

Rocky Mountain spotted fever in Sonora, Mexico

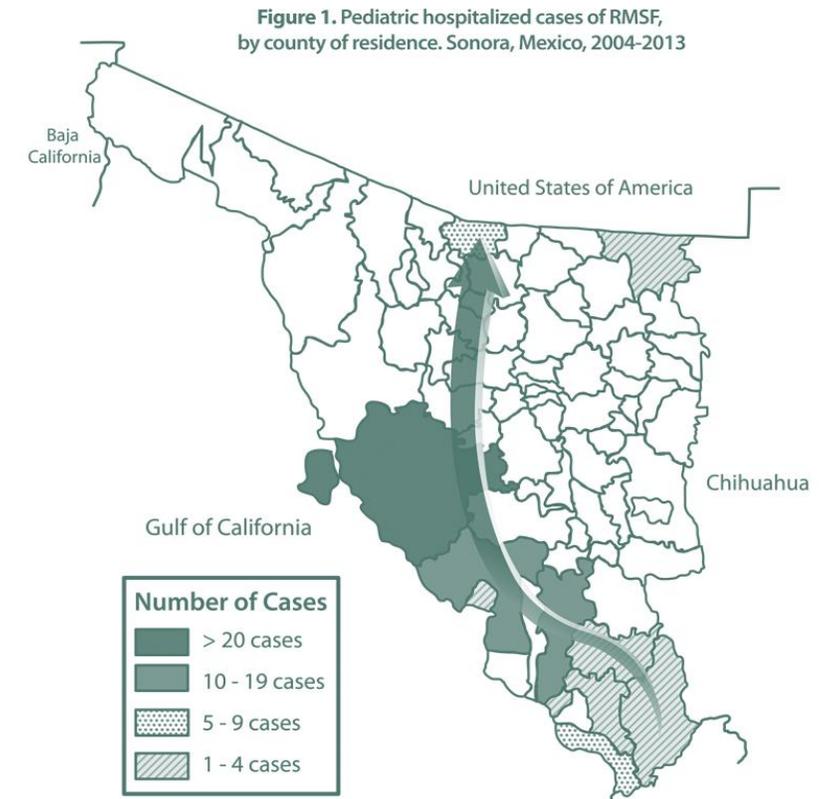
Gerardo Álvarez PhD

Session: Vector-Borne/Zoonotic Disease

Phoenix, Arizona. July 28th 2016

Background

- Sonora, Mexico borders the U.S. state of Arizona
- Population: 2,925,366
- Considered as a well-developed state within Mexico (UN Program, 2012)
- After 5 decades with no cases of RMSF, reemerged early 2000's (Álvarez G. Salud Publica Mex 2013; 55 (2): 151-52)
 - Endemic from 1900-1950. Known as “Fiebre Pinta”
- RMSF incidence coincides with the presence of the tick *Rhipicephalus sanguineus* on dogs (Tinoco L. Vet Rec 2009;164:59-61; Eremeeva ME. J Med Entomol. 2011;48:418–21)



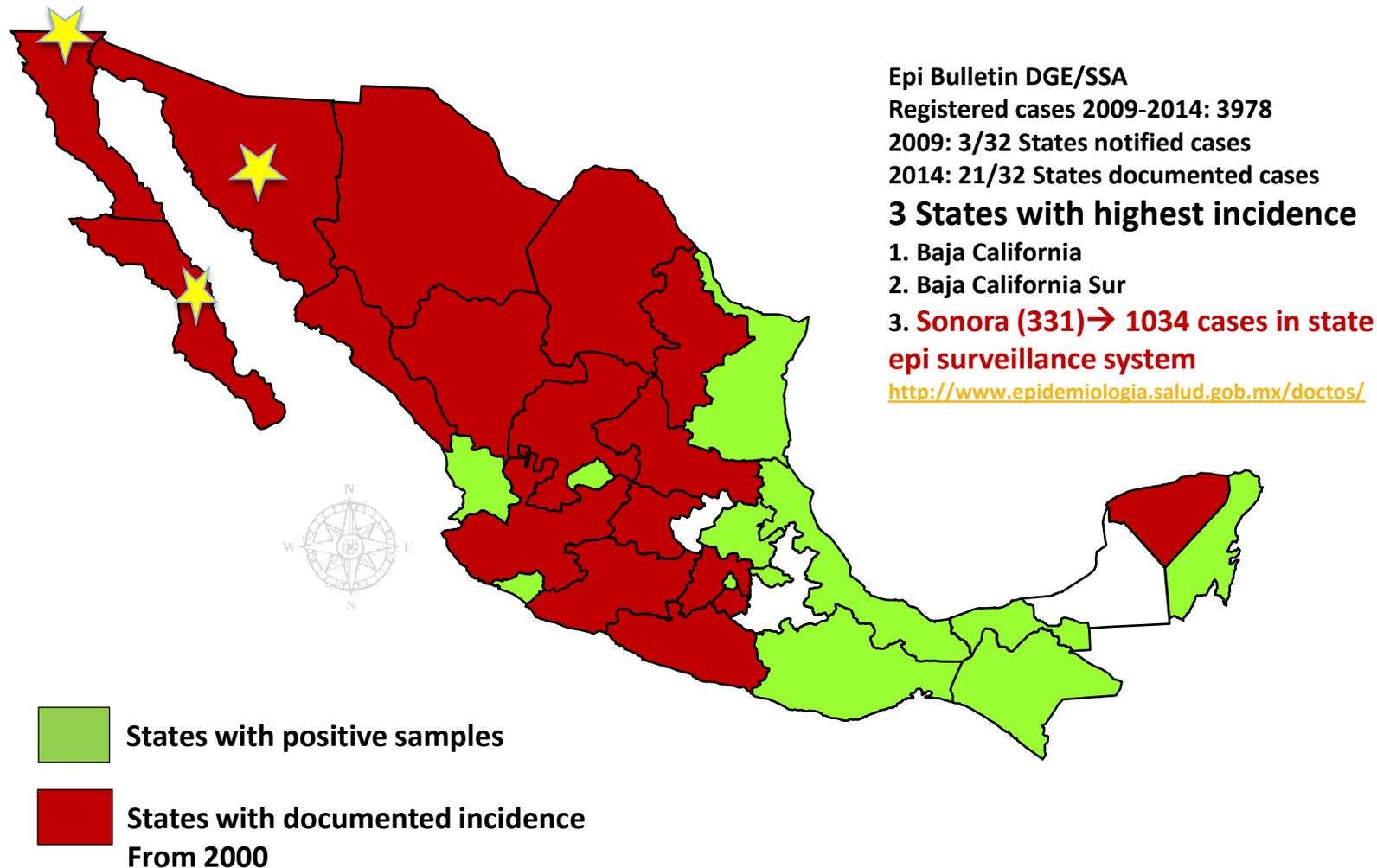
Note: The arrow shows the south to north geographical spread of the RMSF cases during the study period.

Background

- April 2015, Mexican MOH issued a declaration of epidemiologic emergency on Rocky Mountain spotted fever (RMSF)
- Public health concerns in several states, mostly in northern Mexico
- Significant impact in underserved populations
 - Particularly children < 10 years old



