Moving Active Transportation to Higher Ground:

Opportunities for Accelerating the Assessment of Health Impacts

April 13-14, 2015; Keck Center; Washington, DC

PRESENSTATION ABSTRACTS

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

Endeavors in Transportation Health Impact Assessment

Abstract:

Background: Transportation systems impact multiple aspects of health, including injuries, physical activity, and environmentally-mediated illness. Health impact assessments (HIAs) can help maximize the health benefits of transportation plans or projects, accounting for multiple mechanisms by which transportation can impact health. HIA is a six-step process that incorporates data and stakeholder input to determine the potential effect of a plan or project on health, the distribution of the effects, and HIA provides recommendations to manage the effects. The National Academies identified education in HIA methodology and structural support of HIA as key elements of expanding HIA practice in the US.   The Healthy Community Design Initiative within CDC's National Center for Environmental Health recently completed a 3 year Cooperative Agreement to conduct land-use and transportation HIAs. This was the first program in the US to support organizations over several years to conduct multiple HIAs. Supported organizations were also required to develop tools, establish partnerships, and host HIA trainings.

Purpose: Describe the transportation health impact assessments completed and lessons learned via a national HIA program.

Methods: Grantees provided annual reports of their HIA activities which were summarized.

Results: A total of 54 HIAs were completed; 17 were primarily related to transportation. Opportunities to improve walking or bicycling experiences to increase physical activity were identified in the 17 transportation HIAs as well as in housing and land-use HIAs. Transportation HIAs covered a variety of topics, including parking plans, projects to improve transportation corridors, and pedestrian plans. An HIA on a proposed road diet in Douglas County, Nebraska, allowed the county to implement the project more rapidly than other proposed road diets in the county. The road diet is estimated to reduce motor vehicle crashes by 50 per year. An HIA in North Carolina on an active transportation plan led to changes in the prioritization of recommended infrastructure improvements to select areas with greater health needs. Several common practices were found among the grantees. Most started with rapid HIAs. Grantees used HIA trainings to involve active stakeholders. The HIA programs to continued to work with stakeholders from their initial HIAs over the 3 years, creating opportunities to monitor the impact of the HIAs.

Conclusion: Practices used by these HIA program grantees could be used in future HIA work in transportation. Individual HIAs considered a variety of pathways where transportation could influence health; recommendations of the HIAs were incorporated into decisions. The experience of the grantees suggests that HIA of transportation projects can be beneficial to both the transportation and health sectors and the population they jointly serve.

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Use of Health Impact Assessment in Projects, Policies, and Plans to Promote Active Transportation

Abstract:

Background: Health impact assessment (HIA) is a tool that can be used to inform transportation planners of the potential health consequences of their decisions, especially in relation to proposed transportation projects, policies, and plans that impact walking and bicycling. The National Research Council defines HIA as "a systematic process that uses an array of data sources and analytic methods and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program, or project on the health of a population and the distribution of those effects within the population. HIA provides recommendations on monitoring and managing those effects."

Purpose: This review documents the characteristics of and provides examples of HIAs of transportation proposals that focus on active transportation.

Methods: Transportation-related HIAs completed in the United States were identified using the master list of HIAs compiled by the Health Impact Project, a collaboration of Pew Charitable Trusts and the Robert Wood Johnson Foundation. HIAs of projects, policies, and plans were included in this review if they focused on active transportation. HIAs were excluded if active transportation was not central to the purpose of the proposal, such as those for highways, road corridor redevelopments, and transit systems. Twenty-one HIAs related to active transportation were identified that had been conducted in 14 states between 2004 and 2013. Most of these HIAs were conducted by public health professionals, with various levels of collaboration with transportation agencies. Six of the 21 HIAs addressed projects such as walking and biking paths, greenways, and bicycle lanes; six HIAs addressed policies including complete streets, safe routes to school, and walking and bicycling; and nine HIAs addressed pedestrian and bicycling plans. Examples were selected to be representative for each of the three types of HIA.

Results: A project HIA on Oakland's East Bay Greenway was completed by Human Impact Partners in 2007. The proposed Greenway included multiuse trails under elevated transit tracks, connecting neighborhoods to jobs, schools, and transit. The final project plan incorporated several of the HIA's recommendations including improving road and railroad crossings, calming traffic on nearby arterials, and developing an Urban Greenway Rangers Program. A policy HIA of Safe Routes to School (SRTS) was completed by Indiana University Department of Public Health in 2013. Focused on physical activity, asthma, social cohesion, and safety, HIA recommendations included gathering health-related data and counting children who walked to school. The HIA contributed to obtaining a local SRTS grant and creating walk to school days. A plan HIA of the county Bicycle and Pedestrian Master Plan was completed by Clark County (WA) health department in 2011. Its recommendations included setting measurable health-based targets and increasing connectivity, access to healthy food, and safety measures. A subsequent impact evaluation found all 11 major recommendations had been fully or partially adopted in the final plan.

Conclusion: Proposed active transportation projects, policies, and plans are generally favorable to health in their initial design. Recommendations from HIAs of such proposals can strengthen their potential health benefits and minimize negative impacts. HIAs of highway, corridor redevelopment, and transit projects often mention promoting active transportation; it would be worthwhile to assess the extent to which recommendations to promote active transportation from such HIAs are incorporated in final decisions. HIAs offer an opportunity to enhance the health benefits of all transportation-related proposals, especially as they relate to active transportation.

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Exploring How Health Impact Assessments Monetize Health Benefits of Transportation Plans and Projects

Abstract:

Background: Health impact assessments (HIAs) are a structured, but flexible process to identify potential health impacts of proposed projects, policies, plans, and programs. Bringing together stakeholder input, qualitative, and quantitative methods, HIAs can provide valuable recommendations about how to maximize health benefits and avoid or mitigate unintended negative consequences of transportation decisions. While HIAs are often used to demonstrate and predict how transportation decisions may impact a broad set of determinants of health—such as access to employment and healthy foods, ability to walk and exercise safely, and risk of injury —to date, few HIAs have monetized the health benefits of proposed changes to transportation plans and projects.

Purpose: The purpose of this presentation is to convey how HIA methods can connect changes in transportation decision to health benefits, and associated cost implications. This session will first present an overview of how HIAs have been applied to various transportation decisions, and provide examples of data sources, assessment methods, and recommended actions to improve health. The remainder of the presentation will focus on HIAs that have connected positive and negative health impacts to economic value.

Methods: Example HIAs were identified using the searchable Health Impact Project online database of self-reported HIAs. The database includes all HIAs conducted in the U.S. to date that have been reported to the Health Impact Project. Completed HIAs were classified as relevant to the "built environment" or "transportation" sectors. Based on the short titles and short descriptions, HIAs were sorted into sub-topics, such as transportation funding, road projects, bridge projects, etc. Using key words—including cost, monetary, economic, and financial—we searched for HIAs that provided some assessment of how health benefits or negative impacts would be monetized.

Results: Of the 337 HIAs in the database as of October 2014, 140 were completed and categorized in the built environment or transportation sectors. Of the HIAs completed to date, the majority focused on transportation planning. HIAs have used methods such as the Health Economic Assessment Tool (HEAT) and Integrated Transport and Health Impact Modeling Tool (ITHIM) to estimate the potential costs of polices, plans and projects.

Conclusion: Economic impacts of transportation decisions are an important data point for policymakers and decision-makers. As transportation and public health professionals work together to measure the health impacts of various transportation decisions, there are several different existing methods to incorporate economic analysis in the assessment.

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The Health Economic Assessment Tools (HEAT) for Walking and Cycling: supporting the integration of active mobility in healthy and sustainable transport solutions

Abstract:

Background: While economic appraisal is a long-established practice in transport planning, routine economic analysis of cycling and walking only started to emerge in the mid-2000s. A WHO-led project was initiated in 2005 to tackle this gap by focusing on key methodological questions and support the inclusion of the health benefits of active mobility in transport appraisal.

Purpose: The main goal of this multiphase, open-ended project is the development of the Health Economic Assessment Tool (HEAT) for walking and cycling, a harmonized, robust and easy-to-apply method for economic valuation of health effects of cycling and walking, based on best available evidence and international expert consensus. This is achieved by: a) reviewing approaches of including health effects into economic appraisal of transport interventions related to cycling and walking; b) critically evaluating these approaches and indicators regarding relevance, accuracy and feasibility; and c) regularly reviewing and updating the approach in view of user-needs and scientific developments.

Methods: The project is steered by a core project group, working in close collaboration with an advisory group, led by the WHO Regional Office for Europe. The process has included development of proposed approaches by the core group, based on literature reviews, and agreement by the independent advisory group; including on the health outcomes, relative risks, dose-response functions, default values for key parameters, and the approach to be used for the economic quantification of the health effects. Proposals are considered in international consensus meetings that promote critical review and achievement of scientific consensus on the options. The adopted approach is then applied to practical tools made freely available through the WHO web site, and disseminated through a range of other channels.

Results: In 2007, an approach to calculating the economic value of reduced all-cause mortality from cycling was discussed at the first HEAT consensus meeting. It was used to develop the first HEAT for cycling, a practical tool launched in 2009 as a Microsoft Excel document, along with a user guide. HEAT calculates: if x people cycle or walk y distance on most days, what is the economic value of mortality rate improvements? It is primarily aimed at transport planners, traffic engineers, economists and special interest groups, and thus intended to be robust but easy to use. An updated web-based version of HEAT cycling, and a new HEAT walking were launched in 2011 and updated online tools and user guide booklets in 2014. Scientific outputs include several peer reviewed scientific publications and a meta-analysis. HEAT is presented at scientific conferences and policy and practitioners fora. Regular webinars are held to present the approach, training over 400 users. The HEAT has also become part of the official methodology used by several governments.

Conclusion: The process of the development of HEAT serves as a model for successful intersectoral collaboration by actively engaging over 100 international experts from epidemiology, public health, transport research/planning, health and transport economics, environmental sciences, air pollution, policy making and practice. HEAT is conservative and based on best available evidence, makes assumptions and expert consensus transparent and is tailored to the needs of the target audiences. Emphasis on user friendliness has been key to facilitating large scale uptake. Areas for future development include the incorporation of air pollution, injuries and morbidity.

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Modeling health benefits of active transportation in Switzerland

Abstract:

Background: Health impact modeling is a valuable approach to inform policy making. In Switzerland, the section of Human Powered Mobility at the Federal Roads Office deals with national planning and strategic aspects of active transportation (AT) policy and regulations, as well as research. In addition, the Federal Office for Spatial Development and the Swiss Federal Statistical Office publish an annual account of external costs of transportation. In 2012, we estimated the macro-economic health benefits of AT in Switzerland for the Federal Roads Office, using the World Health Organization's Health Economic Assessment Tool (HEAT) for walking and cycling. In 2013, we calculated the health benefits of AT for the Transport Calculation 2010 (TC), which for the first time included AT.

Purpose: The purpose of applying HEAT was to show the order of magnitude of health benefits from AT, and more generally to put health aspects "on the radar" of decision making related to AT. The purpose of the calculation of health benefits for TC was to develop a more detailed and robust methodology for direct comparisons of AT with other modes, namely private motorized transportation, trains, and other public transportation, as part of the well established TC.

Methods: HEAT is a an easy-to-use tool to calculate the number of premature deaths avoided due to beneficial effects from physical activity from walking and cycling (www.euro.who.int/HEAT). Benefits were monetized using Value of Statistical Life (CHF 3.2Mio/USD 3.6Mio). Input data on AT were pulled from the national travel survey (2005). Impacts were calculated for a status quo assessment as well as various hypothetical scenarios. For the methodology developed for TC in addition to mortality, effects on morbidities were estimated; physical activity from AT was converted to metabolic equivalents (MET.hours/week) and used with non-linear, power-transformed dose response relationships; physical activity from non-transport sources was considered; input parameters and calculations were stratified by age groups and gender.

Results: On average, the Swiss walk 1.8 km (28 min./d, mode share: 45%) and bike 0.8 km (4 min./d, mode share 5%) per day. Applying HEAT, approx. 5'500 avoided premature deaths annually are attributable to current levels of AT in a population of 5,6 million (20-74 year olds) (per capita value of approx. USD 2,800). Increasing walking and cycling travel time by 10% would lead to additional 270 premature deaths avoided annually (total value: USD 1,47 billion/a). For TC, benefits were calculated across the full age range and several health outcomes, resulting in over 10,000 premature deaths avoided annually. For the same age range as used in HEAT, 3,000 deaths were avoided annually. These numbers are 13% lower for cycling and 50% lower for walking compared to the HEAT calculation. In addition, AT prevents 12,000 cases of cardio-vascular diseases, 4,000 cases of depression, and 1,900 cancer cases annually.

Conclusion: Health benefits of AT in Switzerland are considerable, mainly due to walking. HEAT is well suited to assess benefits, although the version used likely overestimated benefits of walking (HEAT has since been revised). The difference between HEAT and TC is attributable to lower input values for walking in TC (-20%); use of relative risks based on MET.hours instead walking and cycling minutes; consideration of PA from other activities in combination with a non-linear dose response relationship; and consideration of age distribution across key input parameters. The sensitivity of the calculations to these various factors will be explored in future work.

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Health Benefits of the MassDOT Capital Investment Program

Abstract:

Background: The Massachusetts Department of Transportation (MassDOT) has placed a strong focus on sustainability. In October 2012 MassDOT announced a "mode shift" goal – to triple the share of travel in Massachusetts by bicycling, transit and walking. The Healthy Transportation Policy Directive (September 2013) formalizes MassDOT's commitment to transportation networks that serve all mode choices. Through the weMove Massachusetts (WMM) 2040 Long-Range Transportation Plan and the agency's 2014-2018 Capital Investment Program (CIP), MassDOT is linking its sustainability goals with performance measurement principles compatible with the most recent Federal transportation reauthorization bill. This includes measurement of health impacts of transportation investments.

Purpose: TThe public health benefits of projects selected for the 2014-2018 CIP were evaluated along with mode shift (bicycle, pedestrian, and transit person-miles of travel) and reduction of greenhouse gas emissions. The purpose of this analysis was to create an initial benchmark for the performance of the CIP as it relates to key statewide sustainability goals. In the future, MassDOT intends to apply these metrics to assist in long-range plan and capital program development, to complement other key metrics of transportation system performance.

Methods: o estimate the health benefits of the CIP, physical activity benefits resulting from mode shift to walking and bicycling were considered. Projects included in the CIP that support mode shift include transit investment, road reconstruction consistent with complete streets principles, and shared-use path construction. For transit investment, data from project studies were used (where available), along with assumptions on factors such as access trip lengths and prior mode of travel, to estimate walk trips associated with new transit ridership. For pedestrian and bicycle improvements, the length of affected roadway and shared-use paths was estimated, and various methods were applied to estimate mode shift impacts, as measured in terms of person-miles of travel (PMT) by mode. Different levels of impact were considered for different area types (urban, suburban, rural) based on population density. New walking and bicycling PMT was then entered into the World Health Organization's Health Economic Assessment Tool (HEAT) to estimate lives saved and the monetary value of these savings. An alternative method for estimating benefits was also applied, based on data on the annual individual costs of obesity and overweightness, and an estimated reduction in these conditions due to the expected levels of physical activity.

Results: The MassDOT 2014-2018 CIP is estimated to increase walking PMT by 33 million and bicycling PMT by 101 million in the year 2020, when its projects will be fully implemented. These represent increases of 18 percent and 37 percent, respectively, over baseline levels of walking and bicycling in the Commonwealth. The HEAT tool suggests that this level of increase in physical activity could save on the order of 109 lives annually as a result of reduced health problems associated with inactivity. This savings would equate to a total economic benefit of $3.9 billion. While a large portion of this benefit is non-monetary (e.g., quality of life), the benefits do include health care cost savings, worker productivity, and other monetary costs. The alternative method for estimating benefits, based on the costs of obesity, provides an estimated benefit of $3.5 billion over a 10-year timeframe. This includes medical, wage, disability, productivity, premature mortality, and other cost savings.

Conclusion: The benefits estimated in this paper should be considered illustrative, as there are considerable uncertainties in each step of the analysis. Furthermore, the CIP is not the only tool to improve walking and bicycling conditions, and programs and policies of the Commonwealth's municipalities will also play an important role in achieving the estimated level of mode shift. Nevertheless, the magnitude of the benefits estimated is highly significant. If the CIP even comes close to realizing the potential benefits identified here it will create significant monetary savings and quality of life benefits for residents of the Commonwealth resulting from a healthier population.

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Public transit use: an unlikely panacea to solve the physical inactivity crisis in older adults?

Abstract:

Background: We are confronted with a global physical inactivity crisis that adversely affects the health of individuals of all ages. In older adults, physical activity is paramount to healthy aging, as it additionally promotes functional health, cognitive function, mental well-being and fall prevention. Yet less than 3% of older adults in the US meet physical activity guidelines (Troiano et al. 2008, MSSE 40:181-8). Public transit use is known to be associated with greater physical activity levels in US adults, through higher levels of transport-related walking (Saelens et al. 2014, Am J Publ Health 104:854-9). However, little is known about public transit use in older adults without work-commute routines, and whether transit use may replace daily physical activity from other sources.

Purpose: To assess the contribution of public transit use to daily physical activity in community dwelling older adults from Metropolitan Vancouver. Participants were assessed as part of Walk the Talk (WTT), a cross-sectional study evaluating the association between the built environment and the mobility and health of older adults (≥ 65 years) with low incomes (March-May 2012).

Methods: We measured Body Mass Index and fitted participants with accelerometers (GT3X+, ActiGraph LLC, FL) and GPS monitors (Qstarz BT-Q1000XT, Taiwan) to be worn continuously for seven days. GPS trips were identified manually in ArcGIS 10.1 (ESRI) Tracking Analyst to define the trip mode and start and end, based on speed, distance, duration, and accelerometry (time-aligned). We identified the number of transit trips, and total minutes of moderate-to-vigorous physical activity (MVPA) from transport-related walking (sum of MVPA from transit and walk trips; cutpoints Freedson et al. 1998, MSSE 30:777-81). A valid person-day was defined as having both GPS (≥1 trip) and accelerometry data (≥600 minutes wear time, allowing for <2 minutes of <100 counts/minute; ActiLife v. 6.5.4). We included individuals with ≥1 valid days (median: 3 days). We examined the association between daily physical activity (minutes of MVPA) and transit use (≥1 transit trip vs. no transit trips per person-day (herafter: 'day'); for transit-users, transit day vs. non-transit day), using multilevel regression (adjusting for multiple observations per person). Analyses were conducted in Stata/MP 10.1(StataCorp LP, TX).

Results: We included 86 older adults (73.5±5.5yrs; 67% female), of which one in five used a mobility aid (n=16/86). More than two-thirds were either overweight (n=36/86) or obese (n=20/86). At least one transit trip was made on one quarter of the valid days (71 of 276 person-days, made by n=37 individuals). Daily physical activity was significantly higher for days when transit was used, compared with when it was not used (31.5 vs. 43.7 minutes of MVPA, p=0.002), independently of age and walk aid use. This difference was mostly attributable to greater transport-related walking on days when transit was used (22.7 vs. 10.8 minutes of MVPA, p<0.001). For days on which no transit trips were made, physical activity in transit-users was comparable to individuals who never used transit (31.04 vs. 31.8 minutes of MVPA, p=0.620); however, on days when transit trips were made, daily physical activity was significantly higher than on days on which transit-users made no transit trips (43.7 minutes of MVPA, p=0.029). We found no association between transit use or transport-related walking with BMI.

Conclusion: Daily physical activity levels were higher in older adults who used transit compared with those who did not, which was largely explained by greater levels of transport-related walking. Interestingly, the additional physical activity from transport on transit days did not displace physical activity from other sources during the rest of the day, suggesting that public transit use may provide an extra source of physical activity. Municipalities, health- and transportation authorities should collaborate to effectively facilitate and promote public transit use in older adults.

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Does Public Transit Generate New Physical Activity? Evidence from Individual GPS and Accelerometer Data Before and After Light Rail Construction in a Neighborhood of Salt Lake City, Utah, USA

Abstract:

Background: The lack of physical activity and consequent poor health outcomes such as obesity, diabetes and some cancers is a persistent public health issue. Planners and policy leaders often view public transit as a means for increasing levels of physical activity since this serves individuals who use active transportation such as walking and biking as a complement to public transit. While there is evidence that public transit users are more physically active overall, it is not clear whether it is new or shifted from other forms of physical activity. The generally greater time required to use public transit relative to automobile trips suggests the possibility that users may substitute transit-related physical activity for other forms of physical activity such as recreational walking and biking, attenuating its public health benefits.

Purpose: Using GPS and accelerometer data from a quasi-experimental study of physical activity (PA) before and after construction of a light rail line in a neighborhood of Salt Lake City, Utah USA, we investigate changes in physical activity and explore disaggregate effects.

Methods: Adult participants wore accelerometers and GPS loggers for approximately one week during pre-construction (Time 1) and post-construction (Time 2) of a Complete Street intervention involving a light rail line, new sidewalks, and a bike path. Participants also completed surveys for socioeconomic, attitudinal and behavioral data. We examine 537 participants with complete accelerometer data for both time periods. Complete accelerometer data was defined as a minimum of 10 hours for at least four days. GPS data allows identification of travel mode (walk, bike, public transit and automobile) for a travel episode. Data have been examined in terms of accelerometer counts per minute; in addition, future analyses are planned for bouts of activity at specific intensities.

Results: OLS regressions estimated change in PA from Time 1 to Time 2 as a function of baseline measures of PA, plus socio-demographic control variables (gender, age, Hispanic ethnicity, college graduate, marital status, and employment). A test of the transit ridership groups shows significant changes in activity Counts Per Minute (CPM) measured by the accelerometers, $F(10,517) = 13.67$, $p < .001$. Compared to those who never rode transit, new riders had significantly more accelerometer-measured CPM ($p = .005$) and discontinued riders (who rode transit in 2012 but not 2013) had significantly fewer ($p = .005$). New riders had an increase in time spent in transit-related PA ($p = 0.0001$) but no change in time spent in non-transit-related PA, while discontinued riders had a decrease in time spent in transit-related PA ($p = 0.0005$) but no change in time spent in non-transit-related PA.

Conclusion: Results suggest that transit ridership is associated with new physical activity. Implications are that the health benefits of physical activity should be considered as integral components of transportation policies.

