Snapshot Analysis Development
Draft Report

Metropolitan Transportation Commission
February 2010

Snapshot Analysis Development Draft Report

Table of Contents

Executive Summary **1**

1. Introduction and Background **1**
2. Regional Context **2**
3. Developing the Snapshot Metrics **7**
4. Initial Mapping and Refinements **10**
5. Recommendations **14**

List of Figures

Figure 1. Bay Area Population Concentrations in Communities of Concern by Race/Ethnicity 2
Figure 2. Bay Area Population Concentrations in Communities of Concern by Low-Income Status 3
Figure 3. Weekday Trips by Person Type by Income Status 4
Figure 4. Weekday Trips by Mode by Household Income Group 4
Figure 5. Workers by Income Status and Work Location by County of Residence 5
Figure 6. How the Snapshot Analysis can inform other regional planning activities. 7

List of Tables

Table 1. Proposed Snapshot Analysis metrics 9

Appendix A: List of Maps

Map 1. Names and locations of MTC's 44 communities of concern. A–3
Map 2. Transit service frequency, 2009. ..... A–4
Map 3. Change in transit service 2006–2009 ..... A–5
Map 4. Walkability (destinations reachable by walking), 2006 ..... A–6
Map 5. Auto availability (households with at least one vehicle), 2000. ..... A–7
Map 6. Transportation availability index. A–8
Map 7. Access to essential destinations by 30-minute transit trip, 2006. ..... A–9
Map 8. Access to essential destinations by 30-minute auto trip, 2006. ..... A–10
Map 9. Transportation costs as percent of income for low-income households, 2000. ..... A–11
Map 10. Housing + transportation costs as percent of income for low-income households, 2000. ..... A–12
Map 11. Total reported bicycle collisions, 2006 ..... A–13
Map 12. Total reported pedestrian collisions, 2006. ..... A–14
Map 13. Fine diesel particulate emissionsfrom on-road mobile sources, 2005. ..... A–15
Map 14. Fine diesel particulate emissions from on-road mobile sources as a share of total from all sources, 2005. ..... A–16

Appendix B: Detailed Tables

Detailed Tables by Community of Concern B–1

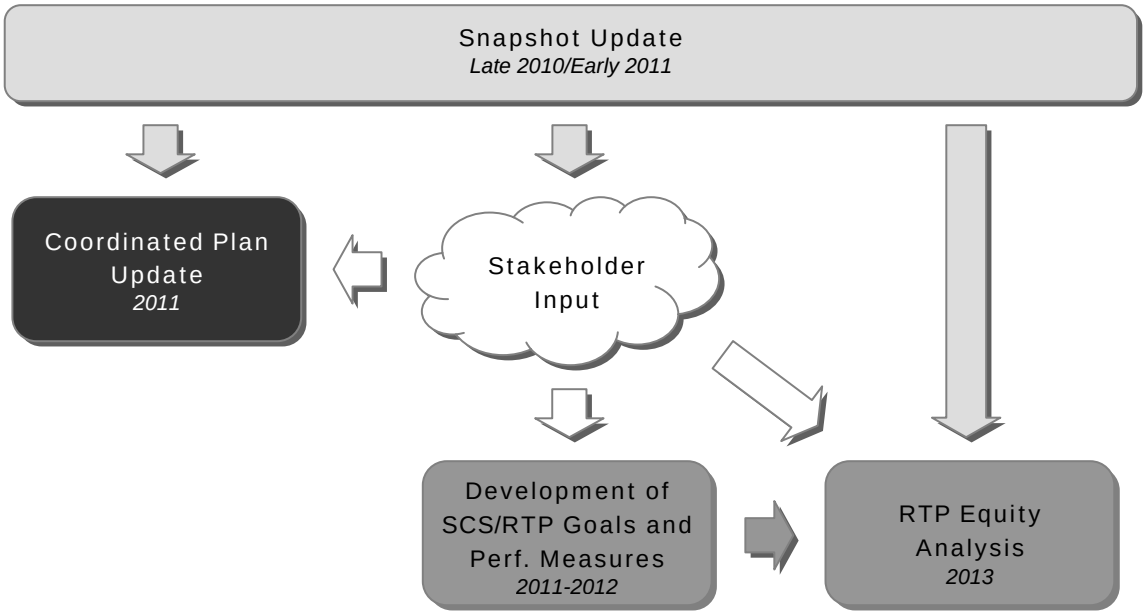
Executive Summary

The purpose of this report is to summarize the development of the Metropolitan Transportation Commission's Snapshot Analysis of transportation-related indicators for the nine-county Bay Area's low-income and minority communities of concern. The idea of a Snapshot Analysis is to take a picture in time of current transportation-related conditions (using specific metrics or indicators). Put together, these pictures of these various indicators can show where differences exist within the region at a point in time, and over time can show how conditions are changing in communities of concern and throughout the region. To provide input on the development of the Snapshot Analysis metrics, members of MTC's Minority Citizens Advisory Committee (MCAC) formed a new Equity Analysis Subcommittee which met regularly with MTC staff and other interested stakeholders through 2009 to identify goals for the analysis, prioritize key questions for the analysis to address, provide input on proposed metrics and draft maps illustrating these metrics, and develop recommendations for future Snapshot Analyses.

Regional Context

MTC defines communities that have concentrations of either minority or low-income residents (below 200% of the federal poverty level) as communities of concern for the purpose of analyzing regional equity. Minorities are defined as those individuals who identify their race or ethnicity as Asian, black or African American, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, other or multiple races, or Hispanic/Latino. MTC has identified 44 distinct communities in the region that meet MTC's defined thresholds of having at least 70% minority or 30% low-income residents. Still, 45 percent of the region's low-income residents,27 percent of minority residents, as well as other transportation-disadvantaged populations such as seniors and people with disabilities, live outside of communities of concern.