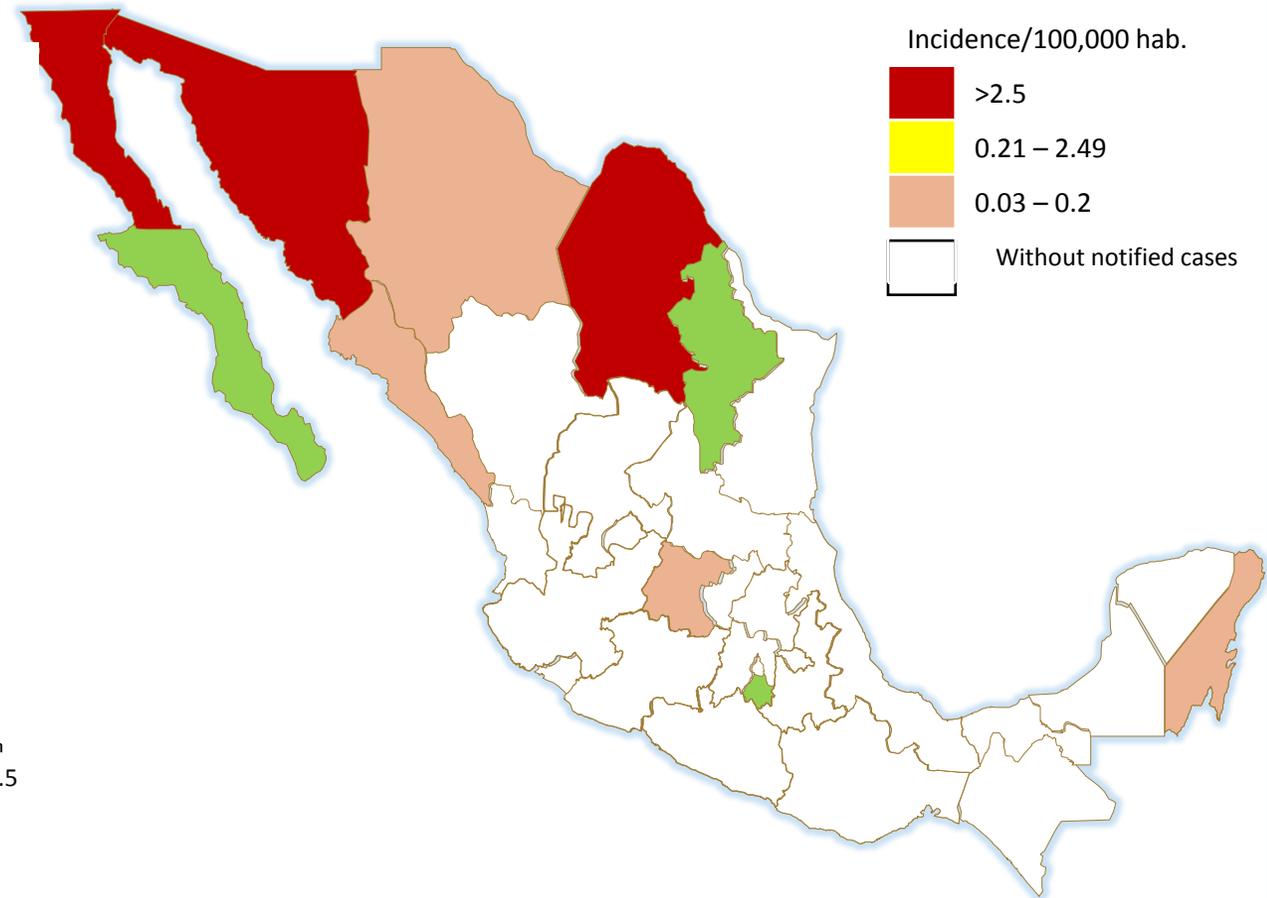
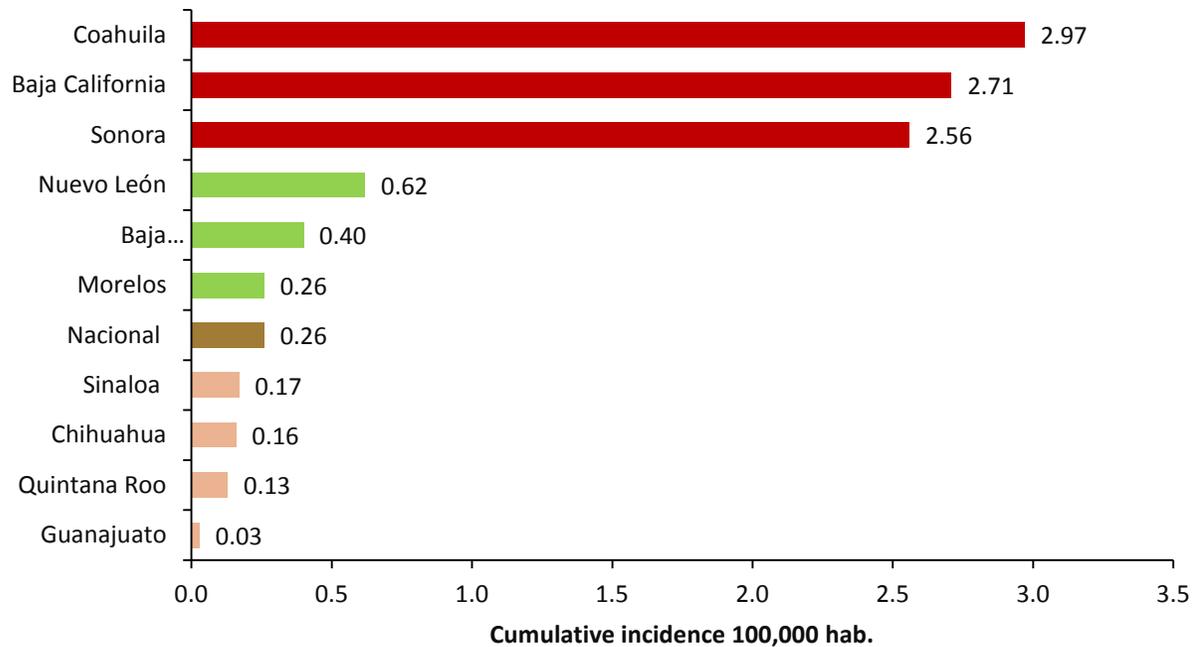
Incidence of RMSF by state. Mexico, 2009-2014



Source: Source: Annual Morbidity Reports, 1984-2014. National Department of Epidemiology. Secretariat of Health

RMSF incidence by State, Mexico, 2014

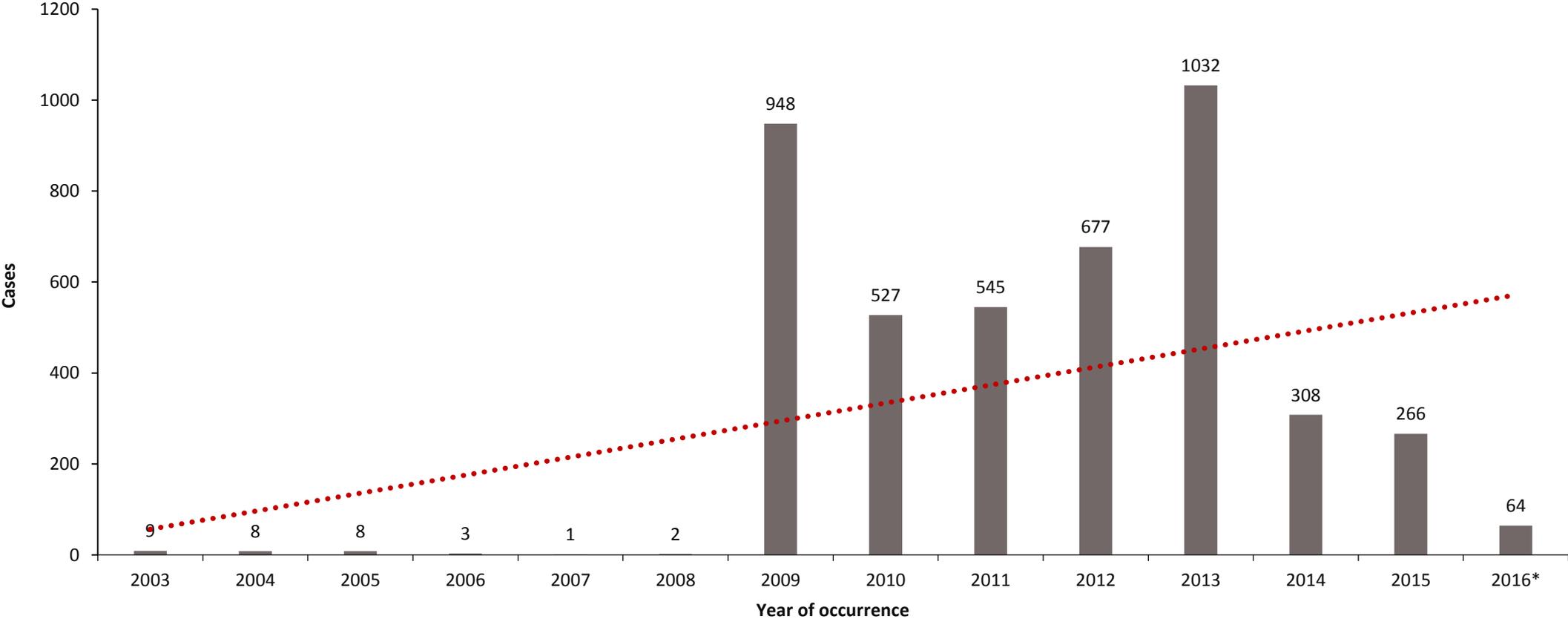
RMSF (A77.0) incidence by State. México, 2014



Source: Source: Annual Morbidity Reports, 1984-2014. National Department of Epidemiology. Secretariat of Health