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Examining the Impact of a New Light Rail Line on Active Transportation: A Natural Experiment

Abstract:

Background: Most studies examining the environmental factors that influence active transportation are cross-sectional. Few studies have examined whether changes in built environment or transportation infrastructure impact travel choice. Natural experiments that examine the impact of such change, that include control comparisons, are required to better estimate the influence of built environment and infrastructure on travel. Use of public transportation's influence on physical activity has received considerable recent focus in both the transportation and health field. Evidence from cross-sectional studies consistently finds that public transport users are more physically active than non-users. We found recently that this higher physical activity is mostly accounted for on days when users were taking public transport and by additional walking occurring temporally near to public transport use (e.g., walking to/from transit stops). However, the cross-sectional evidence is plagued by problems with self-selection and it remains unclear whether improving public transportation access or service actually results in a shift to residents engaging in more active transportation and physical activity overall.

Purpose: The current study examined changes in physical activity, and specifically walking behavior, among adult residents living close (1 mile from a station; controls) from a new light rail line in Seattle that opened in 2009. Case and control area residents were group matched at baseline for built environment, current transit infrastructure/service, and demographic factors.

Methods: Using a longitudinal cohort design, data from among the same > 500 residents were collected prior to the light rail line opening (baseline), 1-2 years later (soon after), and then 3-4 years later (further after). At each time point, residents' travel, physical activity, and walking behavior was measured through the integration of up to 7 days of accelerometry, GPS, and travel diary data. This integration further allows for the distinction in walking behavior between active transportation versus recreational walking.

Results: Data collection for the 3-4 year follow-up was recently completed and data are currently being processed and finalized (September 2014). These main outcome longitudinal results will be presented for the first time at this conference. Analyses will examine differences in cases versus controls in changes in physical activity and specifically walking behavior from before to soon after and then further after the opening of the light rail line. Analyses will also examine changes in public transport use and whether transit use changes mediate any observed changes in physical activity or walking.

Conclusion: With an interest in increasing physical activity and active transportation, evidence that better estimates the causal pathway between transportation infrastructure and travel behavior is needed. Natural experiments that take advantage of changes in environments and policies that could impact active transportation, like the opening of a new light rail system, have the potential to better inform the public health impact of environment and policy changes.

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Integrating Health Impact Assessment into Road Safety Audits: Lessons from a case study in Clackamas County, Oregon.

Abstract:

Background: The Clackamas County (OR) Health Impact Assessment (HIA) of the McLoughlin Boulevard Active Transportation Road Safety Audit (RSA) was initiated by the Clackamas County departments of Public Health and Development & Transportation in early 2014. An RSA is a commonly used tool for transportation planners and engineers working to identify and mitigate crash risk for defined sections of a transportation system. RSAs typically result in a set of proposed projects designed to mitigate identified crash risk factors. This RSA resulted in 42 proposed projects for reducing crash risks for bicyclists and pedestrians traveling through a half-mile section of McLoughlin Blvd, a five lane, high-use, multi-modal corridor that serves about 20,000 vehicles per day. While crash safety would be the most likely health issue to be impacted by the RSA recommendations, county planners and public health staff were also interested in understanding potential impacts on additional health issues such as physical activity and access to resources in order to minimize potential adverse impacts and identify opportunities for enhancing positive health impacts.

Purpose: HIA is a methodology developed by public health professionals to facilitate efforts with non-health sectors to explicitly consider and address the potential direct and indirect health impacts of proposed plans, policies, and projects. The primary goal of this HIA was to provide planners, engineers, and community stakeholders with information about the potential health impacts of the RSA recommendations that would be useful for assessing the RSA recommendations' impacts on multiple transportation-related health issues in addition to crash safety. A secondary goal was to develop a framework for quickly integrating multiple health issues into the RSA process and determine its value.

Methods: The assessment approach developed by the HIA team focused on assessing each of the 42 RSA recommendations according to their relative impacts on the chosen health determinants, using a project scoring approach designed to help planners identify and characterize a broader set of health impacts than the safety impacts considered in the RSA, help prioritize and revise/refine the actions recommended in the RSA, and potentially identify additional opportunities for improving safety and health for people using the study area. The scoring approached was based on having a diverse set of stakeholders (transportation planners, public health professionals, and community members) assign scores (-2…+2) based on professional judgment and local knowledge to a set of easily measurable questions for each recommendation such as whether the recommendation would improve access to local trails or increase exposure to air and noise pollution. The result was a set of scores that rated each of the RSA recommendations according to their relative impacts on opportunities for physical activity, exposure to air and noise pollution, and access to jobs and schools.

Results: The HIA resulted in a set of findings that characterize the relative health impacts of each proposed crash safety solution based on potential changes in opportunities for physical activity, exposure to air and noise pollution, and access to jobs and schools. Key findings include: --Of the 42 RSA proposed solutions, only one solution received a negative score because of potential safety risks that it would create for pedestrians trying to cross McLoughlin --Physical activity is the primary health determinant impacted by most interventions, followed by access to resources --The "high impact" solutions generally appear to be relatively large pedestrian infrastructure projects that both improve pedestrian mobility and encourage changes in driver behavior due to increased visibility and awareness --The HIA added value to the RSA for planners and stakeholders

Conclusion: The HIAs findings and recommendations have proven to be valuable to both planners and stakeholders as they work to determine which projects will be prioritized for funding. The HIA has also helped planners demonstrate the multiple health benefits of safety improvements, and has provided a framework for conveniently including similar assessments in future RSA projects.

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Monetizing Morbidity in Transportation and Climate Scenario Planning

Abstract:

Background: Decision-makers are interested in accounting for health benefits and risks, including monetized information, in transportation planning and policy making. While value of statistical life (VSL) guidance from the U.S. DOT and U.S. EPA allows for valuing avoided mortality, monetizing morbidity is more complicated. Economists' first choice in valuation is a willingness-to-pay (WTP) methodology. However WTP models must account for preferences and perception – both of which vary widely by health endpoints, required health action, and cohort. An alternative to valuing morbidity are a cost-of-illness (COI) approaches which estimate direct health care expenditures and indirect costs such as care-giving, absenteeism, and lost productivity.   The Health Impact Assessment (HIA) Initiative within the Oregon Health Authority, Public Health Division partnered with Metro (MPO for Portland, Oregon) to augment transportation demand modeling for the Climate Smart Communities Scenario Project. This partnership resulted in the Climate Smart Strategy (CSS) HIA to provide a health analysis – including the monetized health benefits – of the draft approach under consideration for adoption in Fall 2014.

Purpose: This presentation highlights the application of a top-down, national COI, attributable fraction approach to monetize health impacts. It uses the CSS HIA as a case study to discuss methodological and pragmatic policy challenges associated with monetizing health impacts of transportation planning.

Methods: The CSS HIA scaled down national COI (direct and indirect) amounts to a regional level for multiple diseases associated with three pathways (physical activity, air quality, and traffic safety). It then applied estimates of percent reduction in disability adjusted life years (DALYs) to estimate changes in the regional COI attributable to the draft approach of the Climate Smart Communities Scenario Project. Challenges associated with monetizing morbidity include quantifying health impacts; sourcing cost-of-illness values appropriately matched to diseases in the health impact modeling; understanding and reporting direct versus indirect costs; the ethical and policy implications of valuing life and disease; and policy implications of the separation of health care and transportation spending in government, business, and household budgets.

Results: Diseases associated with the Climate Smart Communities Scenario Project cost the Portland metropolitan region spends at least $5-6 billion annually (2010$) in medical expenditures and lost productivity. The CSS HIA estimates that fully implementing the draft approach will save the region between $100-125 million annually (2010$) including $5-10 million in caring for those who have suffered a stroke, $10 million in mental health care, $15 million associated with severe traffic injuries, $26 million in diabetes care, and $40 million in heart disease. Much of this cost savings is associated with physical activity. Metro used monetized health benefits in its public outreach and presentation materials; monetized results were favorably received by advisory committees and decision makers.

Conclusion: Economic valuation of morbidity requires knitting together multiple data sources and models that must be carefully examined to provide appropriate estimates of health savings associated with transportation plans and policies. It also requires educating both public health and transportation practitioners and decision-makers about the meaning and assumptions in COI analyses. However, doing so can provide important information to augment public decisions and prioritize transportation investments that reduce illness and health costs by increasing active transportation.

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Are we ready to embrace Health impact assessment?: Lessons Learned from integrating HIA and transportation planning

Abstract:

Background: This presentation articulates what Health Impact Assessment means for transportation planning and showcases lessons learned in working with municipalities, a state DOT, an MPO and a state health agency on HIAs for transportation or regional planning. While much of the buzz nationwide about Health Impact Assessments has posed it as an emerging trend with great promise, there remain challenges among local and state agencies in terms of their understanding of HIA and their willingness to engage in the process and be accepting of HIA. The presentation will focus on how six (6) Health Impact Assessments in North Carolina and Idaho conducted for Regional Planning and Active Transportation encountered both challenges and opportunities related to data collection/evaluation, creating partnerships and breaking down silos, and changing community conversations about health and transportation.

Purpose: The paper/presentation chronicles lessons learned on how HIAs can be applied in a variety of transportation planning contexts. The 5 HIAs used as case studies in this session are: -Southwestern Commission COG/RPO Regional HIA (8 counties in southern Appalachia) -Robbinsville (NC) Pedestrian Connectivity Plan HIA (small town context) -Haywood County (NC) Comprehensive Bicycle Plan HIA (countywide, multi-jurisdictional) - Buncombe County (NC) Greenways & Trails Master Plan HIA (countywide, including Asheville) -Wake County Northeast Area Study HIA for Capital Area MPO (50,000 within study area near Raleigh) -Blaine County (ID) Bicycle & Pedestrian Plan HIA (resort community setting)

Methods: Many practitioners want to immediately default to the physical elements of health and transportation, mainly physical activity, air quality and noise. To move the conversation away from this overarching emphasis, the HIAs have evolved into an examination of the "7 Dimensions of Health & Wellness" (physical, social, environmental, emotional, economic, spiritual and intellectual) as a way to broader the conversation. From a data and stakeholder perspective, while there are similarities in the planning and HIA process, the development and engagement methods vary based on differences in data and emergence of new stakeholders from the health fields. The availability of data and degree to which data from the health sector aligned with common datasets in the transportation sectors also posed challenges. There are few datasets that have information available at a Census tract level as it relates to public health. Each HIA was able to utilized existing Census data tagged through research related to social determinants of health to identify hot spots of high prevalence of poor health conditions.

Results: The varied contexts in which these HIAs were conducted, including population base, local political climate, governance structure, involvement of local health organizations/individuals, geography, and availability of local health data, have led to distinct applications of different methods to address the six steps of an HIA. They revealed varying levels of interest among local, regional and state agencies (both health and transportation) as it relates to fully engaging in the process and utilizing the findings of the HIA. Regarding the 7 Dimensions of Health and Wellness, the degree to which each dimensions is applicable also varied based on the HIA subject matter. Some HIAs have utilized additional data obtained from the North Carolina State Center for Health Statistics, but the utility of this data has been limited based on the geographic scale of the planning effort. In some instances, the HIAs have been able to utilize data collected by local health department to better refine recommendations through the planning process.

Conclusion: The tone of the disucssion around HIA is clearly gaining momentum, but uncertainties remain among practitioners about how to apply them and integrate their findinds. Some of these efforts began with the goal of conducting an HIA but were reduced in scope due to differences of opinion among lead agencies as to the ultimate findings and efficacy of the HIA itself. The other key lessoned learned is that four out of the six HIAs have received their primary funding from non-health-based funding sources, including MPOs, an RPO, the Appalachian Regional Commission and the Community Foundation of North Carolina.

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Cycling health and climate

Abstract:

Background: Co-benefits are defined as the health and other benefits that can accompany greenhouse gas emission reductions. Modeling studies have regularly identified the potential for large health co-benefits in the transport sector from a mode shift to physically active transport, although impacts have been found to be much smaller if behaviour change is restricted to younger people with lower disease rates or already active groups in the population. Findings on emission reductions from active travel have been less clear. Cycling is usually an option for shorter trips, typically exhibiting a strong distance decay function, whilst in most settings the majority of emissions come from longer trips. Large emission reductions have been identified only in scenarios in which mode shift has been accompanied by total travel distance reduction. The highest cycling country, the Netherlands, does not achieve low transport emissions by European standards because of the large number of longer car trips. Despite this there has been little systematic investigation of the circumstances under which active travel can achieve emission reductions and how such scenarios would relate to the size of the health benefits. Health and carbon benefits vary according to who is changing their behaviour and the kind of trips they make and policy goals may not always be aligned.

Purpose: To examine circumstances under which cycling can contribute to substantive greenhouse gas emission reductions and whose travel should be targeted to achieve the biggest health and climate benefits?

Methods: In this study we will fill this gap using a microsimulation model based on individual level travel survey data from England combined with the ITHIM health model. The ITHIM model estimates health impacts from transport scenarios using a comparative risk assessment approach and incorporates variation in disease risk and baseline physical activity levels both between and within age and gender groups. Changes to distributions of physical activity are applied to multiple diseases, using WHO Global Burden of Disease data. The microsimulation model has been implemented in R and parameterised with the English National Travel Survey. In the model four parameters are allowed to vary: 1) the cycling mode split (whilst keeping the current distance decay function), 2) the distribution of travel distances (with a reduction in average travel distances based on both changes to land use and changes to destinations), 3) the distance decay function for cycling (based on faster routes, recumbents and electric bikes), 4) the proportion of multimodal trips (public transport plus cycling) amongst longer trips. The potential for trip distance reduction from changing destinations will be allowed to vary by trip purpose, with more individual level latitude for changing non-commuting trips.

Results: We will search the output of the model to identify those combinations of strategies that would achieve substantive emissions reductions and investigate how these correlate with health benefits. Using person level data we will investigate the top population groups to target for mode shift from a health, a carbon, and a co-benefits perspective.

Conclusion: The results of this study will guide policy on the extent on urban planning and inform development of cycling policies that can achieve multiple societal benefits.

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Quantifying Health Impacts for Three Pathways in Transportation and Climate Scenario Planning

Abstract:

Background: Social and environmental determinants account for over half of the variation in population health. Transportation strategies and investments are a considerable environmental determinant of health, suggesting that transportation plans should be evaluated for broad impacts on community health. In 2009, the Oregon Legislature mandated that MPOs plan for reducing greenhouse gas (GHG) emissions from light-duty vehicles. Metro – the MPO for Portland Oregon – was directed to reduce GHG to 20% below 2005 levels by 2035. Metro initiated its Climate Smart Communities Scenarios (CSCS) Project to evaluate and discuss a range of technological improvements, educational programs, and land use and transportation investments targeting emissions and VMT. Metro also wished to understand impacts on the economy, environment, and public health. The Health Impact Assessment (HIA) Initiative within the Oregon Health Authority, Public Health Division partnered with Metro to augment transportation demand modeling. This partnership resulted in three HIAs released from 2013-2014 and culminated in the Climate Smart Strategy (CSS) HIA to understand the health impacts of the draft alternative put forth for adoption in December 2014.

Purpose: This presentation highlights a quantitative modeling tool – the Integrated Transport Health Impact Model (ITHIM) – used in each of the HIAs supporting the CSCS Project. It shows how a burden-of-disease approach allows for quantifying health impacts associated with transportation strategies including comparing the relative contribution of increased physical activity, air quality, and traffic safety associated with the plan.

Methods: With the guidance of an advisory committee, the scopes of the HIAs were defined to capture active transportation, air quality, and traffic safety health impacts. To quantify these impacts, the Integrated Transport and Health Impact Model (ITHIM) developed by Dr. Woodcock of University of Cambridge was employed. ITHIM expands comparative risk assessment by (1) using current burden of disease estimates derived from U.S. or Oregon-level vital statistics and (2) applying relative risks or odds ratios from the public health scientific literature to measures of expected changes in exposure. Inputs for ITHIM are weekly miles traveled per person per mode as modeled by Metro's and PM2.5 as separately modeled using GreenSTEP. Outputs of ITHIM are avoided premature death and morbidity as measured by disability adjusted life years for 12 diseases associated with physical activity, air quality, and traffic safety.

Results: Depending on the scenario, implementing the Climate Smart Communities Scenario Project may result in between 100 and 135 avoided premature deaths annually and a 1.0 to 1.8% reduction in diseases studied. The draft approach is expected to result in 126 avoided premature deaths with 61 avoided deaths from increased physical activity, 59 avoided deaths from improved air quality, and 6 deaths associated with improved traffic safety. The draft approach is also expected to reduce disease by about 1.6% with the majority of the gain attributable to physical activity. Detailed results of traffic safety also indicate that counts of fatalities and severe injuries will increase for active modes without more aggressive reduction in VMT; alternatively, significant attention to designing for active modes – an element not accounted for in ITHIM – could mitigate inequitable traffic safety impacts on active modes.

Conclusion: Quantifying health impacts provides decision-makers with estimates of prevented mortality and morbidity associated with the plan. All scenarios should result in health benefits with increased benefits associated with more aggressive investments. Using a burden-of-disease approach facilitates comparisons between modes which, given the significant burden of cardiovascular disease and diabetes, can emphasize the need to support active modes.

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Calibrating the Integrated Transportation and Health Impact Modeling (ITHIM) tool in Nashville, Tennessee

Abstract:

Background: In September 2010, Chief Executive Officers for Cities (an urban studies non-profit) ranked Nashville the most congested city in the US. Nashville is also the capital of Tennessee, which was the least physically active US state (Behavioral Risk Factor Surveillance System, 2011). To address these issues, the Nashville area Metropolitan Planning Organization (MPO) plans to improve bicycle and pedestrian infrastructure in the region and is interested in estimating the potential health impacts using the Integrated Transportation and Health Impact Modelling (ITHIM) Tool. Developed in the United Kingdom and imported to California, ITHIM advances transportation health impact modelling beyond estimating the benefits of increased physical activity. For a change in mode share (usually towards walking and bicycling), ITHIM also estimates the impacts of reduced air pollution, estimates the prevalence of bicycle and pedestrian crashes, and calculates age/sex specific effects on multiple chronic diseases. The result is a summary impact score in disability-adjusted life years. California Department of Public Health has streamlined ITHIM calibration for California municipalities; the Nashville experience may help with calibrating ITHIM outside California.

Purpose: To present interim results focused on the challenges and opportunities encountered when calibrating ITHIM for use in Nashville, TN

Methods: The ITHIM tool, which is a multi-page Excel spreadsheet, was obtained from the California Department of Public Health along with calibration and technical documentation. Calibration requirements were categorized into 15 items and potential data sources were identified for each. Data were obtained from the Nashville Area MPO, the Tennessee Department of Health, the US Census Bureau, the Centers for Disease Control and Prevention, and the National Highway Traffic Safety Administration (NHTSA). Wherever possible, data specific to the 7-county Nashville MPO jurisdiction were used. STATA version 13 was used for analysis and formatting raw data into usable calibration data points. For presentation purposes, the results of calibration efforts were reported by data source.

Results: Multiple stratifications of the 15 items (e.g. by sex, age group, mode of travel, and/or roadway type) required calculating 880 discrete data points. The Nashville MPO provided data from a 2012 household travel survey, from which we calculated per capita mean daily travel distance and time, per capita mean daily active transportation time and standard deviation, median walk speed, and the ratio of daily per capita bicycling time to walking time. The MPO also provided outputs from travel demand models, which provided personal and vehicle travel distance by roadway type, CO_2/mile traveled, and PM2.5 concentrations. The Tennessee Department of Health provided cause-specific mortality rates stratified by sex and age group, which provided the underlying burden of diseases associated with physical activity and/or air pollution. We obtained the population distribution from the 2010 census. Fatalities stratified by victim mode and striking mode were from the Fatality Analysis Reporting System (FARS). When local data were not available for non-travel related physical activity or non-fatal injuries, alternative sources were found; this introduced limitations in the model.

Conclusion: The interim results presented above suggest calibration of ITHIM for non-California jurisdictions is possible, but requires considerable data and time. Successful implementation of ITHIM will depend on local data availability. In the Nashville experience, a recent transportation planning survey that included a 1-day trip diary was particularly useful. Two data elements were not available for the MPO's jurisdiction and were sourced from national systems. Other jurisdictions interested in implementing ITHIM may wish to investigate data requirements and availability before committing resources to the project.

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Safer Streets, Stronger Economies: Lessons in Measuring Complete Streets Performance

Abstract:

Background: As elected leaders and transportation officials work to balance their budgets, deliver high-quality infrastructure and retain and attract jobs, they often characterize Complete Streets as an amenity too expensive to effectively implement, and one that would negatively harm existing businesses. As a result, safe and convenient facilities for walking, bicycling and taking transit are effectively eliminated from the transportation project delivery process. To address this challenge, the National Complete Streets Coalition launched a large-scale national research project to make the fiscal and economic case for Complete Streets based on data collected across more than 30 built projects. The results, due to be published in early 2015, aim to demonstrate that in many cases, a Complete Streets approach is a cost-effective investment to achieve transportation objectives and can support local economies.

Purpose: This research creates a data-based foundation to persuade people who ultimately make transportation investment decisions in cities: transportation leadership, elected officials, and city managers. This research rests on the premise that many communities pursuing Complete Streets realize safer streets, healthier residents, and increased economic activity near these improvements. Our project aims to build political will for Complete Streets implementation by documenting and publicizing these outcomes and ultimately lead to public and private investment in transportation choices to address health disparities.

Methods: Our research assesses project-level transportation performance and economic activity before and after Complete Streets improvements and examines annual spending at the municipal-level, comparing costs of Complete Streets to more traditional road-building activities. It also projects averted costs from the improved safety measures. It collects data directly from municipalities and other local and regional entities with access to measures, such as mode counts, crashes, crashes that result in injuries/fatalities, new jobs, wages, sector growth, total private investment and property values and retail sales taxes. It uses a comprehensive conceptual framework to compare what communities currently collect to the data that would provide a general snapshot of the interaction between all modes and safety and economic benefits.

Results: Preliminary analysis suggests: Safety conditions improved: Less crashes, injuries and fatalities (in real terms and by rate). Complete Streets projects encouraged more biking and walking trips. Complete Streets projects did not degrade automobile capacity (as evidenced by more trips and little effect on automobile counts). A majority of Complete Streets projects were low-cost projects compared to average cost of urban arterials. Complete Streets did not harm local businesses in the direct vicinity of these improvements. In some cases, these improvements catalyzed economic development. The research also underscored several lessons related to how municipalities currently measure transportation performance: 1) Transportation performance measures are still underdeveloped and under-used in most communities, particularly as part of the monitoring and evaluation phase. 2) Limited accepted standards for non-automobile travel measurement and unified collection exist. 3) Current studies often only measure some subset of outcomes related to project goals, not all of which are transportation-oriented goals.