MTC undertakes several regional planning activities that can be informed by timely information gleaned from a Snapshot Analysis. These include development of the regional Coordinated Public Transit–Human Services Transportation Plan, as well as the long-range Sustainable Communities Strategy (SCS) MTC plans to develop in conjunction with its next Regional Transportation Plan (RTP), as shown below:



Developing the Snapshot Metrics

To develop the list of metrics to be explored in the Snapshot Analysis, staff worked with members of the MCAC Subcommittee to identify high-priority questions they would like the Snapshot Analysis to answer. Staff then identified specific metrics to address those questions using data MTC currently collects or uses regularly. The proposed metrics are:

Theme	Related Key Questions	#	Measure	Data Source
Transportation Availability and Choices	How frequent is the transit available? How many households have access to autos? How walkable are neighborhoods?	1	Transit service frequency	Regional Transit Database
		2	Change in transit service 2006-2009	Regional Transit Database
		3	Walkability (destinations reachable by walking)	CA Employment Development Department (EDD) and MTC calculations
		4	Auto availability (households with at least one vehicle)	Census Bureau
		5	Transportation availability index	MTC calculations based on #1, 3, 4
Accessibility	How accessible are essential destinations?	6	Access to essential destinations by 30-minute transit trip	EDD, MTC travel model
		7	Access to essential destinations by 30-minute auto trip	EDD, MTC travel model
Affordability	How affordable is transportation to residents?	8	Transportation costs as percent of household income	Center for Neighborhood Technology
		9	Housing + transportation costs as percent of household income	Center for Neighborhood Technology
Safety	How safe is it for residents to get to their destination?	10	Total bicycle collisions	CA Statewide Integrated Traffic Reporting System (SWITRS)
		11	Total pedestrian collisions	CA Statewide Integrated Traffic Reporting System (SWITRS)
Environment	What is the emissions density of diesel particulates and how does the transportation system impact it?	12	Total fine diesel particulate emissions from on-road mobile sources	Bay Area Air Quality Management District estimates
		13	Fine diesel particulate emissions from on-road mobile sources as a % of total from all sources	Bay Area Air Quality Management District estimates

While not every question posed by MCAC could be answered with available data, the list of proposed metrics represents the best effort to link MCAC's priority questions with MTC's available data. Discussion of the mapping of these metrics is provided in Section 4 of this report.

Recommendations

After presenting the draft maps of the proposed metrics to MCAC Subcommittee members, staff reviewed all the comments and feedback received from subcommittee members and other interested stakeholders and formulated recommendations for how the Snapshot Analysis should be utilized going forward:

1. Following the release of 2010 Census data and American Community Survey 5-year estimates, update Census data for communities of concern and re-examine how to address in future analyses the region's low-income and minority populations living outside of today's

communities of concern, as well as other transportation-disadvantaged populations including seniors and people with disabilities. *(Timeframe: Late 2010/2011)*

2. Update and review Snapshot metrics listed in Table 1 during the development of the next Regional Transportation Plan and the update of the Regional Coordinated Public Transit–Human Services Transportation Plan and make data available online, including online interactive maps when available, and with transit frequency data broken out by mode. *(Timeframe: Early 2011)*

3. Ensure that members of the new Policy Advisory Council give input on the next Bay Area Travel Survey *(timeframe: Late 2010)*:
    - Consistency of household income and automobile availability data across MTC's data collection efforts
    - Data collection for transportation-disadvantaged populations, including low-income people, older adults, and people with disabilities.

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1. Introduction and Background

The purpose of this report is to summarize the development of the Metropolitan Transportation Commission's Snapshot Analysis of transportation-related indicators for the nine-county Bay Area's low-income and minority communities of concern. Development of the Snapshot Analysis was intended to explore differences in transportation-related conditions (such as transit and auto availability, access to destinations, and the like) that exist within the region today and which can be tracked over time.

Development of the Snapshot Analysis emerged as a recommendation from the *Transportation 2035 Equity Analysis Report* as a way to provide greater specificity than can be provided by the regional-level, forecasting emphasis that the long-range regional transportation plan's Equity Analysis. The Snapshot Analysis, therefore, seeks to capture changes in conditions over time, with the goal of more effectively answering the question "Are transportation-related conditions improving in communities of concern?"

To provide input on the development of the Snapshot Analysis metrics, members of MTC's Minority Citizens Advisory Committee (MCAC) formed a new Equity Analysis Subcommittee following the conclusion of the work of the Transportation 2035 Equity Analysis Subcommittee. This subcommittee met regularly with MTC staff and other interested stakeholders throughout 2009 to identify goals for the analysis, prioritize key questions for the analysis to address, provide input on proposed metrics and draft maps illustrating them, and review proposed recommendations emerging from the exploratory process. This development process is explained in greater detail in Section 3.

The remainder of this report describes the Snapshot Analysis in the regional context of communities of concern, describes the process by which the metrics were developed and initially evaluated, presents the initial findings from mapping the selected metrics, and provides recommendations and next steps for utilizing the Snapshot framework in MTC's other major planning activities.

2. Regional Context

Communities of Concern in the Regional Context

MTC defines communities that have concentrations of either minority or low-income residents (below 200% of the federal poverty level) as communities of concern in analyzing regional equity. Minorities are defined as those individuals who identify their race or ethnicity as Asian, black or African American, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, other or multiple races, or Hispanic/Latino. MTC has identified 44 distinct communities in the region that meet MTC's defined thresholds of having at least 70% minority or 30% low-income residents as of the 2000 Census (the most recent year for which demographic and socioeconomic data exist at these communities' fine-grained level of geography).[1] A reference map of these communities is provided in **Map 1** in the Appendix.

Residents of all communities of concern together were 77 percent minority and 35 percent low-income in 2000. By comparison, the region as a whole in 2000 was 50 percent minority and 21 percent low-income. As a whole, residents of communities of concern represented 33.2 percent of the region's 2000 population, which includes the entire populations living in these geographically defined communities, including those who are members of any minority group (23 percent of residents) and not defined as low-income (66 percent of residents).

