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

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Centre intégré universitaire de santé et de services sociaux de l'Estrie – Centre hospitalier universitaire de Sherbrooke
Québec

OUTLINE

1. A Look Back
2. The First Days/Weeks
3. The First Years
4. Lessons and Conclusion

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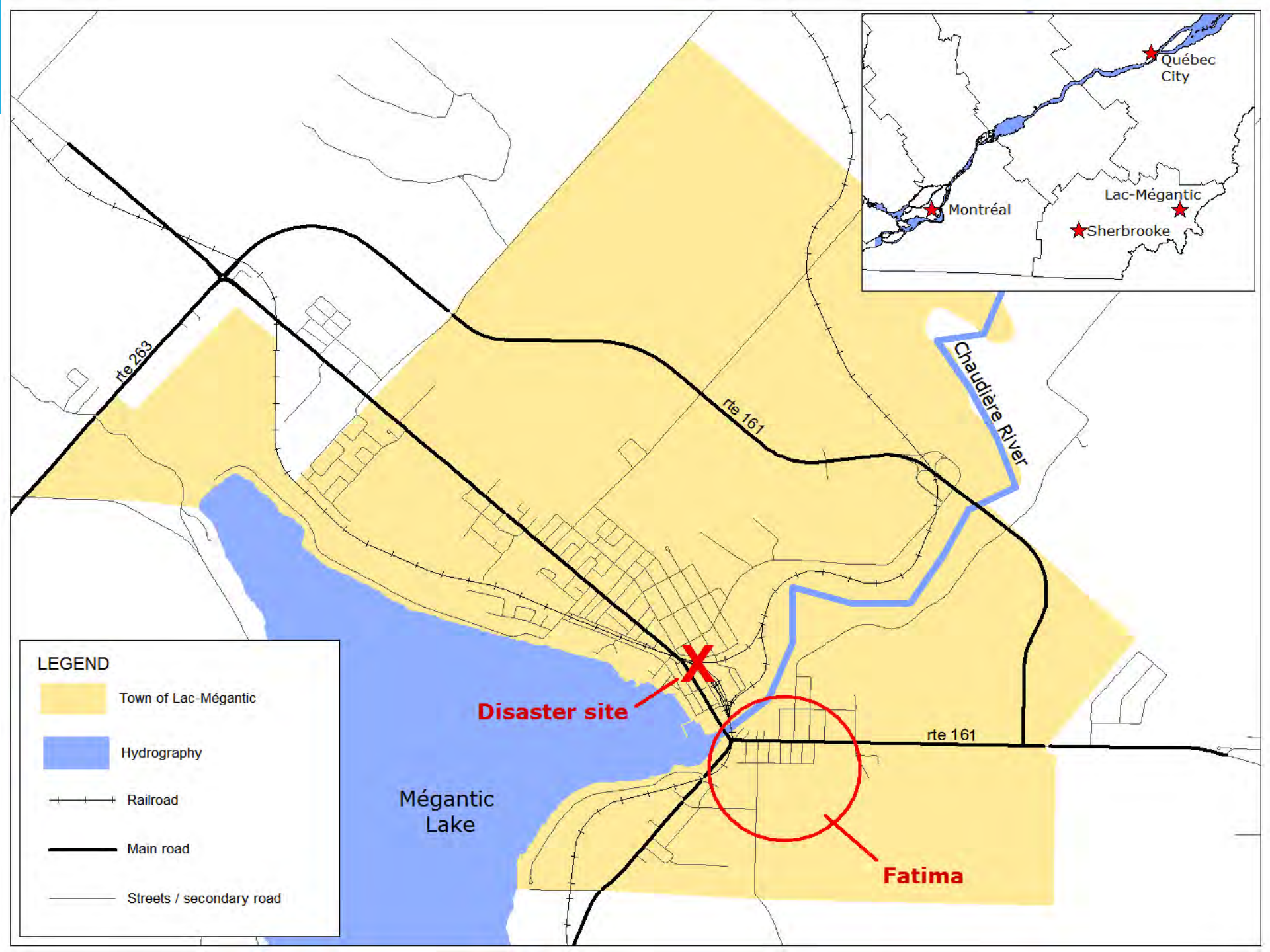
The town of Lac-Mégantic

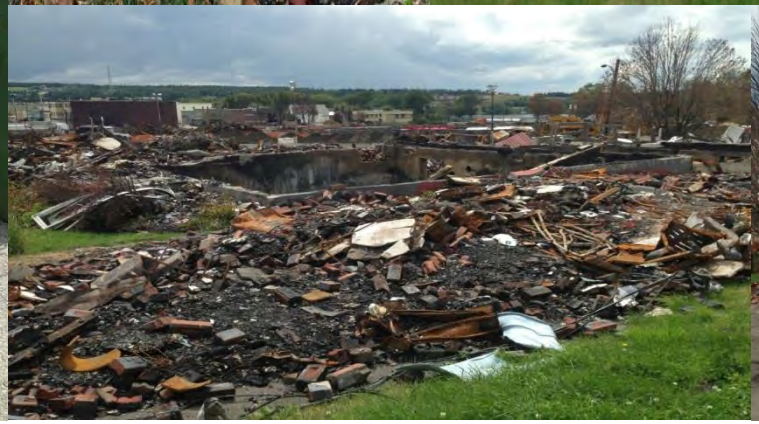
Source: Town of Lac-Mégantic

Background

- 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


Québec City
Montréal
Lac-Mégantic
Sherbrooke
rte 263
rte 161
Chaudière River
Disaster site
rte 161
Mégantic Lake
Fatima
LEGEND
Town of Lac-Mégantic
Hydrography
Railroad
Main road
Streets / secondary road

Devastated neighbourhoods



A cloud of smoke

An oil spill

- 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

Emergency response operations

- 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)

2013-07-06 Urgence Lac-Megantic

		PhD6									Hapsite				
Heure	Station	HAP	SO2	CO	NO	NO2	NOX	TSP	PM-10	PM-2.5	Benz	Tol	Ethyl	Xyl	Remarques
		ng/m³ pt	ppb	ppm	ppb	ppb	ppb	µg/m	µg/m³	µg/m³	ug/m	ug/m3	ug/m	ug/m3	
8h20	commend. Rapproché										15	117	59	312	15 um benzene
8h24		400	6		[illegible]										
8h24	Notre dame/ Daniel	170	6.2		115	37	142	11	11	10.5					
8h30	lallemand/Garnier	300	6		200	400	590	15	15	13					
8h35	Salaberry/St-Edouard	36	6		70	50	100	3	13	10					
8h39	Energex 3823 P. Kennedy	117	6		200	30	219	7	17	15					
8h43	3817 Wolfe	30	6		21	17	38	13	13	11					
8h46	512 Lemay	600	5		120	420	530	96	93	78					ds panache
8h54	salaberry/garnier	10	5		32	1	28	16	15	12					
8h56	Salaberry/St-Edouard	48	5		31	-10	18	21	18	13					
9h00	6982 Salaberry	170	5		50	20	70	31	28	24					max HAP 250
9h05	Salaberry/JM Tardif	280	5		120	-60	50	32	32	27					
9h10	Salaberry/JM Tardif	300	5		4	6	10	47	47	40	5	12	4	22	Hapsite 06
															Transfer de données 9h12
9h13	Au coin Tardif	720	5		4	3	7	78	78	66					
9h18	Un peu plus loin	350	5		10	11	20	56	55	43					
9h27	Sur Villeneuve coin Tardif	800	4		500	180	600	15	15	13					
9h40	Villeneuve/rte 204	9	3		0	2	3	17	15	13					
9h52	Wolfe pres 6589	75	3		16	3	18	16	15	13					pluie forte; max HAP 280
9h56	6585 Wolfe	732	3		1	94	95	36	34	28					pluie forte; max 1100 HAP
9h58	6594 Wolfe	2500	3		160	80	130	14	14	12					
10h03	6594 Wolfe	540	3		160	180	330								moy 5min
10h05	Wolfe/Lemay	1200	3		11	60	70	230	215	165					max HAP 2000
10h07	Wolfe/Lemay	2360	3		63	23	82	220	215	150					Max HAP 3200
10h15	Wolfe/Lemay	1200	4		23	29	40	133	130	105					max HAP 1680
10h20	3517 St-Edouard	15	4		40	100	140	15	15	14					
10h24	Joliette/Salaberry	36	4		1	6	7	18	18	15					
10h27	3720 Joliette	1500	4		1	274	275	26	25	21					
10h30	3189 Joliette	120	4		1	7	8	23	23	20					
10h32	3872 Joliette	280	4		3	34	37	40	40	36					
		400	4		5	2	7	58	58	53					moy 1 min; gorge pique larmoiemer
10h35	Joliette/Lemay	930	4		1	6	7	123	120	103					max HAP 1000
10h39	Cremazie/Wolfe	70	4		24	5	27	18	18	17					max HAP 230
10h42	Cremazie/Foyer	130	4		200	250	432	25	25	22					contamination TAGA?
10h44	Cremazie/P. Kennedy	260	4		260	225	465	15	15	16					
11h00	Montcalm coin Salaberry	30	4		2	8	9	15	15	13					
11h02	Montcalm coin Salaberry	[illegible]						35							Max