RMSF Annual incidence. Mexico, 2003-2016

RMSF cases by year of occurrence, Mexico 2003-2016*

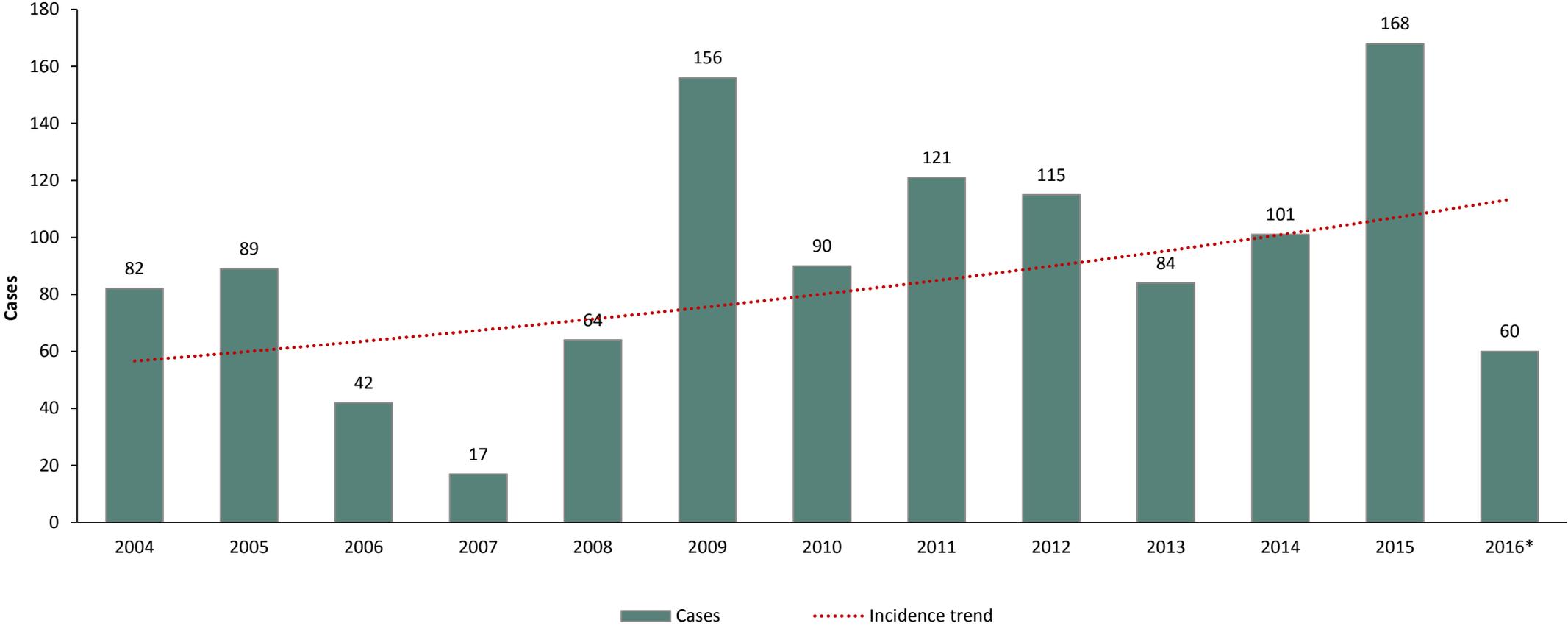


Source: Annual Morbidity Reports, 1984-2014. National Department of Epidemiology. Secretariat of Health

* Up to May 31, 2016

RMSF Annual incidence. Sonora, 2003-2016*

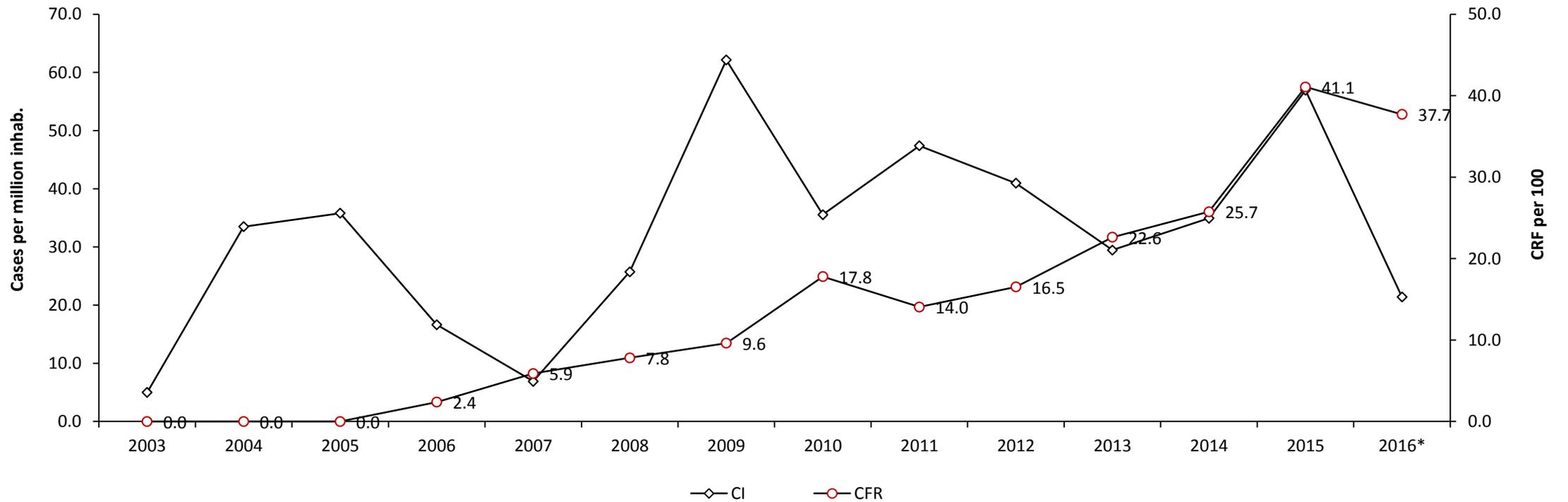
RMSF incidence by year of occurrence. Sonora, 2004-2016*



Source: Sonora Secretariat of Health * Up to July 22, 2016

RMSF incidence and CFR, Sonora. 2003-2016*

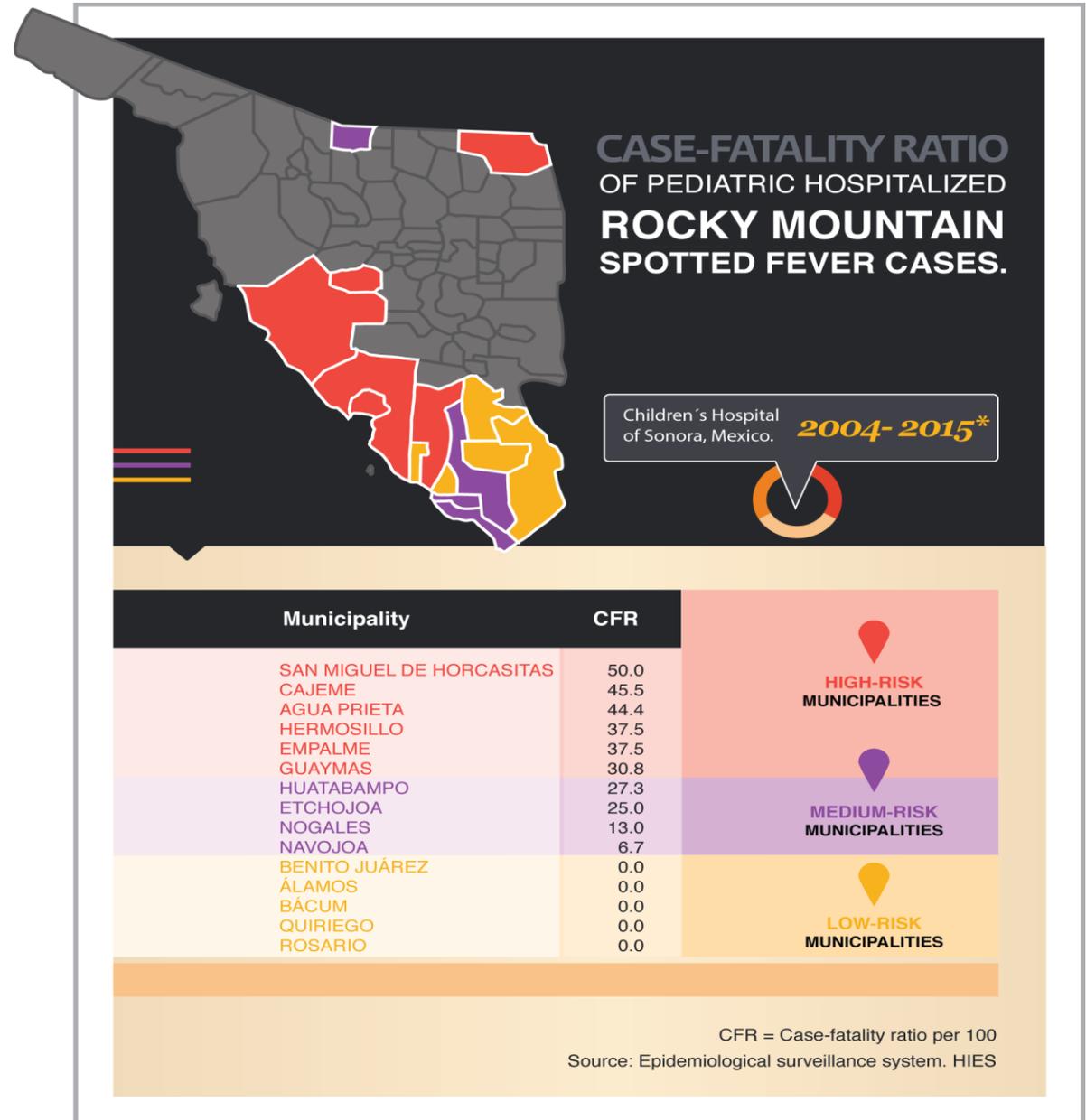
RMSF, trend of cumulative incidence and CFR. Sonora, 2003-2016*



