2023

The U.S. and Chinese Transportation Policies and Practices for the Transportation-Disadvantaged Populations: A Literature Review-based Comparative Study

Xueming Chen
Virginia Commonwealth University, xchen2@vcu.edu

The U.S. and Chinese Transportation Policies and Practices for the Transportation-Disadvantaged Populations: A Literature Review-based Comparative Study

Xueming (Jimmy) Chen

Abstract
Even though China has entered the aging society almost 20 years ago and passed elderly and disability-related laws, its transportation-related facilities and services for the elderly and disabled remain insufficient, which has seriously impacted its Transportation-Disadvantaged Populations' travel and quality of life. Thus, it is necessary to examine other advanced countries' best planning practices in specialized transportation services to assess their applicability to China. This paper first reviews the U.S. and Chinese laws, regulations, implementation measures and studies related to the elderly and disabled transportation. Afterwards, it conducts an analysis on the differences between the U.S. and China and assesses the transferability and applicability of the American transportation policies and practices for the transportation-disadvantaged populations to China. Through this comparative analysis, it is concluded that China may learn from the U.S. in establishing a sound legal framework, enhancing institutional coordination, providing financial subsidy, and conducting comprehensive elderly and disabled transportation planning, design, construction and operation. In the meantime, China's institutional well-organization, implementation efficiency and social mobilization capability can also offer many useful lessons to the U.S.

Keywords
Aging, elderly and disabled, paratransit, U.S., China

INTRODUCTION

Definitionally, the transportation-disadvantaged population refer to those individuals who cannot provide their own transportation due to their age, disability, or income constraints (GAO, 2003a, 2003b, 2004, 2006, 2008, 2012b, 2013, 2014a). Although the size of this population is hard to be precisely determined due to their overlapping situation (many older adults are disabled or poor at the same time), this population is huge, directly related to the emergence of aging society, deepening of age wave, deteriorating health condition of elderly, and reduced post-retirement income level.

With respect to age wave, according to the United Nations (UN), any society with more than 7% of population age 65 and over or 10% of population age 60 and over is called the aging society (UN, 1956). Population aging is the worldwide phenomenon. U.S. and China are no exceptions. It has been more than 70 years since the U.S. entered the aging society in the 1940s. In 2016, the percentage of the U.S. population age 65 and above reached 15.25% (Senior Connections, 2018). By the year 2050, the total population of this cohort could reach as high as 88.5 million (Note: Different sources may have different population projection figures for the year 2050 due to the different assumptions used). This phenomenon is due to the fact that Americans are living longer with an average life expectancy dramatically increasing in the future (National Council on Disability, 2004). Around the turn of the century, China entered the aging society as well. According to the National Bureau of Statistics of China, the proportion of China's elderly persons age 65 and above jumped from 6.2% in 1995 to 10.06% in 2014.

While creating new opportunities, population aging will present many challenges in such areas as social welfare, pension system, built environment/community redesign, transportation,

and many others. This paper primarily focuses on the elderly and disabled transportation issues, which have recently received lots of attention in planning and research (Paez et al., 2007; Schwanen and Páez, 2010; Moniruzzaman et al., 2015). Since many elderly persons are also disabled, elderly issue is intertwined with disability issue, and many laws and regulations directly deal with the transportation-disadvantaged population-related issues in general. Many American paratransit companies such as the Greater Richmond Transit Company (GRTC) use both age (80+) and disability criteria when assessing applicants' eligibility to be enrolled in their complementary paratransit programs mandated by the Americans with Disabilities Act of 1990 (ADA).

So far, no study has been conducted to comprehensively compare the policies and practices for the transportation-disadvantaged populations between the U.S. and China. This fact motivates this paper to fill the research gap. Since the U.S. has entered the aging society and passed aging-, disability-, and other related laws much earlier than China, it presumably has much more established and mature policies and practices for the transportation-disadvantaged populations. In the meantime, China's aging process seems to be occurring much faster than most other regions and has its own distinguishing characteristics (Feng, 2017), and the Chinese case thus also provides a new perspective in this important research area. Therefore, this literature review-based comparative study has both theoretical and practical importance. The central research questions of this paper are: what are the U.S. and Chinese policies and practices for the transportation-disadvantaged populations under each country's unique circumstances and what improvements can be made in each country?

Following this introduction, this paper consists of four sections: Sections 2 and 3 review the U.S. and Chinese laws, regulations, implementation measures and studies related to the transportation-disadvantaged populations. Section 4 conducts an analysis on the differences between the U.S. and China and assesses the transferability and applicability of the American transportation-disadvantaged population-related policies and practices to China. Section 5 summarizes the research findings and draws conclusions.

THE U.S. POLICIES AND PRACTICES FOR THE TRANSPORTATION-DISADVANTAGED POPULATIONS

The U.S. has many laws, regulations, government programs, and scholarly studies on the policies and practices for the transportation-disadvantaged populations. This section provides a comprehensive review on the most important ones. Appendix 1 shows the highlights of the U.S. Laws and Regulations at the federal level.

Congress-Enacted Laws

Title VI of Civil Rights Act of 1964

Title VI was enacted as part of the landmark Civil Rights Act of 1964. It prohibits any discrimination on the basis of race, colour, and national origin in programs and activities receiving federal financial assistance. Due to the protection of minority groups by Title VI, the federal government has to continue subsidizing and developing public transportation, which also benefits the transportation-disadvantaged populations. The travel right for the elderly and disabled is one type of civil rights that must be protected.

Older Americans Act of 1965 and Its Amendments

The Older Americans Act of 1965 (OAA) originally established authority for grants to states for community planning and social services, research and development projects, and personnel training in the field of aging. At the federal level, it established the Administration on Aging (AoA) to administer the newly created grant programs and to serve as the focal point on matters concerning older persons. Today, the national network of service programs consists of 56 state agencies on aging, 629 area agencies on aging, nearly 20,000 service providers, 244 Tribal organizations, and 2 Native Hawaiian organizations representing 400 tribes.

AoA entered into a memorandum of understanding (MOU) with the Federal Transit Administration (FTA) in 2003. Through this MOU, OAA grantees may use OAA's Title III B funds to meet the match requirements for programs administered by the Federal Transit Administration (FTA).[1]

Rehabilitation Act of 1973

Following the requirements in Section 504 of the Rehabilitation Act of 1973, paratransit began to be provided by not-for-profit human service agencies and public transit agencies. The federal law prohibited the exclusion of the disabled from "any program or activity receiving federal financial assistance". The Federal Transit Administration defined requirements for making buses accessible or providing complementary paratransit services within public transit service areas.

The Americans with Disabilities Act (ADA) of 1990

Without directly providing funding supports, the Americans with Disabilities Act (ADA) of 1990 requires public transit agencies that provide fixed-route service to provide "complementary paratransit" service to people with disabilities who otherwise cannot use the fixed-route bus or rail service because of a disability. The ADA-related federal regulations specifically identify a population of disabled customers who are entitled to this service as a civil right.

With respect to the minimum service characteristics that must be met, ADA complementary paratransit service must be provided within 3/4 mile of a bus route or rail station, at the same hours and days, with a fare no more than twice the regular fixed route fare. While the transit agency is required to provide paratransit for trips with origins and destinations within 3/4 of a mile of a route/station, paratransit eligible customers who are outside the service area could still use the service if they are able to get themselves into the service area.

Executive Regulations

Presidential Executive Orders

On June 18, 2001, President George W. Bush issued Executive Order 13217 (Community-Based Alternatives for Individuals with Disabilities). Under this New Freedom program, federal agencies were directed to support new public transportation services and public transportation alternatives for individuals with disabilities. The joint cooperation required by federal agencies for the Freedom Program, created the Interagency Council on Community Living under the Department of Health and Human Services.

[1] https://www.acl.gov/about-acl/authorizing-statutes/older-americans-act.

Issued on February 24, 2004, President Bush's Executive Order 13330 (Human Service Transportation Coordination) called for identification of restrictions and increased coordination between Federal Departments and agencies in improving federal support towards transportation services for persons with no personal transport, persons with disabilities, persons with low-income, and the elderly and disabled that use community transportation systems.

Part of this new coordination initiative created the Interagency Transportation Coordinating Council on Access and Mobility (CCAM) consisting of secretaries from the Departments of Transportation (DOT), Health and Human Services (HHS), Veterans Affairs, the Commissioner of the Social Security, Education, Interior, Housing and Urban Development (HUD), Agriculture (USDA), Social Security and the National Council on Disability (UWR 2005). Under the direction of CCAM (its membership has been expanding, starting with DOT and HHS as initial members), which is chaired by the Secretary of Transportation, these groups were then directed to work together in simplifying access to transportation on human mobility services.

Regulations of Federal Transit Administration (FTA)

Tapping into the private sector, this FTA 5310 program (New Freedom program, 49 U.S.C. 5310) provides formula funding to states for the purpose of assisting private non-profit groups in meeting the transportation needs of elderly adults and people with disabilities when the transportation service provided is unavailable, insufficient, or inappropriate to meeting these needs. The program intends to improve mobility for seniors and individuals with disabilities by removing barriers to transportation service and expanding transportation mobility options. This program supports transportation services planned, designed, and carried out to meet the special transportation needs of seniors and individuals with disabilities in all areas - large urbanized (over 200,000), small urbanized (50,000-200,000), and rural (under 50,000). Eligible projects include both "traditional" capital investment and "nontraditional" investment beyond the Americans with Disabilities Act (ADA) complementary paratransit services.

FTA 5317 goals are to provide new public transportation services to overcome existing barriers facing Americans with disabilities seeking integration into the workforce and full participation into society while expanding the transportation mobility options available to persons with disabilities beyond requirements of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101, et seq.).

The final Circular FTA C 9045.1, effective May 1, 2007, incorporates provisions of the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). This requires projects selected for funding be derived from a locally developed, coordinated public transit-human services transportation plan (Coordinated Plan) and that the plan be "developed through a process that includes representatives of a public, private, and non-profit transportation and human service providers and participation by members of the public".

Service Delivery Procedures for the Transportation-Disadvantaged Populations

In the U.S., the top-down service delivery procedures start from federal programs, which play an important role in helping American transportation-disadvantaged populations, including older adults, by providing funds to state and local grantees that actually deliver transportation services either directly or through private or public transportation providers by the means of: contracting with private transit providers or providing transit passes, taxi vouchers, or mileage reimbursement to program participants, or some combination of these methods. Some programs may use federal funds to purchase and operate their own vehicles.

According to GAO (2013), altogether 80 federal programs are authorized to fund transportation services for the transportation disadvantaged populations, but transportation is not the primary mission of most of the programs identified by General Accounting Office (GAO, old name) or Government Accountability Office (GAO, new name). Of these 80 programs, the Department of Transportation administers 7 programs that support public transportation. The remaining 73 programs are administered by 7 other federal agencies and provide a variety of human services, such as job training, education, or medical care, which incorporate transportation as an eligible expense in support of program goals.

The three most important federal programs or procedures for the transportation-disadvantaged populations are: 1) The human service transportation programs led by the Department of Health and Human Services (HHS procedures); 2) The public transit programs led by the Federal Transit Administration (FTA), the Department of Transportation (FTA procedures); 3) The human service-public transit coordination programs led by the Interagency Transportation Coordinating Council on Access and Mobility (CCAM), and its United We Ride initiative (CCAM procedures). These three procedures are shown in Appendices 2, 3, and 4 and detailed below.

HHS Procedures

As illustrated in Appendix 2, the legal foundation of HHS procedures is Title III Part B of Older Americans Act of 1965 (OAA). Title III of the OAA, as amended, authorizes federal funding for a variety of home- and community-based supportive services that allow elderly to maintain independence. In particular, Part B of Title III provides funding for a variety of supportive services, including transportation for older adults with and without mobility impairments (GAO, 2014b).

The OAA, as amended, established the Administration on Aging (AoA) within HHS as the chief federal advocate for older Americans and assigned responsibility for home- and community-based services to AoA. In 2012, HHS established the Administration for Community Living (ACL), which brought together AoA, the Office on Disability, and the Administration on Developmental Disabilities to better align the federal programs that address the community living service and support needs of both the aging and disability populations, among other things. AoA distributes funding through grants to state units on aging, which allocate these funds to Area Agencies on Aging (AAAs) that either directly provide services, or contract with local service providers.

