The uses of surveillance in environmental health

The case of transportation

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February 25th, 2013
Ottawa
Mandate of the Montréal public health department

• Inform the population on such issues as their state of health, priority health problems, vulnerable groups, risk factors and efficient interventions

• Follow the evolution of the public’s health and conduct appropriate research

• Ensure that the required preventive measures are adopted by the appropriate authorities

• Act as a teaching center in the field of public health
Who we are
Urban environment and health sector

• Multidisciplinary team of MDs and 20 professionals (epidemiologists, toxicologists, urbanist, nutritionist, hygienist, health promotion practitioner, geographic information system specialist (GIS), evaluation specialist, etc.)

• Focusing on the impact of the built environment on public health and the development of efficient interventions

• Working in collaboration with researchers (UQAM, University of Montréal, McGill University) and in the university hospital research centers
Use of surveillance

- Influence healthy public policies
- Support mobilization of partners
- Evaluate public health impact of interventions
Montreal metropolitan region: Increasing presence of cars 1987-2008

- Trips by automobile (AM peak rush hour): + 39%
- Number of cars: + 49% ( +35 000 per year in the past 5 years)
- Population growth: + 19%
Urbanization and distance to downtown

Source: AMT, 2011
Context

Demography and Employment

- Growing population in the metropolitan area
- Significant growth in motorization
- Maintaining the importance of activity centers in the downtown core
Island of Montreal: Current major highway projects

- Actual highways
- Projects
Island of Montreal: Current major highway projects

- Actual highways
- Projects
Evolution of the numbers of passengers using public transportation

Source: STM 2009
Figure 1 - Secteurs propices à une intensification des activités

Réseaux structurants

Secteurs propices à une intensification des activités

Légende

- Intensification des activités aux abords d'arrêts de métro et de train de banlieue
- Intensification des activités aux abords de corridors de métro et de train de banlieue
- Ligne et station de métro existante ou en construction
- Ligne de station de métro à l'étude ou potentielle
- Ligne et station de train de banlieue existante
- Ligne et station de train de banlieue potentielle
- Gare projetée
- Réseau initial de tramways proposé
- Service rapide par bus (SRB) proposé

Source: Ville de Montréal, Plan d'urbanisme, 2004; Modifié en avril 2007 par Division du développement des transports
# Environmental and health impacts of the transportation system

<table>
<thead>
<tr>
<th>Environment</th>
<th>Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air quality</td>
<td>Cardio-respiratory diseases, asthma</td>
</tr>
<tr>
<td>Climate change, heat islands</td>
<td>Cardio-respiratory mortality and morbidity</td>
</tr>
<tr>
<td>Road safety</td>
<td>Road injuries</td>
</tr>
<tr>
<td></td>
<td>Walking and cycling</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Overweight and obesity</td>
</tr>
<tr>
<td></td>
<td>Diabetes</td>
</tr>
<tr>
<td>Noise</td>
<td>Sleep disturbance</td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
</tr>
<tr>
<td>Mobility, accessibility</td>
<td>Exclusion</td>
</tr>
</tbody>
</table>
NO$_2$ à Montréal
Croupe, Goldberg et Ross 2009, soumis

Model $R^2 = 0.80$

Predicted NO$_2$ (ppb)
- 4.2 - 8.2
- 8.3 - 10.1
- 10.2 - 11.8
- 11.9 - 13.8
- 13.9 - 16.2
- 16.3 - 19.8
- 19.9 - 35.9

Kilometers
### Odds ratio - Hospitalizations for respiratory conditions (over 60 years of age) according to exposure to AM peak traffic