Toujours Tous les HAP dans des Sommes
1000 = Symptoms

- BTEX
- Air ambiant donc petites molécules
- Naphtalene

Heure de réception Juil 6. 2013 4:50PM N° 0060

Reintegration

- 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

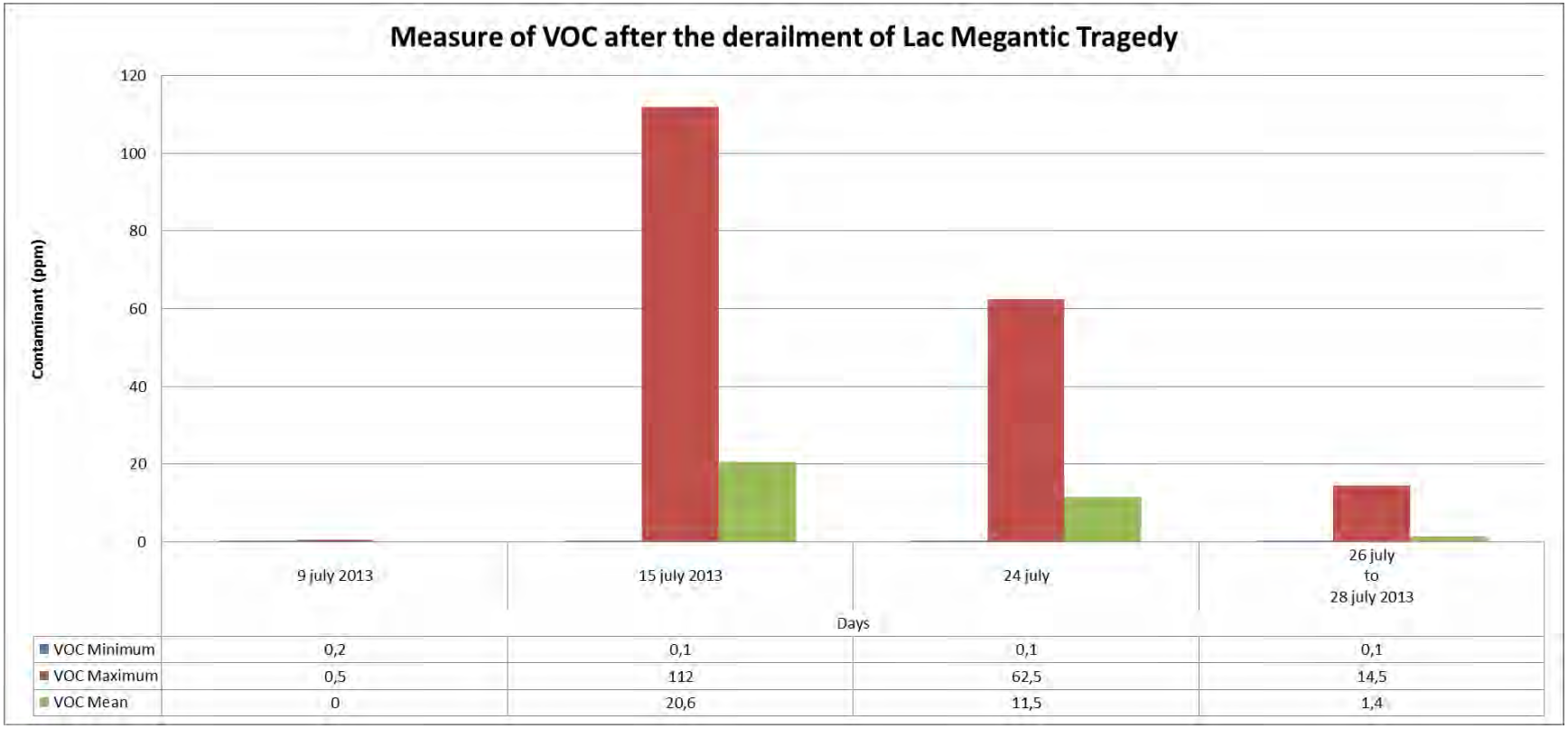
Drinking water monitoring

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

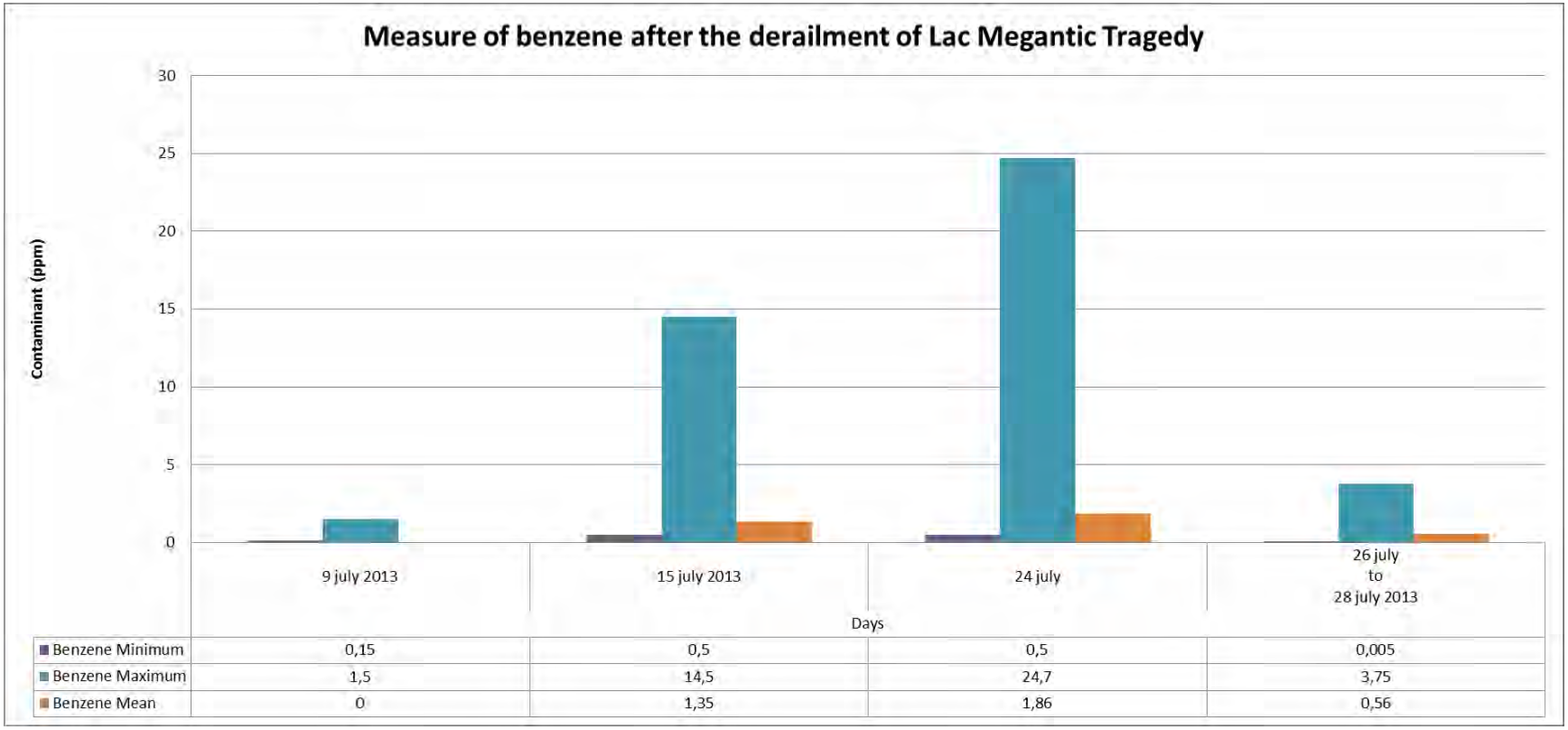
- Daily measurements at the site during the work
- Direct reading instruments
- Gases evaluated:
  - Benzene
  - VOC
  - Toluene
  - Ethylbenzene
  - Xylene
  - Hexane
  - H_2S
  - SO_2
  - CO
- Suspended Dust Particles evaluated:
  - PM_{10}
  - Asbestos
- Lower Explosive Limit (LEL)

