendly perspective. In recent years, Tompkins County has experienced a small increase in market rate senior housing, prompting updates to our understanding of the areas where older adults are concentrated. This growth aligns with the development of convenience services tailored to older adults. During the COVID-19 pandemic, pharmacies and grocery stores in Tompkins County took proactive steps to enhance their delivery services and collaborate with third-party delivery platforms. Here, we will review the changes in the distribution ratio of the elderly population and housing locations, which offers insights into the older adult's demand for services. On the other hand, analyzing the current delivery services availability and range of pharmacies and grocery, which will serve as an aspect of supply.

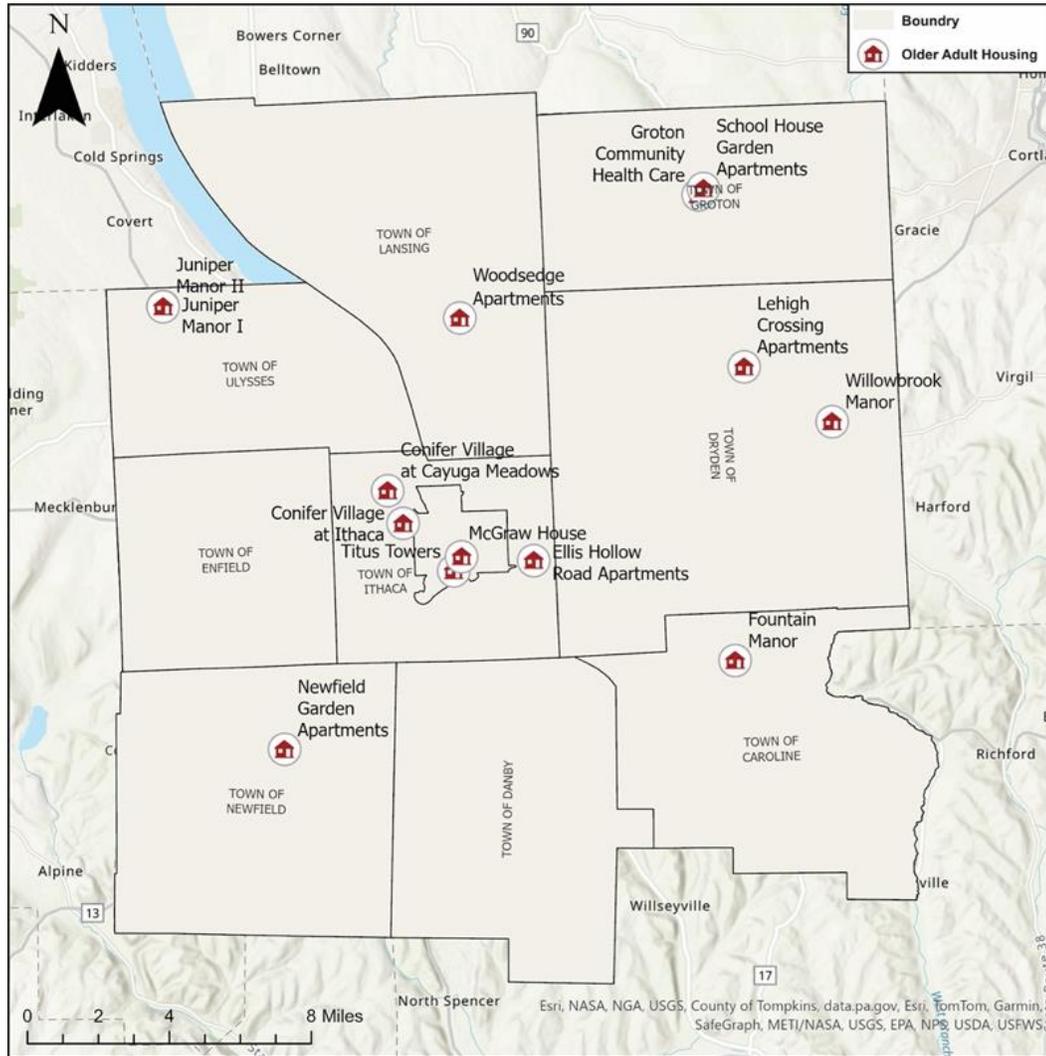
Map 1: Age Over 65 Distribution in Tompkins County in percentage



Data Source: (Zhang & Warner, 2021 Nov)

Firstly, the urban-rural divide in Tompkins County is relatively obvious. Considering the location of Cornell University and the large student population, the Ithaca Center is a population dense area. The proportion of older adults here is relatively low, falling below 15.3%, and they are usually people with middle-to-high incomes. According to the age over 65 population distribution map of Tompkins county, Ulysses, Freeville, Cayuga and Groton have a higher percentage of older adults (more than 23%). These areas might have a greater need for age-friendly services and facilities. It also suggests that delivery services strategies may need to be tailored to the outlying areas where aging population density is higher.

Map 2: Subsidized Senior Housing Locations in 2021



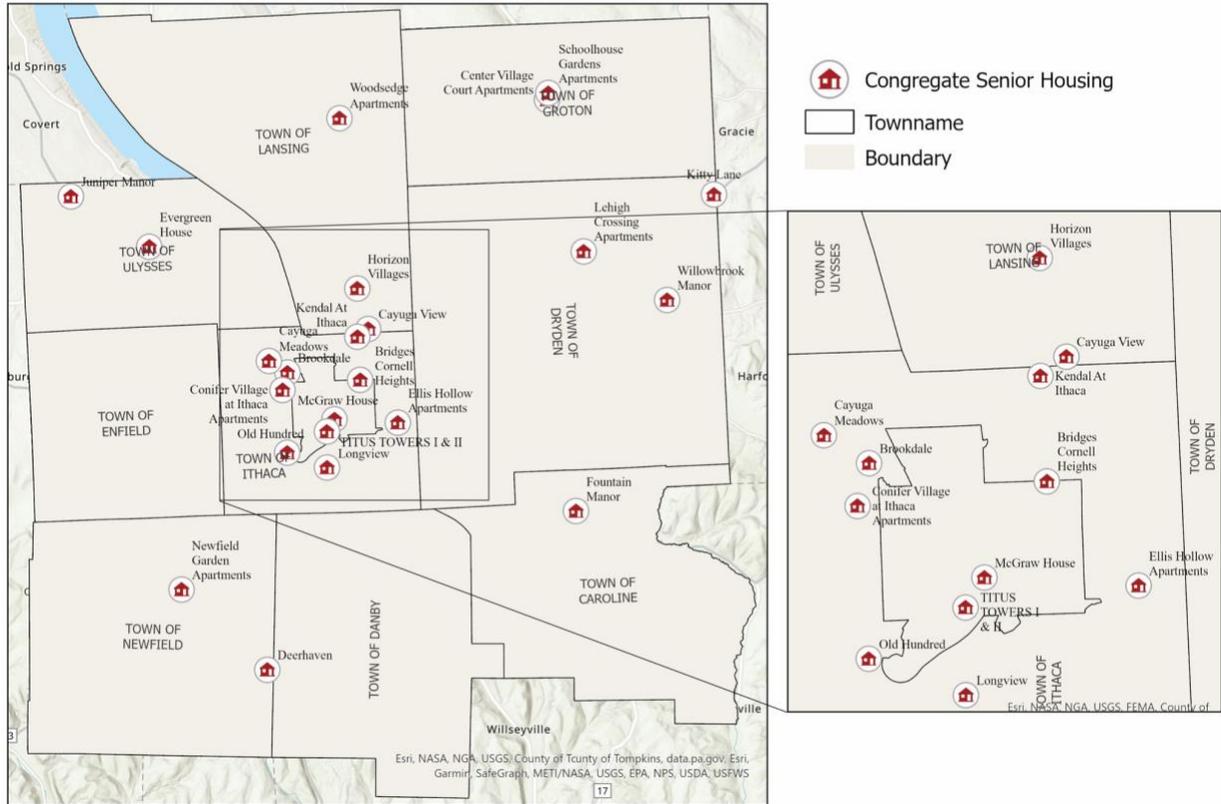
Data Source: Location data provided by Xue Zhang, collected on 2021

(Map 2) In 2021, except for Enfield and Danby, each rural community had 1 to 2 subsidized senior housing locations. There were more housing units in the Town of Ithaca.

Furthermore, (Map 3) the distribution of congregate senior housing shows a tendency towards urbanization. The clustering of designated senior housing in the central area is quite noticeable. Older adults who live in these areas are likely to have higher demand for delivery services, given that a more financially secure older demographic tends to utilize the convenience of digital platforms and home delivery services. The number and diversity of

options for senior living present opportunities for expanded delivery services and e-commerce.

**Map 3: Congregate Senior Housing Locations in 2023
(includes market rate housing, not included in 2021 map)**



Data Source: Updated and made by Yidi Xu on 10/11/2023

Delivery services availability is a direct reflection of the residences' living standards, self-sufficiency, and diversity of choices. While the COVID-19 pandemic has catalyzed a shift in the operational paradigms of pharmacies and grocery stores, with an expansion in service delivery, there remain areas for improvement. The pharmacy sector demonstrates a commendable range of delivery options, with store delivery services ensuring access within a maximum of ten-miles range and alternative third-party delivery mechanisms broadening the reach. These services, complemented by mail delivery, reflect an evolving infrastructure designed to meet the timely health needs of the community. At the same time, major grocery stores like Tops, Wegmans, and ALDI offer delivery services with a considerable range,

with Tops reaching about 10 miles, Wegmans and BJ’s delivering within any 60-minute driving distance.