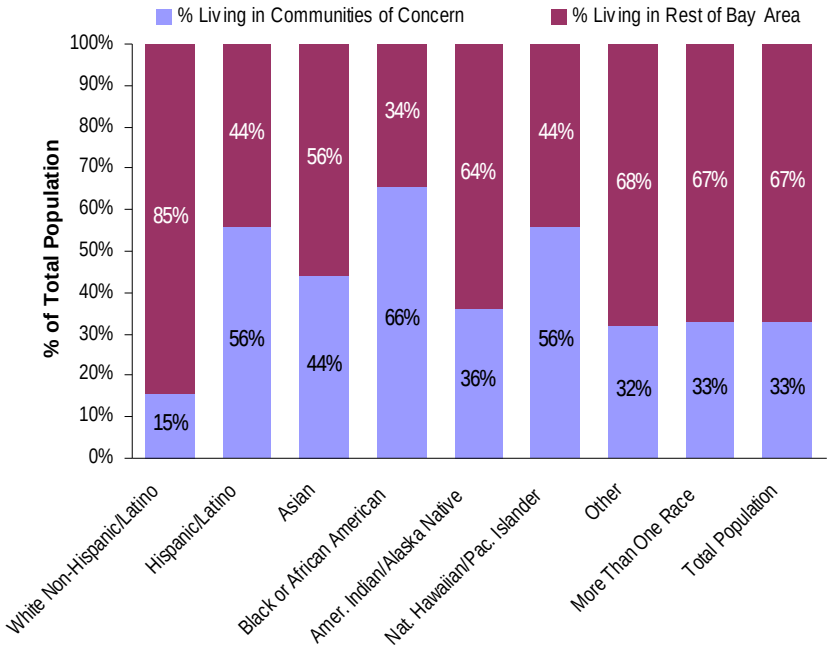

Figure 1. Bay Area Population Concentrations in Communities of Concern by Race/Ethnicity. (Source: 2000 Census)

While communities of concern comprise regional *concentrations* of minority and low-income populations, 45 percent of the region's low-income residents, and 27 percent of minority residents live outside of communities of concern.. **Figure 1** shows the distribution of various

[1] More discussion of and descriptive statistics for MTC's communities of concern can be found in the *Transportation 2035 Equity Analysis Report*, available at http://www.mtc.ca.gov/planning/2035_plan/equity.htm.

racial and ethnic populations in communities of concern relative to the rest of the Bay Area. **Figure 2** shows the distribution of the region's low-income and non–low-income populations in communities of concern.

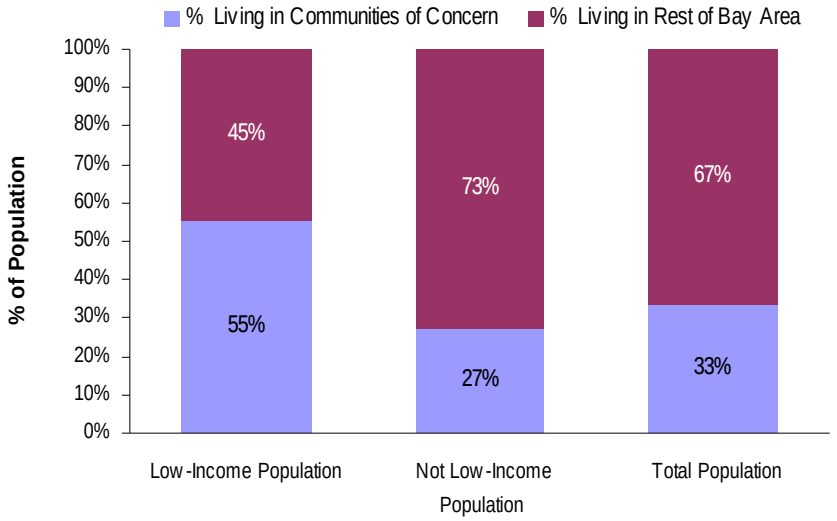

Figure 2. Bay Area Population Concentrations in Communities of Concern by Low-Income Status. (Source: 2000 Census)

As Figure 2 shows, nearly half of the region's low-income residents (45 percent of the region's total low-income population of 1.4 million in 2000) live outside communities of concern, while 27 percent of the region's non–low-income population live in communities of concern.

Regional Travel Trends for Low-Income Users

This section presents characteristics of low-income travelers in the Bay Area as they compare to those of higher-income travelers, including information on who is traveling, how they travel, and where they commute to work. Data are presented from MTC's 2000 Bay Area Travel Survey (BATS) for all person and trip types, and from the 2000 Census 5% Public Use Microdata Sample for workers and work trips. BATS presents data for *household* income status (low-income is defined as having household income below $35,000 in 1999 dollars, or about $45,000 in 2009 dollars[2]), while the Census presents data for workers by *individual* income status (low-income is defined as being below 200% of the federal poverty threshold; this level changes from year to year and is based on a person's household income, size, and composition). Both definitions are used regularly by MTC to characterize individuals and households as low-income.

The makeup of the types of travelers making trips varies notably between travelers living in low-income households versus non–low-income households. **Figure 3** shows that while the greatest share of trips made by low-income travelers are made by full- or part-time workers, more than half of all low-income person-trips are made by students, non-workers, and retirees. In other

[2] Inflation adjustment based on Bureau of Labor Statistics' annual Consumer Price Index for urban consumers (CPI-U) in the San Francisco–Oakland–San Jose Metropolitan Statistical Area for 1999 and 2009.

words, a low-income traveler is more likely than a non–low-income traveler to be a member of one of these three categories.

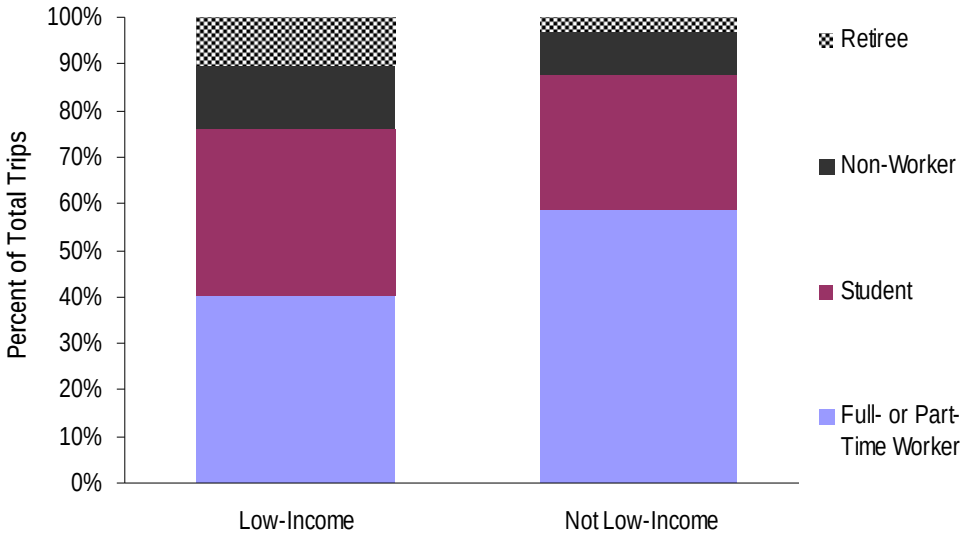

Figure 3. Weekday Trips by Person Type by Income Status.
(Source: Bay Area Travel Survey 2000.)

