



Incorporating Health Equity in the Potential Third Crossing Between San Francisco and Oakland: From Planning to Evaluation

Report: Kate Beck, Teddy Forscher and Karen Trapenberg Frick

The Bay Area is experiencing a period of rapid economic and population growth that is straining the ability of the transportation system to move people to through and the region's core. Along with the core, or transbay, capacity issues come exacerbated housing and health concerns, specifically for long-time residents of the area, many of whom are low-income and/or reside in communities of color. In addition to growing challenges regarding system operations, these conditions make it particularly important to consider the case for a new transbay crossing that could improve urban and regional accessibility, unlock new land uses, and create a more resilient transportation network for a stronger, healthier, more equitable region. A new transbay crossing could provide additional travel capacity between San Francisco and the East Bay, complementing the existing Bay Area Rapid Transit (BART) tube and the Bay Bridge. This project has the potential to impact communities in the nine-county region, the Northern California megaregion and the State of California. This new crossing is commonly referred to as a "second crossing" or "second rail crossing". However, when considered in the context of the two existing transbay crossings, we call it a third crossing to provide a holistic picture of the built infrastructure supporting the core capacity of the region. Numerous studies about or including this third crossing have been conducted. With funding from regional and agency bond measures fueling momentum for further studies and eventual implementation, now is the time to consider the historical health equity impacts of

transportation megaprojects on communities in the Bay Area, and begin to incorporate those who have been historically excluded from the start of the third crossing project.

The explicit inclusion of equity, and health equity, are often absent from planning procedures for transportation infrastructure projects like a new San Francisco Bay crossing, aside from legally mandated requirements. However, large transportation infrastructure projects have the potential to transform an entire region and have significant direct and indirect public health implications. Due to the scale of the health impacts stemming from transportation infrastructure projects like a new crossing – including impacts on life expectancy, asthma rates, mental health, access to opportunities and social services (1–11) – we argue that a health equity framework must be integrated into all phases of megaproject planning and development.

We have developed a health equity framework based on a literature review, stakeholder interviews, and focus groups. This framework is then applied to the potential planning, design, and construction a third crossing of the San Francisco Bay between Oakland and San Francisco. This case study is used to demonstrate how a megaproject could lead to beneficial health outcomes for communities of color and low-income communities, populations that have typically experienced disproportionately negative health outcomes due to large-scale transportation projects.

Methodology

Building from an academic and professionally-focused literature review, semi-structured stakeholder interviews, and focus groups, we develop a health equity framework that focuses on improving health outcomes for vulnerable communities and suggest an evaluation strategy capable of determining specific population needs. The framework considers major phases of a project's lifecycle - planning, constructing, and operating - and proposes indicators by which to track a variety of health outcomes. The framework centers around the perspective that affected communities should be actively involved in project governance through a Community Advisory Board (CAB), which is a governing body that includes representatives from the general public and key community stakeholders. The CAB should be involved in the planning, construction and operation, and in ongoing evaluation of the infrastructure projection (12–14). We apply the framework to the case of the third crossing, using specific examples within the Bay Area context to explore concepts with wider applicability.

Developing a Health Equity Framework

A universally accepted approach for how to determine whether a transportation policy, program, or project broadly achieves equity does not exist. In the transportation sector, three types of equity are typically used – market, opportunity, and outcome – across three units of analysis – geographic, group, and individual (15). Legislative districts, counties, and states are examples of geographic units (15), whereas group units are based on grouping individuals by characteristics, including race/ethnicity, socioeconomic status, age, disability status, or travel mode choice (16).

Transportation professionals working to advance equity often support applying a group level unit of analysis (15) to outcome equity,

pursuing the ideal that all individuals should have reliable access to their employment, education, and services regardless of their sociodemographic status. However, public officials consistently allocate public transit funding based on the geographic unit of analysis, often regardless of how the funds will be spent (15), seemingly promoting opportunity equity. Allocating funds in this manner often results in the promotion of new public transportation infrastructure that prioritizes attracting potential new, typically more affluent, rail transit riders, and over providing and maintaining adequate service to existing bus riders, who are more likely to not own a car and be public transportation dependent (15). Public transit investments that result in the deterioration of bus service have health implications, as bus service cuts can leave riders experiencing reduced access to health-promoting activities and destinations and increased adverse mental health outcomes (3).