Conclusion: While limited data exists, the best available data suggests Complete Streets projects meet transportation transportation goals at comparable costs to other road projects and support local economies. The data-gathering effort also underscores that if communities have an explicit aim to make travel by foot, bike, and transit convenient and safe, then they should measure their progress according to those aims. Lastly, decisionmakers' ability to advocate successfully for these projects is hampered by lack of timely and consistent data.

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Incorporating Public Health in Transportation Corridor Planning Studies

Abstract:

Background: Health and transportation can have a mutually beneficial relationship within communities across the U.S. using the structure provided by transportation decision making to prevent chronic diseases through broad-impact, population-wide strategies. A collaborative approach may provide benefit to both sectors and establish a fully integrated process for health priorities to be considered in transportation decision making. What is missing is guidance identifying when and how health-related concerns and issues are introduced and supported in decision making.

Purpose: U.S. DOT has initiated research to develop the Transportation and Public Health Corridor Planning Framework to support transportation practitioners interested in incorporating public health into decision making. The framework provides a step-by-step structure to identify when and how to consider health priorities within planning practice, integrating the existing body of knowledge on the relationship between transportation and public health along with successful practice to improve partnerships. Framework content will be validated and improved by health and transportation professionals during its development and tested in up to five real-world settings to explore its usefulness in a variety of corridor planning studies.

Methods: A 2013 literature review provided a baseline understanding of relationship between transportation and public health and research gaps. Active transportation and its association with obesity, chronic disease, access, and equity is a high-interest relationship in both fields and is currently explored through both practical experience and scientific studies, as are air quality and safety. With the research database and recommendations developed from the literature review as information sources, a draft version of the framework was developed with steps that are common to corridor planning and information needed at each step to incorporate health. Information was categorized in four topic areas: successful practice; partnerships and stakeholders; data and analytical support; and health equity. In 2014 each topic area was considered in a focus group meeting of knowledgeable practitioners. Information collected will be used to populate each step of the framework. Beta testing of the framework in up to five communities is the final step of testing in order to learn how the framework supports real-world corridor studies. Final adjustments will be made following the beta testing.

Results: In early 2015 the draft framework will be released for beta testing. Although the test period will continue until September, the corridor planning studies selected by beta test teams will illustrate ways in which transportation agencies and their partners are attempting to use this tool. We will share the contents of the draft framework developed from the focus groups and illustrative examples of its potential use from the beta tests as well as progress reported at the time of the conference.

Conclusion: Assessment tools are valuable for practitioners and are often applied to past decisions. The Transportation and Public Health Corridor Planning Framework will support assessments within the typical corridor planning process to allow public health interests and priorities to be incorporated in a systematic and ongoing way.

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The Meaning of Mean Streets: Associations Between Crime, Casualties and Sustainable & Active Travel Choices

Abstract:
Background: Several empirical studies have examined the effects of crimes on travel behavior, but little work has been done on the effects of crime and pedestrian and bicycle casualties and active travel choices. This is one of the first studies to look at influence of various types of crime, as well as the influence of pedestrian and bicycle casualties, along a person's route. Several studies suggest that neighborhood crime levels affect people's propensity for important physical activity. For example Gordon-Larsen et al. find high crime neighborhoods associated with a decrease adolescent exercise, while King, et al. did not find a similar relationship in adult women. This could be due to this could be due to perceptions (Gordon-Larsen, McMurray, et al. find that perceptions of crime were more important than actual crime), or the way things are measured. In response, this study uses a new and unique linear spatial unit of analysis (as travel is inherently linear). Furthermore, this study uses detailed, point measures of crime and casualties--human scale measures to analysis human scale travel-- (walking and bicycling).

Purpose: This paper addresses the question of how criminal activity and pedestrian and bicycle collisions interact with the built environment to influence the mode choice behavior of morning commuters traveling to rapid transit stations. If station area and route access safety could be improved, substantial benefits might be realized by coaxing even a small fraction of these drivers to non-motorized travel (NMT) modes.

Methods: Recognizing the influence between neighborhood crimes, collisions, perceptions of physical safety, and active travel mode choice, this study employs a unique approach and set of metrics that measure the incidence of crimes, pedestrian and bicycle collisions, and the built environment. This is one of the few studies to 1) use a new linear spatial unit of analysis to look at people's entire routes, from home origin to station destination, 2) use point data on crime and pedestrian/bicycle casualties, 3) to analyze bicycling trips for a large enough group to meaningful for policy guidance, and 3) it is one of the few to look at the influence of bicycle and pedestrian accidents in combination with criminal activity. Multinomial logit (MNL) modeling is used in this research to estimate the likelihood an individual will choose active transportation mode choices (walking or bicycling) over driving, transit, or being dropped off.

Results: The results suggest different crimes appear to have different effects on different modes: property crimes deter people who may wish to avoid placing personal property at risk—such as parking a vehicle or a bicycle. Violent crimes along-the-route appear to have a significant deterrent to modes where travelers are more exposed to personal risk, such as walking, bicycling and transit ridership.[1] People who may have the option to avoid certain streets and stations with high threats to personal safety, appear to exercise that option, such as people being dropped-off, carpooling or driving alone.

Conclusion: Our final model results suggest that pedestrian and bicycle casualties have a stronger influence over active travel than crime. Bicyclists, however, appear more indifferent to bicycle casualties along their route than pedestrians. Nevertheless, crime still matters. Violent crimes along the route and stations are correlated with a lower propensity to walk While bicyclists appear to be similarly influenced to walkers to along-the-route property and violent crimes, they are influenced differently by crimes at the station, with property crimes at the station having a significant, negative influence, while violent crimes have are significantly, positively associated— completely opposite associations to pedestrian behavior.

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Substitution of car trips by active transport in 6 European cities: A health impact assessment study.

Abstract:

Background: Motorized transport is responsible for 70% of environmental pollution and 40% of greenhouse gases emissions in European cities. Multiple programs of international organizations such as United Nations Environmental Program, European Environmental Agency and the United States Environmental Protection Agency have proposed transport policies to encourage non-motorized transport (walking and cycling) and public transport in the cities. Physical inactivity and air pollution have been also classified as two of the 10 leading risk factors of burden of disease worldwide in 2010.

Purpose: Assess the health risks and benefits of promoting active transport modes (walking, bicycling) and public transport for commuting (age group 15-60) in six European cities.

Methods: Scenarios.The three scenarios developed included the following aims: 1) Double cycling rate; 2) Attain 5% of cycling rate; 3) Attain 35% of cycling rate (as in Copenhagen). The distribution of the substitution was based on assumptions that were applied equally in the four cities . Framework. We used a HIA framework to estimate the health effects of mode shifts in our scenarios. Exposure-response functions were derived from existing studies and calibrated for current exposure and health conditions in each of the six cities. We modelled all-cause mortality effects due to physical activity behaviour, road traffic fatality, and exposure to air pollution. Data modelling. Transport data were obtained and analysed from a combination of data provided by travel surveys and records reported by transport departments of each city, local governments, municipalities, and intergovernmental institutions.

Results: Among the different scenarios analyzed, the 50% reduction in car trips would produce benefits in all the six cities. The annual numbers of deaths avoided related to this scenario would be 18·8 in Prague, 13·1 in Paris, 10·6 in Basel, 8·5 in Copenhagen, 7·2 in Barcelona and 0·7 in Warsaw. The scenario that considered an increase in bicycle trips to 35% of all trips (as in Copenhagen) would produce health benefits (50 annual deaths avoided in Prague, 26 Warsaw, 24 Barcelona, 13 Paris and 5 Basel). The scenario that considered an increase in walking trips to 50% of all trips (as in Paris) would only produce benefits in Basel (2·45 annual deaths avoided), in the other cities it would increase the estimated deaths, due to the increase in the projected road traffic fatalities. The scenarios with 50% of car trips replacement (214,660-466,321 car trips/day) would reduce 34,751 to 189,779 (ton/year) of CO_2 emissions in the six cities analyzed.

Conclusion: Policies to promote active transportation may produce health benefits but these depend of the existing characteristics of the cities. This study found that the policies aimed at the substitution of car trips could especially increase health benefits. Such policies also help to reduce greenhouse gas emissions.

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Changing the Scope and Scale of Regional Travel Models to Better Estimate Pedestrian Activity: Applications for Public Health

Abstract:

Background: Pedestrian planning tools are becoming increasingly important as walking is recognized as an efficient, economical, equitable, and healthy form of transportation and physical activity. Transportation planners and public health professionals require better estimates of walking behavior in order to assess the transportation and health impacts of projects, programs, and policies that aim to increase active transportation and physical activity. Unfortunately, regional travel demand models are ill-suited for this purpose: most either do not consider the walking mode, use a combined "non-motorized mode" that fails to distinguish walking from bicycling, or operate at a spatial scale too large to effectively evaluate walking. Our project addresses these issues by developing improved models of walking behavior.

Purpose: The primary purpose of our project is to develop spatially-fine-grained and policy-sensitive models of walking behavior. The models are designed to predict the number of walk trips generated and destinations chosen for walk trips from all areas in a metropolitan region. Data inputs include demographic and socioeconomic characteristics, measures of the pedestrian-scale built environment, and the spatial separation and attractiveness of potential destinations. Model outputs (number of trips, distances, and time spent walking) can be used in pedestrian plans, safety analyses, and health impact assessments.

Methods: We estimated two sequential discrete choice models of walking behavior: one for walk trip generation, and one for walk trip destination choice. Our walking behavior data came from the 2011 Oregon Household Activity Survey for the Portland region, including about 4,000 walk trips out of about 50,000 total trips. Our models were estimated and applied at micro-scale "pedestrian analysis zones (PAZs)"—a grid of 1.5 million square cells covering the City of Portland and surrounding communities—each with 1/20-mile-long sides (an approximate 1-minute walking distance). The first model, a binary logit walk mode split model, predicted the proportion of walk trips from each zone, based on socioeconomic characteristics, a new "pedestrian index of the environment (PIE)" measure, and trip purpose. The second model, a multinomial logit destination choice model, predicted a destination zone for each of these walk trips, based on distance, attractiveness, our PIE measure, and other factors.

Results: Our models revealed several statistically significant associations with walking behavior. Depending on trip purpose, a one-point increase in our PIE measure was associated with a 4–5% increase in the odds of making a walk trip. Households with more children, younger adults, and fewer automobiles were more likely to walk. In our destination choice model, distance was a significant deterrent for walking. Also, all else equal, destinations with double the number of retail jobs had 10–50% higher odds of being chosen, while destinations with a one-point higher PIE score had a 1–5% increase in the odds of being chosen.

Conclusion: Our pedestrian models are spatially- and policy-sensitive, predicting shifts in walking behavior due to changes in socio-demographics, density, sidewalks, and street-connectivity. Model outputs are useful for many health-related analyses. Predicted numbers of walk trips or distances walked can be used as measures of exposure when assessing pedestrian crash risk at fine geographic scales. Estimates of distances walked can be converted into minutes walked for measuring levels of physical activity. Regional transportation planning and health organizations can apply our models to evaluate pedestrian safety and physical activity outcomes for specific projects and for land use and transportation system scenarios.

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Predicting active travel behavior and health impacts of regional plans in California
Abstract:
Background: Relationships between built environment characteristics and health outcomes (including physical activity, obesity, and respiratory health) have been established in academic research over the past two decades. With initial recognition of its capacities as a flexible land use planning scenario modeling platform and data repository, UrbanFootprint (UF) is beginning to be used by California Metropolitan Planning Organizations (MPOs) to inform long-range planning processes. Several California MPOs have expressed an interest in operationalizing these findings by incorporating assessments of health impacts into their planning practices, including consideration of health impacts during the current round of Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS) updates, pursuant to Federal Transportation law and California Senate Bill-375 requirements. Supported by funding and/or staff from the Resources Legacy Fund, Sacramento Area Council of Governments, Strategic Growth Council, Governor's Office of Planning & Research, and other state and local agencies, Urban Design 4 Health and Calthorpe Associates are partnering to develop and integrate a series of health impact assessment models into UF.
Purpose: The purpose of this project was to develop a set of physical activity-related health prediction models to be integrated into UrbanFootprint scenario planning software. With methodological and technical review by experts from UCLA, UC Berkeley, RAND Corporation, the Centers for Disease Control and Prevention, LA County, and Resource Systems Group, the UF public health module was designed to use models calibrated from California-specific data sources to predict contrasting levels of active transportation, recreational physical activity, sedentary time, obesity, diabetes, and cardiovascular disease resulting from alternative land use and transportation investment proposals.
Methods: The health models were derived from a variety of California-based data sources including the California Household Travel Survey (CHTS), California Health Interview Survey (CHIS), US Census data, and state, regional, and local transportation system, land use, and employment data. Built environment variables were developed for 1km buffers surrounding each 150x150m grid cell in the 30-county study area, then joined to CHTS and CHIS participants' geocoded residences. The large sample sizes (CHTS, n=53,733; CHIS, n=40,617) allowed models to be calibrated for four unique age cohorts. For the adult cohort, models were also developed for three unique income cohorts. Models were developed for four different CHTS travel behavior and physical activity outcomes and 13 different CHIS travel behavior, physical activity, body weight, and health outcomes. A variety of regression modeling methods were used, including linear, binary logistic, and Poisson. The health models developed for this project are being operationalized in an updated version of UF, which has been under ongoing development to strengthen and expand its capabilities as an open source, web-based scenario development and analysis platform.
Results: Results are presented here for only the CHTS models. For adults of all incomes, key predictors of transportation walking included higher walkability index (which consisted of residential density, retail floor-area ratio (FAR), land use mix, and intersection density components), better access to bus and rail stops/stations, regional jobs, and local parks, and shorter distance to the nearest school. Results were similar for transportation biking, though regional job accessibility was not associated with biking. The only predictors of recreational physical activity episodes were lower walkability index, greater park access, and having made at least one walking trip. Results were generally consistent across adult income cohorts. The most notable exceptions were for low income adults: greater proximity to an arterial or freeway was associated with less biking and the walkability index was not associated with recreational physical activity. Results were similar for transportation walking models across age cohorts. For teens and children as compared to adults and seniors, transit access was a weaker predictor of walking while proximity to a major road was associated with less walking.
Conclusion: When travel behavior, physical activity, and health-related metrics are incorporated into the scenario planning process, it provides an opportunity to apply evidence on built environment relationships with health related outcomes to real-world planning decisions. The UF tool is applicable throughout California at a range of geographic scales, from neighborhood to region, and can be used on a wide variety of projects. The use of evidence-based metrics developed from relationships found in a large sample of local data also provides a substantial innovation over most health impact tools to-date, which tend to be largely qualitative in nature.

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Using Mobility Panel Data to Assess Physical Activity from Active Travel of Individuals over Time: Insights from Germany

Abstract:

Background: Travel surveys are typically cross-sectional and only capture travel behavior during one specific day—prohibiting assessment of active travel and resulting physical activity in individuals over time.

Purpose: This study overcomes limitations of single day cross-sectional travel surveys by using data from the German Mobility Panel (MOP) 1995-2014 to assess physical activity from active travel of individuals (a) across two consecutive years and (b) between individual travel days and the entire week. MOP is a rotating panel with individuals participating for three consecutive years before rotating off. MOP respondents complete detailed travel diaries for 7 consecutive days including information on minutes walked and cycled for each trip taken.

Methods: We aggregated minutes of walking and cycling from the trip file to the person-level distinguishing between minutes of 'active travel' for individual days and the whole week. At the day level we identified individuals achieving 30+ minutes of physical activity. At the week level we used 150+ minutes as cut-off. We also counted the number of days with and without reported active travel.

Results: - Between 1994 and 2014, 40% of respondents reported 150+ minutes of physical activity from active travel per week, meeting physical activity recommendations. 22% achieved 5+ days of physical activity during the week. Roughly, 75% of the population achieved 30+ minutes of active travel on one day of the week and 60% on two days. One in six respondents (15%) reported 30+ minutes of active travel on 5 days of the week. Of individuals reporting data in two consecutive years 27% achieved 150+ minutes in both years. About 13% increased their active travel from less than 150 to over 150 minutes per week, a further 13% decreased their physical activity from travel from 150+ to less than150 minutes per week. 12.7% of respondents achieved 5 days of active travel per week both years. About 9.0% decreased active travel from 5+ to 4 or fewer days and another 9.0% increased their active travel from 4 or fewer to 5 or more days per week.

Conclusion: Active travel can help a large share of the population achieve weekly minimum recommended physical activity levels. Between 1995 and 2014, two of five Germans attained the physical activity recommended levels (150+ minutes) through active travel alone. 27% of respondents achieved 150+ minutes of weekly active travel in two consecutive years—indicating that active travel can be a reasonably stable source of physical activity. For policy makers who want to increase stable long-term physical activity in the population our results suggest that promoting active travel might be a promising strategy--maybe even better than encouraging engaging in sports.

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Incorporating health measures into Vancouver's on-going trip diary panel survey and other initiatives as part of the Healthy City Strategy.

Abstract:

Background: As with other municipalities, Vancouver continues to grapple with several 21st century challenges: climate change, increasing prevalence of chronic health conditions, and growing inequality. In response to these and other challenges, the City of Vancouver has been developing a framework of long-term sustainability strategies for over a decade. Within this overarching framework, the City's social policy component has coalesced around a health theme vis-a-vis the City's Healthy City Strategy (HCS) 2014-2025. Health has long been part of Vancouver's brand representing the values held by its citizens. This long-standing local culture has made the HCS particularly relevant as a vehicle for shifting health-related strategic decisions and resource allocation from being crisis-driven interventions to a longer-term proactive and integrated understanding of wellness. Recognizing the numerous health benefits of travelling by active transportation modes, they figure prominently throughout the HCS.

Purpose: With the development of the HCS, a strong current of support for health-related initiatives has followed in its wake, including actions to better address the HCS transportation-related goals and targets. The following are relevant on-going initiatives lead by the City's Active Transportation Branch: 1. Corridor-scale assessment to evaluate before/after health impacts of projects 2. City-wide safety review of collision data and hospital injury reports 3. System for collecting "demographic" pedestrian and cyclist volumes 4. Video-based automated conflict analysis tools 5. Leading by example with staff incentives program, end-of-trip facilities, and skills training 6. City-wide longitudinal trip diary including health assessment

Methods: In 2013 the City conducted its first iteration of a city-wide trip diary panel survey. With the second iteration currently underway, staff introduced adaptations that help capture the health impacts of travel behaviour. Results from this survey will inform many of the team's other health-related initiatives listed above. Thus, this survey will be the focus of the presentation and important connections to advances on the other initiatives cited would be incorporated where appropriate. Staff did not find any examples of trip diaries that also included questions exploring the health impacts of travel behaviour. Given the already significant respondent burden in filling out a traditional trip diary, changes to the survey were constrained to limit the number of additional questions and increasing in survey complexity. As such, key questions were drawn from survey instruments currently in use in Vancouver, which were then reviewed internally and in consultation with representatives from Vancouver Coastal Health as well as local researchers. Furthermore, recent existing trip diary and health-related surveys were carefully reviewed to ensure consistent language and demographic content.

Results: Based on these internal discussions and external consultation, the following adaptations were introduced into the City's panel survey to help capture some of the health impacts associated with travel behaviour: 1. Include recreational trips (those with the same origin and destination) For a more complete picture of how much travel is contributing to the recommended physical activity as per Canadian guidelines. This required also including self-reported travel time. 2. General health assessment Self-reported overall health assessments are simple but well-established as having a strong correlation with overall mortality risk. This question also allows comparison with results from the on-going My Health My Community survey and from the Canadian Community Health Survey, which has been collecting this data for years. 3. Friendly interaction during travel as insight on social inclusion Rather than ask generally about interaction over the past month, week, day, etc, staff felt the reliability of results could be improved by linking the question to specific trips (allowing for a correlation of community engagement with mode, location, etc).

Conclusion: With the TRB conference running in April and survey data collection already underway, we hope to be able to present preliminary survey results at the conference. Although this will be the first survey iteration that will include health measures and we will not be able to explore temporal changes in health until at least next year, correlations between health and travel behaviour may provide useful insights for a baseline of city-wide information and lessons learned.

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Is the program working? New spatially-discrete tools for rapid assessment and program evaluation

Abstract:

Background: Safe Routes to School (SRTS) programs are premised on two key outcomes: improving the safety of children who are walking or bicycling to school and shifting children out of private auto trips onto their feet or bicycles. Traditional show-of-hand or parent surveys about mode choice are inherently unreliable and methodologically weak because they lack geographic detail and an explicit connection to the available pedestrian network. WalkBoston and the Metropolitan Area Planning Council (MAPC) developed a short and effective survey tool that allows communities to efficiently assess the travel patterns of students living at various distances from school, and to carry out pre- and post-intervention surveys that accurately measure the mode shift effects of SRTS programs.

Purpose: WalkBoston and MAPC sought to develop a survey tool that could effectively assess mode choice in a spatially discrete manner, so that the travel patterns of children living within walking distance could be distinguished from those for whom active transportation is not a feasible option due to distance or lack of safe pedestrian infrastructure. The analysis underlying the survey tool can be used to target SRTS interventions and investments, and the tool itself can be used to assess the effectiveness of interventions.

Methods: MAPC used sidewalk inventory data and information about off-road paths to develop "walksheds" of various distances (

Results: Nearly 10,000 responses have been collected from a great variety of participating schools. Repeat surveys have been conducted at five schools in the City of Revere, a dense urban community northeast of Boston, where WalkBoston has been engaged in a sustained partnership with the school district and community coordinators. Comparison of results from surveys conducted in 2011-2012 versus 2013-2014 show marked improvements in active transportation among students living within walking distance of their school. Walk to school rates for the AM commute increased by an average of 11% for students living in the 0.5 mile walkshed and 7% for students living between 0.5 and 1.0 miles from school. WalkBoston and MAPC have also estimated the GHG reductions and increased physical activity likely to have resulted from such mode shifts.

Conclusion: A new analysis framework and open source survey tool provides a unique resource for districts seeking to conduct rapid assessment of walk-to-school potential and to evaluate program success. We found that more than one-eighth of school commute-related GHG emissions were the result of trips that could have been shifted to walking or biking. The automated report generation component of the online tool is an invaluable resource for school administrators seeking to measure trends and track progress.

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The relationship between utilitarian walking, utilitarian cycling, and body mass index in a population based cohort study of adults: Comparing random intercepts and fixed effects models.

