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Transportation Planning and Quality of Life: Where Do They Intersect?

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Abstract

Policy makers and researchers are increasingly recognizing the connections between public health and transportation, but health improvements are typically framed from a physical health perspective rather than considering broader quality of life (QOL) impacts. Currently, there is a limited understanding of the ways in which transportation and QOL intersect, and little is known about how metropolitan planning organizations (MPOs) in the United States are addressing QOL outcomes. This study addressed these gaps by developing a conceptual framework holistically linking transportation to QOL. The proposed framework identified four transportation-related QOL dimensions—physical, mental, social, and economic well-being—which are predominantly influenced by three components of the transportation system: mobility/accessibility, the built environment, and vehicle traffic. This framework then formed the basis for a content analysis of 148 long-range transportation plans in the United States to evaluate the extent to which QOL is being considered in the planning process. The results of the analysis and a follow-up examination of 13 plans revealed that MPOs are inconsistently addressing QOL. Plans primarily targeted QOL enhancement from the perspective of physical well-being, while mental and social well-being were rarely considered. Policy recommendations were provided to more comprehensively integrate QOL into the transportation planning process.

Keywords

Quality of life; long-range transportation planning; metropolitan planning organizations; health; well-being

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Introduction

Policy makers are increasingly considering public health and quality of life (QOL) in transportation and other domains. Internationally, the Health in All Policies approach promotes the prioritization of health across all sectors of government, while the World Health Organization's (WHO's) Commission on Social Determinants of Health advocates for the consideration of health impacts across all policy making (Marmot et al., 2008). In the United States, the Healthy People 2020 initiative put forth the objective of improving QOL and health equity (USDHHS, n.d.), and California established its Health in All Policies Task Force in 2010 to develop strategies for collaborative health-oriented development and planning (Strategic Growth Council, 2010).

In the realm of transportation planning, many agencies are addressing some of the negative health impacts associated with vehicle travel and the transportation system. For instance, the Nashville Area Metropolitan Planning Organization (MPO) has begun to implement health impact assessments to evaluate the health effects of transportation projects (Nashville Area Metropolitan Planning Organization, 2010), and the Wasatch Front Regional Council has made it a priority to integrate public health into its transportation planning process (Burbidge, 2010). Recognition of the health impacts of transportation actions has led to an increasing interest in assimilating health into transportation planning.

Despite this interest in understanding the influence of transportation on health, practitioners and researchers have traditionally taken a vehicle-centric approach to transportation planning, which can be at odds with public health gains (Frank et al., 2004). Additionally, efforts to incorporate health have primarily been framed from a physical health perspective rather than considering broader QOL impacts. For QOL impacts to be holistically considered in the decision-making process, planners and policy makers must first recognize the numerous connections between QOL and the transportation system, and researchers must establish a theoretical foundation connecting transportation to QOL. Such an understanding will allow for greater support for projects and modes of transportation that can simultaneously ease congestion burdens and enhance overall QOL.

To date, there has been little research linking transportation to QOL and not much is known about how MPOs in the United States are addressing QOL outcomes. To address these gaps, this study started by conducting a literature review of QOL and its interactions with transportation. Next, using the insights obtained from the literature review, we developed a holistic framework linking the transportation system to dimensions of QOL. Based on the proposed framework for transportation-related quality of life (TQOL), we conducted an analysis of long-range transportation plans (LRTPs) to assess how 148 of the largest MPOs in the United States are addressing QOL. The resulting framework and policy recommendations will aid transportation planners and policy makers in more comprehensively integrating QOL into the transportation planning process.

2. Defining Quality of Life

Before interpreting QOL within a transportation context, definitions of QOL were explored within the fields of psychology, philosophy, and health. From the literature, four classes of definitions were identified, which can be classified as objective, subjective, combination objective/subjective, and domain-specific (Figure 1).

Early attempts by social scientists to measure QOL at a community level focused on broad societal indicators such as household income, crime rate, or divorce rate, but these ***objective*** measures failed to capture individuals' life perceptions (Farquhar, 1995; Felce and Perry, 1995; Sirgy et al., 2006). For example, two people with identical life situations may judge the quality of their lives very differently depending on their own values and relative levels of satisfaction (Cella, 1994). QOL is an inherently individualized concept; therefore, objective evaluations of life status more likely reflect society's values than those of the individual (Atkinson, 2013).

More recently, QOL has been acknowledged to have a ***subjective*** self-assessment component, commonly referred to as subjective well-being (SWB), which encompasses life satisfaction and feelings of positive and negative affect (i.e., pleasant and unpleasant emotions) (Diener, 2000). QOL's inherent subjectivity suggests that while it is influenced by personal values at an individual level, it is moderated by cultural values at an aggregate level (Hofstede, 1984). For example, Suh (2000) observed that residents of Canada and the United States subjectively rated their happiness higher than did East Asians, who tended to be less optimistic and have more moderate levels of self-esteem.

Despite the ambiguity associated with self-reported satisfaction measures, SWB has been validated against objective measures of well-being (Oswald and Wu, 2010) and, among the elderly, has been more closely associated with variation in QOL than objective societal indicators (Bowling et al., 2003). However, attempts to define QOL solely through subjective indicators of life satisfaction, independent of life situation, are also limited in that they insufficiently capture one's life state. Felce and Perry (1995) rejected the notion that human welfare is entirely reliant on personal satisfaction because satisfaction alone cannot wholly reflect one's circumstances.

Many now agree that QOL is a multidimensional construct, comprised of a ***combination*** of objective life measures and qualitative measures of life satisfaction (Atkinson, 2013; Bowling et al., 2003; Diener and Biswas-Diener, 2003; Ferkany, 2012; Netuveli and Blane, 2008; Sarch, 2012; Taylor et al., 2008; Xavier et al., 2003). Ferkany (2012) describes these combined subjective and objective elements as "how well one is doing" and "how things are going", while Sarch (2012) considers their complementary effects—a reduction in one will result in the diminishment of the effects of the other, and vice versa. Raibley (2011) developed a value-centered definition of QOL, using the term "agential flourishing" to encapsulate both subjective and objective elements. A value-centered definition suggests that an individual's well-being is primarily predicated on setting and achieving values and goals. This process is dependent upon having the requisite emotional disposition to strive to realize one's values (Raibley, 2011). A value-centered definition of QOL is also presented by

Gardner and Weinberg (2013), who characterize QOL as the distance between an individual's current life state and potential ideal life state.

