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I am Catherine L Ross a Professor at Georgia Institute of Technology in the Schools of City and Regional Planning and Civil and Environmental Engineering. I Direct the Center for Quality Growth and Regional Development (CQGRD) and serve as an Advance Prof. in the College of Design. I teach and have conducted extensive research on regional resilience and sustainability, megaregions, water resources management, energy, transportation, economic development, and Mobility-as-a-Service (MaaS).

Few factors shape the operation and character of regions and cities as much as transportation does. Transport is a primary driver in the lives of citizens in their daily pursuit of social and economic activities and goods and services that are mobility dependent. Transportation sustainability connects numerous sectors and activities and offers the promise of a more equitable, sustainable future. Resilient and efficient transport systems minimize health risks associated with air pollution, traffic injury, and poor physical activity. Such systems also provide access to better housing and higher quality communities.

Past transportation policies and practices have exacerbated the inequities in cities, communities, and regions and have failed to meet the changing travel and social needs of citizens and communities. Zoning regulations have caused physical separation of residential neighborhoods from business districts, encouraging dependence on private vehicles[1]. Interstate design has brought busy highways through communities of color, bringing smog, noise pollution, and destroying economic opportunity for some neighborhoods. Now, as the public

[1] World Health Organization. n.d. “Strategies for healthy and sustainable cities.” Accessed March 21, 2021. https://www.who.int/initiatives/urban-health-initiative/strategies

and private sectors actively engage in the construction of new infill housing and land recycling, there is an opportunity to reexamine and redesign aging infrastructure. These opportunities present the chance to undo some of the damage done to communities under urban renewal. In many communities, old infrastructure must be replaced and repurposed, including the deconstruction of unused highways and land, which can be redeveloped for other purposes. Such actions would help remove existing barriers to economic re-development - particularly in low-income communities. There is a unique opportunity to create healthier sustainable communities, regions and cities. The increased construction of infill housing means we can build better.

Transportation planning decisions have diverse equity impacts that affect both social and economic opportunities. These include the following: land values, the type and location of development, employment opportunities, access to healthcare, housing opportunities, and mobility. Transport equity requires equal treatment of communities, individuals and groups. However, we lack of the tools and strategies to measure transportation equity.

We might ask, who pays for transport accessibility and who benefits? Currently, approximately 80% of all surface transportation dollars are spent on highways with only 20% on transit. This spending pattern results in reduced mobility and accessibility options for many citizens, including those who are older, poorer, of different ethnicities, reside in lower income neighborhoods, students, and persons residing in rural and sparsely populated geographies. In addition, approximately 30 states limit the use of gasoline tax money so dollars can only be spent on roads, to the exclusion of transit.

Recently, I participated in a meeting whose focus was measuring equity in transportation planning, project selection, and decision-making. Numerous participants commented on the deconstruction difficulty and in some cases near impossibility of measuring transportation equity. One method for doing so is to divide the city, community, or region into different sectors and ask a really simple question. How much of our transportation dollars do we allocate on a per capita basis to people in each city, community, neighborhood or region?

All too often, decisions are made regarding the selection of a particular transportation project without understanding of the impact of that project on community health. In 2014, I

published a book entitled *Health Impact Assessment in the United States*. The book examines policies, large-scale construction project, and programs and asks, what is its potential impact on the health of the population? Do the negative health impacts out-weigh the positive benefits? Health Impact Assessment (HIA) is a cross-disciplinary method of answering complex health related questions. The Transportation and Health Tool (THT) developed by the U.S. Department of Transportation and the Centers for Disease Control and Prevention provides data that is used to examine health impacts of transportation systems. The tool includes data on transportation and public health indicators for states and metropolitan areas. In addition, it provides information that agencies can use to better understand the relationship and impact of transportation and health issues.

Universal design is the design of buildings, cities, or products so that they can be used to the fullest extent by all people, regardless of age, disability or other factors[2]. Traditionally, this concept was used to focus on reaching people of all physical abilities. However, this concept should be used when considering the design and function of urban life. When looking at housing and transportation, two of the basics of personal wellbeing, these systems should be designed for use by everyone – from highest to lowest income and regardless of ability.

