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Analysis of mortality during heat waves in 2013-2014 summer in Argentina

First Global Forum for Heat and Health
17-20 December 2018, Hong Kong

Authors: Chesini Francisco, Fontán SG, González Morinigo EC, Herrera N, Savoy F, Skansi MM, de Titto EH.

Objectives

To analyze and characterize the effects on mortality of the heat waves which took place in the warmer half of the year 2013-2014 (October 2013 to March 2014) in the center-north region of Argentina.

Heat wave

It is a period of time in which maximum and minimum temperatures are equal to or higher than the 90th percentile, at least for three consecutive days. These values are calculated based on daily data from October to March (the warmer half of the year) for the 1961-2010 period.

P90 TX: 90th percentile maximum daily temperature, October to March, 1961-2010.

P90 TN: 90th percentile minimum daily temperature, October to March, 1961-2010.

omm_id	Estacion	P90 TX	P90 TN
87046	Jujuy	34.5	20.0
87047	Salta	31.8	18.2
87097	Iguazú	34.9	21.9
87121	Tucumán	35.2	22.0
87129	Santiago del Estero	38.3	23.0
87155	Resistencia	36.2	23.4
87162	Formosa	37.0	24.3
87166	Corrientes	36.0	23.4
87217	La Rioja	38.7	23.5
87222	Catamarca	37.6	24.5
87270	Reconquista	35.3	22.8
87289	Paso de los Libres	35.0	22.2
87311	San Juan	37.4	21.3
87344	Córdoba	33.4	19.5
87371	Sauce Viejo	34.6	22.0
87374	Paraná	33.7	21.0
87418	Mendoza	35.0	20.6
87436	San Luis	34.2	20.3
87480	Rosario	33.4	20.5
87497	Gualeguaychú	34.1	20.7
87585	Buenos Aires	32.3	22.0

Methodology

It was carried out an observational study contrasting the mortality occurred during the heat waves of the summer 2013-2014 with the mortality of the same period in the years 2010-2011 to 2012-2013.

It was calculated general mortality rates and specific mortality rates by sex, age groups, cause of death and provinces. Also, relative risk was calculated with its confidence interval (95%).

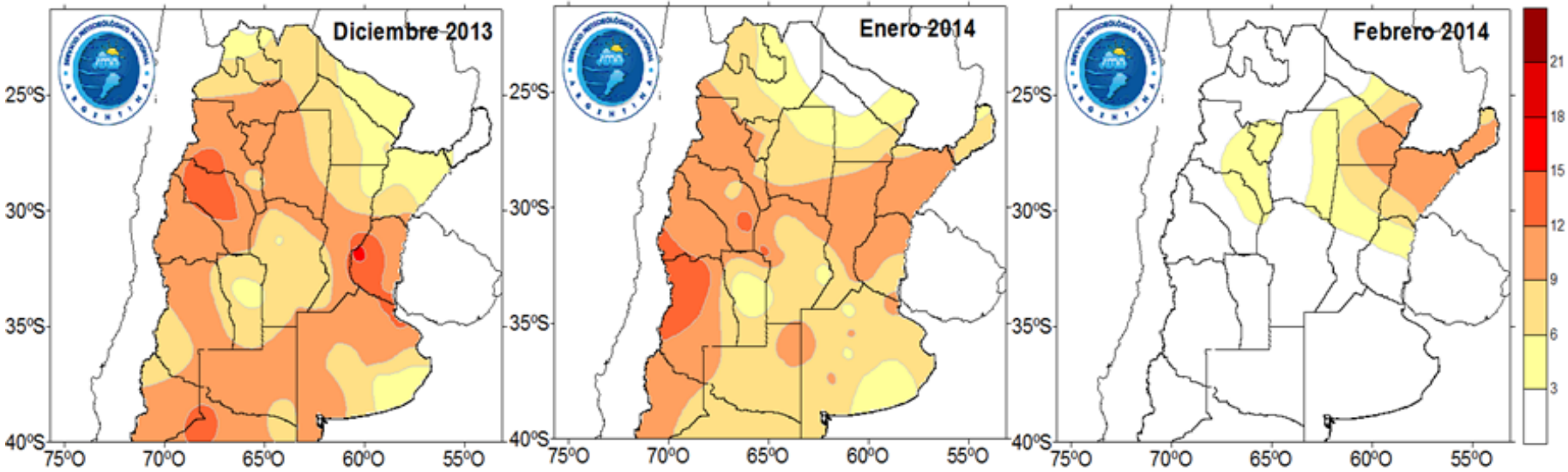
Heat waves were characterized by severity according to duration and mean temperature magnitude by percentiles 70 (P70), 80 (P80), 85 (P85), 90 (P90) y 95 (P95) of each variable.