The pharmacy services system in Tompkins County shows a positive evolution, in order to meet varied consumer demands and the increasing desire for convenience in medication access. Excluding the now-closed Green Street Pharmacy in Downtown Ithaca, the currently operating 11 pharmacies all offer delivery services in various forms, including in-store, third-party, and mail delivery. Seven of them provide two types of delivery options. Of particular note is Kinney Drugs located at 513 North Cayuga Street, which stands out as the only pharmacy providing all three methods of delivery (store, third-party, and mail services), underscoring its significance to the county’s service system. (Table 1) Among the 12 pharmacies offering delivery services, five have independent delivery operations (have their own website). They each offer free delivery services within a 6 to 8-mile range, though some restrict this to certain days of the week. This indicates a strong infrastructure for direct store-to-customer delivery over reasonable distances, likely serving the needs of many residents in Tompkins County effectively and affordably. However, the limitations in specific days might present challenges for timely medication access, particularly for those in urgent need. Fortunately, the limitation of the store delivery alleviated through the collaboration with third-party platforms.

Table 1: Pharmacies-Store Delivery

PHARMACY	DELIVERY SERVICES	STORE DELIVERY RANGE (WITH PRESCRIPTION)
CVS Pharmacy, 625 West Clinton Street	YES	
Kinney Drugs Pharmacy, 2255 North Triphammer Road	YES	10 miles free with prescription(have morning delivery service only on M/W/F)
Kinney Drugs, 513 North Cayuga Street	YES	10 miles free with prescription (everyday in the morning)
Kinney Drugs, 2100 Trumansburg Rd	YES	10 miles free with prescription(have morning delivery service only on M/W/F)
Kinney Drugs, 44 North Street	YES	6 miles free with prescription (MON,TUE,WED,THUR in the morning)
Walgreens Pharmacy, 330 Pine Tree Road	YES	
Tops Pharmacy, 2300 N Triphammer Rd #522	YES	
Walmart Pharmacy, 135 Fairgrounds Memorial Parkway	YES	8 miles, free
Wegmans Food Markets Pharmacy, 500 South Meadow Street	YES	
CVS Pharmacy, 40 Catherwood Rd	YES	
Walgreens Pharmacy, 615 S Meadow St	YES	
Walgreens Pharmacy, 79 NORTH ST Dryden	YES	

Data Source: Collected by Yidi Xu from Jun 2023-Jan 2024

As shown in Table 2, the third-party delivery of pharmacies has engaged 10 stores to participate. Moreover, the delivery range of these services is quite flexible, spanning from 5 miles to the entire county, to meet the needs of residents in various locations, offering greater options diversity. However, although store delivery and third-party delivery have

established a good network of medical services coverage in the county, they often charge higher fees. For example, CVS at 40 Catherwood Rd charges a service fee of \$9.99, which is difficult for some low-income, or impoverished elderly people to afford.

Table 2: Pharmacies-Third Party Delivery

PHARMACY	DELIVERRY SERVICES	THIRD-PARTY DDELIVERY RANGE (normally non-prescription)
CVS Pharmacy, 625 West Clinton Street	YES	6-7 miles
Kinney Drugs Pharmacy, 2255 North Triphammer Road	YES	6-8 miles
Kinney Drugs, 513 North Cayuga Street	YES	6-8 miles
Kinney Drugs, 2100 Trumansburg Rd	YES	
Kinney Drugs, 44 North Street	YES	5 miles
Walgreens Pharmacy, 330 Pine Tree Road	YES	6-10 miles, need prescription
Tops Pharmacy, 2300 N Triphammer Rd #522	YES	6-7 mins
Walmart Pharmacy, 135 Fairgrounds Memorial Parkway	YES	
Wegmans Food Markets Pharmacy, 500 South Meadow Street	YES	Almost cover the whole County (Access to more drugs which requires prescription)
CVS Pharmacy, 40 Catherwood Rd	YES	8-10 miles with 9.99\$ delivery fee (must purchase mmore than \$35)
Walgreens Pharmacy, 615 S Meadow St	YES	6-10 miles, need prescription
Walgreens Pharmacy, 79 NORTH ST Dryden	YES	6-10 miles, need prescription

Data Source: Collected by Yidi Xu from Jun 2023-Jan 2024

In order to reduce delivery costs, some stores also choose to cooperate with reliable shipping carriers, like FedEx. Currently, over half of the pharmacies offer mail delivery as their second service option. This extends the service range of pharmaceuticals throughout Tompkins County and to older adults of different income groups. (Table 3) Mail delivery services usually take 1 to 3 days, but their prices are about half compared to third-party delivery, offering a more affordable option for those not in urgent need of medication. Residents living close to Walgreens have the opportunity to save on delivery costs through mail delivery. Alternatively, purchasing medications from Wegmans or Walmart, although it takes 5 to 10-day to be delivered, is indispensable for older adults unable to afford delivery services. On the other hand, certain pharmacies such as CVS, Walgreens and Wegmans allow prescriptions to be uploaded on their website or third-party apps, which demonstrates that some local businesses have already begun to independently embrace digital technology to enhance their services.

Table 3: Pharmacies-Mail Delivery

PHARMACY	DELIVERY SERVICES	BY MAIL (WITH PRESCRIPTION)
CVS Pharmacy, 625 West Clinton Street	YES	1-2 days \$4.99 delivery (need to upload prescription in CVS app)
Kinney Drugs Pharmacy, 2255 North Triphammer Road	YES	
Kinney Drugs, 513 North Cayuga Street	YES	2-3 days \$4.99 delivery
Kinney Drugs, 2100 Trumansburg Rd	YES	
Kinney Drugs, 44 North Street	YES	
Walgreens Pharmacy, 330 Pine Tree Road	YES	2 days delivery by FedEx, free or \$5.99 (depends on the distance)
Tops Pharmacy, 2300 N Triphammer Rd #522	YES	
Walmart Pharmacy, 135 Fairgrounds Memorial Parkway	YES	5-7 business days Free; 2 day delivery \$8; Overnight \$15
Wegmans Food Markets Pharmacy, 500 South Meadow Street	YES	5-10 days free. 1-2 days with \$8.95. 3-5 days with \$5.95.
CVS Pharmacy, 40 Catherwood Rd	YES	1-2 days \$4.99 delivery (need to upload prescription in CVS app)
Walgreens Pharmacy, 615 S Meadow St	YES	2 days delivery by FedEx, free
Walgreens Pharmacy, 79 NORTH ST Dryden	YES	2 days delivery by FedEx, free

Data Source: Collected by Yidi Xu from June 2023-Jan 2024

Compared with the close cooperation between pharmacies and digital platforms, the sales model of grocery stores seems to rely more on traditional in-store purchases. 10 of the 24 stores offer delivery services (Table 4), including store delivery and through third-parties (Target offering both). Store delivery ranges tend to hover around 5 to 10 miles, with only 4 stores participating. In comparison, the third-party services offer greater flexibility, such as Wegmans and BJ's, who provide delivery services over the whole county. In addition, it is interesting to note these two stores are taking innovative approaches by defining a time-based delivery service. This could potentially offer more equitable service throughout Tompkins County and might even bring convenience to fringe residents in surrounding counties. But the variable cost element (\$5 for every 30 minutes of driving), could affect affordability for some residents.

Table 4: Groceries Store Delivery & Third Party Delivery Data

FACILITY	ADDRESS	DELIVERY SERVICES	THIRD-PARTY CO+OP	STORE D RANGE	THIRD-PARTY RANGE
Tops	2300 N Triphammer Rd #522, Ithaca	YES	Instacart		about 10 miles
Wegmans	500 S Meadow St, Ithaca	YES	Instacart		anywhere in 60 mins driving distance from the store (+\$5 for every 30 mins additional driving distance)
ALDI	2309 N Triphammer Rd, Ithaca	YES	Instacart		about 7 miles
GreenStar Cooperative Natural Foods Market	770 Cascadilla St, Ithaca	YES	Instacart		about 7 miles
Walmart Supercenter	135 Fairgrounds Memorial Pkwy, Ithaca	YES		about 8 miles	
Ithaca Tofu Food Market	23 Cinema Dr, Ithaca	NO			
Eddydale	827 Elmira Rd, Ithaca	NO			
ALDI	505 3rd St, Ithaca	YES	Instacart		about 5 miles
Shur Save	2085 NY-96, Trumansburg	NO	Shursave.com		
Target	40 Catherwood Rd, Ithaca	YES	Instacart, Uber Eats	8 miles	8 miles
Green Castle Asian Market	2255 N Triphammer Rd, Ithaca	NO			
P&C Fresh	315 Pine Tree Rd, Ithaca	YES		5 Miles	
Trader Joe's	744 S Meadow St, Ithaca	NO			
Ren's Mart	701 W Buffalo St, Ithaca	NO			
GreenStar Co-op	215 N Cayuga St, Ithaca	NO			
GreenStar Co-op	307 College Ave, Ithaca	NO			
Green Castle Asian Market	321 Eddy St, Ithaca	NO			
Anabel's Grocery	Anabel Taylor Hall Room 127, 548 College Ave, Ithaca	NO			
Dryden Food Market	33 North St, Dryden	YES		6 miles	
Jason's Grocery & Deli	301 College Ave, Ithaca	NO			
Winli Supermarket	374 Elmira Rd, Ithaca	NO			
Brookton's Market	491 Brooktondale Rd, Brooktondale	NO	Brooktonsmarket.com		
BJ's Wholes Club	40 Graham Rd W Ithaca	Yes	Instacart, DoorDash		anywhere in 60 mins driving distance from the store; For Instacart members: \$0 delivery fees on every order over \$35;

