Phase 1 Performance Measurement and Evaluation Support Plan

Heart of Iowa Regional Transit Agency ITS4US Deployment Project

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The Heart of Iowa Regional Transit Agency (HIRTA) is one of the 5 awardees for Phase 1 of the Complete Trip – ITS4US contract for its proposed concept <i>"Health Connector for the Most Vulnerable: An Inclusive Mobility</i> <i>Experience from Beginning to End"</i> (Health Connector) by the United States Department of Transportation (USDOT). Building on the Concept of Operations (ConOps) and Data Management Plan (DMP) developed earlier in the Phase 1, the Performance Management and Evaluation Support Plan (PMESP) provides an approach for measuring the outcomes of the Health Connector system. This document defines goals and objectives and identifies relevant performance measures and targets. The performance measures take into account the user scenarios developed as part of ConOps. Further the PMESP defines the approach for conducting analyses to calculate performance measures. PMESP also provides our approach for supporting the Independent Evaluation (IE) team identified by the USDOT.								
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Table of Contents

1.	Introdu	uction	1
1.1.	Intende	d Audience	1
1.2.	Project	Background	1
1.3.	Scope		4
1.4.	Perform	ance Measurement and Evaluation Support Plan Purpose	5
2.	Goals	and Objectives	7
2.1.	Deployr	nent Goals and Objectives	8
2.2.	Use Ca	ses/Scenarios	13
3.	Perfor	mance Measurements and Targets	15
3.1.	Identific	ation of Potential Performance Measures and Targets	15
	3.1.1.	PM-1: Ability to Dynamically Reassign Vehicles to Address Service Disruption	20
	3.1.2.	PM-2: Availability of Transportation Alternatives	20
	3.1.3.	PM-3: Trips Unfulfilled Due to System Unreliability	21
	3.1.4.	PM-4 ETA Prediction Accuracy	21
	3.1.5.	PM-5 On-time Performance	22
	3.1.6.	PM-6 Travel Time Prediction Accuracy	22
	3.1.7.	PM-7 Spontaneity Time	23
	3.1.8.	PM-8 Reliability of the system in Assisting with non-vehicle component of a complete tr	ip 23
	3.1.9.	PM-9 Traveler Protection of Privacy	24
	3.1.10.	PM-10 Traveler Safety in Healthcare Transportation	24
	3.1.11.	PM-11 System ability to meet accessibility needs of Travelers	25
	3.1.12.	PM-12 Self-reliance	26
	3.1.13.	PM-13 Reduced anxiety/ stress	26
	3.1.14.	PM-14 Complaints and Customer Satisfaction	27
	3.1.15.	PM-15 System Productivity	28
	3.1.16.	PM-16 Added Capacity from Third-Party Providers	29
	3.1.17.	PM-17 Deadhead miles and hours	29
	3.1.18.	PM-18 WAV reliability	30
	3.1.19.	PM-19 Increased Cost Efficiency	30
	3.1.20.	PM-20 Improved coordination among HIRTA, healthcare providers, health navigators	30
	3.1.21.	PM-21 Delivery of Safe Healthcare Transportation	31
	3.1.22.	PM-22 Reduction in Medical Appointment Deferment Due to Lack of Transportation	31
	3.1.23.	PM-23 Savings due to reduction in the number of missed medical appointments	32
	3.1.24.	PM-24 Safe Transportation Access to Healthcare Facilities	33

3.2	. Relatior	nship between Performance Measures and Technologies/Services/Components	34
3.3	. Potentia	al Constraints	37
4.	Confo	unding Factors and Mitigation Approaches	39
5.	Syster	n Deployment Impact Analysis Design	43
5.1	. Approa	ch/Strategies for Focused Performance Analysis	43
5.2	Survey	Design	45
5.3	. Experin	nental Design	46
	5.3.1.	PM-1: Ability to Dynamically Reassign Vehicles to address Service Disruption	47
	5.3.2.	Availability of Options (PM-2: Availability of Transportation Alternatives and PM-11	
		System ability to meet accessibility needs)	47
	5.3.3.	Trips unfulfilled due to system unreliability (PM-3)	49
	5.3.4.	PM-4 ETA prediction accuracy	49
	5.3.5.	PM-5 On-time Performance	50
	5.3.6.	PM-6 Travel time prediction accuracy	51
	5.3.7.	PM-7 Spontaneity Time	52
	5.3.8.	PM-8 Reliability of the system in assisting with non-vehicle component of the trip	53
	5.3.9.	PM-9 Traveler Perception of Privacy	53
	5.3.10.	Safety (PM-10-Traveler Safety in Healthcare Transportation; PM-21: Delivery of Safe Transportation: PM-24: Safe Access to Transportation)	54
	5.3.11.	PM-12 Self-reliance	56
	5.3.12.	PM-13 Reduced anxiety/ stress	56
	5.3.13.	PM-14 Complaints and Customer Satisfaction	58
	5.3.14.	PM-15 System Productivity	59
	5.3.15.	PM-16 Added Capacity from third-party providers	60
	5.3.16.	PM-17 Deadhead miles and hours	61
	5.3.17.	PM-18 WAV reliability	61
	5.3.18.	PM-19 Increased Cost Efficiency	62
	5.3.19.	PM-20 Improved coordination among HIRTA, healthcare providers, health navigators	62
	5.3.20.	PM-22 Reduction in medical appointment deferment due to lack of transportation	63
	5.3.21.	PM-23 Savings due to reduction in no-shows for medical appointments	64
6.	Suppo	rt to Independent Evaluation Effort	67
7.	Data C	ollection Plan	69
7.1	. Data Ne	eeded	69
7.2	. Baselin	e Data Collection	83
7.3	. Deployi	nent Data Collection	83
	7.3.1.	Data Collection Through Deployment System	83
	7.3.2.	Data Collected Outside Deployment System	83
	7.3.3.	Data Collected Through Survey/Interviews	83

7.4.	Cost Da	ata	84			
7.5.	Data Q	uality Check Approach	85			
	7.5.1.	Missing Data	85			
	7.5.2.	Insufficient Data	85			
	7.5.3.	Invalid Data	85			
	7.5.4.	Outliers	86			
	7.5.5.	Collinearity	86			
	7.5.6.	Exposure to Personal Identifiable Information (PII)	86			
7.6.	Data SI	haring Framework	86			
7.7.	7.7. Summary of Performance Measures and Applicable Data8					
8.	Perfor	mance Reporting	95			
8. 8.1.	Perfor Data M	mance Reporting	95 95			
8. 8.1. 8.2.	Perfor Data M Analyzi	mance Reporting anagement ng Performance Measures	95 95 95			
8. 8.1. 8.2. 8.3.	Perfor Data M Analyzi Reporti	mance Reporting anagement ng Performance Measures ng	95 95 95 96			
8. 8.1. 8.2. 8.3. 9.	Perfor Data M Analyzi Reporti Perfor	mance Reporting anagement ng Performance Measures ng mance Measurement and Evaluation Support Schedule	95 95 95 95 96 97			
 8.1. 8.2. 8.3. 9. 10. 	Perfor Data M Analyzi Reporti Perfor Refere	mance Reporting anagement ng Performance Measures ng mance Measurement and Evaluation Support Schedule ences	95 95 95 96 97 99			
 8.1. 8.2. 8.3. 9. 10. 11. 	Perfor Data M Analyzi Reporti Perfor Refere Apper	mance Reporting anagement ng Performance Measures ng mance Measurement and Evaluation Support Schedule ences ndix A: Acronyms and Glossary	95 95 95 96 97 99 99			

List of Tables

Table 1. Performance Measures by Goals and Objectives and relevance to Use Cases	17
Table 2. Mapping of Performance Measures and Systems/Services	34
Table 3. Confounding Factors and Mitigation Approaches	39
Table 4. Details for PM-1: Dynamic Trip Assignment	47
Table 5. Details for PM-2 and PM-11	48
Table 6. Details for PM-3	49
Table 7. Details for PM-4: ETA prediction accuracy	50
Table 8. Details for PM-5: On-time Performance	50
Table 9. Details for PM-6: Travel time prediction accuracy	51
Table 10. Details for PM-7: Spontaneity Time	52
Table 11. Details for PM-8: Reliability of the System in Assisting with Non-Vehicle Component	Of
the Trip	53
Table 12. Details for PM-9: Privacy Protection	54
Table 13. Details for Safety Measures (PM-10, PM-21 and PM-24)	55
Table 14. Details for PM-12: Self-reliance/ dignity index	56
Table 15. Details for PM-13: Self-reliance/ dignity index	57
Table 16; PM-14: Complains and Customer Satisfaction	58
Table 17. Details for PM-15: System Productivity	59
Table 18. Details for PM-16: Ability to assign trips to third-party providers	60
Table 19. Details for PM-17: Deadhead miles and hours	61
Table 20. Details for PM-18: WAV reliability	61
Table 21. Details for PM-19: Increased Cost Efficiency	62
Table 22. Details for PM-20: Improved coordination among HIRTA, healthcare providers, heal	th
navigators	63
Table 23. Details for PM-22: Reduction in Medical appointment deferment due to lack of	
transportation	63
Table 24. Details for PM-29: Savings due to reduction in no-shows for medical appointments .	64
Table 25. Interaction between HIRTA Project Team and IE Team	68
Table 26. Data Needs	71
Table 27. Data Collection and Analysis Approach for Performance Measures	88
Table 28. Performance Measurement and Evaluation Support Schedule	97

List of Figures

Figure 1. Health Connector Overview (Source: HIRTA Team)	2
Figure 2. High-level System Context Diagram for Health Connector (Source: HIRTA Team)	4
Figure 3. Excerpt of Survey Response from 2014 NLAPH Survey of Dallas County Residents (Source: DCHD)	7
Figure 4. Complete Trip Project Goals (Source: USDOT)	11
Figure 5. Tiered Framework for Metrics in MPM Report (Source: FTA)	16

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1. Introduction

The Heart of Iowa Regional Transit Agency (HIRTA) is one of the 5 awardees for Phase 1 of the Complete Trip – ITS4US contract for its proposed concept *"Health Connector for the Most Vulnerable: An Inclusive Mobility Experience from Beginning to End"* (Health Connector) by the United States Department of Transportation (USDOT). The Health Connector solution will offer a collection of electronic applications and interfaces designed to improve the experience of Dallas County residents looking for transportation services for their medical appointments.

The Performance Management and Evaluation Support Plan (PMESP) builds on the user scenarios and performance measurement framework as established in the ConOps report. The document first identifies goals and objectives and then provides details on the performance measures that the HIRTA team wants to use for measuring the outcomes of the project in Phase 3 and beyond.

Also, the PMESP provides our approach for supporting the Independent Evaluation (IE) team identified by the US Department of Transportation (USDOT).

1.1. Intended Audience

The PMESP will be used by the following groups for an understanding of the performance measurements, related metrics, analysis approaches and required data for calculating the measures:

- Members of the HIRTA ITS4US Complete Trip Project Team that are focused on the concept development (HIRTA, IBI Group, CTAA); design and deployment (Uber) and evaluation (ISU) along with other partners, and HIRTA project stakeholders.
- The USDOT Team managing and supporting the project.
- The IE team conducting an independent assessment of the success and outcomes of the project.
- Other entities implementing similar systems in the future.

1.2. Project Background

The Health Connector solution intends to demonstrate an innovative concept that will address various bottlenecks associated with healthcare access for HIRTA communities. Some of these challenges are the key reason behind missed appointments or unacceptable level of preventive or as-needed healthcare in HIRTA service area. For this deployment, the HIRTA team plans to implement a scalable and replicable solution that enables inclusive access to non-emergency medical transportation for all underserved populations and their caregivers by resolving access barriers with the use of advanced technologies. This solution will allow Dallas County residents

without access to transportation who may be seeking a medical appointment to explore their transportation alternatives and book both medical and transportation appointments at the same time. Further, this solution will include information and wayfinding services to guide them at every step of their trip. provides an overview of the Health Connector concept.



Figure 1. Health Connector Overview (Source: HIRTA Team)

Key capabilities of the proposed technology solution are as follows:

- Enable the customer to use a smart device (e.g., smartphone, smartwatch) application or equally effective alternate methods to schedule and manage medical appointments and transportation services, all in one location (Unified Health Connector App).
- Provide customers options to choose from available providers. Provide same day response if needed by customers.
- Send customers alert before arrival and again when the vehicle is approaching.
- Keep customers informed on trip progress at every step of their complete trip (see Figure 1).
- Provide directions (audible and visual) on where to meet the vehicle/driver. On arrival, drivers should have the ability to automatically confirm customer identity and assist with boarding as needed.
- Provide drivers the capability to request turn-by-turn navigation to a desired destination.
- The Health Connector App will enable the customer to utilize advanced wayfinding solutions with the help of indoor and outdoor navigation technologies to provide personal concierge-style travel from origin to destination. This will include:
 - Locating the vehicle outside origin and destination locations

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- Locating healthcare facility when dropped off by vehicles
- Locating desired floor/room when inside the healthcare facility
- Customers will be able to use the Health Connector solution for any contactless payment needs at any point for transportation-related payments.
- Customers can initiate return trip when the appointment is complete and follow the similar process as the inbound trip to medical facility to locate and board the vehicle for the return trip.
- If customers or their caregivers desire to book and pay for another local trip as an additional leg along with the medical trip they will be able to do that using Health Connector solution.

The systems and interfaces involved in the context of Health Connector can be defined as follows:

- **Traveler-end Subsystem**: this subsystem includes the tools and technologies to be used by travelers or patients seeking transportation services for their medical appointments as part of pre-trip, en-route trip, on arrival and return trip activities.
- **Transportation Management Subsystem (TMS):** this subsystem includes the tools and technologies used to assist customer care and operations staff with reservations, scheduling, dispatching and administration activities. This includes the existing Routematch software and planned upgrades to deploy a combined Routematch/Uber back-end, and new development to deploy additional functionalities, as required for Health Connector.
- Vehicle Subsystem: this subsystem refers to the technologies deployed on vehicles to support Driver-end functions for manifest management, on-board customer information and customer payments.
- **Wayfinding Subsystem:** this subsystem refers to the technologies and infrastructure to be used for providing indoor positioning, orientation and step-by-step guidance on request to travelers.
- Integration:
 - Access2Care: this subsystem refers to State of Iowa Medicaid Brooker's system used for booking and managing Medicaid trips. HIRTA is one of the providers used by Access2Care.
 - Health Navigator-end Subsystem: this subsystem refers to the information and referral system used by Dallas County Health Department. This subsystem will be used to obtain medical and transportation appointment details or availability for a Dallas County resident health navigation/social care services.
 - **EHR/Medical Record Subsystem:** this subsystem refers to the systems used by partner hospitals and clinics for booking medical appointments and maintaining their appointments, including discharge and any subsequent referral activities.

Figure 2 provides a generic system context diagram for HIRTA Health Connector.



Figure 2. High-level System Context Diagram for Health Connector (Source: HIRTA Team)

1.3. Scope

The PMESP build upon the needs, user scenarios and initial performance measures described in the Concept of Operations (ConOps) document. The PMESP also utilizes the data collection, storage, archival and sharing approach defined in the Data Management Plan (DMP).

The PMESP uses the needs and broader USDOT and Complete Trip program goals as inputs to define the goals and objectives for the Health Connector system. The PMESP further defines the following:

- Definition of performance measures, metrics to be utilized and targets for performance measures.
- Confounding factors that may impact the analysis and interpretation of results.
- Experiment design, and analysis approach to be used for each performance measure.
- Needs for data collection and sharing.
- Supporting IE team.

The PMESP will provide input to the systems requirements specifications (SyRS) and other subsequent deliverables of the Phase 1. The PMESP will be finalized after incorporating inputs from finalized DMP, and the inputs from the Institutional Review Board (IRB) by December 2021.

PMESP will be finalized in Phase 1, however, the document may be updated during Phase 2 based on any relevant input as identified during system design, development, and testing. Also, analysis approaches will be updated in Phase 2 when the actual data starts to become available.

1.4. Performance Measurement and Evaluation Support Plan Purpose

A key goal of the Health Connector project is to recognize the net impact that access to health services have on patient health care outcomes as well as both the financial and health outcomes from the perspective of the health care community/Dallas County Health Department (DCHD). The PMESP defines measures and targets with respect to making transportation services accessible, available, efficient, productive, reliable and safe for providing medical appointment-related services to underserved populations.

By conducting performance measurement and analysis activities, the project will be able to identify and quantify which deployed strategies, services, and/or components were of value in addressing the targeted Complete Trip challenges. Documenting the results with robust supporting data and analyses will enable others to understand and build upon the investments made in this project to progress toward Complete Trip goals more effectively in other deployments

2. Goals and Objectives

As discussed in the ConOps, underserved populations in Dallas County often experience challenges accessing medical care due to a lack of transportation, including information and services. In fact, according to a 2014 National Leadership Academy for the Public's Health (NLAPH) survey of Dallas County residents (see Figure 3), approximately 39% of respondents (out of a total of 144 Dallas County respondents) cited missing at least one healthcare appointment due to lack of available transportation options. Further, it is noteworthy that approximately 70% of total respondents relied on either HIRTA or family/friends for their transportation needs.



Figure 3. Excerpt of Survey Response from 2014 NLAPH Survey of Dallas County Residents (Source: DCHD)

Further challenges, as faced by the Dallas County residents, and identified during stakeholder discussions are discussed in detail in the ConOps report. Health Connector is intended to utilize the advanced technologies for planning, booking, service management, payment, and information and wayfinding to solve the challenges faced by underserved populations in Dallas County, IA for transportations services as needed for medical appointments.

A primary objective of the Complete Trip-ITS4US Deployment Program is to demonstrate, quantify, and evaluate the impact of advanced technologies, strategies, and applications toward addressing travelers' challenges to planning and executing a complete trip. Accordingly, Health Connector project is focused on evaluating the measurable impact of increased access to medical transportation on the health of Dallas County residents. After the successful design, development, testing and acceptance in Phase 2, The Health Connector system will be placed in full operations and maintenance in Phase 3. The system will be: 1) closely monitored for its performance; and 2) evaluated to measure the outcome of the project.

2.1. Deployment Goals and Objectives

Based on stakeholder discussions, a summary of the unmet needs, as originally discussed in the ConOps document, are as follows:

- Lack of Awareness About Available Transportation Options: One of the major barriers regarding lack of access to transportation was pointed out as having limited information on options beyond personal (or arranged via family/friends) transportation for medical trips. Health Connector will provide a platform that will allow customers to explore availability of HIRTA and its partner vehicles through a "trip planning/discovery" feature within Health Connector.
- Lack of Integrated Booking and Trip Management Experience: The planned Health Connector deployment concept seeks to address a longstanding need to integrate transportation and healthcare scheduling, management, and day of services monitoring functions for ultimate "one stop" experience for all travelers for their mobility needs, with specific focus on underserved populations. This solution will help Dallas County residents who are not able to make their medical appointments due to lack of access to a transportation mode, will be able to explore their options and book and manage a ride at the schedule of their choice.
- Challenges in Meeting the needs of Underserved Groups: The key challenges relevant to transportation access to healthcare services in the context of HIRTA services are as follows:
 - Return trip is a major issue for all groups since end-time for appointments cannot be accurately determined ahead of time. HIRTA tries to accommodate customers' requests for same day service, particularly for return trips, but due to limited driver/vehicle and financial resources it is not possible to address the needs of all customers. Sometimes customers don't want to be on the same vehicle with others which creates additional burden on resources and capacity to provide single ride transportation.
 - DCHD Health Navigators spend a lot of time and resources, often times arranging multi-party calls, given the lack of access to consolidated information (funding eligibility, transportation availability, healthcare service availability) from a single tool. While most underserved groups are affected due to this limitation, persons with LEP need the most assistance and are severally impacted.
 - HIRTA currently offers services in limited hours which does not meet the needs of many Travelers who may be interested in using HIRTA vehicles but cannot and miss their appointments. Also, some people are not aware of HIRTA or they do not take it because of the fee (e.g., \$5.00 one way). HIRTA has plans for providing services through third-party service providers for Travelers' after-hours needs.

