

Improving decision-making for population health in non-health sectors in urban environments: The example of the transportation sector in three megacities

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Abstract

Non-communicable diseases (NCDs) represent a significant global public health burden. As more countries experience both the epidemiologic transition and increasing urbanization it is clear that we need approaches to mitigate the growing burden of NCDs. Large and growing urban environments play an important role in shaping risk factors that influence NCDs, pointing to the ineluctable need to engage sectors beyond the health sector in these settings if we are to improve health. By way of one example, the transportation sector plays a critical role in building and sustaining health outcomes in urban environments in general and in megacities in particular.

We conducted a qualitative comparative case study design. We compared Bus Rapid Transit (BRT) policies in 3 megacities – Lagos (Africa), Bogotá (South America), and Beijing (Asia). We examined the extent to which data on the social determinants of health, equity considerations, and multi-sectoral approaches were incorporated into local politics and the decision-making processes surrounding BRT. We found that all three megacities paid inadequate attention to the health in their agenda-setting, despite having considerable healthy transportation policies in principle. BRT system policies have the opportunity to improve lifestyle choices for NCDs through a focus on safe, affordable, and effective forms of transportation. There are opportunities to improve decision-making for health by involving more available data for health, building on existing infrastructures, building stronger political leadership and commitments and Establishing formal frameworks to improve multi-sectoral collaborations within megacities. Future research will benefit from addressing the political and bureaucratic processes of using health data when designing public transportation services, the political and social obstacles involved, and the cross-national lessons that can be learned from other megacities.

Introduction

Noncommunicable diseases (NCDs), including cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes, represent a significant disease burden globally.¹ Together, these diseases account for 41 million deaths each year, equivalent to 71% of mortality globally. Of those deaths, 85% occur in low and middle-income countries (LMICs), particularly among persons between the ages of 30-69 years.² Risk factors for NCDs include tobacco use, lack or inadequate physical inactivity, harmful use of alcohol, and unhealthy diets (over or undernutrition).³ It is increasingly recognized that these risk factors, in turn, are influenced by social and economic forces, and how they shape the conditions in which we live, work, and play. For example, availability and quality of food are intimately linked with the risk of poor dietary habits and obesity, and availability of safe, walkable spaces are associated with the probability of exercise, both of which in turn shape obesity and subsequent risk of certain NCDs.

Recognizing the multi-level influences on health, it is becoming ever clearer that we need health-focused policies across sectors, particularly as more and more countries experience the epidemiologic transition while also experiencing rapid urbanization.⁴ Much of the world's population already lives in cities - one in eight people live in 33 megacities worldwide. By 2050, around 2.5 billion additional people will need to be housed in cities – with 90% of the increase occurring in Asia and Africa.⁵ Asia and Africa are home to some of the world's largest megacities, defined as urban agglomerations with over 10 million inhabitants – with a population density of 2,000 per square kilometer.^{6,7} As more cities transition into megacities, their significance as a health-generating, or health-harming environment in which a large and growing population grows, lives, and currently works, increases further.

The health and well-being of people living in urban settings varies by socio-economic status and according to features of the structural environment.^{8,9} As much as these growing cities usher in developments and economic growth, megacities are also characterized by wide inequality and can host powerful combinations of risk factors for NCDs for disadvantaged groups. This is particularly the case in slums and informal settlements. People living in these high poverty neighborhoods can have life expectancies up to 14 years shorter than people living in more affluent neighborhoods within the same city.¹⁰ In these contexts, NCDs can affect individuals and families' economic status and lead to widening

inequities and worsening vulnerabilities that disproportionately impact low and middle-income individuals.^{7,11} These vulnerable populations are more affected by the changes attributed to urbanization due to a range of underlying social and economic structures such as income, education, housing, employment, disease control, built environment, food systems (production, manufacturing, and distribution), and traffic congestion.

The role of complex urban environments in shaping the risk factors, modifiable and non-modifiable, that influence NCDs point to the ineluctable need to engage sectors beyond the health sector if we are to improve health in cities.^{12,13} The transportation sector plays a critical role in building and sustaining health outcomes in urban environments in general and in megacities in particular.^{14,15} Various transportation modes contribute to almost a quarter of energy-related carbon dioxide (CO₂) emissions, which contribute to air pollution, in turn accounting for another 3.2 million deaths. In addition to this, air pollution caused 4.2 million premature deaths in 2006, and most were from NCDs such as cardiovascular diseases, cancer, chronic lung disease and diabetes.¹⁶ Frequent use of motorized modes of transport, particularly personal cars, is also an important contributor to sedentary lifestyles. Physical inactivity, influenced in no small part by use of motorized transportation, is a major risk factor for most NCDs- estimated to globally cause 3.2 million deaths every year. And globally, road traffic accidents (RTA) account for over 1.4 million deaths annually.