Summary of the results: VOC



	9 july 2013	15 july 2013	24 july	26 july to 28 july 2013
VOC Minimum	0,2	0,1	0,1	0,1
VOC Maximum	0,5	112	62,5	14,5
VOC Mean	0	20,6	11,5	1,4

Summary of the results: Benzene



	9 july 2013	15 july 2013	24 july	26 july to 28 july 2013
Benzene Minimum	0,15	0,5	0,5	0,005
Benzene Maximum	1,5	14,5	24,7	3,75
Benzene Mean	0	1,35	1,86	0,56

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 recommandations (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

Type of incident	Number of workers	Causal link
Accidental inhalation of oil vapour	5 cases	• 1 clearly linked • 1 probable • 3 uncertain
Accidental projection of liquid	3 cases	• 2 cases clearly linked, including a CSST intervention to correct work methods • 1 probable case
Exhaustion	4 cases	Unlikely link; non-specific symptomatology
Other	2 cases	Non-specific symptoms difficult to link to exposure

RECOVERY:
THE FIRST YEARS

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

A regional health study

- *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.)

Exposure (in Granit only)

- **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

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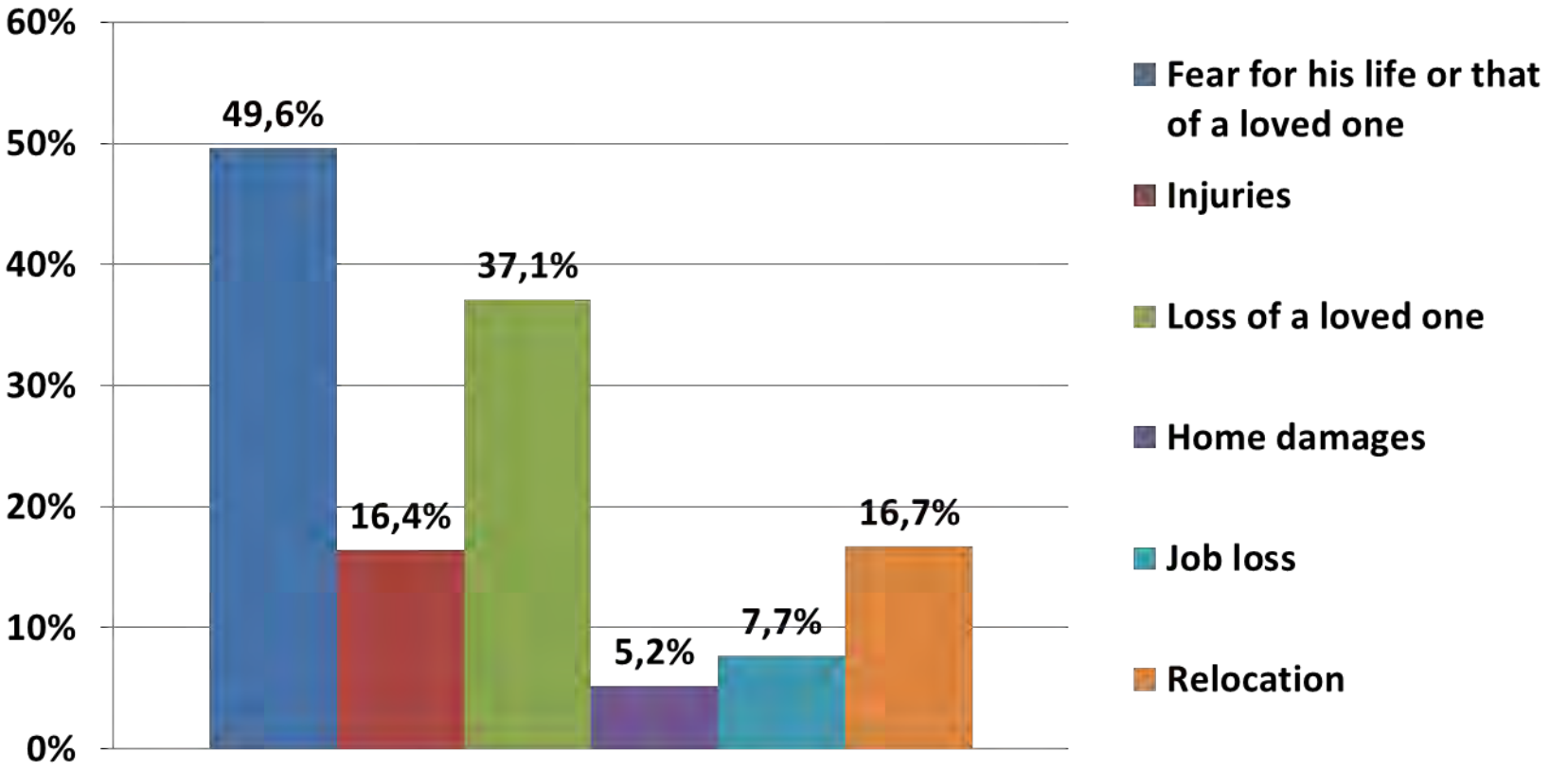
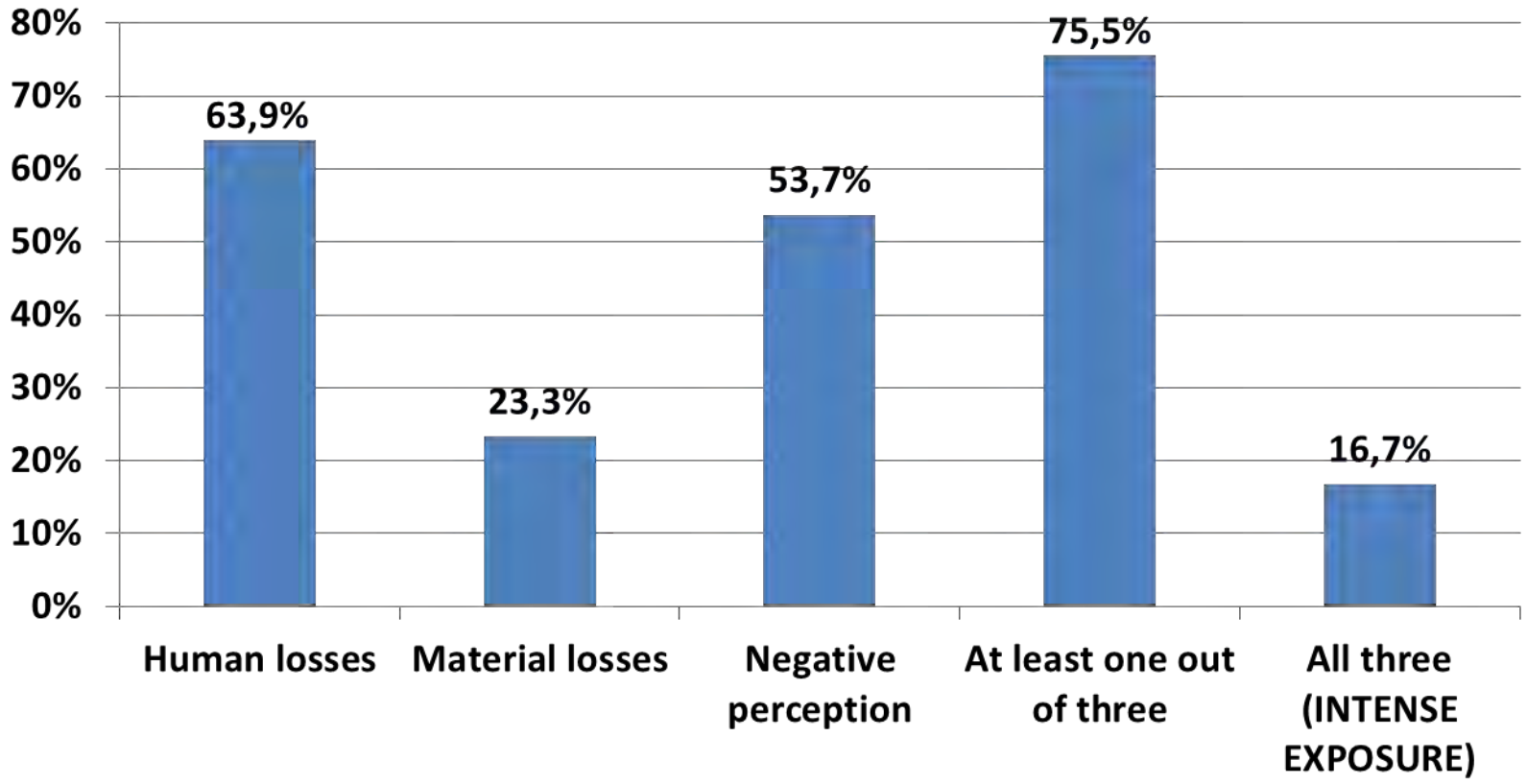
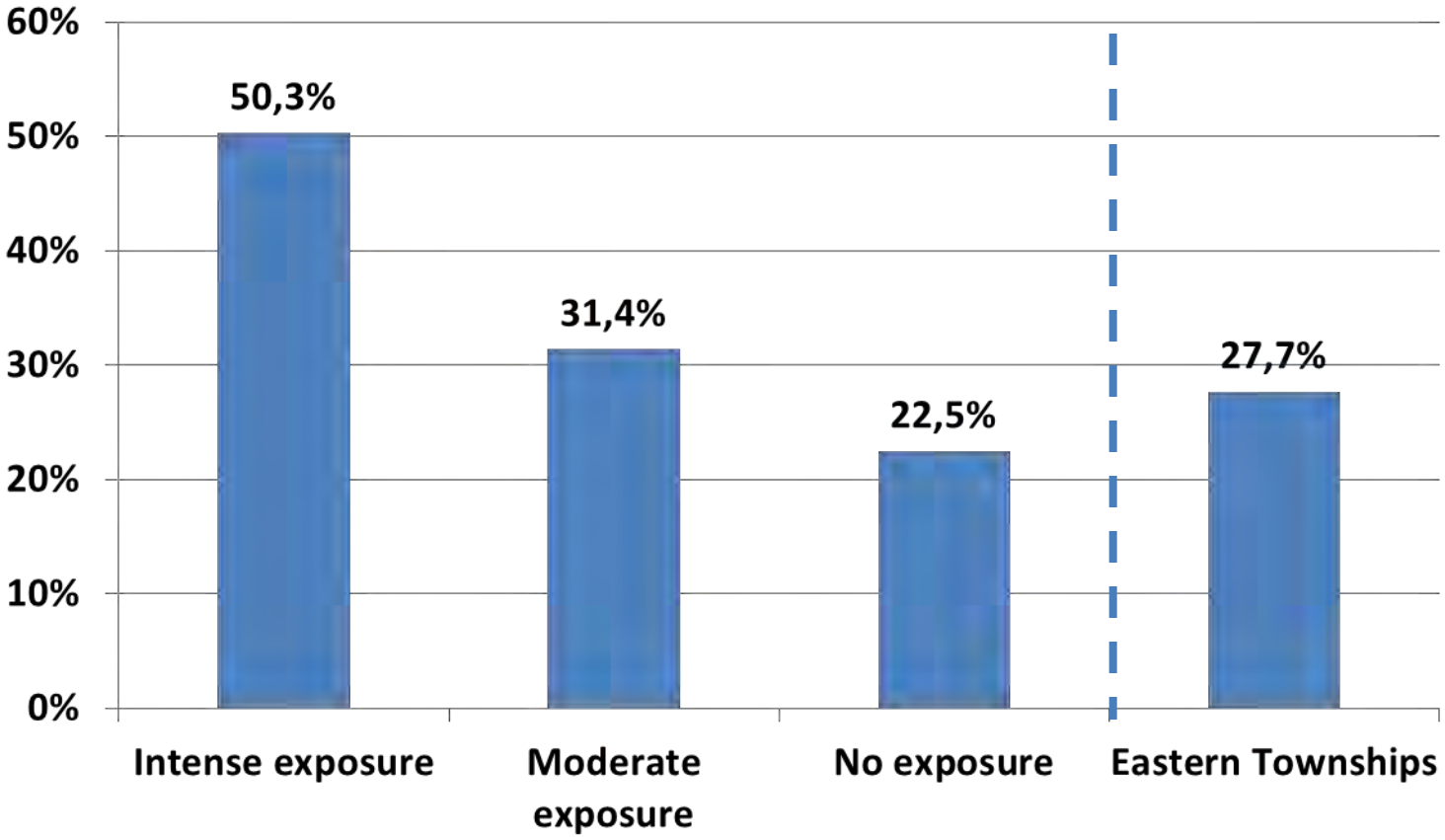
Human and material losses (2014)