Information source:

- Mortality: vital statistics, National Ministry of Health
- Population: National Institute of statistics and census
- Meteorological Information: National Meteorological Service (57 stations)

Frequency of hot days

Frequency of days for maximum temperature ≥ P90 and minimum temperature ≥ P90



Source: National Meteorological Service

December 2013

Provinces	Triennial average 2010-2012			2013			RR	IC 95%
	Deaths	Rates		Deaths	Rates			
		General	Adjusted		General	Adjusted		
CABA	663	21.8	14	984	32.1	20.0	1.48	1.34 - 1.63
Catamarca	37	9.8	12.1	54	14.2	16.37	1.42	0.93 - 2.15
Chaco	78	8.1	11.4	100	9.9	14.6	1.26	0.94 - 1.69
Córdoba	567	16.6	15.4	724	20.9	18.9	1.25	1.12 - 1.39
Corrientes	60	7.5	9.3	72	9.1	11	1.18	0.84 - 1.66
Entre Ríos	366	28.9	28.8	487	36.8	36.7	1.3	1.19 - 1.43
Formosa	37	6.7	8.83	50	8.9	11.17	1.31	0.86 - 2.00
Jujuy	52.3	7.6	10.4	48	7.4	8.8	0.89	0.60 - 1.32
La Pampa	33	9.9	9.1	24	7.2	6.4	0.72	0.43 - 1.22
La Rioja	32	9.1	11.6	50	13.8	17.7	1.54	0.98 - 2.40
Mendoza	164	9.1	9.1	212	12.2	11.2	1.26	1.03 - 1.54
Salta	114	9	17.4	150	11.7	15.2	1.28	1.04 - 1.63
San Juan	52	7.4	8.6	75	10.3	11.8	1.41	0.99 - 2.00
San Luis	38	8.4	9.5	41	9.2	9.7	1.05	0.68 - 1.63
Santa Fe	817	27.1	23.8	1080	35.1	30.7	1.3	1.22 - 1.38
Santiago del E	63	7.1	9	106	12.2	14.5	1.65	1.21 - 2.26
Tucumán	145	9.6	11.6	108	6.8	8.0	0.72	0.56 - 0.93