<table>
<thead>
<tr>
<th>Catégorie de trafic</th>
<th>Nombre de cas (%)</th>
<th>Nombre de témoins (%)</th>
<th>RC (IC95%)</th>
<th>RC ajustés pour le SSE (IC95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 3160 véhicules</td>
<td>5322 (91,7%)</td>
<td>36 725 (93,5%)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>3160-7700 véhicules</td>
<td>345 (5,9%)</td>
<td>1 922 (4,9%)</td>
<td>1.24 (1.10-1.39) p&lt;0.001</td>
<td>1.07 (0.95-1.20) p=0.28</td>
</tr>
<tr>
<td>&gt;7700 véhicules</td>
<td>138 (2,4%)</td>
<td>613 (1,6%)</td>
<td><strong>1.55</strong> (1.29-1.87) p&lt;0.001</td>
<td><strong>1.30</strong> (1.07-1.57) p=0.007</td>
</tr>
</tbody>
</table>

Smargiassi et al., 2005
Estimation des niveaux de bruit le jour par un modèle de type "Land use regression", Montréal, été 2011

**Niveau de bruit**

<table>
<thead>
<tr>
<th>Intervalle</th>
<th>Couleur</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 - 48</td>
<td>Vert</td>
</tr>
<tr>
<td>49 - 50</td>
<td>Vert clair</td>
</tr>
<tr>
<td>51 - 52</td>
<td>Jaune clair</td>
</tr>
<tr>
<td>53 - 54</td>
<td>Jaune</td>
</tr>
<tr>
<td>55 - 56</td>
<td>Orange clair</td>
</tr>
<tr>
<td>57 - 58</td>
<td>Orange</td>
</tr>
<tr>
<td>59 - 60</td>
<td>Rouge clair</td>
</tr>
<tr>
<td>61 - 62</td>
<td>Rouge</td>
</tr>
<tr>
<td>63 - 64</td>
<td>Rouge foncé</td>
</tr>
<tr>
<td>65 - 66</td>
<td>Rouge intense</td>
</tr>
<tr>
<td>67 - 68</td>
<td>Rouge très intense</td>
</tr>
<tr>
<td>69 - 70</td>
<td>Rouge extrêmement intense</td>
</tr>
<tr>
<td>71 - 72</td>
<td>Rouge incroyable</td>
</tr>
<tr>
<td>73 - 74</td>
<td>Rouge absolu</td>
</tr>
<tr>
<td>75 - 76</td>
<td>Rouge total</td>
</tr>
<tr>
<td>77 - 78</td>
<td>Rouge complet</td>
</tr>
<tr>
<td>79 - 80</td>
<td>Rouge total</td>
</tr>
<tr>
<td>81 - 89</td>
<td>Rouge extrême</td>
</tr>
</tbody>
</table>

**Secteur résidentiel**

Projection: NAD83 MTM zone 8

Sources de données:
Direction de santé publique de Montréal,
Ville de Montréal

Cartographie:
S. Goudreau (2012)
Injured PEDESTRIANS* (Montréal, 1999-2008)

Injured pedestrians
- 1-2
- 3-10
- >10

* Ambulance interventions (Urgences-santé).
** 1 January 1999 to 31 July 2008.
Production: F. Tessier, P. Morency.
© Direction de la santé publique de Montréal, 2012.
Context

The number of road injuries increases with the volume of traffic

Pedestrians, cyclists, motorcyclists and motor vehicle occupants injured in the borough of Ville-Marie* 01/01/99 to 31/07/2008

*Victimes d'une collision routière ayant entraîné une intervention d'Urgences-santé.

Cartographie: Direction de la santé publique de Montréal (EUS), François Tessier/Patrick Morency 2010
Major roads, « arteries »

Injured pedestrians at Montreal intersections (1999-2008)

- Artery: 62%
- Collector road: 26%
- Local only: 12%

Analyses: P. Morency; Data source: Urgences-santé; Ville de Montréal.
Transportation: Modernize mobility

- Stop increasing road capacity
- Priority to public transit
- Integration of land use & transportation planning (TOD)
- Compact neighbourhood and traffic calming
Sub-orientation: Towards a city and neighbourhoods that are safe and that promote a physically active lifestyle

**Public Health Objectives**
- Between now and 2020 and in comparison to 2008 numbers, reduce by 40% the number of road injuries.
- Between now and 2020 and in comparison to 2008 numbers, reduce the prevalence of obesity by 2% and the prevalence of overweight by 5% among adults.