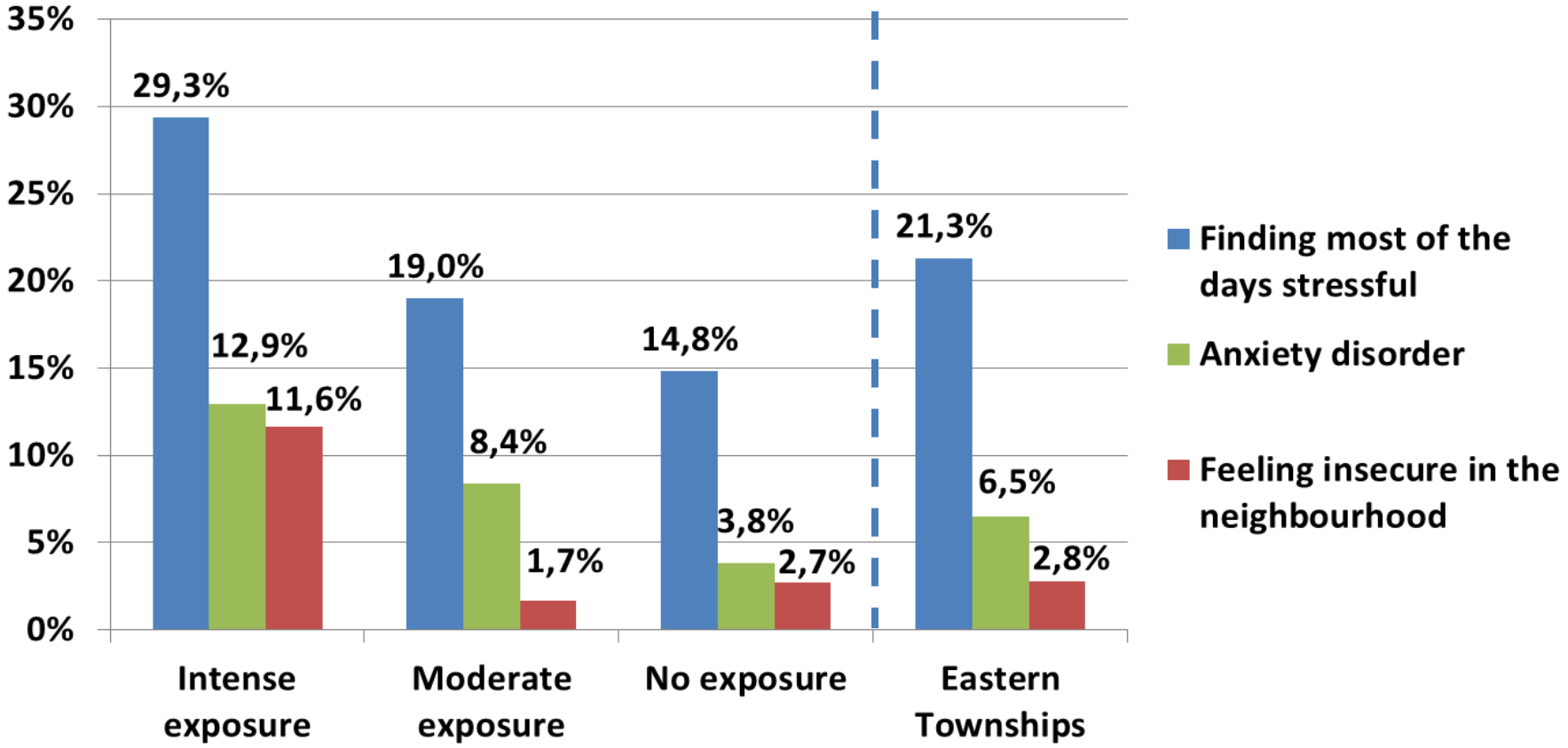
Intensity of exposure (2014)



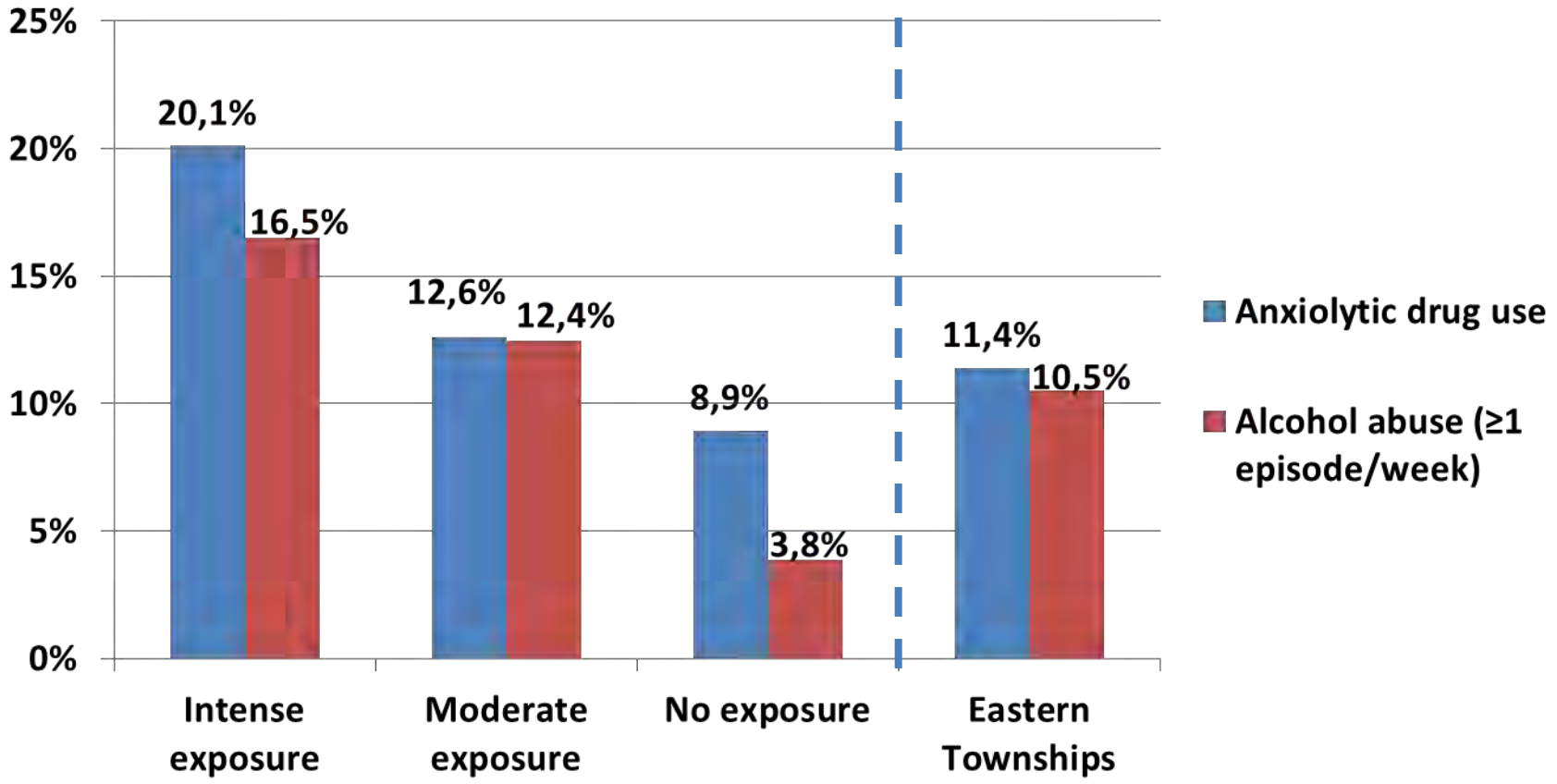
Depressive episode (2014)



Anxiety symptoms (2014)



Substance use (2014)