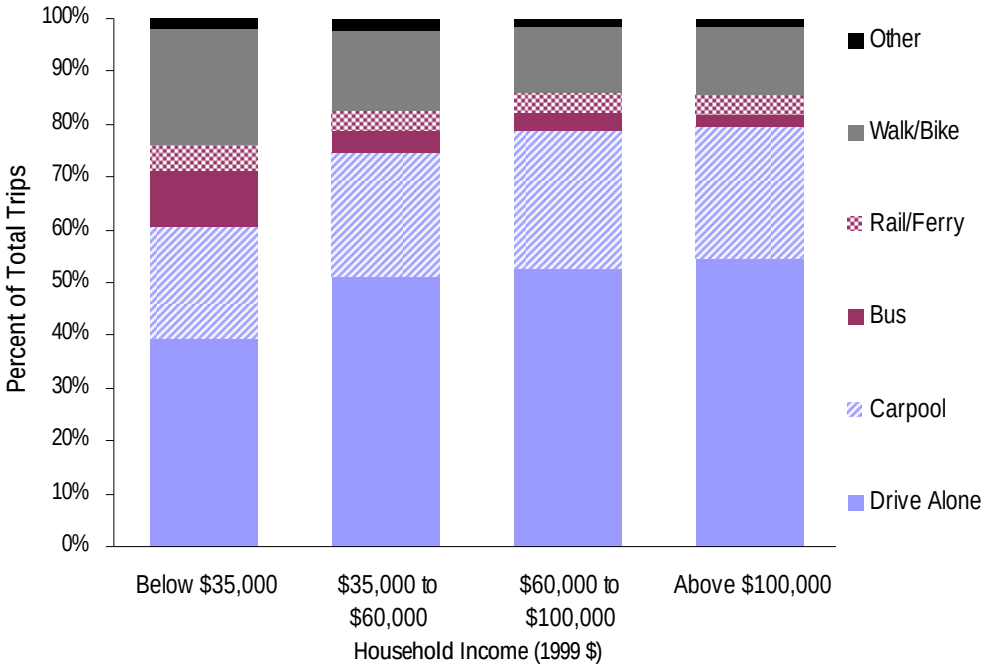

Figure 4. Weekday Trips by Mode by Household Income Group.
(Source: Bay Area Travel Survey 2000.)

Figure 4 shows the travel mode for all weekday trips by income group. These data reveal a notably different mode split for low-income households relative to higher-income groups. While most trips by travelers in low-income households are made by driving alone (similar to other

income groups), only 39 percent of low-income travelers' trips are made this way, compared to over 50 percent of trips for other income groups. Walking and biking combined are the second most frequent mode of travel for low-income travelers (22 percent of trips), which is unique to this income group, while the third most common trip mode is carpooling (21 percent of trips). For higher-income households, carpooling is the second-most common mode of travel, followed by walking and biking. Travelers in low-income households are more likely than other groups to make trips by both bus (10 percent of all trips) as well as by rail and ferry (5 percent of all trips, which combine light rail, BART, commuter rail, and ferries). A low-income traveler is about twice as likely to make a bus trip as a non–low-income traveler.

Focusing on commuters and work trips only, **Figure 5** shows the share of workers residing in each of the region's nine counties broken down by income (low-income or not low-income) and work location (work within their county of residence or work outside their county of residence) as of 2000. Napa, Sonoma, and San Francisco Counties have the highest shares of workers residing in these counties who are low-income. Of the nine counties' respective low-income resident workers, San Mateo and Contra Costa Counties have the highest share that commute outside the county to work, which means low-income workers in these counties may be more likely to take on greater time and financial burdens by whatever mode they commute (whether due to driving more miles and/or paying tolls, or due to paying higher distance-based or multiple operators' transit fares).

In terms of total resident worker population, Alameda and Santa Clara Counties have the highest numbers of resident low-income workers (about 96,000 and 94,000, respectively); Alameda County has the greatest number of low-income workers who travel outside their county to work (about 22,000), followed by Contra Costa County (about 15,000). Region-wide, 19 percent of low-income workers commute outside their county of residence, compared to 28 percent of non–low-income workers.