Abstract:

Background: A number of cross-sectional studies have demonstrated that among adults utilitarian transportation is associated with lower BMI (Body Mass Index), waist circumference, and improved blood lipid profiles (i.e., total cholesterol, low density lipoprotein cholesterol, and triglycerides), while controlling for leisure time physical activity. A recent review and meta-analysis identified a number of prospective cohort studies examining the relationship between active transportation and BMI in children did not identify any prospective cohort studies examining the relationship between active transportation and BMI in adults. Therefore, there is a need for longitudinal studies examining the relationship between active transportation and BMI in order to gain a better understanding of the relationship between active transportation and weight among adults.

Purpose: Examine associations between utilitarian walking, utilitarian cycling and BMI.

Methods: Participants from the National Population Health Survey (NPHS) of Statistics Canada were interviewed by telephone every two years from 1994-2010. Analysis included data from 6894 living participants aged 18-64 years. Response rates of for cycles 1 through 9 ranged from 92.8% to 69.7%. The study population for the analyses was limited to living adults aged 18-64 years during the study period. The outcome variable was BMI calculated using self report height and weight. The primary variables of interest were utilitarian walking and utilitarian cycling measured by self-report to the question, "in a typical week in the past 3 months, how many hours did you usually spend walking/cycling to work or to school or while doing errands?" Analyses used random intercepts and fixed effects models. Fixed effects models, remove all time constant factors from the error term. Random intercepts models assume that time constant factors are a random normally distributed unobserved variable. All models were adjusted for year, season, age, sex, education, marital status, rural/urban, children in the home, mobility restrictions, student status, and smoking status.

Results: The final adjusted models showed no significant relationship between utilitarian walking and BMI. The random intercept regression showed that utilitarian cycling for 1 to 5 hours per week (b =-0.14, 95% CI: -0.29 to 0.02), and more than 6 hours per week (b =-0.19, 95% CI: -0.47 to 0.09) were not significantly associated with a lower BMI trajectory. The fixed effect analysis showed that utilitarian cycling for 1 to 5 hours per week (b =-0.12, 95% CI: -0.27 to 0.03), and more than 6 hours per week (b =-0.16, 95% CI: -0.45 to 0.13) were not significantly associated with BMI over time. Across all models utilitarian cycling more than 6 hours per week had an effect size ranging from -0.16 to -0.35 BMI points. For a 5'10" individual weighing 174 pounds (BMI=25) a BMI reduction of 0.30 converts to an approximate weight reduction of 2.1 pounds from utilitarian cycling. A weight loss of 2.1 pounds has minimal clinical significance for improvements in cardiovascular risk factors.

Conclusion: The results suggest that utilitarian walking is not related to BMI. The relationship between utilitarian cycling and BMI is less clear. Our study showed no statistical or clinically meaningful results. However, physical activity has health benefits over and above those associated with weight loss that were not assessed. Our study findings point to a broader need to review and assess the validity, reliability, and precision of self-report active transportation measures. Poor validity and precision could explain our results and apply to similar questions used for surveillance including the National Health and Nutrition Examination Survey and the American Community Survey.

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Building Capacity in Urban Atlanta: The Environmental Health Core (EHC) and the Community-Soil-Air-Water Initiative (C-SAW) at Georgia State University

Abstract:

Background: The School of Public Health at Georgia State University has established an Environmental Health Core as part of its NIH-funded Center of Excellence on Health Disparities Research. In addition to several focused environmental public health projects, the EH Core has served to catalyze interdisciplinary activities among public health, environmental science, and geospatial science faculty, staff, and students. One such activity, the Community-Soil-Air-Water Initiative (C-SAW), engages faculty from Public Health, the Department of Geosciences, and other units on campus, in partnership with several grassroots community organizations, and local, state, and federal partners.

Purpose: The EH Core and C-SAW seek to integrate quantitative measures of environmental riskscapes (e.g. Pb dispersal or airborne pollutants), exposure models (e.g., Urban Health Index, "exposome", others), community engagement, and citizen science. Our goals are 1) to generate actionable environmental/exposure data over useful spatio-temporal scales to transportation infrastructure and policy domains; 2) to build a network of interdisciplinary scientists and others with an interest in the complex interactions between built environment, exposure, urban socioeconomic processes, governmental and commercial decision making; and 3) supporting grassroots education and engagement by community members in building the future of their communities.

Methods: This presentation will focus on four example issues that directly impact health, and relate closely to transportation infrastructure. Traffic related injuries in downtown Atlanta were evaluated based on their spatial concentration in GIS coupled with built environmental auditing. Pb was assessed in both roadway dust and shallow soils by X-ray fluorescence spectroscopy and ICP-AES. Airborne NO_2 was measured using passive Ogawa badges producing a time-integrated record over fine spatial scales. Resident perceptions of greenspace access were assessed by surveys, in-depth interviews, and park events in Lionel Hampton Nature Preserve in southwest Atlanta.

Results: Some road features and land use patterns protect pedestrians and motirsts, yet the lack of infrastructure in some traffic zones poses a threat to safety. Pb concentrations in road dust and soils indicate geospatial differences between the two, reflecting the difference between ongoing and legacy Pb contributions. NO_2 concentrations varied systematically with proximity to highways. Highest air pollution levels were found in the poorest Atlanta communities. In the greenspace access analysis, a complex set of physical and social barriers to access was discovered, including effects of spatial segregation, fear of crime, local land use policies, and lack of infrastructure investment.

Conclusion: Collaborative, interdisciplinary efforts are underway at Georgia State University to collect environmental and social data that are directly relevant to urban transportation decision makers. These include heavy metal contamination issues, air quality, and greenspace access. All of these bear directly on urban environmental public health. Understanding these issues will directly contribute to efforts to build sustainable, healthy, and prosperous cities.

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Health impact assessment of public bicycle schemes in Ireland

Abstract:

Background: Active transport and public transport policies which encourage cycling in cities can bring not only benefits from the reduction of car congestion and air pollution emissions, but also important health co-benefits, in particular through an increase in physical activity. Physical inactivity and air pollution have been classified as two of the 10 leading risk factors of burden of disease worldwide in 2010. The implementation of public bicycle schemes (PBS) in Dublin has doubled the rate of bicycle trips in the city. In 2014 three other cities in Ireland (Cork, Galway and Limerick) have proposed to implement a new PBS to increase the cycling trips in the cities.

Purpose: Assess the health risks and benefits of public bicycle schemes in Ireland.

Methods: Scenarios.The three scenarios developed included the following aims: 1) Double cycling rate; 2) Attain 5% of cycling rate; 3) Attain 35% of cycling rate (as in Copenhagen). The distribution of the substitution was based on assumptions that were applied equally in the four cities . Framework. We used a HIA framework to estimate the health effects of mode shifts in our scenarios. Exposure-response functions were derived from existing studies and calibrated for current exposure and health conditions in each of the six cities. We modelled all-cause mortality effects due to physical activity behaviour, road traffic fatality, and exposure to air pollution. Data modelling. Transport data were obtained and analysed from a combination of data provided by travel surveys and records reported by transport departments of each city, local governments, municipalities, and intergovernmental institutions.

Results: The annual numbers of deaths avoided related with scenario 1 (doubling the cycling trips) were 1.17 in Dublin, 0.06 in Cork, 0.11 in Limerick and 0.18 in Galway 0.18. Scenario 2(attain 5% of cycling trips) also produced annual health benefits of 1.27 deaths avoided in Dublin, 0.52 in Cork, 0.45 in Limerick and 0.22 in Galway. The scenario 2 reduced between 116,661 to 756,761 (kg/ year) of CO_2 emissions in the four cities analyzed.

Conclusion: Public bicycle schemes in Ireland can produce health benefits. The most benefit of these PBS come from the increment of physical activity and the reduction of traffic fatalities between the travellers. Close collaboration between health practitioners, transport specialists and urban planners is needed.

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The impacts of physical activity level on bicyclist ventilation rates and the uptake of VOC and PM air pollutants

Abstract:

Background: Bicycling and walking provide health benefits through physical activity, but also increase health risks from air pollution exposure. These contrasting effects are directly connected through ventilation: increased activity leads to higher ventilation rates, which lead to higher pollutant inhalation rates. High pollutant inhalation rates for active travelers are documented in the literature; but the next step of pollutant uptake or internal dose has been studied less. A better understanding of the dependence of air pollutant doses on physical activity during travel is needed in order to more accurately assess the relative health benefits and risks of active transportation.

Purpose: This research investigated the dependence of air pollutant uptake on workload and ventilation for bicyclists. Physical activity, ventilation rates, and internal doses of traffic-related volatile organic compounds (VOCs) by bicyclists were measured in situ. The dependence of VOC uptake on physical activity was quantified and compared with the dependence of VOC inhalation rates on physical activity. The role of the equilibrium condition between blood and exposure air in determining VOC uptake is discussed. Comparisons with expected particulate matter (PM) uptake and inhalation rates are made based on published literature.

Methods: Breath biomarkers were used to indicate internal doses of traffic-related VOCs for bicyclists. 74 end-tidal breath samples were collected before and after riding segments of 20-30 minutes. Changes in exhaled breath concentrations reflect uptake of VOCs into the bloodstream over the course of the riding segment. Ambient concentrations of VOCs during riding were also measured, along with rider physiology, location, speed, and other determinants of workload. Inhalation rates were calculated from exposure concentrations and ventilation rates. A distributed lag model was estimated to determine the time-dependent effect of workload on ventilation rate. The effects of exposure concentration and ventilation rate on VOC uptake were modeled with regression analysis. A system of Seemingly Unrelated Regression Equations (SURE) was specified to model breath concentrations for a set of ten aromatic hydrocarbons.

Results: Ventilation rates were elevated during riding, in line with expectations from the estimated workload and past research. Elevated ventilation led to commensurately high inhalation rates during riding. For the modeled compounds, breath concentration elasticity to exposure concentrations was 0.4-0.5 and elasticity to ventilation was 0.1-0.2. Uptake of VOCs (as indicated by breath biomarkers) increased with exertion level, but to a smaller degree than the increase in ventilation or inhalation rate. Thus, the uptake fraction of inhaled VOCs decreased with exertion level. In addition, the effect of varying ventilation on bicyclist uptake of VOCs was smaller than the effect of varying exposure concentrations: exposure explained about ten times more variance in measured breath concentrations than ventilation did. These result are in contrast to the effects of physical exertion on particulate matter (PM) uptake reported in the literature, which shows increasing uptake fraction of inhaled PM with physical activity. Considering only physical activity differences, bicyclists are expected to have 2-5 times higher PM uptake doses than motorized travelers, but only about 2 times higher VOC uptake doses.

Conclusion: This is the first research to measure in-situ VOC uptake by bicyclists using breath biomarkers. The increased uptake of VOCs due to physical activity is shown to be smaller than the increase in ventilation and inhalation. The opposite would be true for PM: uptake fraction of inhaled PM tends to increase with physical activity. This result has potentially important implications for health impact assessments and roadway/network design that considers pollution exposure risks for active travelers. Studies of the net health impacts of active travel should go beyond inhalation to consider the uptake effects of different levels of physical activity.

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Is recreational walking in rural areas a substitute for utilitarian walking in urban areas?

Abstract:
Background: Urban-living adults in the United States (U.S.) walk more than their rural counterparts according to data from the 2001 and 2009 National Household Travel Surveys. Ostensibly this is because of the higher residential and employment densities in urban areas, which can support more destinations and public transportation within walking distance from residences, along with the pedestrian infrastructure that makes walking a viable mode of transportation. But lower levels of utilitarian walking in rural areas could be partially offset by recreational walking – defined as walk trips that start and end at the same location and are not used to access a specific destination. To our knowledge, no studies have obtained and compared detailed measures of utilitarian and recreational walking in urban and non-urban settings.
Purpose: This study compared utilitarian versus recreational walking behaviors in a sample of adults from urban and rural areas (metropolitan and micropolitan statistical areas, respectively). We hypothesized that urban residents walked more for utilitarian purposes, rural residents walked more for recreational purposes, and that utilitarian and recreational walking would be negatively correlated. Such observations would be evidence of rural residents substituting recreational walking for utilitarian walking.
Methods: Adults living in the urbanized Seattle metropolitan area and in 9 rural towns across 3 regions in the U.S. were randomly sampled. In urban Seattle, 464 participants completed a demographic, behavioral and attitudinal survey and wore an accelerometer, GPS device, and completed a travel diary for one week between May 2012 and August 2013. In the rural towns, a sub-sample of 299 participants from a larger survey study wore an accelerometer, GPS device, and completed a travel diary for one week between September 2011 and March 2012. The accelerometer, GPS, and travel diary data were integrated to identify physical activity bouts, defined as time intervals involving sustained physical activity, which were further classified as walking for recreational or utilitarian purposes or non-walking. Differences in weekly minutes of utilitarian and recreational walking between urban and rural residents were modeled using multivariate mixed-effect linear regression models to account for town-level clustering. Pearson's correlation coefficients for recreational and utilitarian walking were obtained for the full sample and only those who walked.
Results: On average, urban adults walked more than rural adults for utilitarian purposes. But urban adults walked less than rural adults for recreational purposes. In analyses that adjusted for socio-demographics, body mass index, walkable destinations as a reason for moving to one's neighborhood, non-walking physical activity, weather conditions during the study, and number of days for which participants' walking data were collected, urban adults obtained an average of 40.3 (95% CI 21.6, 59.1; p
Conclusion: Using detailed walking data, we found that urban adults walked more than rural adults overall. This surplus was explained by greater amounts of utilitarian walking among urban adults, even though they walked slightly less for recreational purposes than their rural counterparts. Non-significant correlations between utilitarian and recreational walking indicated that little substitution occurred between the two types of walking. These findings suggest that successful efforts to increase either utilitarian or recreational walking will likely contribute to overall increases in physical activity rather than the trading one type of activity for another.

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Differences in Walking in Small U.S. Towns by Ethnicity and Language Spoken

Abstract:

Background: Latinos living in urban areas in the US walk less than their non-Latino counterparts. However, very little is known about the types of walking among Spanish-speaking or English-speaking Latinos, and even less is known about walking among Latinos living in small towns in rural US locations. Because language spoken is a marker of acculturation, walking behaviors may differ among members of each ethnicity/language group.

Purpose: We assessed whether the amount of neighborhood walking for utilitarian and recreational purposes differed among three groups of adults in small towns: predominately Spanish-speaking Latinos (SLs), predominately English-speaking Latinos (ELs); and non-Latinos (NLs) (all of whom spoke English and nearly all of whom were non-Hispanic whites). We also explored whether differences in walking behaviors among these three ethnic/language groups remained after accounting for a range of socio-demographic, lifestyle (e.g., screen time), and built environment (BE) measures.

Methods: In 2011-12, we conducted a telephone survey and collected objective BE data among 1,305 adults age 18 years or older residing in 6 small nonmetropolitan (rural) towns (3 in Texas and 3 in Washington State) with populations ranging from 15,000 to 36,000. Of these, 121 (8.6%) were SLs, 95 (6.8%) were ELs, and 1,189 (84.6%) were NLs. We performed mixed-effects logistic regression modeling to examine relationships between ethnicity/language group and levels of reported utilitarian walking ("high" [≥150min per week] versus "low" [

Results: High utilitarian walking was reported by 25.8% of SLs, 23.2% of ELs and 10.2% of NLs (p=.02). In multivariate analyses, ethnicity/language was not statistically significant as a main effect, but the interaction between ethnicity/language and income was significant (p=.02). Utilitarian walking declined as income increased - steeply for SLs, moderately for ELs, and modestly for NLs. Other measures associated significantly with high utilitarian walking included: body mass index

Conclusion: Latinos are fueling population growth in small towns in the US. This study provides insight about walking behaviors in this rapidly growing segment of the population and shows that these behaviors differ substantially by three ethnicity/language groups. Our findings suggest that one-size-fits-all approaches to promoting walking in rural towns may not be as effective as those that are tailored to the needs of SL, EL, and NL inhabitants. Increased attention to the small town environment could lead to increases in walking in each of these groups, which could improve the health status of residents of rural communities in the US.

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The Partnership for Active Transportation – creating a broad-based movement for human-powered mobility to build healthy places for healthy people

Abstract:

Background: Balanced transport systems are fundamental to healthy communities. A strong economy and high quality of life depend on safe and easy access for all residents to jobs, schools, transit, shops, services, parks and playgrounds. Public health is improved by providing a built environment that facilitates routine physical activity. Investing in networks of infrastructure that enable walking, bicycling and use of wheelchairs-or active transportation- is critical to providing transportation systems that meet everyone's needs, regardless of whether they drive, and to spur economic development and promote active living.

Purpose: The Partnership for Active Transportation is a unique collaboration of organizations working across the fields of transportation, public health, economic development, community leadership, equity and livability. The principles that unite us are: access for all, prioritizing active transportation networks, increasing investment in safe places to walk and bicycle, considering relevant policy opportunities and collaborating across all sectors.

Methods: The Partnership is spearheaded by major national organizations including the American Public Health Association, Rails-to-Trails Conservancy, LOCUS (a division of Smart Growth America representing real estate developers), the American Academy of Pediatrics and America Walks. These organizations worked together to draft the Partnership Policy Platform. The platform was produced in January 2014 and released to the public and key members of Congress on February 11, 2014

Results: The Partnership's Platform entitled 'Safe Routes to Everywhere' calls for specific policy innovations, to build healthy places for healthy people through active transportation networks. The platform calls for: (1) increased federal investment (from the current 1.5% to 3% of surface transportation) to fill gaps in walking and biking networks; (2) innovative finance strategies to harness private value of the active transportation projects to leverage public dollars and accelerate completion of networks; (3) a health impact assessment pilot program to learn best how to integrate health considerations into transportation decision-making to improve public health; and (4) develop and implement performance goals and metrics for all transportation projects that incentivize balanced, healthy and safe mobility options. Rep. Tom Petri (R-Wis.), chair of the House Transportation and Infrastructure Subcommittee on Highways and Transit, and ranking member of that subcommittee, Eleanor Holmes Norton (D-D.C.), met with the Partnership on February 11, 2014 to receive the Platform and hear its prescription for creating low-cost, high-impact networks for walking and biking to connect employment, shopping, transit and other key destinations.

Conclusion: For the first time the voices of transportation, health and economic development advocates are formally joined behind a shared policy agenda to influence transportation and health policies. This agenda was officially received by the chair and ranking member of the House Highways and Transit Subcommittee, the most critical body handling active transportation issues. The Partnership for Active Transportation will continue its campaign in the lead up to the reauthorization of a new transportation bill, to ensure the federal government maximizes the impact of taxpayer dollars to meet the needs of all Americans for balanced, healthy and safe transportation choices.

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Perceptions of bicycling determinants to identify active transportation planning targets

Abstract:
Background: In addition to the positive economic, social, and environmental impacts of active transportation, bicycling is also a low-cost transportation option that can help riders meet daily levels of physical activity and possibly contribute to weight maintenance and weight loss. However, prevalence of active transportation using bicycles is very low in the United States, including Baltimore City, Maryland. Published evidence concerning barriers to bicycling is mixed and different population subgroups report different reasons for not choosing bicycling as a transportation option.

Purpose: The purpose of this study is to describe the barriers to bicycling and perceptions of safety in a diverse sample of Baltimore City residents and share the data with governmental, non-governmental, and advocacy groups as a means of informing policy and programmatic interventions geared toward increasing the bicycle mode share.

Methods: A total of 1,334 Baltimore City residents (801 female; 826 riders) completed an online survey during February and March of 2014 assessing barriers and perceptions of safety to bicycle riding. Respondents were recruited through social media and flyers posted throughout Baltimore City public libraries. The sample consisted mostly of higher educated, White women and men. Throughout all stages of the investigation, we consulted with Bikemore, a grass roots bicycle advocacy organization in Baltimore City who meets regularly with Baltimore City Department of Transportation (BCDOT). These meetings helped guide our selection of survey questions. Respondents were presented with 13 different barriers (e.g., "Places I need to travel are too far on a bicycle", "The weather") and indicated if each barrier was a major, minor, or not a factor deterring respondents from riding. These three responses were dichotomized as major vs. minor/not a factor. In addition, respondents rated the extent to which they thought bicycling in the city was safe using 4 or 5 point response scales. The study design was cross-sectional.

Results: Logistic regressions revealed main effects for ridership status and respondent sex regarding to barriers. Non-riders rated hills (22.8%), concerns about drivers (72.2%), concerns about crime (45.2%), bicycle riding as uncomfortable (27.5%), and being unable to carry as many things on a bicycle (34.9%) as major barriers to bicycling compared to non-riders. Additionally, women rated hills (19.4%), concerns about drivers (66.6%), concerns about crime (41.0%), and being unable to carry as many things on a bicycle (26.7%) as major barriers to bicycling compared to men. Linear regressions indicated main effects for ridership status and respondent sex regarding safety perceptions. Non-riders (M = 2.1, SD = .76) agreed more than riders (M =1.9, SD = .67) that sharing the roadway with motor vehicles is unsafe and disagreed more (M =3.7, SD = .84) than riders (M = 3.3, SD = 1.0) that it is safe to bicycle in Baltimore City. Finally, men had greater disagreement (M = 2.63, SD = .75) than women (M =2.53, SD = .77) that bike lanes are only safe for experienced bicyclists.

Conclusion: Road and crime safety were the biggest concerns for non-riding and female residents. Non-riders perceived bicycling in Baltimore City as less safe than riders. We have meetings slated for fall of 2015 with the BCDOT to present the findings and to propose recommendations including the construction of cycle tracks and protected bicycle lanes on roads that are popular bicycle routes. Additionally, we recommend stricter enforcement of speed limits and reducing speed limits on roads with high volumes of bicycle traffic. Finally, to overcome crime as a major barrier, we recommend adopting principles consistent with Crime Prevention through Environmental Design (CPTED).

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THE POTENTIAL FOR HEALTH COST REDUCTIONS RELATED TO TRANSIT INDUCED PHYSICAL ACTIVITY

Abstract:

Background: Public transportation (transit) struggles to maintain funding and develop as a transportation mode in the US. Transit projects compete for funding and receive funding based on the perceived benefits the mode can provide. These include health benefits that do not typically factor into the transit funding process—possibly because the health benefits are not immediately apparent to decision makers and planners.

Purpose: Recognizing this gap in knowledge, this paper aims to provide a basis for understanding the positive health impacts of transit use and the budgetary implications associated with such benefits as well as an understanding of current knowledge regarding the intersection of public transportation and health.