Data Source: Collected by Yidi Xu from June 2023-March 2024

Overall, the increasing older adult housing of Tompkins County underscores the necessity for services that cater to the aging population's need for convenience and digital platform connectivity. Catalyzed by the Covid-19 pandemic, the proactive adaptations of pharmacy services have led to a more dynamic delivery system. Through store delivery, third-party, and mail delivery, the pharmacy services in Tompkins county have ensured broader coverage and accessibility. This flexibility is vital for older adults residing outside the delivery zones, offering a diversity of options to ensure that they can maintain their health needs under different circumstances. The Kinney Drugs on North Cayuga Street exemplifies this shift by offering all three delivery methods, which set a benchmark for comprehensive service provision. In terms of grocery delivery, there is still room for potential improvement of delivery services. Although larger stores like Tops and Wegmans can offer a broader

range of service distances, over half of the grocery stores are still lacking in providing different service options. Considering the distribution of the older adult population, there might be a gap of grocery accessibility. Followed by the growing aging population of Tompkins county, it is essential to bridge the service gaps, particularly in outlying areas with a higher density of older adults. The integration of digital technologies (such as building their own website or cooperating with third parties) in service delivery by local businesses is promising. Overall, the development of the delivery services network in Tompkins county reflects the demand for service diversity and convenience, and also shows that more businesses are becoming aware of optimizing their services through collaboration and digital methods.

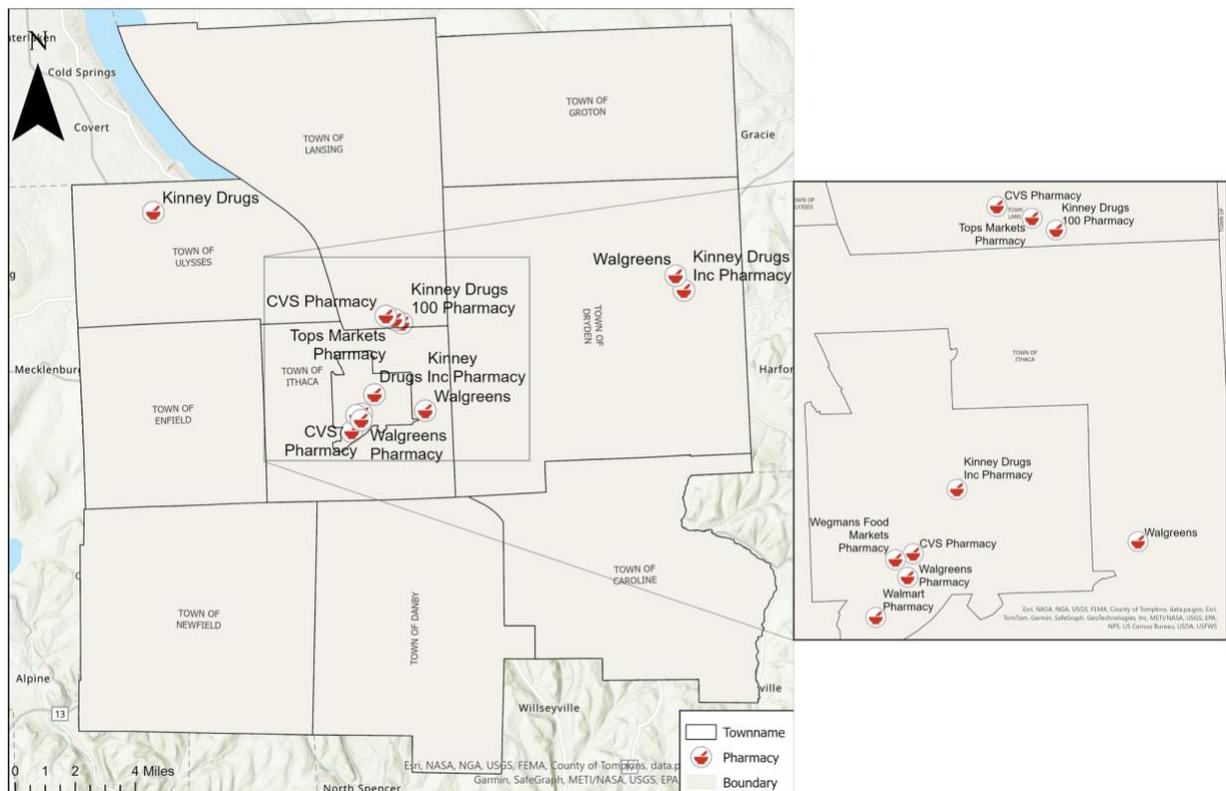
ACCESSIBILITY OF DELIVERY SERVICES

To further examine the accessibility of pharmacy and grocery store delivery services, we need to analyze three aspects, including the locations of the businesses, their delivery range, and its overlap with the designated older adult's housing locations. Since the pandemic, the overall changes in pharmacies and grocery stores have aligned with broader trends in the United States. The store delivery of both pharmacy and grocery stores illustrates a marginalization of accessing services of older adults in rural areas. However, as focal points of attention during the pandemic, pharmacies have demonstrated greater coverage compared to grocery stores, especially considering the locations of older adults. Since the third-party delivery range of both grocery and pharmacy stores covers the entire county, I will focus on its store delivery range here. Through further understanding where the gaps exist in service accessibility in Tompkins County, we will be able to inform targeted strategies to ensure that all older adults in Tompkins County have access to their essential needs.

Comparing the changes in pharmacies before and after the pandemic, the latest 2023 data found that Green Street Pharmacy located in downtown Ithaca has closed. (Map 5) The current distribution of the 12 pharmacies are primarily concentrated in and around Ithaca. In contrast, Groton, Caroline, Danby, Newfield and Enfield have no pharmacies. A total of six businesses are located in the central and eastern areas of the Town of Ithaca, with five

clustered in downtown Ithaca, forming a solid health barrier from north to south. The Walgreens just east of the city center brings medical convenience to the eastern suburban areas of Ithaca. Additionally, three pharmacies are situated at the border between Ithaca and its northern neighbor, Lansing. These nine pharmacies together form a health triangle centered around Ithaca, accessible to surrounding residents by foot. The other three pharmacies are Walgreens and two Kinney Drugs in Ulysses and Dryden, which are located close to the Tompkins County boundaries, offering hope to older adults in the eastern and western suburbs of the county. Especially important is the Kinney in Ulysses town, considering the high proportion of over 23% of the older adults' population there (Map 1). In stark contrast, Groton Town, despite having a higher elderly population percentage than other areas in the county, has no pharmacy stores.

Map 5: Pharmacies Location in 2023

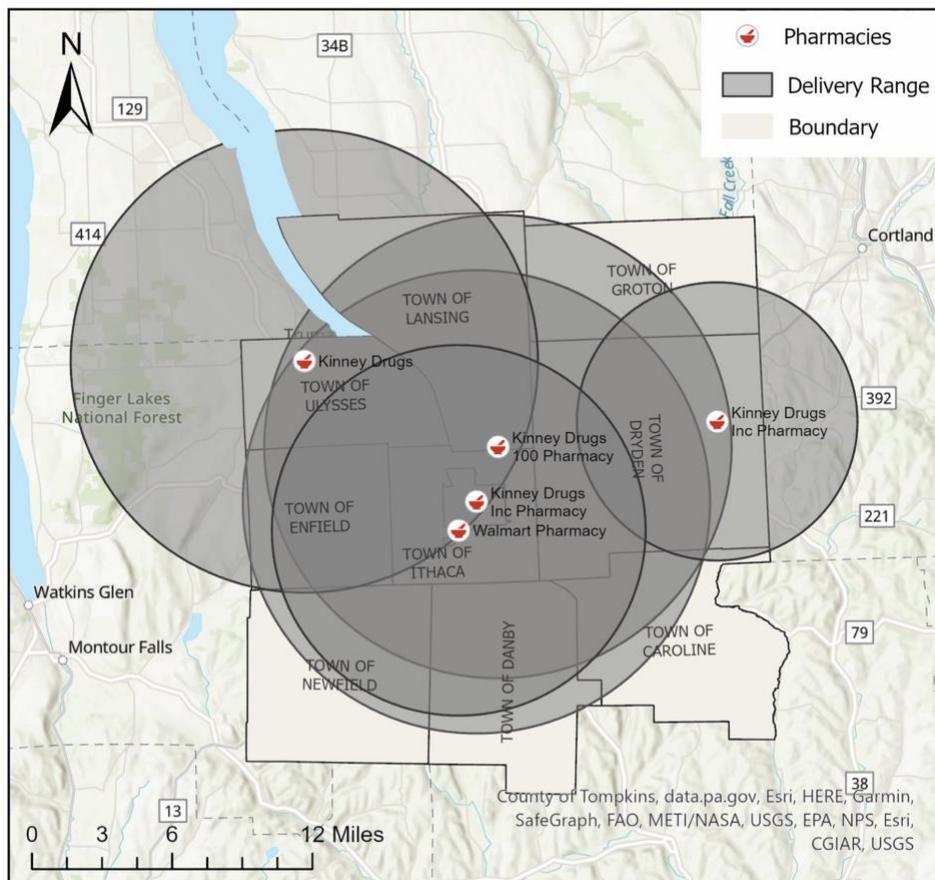


Data Source: Map created by Yidi Xu on Nov 2023

Upon further examining the service range of pharmacies with store delivery among the 12 pharmacies, we focused on 5 pharmacies. Among these, four are Kinney Drugs, and one is Walmart Pharmacy. The coverage area on Map 6 shows us the significant role of Kinney