- Most of the customers that Iowa Health and Human Services (HHS) works with are on Medicaid and Medicare. Also, the elderly groups are on Supplementary Security Income (SSI) and getting Medicaid, which covers some part of the transportation. However, Medicaid has very strict requirements as what qualifies and if it does not, that could be a big barrier for the customer. When customers are not eligible for Medicaid, HIRTA coordinates with funding partners and health navigators to determine other applicable funding sources for healthcare trips.
- Older adults have identified lack of comfort with the use of smart devices as a major issue and have mentioned devices with larger font specifically designed for older adults as preferred device (e.g., Grand Pad). However, those devices have limited functions. Applications to be used by older adults must have the ability to adjust user experience by utilizing accessibility functions either available in the operating system or supplemented by built-in advanced capabilities within the application. Also, extensive training will be required so older adults are self-reliant in using the capabilities offered by the Health Connector solution. Overall, making the system as simple as possible with larger fonts or design to increase usability for populations that are not tech-savvy would be most helpful.
- Persons with disabilities have limited mobility options when booking transportation due to lack of accessible vehicles or those that can accommodate mobility needs such as walkers, oxygen tank, service animals and others. All HIRTA vehicles are accessible but commercial vehicles (e.g., taxis or TNCs) provide limited fleet of accessible vehicles.
- Even at smaller facilities, wayfinding is an issue. Customers may have first appointment on one side of facility and second on another side, but they may not remember. Drivers typically have to coordinate with Dispatchers to find out exact pick-up location/spot.
- Customer experience during initial trips is critical. If customers had to wait long or services were not available when needed for an appointment, customers are likely to prefer other transportation options. Most trips are on time but when there are delays those customers may have miserable experience.
- Customer's ability to pay for trips is a major issue. While HIRTA services are offered at a fixed low fare for customers that are covered by funding sources, many low-income customers may still not be eligible for those services due to the income criteria established by those programs (e.g., Medicaid). Also, low-income population may rely on cash since they typically do not use banking and financial institutions.
- Persons with LEP prefer to have someone accompany them for medical appointments so they can be helped. They may not use the tools and services available (e.g., translation service) as may not feel comfortable.
- Getting customers to go where they need to is an additional cost to hospitals at times. While there are Social Workers and Health Navigators affiliated with hospitals who help customers looking for transportation services, the process of registering and booking trips creates an administrative burden due to a largely manual process. Also, healthcare providers have only limited funds available to

help customers who may not have funds to pay for services arranged. One of the healthcare providers, in particular, mentioned that coordination for follow-up care, coordinating the time and availability for the patients and the provider, educating the patient on their options, and communicating with the provider ends up being a time-consuming process for healthcare professionals.

- Healthcare customer coordinators currently rely on manual methods (e.g., phone calls, emails, in-person coordination, spreadsheets) to assist customers who may be looking for transportation services. They would prefer electronic capabilities as conceived within Health Connector, particularly real-time information on transportation services.
- Many customers live in rural areas where broadband access is an issue. Also, low-income population has limited data plans which limit their ability to use applications that may require extensive data bandwidth (e.g., feature-rich map interface).
- Limited Capabilities with current Transportation Modes: Apart from HIRTA vehicles, there are limited modes that can meet the needs of underserved groups related to language barrier; visual, hearing and learning disabilities and other limitations. The proposed project deployment will be universally designed to meet the needs of all Dallas County's underserved population, including persons with disabilities, low income, rural, older adults, veterans, and persons with limited English proficiency. As needs vary by the individual, underserved citizens may qualify for one or more these subgroups (i.e., the person may be an older adult, a veteran, a person with a disability and lives in a rural area).
- Limited Wayfinding Capabilities: Another missing link in medical transportation has been wayfinding both for locating the vehicle on arrival or wayfinding/navigating to the correct destination inside a facility upon arrival. The Health Connector solution will provide a seamless wayfinding experience from the same application.
- Same Day Reservation and Service Capacity Issues: HIRTA typically does not provide same day reservation. Uncertainty with return trips may often times generate need for same day booking or modifications creating capacity challenges in meeting customer demand. Health Connector will augment such capacity through a seamless integration with taxi, TNC and other NDSPs. Please note that these services are expensive and will have to be subsidized so the Traveler share is comparable to the use of other HIRTA services. Final subsidy levels will be developed as part of the financial planning exercise in the later stage of the project. HIRTA will be invoiced by NDSPs on a monthly basis for trips successfully performed.
- Limited Coordination among Different Organizations: The proposed deployment seeks to further integrate the operations and services provided by HIRTA, DCHD, and the Dallas County healthcare community to maximize outcomes for the community and reduce the level of manual coordination by phone calls and emails.
- **Data Sharing and Reporting:** Currently, healthcare providers, DCHD and HIRTA do not have any ability to share data or report on booking and delivery of medical trips. HIRTA has those trips captured within the Routematch by Uber software but there is not enough data to analyze health outcomes of those trips. Health Connector will allow tracking of

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medical and transportation appointment related data (e.g., appointment date, time and location by a customer identifier) by healthcare partners so DCHD, HIRTA, community partners, funding entities and government partner agencies are able to monitor the impact of improved transportation access while protecting privacy of individuals requesting trips. All data collection and sharing will be conducted per the approved process from the Institutional Review Board (IRB) as documented in the DMP.

A detailed needs assessment is also provided in the ConOps document.

Error! Reference source not found. provides a list of Complete Trip Program goals that primarily focus on identifying needs and challenges for populations so appropriate tools can be identified for enhanced mobility. Also, a key goal is to measure the outcomes of the deployed applications/systems. Further, a key goal of the Program is to identify solutions which are scalable and replicable so similar solutions/systems can be deployed nationwide in other communities.



Figure 4. Complete Trip Project Goals (Source: USDOT)

Health Connector goals and objectives based on user needs and using the USDOT and Complete Trip Program goals as the context are provided below:

- Goal G1. Improved health outcomes through increased access to medical transportation for Dallas County residents: Reduction in the number of no-shows for medical appointments due to increased access to transportation will help Dallas County residents, particularly underserved populations, make their appointments in a timely manner. This increased access to medical services will result in measurable positive health outcomes. Relevant objectives are:
 - a. G101. Reduced number of no-shows for medical appointments with availability of increased access to transportation options in Dallas County.
 - b. G102. Increased access to follow-up care options through availability of transportation services.

- c. G103. Tracking of measurable positive impacts of transportation access on healthcare outcomes for Dallas County residents.
- 2. **Goal G2. Self-reliance and spontaneity for underserved groups:** Health Connector will provide tools to access safe, affordable and reliable transportation services, and relevant information/wayfinding as and when needed by underserved groups. Relevant objectives are:
 - a. G201: Access to safe transportation services for underserved groups through the availability of secure and reliable tools and services for planning, booking, payment, and customer information.
 - b. G202. Ability to safely assist under-served travelers in locating vehicles and/or facilities at destinations through the availability of secure and reliable outdoor and indoor way-finding tools.
 - c. G203. Availability of safe and reliable transportation services when needed by underserved groups for their medical appointments, return trip and follow-up care.
- 3. Goal G3. Efficient transportation management capabilities for medical transportation services: HIRTA and its contractors, Access2Care, DCHD, healthcare providers and funding agencies will have access to tools and services for coordinating booking, management, completion, billing, and payments for medical transportation in Dallas County requested by underserved Travelers. Relevant objectives are:
 - a. G301. Ability to manage transportation services from multiple service providers from a centralized Health Connector system along with enabling as-needed transportation capacity at all times.
 - b. G302. Ability to provide reliable transportation for requested trips using tools and procedures as necessary.
 - c. G303. Provision of affordable transportation through coordination with funding entities for subsidizing transportation for the underserved.
 - d. G304. Reduction in time needed by involved staff and HIRTA partners in trip coordination through the implementation of automation.
- 4. **Goal G4. Financial sustainability of medical transportation programs:** Availability of tools to efficiently coordinate booking and manage delivery of transportation services through optimal use of resources will help in cost-reduction of medical transportation and will help with maintaining long term sustainability of funding programs. Relevant objectives are:
 - a. G401. Ability to analyze the total cost of delivering medical transportation services for HIRTA and partners through the availability of tools to track cost and revenue measures along with applicable subsidies.
 - b. G402. Reduction in resources spent in delivering and administering trips funded by various programs through implementation of processes.
- 5. **Goal G5. Safe medical transportation services:** Availability of advanced tools to provide trip information and wayfinding services customized per the needs underserved

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Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

groups will help provide safe transportation options to travelers who may lack those. Relevant objectives are:

- a. G501.Enhanced perceived safety through timely and reliable delivery of required information on vehicle and trip status.
- b. G502. The mitigation of risks related to accidents, incidents, injuries, and severe consequences associated with trips to medical facilities, outdoor/indoor wayfinding and return trips through the implementation of required safety measures.

2.2. Use Cases/Scenarios

As explained in the ConOps document, Health Connector system will interact with at least 4 distinct operational environments: HIRTA, third-party service providers, healthcare providers and health navigation/social care providers. Therefore, the HIRTA Project team has developed scenarios considering situations faced by specific user groups pertaining to those operational environments.

For Travelers, scenarios play out differently if their healthcare is paid through Iowa's Medicaid program. For Medicaid participants, whether enrolled in traditional (fee-for-service) or managed care, transportation is centralized through the state's broker, Access2Care, but there are specific practices and procedures that will need to be followed, and there can be issues around the need to ensure that an eligible person is receiving allowable care or services from an approved provider, and challenges around what to do if proper procedures aren't followed, even if the transportation would otherwise be eligible. For persons not covered by Medicaid, the scenarios are more diverse and more complex, and include the risk that needed medical transportation might not be available, accessible, affordable, or appropriate.

The most applicable scenarios that the Health Connector solution will address are as follows. Please note that scenario numbers are the same as in ConOps document for easy reference regarding details.

- ConOps Scenario 4- Fixed Recurring Appointment (referred in this document as U1): A person with disability looking for transportation for a recurring appointment (e.g., dialysis or cancer treatment).
- 2. ConOps Scenario 5-Recurring but Irregular Appointment (referred in this document as U2): A person with limited English proficiency (LEP) looking for a prenatal appointment and will need transportation. It is recurring but not on a fixed schedule. The person coordinates with a Health Navigator for appointment booking. The person also requests a personal companion so they can be helped during the appointment.
- 3. ConOps Scenario 6- Medical Transportation Needs for Veterans (referred in this document as U3): A Traveler, also a veteran, looking for preventative care appointment. They need to change the return trip appointment to another leg to pick-up medicines from a pharmacy on the way to home.
- 4. ConOps Scenario 8-An Older Adult using Medicaid Benefits (referred in this document as U4): An older adult is approved to take Medicaid eligible trip but they would

like family to accompany them so can be helped. Only the eligible portion of the trip will be billed to Medicaid. Traveler books a return trip home at later time/day.

- 5. ConOps Scenario 11-Return Trip Depends on Planned Discharge Per Progression of Recovery (referred in this document as U5): Customer has a planned discharge based on progression of recovery for next day. Discharge Planner will set up transportation to residence and/or skilled care facility.
- 6. ConOps Scenario 13-No-show for Inbound Transportation but Return Trip Needed (referred in this document as U6: Customer was a no-show for outbound trip to medical appointment (or cancelled without providing a reason) but the customer had also booked a return trip and HIRTA has to follow-up with both customer and the hospital to find out if the customer needs the return trip before their trip back to home can be cancelled.
- 7. ConOps Scenario 14- After-hours Service Needed for Urgent Care (referred in this document as U7): A Traveler, living in the rural area, is looking for after-hours appointment for an urgent care treatment. Given HIRTA vehicles are not available, a third-party service has to be used.

These 7 scenarios have been selected for performance management out of the total of 14 scenarios as they cover most of the operational complexities and Traveler needs as follows:

- **Needs for Underserved Groups**: Needs for all underserved groups, as applicable to Health Connector (e.g., persons with disabilities, older adults, persons in rural areas, veterans, persons with low income, persons with limited LEP).
- Schedule type: Recurring on fixed schedule, recurring on irregular schedule, ad-hoc.
- **Timing:** Trips may be scheduled in advance or same day/on-demand, including during after-hours.
- Types of vehicles/drivers: HIRTA-owned, taxi/TNC or other NDSP.
- Service anomalies: no-shows, incidents.
- Types of funding sources: Medicaid and Non-Medicaid.

3. Performance Measurements and Targets

This section identifies performance measures, relevant metrics and targets, as applicable to identified goals and objectives. A mapping of performance measures and user scenarios is also provided.

Further, this section provides a description of a high-level description of any constraints related to obtaining, processing, and analyzing necessary data, including resolution and granularity necessary for the performance measure to be functionalized.

3.1. Identification of Potential Performance Measures and Targets

Performance measures are based on the goals and objectives identified according to the needs identified in ConOps. Further, goals are built using the preliminary measures that were identified in ConOps.

The performance measures are also mapped to Mobility Performance Metrics (MPM) and the measures are identified under the following high-level categories, also illustrated in Figure 5**Error! Reference source not found.**:

- **Core Measures**: This category includes Traveler-centric measures and related to the following key aspects associated with a trip: availability of services; reliability of available services; budget needed/affordability; travel time; and safety.
- **Tier 1 Measures**: This category indicates system's ability to deliver on the required goals and objectives and refers to system capacity; system efficiency, effectiveness, and cost; utilization; safety; and reliability.
- **Tier 2 Measures**: This category refers to system's availability to deliver on the broader goals of the local community. The measures are related to overall mobility and safety/health of the members of the community; and financial performance of the systems and organizations involved.
- **Tier 3 Measures**: This category refers to system's ability to contribute to trends nationally and identifies measures related to financial performance of organizations delivering services; and safety/health of communities.



Figure 5. Tiered Framework for Metrics in MPM Report (Source: FTA)

For each of these categories, the HIRTA team has defined measures for the 3 stages of a Complete Trip that include pre-trip, trip/en-route, and post-trip.

Initially, the HIRTA project team identified 57 measures in total and prioritized those as follows:

- **High**: These measures are highly critical to monitor to evaluate the success of the program.
- Medium: These measures are significant but a regular monitoring is not required.
- Low: These measures are not necessary for evaluating the success of the program.

A detailed discussion in this document is provided for only "high" priority measures. Table 1 provides a list of performance measures by goals and objectives (as listed in **Error! Reference source not found.**) and provides a mapping of measures by use cases as listed in Section 2.2. Additional measures, not included in the analysis, are provided in Appendix B.

MPM Tier	Goal	Objective	PM#	Performance Measure Type	U1	U2	U3	U4	U5	U6	U7
Core	G3	G301, G302	1	Ability to dynamically reassign vehicles to address service disruption	Х	Х	Х	Х	Х	Х	Х
Core	G2	G201, G102	2	Availability of transportation alternatives	Х	Х	X	Х	Х	X	Х
Core	G3	G302	3	Trips unfulfilled due to system unreliability	X	X	X	Х	X	X	X
Core	G3	G302	4	Estimated Time of Arrival (ETA) prediction accuracy	Х	Х	Х	Х	Х	Х	Х
Core	G3	G302	5	On-time performance	Х	Х	Х	Х	Х	Х	Х
Core	G3	G302	6	Travel-time prediction accuracy	Х	Х	Х	Х	X	Х	Х
Core	G2	G203	7	Spontaneity time			Х		Х		Х
Core	G2	G202	8	Reliability of the system in assisting with non-vehicle component of the complete trip	Х	X	Х	Х	X	Х	X
Core	G2	G201	9	Traveler perception of privacy	Х	Х	Х	Х	Х	X	Х
Core	G2, G5	G203, G501	10	Traveler safety in healthcare transportation	Х	Х	х	Х	Х	Х	Х
Core	G2	G201	11	System's ability to meet accessibility needs of travelers	Х	Х	Х				

Table 1. Performance Measures by Goals and Objectives and relevance to Use Cases

MPM Tier	Goal	Objective	PM#	Performance Measure Type	U1	U2	U3	U4	U5	U6	U7
Core	G2	G201, G202	12	Self-reliance	Х	Х	Х	Х	X	Х	Х
Core	G2, G5	G201, G202, G203, G501, G502	13	Reduced trip anxiety	X	X	X	X	X	X	X
Core	G2, G5	G201, G202, G203, G501	14	Complaints and customer satisfaction	X	X	X	X	X	X	X
Tier 1	G3	G301	15	System productivity	Х	Х	Х	X	Х	Х	Х
Tier 2	G3	G301, G302	16	Added capacity from third-party providers	Х	Х	Х	Х	Х	Х	Х
Tier 2	G3	G301, G304	17	Deadhead miles and hours	Х	Х	Х	Х	Х	Х	Х
Tier 2	G3	G302	18	Wheelchair Accessible Vehicle (WAV) reliability	Х	Х	Х	Х	Х	Х	Х
Tier 2	G4	G401, G402	19	Increased cost efficiency	Х	Х	Х	X	Х	Х	Х
Tier 2	G3	G301	20	Improved coordination among HIRTA, healthcare providers, health navigators		X			X	X	
Tier 2	G5	G501, G502	21	Delivery of safe healthcare transportation	Х	Х	Х	Х	Х	Х	Х
Tier 2	G1	G101	22	Reduction in medical appointment deferment due to lack of transportation	Х	Х	Х	X	X	X	X

MPM Tier	Goal	Objective	PM#	Performance Measure Type	U1	U2	U3	U4	U5	U6	U7
Tier 3	G1, G4	G101, G401	23	Savings due to reduction in the number of missed medical appointments	Х	Х	X	X	X	X	Х
Tier 3	G1, G5	G101, G502	24	Safe transportation access to healthcare facilities	Х	Х	Х	х	Х	х	Х

Further discussion on each of the measures in Table 1 is provided in the following subsections.

3.1.1.PM-1: Ability to Dynamically Reassign Vehicles to Address Service Disruption

Details of the measures are as follows:

- **Evaluation Question:** Will Health Connector enhance service reliability by reassigning disrupted healthcare trips in an efficient manner?
- **Metric Description**: Refers to the capability of the system to dynamically reassign a healthcare trip to an alternative vehicle in the event of the originally scheduled trip was disrupted due to vehicle/driver issue so a Traveler is not left stranded or is not delayed for an appointment. It is measured as:
 - Percentage of instances a Traveler was picked up within a targeted threshold (includes Traveler wait time and boarding time in number of minutes) in the event of a service disruption.
 - Percentage of instances a Traveler was not picked up within a targeted threshold (includes Traveler wait time and boarding time in number of minutes) in the event of a service disruption.
- **Target:** A Traveler is picked up by a replacement vehicle within 10 minutes of delay 95% of time. This target is being used since HIRTA guarantees pick-up within +/- 10 minutes of requested time.
- MPM Categories: Core (Impact stage), Trip/En-route (trip stage), reliability (category).

3.1.2.PM-2: Availability of Transportation Alternatives

- **Evaluation Question**: Will Health Connector promote self-reliance for underserved groups by providing reliable access to preferred alternatives for healthcare transportation?
- **Metric Description**: Refers to the capability of the system to provide availability of travel alternatives for a given origin and destination and given pick-up and drop-off time every time when that is requested by Travelers. It is measured as:
 - Percentage of time when at least one travel alternative (e.g., vehicle x and vehicle y available within pickup time window) is available for each underserved group when searched per their preferences.
- Target:
 - At least 1 potential alternative within 10 minutes of requested pick-up time, found 95% of time.

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 At least 2 potential alternatives within 10 minutes of requested pick-up time, found 90% of time.

These targets are being used since HIRTA guarantees pick-up within +/- 10 minutes of requested time with at least 1 vehicle.

It is likely that the availability of additional capacity through third parties may impact the calculation of this measure. We will track any trip fulfillment that requires external capacity separately so that can be indicated as part of this analysis.

The metrics will be calculated for each of the 6 underserved groups.

• MPM Categories: Core (Impact stage), pre-trip (trip stage), reliability (category).

3.1.3.PM-3: Trips Unfulfilled Due to System Unreliability

Details of the measures are as follows:

- **Evaluation Question**: Will Health Connector help reduce the number of unfulfilled trips by improving system reliability through improved transportation management capabilities?
- **Metric Description**: Refers to system's ability to monitor capacity and reliability to ensure that the requested trips are not denied, and if trips were booked then the number of missed trips are minimized by providing a reliable service. A missed trip event occurs when a driver arrives after the pickup window has passed. The metrics include the following
 - Reduction in the number of trip denials.
 - Reduction in the number of missed trip events.
- Target:
 - At least 30% reduction in the number of trip denials by traveler after Health Connector is in use.
 - At least 20% reduction in the number of missed trip events by traveler after Health Connector deployment.
- MPM Categories: Core (Impact stage), trip (trip stage), reliability (category).

3.1.4. PM-4 ETA Prediction Accuracy

Details of the measures are as follows:

• **Evaluation Question:** Will Health Connector help in delivering reliable services by calculating ETA predictions accurately and reliably?