Methods: The current state of knowledge pertaining to physical activity and transit as related to health costs was reviewed. In particular, the interrelationship between transit and health was evaluated in various dimensions, including the health effects of physical inactivity, the financial costs of physical inactivity, the relationship between physical activity and transit, the quantifiable reduction in health costs associated with transit use and the current state of available research on healthcare costs. Additionally, available health cost data were used in a mock analysis comparing transit availability and health costs designed to determine the potential for using current datasets to assess transit's capacity to reduce health costs.

Results: Physical activity correlates with reductions in chronic disease incidence, improved life condition, greater longevity, and reduced personal health expenditures. Experts generally accept transit as a travel mode that imparts positive health benefits that result directly from users' physical activity (when accessing the mode) as well as community level benefits such as reductions in congestion and reduced vehicular emissions. However, the findings indicate that research investigating the intersection of transit and health costs is limited. Furthermore, existing generalized annual health cost data sets are found to be limiting to this type of research—costs are only available at the statewide level and do not allow for localized analysis of transit's impact. In order to determine both the health and the financial benefits associated with increased transit use, data sets which offer fine-grain data are required. Though positive correlations were found between physical health and transit at a very high level, once this data is available, it is likely that a health cost reduction will be strongly linked to transit use and transit saturation.

Conclusion: Research on the potential for reducing health costs by increasing transit use/availability is lacking. Moving forward, the potential for health cost reductions associated with transit use presents a largely uninvestigated area of research. Development of a more robust health cost data set will allow more holistic assessment of the benefits of transit and, assuming positive results, potentially impart increased funding opportunities for the mode while contributing (through greater transit saturation) to a more balanced transportation system.

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On Developing the Transportation Exposome: Using a Panel Study of Commuters as an Integrative Platform of Acute Health Effects from Roadway Emissions

Abstract:

Background: Exposure to roadway emissions, whether by proximity or travel, has been linked to adverse health outcomes across study designs. Evidence suggests increased risks of low birth weight pregnancies, reduced autonomic heart rate control, and increased hospital admissions for respiratory distress. In our previous commuter study, we found acute increases of malondialdehyde, a marker of oxidative stress, in exhaled breath condensate and reduced heart rate variability after exposure to highway commuting. In contrast, avoiding these exposures, perhaps through active transportation in shorter commutes, may improve acute health outcomes. Examining roadway emission exposures during passive transportation, specifically within personally driven vehicles, is important to understanding the pathways which impinge upon human health during commuting. Determining the environmental causes are challenging. The human exposome is a complex mixture of joint environmental exposures and biological responses. Typically, human exposures to transportation related pollution are assessed with modeled surrogates or sampled tracers with measurement error and source uncertainty. The tools available are limited by technology and cost. Newer analytical methods show promise in cost and environmental sampling burden.

Purpose: Metabolomics—a high-throughput analytical method for measuring small molecules in samples—may provide a single, cost-effective method of biomonitoring exposures to transportation related activities. The present exposure assessment of particulate matter (PM2.5) exposures in commuters affords comparisons between traditional, proven exposure assessment methods with exposure assessment in plasma using metabolomics.

Methods: A panel of 60 people, 30 with well-controlled asthma, participated in two, 2-hr, scripted commutes starting at 7AM. All participants drove on high-traffic freeways around Atlanta for one commute day. For the second commute day, the participants were randomly assigned to either a major road commute or an indoor, clinic exposure. Participants randomized into the clinic exposure for one of their commutes will serve to examine the same health effects in the absence of roadway emissions. The vehicle cabins were outfitted with a battery of instrumentation in the front passenger seat for continuous and integrated measures of traffic-related air pollution. PM2.5 mass, black carbon, ultrafine particle, particle-bound polycyclic aromatic hydrocarbon concentrations were measured continuously. Filter-based samples provide integrated measures of ions, organic and elemental carbon content, and total PM2.5 mass. Plasma was collected immediately before the commute and in the evening the day of a commute, frozen at -80°C, and analyzed via high-resolution mass spectrometry at the close of the study.

Results: Ongoing comparisons of pre- and post-commute plasma samples of participants may reveal exposure indicative patterns of metabolic changes which may explain observed acute health effects in the panel population.

Conclusion: Understanding the human exposome requires a piecewise understanding of known exposures. Transportation related exposures are a subset of a dynamic, complex mixture of human exposures leading to health effects. Integration of –omic technologies in more traditional exposure assessments of transportation, such as the present panel study of commuters, permits the advancement of exposure assessment with the existing foundation of the science.

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Physical Activity through Sustainable Transport Approaches (PASTA) – a pan-European project on determinants and impacts of active transportation.

Abstract:

Background: The promotion of active transportation (AT), i.e. walking and bicycling for day-to-day travel, is a promising approach to increase overall physical activity (PA) across the population. Health impact modeling (HIM) shows substantial benefits of AT. However, a number of research gaps remain.

Purpose: The PASTA project (www.pastaproject.eu) takes a broad approach in investigating how AT contributes to PA. It brings together perspectives from transport planning, travel behavior and health research as well as policy and practice. A cohort study within the project is investigating (a) the key determinants of AT, b) how AT relates to PA as well as (c) evaluating the effects of measures to promote AT in seven European cities. A main aim of this empirical study is to contribute to the improvement of HIM of AT.

Methods: PASTA is a 4-year project (2013-2017) involving 7 European cities (Antwerp, Barcelona, Orebro, Rome, Vienna, Zurich). The core study is designed as a longitudinal web-based survey which consists of a substantial baseline questionnaire and biweekly short follow-ups. Survey contents were defined based on a comprehensive conceptual framework specifically developed for the project. The framework combines three domains of travel demand modeling, namely a rationalist mode choice approach, a socio-geographical approach including various spatial factors, and a socio-psychological approach, building on established psychological theories. The survey combines items on PA (adapted GPAQ separating walking and cycling), mobility (one-day travel diary, commute route identification), Theory of Planned Behavior, as well as items from other AT surveys. Participants experiencing crashes will be asked to fill out an additional questionnaire. Participants will be recruited opportunistically on a rolling basis (target sample size: 2000 per city). Subsamples will be used to evaluate a selected measure to promote AT in each city or to collect objective data as part of add-on modules (GPS tracking, accelerometry, air pollution exposure).

Results: Findings emerging from baseline data analyses are expected in late 2015, and findings from evaluation in late 2017. Final results will be available in 2018.

Conclusion: The longitudinal design of the empirical study of PASTA and the use of innovative data collection approaches offers opportunities to tackle research questions that have not been addressed or resolved by existing, predominantly cross-sectional studies. Results will feed directly into further developments of the WHO's Health Economic Assessment Tool (HEAT) for walking and cycling.. Evaluations of key measures will benefit from PASTA's novel study design of frequent repeated measures improving statistical power – a limitation of many evaluation studies. Key challenges will include balancing measurement accuracy with participant burden and the successful recruitment of suitable and representative population samples.

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Trail Modeling and Assessment Platform (TMAP)

Abstract:

Background: Rails-to-Trails Conservancy (RTC) is the leading trail advocacy group in the United States, with more than 150'000 members. Today, in the U.S. there are more than 21,000 miles of rail-trail in rural, suburban and urban communities that are used by tens of millions of Americans every year for walking, running, skating and biking. Assessing and communicating benefits resulting from trail use and from active transportation in general, have always been a central piece of RTC's advocacy work.

Purpose: The purpose of this project is to build a comprehensive platform to model trail usage and assess related impacts .The platform aims to empower trail advocates and local decision-makers by providing them with the analytical capacity to forecast the impact of investments in creating trail systems. In particular it facilitates data collection, the use of impact calculators and semi-automated creation of reports.

Methods: The platform will integrate collection of count data through automated counters and a smartphone app for manual counts, the collection of trail user attributes through a survey tool for intercept surveys and online surveys as well as various other data sources (GIS, census, weather data, etc.). Manual (short term) counts will be factored to reflect long term estimates. Intercept surveys (complemented by online surveys) will add several attributes essential to impact calculations, namely trip distance and purpose, and age and gender distribution of users, among others. The platform will provide impact calculators for health benefits, building on existing tools, like HEAT, and environmental impacts. To the extent feasible, impacts will be monetized. Results will be presented to the user as fully standardized reports which can be edited to local needs. All components will be linked through a central database and made available through a web interface. The platform will also include an internal component which serves more in depth analyses of trail connectivity and gap closing measures which serve the purpose to prioritize trail investments.

Results: TMAP is a three year project. Data collection began in July of 2014. Trail surveys will take place in the summer of 2015. First deliverables are expected in the fall of 2015.

Conclusion: TMAP aims to bring quantitative assessments of trail usage to a new level and promises great potential for the work of advocates as much as researchers.

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Physical Activity and Air Quality: A Transdisciplinary Research Opportunity

Abstract:
Background: Physical inactivity and outdoor air pollution are important public health issues that negatively impact population health and well-being. More than three million deaths each year globally are attributable to each factor. Although the independent health effects of physical activity and air pollution exposure are well established, less is known about how these two factors interact with each other on a short- and long-term basis to affect acute and chronic health outcomes, especially among the general population in real-life conditions. Additionally, the effect of promoting physical activity as a way to improve ambient air quality has not been sufficiently explored. The relationship between physical activity and air pollution exposure is complex to characterize. Different types of activity (i.e., leisure-time, occupational, transportation, household) occur in different locations (e.g., indoor/outdoor, urban/rural, on/off road) with different air pollution levels and mixtures. Likewise, concentrations of air pollutants (e.g., particulate matter, ozone, nitrogen oxides, carbon monoxide) vary both spatially and temporally depending on meteorological conditions, topography, land use patterns, urbanization, and stationary and mobile (e.g., traffic) sources.
Purpose: To highlight the need for more comprehensive transdisciplinary research in physical activity and air quality and to propose an integrated research approach for advancing scientific understanding of the intersection between physical activity and air pollution exposure and related health effects.
Methods: In 2010, the Centers for Disease Control and Prevention convened a two-day workshop of 25 scientists with expertise in air pollution or physical activity to discuss the state of science and public health guidance related to physical activity and outdoor air quality. Since 2013, an interdisciplinary team of 11 workshop participants have collaborated to develop and disseminate an integrated research approach.
Results: Key workshop conclusions included: 1) more interdisciplinary research is needed to inform evidence-based public health guidance; 2) future guidance should be careful not to discourage physical activity; 3) guidance should be consistent across federal agencies (e.g., HHS and EPA); and 4) improving outdoor air quality should be prioritized to reduce concerns about air pollution exposure while being physically active. There is growing interest among scientist from varying disciplines about how physical activity and air pollution interact to affect individual and population health. Recent publications have made meaningful contributions to the science; however, many important questions still exist. An integrated research approach was developed to promote transdisciplinary research and address knowledge gaps in four key areas: effect modification between physical activity and air pollution exposure on acute and chronic health outcomes, identification of at-risk populations, role of the built environment and urban form, and equitable distribution of physical activity opportunities and air pollution exposure across setting and sub-populations.
Conclusion: Balancing the sometimes competing public health priorities of keeping people active and minimizing air pollution exposure, communicating this information to the public, and understanding the co-benefits of physical activity and clean air promotion are important challenges that deserve additional attention within the research community. By working together using an integrated perspective, scientists and practitioners from relevant disciplines can address knowledge gaps and promote evidence-based policies and recommendations that will ultimately safeguard and improve public health.

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Determinants and health benefits of active commuting to school
Abstract:
Background: Active commuting to school (ACS) decreased from 50% of all trips in 1969 to 13% of all trips in 2009. Students who engage in ACS accumulate more daily physical activity (PA) than do non-active commuters, making ACS one viable option in combatting childhood obesity.
Purpose: To determine factors associated with the decision to engage in ACS, and to examine the association between ACS and weight status.
Methods: A random digit-dial survey of 1408 low-income, high-minority households was conducted in four New Jersey cities in 2009-10. Survey questions included information about ACS for one randomly selected school-going student in the household, demographic characteristics, and parental perceptions of the neighborhood environment. Locations of households and schools were geocoded to calculate distance between home and school. Parent-measured heights and weights of students were also collected. Multivariate regressions were used to assess the association of ACS with demographics and parental environmental perceptions, as well as the association of ACS with student weight status.
Results: 54% of students actively commuted to school. 37% of students were overweight or obese. Parental perceptions of crime, traffic, and sidewalk conditions in the neighborhood were not associated with ACS. Parental perception of the neighborhood as unpleasant for activity was associated with lower odds of a student engaging in ACS (OR=0.39, 95% CI: 0.19-0.80). This association was moderated by weight status. Overweight/obese students had 98% (OR=0.02, 95% CI 0.00-0.14) lower odds of actively commuting to school when their parents perceived the neighborhood as unpleasant for activity, while the association among normal weight students was not significant. When examining active vs. non-active commuters, ACS was not associated with a student's weight status. However, when distance actively commuted by students was taken into consideration, ACS greater than a half-mile was associated with 65% (OR=0.35, 95% CI: 0.16-0.78) lower odds of a student being overweight/obese compared to non-active commuters. ACS a half-mile or less was not associated with weight status.
Conclusion: Efforts, including graffiti cleanup and providing shade trees, to increase neighborhood pleasantness could potentially increase ACS in low-income urban communities, particularly among overweight/obese students who may benefit the most from ACS. Students who actively commuted more than a half-mile to school had lower odds of overweight/obesity. While difficult to discern directionality of the association, PA is healthy, regardless of its effect on weight. Locating bus and car drop-off points at least half-mile from school would ensure more students walk at least that distance getting to and from school. Walking School Buses, crossing guards, and traffic calming would provide route safety.
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Models for Expanding Active Transportation for Healthier Communities
Abstract:
Background: There is an increasing awareness and a growing body of research related to the impacts transportation policy and investments can have on the livability of our communities as well as our individual and collective health. Cities and towns across the US are seeking ways to balance the regional need for moving automobile traffic with the community need for vibrant, connected and safe places to walk, bicycle and make multi-modal transportation connections. Such transportation policy and investment decisions have the potential to save lives by reducing motor vehicle related injuries and deaths as well as combat chronic diseases including obesity and diabetes. Research and the emergence of new tools support transportation decision making by expanding on the ability to assess and forecast the impacts of active transportation. The American Planning Association (APA), Washington Department of Transportation (WSDOT) and Renaissance Planning Group are providing national leadership in best practices and new tools to improve decision-making for active transportation, and have joined to blend education, applied methods and use of tools to demonstrate enhanced decision-making for active transportation.
Purpose: Lack of tools to model transportation policy decisions and demonstrate impacts of modal trade-off scenarios are an impediment to creating safer and more prosperous communities. The work of APA, WSDOT, and Renaissance Planning Group represents a critical step in the development of transferable tools and techniques that support the design and development of healthier communities, including: ·   Current case studies of strategies being employed across the US. ·   New tools and techniques for estimating bicycle and pedestrian demand at various scales. ·   Methods for identifying and benchmarking a priority subset of highways, streets and roads serving as community main streets.
Methods: The Transportation Research Board (TRB) has recently published Renaissance Planning Group's NCHRP Report 770 that includes three new modeling tools. Each of the new tools relies heavily on accessibility relationships to convey the key transportation and land use elements making it possible to identify the relative importance of the built environment (density, mix, design) independently of the transportation infrastructure. WSDOT's recent research has developed criteria for objectively identifying sections "main street highways" and measuring impacts of community design efforts conducted as part of transportation project development processes. The American Planning Association has developed several important new tools and resources useful in assessing the impacts of active transportation. These include the Healthy Community Design Toolkit, to better inform decisions about based on chronic disease burden and social equity; case studies of health impact assessments applied to planning and transportation projects across the US; and a series of evidence-based policy, system, and environment strategies to support active living and engaging stakeholders on active transport as part of a three year CDC implementation grant.
Results: Using these tools and techniques, planners can identify the most cost-effective measures (land use and/or transportation) that will impact mode choice, vehicle trips, VMT and congestion all supporting healthier and more active communities. These tools offer support for planning smart growth communities, transit and transit-oriented development, and cost-effective non-motorized transportation network improvements. For example, case study applications in Arlington, VA and Maryland demonstrate how planners can achieve greater walking and biking mode share through specific accessibility strategies. WSDOT's research took an important step forward advancing this discussion by using a consistently applied set of criteria to identify a subset of state highways that serve as main streets. This provides a benchmark for tracking investments and impacts and a strategic focus for community design efforts. This research also provided the foundation for House Bill 1071, Washington's Complete Streets Act, which became law this past legislative session.
Conclusion: Our transportation system focuses on efficient motor vehicle travel and provides few transportation options for many Americans. Expanding transportation options for active transportation requires changing transportation policy and investments. This research provides new tools and techniques to support difficult policy decisions by expanding on the ability to assess the impacts of active transportation (e.g., health impact assessments of transportation projects and local, regional, and state planning scenarios), and providing innovative tools to better forecast the effects on active transportation. The APA, WSDOT and Renaissance Planning Group will present analysis findings and demonstrate new tools to help communities achieve healthier outcomes.

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CO-BENEFITS: A FRAMEWORK AND CASE STUDY FOR UNDERSTANDING BROADER HEALTH AND ACTIVITY BENEFITS OF MAJOR TRANSIT INVESTMENTS

Abstract:

Background: The city of Canberra, Australia, that nation's capital, is just beginning design and implementation of a light rail transit (LRT) system for this predominantly suburban community of approximately 310,000 people. LRT has obvious transport benefits but the project is seen as having far greater impacts outside this, especially its potential to change urban form, connectivity, accessibility and, importantly, modal shift from automobile to transit and active transport. Canberra is a spread out city in which 85% of Journeys to Work (JTW) take place by car. Yet it is a planned city with an extensive network of pedestrian and cycling paths and with strong stated policy objectives of doubling shares of active transport to work and attaining zero Greenhouse Gas Emissions (GHG). Understanding the nature and magnitude of health and environmental 'co-benefits' of the LRT is therefore critical.

Purpose: The purpose of this research is to fill the 'gaps' in much current transit planning to provide a more holistic urban and social planning context in which active transport, health, safety and environmental benefits are all understood as well as, and clearly seen to be co-equal with, economic and traditional transport benefits. The links between these benefits will also be more explored and operationalized to be 'practice-ready' for the basic tasks of project design, construction, finance and implementation.

Methods: This paper reports on the results of a 'rapid review' of the broad peer-reviewed literature on LRT and its various benefits in the broad categories urban design, transport and health. This is a method especially appropriate for contexts in which decision-making time frames are short and resources for advance analysis are limited, which is the case in Canberra and often the case in other localities making major transit investments. This paper will indicate the strengths and weaknesses of this method for transit planning and also discuss what extensions, such as more detailed meta-review, might be appropriate to given time and resource constraints. The general findings will then be applied to the case study of Canberra, with discussion of broader implications for transit planning and active transport.

Results: The paper will produce a detailed cross-cutting matrix of co-benefits which identify the tangible (e.g. intermodal) and intangible (i.e. social and cultural) connections that are important to transforming people's behaviour, perceptions and expectations with respect to LRT generally and in Canberra specifically. Qualified and quantifiable input into further design and implementation, planning strategies and indicative evidence to inform community consultation and engagement will fill the various cells, both generally, and as pertains to the case study of Canberra.

Conclusion: This paper will provide a matrix of indicative co-benefits, based on peer-reviewed literature, which can be applied to other communities planning LRT investments and extensions. Discussion of current knowledge of and needed further research in various issues will be presented, including: measurement of the change in and co-benefits across specific categories (e.g. urban form and walkability), feedback between co-benefits and LRT project elements (e.g. design and placement of stops) and generation of information to engage community stakeholders and maximise active transport uptake and associated health and broader improvements.

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The Effect of Light Rail Transit on Physical Activity: Design and Methods of the Travel Related Activity in Neighborhoods (TRAIN) Study

Abstract:

Background: Mass transit has been proposed as a way to incorporate regular physical activity into daily life, since transit use typically requires additional travel to access and depart the stop or station. If this additional travel is active, a small but important amount of physical activity can be achieved each day. While we know that transit use is associated with minutes of physical activity per day, important questions remain. We lack an understanding of displacement effects: does the introduction of a new form of transit (light rail) displace existing bus riders, or does it add new riders? Similarly, does transport-related physical activity displace recreational activity? Also, we lack data from long-term studies concerning the relation between transit and physical activity. Houston has embarked on an expansion of its light rail system by adding 15.2 miles of new track and 27 new stations. These new lines will serve neighborhoods that are predominantly low income and ethnically diverse. Utilizing the new lines as a natural experiment, the Houston TRAIN Study was developed to addresses these unanswered questions.

Purpose: The purpose of the TRAIN Study is to determine if the development of light rail lines in Houston, Texas will prospectively affect both transit use and transit-related physical activity, as well as other domains of physical activity over four years. We also aim to understand how contextual effects (i.e. moderators or interaction effects), such as the neighborhood built environment and socioeconomic factors, affect the primary relations under study. The TRAIN Study includes a unique partnership between academic researchers in physical activity and transportation engineering.

Methods: The TRAIN Study is a longitudinal cohort design, in which participants are recruited at baseline and measured four times: Prior to or immediately after the opening of new lines, and at 12, 24 and 36 months post line opening. Recruitment is accomplished via telephone contact and targeted community outreach, and participants are recruited from a 3-mile buffer around each of the three new lines, with a goal of 1900 participants at baseline. Data are collected via mail, and include: questionnaire-assessed factors such as perceived neighborhood characteristics, attitudes about transportation, demographics, and reported physical activity; a 2- or 7-day travel diary; and seven consecutive days of accelerometer recordings. Additionally, field-based neighborhood audits are conducted to capture micro-scale environmental features. To assess macro-scale environmental characteristics, we will utilize GIS mapping and spatial analyses. Statistical analyses will be conducted using latent growth curve modeling and discrete choice models, with a strong focus on identifying moderating factors (i.e. statistical interaction effects). Selection bias will be controlled via recruitment design and propensity score analysis.

Results: Recruitment and data collection are ongoing; 338 participants have completed baseline data collection thus far. The first light rail transit extension opened December 2013; the other two are scheduled to open April 2015. One-year follow-up data collection on the initial cohort will begin in early 2015. Neighborhood audits have been completed, and a library of relevant GIS map layers is currently being assembled.   We will present baseline data on individual- and environmental-level correlates of transit use and physical activity.

Conclusion: The TRAIN study is a unique opportunity to study how a multi-billion dollar investment in mass transit can simultaneously affect transportation needs and physical activity behavior. This comprehensive evaluation will provide needed evidence for policy makers, and can inform health impact assessments of future transportation projects around the United States.