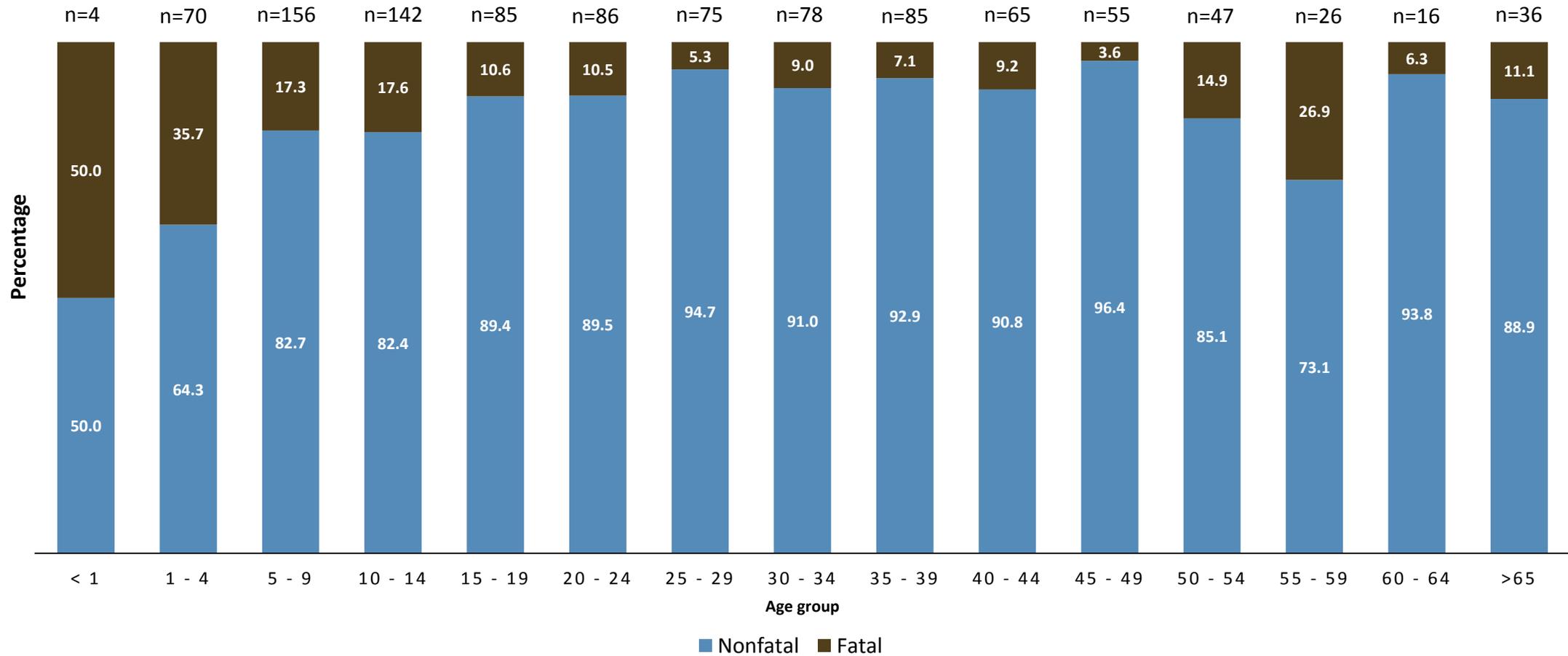
USA CFR <0.5%. Sonora CFR >25%

Epidemiology

- RMSF in Sonora spreads from the southern to the northern areas of the state
- 2004-2016: 1200 cases; 211 deaths. CFR = 17.6%
- 497 cases in <19 years old; 108 deaths. 51% of RMSF total mortality. CFR=22%
 - 225 cases in a pediatric hospital; 75 deaths. CFR=33.3%



**Rocky Mountain spotted fever. Case-fatality ratio by age group.
Sonora, Mexico. 2004-2015*
(n=1030)**



Source: Epidemiological Surveillance System. UIEES/DE/DGSSC/SSP

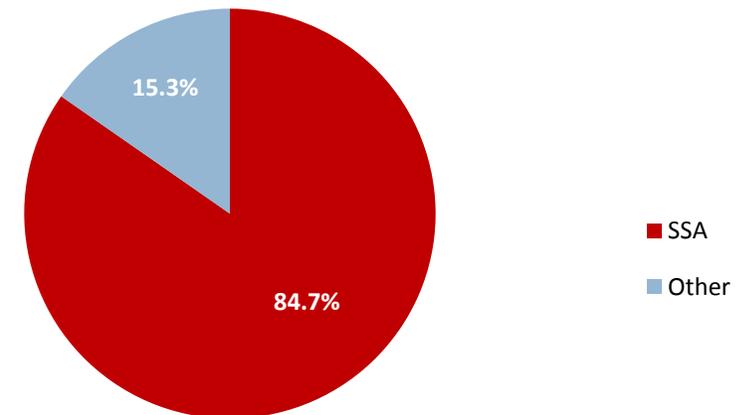
*Up to 10/22/2015

Epidemiology

- **RMSF in children from Sonora**
- Mostly urban (75% patients live in urban localities)
- Socioenvironmental factors may play a role in the epidemic → 90% live in poverty
 - 85% has temporary medical insurance (seguro popular)
- 90% had a documented history of tick contact



RMSF cases by medical care insurance. Mexico, 2009-2013

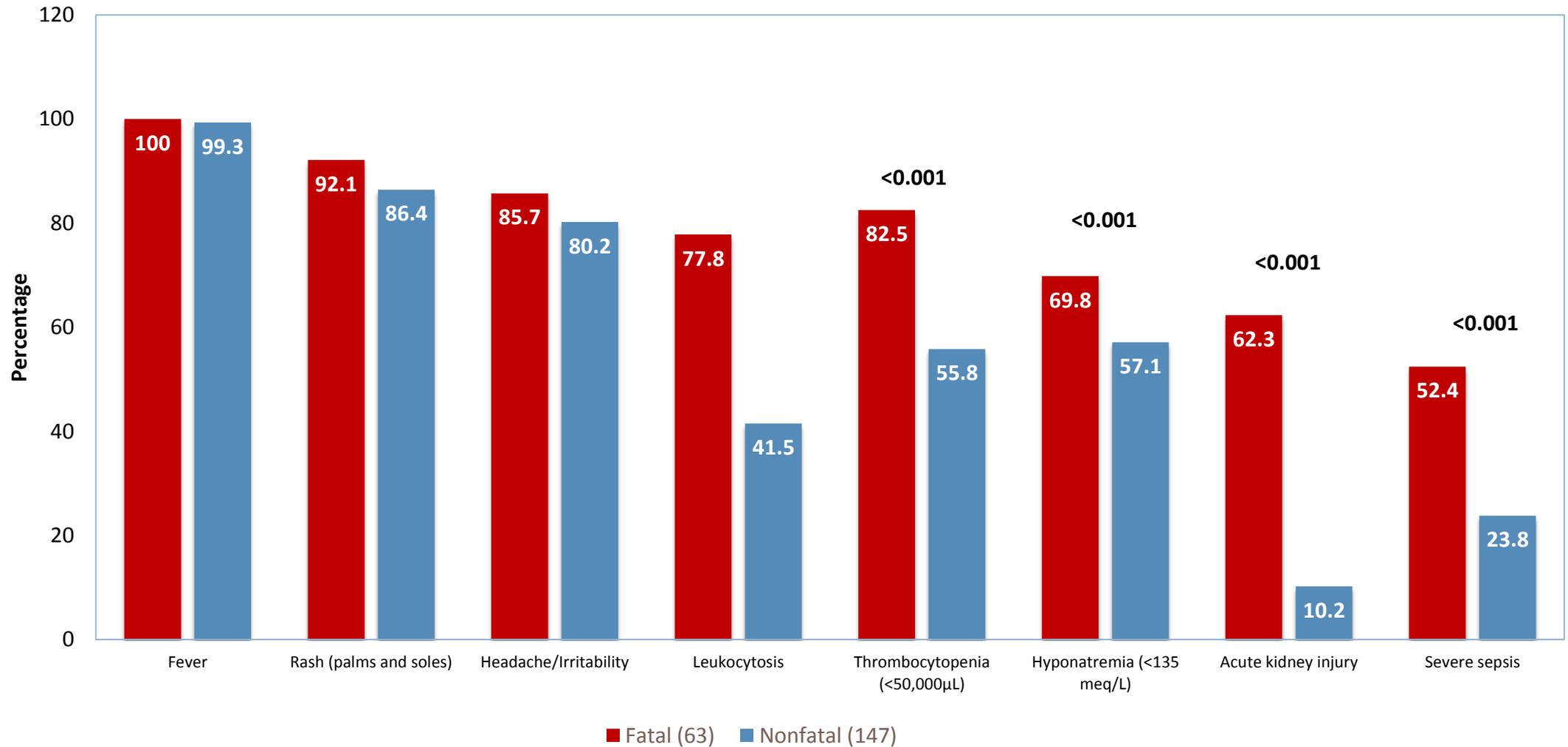


Epidemiology



- “Where you live makes a difference to your health, over and above who you are” (S.V. Subramanian, 2000)