1046
Excess deaths

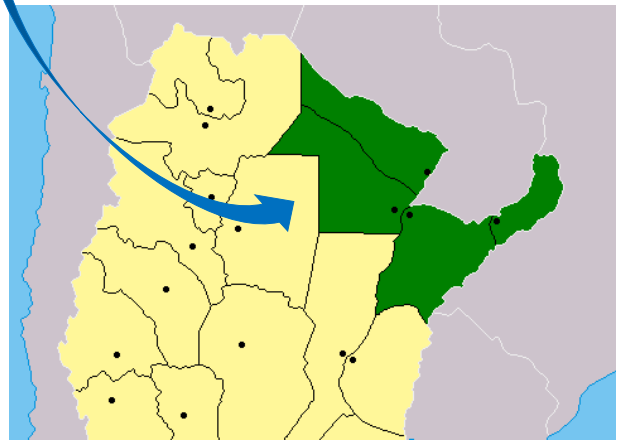
January 2014

Provinces	Triennial average 2010-2012			2014			RR	IC 95%
	Deaths	Rates		Deaths	Rates			
		General	Adjusted		General	Adjusted		
CABA	294	9.7	6.2	345	11.0	7.4	1.17	1.05 - 1.31
Catamarca	23	5.9	6.9	32	8.1	9.4	1.39	0.9 - 2.14
Chaco	33	6.1	8.4	30	5.2	7.9	0.88	0.58 - 1.33
Córdoba	756	21.9	20.1	894	24.9	22.9	1.16	1.08 - 1.24
Corrientes	143	13.8	16.6	180	17.3	19.8	1.23	0.99 - 1.54
Entre Ríos	205	16	15.8	227	16.9	16.7	1.08	0.94 - 1.25
Formosa	23	6.3	8.4	24	6.2	9.3	1.02	0.63 - 1.66
Jujuy	35	5	6.5	39	5.4	6.8	1.1	0.76 - 1.59
La Pampa	53	15.8	14.2	54	15.9	14.0	1.01	0.74 - 1.37
La Rioja	16	4.6	5.65	38	10.1	13.0	2.3	1.48 - 3.58
Mendoza	332	18.3	18	414	22.2	21.3	1.22	1.10 - 1.35
Misiones	98	8.5	12.4	103	8.9	12.5	1.03	0.83 - 1.27
Salta	50	3.9	5.3	64	5.1	6.28	1.23	0.93 - 1.64
San Luis	80	17.5	19.5	94	20.0	21.6	1.15	0.91 - 1.44
Santa Fe	603	19.2	16.9	803	25.1	22.0	1.31	1.22 - 1.41
Tucumán	96	6.3	7.3	134	9.3	9.8	1.36	1.12 - 1.64

635
Excess deaths

February 2014

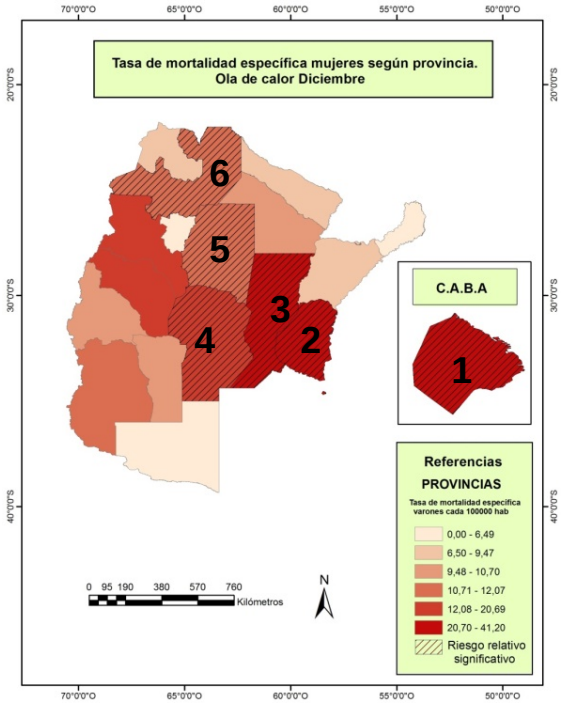
Provinces	Trienial average 2010-2012			2014			RR	IC 95%
	Deaths	Rates		Deaths	Rates			
		General	Adjusted		General	Aadjusted		
Chaco	204	18.4	24.9	280	24.9	32.8	1.34	1.18 - 1.53
Corrientes	221	21.3	25.5	276	26.1	30.3	1.22	1.08 - 1.39
Formosa	100	19.2	25.9	109	21.2	29.1	1.07	0.87 - 1.32
Misiones	198	17.3	24.7	254	22.4	30.4	1.25	1.10 - 1.43



