The 2013 Lac-Mégantic tragedy: The Public Health response then and now

Dr Mélissa Généreux (director) and her team
Estrie Public Health Department (PHD)
April 28, 2016
OUTLINE

1. A Look Back
2. The First Days/Weeks
3. The First Years
4. Lessons and Conclusion
The town of Lac-Mégantic

Source: Town of Lac-Mégantic
On July 6, 2013, a train derailed in downtown Lac-Mégantic, the seat of the Granit Regional County Municipality (RCM), provoking a major conflagration and explosions.

The tragedy was responsible for:
- 47 deaths;
- 44 buildings destroyed
- 2000 evacuees
- an unparalleled oil spill
Devastated neighbourhoods
A cloud of smoke
72 wagons with a capacity of 100,000 litres of light crude oil

6,000,000 litres of crude oil spilt:

- Some of it burned
- Some of it seeped into the soil
- Some of it spilled into the lake and the river (100,000 L)
Public Health response

- Emergency response operations
  - Crisis management: First hours and days
  - Risk management: First weeks

- Recovery operations
  - From September 2013
  - Still ongoing
EMERGENCY RESPONSE: THE FIRST DAYS/WEEKS
Many services provided by the Public Health Department (PHD) of Eastern Townships in the immediate aftermath of the Lac-Mégantic tragedy

Response to acute threats:

- **Chemical**: toxic cloud, soot fallout, oil vapours, dust from debris, oil spilled on the ground and into the lake, oil seepage into the soil
- **Physical**: building collapse and injuries, heat wave
- **Biological**: bacteriological contamination due to water main break and power outage
Alert

- Major fire in downtown Lac-Mégantic around 1:15 a.m.
- Health Mission coordinator notified by local health and social services center around 1:30 a.m.
- Physician on duty in environmental health called around 2 a.m.
- Public Health Director called around 5 a.m.
- The head of the public health component of the health mission on vacation
Initial crisis management

- Present at the emergency measures coordination centre around 6 a.m.
- Present on site around 8 a.m.
- Team mobilized
- Work organized
- Request for support from the province
Evacuation

- Initial evacuation around a large safety perimeter by firefighters
- First data gathered by TAGA around 8:30 a.m.
- First data transmitted to Public Health around 10 a.m.
- Evacuation of the Fatima sector as requested by Public Health around 11 a.m.

More than 2,000 persons were evacuated (1/3 of the population)
### Urgence Lac-Mégantic

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<th>NO₂ (ppb)</th>
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**Remarques:**
- BTEX
- Air contenant des petites molécules
- Methylène
- Gorge piquée, larmoiement
- Max

**Heure de réception** Juin 6, 2003 4:50PM N° 0060

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**Notes:**
- Toujours Tous Les HAP
- Évitez des somnifs 1000 = symptômes
- BTEX
Reintegration began as early as July 7

Coordination of the decision to reintegrate:

- Huge challenge at first
- Consensus was required from all partners: municipality, environmental authorities, firefighters, police, public health

- Public Health perspective:
  - Are there any residual risks?
  - How do you protect yourself from them?
  - How do you notify the public?
Soot fallout
Drinking water monitoring

**July 6, 2013**
- Water main break
- Preventive boil water advisory

**July 10, 2013**
- Analysis of PH C_{10} - C_{50}, PAH, and BTEX at various sites within the network

**July 12, 2013**
- C_{10} - C_{50} and toluene detected (levels below health guidance value)
- Boil water advisory lifted
- Request for raw water analyses

**July 18, 2013**
- Raw water analyses results all normal
- Recommendation of a weekly follow-up at various sampling points within the network and monthly analysis of raw water (wells)
Air quality monitoring

- Daily measurements at the site during the work
- Direct reading instruments
- Gases evaluated:
  - Benzene
  - VOC
  - Toluene
  - Ethylbenzene
  - Xylene
  - Hexane
  - H₂S
  - SO₂
  - CO
- Suspended Dust Particles evaluated:
  - PM₁₀
  - Asbestos
- Lower Explosive Limit (LEL)
Summary of the results: VOC

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<td>VOC Minimum 0.1, VOC Mean 20.6, VOC Maximum 112</td>
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<td>24 July</td>
<td>VOC Minimum 0.1, VOC Mean 11.5, VOC Maximum 62.5</td>
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<td>26 July to 28 July 2013</td>
<td>VOC Minimum 0.1, VOC Mean 1.4, VOC Maximum 14.5</td>
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Summary of the results: Benzene

Measure of benzene after the derailment of Lac Megantic Tragedy

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<th>Benzene Minimum</th>
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Risk assessment / management

- **Risk assessment**
  - Very limited risk for the general population
  - Limited risk for the workers in the exclusion zone
  - Risk avoidable through simple protective measures