PSYCHOLOGICAL IMPACT OF THE DISASTER, 2½ YEARS AFTER

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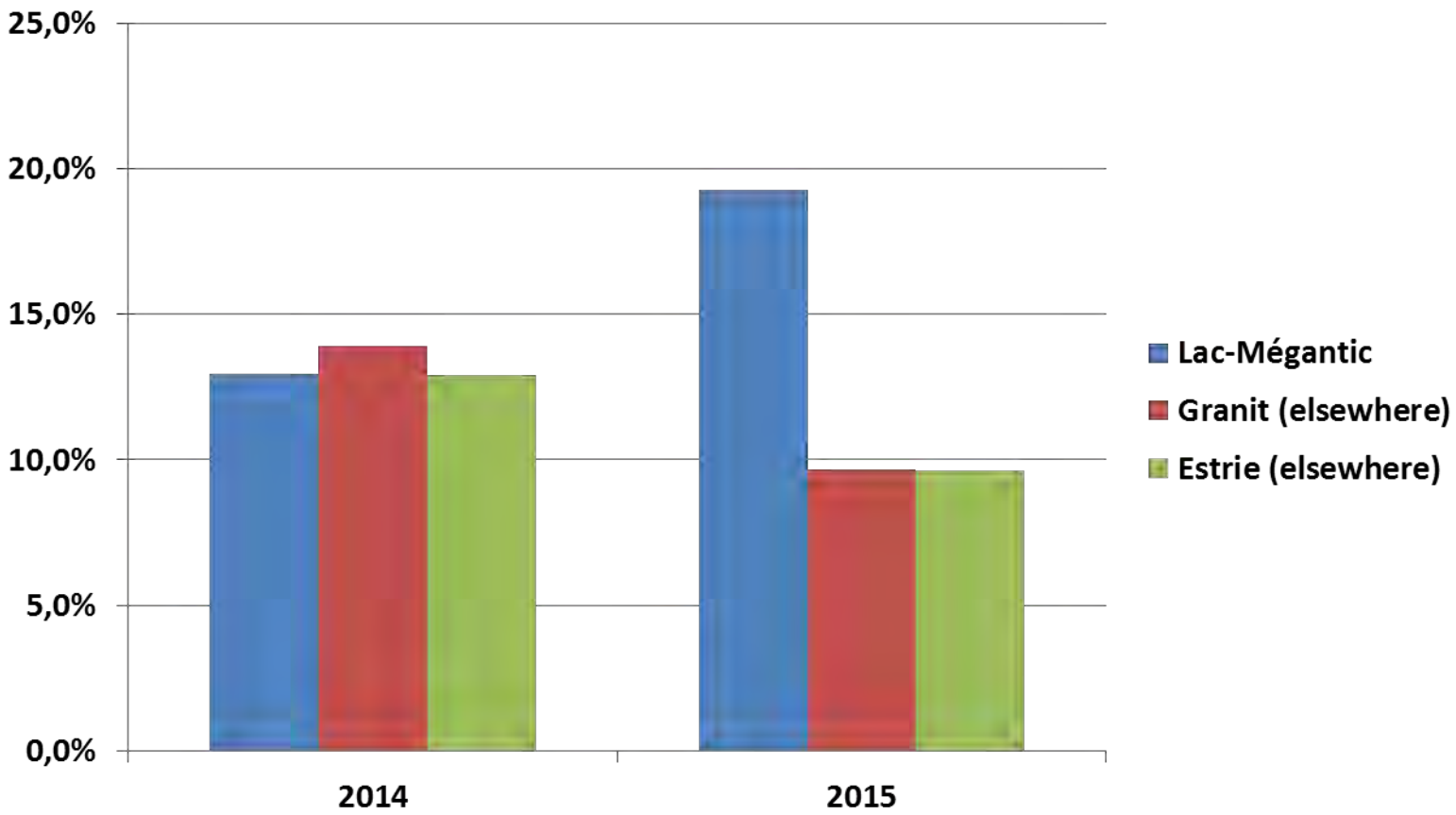
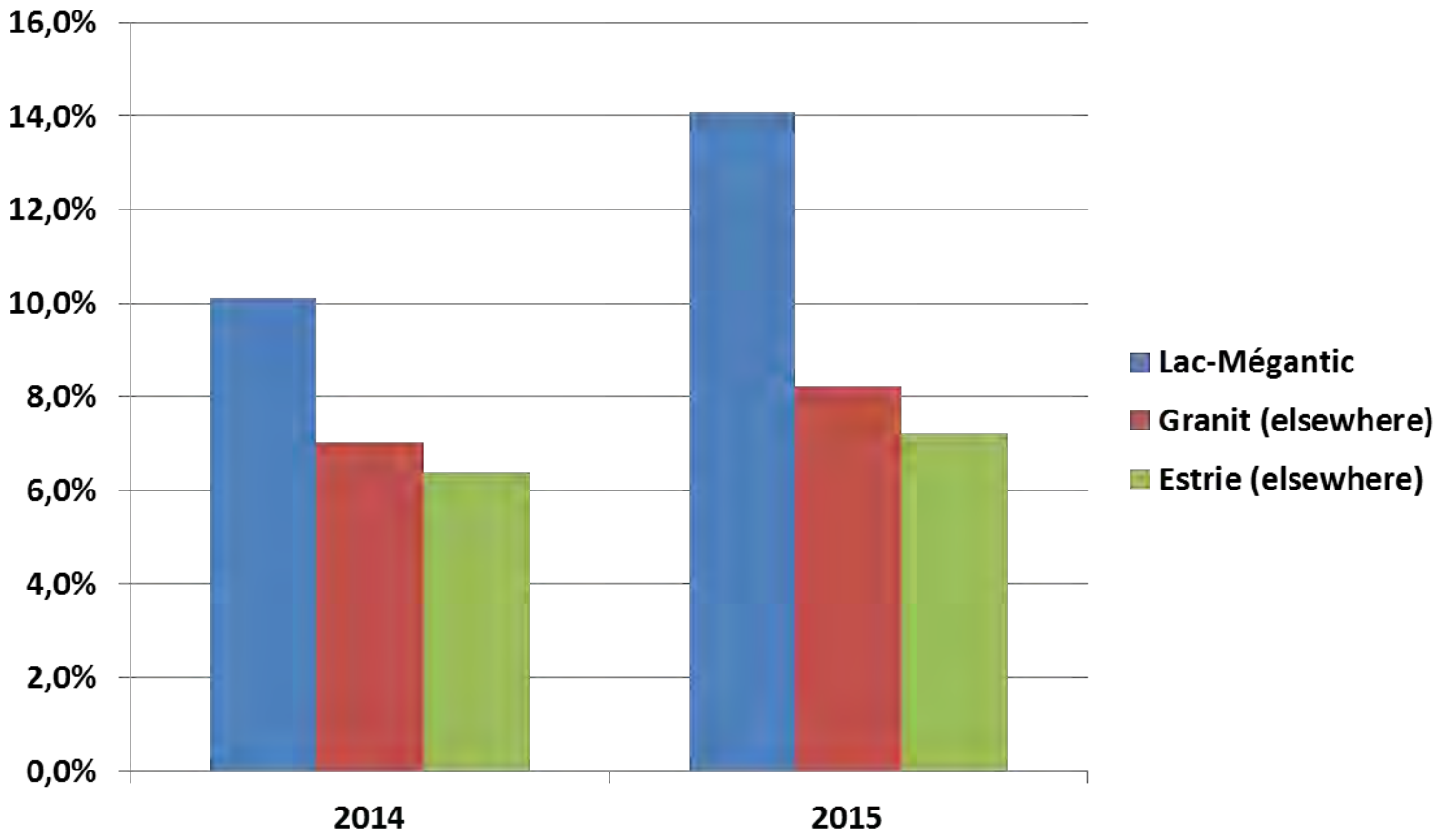
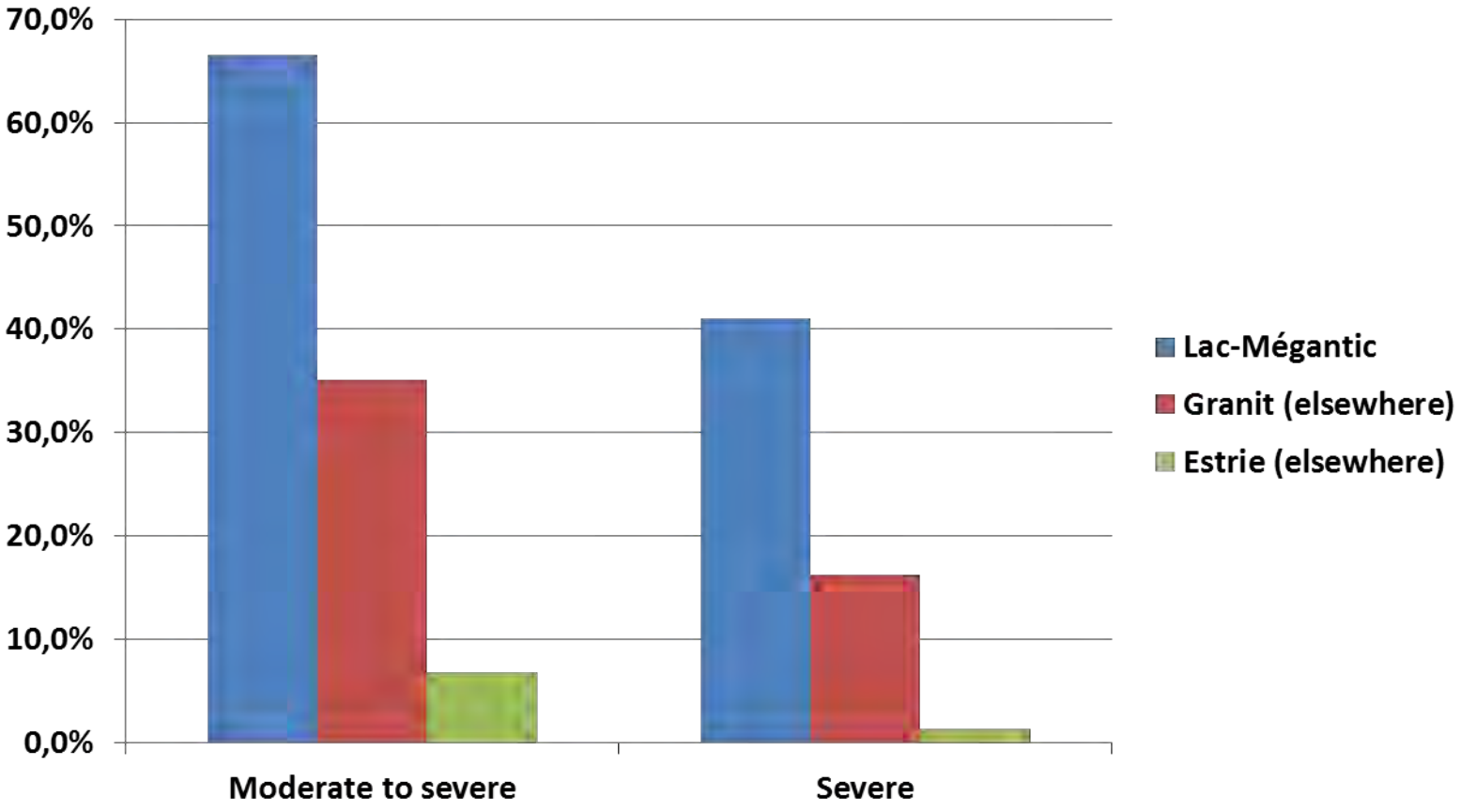
Poor general health (2014-2015)