- **Metric Description**: Refers to the capability of the system to accurately and reliably calculate ETA for all trips. It is measured as:
 - Accuracy in number of minutes/seconds for the delta between the estimated and actual arrival time.
- Target:
 - ETA accuracy target measured for Traveler pickups will be calculated as follows (for aggregation across all pickups, average will be measured):
 - 0-5 mins away: +/-1 min error, 95% of time.
 - 6-10 mins away: +/-2 mins error, 95% of time.
 - 11-20 mins away: +/-3 mins error, 95% of time.
 - 20-30 mins away: +/-4 mins error, 95% of time.
 - 30+ mins away: +/-5 mins error, 95% of time.
- MPM Categories: Core (Impact stage), trip (trip stage), reliability (category).

3.1.5. PM-5 On-time Performance

Details of the measures are as follows:

- **Evaluation Question:** Will Health Connector help in delivering services on-time in a reliable manner?
- **Description**: Refers to the capability of the system to be on-time for pick-up events. It is measured as:
 - Percentage of times pick-up events occur within +/- 10-minute window.
- Target:
 - o 95% on-time performance on average across all trips.
- MPM Categories: Core (Impact stage), trip (trip stage), reliability (category).

3.1.6.PM-6 Travel Time Prediction Accuracy

- **Evaluation Question:** Will Health Connector help in calculating on-board (in-vehicle) travel time for a trip accurately and reliably at the time of scheduling?
- **Metric Description**: Refers to the capability of the system to accurately predict the total travel time (boarding, on-board time and alighting) for a travel at the time of scheduling. It is measured as:
 - Travel time accuracy in number of minutes and seconds.

U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

• Target:

- +/-10 minutes error 90% of time, assuming the trips cannot be delayed by the promised window of +/10 minutes.
- MPM Categories: Core (Impact stage), post-trip (trip stage), time (category).

3.1.7.PM-7 Spontaneity Time

Details of the measures are as follows:

- **Evaluation Question:** Will Health Connector improve self-reliance and spontaneity by making travel alternatives available per Traveler preferences within a reasonable time window when requested?
- **Metric Description**: Refers to the capability of the system to offer Travelers alternatives for their travel per their requested pickup time and preferences (e.g., mobility needs) and minimize any gaps between requested time of trip and actual time of trip. Alternatives must be made available without any additional fare. It is measured separately for both inbound trips to a healthcare facility and return trip from the facility as:
 - Percentage of requests (new trips or modifications) for same day service met without additional fare.
 - Percentage of trips (new trips or modifications) provided after hours at standard fare price.
- Target: The following targets are considered for this measure:
 - 95% of same day requests met by mobility need (e.g., wheelchair, personal companion).
 - 95% of trip requests met after official HIRTA hours by mobility need (e.g., WAV, need for personal companion).
- MPM Categories: Core (Impact stage), pre-trip (trip stage), time (category).

3.1.8.PM-8 Reliability of the system in Assisting with non-vehicle component of a complete trip

- **Evaluation Question:** Will Health Connector provide wayfinding tools to increase selfreliance in Travelers so they are able to navigate to/from a pick-up or a drop-off location?
- **Metric Description**: Measures if Travelers are requesting wayfinding direction and following it to successfully reach their destination before and after their vehicle component of the Complete Trip. Measured as:

- Average traveler ratings received for the wayfinding directions provided prior to pick-up upon request.
- Average traveler ratings received for the wayfinding directions after drop-off and upon wayfinding request
- Target:
 - Average ratings of 4 or better for the wayfinding directions provided prior to pickup
 - o Average ratings of 3 or better for the wayfinding directions provided after drop-off.
- MPM Categories: Core (Impact stage), trip (trip stage), time (category).

3.1.9.PM-9 Traveler Protection of Privacy

Details of the measures are as follows:

- **Evaluation Question:** Do Travelers feel confident that their information is protected when using Health Connector?
- **Description**: Refers to Traveler's opinion on how privacy is handled by the system. This is a qualitative measure and will be calculated based on survey input. The measure will be calculated on a five-point Likert scale, with 5 indicating the highest rating. The following (or similar) questions may be asked of Travelers:
 - Do you have any concerns with any of the information you were asked to provide? If so what information was a concern?
 - For travelers who indicated they had opted not to use the system, a question about privacy concerns will be included. For instance, select all the reasons you chose not to use the system – responses could include 1) they feel confident navigating on their own; 2) have options other than public transit; 3) have concerns about sharing personal information.
- **Target:** It will be highly critical to ensure that the Travelers have high confidence in the system. Target will be 4 or above rating received from 95% of survey respondents.
- MPM Categories: Core (Impact stage), post-trip (trip stage), safety (category).

3.1.10. PM-10 Traveler Safety in Healthcare Transportation

- **Evaluation Question:** Will Health Connector help ensure safety of Travelers during all Complete Trip segments of healthcare transportation?
- **Description**: Refers to:

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Intelligent Transportation Systems Joint Program Office

- The number of valid safety events investigated and resolved by HIRTA and recorded in their Safety Management System (SMS), as reported by Travelers/caregivers or healthcare partners.
- Traveler's opinion on how safety is handled by the service. This is a qualitative measure and will be calculated based on survey input on a five-point Likert scale, with five (5) representing the highest level of safety. The following questions may be asked of Travelers:
 - Do you feel safe when riding HIRTA vehicles in a shared ride environment? If not, provide concerns.
 - Do you feel safe when riding vehicles not operated by HIRTA? If not, provide concerns.
 - Do you feel safe when waiting to be picked or during boarding process?
 If not, provide concerns.
 - Do you feel safe when walking or using a mobility aid to arrive at your final destination after getting dropped off? If not, provide concerns.
- Target:
 - Less than 5 valid safety events per 100 trips.
 - o 4 or higher rating received from 95% of survey respondents.
- MPM Categories: Core (Impact stage), trip (trip stage), safety (category).

3.1.11. PM-11 System ability to meet accessibility needs of Travelers

Details of the measures are as follows:

- **Evaluation Question**: Do Travelers feel confident that the system and services are accessible?
- **Metric Description**: Refers to Traveler input on system's ability to accommodate their personal needs and preferences (e.g., limited English proficiency, disabilities, access to transportation in rural areas) with capabilities provided. This is a qualitative measure and will be calculated based on survey input. The measure will be calculated on a five-point Likert scale, 5 indicating that the system meets most of Traveler needs. Questions that may be asked of Travelers are:
 - Have you had difficulty or intentionally not used the Health Connector? Due to:
 - Language barriers
 - Concerns about ability to access the service
 - Availability of the service in your area
 - Affordability of the service

- Were you ever denied trip or could not take a transportation for medical appointment due to one of the following needs:
 - Need for accessible vehicles.
 - Need for a personal caregiver.
 - Inability to pay required fare.
 - Living in a rural area.

• Target:

- o 4 or higher rating received from 95% of survey respondents.
- MPM Categories: Core (Impact stage), trip (trip stage), customer satisfaction (category).

3.1.12. PM-12 Self-reliance

Details of the measures are as follows:

- **Evaluation Question**: Will Health Connector provide Travelers freedom of movement while accommodating their needs and preferences so they can become self-reliant?
- **Metric Description**: Refers to a Traveler's overall experience on how their personal preferences were accommodated and transportation access made the care available without any perceived bias in making them self-reliant in arranging and completing the trip for the care needed.

For a basic measurement, this will be considered a qualitative measure and will be calculated based on the survey input. The measure will be calculated on a five-point Likert scale, with 5 indicating that Travelers feel they are fully self-reliant. Question that may be asked of Travelers before and after evaluation period is:

• How would you rate Health Connector's ability in making you self-reliant with medical trip provided by HIRTA?

While we explored definition of a metric to calculate a comprehensive measurement of perceived quality of life as related to freedom of movement, literature reviewed thus far on measuring self-reliance in form of "dignity" for transportation purpose is limited. Therefore, the measurement is limited to availability of tools that make Travelers self-reliant.

- **Target:** To be determined in Phase 2.
- **MPM Categories:** Core (Impact stage), post- trip (trip stage), customer satisfaction (category).

3.1.13. PM-13 Reduced anxiety/ stress

Details of the measures are as follows:

• **Evaluation Question**: Will the system help in reducing stress related to medical transportation?

U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office
Metric Description: Health Connector's role in reducing the level of anxiety associated with every step of a complete trip needed for medical care. While anxiety (PM 13) and self-reliance (PM 12) are somewhat related HIRTA Team would like to measure those separately since anxiety may still persist even if tools are provided for self-reliance Customers may feel comfortable proceeding on their own with access to tools (PM 12) but PM13 measures the overall Complete Trip experience and gaps (e.g., need for further travel training, providing assurance on safety measures).

At a basic level, this is a qualitative measure and will be calculated based on survey input. The measure will be calculated on a five-point Likert scale, with 5 referring to highest level of success is reducing stress. Question that may be asked of Travelers before and after evaluation period is:

- How would you rate Health Connector's ability to reduce anxiety related to a medical trip for the following stages of a trip:
 - Pre-trip.
 - Trip.
 - Post-trip.
 - Return trip.

However, a detailed methodology to calculate the measure without any bias or influence of a confounding factor still needs to be determined. Literature reviewed thus far on measuring "anxiety" as related to using public transportation for healthcare needs is limited. Various indirect indicators (e.g., number of calls made to customer service during a trip, queries made for vehicle status during a trip, wait time, missed trips caused due to vehicle delays, complaint/clash with driver, safety perception, traveling alone vs using a companion) could be used to develop a methodology. A detailed methodology for this metric is still being researched by the HIRTA Project team and may not be completed until design phase in Phase 2 when the PMESP will be finalized.

- **Target:** To be determined in Phase 2.
- MPM Categories: Core (Impact stage), post-trip (trip stage), customer satisfaction (category).

3.1.14. PM-14 Complaints and Customer Satisfaction

- **Evaluation Question**: Will the system help in reducing complaints related to a medical trip and increase Traveler satisfaction with delivery of service for healthcare trips?
- Metric Description:

- Refers to the reduction in the number of valid complaints recorded by HIRTA and satisfaction with driver/HIRTA related to medical transportation needs. It is measured as follows:
 - Reduction in the number of complaints from the baseline measure or achieve a target number of complaints per month.
 - Ratings received by HIRTA for each delivered trip.
- Also, refers to customer satisfaction with the Health Connector service as reported by Traveler during a survey. The measure will be calculated on a fivepoint Likert scale, with 5 referring to highest level of satisfaction. The following questions may be asked:
 - How will you rate HIRTA services for healthcare transportation?
 - How likely are you to pick HIRTA services over other alternatives for healthcare transportation?

• Target:

- Up to 25% reduction in the number of valid complaints during evaluation period or achieve a target of no more than 5 valid complaint per month.
- At least 3 (out of a maximum of 5) rating for customer satisfaction recorded across all trips delivered per month and during evaluation period.
- Rating of 4 or above from 95% of survey respondents.
- MPM Categories: Core (Impact stage), trip (trip stage), customer satisfaction (category).

3.1.15. PM-15 System Productivity

- **Evaluation Question**: Will the system enhance productivity as evidenced by increasing number of medical trips per hour each month?
- **Description**: Refers to the number of healthcare trips delivered by the service/system per hour. Measured as:
 - Average number of trips/hour in a month.
 - Average number of trips/hour during evaluation period.
- **Target:** Achieve a target of 4 trips/hour. HIRTA's pre-pandemic productivity was 3+ trips per revenue hour. Productivity can vary 2-4 trips/hour in the industry depending on various factors.
- MPM Categories: Tier 1 (Impact stage), trip (trip stage), customer satisfaction (category).

3.1.16. PM-16 Added Capacity from Third-Party Providers

Details of the measures are as follows:

- **Evaluation Question:** Will Health Connector demonstrate efficient transportation management capabilities to provide as needed capacity by assigning trips to third-party providers when needed?
- **Metric Description**: Refers to the capability of the system to automatically assign trips to a third-party service provider when HIRTA does not have the capacity to provide those trips. While most impact will be seen for same say service, third party providers will also help better provide trips booked in advance for rural areas where HIRTA has limited service available. It is measured as:
 - Increase in the number of trips successfully delivered that are booked with at least 24 hours' notice.
 - Increase in the number of trips successfully delivered that are booked same day with at least 20 minutes' notice.
- Target: Targets to be considered as:
 - Increase of 10% in the number of trips successfully delivered that are booked with at least 24 hours' notice.
 - Increase of 30% in the number of trips successfully delivered that are booked the same day with at least 20 minutes' notice.
- MPM Categories: Tier 1 (Impact stage), trip (trip stage), capacity (category).

3.1.17. PM-17 Deadhead miles and hours

- **Evaluation Question:** Will the system help improve efficiency by minimizing deadhead miles and hours for healthcare trips?
- **Metric Description**: Refers to the capability of the system to minimize the number of deadhead miles and hours (excluding pull-out/pull-in time and hours) to increase the system efficiency. Measured as follows:
 - Change in number of deadhead miles.
 - Change in number of deadhead hours.
- **Target:** At least 5% improvement within 18 months from the baseline levels.
- **MPM Categories:** Tier 1 (Impact stage), trip (trip stage), Effectiveness/Efficiency/Cost (category).

3.1.18. PM-18 WAV reliability

Details of the measures are as follows:

- **Evaluation Question:** Will the system help demonstrate efficiency by assigning vehicles with operational wheelchair lifts as needed on a consistent basis?
- **Metric Description**: Refers to the reliability of the system to find and assign a WAV to meet Traveler request. Measured as
 - Number of times a trip vehicle with operational wheelchair lift could not be assigned or lift didn't operate in the field.
- **Target:** No more than 5 failures per month.
- **MPM Categories:** Tier 1 (Impact stage), trip (trip stage), Effectiveness/Efficiency/Cost (category).

3.1.19. PM-19 Increased Cost Efficiency

Details of the measures are as follows:

- **Evaluation Question**: Will system demonstrate efficient transportation management by reducing the cost of medical transportation?
- **Metric Description**: Refers to the cost of delivering a healthcare trip and measured as
 - Average cost/trip.

This cost includes driver, vehicle and any administrative/compliance cost as allocated per trip without accounting for any revenue (e.g., fare paid or subsidy). A more detailed discussion on cost data is available in Section 7.4.

- **Target:** Initial target set at average cost of \$25 per healthcare trip without accounting for any revenue.
- **MPM Categories:** Tier 1 (Impact stage), post-trip (trip stage), effectiveness/ Efficiency/ Cost (category).

3.1.20. PM-20 Improved coordination among HIRTA, healthcare providers, health navigators

- **Evaluation Question:** Will the system demonstrate efficiency by coordinating trips among HIRTA and its partners in a short period of time?
- **Metric Description**: Refers to the ability of the system in automating tasks so the number of person-minutes spent in coordinating a trip by HIRTA and partners are

U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

minimized. Healthcare partners and health navigators will have access to the same trip booking and dispatching software as HIRTA dispatchers and will be able to register customers, and book or modify trips, as authorized. It is measured as:

- Average number of minutes spent for booking of a trip with Traveler and partners.
- Target:
 - Less than 5 minutes spent per trip for registered Travelers who are using the call center, 95% of the time.
 - Less than 2 minutes spent per trip for registered Travelers, using Traveler Application (website or smart device), 95% of the time.
- **MPM Categories:** Tier 1 (Impact stage), post-trip (trip stage), effectiveness/ Efficiency/ Cost (category).

3.1.21. PM-21 Delivery of Safe Healthcare Transportation

Details of the measures are as follows:

- Evaluation Question: Will Health Connector help provide safe transportation?
- **Metric Description**: Refers to the number of safety events recorded by the system. Measured as:
 - Number of safety events recorded per month.
- Target: Less than 10 safety events per month.
- MPM Categories: Tier 1 (Impact stage), post-trip (trip stage), safety (category).

3.1.22. PM-22 Reduction in Medical Appointment Deferment Due to Lack of Transportation

- **Evaluation Question**: Will capabilities available through Health Connector encourage Dallas County Residents to not miss their medical appointments due to convenient access to transportation services available through HIRTA?
- **Description**: Refers to the ability of the system to help reduce the number of missed medical appointments caused due to lack of access to transportation. This will be tracked by healthcare providers and will be recorded in the system when an appointment is cancelled or rescheduled due to patients not having access to a reliable transportation service. It will be measured as:

 Reduction in the number of medical appointments missed by healthcare customers (patient did not arrive or did not timely reschedule) that can be linked to transportation. This will be calculated by underserved groups so needs for one group don't skew the results.

Also, Dallas County residents will be asked this question in the survey to determine if transportation was a barrier in making the medical appointment. Residents may be asked the following question:

 Did lack of transportation services impact access to healthcare? If yes, please list the number of events encountered in the past 6 months and the nature of the issue.

• Target:

- At least 30% reduction in the number of missed medical appointment that are related to transportation access during the 18-month evaluation period.
- At least 80% residents responding by indicating that transportation did not present a barrier to healthcare access 6 months after the Health Connector launch.
- At least 90% residents responding by indicating that transportation did not present a barrier to healthcare access 12 months after the Health Connector launch.
- MPM Categories: Tier 2 (Impact stage), pre-trip (trip stage), mobility (category).

3.1.23. PM-23 Savings due to reduction in the number of missed medical appointments

Details of the measures are as follows:

- **Evaluation Question**: Will the system result in financial savings for healthcare partners with reduction in the missed number of medical appointments?
- **Metric Description**: Refers to the financial savings due to reduced number of missed appointments for medical appointments. This will be extrapolated to determine national trend. The metric will be calculated in amount of dollars and cents.

Further research is needed to determine this target and scheduling calls with healthcare stakeholders, including the Center for Disease Control (CDC). However, HIRTA team has reviewed the TCRP report on *"Cost-Benefit Analysis of Providing Non-Emergency Medical Transportation"* and planning to follow the guidance described in the report as the starting point for calculating net savings delivered by transportation for the healthcare community.

Approach for this may not be determined until Phase 2 design.

U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

- **Target:** To be determined in Phase 2 once the methodology is finalized.
- MPM Categories: Tier 3 (Impact stage), post-trip (trip stage), financial (category).

3.1.24. PM-24 Safe Transportation Access to Healthcare Facilities

Details of the measures are as follows:

- **Evaluation Question**: Will the system help provide safe transportation access to healthcare facilities?
- **Metric Description**: Refers to safe access to medical appointments through better transportation access. Extrapolated for national trend. This measure is similar to PM # 10 and PM # 21, however, the intent is to extrapolate the metric to determine national impact. The methodology for extrapolation is not yet defined and will be finalized in Phase 2.
- **Target:** No more than 10 safety events in a month.
- MPM Categories: Tier 3 (Impact stage), post-trip (trip stage), safety/health (category).

U.S. Department of Transportation

3.2. Relationship between Performance Measures and Technologies/Services/Components

Table 2 illustrates how the performance measures relate to the Health Connector's system components (as described in Section 1.2) and help to ensure that the set of performance measures adequately cover the planned technologies, services and/or components.

PM#	Performance Measures	Traveler- end System	HIRTA TMS/ Operations	Wayfinding System	Translation Capability	Vehicle System	Medicaid and other Funding Sources	EHR Interface and Healthcare Coordination	Health Navigation Services
1	Ability to dynamically reassign vehicles to address service disruption	Х	Х						
2	Availability of transportation alternatives	Х	X		X			X	X
3	Trips unfulfilled due to system unreliability	Х	Х			X			
4	ETA prediction accuracy	Х	Х			Х			
5	On-time performance	Х	Х			Х			
6	Travel-time prediction accuracy	Х	X	Х					
7	Spontaneity time	Х	Х	Х		Х			

Table 2. Mapping of Performance Measures and Systems/Services

U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology

Intelligent Transportation Systems Joint Program Office

PM#	Performance Measures	Traveler-	HIRTA	Wayfinding	Translation	Vehicle	Medicaid and	EHR Interface	Health
		end	TMS/	System	Capability	System	other Funding	and	Navigation
		System	Operations				Sources	Healthcare	Services
								Coordination	
8	Reliability of the system in	Х		Х				Х	
	assisting with non-vehicle								
	component of the complete								
0	Inp Privacy protection	V	V	V				V	V
9	Privacy protection	^	^	^				^	^
10	Traveler safety in healthcare	Х		Х		Х			
	transportation								
11	System ability to meet	Х	Х	Х	Х	Х			
	accessibility needs of								
	Travelers								
12	Self-reliance/ dignity index	Х		Х	Х	Х			
40	Deduced envietu/ etwace	V	V	V	V	V	V	V	V
13	Reduced anxiety/ stress	Χ.	~	~	X	^	~	~	~
14	Complaints and customer	X	X	X	X	X			
	satisfaction	~		~	X	~			
15	System productivity	V	V			V			
13	System productivity	~	^			^			
16	Ability to assign trips to third		Х			Х			
	party providers								
47			N/			N/			
1/	Deadhead miles and hours		X			X			
18	WAV reliability		Х			Х			
	_								

PM#	Performance Measures	Traveler- end System	HIRTA TMS/ Operations	Wayfinding System	Translation Capability	Vehicle System	Medicaid and other Funding Sources	EHR Interface and Healthcare Coordination	Health Navigation Services
19	Increased cost efficiency		Х			Х	Х		
20	Improved coordination among HIRTA, healthcare providers, health navigators		X			Х	X	X	X
21	Delivery of safe healthcare transportation	Х	Х	Х	Х	Х			
22	Reduction in medical appointment deferment due to lack of transportation		Х			Х		X	Х
23	Savings due to reduction in the number of missed medical appointments		Х					X	
24	Safe access to healthcare facilities	X	X	X	Х	X			

3.3. Potential Constraints

This section identifies potential constraints in obtaining, processing, and analyzing necessary data, including resolution and granularity necessary for the performance measure to be functionalized.