Addressing Equity in Housing

One of the biggest roadblocks to racial equity is the disparity in homeownership in minority populations, particularly within the black community. Black homeownership reached a high of 46% in 2005, but those rates subsequently fell to 44% in 2010 and to 41% in 2015, as the 2008 recession hit the black community hard[3]. During the next decade, research predicts that these rates will continue to fall. Closing the housing disparity gap enables African Americans to accumulate wealth through property ownership. As such, this should be a national, state, and local housing policy goal. People of color are too often denied loans or insurance because they live in an area deemed to be a poor financial risk is discriminatory. Such

[2] Mace, Ronald. 1998. "The Principles of Universal Design". Last modified April 1, 1997. https://projects.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm

[3] Landis, John, and Vincent Reina. "Eleven Ways Demographic and Economic Change Is Reframing American Housing Policy." *Housing policy debate* 29, no. 1 (2019): 4-21. https://doi.org/10.1080/10511482.2018.1492739.

redlining practices are discriminatory and often results in residential loan terms and conditions that have more onerous terms. This effectively puts home ownership out of reach for residents of certain areas based on race or ethnicity. In 1992 in a study of lending discrimination by the Federal Reserve Bank of Boston determined that race was a significant factor in the decision to make or not make a loan (https://www.fdic.gov/regulations/laws/rules/5000-3860.html) . . Discrimination in lending on the basis of race or other prohibited factors is destructive, morally repugnant, and against the law.

Enabling minority communities to own homes is an important part of housing equity. It has been estimated that by eliminating disparities in black homeownership rates and home equity gain would shrink the racial wealth gap for African Americans by 31% and 16% respectively[4]. One consequence of excluding Black families from homeownership through discriminatory housing policies is that Black parents have less wealth to pass on to their children. This also makes it more difficult for prospective homebuyers to have the funds for a down payment. Down payment assistance (DPA) programs can be very helpful in this regard. They assist in bridging this gap through creating a tax credit that targets low-income, minority homebuyers, implementing savings matching programs to help families build assets, or expanding existing local and state DPA programs to reach eligible Black renters who may not otherwise look to purchase a house[5].

On a broader level, to address housing disparities, federal, state, and local governments must look at discriminatory laws and policies that continue to perpetuate low access to quality housing. For example, localities can reform their zoning codes to support a broader mix of homes in their communities. Allowing more apartments, permitting duplexes, and allowing for smaller home sizes are several ways that zoning can encourage more affordable home prices. Additionally, governments should go beyond these reforms and increase investment in

[4] Habitat for Humanity International. 2020. "The role of housing policy in causing our nation's racial disparities – and the role it must play in solving them." Accessed March 12, 2021. https://www.habitat.org/sites/default/files/documents/Racial-Disparities-and-Housing-Policy-.pdf

[5] Habitat for Humanity International. 2020. "The role of housing policy in causing our nation's racial disparities – and the role it must play in solving them." Accessed March 12, 2021. https://www.habitat.org/sites/default/files/documents/Racial-Disparities-and-Housing-Policy-.pdf

affordable housing developments, particularly in well-resources neighborhoods, to encourage non-segregated communities.

Equity in Transportation

While the design and development of the U.S. highway system is an engineering marvel, the permanent legacy of this system is one of destruction and displacement. Through the 1956 Highway Act, federal funds were used to build highways directly through cities, typically through communities of color. These highways, cutting through communities ,brought more congestion, more pollution, and thus greater health risks to these communities of color, which largely did not see the benefits of this "urban renewal" that cities promised. As the highway system is now over 50 years old and in dire need repair or redesign, state and local governments have the opportunity to reconsider some of the choices made long ago and find ways to support the communities that bore the adverse consequences of the expansion of the highway system.