Clinical features of RMSF in hospitalized children. Sonora, Mexico. 2004-2015* (n=225)



* 01/01/2004-06/18/2015

RMSF. Clinical features

**RMSF rash may involve palms
and soles. Sign of delay in clinical suspicion**
[Buckingham, 2007; Graham, 2011, Alvarez, 2015]



RMSF. Female. 4 years old. 2014



RMSF. Female. 15 years old. 2011



RMSF. Male. 6 years old. 2014

RMSF. Clinical features



Other significant clinical signs include periorbital edema and swelling of ankles and hands. [Buckingham, 2005; Graham, 2011; SSA-Mexico, 2013]



RMSF. Clinical features



RMSF. Male. 4 years old. 2015



RMSF. Male. 17 years old. 2015



RMSF. Female. 7 years old. 2015

“With progression the rash becomes more petechial and individual lesions often enlarge and coalesce to form ecchymoses” (Paddock, C. In press, 2015)

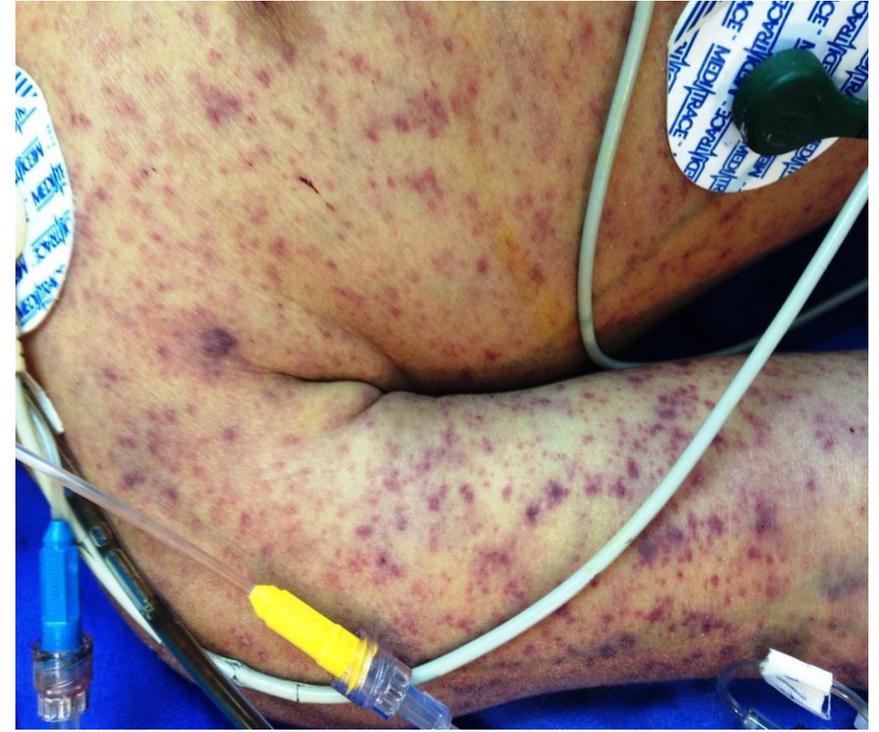
RMSF. Clinical features



RMSF. Female 4 years old. 2014



RMSF. Female 16 years old. 2013



RMSF. Male 3 years old. 2013

Petechial component is very frequent, 82% of our patients had severe petechiae

RMSF. Clinical features



RMSF. Male 6 years old. 2006



RMSF. Male 1 year old. 2015

RMSF. Clinical features



Predictors of mortality in hospitalized children with Rocky Mountain Spotted Fever, Sonora 2004-2015

Results of logistic multivariate analysis*

Predictor	β coefficient	Standard error	OR _{adj} ^{1/}	95% IC
Intercept	-2.33	0.28	0.10	(0.02, 0.42)
Delay in specific treatment with doxycycline ($\geq 5^{\text{th}}$ day) [1=Yes]	1.08	0.51	2.95	(1.10, 7.95)*
Acute kidney injury (1=Yes)	2.17	0.48	8.79	(3.46, 22.33)*
Severe sepsis (1=Yes)	1.31	0.48	3.71	(1.44, 9.58)*
Age (1= Less than 10 years old)	1.07	0.57	2.93	(0.97, 8.87)
Hypoproteinemia [<6.4 g/dL] (1=Yes)	0.70	0.92	2.02	(0.33, 12.32)
Ecchymosis (1=Yes)	0.46	0.46	1.58	(0.64, 3.91)
Petechiae (1=Yes)	-0.88	0.70	0.42	(0.11, 1.64)
Thrombocytopenia $<50,000$ μL (1=Yes)	1.08	0.64	2.95	(0.84, 10.35)

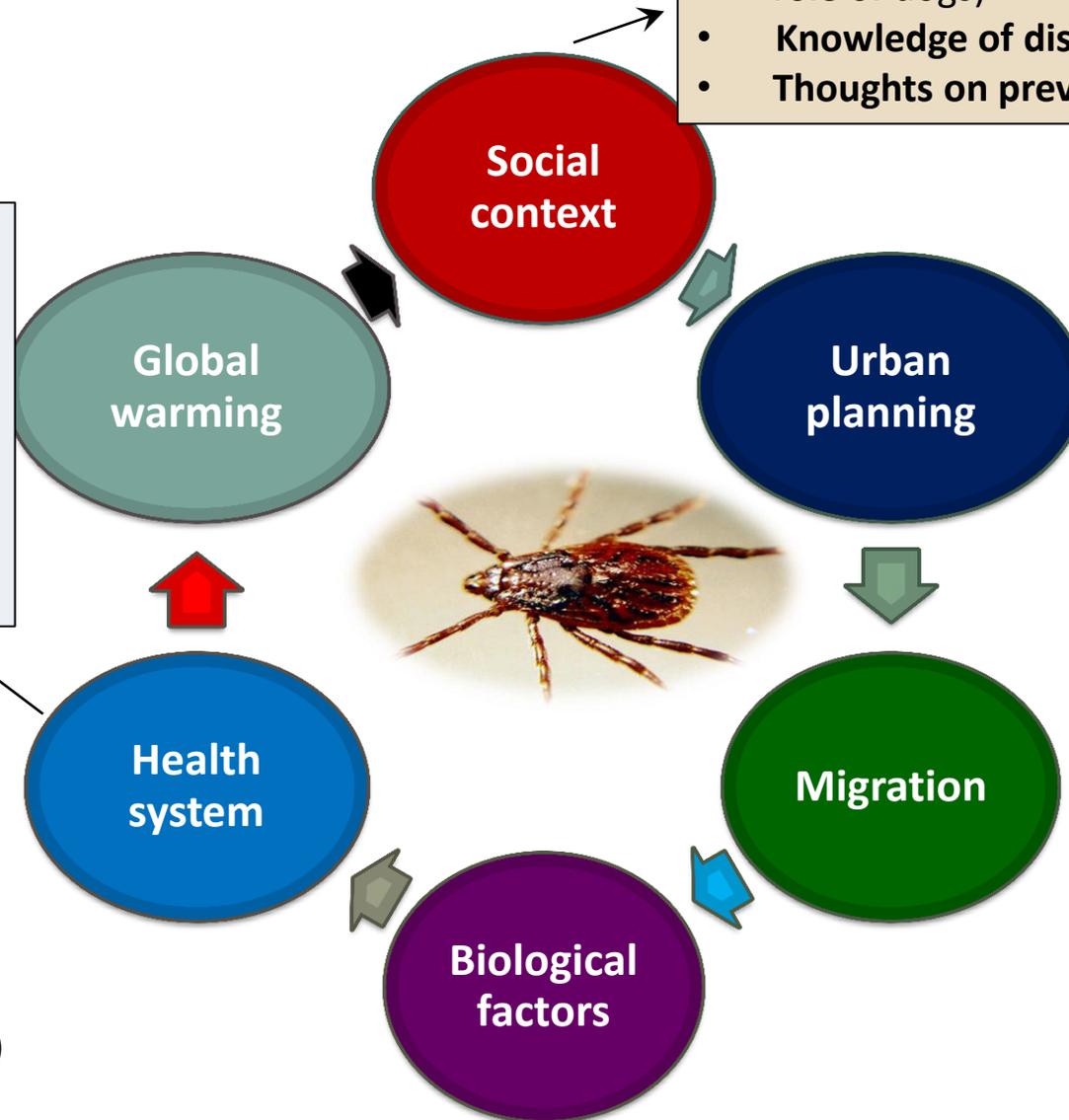
* The significance of the final model was assessed by Log Likelihood [-66.36229]. Model $R^2 = 0.50224$.