 Traveler Details and Trip History Data: While HIRTA will have access to Traveler details and trip history at individual level for all Travelers and can be used to export data at aggregated levels, data to be made available for analysis publicly will not include any personally identifiable information (PII) for privacy protection. PII in this context includes customer name, address, origin/destination locations, mobility needs by Travelers.

Metrics on no-shows, cancellations, on-time performance, reassignments and other trip performance measures will be calculated.by aggregating data at trip level and anonymizing any PII. To calculate any metric by underserved group, as planned, appropriate aggregation will have to be made when exporting trip performance history. The following types of aggregations are planned: 1) trip-level (e.g., trip performance); 2) geographic, such as, traffic analysis zone (TAZ) or census tract (CT)-level (e.g., travel time); and 3) temporal (e.g., daily, weekly or monthly); and 4) by underserved group

Impacted Measures: PM-2, PM-3, PM-4, PM-6, PM-7, PM-10, PM-14

• Search History Logs: To calculate availability of service, Traveler's trip search records will have to be analyzed. HIRTA team is still evaluating the best approach to collect, analyze and share this data. Traveler's consent will be needed for access to their travel records, either on mobile devices locally or on HIRTA TMS servers (if logged). To address this concern, HIRTA team will log all requests that cannot be fulfilled.

Impacted Measures: PM-2, PM-3, PM-7

• **Wayfinding Request Data**: Wayfinding requests will be made on mobile devices and system will have to log those requests to collect data on 1) requests received; 2) whether or not suggested direction was followed by a Traveler during indoor navigation assistance (e.g., if a Traveler followed certain steps but didn't follow all; or Traveler did not follow any steps); 3) whether or not the system was able to assist with reorientation if an incorrect step was taken by the Traveler during step-by-step guidance; 4) time taken by Traveler from the origin and destination points when using step-by-step guidance. The HIRTA team is finalizing the extent of data from this system that can be made available for analysis by the wayfinding system provider, particularly as that relates to indoor navigation.

Impacted Measures: PM-8

• Survey Design and Recruitment: Several qualitative measures have been identified that will require a 1) well designed survey instruments; 2) a representative sample set of active participants in Health Connector program of sufficient size to determine statistical significance; and 3) a control group that may not use Health Connector and will continue with the tools they currently use. A representative sample size depends on having sufficient number of characteristics for each for response of interest so that statistical

significance can be determined. For instance, if the metrics present information for a sub-group (i.e. veterans or under-represented), a minimum sample size for each sub-population needs to be determined. A cross-section of responses for each question is also needed. For instance, if the survey intends to measure satisfaction with transportation alternatives, survey responses would need to include travelers who attempted trips at times when alternatives were likely to be lower. Sample size is typically determined by expected population size, standard deviation, margin of error, and a confidence level

Impacted Measures: PM-10, PM-11, PM-12, PM-13, PM-14, PM-22

• Extrapolation for Tier 2 and Tier 3 Metrics: Most of the data that will be collected will be at Traveler-level through their trip requests. For extrapolation, methods will have to be developed to calculate planned measures related to transportation safety/health and health outcomes, and financial savings due to reduced number of missed medical appointments at community-level (beyond Dallas County) and subsequently across the state of Iowa and nationally. Direct extrapolation using geographic and demographic factors alone may not be sufficient since local factors may also play a role (e.g., capabilities and capacities of healthcare systems, level of transportation services available, connectivity to healthcare services, levels of current baseline metrics, and socio-economic conditions).

Impacted Measures: PM-21, PM-22, PM-23, PM-24

4. Confounding Factors and Mitigation Approaches

Cofounding factors or externalities will impact how metrics can be successfully calculated and interpreted. While some confounding factors can be identified at this time either based on knowledge or anticipation, others may still not be known. HIRTA team will continue to update this list with any additional factors as they become known throughout Phase 1 and then during Phase 2/3 (and beyond) so operations and maintenance staff, ISU team conducting the evaluation, independent evaluators, researchers are able to interpret the results appropriately when evaluating systems impacts.

Confounding Factor	Description	Mitigation Approaches
Similar Capabilities offered to Travelers by Healthcare Providers or Funding entities	Unity Point Health has informed that they work with Kaizen Health (https://kaizenhealth.org/) that provides an application that has some similarities to Health Connector. Given this, it may be difficult to measure Tier 1 and Tier 2 metrics associated with efficiency gains resulting only by the deployment of Health Connector. Further, Access2Care provides app- based booking for medical appointments that Medicaid members are required to use. VA also provides their own solution for managing healthcare appointments for veterans. Customer perception of medical transportation may be confounded unless benefits from their use of Health Connector is fully isolated.	When recruiting Travelers for the evaluation purpose, their level of use of and dependency on other similar systems will be documented. For situations where Travelers use multiple apps, survey questions will be designed to get input related to functions specifically provided by Health Connector (e.g., wayfinding, vehicle dispatching, on-board experience). Also, telephone or mail-in surveys will be used.

Table 3. Confounding Factors and Mitigation Approaches

Confounding Factor	Description	Mitigation Approaches
Traffic delays caused by other factors that are beyond HIRTA's control	 The following measures may be impacted: ETA and travel time prediction may be impacted due to construction activities. ETA and travel time prediction may be impacted due to severe weather event and its aftermath. ETA and travel time prediction may be impacted due to uncertainty related to an accident/incident. 	Historical travel time variability by time of day and day of week for a given O-D pair will be analyzed so anomalies can be detected and isolated. Outlier data that falls outside the 95 th percentile will not be used in the calculation of metrics for ETA and Travel Time measures. Source of historical data is currently not identified. HIRTA's own record of past trip performance along with vehicle location log can be considered as the primary source. Also, data from private providers such as INRIX can be utilized, if necessary.
Impact of weather on Traveler's choices and perception	Travelers may no-show or cancel for a trip as they may rely on family/friend in the event of an adverse weather condition for better level of comfort. Similarly, Travelers may make other decisions that may depend on weather.	Historical weather record will be used to isolate anomalies as it tends to factor in Traveler choices in general.

Confounding Factor	Description	Mitigation Approaches
Limitation in capacity due to participation of service providers in rural areas	Availability and operation of TNCs and taxi providers are limited in the rural areas. It may change in the future and additional capacities may become available or it may get worse. Status of this factor is important when evaluating agency productivity and capacity.	Before the launch of Health Connector, HIRTA will contract with third-party service providers (e.g., TNCs, taxis, volunteer drivers) that are available to provide service in rural areas under contract to HIRTA. The system will have information on their service hours, service area and any other restrictions and will assign trips accordingly. The system will also document available capacity through all providers at a given time and will utilize that in calculating metrics related to productivity and cost efficiency
Injuries caused due to activities beyond the control of HIRTA and its partners	Some injuries caused during the complete trip that relate to infrastructure (e.g., poor sidewalk conditions) may not be in control of HIRTA's or other partners.	Accidents and incidents involving HIRTA customers will be promptly investigated and detailed incident reports will be filed in the Safety Management System (SMS) to be maintained by HIRTA, as explained in the Safety Management Plan (SMP).
Other factors causing improvements in health outcomes due to increased spontaneity of travel and reduction in the number of missed medical appointment.	There are plans for construction of additional healthcare facilities in the study area. There may be other similar changes in the geographic area. While there may be no direct relationship with Health Connector solution, added capacity and similar changes may impact how some underserved groups may perceive spontaneity.	 Mitigating this particular factor will require multiple steps: 1) Complete documentation of known and anticipated changes. 2) Interpretation of other qualitative and quantitative measures/metrics alluding to customer satisfaction and other Traveler metrics. 3) Historical record of customer satisfaction, if available.

Confounding Factor	Description	Mitigation Approaches
Reasons for no-shows and cancellations may not be fully known	Travelers are typically not required to provide reasons for no-shows and cancellations.	Follow-ups will be done with Travelers to document reasons for no-shows and cancellations and responses immediately after notified by Travelers. Also, reasons will be stored in the system under standardized categories.
Traveler anxiety may be a result of other factors beyond the control of HIRTA or its partners.	Stress level/anxiety is a measure the HIRTA team has planned to evaluate to assess customer satisfaction with the system. However, it is likely that the stress is caused by other factors that may be completely unrelated to Health Connector capabilities.	HIRTA team is conducting additional research on ways to determine stress-level as associated with access to transportation services (e.g., number of calls made to customer service during a trip, queries made for vehicle status during a trip, wait time, missed trips caused due to vehicle delays, complaint/clash with driver, safety perception, traveling alone vs using a companion). Also, the HIRTA team is researching ways to isolate factors that may not be relevant (e.g., coordination with other unrelated household or work needs).
Temporary outage or degraded performance of the system may impact customer perception.	System may sometimes be non- responsive due to outage with one or more components or performance may be degraded due to technical issues leading to inaccurate results.	Any system outage log will be documented and will be made available to evaluators so that can be factored in the analysis and interpretation.
Customer complains may not be valid	It is likely, in some cases, customer complaints are received but are not valid as there may be valid reasons for why a particular event may have occurred.	A detailed analysis of relevant events is needed before a complaint is closed in the system.

5. System Deployment Impact Analysis Design

This section provides an approach for measuring the outcomes of Health Connector deployment using the performance measures as defined in Section 3. The section includes the following details:

- 1. Analysis approaches to be used for calculating the measures. This includes before/after analysis, controlled experiment using participants and control group, system impact study, behavioral analysis and financial modeling.
- Detailed information on how experiments will be conducted for each performance measure. Discussion in this section is provided by performance measure and applicable user scenarios identified for each measure. Most of the performance measures apply to all scenarios.

5.1. Approach/Strategies for Focused Performance Analysis

The HIRTA team will use the following approaches for calculating identified measures:

• Before and after analysis: As one of the primary methods for evaluation for this project, the team will set up baseline metric for measures where such approach is applicable. The analysis will be conducted using both qualitative and quantitative methods. Data collection period for before and after stages will be identified. This section also identifies various applicable confounding factors for this type of analysis for each performance measure. The before and after analysis will be conducted for all trips recorded by the system for Travelers that will use Health Connector. For qualitative measures, surveys will be conducted before and after the launch of Health Connector.

As compared to control and treatment method (discussed below), where data collection will be continuous for the selected group of participants, in the before and after method, data collection timeframes will be limited. There may be overlap between the group used for before/after analysis and the group used for treatment in the control/treatment method.

• **Control and Treatment Method:** Controlled experiment will be conducted by 1) recruiting participants who will use Health Connector ("with" group); and 2) identifying a control group that will use other methods ("without" group). This experiment will be conducted for the entire evaluation time-period during Phase 3 after setting a baseline.

The control and treatment groups will be designed to remove any bias by randomly selecting Travelers from the HIRTA's customer database to ensure they are familiar with the HIRTA services. In general, apart from the treatment (use of Health Connector) all other variables will be kept common in the experimental design. Most significantly, both groups will be representative of the 6 underserved categories that the HIRTA team is targeting for this study. Key factors to consider when recruiting participants for groups will be as follows:

- o Level of utilization of HIRTA services for healthcare needs.
- o Availability of transportation services in the area.
- Trip length/travel time to access healthcare facilities.
- Demographic makeup.
- Socio-economic conditions.
- o Language barriers.
- o Comfort level with technology for travel needs.
- Disabilities and assistance needs.

While treatment group will utilize all tools available through the Health Connector system, the control group will have access to tools HIRTA currently provides. Data from this group may primarily get collected through mail-in and phone surveys due to lack of advanced customer-facing and same-day-booking management tools in the current system.

- Trend Analysis of System Performance: The HIRTA team will assess the overall performance of the system using trend analysis. This approach will ideally be used to determine the capability of the system itself in meeting goals and objectives. We have identified further details on the types of analyses that will be performed in Section 5.2, however, a detailed analysis approach (e.g., simple or multiple regression, logistic regression. comparison tests) is not yet determined and will be completed as part of PMESP refinement during Phase 2 when further details on data structure and actual data samples for identified datasets are reviewed from the MOD vendor. Analysis approach will be defined/adjusted in Phase 2 based on data and sample size collected. Currently, sample size is expected to be no more than 400 trips a day which may not require sophisticated analysis techniques as no more than 200,000 trip records will be produced for the evaluation timeframe of 18 months.
- Behavioral analysis: A separate analysis will be conducted for understanding behavioral or physiological impact of access to Health Connector on Dallas County residents. HIRTA team is still researching methodologies that can be used and the plan to develop a detailed methodology by design stage in Phase 2. It will require additional discussions with 1) social scientists at ISU; and 2) healthcare partners. Calculation of this measure may require correlation with health data that the HIRTA team is not planning to collect as

U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

part of the Health Connector system but may be available to the healthcare partners for analyses. Primarily, these methods apply to the following measures:

- o PM-15: Self-reliance/dignity index.
- o PM-16: Reduced anxiety/stress.
- **Financial Modeling:** A separate methodology will be developed to understand financial savings through availability of Health Connector as it will be based on resource utilization at 3 separate organizations- HIRTA, DCHD and healthcare providers (a total of 4 providers). The modeling will factor in the following considerations:
 - Financial benefits observed by healthcare providers due to reduced number of missed appointments.
 - Financial benefits observed by healthcare providers due to timely primary/preventive care resulting in reduced urgent care or emergency room (ER) visits.
 - Reduction in time spent by call center staff at DCHD, healthcare partners and HIRTA in coordinating a transportation for a medical trip.
 - Reduction in time spent by a discharge planner in arranging transportation for a patient based on progress in recovery.

The extent of modeling will depend on the availability of data, particularly where the models will depend on the data provided by the healthcare providers. As mentioned earlier, the HIRTA team is planning to develop a methodology by following the approach described in the TCRP Report on *"Cost-Benefit Analysis of Providing Non-Emergency Medical Transportation."*

A detailed approach for this may not be determined until Phase 2 design.

5.2. Survey Design

Success in obtaining respondent feedback depends on well-designed questions that can be answered or asked in a reasonable time frame. As a result, an electronic survey will initially be the primary survey instrument. All questions used in any survey format will drafted and then reviewed by several people not involved with the project to ensure the questions are understandable and can be answered in a reasonable time frame. Updates will be made as needed. Additionally, the survey will be tailored so that questions for specific groups (i.e. persons with disabilities) can be included for those groups but not others in order to avoid lengthy surveys which will impact response rates.

Several different methods will be used. One set of participant survey questions may be asked through the Health Connector app. For instance, once a participant has completed a trip, they may be asked to complete a short survey. Since respondents would be completing this on their phone, the survey needs to be short and simple to answer. Questions appropriate to this type of survey are those specific to the current trip. This includes questions such as whether the ride

service showed up on time, if they were able to make their appointment on time, whether they were able to locate the pick-up transportation point or navigate to their appointment using the wayfinding features, etc.

A more traditional survey will also be conducted which will also be distributed electronically through email or other channels. In order to ensure sufficient participation by populations of interest, the request will be followed up with an email reminder then a phone call if initial responses are not received. Once the initial surveys have been gathered, the sample size for sub-populations will be reviewed and if needed other survey methods will be utilized. For instance, if underserved populations are not sufficiently included, the team may conduct an inperson survey in locations where they may be more likely to be contacted (i.e. community enter) or use a targeted phone survey. If needed, in-person surveys will also be conducted at medical facilities.

Surveys of transportation and medical providers will also be may be conducted. An electronic survey will initially be used but these groups may be more likely to respond through a telephone survey. Questions that may be asked of transportation providers include whether participants were picked up on time; if they had difficulty in finding the pick-up time; etc. Questions for medical providers may include whether participants indicated they were able to find the location after being dropped off, number of no-show appointments before and after the app is widely used, cost to medical providers for missed appointments, etc.

Each different survey tool will be submitted and approved by the Institutional Review Board (IRB) process at the Iowa State University (ISU). Typical information required includes survey methods, survey questions, descriptions of how data will be collected and utilized, what personally identifying information (PII) will be collected, how PII will be protected. The actual survey instruments and methodologies for analysis will not be outlined in detail in the Phase 2 design.

Although several different techniques will be attempted to ensure an adequate sample size, several constraints are present which may impact the number and types of responses ultimately gathered. First, the effort will need to be conducted within the time and resource constraints of the project. For instance, a majority of the needed respondents will need to come from initial surveys through the Health Connector app or other electronic means. Additional samples will be sought through other means such as telephone calls or in-person surveys. However, these methods are much more time and cost intensive. As a result, the number of additional samples that can be gathered may be limited if sufficient initial responses are not received. Additionally, it may be difficult to ensure an adequate sample size of some groups since their representation in the available population of respondents is low and they may be harder to contact through electronic means and may less likely to answer surveys.

5.3. Experimental Design

The following subsections describe the experimental design to be followed. Please note that the current discussion is preliminary and will be revised as the HIRTA team goes through the IRB process as part of Human Use Approval (HUA) summary development.

5.3.1.PM-1: Ability to Dynamically Reassign Vehicles to address Service Disruption

CATEGORY	DETAILS
Description	 Refers to the capability of the system to dynamically reassign a healthcare trip to an alternative vehicle in the event of the originally scheduled trip was disrupted due to vehicle/driver issue so a Traveler is not left stranded or is delayed for an appointment. It is measured as: Percentage of instances a Traveler was picked up within a targeted threshold (includes Traveler wait time and boarding time in number of minutes) in the event of a service disruption. Percentage of instances a Traveler was not picked up within a targeted threshold (includes Traveler was not picked up within a targeted threshold (includes Traveler was not picked up within a targeted threshold (includes Traveler was not picked up within a targeted threshold (includes Traveler was not picked up within a targeted threshold (includes Traveler was not picked up within a targeted threshold (includes Traveler was not picked up within a targeted threshold (includes Traveler was not picked up within a targeted threshold (includes Traveler was not picked up within a targeted threshold (includes Traveler was not picked up within a targeted threshold (includes Traveler was not picked up within a targeted threshold (includes Traveler wait time and boarding time in number of minutes) in the event of a service disruption.
Data Needs	DMP ID#5: Trip request. DMP ID#22: Trip request (Medicaid). DMP ID# 10: Trip performance. DMP ID# 17: Trip performance (third party). DMP ID# 23: Trip performance (Medicaid). DMP ID #28: Safety event. DMP ID #29: Safety event report
Experimental Design	Currently, reassignments are done manually by dispatchers by tracking available capacity and vehicle/driver needs in real-time. All such reassignments are logged in the current Routematch by Uber system. A baseline will be set for wait time and successful instances per allowed threshold for wait time for pickup using the currently available data.
Modeling/Tools	Trip performance data will be analyzed to determine the capability of the system in helping HIRTA with the percentage of successful reassignments during the evaluation period so travelers are picked up within an allowed wait time threshold.
Hypothesis	Travelers will not be stranded or delayed during a trip due to an unforeseen service disruption.
Targets	A Traveler is picked up by a replacement vehicle within 10 minutes of delay 95% of time.
Risks	While such events are likely, occurrences may be low in number. A lower threshold of wait time may be needed for a larger sample size.
Confounding factor	None
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.2. Availability of Options (PM-2: Availability of Transportation Alternatives and PM-11 System ability to meet accessibility needs)

DETAILS
Refers to the capability of the system to provide availability of travel alternatives for a given origin and destination and given pick-up and drop-off time every time when that is requested by Travelers. It is measured as:
• Percentage of time when at least one travel alternative (e.g., vehicle x and vehicle y available within pickup time window) is available for each underserved group when searched per their preferences.
Further, refers to Traveler input on system's ability to accommodate their personal needs and preferences (e.g., limited English proficiency, disabilities, access to transportation in rural areas) with capabilities provided. This is a qualitative measure and will be calculated based on survey input. The measure will be calculated on a five-point Likert scale, 5 indicating that the system meets most of Traveler needs. Questions that may be asked of Travelers are:
 Have you had difficulty or intentionally not used the Health Connector? Due to: Language barriers Concerns about ability to access the service Availability of the service in your area Affordability of the service Were you ever denied trip or could not take a transportation for medical appointment due to one of the following needs: Need for accessible vehicles. Need for a personal caregiver. Inability to pay required fare. Living in a rural area.
DMP ID # 5: Trip request. DMP ID # 22: Trip request (Medicaid). DMP ID # 34: Customer survey data and results.
A control and treatment experiment will be conducted by recruiting a group of Travelers for both "with" and "without" groups. Data will be analyzed for the evaluation period to review the number of trips requested by both groups. Further, survey (details TBD but may include a combination of phone, mail-in and web/mobile-based) will be conducted for the groups to address any gaps.
Analysis of time series data; Analysis of survey results.
All underserved groups will have access to transportation for healthcare appointments and return trip regardless the time and location of a request.
 At least 1 potential alternative within 10 minutes of requested pick- up time, found 100% of time. At least 2 potential alternatives within 10 minutes of requested pick- up time, found 90% of time.