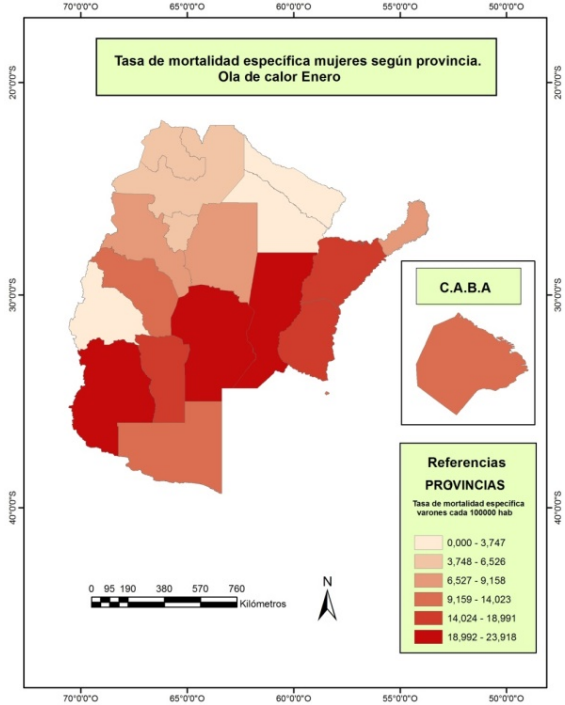
196
Excess deaths

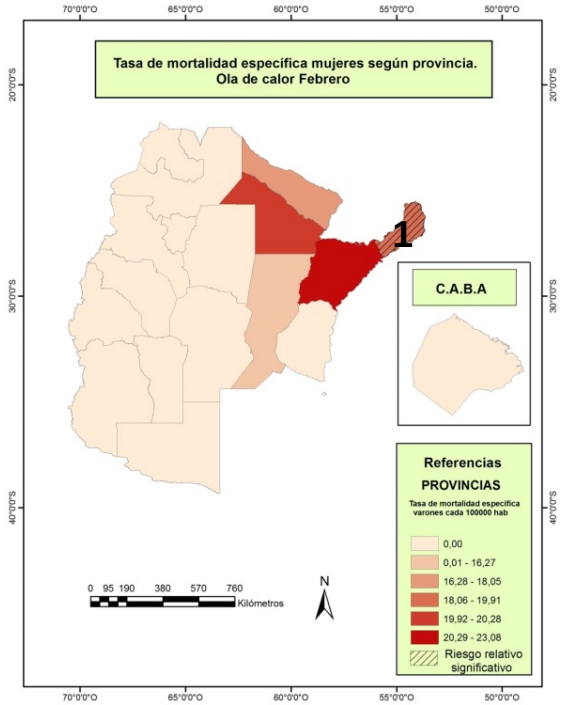
Total excess deaths: 1877

Mortality rates for women by provinces



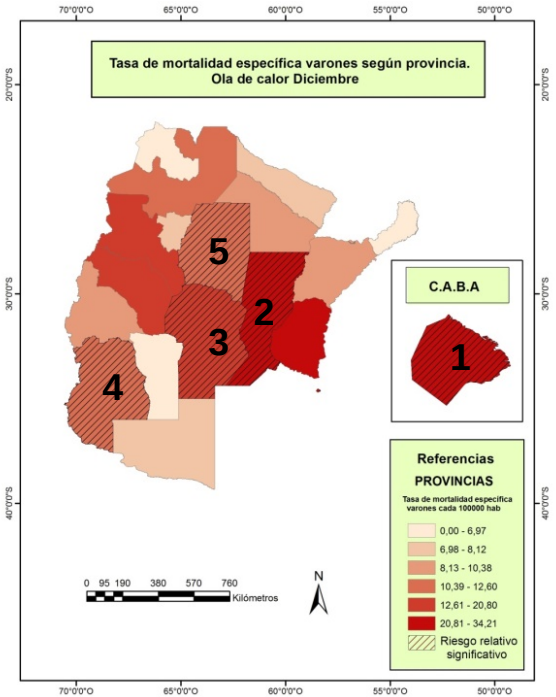
