Title: Considering daily mobility for a more comprehensive understanding of contextual effects on social inequalities in health

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Research highlights

1. We conceptualize the links between daily mobility, context, and health inequalities.

2. Contextual influences on health inequalities are anchored in mobility potential.

3. Mobility potential can be converted into realized (im)mobility via individual agency.

4. Inequalities in mobility potential and agency give rise to inequalities in realized (im)mobility.

5. Various pathways link inequalities in exposure experienced via (im)mobility and inequalities in health.

ABSTRACT

Despite growing interest in integrating people's daily mobility into contextual studies of social inequalities in health, the links between daily mobility and health inequalities remain inadequately conceptualized. This conceptual proposal anchors the relationship between daily mobility and contextual influences on social inequalities in health into the concept of mobility potential, which encompasses the opportunities and places individuals can choose (or are constrained) to access. Mobility potential is realized as actual mobility through agency. Being shaped by socially-patterned personal and geographic characteristics, mobility potential is unequally distributed across social groups. Social inequalities in realized mobility may thus result. We discuss pathways by which these may contribute to contextual influences on social inequalities in health. One pathway is reflected in disadvantaged groups encountering more fast-food outlets during their daily activities, which may relate to their higher risk of unhealthy eating. This proposal lays the bases for empirical research explicitly testing hypotheses regarding the contribution of daily mobility to social inequalities in health.

KEYWORDS: conceptual; context; daily mobility; neighborhood; social inequality

BACKGROUND

In recent years, there have been calls to consider individuals' agency in contextual studies of social inequalities in health (Entwisle, 2007), and to take into account the interplay between individuals and their environment (Frohlich et al., 2001, Cummins et al., 2007, Kwan, 2009). A suggested response has been to integrate people's daily mobility across space when defining context or the spatial area(s) within which health-relevant resources and features are measured (Cummins et al., 2007, Kwan, 2009, Chaix et al., 2009, Matthews, 2011). Inspired by Hägerstrand's work in space-time geography (Hägerstrand, 1970), these calls reflect an increasing challenge to residential neighbourhoods as the sole and most salient settings for understanding contextual influences on social inequalities in health. Echoes of this push to adopt a daily mobility perspective can be found in Cummins' relational approach to place (Cummins et al., 2007), in Kwan's people-based exposure measures (Kwan, 2009), in Chaix's proposal to overcome the residential trap (Chaix et al., 2009), and in Matthews' coining of the term "spatial polygamy" to describe belonging to multiple settings (Matthews, 2011).

Concretely, place and health researchers are increasingly considering daily mobility by investigating "activity space" (Inagami et al., 2007, Basta et al., 2010 , Kestens et al., 2010, Troped et al., 2010, Vallee et al., 2010, Christensen et al., 2011, Vallee et al., 2011, Zenk et al., 2011, Hurvitz and Moudon, 2012, Lebel et al., 2012), defined as "the subset of all locations with which an individual has direct contact as a result of his day-to-day activities" (Golledge and Stimson, 1997 p.279). However, few studies have directly examined the relationship between daily mobility and social inequalities in health, rather than health more generally. This is so despite the fact that, as noted by several authors, daily mobility is a central driver of social stratification and inequality (Canzler et al., 2008, Manderscheid, 2009, Jiron, 2007, Kaufmann et al., 2004, Brighenti, 2011).

Indeed, features and resources are unequally distributed across space (Golledge and Stimson, 1997), and the places where social groups conduct activities may be restricted due to elements of the social structure, including class and power relations (Gatrell, 2002, Hägerstrand, 1970). While inequalities in residential neighbourhood features and resources – defined as physical (e.g. green spaces, food stores, air pollution) and social (e.g. area-level disadvantage, crime rate) attributes of environments – may translate into health inequalities (Kawachi and Berkman, 2003, Riva et al., 2007), so too could inequalities in exposures experienced during daily travels and activities. These relationships merit being studied.