WHO recognizes the multidimensional nature of QOL in its definition:

> WHO defines Quality of Life as individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of their environment (WHO, 1997).

This definition identifies six dimensions of QOL: physical health, psychological health, independence, social relationships, personal beliefs, and environment. Despite general agreement in the literature regarding many of the determinants of QOL, these dimensions can overlap considerably. An individual's independence, for example, can be limited by his or her physical health, mental health, or environment. Similarly, a person's beliefs could be considered a constituent of psychological health rather than a separate dimension. As a generalized definition, this interdependence is not necessarily problematic, although when attempting to evaluate particular components of QOL or create a multidimensional QOL scale, dimensional independence is preferable. Felce and Perry (1995) present a more reduced QOL framework with five life dimensions: physical well-being, emotional well-being, social well-being, material well-being, and development and activity. Many of these are directly comparable to WHO's QOL dimensions,[1] with the exception of emotional well-being, which combines WHO's psychological health and personal belief components.

A final class of definitions frames QOL impacts within specific domains or disciplines. Researchers in the health and social sciences, for example, have explored the association between housing and QOL (Kyle and Dunn, 2008; Nelson et al., 2007), work-related impacts on QOL (Drobnič et al., 2010), and the influence of neighborhood features on QOL (Sirgy and Cornwell, 2002). Within the medical literature, "health-related quality of life" has been commonly adopted as a holistic measure of the effects of health conditions on an individual's overall well-being (e.g., Bize et al., 2007). While less universal than general QOL definitions, these ***domain-specific*** definitions can be of more use to practitioners within their respective fields by more precisely outlining the ways in which domain-related factors interact with QOL dimensions. For policy makers and decision makers, more focused definitions can be particularly beneficial when it comes to the development of QOL-related performance measures (Atkinson, 2013), which in turn can be used to provide sounder rationale for planning decisions.

3. A Framework for Transportation-Related Quality of Life

Keeping this discussion in mind, and in particular the concept of domain-specific QOL, we applied a transportation-focused approach to explore transportation and QOL effects. Given

[1]Emotional well-being, material well-being, and development and activity are roughly analogous to psychological health, environment, and independence, respectively.

the lack of agreement on QOL definitions, and because QOL has been used across a multitude of disciplines and at opposing scales (e.g., individual versus community), finding a single overarching global definition is unrealistic. From a practical perspective, it can instead be more worthwhile to identify the pathways through which transportation influences QOL.

In recent years, a growing body of research has linked transportation to physical, mental, social, and economic well-being. The following subsections present an overview of the research that has been conducted in these areas to date, and develop a conceptual framework unifying transportation and QOL. It is expected that this TQOL framework will aid transportation planners, policy makers, and researchers in better understanding the connections between transportation and these QOL dimensions.

3.1 Physical Well-Being

Transportation and physical well-being—which refers to one's fitness, energy, and the absence of illness or physical dysfunction—are closely related. For example, the act of walking for transport is itself a form of beneficial physical activity. On the other hand, transportation can negatively impact one's physical health. The number of deaths attributable to vehicle emissions may rival that of vehicle collisions (WHO, 2005), and vehicle-related air pollution is also known to contribute to a number of respiratory and health ailments (Laumbach and Kipen, 2012; Zhang and Batterman, 2013), to say nothing of complex secondary climate change–related impacts. Vehicle safety is perhaps the most direct link between physical well-being and transportation. Collisions are the leading cause of death among 15–29 year olds worldwide (WHO, 2013), and in the United States, over 2 million individuals are injured in crashes every year (NHTSA, 2014). Such crashes can be physically devastating and often entail a severe psychological and financial burden for crash victims.

Numerous researchers have also examined the ways that physical activity for transportation (e.g., walking, bicycling, or walking to transit) can enhance one's physical well-being. Active travel has been linked to a lower body mass index (BMI) and decreased odds of hypertension, diabetes, and cardiovascular disease, even after controlling for sociodemographic variables and non-travel-related physical activity (Furie and Desai, 2012; Hamer and Chida, 2008). Similarly, aggregate research at the international level has demonstrated an inverse relationship between walking/bicycling and rates of obesity (Bassett et al., 2008; Pucher et al., 2010), although the results of other studies have been inconclusive (Saunders et al., 2013; Shephard, 2008). The use of alternative travel modes would additionally provide net societal health benefits by reducing emissions and congestion, should it result in a concurrent decline in vehicle travel.

While the physical health benefits of walking and bicycling are well-recognized, they must simultaneously be weighed against their attendant health risks. The higher degree of physical exposure for active travelers poses unique health threats, and active travelers suffer from higher injury and fatality rates than drivers (Elvik, 2009; Reynolds et al., 2009; Teschke et al., 2012). Pedestrians and bicyclists may also be disproportionately subject to vehicle emission impacts, though evidence in this area is not yet conclusive (Teschke et al.,

2012). Still, the risks of walking or bicycling appear to be far outweighed by their health benefits (de Hartog et al., 2010). Earlier research studies point to the existence of a safety in numbers effect from increased pedestrian and bicycle mode share (Elvik, 2009; Jacobsen, 2003; Lusk et al., 2013; Reynolds et al., 2009), suggesting that the continued encouragement of active travel modes will only serve to enhance their net health benefits.

Much like active travelers, it appears that public transit users have significantly higher levels of physical activity than drivers (Brown and Werner, 2007; Rissel et al., 2012; Saelens et al., 2014; Wener and Evans, 2007). Not being a point-to-point service, most transit trips comprise a walking trip to or from the stop, which can help riders reach daily recommended physical activity levels. In the United States, nearly one-third of transit riders achieve the recommended 30 minutes a day from the walk to or from transit alone (Besser and Dannenberg, 2005) and light-rail users have been associated with lower a BMI and a reduced likelihood of obesity compared to non-users (MacDonald et al., 2010). Similarly, Saelens et al. (2014) reported that transit users had lower BMIs and higher levels of physical activity than non-transit users. The study noted that all travelers attained similar activity levels on days without transit use, providing stronger evidence for the direct effect of transit on physical activity behavior.