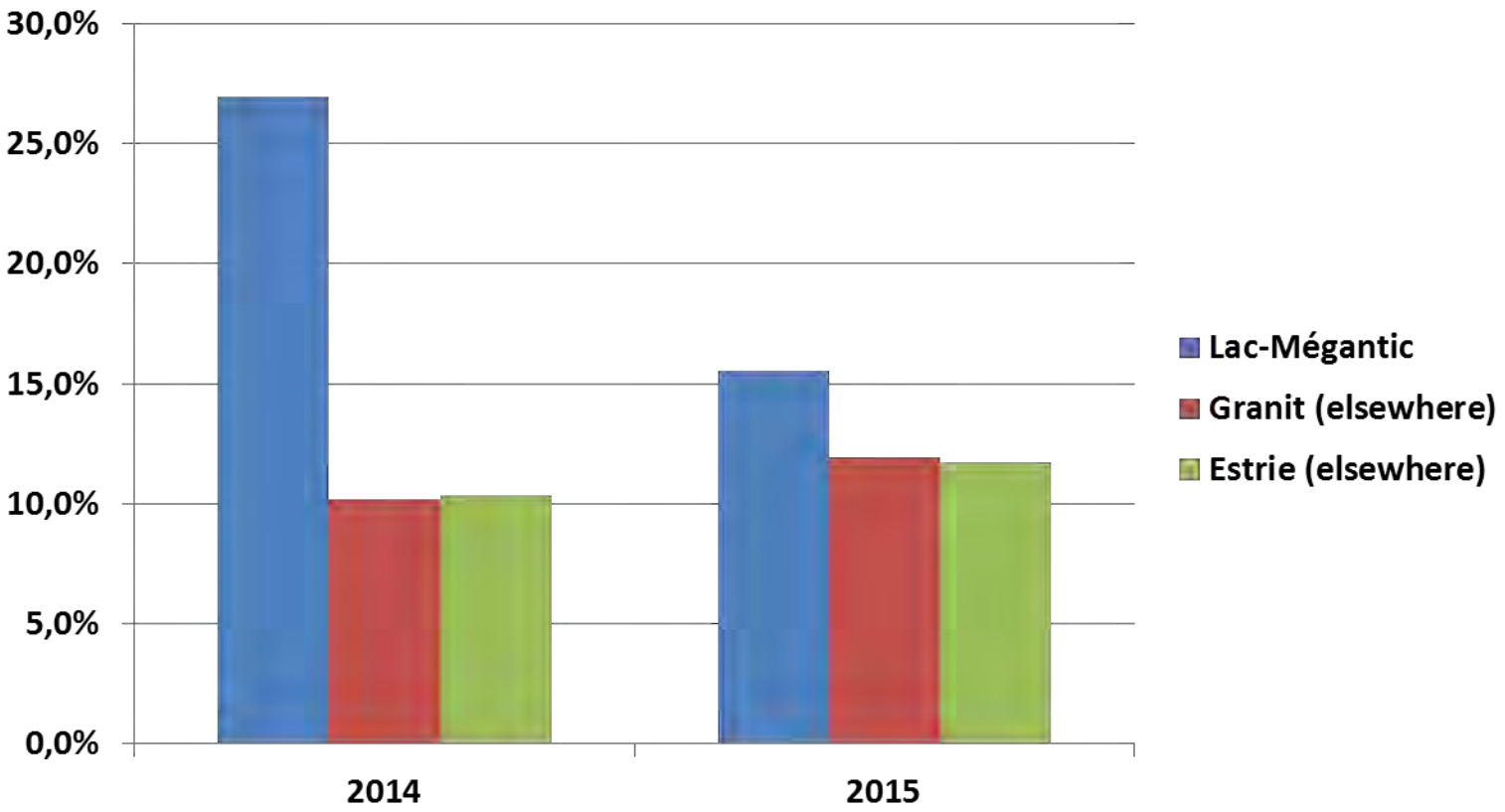
Anxiety disorder (2014-2015)



