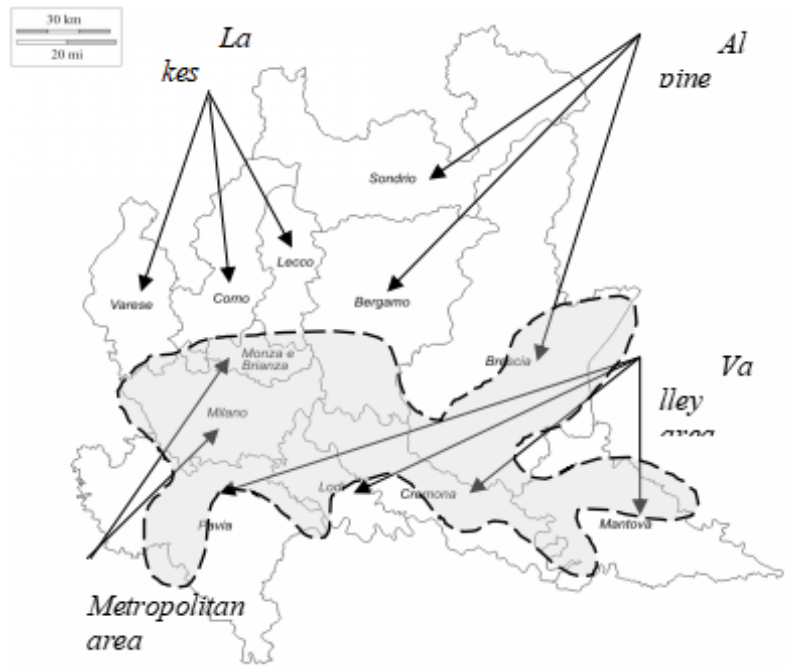

Supplementary data



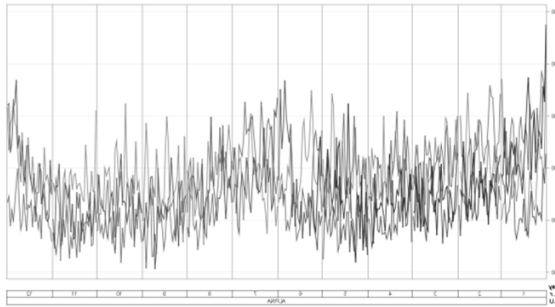
Supplementary Figure 1: Event Area.

This figure shows the overlap between the frozen rain event area and the Azienda Regionale Emergenza e Urgenza AREU territory (modified from www.centrometeolombardo.com)¹. The report regarding the extension of the event area was obtained from official records by the regional institute of environmental policies in Northern Italy (ARPA – Agenzia Regionale per la Protezione Ambientale) and from meteorological bulletins published on newspapers and the Internet. The AREU territory embraces all Lombardy and is organized into four areas, each with a Regional Dispatch Centre, receiving emergency medical calls from one of the three Public Safety Answering Points (PSAPs) of the European Emergency Number 1.1.2.. The Metropolitan area encompasses the city of Milan and the province of Monza-Brianza; the Lakes area, located north from Milan, is composed by the provinces of Varese, Como and Lecco; the Alpine area covers the mountain region in the provinces of Sondrio, Bergamo and Brescia, to the north-east of Milan; finally, the Po river Valley area extends to the south-east of the city, made up by the provinces of Pavia, Lodi, Cremona and Mantua.

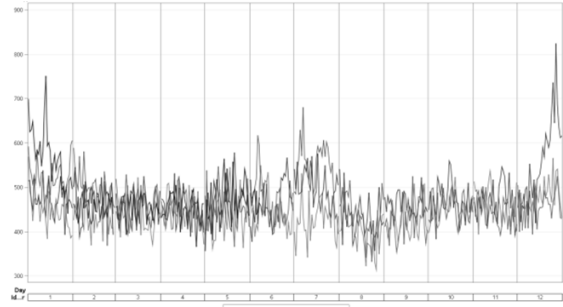
¹.Centro Meteo Lombardo - Mappe Climatiche.

<http://www.centrometeolombardo.com/content.asp?ContentID=7112&ContentType=Mappe>. Published 2017.