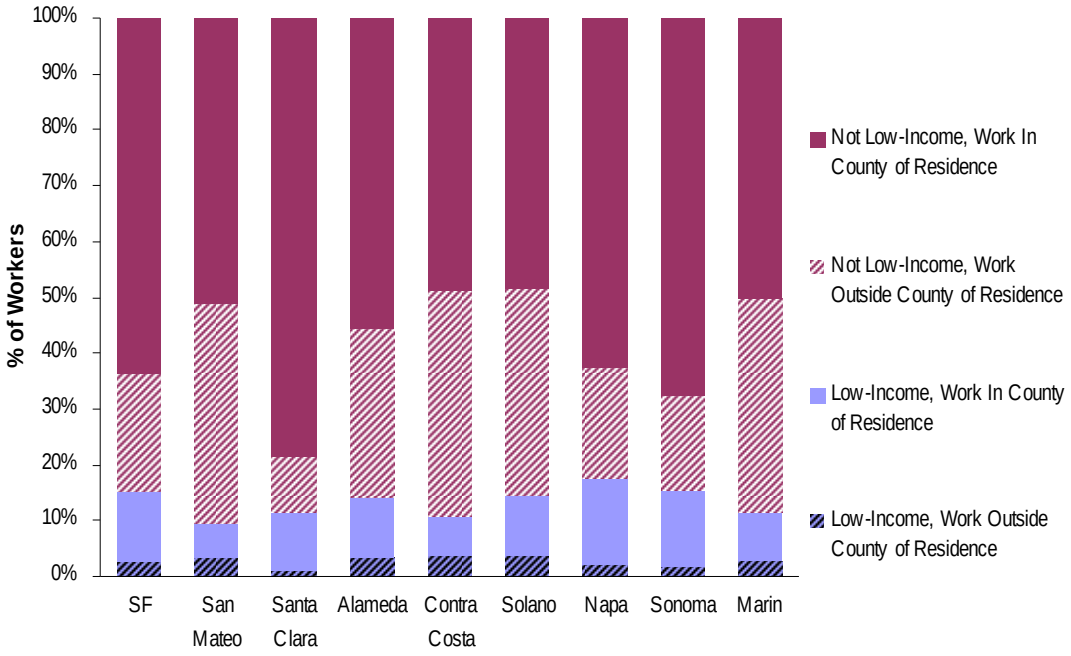

Figure 5. Workers by Income Status and Work Location by County of Residence. (Source: Census 2000 5% PUMS)

Communities of Concern in MTC's Regional Planning Context

In addition to collecting and analyzing data on the region's low-income and minority communities and populations, MTC also undertakes a variety of planning and funding efforts directed toward low-income or minority communities of concern and populations in the region. Some, such as the ongoing Community Based Transportation Planning[3] and Lifeline Transportation Programs,[4] focus on the region's low-income communities and residents regardless of minority status, age, or disability. These programs identify transportation gaps and potential solutions via local collaborative planning, and provide funding opportunities to close those gaps. The federally required Coordinated Public Transit–Human Services Transportation Plan[5] (next scheduled to be updated in 2011) emphasizes all transportation-disadvantaged populations recognized in federal programs, including low-income people, seniors, and people with disabilities, to identify regional needs and potential solutions across these populations.

The federally required Equity Analysis of MTC's long-range regional transportation plan (RTP),[6] next scheduled to be updated in 2013, focuses on low-income and minority communities of concern to ensure that these communities share equitably in the benefits of MTC's long-range transportation investments without bearing a disproportionate share of the burdens. The next update of the RTP will be the first to incorporate a Sustainable Communities Strategy (SCS) as required under California's SB375, which is intended to align regional housing and transportation planning to meet specific greenhouse-gas reduction targets.

The most recent long-range equity analysis, summarized in the *Transportation 2035 Equity Analysis Report*, found that overall, similar or greater benefits accrue to low-income and minority communities of concern under the Transportation 2035 Plan than the remainder of the region in terms of most of the indicators used in the analysis: accessibility to low-income jobs and non-work activities, housing and transportation affordability, and emissions of toxic air contaminants. However, the Equity Analysis also found that in the base year 2006, the region's communities of concern were less affordable to residents in terms of combined housing and transportation costs, and had a greater share of the region's emissions of toxic air contaminants compared to non–communities of concern. While the long-range analysis forecast both of these indicators as improving in communities of concern by the horizon year of 2035, the Snapshot Analysis provides a useful tool to measure these and other conditions in the interim.

Figure 6 illustrates how data from the Snapshot Analysis can serve to inform other regional planning activities.

[3] See http://www.mtc.ca.gov/planning/cbtp/ for more information about the Community Based Transportation Planning Program.
[4] See http://www.mtc.ca.gov/planning/lifeline/ for more information about the Lifeline Transportation Program.
[5] See http://www.mtc.ca.gov/planning/pths/ for more information about MTC's Coordinated Public Transit–Human Services Transportation Plan.
[6] See http://www.mtc.ca.gov/planning/2035_plan/equity.htm for MTC's most recent long-range equity analysis, the *Transportation 2035 Equity Analysis Report*.

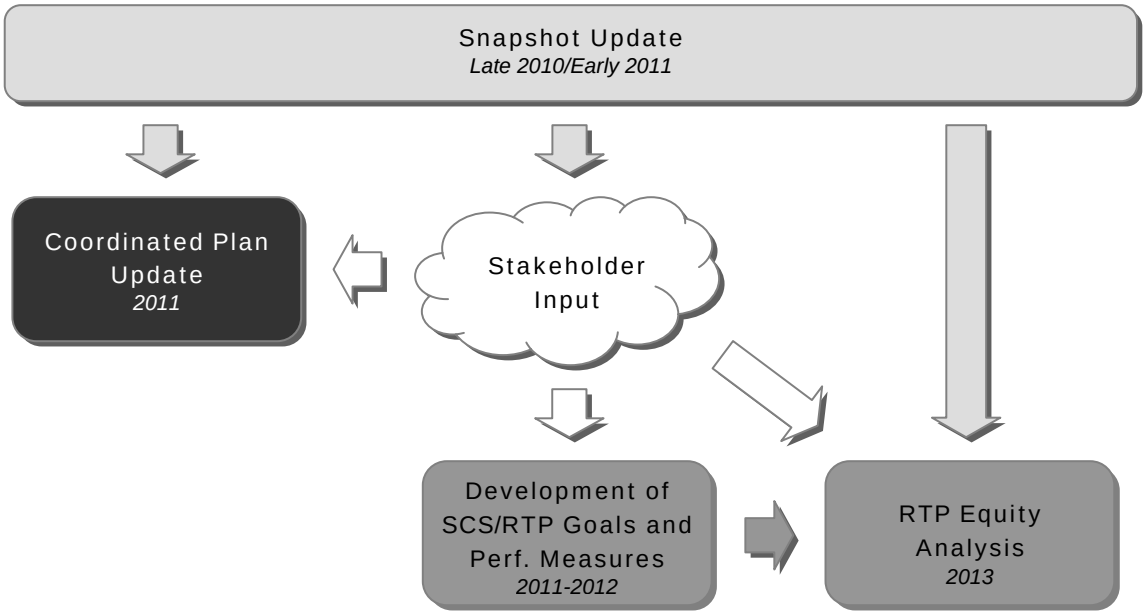

Figure 6. How the Snapshot Analysis can inform other regional planning activities.