FTA Procedures

As one of 10 modal administrations within the U.S. Department of Transportation, FTA is a key source of transportation funding and technical assistance for state and local entities and transportation providers. As FTA 5310 program (49 U.S.C. 5310), FTA's Enhanced Mobility of Seniors and Individuals with Disabilities program (Enhanced Mobility program) provides formula funding to states to serve the special needs of transit-dependent populations beyond traditional public-transportation services. The Moving Ahead for Progress in the 21st Century Act (MAP-21) of 2012 expanded the eligibility of the Enhanced Mobility program to include activities previously eligible under the New Freedom program and to public transportation projects that improve access to fixed-route service and decrease reliance by individuals with disabilities on complementary paratransit. See Appendix 3 for details.

The Enhanced Mobility program requires grantees to develop coordinated public transit-human services plans. This plan development needs to go through a development and approval process that includes seniors, people with disabilities, and transportation providers, and is

coordinated with transportation services assisted by other federal departments and agencies. As stated earlier, the program also allows other federal non-DOT funds, such as Title III Part B funds, to be used as matching funds in order to meet the transportation needs of older adults and promote federal coordination.

CCAM Procedures

Due to the variety of transportation programs that have been created in conjunction with health and human services programs, transportation services are often fragmented, underutilized, or difficult to navigate, and can be costly because of inconsistent, duplicative, and often restrictive federal and state program rules and regulations. To address these issues, the Interagency Coordinating Council on Access and Mobility (Coordinating Council or CCAM) was established according to President Bush's Executive Order 13330 issued on February 24, 2004, and has been responsible for leading federal efforts to improve the efficiency and effectiveness of human service transportation by coordinating related programs. Federal agencies' involvement in the council and its activities varies, with coordination on older adult transportation primarily occurring between Administration on Aging (AoA) and Federal Transit Administration (FTA) through working groups, initiatives, and technical assistance efforts. See Appendix 4 for details.

CCAM created United We Ride (UWR) initiative to facilitate coordination between transportation and human services programs. To that end, UWR is working with states and communities to identify transportation-service gaps and needs, reduce transportation duplication, create more efficient and productive services, and provide assistance in building local partnerships and developing coordination plans. UWR's vision - "One Call" - simplifies access to transportation services. Transportation to the doctor, employment, worship services, and the grocery store should be as easy as picking up the phone and making one call. Behind the scenes, however, "One Call" requires improving coordination for those scheduling, funding, and providing a ride.

State and Local Transportation Coordination Efforts

According to the survey conducted by GAO (2014b), there are many mechanisms and vehicles being applied to coordinate state and local transportation services.

1) State coordinating council

Several states have created statewide coordinating bodies to oversee the implementation of coordinated transportation for the transportation-disadvantaged in their states, such as Commission for the Transportation Disadvantaged in Florida.

2) Regional and local planning

With regional and local planning, some combination of human service and transportation agencies and providers work together to plan transportation services for their clients, such as in Texas.

3) One-call center

For example, a regional planning commission in Virginia operates a one-call center that provides clients with information on the public, private, and volunteer transportation options

available in the region, and it also provides referral services for the transportation-disadvantaged populations.

4) Mobility manager

Mobility managers can serve as policy coordinators, operations service brokers, and customer travel navigators.

5) Vehicle sharing

With vehicle sharing, one agency may provide transportation for clients of multiple programs, or each program may own its own vehicles but allow them to be used by other programs.

Remaining Implementation Issues

In spite of the above progresses and efforts made at the federal, state and local levels, there are continuing challenges, such as insufficient leadership at the federal level, changes to state legislation and policies, and limited financial resources and growing unmet needs at the state and local level. For example, as elaborated later, demand for Americans with Disabilities Act paratransit - service that can be more costly to operate than traditional fixed-route transit and that is often used by the transportation-disadvantaged populations including the elderly - has increased because of the growing older population.

Over the past years, GAO has published dozens of reports evaluating the federal transportation program performance for the transportation-disadvantaged populations and making a series of improvement recommendations. See Appendix 5 for their highlights.

U.S. Transportation Implementation Measures for the Transportation-Disadvantaged Populations

U.S. Transportation Implementation Measures associated with Private Vehicles

Even though there are traffic congestion, air pollution and other environmental problems, private vehicle continues to be the primary transportation mode for the American elderly persons after their retirement. Due to suburbanization, 75% of the American elderly persons live in the suburban areas, where private automobile is normally the only transportation mode available (Rosenbloom, 2009).

However, due to the declining vision, hearing and ambulatory abilities of the elderly persons, transportation agencies must make improvements in road transportation planning and design, and improve those automobile-related infrastructure facilities so the elderly persons can safely drive (Staplin, 2004). For example, traffic signs should be colorful and spectacular, which will attract the elderly persons' attention. It is necessary to tighten the requirements for elderly driver license renewal, and to carefully examine their health condition (Bo, 2016). Moreover, traffic signal timing should consider the elderly persons' walking pace and the required time to cross the streets. If it is necessary, traffic warning signs should be placed on the crosswalk to alert motorists' and pedestrians' attention to transportation safety and the special audible or count-down signals should be used so elderly persons can hear and see.

U.S Transportation Implementation Measures associated with Public Buses

In the U.S., only 1.3% of elderly (age 65 and over) trips use public buses. For those elderly persons who neither drive nor ride other vehicles as passengers, they more likely walk than

taking public buses (BTS 2002, 2003). In order to increase attraction of public transportation to the elderly persons, it is necessary to provide direct transit services for the elderly persons to destinations during non-peak periods (TCRP, 2002, 2004). In addition, it is necessary to coordinate public sector with private sector to improve fixed-route bus services from multiple perspectives to better serve the elderly persons through the following means:

1) Interagency coordination

Improve the coordination of human service transportation among different federal agencies as proposed by Executive Order 13330.

2) Upgrading public transit facilities and driver services

At every transit stop, transit company needs to provide simple and convenient timetables and route maps so elderly and disabled passengers can read them. Bus stop needs to improve its lighting conditions and provide benches and all-weather facilities. Buses must be low-floored and be equipped with wheel-chair ramps and uplift equipment. Bus drivers should receive adequate training so they will know the demands of elderly and disabled passengers, and speak politely and allow elderly and disabled passengers to use accessible facilities.

3) Training and public facility improvement

Transportation-disadvantaged populations should be trained so they know how to use conventional fixed-route buses instead of directly using paratransit services, which will significantly reduce operating costs.

U.S. Transportation Implementation Measures associated with Paratransit Services

According to the definition of FTA, paratransit is any type of public transportation that is distinct from conventional transit, providing flexibly scheduled and routed services such as airport limousines, carpools, jitney, taxi, etc.

The term paratransit can be defined either narrowly or broadly. Paratransit services are typically provided in the U.S. as special transportation services for people with disabilities or elderly people, often provided as a supplement to fixed-route bus and rail systems by public transit agencies. At their simplest form, they may consist of a taxi or small bus that will run along a more or less defined route and then stop to pick up or discharge passengers on request. At the most complex form, they can be the most flexible paratransit systems offering on-demand call-up door-to-door service from any origin to any destination in a service area. Paratransit can also promote efficient feeder services to rail transit, as demonstrated in the San Francisco Bay Area (Cervero et al., 1995). Besides public transit agencies, paratransit services may also be operated by community groups or not-for-profit human service organizations, and for-profit private companies or operators.

Blumenberg and Manville (2004) also recognizes that demand-responsive transit, though expensive per ride, shows an early promise in poverty reduction because it can provide door-to-door service rivalling that of the automobile and requires less capital outlay than bus or rail, and has its operational flexibility.

Table 1 shows the operation models of five American transit companies providing ADA paratransit services in the U.S. as examples. Most companies choose to contract out their paratransit services.

Table 1 Operation Models of Five American Transit Companies Providing ADA Paratransit Services

Company Name	Service Area	Operation Model	Number of passengers in 2008
The Fort Worth Transportation Authority, FWTA	The Fort Worth area in Texas	Direct operation plus 6 contractors	383,273
Pace	The Chicago area in Illinois	3 contractors	1,925,000
Santa Clara Valley Transportation Authority	San Jose and surrounding area in California	Private contractor	1,055,426
Lane Transit District	Eugene, Springfield and surrounding areas in Oregon	Private contractor	84,797
Dallas Area Rapid Transit	Dallas and surrounding areas in Texas	Private contractor	722,323

Source: Koffman, David, Richard Weiner, Amy Pfeiffer, and Scott Chapman. 2010. *Funding the Public Transportation Needs of an Aging Population*. Washington, D.C.: Transportation Research Board, TCRP Project J-11, Task 8.

ADA imposes the stringent requirements for paratransit services, with which all public transit companies must comply. Table 2 shows the ADA compliance guidelines adopted by the Greater Richmond Transit Company (GRTC) in Richmond, Virginia. GRTC provides paratransit services to all disabled and the elderly persons age 80 and above in the Richmond Metropolitan region. Figure 1 shows the ¼ mile buffer (fixed-route service area) and ¾ mile buffer (paratransit service area) in Richmond, Virginia area.

Table 2 ADA Compliance Guidelines Adopted by the Greater Richmond Transit Company (GRTC)

Criteria	Specific Requirements	GRTC Compliance
Service Area	Provide next-day paratransit service to origins and destinations within a 3/4-mile of the fixed-route system.	Provide next-day paratransit service to origins and destinations within a 3/4-mile of the fixed-route system.
Response Time	Provide reservation services during normal business hours for next- day services within a one-hour time span of the requested service.	Provide reservation services during normal business hours for next- day services within 15-minute time span of the requested service.
Fares	Charge no more than twice the comparable fixed-route fare.	Fixed-route transit fare: $1.50 Paratransit fare: $2.50
Trip Purpose	Prevent prioritization or restrictions of paratransit trips based on trip purpose.	No restrictions
Hours and Days of Service	Provide paratransit service during the same operating hours and days as the fixed-route service.	Fixed-route transit service span: 5:00 am- 1:00 am Paratransit service span: 4:30 am-12:30 am
Capacity	Prevent transit agencies from limiting the availability of service by constraints such as trip limitations, waiting lists, or restrictive operating practices.	No restrictions

Source: Chen, Xueming, and Ashray Pande. 2012. Enhancement of Senior Connections Elderly/Disabled Transportation Services. Submitted to Senior Connections, the Capital Area Agency on Aging (SCCAAA).

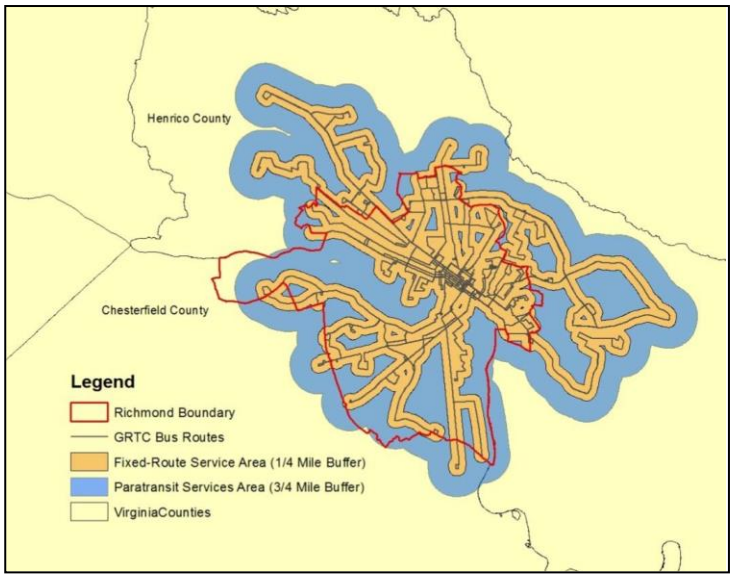


Figure 1 ¼ mile buffer (fixed-route service area) and ¾ mile buffer (paratransit service area) in Richmond, Virginia area (Source: Pande, 2012)

The legally mandated ADA paratransit now faces several challenges:

First, ADA paratransit only provides temporary and complementary transportation services to the disabled persons until fixed-route bus services become accessible (National Council on Disability, 2005).

Second, the eligibility requirement for enrolling in ADA paratransit program is very stringent. For example, GRTC's primary requirement is disability (must be too serious to take fixed-route bus) plus very old age (80 or above). Because of this reason, many elderly persons are not eligible to be enrolled in this program.