One way to address community damage from highways is to remove or repurpose existing highway routes. Several communities have already done this successfully. For example, Greenville, South Carolina, tore out a four-lane highway bridge and replaced it with greenspace and a pedestrian bridge. Those actions brought investment to the previously underserved neighborhoods of its West End. Milwaukee, Wisconsin also tore down part of its freeway system, and eventually attracted over $880 million in private investment by opening up commercial and residential space in the 24-acre corridor[6]. Projects like these lower emissions, encourage walking or biking, and improve health outcomes in disadvantaged communities by reducing their exposure to harmful smog.

[6] Transportation for America. 2020. "A policy proposal to undo the damage of 'urban renewal'." Accessed March 13, 2021. https://t4america.org/2020/12/07/four-recommendations-to-undo-the-damage-of-urban-renewal/

Figure 1: Greenville, Sc pedestrian bridge that replaced a highway[7]

Transportation planning has historically been overwhelmingly automobile centric. This focus on the automobile has brought issues of congestion, long commutes, and air pollution. Additionally, many low-income households do not have access to private vehicles. Instead, they rely on alternatives, such as public transportation, biking, walking, or ridesharing services. While traditionally these low income, zero car households are located in major cities, the geography of poverty is changing. Between 2000 and 2012, the number of suburban low-income residents living in distressed neighborhoods grew by 139 percent—almost three times the pace of growth in cities[8]. As the government continues to spend 80% of transportation funds on roadways and highways, these low-income communities will be left with fewer affordable, safe options for transportation.

Buford Highway is a 50-mile thoroughfare that runs from the Midtown district of the City of Atlanta to Gainesville, a far-reaching suburb of Atlanta. Initially designed as the main North-South corridor through the metro area, it was replaced by the building of I-85 and I-285 in the mid-20th century. The nearby interstate system combined with an increase of industry in

[7] Transportation for America. 2020. "A policy proposal to undo the damage of 'urban renewal'." Accessed March 13, 2021. https://t4america.org/2020/12/07/four-recommendations-to-undo-the-damage-of-urban-renewal/
[8] Federal Highway Administration. 2014. "Mobility Challenges for Households in Poverty." Accessed March 20, 2021. https://nhts.ornl.gov/briefs/PovertyBrief.pdf

the area made Buford Highway a popular place for lower- and middle-income families to live. Then, as the factories of the area slowed down and rental vacancy rates climbed, the multi-family units became extremely affordable, and Buford Highway became a natural destination for Atlanta's growing immigrant population. These households often use alternatives to a household-owned car, such as the bus routes that run along the corridor, walking, or biking.

In the last decade, Buford Highway has been designated "the most dangerous road in America" for pedestrians[9]. In 2010, the number of fatalities along Buford Highway was triple that of any roadway in the state. Many areas lack sidewalks and crosswalks, and drivers often speed up and down the seven-lane road at speeds greater than the 45 MPH speed limit. Of the accidents that occur along the Highway, 25% involve pedestrians that are hit while trying to catch the bus[10]. In response, the Georgia DOT in partnership with municipalities along the route have been focusing on increasing pedestrian safety and continuing to support the immigrant populations that live along the road.

The vision for the corridor focuses on repurposing lanes of the highway for bus and bicycle travel, building medians, reducing curb cuts, and implementing a unified speed limit[11]. Using immediately adjacent properties, the long-term plan for Buford Highway ties together various existing and proposed path connections to support bicycling and walking. The plan also has a goal to create a system of green spaces every 800 feet along the highway, to tie together commercial, retail or residential systems. Murals and public art will also encourage foot traffic and make the district more pedestrian friendly. Although the implementation of the plan is still in the early stages, this comprehensive planning approach exemplifies how it is possible to support low-income communities through repurposing roadways to make transportation more accessible and safer.