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Modeling by committee: the State of Oregon's efforts to coordinate modeling health impacts of transportation

Abstract:

Background: In 2011, the Oregon Health Authority's (OHA) Health Impact Assessment (HIA) program began researching existing models and toolkits designed to estimate health effects of predicted changes in behavior and environmental conditions to support Metro - the Portland metropolitan planning organization (MPO) - Climate Smart Communities Scenarios Project. While the HIA program selected the Integrated Transport and Health Impact Model (ITHIM), it was clear that the State of Oregon could benefit from a more coordinated approach to support modeling health outcomes in transportation planning settings.

Purpose: In 2013, the Oregon Modeling Steering Committee (OMSC) formed a Transportation and Health Subcommittee to assess feasibility and provide recommendations for a model(s) to support the State and MPOs in evaluating future strategic visioning and regional transportation projects for health impacts. The subcommittee met quarterly to share ideas, review tools, share methodologies, and understand data requirements to answer the question, "Given a transportation investment package, what are the health impacts?" This presentation documents the challenges and conclusions of this collective effort.

Methods: Using a case-study approach, this presentation documents the challenges and conclusions of the OMSC transportation and health subcommittee. OMSC Transportation and Health Subcommittee includes transportation forecast modelers and planners, air quality modelers, public health professionals and academics; addressing interdisciplinary challenges to create shared language and understanding was a constant challenge. The group focused on understanding each other's work, models, and data before moving onto other options in development or use elsewhere. Time was specifically spent understanding the strengths and weaknesses between comparative risk assessment and regression-based health models; the limitations of joining physical and air quality models; data challenges; geography challenges; and the current trajectory of activity-based and air-dispersion modeling

Results: The OMSC Transportation and Health Subcommittee has thus far agreed that health outcomes affected by physical activity should be addressed separately from health outcomes from air quality. For physical activity, the subcommittee selected ITHIM to estimate health benefits of increased physical activity from active modes of transportation over other options because OMSC is primarily interested in state, regional, and corridor level plans. For air quality, it is uncertain whether the subcommittee will recommend ITHIM's relative risk factor approach to estimate health effects from mobile emissions or recommend additional research. Regardless, models will need to be puzzled together to move from transportation to air quality to health. The committee sought new models and methods from across the country to pre-screen transportation projects. The air quality models agreed to test the new "user-friendly" version of CAL3i developed by the Federal Highway Administration (FHWA) and assess the extent transportation modelers would be comfortable as users. Finally, the subcommittee agreed to evaluate EJSCREEN to identify vulnerable populations.

Conclusion: OMSC Transportation and Health Subcommittee has made significant progress in understanding each other's modeling needs in relation to transportation and public health. The work of OMSC has helped solidify cross-sector relationships and collaborations. Over the next six months the OMSC Transportation and Health Subcommittee will continue to test the feasibility of using the methods and models already identified and look at additional models; it anticipates meeting a September 2015 deadline for RFP recommendations.

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Examining Travel Mode Choice in Underserved Populations

Abstract:
Background: The majority of Americans do not meet physical activity (PA) recommendations. Current trends show that underserved populations (i.e., minorities and low-income populations) are largely less active than the general population. Although the diversity of advocates for both walking and biking is expanding, limited data exists on sustainable PA improvement for interventions targeted at underserved populations. Popular interventions have been found to be less effective among these populations. Research is even more limited in this population in understanding, promoting, and intervening on active travel (AT) despite its well-documented benefits and its influence in preventing PA declines. Accordingly, this gap in the literature poses a major hindrance in the development of cost-effective and successful active living interventions.
Purpose: Active travel is influenced by multiple levels of influence as described in the social ecological model (SEM): individual, interpersonal, institutional, community, and environmental. Given the importance of improving rates of PA, it is crucial to examine each level of influence on AT, especially in a population with such high rates of physical inactivity. Little high-quality data exists investigating AT in underserved populations using the SEM. Thus, the purpose of this study was to examine multi-level correlates of AT in underserved adults.
Methods: This was a cross-sectional study with a survey distributed online from June to December of 2011 using Qualtrics (Provo, UT). Individuals were eligible to participate in the survey if they were over the age of 18, employed outside of the home, and physically able to walk or bike. Recruitment took place primarily in the mid-Atlantic United States with large employers in the region. Employees were contacted directly via email. Participants reported on commuting patterns (trips/week walk, bike, public transit and drive), demographic, medical status, self-efficacy for cycling, AT behavioral beliefs, perceived behavioral control for AT, normative beliefs for AT behavior, institutional and community level supports for AT, and environmental barriers. Underserved populations examined in this study include: minorities, low-income populations, and those living in non-metro areas.
Results: Respondents were classified by race as white(n=941), black(n=33), and all other racial groups(n=48). Participants were also classified by metro(n=902) and non-metro area(n=81) and higher-income(n=810) and lower-income status(n=78). Metro area participants were more likely to walk(0.49±1.85 trips; p
Conclusion: This study provide a number of valuable insights into rates and multiple levels of influence on AT in underserved populations. These findings may be useful in the development of operative and cost-effective interventions tailored to this highly inactive population and may provide direction for local, state, and national policies and environmental improvements. Due to the increasing rates of physical inactivity-related diseases, public health strategies to promote AT are necessary to address these health problems.

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Integrating Health into Long Range Land Use and Transportation Planning

Abstract:

Background: Relationships between health and built environment are gaining increasing attention in local and regional policy arenas. It is becoming more evident that the presence and concentration of various land uses and transportation systems shape communities and the people living there. City planners and policy-makers however, typically do not directly consider individual and community health impacts of these features. San Ysidro, the project area, is the southernmost community within the City of San Diego, adjacent to the world's busiest land crossing border. The San Ysidro community experiences a variety of distinct environmental, economic, and social impacts related to its proximity to the border. As a majority of border crossers are traveling by car, approximately 35,000 northbound vehicles per day idling an average of 100 minutes, air quality impacts are of particular concern. In addition to this unique dynamic, San Ysidro also shows high concentrations of low-income, minority populations, leading to broad concerns related to social and environmental quality.

Purpose: The Border Health Equity Transportation Study serves to evaluate the significance of various mobility/built environmental factors in the health of San Ysidro community members. Ultimately, the study seeks to elucidate a process for directly including health considerations in long-range land use and transportation planning practice.

Methods: The initial existing conditions analysis utilized data from two publicly available sources: the 2012 Healthy Communities Atlas (from the San Diego Association of Governments) and the 2013 San Diego Community Profiles (San Diego County Health and Human Services Agency). The Healthy Communities Atlas includes seven groupings of mobility/built environment variables at the census block group level, while the community profiles provide health data aggregated by Subregional Areas (SRA), allowing for health outcome comparisons of 41 SRAs across San Diego County. Partial correlations were performed to understand the significance, direction and strength of the relationships between mobility/built environment factors and health outcomes across San Diego County, while controlling for age and income. Results of the partial correlations analysis were used to prioritize mobility/built environment factors having the most consistent, significant effect on health outcomes across the San Diego region.

Results: The analyses found that community members in the South Bay SRA (including the community of San Ysidro) experience several health outcomes, such as diabetes, asthma, COPD, and rates of pedestrian injury, at relatively higher rates than the region as a whole. Mobility/built environment factors with the strongest and most consistent associations with health outcomes across the San Diego region were identified to serve as a base from which to develop recommendations that could be integrated in long range planning documents for the community.

Conclusion: A final set of 16 focused recommendations were identified to positively impact mobility/built environment factors with the strongest and most consistent associations with health outcomes. The analysis process developed for this study is unique in that it establishes a framework for identifying significant health-related issues within a community, the mobility/built environment factors related to those health issues, and a set of land use/transportation recommendations intended to address the identified health issues. It provides a model for integrating health directly into long range planning, thereby equipping local planners with ability to direct decision-making toward recommendations that will improve community health.

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GPS technology and route choice models to assess the impact of built environment characteristics on walking trips in Brazil

Abstract:

Background: Studies show that the built environment may help people walk more and avoid sedentary lifestyles, at the same time that it may offer risks for personal safety, in terms of transport related injuries and, in some societies, by being exposed to urban violence. The use of GPS in health and transportation research, especially to monitor and analyze non-motorized trips can provide deeper understanding of individuals' behavior and their choices related to the built environment. In Brazil there is a lack of research in this field, and the relationship between transportation and health – individual or public – remains understudied.

Purpose: The goal of this study was to understand walking trips' patterns as related to their routes' characteristics, deepening the knowledge about the choice processes made by individuals who travel on foot in urban environments. The assessment of built environment features' impact on these decisions, which involve trade-offs between physical effort, personal safety and pleasantness, can contribute to create walking-friendly environments and to promote walking as a true healthy activity in Brazil.

Methods: The analysis used data from trip legs made on foot - collected by GPS and validated by travel logs – in three types of neighborhoods in Porto Alegre / Brazil. They were performed in 2012 and 2013 by 82 individuals of different ages, level of education and occupation, randomly sampled by LASTRAN, the Transportation Systems Laboratory of UFRGS – Universidade Federal do Rio Grande do Sul, Brazil. Neighborhoods were selected to vary on macro-environment features, specifically those related to their walkability potential – built density, road network and destination accessibility - and validated by their share of trips on foot as reported by the last city's Travel Household Survey (2004). Actually taken trip legs were map-matched to a GIS network model and analyzed in terms of distance, time and micro-scale built environment characteristics. Feasible alternative routes were modelled based on basic effort and safety cost functions: least distance, least time, least slope and least crossings with busy roads. Comparisons between actual and modelled routes were conducted, and choice models were ran using logistic regressions.

Results: Walking distances followed a relatively common pattern, consistent with other studies based either on GPS or self-report instruments: the mean and median values are 770 and 550 meters respectively. About 78% of the trips were shorter than 800m (aprox. 0.25 mile) and the 3rd quartile fell on approx. 1000m. Large variations in distance were found among various purposes, but individual's significant differences occur only between students and no students and between people who drive as the main mean of transportation and those who not. More than 63% of the walking trips chose the least distance path, the most part for recreational purposes, when covering large distances and were located outside the central district. The deviation from the shortest path reached a maximum of 2.01*, with the 85th percentile at 1.26*. The other attributes' differences between the taken routes and their alternative shortest paths are small: only the straightness (p

Conclusion: Travelers in a large Brazilian city (1.4 million inhabitants) tend to systematically choose the least effort or less insecure path to perform trips on foot. Environmental influences on the decision of "by which route to go by" are still restricted to the road system features, pointing to the fact that the city seems to offer more risks than advantages for walking. Walking trips able to meet physical activity recommendations are very restricted to leisure journeys and non-central locations. They therefore still contribute little to a healthier lifestyle in the country.

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Active transportation in Portuguese adolescents: Using PALMS to detect trip modes
Abstract:
Background: Active transportation to school (ATS) has been proposed as a potentially source of physical activity (PA) in adolescents and can represent 20 to 30% of daily moderate-to-vigorous physical activity (MVPA). With decreasing levels of physical activity in adolescents, ATS due to its regular nature, is likely to be a key element for youth's health and interventions to encourage ATS are becoming a priority in some countries. While evidence suggest that ATS is influenced by country specific environmental and cultural factors, little is known about Portuguese children mode of travel to school, distance and time travelled. Global position system (GPS), used in combination with accelerometer data, are arising as an objective approach to access means of transport and reduce self-reporting bias. The Personal Activity Location Measurement System (PALMS) is a web-based application capable of integrating and processing activity and location data in a relatively simple way and may be the key to uniform methods and allows comparison of results helping in clarification of findings in this field.
Purpose: The aim of this study was to explore travel behavior in Portuguese students using a new objective methodology.
Methods: 197 students (54% females) with mean age 15.9±1.1 years old wore an accelerometer and a GPS attached to an elastic belt and placed on opposite sides of the waist for 7 consecutive days. Physical Activity and positional data from both monitors were then aggregated in 30 second epochs and were processed using the Personal Activity Location Measurement System (PALMS). PALMS processed accelerometer data based on Evensons´ cut points and a non-wear time definition of 60 minutes of consecutive zeros. Trips were classified into Walking trips if they had a 90th percentile speed of < 9 km/hour; trips with a 90th percentile speed between 10 and 35 km/hour were classified as bicycling trips and vehicle trips were considered if for trips with a 90th percentile speed of ≥ 35 km/h.
Results: Sixty-four percent of the children used ATS in most school days. From a total of 7220 trips identified 609 were trips to and from school. Home/school/home trips contributed with 9.5% for the total of active trips. The most frequently used travel mode to school was by far walking (60.8%), followed by vehicle (16.7%) and bicycle (14.4%). Median walking trip length between home and school was 0.94 km, being the longest 3.38 km; 96.7% of walking trips were less than 2.0km. For adolescents walking to/from school mean time in MVPA was 12±5.6 minutes, i.e. 20% of recommended guidelines of 60 minutes of MVPA. Journeys longer 4.5km were exclusively made by vehicle. Differences were found whether the trip started at home or at school particularly for minutes in MVPA and duration of the walking trips. Despite walking was the dominant mode of transportation in both trips, a significant 16% increase in walking trips was found for school-home trips when compared to home-school trips.
Conclusion: Contributing with 20% of recommended MVPA, walking represent great potential for interventions to increase physical activity in adolescents, particularly the home-school trip. Despite no reservations exist for the objective method used to categorize walking and vehicle trips there may be an overestimation of cycling trips. First few adolescents reported using this means of transportation, second accelerometer has limitations in measuring this behavior and third because public transportation mean velocity is 16km/h the same shown in literature for bicycle trips and used in our research. So, a method that differentiates public transportation from bicycle trips is needed. Grant:PEst-OE/SAU/UI0617/2011 FCT-SFRH/BD/70513/2010 PTDC/DES/099018/2008-FCT/FCOMP-01-0124-FEDER-009573
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Automatic Cyclists Data Collection for Transportation Health Impact Assessment

Abstract:
Background: Promoting bicycles as a healthy and sustainable mode of travel faces several challenges related to the mobility, health hazards as well as infrastructure safety. Safety and exposure to hazardous situation is considered one of the main variables in assessing the health impact of cycling. Best practice for conducting proper health impact assessment would require among its tools a proper access of quantitative evidence. Quantitative evidence is of the form of data collected about traffic condition, safety indicators as well attributed data that involve the discernment of cyclists' behavior. Emergent sensors technologies in intelligent transportation systems extend the depth and wealth of information on the road-users and traffic conditions that can be captured. One approach that holds considerable potential for data collection is computer vision analysis.

Purpose: The current presentation fulfills three purposes that touch on elements of health impact assessment. This is facilitated through studying cyclists traffic and behavior using automated video analysis. First, an automated facility safety diagnosis using surrogates measure is demonstrated. Second, helmet detection is described as a means to understand cycling behavior towards helmet usage. The third application concerns the effect that cycling has on physical activity. An estimation of the cadence of cyclists is estimated to evaluate the effort performed during pedaling.

Methods: Traffic conflicts are automatically detected and their severity ranked using the Time to collision (TTC) safety indicator. Vehicle-bicycle conflicts areidentified and examined. Traffic conflicts can provide insight into the failure mechanism that leads to road collisions and do not require long observation periods. Cyclist's trajectories are also used to identify cyclist's movement and orientation. A classification procedure to identify helmet usage is then applied. Cyclist's pedal rotation is observed to introduce a periodic fluctuation in the speed profile, and therefore, the cadence parameter can be computed by analyzing the speed profile signal. Identifying the cadence frequency corresponds to detecting the dominant periodicity in the signal of the speed profile.

Results: The presented research is applied, evaluated and validated on datasets collected across greater Vancouver, BC, with promising results that show the usefulness of the framework. Safety evaluation using traffic conflicts highlighted the potential conflicts regions in the intersection along with estimate of the conflicts types and severity. The results showed a high exposure of cyclists to traffic conflicts and a significant driver non-compliance rate. Several countermeasures to mitigate the safety issues were presented and evaluated. Automated helmet detection proved promising with around 90 percent correct detection rate. This leads to potentially reducing the number of video records that are needed to be manually analyzed to find instances of non-helmet wearing cyclists. Cadence estimation is validated and compared across different rider's population. Primarily, results showed that there is significant difference between the cadence means across both genders.

Conclusion: The reported results can provide a motivation for traffic engineers to rely on automated data collection as guidance during the decision-making process and to explore further the potential health impact of non-motorized transportation infrastructure. In addition, this research can also bring benefits to applications in traffic simulation, trip planning, the development of safety and crash prevention programs, and legislation studies.

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Designing and Implementing a Temporary Regional Automated Bicycle Counting Program

Abstract:

Background: In 2013, the Maricopa Association of Governments (MAG) designed and implemented an innovative approach to regionwide, temporary automated bicycle counting that promises to be a model for other regional agencies seeking to understand cycling levels and patterns in a manner more robust than offered by short duration manual counts, but without investing in permanent automated counting equipment.

Purpose: The MAG Bicycles Count Project was an 18-month effort focused on the development of a regional bicycle count strategy. The final approach combined 84 peak period manual counts with 44 temporary automated counts to collect a comprehensive sample of cycling levels across the region. These baseline measures will help inform an understanding of the effects of future actions, such as construction of new bicycle facilities or changes in land uses, on cycling in Maricopa County. The data will also support the potential development of health and air quality metrics related to cycling.

Methods: Bicycle count data was collected from 128 locations reflecting a representative sample of the region in terms of population density, employment density, and income levels. Eighty-four peak period counts (collected manually over 2 hours) and forty-four two-week continuous, automated counts were collected via inductive tubes placed in the roadway. Manual counts were used to cast a wider net around the region, and to collect sidewalk cycling counts, which automated counters are unable to record. An estimate of sidewalk cycling was then applied to the automated count data so that daily bicycle totals would reflect sidewalk cyclists not counted via inductive loops. The automated count data was also used to develop peak period bicycle factors for weekdays and weekends. These factors were used to extrapolate average daily bicycle counts from peak-period manual counts.

Results: The MAG bicycle volume data serves as a baseline measurement for comparison against future counts to quantify the benefits of cycling and responses to future investments in cycling infrastructure. The data creates an improved understanding of the true demand for cycling in the MAG region and bicycle travel patterns related to facility types, location, and temporal factors. Initial summaries of the data show the following: ·   Bike paths show the highest levels of cycling activity in the region, relative to other facilities, such as bike lanes, bike routes or roadways without bike facilities. ·   Peak period manual counts show sidewalk cycling rates between 30% and 94%. ·   Peak period cycling represents about 16% to 18% of daily cycling, which is consistent with peak period shares of daily cycling found in San Diego where automated bicycle count data has been collected for almost 2 years at 33 sites.

Conclusion: The project provides a strategy for selecting count locations that are representative of population characteristics and a method for combining limited continuous automated counts with more abundant peak period manual counts in order to increase the coverage of estimated daily bicycle volumes across the Maricopa County bicycle network.

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Improving Active Transportation Data in HIAs with Automated Counters: Lessons from CA

Abstract:

Background: Quantifying the active transportation by biking and walking through counts is an important part of developing policy and intervention to mitigate risk and encourage active lifestyles. Numerous studies have evaluated the different methods of counting bicycles and pedestrians, but very little work has evaluated actual cases of how they fit into active transportation programs and health impact assessments (HIAs).

Purpose: The purpose of this study was to study validates the results of those studies looking at the reliability of results gathered as a part of two California projects and how they fit into existing planning and health assessment programs.

Methods: Automated counters were installed at 10 locations throughout 2 cities. Manual counts were taken at these locations evaluating the accuracy based on platooning and ancillary factors such as weather and site conditions. Additional policy and case assessment was done to evaluate how the counts can and are being pulled in to existing programs and the opportunities and barriers to doing so.

Results: Automated counters can be reliable sources of information to gauge performance of HIAs but are rarely being used outside of the preliminary data gather phase. Data confirms over counting by approximately 30%, especially when groups are involved and sensitivity to environment conditions.

Conclusion: Automated counters can be important part of a community planning process and should be considered as a part of the HIA process, but consideration should be given to details regarding siting and user dynamics.

Authors:

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BikeMaps: Citizen web-mapping for safer cycling

Abstract:

Background: Cycling has the potential to reduce air and noise pollution, improve health, and reduce greenhouse gases (Reynolds et al. 2009). A primary barrier to increased ridership is the real and perceived risks of incurring substantial injury (Winters et al, 2011). In the past decades, overall levels of ridership have increased in North America and cyclist fatalities have declined (Pucher et al. 2011). However, cyclists are still at a greater injury risk than automobile drivers, and there is substantial spatial variation and socioeconomic inequality in cycling rates and safety (Pucher et al. 2011). Data on cycling crashes are limited. For instance, in British Columbia, Canada official data sources are estimated to capture 30-40% of bike collisions and no data exists on "near-misses". Existing data emphasizes crashes with cars, while no crashes with infrastructure, pedestrians, and other cyclists are reported. Comprehensive data on cycling crashes is required to assess safety and risk, to overcome the gap between real and perceived safety issues, and to identify priority locations for traffic safety interventions and monitor progress over time.

Purpose: The goal of our research is to generate new data and information on bicycle safety and risk by building crowd-source technology to support citizen-driven data collection. Here we describe the development of a web-mapping platform that will allow citizens to map their bicycle crashes, near misses, and identify the location of hazards.

Methods: BikeMaps.org is built with free and open source tools. The web framework is built in Django and the backend database system is PostgreSQL, a database that accommodates efficient storage and querying spatial data. The website front end HTML templates use additional open source JavaScript and CSS packages to provide professional styling, dynamic user interaction, and containers for rendering map content. The map interface is Leaflet, a JavaScript mapping library that can retrieve and render "map tiles" from a map tile server and display point, polyline, polygon, and popup features. Citizen mappers report details of near-miss or crash circumstances through pull-down options, including date and time, infrastructure, weather, and visibility, and the nature of any injury, key variables for studies of injury risk (Teschke et al. 2012). Likewise, citizen mappers can record bicycle theft locations or other hazards. For knowledge mobilization, users also have the opportunity to define riding areas and receive monthly reports, via email, of new crashes and reports in their area.

Results: BikeMaps.org provides a global system for mapping cycling safety. The site currently includes police and insurance-reported crashes across BC as well as generalized global ridership data available from strava.com. The website can also be used to generate personalized reports on safety for citizen defined riding areas, providing tailored information directly to individual riders. Similarly, regional reports can be provided to decision-makers and advocacy groups interested in cycling safety surveillance or monitoring the safety impacts of new infrastructure. The public launch and citizen engagement is being led in Victoria and Vancouver in the fall of 2014 through community launch events, media releases, public meetings, and partnerships with local governments and cycling advocacy organizations. The citizen-mapping data will provide valuable data on near misses, a substantial data gap. BikeMaps.org data will thus enable exploration of space-time patterns on crashes, near misses, and other safety hazards, allowing us to map hot spots of cycling safety and risk and quantify changes throughout the day and over a week.