Table 5. Details for PM-2 and PM-11

U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

CATEGORY	DETAILS
	 4 or higher rating received from 95% of survey respondents
Risks	Search records will have to logged which will depend on Traveler's consent.
Confounding factor	None
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.3. Trips unfulfilled due to system unreliability (PM-3)

Table 6. Details for PM-3

CATEGORY	DETAILS
Description	 Refers to system's ability to monitor capacity and reliability to ensure that the requested trips are not denied, and if trips were booked the number of missed trips are minimized by providing a reliable service. A missed trip event occurs when a driver arrives after the pickup window has passed The metrics include the following Reduction in the number of trip denials. Reduction in the number of missed trip events.
Data Needs	 DMP ID#5: Trip request. DMP ID#22: Trip request (Medicaid). DMP ID# 10: Trip performance. DMP ID #13: Driver messages. DMP ID#14: Dispatcher messages. DMP ID# 17: Trip performance (third party). DMP ID #19: Driver messages (third party). DMP ID#20: Dispatcher messages. DMP ID#23: Trip performance (Medicaid). DMP ID #34: Customer survey data and results (optional).
Experimental Design	A comparison between before and after measurements will be conducted to analyze the change in the number of trips unfulfilled.
Modeling/Tools	Analysis of time series data. Analysis of survey results (optional).
Hypothesis	The system will help HIRTA reduce the number of trips unfulfilled by providing reliable service.
Targets	 At least 30% reduction in the number of trip denials by traveler after Health Connector is in use. At least 20% reduction in the number of missed trip events by traveler after Health Connector deployment.
Risks	No-show reason to be tracked which may not be available. Investigation will be needed in some cases which could be done through a combination of surveys and staff interviews.
Confounding factor	Reasons for no-shows and cancellations may not be fully known.
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.4. PM-4 ETA prediction accuracy

CATEGORY	DETAILS	
Description	 Refers to the capability of the system to accurately and reliably calculate ETA for all trips. It is measured as: Accuracy in number of minutes/seconds for the delta between the estimated and actual arrival time. 	
Data Needs	DMP ID#9: Vehicle location. DMP ID# 10: Trip performance. DMP ID# 17: Trip performance (third party). DMP ID#18: Vehicle location (third party). DMP ID# 23: Trip performance (Medicaid).	
Experimental Design	A trend analysis will be conducted to evaluate system's capability to accurately predict ETA for trips	
Modeling/Tools	Time series analysis of the dataset for the evaluation time period	
Hypothesis	The system will reliably predict estimated arrival time for vehicles.	
Targets	 ETA accuracy target measured for Traveler pickups will be calculated as follows (for aggregation across all pickups, average will be measured): 0-5 mins away:- +/-1 min error, 95% of time 6-10 mins away: +/-2 mins error, 95% of time 11-20 mins away: +/-3 mins error, 95% of time 20-30 mins away: +/-4 mins error, 95% of time 30+ mins away: +/-5 mins error, 95% of time 	
Risks	None	
Confounding factor	 ETA prediction may be impacted due to construction activities. ETA prediction may be impacted due to severe weather event and its aftermath ETA prediction may be impacted due to uncertainty related to an accident/incident. 	
Applicable use cases	U1, U2, U3, U4, U5, U6, U7	

Table 7. Details for PM-4: ETA prediction accuracy

5.3.5.PM-5 On-time Performance

Table 8. Details for PM-5: On-time	e Performance
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CATEGORY	DETAILS
Description	 Refers to the capability of the system to be on-time for pick-up events. It is measured as: Percentage of times pick-up events occur within +/- 10-minute window.

U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

50 Phase 1 Performance Measurement and Evaluation Support Plan - HIRTA

CATEGORY	DETAILS	
Data Needs	DMP ID#9: Vehicle location. DMP ID# 10: Trip performance. DMP ID# 17: Trip performance (third party). DMP ID#18: Vehicle location (third party). DMP ID# 23: Trip performance (Medicaid). DMP ID #34: Customer survey data and results (optional)	
Experimental Design	A control and treatment experiment will be conducted by recruiting a group of Travelers for both "with" and "without" groups. Data will be analyzed for the evaluation period to review the number of trips booked by both groups and their on-time performance. Further, survey will be conducted for the groups to address any gaps.	
Modeling/Tools	Analysis of time series data; Analysis of survey results (optional)	
Hypothesis	During normal operations, services will be on-time most of the time.	
Targets	95% on-time performance on average across all trips.	
Risks	On-time performance may be high due to the +/-10 minutes window. Customer perception of on-time performance may be different and will be measured through survey.	
Confounding factor	 On-time performance may be impacted due to construction activities. On-time performance may be impacted due to severe weather event and its aftermath On-time performance may be impacted due to uncertainty related to an accident/incident. 	
Applicable use cases	U1, U2, U3, U4, U5, U6, U7	

5.3.6.PM-6 Travel time prediction accuracy

Table 9. Details for PM-6: Travel time prediction accuracy

CATEGORY	DETAILS
Description	Refers to the capability of the system to accurately predict the total travel time (boarding, on-board time and alighting) for a travel at the time of scheduling. It is measured as:
	 Travel time accuracy in number of minutes and seconds.
Data Needs	DMP ID#9: Vehicle location. DMP ID# 10: Trip performance. DMP ID# 17: Trip performance (third party). DMP ID#18: Vehicle location (third party). DMP ID# 23: Trip performance (Medicaid).
Experimental Design	A trend analysis will be conducted to evaluate system's capability to accurately predict travel time for trips.

U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology Intelligent Transportation System Joint Program Office

CATEGORY	DETAILS
Modeling/Tools	Time series analysis of the dataset for the evaluation time period
Hypothesis	Travel-time or on-board time notified to the Traveler at the time of pickup will be accurate most of the time.
Targets	+/-10 minutes error 90% of time, assuming the trips cannot be delayed by the promised window of +/10 minutes.
Risks	None
Confounding factor	 Travel time prediction may be impacted due to construction activities.
	• Travel time prediction may be impacted due to severe weather event and its aftermath
	• Travel time prediction may be impacted due to uncertainty related to an accident/incident.
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.7.PM-7 Spontaneity Time

Table 10. Details for PM-7: Spontaneity Time

CATEGORY	DETAILS
Description	 Refers to the capability of the system to offer Travelers alternatives for their travel per their requested pickup time and preferences (e.g., mobility needs) and minimize any gaps between requested time of trip and actual time of trip. Alternatives must be made available without any additional fare. It is measured separately for both inbound trips to a healthcare facility and return trip from the facility as: Percentage of requests (new trips or modifications) for same day service met without additional fare. Percentage of trips (new trips or modifications) provided after hours at standard fare price.
Data Needs	DMP ID#5: Trip request. DMP ID#22: Trip request (Medicaid). DMP ID# 10: Trip performance. DMP ID# 17: Trip performance (third party). DMP ID# 23: Trip performance (Medicaid). DMP ID #34: Customer survey data and results (optional)
Experimental Design	A control and treatment experiment will be conducted by recruiting a group of Travelers for both "with" and "without" groups. Data will be analyzed for the evaluation period to review the number of trips booked by both groups. Further, survey will be conducted for the groups to address any gaps.
Modeling/Tools	Analysis of time series data. Analysis of survey results (optional)

U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

CATEGORY	DETAILS
Hypothesis	Health Connector will provide transportation services as and when requested by Travelers.
Targets	The following targets are considered for this measure:
	 95% of same day requests met by mobility need (e.g., wheelchair, personal companion).
	• 95% of trips requests met after official HIRTA hours by mobility need (e.g., wheelchair, personal companion).
Risks	Search history must be logged which will require Traveler consent.
Confounding factor	None
Applicable use cases	U3, U5, U7

5.3.8.PM-8 Reliability of the system in assisting with non-vehicle component of the trip

Table 11. Details for PM-8: Reliability of the System in Assisting with Non-Vehicle Component Of the Trip

CATEGORY	DETAILS
Description	 Measures if Travelers are requesting wayfinding direction and following it to successfully reach their destination before and after their vehicle component of the Complete Trip. Measured as: Average traveler ratings received for the wayfinding directions provided prior to pick-up upon request. Average traveler ratings received for the wayfinding directions after drop-off and upon wayfinding request.
Data Needs	DMP ID # 26: Traveler wayfinding request. DMP ID #27: Traveler wayfinding guidance and Traveler feedback.
Experimental Design	A trend analysis of the data will be conducted to calculate impact on access time to final destination after drop-off.
Modeling/Tools	Analysis of time series data.
Hypothesis	Pick-up and drop-off locations will be such that any inconvenience is not caused during access-leg (walk to/from pick-up/drop-off locations) of the complete trip.
Targets	 Average ratings of 4 or better for the wayfinding directions provided prior to pick-up Average ratings of 3 or better for the wayfinding directions provided after drop-off.
Risks	None
Confounding factor	None
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.9. PM-9 Traveler Perception of Privacy

CATEGORY	DETAILS
Description	 Refers to Traveler's opinion on how privacy is handled by the system. This is a qualitative measure and will be calculated based on survey input. The measure will be calculated on a five-point Likert scale, with 5 indicating the highest rating. The following (or similar) questions may be asked of Travelers: Do you have any concerns with any of the information you were asked to provide? If so what information was a concern? For travelers who indicated they had opted not to use the system, a question about privacy concerns will be included. For instance, select all the reasons you chose not to use the system – responses could include 1) they feel confident navigating on their own; 2) have options other than public transit; 3) have concerns about sharing personal information.
Data Needs	DMP ID #34: Customer survey data and results
Experimental Design	Different in perception of "with" and "without" groups will be measured.
Modeling/Tools	Analysis of survey results.
Hypothesis	Health Connector will emphasize on privacy at all times and will be compliant with HIPAA and other applicable standards.
Targets	It will be highly critical to ensure that the Travelers have high confidence in the system and the highest rank will be used as the target. Target will be 4 or above rating received from 95% of survey respondents.
Risks	None
Confounding factor	None
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

Table 12. Details for PM-9: Privacy Protection

5.3.10. Safety (PM-10-Traveler Safety in Healthcare Transportation; PM-21: Delivery of Safe Transportation: PM-24: Safe Access to Transportation)

CATEGORY	DETAILS
Description	 Refers to: The number of valid safety events investigated and resolved by HIRTA and recorded in their Safety Management System (SMS), as reported by Travelers/caregivers or healthcare partners. Traveler's opinion on how safety is handled by the service. This is a qualitative measure and will be calculated based on survey input on a five-point Likert scale, with five (5) representing the highest level of safety. The following questions may be asked of Travelers: Do you feel safe when riding HIRTA vehicles in a shared ride environment? If not, provide concerns. Do you feel safe when riding vehicles not operated by HIRTA? If not, provide concerns. Do you feel safe when waiting to be picked or during boarding process? If not, provide concerns. Do you feel safe when walking or using a mobility aid to arrive at your final destination after getting dropped off? If not, provide concerns.
Data Needs	DMP ID #28: Incident/accident DMP ID # 29: Incident report DMP ID#32; Customer complains log DMP ID# 34: Customer survey data and results.
Experimental Design	Before and after analysis will be performed to assess the impact of access to Health Connector on safe access to transportation. Further, survey will be conducted for the groups to address any gaps.
Modeling/Tools	Analysis of time series data; Analysis of survey results.
Hypothesis	Health connector will provide safe transportation at all times for medical appointment needs.
Targets	 Less than 5 valid safety events per 100 trips. 4 or higher rating received from 95% of survey respondents.
Risks	None

Table 13. Details for Safety Measures (PM-10, PM-21 and PM-24)

CATEGORY	DETAILS
Confounding factor	Some safety events caused during the complete trip that relate to infrastructure (e.g., poor sidewalk conditions) may not be in control of HIRTA's or other partners.
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.11. PM-12 Self-reliance

Table 14. Details for PM-12	Self-reliance/	dignity index
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CATEGORY	DETAILS
Description	Refers to a Traveler's overall experience on how their personal preferences were accommodated and transportation access made the care available without any perceived bias in making them self-reliant in arranging and completing the trip for the care needed.
	This is a qualitative measure and will be calculated based on the survey input. The measure will be calculated on a five-point Likert scale, with 5 indicating that Travelers feel they are fully self-reliant. Question that may be asked of Travelers before and after evaluation period is:
	 How would you rate Health Connector's ability in making you self-reliant with medical trip provided by HIRTA?
	While we explored definition of a metric to calculate a comprehensive measurement of perceived quality of life as related to freedom of movement, literature reviewed thus far on measuring self-reliance in form of "dignity" for transportation purpose is limited. Therefore, the measurement is limited to availability of tools that make Travelers self- reliant.
Data Needs	Survey input and other data (TBD)
Experimental Design	Behavioral analysis to be conducted to understand impact of access to Health Connector on perception of Travelers.
Modeling/Tools	Analysis of time series data; Analysis of survey results.
Hypothesis	Health Connector will enhance self-reliance of Travelers.
Targets	To be determined in Phase 2
Risks	None
Confounding factor	None
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.12. PM-13 Reduced anxiety/ stress

U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

CATEGORY	DETAILS
Description	Refers to a Traveler's overall experience on how their personal preferences were accommodated and transportation access made the care available without any perceived bias in making them self-reliant in arranging and completing the trip for the care needed. While anxiety (PM 13) and self-reliance (PM 12) are somewhat related HIRTA Team would like to measure those separately since anxiety may still persist even if tools are provided for self-reliance Customers may feel comfortable proceeding on their own with access to tools (PM 12) but PM13 measures the overall Complete Trip experience and gaps (e.g., need for further travel training, providing assurance on safety measures). For a basic measurement, this will be considered a qualitative measure and will be calculated based on the survey input. The measure will be calculated on a five-point Likert scale, with 5 indicating that Travelers feel they are fully self-reliant. Question that may be asked of Travelers before and after evaluation period is: How would you rate Health Connector's ability to reduce anxiety related to a medical trip for the following stages of a trip: Pre-trip. Return trip.
	However, a detailed methodology to calculate the measure without any bias or influence of a confounding factor still needs to be determined. Literature reviewed thus far on measuring "anxiety" as related to using public transportation for healthcare needs is limited. Various indirect indicators (e.g., number of calls made to customer service during a trip, queries made for vehicle status during a trip, wait time, missed trips caused due to vehicle delays, complaint/clash with driver, safety perception, traveling alone vs using a companion) could be used to develop a methodology. A detailed methodology for this metric is still being researched by the HIRTA Project team and may not be completed until design phase in Phase 2 when the PMESP will be finalized
Data Needs	Survey and other data (TBD)
Experimental Design	A detailed methodology for behavioral analysis is being researched to understand the impact of a tool such as Health Connector in reducing stress/anxiety.
Modeling/Tools	Analysis of time series data; Analysis of survey results.
Hypothesis	Health Connector will enhance self-reliance of Travelers.
Targets	TBD
Risks	None

Table 15. Details for PM-13: Self-reliance/ dignity index

CATEGORY	DETAILS
Confounding factor	Limited literature on experiment design in the context of demand response transportation. Also, it will vary based on personal constraints that may be linked to underserved groups. Stress level/anxiety is a measure the HIRTA team has planned to evaluate to assess customer satisfaction with the system. However, it is likely that the stress is caused by other factors that may be completely unrelated to Health Connector capabilities.
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.13. PM-14 Complaints and Customer Satisfaction

CATEGORY	DETAILS
Description	Refers to the reduction in the number of valid complaints recorded by HIRTA and satisfaction with driver/HIRTA related to medical transportation needs. It is measured as follows:
	• Reduction in the number of complaints from the baseline measure or achieve a target number of complaints per month.
	• Ratings received by HIRTA for each delivered trip.
	Also, refers to customer satisfaction with the Health Connector service as reported by Traveler during a survey. The measure will be calculated on a five-point Likert scale, with 5 referring to highest level of satisfaction.
	 The following questions may be asked: How will you rate HIRTA services for healthcare transportation? How likely are you to pick HIRTA services over other alternatives for healthcare transportation?
Data Needs	 DMP ID#5: Trip request. DMP ID#22: Trip request (Medicaid). DMP ID# 10: Trip performance. DMP ID #13: Driver messages. DMP ID#14: Dispatcher messages. DMP ID# 17: Trip performance (third party). DMP ID #19: Driver messages (third party). DMP ID#20: Dispatcher messages. DMP ID#23: Trip performance (Medicaid). DMP ID #33: Customer complaints log. DMP ID #34: Customer survey data and results.

Table 16; PM-14: Complains and Customer Satisfaction

Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

U.S. Department of Transportation

CATEGORY	DETAILS
Experimental Design	A before and after analysis will be conducted to analyze the change in the number of customer complaints and customer satisfaction.
Modeling/Tools	Analysis of time series data. Analysis of survey results.
Hypothesis	Health Connector will assist in improving customer satisfaction.
Targets	 Up to 25% reduction in the number of valid complaints during evaluation period or achieve a target of no more than 5 valid complaint per month. At least 3 (out of a maximum of 5) rating for customer satisfaction recorded across all trips delivered per month and during evaluation period. Rating of 4 or above from 95% of survey respondents.
Risks	None
Confounding factor	Customer complaints may not be valid and a detailed analysis may be required for calculating this measure to ensure validity of complaints. System may sometimes be non-responsive due to outage with one or more components or performance may be degraded due to technical issues leading to inaccurate results
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.14. PM-15 System Productivity

Table 17. Details for PM-15: Sy	stem Productivity
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CATEGORY	DETAILS
Description	 Refers to the number of healthcare trips delivered by the service/system per hour. Measured as: Average number of trips/hour in a month. Average number of trips/hour during evaluation period.
Data Needs	 DMP ID# 10: Trip performance. DMP ID #13: Driver messages. DMP ID#14: Dispatcher messages. DMP ID# 17: Trip performance (third party). DMP ID #19: Driver messages (third party). DMP ID#20: Dispatcher messages. DMP ID# 23: Trip performance (Medicaid).
Experimental Design	A trend analysis of the data will be conducted to calculate the number of trips complete per hour.
Modeling/Tools	Analysis of time series data
Hypothesis	Health Connector will HIRTA enhance productivity.
Targets	Achieve a target of 4 trips/hour. HIRTA's pre-pandemic productivity was 3+ trips per revenue hour. Productivity can vary 2-4 trips/hour in the industry depending on various factors.