Furthermore, the integration of mobility in place and health research has benefited from an increasing reliance on novel technologies, such as global positioning systems (Rainham et al., 2008) and interactive mapping tools (Chaix et al., 2012), to track people across space. However, it has not been accompanied by substantial developments on the conceptual front. Although Chaix et al. (2013) proposed a succinct conceptualization of the links between socio-economic position, mobility, environment, and physical activity/weight risk, the authors only briefly described factors which might account for a differential access to resources across areas of differing affluence. A conceptual proposal of the mechanisms by which social inequalities in mobility may arise and contribute to social inequalities in health is needed. It would allow testing *a priori* hypotheses and prevent *post hoc* theorizing about causal pathways, which risks over-interpretation of empirical findings based on assumptions alone (Frohlich et al., 2004). A conceptual base would also facilitate replication across studies and contribute to a unifying body of evidence (Frohlich et al., 2007).

OBJECTIVE

Drawing from literature in geography, urban studies, public health, and sociology, this paper seeks

to provide elements of response to the above limitations. It introduces a conceptual proposal which anchors the links between daily mobility and contextual influences on social inequalities in health into the concept of *mobility potential*. Mobility potential is defined as the capacity to be mobile and a resource that is unequally distributed across social groups (Kaufmann et al., 2004). We argue that social inequalities in mobility potential may engender social inequalities in realized, observable mobility, or what we call *mobility patterns*. We review empirical evidence to describe social inequalities along two dimensions of mobility patterns: (1) the extent to which one is (im)mobile, and (2) the characteristics of places and resources experienced during daily travels. Finally, we discuss how social inequalities in mobility patterns may help explain contextual influences on social inequalities in health. Key concepts and their relationships are illustrated in Figure 1 and described below.