[9] Atlanta Public Broadcasting Service. 2010. "Dangerous Crossing: A new suburbia as economy changes." Accessed March 20, 2021. https://www.pbs.org/wnet/blueprintamerica/video/profiles-from-the-recession-video-dangerous-crossing-a-new-suburbia-as-economy-changes/1053/

[10] Schmitt, Angie. 2017. "The Campaign to Fix Atlanta's Most Dangerous Street and Preserve Its Immigrant Cultures." Accessed March 21, 2021. https://usa.streetsblog.org/2017/09/21/the-campaign-to-fix-atlantas-most-dangerous-street-and-preserve-its-immigrant-cultures/

[11] 2017. "Buford Highway LCI Master Plan." Last modified September 17, 2017. https://cms.revize.com/revize/doravillega/BuHi%20LCI%20FINAL%20(9.22.17).pdf

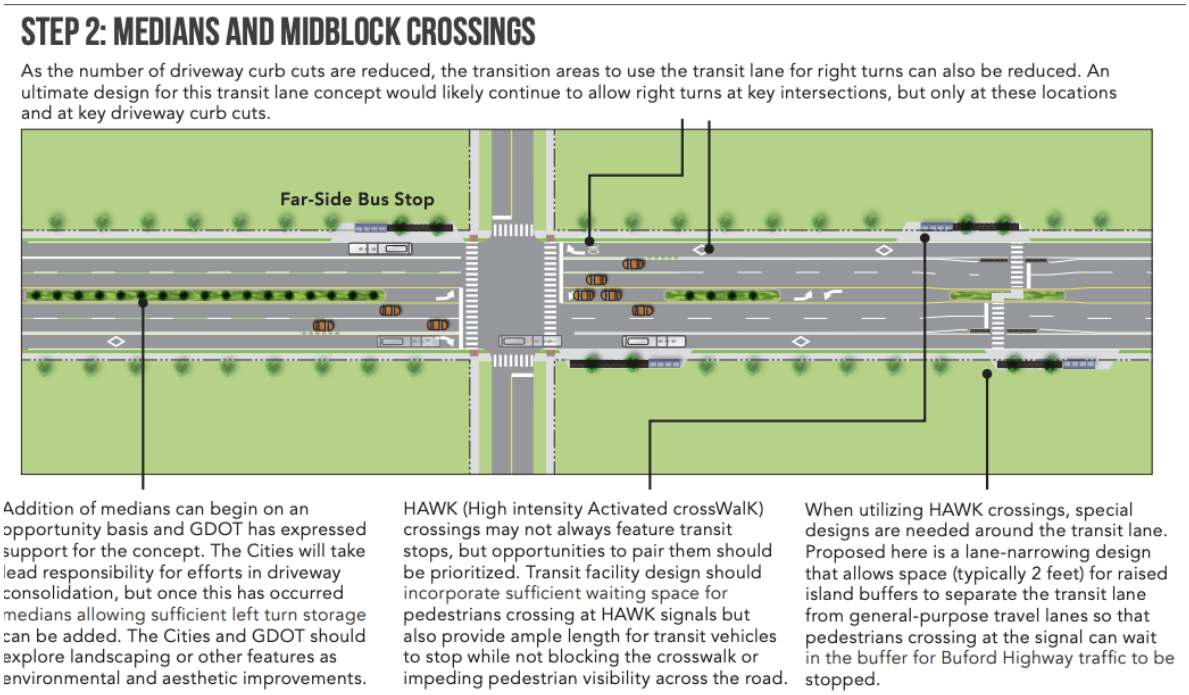

Figure 2: BuHi LCI Master Plan. 2017.[12]

Housing and Transportation

As communities have grown, the relationship between housing and transportation has become increasingly complex. They can be in conflict and at other times complementary of each other. Transportation networks shape development, influence the character of neighborhoods, and impact quality of life. When addressing housing affordability, we must consider more than just rental cost or a mortgage. While the numbers vary, the average American family spends 17.8% of their average annual income on transportation costs, which is second only to housing costs[13]. While typically, affordability metrics focus on housing costs, the Center for Neighborhood Technology (CNT) developed a Housing + Transportation Affordability Index, which includes transportation costs. Instead of simply using 30 percent of household expenditure on housing as a threshold measure of housing affordability, the Housing +