Health equity can be understood as outcome equity that specifically focuses on health outcomes, and is most frequently applied at a group unit of analysis. The World Health Organization defines health equity as “the absence of avoidable or remediable differences [in health outcomes] among groups of people” including the absence of differences in structural determinants of health and access to “resources needed to improve and maintain health” (17). Figures 1 and 2 depict different theories for how public health interventions impact population health. The two bell curves in Figure 1 represent the hypothetical distributions of a health risk in a population before and after a population-wide intervention. The shift of the population distribution curve to the left after the hypothetical intervention demonstrates Rose's theory that if a change to a ubiquitous exposure is made within a given society, some people will still experience high levels of the risk, but everyone's risk will be reduced and, ultimately, fewer people will suffer from serious health conditions (18).



FIGURE 1 Hypothetical homogeneous effect on the distribution of risk in a population from an overall population approach intervention [Adapted from Frohlich and Potvin (19)]

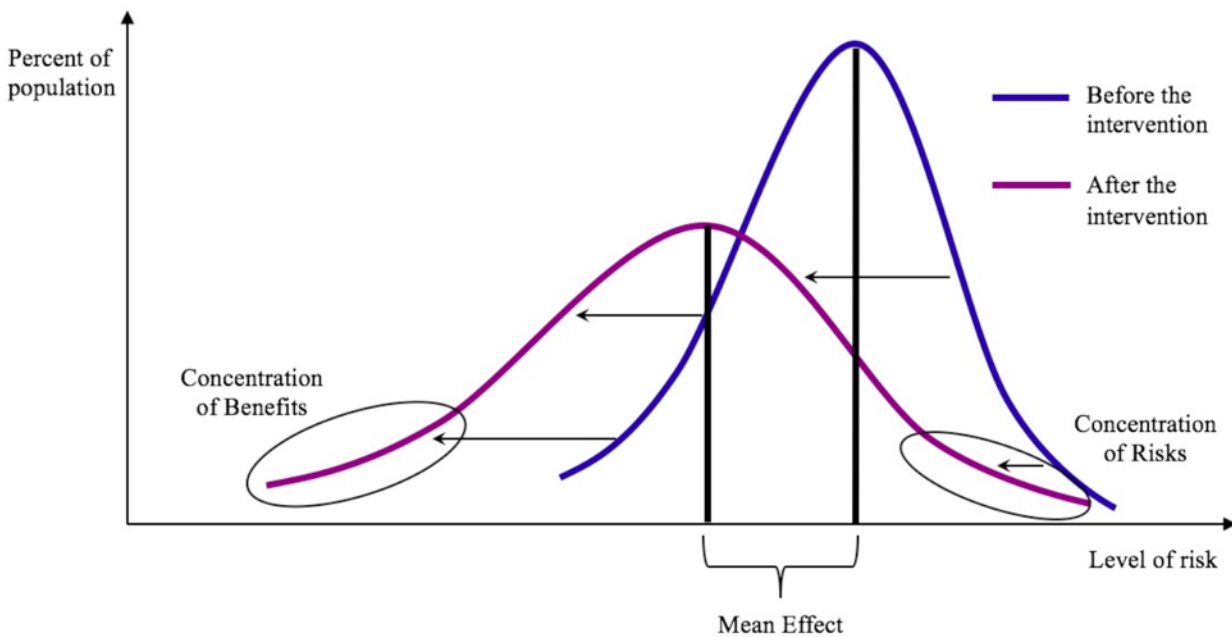


FIGURE 2 Depiction of a potential disparity in health benefits received from an overall population approach intervention [Adapted from Frohlich and Potvin (19)]

Because health gains from actual interventions are not distributed evenly across entire populations as the theory depicted in Figure 1 suggests, focusing only on a shift in the overall population results in magnifying disparities in health between vulnerable populations at the far right end of the health distribution curve and

those in the middle of the bell curve (19). Figure 2 demonstrates this theory and highlights how those on the right end of the distribution experience a concentration of health risks, whereas those on the left end of the distribution experience a concentration of health benefits.