Figure 1

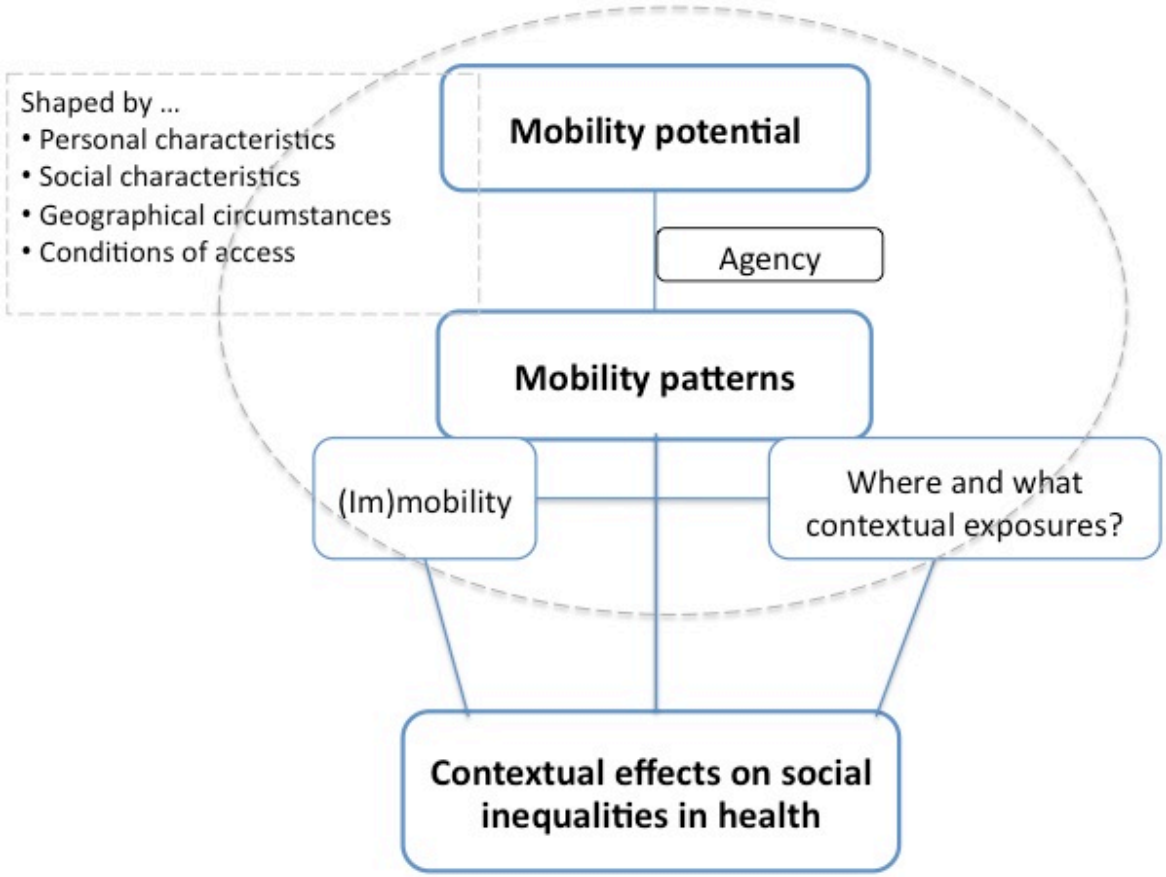

Figure 1: Diagram depicting the links between mobility potential, mobility patterns and contextual effects on social inequalities in health. Mobility potential requires agency to be converted into realized, observable mobility patterns. Concepts encompassed by the dashed circle are shaped by unequally distributed personal and social characteristics, geographic circumstances and conditions of access.

CONCEPTUAL PROPOSAL

Daily mobility potential: an unequally distributed resource

We conceptualize daily mobility as a behaviour embedded within a social context (Kaufmann, 2011, Camarero and Oliva, 2008) which involves social norms (including aspects of interpersonal relationships), social structures (e.g. class, race, gender), as well as institutional practices (Poland et al., 2006). The concept of "mobility potential" which, following Kaufmann et al. (2004), is the "capacity to move in geographic and social space" (p.750), is central to this perspective. Indeed, it has been developed to bridge the separation between spatial mobility and social inequality, and to consider the underlying causes of differential patterns of mobility across social groups (Camarero and Oliva, 2008). Mobility potential also acknowledges individuals' agency or capacity to act in a given social context: as depicted in Figure 1, mobility potential is transformed into realized (im)mobility once agency has been expressed (Kaufmann et al., 2004, Manderscheid, 2009, Jiron, 2007, Weiss, 2005).

Several authors have referred to the potential to be mobile using various terminology including "motility" (Flamm and Kaufmann, 2006, Kaufmann et al., 2004), "spatial capital" (Lévy, 1994), "spatial capability" (Shin, 2011), and "spatial autonomy" (Weiss, 2005). However, Kaufmann *et al*. (2004) have offered one of the most thorough descriptions of mobility potential, describing it as a resource composed of interdependent elements of access, competence, and appropriation (Kaufmann et al., 2004). Rooted in Hägerstrand's space-time prisms (Golledge and Stimson, 1997) and other concepts such as potential path space or area (Miller, 1991, Kwan, 1998), "access" represents the set of opportunities and locations from which individuals can choose to participate in an activity. The "competence" element encompasses the physical abilities and skills needed to exploit mobility options, while "appropriation" refers to decision-making processes, evaluation of mobility options, and the adoption of a course of action which will eventually be enacted through agency (Kaufmann et al., 2004).

The access element of mobility potential is particularly relevant to the study of mobility and contextual influences on social inequalities in health. First, it incorporates both the range of possible mobilities in which one can engage, as well as the types and characteristics of places, activity settings, and resources accessible by being (im)mobile (Kaufmann et al., 2004). Knowledge of these dimensions of mobility is essential to any empirical investigation of contextual exposure measures and their relationship to health (Chaix et al., 2013). Second, access – and thus mobility potential – has been discussed as being influenced both by personal characteristics (e.g. preferences, needs, transportation resources) and social characteristics (e.g. gender, socio-economic status), as well as by geographic circumstances (e.g. public transit, the location of activity places and resources) (Kaufmann et al., 2004, Manderscheid, 2009). Access is also regulated by conditions which Hägerstrand has called "authority constraints" or "those general rules, laws, economic barriers, and power relationships that determine who does or does not have access to specific domains at specific times" (Pred, 1977 p.208). These conditions may include, for instance, price and rights mechanisms (Bernard et al., 2007, Golledge and Stimson, 1997), as well as norms (Baldassare, 1978, Jiron, 2007, Skelton, 2013, Reynolds, 2013). As an outcome of price mechanisms, for example, high quality resources such as healthy foods, which are usually priced higher than unhealthy foods, are less accessible to low income groups. Furthermore, the cost of travel to access more affordable high-quality resources than those found in one's local area may deter people from doing so. Social and civic rights are another type of rules which determine access to resources provided by formal (often publically funded) institutions (Bernard et al., 2007). For example, resources such as public libraries or employment and health services may be earmarked to specific populations based on age, employment status, vulnerability, or residential location, such as in the case of publically-administered first-line health care services intended exclusively for

residents of a specific catchment area.