^{1/} Adjusted odds ratio accounting for all the variables included in the final model. *Statistically significant

Multiple risk factors for RMSF

- **Social deprivation** (poverty, marginalization)
- **Risk perception** (daily contact with ticks; the role of dogs)
- **Knowledge of disease** (i.e. meaning of fever)
- **Thoughts on prevention**

- **Policies, programs and allocated resources**
- **The role of science**
- **Risk communication**
- **Knowledge of disease** (clinical signs and symptoms, and risk factors)
- **Poor knowledge on prevention** (timely diagnosis, reluctance to treatment, care of medical complications)

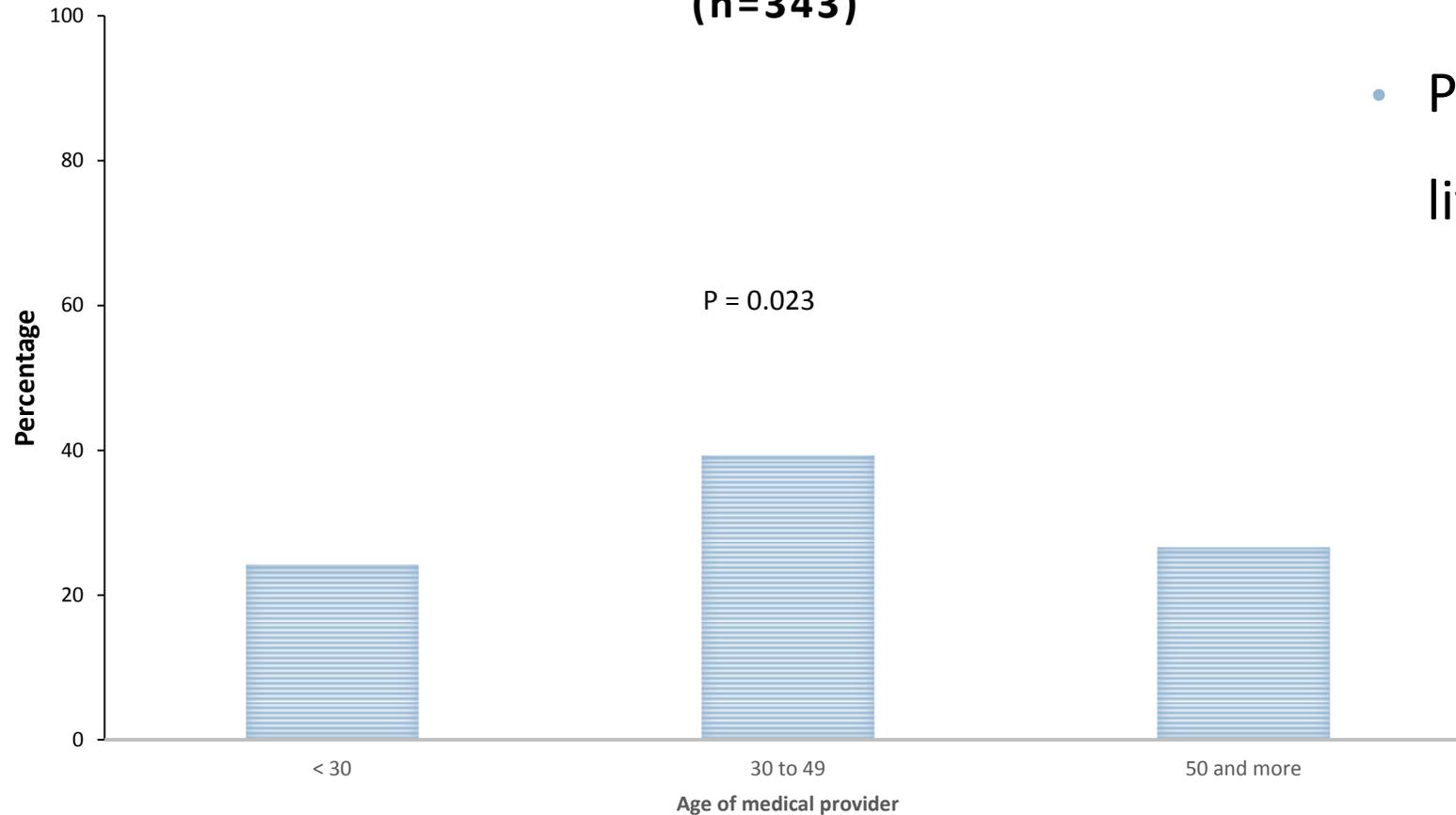


(Suárez, 2006; Süss, 2008; Labruna, 2011)

- **What factors are associated with morbidity and mortality of people infected by *R. rickettsii* in Sonora?**