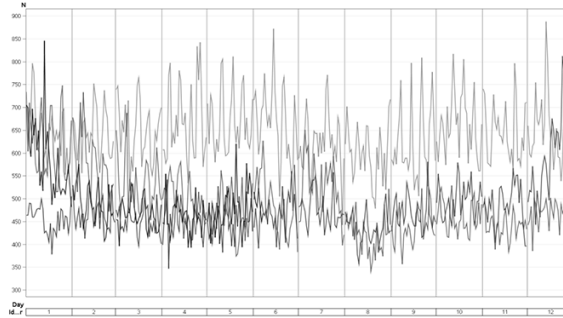
Panel A – Alpine area



Panel B – Lakes area

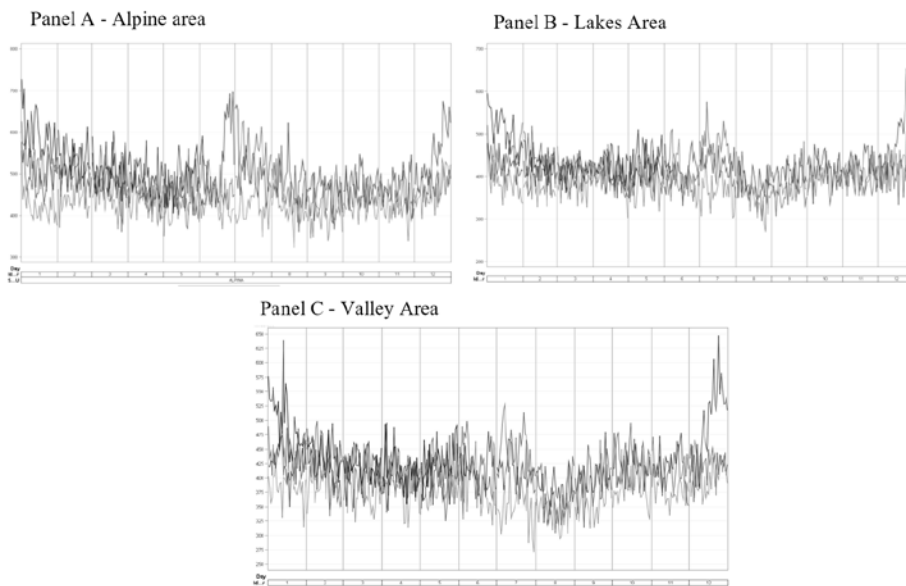


Panel C – Valley area



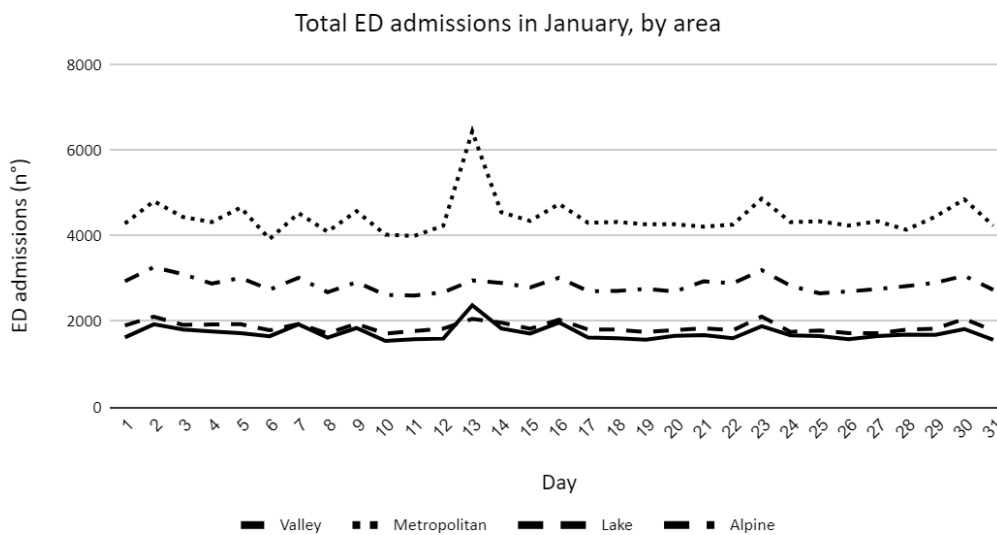
Supplementary Figure 2 (Panels A, B, C): Emergency Calls.

Yearly trends and total calls from January 1st 2014 until May 31st 2017, are shown in the figure for three of the four areas covered by AREU. Each line depicts a single year. The average daily calls were 565 in the Alpine area, 461 in the Lakes area and 539 in the Po valley. On the day of the event, the number of emergency calls rose to more than 750 in the Alpine and Lakes areas and to 850 in the Po Valley area. Figure S2 Panels A to C reports this data.