Multiple successful attempts have been made in the transportation sector to address the challenge of NCDs; for example, Vietnam's multisectoral National Traffic Safety committee ensured that motorcycle helmet use is enforced to reduce RTA, Ethiopia introduced monthly "Car Free Days" to promote physical activities and reduce pollution; Bangalore in India converted buses to compressed natural gas, discouraging motorized transportation and reducing traffic.¹⁷ The Bus Rapid Transit (BRT) system, which is an effective reform of the existing instructional structures of public transit, presents an opportunity for successful action and policy transfer on transport-related NCDs across several megacities. BRT systems may represent a way for megacities to address the prevention and reduction of NCDs and public transport issues.¹⁸ BRT systems has the potential of boosting walking, biking and cycling if designed around promoting multi-modal transport, which reduces physical inactivity that has been linked to cardiovascular

disease, strokes, obesity, type 2 diabetes, cancer, and poor musculoskeletal and mental health.^{14,19–21} The World Health Organization recommends that ministries of transport in various countries work to ensure that there is allocation of land for sustainable forms of transportation like BRT systems, that will encourage physical activities, low emission and energy-efficient form and accessibility and affordability for individuals as well as co-financing of these high-impact interventions that deliver benefits in prevention and reduction of NCDs.¹⁴

It is however unclear how and to what extent health and equity goals are considered in the decisions regarding transportation policies in megacities, and to what extent they vary across contexts.

This paper seeks to compare BRT policies in the transportation sector²² in 3 megacities – Lagos (Africa), Bogotá (South America) and Beijing (Asia). We examined the extent to which data on the social determinants of health, equity considerations, and multisectoral approaches were incorporated into local politics and the decision-making processes surrounding BRT.

Healthy transportation policies in three megacities

Bogota, the capital of Colombia, with an estimated population of 7.2 million inhabitants, ushered in urban transitioning as far back as 1990. This informed the changes in implementing the megacity's mass transport system using a BRT system called the *TransMilenio* in 2000. Since then Bogota has emerged as a model for sustainable urban design, accounting for 2.3 million trips daily.²⁴ In the mid-2000s, some Asian cities also looked towards Latin American cities like Bogota to establish BRT systems. In 2006, Beijing, with a population of 21 million, started operating a BRT system as a majority state-owned system, subsidized by the Beijing General Bus Company. The main commercial hub, port center and largest city in sub-Saharan Africa, Lagos (metro area population of approximately 21.3 million), sought to learn from other megacities to address the issue of its unreliable and relatively fragmented public transportation problems in 2008.²⁵ This led to the Lagos Urban Transport Project being established in partnership with the World Bank and Lagos Metropolitan Area Transport Authority.

Methodology

We conducted a qualitative comparative case study design focusing on the cities of Bogotá, Lagos, and Beijing were selected for several reasons. First, all three cities have been publicly praised for their innovative success in implementing BRT services. Bogotá's *TransMilenio*, for example, received a high rating and "gold standard" award for its services by the Institute for Development and Transportation Policy.^{26,27} Second, we aspired to provide broad regional representation, with case studies from Africa, Asia, and Latin America. We extracted qualitative data from policy reports written in the Spanish language (for the case of Bogotá), but were restricted to english reports in the case of China (Beijing). We also obtained data from the review of municipal policy documents where available, focusing on city-specific policy documents obtained from government ministry websites and development websites, supplemented by published articles identified in ScienceDirect and Google Scholar regarding transportation in the context of these cities. Documents identified included policy documents, statements, strategic plans, and articles from the Institute of Transportation and Development Policy website. A comparative thematic analysis was conducted on the policies for each megacity. The Association of State and Territorial Health Officials (ASTHO) has developed cross-sectoral, evidence-based policy guides on transportation using multiple resources from credible resources that catalog policies that link transportations and health.²⁸ We found this to be a reasonable comparative standard to use in comparing the transportation policies of the 3 megacities (see table 1).

Results

Four (4) overarching themes emerged from the reviewed documents around various institutional history the BRT agenda is set, availability of health-focused data, International collaboration and financing, and lastly, evidence support from a public health point of view. Table 1 summarizes the available evidence for healthy transportation policies in each of the three megacities.