Applying the Health Equity Framework to Transportation Infrastructure Projects

Often, health opportunities and burdens associated with transportation are not distributed equitably, disproportionately affecting low-income communities and communities of color. For instance, the residents of West Oakland, living near the Port of Oakland and multiple freeways, including the approaches to the San Francisco-Oakland Bay Bridge, are “exposed to three times more diesel particles than the rest of the Bay Area” (1) and experience some of the highest regional rates of emergency department visits due to asthma (2). Figure 3 shows that rates of asthma emergency department visits within the West Oakland area are higher than 98.99% of the census tracts in California.

In addition to health outcomes related to transportation networks, there are also a number of health outcomes related to land use changes that occur due to transportation infrastructure projects. Low-income communities and communities of color have been negatively impacted by direct displacement from the

construction of transportation infrastructure projects as well as indirect displacement due to public transportation investments. For instance, Chapple (20) analyzed gentrification in the Bay Area between 1990 and 2000 and found that convenient access to transit for commuters was one of the most significant factors associated with whether a neighborhood experienced increased property values and subsequent displacement of existing residents. Many neighborhoods that could be impacted by an additional crossing between the East Bay and San Francisco are already under significant housing affordability and displacement issues, as depicted in figure 4, which shows the percent of people who are housing burdened in West Oakland is higher than 82-98% of the those who are housing burdened in the rest of the state. New rail infrastructure could exacerbate these issues by increasing the property values and rents within these areas (39).

Involuntary displacement directly impacts health because people are often forced to move to areas with more environmental health and safety issues, fewer health care facilities, and longer commutes to employment centers (7). A recent example demonstrated that San Francisco workers earning less than \$1,250