To complement policies aimed at enhancing safety, reducing vehicle emissions, and promoting active travel and transit modes, transportation planners can exploit the built environment as a tool to enhance physical well-being. Greater land use mix, walkability, and access have been correlated with higher levels of physical activity and a reduced incidence of obesity (de Bourdeaudhuij et al., 2003; Frank et al., 2004; Troped et al., 2003). Compact urban development can reduce commute distance, which has been negatively associated with several physical health indicators including BMI, blood pressure, and inactivity (Hoehner et al., 2012). In rural areas, an estimated 3.6 million Americans miss at least one medical trip per year as a result of a lack of access to transportation. This population tends to be disproportionately lower income and older, and suffers from a higher rate of health ailments (Wallace et al., 2005). For many older adults, simply accessing health care can be a significant challenge (Ahern and Hine, 2015), and those without a driver's license or living farther from health care facilities will be less likely to visit a doctor (Arcury et al., 2005).

3.2 Mental Well-Being

Mental well-being describes a person's psychological health, mood, and self-perception. Although the ties between transportation and mental well-being are not as well documented as those for physical well-being, they are no less relevant. For many, the psychological and time burdens presented by the daily commute are a primary source of life stress, particularly for longer commutes. Several research studies have indicated that commute duration is associated with increased stress and diminished life satisfaction after controlling for individual and work-related characteristics (Evans and Wener, 2006; Gottholmseder et al., 2009; ONS, 2014; Stutzer and Frey, 2008). Commute mode can also affect mental well-being; car commuters have reported higher levels of stress than train commuters (Wener and Evans, 2011) and walking and bicycling have been tied to greater levels of travel satisfaction than driving or taking transit (Olsson et al., 2013). Although most of the research in this area

has centered on travel for work, similar effects can be expected to some degree for all trip purposes. In general, it appears that satisfaction with travel positively influences one's overall perception of life satisfaction (Cao, 2013). Other transportation-related factors adversely impacting mental well-being include a lack of mobility in older adults (Ragland et al., 2005) and noise pollution (Botteldooren et al., 2011; Dratva et al., 2010; Turnovska et al., 2013). For men, neighborhood walkability (Berke et al., 2007) and bicycling (Crane et al., 2014) have been related to positive mental well-being.

It is also important to recognize the interdependency between physical and mental well-being. Along with its more easily observable physical health benefits, engaging in physical activity can have mentally therapeutic benefits, having been tied to a lower risk of depression, reduced stress, and improved SWB (Fox, 1999). Moreover, a longitudinal study of older adults reported that those who walked more demonstrated lessened grey matter deterioration (Erickson et al., 2010), suggesting a physiological mechanism linking mental well-being to physical health. This relationship is not just unidirectional; poor mental well-being has also been related to negative physical outcomes. Depression is associated with an increased risk of stroke (Pan et al., 2011), cardiovascular diseases (Van der Kooy et al., 2007), cognitive impairments, and mortality (Kohn and Epstein-Lubow, 2006). Given their complementary relationship, the promotion of physical and mental well-being cannot be viewed as independent goals.

3.3 Social Well-Being

Social well-being refers to the quality of one's social support network, family or personal relationships, and level of community involvement. Mobility and accessibility are the primary mechanisms through which the transportation system influences social well-being; the more difficult it is to travel, the more difficult it will be to develop social connections. Exploring the links between mobility and social well-being, Stanley et al. (2011) reported a higher risk of social exclusion among those who conducted fewer trips or activities. Similarly, a decline in mobility has been associated with reductions in social integration and community activity (Harrison and Ragland, 2003; Ragland et al., 2005), as well as a reduction in social activities among rural residents (Kolodinsky et al., 2013). The analysis of Sener and Reeder (2014) also highlighted the potential for workers using active travel modes to have increased awareness of transportation infrastructure deficiencies (i.e. lack of walkways/sidewalks and access to or availability of public transit). Given the declining functional capacities associated with the latter years of life, older adults are especially susceptible to mobility-based reductions in social well-being, which has been identified as a primary determinant of QOL among the elderly (Bowling et al., 2003; Martinez-Martin et al., 2012).

Vehicle traffic may also hinder social well-being by inhibiting the development of neighborhood social connections. High-volume roads can make activities more unpleasant and provide a physical barrier to social interaction, which might explain the findings of Hart and Parkhurts (2011), who reported that residential traffic volume was inversely related to the number of neighborhood friends. For these reasons, the recent emphasis on the creation of livable streets, which employ traffic-calming techniques to reduce vehicle congestion and

encourage active travel (Lusher et al., 2008) can help facilitate social interaction within a community. As with physical and mental well-being, it is also important to acknowledge the complementary effects of mental and social well-being since an increase or decline in one can consequently influence the other (Almedom, 2005).

3.4 Economic Well-Being

Economic well-being reflects one's financial resources and access to employment opportunities. Increased mobility can improve access to employment (Fan et al., 2012) and other necessary services leading to improvements in perceived QOL (Kolodinsky et al., 2013). These concerns are especially pertinent for elderly or low-income individuals, for whom the loss of mobility is of graver consequence. Thakuriah and Metaxatos (2000) revealed that vehicle availability and employment access significantly impacted the tenure of employment for female welfare clients, indicating the influence of the transportation network and residential location on job retention. Poor physical well-being can additionally impact economic well-being, given the high cost of health care in the United States. Serious-injury vehicle accidents are especially financially damaging for victims due to the burden of medical costs and potential lost income from the interruption of work (Khati et al., 2013).

3.5 A TQOL Framework

Using these insights, we propose a framework for the myriad interactions between transportation and four QOL dimensions: physical, mental, social, and economic well-being (Figure 2). The framework indicates that targeting improved QOL through transportation will require the consideration of three components of the transportation system: the built environment, mobility/accessibility, and vehicle traffic. In general, mobility/accessibility was the primary driver of overall QOL, having direct ties to each TQOL dimension. The framework additionally illustrates the feedback between TQOL dimensions, revealing the ways that transportation-related factors can impact other components of QOL, even if not directly linked. For example, while active travel may not be a direct driver of one's mental well-being, its demonstrated physical health benefits can indirectly improve one's mood or emotional state, and vice versa.