Importantly, these characteristics, geographic circumstances, as well as conditions regulating access to places and resources have been discussed as "fundamentally linked to social, cultural, economic, and political processes and structures within which mobility is embedded and enacted" (Kaufmann et al., 2004 p.750). It follows that mobility potential is unequally distributed across social groups (Kaufmann et al., 2004, Manderscheid, 2009, Weiss, 2005, Gough, 2008). In fact, the distribution of resources and of physical environment characteristics are neither socially nor politically neutral (Harvey, 1973, Soja, 2010). For instance, mobility opportunities such as public transit routes, bike paths, and access to highways may not be distributed equally across urban spaces (Miciukiewicz and Vigar, 2012), though this may depend on the layout of a given city (Fuller et al., 2013). Individual and geographic characteristics, as well as access conditions, thus interact to enable or impede certain social groups' possible mobilities. For instance, low socio-economic status (SES) youth might not travel to high-quality recreational facilities in affluent neighbourhoods due to unwritten rules or norms signifying they are unwelcome, or because they feel "out of place". Their mobility potential excludes such recreational facilities due to interacting factors, including rules at play in affluent areas, as well as youth's preference for feeling "in" rather than "out" of place. Because it inherently incorporates the idea that socially-patterned factors may determine the realm of possible mobilities from which one can (or is constrained to) choose, the concept of mobility potential is thus useful to recognize social inequalities in realized mobility (Hägerstrand, 1970) and, we argue, contextual effects on health inequalities.

Converting mobility potential into mobility patterns: the role of agency

Anchoring the links between daily mobility and contextual influences on social inequalities in

health in the concept of mobility potential is also useful because it makes room, through its appropriation element, for individual agency. Mobility potential is conceptualized as a resource which may be converted into one of several observable (im)mobility scenarios (Kaufmann et al., 2004), a conversion which requires agency (Fig. 1). This consideration for agency in place and health inequalities research has so far been neglected (Entwisle, 2007).

Here, we define agency as the capacity to "intervene in the world, or to refrain from such intervention, with the effects of influencing a specific process or state of affairs" (Giddens, 1984 p.14). Agency is expressed within a social context and reflects the ability to choose a course of action from available options for mobility – including *whether or not to be mobile*, as well as *where to go* (Kaufmann et al., 2004, Manderscheid, 2009). For example, people may choose to be mobile because they prefer to shop at a particular store located at a distance from their home, or they may be forced to travel outside their residential neighbourhood to access resources not found there. Conversely, people may stay in their area if they can find all needed resources in close proximity, or they may be relegated to their local environment if physical constraints hamper their mobility or if transport amenities are unavailable.

It is also worth noting that individual agency is circumscribed by personal, social, and geographic factors, and by conditions similar to those influencing access. As previously discussed, these characteristics are socially-patterned, which may give rise to social inequalities in agency. Acknowledging that agency may be unequally distributed across social groups is particularly helpful in understanding contextual influences on social inequalities in health since such social inequalities may stem from the joint contribution of inequalities in agency and in the social and spatial distribution of resources, rather than from either one of these explanations (Frohlich et al.,

2001, Abel and Frohlich, 2012). For example, the higher prevalence of unhealthy eating among lower SES groups may derive from fewer fresh produce stores in their local areas and activity spaces (inequalities in resource distribution), as well as from less knowledge about culinary preparation (inequalities in agency).

As defined above, mobility potential allows for the explicit consideration of inequalities in both the distribution of resources and opportunities (independent of individual's capacity to reach them), as well as in individual agency. This provides a comprehensive understanding of mobility patterns and their contribution to social inequalities in health. Before turning to mobility patterns, however, a note should be made regarding how mobility potential has been discussed in the literature thus far. The few attempts to operationalize mobility potential have generally focused on whether people were mobile given their *access to transportation* (or lack thereof) and *physical (in)ability* to use such transportation (e.g. a car) to move across space (Flamm and Kaufmann, 2006, Shin, 2011). Scant focus has been given to the *places* and *resources* potentially accessible through being (im)mobile (Jiron, 2007), even though, as per Urry (2007): "social inequality cannot be reduced merely by improving access to the means of mobilities. What is at stake are the activities, values and goods to which mobilities allow access" (p.187). This is all the more important given that social inequalities in this dimension of mobility patterns have been documented, and these, we argue below, may further contribute to social inequalities in health.