U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology Intelligent Transportation System Joint Program Office

CATEGORY	DETAILS
Risks	None
Confounding factor	None
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.15. PM-16 Added Capacity from third-party providers

Table 18. Details for PM-16: Ability to assign trips to third-party providers

CATEGORY	DETAILS
Description	 Refers to the capability of the system to dynamically assign trips to a third-party service provider when HIRTA does not have the capacity to provide those trips. While most impact will be seen for same say service, third party providers will also help better provide trips booked in advance for rural areas where HIRTA has limited service available. It is measured as: Increase in the number of trips successfully delivered that are booked with at least 24 hours' notice.
	 Increase in the number of trips successfully delivered that are booked same day with at least 20 minutes' notice
Data Needs	 DMP ID# 10: Trip performance. DMP ID #13: Driver messages. DMP ID#14: Dispatcher messages. DMP ID# 17: Trip performance (third party). DMP ID #19: Driver messages (third party). DMP ID#20: Dispatcher messages. DMP ID# 23: Trip performance (Medicaid).
Experimental Design	A trend analysis of the data will be conducted to assess system's capability to assign trips to third-party service providers. Also, the system must be able to manage the trips assigned to third parties for successful delivery.
Modeling/Tools	Analysis of time series data
Hypothesis	Health Connector will HIRTA enhance productivity.
Targets	 Targets to be considered as: Increase of 10% in the number of trips successfully delivered that are booked with at least 24 hours' notice. Increase of 30% in the number of trips successfully delivered that are booked the same day with at least 20 minutes' notice
Risks	None
Confounding factor	Limitation in capacity due to participation of service providers in rural areas
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

5.3.16. PM-17 Deadhead miles and hours

CATEGORY	DETAILS
Description	 Refers to the capability of the system to minimize the number of deadhead miles and hours (excluding pull-out/pull-in time and hours) to increase the system efficiency. Measured as follows Change in number of deadhead miles. Change in number of deadhead hours.
Data Needs	DMP ID# 10: Trip performance. DMP ID #13: Driver messages. DMP ID#14: Dispatcher messages. DMP ID# 17: Trip performance (third party). DMP ID #19: Driver messages (third party). DMP ID#20: Dispatcher messages. DMP ID#23: Trip performance (Medicaid).
Experimental Design	A trend analysis of the data will be conducted to assess system's capability to control deadhead miles.
Modeling/Tools	Analysis of time series data
Hypothesis	Health Connector will HIRTA enhance efficiency.
Targets	Targets to be considered as:At least 5% improvement within 18 months from the baseline levels
Risks	None
Confounding factor	None
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

 Table 19. Details for PM-17: Deadhead miles and hours

5.3.17. PM-18 WAV reliability

Table 20. Details for PM-18: WAV reliability

CATEGORY	DETAILS
Description	 Refers to the reliability of the system to find and assign a WAV to meet Traveler request. Measured as Number of times a trip vehicle with operational wheelchair lift could not be assigned or lift didn't operate in the field.
Data Needs	 DMP ID#5: Trip request. DMP ID#22: Trip request (Medicaid). DMP ID# 10: Trip performance. DMP ID #13: Driver messages. DMP ID#14: Dispatcher messages. DMP ID# 17: Trip performance (third party). DMP ID #19: Driver messages (third party). DMP ID#20: Dispatcher messages. DMP ID# 23: Trip performance (Medicaid).

U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology Intelligent Transportation System Joint Program Office

CATEGORY	DETAILS
Experimental Design	A trend analysis of the data will be conducted to assess system's capability to make WAV available as needed.
Modeling/Tools	Analysis of time series data
Hypothesis	Health Connector will HIRTA enhance productivity.
Targets	No more than 5 failures per month.
Risks	None
Confounding factor	None
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.18. PM-19 Increased Cost Efficiency

Table 21. Details for PM-19: Increased Cost Efficiency

CATEGORY	DETAILS
Description	Refers to the cost of delivering a trip and measured asAvg. cost/trip
	This cost includes driver, vehicle and any administrative/compliance cost as allocated per trip without accounting for any revenue (e.g., fare paid or subsidy). A more detailed discussion on cost data is available in Section 7.4.
Data Needs	 DMP ID# 10: Trip performance. DMP ID #13: Driver messages. DMP ID#14: Dispatcher messages. DMP ID# 17: Trip performance (third party). DMP ID #19: Driver messages (third party). DMP ID#20: Dispatcher messages. DMP ID# 23: Trip performance (Medicaid). DMP ID # 37: Cost and revenue data. DMP ID # 15: Fare Payment Log DMP ID # 21: Fare Payment Log (third party)
Experimental Design	A trend analysis of the data will be conducted to calculate the cost per trip.
Modeling/Tools	Analysis of time series data
Hypothesis	Health Connector will help in reduction of cost/trip.
Targets	Initial target set at average cost of \$25 per healthcare trip without accounting for any revenue.
Risks	None
Confounding factor	None
Applicable use cases	U1, U2, U3, U4, U5, U6, U7

5.3.19. PM-20 Improved coordination among HIRTA, healthcare providers, health navigators
Table 22. Details for PM-20: Improved coordination among HIRTA, healthcare providers, health navigators

CATEGORY	DETAILS
Description	 Refers to the ability of the system in automating tasks so the number of person-minutes spent in coordinating a trip by HIRTA and partners are minimized. Healthcare partners and health navigators will have access to the same trip booking and dispatching software as HIRTA dispatchers and will be able to register customers, and book or modify trips, as authorized. It is measured as: Average number of minutes spent for booking of a trip with Traveler and partners.
Data Needs	DMP ID#5: Trip request. DMP ID#22: Trip request (Medicaid). DMP ID #41 Call center log (to be added to DMP).
Experimental Design	A before and after analysis will be conducted.
Modeling/Tools	Analysis of time series data
Hypothesis	Health Connector will reduce the time spent in coordination per trip.
Targets	 Less than 5 minutes spent per trip for registered Travelers who are using the call center, 95% of the time. Less than 2 minutes spent per trip for registered Travelers, using Traveler Application (website or smart device), 95% of the time.
Risks	Call center log may not be fully available if not recorded electronically
Confounding factor	None
Applicable use cases	U2, U5, U6

5.3.20. PM-22 Reduction in medical appointment deferment due to lack of transportation

Table 23. Details for PM-22: Reduction in Medical appointment deferment due to lack of transportation

CATEGORY	DETAILS
Description	 Refers to the ability of the system to help reduce the number of missed medical appointments caused due to lack of access to transportation. This will be tracked by healthcare providers and will be recorded in the system when an appointment is cancelled or rescheduled due to patients not having access to a reliable transportation service. It will be measured as: Reduction in the number of medical appointments missed by healthcare customers (patient did not arrive or did not timely reschedule) that can be linked to transportation. This will be calculated by underserved groups so needs for one group don't
	skew the results.

CATEGORY	DETAILS
	Also, Dallas County residents will be asked this question in the survey to determine if transportation was a barrier in making the medical appointment. Residents may be asked the following question:
	• Did lack of transportation services impact access to healthcare? If yes, please list the number of events encountered in the past 6 months and the nature of the issue
Data Needs	DMP ID#5: Trip request. DMP ID#22: Trip request (Medicaid). DMP ID# 34: Customer survey data and results. DMP ID #42: Missed medical appointments linked to lack of transportation access
Experimental Design	A before and after analysis of the data will be conducted to calculate trip deferment.
Modeling/Tools	Analysis of time series data Survey analysis
Hypothesis	Health connector will provide safe and reliable transportation at all times for medical appointment reducing no-shows or deferments.
Targets	 At least 30% reduction in the number of missed medical appointment that are related to transportation access during the 18 month evaluation period. At least 80% residents responding by indicating that transportation did not present a barrier to healthcare access 6 months after the Health Connector launch.
	 At least 90% residents responding by indicating that transportation did not present a barrier to healthcare access 12 months after the Health Connector launch.
Risks	None
Confounding factor	None
Use cases	U1. U2. U3. U4. U5. U6. U7

5.3.21. PM-23 Savings due to reduction in no-shows for medical appointments

Table 24. Details for PM-29: Savings due to reduction in no-shows for medical appointments

CATEGORY	DETAILS
Description	Refers to the financial savings due to reduced number of missed appointments or no-shows for medical appointments. It is measured in amount of dollars and cents.
	Further research is needed to determine this target and scheduling calls with healthcare stakeholders, including the Center for Disease Control (CDC). However, HIRTA team has reviewed the TCRP report on "Cost- Benefit Analysis of Providing Non-Emergency Medical Transportation" and planning to follow the guidance described in the report as the

U.S. Department of Transportation

Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

CATEGORY	DETAILS
	starting point for calculating net savings delivered by transportation for the healthcare community. Approach for this may not be determined until Phase 2 design.
Data Needs	To be determined.
Experimental Design	A before and after analysis of the data will be conducted.
Modeling/Tools	Financial modeling methodology to be developed
Hypothesis	Health Connector will help reduce the financial burden on HIRTA and healthcare partners.
Targets	To be determined
Risks	None
Confounding factor	Similar Capabilities offered to Travelers by Healthcare Providers or Funding entities
Use cases	U1, U2, U3, U4, U5, U6, U7

6. Support to Independent Evaluation Effort

HIRTA team will support the needs of the IE team as required as follows:

- **Documentation Review and Input**: The HIRTA team understands that the IE team is required to review ConOps, DMP, PMESP and any other document produced during Phase I, II and III as required by the USDOT and for understanding of the project. HIRTA team will support with the review and welcome any feedback on the documents from the IE team and address and questions or concerns as part of regular process of addressing comments from the USDOT team. HIRTA team will also be available to answer any questions outside the regular review cycle.
- Data Sharing: HIRTA team will coordinate with IE team on any needs related to data needs for analysis, data sources, and the baseline data for the performance measures or key performance indicators as set by the IE team. HIRTA will define the approach for sharing data in both DMP and the PMESP. Where data will be made available via a public portal, access levels for data will be defined in the DMP. As discussed in the DMP, in most cases, data can be made available for analyses in a comma separated value (CSV) file format per a request.

If baseline data is not readily available, HIRTA team will coordinate with the IE team to understand the experiment design and related analysis and modeling methodology so an alternate approach for identifying the baseline data can be determined. It is likely that in some cases quantitative data is not being collected due to lack of availability of tools in the current system.

• Interviews: HIRTA will also support any staff interview requests from the IE team. Core group of HIRTA team members that include the Project Management Lead (PML), Concept Development Lead (CDL), System Development Lead (SDL), Technology Deployment Lead (TDL) and Stakeholder Engagement Lead (SEL) have been involved with every step of the project and will be available to answer any questions, as submitted by the IE team through an interview questionnaire.

Additionally, The HIRTA team will address any questions received from the IE team as they arise. It is anticipated that the IE team will ask any questions or make any data requests via COR. HIRTA PML will then coordinate with the internal team to develop an appropriate response.

Table 25 provides the current plan for interactions between the HIRTA team and the IE team.

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

Participant Role	Pre- Deployment Interviews	Post- Deployment Interviews	Questionnaire(s) - TBD
Federal Program Managers (ITS JPO, FTA, FHWA staff members)	X	X	
Deployment Managers (e.g., HIRTA)	X	X	
Deployment Partners (HIRTA staff, IBI Group, Uber, Navi Lens, ISU, DCHD)	X	X	
Project Stakeholders (Broadlawn, Dallas County Hospital, Unity Point, Access2Care, Iowa Total Care and other stakeholder identified in the ConOps)			X
Government Entities (FTA Region 7 office, FHWA Resources Center, FHWA Iowa Division Offices, Iowa DOT and Government partners listed in the ConOps.)			X

Table 25. Interaction between HIRTA Project Team and IE Team

Going forward, the HIRTA team will update this section for any further discussions related to IE team requests, any coordination needs and documentation of any agreements.

7. Data Collection Plan

This section provides details on the data to be collected for performing the analyses described in Section 5. This data will be collected before and during the deployment. The pre-deployment data will be collected to set the baseline. Further information is provided in the subsections below as follows:

- Section 7.1 provides a summary of all datasets identified in the DMP as a reference in this document. These datasets are also mapped to individual performance measures in Section 5.3.
- Section 7.2 provides overview of baseline data collection approach.
- Section 7.3 provides an overview of the types of data that will be collected during deployment.
- Section 7.4 provides an overview of financial data that will be collected.
- Section 7.5 provides an overview of approach that will be used for data quality checks.
- Section 7.6 provides an overview of data sharing framework, fully identified in the DMP.
- Section 7.7 provides a summary of how information identified in this section applies to performance measures.

7.1. Data Needed

As a reference, Table 26 provides an overview of the data to be collected in the Health Connector system and provides the following information for each dataset:

- **Data**: Refers to distinct category of data exchanged between two systems. Distinction is provided by type of appointment (e.g., medical appointment or trip request), provider (e.g., in-house or contracted), type of trip (e.g., Medicaid and non-Medicaid) since the level of aggregation or anonymization needed will be different.
- Dataset: Refers to the dataset that acts as the container for the data identified. As follows:
 - Admin: includes data that is required for administrative needs prior to a trip can be provided (e.g., customer registration, eligibility management, fleet management/ maintenance). It also refers to any data that is part of routine process (e.g., safety management, complaints).
 - **Driver:** includes driver-level details on name, vehicle used, and their service performance (revenue miles, revenue hour, on-time performance).
 - **Trip:** includes trip-level data for Travelers and Drivers on location, time, fare payment. Traveler, Driver and Trip identifiers are anonymized.

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

- **Aggregated:** refers to aggregated summary for a chosen time interval. Summary available at Traveler, Driver /Vehicle, Provider and Trip level.
- Survey: refers to survey data and results. Details regarding this will be provided after the IRB process is complete.
- **Health**: refers to medical appointment related data and any data collected by Dallas County Health Department for Health Navigation purposes.
- System Log: refers to data logged in the system to assess system performance and reliability. Also, may include supportive information (e.g., communication log indicating traffic delay).
- Wayfinding: refers to log of requests and pathways directions provided at device level.
- Description: Provides preliminary details on the fields available in a dataset. Other details are available in the DMP.
- **Type and Scale**: Provides the type of data included in the dataset. Also, provides a high-level information on scale of data.
- Collection method: Provides information on how data is collected by the system.
- Format: Format to be used for data sharing.

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
1	Customer profile	Admin	Consists of personal details (e.g., name, addresses, contact information, eligibility) and travel preferences (e.g., mobility aid, notification) for customers stored in Traveler profile.	Type: Text data, numerical data, temporal data, positional data. Scale: 3000 or less customers	Traveler input; HIRTA or partner staff input as concierge service (HIRTA Customer care, healthcare customer care, Health Navigator)	CSV
2	Customer eligibility for a funding source	Admin	Status of eligibility for each customer for a funding source, as stored in Traveler profile.	Type: Text data, Numerical data. Scale: 3000 or less customers	Traveler input, Provided by funding entity	CSV
3	Fleet information	Admin	Consists of information on fleet (e.g., age, number of seats, accessibility).	Type : Text data, numerical data. Scale: 50 vehicles.	As maintained by HIRTA in driver and vehicle management (supporting) system	CSV
4	Driver information	Driver	Consists of information on driver identifier and their status (e.g., experience, part time, full time, contract, shift).	Type: Text data, numerical data. Scale: 50 drivers	As maintained by HIRTA in driver and vehicle management (supporting) system. Uber Transit will maintain the list of third-party drivers.	CSV
5	Trip request	Trip	Consists of customer identifier, trip identifier, date, time, and locations of pick-ups and drop-offs.	Type: Text data, numerical data, temporal data, positional data. Scale: 400 trips per day.	Traveler input; HIRTA or partner staff input as concierge service.	CSV

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
6	Trip modification	Trip	Consists of customer identifier, trip identifier, date, time, and locations of pick-up and drop-off.	Type: Text data, numerical data, temporal data, positional data. Scale: 400 trips per day	Traveler input; HIRTA staff input as concierge service.	CSV
7	Trip status	Trip	Consists of estimated time of arrival and/or delay status, as applicable along with pick-up location.	Type: Text data, numerical data, temporal data, positional data. Scale: 400 trips per day	System-generated using vehicle location and driver/vehicle performance data received in real-time.	CSV
8	Manifest	Admin	Consists of all trips to be performed by a driver on a particular shift. Trip details provide necessary information needed for a driver to perform a trip (e.g., trip identifier, customer info, pick-up and drop-off locations and times, fare to be paid, mobility-aid needed). This dataset is listed for reference purpose only and is meant for internal operations management. This will not be made accessible to external entities. Trip request, Trip status and Trip performance datasets provide necessary information for external parties. For on-demand services, manifest may not be needed as vehicles are dispatched in real-time.	Type: Type:Text data, numerical data, temporal data, positional data. Scale: Up 20 trips a day per driver manifest.	System-generated using confirmed trips after runcutting and driver assignment process is complete. Real-time updates are made to the trips and driver/vehicle manifests if there are any changes through automated data transmission by HIRTA TMS communicating to the vehicle-end system using cellular communications. Changes to manifest are not stored.	CSV (unformatted) / PDF (formatted)

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
9	Vehicle location	Trip	Consists of vehicle location and heading along with time, speed, and vehicle or driver identifier. Current plan is for providing only historical record since use case for real-time data is unclear.	Type: Text data, numerical data, temporal data, positional data. Scale: Up to 20,000 records per day at 30 second refresh rate.	Automated data transmission at a configurable interval over cellular communications.	CSV, JSON
10	Trip performance	Trip	Consists of actual times and locations for pick-up and drop-off. Also, includes information on no-shows and cancellations, as applicable. Reasons for no-shows and cancellation will be included if available.	Type: Text data, numerical data, temporal data, positional data. Scale: 400 trips per day	Automated data transmission over cellular communications; driver input on on-board terminals.	CSV
11	Driver performance	Driver	Consists of driver performance at trip or aggregated level (e.g., miles driven as revenue or deadhead, on-time performance).	Type: Text data, numerical data, temporal data, positional data. Scale: For up to 50 drivers	System-generated based on trip performance data.	CSV
12	Travel time	Aggregated	Consists of time taken by driver/vehicle for a particular trip leg, available by origin and destination.	Type: Numerical data, positional data Scale: 400 trips a day	System-calculated using trip performance data.	CSV, JSON

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
13	Driver Messages	System Log	Consists of data messages sent by Drivers. Includes vehicle, driver identifier. This data is included to support analysis as in some cases results may not be conclusive due to confounding factors but relevant messages explaining a situation may be available (e.g., construction detour, traffic delay, slippery conditions, unexpected dwell time due to wheelchair cycle issue).	Type: Text data, positional data, temporal data. Scale: 5-10 messages per day per driver	Driver input on on-board terminals.	CSV
14	Dispatcher Messages	System Log	Consists of data messages sent by Dispatchers. Includes vehicle and driver identifier. This data is included to support analysis as in some cases results may not be conclusive due to confounding factors but relevant messages explaining a situation may be available (e.g., driver asked to swap vehicle mid-shift by dispatcher, no- show not approved, Traveler waiting at another pickup spot).	Type: Text data, positional data, temporal data. Scale : 100 messages per day	Dispatcher input in HIRTA TMS.	CSV
15	Fare Payment Log	Trip	Consists of log of fare paid by Traveler and method of payment. Includes trip identifier and customer identifier.	Type : Text data, numerical data Scale : 400 trips per day	Automated data transmission over cellular communications; driver input on on-board terminals for actual amount paid (some customers may overpay and balance is applied to their account which can be used towards future trips).	CSV

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
16	Manifest (third party)	Admin	Consists of all trips to be performed by a driver on a particular shift. Trip details provide necessary information needed for driver to perform the trip (e.g., trip identifier, customer info, pick-up and drop-off locations and times, fare to be paid, mobility-aid needed). This dataset is listed for reference purpose only and is meant for internal operations management. This will not be made accessible to external entities. Trip request, Trip status and Trip performance datasets provide necessary information for external parties. For on-demand services, manifest may not be needed as vehicles are dispatched in real-time.	Type: Text data, numerical data, temporal data, positional data. Scale : 50-75 trips per day	Automated data transmission over cellular communications; driver input on on-board terminals.	CSV (unformatted) /PDF (formatted)
17	Trip performance (third party)	Trip	Consists of actual times and locations for pick-up and drop-off. Also, includes information on no-shows and cancellations as applicable. Reasons for no-shows and cancellation will be included, if available.	Type: Text data, numerical data, temporal data, positional data. Scale: 50-75 trips per day	Automated data communication over cellular; driver input on on- board terminals	CSV
18	Vehicle location (third party)	Trip	Consists of vehicle location and heading along with time, speed and vehicle identifier. Driver identifier may not be available. Current plan is for providing only historical record since use case for real-time data is unclear.	Type: Text data, numerical data, temporal data, positional data. Scale: Up to 5,000 records per day at 30 second refresh rate.	Automated data communication over cellular	CSV, JSON