Third, many paratransit services are not very frequent and are poorly integrated with each other and with the fixed-route transit system (Pucher, 2004). Due to this reason, many studies have recommended the integration and coordination of demand-responsive paratransit services for the elderly, disabled and other types of transportation disadvantaged groups (Altshuler et al., 1979).

Fourth, ADA paratransit has an extremely high operating cost. For example, in 2012, GRTC's ADA paratransit operating cost was $28.31/trip, which was more than seven times as high as that of fixed-route operating cost ($3.93/trip). In the meantime, paratransit's fare ($2.5/trip) was only less than twice as high as that of the fixed-route bus fare ($1.50/trip), following the legal mandate of ADA. According to GAO (2012a), the average operating cost of ADA paratransit across the U.S. was $29.30/trip, which was 3.5 times that of the fixed-route bus operating cost ($8.15/trip). Table 3 compares the financial profiles of 15 American paratransit companies.

Table 3 Financial Profiles of 15 Major American Paratransit Companies

City	Paratransit Company	ADA Paratransit Operating Cost （USD/Trip）	ADA Paratransit Fare （USD/Trip）	Fixed-Route Bus Fare（USD/Trip）
Boston	THE RIDE	$31.35	$ 2.00	$1.25
Broward County	Transportation Options-TOPS	$31.03	$ 2.50	$1.50
Chicago	ADA Service	$33.35	$ 3.00	$1.75
Dallas	DART Paratransit Services	$43.46	$ 3.00	$1.75
Denver	Access-a-Ride	$44.00	$ 4.00	$2.00
Houston	METROLift	$28.30	$ 0.98	$1.25
Los Angeles	Access Services Paratransit	$40.39	$ 1.80	N/A
Miami	Special Transportation Services-STS	$29.41	$ 3.00	$2.00
New Jersey	Access Link	$48.06	$ 1.35	$2.00
New York City	Access-A-Ride	$69.54	$2.00	$2.25
Philadelphia	Customized Community Transportation-CCT	$26.70	$ 4.00	$2.00
Richmond	Greater Richmond Transit Company's CARE	$22.66	$2.50	$1.50
Seattle	King County Metro Access	$35.13	$ 1.00	$2.75
Washington, DC	Metro Access	$41.07	$ 2.50	$1.25
Westchester	Westchester County Paratransit Services	$58.00	$ 4.00	$2.00

Source: Fei, Di, and Xueming Chen. 2015. "The Americans with Disabilities Act of 1990 (ADA) paratransit cost issues and solutions for the Greater Richmond Transit Company (GRTC)." *Case Studies on Transport Policy*, (3): 402-414.

Due to the high operating cost, provision of ADA paratransit services is a money-losing business, which can only be sustained by the continuing governmental financial subsidy (especially federal government support and local sales taxes). Obviously, lowering its enrolment eligibility to meet higher passenger demand and lowering its operating cost constitutes a conflict, which cannot be easily solved.

In order to address this cost overrun issue, many transit agencies have taken different measures from both revenue side and cost side, such as:

1) Changing the fare structures (revenue side)

The paratransit fare will be made flexible, from flat rate to distance-based rate, and charging extra fees for those passengers living beyond ¾ mile from the fixed-route bus line. In addition, the fare should also be income-based so both efficiency and equity goals can be balanced.

2) Providing training to those transportation-disadvantaged populations so they will know how to use conventional fixed-route buses (cost side)

This would reduce the demand for paratransit services and its operating costs.

3) Providing discount or free fare to induce more paratransit-eligible riders to use conventional fixed-route buses (cost side)

The ridership of fixed-route transit by ADA eligible individuals is very sensitive to fare. Elimination of even a very low fare of $0.35 in Ann Arbor, Michigan, had dramatic effects during the free months in 1995-1996 (Levine 1997).

4) Using special subscription service (cost side)

For those passengers who use paratransit services more than 4 times per week, it is suggested to use subscription method to reduce frequent reservation phone calls to dispatcher.

5) Improving the enrolment eligibility examination (cost side)

It must be ensured that those passengers who are eligible and urgently need services to get priority of service, thus raising efficiency and reducing waste.

6) Enhancing the interagency coordination (cost side)

Transportation agency needs to work with health and public service, and other local human service agencies to provide coordinated human service transportation services to elderly persons.

After reviewing the eight case studies, Burkhardt (2000) found that public transit-human service transportation coordination has yielded many benefits, such as: lowered trip costs for older persons and for human services agencies; extended service hours; services to new areas or new communities and to more people; more trips made by older persons; services responsive to the schedules, points of origin, and destinations of customers; greater emphasis on safety and customer service; door-to-door service; and flexible payment and service options.

GAO (1999) found that in one instance, due to transportation coordination, the local human service agency's average cost per passenger trip decreased from $7.92 to $4.06, and the average cost per vehicle hour declined from $12.83 to $6.89. However, thus far the effective intergovernmental coordination is still insufficient. Obstacles impeding coordination include concern among administrators that their own participants might be negatively affected, program rules that limit use by others, and limited guidance and information on

coordination (GAO, 2003). Even though 80 federal programs are authorized to fund transportation services for the transportation disadvantaged, transportation is not the primary mission of most of the programs, GAO found (GAO, 2012a, 2012b).

7) Providing taxi trip subsidies (cost side)

Many communities provide taxi trip subsidies for those elderly persons age 65 and above. For example, City of Mesa, Arizona provides taxi trip subsidies for those elderly age 65 and above and disabled persons. The passengers only need to pay $25 out of their pocket and enjoy the $100 worth of taxi services.

8) Recruiting volunteering drivers (cost side)

Many regions have volunteering driver programs to alleviate the driver shortage situation. City of Mesa in Arizona has a mileage-reimbursement program, which allows elderly persons age 65 and older to choose a driver to drive them to the destinations they want to go. These eligible elderly persons may be reimbursed for their mileage accumulated, and the reimbursed money will be transferred to the volunteering drivers. The volunteering drivers may be their friends, neighbours or relatives, but cannot live in the same house as passengers. The monthly reimbursement amount is up to 300 miles/person. In 2009, this program successfully served 39,664 trips.

9) Providing information assistance and other services (cost side)

Public transit operators may provide elderly persons with aging-related information, such as government service agencies, and facilities.

Of course, in order to make paratransit services more successful, we need to ensure that paratransit vehicles and station design must meet the ADA requirements, such as providing wheelchair lift. In addition, all those facilities (including roadways) leading to the bus stops must be designed to be accessible (DiPetrillo et al., 2016).

In addition to the above list of implementation measures, many American cities also provide different degrees of demand-responsive door-to-door transportation services (e.g., TRIPS in Irvine, California; Care-A-Van and Shuttle in Newport Beach, California; Senior Transportation Plan in Buena Park, CA; Seniors' Resource Center, in Denver, Colorado) yielding different degrees of beneficial results. In addition, both neighborhood design and built environment have impacts on the accessibility and travel behavior of elderly people (Cao et al., 2010; Feng, 2017).

U.S. Studies on the Elderly and Disabled Transportation

Population aging characteristics in the U.S.

The U.S. Bureau of the Census predicts that the number of senior Americans will more than double between 1996 and 2050 - from 34 million to 78 million (Rosenbloom 2004). The baby boomers are largely responsible for this increase in the older population, as they began turning 65 in 2011 (Ortman, 2014). Its percentage share of total population will increase from 12.4% in 2000 to a projected 19.7% in 2030 (Cao et al. 2010). Between 2020 and 2030 alone, the number of elderly persons is projected to increase by almost 18 million as the last of the large baby boom cohorts reaches age 65. Although much smaller in total size, the number of people

age 85 and older is projected to more than triple from 6 million today to nearly 20 million by 2060 (Mather, Jacobsen, and Pollard, 2015).

Travel behaviour of the elderly and its determinants

Mobility is critical to the human well-being of the elderly. The living patterns and transportation requirements of the elderly are constantly changing. Compared to the past, the current elderly are more heterogeneous, more affluent, and more likely to drive (Wachs, 1979).

The 1995 Nationwide Personal Transportation Study (NPTS) data indicate that roughly 92% of all trips of Americans over age 65 were taken in a private vehicle - almost exactly the same percentage as those age 16-64. In the U.S., most elderly people will have active lifestyles in which mobility and access play a major role and almost all older men and a majority of older women will be car drivers, used to the convenience and flexibility which the car provides (Rosenbloom, 2001). According to Rosenbloom (2004), no cohort of older travelers (age 65 and older) takes less than 8 out of 10 trips in a private vehicle. In the meantime, it should be recognized that as they age, due to their deteriorating physical and mental conditions, older people more likely become the passengers in the car and not the drivers. Conversely, no cohort of the elderly takes more than 2.3% of their trips by transit. Walking is a more frequent mode choice for older people than public transit by a factor of at least two. Using the data from a national survey conducted by the American Association of Retired Persons in 2004, Kim (2011) uses a multinomial logit model to analyze various personal, household, and neighborhood environmental factors associated with transportation alternatives. His study also found that getting a ride as a passenger (not a driver) was the most preferred mode of transportation and the elderly were less likely to consider public transit and walking as their alternatives when they ceased driving.

To meet the needs of elderly people, some of which suffer physical, social and economic disadvantages, Rosenbloom (2004) suggests to develop a comprehensive strategy including such measures as: 1) Effective driver evaluation and retaining programs; 2) Better-designed cars and improved signage and information on roads and highways; 3) User-friendly public transportation networks; 4) Choice of transportation alternatives; 5) Well-designed land use and housing choices; 6) Cost-effective delivery of private and public services; and 7) Coordinated delivery of human and social services.

Cao et al. (2010) uses data collected from Northern California in 2003 to explore the ability of neighbourhood design to preserve accessibility for the elderly by enabling a shift from driving to transit and walking, controlling for confounding factors. Overall, neighbourhood design seems to be an important aspect of sustaining the accessibility of older people.

Giuliano (2004) also echoes the finding of Rosenbloom (2004) that the elderly both now and in the future will want to retain the ability to drive for as long as possible. The planning focus should be on driver-friendly urban design alternatives such as more and better signage and traffic control, and easily negotiated parking facilities. Conventional transit's potential for offering an acceptable substitute to the private vehicle is limited because most elderly will not be living in places where fixed-route transit is efficient or effective. She also recognizes that there may be two main barriers to paratransit: First, there is the problem of serving sparse, dispersed travel demand patterns in a cost-efficient manner. New technology provides the potential for developing more efficient dispatching and routing and for accommodating real-time, "on the fly" trip requests. Combined with private contracting or other strategies that reduce costs, new technology may generate cost-effective paratransit options. Second, the existing regulatory and institutional barriers may prevent jitneys, shared-ride taxis, or other privately provided paratransit services from operating within the service areas of conventional transit operators or in competition with local taxi services.

Besides transit and paratransit services provided by public transit agencies, the transportation services provided by medical and human service agencies cannot be neglected. Rosenbloom (1993) points out that, in the future, when senior Americans can no longer drive or receive rides and transit and para-transit options are impractical or costly, their mobility will drop and they may have to make drastic changes in their whole life network to be able to access just a few necessary services. Under this circumstance, medical and human service agencies will have to make an effort to make their programs accessible to the elderly population.

Several new research areas have emerged. As Feng (2017) notes, more scholars recently pay attention to the importance of including subjective norms, such as attitudes, values and orientations in the travel behavior research (van Acker et al. 2010; Ohnmacht et al., 2009). Lifestyle and attitudinal research have been identified as important additional approaches for explaining travel behavior by several scholars (Cao and Mokhtarian, 2005; Ohnmacht et al., 2009; Scheiner, 2010).

Travel Patterns of the Elderly

According to Rosenbloom (2004), the elderly people in the U.S. are heavily dependent on the private automobile for their mobility and access, followed by walk, as shown in Table 4. Other modes are negligible.

Table 4 Mode Choice for All Trips by Age, 1995 (percent)

Age Cohort	*Private Automobile*			Public Transit	Taxi	Walk	Bike	Other Modes
	Total	*Driver*	*Passenger*					
65–69	90.1	71.5	18.6	1.7	0.2	4.5	0.2	3.4
70–74	89.4	67.6	21.8	1.5	0.2	5.5	0.2	3.2
75–79	88.4	63.3	25.1	2.1	0.3	5.9	<0.01	3.4
80–84	89.0	57.6	31.4	1.6	0.2	5.3	0.3	3.6
85+	81.5	49.3	32.2	2.3	0.9	11.0	0.0	4.4

Source: Rosenbloom (2004), calculated from the unpublished data from the 1995 National Personal Transportation Survey (NPTS).