Our framework is not the first to demonstrate the transportation and QOL link, but it differs from many previous frameworks in that our broad domain-specific conceptualization of QOL encompasses both subjective and objective elements. In this respect, it is somewhat similar to the public transit QOL model put forth by Carse (2011), though ours is broadly applicable to all modes and more strongly emphasizes physical and mental health components. Many other researchers have defined QOL from a more limited scope, mainly in terms of subjective self-assessments of happiness or emotional response. For instance, the frameworks developed by Delbosc (2012) and Ettema et al. (2010) consider transportation and well-being from the perspective of SWB and happiness. Similarly, Abou-Zeid and Ben-Akiva (2014) studied the incorporation of SWB in travel behavior models, Steg and Gifford (2005) explored sustainable transportation impacts on SWB, and Duarte et al. (2010) evaluated happiness in transportation policy decision making. Reardon and Abdallah (2013) developed a more expansive understanding of QOL in identifying transportation-related links, though their framework was still primarily psychologically-oriented.

4. The Transportation Planning Perspective of Quality of Life: A Focus on the United States

Transportation planning has traditionally worked to improve public health through improvements to driver safety, air pollution, and accessibility (Litman, 2014; Singleton and Clifton, 2014). In the United States, the Clean Air Act Amendments of 1990 and Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 mandated that MPOs conform to State Implementation Plan air quality requirements. MPOs have also addressed health from an environmental justice and accessibility standpoint under the direction of Executive Order 12898, which aims to minimize health inequalities for minority and low-income populations. More recently, there has been greater availability of funding for active travel, but the lack of a federal mandate means that the degree of support for active travel projects varies by MPO (Handy and McCann, 2011).

While the consideration of health impacts has become an area of greater interest in regional transportation planning, in practice and in the planning literature, health is, at most, considered from the perspectives of safety, air quality, accessibility, and active travel (e.g., Lyons et al., 2012; Singleton and Clifton, 2014; van Balen and Winters, 2014). A holistic QOL-based approach is conspicuously absent, despite federal legislation mandating the consideration of QOL in the transportation planning process. Among their eight planning factors, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and Moving Ahead for Progress in the 21st Century Act (MAP-21) federal transportation bills directed MPOs to “improve the quality of life,” “increase the safety of the transportation system” and “increase the accessibility and mobility of people” (MAP-21, 2012; SAFETEA-LU, 2005).

One of the primary responsibilities of an MPO is to develop an LRTP, which documents current and projected regional transportation needs for a planning horizon of at least 20 years. While all recent LRTPs have attempted to respond to the aforementioned federal planning guidelines addressing QOL, it is unclear to what degree the promotion of QOL is being actively encouraged in the planning process. To determine agencies’ level of commitment to realizing positive QOL outcomes, the following subsections provide a content analysis of regional LRTPs. The overall analysis is based on the most recent LRTPs for 148 of the 158 MPOs with populations over 250,000 (according to the U.S. Department of Transportation’s MPO Database [USDOT 2014]), which were downloaded directly from MPO websites (Figure 3).[2]

The analysis was conducted using a two-step approach. First, using the TQOL framework discussed in Section 3, an initial assessment was performed using keyword queries. Second, a follow-up in-depth analysis was conducted by examining a subset of plans to more closely evaluate the context in which QOL-related language was used in LRTPs and to develop a broad understanding of the extent to which QOL is being considered in the planning process.

[2]Nearly every LRTP collected was created within the last five years with a forecast year of 2035 or 2040. LRTPs for the other 10 MPOs were either unavailable or not available in the proper format for analysis conducted in this study.

These 13 MPOs were chosen for being characteristic of the larger sample, representing a wide range of regions, population sizes, and level of commitment to QOL outcomes.

4.1 Initial Assessment of LRTPs in TQOL Framework

An initial evaluation of the elements of the TQOL framework led to the selection of 10 keywords or phrases, or groupings of keywords, for frequency analysis (Table 1). The terms most commonly mentioned tended to be those explicitly relating to the adherence of federal requirements. “Air quality” or “air pollution” was referenced in almost every plan, and keywords cited within the SAFETEA-LU and MAP-21 planning factors (i.e., “quality of life”, “safety”, “access” or “accessibility”, and “mobility”) were universal. “Quality of life” was referenced an average of 14 times, while “safety” appeared most frequently in the language of transportation plans (122 average references), indicating the high priority agencies placed on protecting motorized and non-motorized travelers from harm. “Access” or “accessibility” and “mobility” were nearly as prevalent (114 and 57 average references, respectively) and often used in conjunction with each other. “Access” or “accessibility” typically referred to the ability to reach destinations in the context of the transportation system, while “mobility” referred to the physical movement of individuals or populations. References to “air quality” or “air pollution” and “economic” were also extremely prevalent in LRTPs, though “economic” was predominantly applied in a macro-regional sense rather than at a personal level.

Agencies appeared to be cognizant of the potential for the transportation system to influence public health. “Health” was mentioned in nearly every plan (144 of 148), often in the context of air quality or emissions, environmental justice, or active transport. Occurrences of the term “physical activity” were far less frequent but strongly related to the number of mentions of “health” (Pearson’s $R = 0.698$, $p < 0.0001$), suggesting that agencies prioritizing health also place an emphasis on promoting physical activity. “Social” (excluding references to “social media”) was referenced by only 103 of the reviewed MPOs, while just 114 total references to “mental,” “emotional,” or “psychological” were found across 48 plans.

Table 1 presents the average number of references for keywords by MPO population. Despite variation in the number of references for some terms depending on MPO size, one-way analysis of variance tests revealed no significant differences in keyword frequency when analyzed by population subgroups. This held true even when assessing the rate of keyword occurrence (number of occurrences/total words) by population, which normalized keyword frequency by plan length.

4.2 In-Depth Examination of Selected LRTPs in TQOL Framework

Thirteen plans were examined in further detail (Figure 4) to assess the context in which QOL was addressed and to ascertain the extent to which MPOs are actively working to achieve positive QOL outcomes, beyond simply satisfying federal legislation. These plans were selected to represent a diversity of regions, population sizes, and level of commitment to QOL outcomes. Some, like the Nashville Area MPO, which is widely noted for its integration of health and transportation planning, are known for being forward-thinking. Others have done relatively little to incorporate QOL considerations into planning decisions.

In selecting LRTPs for further review, our aim was not to highlight best practices, though such an undertaking would certainly be valuable exercise for practitioners. Rather, we present a snapshot of current planning practices across the United States given the emerging nature of the field.

