Office of Health Equity
Healthy Communities Data and Indicators Project

Short Title: Miles traveled by occurrence.
Full Title: Annual miles traveled by occurrence and mode.

1. Healthy Community Framework:
Meets basic needs of all.

2. What is our aspirational goal?
Safe, sustainable, accessible and affordable transportation options.

3. Why is this important to health?

a. Description of significance and health connection.

Miles traveled by individuals and their choice of mode – car, truck, public transit, walking or bicycling – have a major impact on mobility and population health. Miles traveled by automobile offers extraordinary personal mobility and independence, but it is also associated with air pollution, greenhouse gas emissions linked to global warming, road traffic injuries, and sedentary lifestyles. Active modes of transport – bicycling and walking alone and in combination with public transit – offer opportunities for physical activity, which has many documented health benefits. Risks of injury in traffic collisions are greatest for motorcyclists, pedestrians, and bicyclists and lowest for bus and rail passengers. Minority communities bear a disproportionate share of pedestrian-car fatalities; Native American male pedestrians experience 4 times the death rate Whites or Asian pedestrians, and African-Americans and Latinos experience twice the rate as Whites or Asians. Miles traveled is influenced by affordability and quality of mode choices. Car ownership is lower in low-income and minority populations, who use a greater share of public transit and may spend a proportionally larger amount of their income and time budget on transportation than higher income groups. Increased time burden may increase stress of daily living. However, use of public transport is associated with increased walking.

b. Summary of evidence.

Emissions from motor vehicles powered by fossil fuels are proportional to vehicle miles traveled and account for approximately 1/3 of California's annual emissions of air pollutants such as fine particulates and precursors of ozone. These air pollutants have established links to increased mortality, hospital admissions, and other adverse health effects. Numerous epidemiological studies have documented that physical activity, including that related to walking and bicycling, decrease risks of cardiovascular disease and stroke, colon and breast cancer, and dementia and depression. Miles traveled is also associated with road traffic injuries, although injury rates of bicyclists and pedestrians tend to level off as their miles traveled and mode share increases.

c. References.

1. California Air Resources Board. *Estimated Annual Average Emissions (http://www.arb.ca.gov/app/emsinv/emseic1_query.php),* California. Sacramento, CA: California Air Resources Board. 2008. Accessed July 19th 2013.
2. McKenzie B, Rapino, M. *Commuting in the United States: 2009 (http://www.census.gov/prod/2011pubs/acs-15.pdf).* U.S. Census Bureau. Washington, DC. 2011. Accessed July 19th 2013.
3. Tran HT, Alvarado A, Garcia C, Motallebi N, Miyasato L, Vance W. *Methodology for Estimating Premature Deaths Associated with Long-term Exposures to Fine Airborne Particulate Matter in California (Draft: Staff Report) (http://www.arb.ca.gov/research/health/pm-mort/pm-mort_final.pdf).* Sacramento, CA: California Air Resources Board. 2009. Accessed August 16th, 2012.
4. Woodcock J, Edwards P, Tonne C, Armstrong BG, Ashiru O, Banister D, et al. Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport. *Lancet* 2009;374(9705):1930-1943.
5. Jacobsen PL. Safety in numbers: more walkers and bicyclists, safer walking and bicycling. *Injury Prevention* 2003; 9(3): 205–209.

4. What is the indicator?

a. Detailed Definition.

Annual miles traveled by occurrence 1) per capita, 2) per square mile.

b. Stratification.

Mode of transport (pedestrian, bicycle, motor vehicles).

c. Data Description.

i. Data sources: Numerator: California Public Road data (CPR); Division of Research, Innovation and System Information; Office of Highway System Information & Performance; Highway Performance Monitoring System; California Department of Transportation (http://www.dot.ca.gov/hq/tsip/hpms/ datalibrary.php). U.S. Department of Transportation, Federal Highway Administration, 2009 National Household Travel Survey (NHTS) (http://nhts.ornl.gov). Denominator 1: Historical Population and Housing Estimates for Cities, Counties, and the State, 2000 through 2010, Demographic Research Unit, Department of Finance (DOF) (http://www.dof.ca.gov/research/demographic/reports/estimates/e-8/2000-10/view.php). Denominator 2: 2010 Census Gazetteer files, U.S. Census Bureau, http://www.census.gov/geo/maps-data/data/gazetteer2010.html.

ii. Years available: individual years 2002 through 2010.

iii. Updated: Annually.

iv. Geographies available: city/town, counties, regions (derived), consolidated metropolitan statistical areas (CMSA), and state.

Numerator: Data on the daily vehicle miles traveled for cities, counties, and the state was obtained from CPR. Vehicles included cars, trucks, buses, and motorcycles. Daily miles traveled were multiplied by 365 to estimate annual miles traveled. Annual miles traveled by bicyclists and pedestrians for CMSAs (county clusters for major metropolitan areas) and California was estimated between 2002 and 2010 from the NHTS by applying the annual rate of change between 2001 and 2009. Denominator 1: Annual population counts from 2002 to 2010 for California's 481 incorporated cities and 58 counties were abstracted from DOF reports. July- centered population counts were obtained by averaging January counts for consecutive years, except for 2010, which used an April enumeration. Three-year population averages were also calculated for 2002-4, 2005-7, and 2008-10. A five year population average was also calculated for 2006-10. Denominator 2: Data on the land area in square miles for places and counties was obtained from the 2010 Census Gazetteer files. Decile rankings of counties were calculated.

Regions were based on counties of metropolitan transportation organizations (MPO) as reported in the *2010 California Regional Progress Report (http://www.dot.ca.gov/hq/tpp/offices/orip/Collaborative%20Planning/Files/CARegionalProgress_2-1-2011.pdf)*.

5. Limitations.

Mileage data were not available to disaggregate different motorized modes (car, bus, truck, motorcycle) and data were not statistically stable for pedestrians and bicyclist at city geographies. Data were not available to stratify by race/ethnicity or to calculate standard errors. City-specific estimates do not include miles traveled in unincorporated areas of counties. The annual miles traveled data is by occurrence and the population data is by residence; because of this discrepancy it is not recommended to construct this indicator for cities since it could result in misleading outcomes (for example, cities with small populations but high through mileage could show an overestimated annual miles per capita rate).

6. Projects using this indicator.

a. Stair P, Wooten H, Raimi M. How to Create and Implement Healthy General Plans: A Toolkit for Building Healthy, Vibrant Communities Through Land Use Policy Change. Public Health Law & Policy; 2012. How to Create and Implement Healthy General Plans (http://www.phlpnet.org/healthy-planning/create_implement_gp).

b. San Francisco Department of Public Health. Healthy Development Measuring Tool (HDMT). San Francisco Department of Public Health; 2011. Healthy Development Measuring Tool (http://www.thehdmt.org/).