3. Developing the Snapshot Metrics

Identification of Snapshot Goals

After reviewing the results and recommendations of the Transportation 2035 Equity Analysis in December 2008, MTC's Planning Committee directed staff to work with members of MTC's Minority Citizens Advisory Committee and other interested stakeholders to develop a methodology for a Snapshot Analysis that could drill down further into characteristics of low-income populations and communities of concern and help refine the approach to subsequent RTP Equity Analyses.

Based on initial discussions with MCAC's Equity Analysis Subcommittee in early 2009, staff identified two goal statements to frame the development of the Snapshot Analysis:

1. *To better understand transportation-related differences between and recent changes in communities of concern and for transportation-disadvantaged populations.*

2. *To bring analysis findings and results to MTC's Planning Committee for consideration in future RTP Equity Analysis methodologies.*

The first goal would be accomplished primarily by developing a list of key transportation-related questions that MCAC Subcommittee members saw as priority issues for communities of concern, developing a set of metrics that matched regionally available data with these key questions, and mapping the metrics and exploring the results. The second goal would be accomplished by discussing these results and further exploring ways the information revealed could inform the development of goals and performance measures for future Regional Transportation Plans and long-range Equity Analyses.

Development of Priority Questions and Available Data

Under previous long-range Equity Analysis methodologies, the availability of transportation-related equity metrics was limited to those variables for which MTC is able to produce long-range regional forecasts. Thus, an important first step in developing metrics to analyze via a Snapshot Analysis was to prioritize key questions about the transportation system that MCAC Subcommittee members and other stakeholders would like the Snapshot to be able to answer. Discussions revealed the following questions as being high-priority:

- Can residents get where they need to go?
- Has transit service increased or decreased?
- How reliable is the transit service?
- Has auto access increased or decreased?
- Have other transportation options (car sharing, shuttles) increased or decreased?
- How much are residents spending on transportation costs, and is it affordable?
- Are residents able to access essential destinations without autos?
- Is it safe to walk or bike places, or are there barriers or hazards?
- Are transit stops and vehicles secure, well-lit, and comfortable?
- Has air pollution increased or decreased?

Next, MTC staff reviewed regionally available data sources to match existing data that could be applied to answering these questions with regionally available and consistent data sets.[7] These data sources included U.S. Census Bureau products (including the decennial Census, American Community Survey, and the Census Transportation Planning Package); MTC regional data sources (Bay Area Travel Survey, Transit Passenger Demographics Survey, Regional Transit Database, MTC travel model); and other data sources to which MTC has access, both public and proprietary (the California Highway Patrol's Statewide Integrated Traffic Records System, emissions data from the Bay Area Air Quality Management District, employment and commercial data from the California Employment Development Database, and transportation affordability data provided to MTC by the Center for Neighborhood Technology).

A desirable feature of data sources used in answering the MCAC Subcommittee's key questions was that they be updated on a regular basis, in order to be able to show changes over time.

Unavailable or Inconsistent Data

After reviewing regionally available data sources, it was clear that information needed to answer some of the priority questions was either unavailable, not available for all areas of the region, or not provided in a regionally consistent form. Examples included a lack of data on amenities at transit stops such as lighting, benches, and shelters; a lack of regionally available or consistent data about crime at or near transit stops or in vehicles; and a lack of available data specifically on fare payments made by low-income transit riders (which would require more detailed data on length and frequency of trips, fare media used, and number of transfers required to complete a trip); as well as a lack of regionally consistent data on transit ridership and operating costs on a route-by-route basis. In addition, there is a lack of regionally consistent data on qualitative aspects of the transportation system, such as whether it serves people's needs or whether they feel comfortable using it.

[7] For more information on MTC's regional sources of demographic, socioeconomic, and transportation data, see MTC's DataMart page at http://www.mtc.ca.gov/maps_and_data/datamart/index.htm.

Some data sources offered regionally available data, but couldn't represent the entire scope of issues with which MCAC Subcommittee members were concerned. For example, California's Statewide Integrated Traffic Reporting System (SWITRS) reports on-road collisions involving pedestrians and bicyclists, but doesn't include collisions not reported to police, or those occurring on private property or off-road locations. In this case, Subcommittee members felt the data could be used on its own, but further exploration should be made of how to get a more complete picture of pedestrian and bicyclist safety in the region.

Answering some of these questions more thoroughly would require more involved data collection on the part of local jurisdictions or individual survey work to assess people's attitudes and experiences.

Proposed Snapshot Metrics Using Available Data

Finally, MTC staff summarized the key questions that could be matched with available regional data into a list of proposed Snapshot metrics, as listed in **Table 1** and grouped by overall theme. Some of MCAC's original key questions were refined slightly to reflect how the available data would answer them.

Staff prepared draft maps illustrating the desired data at a fine-grained level of detail, typically Census block groups or MTC travel analysis zones, for the MCAC Subcommittee members' review and feedback.

Table 1. Proposed Snapshot Analysis metrics.

Theme	Related Key Questions	#	Measure	Data Source
Transportation Availability and Choices	How frequent is the transit available? How many households have access to autos? How walkable are neighborhoods?	1	Transit service frequency	Regional Transit Database
		2	Change in transit service 2006-2009	Regional Transit Database
		3	Walkability (destinations reachable by walking)	CA Employment Development Department (EDD) and MTC calculations
		4	Auto availability (households with at least one vehicle)	Census Bureau
		5	Transportation availability index	MTC calculations based on #1, 3, 4
Accessibility	How accessible are essential destinations?	6	Access to essential destinations by 30-minute transit trip	EDD, MTC travel model
		7	Access to essential destinations by 30-minute auto trip	EDD, MTC travel model
Affordability	How affordable is transportation to residents?	8	Transportation costs as percent of household income	Center for Neighborhood Technology
		9	Housing + transportation costs as percent of household income	Center for Neighborhood Technology
Safety	How safe is it for residents to get to their destination?	10	Total bicycle collisions	CA Statewide Integrated Traffic Reporting System (SWITRS)
		11	Total pedestrian collisions	CA Statewide Integrated Traffic Reporting System (SWITRS)
Environment	What is the emissions density of diesel particulates and how does the transportation system impact it?	12	Total fine diesel particulate emissions from on-road mobile sources	Bay Area Air Quality Management District estimates
		13	Fine diesel particulate emissions from on-road mobile sources as a % of total from all sources	Bay Area Air Quality Management District estimates

4. Initial Mapping and Refinements

This section describes the initial mapping of the proposed Snapshot metrics by theme and general trends revealed by the maps. While it generally isn't be possible to capture trends until the data are updated, the maps provide a starting point for understanding the variations within the region that exist today for each of the proposed metrics, and how they relate to communities of concern. All maps are located in Appendix A for reference. Summary tabulations of each Snapshot metric for all 44 communities of concern are located in Appendix B.