Daily mobility patterns

In examining daily mobility patterns, our focus shifts from what people *could* do, to what they *have done* with their mobility resources and opportunities at a given time and in a given social context (Camarero and Oliva, 2008). Mobility patterns are thus directly connected to mobility potential:

social differentials in observable mobility reflect social differentials in the characteristics, circumstances, and conditions shaping mobility potential and agency. We define daily mobility patterns as structured by key locations, such as place of residence or location of work or school (Golledge and Stimson, 1997). Mobility patterns have both spatial and temporal dimensions. They include such factors as whether or not one is mobile, the spatial spread and shape of movement, the degree of constraint, flexibility, and spontaneity of travel, the types of activities performed, and the characteristics of places where activities are conducted (i.e. activity settings, and the resources encountered during travel) (Ramadier et al., 2005). In the present paper, we focus on the extent to which an individual is (im)mobile and on the characteristics of places and resources experienced (i.e. contextual exposures) (Figure 1), since we believe these have a strong theoretical link to social inequalities in health. Social variability in a number of these dimensions has also been documented.

According to Golledge and Stimson (1997), "there are a relatively small number of primary factors in everyday life that impinge upon all individuals and constrain their freedom to occupy certain space and time locations" (p.268). These are similar to the socially-patterned factors that are conceptualized to influence mobility potential and agency. For instance, empirical studies of mobility patterns have found that lower income groups generally travel shorter distances from their place of residence than higher income groups (Gough, 2008, Vallee et al., 2010, Morency et al., 2011), although this observation is contested and may depend on the urban layout (Schönfelder and Axhausen, 2003). Students and full-time employees also tend to travel greater daily distances compared to other groups (Morency et al., 2011, Paez et al., 2010), while part-time employees (Kwan, 2000) and unemployed people are usually more place-bound (Zenk et al., 2011, Vallee et al., 2010). Similarly, educational attainment has been associated with mobility (Golledge and Stimson, 1997, Vallee et al., 2010), with less educated groups demonstrating less mobility (Vallee

et al., 2010). Ownership of a driver's license, a personal vehicle, a public transit pass or car-sharing membership have also been shown to favour mobility (Kaufmann et al., 2004, Morency et al., Naess, 2006, Casas, 2007, Frandberg and Vilhelmson, 2011, Zenk et al., 2011, Paez et al., 2010). On the other hand, expenses involved in travelling distances to access more affordable high-quality resources may deter people from doing so (Skelton, 2013). Environmental features of the residential neighbourhood, such as land use mix, and density of destinations and resources, have also been associated with varying levels of mobility (Kestens et al., 2010).

Although mobility in itself has been deemed "a critical key to individual freedom, independence, access to work, education, health, and leisure" (Miciukiewicz and Vigar, 2012), as well as important for social inclusion (Stanley et al., 2011) and well-being (Spinney et al., 2009), we cannot over-emphasize the importance of also considering social inequalities in the characteristics of places or activity settings and in the types of resources accessible when (im)mobile. Attributes which define an individual's social role (e.g. gender) (Kwan, 1999), social position (e.g. income or education) (Krivo et al., 2013, Kestens et al., 2010, Christian, 2012, Paez et al., 2010), or one's relation to others (e.g. social network) (Skelton, 2013, McPherson et al., 2001, Matthews et al., 2005, White and Green, 2010), have all been related to this dimension of mobility patterns. In the L.A.FANS study, people of lower educational attainment conducted activities in more disadvantaged areas than their more educated counterparts (Krivo et al., 2013). In another study women encountered fewer opportunities in the course of their daily travels, compared to men – although the types of opportunities (e.g. shopping, recreation, education, and employment) did not differ (Kwan, 2000). Residents of lower income neighbourhoods have also been suggested to experience higher densities of convenience stores and fast food outlets during their daily travels compared to residents of more affluent areas (Kestens et al., 2010). Finally, certain implied rules

may also regulate which social groups can access certain resources, as well as who may or may not be accepted in specific places (White and Green, 2010, Reynolds, 2013). For instance, in a study of African diaspora youth living in a deprived area of London, UK, many preferred schools closer to home, even though they were inferior, because they did not feel they belonged in privileged schools of white middle-class areas (Reynolds, 2013).