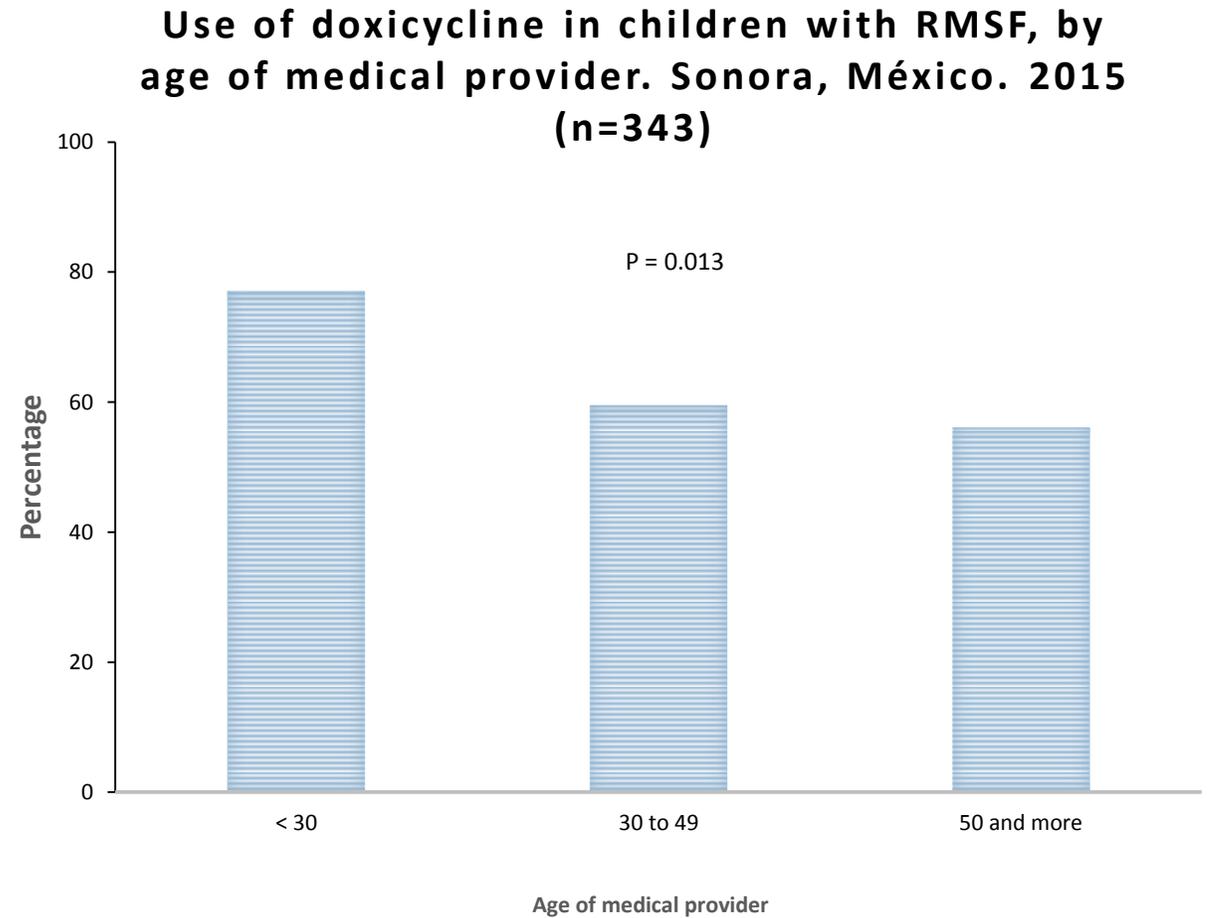


**Aware of RMSF case-fatality rate, by age of medical provider. Sonora, Mexico. 2015
(n=343)**



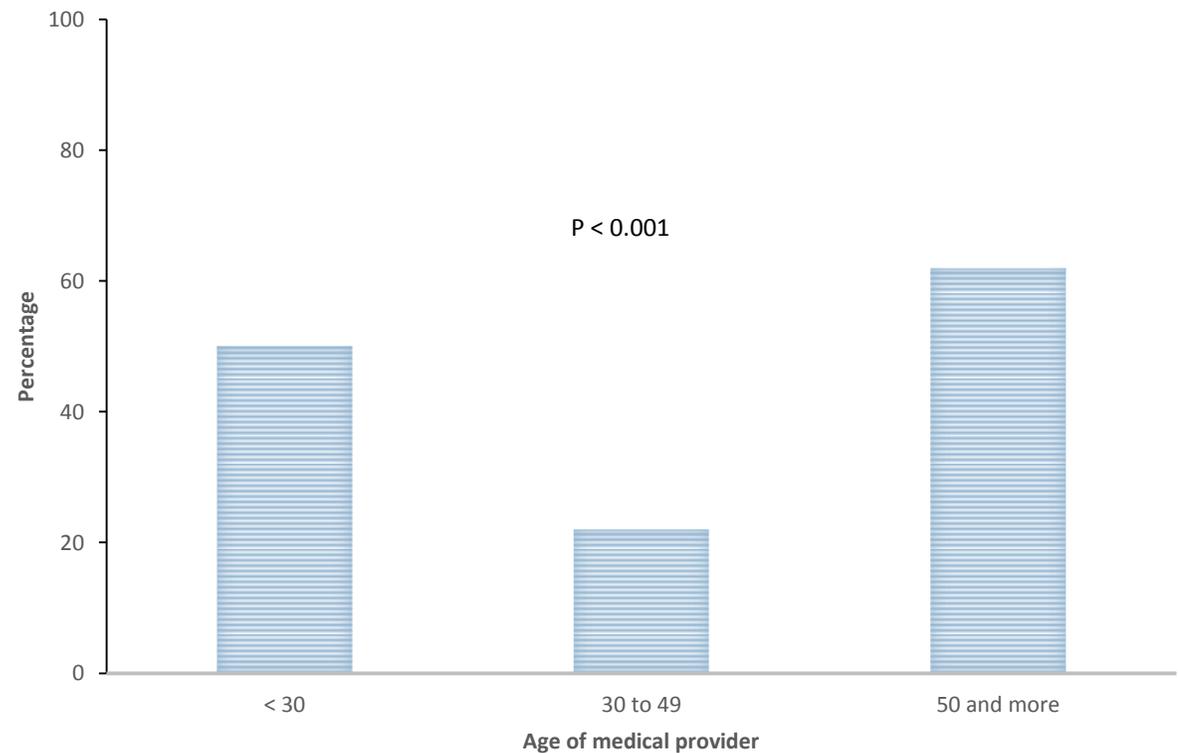
- Physicians do know very little about fatality of RMSF

- 30-40% of physicians are reluctant to initiate doxycycline in children

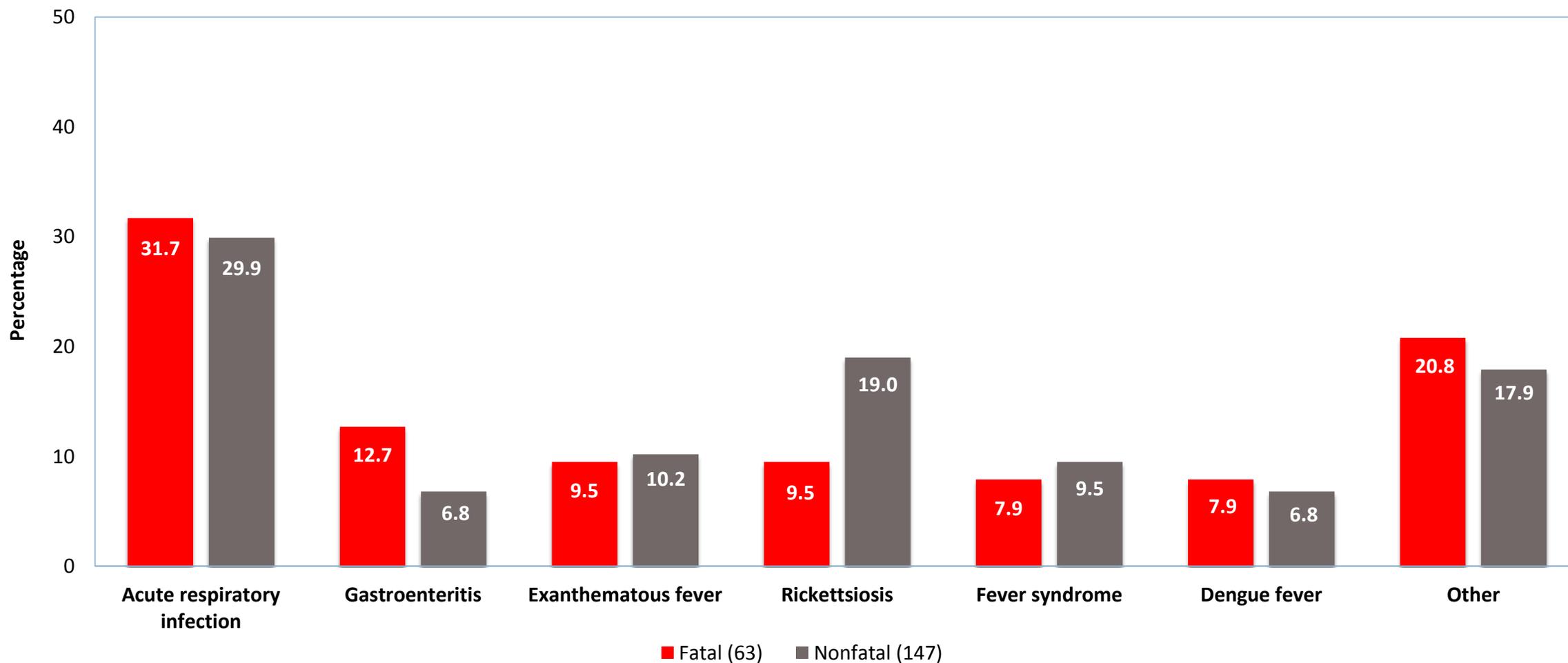


- <50% of physicians initiate timely specific treatment

**Treat patients with RMSF within recommended time frame. Sonora, Mexico. 2015
(n=343)**



Diagnosis at initial presentation for medical care in children with RMSF. Sonora, Mexico, 2004-2015*

