

## SESSION 2-3

### « Air, noise, pollution, transport »

Wednesday, September 11<sup>th</sup>

Room : D 314 à 16h30

#### **Claire BOULANGE**

**Town** : Carlton North, Australia

**Job Title** : PhD Student

**Company** : University of Melbourne

**Title of the presentation** : « A complex approach for understanding the relationship between walking behaviors and the urban environment »

#### **Abstract** :

Physical inactivity is a rising trend which significantly affects Australians' health and well-being. More than 50% of Australian adults do not meet the recommended amount of physical activity to maintain good health - the WHO recommends that adults aged 18–64 should do at least 150 minutes of moderate-intensity physical activity a week. Being insufficiently active is a major risk for ill health and premature mortality; it increases the risk of a range of chronic diseases including cardiovascular disease and type-two diabetes. Insufficient physical activity is second to tobacco smoking as the leading contributor to the burden of disease in Australia, and it is the leading contributor to disease in women. In 2007 the direct health care cost of physical inactivity in Australia was estimated to be \$1.5 billion. Scientific consensus now exists on the relationships between population health and the built and socio-cultural environments. The research shows that the economic, social and physical environments that surround people can affect their health directly (i.e. road injuries) and indirectly (i.e. limited access to healthy food). Rising obesity rates together with rapid urban growth are global challenges reinforcing the research that aims to explore the link between the built environment and physical activity. It is now understood that the way places are built and operated can either stimulate people, provide them with countless opportunities to participate in physical activities or discourage them from walking or cycling. The relationship between the built environment and walking behaviors has been extensively studied in the past two decades. Evidence suggests that the number and variety of key destinations (such as public transport stops, shops or services) within an area, together with the ease of access to those destinations, are critical factors influencing the choice to walk for transport. "Urban density" also appears to impact on walking behavior; areas with the highest residential densities or employment densities will have the highest number of shops and services; thus the highest number of destinations reachable by foot. Finally, street patterns and more

specifically “streets connectivity” matters: people are more likely to walk for transport in places where the street network is highly connected, obstacles kept to a minimum, and where there is no necessity to cross major roads. The nature of cities is one of structural system complexity; urban areas are extremely complex environments in which a large number of environmental, social, cultural and economic factors are in constant interaction. In other words, it is the whole combination of infrastructures such as roads and parks that makes urban settings what they are. These circumstances can exacerbate difficulties in urban management. A complex system approach is a way of thinking in terms of how a set of sub-systems work and interact with each other to generate greater outcomes. It is an approach which has potential to assess the strength and effectiveness of inter sectoral action for increasing walkability. The presentation will outline and discuss the complex-system approach and the System Dynamic methodology designed for this study.

## **Noëlla KARUSISI**

**Town** : Paris, France

**Job Title** : Doctorante

**Company** : Inserm U707 - UPMC

**Title of the presentation** : « Associations between the environment and recreational and transportation physical activity in the Paris metropolitan area: results from the RECORD Cohort study »

### **Abstract** :

Introduction To investigate the physical activity behavior, we conducted three complementary studies that examined associations between environmental characteristics and informal recreational activity (jogging), formal recreational activities (requiring facilities), and transportation activity (commuting). Methods We conducted cross-sectional analyses with the RECORD Cohort Study (7290 participants, 30-79 years, Paris region). Multiple environmental characteristics were measured and spatial accessibility to sport facilities was assessed with two approaches that take into account the street network (distance to the nearest facility and count of facilities around the dwelling). Active commuting was studied by geocoding the place of residence, the workplace and the supermarket. Markov chain Monte Carlo approaches were used to estimate multilevel models investigating variations in the outcomes. Results After controlling for various individual socio-demographic characteristics, individual neighborhood experiences and various contextual variables, a high individual education was associated with a higher probability of jogging and with the practice of racket sports, swimming, and fitness over the previous 7 days. The presence and high quality of green and open spaces was associated both with a greater probability of jogging and with the practice of jogging within rather than outside the neighborhood. The spatial accessibility to swimming pools was associated with swimming. The spatial accessibility to facilities was not