6 Provinces with RR>1



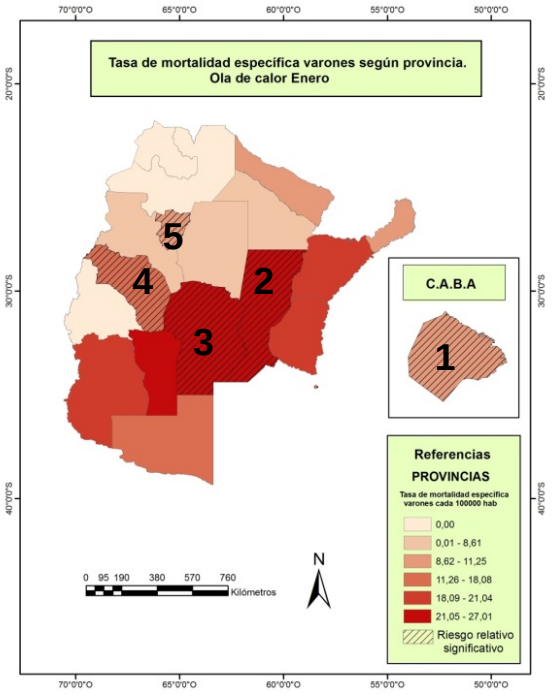


1 Provinces with RR>1

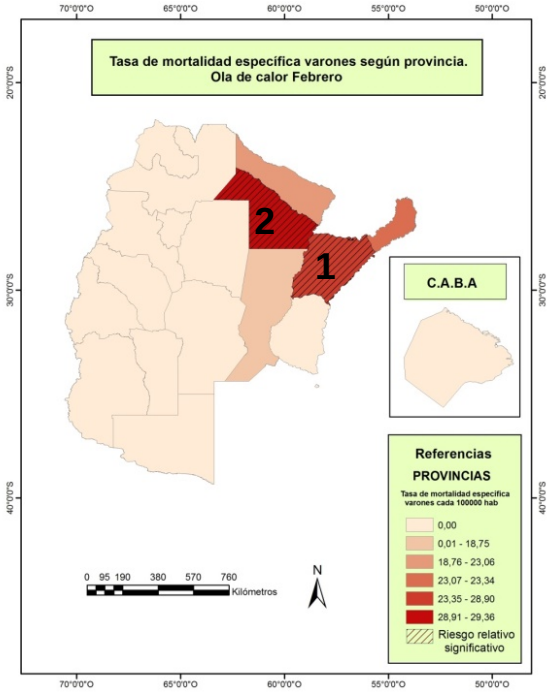
Mortality rates for men by provinces



5 Provinces with RR>1