Drugs in providing health services to Tompkins County and some areas beyond the county. The central region of the county, including Ithaca and its bordering areas with surrounding counties, is covered by the delivery services of 3 to 4 pharmacies. This enhances the diversity of pharmacy choices in the central area. Residents in some peripheral areas like Dryden and Lansing have limited options and may need to rely on a specific pharmacy. In contrast, areas not receiving services are shown as beyond the shaded areas on the map, which are Groton, Caroline, Danby and Newfield. Places near the Montour Falls, and southern side of the county are highlighted as potential service gaps, which also suggests a group of older adults who might not be able to access services.

Map 6: Pharmacy Store Delivery Range

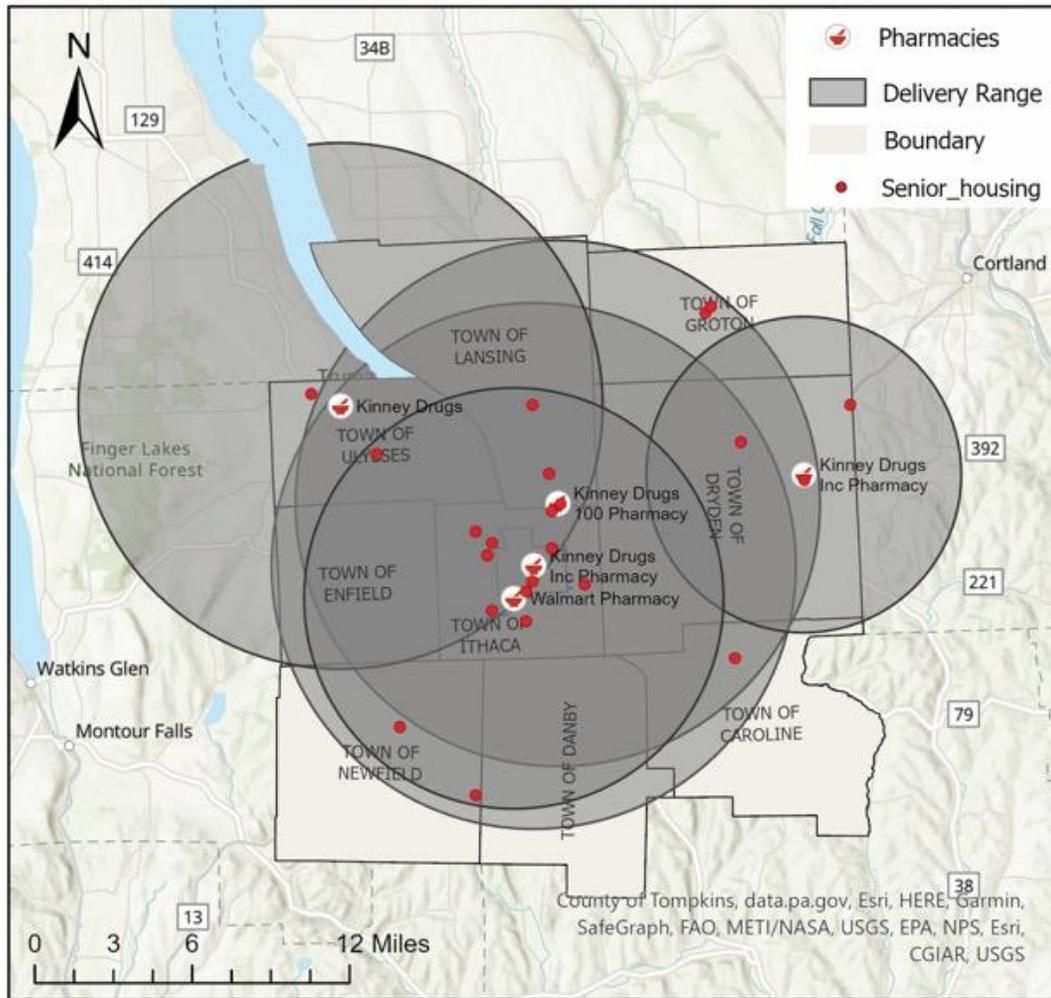


Data Source: Map Created by Yidi Xu on Dec 2023

To further discuss the gaps in accessing pharmacy delivery services for older adults in Tompkins County, we need to combine the pharmacies delivery ranges map with the designated older adult's housing locations. (Map 7) The overall overlap between the delivery

ranges of these five pharmacies and the designated senior housing is indeed encouraging. It shows that these pharmacies adhere to an age-friendly service mission. However, the delicate balance between the service areas and the designated senior housing locations also sets the current delivery ranges as the minimum service standard to meet older adults' essential needs for drugs. Older adults living in Groton, Newfield and Caroline are on the edges of the pharmacies' service areas, indicating a restriction in their choice of stores.

Map 7: Pharmacies Store delivery range & Senior Housing Overlay map

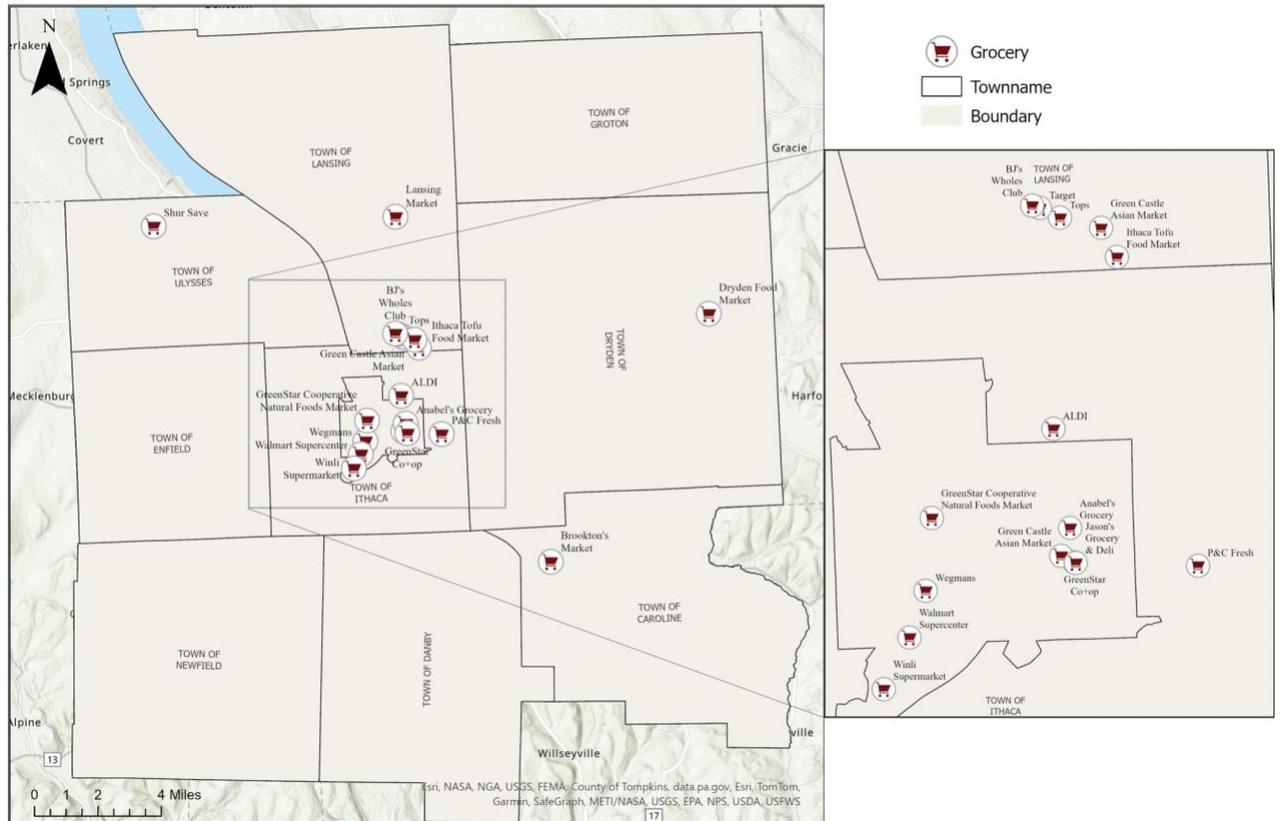


Data Source: Map Created by Yidi Xu on Dec 2023

Compared to the transformation of pharmacies since the Covid-19 and its current service coverage, the grocery stores in Tompkins county show a greater potential for improvement. From 2021 to 2023, one grocery store ran out of business and 2 stores were added. On one hand, (Map 8 & 9) the closure of Lansing market exacerbates the inconvenience for rural