related to the practice of other sports. High neighborhood income was associated with the practice of a racket sport and fitness. Moreover, a high social cohesion was associated with a higher probability of jogging while the presence of a lake or waterway in the residential neighborhood increased the probability of jogging inside the neighborhood. Neighborhood affective and relational experiences were also related to jogging. After determining the shortest path between the residence and the workplace and the supermarket with a Geographic Information System, we found that geographic characteristics of the neighborhood and of these paths were associated with the reported walking time to work and to shop. Discussion/Implications Our results suggest that physical activity is a multi-dimensional concept that integrates geographical, financial, and environmental aspects. These results also suggest that policymakers should pay attention to the attractiveness of the neighborhood, social relationships among neighbors, related neighborhood experiences, and attitudes towards health to promote outdoor physical activity. Our work supports the evidence that strategies to increase participation in sport activities should improve the spatial and financial access to specific facilities and that this should be taken into account in public health prevention actions against obesity and cardiovascular diseases.

## **Tor H. Oiamo**

**Town** : London, Canada

**Job Title** : SSHRC Doctoral Fellow

**Company** : Western University

**Title of the presentation** : « Environmental determinants of urban health: an integrated approach to modeling noise and air pollution for predicting exposure »

### **Abstract** :

Previous research has demonstrated significant impacts of community noise and air pollution on health and well-being in urban environments. However, the current state of knowledge is limited by data on individual exposures to these environmental determinants of health. In general, researchers have either resorted to aggregated environmental data for large study populations, or highly resolved data on relatively small study populations. Both types of study designs are to a certain degree a consequence of high costs (monetary or computational) associated with monitoring and modeling exposure over large areas. Developments in predicting air pollution exposure such as Land Use Regression (LUR) modeling have significantly reduced costs, but still rely on environmental monitoring of air pollution and detailed traffic data. Nonetheless, the technique provides an affordable alternative to, for example, dispersion modeling. A similar approach has recently been applied to community noise, where computationally intense noise models intended for small areas can be sidestepped with LUR over larger areas. This paper describes a novel approach

to modeling traffic noise and nitrogen dioxide for a community health study in Windsor, Ontario, Canada. This is part of a larger project examining the policy and practice of community health for a transportation megaproject to modernize the US-Canada border crossing between Windsor and Detroit, Michigan. Both noise and nitrogen dioxide are modeled using LUR, but travel demand models rather than manual traffic counts provide data on transport contributions to pollution. This provides two major advantages: Costs and validity challenges of manual traffic count data are eliminated, and the final models can be used to forecast environmental exposure as urban development and associated travel demands evolve. The paper compares the results to models of noise and nitrogen dioxide based on conventional techniques and the utility of travel demand models versus traffic monitoring as data inputs.

## **Camille Perchoux**

**Town** : Paris, France

**Job Title** : Doctorante

**Company** : INSERM U707/ CRCHUM

**Title of the presentation** : « A typology of individual spatial behavior and related environmental exposure in the RECORD Cohort Study »

### **Abstract** :

Authors: Camille PERCHOUX, Yan KESTENS, Basile CHAIX Background: Prior epidemiological studies have focused on residential neighborhoods to assess environmental exposures. However, individuals' spatial behavior likely modifies residential neighborhood influences, with weaker effects expected for mobile populations. This study examines the relationship between individual demographics, environmental features and spatial behavior. Methods: We used the data from the RECORD Cohort Study (second wave) conducted in 2011-2012 in the Paris metropolitan area. A sample of 2114 individuals aged 30-70 years was investigated. Participants' perceived residential neighborhood and regular activity locations were geocoded. A set of 24 indicators was created to qualify and quantify individual space-time patterns, using spatial analysis methods and a geographic information system. Three domains of indicators were considered: behavioral indicators (e.g., number of activity locations and visits per week), indicators related to the geometry of the activity space (e.g., shape, structure, extent, and eccentricity), and indicators related to the residential neighborhood. Principal component analysis was used to select indicators from the original list for further analysis. Then cluster analysis was applied to elaborate a typology of spatial behavior. Finally, multilevel logistic regression was conducted to determine the individual characteristics associated with each type of spatial behavior. Results: The principal component analysis identified five dimensions of spatial behavior: extent of the activity