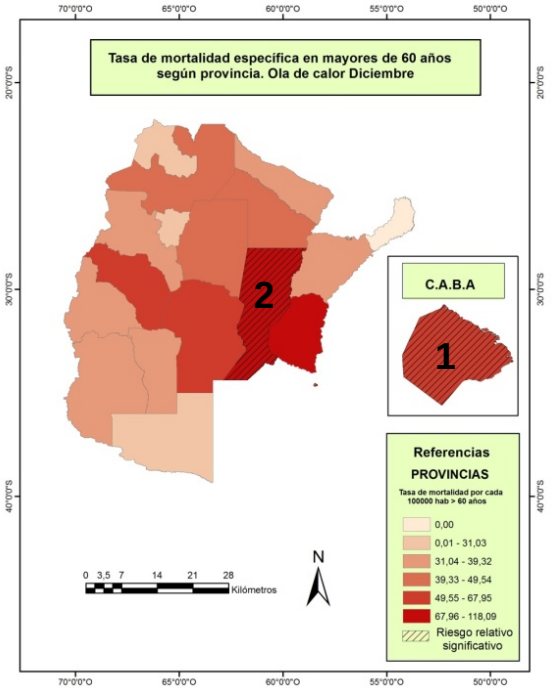


5 Provinces with RR>1

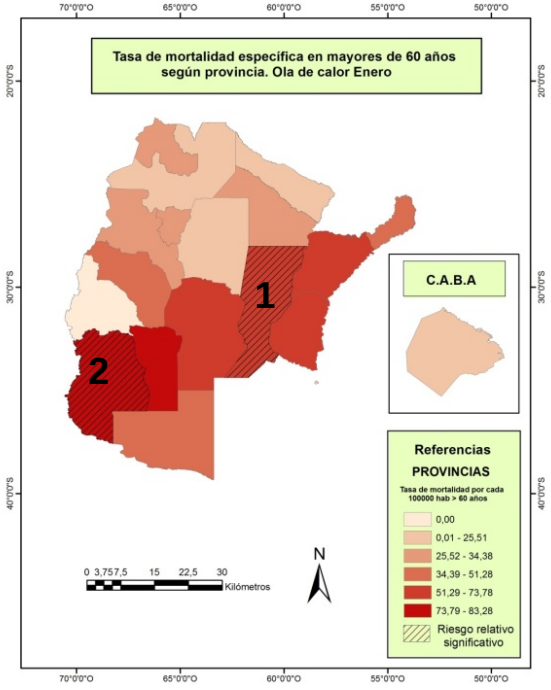


2 Provinces with RR>1

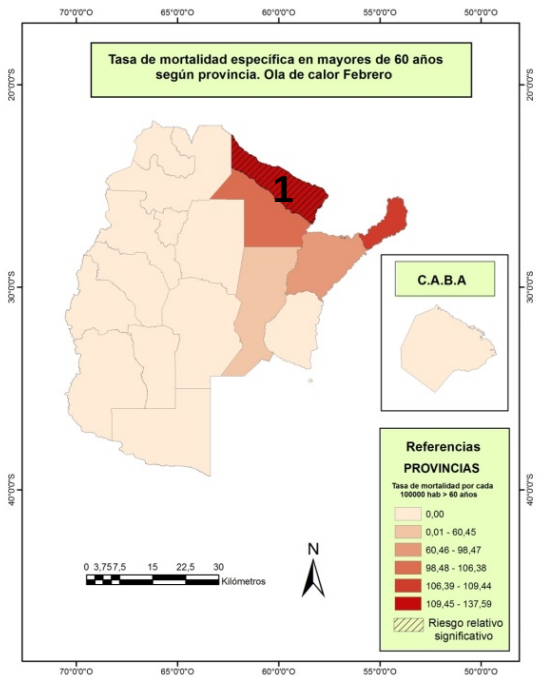
Mortality rates for the 60-79 age group by provinces