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
19	Driver Messages (third party)	System Log	Consists of data messages sent by Drivers. Includes vehicle, driver identifier. This data is included to support analysis as in some cases results may not be conclusive due to confounding factors but relevant messages explaining a situation may be available (e.g., construction detour, traffic delay, slippery conditions, unexpected dwell time due to wheelchair cycle issue).	Type: Text data, positional data, temporal data Scale: 5-10 messages per day per driver for a total of 20 drivers.	Driver input on on-board terminals	CSV
20	Dispatcher Messages (third party)	System Log	Consists of data messages sent by Dispatchers. Includes vehicle and driver identifier. This data is included to support analysis as in some cases results may not be conclusive due to confounding factors but relevant messages explaining a situation may be available (e.g., driver asked to swap vehicle mid-shift by dispatcher, no- show not approved, Traveler waiting at another pickup spot).	Type: Text data, positional data, temporal data Scale : 50 messages per day	Dispatcher input in HIRTA TMS	CSV
21	Fare Payment Log (third party)	Trip	Consists of log of fare paid by Traveler and method of payment. Includes trip identifier and customer identifier.	Type : Text data, numerical data Scale : 400 trips per day	Automated data transmission over cellular communications for actual amount paid.	CSV

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
22	Medicaid trips requests	Trip	Trips requested by Travelers for Medicaid. Consists of customer identifier, trip identifier, date, time, and locations of pick-ups and drop-offs.	Type: Text data, numerical data, temporal data, positional data. Scale: 50-80 trips a day	Traveler/concierge input into Access2Care system. From Access2Care, trips assigned to HIRTA will be ingested in HIRTA TMS. Current process of ingestion is manual and it is currently done on a daily basis for the trips scheduled for the next day. For ad-hoc/same day trips, Access2Care calls HIRTA to confirm and trips are entered at that point. A more frequent ingestion will be needed for same-day requests (e.g., return trips), which are critical to Health Connector. Since ConOps discussions, the HIRTA team has determined that an automated ingestion will be a better approach which will automatically ingest the trip if a same day trip is booked by the Access2Care	CSV
23	Medicaid trip performance	Trip	Consists of actual times and locations for pick-up and drop-off. Also, includes information on no-shows and cancellations as applicable. Reasons for no-shows and cancellation will be included if available.	Type: Text data, numerical data, temporal data, positional data. Scale: 50-80 trips a day	Automated data transmission over cellular communications; Driver input on on-board terminals	CSV

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
24	Medical appointment details	Health	Consists of medical appointment date, time and location (facility address and doctor's office) for a particular customer. Whether or not transportation was requested, or a telehealth appointment was requested will be included. Linked to a customer identifier and trip identifier if a corresponding transportation is booked. Data to be shared will include anonymized data on any link between medical appointment and transportation provided for those appointments.	Type: Text data, numerical data, temporal data, positional data. Scale: 100 trips a day	Data entry in EHR or medical appointment system or Uber Health;	CSV
25	Trip Summary	Aggregated	Consists of aggregated data on trip performance by different providers (e.g., revenue miles, fares collected, on-time performance, travel time, no- shows, cancellations, missed trips).	Type: Text data, numerical data, temporal data, positional data. Scale: Up to 400 trips a day	System-generated	CSV, JSON
26	Traveler wayfinding request	Wayfinding	Consists of origin and destination location requested for step-by-step guidance by Traveler outdoors or indoors. Time of request and device ID (anonymized) will also be included.	Type: Positional data, temporal data. Scale: Requests for up to 50 trips a day	Data entry by Travelers/ caregivers on devices.	CSV/ JSON
27	Traveler wayfinding guidance	Wayfinding	Consists of the actual pathways provided to the customer; Also includes data on whether or not a provided guidance was used by a customer once provided. Time of request and device ID (anonymized).	Type: Positional data, temporal data Scale: Requests for up to 50 trips a day	System-generated step- by-step pathways direction as provided by the wayfinding system; depends on availability of mapping data	CSV/ JSON

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
28	Incident/ accident	Admin	Consists of any incident or accident event reported by Driver; Trip, vehicle and driver identifier included for internal analysis but only aggregated data by safety event type per day will be available for external use.	Type: Text data, Numerical data, Positional data, temporal data Scale: 10 events per months	Driver input using on-board terminals for a particular safety event. Initial incident data per report entered into HIRTA TMS by Dispatcher. Final report after investigation filed in Safety management System by Safety Program Manager.	CSV
29	Incident report	Admin	Consists of details of report after investigation by the Safety Program Manager. Trip, vehicle and driver identifier included for internal analysis but only aggregated data by safety event type per day will be available for external use.	Type: Text data, Numerical data, Positional data, temporal data Scale: 10 events per month	Filed in the Safety Management System by Safety Program Manager	CSV
30	Trip History Playback	Trip	Consists of a replay of events performed by a Driver during their shift. Used for internal investigation of customer complains. Listed here for information purpose only. Not to be made available to the external entities.	Type: Video Scale: 400 trips a day	System-generated using trip performance data by HIRTA TMS	MPEG, CSV
31	System performance	System Log	Consists of data on system reliability. It will be generated on a daily basis and will be grouped by failure type and system component.	Type: Numerical. Scale: N/A	System-generated; Analysis	CSV

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
32	Information/ referral request	Health	Consists of information/referral requests received by DCHD from Dallas County residents and outcome of efforts made by Health Navigators. This data will help track if I&R effort resulted in booking of an appointment.	Text data, numerical data, temporal data, positional data. Scale: 500 new customers per year. 1500 active customers. Customers typically active for 6-8 weeks.	Data entry; customer Surveys in the I&R system. There is no plan to link I&R system with HIRTA TMS. Therefore, information will be stored in the I&R system only.	CSV
33	Customer complaints log	Admin	Consists of customer complaint received, complaint date, resolution, and resolution date. Will be aggregated by complaint type and provider type at daily level for tracking customer complaints received.	Type: Text, numerical, temporal. Scale: 10 complaints per month	Data entry in Customer Service system	CSV
34	Customer survey results	Survey	Consists of analysis of survey data designed to measure the project outcomes. It will be managed by ISU. Results will be shared after using appropriate anonymization and aggregation. Additional details will be added regarding survey data once the approach is finalized through the IRB process.	Type: Text data, numerical data, temporal data, positional data. Scale: List of human participants TBD	Survey methods and details are yet to be determined. Will be finalized before IRB application filing in November 2021.	CSV (non- spatial), SHP format (spatial), charts
35	Processed private data for controlled sharing	Aggregated	Refers to anonymize and aggregated reports at daily level that will be provided to researchers and independent evaluators.	Type: Text data, numerical data, temporal data, positional data. Scale: 400 trips a day	System-generated by processing information stored in the reporting database	CSV, JSON

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
36	Public data for USDOT- managed System	Aggregated	Refers to anonymized aggregated reports at daily level that will be provided for USDOT-managed System.	Type: Text data, numerical data, temporal data, positional data. Scale: 400 trips a day	System-generated by processing information stored in the reporting database	CSV, JSON
37	Cost and revenue summary	Aggregated	Refers to the cost and revenue data, aggregated on a monthly basis.	Type: Text data, numerical data, financial data Scale: 400 trips a day	System-generated by processing information stored in the reporting database	CSV
38	Wheelchair failure log	Aggregated	Refers to wheelchair failure log aggregated on a daily basis by vehicle.	Type: Text data, numerical data, temporal data, positional data Scale: 400 trips a day	System-generated by processing information stored in the reporting database	CSV
39	Medical appointment status	Health	This is for internal use only and is needed to track any changes in medical appointments that also require changes in transportation appointments.	Type: Text data, numerical data, temporal data, positional data Scale: 100 trips a day	Data entry in EHR or medical appointment system or Uber Health;	CSV
40	Discount coupon/credit	Trip	Consists of a log of discount code applied to trips and amount of credit. Available at trip level and will be linked to Fare Payment Log.	Type: Text data, numerical data, temporal data, positional data Scale: 100 trips a day	Entered by Traveler or concierge/ customer service staff	CSV

ID	Data	Dataset	Description	Type/Scale	Collected Method	Format
41	Call center log	Admin	Call center statistics available from HIRTA, DCHD and healthcare providers, as available from phone systems or manual logs	Type: Text, numeric, temporal Scale : 500 calls per day	Generated from phone system	CSV
42	Missed medical appointments linked to lack of transportation access	Trip	Anonymized missed appointments linked to transportation access	Type: Text data, numerical data, temporal data, positional data	Manual record	CSV
43	Trip request (partners)	Trip	Trips manually requested by DCHD and healthcare providers using HIRTA TMS. To be tracked separately to assess the benefit of such capability.	Type: Text data, numerical data, temporal data, positional data. Scale:	Manual entry	CSV

7.2. Baseline Data Collection

Current Routematch by Uber system records data for various performance measures identified in this document. Initial baseline for those measures will be calculated as much as possible after setting the baseline parameters. Details are provided in Table 27.

7.3. Deployment Data Collection

Continuous data will be collected during the deployment period after the system launch as follows.

7.3.1. Data Collection Through Deployment System

Table 26 list the data that will be collected by the system. Access level is defined for accessing data as follows:

- **Open** Data that can be used by the public with no or limited licensing restrictions. This data is available to the public without needing to request permissions and will be provided to the USDOT-managed Public System. These datasets will be provided after anonymizing and aggregating raw private datasets to protect PII.
- **Private** Data that cannot be shared with external users. Access to this data is limited and only granted with IRB and Project Team approvals.

Details on how HIRTA team categorizes each dataset is provided in the DMP.

7.3.2. Data Collected Outside Deployment System

As indicated in Section 5, some of the measures will require data collected by the external systems owned by healthcare partners and DCHD. The purpose of those datasets is to primarily help determine the impact of increased transportation access on missed medical appointments and subsequently measured net financial outcomes. This data will include:

- Missed appointments linked to lack of transportation access.
- Resources spent in number of person-minutes in scheduling a transportation service from HIRTA for a medical appointment.
- Data on referral and tracking of results as managed by health navigators at the DCHD.
- Data captured by third party service providers for the services they would operate for HIRTA.
- Details on nature of care (e.g., dialysis, cancer treatment, vaccination) provided by a healthcare provider when a service provided by HIRTA was used by the Traveler.

7.3.3.Data Collected Through Survey/Interviews

The following data is required to be collected for conducting qualitative assessments in the event data is not available for quantitative analysis:

- Surveys for before and after Analysis: As discussed in Section 5, some performance measures include qualitative metrics for before/after experiments to supplement the results obtained through quantitative analysis. These will be required particularly in cases when results from quantitative analysis are not conclusive. HIRTA team has plans to survey the Travelers through the app, website, email or telephone. Mail-in surveys will also be conducted if needed.
- Surveys for control and treatment analysis: As discussed earlier, "with" and "without" groups will be recruited for some experiments to measure the impact of Health Connector on Travelers' access to transportation services for medical appointments. The Control group will not be using the Health Connector app or website and will be surveyed via email, phone or mail-in survey methods.
- In-person Interviews where Survey results are not sufficient or inclusive: In-person interviews with staff at HIRTA, DCHD and healthcare facilities are planned to supplement the findings from surveys. In-person surveys may also be used if sufficient samples of core populations cannot be obtained using other methods.

7.4. Cost Data

DMP ID # 37 identifies 'cost and revenue' dataset. The cost will be calculated accounting for the following:

- Driver wages, compliance, and administrative costs.
- Vehicle ownership cost (e.g., insurance, fuel, maintenance, and other expenses).
- Contracting cost for third-party provided services.
- Staff cost for providing call taking, reservations, scheduling, dispatching and administrative functions.
- Call center system and facility cost.
- Capital cost of deployment of in-vehicle and facility hardware, software and field assets (e.g., visual markers for wayfinding, kiosks).
- Recurring cost of system operations and maintenance.
- Installation and maintenance of any fixed asset cost (e.g., fixed stop at a healthcare facility).
- Administrative cost of Health Connector program management (e.g., coordination with healthcare partners, coordination with funding partners).

U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

This data will be primarily used for calculating metrics for PM#19. Additional cost data may be requested from DCHD and healthcare providers for calculating metrics for PM# 23 but it is not planned in the DMP as that PM is not yet fully defined.

7.5. Data Quality Check Approach

The following subsections describe the approach HIRTA team will take in verifying the quality of the data before it is utilized for calculating performance measures or is shared externally. Also, the data will be processed to correct any issues before it is used or shared externally.

This section will be further expanded upon in Phase 2 when data becomes available. Also, a detailed survey plan with questionnaire and data quality check process will be finalized by Phase 2 design after obtaining IRB's approval.

The following subsections provide the process that will be used by the HIRTA team for performing data quality checks.

7.5.1. Missing Data

It is common to have transit datasets to have missing data from records. This may happen due a variety of reasons, such as, malfunctioning on-board hardware, issues with data communication network or system, data input error from driver, incorrect configurations. If any of the datasets are missing data those will be flagged for review through automated review process. Subsequently, the dataset will be filtered for those anomalies to ensure the analysis is not impacted. Also, a corrective action will be taken to ensure that issue causing the missing data is resolved immediately.

Missing data may be observed in survey responses as well if respondents don't answer a question. Depending on sample size and significance of question, the HIRTA team may reach out to respondents or develop a process to filter the responses to remove any bias in the results.

7.5.2.Insufficient Data

There may be situations when data is not sufficient to conduct an analysis. This may occur due to low trip volume, low number of expected events (e.g., safety, no-shows, cancellations), service cancellations due to severe weather or other reasons, missing data and others. If such situations occur, the HIRTA team will evaluate the effects of data insufficiency and identify corrective actions. This may include identifying qualitative measures or collecting additional data which may supplement the analysis and findings. Initial data sufficiency check will be performed in Phase 2 when preliminary data starts to become available.

For survey responses, if data obtained is not sufficient for analysis, follow-up surveys may be conducted, or indirect metrics may be calculated for a PM using available data.

7.5.3. Invalid Data

Data may be invalid or inaccurate due to data entry errors or data may be generated incorrectly by the system based on invalid configurations. Data validity checks will be performed by the system on a continuous basis before a data is used for reporting or sharing.

7.5.4. Outliers

Due to unique situations tied to individuals or individual events (e.g., higher than expected dwell time at a pick-up location, longer than expected travel time on a trip, high number of unfulfilled trips in a day due to a weather event), outlier data may be generated. Additional logs (e.g., driver messages, dispatcher messages) will be consulted when outliers are observed to eliminate any bias in interpretation of results.

7.5.5. Collinearity

PMs and experiments are defined in Section 5 to remove any issues caused by data correlation between data variables used to calculate metrics. This may be an issue, particularly for, regression analyses and may impact the statistical significance of dependent variables. In most cases this can be addressed by using the appropriate statistical method and accounting for this in the model.

7.5.6. Exposure to Personal Identifiable Information (PII)

One key issue HIRTA team will be careful about a dataset is any exposure to PII. DMP has already identified potential datasets that will be exposed to PII and what will be done to prevent any exposures. As defined in the DMP, the following two approaches will be used to remove any PII exposure.

- **Anonymization**: System-generated data will be anonymized at Trip, Driver and Traveler level datasets so PII is not included. Similar strategy will be adopted for survey data.
- **Aggregation:** Certain datasets may still contain information (e.g., address) which could be utilized to decipher PII. Therefore, for public data and controlled access to private data, aggregated dataset will be provided.

7.6. Data Sharing Framework

Data will be shared using the following standard formats:

- CSV: non-spatial data will be shared using text-based files using CSV format. Files will include a header and data. Details on the header fields will be available in the metadata.
- JSON: will be used for sharing spatial data.
- SHP: Shape file format may be used for sharing spatial analysis conducted using survey data.

U.S. Department of Transportation Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

A detailed data sharing approach is provided in DMP that includes details on how HIRTA team will treat data public or private. Also, the DMP provides details on versioning, metadata and frequency of data sharing.

7.7. Summary of Performance Measures and Applicable Data

Table 27 provides a summary of the datasets, collection approach and sharing framework as defined in Sections 7.2 - 7.6 with respect to Performance Measures.

PM#	Performance Measures	Data Needs	Analysis Method	Baseline Data Source	System Data Collected During Deployment	Data Collected Outside Deployment System	Surveys/Interviews
1	Ability to dynamically reassign vehicles to address service disruption	Trip request, Trip performance, Safety event, Safety event report, Customer survey data and results.	Before and After	Wait time for reassignment using data in Routematch by Uber system	Health Connector MOD Platform will be used to collect identified datasets	Weather and Traffic, if available	HIRTA, DCHD and healthcare staff interviews may need to be conducted to address gaps based on operational experiences
2	Availability of transportation alternatives	Trip request, Customer survey data and results.	Control and Treatment	N/A	Health Connector MOD Platform will be used to collect identified datasets	N/A	Follow-up customer survey may be conducted for with and without groups to address any data gaps.
3	Trips unfulfilled due to system unreliability	Trip request, Trip performance, Safety event, Safety event report, Customer survey data and results (optional), Driver messages, Dispatcher messages.	Before and After	Baseline will be set using Routematch by Uber system	Health Connector MOD Platform will be used to collect identified datasets	Healthcare partners may have baseline record of transportation request denials but TBD	Customers will be surveyed (if needed) to identify denial/missed events

Table 27. Data Collection and Analysis Approach for Performance Measures

PM#	Performance Measures	Data Needs	Analysis Method	Baseline Data Source	System Data Collected During Deployment	Data Collected Outside Deployment System	Surveys/Interviews
4	Estimated Time of Arrival (ETA) prediction accuracy	Vehicle location, Trip performance	Trend Analysis	Baseline will be set using Routematch by Uber system	Health Connector MOD Platform will be used to collect identified datasets	Weather and Traffic, if available	N/A
5	On-time performance	Vehicle location, Trip performance, Customer survey data and results (optional)	Trend Analysis, Control and Treatment	N/A	Health Connector MOD Platform will be used to collect identified datasets	Weather and Traffic, if available	Follow-up surveys with Control and Treatment group customers will be conducted (if needed) to assess their experience with on-time performance to compare with information from the system
6	Travel-time prediction accuracy	Vehicle location, Trip performance, Customer survey data and results (optional)	Trend Analysis	N/A	Health Connector MOD Platform will be used to collect identified datasets	Weather and Traffic, if available	N/A
7	Spontaneity time	Trip request, Trip performance, Customer survey data and results.	Control and Treatment	N/A	Health Connector MOD Platform will be used to collect identified datasets	N/A	Follow-up customer survey may be conducted for with and without groups to address any data gaps.