Nearly every MPO listed the enhancement of QOL as a primary objective in its LRTP—with many adapting planning goals directly from MAP-21 planning factors—but often did little to directly relate planning objectives to improved QOL outcomes. Some MPOs, however, went a step further than mirroring federal legislation. For example, in its vision statement, the Capital Area Metropolitan Planning Organization (CAMPO) emphasized the importance of having a transportation system that supports regional QOL. Likewise, the Florida-Alabama Transportation Planning Organization's vision statement reads, in part: "to provide a multi-modal transportation system that improves quality of life in the TPO Service Area." The Miami-Dade MPO recognized the relationship between transportation and QOL in the opening sentence of its LRTP, declaring that "transportation plays a prominent role in shaping the quality of life experienced by [its] residents." Among the 13 plans reviewed, this LRTP was the only one to establish its own definition of QOL, which incorporated "all of the characteristics of an area's living conditions." Metroplan also placed an additional emphasis on QOL, linking it with the idea of livability. The plan indicated an intention to improve QOL by developing more dense and walkable communities, reducing congestion, and encouraging multiple modes of travel. Making an even stronger commitment to the enhancement of QOL, the Genesee Transportation Council claimed that QOL impacts were considered in every planning decision made.

Despite the universally stated desire to improve QOL, it is more instructive to examine the specific ways MPOs are addressing each TQOL dimension. It is clear that MPOs are working most strongly to improve the physical well-being of their communities and support regional economic vitality. The other two TQOL dimensions, mental well-being and social well-being, are rarely considered.

4.2.1 Physical Well-Being—Every plan outlined efforts to improve the safety of drivers, bicyclists, and pedestrians. In accordance with federal guidelines, each plan also addressed air quality compliance to varying degrees. The Rockford Metropolitan Agency for Planning (RMAP) devoted considerable effort to improving air quality, thoroughly detailing past and future approaches for reducing emissions. In contrast, the Des Moines Area Metropolitan Planning Organization stated that air quality impacts were not considered in its planning process due to the region being an attainment area. Under Executive Order 12898, every LRTP was also required to consider equitable access and the mitigation of adverse impacts for environmental justice populations, though efforts were typically described in appendices rather than within plan bodies.

While every plan intended to improve bicycle and pedestrian infrastructure, many did so from the perspective of improved accessibility and modal choice rather than the enhancement of QOL or public health. CAMPO was one of the few to explicitly relate active transport to QOL outcomes, stating that "well-planned facilities for bicycle and pedestrian travel have been shown to have positive impacts on accessibility of destinations, air quality,

congestion, health, local economies, personal savings, road maintenance and safety." The CAMPO plan was particularly notable for its strong incorporation of public engagement planning to better understand the particular QOL needs of its residents. Similarly, Metroplan aimed to improve public health through active transport and improved accessibility to healthy foods.

Perhaps more than any other MPO, the Nashville Area MPO strongly emphasized public health. The MPO incorporated health impacts into its project prioritization process and recently completed a pilot health impact assessment for a transit-oriented development site. The Nashville MPO was unique in that it began with the concept of livability to shape its LRTP. Specifically, it defined livability as "work to enhance the quality of life in the region by supporting initiatives that increase opportunities for affordable housing, education, jobs, recreation, and civic involvement." The Puget Sound Regional Council (PSRC) similarly aimed to integrate the consideration of public health outcomes into its planning process. PSRC stressed the importance of promoting well-being in its LRTP in an aim to maintain a healthy region, and acknowledged the provision of open space and active living as integral elements of QOL.

4.2.2 Economic Well-Being—Every plan outlined efforts to support regional economic development and growth through improved accessibility and connectivity. For the Genesee Transportation Council, economic impacts are a key consideration in every planning decision. Overall though, economic impacts were only considered from a macro regional perspective. Consideration of individual-level economic well-being is typically absent from transportation plans. One exception to this was the Sacramento Area Council of Governments, who developed measures of access to employment in evaluating environmental justice. This measure was only used as part of its equity analysis and not in broader planning decisions.

4.2.3 Mental Well-Being—Transportation-related noise pollution was linked to reduced QOL by a few MPOs, but the Genesee Transportation Council was the only one to extensively describe the negative effects of noise pollution and outline techniques for excessive-noise mitigation. The Genesee LRTP was also the only one of the 13 reviewed plans to explicitly target mental well-being gains; otherwise, references to mental well-being were nearly nonexistent.

4.2.4 Social Well-Being—Social well-being was briefly mentioned in just a few of the LRTPs. Metroplan placed the greatest emphasis on social well-being, pointing out the damaging social effects and isolation resulting from automobile-centered urban environments. RMAP also identified growing sprawl and suburbanization as deterrents to social integration, proclaiming that dense and diverse neighborhood environments can help to establish a strong, positive social atmosphere.

5. Conclusions and Next Steps: Combining Theory and Practice

This research investigated the intersection of transportation and QOL by first reviewing the scholarly literature to develop a conceptual framework for TQOL. LRTPs were then

assessed to determine how MPOs across the United States are approaching the task of improving QOL through the transportation system in light of the proposed framework. In general, QOL was inconsistently addressed by agencies, and references to QOL were often vague and imprecise, appearing to reflect the obligations of federal legislation more than a desire to support QOL outcomes. Some LRTPs addressed physical well-being in innovative ways, but mental and social well-being received little to no attention. Otherwise, it appeared that QOL was primarily referenced in order to satisfy federal requirements.

The TQOL framework suggests that transportation planners aiming to improve QOL should target improvements to the built environment, accessibility, mobility, and vehicle traffic. While these improvement areas are already being focused on by planning agencies, they are typically not considered from a QOL-oriented perspective. Consequently, QOL is primarily being influenced indirectly through traditional planning strategies aimed at improving general accessibility and congestion management. QOL itself remains more of an afterthought or byproduct of other planning objectives, and MPOs' effectiveness in achieving meaningful QOL gains is difficult to determine.