Transportation Availability and Choices (Maps 2–6)

These maps represent the transportation opportunities available to residents with respect to transit frequency, household auto availability, and walkability of neighborhoods. While they do not indicate what modes people might ultimately choose to travel in a particular area or why, they can give a sense of locations where some travel modes might not be available or practical for residents, for example because automobiles are not widely available, transit is not very frequent, or destinations are not reachable by walking. And since people with more travel options have greater opportunity to optimize their choices than people with fewer options, taken together they provide insight on residents' overall ability to choose the travel mode that best meets their

needs, based on factors such as cost, travel time, convenience, reliability, flexibility, or other needs.

Map 2 illustrates the overall transit service levels in different parts of the region as of February 2009, including existing rail, ferry, and bus weekday service frequencies. Service levels are measured based on the daily average number of times a transit vehicle stops each hour, for each transit mode. The data are collected from MTC's Regional Transit Database, which contains information for approximately 25,000 transit stops for the entire nine-county Bay Area (this database also powers the region's 511 Transit Trip Planner). The geographic level represented on the map is the location of each transit stop within a half-mile search radius. Locations with the most frequent transit vehicle stops are along San Francisco's main transit corridors, downtown Berkeley and Oakland, Central San Jose, and at major transit centers elsewhere in the region. Transit service is also more frequent along the region's major road and rail corridors. North Bay counties have transit frequencies that are mostly below the average for the region, except for parts of San Rafael and Santa Rosa.

Map 3 shows the difference between 2006 transit service levels and 2009 service levels. Areas are shown as having either an increase in transit frequencies (that is, a decrease in the average number of minutes between transit vehicles), a decrease in transit frequencies (an increase in minutes between vehicles, or having had some kind of service change between the two time periods that makes it difficult to compare average frequencies to each other. Based on feedback from MCAC Subcommittee members and other stakeholders, subsequent versions of these transit frequency maps will illustrate transit frequencies by mode.

In addition to transit availability, analyzing walkability of neighborhoods provides insight about the availability of walking as a mode of travel that is affordable, healthy, and sustainable for carrying out daily needs. And while anyone with a pair of shoes and a safe path of travel can enjoy walking for recreation, it is a viable form of transportation when there are a number and variety of destinations reachable within walking distance as an alternative to making an auto or transit trip. **Map 4** shows the walkability of different parts of the region with respect to the number and variety of essential destinations within walking distance.

Automobiles provide the most flexible and convenient, and often the fastest, mode of travel, but this convenience also comes with a high price in terms of auto ownership and operating costs. Of all low-income households in the Bay Area, 75 percent owned at least one automobile in 2006 (compared to 91 percent of all households).[8] **Map 5** shows the percentage of households with at least one vehicle available in 2000 at the Census block group level. Neighborhoods with below-average access to household autos are concentrated mostly in San Francisco; the Hayward, Oakland, Berkeley, Richmond, Vallejo communities of concern in the East Bay; the El Camino Real corridor in San Mateo County; Central San Jose; central Santa Rosa; and along the I-680 corridor and parts of the Pittsburg/Bay Point/Antioch community of concern in Contra Costa County.

[8] Source: 2006 American Community Survey estimates; see Chapter 3 of MTC's *Transportation 2035 Equity Analysis Report* for more discussion of auto ownership trends among low-income households.

Map 6 shows MTC's calculation of the Transportation Availability Index for each of the region's travel analysis zones, which is derived from combining the metrics shown in Maps 2, 4, and 5.

Accessibility (Maps 7 and 8)

Accessibility is frequently expressed as a measure of people's ability to reach destinations within a certain period of time by a certain travel mode, usually either auto or transit. It measures both whether the means to access destinations exists (such as a road, highway, or transit route) as well as the number of destinations reachable within a certain travel time from trip's origin. Thus, good accessibility results from having both a large number of destinations within a reasonable distance as well as the means available to get to them.

The metrics proposed for the Snapshot Analysis measure accessibility in terms of the number of essential destinations reachable within or near a neighborhood within 30 minutes, estimated using MTC's travel model for each of the region's 1,454 travel analysis zones. Essential destinations from the California Employment Development Department included in the analysis are schools, food stores (excluding liquor or convenience stores), health services, social services, post offices, banks, and places of worship.

Map 7 shows the number of essential destinations accessible by a 30-minute transit trip for each travel analysis zone in the region in 2006. It shows that above-average transit accessibility is concentrated regionally in San Francisco, Berkeley, and parts of Oakland and San Jose. Outside these areas, accessibility by transit is relatively poor throughout the region with few exceptions.

Map 8 shows the same accessibility to essential destinations within 30 minutes as the previous map but by automobile instead of transit. Obviously traveling by auto offers more consistent levels of accessibility throughout the region than by transit. Generally speaking, the closer in to the region's commercial centers of San Francisco, Oakland, Berkeley, and the South Bay, the higher the level of accessibility. The North Bay counties and outer East Bay have the lowest levels of accessibility relative to regional averages.