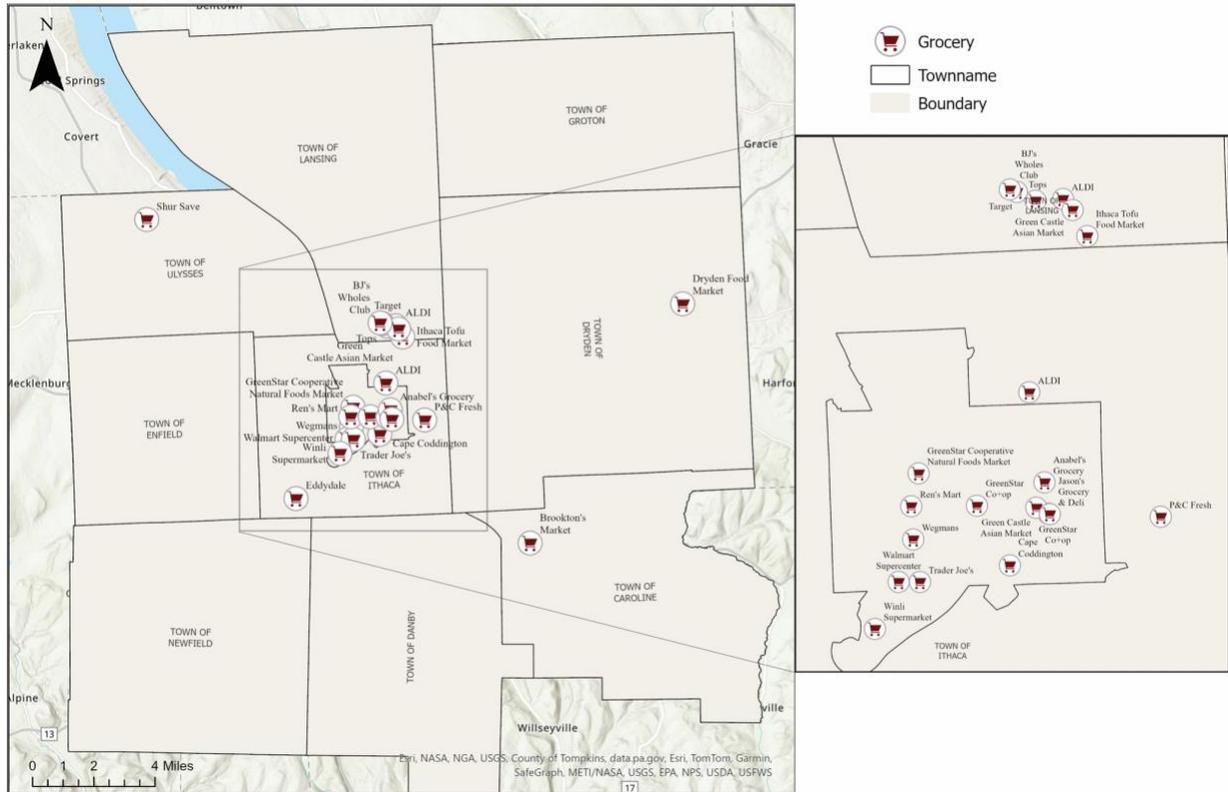
residents who live near it or within its service range. Secondly, Trader Joe's and ALDI are newly joined in Feb 2021 and July 2022 around the town of Ithaca. This growth phenomenon is dependent on the population base of the area and the needs of many students.

Map 8: Groceries Location in 2021



Data Source: Map Created by Yidi Xu on July 2023 (Data collected by Xue Zhang in 2021)

Map 9: Groceries Location in 2023



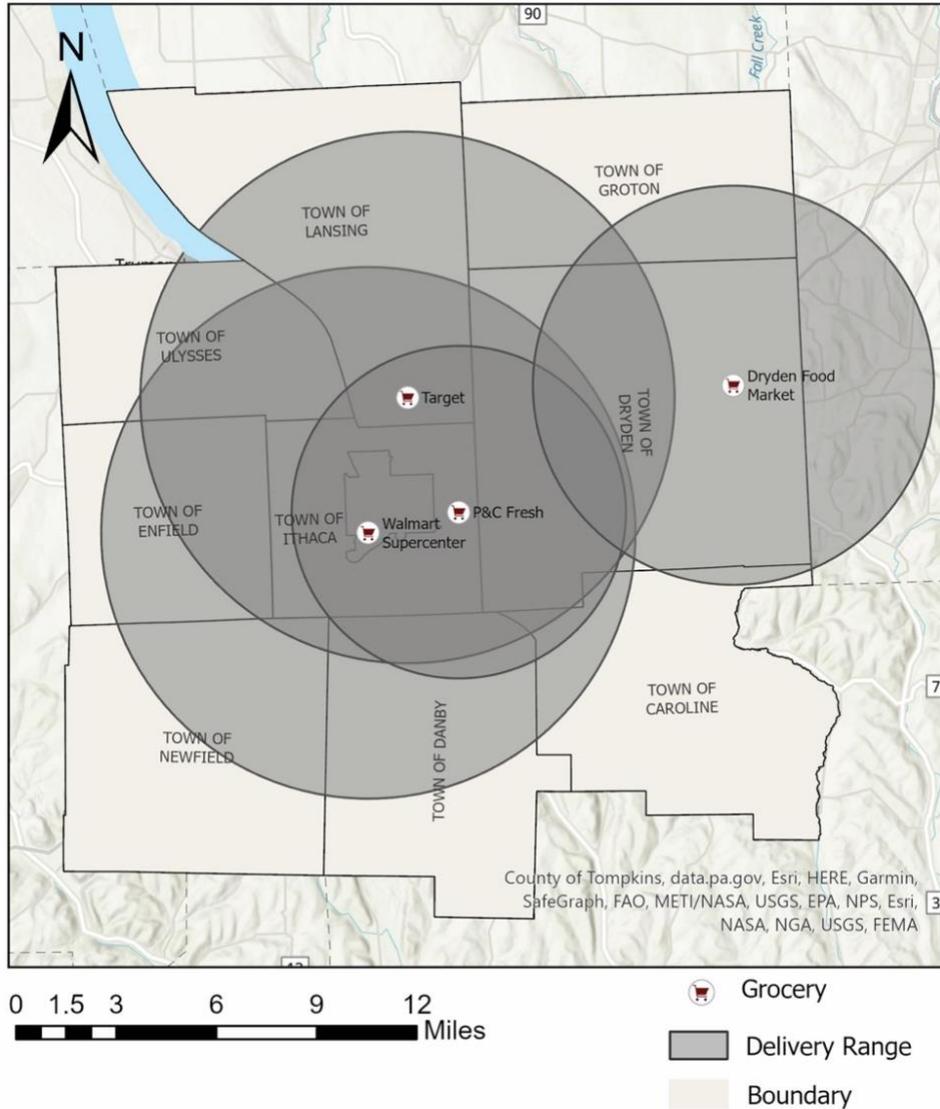
Data Source: Map created by Yidi Xu on March 2024

Today in Tompkins County, half of the towns on the county’s periphery, including Groton, Enfield, Newfield, and Danby, do not have a grocery store. Only three out of 23 grocery stores are explicitly located outside of the Ithaca area. These are Shur Save in Ulysses, Dryden Food Market in Dryden, and Brookton’s Market in Caroline town. They are all local grocery stores, serving as a direct channel for the surrounding rural residents, to access essential nutrition. This distribution indicates a concentration of grocery service coverage in the central area.

The range of In-store delivery services of grocery stores evidently falls short of expectations. Among the 23 grocery stores, only four offer store delivery services. (Map 10) Around the rural areas of Tompkins County, except for Dryden, the other seven towns are all facing issues with access to delivery services for fresh food to varying extents, especially those who live in Caroline, Groton, Newfield and Danby townships. While these residents

can rely on third-party platforms for their necessities, this results in extra costs, increasing the financial burden on residents in these fringe areas and contributing to the urban-rural divide.