- **Risk management**
  - Reintegration of most evacuees, along with a variety of recommendations (cleaning of surfaces, drinking water, food, medications, swimming, fishing)
  - Respiratory and skin protection measures for workers
  - Reporting all health problems
Health problems observed

- Epidemiological study

  *Through the case declarations seen at the emergency rooms, at the local medical clinics, and of the occupational health teams for all regions (to get workers from other regions)*

  - A dozen identified cases that could be linked to exposure to chemical contaminants (almost all workers)

  - Various symptoms: headache, weakness, difficulty breathing, irritation of the eyes and face

  - No severe cases
### Epidemiological monitoring:

#### Cases of workers seen at the emergency room

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<th>Type of incident</th>
<th>Number of workers</th>
<th>Causal link</th>
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<td>Accidental inhalation of oil vapour</td>
<td>5 cases</td>
<td>• 1 clearly linked&lt;br&gt;• 1 probable&lt;br&gt;• 3 uncertain</td>
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<td>Accidental projection of liquid</td>
<td>3 cases</td>
<td>• 2 cases clearly linked, including a CSST intervention to correct work methods&lt;br&gt;• 1 probable case</td>
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<td>Exhaustion</td>
<td>4 cases</td>
<td>Unlikely link; non-specific symptomatology</td>
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<td>Other</td>
<td>2 cases</td>
<td>Non-specific symptoms difficult to link to exposure</td>
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Components of recovery (Public Health)

1. Coordination with local and regional partners
2. Surveillance and monitoring
3. Research
4. Community development
5. Occupational health
6. Environmental health
7. Health impact assessment
Enquête de santé populationnelle estrienne
A regional initiative (Estrie PHD)
Cross-sectional survey
Summer 2014 / Fall 2015
Recruitment through random-digit-dialling
Representative sample of adults (18+):
  - 2014: 811 adults in Granit / 7926 adults elsewhere
  - 2015: 800 adults in Granit / 800 adults elsewhere
Telephone or web questionnaire (≈ 30 min.)
Types of exposure

- Human losses: fearing for one’s life or that of a loved one, losing a loved one, suffering injuries
- Material losses: relocation, loss of employment, property damage
- A negative perception: perception of the event as having been stressful, as having adverse effects in the future, as having interrupted something important, or as having caused the loss of something important

Intensity of exposure

- Intense exposure (3/3), Moderate exposure (1/3 or 2/3), No exposure (0/3)
Health issues

- Global health perception
- **Health behaviours:** tobacco, alcohol, drugs
- **Psychological health:** resilience, anxiety and mood disorders, depressive episode, psychological distress, finding most days stressful, medication, PTSD (2015 only)
- **Access to ressources:** services received from physician, nurse, pharmacist, psychologist and social worker, counselling received for stress management, social support (2015 only)
- **Neighbourhood perceptions:** sense of belonging, quality of life, satisfaction, insecurity, air pollution, odours and noise (2015 only)
PSYCHOLOGICAL IMPACT OF THE DISASTER, 1 YEAR AFTER
Human and material losses (2014)

- Fear for his life or that of a loved one: 49.6%
- Injuries: 16.4%
- Loss of a loved one: 37.1%
- Home damages: 5.2%
- Job loss: 7.7%
- Relocation: 16.7%
Intensity of exposure (2014)

- Human losses: 63.9%
- Material losses: 23.3%
- Negative perception: 53.7%
- At least one out of three: 75.5%
- All three (INTENSE EXPOSURE): 16.7%
Depressive episode (2014)

- Intense exposure: 50.3%
- Moderate exposure: 31.4%
- No exposure: 22.5%
- Eastern Townships: 27.7%
Anxiety symptoms (2014)

- Intense exposure: 29.3%
  - Finding most of the days stressful: 12.9%
  - Anxiety disorder: 11.6%
  - Feeling insecure in the neighbourhood: 1.7%
- Moderate exposure: 19.0%
  - Finding most of the days stressful: 8.4%
  - Anxiety disorder: 1.7%
- No exposure: 14.8%
  - Finding most of the days stressful: 3.8%
  - Anxiety disorder: 2.7%
- Eastern Townships: 21.3%
  - Finding most of the days stressful: 6.5%
  - Anxiety disorder: 2.8%
Substance use (2014)