space, eccentricity of the activity space, centering of the activity space on the residential neighborhood, volume of activities, and type of activities. The cluster analysis identified four types of patterns of spatial behavior: (1) large activity space with people traveling outside their residential neighborhood, (2) intermediate activity space with few activity places, (3) intermediate activity space with numerous activity places frequently visited, (4) small activity space with few activity places clustered in their residential neighborhood. Conclusion: Our study suggests that there is a high variability in individual spatial behavior, which should be accounted for in our assessment of environmental exposure in epidemiological studies. The typology of space-time patterns and related mobility behaviors will help us better understand the relationships between environmental exposures and health outcomes. Finally, our findings can help health promotion interventions by identifying low mobility people trapped in low resource residential neighborhoods and mobile people traveling exclusively across low resources environments.

## **Anne Dorothée Slovic**

**Town** : São Paulo, Brazil

**Job Title** : Candidate au doctorat

**Company** : Faculté de Santé Publique - Université de São Paulo

**Title of the presentation** : « Sustainability Of Air Pollution Policies In Urban Areas In The Context Of Global Environmental Health: Sao Paulo, New York And Paris»

### **Abstract** :

The focus of this project is to study the relationship between air pollution and its derived effect on the urban environment and global health. It will consider vehicle emissions as a primary source of atmospheric urban pollution and look into the different levels of pollutants derived from it such as: nitrogen, ozone, sulfates and particulate matter. The project will compare the policies that aim to have a positive effect on atmospheric pollution in the metropolitan areas of São Paulo, Paris, and New York such as related to A) vehicle circulation restriction B) public and alternative transportation and C) fuel and fleet standards. The study will initially place the policies in their geographical/climatic, socioeconomic, legislative and historical context for each city, and develop tools that will enable a side-by-side comparison of each region and the policy's impact on global and local health indices. The specific health indices analyzed will be outdoor air pollution impact on mortality overall and infant, respiratory disease and the decrease or increase of life expectancy. Special attention will be paid to the urban center of São Paulo due to its high quantity of gaseous vehicle emissions and its emerging economy. São Paulo presents a unique situation in that it is experiencing rapid development and an increase in vehicular traffic from both light passenger vehicles as well as cargo trucks due to an inadequate rail system and insufficient public transportation.

In addition, São Paulo (and Brazil in general) present particular issues of interest such as the high use of biofuels such as bioethanol, as well as diesel fuel in heavy trucks that is high in dissolved sulfur (50-500 ppm). In the current presentation, focus will be given on policy group (A), consisting of vehicle circulation restriction legislation such as legislation relevant to 1) car inspection, 2) driving restrictions for light (gasoline or ethanol), and 3) heavy duty (diesel) vehicles. In each of these cases data will be presented on the motivations that led to the existence of the policy, the stakeholders affected and the willingness to pay. It will look into the environmental outcomes considering aspects such as, innovation and technology, reduction on pollutants and inclusion or not of health indicators to measure its impact. In addition, it will be essential to the project to understand which air pollution standards are applied, specifics of each city fleet, fuels, public and alternative transportation situation. A survey of the major public policies related to these categories will be done and restricted to a time frame of ten years. The long-term goal is to inform policy recommendations for the city of São Paulo based on previous experience from Paris and New York. Preliminary results will be presented at the Conference.