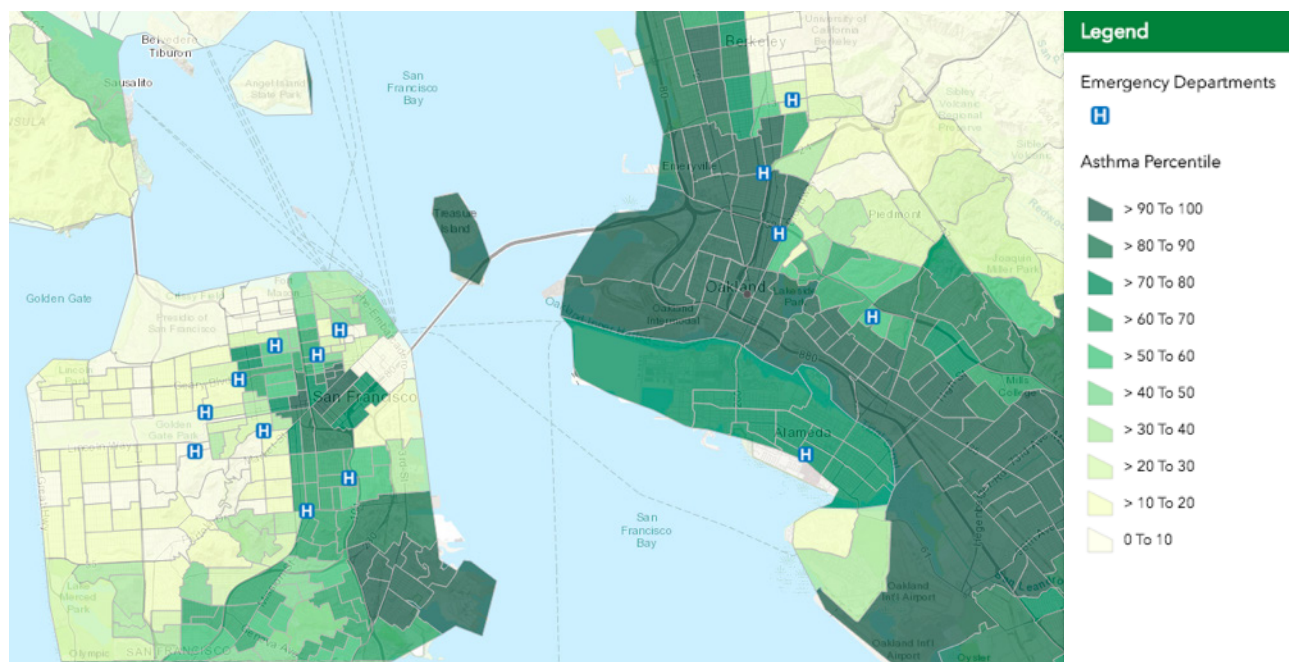


FIGURE 3 The number of emergency department visits for asthma per 10,000 people over the years 2011 to 2013 as a percentile of California Census Tracts [Adapted from CalEnviroScreen 3.0]

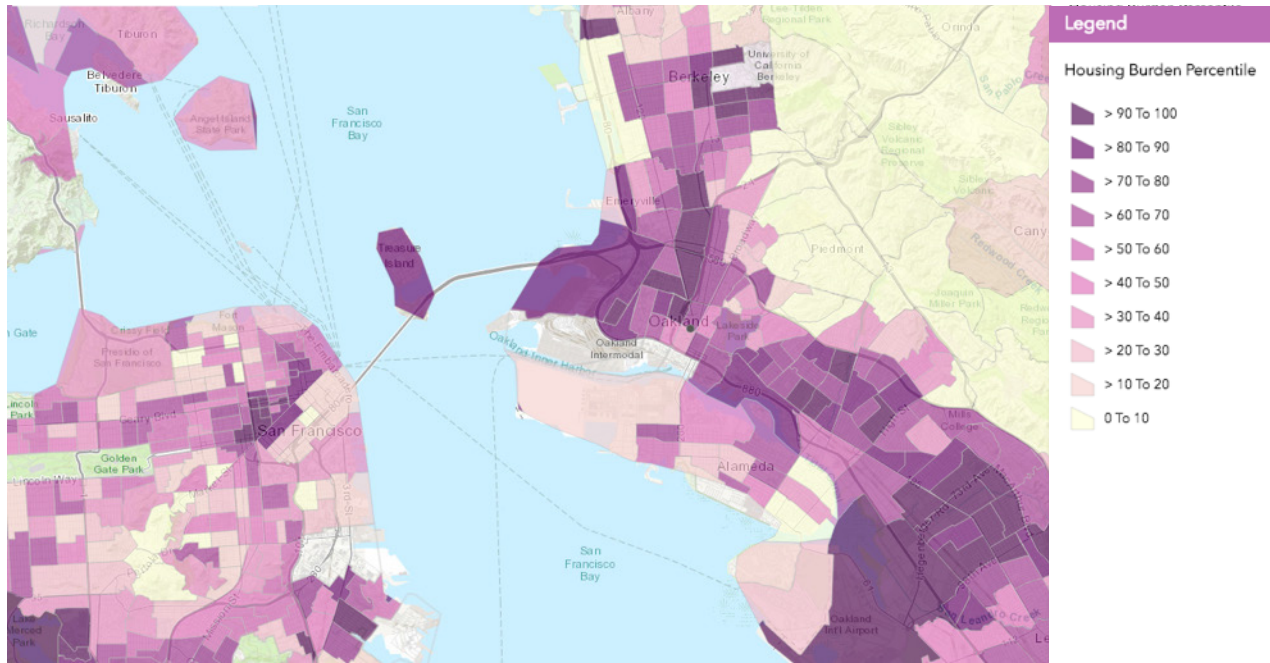


FIGURE 4 The percent of households that are both low income (making less than 80% of their county’s median family income) and severely burdened by housing costs (paying greater than 50% of their income to housing costs), between 2009 - 2013.

per month experienced the largest increase in commute distance of any wage group and a new low-wage worker in San Francisco had to travel an average of about four times further than a new high-wage worker (21).