Results of ADA Implementation

Implementation of ADA had mixed results in the U.S. According to GAO (2007), on the one hand, the reports from the National Council on Disability and the Bureau of Transportation Statistics found that more public and private transportation vehicles in the U.S. are accessible now than at the time the Americans with Disability Act of 1990 (ADA) was enacted. But on the other hand, a national study conducted by the Bureau of Transportation Statistics in 2002 found that approximately 12 percent of individuals with disabilities still had difficulties obtaining the transportation they need, compared with 3 percent of people without disabilities. A 2004 national survey found that people with disabilities were twice as likely to have inadequate transportation as people without disabilities. Transit agencies reported that the percent of accessible transit buses in urban areas increased from 36 percent in 1989 to 97 percent in 2005 as new, accessible vehicles replaced older ones. However, problems persist in compliance with other ADA requirements, such as maintaining lifts and ramps and announcing transit stops.

Summary Evaluation of U.S. Policies and Practices for the Transportation-Disadvantaged Populations

Since 1990, the U.S. Congress enacted several major laws, which had provided a solid legal foundation for the implementation of transportation policies for the transportation-disadvantaged populations, examples of which are: 1) The 1990 ADA clearly stipulates that the citizen's travel right is one type of civil rights that must be protected. Public buses and trains must provide facilities and conditions for the disabled persons and no federal agencies could discriminate against those disabled groups using any excuses; 2) The 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) and 1998 Transportation Equity Act for the 21st Century (TEA-21) appropriated sizeable amounts of funds to provide driver training, development of intelligent transportation system (ITS) and other public transit facilities; 3) The Older Americans Act Amendments of 1992 and 2006 further reaffirmed the critical importance transportation plays in elderly people's health and elderly, and also demanded each state to set aside enough funds for elderly persons' transportation projects (Mao and Huang, 2006).

Through the efforts made during the past decades, the U.S. transportation policies for the transportation-disadvantaged populations have achieved a great degree of success. For example, almost all cities' public entities, private non-profit organizations, hospitals and faith-based organizations and other civil organizations have provided various types of senior transportation facilities. A few ethnically complicated cities also provide non-English services. For example, the Los Angeles-based paratransit company *Access* provides English/Spanish bilingual services. Many cities' buses were also equipped with accessible facilities, which make it more convenient for elderly and disabled people to board and alight transit vehicles.

Despite the above achievements, the U.S. transportation policies for the transportation-disadvantaged populations still have many issues yet to be resolved:

First, the federal government has not provided enough funds in aging and disabled undertakings, which has made it difficult for many transit companies to provide and expand their expensive paratransit services;

Second, the collaboration and coordination between government agencies and between public and private sectors in providing human transportation services is still not enough, with relatively low efficiency and waste of resources;

Third, the federal monitoring of public transit companies remains as a formality, lacking a rigorous quality checking of the transit operating data submitted by public transit companies, which has made the National Transit Database somewhat inaccurate.

The Chinese Laws, Regulations, Implementation Measures and Studies related to Transportation for the Transportation-Disadvantaged Populations

Appendix 6 shows the list of related Chinese laws and regulations and their highlights.

Chinese Laws

Law of the People's Republic of China on Protection of the Rights and Interests of the Elderly

In 1996, during its 21st meeting, the Standing Committee of National People's Congress of China passed the "Law of the People's Republic of China on Protection of the Rights and Interests of the Elderly." Even though China's population aging structure at that time was still pretty young, this landmark law played an important role in safeguarding the elderly rights and interests, fostering the undertakings of the elderly, and promoting the harmonious social development. The elderly referred to in this Law are citizens at or above the age of 60.

In 2007, the Ministry of Civil Affairs and National Elderly Commission initiated the amendment of the "Law of the People's Republic of China on Protection of the Rights and Interests of the Elderly." The Amended law was passed by the National People's Congress on December 28, 2012 and took effect on July 1, 2013.

According to this amended law, the central government needs to establish the multi-layer social security system and to gradually increase the security level of the elderly. The new social security system should be home-based, supported by community and government agencies. Its Article 57 stipulates that urban transportation facilities (public transportation, highway, railway, and aviation) need to provide preferential treatments and caring for the elderly people.

Law of the People's Republic of China on the Protection of Disabled Persons

This law was adopted at the 17th Meeting of the Standing Committee of the Seventh National People's Congress on December 28, 1990. Its article 33 stipulates to provide disabled persons with preferential treatment and assistance.

Chinese Plans and Government Regulations

The 12th Five-Year Plan of the Chinese Elderly Undertaking Development

To cope with the population aging and accelerate the elderly undertakings, the State Council released "The 12th Five-Year Plan of the Chinese Elderly Undertaking Development" in September 2011. This plan proposed 7 major objectives and 11 tasks.

In elderly services, the Plan emphasizes the home-based care services, establishes and refines county, town and community service networks to ensure that urban areas and communities should be 100% covered by care services, the town areas and rural communities 80% covered, and rural areas 50% covered.

The State Council's Suggestions on Accelerating the Elderly Undertakings

In September, 2013, the State Council issued a series of tasks and measures associated with elderly care service, such as improvement of financing and investment policies, land supply policies, taxation benefit policies, financial subsidies, and encouragement of non-profit organizations to provide elderly care service.

More specifically, in city master plan and controlled detailed plan, it must allocate 0.1 square meter/person to set up elderly care service and facilities.

Notice of the State Council on National Population Development Plan (2016-2030)

This population development plan was issued by the State Council in 2016 to lower governments at all levels. This document described the guidance of State Council on the current population situation in China. The balanced development of the population is the main guiding ideology. Facing the problem of population aging, the State Council stipulated the requirement to improve social security system and develop endowment insurance. It also advocates for constructing accessible, elderly-friendly communities and cities. This document was targeted at all local governments and the people. It works to provide a better environment for the growing travel needs of elderly people.

Through the amendment of the "Law of the People's Republic of China on Protection of the Rights and Interests of the Elderly," the entire society is required to pay a special attention to the elderly problems. During the past 20 years, the functions of taking care of

elderly people through family and employers have been weakening. In the meantime, the functions played by the government and society have been strengthening. It is necessary to readjust their roles to better meet the requirements of the elderly people.

Ministry of Transport et al.'s "Implementation Suggestions on Further Strengthening and Improving the Travel Services of Elderly and Disabled People"

On January 8, 2018, China's Ministry of Transport (MOT), Ministry of Housing and Urban-Rural Development, State Railway Administration, China Civil Aviation Bureau, State Post Office Bureau, China Disabled Persons' Federation, Office of the National Committee on Aging jointly published the "Implementation Opinion of Strengthening and Improving Transportation-Disadvantaged Populations' Travel Services."[2]

This "Implementation Opinion" was issued with an understanding that China currently has 230 million elderly persons age 60 and above, and 85 million disabled persons. It is very urgent and important that accessible travel services for Transportation-Disadvantaged Populations be provided as soon as possible. The initial goal is to build the accessible system by the year 2020, and improve the accessible travel service level.

More specific targets are to: 1) Provide accessible facilities in all newly built or renovated railway stations, highway service plazas, second class and above bus stations, urban ferries, international passenger water ports and airports, and urban subway stations; Post Office must deliver all mails, printed matters, and remittance notices according to their mailing addresses; encourage those cities with suitable conditions to purchase low-floored buses; and all cities of more than 5 million people operate 100% of low-floored buses; 2) By the year 2035, the fully covered, seamlessly integrated, safe and comfortable accessible travel service system must be established with constantly improved service environment, service level, thus adequately satisfying the travel needs of Transportation-Disadvantaged Populations; 3) All accessible transportation infrastructure plans must be incorporated into the local development plans. The constructions must be undertaken in an orderly way; 4) It is essential to upgrade travel service quality by adopting innovative service models; establishing travel information service system; improving service levels; and ensuring the travel safety.

Chinese Transportation Implementation Measures for the Elderly Persons

Since Chinese elderly persons primarily rely on public transit (especially buses) and walking as their travel modes, most implementation measures (financial subsidy and accessible transit facilities) are associated with public transit, as shown below.

Chinese Transportation Implementation Measures associated with Public Transit

The Chinese local governments and transit companies have provided various forms of direct and indirect financial subsidies to support elderly people using public transit: 1) Cash (Shanghai); 2) Unlimited free boarding (Beijing, Shenzhen); 3) Unlimited monthly pass (Suzhou); and 4) Discount fare (Hong Kong) (Chen, 2018). Chen (2018) surmised that direct cash subsidy is perhaps the most effective form of public transit subsidy in terms of maximizing passengers' travel utility and increasing their discretion of expenditure.

Starting on June 27, 2016, Shanghai decided to cancel the free senior citizen card and replaced it with the senior citizen comprehensive subsidy system, which gives them cash, with an amount increasing with age.

[2] Source: http://www.law-lib.com/LAW/law_view.asp?id=609674.

In the past, the Chinese cities generally paid a less attention to the design and construction of accessible public transit facilities, which has resulted in insufficient supplies of these much needed transportation facilities. The situation is gradually changing after the issuance of Ministry of Transport et al.'s "Implementation Suggestions on Further Strengthening and Improving the Travel Services of Elderly and Disabled People." Many Metro Rail Stations in Chinese cities have been equipped with vertical elevators. But most buses still do not have wheelchair ramps and lift equipment.

Chinese Implementation Measures associated with Paratransit

Except for few cities such as Beijing, which is the first Chinese city providing good paratransit services by transit agencies, most Chinese cities do not have the widespread application of paratransit services for the elderly and disabled. Unlike ADA, the Chinese laws have not legally mandated the provision of complementary paratransit services for the elderly and disabled yet. The Chinese elderly persons are accustomed to using the old way of hailing taxi cabs by hands on streets, rather than using smart phones due to their unfamiliarity with new internet technology.

One recent paratransit development that has emerged in Suzhou is to tackle the travel difficulties and provide better travel environment for elderly persons by the means of community-based bus (See Figure 2 for its routes). It is regarded as the "gap filler" between conventional public transit systems, feeding the connection between main public functions (such as hospital, school, parks, market and commercial complex) and residential neighborhoods (Kaufman et al. 2016).

Figure 2 Community Bus Routes in Suzhou

Figure 2 shows the distribution of the current community bus routes in Suzhou which are still insufficient for Suzhou and the Suzhou Industrial Park (SIP). According to "the 13th Five-Year Plan for Suzhou Transportation Development Plan" in 2016, the Suzhou municipal government encouraged paratransit services like community-based bus and proposed to reinforce the development of this kind of transport services.

Several Chinese cities have tried to use taxi cabs to provide door-to-door transport services to the elderly and disabled, similar to the *Access* paratransit services in Los Angeles. However, the results were not satisfactory due to the low utilization rates. The co-author of this paper recently used WeChat software to interview several transportation officials on taxi services in their cities. The interview results are summarized below:

- Shenzhen: The city has 96,880 dial-a-ride taxi cabs, of which 100 taxi cabs are specifically designed for the disabled persons.

- Xi'an: The pilot project had 50 wheelchair-accessible vehicles. However, these specially designed vehicles are underutilized, thus yielding poor economic benefits. Recently, these vehicles seemed to be converted back to regular taxi cabs, which are not wheelchair-accessible vehicles. This case suggests that, unless government can provide financial subsidies, taxi drivers are not incentivized to provide services to the elderly and disabled because it is difficult and time-consuming to pick up and drop off the elderly and disabled. If the taxi fare for the elderly and disabled remains the same as that of the normal passengers, the taxi drivers would have less incentives to do so.
- Beijing: The Beijing Disabled Persons Federation subsidizes and provides certain incentives to those taxi cabs serving the disabled persons. The fares of the Beijing accessible taxi cabs are determined by the market and posted on the platform. For those online hailing taxi cabs serving the first and second class disabled passengers, the Beijing Disabled Persons Federation will apply for additional funds to provide subsidies.
- Shanghai: Shanghai also tried to provide taxi services to the disabled persons. However, the results are less than desirable due to low utilization rates.

In spite of these issues, it is still necessary to provide these types of paratransit services from the social justice's perspective.

