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Weather dynamics explain part of the increase in reported domestic legionellosis cases, Belgium 2010-2017

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CONTEXT:

In many European countries, the numbers of reported cases of domestic legionellosis are increasing. This might be linked to improved access to diagnostic methods and an increased awareness among physicians. Besides, there is increasing evidence that the number of legionellosis cases is associated with meteorological factors.

AIM:

We aim to assess the association between the number of reported domestic legionellosis cases and selected meteorological variables in Belgium, during 2010-2017.

Results

Reported cases fo legionellosis :

- The number of reported domestic legionellosis cases increased from 131 in 2010 towards 200 in 2017, with a peak of 217 cases in 2016.

Temperature trend over time:

- Adjusted for annual seasonality (26 & 52 weeks), an increasing trend was observed (2010-2017) for daily maximum temperature (Tmax), with a slope of 0.002 °C per week (linear regression): 0.1℃ per year.

Humidity trend over time:

- Adjusted for annual seasonality (26 & 52 weeks), an increasing trend was observed (2010-2017) for relative humidity (RH), with a slope of 0.009 percent per week (linear regression): 0.5% per year.

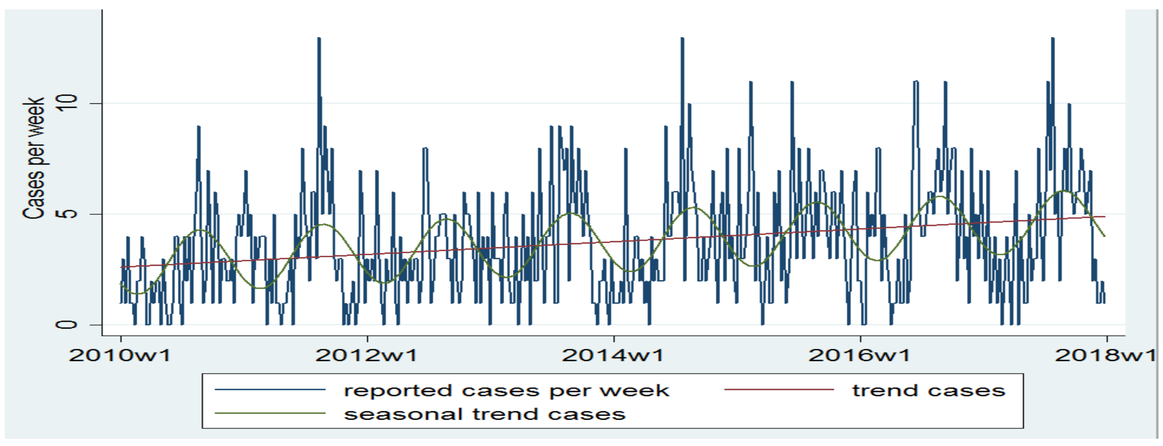
Legionellosis cases depend on meteorological variables:

- A multivariate model, adjusted for seasonality (26 & 52 weeks), estimates the adjusted incidence rate ratio (IRR) for trend over time per week, maximum Tmax (increase in rate ratio for every ℃) and RH (increase in rate ratio for every % humidity).

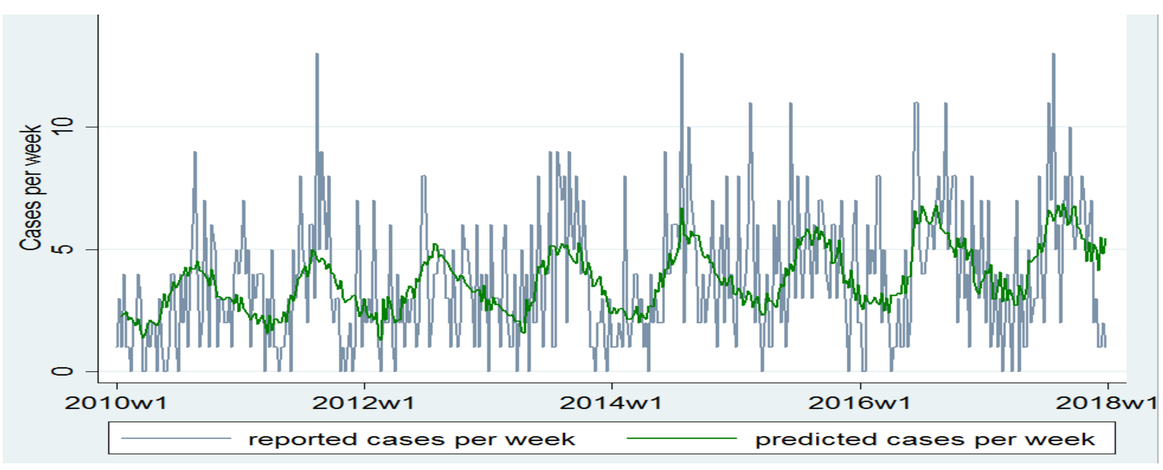
	Adjusted IRR	95%CI	P-value
Trend	**1.0011**	1.0007-1.0016	**0.000**
RH (2 weeks delay)	1.037	1.018-1.055	**0.000**
Tmax (2 weeks delay)	1.089	1.018-1.165	**0.000**
Interaction Tmax*RH	0.999	0.998-1.000	0.01

Conclusions

- Meteorological conditions (RH and Tmax) are associated with the occurrence of domestic cases of legionellosis.
- The observed increase in reported legionellosis cases is partly explained by the dynamics of RH and Tmax: 2 cases per year are explained by the changing weather.
- The increase in reported legionellosis cases is not completely explained by meteorological variables, and an increase in awareness and testing practices may contribute to this increase.



Trend <u>without</u> accounting for weather conditions: increase of the weekly number of cases with 0.0013, representing an increase of 12 cases per year (Poisson regression).



Trend <u>when accounting</u> for weather conditions: increase of the weekly number of cases with 0.0011, representing an increase of 10 cases per year (Poisson regression).

Methods

Data sources

- Reported cases of legionellosis from the three surveillance networks:
  - laboratory sentinel surveillance network,
  - national reference center,
  - mandatory notifications.
- Meteorological data from the weather institute (KMI) Uccle, Brussels:
  - daily maximum temperature (Tmax),
  - daily average relative humidity (RH).

Data analysis

- Cases with known travel history during incubation period excluded.
- Meteorological variables were averaged per week.
- Time series analyses performed using Poisson regression, adjusted for annual seasonality.
- RH and Tmax were included in the model with 2 weeks time lag.
- Data analysis was performed in STATA 14.1.

Recommendations

- Regional infectious disease control teams and physicians might be more alert for cases of legionellosis about 14 days after ‘out-of-season’ humid and warm weather conditions.
- We recommend further studies to model the spatial-temporal relationship between meteorological variables and cases of legionellosis in Belgium.

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