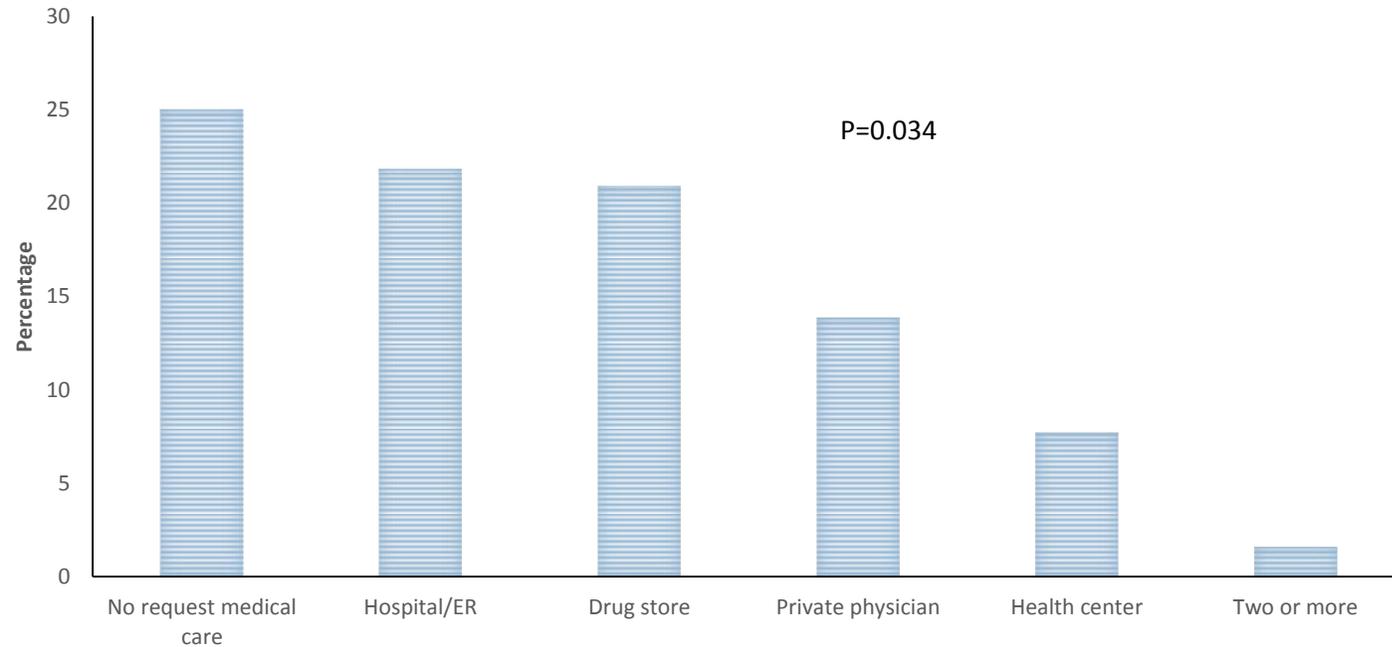


* 01/01/2004-06/18/2015

No statistically significant differences were observed

Community knowledge about RMSF. Sonora, 2015

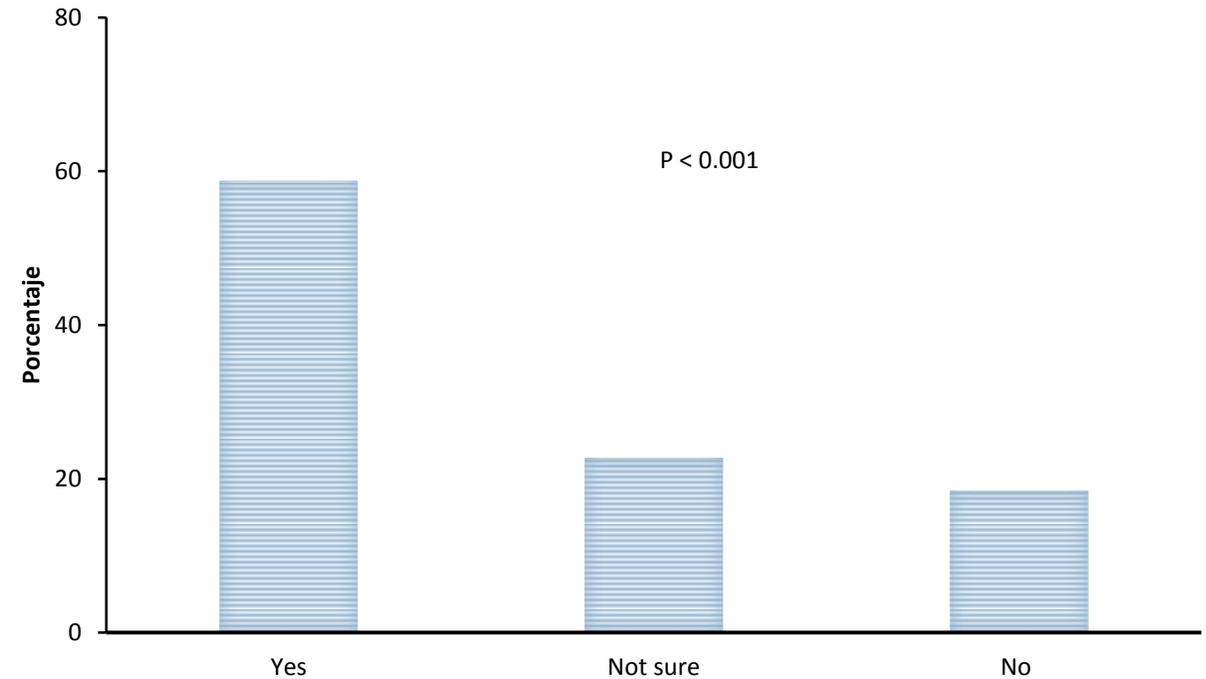
If you or someone of your family got fever, where would you go?



- There is a low perception in community about early manifestations of RMSF

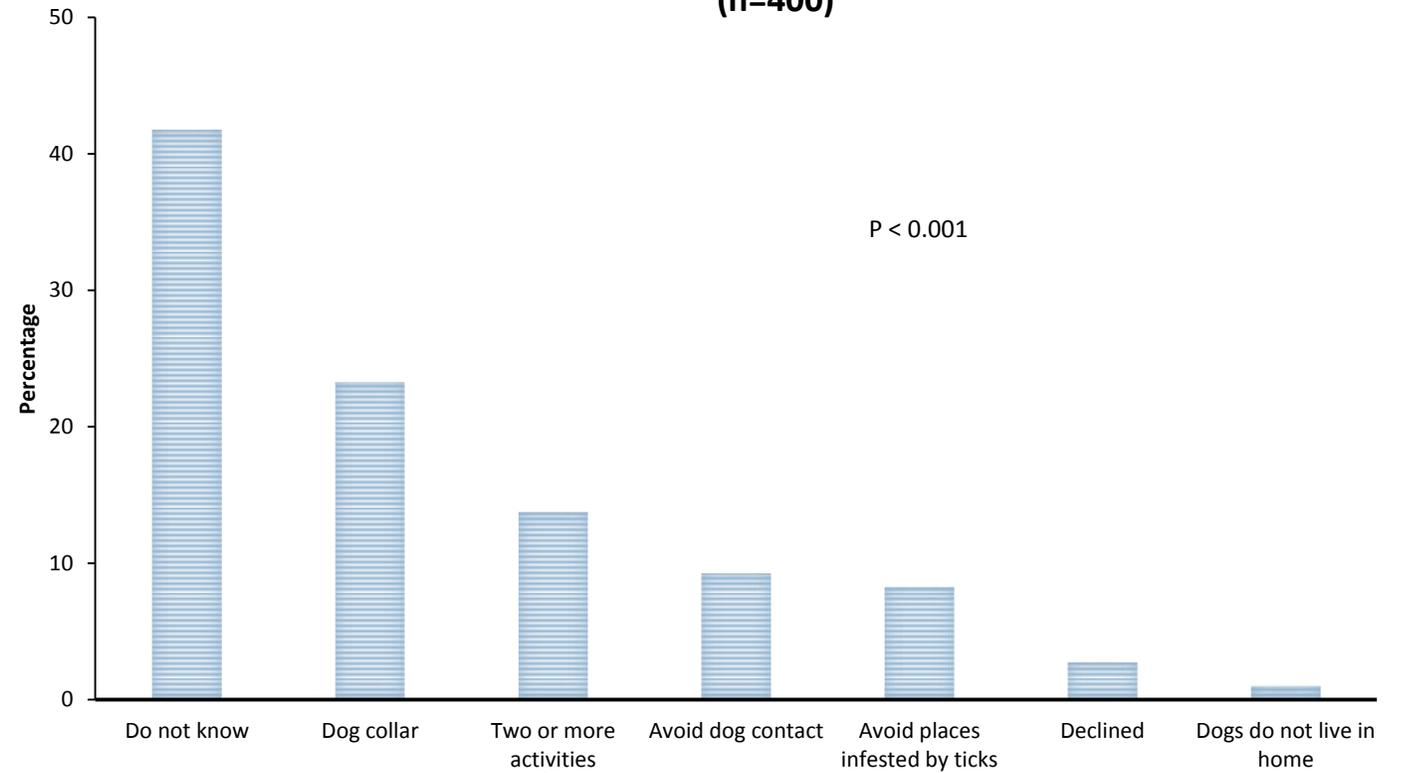
- In areas highly epidemic, 40% of those responsible for family health care do not know about RMSF

Community knowledge about RMSF. Sonora, 2015
Have you heard about a disease called RMSF or “rickettsia”?
(n=400)



**Community perception about how to prevent RMSF. Sonora, 2015
(n=400)**

- Almost 50% of subjects do not know how to prevent RMSF



- Poor knowledge about RMSF in both physicians and community
- We know very little about diagnosis, treatment, prevention
- “...I allude to a blindness of reason. We are blind to reason and behave as blind” (José Saramago, 1995)



Final remarks

1. RMSF is reemerging in Sonora
2. Highly lethal but preventable. Deaths can be avoided
3. Shows an unacceptable burden in pediatric population
4. Participation of pharmaceutical industry and international agencies of health and social welfare is required



Final question

- Is RMSF in Mexico just a health-related problem ... or is an ethical neglect?
- It is not only a health problem, it is an expression of social injustice
 - Because it is associated with social backwardness, does affect individuals and vulnerable populations and is not addressed as a priority



Conclusion

- In Mexico, to properly address RMSF political will and moral commitment is needed, in addition to technical and scientific approach



Contact:

Gerardo Alvarez PhD

Department of Medicine and Health Sciences

University of Sonora

galvarezh63@gmail.com

¡¡GRACIAS!!