To effectively address the health needs of vulnerable populations, Frohlich and Potvin argue that members of these populations must be involved in the definition of the health problem, the development of the appropriate intervention, and the evaluation of the intervention (19). Without this insight, decision-makers will likely not have the information needed to effectively serve vulnerable populations (19). Based on findings in health equity academic research and best practices used in transportation infrastructure development, infrastructure projects that comprehensively address health outcomes involve impacted communities over and above what is legally required (5, 12, 22–24).

Health Equity in Infrastructure Planning, Governing, Constructing and Operating

Beginning with an infrastructure project’s conception, governing agencies must move beyond traditional public outreach procedures. Instead, agencies need to be willing to work directly with affected communities to seek meaningful conceptual and design input (25, 26). A Community Advisory Board (CAB) is an effective way to represent the needs of low-income communities, communities of color, and nonprofits and small businesses that serve these communities. Extending this concept to the third crossing necessitates developing health outcome metrics in collaboration with affected communities that should 1) be able to be tracked over time, 2) be representative of the interests/needs of the community, and 3) be able to be compared across communities (23).

Major transportation infrastructure projects can often take years to construct, and frequently suffer from schedule delays (27–29), significantly impacting regional accessibility to social services, employment centers, and residential areas, and subsequently negatively impacting health outcomes. This limited access can impact low-income, transit dependent individuals more significantly because these groups often heavily rely on social services, and work in employment sectors that are less flexible in terms of geographic location and work hours. By ensuring that 1) accessibility during the construction phase is not disproportionately limited, 2) impacted residents are compensated, and 3) the project employs local workers, governing agencies can work to mitigate negative outcomes over lengthy construction timelines. Once new transportation facilities are operational, a CAB can help to oversee operations and maintenance, monitor the performance of the infrastructure project against health equity metrics, work with the governing agency to address negative health outcomes that do occur, and continue to develop countermeasures to improve health outcomes related to the project.

Table 1 summarizes findings from the literature review, interviews and focus groups, using the third crossing as a case study, with a focus on the operations phase of the potential project. Findings have been grouped into four categories: ways in which the project can 1)

improve regional accessibility, 2) address increased land use changes related to the project, 3) improve access to social services, and 4) provide employment opportunities.

Conclusion

To substantively incorporate a health equity approach throughout planning, governing, construction, and operation of a third crossing project, stakeholders must first acknowledge the current and historical harms that have been inflicted by the transportation system on low-income communities and communities of color and embrace the need to use a project with such transformative potential as a means of rectifying these wrongs. Additionally, stakeholders must understand that public transit projects do not inherently promote equity in health outcomes, and such projects could actually widen the existing disparities in access and health.

Large transportation infrastructure projects have typically been conduits through which low-income communities and communities of color have been made to disproportionately experience reductions in access and health. Incorporating a health equity approach to the development of a third crossing project would serve as a means of developing a new model for how future megaprojects could help transform a region’s transportation and land use systems to achieve more equitable outcomes for its most underrepresented communities.

TABLE 1 Potential health equity benefits that could be incorporated into the third crossing project

<p>Improve Regional Accessibility</p> <p>Transportation infrastructure projects have significant impacts on regional accessibility. A third crossing would add a major regional link to the Bay Area’s transportation network.</p>
<p>Strategies for a third crossing project</p> <ul style="list-style-type: none"> • Provide frequent bus service to rail from low-income communities during peak and off-peak hours to increase access to the region’s existing and new rail network.

- **Guarantee that the third crossing will provide overnight rail service across the San Francisco Bay** to increase access for those most underserved by the current transit system.
- Use the project as a stimulus to **initiate an equitable regional transit fare structure** to simplify connections between modes, particularly for customers not using credit cards, lowering another barrier to accessing the transit network.
- **Provide discounted bridge tolls for low-income motorists** on all bridges across the Bay to remove a barrier to accessing the transit network.