Table 1 - Comparison of megacities against criteria for healthy transportation policies

Criteria for Healthy transportation Policy	Lagos	Bogota	Beijing

Promote transit-oriented development	Yes ^{29,30}	Yes ³¹	Yes ³²
Increase opportunities for active transportation	Partially ³³	Yes ^{31,34}	Partially ³²
Improve air quality and mitigate other sources of pollution	No data available	Yes ^{35,36}	No ³⁷
Promote the use of clean energy technology	In policy, not implemented ³⁸	Yes ^{35,39,40}	No data available
Improve access to public transportation	Yes ²⁵	Yes ⁴¹	Yes ⁴²
Improve transportation safety	Yes ²⁹	Yes ⁴³	Yes ⁴¹
Encourage shifts from individual driving to public transportation.	Partially ²⁹	Yes ⁴⁴	Partially ⁴⁵
Improve public transportation quality	Partially ³³	Yes ^{24,34}	Yes ⁴⁶
Encourage comprehensive regional planning	Yes ⁴⁷	Partially ³¹	No data available

Emerging themes

Availability of data. A review of municipal and other documents shows that while BRT decision-making within each of the three megacities is influencing health, relatively few of these decisions take into account the health impact of transportation policies. In addition, there are limited data available that might better inform future policies, should health be given a greater consideration. This has implications for the quality of the interventions being implemented. For example, in Lagos, limited attention to health in decision-making is accentuated by inadequacy of data at the subnational level, in turn making it difficult to evaluate the health-promoting influence of the transportation sector. There were challenges in accessing BRT policy documents for all megacities. Operational information on how BRT is being implemented vis-à-vis NCDs and health in particular, were largely unavailable.

Existing Infrastructure upon which to build. BRT system interventions rely on the existing transportation structure, which ensures some level of sustainability and less pressure to innovate in governance, cross-sectoral policy and decision-making process. In all three countries, there were no previous experience for BRT planning in the region to build on^{25,48} except for localized public transport system already in existence. At the time of planning for BRT systems, transportation regulatory bodies were tasked solely with the aim of solving commuting issues within the growing cities. Transportation policies in all three megacities are managed at national levels but implemented by municipal/ state governments, without the input of other regulatory bodies, like the Ministry of Health. For example, in China, transportation policies are shared responsibilities of the Ministries of Construction, Communication, Rail and Public security, which are all at the national level. However, most of the urban transportation and planning/implementation is done at the local level by the provincial government, such as the Urban Planning Bureau or Transportation Research Bureau, as seen in Beijing.⁴⁹ The challenge with this is that the transportation sector in all three cities has little incentive to think creatively about how to make decisions that can positively influence population health. This points to the need for new catalytic thinking about the role that transportation systems can play in generating health and the encouragement of megacities' governments to engage in decision-making along these lines. This will require a substantial shift in the public conversation around health going forward.

International collaboration and financing. International organizations were involved in transportation decision-making in all three megacities. For example, the Institute of Transportation and Development Policy facilitated visits by experts for Bogotá and Lagos^{25,50} and the Beijing office of Energy Foundation had support from the Hewlett Packard and Blue Moons foundations. While there are ample examples of how international organizations can adversely influence local policy formation agendas,^{3,51–53} the involvement of international organizations in BRT implementation appears to have been largely salutary. International agencies were mostly influencers rather than controllers of the policy conceptualization, uptake, implementation and subsequent development. The downside to the external funding involved is clearly the issue of sustainability, particularly in Lagos. Most of the transit systems were initially properly managed by public-private partnerships (for example, LAGBUS in Lagos); however, increasingly these systems face barriers such as inadequate funding, lack of technical expertise, and inability to sustain a well-functioning system.

Political leadership, commitment and evidence support. In our evaluation, none of the policies we identified showed that health experts were involved as stakeholders in the design and implementation BRT policies, nor was there evidence of data collection, examination, or usage specifically aiming to understand the influence of these systems on health once implemented. This calls into question the evidence that was used in decision-making and whether NCDs were a consideration in the development of these systems at all. In Lagos state, for example, a ruling party had initiated the BRT system implementation towards the end of their political tenure. The BRT system was part of the successors' campaign (especially through a political transportation governing body - National Union of Road Transport Workers (NURTW)),⁵⁴ and it is unclear if this was a researched evidence-based decision or a political one. This is not atypical of other global examples where the BRT becomes dependent on political changes.⁵⁵ This points to the political and economic factors that often come to play over and above the use of evidence on how a large-scale effort like BRT development can improve, for example, physical activity, while also limiting pollution. The politically driven BRT development in Lagos suggests that transportation policies in this context were not coherent and not inclusive of efforts to support walking and cycling and other forms of physical activities.⁵⁰