Supplementary Figure 3 (Panels A, B, C): Emergency Missions.

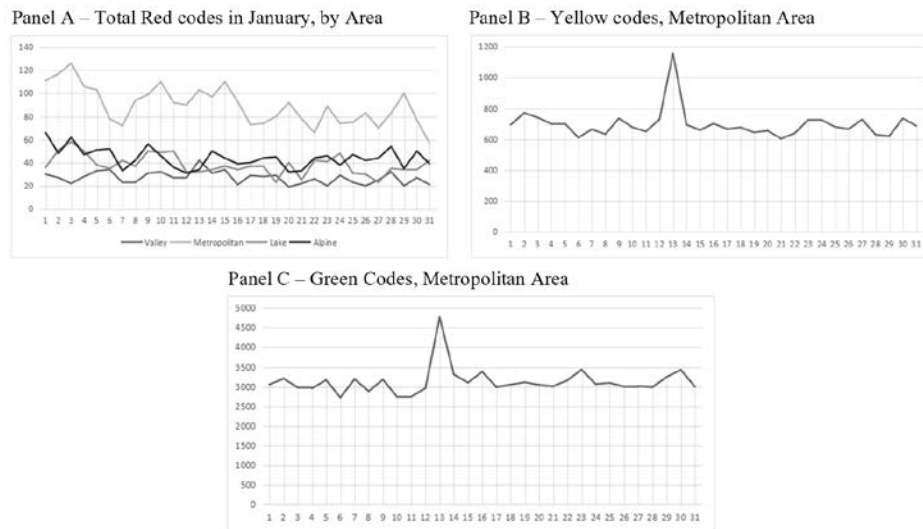
The average daily missions performed were 464 in the Alpine area, 407 in the Lakes area and 404 in the Po valley. During the glaze event, missions dispatched were 650 in the Alpine area, 550 in the Lakes area, and 630 in the Po valley area.



Supplementary Figure 4: Total ED admissions.

Total emergency department admissions during the freezing rain day were 2379 in the Po valley area and 6443 in the Metropolitan Area, against a daily average total of 1728 and 4434 admissions respectively. Admissions increased by 38% and 45% in these two areas, respectively. This is much less evident in the remaining two areas,

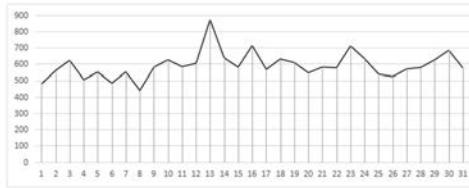
where total admissions during the event day reached 2059 in the Lakes area and 2959 in the Alpine area, a respective increase of only 10% and 4% respectively, over a daily average of 1866 and 2857 cases.



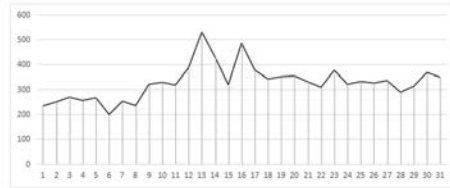
Supplementary Figure 5 (Panels A, B, C): ED severity.

Severe cases, coded “red”, on the event day in the Valley Area were 42 on a daily average of 27 daily emergencies during the month. In the Metropolitan area they were 103 where the mean is 89 red codes daily, while they were slightly under the daily average in the other areas. Lower severity cases coded green and yellow increased by 66% and 52% above the average respectively in the Metropolitan Area, as shown in Panels B and C. Low severity cases increased in the Valley Area too: yellow cases were 66% higher, green cases were 37% more. In the Alpine and Lakes area low severity cases were only slightly more than the daily average in January.

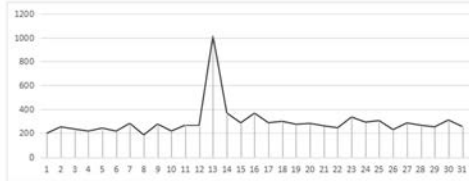
Panel A – Alpine Area



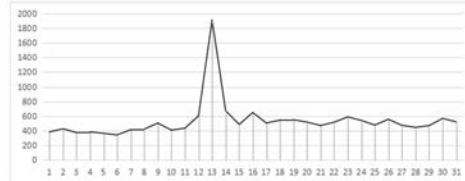
Panel B – Lakes Area



Panel C – Valley Area



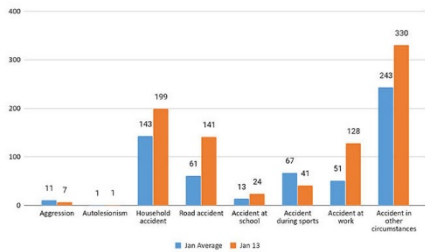
Panel D – Metropolitan Area



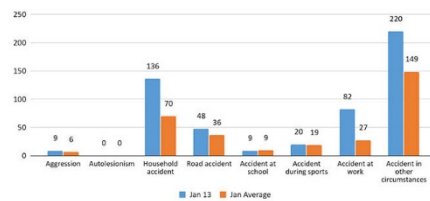
Supplementary Figure 6 (Panels A, B, D): Trauma diagnoses.