Potential health equity impacts

- Reduced commuting time by vehicle or transit is linked to higher physical activity levels and reduced obesity rates (4).
- Exposure to air pollution from vehicular traffic is associated with respiratory disease, certain types of cancer, cardiovascular disease, and consequently chronic stress (30).
- Low-income individuals are more likely to find employment when they have consistent access to an automobile (32).
- Increases in transit reliability could reduce levels of stress for riders (3).

Housing Costs, Gentrification and Indirect Residential Displacement

Pairing infrastructure projects with a large investment in land development would align with California Senate Bill 375's call to Metropolitan Planning Organizations to link transportation and land use in regional planning.

Strategies for a third crossing project

- Provide incentives for cities with existing and new rail transit stations to **adopt rent stabilization and just cause eviction ordinances.**
- Provide incentives to cities with existing and new rail transit stations to adopt policies that **expedite the review process for affordable housing development projects.**
- Establish a percentage of newly available land to be included in a **community land trust** to ensure the supply of affordable housing increases.
- Incentivize cities with existing and new rail transit stations to **adopt policies that support the development of Accessory Dwelling Units (ADUs).**

Potential health equity impacts

- Recent studies find that displacement in the Bay Area has negative health impacts; approximately 30% of displaced households report some level of homelessness after being displaced; many households moved to areas with more health and safety concerns and fewer healthcare facilities after being displaced; many households had longer commutes after being displaced (7).
- The process of displacement can compromise mental health (7).

Access to Social Services

New and existing rail stations can become clusters of community-relevant services to improve access to social services for those who are transit dependent.

Strategies for a third crossing project

- Develop new and existing transit stations into **hubs of supportive services**, including education, healthcare, and social services.
- **Establish Ride-to-Provider Programs** to further extend access to these new hubs.

Potential health equity impacts

- Increased access to healthcare is found to establish a better link between providers and patients, and could increase the likelihood of preventative care provision.
- Increased access to resources, including affordable grocery stores, education centers and recreational facilities is associated with better mental and physical health outcomes (8).

Provide Employment Opportunities

Pairing infrastructure projects with policies and projects specifically aimed at protecting or generating job opportunities for low-income communities, communities of color, and/or nonprofits and small businesses that serve these communities can have significant health impacts (40).

Strategies for a third crossing project

- **Offer training for skilled and technical positions** created by the third crossing project in low-income communities and communities of color could actively extend opportunities to populations traditionally harmed by large-scale transportation infrastructure projects.
- **Establish “ban the box”/fair chance hiring policies** and considering a program to actively employ formerly incarcerated people for construction and permanent jobs created by the third crossing project could extend employment opportunities even further.
- To prevent businesses and services from displacement, developments resulting from a third crossing could **establish affordable workspaces for nonprofits, small businesses, work centers, and industry guilds for low- and moderate-wage private sector jobs**.

Potential Health Equity Impacts

- Access to stable employment leads to improved levels of health for employed individuals, including decreased stress related to future employment status or earnings (9, 10).
- Increased access to, and levels of, employment amongst parents has been shown to have positive outcomes for children, such as fewer emergency room visits and days of school missed due to sickness (11).