PM#	Performance Measures	Data Needs	Analysis Method	Baseline Data Source	System Data Collected During Deployment	Data Collected Outside Deployment System	Surveys/Interviews
8	Reliability of the system in assisting with non- vehicle component of the complete trip	Wayfinding request, Wayfinding Guidance, Traveler Feedback	Trend Analysis	N/A	Wayfinding App will be used to collect required data	Healthcare partner may be asked to obtain check-in time data to calculate the non-vehicle leg travel time for arrival	N/A
9	Traveler perception of privacy	Customer survey data and results	Control and Treatment	N/A	N/A	N/A	With and without groups will be surveyed to assess the difference in their perception of using the HIRTA service
10	Traveler safety in healthcare transportation	Incident/accident data, Customer complaints log, Customer survey data and results	Before and After, Trend Analysis	Baseline will be set using Routematch by Uber system	Health Connector MOD Platform will be used to collect identified datasets	N/A	Customer survey will be conducted per survey plan (TBD)
11	System's ability to meet accessibility needs of travelers	Trip request, Customer survey data and results.	Control and Treatment	N/A	Health Connector MOD Platform will be used to collect identified datasets	N/A	Follow-up customer survey may be conducted for with and without groups to address any data gaps.
12	Self-reliance	Survey, other data TBD	Control and Treatment	N/A	TBD	N/A	Customer survey will be conducted per survey plan (TBD)
13	Reduced trip anxiety	Survey, other data TBD	Control and Treatment	N/A	TBD	N/A	Customer survey will be conducted per survey plan (TBD)

PM#	Performance Measures	Data Needs	Analysis Method	Baseline Data Source	System Data Collected During Deployment	Data Collected Outside Deployment System	Surveys/Interviews
14	Complaints and customer satisfaction	Incident/accident data, Customer complaints log, Customer survey data and results	Trend Analysis	N/A	Health Connector MOD Platform will be used to collect identified datasets	N/A	Customer survey will be conducted per survey plan (TBD)
15	System productivity	Trip request, Trip performance, Driver messages, Dispatcher messages.	Trend Analysis	N/A	Health Connector MOD Platform will be used to collect identified datasets	N/A	HIRTA operations staff will have to be interviewed to address data gaps or for interpretation/verification of results
16	Added capacity from third-party providers	Trip request, Trip performance, Driver messages, Dispatcher messages.	Trend Analysis	N/A	Health Connector MOD Platform will be used to collect identified datasets	N/A	HIRTA operations staff will have to be interviewed to address data gaps or for interpretation/verification of results
17	Deadhead miles and hours	Trip request, Trip performance, Driver messages, Dispatcher messages.	Trend Analysis	N/A	Health Connector MOD Platform will be used to collect identified datasets	N/A	HIRTA operations staff will have to be interviewed to address data gaps or for interpretation/verification of results
18	Wheelchair Accessible Vehicle (WAV) reliability	Trip request, Trip performance, Driver messages, Dispatcher messages.	Trend Analysis	N/A	Health Connector MOD Platform will be used to collect identified datasets	N/A	HIRTA operations staff will have to be interviewed to address data gaps or for interpretation/verification of results

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

PM#	Performance Measures	Data Needs	Analysis Method	Baseline Data Source	System Data Collected During Deployment	Data Collected Outside Deployment System	Surveys/Interviews
19	Increased cost efficiency	Trip request, Trip performance, Driver messages, Dispatcher messages.	Trend Analysis	N/A	Health Connector MOD Platform will be used to collect identified datasets	N/A	HIRTA operations staff will have to be interviewed to address data gaps or for interpretation/verification of results
20	Improved coordination among HIRTA, healthcare providers, health navigators	Trip requests, Call center logs	Before and After	As available from current HIRTA and healthcare partner logs	Health Connector MOD Platform will be used to collect identified datasets; Call center log to be made available from phone system or other records at HIRTA	Call center log from healthcare partners	HIRTA, DCHD and healthcare staff interviews will need to be conducted
21	Delivery of safe healthcare transportation	Incident/accident data, Customer complaints log, Customer survey data and results	Before and After, Trend Analysis	Baseline will be set using Routematch by Uber system	Health Connector MOD Platform will be used to collect identified datasets	N/A	Customer survey will be conducted per survey plan (TBD)
22	Reduction in medical appointment deferment due to lack of transportation	Trip request, Customer survey data and results, Missed medical appointments linked to lack of transportation access	Before and After, Trend Analysis	As available from current HIRTA and healthcare partner logs	Health Connector MOD Platform will be used to collect identified datasets	Completed medical appointment data linked to transportation access from healthcare partners	Customer survey will be conducted per survey plan (TBD)

PM#	Performance Measures	Data Needs	Analysis Method	Baseline Data Source	System Data Collected During Deployment	Data Collected Outside Deployment System	Surveys/Interviews
23	Savings due to reduction in the number of missed medical appointments	TBD	Before and After	As available from current HIRTA and healthcare partner logs	TBD	Cost/savings data from healthcare partners linked to no-shows reduced by transportation	TBD
24	Safe transportation access to healthcare facilities	Incident/accident data, Customer complaints log, Customer survey data and results	Before and After, Trend Analysis	Baseline will be set using Routematch by Uber system	Health Connector MOD Platform will be used to collect identified datasets	N/A	Customers will be surveyed at TBD intervals (likely every 6 months) to document safety perception

8. Performance Reporting

8.1. Data Management

The following types of data will be collected for use in the various analyses:

- Trip performance variables (i.e. number of trips, trip length, number of safety events) will be reported by HIRTA. They may be provided in raw or reduced format. If needed, a unique user ID may be assigned. However, any PII will be stripped before the data are provided to Iowa State researchers.
- Participant and control survey variables: this includes all data reported and reduced from any survey instrument used to question users of the Health Connector app and those used as a control. Data will be collected by researchers at ISU. As a result, both raw and reduced data will be stored at ISU. Some information may be collected so that duplicate responses can be identified but no PII will be collected.
- Driver/medical facility survey: this includes any data requested or collected through a survey of transportation drivers or medical facilities. This may include information such as number of drivers who report participants having issues finding the pick-up point or number of missed medical appointments. Data may be collected by HIRTA or the ISU research team. As a result, both raw and reduced data will be stored at ISU. No PII will be collected.

Data for analyzing and reporting performance measures will be stored at ISU. All of the team members who will have access to the data, including IT, have IRB training. Data will be stored on CyBox which is a FERPA- and HIPAA-compliant file storage system. All access to CyBox is password controlled with encryption. Data are stored in user created files and only users who are granted permission are able to access files. Most of the anticipated data will be gathered and stored in databases. Although no PII information will be collected, any PII that is discovered will be cleansed from the data. For instance, a user may list their name in a question that allows text entry.

8.2. Analyzing Performance Measures

Performance measures will be calculated from the available data. Performance measures can be presented using simple comparisons or charts. Performance measures can be compared to each other or for before versus after using simple tools such as ANOVA or chi-squared tests.

Relationships, including dependencies, between variables will also be explored using statistical methods such as regression analyses. For instance, the relationship between missed appointments and inability to utilize the wayfinding feature of the Health Connector app could be evaluated.

8.3. Reporting

Travel performance metrics (i.e. availability of transportation option, ETA prediction accuracy, number trips) will be regularly calculated and reported once per quarter. This information will be provided in the regular project progress reports to USDOT. This information will be presented in a dashboard which shows an aggregate summary of each metric. Information may be displayed using bar charts, summary tables, pie charts, etc. The team has access to and expertise with Tableau (data visualization software) which can be used to prepare dashboards.

Survey statistics will be evaluated. The methodology for collecting, reducing, and analyzing data will be provided in a report format. Summary information will also be presented using charts or tables so the information can be understood. It is expected this information will be provided to USDOT in annual reports (as available) as well as interim and final reports

9. Performance Measurement and Evaluation Support Schedule

Table 28 provides a tentative schedule per the current understanding of the HIRTA team for conducting performance measurement and supporting independent evaluation. Relevant Phase 1 and 2 activities for PMESP finalization are also listed. Schedule for surveys is currently not known will likely be determined as part of Phase 2 design.

ID	Event Title	Description	Phase	Date
1	Draft PMESP Is delivered to USDOT	Initial Draft PMESP with basic information known at the time of writing.	Phase 1	Aug 2021
2	Final DMP	PMESP is updated with USDOT comments addressed.	Phase 1	Nov 2021
3	IRB application submitted	Data and performance management approach along with details regarding engaging human subjects in the study submitted to IRB for approval; May take up to 6 weeks per ISU process	Phase 1	Oct 2021
4	System requirements finalized	Requirements on performance and data developed; walkthrough conducted, and requirements finalized.	Phase 1	Nov 2021
5	IRB approval and Draft Human Use Approval (HUA) summary complete	IRB approval is received, and HUA summary is developed for USDOT review.	Phase 1	Nov 2021
6	PMESP updated as needed based on IRB input, HUA Summary	Per suggested updates to DMP, PMESP may need to be updated.	Phase 1	Dec 2021
7	Final Human Use Approval (HUA) summary complete	HUA summary document finalized per USDOT comments.	Phase 1	Dec 2021
8	ICTDP Finalized	Data and performance management approaches are finalized per finalized Phase 1 DMP and PMESP.	Phase 1	Jan 2022
9	Initial data samples provided to USDOT	Initial Data samples are created validated and submitted to USDOT for review.	Phase 2	Sep 2022
10	Initial meeting with USDOT data team to review data	Meeting to review data with USDOT and walkthrough the data schema and DMP	Phase 2	Oct 2022

Table 28. Performance Measurement and Evaluation Support Schedule

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

ID	Event Title	Description	Phase	Date
11	Baseline data collection starts	Initial collection of data on current conditions starts	Phase 2	Nov 2022
12	PMESP and DMP updated	DMP and PMESP updated with any changes from testing and sample data schema.	Phase 2	Jan 2023
13	Baseline data provided to USDOT	Complete Baseline data sets are uploaded to USDOT and the IE	Phase 2	Jan 2023
14	Month of testing of applications begins	Initial upload after datasets are collected through testing	Phase 2	Feb 2023
15	Data transferred to USDOT	Daily updates of after case data (testing and go-live) are provided to USDOT and IE	Phase 2/3	Feb2023- Jan 2025
16	Go-live	Go-live	Phase 3	Aug 2023
17	Data Review	Data Review conducted with USDOT and IE to ensure datasets are complete	Phase 3	Sep 2024
18	Evaluation Period Start	Phase 3 evaluation period begins	Phase 3	Aug 2023
19	Sharing of Performance Report	Performance results of system operations are shared daily or monthly as required for the measures.	Phase 3	Aug 2023- Jan 2025
20	Evaluation Period End	Phase 3 evaluation period (18 months) ends	Phase 3	Jan 2025
21	Draft Final Analysis Report submitted	Draft Final Analysis Report submitted to USDOT	Phase 3	Jan 2025
22	Final Analysis Report submitted	Draft Final Analysis Report submitted to USDOT	Phase 3	Feb 2025
10. References

- 1. Complete Trip- ITS4US Deployment Broad Agency Announcement (693JJ3-20-BAA-0004).
- 2. HIRTA Proposal for Complete Trip-ITS4US Deployment.
- 3. Transit Center, "Mobility Performance Metrics (MPM)," February 2020, Federal Transit Administration.
- Anat Caspi et al, "Accessible Transportation Technologies Research Initiative (ATTRI) Performance Metrics and Evaluation, Final Evaluation Framework Report," July 2020, US Department of Transportation.
- Santosh Mishra et al., "Phase 1 Phase 1 Concept of Operations (ConOps), Heart of Iowa Regional Transit Agency ITS4US Deployment Project," August 2021, US department of Transportation
- Santosh Mishra et al., "Phase 1 Phase 1 Data Management Plan (DMP), Heart of Iowa Regional Transit Agency ITS4US Deployment Project," August 2021, US department of Transportation.
- Paul Hughes-Cromwick et. al., "Cost Benefit Analysis of Providing Non-Emergency Medical Transportation", Transit Cooperative research Program, Transportation research Board, Report Number: 22055

11. Appendix A: Acronyms and Glossary

Access2Care

A transportation broker for State of Iowa Medicaid program that performs booking and scheduling and works with service providers such as HIRTA for successful delivery of Medicaid-eligible trips.

ADA – Americans with Disabilities Act

Refers to the civil rights legislation passed and signed into law in 1990 to prevent discrimination against people with disabilities.

Billing

Refers to the process of invoicing third-party funding sources (e.g., Medicaid) after a successful delivery of a trip. Billing is typically done on a monthly basis.

CHNA - Community Health Needs Assessment

Refers to the Community Health Needs Assessment Report developed by Dallas County in 2019.

CO: Contract Officer

The CO will serve as the USDOT point of contact for any concerns related to the contracts.

COR - Contract Office Representative

The Contract Office Representative will serve as the USDOT representative for this project and is responsible for coordination and review of the proposer's work.

Cost Allocation

Refers to the process of associating a funding source that should be billed for a trip in a shared ride scenario when riders covered by separate funding sources share the vehicle for their trips and trip purposes at the same time.

CTAA – Community Transportation Association of America

One of the project Partners who will lead stakeholder engagement on this project.

DCHD – Dallas County Health Department

One of the project Partners who will lead integration with health care services.

DR-Demand Response

Refers to a service that is not run on a fixed route or a schedule (e.g., dial-a-ride, vanpool etc). This requires making trip booking by contacting the service provider (e.g., HIRTA). However, DR is different than an ADA Paratransit service which is provided as a complement to a fixed route and is governed by specific requirements provided in 49 CFR- Part F. HIRTA operates only DR Service in Dallas County and all discussion in this document is related to DR Service.

Dispatching

Refers to an operations management function which involves assigning vehicle, tracking fleet location, managing schedule adherence, managing trip manifests and other operational functions.

DMP – Data Management Plan

The Data Management Plan is Task 3 of Phase 1 and will describe the approach for data collection, processing, storage and utilization.

DOT – Department of Transportation

The government department responsible for transportation. In this report, this generally refers to either the State of Iowa's DOT or the United States DOT referred to as Iowa DOT and USDOT, respectively.

EDI – Electronic Data Interchange

In this context, refers to the electronic data interchange (EDI) format messages developed by HIPAA following American National Standards Institute (ANSI) X12 standard for electronic data exchange and are used to communicate with third-party health care provider systems (e.g., Medicaid).

EHR – Electronic Healthcare Record

Refers to the healthcare information management system used by hospitals for patients' healthcare-related appointments, transactions, and records management.

GTFS – General Transit Feeds Specification

GTFS is a standard to provide static public transportation schedule information. The standard has been expanded to include real-time passenger information (GTFS-real-time), flexible services (GTFS-flex) and accessible routing within stations (GTFS-pathways).

HIPAA – Health Insurance Portability and Accountability Act of 1996

Provides guidelines for data protection of sensitive patient health information.

HIRTA - Heart of Iowa Regional Transit Agency

Rural, regional public transit agency in central Iowa. HIRTA will serve as Proposer/Applicant for the Complete Trip - ITS4US project.

HL7 – Health Level Seven International

A not-for-profit, standards developing organization focused on electronic health information.

HN-Health Navigator

Refers to services provided by Dallas County Health Department to Dallas County residents in identifying resources as necessary for improving social determinants of health.

ICTDP – Integrated Complete Trip Deployment Plan

The Integrated Complete Trip Deployment Plan is a deliverable of Task 13 under Phase 1.

Information and Referral

Refers to public and private entities that help their customers in identifying resources for health and human services and other needs.

IPFP - Institution, Partnership, and Financial Plan

The Institution, Partnership and Financial Plan is a deliverable of Task 10 under Phase 1.

ISU– Iowa State University

lowa State University is a public research university with multiple campuses in the State of Iowa and will be engaged as the research and evaluation partner in Phases 2 and 3.

KPI – Key Performance Indicators

Represents primary metrics used to assess the success of a project or operations.

LEP – Limited English Proficiency

Refers to individuals who have a limited ability to read, speak, write, or understand English.

NDSP- Non-Dedicated Service Provider

NDSP refers to operators providing service under contract (e.g., taxis) to an agency (e.g., HIRTA).

NEMT – Non-emergency Medical Transportation

The provision of transportation to patients for medical appointments, lab visits, and other routine care. Generally, used in the context of Medicaid service only.

PII – Personally Identifiable Information

Refers to any data that can distinguish an individual, either alone or when linked with other available data.

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

Provider

Provider in this context mainly refers to an entity performing service delivery for requested trips, sometimes also referred as service provider. The HIRTA team has also used healthcare partners as providers in some cases but referred as 'healthcare providers.'

Reservation

Refers to the act of booking a trip based on a request from a customer. Reservation is available to only registered customers.

RWP – Requirements Working Group

Is subset of identified stakeholders that will guide the requirements development process.

Scheduling

Refers to the process of identifying driver and vehicle resources and their runs/shifts for a given workday. Scheduling is typically performed for all requests received until 24 hours in advance. Booking within 24-hour notice and on-demand is offered but not encouraged due to limited system capacity and resources.

SEMP – System Engineering Management Plan

A System Engineering Management Plan describes how systems engineering process of planning, design, and deployment is applied to a project.

SMP – Safety Management Plan

A Safety Management Plan describes the steps to be taken to ensure the safety of the project stakeholders and beneficiaries.

Smart Device

Refers to smartphone, smartwatch and similar personal devices that may be internet enabled and are equipped with sensors.

TAG – Transportation Advisory Group

The TAG is a diverse group of community stakeholders and business representatives interested in the advancement and improvement of public transportation in the HIRTA service area.

TNC – Transportation Network Company

Encompasses a group of companies that provide on-demand Ridehailing services.

Wayfinding

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Office of the Assistant Secretary for Research and Technology Intelligent Transportation Systems Joint Program Office

Refers to the tools and technologies that assist in orientation, locating objects, and step-by-step navigation to destinations in outdoor and indoor environments using visual markers, sensors or physical signage

12. Appendix B: Additional Measures Considered

MPM- Impact Stage	MPM- Trip Stage	MPM- Category	Goal	Objective	Performance Measures	Description	Priority
Core	Pre-trip	Availability	G2	G2O1	Number of availability of options by underserved group needs	Measuring the capability of the system to meet the needs of all underserved groups. Measured individually for each of the 6 target groups.	Medium
Core	Pre-trip	Availability	G2	G2O1	Trip deferment	Measuring the instances when trips were not taken due to lack of options. Measured as number of trips deferred/100 trips	Medium
Core	Trip	Availability	G2	G2O3	Service redundancy	Available capacity for dynamic reassignment in the event of a service anomaly. May be searched by Traveler or automatically assigned by the system. Measured as number of available options at the point of disruption	Medium

MPM- Impact Stage	MPM- Trip Stage	MPM- Category	Goal	Objective	Performance Measures	Description	Priority
Core	Pre-trip	Reliability	G2	G2O1	Transportation option reliability	Percentage of time same menu of options are available for recurring trips for each underserved group when searched per their preferences	Medium
Core	Post-trip	Reliability	G2	G2O3	Travel-time reliability	Measured as standard deviation of actual travel time	Medium
Core	Trip	Time	G2	G2O1, G2O3	Offset time	measured in terms of window needed for pick-up time. Current standard is +/-10 minutes	Medium
Core	Trip	Time	G2	G2O1, G2O3	Wait time	Delta between Traveler's arrival at pickup location and actual pickup time. Measured in number of minutes	Medium
Core	Post-trip	Safety	G2, G5	G2O3, G5O1	Impact of trips not taken (deferred/no- showed/missed)	Traveler input on impact of trips not taken. Consequential impact or higher order care needed linked to trips not taken.	Medium
Core	Post-trip	Safety	G2, G5	G2O3, G5O1	Measurable improvements in health with trips taken	 Measurable outcomes in health: Critical care: (dialysis, cancer treatment delivered) Preventive care (vaccinations targets met) Ad-hoc: (urgent care needs addressed) 	Medium

MPM- Impact Stage	MPM- Trip Stage	MPM- Category	Goal	Objective	Performance Measures	Description	Priority
Core	Trip	Customer Satisfaction	G2	G2O3	Enhanced on-board experience	Traveler's input on information provided while on-board and general on-board experience	Low
Core	Post-trip	Customer Satisfaction	G2	G2O1, G2O2, G2O3	Improved experience with patient care	Traveler input on improved experience with availability of Health Connector tools	Low
Core	Post-trip	Customer Satisfaction	G2	G2O2	Comfort level in unfamiliar environment	Traveler input on improved experience with availability of Health Connector tools inside unfamiliar surrounding with the help of outdoor and indoor wayfinding tools and other traveler information.	Low
Tier 1	Trip	Capacity	G3	G3O2	Accuracy of predictive demand	Historical analysis of demand to predict the level of capacity needed	Low
Tier 1	Pre-trip	Effectiveness/ Efficiency/ Cost	G4	G4O2	Resources spent per trip on coordination by agency	Number of minutes spent per trip by HIRTA, DCHD and healthcare staff in coordination, measured by underserved group category	Medium
Tier 1	Trip	Effectiveness/ Efficiency/ Cost	G3	G3O2	Wait time	Avg. number of minutes spent waiting per trip	Medium

MPM- Impact Stage	MPM- Trip Stage	MPM- Category	Goal	Objective	Performance Measures	Description	Priority
Tier 1	Post-trip	Effectiveness/ Efficiency/ Cost	G4	G4O1	System cost	Total cost of delivering medical transportation per month without any subsidy;	Medium
Tier 1	Post-trip	Effectiveness/ Efficiency/ Cost	G4, G3	G4O1, G3O3	Annual system subsidy	Subsidy levels per trip	Low
Tier 1	Post-trip	Effectiveness/ Efficiency/ Cost	G3	G3O2	Missed trips per month	Number of missed trips per month	Medium
Tier 1	Post-trip	Effectiveness/ Efficiency/ Cost	G3	G3O1	Missed medical appointments due to transportation per month	Missed medical appointments due to lack of transportation access	Medium
Tier 1	Post-trip	Effectiveness/ Efficiency/ Cost	G4	G4O4	Efficient cost allocation and billing	Ability to allocate cost and bill appropriate funding sources in an accurate and timely manner. Measured in terms of staff time spent.	Medium
Tier 1	Post-trip	Utilization	G4	G4O1	Revenue miles and hours	Revenue miles and hours spent per trip	Medium
Tier 1	Post-trip	Safety	G5	G5O2	Incidents	Number of incidents per 100 trips systemwide	Medium
Tier 1	Post-trip	Safety	G5	G5O2	Driver injuries	Number of driver injuries per 100 trips systemwide	Medium
Tier 2	Pre-trip	Accessibility	G1	G1O1, G1O2	Increased access to medical facilities by underserved	reduction in number of medical appointment no-shows	Medium

MPM- Impact Stage	MPM- Trip Stage	MPM- Category	Goal	Objective	Performance Measures	Description	Priority
Tier 2	Post-trip	Safety/Health, Social	G1	G1O3	Health outcome in the Community	Measurable outcomes in health: Critical care: (dialysis, cancer treatment delivered) Preventive care (vaccinations targets met) Ad-hoc: (urgent care needs addressed)	Medium

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