The establishment of performance measures to gauge progress in relation to planning objectives has been a point of greater emphasis since MAP-21, but MPOs do not appear to be comprehensively evaluating QOL outcomes. Performance measures were generally centered on congestion reduction, level of service for roadways and transit, safety, and accessibility, while QOL measures were mostly absent. As an indication of agency priorities, the lack of performance measures suggests that enhancement of QOL is typically not a chief planning concern. Moving forward, agencies looking to actively integrate QOL into the planning process should adopt new performance measures and project prioritization criteria to gauge the QOL impacts of proposed projects. In particular, variables directly targeting TQOL dimensions can more effectively capture the well-being of communities and individuals. Given the recognized ties between transportation and health, physical well-being is the dimension most frequently targeted by MPOs, but often at a surface level. Access to nutrition, access to healthcare, access to recreational opportunities, and obesity rate are all readily measurable ways that MPOs could immediately track physical well-being gains more effectively. Individual economic well-being was rarely considered in LRTPs, but can just as easily be incorporated in transportation plans using readily available population-level indicators such as access to employment opportunities, travel costs, or income.

Measures of mental and social well-being are admittedly more difficult to capture and complicated to measure despite being significant indicators of QOL. Not surprisingly, these were absent from LRTPs as they typically rely upon subjective self-evaluation from surveyed participants (e.g., rating the level of agreement with statements such as, "I believe I have found a purpose in life," or "I regularly interact with my neighbors"). Due to the greater difficulty associated with developing subjective measures of well-being, their inclusion in transportation planning will require a stronger commitment from MPOs toward QOL enhancement. Given the multidisciplinary nature of these measures, it would be worthwhile for transportation agencies to partner with other local or national agencies that can provide important insights into these issues and are better equipped to understand them. Collaboration with specialized professionals (such as public health professionals) is

recommended to capitalize on their expertise and help ensure that QOL becomes a central focus for transportation planners.

It will also be important for researchers to continue to investigate the complex interactions between the transportation system and QOL so that planners are aware of how specific elements of the transportation system affect the various dimensions of QOL. Of particular note may be the effect of residential self-selection on understanding social-well being. It is possible that more sociable individuals, or those who strongly value social well-being, are more likely to self-select into denser, more highly connected neighborhoods. Conversely, less social individuals may prefer to live in a quieter and more isolated environment. Future research would benefit from devising ways to measure and account for such selection effects. Another point to consider is geographic context. The framework developed in this study was used in an evaluative manner to review long-range planning documentation in the United States and provide a current snapshot of MPO objectives and strategies. It would be beneficial to compare these results to the international context and understand how other countries are addressing QOL through transportation planning.

One of the limitations of our approach is that it reflects organizational intent more than it does action. It is possible that agencies strongly emphasizing QOL in their LRTPs may do little to address it in practice. Conversely, agencies might actively work to achieve QOL gains without documenting their achievements. One way to resolve this inconsistency would be to relate the level of priority placed on QOL in LRTPs to the level of funding for QOL-related projects in order to evaluate the extent to which intention corresponds to implementation. Continued research in this area will additionally allow for a characterization of how QOL is evolving over time in long-range transportation planning. As more agencies realize the important connections between transportation and QOL, it will be more feasible to develop innovative ways to support the enhancement of QOL in their communities.

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Highlights

- Developed a framework for transportation-related quality of life.
- Quality of life is not a key consideration for US transportation planning agencies.
- Physical and economic well-being receive more attention than mental or social well-being.
- Current performance measures are not effectively evaluating quality of life indicators.

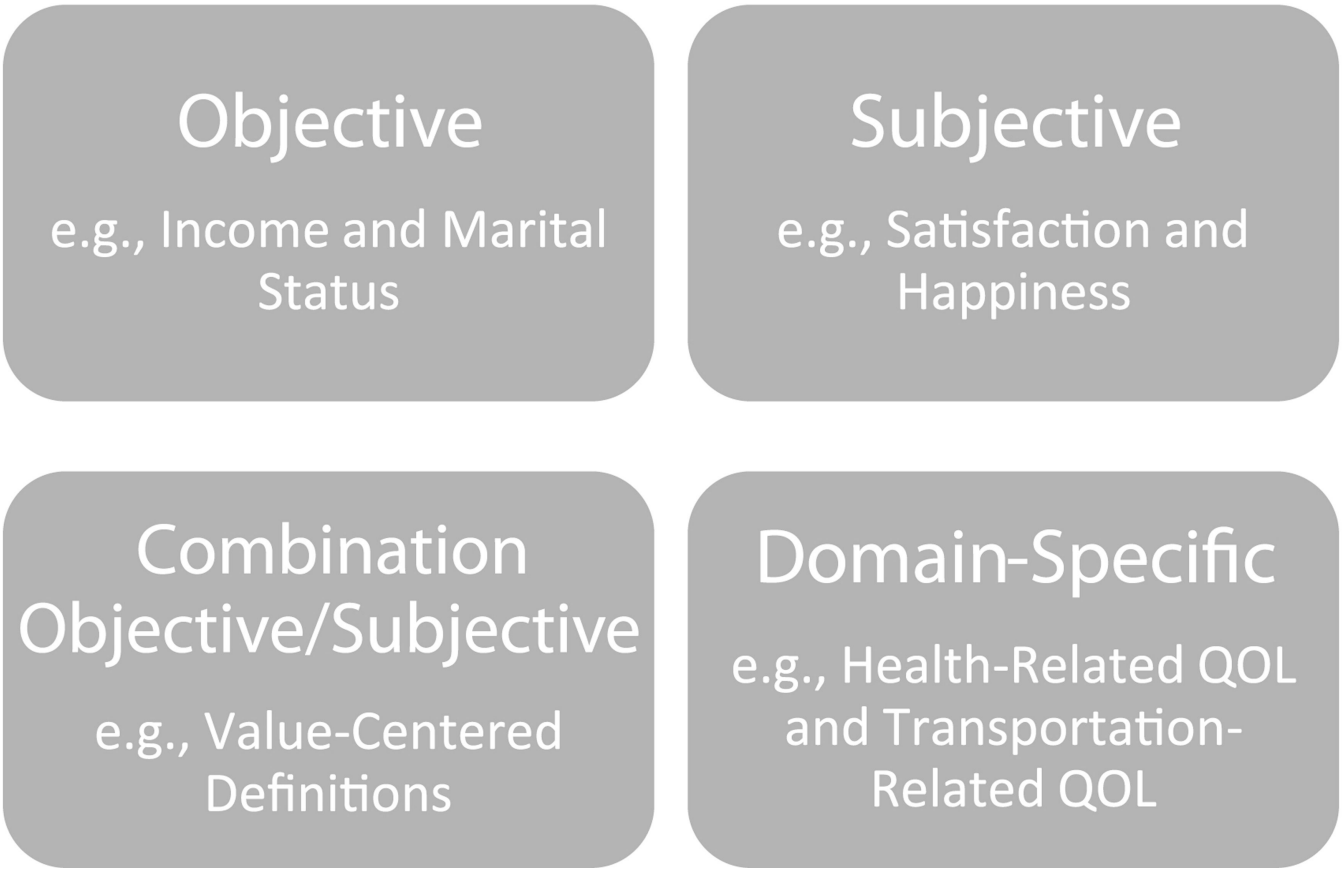

Figure 1.
Classes of QOL Definitions.