Map 10: Grocery Store Delivery Range

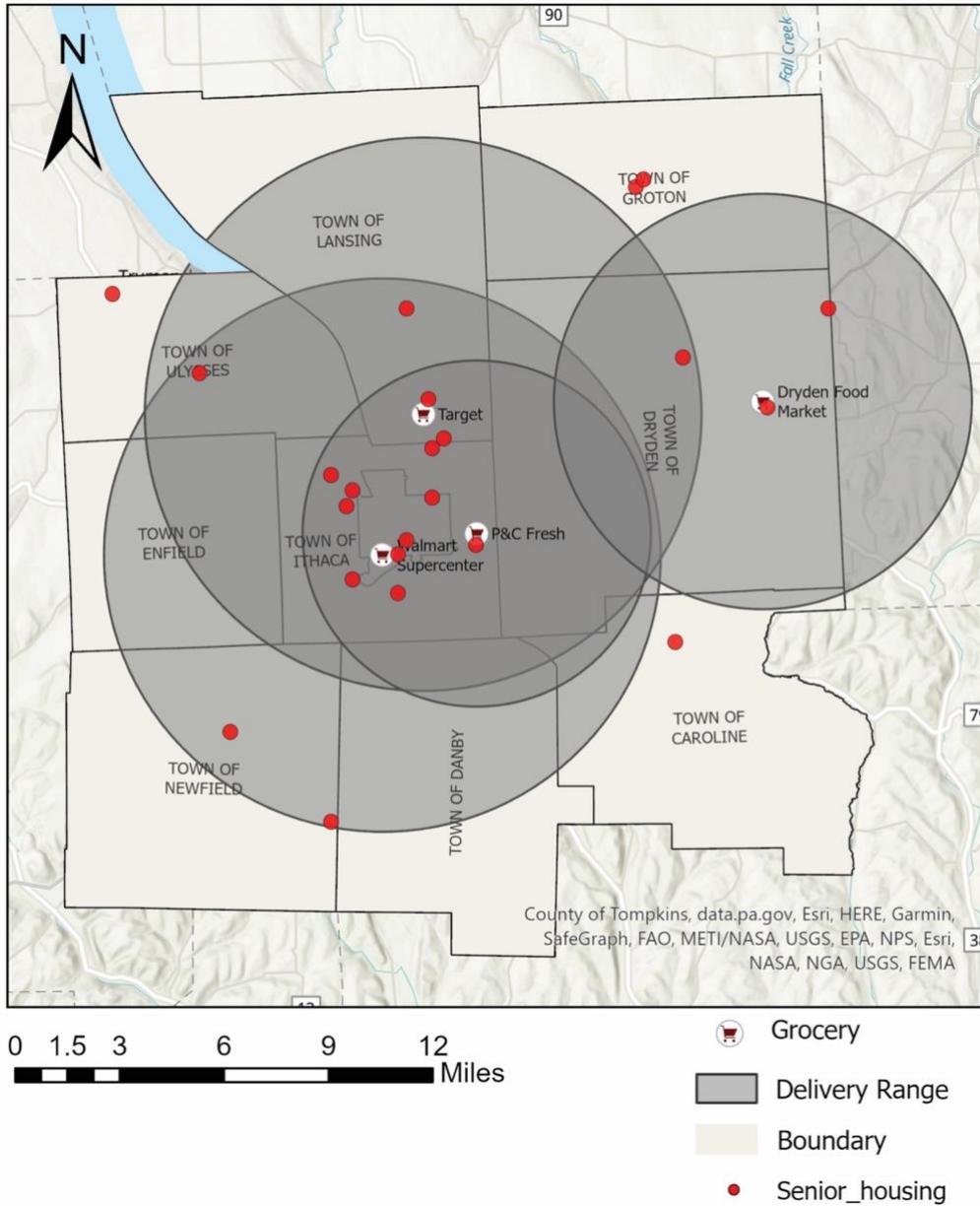


Data Source: Map Created by Yidi Xu on Dec 2023 (Data collected through interview and direct call to business)

Furthermore, looking at the overlap of designated housing locations of older adults with grocery store delivery ranges, (Map 11) the services range shows significant shortcomings as regards the senior housing locations. The older population in Ithaca and its bordering northern areas will have the opportunity to access goods and services through three grocery

stores. In contrast, the 4 designated senior housing locations falling outside the delivery perimeters of these stores (Table 5), and the Deerhaven in town of Newfield lie on the edge of the delivery services, which underscore the service disparities between urban and rural seniors.

Map 11: Groceries Store delivery range & Older Adult Housing Overlay map



Data Source: Map Created by Yidi Xu on Dec 2023

Table 5: Older adults housing that lies outside the delivery perimeters

County	Type	Location	Name
Trumansburg	Subsidized Independent Apartment	24 Elm St, 14886	Juniper Manor
Groton	Subsidized Independent Apartment	200 W South St, 13073	Center Village Court Apartments
Groton	Subsidized Independent Apartment	177 Main St, 13073	Schoolhouse Gardens Apartments
Caroline	Subsidized Independent Apartments	9 Midline Rd Slaterville Springs, 14881	Fountain Manor

Data Source: Screenshot from Older adults housing attribute table in GIS

The imbalance between demand and supply often marks the beginning of a negative cycle, especially when considering the interplay between consumer choices and the services offered by businesses. During the last 2 years, one pharmacy has closed in downtown Ithaca. At the same time, the Kinney Drugs on the eastern and western edges of the county have maintained the convenience experience for the older adults in rural areas, making them pioneers in practicing senior-friendly initiatives. In general, the pharmacy store delivery covered most senior housing until 2023, facilitating service equity. For some rural older adults, they still live on the edge of where they can reliably access medication delivery services. In comparison, the changes in grocery stores are more significant. In the rural area, 1 store (Lansing market) ran out of business, increasing the difficulty for residents in the rural area of Lansing to access services. Conversely, two newly added grocery stores enhance the supply of fresh fruits and vegetables in the central region. Moreover, compared to the enthusiasm of pharmacy businesses in expanding delivery services, grocery stores show lower participation in delivery services. Currently, only Target, Walmarts, P&C Fresh, and Dryden Food Market, a total of 4 stores out of 23, offer store delivery. Furthermore, considering the aging trend in Tompkins County and the vision to create an age-friendly community, we need to pay special attention to designated senior housing residences isolated from grocery delivery services in Groton, Caroline, Ulysses and Newfield. Overall, the spatial analysis of delivery services in Tompkins County indicates a robust support network for older adults in the central areas. But this does not extend uniformly across the county. The distribution of services underscores a pronounced urban-rural divide, with the peripheral areas demonstrating a lack of comprehensive coverage.

FURTHER DISCUSSION

The expansion of delivery service range is the start for establishing a positive, sustainable local service network loop. Through reflections on the current network of pharmacy and grocery delivery, we will be able to improve the service accessibility in Tompkins county systematically, thus fostering a more inclusive and age-friendly community. The collaboration between businesses and courier companies, along with the service background of local grocery stores in the suburbs, hints at a broader range of services.

Given the county's established practice of cross-sector collaboration, incorporating the concept of expanding delivery services into discussions is expected to lead to a more equitable distribution model. The co-work between Fedex and local Pharmacies creates potential logistical models that offer a promising solution to address the inefficiencies in delivery services across dispersed rural housing areas. It also suggests an affordable services path. Secondly, forming partnerships with third-party platforms can provide more efficient and comprehensive delivery services to residents in peripheral regions. Extending delivery ranges will help more rural residents to explore and choose online services, as many older adults in rural areas are expecting from interviews conducted by Zeng, Wang & Xu (2023). Such collaborations can help with the digital transformation of more small businesses across the county. The lens of age-friendly initiatives and cross-sector collaboration can integrate all the resources, in order to create a sustainable and efficient closed-loop system of delivery services, and achieve direct-to-consumer e-commerce. Large platforms like Instacart and DoorDash have extensive experience and more delivery resources, including delivery personnel, which can help businesses achieve delivery services over the whole of Tompkins county.

The mix of current grocery location and delivery network reflects a service ecosystem with potential for expansion, especially in enhancing access to local and specialty products. As for now, there is a varied landscape of grocery delivery accessibility, with larger supermarkets providing a broader delivery range through third parties, and located within or near the town of Ithaca. Store delivery options are limited. But the participation of the Dryden Food Market reflects consumer demand for diverse options that go beyond the standard offerings of larger supermarkets. Some people also rely on local products, with some expressing a desire to support local businesses (Zeng, Wang & Xu 2023). This

sentiment provides foreseeable market support for local, small retailers to initiate their own independent or online delivery services. Expansion in their service delivery range could support local economies and provide tailored services that cater to the unique preferences of community members, thus fostering a more inclusive market. This requires a strategic approach to urban planning that incentivizes the integration of local and smaller businesses into the delivery network and provides technical support.

The ongoing efforts of the County Office for the Aging and the cross-sector collaboration approach in the county have laid a foundation for public trust and tacit understanding in the county, which has been a primary driver for a more inclusive and diverse improvement in delivery services. It will help the majority of the county's older residents to have online services options and proactively facilitate their own lives (Zeng, Wang & Xu 2023). By encouraging and supporting more pharmacies and grocery businesses to join or innovate their own delivery network, Tompkins County will be able to develop a service ecosystem that meets more diverse needs and characteristics. Narrowing the existing gaps in rural areas and laying a strong foundation for an age-friendly future. From a broader perspective, this is conducive to the joint development of the local economy, infrastructure and stakeholders, fostering a collaborative and inclusive growth environment that benefits all members of the community.