2 Provinces with RR>1

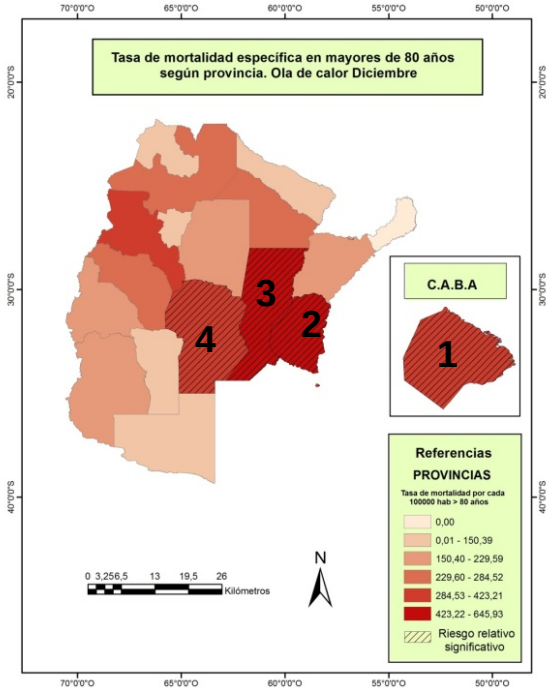


2 Provinces with RR>1

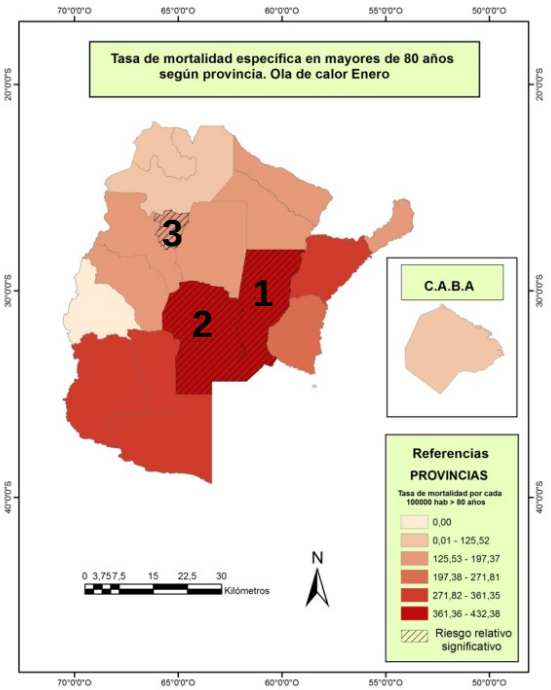


1 Provinces with RR>1

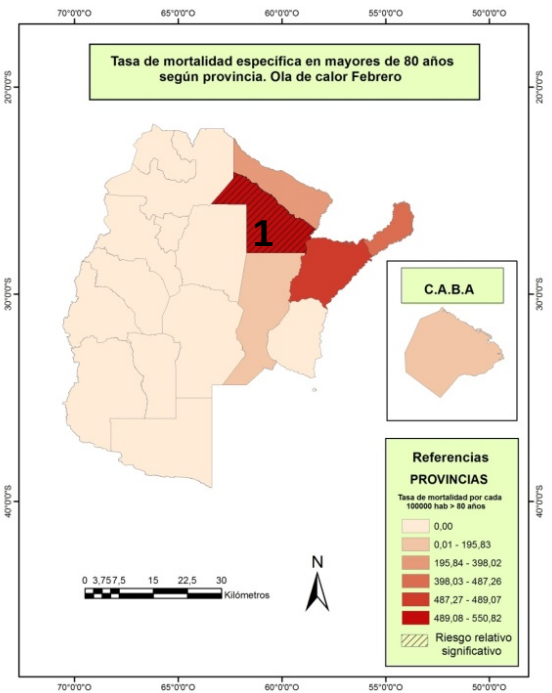
Mortality rates for 80 and over age group by provinces