Interestingly, since mobility patterns emerge at the intersection of mobility potential and agency, it could be hypothesized that mobility might balance out inequalities in contextual exposure between groups. Indeed, some individuals may access resources and places not originally destined to them (i.e. places that are not part of their mobility potential). However, the empirical evidence reviewed suggests that disadvantaged groups are more often limited in their spatial extent, and are more likely to conduct activities in less advantaged and more health-deterring settings than affluent groups. How such social inequalities in both the extent to which one is (im)mobile and the types and quality of places and resources experienced daily relate to contextual influences on social inequalities in health is discussed in the following section.

From daily mobility patterns to contextual influences on social inequalities in health

Mobility limited to the local, residential area

A first pathway involves mobility restriction, which can directly influence health by "trapping" people in their local, residential area. Such restriction can contribute to social exclusion by limiting access to job opportunities, and educational and health services (Preston and Rajé, 2007, Stanley et al., 2011). This can further influence health through delayed medical consultation (Vallee et al., 2010). However, the health effects of mobility restriction may greatly depend on the features and resources of one's setting. Restricted mobility could negatively affect health in resource-poor and

health-deterring areas; however, positive or null effects on health could result if restricted mobility occurred in resource-rich and health-promoting areas. This interactive effect was observed by Vallée *et al*. (2011), who found that of those participants who concentrated their activities in their residential neighbourhood and limited their mobility, those who lived in affluent areas had better mental health than those in disadvantaged neighbourhoods.

Whether restricted mobility is chosen or imposed may also differentially influence health. Living in resource-rich areas may lessen the need to travel, leading to limited mobility by choice, which may be positively associated with health. On the other hand, having restricted mobility in resource-poor neighbourhoods due to limited mobility potential and agency, may negatively affect health. When investigating links between mobility and contextual influences on health inequalities, it is therefore critical to unpack the characteristics of places in which limited mobility occurs, but also to understand why certain groups have restricted mobility.

Mobility beyond the local, residential area

Just as *mobility restriction* is generally associated with exclusion and potential negative health effects, *mobility*, regardless of destination, has been said to increase access to resources and opportunities, and to promote social inclusion and health (Allen and Hollingworth, 2013, Stanley et al., 2011). In one study, a high degree of mobility (measured as the number of trips/activities conducted in a given time frame) was associated with a reduced risk of social exclusion (measured as access to health care and food shops) (Stanley et al., 2011). However, it should be noted that high mobility does not necessarily equate to social inclusion and better health. As argued by Cass *et al*. (2005): "highly paid commuters are excluded from their local neighbourhood precisely because of their high mobility" (p.542). Time spent commuting may in fact reduce time available

to engage in opportunities and activities or to exploit resources, locally or elsewhere (Jiron, 2007).

Furthermore, high mobility *per se* may not be a sign of affluence, but rather, necessity (Delbosc and Currie, 2011). For example, residents of neighbourhoods lacking healthy food stores or recreational facilities may be obliged to travel long distances to access such resources. In a qualitative study of urban daily mobilities in Santiago de Chile, Jiron (2007) observed that work-related commuting routines varied considerably across income groups. Jiron identified two group, the "cash rich-time poor" (middle class) and "cash poor-time rich" (lower class), for whom the necessity to be mobile in order to commute was especially stressful. Both groups had long commute hours, the former by car, the latter by public transit – a commute that left them exhausted at the end of the day (Jiron, 2007). In this case, mobility may negatively affect health and well-being. This example highlights that different groups may have different mobility trajectories depending on their mobility potential, as well as on their agency to transform this potential into distinct mobility patterns. Mobility, in itself, can thus have both negative and positive impacts on health depending upon an array of circumstances.

Contextual features and resources experienced during daily travels

A final pathway relating mobility patterns to social inequalities in health pertains to features of places and resources experienced during daily travels, or what we call "activity space exposures". Activity spaces comprise the places encountered on a recurring basis, and may also include the routes travelled which link major anchors or activity locations (Golledge and Stimson, 1997). Just as features and resources of residential neighbourhoods influence health inequalities (Kawachi and Berkman, 2003, Riva et al., 2007), so too could activity space exposures. First, we elaborate potential links between activity space exposures and social inequalities in health, regardless of

where people live. Then we combine residential and activity space features and resources for a more granular understanding of contextual influences on social inequalities in health.