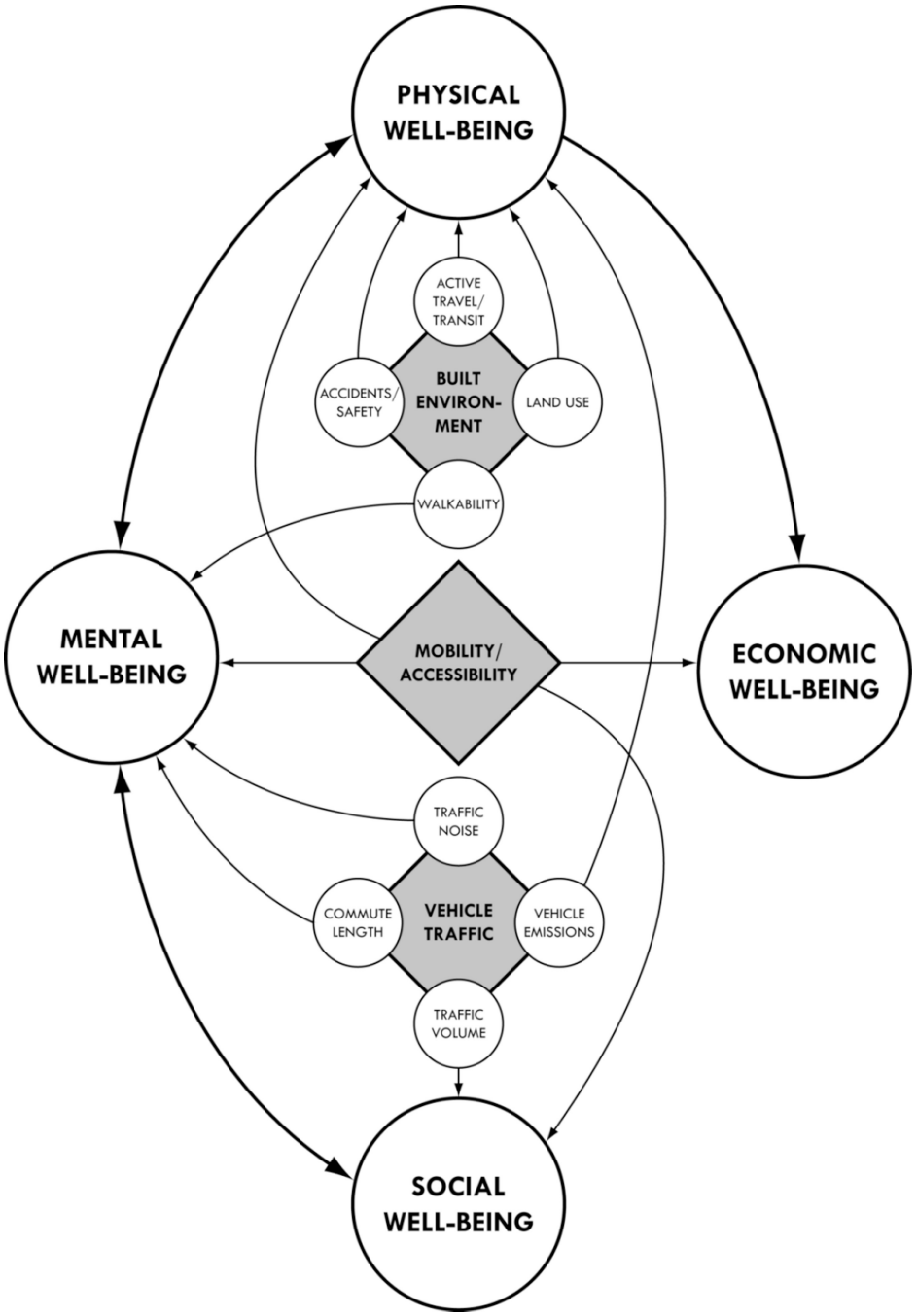

Figure 2.
Conceptual Framework for TQOL.