[12] 2017. "Buford Highway LCI Master Plan." Last modified September 17, 2017. https://cms.revize.com/revize/doravillega/BuHi%20LCI%20FINAL%20(9.22.17).pdf

[13] Department of Transportation. 2018. "Household Spending on Transportation." Accessed March 18, 2021. https://www.bts.dot.gov/sites/bts.dot.gov/files/docs/browse-statistical-products-and-data/transportation-economic-trends/224726/tet-2018-chapter-6.pdf

Transportation Affordability Index also takes into account transportation costs associated with a given location (HTAI 2010), with affordability defined as an expenditure on housing and transportation of no more than 45 percent of household income[14].

This relationship was recognized at the federal level through President Obama's Partnership for Sustainable Communities, which is a federal interagency partnership between EPA, HUD and DOT. The Partnership focuses on the idea that how and where we develop our communities affects our economy, environment, and everyday lives. Therefore, policies and investments should be aligned in supporting affordable housing choices, making transportation systems more effective, and supporting local economies[15].

Measuring Affordability and Accessibility

Policymakers have developed tools to measure and understand the linkage between housing affordability and transportation access, as well as incentivizing land use planning that takes this link into consideration. For example, the Location Affordability Index (LAI) is a tool that increases public access to data about housing, transportation and land use[16]. It helps home buyers or renters make informed choices about where to live, by factoring transportation costs into those decisions. It can also help policymakers and stakeholders get access to data when making decisions about land use, economic development, transportation systems, and housing.

Similarly, in 2011, the EPA released the first Smart Location Database[17], which is a nationwide geographic data resource measuring location efficiency. The Database includes almost 100 attributes ranging from housing density, diversity of land use, transit service and employment. From those attributes, planners can visualize spatial variation in various services and opportunities when looking to build housing or expand transit services. The Smart Location

[14] Gustafson, Thomas and Zhao, Fang. 2013. "Transportation Needs of Disadvantaged Populations: Where, When, and How?" *Federal Transit Administration Report No. 0030.* Accessed March 20, 2021. https://www.transit.dot.gov/sites/fta.dot.gov/files/FTA_Report_No._0030.pdf

[15] The White House. "Partnership for Sustainable Communities: Fact Sheet." Accessed March 19, 2021. https://obamawhitehouse.archives.gov/sites/default/files/uploads/SCP-Fact-Sheet.pdf

[16] U.S. Department of Housing and Urban Development (HUD) Exchange. "About the Location Affordability Index." Accessed March 18, 2021. https://www.hudexchange.info/programs/location-affordability-index/about/

[17] Environmental Protection Agency. n.d. "Smart Location Mapping." Accessed March 18, 2021. https://www.epa.gov/smartgrowth/smart-location-mapping#SLD

Calculator[18] is another tool that explores how workplace location affects worker commute travel. It supports more walkable neighborhoods with strong transit service, which will enable employees to rely less on personal vehicles for commuting and daytime trips.

Policy and Planning Options

Purchasing and owning a car is expensive and often out of reach for low-income families, so they rely on public transportation or other alternatives. The micromobility industry is one that seeks to fill this gap, encompassing a range of lightweight vehicles, such as bicycles, e-scooters, and mopeds. They have the potential to better connect people with public transit, reduce reliance on private cars, and make the most of existing space by "right-sizing" the vehicle, all while reducing greenhouse gas emissions[19]. More than half of all trips taken annually in the United States cover less than five miles, which makes these greener, more active alternatives a valid alternative. These can also cover the "first/last mile" problem, by getting people between their home or place of work and a transit station in a cheaper and more effective way.