Trauma was the most common diagnosis during the freezing rain day. Panels A to D shows the total trauma diagnoses at ED admission during January in the Alpine, Lakes and Valley areas. Trauma diagnoses increased everywhere on the day of freezing rain but only in the Valley and Metropolitan Areas they coincided with the increment in ED visits. Thus it is apparent that the peak in ED visits in the areas most hit by freezing rain was driven by trauma alone.

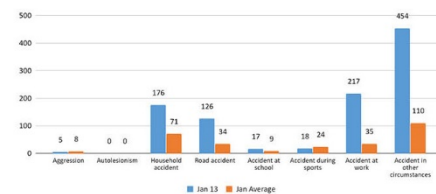
Panel A – Alpine Area



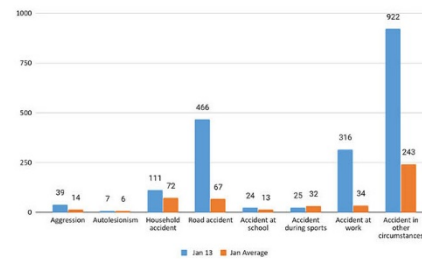
Panel B – Lakes Area



Panel C – Valley Area



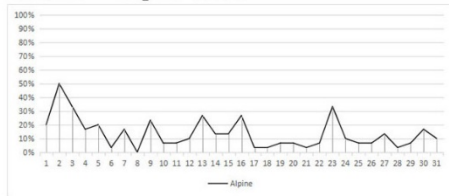
Panel D – Metropolitan Area



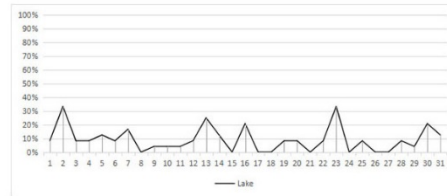
Supplementary Figure 7 (Panels A, B, C, D): Trauma location.

Causes and location of trauma are shown in Panels A to D. Road accidents and accidents during work were highest in the areas where freezing rain hit the most.

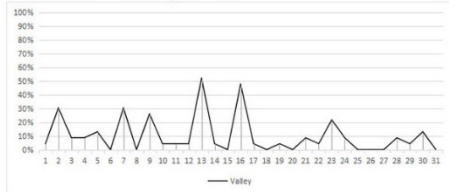
Panel A – Alpine Area



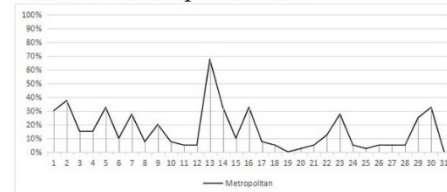
Panel B – Lakes Area



Panel C – Valley Area



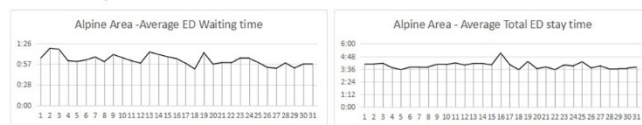
Panel D – Metropolitan Area



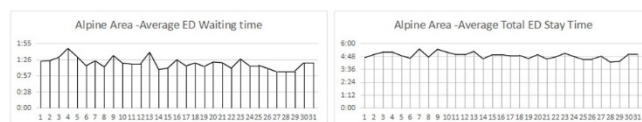
Supplementary Figure 8 (Panels A, B, C, D): ED overload.

Overload for a particular emergency department (ED) was declared when admissions on a selected day surpassed the 90th centile of that ED's normal distribution of cases in the past years. The chart depicts the fraction of overloaded EDs for each area during January 2017. Of note, 68% of EDs in the Metropolitan Area were overloaded. 52% in the Valley Area.