Like in the U.S., the government's funding support is critical to the successful paratransit operation in China. Without financial subsidy from government, paratransit is unlikely successful in China and U.S.

Chinese Implementation Measures associated with Walking

Overall, the street furniture for walking is still lacking in most Chinese cities. Even though most Chinese city streets have sidewalks, crosswalks, overpasses and underpasses, there are very few benches, water fountains, restrooms, and trash receptacles provided along the streets. Some streets are very wide and their traffic signals are not timed for the walking pace of the elderly persons.

Chinese Studies on the Elderly Transportation

Population Aging Characteristics in China

China entered the aging society roughly around the year 2000 with 6.69% of population age 65 and above[3]. According to the 6th National Population Census in 2010, China had 12.4% of population age 60 and above, and 8.91% of population age 65 and above in 2010[4].

Population aging in China has the following characteristics:

1. Large elderly population size, fast aging speed, at low income level.

From 2011 to 2015, the number of Chinese population ages 60 and above increased from 178 million to 221 million, with an average increase of 8.6 million each year. Such a fast aging speed is very fare in the world.

China entered the aging society at the per capita GNP of $840. According to the international experience, of 72 aging countries, 36% of them have a per capita GNP of $10,000,

[3] Source: http://www.china.com.cn/renkou/6thrkpc/2010-08/19/content_20746721.htm.
[4] Source: http://www.stats.gov.cn/tjsj/pcsj/rkpc/6rp/indexch.htm.

and 28% of them (such as Sweden, Japan, UK, Germany, France) have a per capita GNP of $10,000 - $30,000. This means that China directly entered the aging society at the much lower socioeconomic development level, severely constrained by the limited economic and human resources. Insufficient supply and excessively high elderly demand constitutes an obvious conflict.

2. Aging accompanied by hyper-aging, with huge regional disparities

Hyper-aging population refer to those population age 80 and above. In 2010, China had about 20 million population age 80 and above, accounting for 1.5% of total population. China's aging and hyper-aging phenomenon is directly attributable to the reduction of fertility and mortality rate, and increase of life expectancy. The most popular family pattern in the next few decades will be 4-2-1, meaning 4 grandparents, 2 parents, 1 child, dramatically increasing the dependency ratios and family burdens.

Within China, there exists a huge discrepancy of economic development level among different regions. Different regions have different elderly dependency ratios. Due to this reason, it is very difficult to adopt and implement the uniform and centralized elderly transportation policies across the country. The elderly transportation policy making process and its implementation have to be decentralized with the major responsibilities falling on local governments. Local governments may set appropriate policies based on local economic development level, population aging degree, financial revenue and expenditure situation and the marketization of elderly undertakings.

Due to its larger elderly population size and lower income level, China has a much heavier burden in taking care of its elderly population in terms of giving financing subsidies, building sustainable and accessible facilities, and providing suitable and comfortable services.

Travel Characteristics and Patterns of the elderly in China

1. Elderly Travel Characteristics

By surveying the Beijing elderly and analyzing their travel times, frequency and purposes, etc., Mao et al. (2005) indicates that the elderly trip purposes have been shifted from "mandatory" to "recreational" characterized by the diminishing trend of average daily travel volume occurring during non-peak hours, and relying on walking and public transportation as their travel modes, based on which they proposed to strengthen public transportation system and enhance the elderly safety education, etc.

Mao et al. (2005), Zhang et al. (2007), Xia et al. (2013) conducted statistical analysis on the time-spatial characteristics of elderly travel, and found that: based on their travel distance, the distribution space of elderly outdoor activities can be classified into (from near to far): basic living activity circle; expanded neighborhood activity circle; and citywide activity circle.

In terms of elderly trip purposes and activity areas, Xia et al. (2013) surveyed the travel behavior of those elderly aged 60 and above in Beijing, examined their pattern of physical exercises, shopping and seeing doctors. He found that the elderly typically have the relatively larger activity space, but also tend to see doctors near their residences.

2. Determinants of the elderly travel patterns and other studies in China

Based on disaggregated theory, Chen (2007) analyzes those factors impacting the elderly travel behaviors, especially those individual and family socioeconomic background, and forecasts their future travel behaviors. His study indicates that gender, age, licensed driver or not, family

monthly income, family vehicle ownership et al. have significant impacts on the elderly travel choices.

Liang (2015) uses disaggregated mixed logit model to study the heterogeneity issue of elderly mode choices (walking, cycling, mobike, private vehicles, and public buses), which indicates that elderly individual attributes (gender, and age) and family economic attributes (vehicular and bicycle ownership, etc.) have profound impacts on their travel choices.

By the means of geographical approach, Cai (2005) and Zhang (2007) analyzed different residential areas' elderly shopping spatial behavior through the cases of different cities (Beijing, Shenzhen, Shanghai), which indicates that neighborhood-level commercial facilities and accessibility directly determine the convergence degree of their shopping space.

Several scholars also studied the design principles of walking mode and safety issues associated with elderly travel (Hou et al., 2014; Yang, 2013).

Feng (2017) uses Nanjing as a case to show that the determinants of elderly travel behavior in China are different from those in the western countries characterized with an auto transportation accessibility. Availability and use of automobile is an important determinant of the travel behavior of the elderly in western countries, especially in the U.S. But in China, automobile has a negligible influence on the mobility pattern of the elderly. Instead, public transportation accessibility and walking environments exert profound influences on the elderly travel behavior in China.

Summary Evaluation of Chinese transportation policies and practices for the Transportation-Disadvantaged Populations and its effects

In spite of its fast progress and dramatic achievements, there are serious issues existing in the Chinese transportation policies and practices for Transportation-Disadvantaged Populations.

Imbalanced elderly and disabled transportation demand and Supply

Due to their stable income sources and large population size, Chinese Transportation-Disadvantaged Populations have rising travel demand. In the meantime, social resources for caring Transportation-Disadvantaged Populations are severely insufficient. Part of this mismatching may be attributable to the fact that China has entered the aging society at a relatively low income level, which is starkly different from that of the U.S.

Insufficient attention from the policy level

So far, most elderly policies aim at meeting elderly persons' basic needs from the "relief" standpoints, rather than improving their life quality and demand. The Chinese transportation policies for elderly persons and its effects are concentrated on the construction and provision of accessible public transportation facilities. The door-to-door paratransit services and other human transportation services are still in their infancy absent in China. China is beginning to pay more attention to social equity and justice issues due to the country's commitment and determination to building a harmonious society in the years to come.

Need more enforceable and operative laws and regulations

So far there are a few general laws and regulations related to the elderly and disabled transportation, such as "Law of the People's Republic of China on Protection of the Rights and Interests of the Elderly", "12th Five-Year Development Plan of the Chinese Elderly Undertakings", and "Temporary Methods of Social Welfare Institutional Administration", etc.

These laws and regulations still need more "teeth", i.e., detailed implementation details and enforcement. China's legal framework needs to be strengthened and improved.

So far, the Chinese laws primarily aimed to solve the issues of elderly care service transformation and low degree of service socialization, which focus on the provision of stationary elderly facility supplies, rather than addressing the mobile demand. In other words, the elderly mobility has received a lower priority in the government's agenda of elderly undertaking development.

No nationwide statistical data on elderly transportation

There are no nationwide statistical data on elderly transportation available. Moreover, survey and analysis on the elderly travel behavior and their determinants are generally lacking. Because of data scarcity, there are only few less authoritative and universally applicable conclusions.

Analysis and Assessment on the Transferability and Applicability of the American Elderly and Disabled Transportation Policies and Practices to China

Differences between U.S. and China

Before analyzing and assessing the transferability and applicability of the American elderly and disabled transportation policies and practices to China, it is necessary to take a snapshot look at the differences between these two countries, as illustrated in Table 5.

Table 5 Differences between U.S. and China and their Implications on Elderly and Disabled Transportation Policies

Indicator	U.S.	China	Implication
Elderly population size and density	Relatively smaller and lower	Much larger and higher	Heavier financial burden in China
Income level and vehicle ownership rate	Higher. In 2016, the U.S. had a per capita GDP of $57,467 and 100 U.S. households have more than 200 vehicles.	Lower. In 2016, China had a per capita GDP of $16,600, and 100 households have less than 35 vehicles.	In modal shares, American senior citizens primarily drive. The Chinese elderly persons primarily rely on walking and public transit due to their ages and declining health conditions (Xu, 2012).
Availability of paratransit	Legally mandated by ADA	Not mandated and largely absent	Chinese elders are generally not aware of this service and are unwilling to pay higher fares. The Chinese government has not funded transit operators to provide paratransit services.
Financial incentives and priority parking for taxi cabs picking up or dropping off elderly or disabled passengers	Very few	Very few	Local government needs to ensure that those taxi cabs picking up or dropping off elderly or disabled to get parking priority and financial incentives.
Related laws and regulations	Detailed and enforceable	Sketchy and not enforceable	The Chinese government needs to strengthen and detail related laws and regulations
Public transit network	Sparsely distributed and undeveloped	Densely distributed and developed	It makes more sense for the Chinese government to improve existing public transit network's efficiency and accessibility to better

			serve Transportation-Disadvantaged Populations
Public transit planning process	Relatively fragmentary	Highly centralized	The central government needs to take the lead in setting and enforcing elderly transportation policies

Recommendations for Chinese Transportation Policies for Elder Persons

Recognizing the differences between U.S. and China, it seems unlikely and unreasonable to transfer all U.S. elderly and disabled transportation policies and practices to China without any modification.

Nevertheless, we recommend that China learn from the U.S. in the following aspects:

Legal and Institutional Measures

1. Enact and adopt more detailed and enforceable transportation laws and regulations to guarantee the travel right of Transportation-Disadvantaged Populations

With respect to its legal framework, China needs to strengthen and detail its laws and regulations associated with the transportation for Transportation-Disadvantaged Populations to ensure that they can be better enforced and operationalized. It is critical to safeguard and provide a transportation justice for all persons, irrespective of their age and disability status.

The Chinese government agencies at both central and local levels have published many regulations under the titles of "Implementation Opinions", "Temporary Suggestions" and others, which should be formalized and streamlined to maintain their naming consistency.

2. Enhance and legally mandate both vertical and horizontal coordination among different government agencies and public entities, as well as facilitate public-private partnership

It is not possible to rely on one public agency (e.g., Ministry of Transport) to provide transportation for elderly or disabled persons. Government agencies, transit operators, elderly persons, communities and neighborhoods, non-profit organizations, and business organizations must all play important roles simultaneously. China needs to integrate and coordinate all of these organizations to maximize their effectiveness.

It is particularly worth noting that public-private partnership is becoming more important and popular in China than ever before.

Financial Measures

3. Provide more financial subsidies to elderly transportation services

The Chinese government needs to increase financial subsidy and improve operational transparency in elderly and disabled transportation. With the acceleration of Chinese motorization and the widespread application of advanced car-hailing platforms (e.g., Didi Chuxing and Uber Technologies) and more uses of shared bikes (e.g., mobile bikes), many large cities have suffered a drastic decline in transit ridership, which in turn led to the declining of transit operating revenues. Because of this unfavourable reason, the reliance on government subsidy has been ever heavier than before. Both central and local governments need to give more careful thoughts to this issue to ensure that, under the circumstance of

constant financial revenue, how to reasonably allocate more revenue to elderly transportation and to foster better social justice of financial expenditure.

China can implement many revenue maximization and cost minimization measures practiced in the U.S. Considering China's special circumstance, this paper suggests, as a first action, that taxi vouchers be provided to qualified elderly persons, so they can use them to defray part of their taxi costs. Local governments should provide priority parking (with a longer stop time for elderly passenger getting on and getting off) for those taxi cabs picking up or dropping off elderly passengers. To ensure both efficiency and equity, both distance-based and income-based taxi fares should be charged.

Regarding the financial subsidy to transit fares, a direct cash subsidy is recommended.

Implementation Measures

4. Improve the comprehensive public transit system planning, design and construction

It is necessary to strengthen and improve the comprehensive public transit system planning, design and construction so they can be more safe, comfortable, convenient, and accessible to elderly and disabled passengers. In addition, it is important to strengthen elderly persons' transportation safety perception, and provide effective elderly driving training and driver licensing examination system. The national transit data system needs to be established.