**General Objective: Increase transportation physical activity**
- Between now and 2020, increase the modal share of walking and cycling from 14.5% to 20% during peak morning traffic.
- Between now and 2020, increase the modal share of children (6-12 yrs) who use active transport from 34% to 45% during peak morning traffic.
- Between now and 2020, increase the modal share of public transit from 30% to 40% during peak morning traffic.
- Between now and 2020, reduce the volume of traffic by 20% especially in central neighbourhoods.

**Orientation**
- A city and its neighbourhoods that are safe and that promote a physically active lifestyle

**Specific Objectives for the built environment**
- Between now and 2020 and in comparison to 2010 numbers, increase the offer of public transit by 30% while limiting the expansion of road capacity.
- Plan and design neighbourhoods that support safety and active transportation.
- Increase the proportion of the road network that have traffic calming measures and reduce conflicts between road users.

**Actions by the MPH (regional offer of services)**
- Acquiring strong scientific and practice-based evidence
- Influencing healthy public policies
- Support mobilization of partners
- Evaluation
Appropriate research and surveillance

- Geographic distribution of road injuries
- Research on the impact of traffic volume and road design on public health
- Platform for the quantification of health risks and benefits of transportation and land use planning (local, regional and metropolitan levels)
- Built environment and health observatory
- Diffusion to key stakeholders (media, professionnals, policy makers, NGOs and politicians)
Independent research

**ORIGINAL ARTICLE**

From targeted “black spots” to area-wide pedestrian safety

P Morency, M-S Cloutier

See linked commentary, p 356


**Brief report**

Risk of injury for bicycling on cycle tracks versus in the street

Anne C Lusk,1 Peter G Furth,2 Patrick Morency,3,4 Luis F Miranda-Moreno,5 Walter C Willett,1,6 Jack T Dennerlein7,8

The link between built environment, pedestrian activity and pedestrian–vehicle collision occurrence at signalized intersections

Luis F. Miranda-Moreno a,*, Patrick Morency b,1, Ahmed M. El-Geneidy c,2

a Department of Civil Engineering and Applied Mechanics, McGill University, Canada
b Montreal Department of Public Health, Montreal, Canada
c School of Urban Planning, McGill University, Montreal, Quebec H3A 2K6, Canada
• Be very active in the public debate at multiple levels to provide public health advisories using health impact assessment data and the best practices
  – Federal (national public transit infrastructure plan)
  – Provincial (a shift from car oriented to transit oriented development)
  – Metropolitan (transit oriented development plan)
  – Regional (public transit and cyclist infrastructures)
  – Local (compact neighbourhood design, traffic calming and safe pedestrian infrastructure)

• Integrate health impact assessments into economic and environmental impact assessments of specific transport and infrastructure projects (sustainable impact assessment)
Making the diagnosis public

Publications

Media coverage

Public events
• **Sharing best practices** with NGOs, engineers, urban planners, public health professionnals, politicians, etc. at multiple levels

• **Financial support for NGOs**
  - « Quartier 21 »
  - « Quartiers verts actifs et en santé »
  - Transit coalition (increase financing of public transit)

• **Provide new tools** (ex.: walkability audits) and health data associated with the built environment
Supporting community mobilisation

NGOs

Citizens

Universities
- Bixi bike sharing system
- Community mobilisation: CLASP Project
- Transport Plan at the metropolitan level
- Share the results and recommendations with key stakeholders
Conclusion

• Providing public health data linked with the built environment is crucial to orient decision making process at all levels (ex.: mobility plan)
• Multidisciplinary team and partnership with universities is necessary
• Key stakeholders must be involved in the process
• Communication strategy is a key factor of success