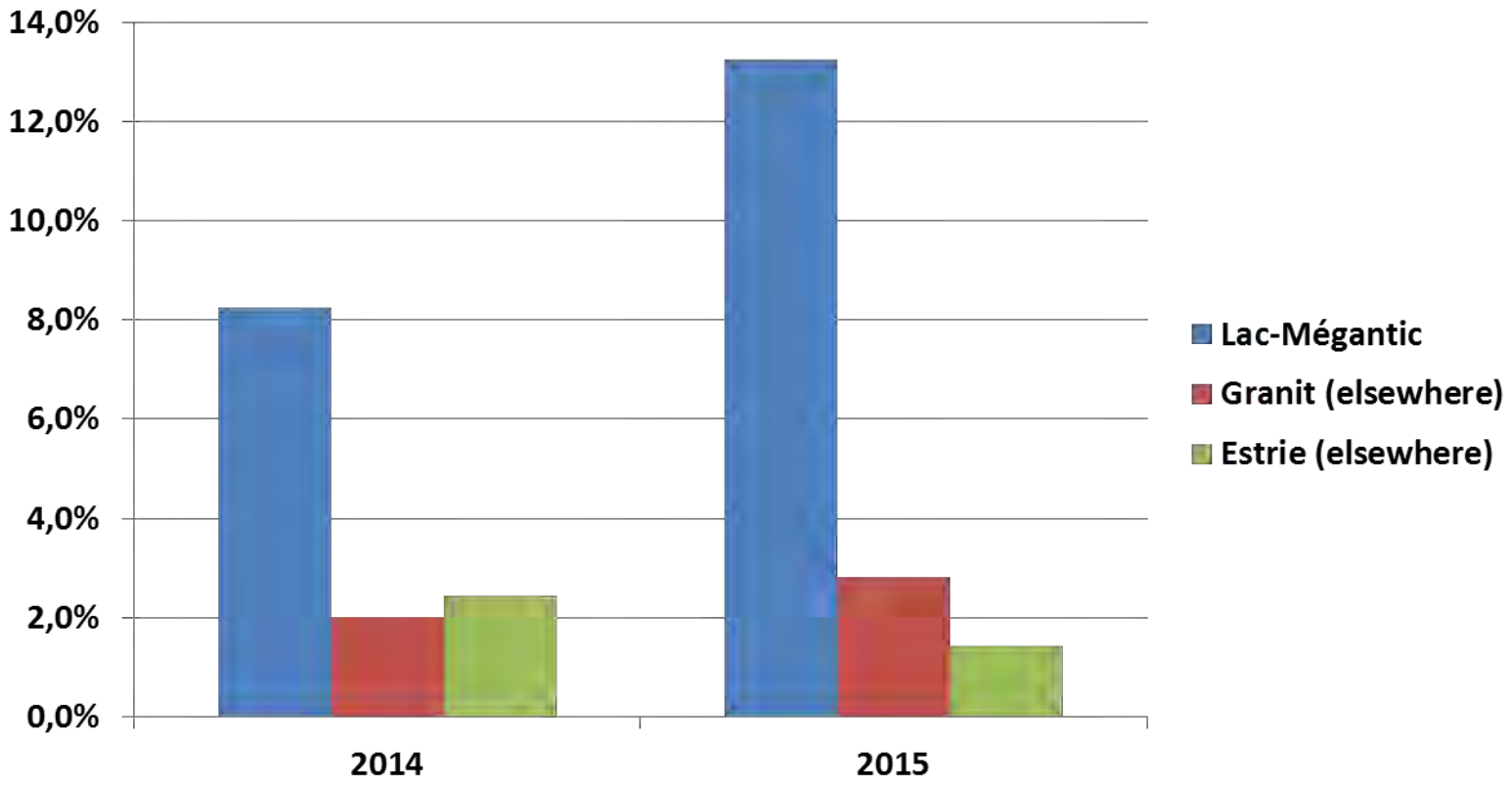
Post-traumatic stress (2015)



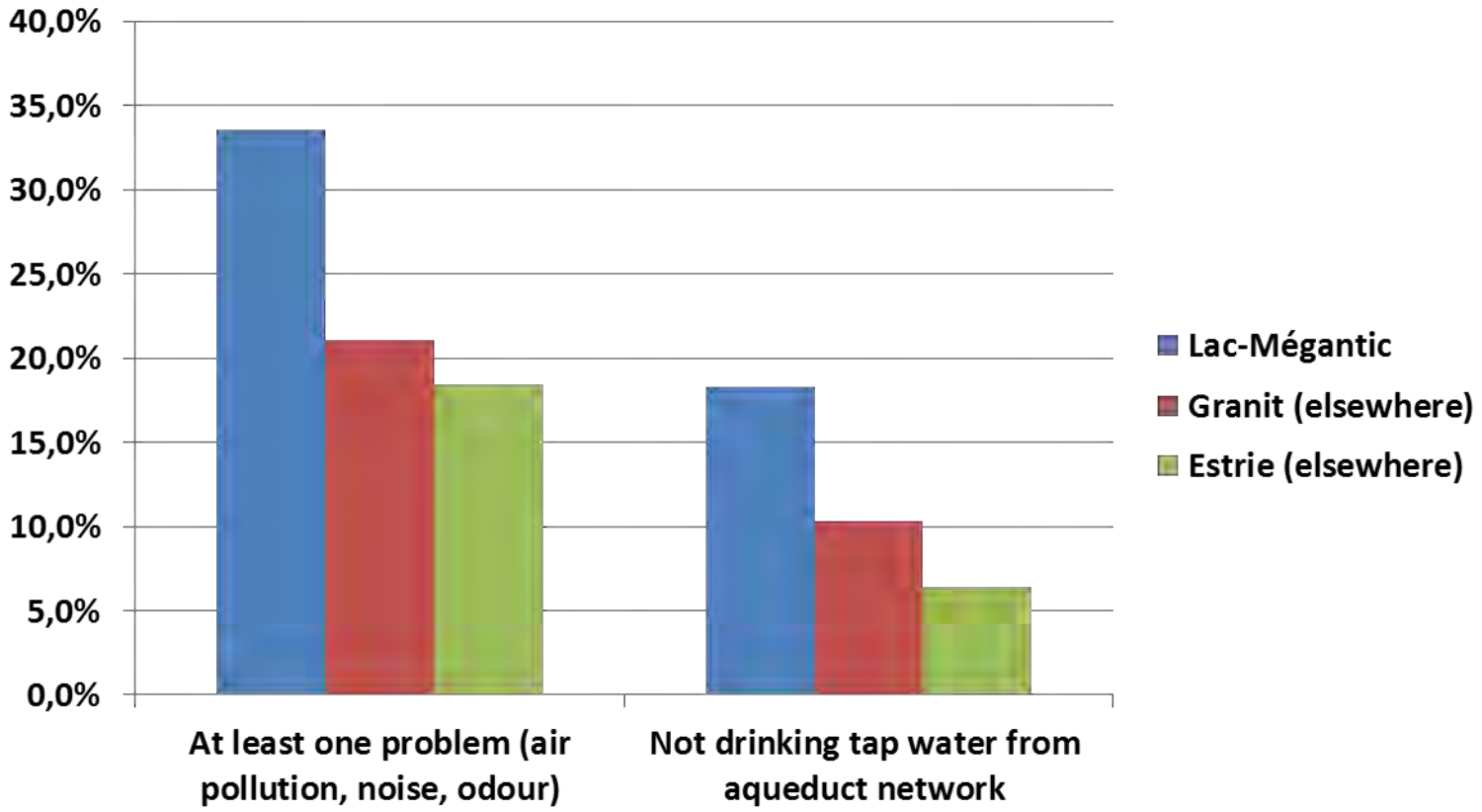
Psychosocial services use (2014-2015)



Neighbourhood insecurity (2014-2015)



Environmental risk perception (2015)



What we learnt

- 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

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

  - 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

Upcoming

- 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

Recovery

- Two lessons

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

Conclusion

- 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!

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PAPER RECENTLY PUBLISHED

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

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