5. Improve and upgrade the conventional fixed-route buses to make them more appealing and user-friendly for Transportation-Disadvantaged Populations

A list of implementation measures are suggested to be implemented, such as:

- Expand the bus network coverage and increase bus operation frequency;
- Extend bus operation hours into nighttime periods and weekends;
- Work with private contractors to provide more short-distance shuttle buses and new service routes and community circuitous services;
- Apply advanced technologies (such as Geographic Information System, and Automated Vehicle Location) to provide real-time transit operating information to bus riders;
- Provide more bus riding training to Transportation-Disadvantaged Populations so they will become more familiar to take buses;
- The buses should be better designed to serve elderly and disabled riders, including provision of wheel-chair ramps and uplift equipment and others;
- Provide more financial subsidies to bus fares.

6. Improve street design to make it more pedestrian-friendly

The implementation measures may include the better geometric design of street, improvement of traffic signals, street signs and lighting illumination.

Summary of Findings and Conclusions

Both U.S. and China have entered the aged or aging societies. Therefore, it is essential for each country to adopt and implement suitable elderly transportation policies to fit their own circumstances.

In the U.S., private vehicle will continue to be the dominant travel mode for elderly persons after their retirement. To accommodate their travel demand, government and transportation agencies have to improve the roadway system so it will be more user-friendly for senior American citizens. In the meantime, due to various federal mandates, public transit will continued to be provided for both captive and choice riders irrespective of their income, ethnicity, and other socioeconomic status. For those persons with disabilities, transit operators will provide complementary paratransit services. However, due to financial constraints, transit operators throughout the country try very hard to expand operating revenues and reduce operating costs to make ends meet. This process calls for more intergovernmental coordination, and public-private partnership. The U.S. has a more rigorous legal framework consisting of statutory laws and executive regulations guiding the elderly transportation policy-making, planning, design, construction and operation process.

In China, due to the dominance of its public transit system and a large transit patronage of elderly persons, government agencies and transit operators have been trying to improve the existing transit system to make it more accessible and user-friendly to those elderly persons. In the future, more and more paratransit services (especially taxi services) will be provided for those most qualified and eligible Transportation-Disadvantaged Populations. This requires the government agencies to take the lead and provide necessary financial supports such as taxi vouchers.

What can China learn from the U.S. in both elderly transportation policies and practices? We believe that the following aspects are perhaps most important:

First, the Chinese lawmakers need to enact more detailed and operationalized laws to guide the elderly undertakings, especially related to elderly transportation policies.

Second, both institutional coordination and public-private partnership needs to be strengthened to reduce or eliminate institutional barriers and reduce operating costs.

Third, the Chinese government needs to provide more financial assistance to paratransit and transit services to Transportation-Disadvantaged Populations can get travel benefits.

Fourth, China needs to overhaul its comprehensive transportation system to ensure it is more accessible, convenient, safe, and comfortable to elderly and disabled passengers. The accessible design of transportation facilities needs to be accelerated.

In the meantime, China's well-organization, implementation efficiency and social mobilization capability can also offer many good lessons to the U.S.

References

Altshuler, Alan, James P. Womack, and John R. Pucher. 1979. *The urban transportation system: Politics and policy innovation*. Cambridge, MA: MIT Press.

Blumenberg, Evelyn, and Michael Manville. 2004. "Beyond the Spatial Mismatch: Welfare Recipients and Transportation Policy." *Journal of Planning Literature*, 19 (2): 182-205.

Bo, Yunhua. 2016. "Urban Digital Public Transit Facility Design in the Aging Society (in Chinese)." *Civic Engineering*, (42): 75-75.

Burkhardt, Jon E. 2000. *Coordinated Transportation Systems*. Submitted to the Public Policy Institute, AARP.

Cai, Yanwei, and Changxia Li. 2005. "Spatial Characteristics of Daily Shopping Behaviours of the Chinese Urban Elderly (in Chinese)." *Acta Geographica Sinica*, 60 (3)：401-408.

Cao, Xinyu, and Patricia L. Mokhtarian. 2005. “How do individuals adapt their personal travel? Objective and subjective influences on the consideration of travel-related strategies for San Francisco Bay Area commuters.” *Transport Policy*, 12 (4): 291-302.

Cao, Xinyu, Patricia L. Mokhtarian, and Susan L. Handy. 2010. “Neighborhood Design and the Accessibility of the Elderly: An Empirical Analysis in Northern California.” *International Journal of Sustainable Transportation*, 4: 347-371.

Cervero, Robert, Thomas Kirk, Douglas Mount, and Carma Reed. 1995. *Paratransit in the San Francisco Bay Area: Providing Feeder Connections to Rail*. Working Paper for National Transit Access Center, Institute of Urban and Regional Development, University of California at Berkeley.

Chen, Peilong. 2018. *Study on the Urban Elderly Public Transit Subsidy System – Case of Beijing (in Chinese)*. Presented at the World Transport Convention 2018, June 19, 2018, Beijing, China.

Chen, Tuansheng, Fang Yue, and Lingling Yang. 2007. “Study on the determinants of Elderly Travel Choice Behavior (in Chinese).” *Southwest Jiaotong University Journal*, 8 (5): 17-21.

Chen, Xueming, and Ashray Pande. 2012. *Enhancement of Senior Connections Elderly/Disabled Transportation Services*. Submitted to Senior Connections, the Capital Area Agency on Aging (SCCAAA).

DiPetrillo, Stephanie et al. 2016. *Improving Pathways to Transit for Persons with Disabilities*. Mineta Transportation Institute, Report 12-59.

Fei, Di, and Xueming Chen. 2015. “The Americans with Disabilities Act of 1990 (ADA) paratransit cost issues and solutions for the Greater Richmond Transit Company (GRTC).” *Case Studies on Transport Policy*, (3): 402-414.

Feng, Jianxi. 2012. “The influence of built environment on travel behaviour of the elderly in urban China.” *Transportation Research Part D*, 52: 619-633.

Giuliano, Genevieve. 2004. “Land use and travel patterns among the elderly.” Pp. 192-210 in *Transportation in an Aging Society: A Decade of Experience, Conference Proceedings 27*. Washington, DC: Transportation Research Board.

Hou, Lili, and Jing Wen. 2014. “Exploring the Pedestrian Transportation System Design of Urban Elderly (in Chinese).” *Wireless Internet Technology*, 10: 51-51.

Kim, Sungyop. 2011. Transportation Alternatives of the Elderly after Driving Cessation. *Transportation Research Record: Journal of the Transportation Research Board* No. 2265.

Koffman, David, Richard Weiner, Amy Pfeiffer, and Scott Chapman. 2010. *Funding the Public Transportation Needs of an Aging Population*. Washington, D.C.: Transportation Research Board, TCRP Project J-11, Task 8.

Liang, Huili. 2015. Travel *Characteristics of the Elderly Groups and Associated Transportation Policy Studies (in Chinese)*. Working Paper of Antai School of Economics and Management, Shanghai Jiaotong University, 1-55.

Mao, Haixiao, and Futian Ren. 2005. "Probe into the Aging Society-Oriented Urban Transportation (in Chinese)." *Journal of Wuhan University of Science and Technology*, 27（3）：64-67.

Mao, Haixiao, and Jin Huang. 2006. "American Urban Transportation Policies for the Aging Society and Its Enlightenments for China (in Chinese)." *Journal of Urban Planning International*, 21(4): 90-92.

Mather, Mark, Linda A. Jacobsen, and Kelvin M. Pollard. 2015. "Aging in the United States." *Population Bulletin*, 70 (2). Accessed 25 June, 2018 from https://www.prb.org/wp-content/uploads/2016/01/aging-us-population-bulletin-1.pdf.

Ortman, Jennifer M., Victoria A. Velkoff, and Howard Hogan. 2014. "An Aging Nation: the Older Population in the United States: Population Estimates and Projections." *Current Population Reports*, Issued May 2014.

Moniruzzaman, Md, Antonio Páez, and Darren Scott Catherine Morency. 2015. "Trip generation of seniors and the geography of walking in Montreal." *Environment and Planning A*, 47 (4): 957-976.

National Council on Disability. 2004. *Livable Communities for Adults with Disabilities*. Retrieved October 14, 2012, from National Council on Disability: www.ncd.gov/rawmedia_repository/27da565e_a048_4844_ad82_0b37ba47af7d?document.pdf.

National Council on Disability. 2005. *The Current State of Transportation for People with Disabilities in the United States*. Washington, D.C.: National Council on Disability.

National Council on Disability. 2011. *National Disability Policy: A Progress Report*. Washington, D.C.: National Council on Disability.

Ohnmacht, Timo, Konrad Gotz, and Helmut Schad. 2009. "Leisure mobility styles in Swiss conurbations: construction and empirical analysis." *Transportation*, 36 (2): 243-265.

Paez, Antonio, Darren Scott, Dimitris Potoglou, Pavlos Kanaroglou, and K. Bruce Newbold. 2007. "Elderly mobility: demographic and spatial analysis of trip making in the Hamilton CMA, Canada." *Urban Studies*, 44 (1): 123–146.

Pande, Ashray. 2012. *Addressing Increased Ridership and Demand: GRTC – CARE Paratransit Service Sustainability for the City of Richmond*. A thesis submitted in partial fulfillment of the requirements for the degree of Master of Urban and Regional Planning at Virginia Commonwealth University.

Pucher, John R. Public Transportation. In: Hanson, Susan and Giuliano, Genevieve (eds.), *The Geography of Urban Transportation*, Third Edition, The Guilford Press, 2004.

Rosenbloom, Sandra. 1993. "Transportation needs of the elderly population." Clinics in *Geriatric Medicine*, 9 (2): 297-310.

Rosenbloom, Sandra. 2001. "Sustainability and automobility among the elderly: An international assessment." *Transportation*, 28 (4): 375–408.

Rosenbloom, Sandra. 2004. "Mobility of the elderly: Good news and bad news. Pp. 3-21 in Transportation in an Aging Society: A Decade of Experience." *Conference Proceedings 27*. Washington, DC: Transportation Research Board.

Rosenbloom, Sandra. 2009. "Meeting Transportation Needs in an Aging-Friendly Community." *GENERATIONS. Journal of the American Society on Aging*, 33(2): 33-43.

Schwanen, Tim, and Antonio Páez. 2010. "The mobility of older people–an introduction." *Journal of Transport Geography*, 18 (5): 591-595.

Senior Connections. *Senior Connections - The Capital Area Agency for Aging*. Accessed February 23, 2018 from: http://www.seniorconnections-va.org/.

Scheiner, Joachim, 2010. "Social inequalities in travel behaviour: trip distances in the context of residential self-selection and lifestyles." *Journal of Transport Geography*, 18 (6): 679-690.

Staplin, Loren. 2004. "Highway Enhancements to Improve Safety and Mobility of Elderly Road Users: Practical Applications." In: Transportation Research Board, eds., *Transportation in an Aging Society*, pp. 155-166. Washington, D.C.: National Academies Press.

Transit Cooperative Research Program (TCRP). 2002. *The Use of Small Buses in Transit Service: A Synthesis of Practice*. Washington, D.C.: Transportation Research Board, TCRP Synthesis 41.

Transit Cooperative Research Program (TCRP). 2004. *Operational Experiences with Flexible Transit Services: A Synthesis of Practice*. Washington, D.C.: Transportation Research Board, TCRP Synthesis 53.

United Nations (UN). 1956. "The Aging of Populations and its Economic and Social Implications." *Population Studies*, No. 26. New York, NY: United Nations publication, Sales No. 1956. XIII.6.

United We Ride (UWR). 2005. *Report to the President - Human Service Coordination*. Coordinating Council on Access and Mobility. United We Ride.

U.S. Bureau of Transportation Statistics (BTS). 2002. *Transportation Availability and Use Study for Persons with Disabilities*. Washington, D.C.: U.S. Department of Transportation.

U.S. Bureau of Transportation Statistics (BTS). 2003. *Freedom to Travel*. Washington, D.C.: U.S. Department of Transportation.

U.S. General Accounting Office (GAO). 1999. *Transportation Coordination – Benefits and Barriers Exist, and Planning Efforts Progress Slowly*. Washington, DC: U.S. General Accounting Office, GAO/RCED-00-1.

U.S. General Accounting Office. 2002. *Welfare Reform: Job Access Program Improves Local Service Coordination, but Evaluation Should Be Completed*. Washington, DC: U.S. Government Accountability Office, GAO-03-204.