When investigating daily mobility and health, researchers have studied exposure to area-level disadvantage (Inagami et al., 2007), food environments (Kestens et al., 2012, Lebel et al., 2012, Christian, 2012, Zenk et al., 2011), and green spaces in the activity space (Zenk et al., 2011, Rodriguez et al., 2012), relating these to health outcomes such as self-rated health (Inagami et al., 2007), body mass index (Kestens et al., 2012, Lebel et al., 2012, Christian, 2012), dietary practices (Zenk et al., 2011, Christian, 2012), and physical activity (Zenk et al., 2011, Rodriguez et al., 2012). However, the focus of these studies was not social inequalities in health behaviours and outcomes *per se*. Nevertheless, for the past twenty years, a wealth of studies have suggested that living in deprived and resource-poor areas is detrimental to health (MacIntyre and Ellaway, 2000, Pickett and Pearl, 2001, Riva et al., 2007). If certain groups, based on their shared social characteristics, are excluded (or exclude themselves) from parts of a city or from environments offering specific types and qualities of resources (Reynolds, 2013, Krivo et al., 2013), social inequalities in activity space exposures could result (Krivo et al., 2013). These, in turn, could contribute to social differentials in health.

The effect of activity space features and resources on social inequalities in health may also depend on the *relative difference* in exposure between activity spaces and residential neighbourhoods, rather than on one or the other of these contexts (Zenk et al., 2011, Inagami et al., 2007). Inagami *et al*. (2007) in fact found that conducting activities in more advantaged areas than one's residential neighbourhood was associated with better self-rated health than doing so in more disadvantaged areas. This *relative effect* of experiencing more and less advantaged areas in the course of one's

daily activities can be likened to findings from studies of residential mobility suggesting that health improved after moving to wealthier and healthier areas, while the opposite was also true (Norman et al., 2005). Alternatively, a parallel can be also drawn to the experience of low income residents in affluent neighbourhoods who have been suggested to suffer from an internalized stigma associated with living in an well-off neighbourhood, and so excluded themselves from available opportunities due to feelings of shame (Browne-Yung et al., 2013). While, this latter study was solely concerned with the residential neighbourhood, findings could be transposed to studies of daily mobility and health, suggesting that the effect on health of relative improvements in contextual exposures between activity spaces and residential neighbourhoods could be null or even negative due to internalized stigma and self-exclusion from opportunities provided in the activity space.

In the previous section, we have offered a general overview of the influence which various combinations of two dimensions of mobility patterns could have on social inequalities in health. As per our conceptual proposal, the influence of mobility patterns on social inequalities in health depends on numerous factors: (1) if and where mobility restriction occurs, (2) the combination of residential and activity space exposures, and (3) whether movement occurs between areas with similar features and resources. We thus recommend that, given the range and diversity of possible combinations, the hypothesized mechanisms linking daily mobility to social inequalities in health should be conceptualized expressly for a specific exposure and health outcome. This would help identify, for instance, whether residential and activity space exposures have independent influences on social inequalities in health, or if combined or relative effects are suspected (Cook, 2003).

DISCUSSION

Drawing from conceptual and empirical work conducted in various fields, we developed a conceptual proposal linking daily mobility with contextual influences on social inequalities in health. Given the increasing interest in integrating mobility in the social sciences in the past 15 years (Sheller and Urry, 2006) (and more recently in public health (Kwan, 2009)), and given the long-standing mandate of public health to reduce social inequalities through action on local environments (Diez Roux and Mair, 2010), this proposal fills a gap in place and social inequalities in health research, especially on the conceptual front. Without discounting the central role of residential neighbourhoods in providing health-influencing exposures and resources, our conceptual proposal offers insights into a more comprehensive and nuanced understanding of contextual influences on social inequalities in health. (Im)mobility is part of our everyday lives (Jiron, 2007), and as such, it is fundamental to the study of contextual influences on health.

By conceptualizing contextual influences on social inequalities in health as deriving from inequalities in mobility patterns, the proposal permits us to formulate questions regarding the underlying causes of social inequalities in daily mobility. It allows to turn the focus to, and empirically study, socially-patterned factors that determine both the realm of mobilities from which one can choose (or is constrained to choose), i.e., mobility potential, as well as realized mobility, i.e., observable mobility patterns. This is useful since several authors have argued that while it is much easier to describe social aggregates of mobility patterns than to understand the socially-embedded possibilities and constraints defining mobility potential (Golledge and Stimson, 1997), the latter might be more informative and reveal new aspects of inequalities in mobility (Kaufmann et al., 2004). As expressed by Hägerstrand : “it is not so much what people actually do as what they are free to do which is most important to understand” (Pred, 1977 p.210). Our proposal

accommodates the study of both mobility potential and patterns, as well as the conversion of the former into the latter through agency.