Environmental Justice

Efforts to promote environmental justice in transportation focuses on engaging low-income communities in transportation decisions. Currently, micro mobility in most cities is not very inclusive. People who actually use these solutions tend to be younger, upper income, single and male[20] - specifically those who use e-scooters and bicycles. To combat this, cities and industries are working to create infrastructure that fosters inclusion, specifically targeting underserved communities. For example, much of micromobility rests on the assumption that people have access to digital technology, such as a smartphone. In many low-income and minority

[18] Environmental Protection Agency. n.d. "Smart Location Calculator." Accessed March 21, 2021. https://www.slc.gsa.gov/slc/

[19] Kelman, Ben, Pankratz, Derek, Zarif, Raseq. 2019. "Small is Beautiful: Making micromobility work for citizens, cities, and service providers." *Deloitte*. Last modified April 15, 2019. https://www2.deloitte.com/xe/en/insights/focus/future-of-mobility/micro-mobility-is-the-future-of-urban-transportation.html

[20] Talton, Ellis and Tonar, Remington. 2020. "Cities Need to Rethink Micromobility To Ensure It Works for All." *Forbes*. Last modified January 7, 2020. https://www.forbes.com/sites/ellistalton/2020/01/07/cities-need-to-rethink-micromobility-to-ensure-it-works-for-all/?sh=456003ea2ebf

communities there is a lack of broadband technology limiting resident's access to information and services. Currently, the focus on making e-scooters and bicycles as lightweight as possible, makes them ill-equipped to handle children, grocery bags, or other large loads. This strongly discourages women from using these technologies[21]. Urban mobility cannot rest on the assumption that its users are young, childless, single and male.

Alternatively, public transit is often the most effective and efficient way to reach underserved populations. Even as it is a low-cost alternative to the single-family car, it can still be inaccessible and expensive for populations that need it the most. Many older Americans are "aging in place" in communities where traveling by car is their only option. As they lose the ability to drive and have difficulty using traditional transit options, they must find alternatives. Many employ ridesharing. Uber has the Uber Assist program which provides their drivers information on how to accommodate passengers with disabilities or that use wheelchairs or walkers. Lyft has a service through United Way which provides free rides for people who have difficulty using public transit through the 211 phone service[22]. In rural areas, with no transit access, counties have come together to offer paratransit services, often to provide patients non-emergency transportation services to healthcare centers. However, equity, level of service and the overall accessibility is rarely measured and quantified.

Student populations also benefit from public transportation, but often cannot afford the price of a fare. In Atlanta, MARTA has a University Program, where metro area universities partner with the transit service to offer unlimited transit trips for a reduced price for students and faculty [23]. Not only does this give transportation access to those who could not otherwise afford it, but it also shows the benefits of public transit to a future generation, which could encourage lifelong ridership. In Chicago, CTA offers reduced fares to enrolled students who are

[21] Talton, Ellis and Tonar, Remington. 2020. "Cities Need To Rethink Micromobility To Ensure It Works For All." *Forbes*. Last modified January, 7, 2020. https://www.forbes.com/sites/ellistalton/2020/01/07/cities-need-to-rethink-micromobility-to-ensure-it-works-for-all/?sh=456003ea2ebf

[22] AARP. 2020. "Transportation: What Caregivers Need to Know." Last modified January 17, 2020. https://www.aarp.org/caregiving/home-care/info-2020/transportation-services.html

[23] Metropolitan Atlanta Rapid Transit Authority. n.d. "Fare Programs." Accessed March 20, 2021. https://www.itsmarta.com/university-program.aspx

between the ages of 7-20 who ride between 5:30 AM and 8:30 PM Monday thru Friday[24]. This decreases transit barriers for young students.

Although the average family spends 17% of its income on transportation, extremely low-income households can spend over 50% of their income on transportation and often depend on unreliable automobiles. However, for those who live in transit rich locations, transportation costs can be as low as 9%. Transit-Oriented Development (TOD) seeks to capitalize on the economic and social benefits of living near transit by maximizing the amount of residential, business, and leisure space within walking or biking distance of public transportation. While often these spaces focus on young, urban professionals with luxury apartment complexes, TOD could also address issues of equity, by providing transit oriented affordable housing – both lowering housing and transportation costs.