RECOMMENDATIONS

According to the analysis and understanding of the current delivery services availability and accessibility in Tompkins County, there are three steps towards a more age friendly community. Firstly, address existing gaps, and prepare for more targeted expansions. Focus on residents living on the edges of pharmacy service areas and the designated senior housing locations that have been isolated from grocery store delivery services, including Ulysses, Groton, Caroline and Newfield. Meet the accessibility and basic convenience needs within the current living areas of older adults.

Secondly, targeted expansion of the current delivery service ranges. Focus on rural areas with no pharmacies and groceries, including Groton, Caroline, Danby, Newfield and Enfield. As well as Ulysses and Groton, where they have the highest proportion of older adults. Provide technical support and strategic analysis to its surrounding businesses in need, helping them start or expand delivery networks that cater to the distribution of the older adult population. This will have a long-term strategic significance for the quality of life and health governance in rural areas. This step aims to improve service coverage and diversity of service choices for older adults, considering varying income and health levels across different areas. Overall, the dual approach of the first two steps include bridging the gap in the current targeted areas and expanding delivery services will help balance the availability and accessibility of the current delivery services network. This is essential to fulfill our commitment to our vision of an age-friendly community.

Thirdly, expand, and optimize local public-private partnerships.

Expand - Expanding new partnerships is important to expand the current service network. Active cooperation between businesses and third-party platforms, as well as the postal service, is key to extending service networks. This relies on the digital experience and network infrastructure of the older adults and rural communities. Public sector collaboration of infrastructure building and digital literacy can be a foundation in moving the delivery services further. Through local libraries, community centers, and educational institutions, they can offer tutorials of older adults on how to use online delivery platforms, apps, and business websites (Zeng, Wang & Xu 2023).

Optimize - Optimizing current data response systems and feedback will help promptly identify the older adults' services availability and accessing issues. Include a dynamic data analysis system that regularly updates on the distribution of the older adults and senior housing information. From the delivery services perspective, the older adults' community engagement and feedback mechanism will help. To receive timely feedback on service experience and access requires active participation of the older adult population to ensure their experiences are effectively heard and communicated. We can also establish a structured mechanism for ongoing engagement with the senior community, including forums, surveys,

and focus groups. This will ensure that service development and adjustments are aligned with the actual needs and preferences of older adults in Tompkins County. These systems will serve as an important basis for evaluating the delivery service network, from both the perspective of service availability and the accessibility of older adults. This will help us identify and respond to emerging service gaps.

CONCLUSION

Over the past two years, various restrictions from the COVID-19 pandemic have magnified pre-existing issues across the United States, including food and pharmacy deserts. It has refocused peoples' attention on the accessibility and convenience of obtaining essential needs. Under this context, the development of delivery service networks has provided a new background for our discussion on accessing medication and fresh foods. Older adults as a vulnerable group under the impact of the pharmacy and food deserts, have become a particular focus of this study. Specifically, in today's Tompkins County, we are at a critical moment in terms of growth and aging population. Through updating and reviewing the availability and accessibility of pharmacies and grocery stores in Tompkins county, we will understand the position of older adults within the current delivery service network. This will guide us to integrate age-friendly initiatives within the gaps of delivery services.

The study builds upon Xue Zhang's 2021 data collection on the distribution of subsidized senior housing and pharmacies and grocery stores locations in Tompkins County by 2021. It comprehensively updates these three data sets in the post-pandemic era. Through online research, telephone inquiries, and on-site visits from June 2023 to March 2024, I have updated and expanded with the 2023 location of congregate senior housing (including market rate and subsidized), pharmacies and groceries, as well as the delivery services and ranges of pharmacies and grocery stores in Tompkins County, including store delivery, third-party delivery, and mail delivery. This nine-month research process ensured the freshness and accuracy of the data gathered. By visualizing and analyzing the collected data, which outlines the current delivery network of pharmacies and grocery stores in Tompkins County, I identify specific areas for service improvement and offer feasible

recommendations for moving towards a more inclusive and age-friendly delivery service in the future.

The current delivery services range network of pharmacy and grocery stores reveals a landscape marked by both progress and disparity. This dichotomy underscores the possibility of broader access to services. Compared to 2021, there has been an overall decrease in pharmacies and grocery stores have seen an increase. The service improvement of both stores has been achieved through collaborations with third-party platforms, which allows for delivery services across the entire county. In terms of store delivery, due to fewer businesses participating, there are still gaps where the location of older adults cannot access fresh food delivery, raising concerns about health disparities. However, the more established store delivery coverage of pharmacies slightly alleviates these concerns for medications. Although a small portion of designated senior housing is on the edges of service coverage, the overall coverage of the senior residences by pharmacy delivery services suggests a positive overlap with the consideration of age-friendly. Moreover, the delivery range of both pharmacies and grocery stores shows that older adults living in the central area of the county have more diverse service options, as they can choose services from different businesses. This diversity contrasts with the clear gaps in rural areas. Furthermore, the gaps in service diversity is not only geographical but also includes methods of services. Increasing service methods can have a complementary effect, which benefits more rural residents. For example, the third service method offered by pharmacies - mail delivery – has a price advantage and wide service range, which allows more residents in areas with inconvenient transportation or lower income groups to enjoy delivery services. Overall, the delivery networks of pharmacies and grocery stores have undergone a positive transformation to some extent, but the coverage in peripheral areas needs more attention.

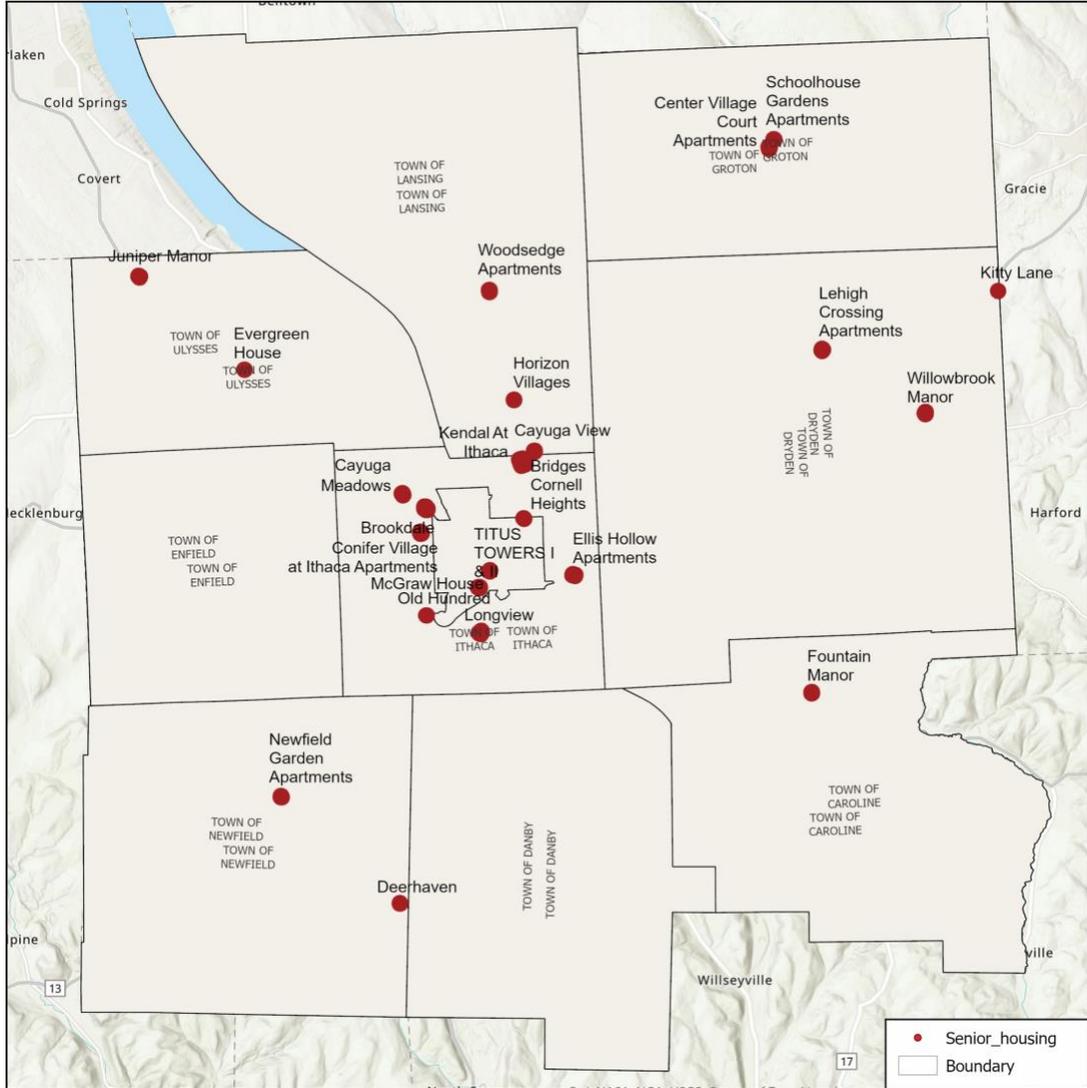
In conclusion, the aim of this report is to understand the current gaps in the current delivery services and expect a future where older adults are supported through more inclusive and diverse delivery services. The path forward involves addressing existing service gaps, particularly for those living on the fringes of current delivery networks, and preparing for the targeted expansion of these services into rural areas rich in older residents. This effort

must be supported by a dynamic, responsive infrastructure that accommodates the growing demand for accessible grocery and pharmacy services, ensuring technological benefits that are equitably distributed. Expanding and optimizing the idea of cross-sector collaboration are crucial steps toward extending service networks and enhancing digital literacy among older adults. I suggest prioritizing the voices and participation of the senior community and setting the stage for a truly inclusive and age-friendly environment. These recommendations offer a pathway towards a more inclusive and adaptive service framework that aligns with the evolving needs of the county's aging population. Tompkins County's response to these improvements will be the commitment to older adult's health and wellbeing.