4 Provinces with RR>1



3 Provinces with RR>1

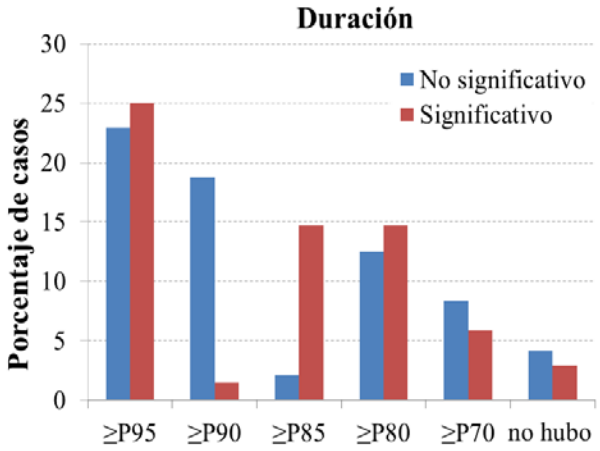


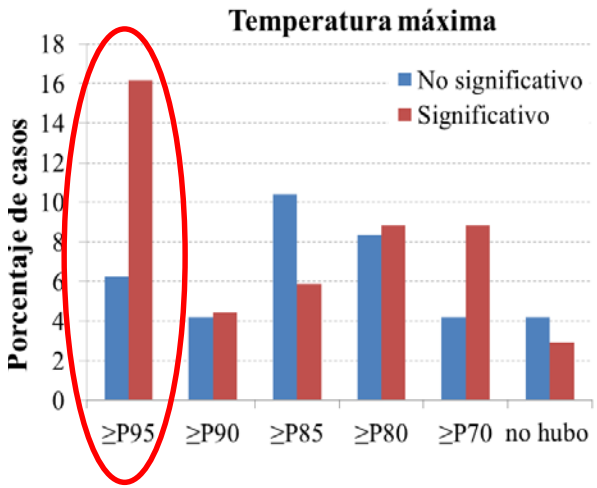
1 Provinces with RR>1

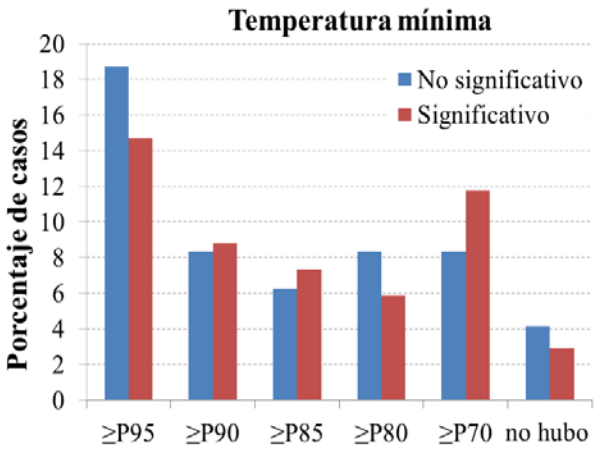
Increases in mortality by death causes during heat waves

Causes of death		CABA		Córdoba		E. Ríos	Mendoza		Misiones	Santa Fe	
		Dec.	Jan.	Dec.	Jan.	Dec.	Dec.	Jan.	Feb.	Dec.	Jan.
Diabetes mellitus	Deaths										29
	Rates										0,91
	RR										1,99
Cerebrovascular diseases	Deaths			59					46		
	Rates			1,69					3,92		
	RR			1,54					2,88		
Ischemic heart disease	Deaths	135		70	95			44	50		
	Rates	4,43		2,01	2,69			2,36	4,26		
	RR	1,62		1,83	1,84			1,82	1,85		
Chronic lower respiratory diseases	Deaths	21								26	17
	Rates	0,69								0,85	0,53
	RR	2,32								2,02	2,18
Kidney failure	Deaths	35									
	Rates	1,15									
	RR	2,28									
Pneumonia	Deahts	101	37		62	36	13			85	59
	Rates	3,32	1,21		1,76	2,78	0,71			2,77	1,85
	RR	2,20	1,54		1,58	1,76	3,18			2,03	1,71
Other forms of heart disease	Deaths	189									
	Rates	6,21									
	RR†	1,54									
Percentual national population		7,2		8,2		3,1	4,3		2,7	8	

Mortality risk by duration and severity of heat wave







Conclusions

- During the summer 2013-2014 there were **three heat waves** with large duration and temperature intensity.
- The mortality during the heat waves of the summer 2013-2014 showed increases in the general mortality rate as well as in the specific mortality rates related to age, sex and cause of death.
- The greatest differences between significant and non-significant increases in mortality risk were observed in the extreme mean maximum temperature (≥ P95) of heat waves.

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¡Thanks for your attention!