Affordability (Maps 9 and 10)

Affordability metrics examine the estimated annual cost of transportation as a percentage of income for low-income households (earning $35,000 per year in 1999 dollars), as well as the combined costs of housing plus transportation. Housing and transportation costs are examined together because many households may trade-off one or the other in making locational decisions, choosing cheaper housing and a longer commute, for example, or more expensive housing in dense areas where fewer autos are needed to meet daily needs. Transportation costs are estimated based on a model developed by the Center for Neighborhood Technology (CNT), which takes into account various household socioeconomic and neighborhood variables to estimate household transportation costs based on residential location.[9]

Map 9 shows average household transportation costs for low-income households at the Census block group level. Areas with below-average costs are concentrated in San Francisco, central

[9] For more information on housing and transportation affordability in the region, see MTC's report, *Bay Area Housing and Transportation Affordability: A Closer Look*, available at http://mtc.ca.gov/planning/smart_growth.

Oakland, Berkeley, and central San Jose. The North Bay and outer East Bay generally have higher-than-average household transportation costs than other parts of the region.

Map 10 shows both housing and transportation affordability combined at the Census block group level, based on housing cost data from the Census Bureau combined with CNT's transportation cost estimates. Although CNT recommends that the combined cost of housing and transportation not exceed 48% of a household's budget, only very small areas of San Francisco, Oakland, Berkeley, and downtown San Jose offer locations affordable to low-income households in terms of both housing and transportation costs. In terms of regional averages, communities of concern are more affordable to low-income residents than areas outside communities of concern. However, most of these communities are still not considered affordable to their residents in absolute terms of keeping housing and transportation costs below 48 percent of household income.

Safety (Maps 11 and 12)

Currently, the best available regional data source to analyze safety for bicyclists and pedestrians is the Statewide Integrated Traffic Records System (SWITRS), which is maintained by the California Highway Patrol (CHP), Caltrans, and the California Department of Motor Vehicles (DMV). SWITRS contains data on all reported vehicle crashes in California that occur on a public roadway, including collisions involving pedestrians and bicyclists. Location data from the database was aggregated to the traffic analysis zone level for regional analysis of the locations of such collisions.

Map 11 shows the total number of reported bicycle-involved collisions in 2006. Areas with above-average incidences of collisions are located throughout the region, with Berkeley and North Oakland being perhaps the largest concentration in terms of area, as well as Napa, southern Santa Rosa, and parts of Marin. The South Bay also features a patchwork of varying collision incidence rates covering a large area.

Map 12 illustrates similar data to Map 11 but for pedestrian-involved rather than bicycle-involved collisions. Concentrations of above-average collision rates in 2006 were in downtowns of several cities, including San Rafael, San Francisco (mid-Market/Civic Center), San Mateo, Palo Alto, Hayward, Alameda, Oakland, and Berkeley, areas which also have high pedestrian volumes.

It is important to note that neither of these maps measure or reflect issues of perceived safety while walking or biking, which were key concerns expressed by the MCAC Subcommittee.

Emissions (Maps 13 and 14)

Emissions of fine diesel particulate matter from on-road vehicles and other mobile and stationary sources are believed to have greater health impacts from localized exposure than many other kinds of pollutants such as those which form smog at a more regional level. Because fine diesel particulates (particles 2.5 microns or less in diameter which can become entrained in the lungs and cause health problems, also called $PM_{2.5}$) can come from both on-road sources (cars and trucks) as well as other off-road mobile and stationary sources such as ships, construction equipment, and industrial sources, this analysis looks at both the amount of emissions from on-road vehicles as well as these vehicles' share of the total emissions for a given area.

Estimated emissions data are provided by the Bay Area Air Quality Management District (BAAQMD) as the quantity of diesel $PM_{2.5}$ emitted by on-road sources in pounds per day over a 1-km-square grid covering the BAAQMD region (which does not include parts of Sonoma and Solano Counties which are in other air basins). While these emissions data are not a direct measure of air quality (which takes into account other environmental and meteorological factors), they serve to highlight areas of potentially greater localized exposure risk. BAAQMD has conducted its own exposure risk assessment through the Community Air Risk Evaluation (CARE) Program,[10] taking into account a variety of emissions, air quality, and socioeconomic factors in determining localized risks of exposure to toxic air contaminants including diesel PM.

Map 13 shows the estimated inventory of diesel $PM_{2.5}$ emitted from on-road mobile sources in 2005. Areas with highest emissions from on-road sources relative to regional averages include several areas with heavy freeway traffic and/or major interchanges, including South of Market in San Francisco, the I-80 corridor in Berkeley, the I-880 corridor in Oakland to Highway 238, and most other major freeway interchanges in Alameda County.

Map 14 illustrates the same data presented in Map 13 but as a share of the total diesel $PM_{2.5}$ from all sources (including stationary and off-road mobile sources such as ships, construction equipment, and industrial sources).

Using the Maps

As presented, the maps illustrating the Snapshot metrics are static maps, but together they can provide a wealth of additional informative analyses if used in combination with each other, for example by generating overlays of the data. An online, interactive mapping tool would be an ideal tool to allow users, including interested members of the public, to pull up this data for a given area and create their own maps to explore the data via a dedicated web site.

5. Recommendations

Based on comments and feedback from MCAC Subcommittee members and other interested stakeholders, staff recommends the following steps for using the Snapshot Analysis going forward:

1. Following the release of 2010 Census data and American Community Survey 5-year estimates, update Census data for communities of concern and re-examine how to address in future analyses the region's low-income and minority populations living outside of today's communities of concern, as well as other transportation-disadvantaged populations including seniors and people with disabilities. *(Timeframe: Late 2010/2011)*

2. Update and review Snapshot metrics listed in Table 1 during the development of the next Regional Transportation Plan and the update of the Regional Coordinated Public Transit–Human Services Transportation Plan and make data available online, including online

[10] For more information on BAAQMD's CARE Program, see http://www.baaqmd.gov/Divisions/Planning-and-Research/CARE-Program.aspx.

interactive maps when available, and with transit frequency data broken out by mode. *(Timeframe: Early 2011)*

3. Ensure that members of the new Policy Advisory Council give input on the next Bay Area Travel Survey *(timeframe: Late 2010)*:
   - Consistency of household income and automobile availability data across MTC's data collection efforts
   - Data collection for transportation-disadvantaged populations, including low-income people, older adults, and people with disabilities.

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