We found little evidence to suggest Bogotá officials took into consideration health equity or NCD data when designing the *TransMilenio* system in 2000. Implemented under the leadership of Mayor Enrique Peñalosa, with cross-administrative collaboration initially expediting its construction⁵⁶ it has been suggested that only information about *TransMilenio*'s general impact on air pollution and improvements to citizens' quality of life was considered when designing this system.⁵⁷ The principal influence on establishing *TransMilenio* appears to have been mass transportation systems in other countries, particularly Brazil's successful approach in the city of Curitiba.⁵⁸ Indirect evidence further suggests that those planning the *TransMilenio* did not take into consideration the health and well-being of the local citizens as effectively as they could have. For example, zoning laws could have been lifted to create houses closer to bus stations, in turn improving local welfare.⁵⁹ Therefore, the case of Bogotá corroborates the evidence that, in general, in those cities in Latin America that adopted BRT systems, health considerations were not seriously considered when designing these policies.⁶⁰

Financing- Appropriate sources of funding. A BRT system represents a less capital-intensive solution to public transport compared to rail-based and metro systems, hence several megacities opting for this approach for ease of transportation in the context of their urban settings. The international support Beijing received was limited to technical assistance,⁶¹ whereas Lagos and Bogota both received substantial external funding. Further, in China, despite the capacity of most municipal governments in generating funds to build their own BRT systems, the central government, in a bid to have control on the efficiency and the quality of the system, opted for funding the system in Beijing and other municipalities in China.⁶¹ At times such financing can take advantage of innovation specific to local contexts. Colombian national laws also allow for municipalities to generate local revenues. The city of Bogotá at the outset of their BRT development had some level of independence from the national transportation budget, however, as the project progressed, the national urban transport funding with support from the World Bank and Brazilian expert credit agency paid the majority of the cost, with the city of Bogota generated the rest of the funds through municipal taxes and revenue.⁶¹ Despite the availability of local funding in Bogota and Beijing, international collaboration was used as a link to engage international consultants who are more comfortable working with international funding donors. This availability of expertise through funding

provides opportunity for innovation for health on which local municipalities can capitalize. Such innovations could include the voices of health experts playing a greater part in consultations during BRT system planning.

Lessons for the Future

Megacities and their rapid development represent modern-day laboratories, that can influence the upstream drivers that affect population health at the subnational level, at times commanding most of a country's resources and budgetary allocations, and the attention of national policies and public investments.^{62,63} As such, megacities provide unique opportunities for a coordinated public policy that takes structural and social determinants of health and exposure to unhealthy environments into consideration. However, in this review of the implementation of BRT systems in Bogota, Lagos, and Beijing we found that both the broader determinants of health, and data describing them, were underdiscussed in the context of such planning initiatives.

Transportation networks have the opportunity to improve lifestyle choices for NCDs through a focus on safe, affordable and effective forms of transportation, infrastructure, and services that encourage physical activity such as walking or cycling, reduce traffic congestion, reduce air pollution, and promote social interactions within neighborhoods, enhancing social inclusion.⁶⁴ However, these benefits will not be maximized if transportation and other non-health systems fail to incorporate considerations of health and health equity as fundamental components in their framing, planning, execution, and assessment. This review of BRT system agenda-setting in three megacities shows that while there is promise for health improvements in certain local settings, city government officials need to prioritize health issues when designing these policies, including creating health-supportive environments.⁶⁵

There is considerable agreement on the need for megacities to address NCDs.^{7,13,66,67} However, implementation is more variable and city-specific and in practice, different sectors have more of a siloed focus and set of deliverables, rather than operating in agreed collaborative frameworks with other sectors in the same megacity.^{31,68}

It is also clear that data is seldom at the heart of decision-making for transportation in these contexts. Fundamentally, there are inadequate data linking health and transportation.⁶⁹ There is a need for

transportation policies to be informed by data from public health research and to include perspectives of local government bodies, municipal and civic societies as well as population health experts.

At core this article suggests the promise, but also the shortcomings, of megacities' planning for health in their development of BRT systems. Our findings suggest the possibility for better integration of health in all policies approaches in megacities, particularly in the development of transportation policies in decades to come.

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