U.S. General Accounting Office (GAO). 2003a. *Transportation Disadvantaged Populations: Some Coordination Efforts Among Programs Providing Transportation Services, but Obstacles Persist*. Washington, DC: U.S. General Accounting Office, GAO-03-697.

U.S. General Accounting Office (GAO). 2003b. *Transportation Disadvantaged Populations: Many Federal Programs Fund Transportation Services, but Obstacles to Coordination Persist*. Washington, DC: U.S. General Accounting Office, GAO-03-698T.

U.S. General Accounting Office (GAO). 2004. *Transportation Disadvantaged Populations: Federal Agencies Are Taking Steps to Assist States and Local Agencies in Coordinating Transportation Services*. Washington, DC: U.S. General Accounting Office, GAO-04-420R.

U.S. Government Accountability Office (GAO). 2006. *Transportation Disadvantaged Populations: Actions Needed to Clarify Responsibilities and Increase Preparedness for Evacuations*. Washington, DC: U.S. Government Accountability Office, GAO-07-44.

U.S. Government Accountability Office (GAO). 2008. *Status of Implementation of GAO Recommendations on Evacuation of Transportation-Disadvantaged Populations and Patients and Residents of Heath Care Facilities*. Washington, DC: U.S. Government Accountability Office, GAO-08-544R.

U.S. Government Accountability Office (GAO). 2012a. *ADA Paratransit Services: Demand Has Increased, but Little is Known about Compliance*. Washington, DC: U.S. Government Accountability Office, GAO-13-17.

U.S. Government Accountability Office (GAO). 2012b. *Transportation Disadvantaged Populations: Federal Coordination Efforts Could Be Further Strengthened*. Washington, DC: U.S. Government Accountability Office, GAO-12-647.

U.S. Government Accountability Office (GAO). 2013. *Transportation Disadvantaged Populations: Coordination Efforts are Underway, but Challenges Continue*. Washington, DC: U.S. Government Accountability Office, GAO-14-154T.

U.S. Government Accountability Office (GAO). 2014a. *Transportation Disadvantaged Populations: Nonemergency Medical Transportation Not Well Coordinated, and Additional Federal Leadership Needed*. Washington, DC: U.S. Government Accountability Office, GAO-15-110.

U.S. Government Accountability Office (GAO). 2014b. *Transportation for Older Adults: Measuring Results Could Help Determine if Coordination Efforts Improve Mobility*. Washington, DC: U.S. Government Accountability Office, GAO-15-158.

Van Acker, Veronique, Bert Van Wee, and Frank Witlox. 2010. “When transport geography meets social psychology: toward a conceptual model of travel behaviour.” *Transport Reviews*, 30 (2): 219-240.

Wachs, Martin. 1979. *Transportation for the Elderly*. University of California Press, Berkeley.

Xu，Zhiyong. 2012. Urban Transport Strategies of Aging Society in China (in Chinese). *Transportation Information and Safety*, 30 (2): 46-49.

Yang, Bo. 2013. *Elderly Bus Travel Analysis and Strategic Research (in Chinese)*. Dissertation of Harbin Institute of Technology, pp. 1-74.

Zhang, Chun, Yanwei Cai, and Changxia Li. 2007. “Daily Activity Paths and Time-Spatial Characteristics of the Beijing Urban Elderly (in Chinese).” *Areal Research and Development*, 26 (4): 116-120.

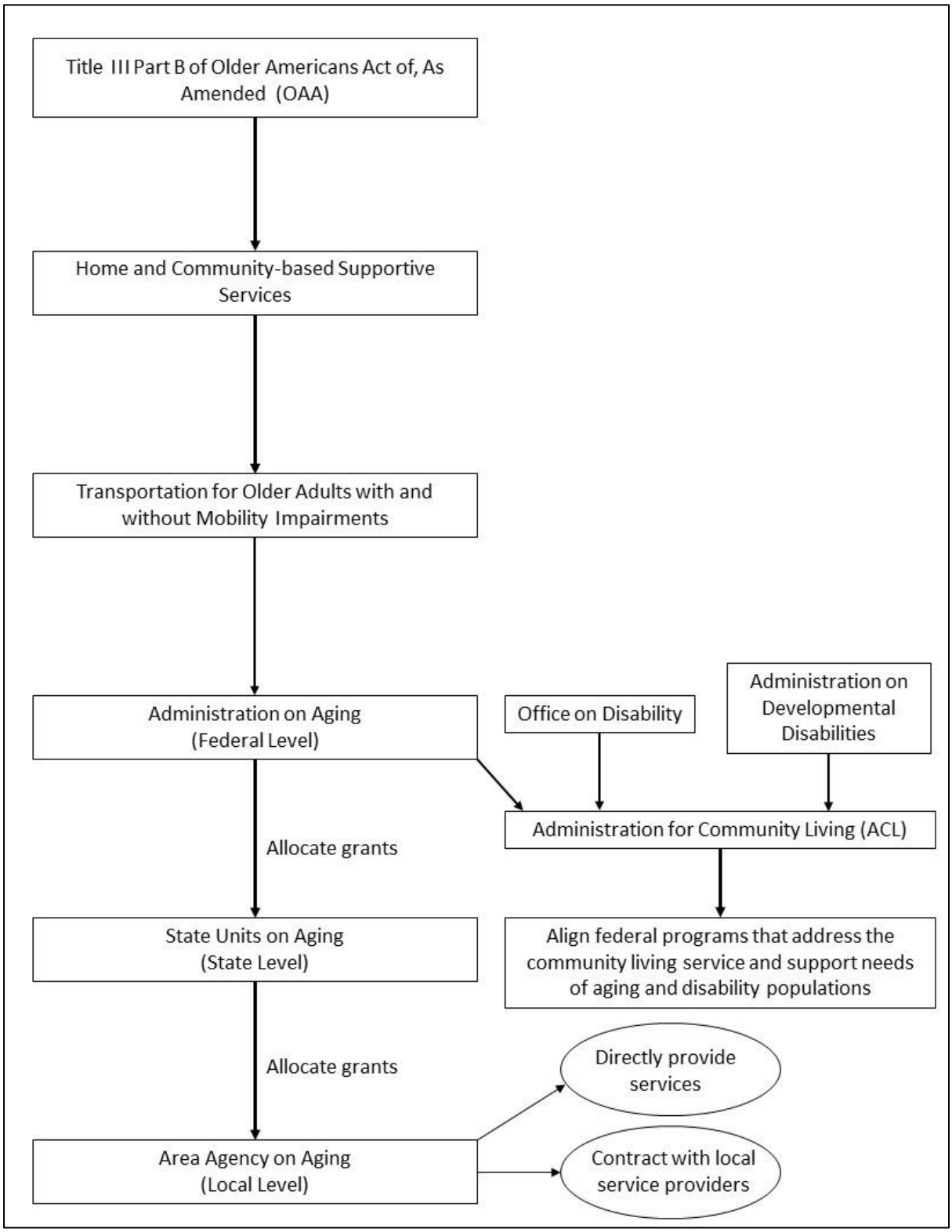
Appendix 1

U.S. Laws and Regulations

Names of U.S. Laws and Regulations	Highlights
U.S. Laws	
- Title VI of Civil Rights Act of 1964	It prohibited any discrimination on the basis of race, color, and national origin in programs and activities receiving federal financial assistance.
- Older Americans Act of 1965 and Its Amendments	It created the National Aging Network comprising the Administration on Aging on the federal level, State Units on Aging, and Area Agencies on Aging at the local level.
- Section 504 of Rehabilitation Act of 1973	Paratransit began to be provided by not-for-profit human service agencies and public transit agencies. The federal law prohibited the exclusion of the disabled from "any program or activity receiving federal financial assistance".
- The Americans with Disabilities Act (ADA) of 1990	It required public transit agencies to provide “complementary paratransit” service to people with disabilities who otherwise cannot use the fixed-route bus or rail service because of a disability.
U.S. Regulations	
- Presidential Executive Order 13217 issued by President George W. Bush on June 18, 2001	Federal agencies were directed to support new public transportation services and public transportation alternatives for individuals with disabilities.
- Presidential Executive Order 13330 issued by President George W. Bush on February 24, 2004	It created the Interagency Transportation Coordinating Council on Access and Mobility (CAM) to increase coordination between Federal Departments and agencies in improving federal support towards transportation services for transportation disadvantaged persons.
- Federal Transit Administration 5310	It provided formula funding to states for the purpose of assisting private non-profit groups in meeting the transportation needs of elderly adults and people with disabilities when the transportation service provided is unavailable, insufficient, or inappropriate to meeting these needs.
- Federal Transit Administration 5317	It provided new public transportation services to overcome existing barriers facing Americans with disabilities seeking integration into the workforce and full participation into society while expanding the transportation mobility options available to persons with disabilities beyond requirements of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101, et seq.).
- Circular FTA C 9045.1	This requires projects selected for funding be derived from a locally developed, coordinated public transit-human services transportation plan (Coordinated Plan) and that the plan be “developed through a process that includes representatives of a public, private, and non-profit transportation and human service providers and participation by members of the public”.