<table>
<thead>
<tr>
<th>Exposure Type</th>
<th>Anxiolytic Drug Use (%)</th>
<th>Alcohol Abuse (≥1 episode/week) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intense exposure</td>
<td>20.1%</td>
<td>16.5%</td>
</tr>
<tr>
<td>Moderate exposure</td>
<td>12.6%</td>
<td>12.4%</td>
</tr>
<tr>
<td>No exposure</td>
<td>8.9%</td>
<td>3.8%</td>
</tr>
<tr>
<td>Eastern Townships</td>
<td>11.4%</td>
<td>10.5%</td>
</tr>
</tbody>
</table>
PSYCHOLOGICAL IMPACT OF THE DISASTER, 2½ YEARS AFTER
Poor general health (2014-2015)
Anxiety disorder (2014-2015)
Post-traumatic stress (2015)
Psychosocial services use (2014-2015)
Environmental risk perception (2015)

- At least one problem (air pollution, noise, odour)
- Not drinking tap water from aqueduct network

- Lac-Mégantic
- Granit (elsewhere)
- Estrie (elsewhere)
More than 2 years after the disaster, direct victims (i.e. objective and subjective losses) as well as the whole community of Lac-Mégantic still suffer.

Various global and psychological health issues were found to be more common in Lac-Mégantic relative to other parts of the region.

Unfortunately, and despite intensive efforts to support the community, very limited improvement was observed between 2014 and 2015 regarding the psychological recovery of local population.
What we learnt

- In the Granit region, and more specifically in Lac-Mégantic:
  - Signs of post-traumatic stress are common

<table>
<thead>
<tr>
<th></th>
<th>Total IES mean</th>
<th>Intrusion mean</th>
<th>Avoidance mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Score 0-75</td>
<td>Score 0-35</td>
<td>Score 0-40</td>
</tr>
<tr>
<td>Lac-Mégantic residents 2015</td>
<td>35.5</td>
<td>19.4</td>
<td>16.1</td>
</tr>
<tr>
<td>Direct victims (Granit RCM)</td>
<td>40.0</td>
<td>22.0</td>
<td>17.9</td>
</tr>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Mobile County (AL) 2010*</td>
<td>25.0</td>
<td>13.7</td>
<td>11.3</td>
</tr>
<tr>
<td>South Mobile County (AL) 2011*</td>
<td>25.3</td>
<td>13.7</td>
<td>11.6</td>
</tr>
<tr>
<td>Rape victims (initial assessment)*</td>
<td>49.8</td>
<td>23.8</td>
<td>26.0</td>
</tr>
<tr>
<td>Rape victims (2 years)*</td>
<td>27.4</td>
<td>11.4</td>
<td>16.0</td>
</tr>
<tr>
<td>Bereavement from parental death (3-6 wks)*</td>
<td>-</td>
<td>21.6</td>
<td>-</td>
</tr>
<tr>
<td>Bereavement from parental death (6 months)*</td>
<td>-</td>
<td>13.8</td>
<td>-</td>
</tr>
</tbody>
</table>

- Health needs are persistent, and even increasing
- **Paradox**: demand for psychosocial services has declined
- Concerns have been raised regarding the physical and social environment

*Gill et al., Nat Hazards (2014)*
What we know

- Most studies have found significant differences between persons who are exposed to a catastrophe and those who are not.
- Catastrophes caused by human error are more detrimental.
- The accumulation of losses and disruptive events increases the risk of developing health problems.
- The presence of secondary stressors amplifies the feeling of distress of individuals which has an influence on its duration.
- The consequences of disasters can persist over time if there is insufficient assistance or support.
- Some health problems may develop a few months or years after the traumatic event.
An ongoing mixed methods study (SSHRC, 2015-2020) will provide deeper understanding on the consequences of such disasters and ways to enhance the well-being of victims.
Emergency response

Five lessons

1. Need for a national framework orienting public health actions before, during, and after a disaster

2. Agreement with respect to the timely sharing of sensitive information before a disaster

3. Understanding of respective roles and responsibilities of partners prior facing the challenges of a real tragedy

4. Interpretation guide for the mixture of compounds available at all time to physicians on duty

5. Local radio, direct local communication and door-to-door distribution of written communication most effective
Two lessons

1. Never underestimate the long-term impacts of a tragedy, especially on mental health and psychological well-being.

2. For the sake of transparency, complete and accurate relevant information should be disclosed as far as possible.
Conclusion

- Public Health issues:
  - Diverse:
    - Real and perceived risks
    - Chemical, physical, biological, psychosocial hazards
    - Many potential sources of exposure
  - Concerning the public and the workers
  - In the short, medium and long term
- Importance of a joint, sustained, flexible and adaptable intervention
- Need for adequate public health emergency preparedness
The recovery of those affected:
- is a decisive phase for health and well-being
- will span into the medium and long term
- requires a sustained effort from everyone involved
- requires a flexible, collaborative approach
- must capitalize on the strengths of the community
THE END
THANK YOU!
Généreux et al., The public health response during and after the Lac-Mégantic train derailment tragedy: a case study, Disaster Health (2015)

http://www.tandfonline.com/doi/full/10.1080/21665044.2014.1103123