References

1. Alameda County Public Health Department. How Place, Racism, and Poverty Matter for Health in Alameda County Presentation. <http://www.acphd.org/data-reports/reports-by-topic/social-and-health-equity.aspx>, , 2013.
2. California Department of Public Health. Asthma Emergency Department Visit Rates by ZIP Code 2012. <https://chhs.data.ca.gov/Diseases-and-Conditions/Asthma-Emergency-Department-Visit-Rates-by-ZIP-Cod/5f6i-kert>. Accessed Dec. 5, 2016.
3. Alameda County Public Health Department. Getting on Board for Health - A Health Impact Assessment of Bus Funding and Access. Alameda County Public Health Department, 2013.
4. Lopez-Zetina, J., H. Lee, and R. Friis. The Link between Obesity and the Built Environment. Evidence from an Ecological Analysis of Obesity and Vehicle Miles of Travel in California. *Health & Place*, Vol. 12, No. 4, 2006, pp. 656–664. <https://doi.org/10.1016/j.healthplace.2005.09.001>.
5. Seattle Office of Planning & Community Development. Equitable Development Implementation Plan. 2016.
6. Morency, P., Gauvin, L., Plante, C., and Fournier, M. Neighborhood Social Inequalities in Road Traffic Injuries: The Influence of Traffic Volume and Road Design. *American Journal of Public Health*, Vol. 102.
7. Marcus, J., and M. Zuk. Displacement in San Mateo County, California: Consequences for Housing, Neighborhoods, Quality of Life, and Health. University of California, Berkeley Institute of Governmental Studies, 2017.
8. Brennan Ramirez, Laura. Promoting Health Equity A Resource to Help Communities Address Social Determinants of Health. Center for Disease Control.
9. Lewchuk, W., M. Clarke, and A. de Wolff. Working without Commitments: Precarious Employment and Health. *Work, employment and society*, Vol. 22, No. 3, 2008, pp. 387– 406. <https://doi.org/10.1177/0950017008093477>.
10. Lewchuk, W., A. de Wolff, A. King, and M. Polanyi. From Job Strain to Employment Strain: Health Effects of Precarious Employment. *Just Labour*, Vol. 3, 2003, pp. 23–35.
11. Slack, K. S., J. L. Holl, J. Yoo, L. B. Amsden, E. Collins, and K. Bolger. Welfare, Work, and Health Care Access Predictors of Low-Income Children’s Physical Health Outcomes. *Children and youth services review*, Vol. 29, No. 6, 2007, pp. 782–801. <https://doi.org/10.1016/j.childyouth.2006.12.006>.
12. Mid-Ohio Regional Planning Commission. Community Advisory Committee. <http://www.morpc.org/transportation/public-involvement/community-advisory-committee/index>. Accessed Dec. 22, 2016.
13. Metropolitan Council. Corridors of Opportunity HUD Sustainable Communities-Funded Projects

in the Minneapolis – Saint Paul Region. U.S. Department of Housing and Urban Development, 2011.

14. Cairns, S., J. Greig, and M. Wachs. Environmental Justice & Transportation: A Citizen's Handbook. Institute of Transportation Studies, 2003.

15. Taylor, B. D. The Geography of Urban Transportation Finance. In *The Geography of Urban Transportation* (S. Hanson and G. Giuliano, eds.), The Guilford Press, New York, NY, pp. 294–331.

16. Transportation Research Board. TRB Special Report 303: Equity of Evolving Transportation Finance Mechanisms. Transportation Research Board, Washington, D.C., 2011.

17. World Health Organization. WHO | Equity. World Health Organization. <http://www.who.int/healthsystems/topics/equity/en/>. Accessed Jul. 10, 2017.

18. Rose, G. Sick Individuals and Sick Populations. *International Journal of Epidemiology*, Vol. 30, No. 3, 2001, pp. 427–432.

19. Frohlich, K. L., and L. Potvin. Transcending the Known in Public Health Practice: The Inequality Paradox: The Population Approach and Vulnerable Populations. *American Journal of Public Health*, Vol. 98, No. 2, 2008, pp. 216–221.

20. Chapple, K. Mapping Susceptibility to Gentrification: The Early Warning Toolkit. Center for Community Innovation, Berkeley, CA, 2009.

21. Karner, A., and C. Benner. Job Growth, Housing Affordability, and Commuting in the Bay Area. Bay Area Regional Prosperity Housing Working Group, 2015.

22. Cypress Freeway Replacement Project. http://www.fhwa.dot.gov/environment/environmental_justice/case_studies/case5.cfm. Accessed Dec. 22, 2016.

23. Moore, E., S. Prakash, C. Garzon, C. Hernandez, L. McNeil, C. Perez, C. Smith, A. Vanderwarker, and C. Violich. *Measuring What Matters*. Pacific Institute, 2009.

24. Palaniappan, M., A. Wong, S. Costa, J. Hays, C. Landeiro, and J. Rongerude. *Neighborhood Knowledge for Change: The West Oakland Environmental Indicators Project*. Pacific Institute, 2002.