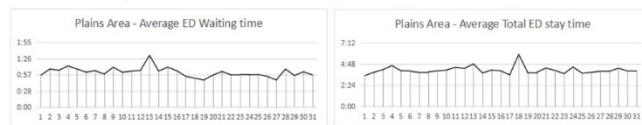
Panel A – Alpine Area



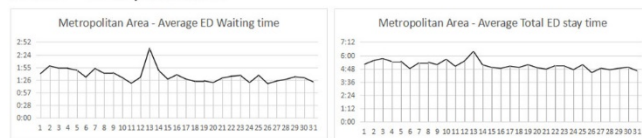
Panel B – Lakes Area



Panel C – Valley Area



Panel D – Metropolitan Area



Supplementary Figure 9 (Panels A, B, C, D): ED waiting time and visit time.

Emergency Department (ED) overload can be also viewed from the analysis of the average time patients had to wait before being visited and the total ED stay time. Notably, on the day of freezing rain visits were significantly delayed in the Metropolitan and Valley Areas, the latter only slightly, while this was not the case elsewhere. On the other hand, total ED stay did not increase with the same magnitude. This may further prove that EDs were overloaded but mostly with less severe cases, rapidly dispatched.

Supplementary Table 1. Non-traumatic diagnoses.

Diagnosis	January 13th	January Average
Alpine Area		
Rhythm disturbances	30	26
Other neurologic symptoms	60	48
Self-inflicted injury	0	1
Fall from reduced height	2	6
Coma	2	2
Dyspnea	79	91
Abdominal pain	129	132
Precordial pain	6	8
Chest pain	70	76
Non traumatic bleeding	15	12
Fever	93	148
Poisoning	6	4
Arterial hypertension	8	8
Respiratory condition	14	9
Social condition	0	1
Psychiatric condition	8	8
Allergy	5	8
Shock	1	0
Acute neurologic syndrome	8	10
Skin condition	31	24
Eye condition	79	84
Dental condition	7	6
Obstetric/gynecological condition	176	179
ENT condition	53	72
Urologic condition	53	59
Agitation	4	5
Burn	5	3
Private violence	5	4
Lakes Area		
Rhythm disturbances	21	18
Other neurologic symptoms	17	14
Self-inflicted injury	2	1
Fall from reduced height	0	0
Coma	1	1
Dyspnea	66	56
Abdominal pain	60	69
Precordial pain	11	9

Chest pain	60	82
Non traumatic bleeding	8	7
Fever	48	68
Poisoning	1	2
Arterial hypertension	7	8
Respiratory condition	4	6
Social condition	0	0
Psychiatric condition	9	6
Allergy	6	6
Shock	0	0
Acute neurologic syndrome	4	6
Skin condition	4	10
Eye condition	36	38
Dental condition	1	2
Obstetric/gynecological condition	88	88
ENT condition	27	30
Urologic condition	29	31
Agitation	1	4
Burn	0	1
Private violence	2	2
Valley Area		
Rhythm disturbances	13	17
Other neurologic symptoms	27	27
Self-inflicted injury	0	1
Fall from reduced height	0	1
Coma	2	1
Dyspnea	77	65
Abdominal pain	52	89
Precordial pain	5	8
Chest pain	59	54
Non traumatic bleeding	18	16
Fever	53	77
Poisoning	8	5
Arterial hypertension	3	8
Respiratory condition	7	8
Social condition	0	0
Psychiatric condition	3	3
Allergy	3	5
Shock	0	0
Acute neurologic syndrome	2	4
Skin condition	6	11
Eye condition	12	24
Dental condition	6	4

Obstetric/gynecological condition	56	62
ENT condition	10	23
Urologic condition	14	23
Agitation	4	5
Burn	3	1
Private violence	1	2
Metropolitan Area		
Rhythm disturbances	47	40
Other neurologic symptoms	36	40
Self-inflicted injury	0	0
Fall from reduced height	14	2
Coma	4	2
Dyspnea	85	116
Abdominal pain	118	153
Precordial pain	4	8
Chest pain	88	88
Non traumatic bleeding	15	21
Fever	75	156
Poisoning	3	7
Arterial hypertension	20	20
Respiratory condition	2	6
Social condition	2	1
Psychiatric condition	7	10
Allergy	12	17
Shock	0	0
Acute neurologic syndrome	11	11
Skin condition	39	49
Eye condition	133	136
Dental condition	24	28
Obstetric/gynecological condition	138	153
ENT condition	42	59
Urologic condition	38	51
Agitation	7	6
Burn	4	3
Private violence	7	7