APPENDIX

Additional Maps

Map 1: Senior Housing Covered Area Map 2023



Data Source: Updated and made by Yidi Xu on 10/11/2023

REFERENCES

1. Ahern, M., Brown, C., & Dukas, S. (2011). A national study of the association between food environments and county-level health outcomes. *The Journal of rural health : official journal of the American Rural Health Association and the National Rural Health Care Association*, 27(4), 367–379. <https://doi.org/10.1111/j.1748-0361.2011.00378.x>
2. Cameron, K. (2020). Ensuring access to needed medications during the COVID-19 pandemic. National Council on Aging. Retrieved from <https://www.ncoa.org/article/ensuring-access-to-needed-medications-during-the-covid-19-pandemic>
3. Choi, Y. J. (2022). Food insecurity, food environments, and disparities in diet quality and obesity in a nationally representative sample of community-dwelling older Americans. *Preventive Medicine Reports*. Retrieved from <https://doi.org/10.1016/j.pmedr.2022.101912>
4. Davis, J. C., Rupasingha, A., Cromartie, J., & Sanders, A. (2022). Rural America at a Glance: 2022 Edition. Economic Research Service, U.S. Department of Agriculture, Economic Information Bulletin Number 246. Retrieved from <https://www.ers.usda.gov/webdocs/publications/105155/eib-246.pdf?v=4569.3>
5. Da Silva Miguel, E et al. (2020) Association between food insecurity and cardiometabolic risk in adults and the elderly: A systematic review. *J Glob Health*. 2020 Dec;10(2):020402.doi: 10.7189/jogh.10.020402. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7568919/>
6. Fichter, H. (2023, October 23). The battle against food insecurity. Ithaca Week. <https://www.ithacaweek-ic.com/the-battle-against-food-insecurity/>
7. Gregg, A., & Peiser, J. (2023, October 22). Drugstore closures are leaving millions without easy access to a pharmacy. *The Washington Post*. Retrieved from <https://www.washingtonpost.com/business/2023/10/22/drugstore-close-pharmacy-deserts/>
8. INDUSTRY PRESS RELEASE (2023). Food Deserts in Rural America Expose Need for Broader Distribution Strategies. *Drovers*.

- <https://www.drovers.com/news/industry/food-deserts-rural-america-expose-need-broader-distribution-strategies>
9. Jackson, J. A., Branscum, A., Tang, A., & Smit, E. (2019). Food insecurity and physical functioning limitations among older U.S. adults. *Preventive Medicine Reports, 14*, 100829. <https://doi.org/10.1016/j.pmedr.2019.100829>
 10. Leung, C. W., & Wolfson, J. A. (2021). Food Insecurity Among Older Adults: 10-Year National Trends and Associations with Diet Quality. *Journal of the American Geriatrics Society, 69*(4), 964-971. <https://doi.org/10.1111/jgs.16971>
 11. Mather, M., & Scommegna, P. (2024, January 9). Fact Sheet: Aging in the United States. Population Reference Bureau. <https://www.prb.org/resources/fact-sheet-aging-in-the-united-states/>
 12. Miller, N. S. (2022, September 27). Food insecurity in the US: An explainer and research roundup. The Journalist's Resource. <https://journalistsresource.org/home/food-insecurity-health/>
 13. Morell, L. (2022). *The impact of the COVID-19 pandemic on online food delivery apps* [Master's thesis, University of Nevada, Las Vegas]. UNLV Theses, Dissertations, Professional Papers, and Capstones. <https://digitalscholarship.unlv.edu/cgi/viewcontent.cgi?article=5553&context=theses-dissertations>
 14. NABP Staff. (2023, August 23). The changing pharmacy landscape and its effects on patient safety. National Association of Boards of Pharmacy. <https://nabp.pharmacy/news/blog/the-changing-pharmacy-landscape-and-its-effects-on-patient-safety/>
 15. Nash, S. (n.d.). The pandemic has accelerated the need to close the digital divide for older adults. Stanford Center on Longevity. Retrieved from <https://longevity.stanford.edu/the-pandemic-has-accelerated-the-need-to-close-the-digital-divide-for-older-adults/>
 16. Rural Health Information Hub. (2023, November 1). Rural Pharmacy and Prescription Drugs. <https://www.ruralhealthinfo.org/topics/pharmacy-and-prescription-drugs>

17. Shaw, N., Eschenbrenner, B., & Baier, D. (2022). Online shopping continuance after COVID-19: A comparison of Canada, Germany and the United States. *Journal of Retailing and Consumer Services*, 69, 103100.
<https://doi.org/10.1016/j.jretconser.2022.103100>
18. Tompkins County Office for the Aging. (2022). *Tompkins County action plan 2022*. Retrieved from <https://www.tompkinscountyny.gov/files2/cofa/ny-tompkinscounty-action-plan-2022.pdf>
19. Tompkins County Office for the Aging. (2023). Age-Friendly. Retrieved from <https://www.tompkinscountyny.gov/cofa/age-friendly>
20. Tompkins Food Future. (2022). Food Access and Security: Food System Baseline Assessment [PDF file]. Food Policy Council of Tompkins County.
https://www.tompkinsfoodfuture.org/_files/ugd/bfff24_376858da90664a7e975dcfb1cc5c0d95.pdf
21. Tompkins County Whole Health. (2022). Community Health Assessment and Community Health Improvement Plan 2022-2024. Cayuga Medical Center.
Retrieved from <https://www.tompkinscountyny.gov/files2/health/chachip2024/CHACHIP2022-TompCo-TOC-CHIP.pdf>
22. U.S. Census Bureau. (2023). Tompkins County, New York. Retrieved from <https://www.census.gov/quickfacts/tompkinscountynynewyork>
23. World Economic Forum. (2021). COVID-19 accelerated digital transformation: How companies can adapt. Retrieved from <https://www.weforum.org/agenda/2021/03/covid-19-accelerated-digital-transformation-how-companies-can-adapt/>
24. Xu, J. (2020). *Best practice report: Multiagency response to food insecurity during the COVID-19 pandemic*. Supervised by Prof. Dr. Mildred Warner and Dr. Xue Zhang. Retrieved from https://labs.aap.cornell.edu/sites/aap-labs/files/2022-05/Xu%282020%29_Best%20Practice%20Report.pdf
25. Xu, J. (2021). Effective Community Response to Food Insecurity: Investigating Cross-Agency Collaboration in Tompkins County in the Context of the COVID-19 Pandemic (Undergraduate thesis, CRP 4970 Independent Study). Supervised by Prof.

- Mildred Warner. Retrieved from
<https://ecommons.cornell.edu/server/api/core/bitstreams/f7150673-6bb7-4c83-be9d-bada047f802c/content>
26. Zarei, M, et al. (2021) Food Insecurity and Dietary Intake Among Elderly Population: A Systematic Review. *Int J Prev Med*. 2021 Jan 19;12:8. doi: 10.4103/ijpvm.IJPVM_61_19. eCollection 2021.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8106269/>
27. Zeng, H., Wang, C., & Xu, Y. (2023). Delivery accessibility improvement for older adults in Tompkins County. Cornell University, Department of City and Regional Planning. Retrieved from https://labs.aap.cornell.edu/sites/aap-labs/files/2024-01/delivery_report.pdf
28. Zhang, X., & Warner, M. E. (2021). Age-friendly planning in Tompkins County: Bridging the rural-urban divide. A Report to the Tompkins County Age-Friendly Center for Excellence. Retrieved from https://labs.aap.cornell.edu/sites/aap-labs/files/2022-05/Zhang%26Warner%282021%29_Age-Friendly%20Planning%20in%20Tompkins%20County.pdf

Data References

Tompkins County Office for the Aging. (n.d.). [Housing For Seniors in Tompkins County NY]. Retrieved from
<https://tompkinscounty.maps.arcgis.com/apps/MapSeries/index.html?appid=eafa4bcc4bb44bb6a8a3ffb29a8b47a4>

Image References

Zhang, X., & Warner, M. E. (2021). Age-friendly planning in Tompkins County: Bridging the rural-urban divide. A Report to the Tompkins County Age-Friendly Center for Excellence. Cornell University. [Image] Retrieved from https://labs.aap.cornell.edu/sites/aap-labs/files/2022-05/Zhang%26Warner%282021%29_Age-Friendly%20Planning%20in%20Tompkins%20County.pdf