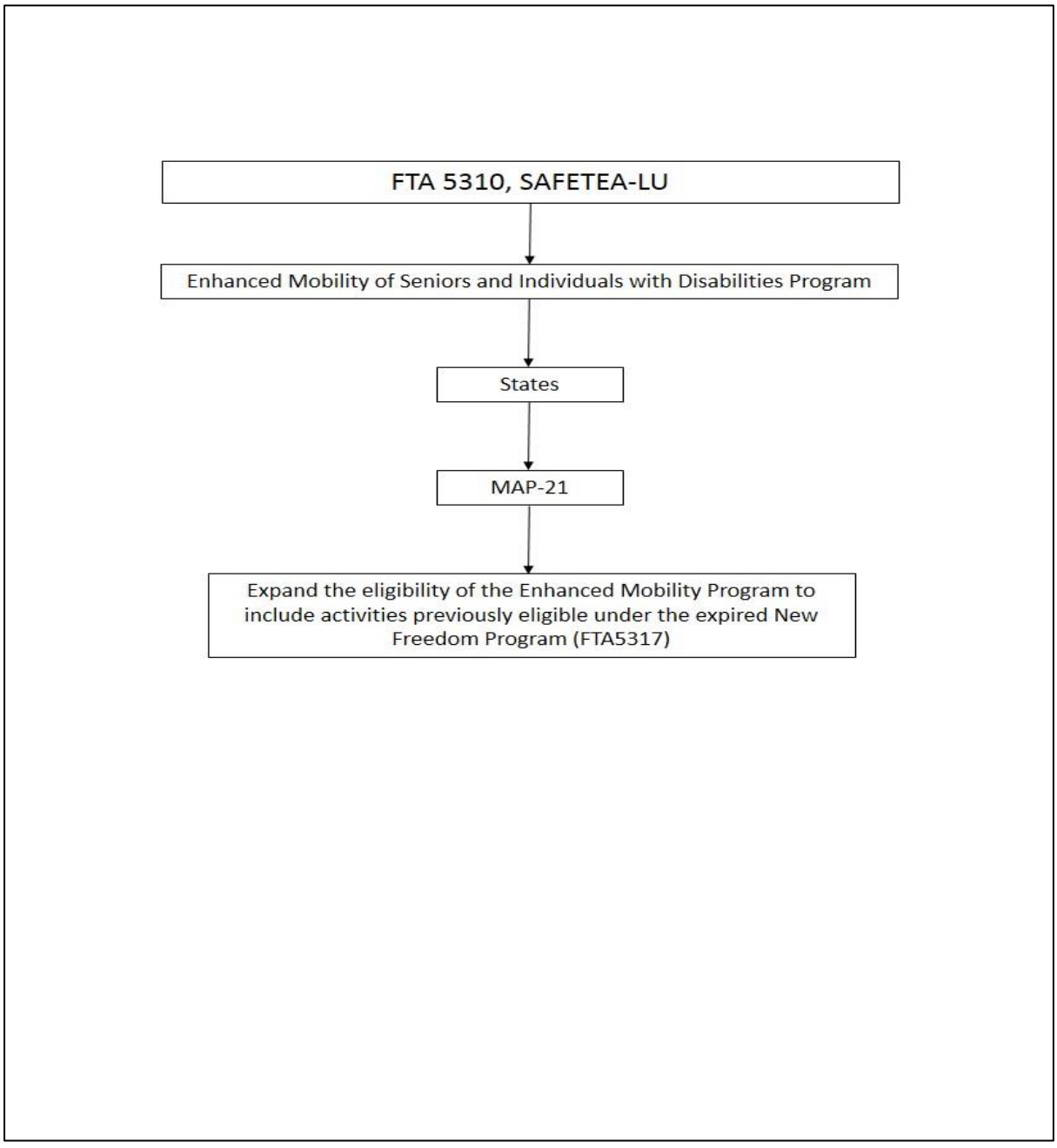
Appendix 2

HHS Procedures of Providing Transportation Services



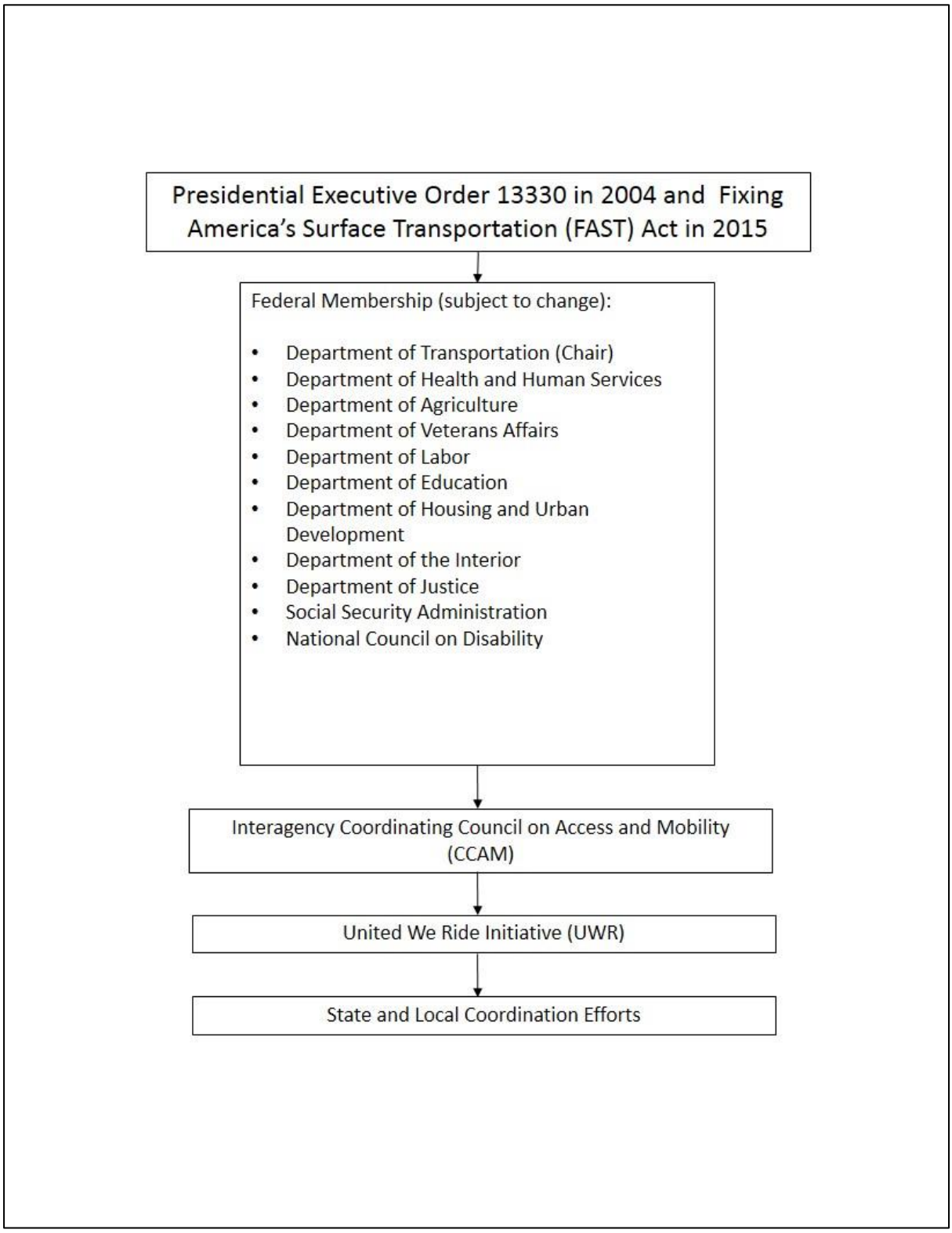
Appendix 3

FTA Procedures of Providing Transportation Services



Appendix 4

CCAM Procedures



Appendix 5

Related GAO Publications and Their Highlights

GAO Publication Number/Publication year	Title	Highlights
RCED-00-1/1999	Transportation Coordination – Benefits and Barriers Exist, and Planning Efforts Progress Slowly	The lack of coordination among human services transportation providers (HHS) and public transit operators (FTA) contributes to the duplication or overlapping of transportation services. In view of slow progress, this report recommends that HHS and DOT issue a prioritized strategic plan by a specific date and increase accountability for achieving the work outlined in the strategic plan through an action plan and an annual report on the Council's work to the Secretaries of HHS and DOT.
GAO-03-204/2002	Welfare Reform: Job Access Program Improves Local Service Coordination, but Evaluation Should Be Completed	Job Access program has met its goal of encouraging collaboration among transportation, human service, and other community-based agencies in Job Access service design, implementation, and financing. However, most of the program's services are not financially sustainable.
GAO-03-697/2003	Transportation Disadvantaged Populations: Some Coordination Efforts Among Programs Providing Transportation Services, but Obstacles Persist	62 federal programs fund transportation services for the transportation disadvantaged. In spite of the efforts made by the Coordinating Council on Access and Mobility, the council's strategic plan is not linked to its action plan and contains few measurable performance goals. Obstacles impeding coordination include concern among administrators that their own participants might be negatively affected, program rules that limit use by others, and limited guidance and information on coordination.
GAO-03-698T/2003	Transportation Disadvantaged Populations: Many Federal Programs Fund Transportation Services, but Obstacles to Coordination Persist	62 federal programs fund transportation services for the transportation disadvantaged. Most of these programs purchase transportation from existing public or private sources, such as providing bus tokens or passes, or contracting for service from private providers. Some agencies that have realized substantial benefits by coordinating their transportation services through sharing vehicles, consolidating services under a single agency, or sharing information about available services, while others that do not coordinate have experienced overlapping, fragmented, or confusing services. The obstacles that impede coordination have three categories: (1) reluctance to share vehicles and fund coordination activities; (2) programmatic differences, including fragmented administration and distinct reporting requirements among programs; and (3) limited guidance and information on coordination.
GAO-04-420R/2004	Transportation Disadvantaged Populations: Federal Agencies Are Taking Steps to Assist States and Local Agencies in Coordinating Transportation Services	Federal departments and the Coordinating Council have made progress in transportation coordination. However, the departments have made limited efforts to include coordination in their strategic and annual performance plans.
GAO-07-44/2006	Transportation Disadvantaged Populations: Actions Needed to Clarify Responsibilities and Increase Preparedness for Evacuations	When preparing for the evacuation of transportation-disadvantaged populations, state and local emergency management officials face challenges in identifying and locating these populations, determining their transportation needs, and providing for their transportation. For instance, when preparing evacuation plans, it is difficult for officials to identify transportation-disadvantaged populations because they are large, diverse, and constantly changing. In addition, locating transportation-disadvantaged populations is a challenge for state and local officials because information on their locations has not been or cannot be collected, is not centrally compiled, or has not been traditionally shared with officials responsible for preparing to evacuate these populations.
GAO-08-544R/2008	Status of Implementation of GAO Recommendations on Evacuation of Transportation-Disadvantaged Populations and Patients and Residents of Heath Care Facilities	It reports to the Congressional Committees on the implementation status of GAO recommendations made in GAO-07-44.

GAO-12-647/2012	Transportation Disadvantaged Populations: Federal Coordination Efforts Could be Further Strengthened	The interagency Coordinating Council on Access and Mobility, which the Secretary of Transportation chairs, has led governmentwide transportation coordination efforts since 2003. The Coordinating Council has undertaken a number of activities through its "United We Ride" initiative aimed at improving coordination at the federal level and providing assistance for state and local coordination. However, the Coordinating Council lacks a strategic plan that contains agency roles and responsibilities, measurable outcomes, or required follow-up. State and local officials GAO interviewed use a variety of planning and service coordination efforts to serve the transportation disadvantaged. Efforts include state coordinating councils, regional and local planning, one-call centers, mobility managers, and vehicle sharing.
GAO-13-17/2012	ADA Paratransit Services: Demand Has Increased, but Little is Known about Compliance	The demand for ADA paratransit trips increased, since 2007 for some transit agencies, and costs for providing the trips remain high. The average number of annual ADA paratransit trips provided by a transit agency increased 7 percent from 2007 to 2010; from 172,481 trips in 2007 to 184,856 trips in 2010. ADA paratransit trips are much more costly to provide than fixed-route trips. The average cost of providing an ADA paratransit trip in 2010 was $29.30, an estimated three and a half times more expensive than the average cost of $8.15 to provide a fixed-route trip. Transit agencies are taking actions such as coordinating with other transportation providers, offering travel training, and improving accessibility to address changes in ADA paratransit demand and costs.
GAO-14-154T/2013	Transportation Disadvantaged Populations: Coordination Efforts are Underway, but Challenges Continue	While some transportation planning and service coordination efforts are under way at the federal, state and local levels, GAO previously identified continuing challenges such as insufficient leadership at the federal level and limited financial resources and growing unmet needs at the state and local level. In addition, limited financial resources and growing unmet needs challenge state and local providers as well. Several state and local officials expressed concern about their ability to adequately address expected growth in elderly, disabled, low-income, and rural populations.
GAO-15-110/2014	Transportation Disadvantaged Populations: Nonemergency Medical Transportation Not Well Coordinated, and Additional Federal Leadership Needed	Coordinating Council has taken some actions to improve coordination, such as developing a strategic plan. However, the council has provided limited leadership and has not issued key guidance documents that could promote coordination. For example, the council has not met since 2008 and has not finalized a cost-sharing policy that would allow agencies to identify and allocate costs among programs.
GAO-15-158/2014	Transportation for Older Adults: Measuring Results Could Help Determine if Coordination Efforts Improve Mobility	Two key federal programs and several other programs identified by GAO provide funding for transportation services for older adults. The Administration on Aging (AoA) within the Department of Health and Human Services (HHS) provides funding for supportive services—including transportation—to state and local agencies exclusively for older adults. Within the Department of Transportation (DOT), the Federal Transit Administration's (FTA) Enhanced Mobility of Seniors and Individuals with Disabilities program is focused on improving the mobility of older adults as one of its two primary populations. State and local transportation agencies and aging organizations in the four states GAO visited used a variety of mechanisms to coordinate transportation services for older adults.

Appendix 6

Chinese Laws and Regulations

Names of Chinese Laws and Regulations	Highlights
Chinese Laws	
- Law of the People's Republic of China on the Protection of Disabled Persons of 1990	Its article 33 stipulates to provide disabled persons with preferential treatment and assistance.
- Law of the People's Republic of China on Protection of the Rights and Interests of the Elderly of 1996	Its Article 57 stipulates that urban transportation facilities (public transportation, highway, railway, and aviation) need to provide preferential treatments and caring for the elderly people.
Chinese Regulations	
- The 12th Five-Year Plan of the Chinese Elderly Undertaking Development of 2011	The Plan emphasizes the home-based care services, establishes and refines county, town and community service networks to ensure that urban areas and communities should be 100% covered by care services, the town areas and rural communities 80% covered, and rural areas 50% covered.
- The State Council's Suggestions on Accelerating the Elderly Undertakings of 2013	It is associated with the elderly care service, such as improvement of financing and investment policies, land supply policies, taxation benefit policies, financial subsidies, and encouragement of non-profit organizations to provide elderly care service.
- Notice of the State Council on National Population Development Plan (2016-2030)	Facing the problem of population aging, the State Council stipulated the requirement to improve social security system and develop endowment insurance. It also advocates for constructing accessible, elderly-friendly communities and cities. This document was targeted at all local governments and the people. It works to provide a better environment for the growing travel needs of elderly people.
- Ministry of Transport et al.'s "Implementation Suggestions on Further Strengthening and Improving the Travel Services of Elderly and Disabled People" of 2018	The initial goal is to build the accessible system by the year 2020, and improve the accessible travel service level.