Conclusion: BikeMaps.org is a new tool for collection and analysis of bike safety and risks. Long-term, our aim is to apply spatial analysis and statistics to citizen-generated cycling safety data to develop new knowledge for decision making and planning. It is designed as a mechanism for data collection, but is also a tool for promotion of cycling through citizen engagement and increased awareness of cycling safety using mapping as a mechanism. The data generated through BikeMap.org fill important data gaps for personal and regional planning to support safer cycling.

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Utilitarian and Recreational Walking Differ in Their Associations with the Built Environment

Abstract:

Background: A popular form of physical activity (PA), walking is not a singular behavior. Utilitarian walking and recreational walking have different purposes and may occur under different environmental contexts and influences. Many prior studies examining built environment correlates of physical activity did not separate walking by type, nor move beyond reliance on exclusively self-reported measures of walking.

Purpose: First, we developed a new method to classify utilitarian and recreational walking based a combination of objective device-based and self-reported data. Second, we examined separately the associations between environmental factors and utilitarian and recreational walking.

Methods: We collected adult participants' 7-day accelerometer, GPS, and travel diary data from a sample of urban residents in King County, WA. Valid assessment days were defined as having accelerometer wearing time ≥ 8 hours. Combined data were processed to identify physical activity bouts (≥ 5 min) and further processed to identify walking bouts. Walking bouts were then classified as utilitarian or recreational, based on recorded destinations from either GPS or travel diary data. Walking bouts with destinations at nearly same locations as their origins (bouts with their first and last GPS points ≤ 40.2 m apart) or with concurrent travel diary trip records starting and ending at the same place (recorded as 'tours'), were classified as recreational. All non-recreational walking bouts were classified as utilitarian. Daily times in each walking type were averaged across valid days per participant. We ran separate multivariate regression models to examine built environment metrics in home neighborhoods as predictor variables for average daily time spent in utilitarian or recreational walking, with adjustment for socio-demographic and psycho-social characteristics.

Results: The final sample consisted of 657 participants' 4,283 valid person-days (average of 6.5 days per participant). The sample yielded a total of 7,567 walking bouts. Of the total, 6,765 walking bouts (89%) were classified as utilitarian and 802 (11%) as recreational. Participants had a daily average of 26.6 min of walking, with 21.7 min in utilitarian and 4.8 min in recreational walking. The multivariate model of utilitarian walking showed that utilitarian walking was associated with self-reported sex (female, -), age (-), self-confidence (+), perceived barriers (-), social support for PA (-), neighborhood attractiveness (+), and objective residential density (+) and employment density (+) (R^2=.23). Recreational walking was associated with sex (female, +) and employment density (-) (R^2=.078).

Conclusion: This paper implemented a new approach to define utilitarian and recreational walking using objective location and activity devices and subjective travel diary data. Variation in utilitarian walking was relatively well explained by predictors of sex, age, psycho-social variables, residential density, and job density, while recreational walking was only significantly explained by sex and job density. It is noteworthy that the two significant variables, sex and job density, had opposite associational directions for utilitarian versus recreational walking. Amount of individual-level utilitarian and recreational walking differed substantially in association with built environmental variables as well as socio-demographic and psychosocial variables.

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Prevalence and correlates of active transportation among adults: the 2007-2011 Canadian Health Measures Surveys

Abstract:

Background: Active transportation (AT) is an important source of daily physical activity (PA) which has been shown to be associated with reduced cardiometabolic risk. However, previous AT research has generally focused on the trip to/from work; hence little is known about the prevalence and correlates of utilitarian walking and cycling to/from other destinations.

Purpose: Combining data from the 2007-2009 and 2009-2011 Canadian Health Measures Surveys, we examined the prevalence and socio-demographic correlates of AT among nationally-representative samples of Canadian adults aged 20-79 years (N=7,160).

Methods: Participants reported the amount of time that they spent walking and cycling either to/from work, school, or while doing errands in a typical week during the past three months. Information on gender, age, education, household income and usual daily PA (e.g., a questionnaire item designed to capture occupational PA) was also reported by participants. We used multinomial logistic regression models adjusted for the complex survey design to examine the relationship between these variables and levels of walking and cycling. 34.2% of participants reported walking 5 hours/week. In contrast, 94.0% of participants reported no cycling, 2.4% reported

Results: Women were more likely to report walking 1-5 hours/week (OR=1.63; 95% CI=1.35-1.97) or >5 hours/week (OR=1.77; 95% CI=1.46-2.13), but they were less likely than men to report biking ≥1 hour/week (OR=0.39; 95% CI=0.25-0.60). Participants reporting greater usual daily PA were more likely to report walking >5 hours/week (OR=2.12; 95% CI=1.55-2.88). Compared to 20-39 year olds, 40-59 and 60-79 year olds were less likely to report walking 1-5 hours/week (40-59 years: OR=0.67; 95% CI=0.54-0.84; 60-79 years: OR=0.76; 95% CI=0.64-0.91) or >5 hours/week (40-59 years: OR=0.64; 95% CI=0.49-0.82; 60-79 years: OR=0.57; 95% CI=0.42-0.77). 40-59 years were less likely to report cycling ≥1 hour/week (OR=0.61; 95% CI=0.44-0.84) while 60-79 years were less likely to report cycling 5 hours/week (OR=0.64; 95% CI=0.46-0.88). Levels of cycling were not associated with income, education and usual daily PA.

Conclusion: Our study extends previous research by examining the correlates of adults' AT beyond the trip to/from work in a large nationally-representative sample of Canadian adults. Overall, our results indicate a high prevalence of walking (although at low levels), but a very low prevalence of cycling. Both levels of walking and cycling were markedly lower among older participants, consistent with previously-reported age-related declines in PA. The lower prevalence of utilitarian cycling among women is also consistent with previous North American studies. Future longitudinal studies are warranted to examine the correlates of travel behaviour change, and assess the effectiveness of AT interventions.

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What Moves Us: A Comparison of Perceived and Objective Predictors of Active Transportation Behaviors

Abstract:

Background: On average in the United States, approximately 3.5 percent of commuting trips are taken by foot or bicycle, 5 percent by public transit, and the remaining 91.5 percent by motor vehicle. Lack of regular physical activity has been identified as one of the most significant public health issues in the United States, and the global significance of physical inactivity is increasing as developing countries adopt more Western modes of transportation. Recent evidence suggests that the physical design of the places where people live and work affects overall travel choices and the extent to which commuters utilize active transportation methods. However, studies to date offer an unclear picture of what specific neighborhood elements facilitate these modes of transport.

Purpose: To analyze the association between objective measures of the built environment and active transportation behavior. Concurrently, to examine the association between people's perceptions of their built environment and their subsequent propensity to use active transportation.

Methods: Analysis of the interview-based and self-report data from the Survey of the Health of Wisconsin (SHOW) and the observational Wisconsin Assessment of the Social and Built Environment (WASABE), an ancillary study of the SHOW to assess attributes of the physical environment surrounding households of 1,029 adult residents living in urban, suburban, and rural communities. Active transportation behaviors were linked to environmental audit data and other geographic information systems (GIS) data.

Results: Both perceived and objective observations of many destinations within walking distance from home were positively associated with active transportation. Objectively measured bicycle friendliness (presence of a bike lane or road width supportive of bicycles), presence of trails, and sidewalk availability were also associated with active transportation.

Conclusion: Active transportation behaviors are likely to be associated with individuals' perceptions of their built environment, but primarily with the presence of proximal destinations, trails, and streets supportive of bicycling and walking.

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Health impact assessment of active transport policies: A systematic review

Abstract:

Background: Walking and cycling for transportation (i.e. active transportation, AT), are believed to provide substantial health benefits from increased physical activity (PA). However, risks of injury from exposure to motorized traffic and their emissions (i.e. air pollution) exist. The objective was to systematically review studies conducting health impact assessment (HIA) of a mode shift to AT on grounds of associated health benefits and risks.

Purpose: HIAs of AT have not been reviewed before. We systematically reviewed the literature on quantitative HIA studies of active transport policies.

Methods: Systematic database searches of MEDLINE, Web of Science and Transportation Research International Documentation were performed by two independent researchers, augmented by bibliographic review, internet searches and expert consultation to identify peer-reviewed studies from inception to December 2014.

Results: Thirty studies were included, originating predominantly from Europe, but also the United States, Australia and New Zealand. They compromised mostly HIA approaches of comparative risk assessment and cost-benefit analysis. Estimated health benefit-risk or benefit-cost ratios of a mode shift to AT ranged between -2 to 360 (median=9). Effects of increased PA contributed the most to estimated health benefits, which strongly outweighed detrimental effects of traffic incidents and air pollution exposure on health.

Conclusion: Despite different HIA methodologies being applied with distinctive assumptions on key parameters, AT can provide substantial net health benefits, irrespective of geographical context.

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Making the Connection Between Utilitarian Walking and Health Measures using the American Time Use Surveys

Abstract:

Background: Walking for transportation, as a moderate-pace activity, can be a strategy used to facilitate daily physical activity, required for a healthy (active) lifestyles in adults. While the relationship between walking and health appears intuitively straightforward, the empirical research on this subject is largely based on small-sample clinical trials and/or focused on specific population segments or geographic areas.

Purpose: The object of this research is to contribute to the literature by exploring the relationship between individuals' walking patterns and their health using a recent large cross-sectional survey of health and time-use from the US. The survey samples are not limited to any one geographic area or to a specific population segment. At the same time individual-level time use and health data are modeled after controlling for the effects of several other contributing factors.

Methods: This analysis uses data from the 2006, 2007, and 2008 American Time Use Surveys and the corresponding Eating & Health Modules. ATUS collected detailed socio-economic, demographic, and one-day activity-travel information for a large sample of persons. There are two measures of health available from the well-being module of the ATUS. These are the Body Mass Index (BMI) and a Self-Assessed Physical Health Score (SAPHS). To estimate the effect of walking on health, BMI is modeled using a linear regression model and SAPHS is modeled using ordered-probit. An instrumental-variables approach is adopted with a "predicted probability of walking on a day" being used as the instrument as walking patterns on one day need not reflect general walking patterns. For the effect of health on walking, binary logit models are estimating considering the dichotomous outcome variable (walked or not, with two different walking thresholds of 10 and 15 minutes). Separate models are estimated to capture the differential impacts of health on weekday and weekend walking.

Results: Effect of walking on health: The predicted probability of weekday/weekend walking (≥10 minutes) has a negative impact on BMI and a positive impact on SAPHS. This indicates that individuals who are more likely to walk have lower BMI and "feel" healthier (higher SAPHS). On examining the effect of predicted probability of walking ≥15 minutes, the effect on BMI is statistically insignificant but positive and significant on SAPHS. Overall, walkers are estimated to "feel" healthier but the effect of walking on BMI is significant only for one of the definitions of walking. Effect of health on walking: The models indicate a negative relationship between BMI and walking for both weekdays and weekend ; i.e., persons with higher BMI are less likely to walk. However, the relationship between SAPHS and walking holds only for weekend days. Specifically, those who feel healthier are more likely to walk on weekends but the effect on weekday walking is statistically insignificant. This could be because weekday walking is more likely to be for mandatory purposes whereas weekend walking is leisure-oriented.

Conclusion: The estimated positive effects of walking on health are encouraging especially considering the large and diverse sample and the inclusion of a large number of control variables. Correspondingly, the results on the negative effects of BMI on walking highlight the need for encouraging people who are currently not overweight to walk as onset of obesity can have a detrimental impact on walking.

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Energy demand of walkers and riders of electric-assist bicycles and traditional bicycles

Abstract:

Background: Electric assist bicycles (e-bikes) have emerged as a sustainable, alternative form of transportation. Compared to other active transportation modes such as walking or bicycling, the performance of e-bikes offers users some important benefits such as expanded mobility. Some e-bikes are becoming available in bike-sharing platforms, where benefits can be extended to a large group of users.

Purpose: There is currently little understanding of the comparative physical health benefits of e-bike use versus other active transportation modes. The purpose of this research is to evaluate the physical activity of bicycling, e-bike riding, and walking, in the context of a bicycle and e-bike sharing system.

Methods: The study includes 19 users of a bicycle and e-bike sharing system and studies identical trips made by those users with three active transportation modes: bicycle, e-bike, and walking. The bicycles and e-bikes used in the study are available as options in the sharing platform. Walking trips are studied because walking was identified as the mode most displaced by the system in previous studies. Laboratory tests are used to relate VO2 (ml/kg/min) and EE (kcal/min) to user heart rate during trips as a measure of energy expenditure. Participants then completed identical 2.75 mile trips on rolling terrain using each mode, with each trip completed on different days and in random order. Heart rate and user supplied power output, using a bicycle power meter, were directly monitored and matched with GPS data for each trip. Additional information was collected through post-activity surveys.

Results: The study finds that energy expenditure per unit time for e-bike trips is 11.1% less than that for regular bicycle trips and 8.0% more than for walking trips. Average moving speed for the three modes was 5.1 kph for walking, 14.4 kph for bicycle, and 16.4 kph for e-bike. Walking trips, while requiring less energy per unit time, take longer to complete and, in this case, require a greater amount of total energy from the user. Considering the performance advantages of e-bikes over the course of the trips studied, the total energy demanded for e-bike trips was 20.7% less than required for regular bicycle trips and 61.7% less than for walking trips. These comparisons vary between male and female users and between users who do or do not own a bicycle. The study also reports on perceived exertion and level of enjoyment among the participants for each trip.

Conclusion: While electric bicycles do not provide the same physical activity benefits as regular bicycles, they do provide benefits over more sedentary transportation modes and, because of their performance and added level of enjoyment, could promote additional trips. Earlier research showed that e-bikes replace sedentary modes at a higher rate than bicycles. This research shows that e-bike sharing can be a method to promote greater physical activity for users through active transportation. Further, the methods used in this research can be extended to more naturalistic studies of e-bike users.

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An investigation of the relationship between walking and cycling and reduced risk for all-cause mortality: Systematic review and meta-analysis

Abstract:

Background: Walking and cycling have been shown to have beneficial effects on population risk of all-cause mortality (ACM). These effects are used in Health Impact Assessments (HIA) for active transportation. There is equivocal evidence on the strength of the effects and the appropriate dose-response curves to apply which limits our ability to model the health and economic benefits of interventions and policies. For walking, meta-analyses have suggested reduced population risks for ACM of 3-32%. For cycling, no meta-analyses have previously been conducted and individual cohort studies have reported reduced risks of 56% to increased risks of 2%. For both walking and cycling a range of possible dose-response relationships have been proposed. Within the available evidence a range of approaches for considering the confounding effect of overall physical activity (PA) status have been used.

Purpose: This study aimed to systematically review the evidence for the effect of walking and cycling on risk of ACM. Appropriate data were pooled for meta-analysis and reduced risks for a quantified dose of walking and cycling reported. To identify the independent effect of walking and cycling, only studies that reported risks adjusted for other PA were included in meta-analysis. By using ACM as an outcome deaths from walking and cycling incidents were accounted for in analysis.

Methods: Systematic review of the following health databases of publications was conducted in November 2013: Embase (OvidSP); Medline (OvidSP); Web of Knowledge; CINAHL; SCOPUS; SPORTDiscus. Reference lists of relevant texts and reviews were also searched. To be eligible for inclusion studies were required to have prospective cohort design. They were also required to report walking or cycling as an exposure and exposure group mortality as an outcome. If the cohort was not healthy at baseline (e.g. patient or hospital based) the study was excluded to reduce risk of reverse causality. The following data were extracted from included studies: study population and location, sample size, cohort sample demographics (e.g. age and sex), follow-up period in years, walking or cycling exposure information, mortality outcome as reported, and reported adjustment for other co-variables. In pooled analysis, random-effects meta-analyses were used to investigate the beneficial effects of a quantified exposure of regular walking and cycling.

Results: Systematic review identified 18 walking results from 14 studies with 280,000 individuals and 2.6 million person-years. For cycling, 8 results from 7 studies were identified with 187,000 individuals and 2.1 million person-years. Meta-analysis demonstrated that walking was shown to reduce the risk of ACM by 11% (95% CI = 4 to 17%) and cycling was shown to reduce the risk for ACM by 10% (95% CI = 6 to 13%). These effects are based on a standardised dose of 11.25 MET.hours per week (or 675 MET.minutes per week) which is equivalent to global PA recommendations for adults of 150 minutes per week. The shape of the dose-response relationship was modelled through meta-analysis of pooled relative risks within three exposure intervals. The dose-response analysis showed that walking or cycling had the greatest effect on risk for ACM in the first (lowest) exposure interval with diminishing returns for increased walking and cycling above global PA recommendations.

Conclusion: These results confirm that transportation and public health policy and guidelines should include walking and cycling. This study demonstrates that walking and cycling at global PA recommendations lead to 11% and 10% reductions in population risk of ACM. These reductions are controlled for the confounding effect of other PA. Analysis of dose-response suggests decreasing rate of benefit at higher exposures and that HIA should apply non-linear and reduced effects above global PA recommendations.

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An Integrative Approach to Regional Bicycle and Pedestrian Planning: The Utah Collaborative Active Transportation Study

Abstract:

Background: Walking and bicycling are effective ways for people to improve their health and wellbeing. But the benefits of active transportation go beyond the health of the individual. A growing body of research shows that active transportation can also benefit the environment and improve the transportation network. These improvements can include improved air quality, a reduction in Vehicle Miles Traveled (VMT), congestion reduction, increased transit ridership, mode share shift, health benefits, improved transportation safety. The addition of active transportation infrastructure can even boost economic viability in the places where it is located. While the benefits of active transportation infrastructure are well documented, implementation can be complex. For example, an individual municipality may construct a bicycle or pedestrian facility that may or may not be compatible with facilities in neighboring cities. If adjacent jurisdictions do not adequately communicate during their planning processes, it can result in an incongruous bicycle and pedestrian network that restricts movement and may actually inhibit active travel behavior.

Purpose: In 2012 the Utah Collaborative Active Transportation Study (UCATS), a region wide innovative effort by a multi-agency team located on Utah's Wasatch Front (the Salt Lake City Metropolitan area), was conducted to create a large scale plan for an urban network of bicycle routes across a five county area, by identifying bicycle and pedestrian infrastructure that is usable and accessible to a wide range of people with varying interests and abilities. This included identifying links in unfinished networks, and options to fill in gaps, overcomes barriers and emphasized connections to transit.

Methods: The study area for UCATS focused on the urban areas of the Wasatch Front in Box Elder, Weber, Davis, Salt Lake, and Utah Counties. The process required extensive collaboration and comprehensive data. Existing bike lanes and trails for all five counties were pinpointed and mapped. Utah Transit Authority station area walkability and a latent demand model was employed to identify key locations for potential bicycling and pedestrian activity.   Most notably, this process utilized a first of its kind pro-forma model to create a site specific evaluation of the specific health benefits of all potential projects. Public opinion was sought at every stage of the process through targeted outreach and a continual, interactive online presence.

Results: The most important outcome of the UCATS process was the development of a regional network of bicycle facilities and proposed projects that enhance active transportation access to transit. The UCATS Regional Bicycle Network is comprised of bicycle facilities that fill in gaps in existing bicycle networks, paths, and routes, particularly those routes that connect to TRAX (light rail) and FrontRunner (commuter rail) transit stations. In order to facilitate the eventual construction of the UCATS Regional Bicycle Network and transit connections, UCATS pinpointed 25 project areas on the regional network. Potential bicycle and pedestrian infrastructure and treatments were identified and evaluated within the 25 project areas. This evaluation helped to determine construction and environmental challenges, as well as economic and quality of life advantages associated with implementation.

Conclusion: Many people rely on walking and biking to get to school, work, transit, shopping and other places they need to or want to access. Many more would walk and bike if adequate opportunities were available. As Utah continues to grow, it becomes more important to provide walking and biking facilities that are safe, comfortable and accessible for a wide range of people. UCATS has developed a Regional Bicycle Network with links to transit and has identified 25 project areas where adding bicycle and/or pedestrian treatments will kick-start the implementation of the plans developed under the project.

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Building Health Evidence to Support Complete Streets in Toronto

Abstract:
Background: In May 2013, Toronto City Council recommended that city staff develop Complete Streets Guidelines to help reshape Toronto streets. To support the Guidelines development Toronto Public Health commissioned a series of Healthy Streets reports (Healthy Streets: Evidence Review, Healthy Streets: Jurisdictional Review, and Healthy Streets: Design Features and Benefits) from consultant team Urban Design 4 Health (UD4H) including Toronto Centre for Active Transportation (TCAT). To better support an integrated approach to Complete Streets in Toronto the project team worked with City of Toronto Division staff representing Transportation Services (Cycling Infrastructure; Pedestrian Projects/ Public Realm) and City Planning (Urban Design) who will be developing the City of Toronto Guidelines. The reports identify and showcase health evidence about how Complete Streets support positive health impacts and why Public Health supports the development of Complete Streets.
Purpose: Building a credible and accessible resource of health evidence about the multiple health benefits of Complete Streets will ensure that health is considered as part of the spectrum of impetus for developing Complete Streets in Toronto. The cross divisional project team structure created opportunities for strengthening partnerships and the quality of the reports. The role Complete Streets can have on the increasing opportunities for city residents to incorporate physical activity into their daily lives is important and required explicit support from Public Health.
Methods: UD4H conducted a systematic literature review of academic and other databases to identify relevant studies. Using the results of this search the project developed an evidence review of health evidence related to design features of Complete Streets. To balance the theoretical insights provided by the literature review a second process with key informant interviews conducted by TCAT was used to explore how health information has been integrated into Complete Streets decision-making, and to understand and capture the health implications of real life street design trade-offs in cities like Toronto. Based on the Healthy Streets reports identification and assessment of the published evidence for how specific street design choices influence health outcomes, and incorporating the practical experiences of transportation and public health officials from 10 North American jurisdictions a final user friendly design feature and benefit document meant to support and increase understanding from a health perspective the value of investing in Complete Streets infrastructure was created.
Results: Through the input with City partners the project was tailored to create scientifically accurate and persuasive resources to help transition the City to Complete Streets Guidelines. Development of the Guidelines is in process. The research identified three paths through which Complete Streets can support health: (1) Improve Accessibility, (2) Ensure safety and security and (3) Enhance the experience, by moving the focus of roadways from moving cars to moving people. The health evidence found during the literature review and jurisdictional interviews are valuable resources to help frame the importance of making infrastructural changes to support active transportation, taking advantage of this moment of civic renewal to decrease the impact of chronic disease and collisions on the health care system.
Conclusion: Health evidence presented in a compelling format with sound methodological structure can help shift the City to keep transitioning to a more equitable use of roadways that will keep the City healthy for many years to come.