Cities across the country have adopted TOD regulations and programs that maximize the nexus between housing and transportation affordability. In San Francisco, rising housing costs are displacing lower income families to the suburbs, but transportation costs are still overly burdening those displaced. Legislative initiatives, in partnership with the Bay Area Rapid Transit (BART), include zoning exemptions and a faster approval process for projects that focus on transit-oriented, mixed-income housing on land owned by BART[25]. Approximately 30% of the units in these developments must be marketed for very low (<50% Area Median Income (AMI)and low-income households (50%-80% AMI). In Atlanta, the Greater Atlanta Transit-Oriented Affordable Housing Preservation Fund is a $100 million fund from Morgan Stanley and National Equity Fund (NEF) to support long-term preservation of affordable housing located within a one-mile radius of Metropolitan Atlanta Rapid Transit Authority (MARTA) rail stations. It can be used to acquire real estate, pay off first mortgages, restructure existing gap financing, fund improvements for properties, or other project costs. Transit-oriented affordable development is also supported by the MARTA board's affordable housing policy. It requires 20%

[24] Chicago Transit Authority. n.d. "Renew Student Reduced Fare Riding Privileges." Accessed March 19, 2021. https://rdhs.org/wp-content/uploads/2018/07/Ventra-Renewal-Student-Card-2018-19.pdf

[25] Cohen, Oriya. 2019. "Can Transit-Oriented Affordable Housing Boost Economic Mobility and Minimize Displacement?" *Urban Institute*. Accessed March 21, 2021. https://housingmatters.urban.org/articles/can-transit-oriented-affordable-housing-boost-economic-mobility-and-minimize-displacement

of the rental units surrounding stations to be affordable to those earning 60%-80% of the Metro area's AMI and for-sale units to be affordable to those earning 80%-100% of AMI[26].

The federal government is focusing on incentivizing transit-accessible or pedestrian friendly affordable housing options. In the early 21st century, location efficient mortgages emerged as a way to encourage "smart growth" in areas with higher density, access to transit, and less of a need for cars. Because homes in these areas tend to be more expensive, this service allows a mortgage lender to recognize the transportation-related cost savings of living near transit by adding the savings to the qualifying income of the potential homebuyer. As an example, a household making "$50,000 may qualify for a 30-year loan of $163,000 using conventional underwriting guidelines; using Location Efficient Mortgage services that household could qualify for a $213,000 mortgage -- depending on how "location efficient" their desired piece of property or condominium is"[27].

On a larger scale, when improving the wellbeing of populations, addressing health is at the forefront of this conversation. In this context, "health" is not merely the absence of disease. Rather, it is the physical, mental, cultural, and social characteristics that make up a state of complete wellbeing[28]. When looking at wellbeing through this lens, health should be interwoven in all planning decisions. To fully address issues of public health, Health in All Policies (HiAP) is a collaborative approach that integrates and articulates health considerations into policymaking across sectors to improve the health of all communities and people[29]. HiAP recognizes that health is created by a multitude of factors beyond healthcare and, in many cases, beyond the scope of traditional public health activities.

We must recognize the past actions of planners and governments that have negatively impacted certain communities, particularly lower income and minority communities. When

[26] Luczak, Marybeth. 2021. "Affordable Housing Fund Boosts MARTA TOD Program." *Railway Age*. Accessed March 20, 2021. https://www.railwayage.com/passenger/rapid-transit/affordable-housing-fund-to-boost-martas-tod-program/

[27] Sierra Club. n.d. "Location efficient mortgages make convenient living more affordable." Accessed March 18, 2021. https://vault.sierraclub.org/sprawl/community/mortgages.asp

[28] World Health Organization. n.d. "Constitution." Accessed March 19, 2021. https://www.who.int/about/who-we-are/constitution#:~:text=Health%20is%20a%20state%20of,belief%2C%20economic%20or%20social%20condition.

[29] Centers for Disease Control and Prevention. n.d. "Health in All Policies." Last modified June 9, 2016. https://www.cdc.gov/policy/hiap/index.html

looking to the future of cities, policies and programs should target these communities making affordable housing and transportation policies a priority.