25. Guthrie, A., Y. Fan, and K. V. Das. Accessibility Scenario Analysis of a Hypothetical Future Transit Network. *Transportation Research Record: Journal of the Transportation Research Board*, Vol. 2671, 2017, pp. 1–9. <https://doi.org/10.3141/2671-01>.

26. Federal Transit Administration. Innovative Public Transportation Workforce Development Program (Ladders of Opportunity Initiative) Project Selections. FTA. <https://www.transit.dot.gov/funding/grants/innovative-public-transportation-workforce-development-program-ladders-opportunity>. Accessed Dec. 11, 2016.

27. Flyvbjerg, B. What You Should Know About Megaprojects and Why: An Overview. *Project Management Journal*, Vol. 45, No. 2, 2014, pp. 6–19. <https://doi.org/10.1002/pmj.21409>.

28. Flyvbjerg, B. Over Budget, Over Time, Over and Over Again: Managing Major Project. In *The*

Oxford Handbook of Project Management, Oxford University Press, Oxford.

29. Analyzing Schedule Delay of Mega Project: Lessons Learned From Korea Train Express. IEEE Transactions on Engineering Management, Vol. 56, No. 2, 2009, pp. 243–256. <https://doi.org/10.1109/TEM.2009.2016042>.

30. McAndrews, C., E. G. Rosenlieb, A. Troy, and W. E. Marshall. Transportation and Land Use as Social Determinants of Health: Analysis of Exposure to Traffic in the Denver Metropolitan Region. Mountain-Plains Consortium, 2017.

31. Metropolitan Transportation Commission. MTC's Lifeline Transportation Cycle 4 Program of Projects for FY 2014 through FY 2016. http://mtc.ca.gov/sites/default/files/A-47_RES-4179_Lifeline_FY14_thru_FY16.pdf. Accessed Dec. 4, 2016.

32. Blumenberg, E., and G. Pierce. A Driving Factor in Mobility? Transportation's Role in Connecting Subsidized Housing and Employment Outcomes in the Moving to Opportunity (MTO) Program. Journal of the American Planning Association, Vol. 80, No. 1, 2014, pp. 52–66. <https://doi.org/10.1080/01944363.2014.935267>.

33. Reid, C. K., C. Galante, and A. Weinstein-Carnes. Borrowing Innovation, Achieving Affordability: What We Can Learn From Massachusetts Chapter 40B. Publication 1. Turner Center for Housing Innovation, Berkeley, CA, 2016.

34. Zuk, M., and K. Chapple. Urban Displacement Project. <http://www.urbandisplacement.org>. Accessed Dec. 10, 2016.

35. Sage Computing, Inc. Accessory Dwelling Units: Case Study. U.S. Department of Housing and Urban Development Office of Policy Development and Research, 2008.

36. The Unity Council. Fruitvale Village – The Unity Council. <https://unitycouncil.org/property/fruitvale-village/>. Accessed Dec. 11, 2016.

37. Bay Area Rapid Transit. Transit Career Program. Bay Area Rapid Transit. <https://www.bart.gov/news/articles/2016/news20160408-0>. Accessed Dec. 11, 2016.

38. SPUR, Center for Continuing Study of the California Economy, San Mateo County Union Community Alliance, and Working Partnerships USA. Economic Prosperity Strategy: Improving Economic Opportunity for the Bay Area's Low- and Moderate-Wage Workers. The Bay Area Regional Prosperity Plan Steering Committee, 2014.

39. Zuk, Miriam, Ariel H. Bierbaum, Karen Chapple, Karolina Gorska, Anastasia Loukaitou-Sideris, Paul Ong, Trevor Thomas. Gentrification, Displacement and the Role of Public Investment: A Literature Review. Urban Displacement Project. https://www.urbandisplacement.org/sites/default/files/images/displacement_lit_review_final.pdf. 2015.

40. Kong, Julia, Brooke Staton. Co-Designing Equitable Transportation in Southeast San Francisco. Re ex Design Collective. <https://medium.com/re-ex-design-collective/co-designing-equitable-transportation-in-southeast-san-francisco-43ac70b4ae55>