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Estimating Walking and Cycling At the State Level

Abstract:

Background: States routinely estimate vehicle miles traveled (VMT) to measure motor vehicle use and desire to estimate bicycle and pedestrian miles traveled (BMT and PMT) to better quantify bicycling and walking, which would provide a measure of state-wide physical activity. While BMT and PMT has been estimated at the county level, such estimates have not been made at the state level using count based methods.

Purpose: What approaches could be used to estimate BMT and PMT on the state level? This paper discusses three such approaches, identifies the advantages and disadvantages of each when applied to an example state (Washington State) and example county (King County, Washington), and recommends a path forward. The paper also discusses the utility of the metric and a range of values per capita that would be expected. Employing these methods over time would allow states to track changes in physical activity and compare them to statewide health outcomes and goals.

Methods: The first approach employs national survey data. The second approach is sample-based using pedestrian and bicycle count data. The third approach is an aggregate demand model approach using demographic data combined with count data. This research tackles the question and provides rough estimates of the metric for an example state and an example county.

Results: Experience applying these methods to the example state reveals the advantages and disadvantages of each. Due to lack of data from some regions of the state, only at the county level were all three methods able to compute BMT and PMT for comparison purposes. On the state level, the count-based method was used to estimate absolute upper and lower bounds for the values in order to describe the order of magnitude of state-wide BMT and PMT. The survey method seems to underestimate BMT and PMT because the values were close to the lower bound. Conversely, the count based method likely overestimated the values because they were based on counts at sites selected for high volumes. Per capita BMT and PMT were compared to other studies to show how such a metric can be used to compare physical activity in different areas.

Conclusion: Whatever approach is used to estimate BMT and PMT, additional data is needed to obtain reliable estimates. This research illustrates the utility of count-based methods if volumes are desired at the facility level as well as the state level, especially for cyclists. For pedestrians the aggregate model might be more appropriate on the state level, because of the more dispersed nature or pedestrian travel, but additional explanatory variables should be included. This research also identifies the expected range of BMT and PMT values per capita.

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Improving Sustainable Development: Reducing Exposure to Traffic-Related Air Pollution

Abstract:

Background: Studies have shown that pollution levels tend to be high near heavily traveled roads and that road proximity is related to adverse health effects. As a result of emission standards, newer light-duty automobiles and trucks emit substantially less pollution than their older counterparts, and over time, the average amount of pollution emitted per vehicle mile traveled is declining. However, it takes many years for the vehicle fleet to completely turn over, and even the newest vehicles emit some pollution. In addition, as the population increases, there will be an increase in overall vehicle miles traveled. An important challenge is to promote transportation and land use decision making that improves sustainability for future generations, while minimizing air pollution exposure.

Purpose: The chief objective of this work was to encourage sustainable or "smart" urban growth, such as transit-oriented development, while guiding planners to minimize traffic-related air pollutant exposure. Smart growth improves social welfare by encouraging active transportation and providing opportunities to minimize auto use. Planning decisions to encourage smart growth can involve significant economic investment and result in infrastructure placement that lasts decades; it is vital that such development be optimized to reduce pollutant exposure.

Methods: Although smart growth facilitates transit use, walking, and bicycling, it may be implemented near major transportation corridors. This presentation consolidates findings from a recent study sponsored by several offices of the U.S. Environmental Protection Agency (EPA) and completed with assistance from Sonoma Technology, Inc. (STI) and Arup North America Ltd. We build on previous work, synthesizing the results of near-road pollution studies and creating a new assessment framework to improve local planning affecting transportation infrastructure and land use. We also share case study findings to illustrate the concepts.

Results: In this talk, we explain the near-road pollution issue and introduce an assessment framework that can help planners mitigate near-road pollution exposure and promote healthier and more livable communities. The framework covers corridor, street, development site, and building-specific actions that can reduce exposure to pollutants, demonstrating that there are approaches ranging from larger-scale traffic corridor design strategies down to smaller-scale building-related options.

Conclusion: The material presented will familiarize planners with the near-road pollution problem as well as strategies that can prevent an inadvertent increase in pollution exposure when applying smart growth design principles.

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Calibrating Walk Score to better predict active transportation behavior

Abstract:

Background: Health researchers have regularly been using data from the online Walk Score website (www.walkscore.com) as a proxy measure for the built environment of study participants, in part because it is relatively easy to acquire and available using a consistent methodology for any location in the United States. However, the Walk Score algorithm was initially calibrated based on limited published evidence and never calibrated or validated with objectively-measured physical activity data. To help resolve this limitation of the Walk Score data, Urban Design 4 Health and Walk Score, with funding from the Robert Wood Johnson Foundation developed improved and calibrated methods for calculating Walk Scores.

Purpose: The purpose of this project was to improve the calibration and validate the ability of the web-based tool Walk Score to identify locations with environmental characteristics associated with increased physical activity and reduced body weight. Such a tool provides public health researchers and practitioners with a low-cost and easily accessible method for evaluating the walkability of neighborhoods or specific addresses using data and methods that are consistent nationwide.

Methods: Previously-collected National Institute of Health (NIH) funded survey data for four age groups (adults, seniors, teens, and children) were joined with Walk Score (WS) data for each survey participant. During Phase 1, the original WS, which uses airline distances to measure the proximity of destinations to a home point, was enhanced by implementing a street network-based distance measurement method. In Phase 2, we tested whether the network-based WS could be further improved by modifying the WS decay function for weighting the distance to destinations, calibrating the weights derived from the predictive importance of each WS component, and addition or removal of variables included in the WS algorithm. Statistical analyses were conducted to understand the relationships between WS neighborhood data and NIH study participants' health and physical data. With this understanding, we provided recommendations for calibrating the WS algorithm for each age cohort to better predict objectively-measured moderate and vigorous physical activity. The re-calibrated WS algorithm was also tested with other outcomes, such as active transportation behavior and obesity, and validated against an external data set.

Results: We found that implementing the street network-based distance measurement method, revising the distance decay function, adjusting destination weights, and revising how street connectivity variables are incorporated into Walk Score all resulted in an improved ability to predict active transportation behavior, physical activity, and obesity. Adults were the least sensitive to destination distances up to 0.4 miles, whereas seniors were slightly more sensitive and teens were the most sensitive. Beyond 0.4 miles, seniors were the least sensitive to distance, while adults and teens were similarly sensitive. For adult, senior, and teen cohorts, proximity to coffee shops was the strongest predictor of physical activity. Park proximity was important for seniors, less so for adults, and relatively low for teens. Other important proximal destinations included book stores for adults and restaurants and banks for seniors, while street connectivity was important for teens. The revised Walk Score was significantly (p

Conclusion: Walk Score's ability to predict active transportation, physical activity, and obesity outcomes can be improved by using network-based distance calculations and making revisions to the distance decay, destination weighting, and street connectivity components of the algorithm. The proposed revised Walk Score provides researchers with a more valid measure of walkability for use in health and physical activity studies. The association of Walk Score with most physical activity and obesity outcomes was strongest for adults, followed by seniors, teens, and children, and stronger for transportation-related behaviors than for leisure or overall physical activity.

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Jared Ulmer

The Effects of Socio-Economic and Transportation Accessibility on Area-Level Diabetes Counts: A Latent-Variable Structural Equation Model Approach

Abstract:

Background: The built environment (BE), which is reflected by land use patterns and road network connectivity, can affect public health via the pathways of neighborhood accessibility and physical activity levels. Health issues, like diabetes, represent a complex interplay of nutrition, genetics, and environment. While some studies have been able to quantify the effects of BE on active transportation (e.g., biking and walking), the quantitative linkage between public health and BE has been largely unknown.

Purpose: The goal of this paper is to understand if and how greater transportation accessibility affects one of the public health issues--diabetes risk--while controlling for socio-economic status (SES) variables and purging out bias due to residential self-selection.

Methods: Latent variables are used within the structural equation model (SEM) specification to capture a multitude of factors underlying area-level diabetes risk. This is motivated by the fact that latent variables (e.g., accessibility and SES) are often imperfectly measured, through proxies that are available to the analysts and describe some, but not all, facets of the latent variables of interest. The SEM approach can purge out spurious effects between the BE and diabetes risk due to residential self-selection, a situation where people choose to live in a neighborhood based on their travel "abilities and preference". This work uses the diabetes count data at the traffic analysis zone (TAZ) level and a handful of accessibility and socio-economic variables (e.g., proximity to bike lanes, land-use balance, population density, land value, etc.) in Travis County, Texas.

Results: Results suggest that accessibility and socio-economic factors play an important role in understanding diabetes prevalence. On average, forty-eight percent of multi-family dwelling units are within a half mile distance from bike lanes in the county. Providing bike lanes near multi-family developments would reduce diabetes risk: a one percent increase in multi-family housing units within a half mile of bike lanes could reduce diabetes rates by 0.7 percent. For a one percent rise in land-use balance, diabetes risk is estimated to decrease by 0.28 percent. Outputs also suggest that, to curb diabetes prevalence, emphasis should be placed not only on enhancing accessibility, but also on narrowing the health disparities by improving access to quality health care and raising awareness of healthful lifestyles for people with lower socio-economic status. The latent-variable SEM model yields stronger statistical significance of individual coefficients and better goodness-of-fit for the overall prediction than the results from two alternative models—a standard SEM model and a spatial model that is widely used to estimate disease prevalence.

Conclusion: The latent-variable SEM approach appears to be successful in describing unobserved factors underlying diabetes prevalence via observed (but limited or imperfect) covariates. This work quantified the effects of transportation accessibility and SES on diabetes prevalence while factoring in residential self-selection. The generalized model framework could be applied to other public health settings. The study also reflects some aspects of the tiered approaches to data collection for different levels of health-related analysis for local transportation governments.

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More walkable-oriented zoning and land use laws are associated with active travel to work

Abstract:

Background: Communities that are zoned to include bicycling and walking infrastructure expand commuters' transportation options. While active commuting through walking, biking, or public transit use is relatively small (9.4%) compared to motorized transport (86.2%), it is still an important mode of travel for certain segments of the population, particularly those residing in larger urban areas, college towns, and among 16-24 year old workers. Local government zoning reforms have emerged in recent years to combat sprawl, single use development, high-reliance on automobiles, and limited opportunities for physical activity (PA), including active commuting. Zoning reforms seek to create pedestrian-friendly neighborhoods with increased street connectivity, mixed-use and higher density, open space, transportation infrastructure, and a traditional neighborhood structure.

Purpose: This presentation will examine the association between the walkability/bikeability orientation of municipal-level zoning and land use laws nationwide and adult active travel to work. This study addresses the recommendations of the National Physical Activity Plan and the Institute of Medicine for local governments to develop/modify built environment-related policies that will encourage PA.

Methods: Zoning codes for 1925 municipal jurisdictions located in the 147 largest US counties (covering ~50% of the US population) were compiled and coded by trained, Master's level urban planners using a systematic audit tool developed by the study team. Seventeen (yes/no) measures assessed the active living orientation of the zoning codes: code reform/new urbanist-type zoning; any infrastructure requirements for sidewalks, crosswalks, bike-pedestrian connectivity, street connectivity, bike lanes, bike parking, bike-pedestrian trails/paths, or mixed use development (8 measures); and infrastructure requirements applying to all districts in a zoning code (8 measures). Two scales assessed the number of infrastructure items addressed and required, respectively. Two continuous outcome measures were constructed using 2007-2011 American Community Survey municipal-level 5-year estimates that measured the percentage of workers living in a municipality who worked away from home and: (1) walked to work or (2) took public transit. Linear regression analyses examined the association between the zoning provisions and walking or taking public transit. Regression models, clustered on county, controlled for median household income, families with children in poverty, race/ethnicity and region.

Results: After adjusting for municipal level controls, code reform zoning was associated with increased walking (β=0.48, 95% CI=0.08-0.88, R2=0.097) and public transit use (β=2.02, 95% CI=0.88-3.15, R2=0.35). Increased public transit use also was associated with any zoning requirement for crosswalks (β=2.34, 95% CI=0.51-4.17); bike-pedestrian connectivity (β=1.17, 95% CI=0.23-2.11); and bike parking (β=2.04, 95% CI=1.11-2.97) (all R2s were approximately 0.35). In contrast, increased walking to work was associated with zoning requirements for all districts in the community to include each of the active living provisions of interest (e.g., sidewalks, crosswalks, bike-pedestrian connectivity, etc.). Increased walking to work was most associated with requirements for all districts to include bike-pedestrian connectivity (β=1.79, 95% CI=0.16-3.44); sidewalks (β=1.34, 95% CI=0.59-2.08); and street connectivity and bike parking (β=1.12, 95% CI=0.46-1.77 for both measures) (all R2s were approximately 0.096).

Conclusion: Zoning code reforms and active living-oriented zoning provisions are associated with adult active transport to work.

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The Relationship between Local Walkability, Pedestrian Danger and Active Travel to Work

Abstract:

Background: Environmental and policy factors play an important role in influencing people's lifestyles, physical activity, and risks for developing obesity. Evidence shows that community- and street-scale urban design promotes physical activity. Characteristics of communities that facilitate physical activity include more compact developments with a mix of residential, commercial, retail, and recreational destinations; traditional neighborhood design that provides street and sidewalk connectivity; transportation infrastructure; and proximity to recreational areas/facilities. In contrast, sprawling communities requiring the use of automobiles and communities with limited transportation infrastructure, poor street/sidewalk connectivity, lack of sidewalks or bike paths, and high traffic volume have lower rates of physical activity. Thus, more walkable communities are needed to sustain lifelong physical activity behavior.

Purpose: This presentation examines the association between local walkability, pedestrian danger, and the percent of adults who walked or took public transit to work at the county-level.

Methods: Built environment and physical activity outcome measures were constructed for the 492 most populous counties representing 73 percent of the U.S. population. GIS-based walkability (intersection, population and housing density) and traffic calming (count of medians, roundabouts, parking, and low mobility streets, and intersection density) scales were constructed for the census of roads located within the counties using 2011 Navteq data. The pedestrian danger index (PDI), using data collected from the Fatality Analysis Reporting System 2009-2011, measures the likelihood of a person on foot being hit and killed by a vehicle. Two continuous outcome measures were constructed using 2007-2011 American Community Survey county-level 5-year estimates representing 1) the percentage of workers living in a county who walked to work; and 2) the percentage of workers living in a county who took public transit. Linear regression and mediation analyses were conducted to examine the association between walkability, pedestrian danger and active travel. Regression models accounted for clustering within state with robust SEs, and controlled for median household income, families with children in poverty, race, ethnicity and region.

Results: The walkability scale was negatively associated with the PDI (β=-0.059, 95% CI=-0.115, -0.003). Local walkability (β=1.14, 95% CI=0.95, 1.33) and the PDI (β=-1.09, 95% CI=-1.34, -0.84) were directly associated with the percent of people who walk to work. Results showed 7.5 percent of the significant positive relationship between local walkability and workers who walk to work was partially mediated (Sobel test statistic 0.09, p=0.012) by the PDI. The walkability scale (β=5.90, 95% CI=5.53, 6.24) and the PDI (β=-1.80, 95% CI=-2.51, -1.09) were directly associated with the percent of workers who took public transit. Results showed 1.7 percent of the significant positive relationship between local walkability and workers who took public transit was partially mediated (Sobel test 0.08, p=0.29) by the PDI. We found no association between traffic calming and the PDI or the percent of workers who walk to work. The traffic calming scale was positively (β=0.77, 95% CI=0.088, 1.46) and the PDI was negatively (β=-1.35, 95% CI=-1.99, -0.71) associated with the percent of workers who took public transit, but no mediating relationships were found.

Conclusion: Walkability and traffic calming scales can serve as proxy measures of implementation of municipal and county land use laws and policies on the ground. Results of this study provide evidence that developing walkable neighborhoods is associated with increased healthy behavior and reduced pedestrian-related fatalities. With recent evidence showing physical inactivity, and not diet, as the primary driver in obesity prevalence, communities need rigorous scientific evidence to inform future policy decisions on how to increase active travel in communities.

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Joint effects of walkability and parental perceived neighbourhood safety on likelihood of active travel to school: A longitudinal follow-up of Operation Wixx

Abstract:

Background: Rising physical inactivity in preadolescence constitutes a health concern, prompting physical activity promotion initiatives such as Operation Wixx, a multimedia communication campaign implemented by Quebec en Forme in 2012 among preadolescents aged 9-13 years old (tweens) living in Quebec, Canada. As part of a larger evaluation project focusing on the role of the physical and social environment in modifying the outcomes of the Wixx campaign, the present study focuses on campaign outcomes regarding urban tweens' levels of active travel to school (ATS) using data collected at baseline (2012) and 1 year following campaign roll-out (2013).

Purpose: This study investigated how the association of neighbourhood walkability and parental perceived neighbourhood safety with preadolescents' ATS changed between 2012 and 2013 and how ATS was further influenced by the levels of neighbourhood material and social deprivation and by individual-level factors.

Methods: We assembled a Geographic Information Systems database containing information on neighbourhood material and social deprivation and individual variables available from two surveys conducted with urban tweens and one of their parents in 2012 (n1= 809) and 2013 (n2= 810). Using households' postal codes, we computed a neighbourhood walkability index within street network distance buffers of 800 and 1200 m radii. We assigned levels of neighbourhood material and social deprivation to the Dissemination Area in which each household was located. We conducted separate logistic regression analyses for tweens' ATS as reported by children, dichotomized as Inactive (including inactive or combined active and inactive ATS) versus Active, and by parents, dichotomized as Inactive (0-2 days of ATS) versus Active (3-7 days of ATS), using the following predictors: walkability, parental perceived neighbourhood safety (Low versus High), and time (2012 versus 2013). We then examined the two- and three-way interactions and the extent to which predictors' influence changed by neighbourhood deprivation and by child's weight status (dichotomized as thin/normal versus overweight/obese) and socio-demographic characteristics as reported by a parent.

Results: Because results for both buffers were similar across models (children and parental reports of tweens' ATS), we describe results for 800 m buffers based on children's reports of ATS. Higher walkability (OR=1.14; 95%CI: 1.03,1.26) and higher parental perceived neighbourhood safety (OR=1.96; 95%CI: 1.37,2.80) were associated with greater likelihood of ATS. The main effect of time (OR=0.37; 95%CI: 0.23,0.62) and the interaction between time and perceived neighbourhood safety (OR=5.13; 95%CI: 2.79,9.46) were statistically significant, indicating that perceived safety was associated with greater likelihood of ATS at both times, but that lower safety became a greater deterrent to ATS in 2013. Greater likelihood of ATS was also associated with living in higher quintiles of neighbourhood material (OR=1.57; 95%CI: 1.04,2.38) and social deprivation (OR=2.10; 95%CI: 1.30,3.38), attending primary school (OR=2.37; 95%CI: 1.73,3.24), and with a lower likelihood of being female (OR=0.71; 95%CI: 0.55,0.92).

Conclusion: Higher walkability and parental perceived neighbourhood safety jointly influence the likelihood of ATS, controlling for child's weight status and other covariates. A one-year change in the effect of parental perceived neighbourhood safety on ATS was observed, with children whose parental perceived safety was lower being less likely to ATS in 2013 compared to 2012. Future interventions targeting ATS among tweens needed to be tailored differently for girls and boys. Such interventions are particularly beneficial in children from families with lower familial income. Finally, interventions should be directed towards ameliorating neighbourhood walkability and safety as well as perceptions of neighbourhood safety.

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Updating Crosswalk Policies in San Diego - Debunking the False Sense of Security Arguement

Abstract:

Background: The San Diego Pedestrian Safety Study presents a comprehensive review of pedestrian safety issues in the City of San Diego, along with an update to the City's 1990 pedestrian crossing treatment policies (Council Policy 200-07). That policy was based on a study conducted by traffic engineer Bruce Herms in San Diego during the 1970's which stated that "[e]vidence indicates that the poor crash record of marked crosswalks is not due to the crosswalk being marked as much as it is a reflection on the pedestrian's attitude and lack of caution when using the marked crosswalk."

Purpose: The current study examines pedestrian collisions across the City of San Diego, develops a pedestrian risk model, and utilizes the analysis results to support a comprehensive update to the City's policy on pedestrian crossing treatments.

Methods: There have been significant advances in both technologies and practices aimed at improving pedestrian safety since the City adopted Council Policy 200-07 in 1990. The current policy update is relying upon the development of a pedestrian risk model requiring extensive data collection. A 14-year pedestrian-involved collision database with over 7,500 pedestrian related collisions was obtained from the City of San Diego. Sixty study intersections were selected for in-depth data collection related to roadway environments and driver and pedestrian behaviors. The study intersections were selected to be representative of signalized versus unsignalized intersections, various roadway environments, and collision cause. The dependent variable used in the analysis is "pedestrian risk", calculated as pedestrian collision frequency divided by the annualized pedestrian crossing volume. The independent variables used to describe potential causal factors are divided into four groups: Driver Behavior, Roadway Environment, Intersection Characteristics, and Population Characteristics.

Results: The final pedestrian risk model shows that vehicle ADTs, posted speeds, presence of bus stops, crosswalks in "medium" condition, and "not passible medians" are positively associated with pedestrian risk at the crosswalk. This suggests that increases in ADT or posted speed may increase pedestrian risk. Similarly, crosswalks with bus stops, or crosswalks where the paint is in "medium" condition, or intersection legs not passible to pedestrians, may increase risk for pedestrians more than crosswalks without any of these characteristics. In addition, crosswalks with the highest ADT can have 10 times the risk for pedestrians compared with the crosswalks having the lowest ADT. Employment within 500 feet and pedestrian signal head presence are negatively related to the pedestrian collision risk.

Conclusion: This study provides a comprehensive example of the application of research to inform the update of pedestrian-related policies for one local government. Of particular concern are results for transit riders who may be especially vulnerable to risk of getting hit while walking to a bus stop. Results related to vehicular volumes and speeds support other research from the past decade related to treatment variation by these factors.

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Offer Grembek

Sean Vienna

Sasha Jovanovic