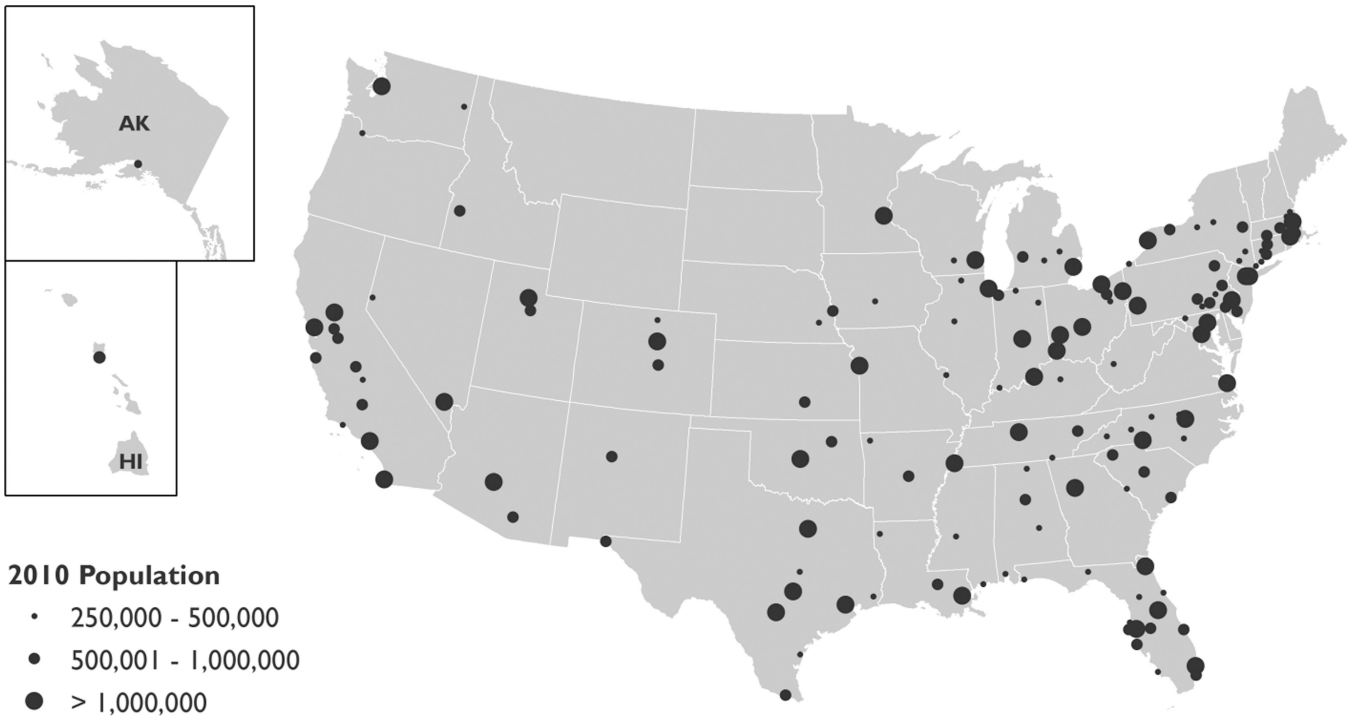

Figure 3.
MPO Regions by Population Size.

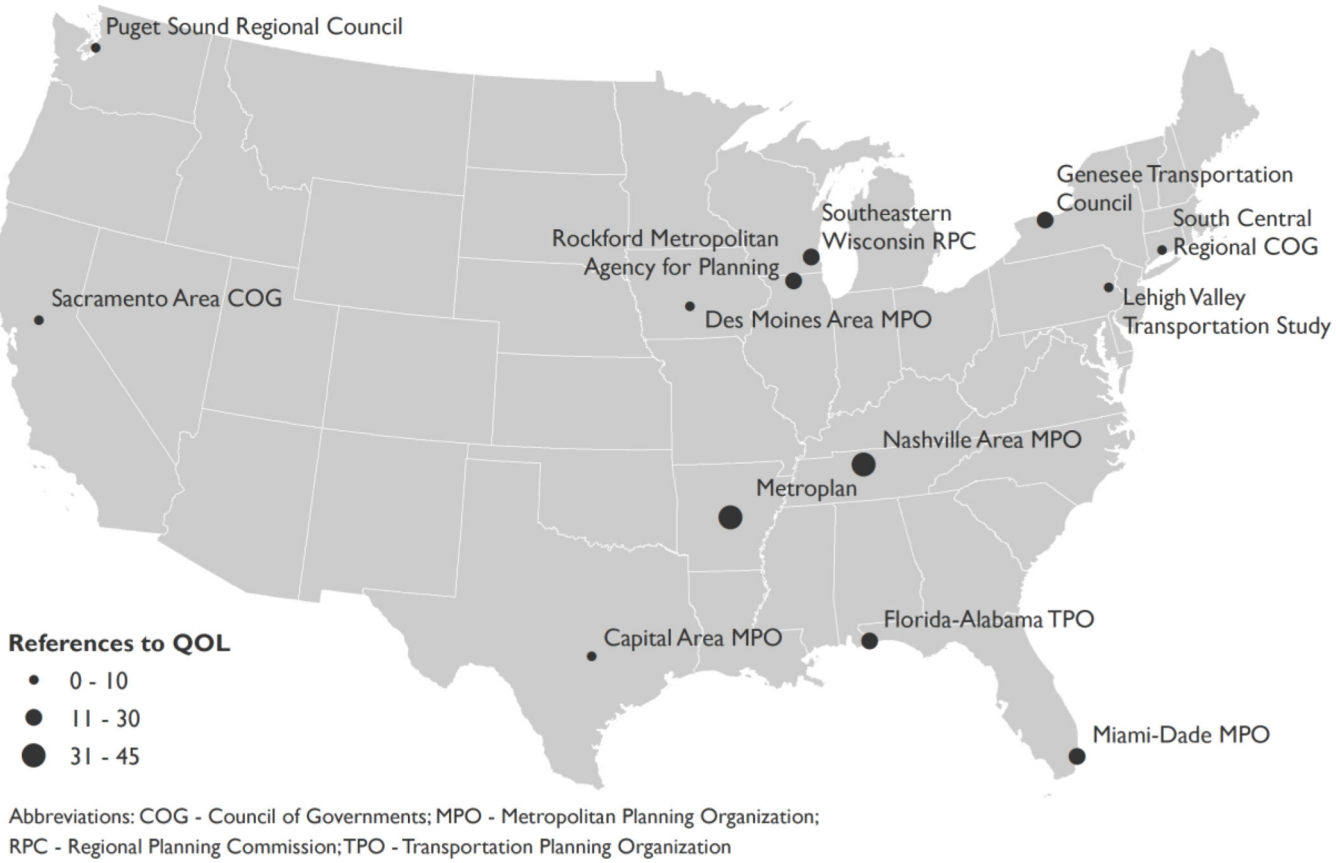

Figure 4.
MPOs Selected for In-Depth Examination.

Table 1

Number of References to TQOL Keywords.

MPO Category	Access/ Accessibility	Air Quality/ Air Pollution	Economic	Health	Mental/ Emotional/ Psychological	Mobility	Physical Activity	Quality of Life	Safety	Social
25th percentile	59	21	30	8	0	24	0	6	57	0
50th percenti	83	36	49	15	0	38	0	10	98	5
75th percentile	138	65	78	32	1	64	2	17	153	10
Average (MPO pop. 250,000–500,000u)	125	51	55	20	1	48	1	12	134	8
Average (MPO pop. 500,001–1,000,000)	103	44	57	27	1	57	1	14	119	9
Average (MPO pop. >1,000,000)	110	49	76	26	1	69	2	16	109	5
Average (all MPOs)	114	49	62	24	1	57	1	14	122	8
LRTPs with at least one reference (out of 148)	148	146	148	144	48	148	59	148	148	103

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