Our proposal is further useful for: (1) the identification of population subgroups who are trapped (due to mobility restriction) in resource-poor or health-deterring residential neighbourhoods; (2) the identification of subgroups who are constrained (despite mobility) to conducting activities in resource-poor or health-deterring areas; and (3) an improved assessment of exposure to contextual resources and features (Chaix et al., 2013), as well as the study of these scenarios in relation to social inequalities in health. It provides a base for testing specific hypotheses and building thorough interpretations as to why certain social groups display specific mobility patterns and how these influence social inequalities in health. Since few studies have yet empirically examined the relationship between inequalities in daily mobility and social inequalities in health, further empirical work is needed to do so and to refine the conceptual proposal. Empirical tests of the proposal will profit from the increasing use and development of novel tools and technologies which allow for the collection of detailed information on people's movement across space and activity places (Shareck et al., 2013, Kerr et al., 2011, Vallee et al., 2011, Chaix et al., 2012, Kestens et al., 2012, Rainham et al., 2008), as well as methods to process spatialized data (Thierry et al., 2013), operationalize daily mobility and activity spaces (Rainham et al., 2010, Matthews and Yang, 2013), and analyze their association with health (Matthews and Yang, 2013).

Our conceptual proposal may further have implications for public health practice. As previously suggested, high mobility is not an end in itself; it does not automatically equate with social inclusion, better health or high-quality activity settings. As per Soja (2010), resources and opportunities will always be somewhat unequally distributed across geographic space. Simply

promoting increased mobility for all would not redress this unequal distribution (Jiron, 2007), and would leave unaddressed the social drivers and rules underlying inequalities in mobility patterns, which we proposed, lie in both mobility potential and individual agency. By explicitly considering individuals and the role they play in realizing mobility, our conceptual proposal suggests that public health interventions and policies aiming to create healthy settings and reduce social inequalities in health should focus on improving mobility potential, *as well as* people's capacity to reach and occupy all desired locations in a city, irrespective of social background. Our proposal could also help advise urban planners and public policy makers to factor for the social context of mobility and related inequalities. To adequately inform such interventions and policies, a deeper understanding of the interplay between the socially-structured personal and geographic circumstances, as well as rules such as rights and norms, which may enable and constrain mobility potential will be required.

We finally wish to highlight two elements which, although not explicitly part of the conceptual proposal, could be accommodated by it. First, despite the fact that the focus was on daily repeated movement across space, the concepts presented and their relationships could well extend to other types of mobility occurring across the lifecourse, such as residential mobility (Sharkey, 2012, Smith and Easterlow, 2005, Entwisle, 2007). Selection into residential neighbourhoods in fact stipulates that people may "choose" to live where they do because of personal and social characteristics (e.g. preferences or economic resources) similar to those we described as shaping daily mobility (Diez Roux, 2004). Second, places change over time. Just as changes can occur through actions undertaken by individuals with regard their residential neighbourhood, such as demands for specific resources (Frohlich et al., 2008, Entwisle, 2007), they could also result from pressures made by populations through their recurrent mobility patterns, in their activity locations.

Although discussing this recursive relationship between daily mobility patterns and environmental changes was beyond the scope of this paper, it would be worth further conceptualizing.

CONCLUSION

Public health is perpetually focused on reducing health inequalities by acting on people's daily lives and on the places where they live, work, study, and play (Organisation mondiale de la santé, 2008). This paper offers a timely contribution, pressing for more conceptually-rooted research and action, focused on context and social inequalities in health. The conceptual proposal made here allows the direct study of mobility potential and the factors enabling or constraining it, a first step towards better understanding why one course of action is selected over another, and why various social groups exhibit the daily mobility patterns that they do (Hägerstrand, 1970). Our proposal, we hope, will encourage conceptual reflections and guide researchers in designing empirical studies to explicitly test specific hypotheses linking daily mobility patterns, activity spaces, and social inequalities in health.

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