Effect of outdoor air pollution in Iceland's capital region on asthma drug dispensing

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Air pollution

- From traffic and other sources around Reykjavík.
- Known to irritate lungs and worsen symptoms of chronic lung disease.
- Many health limit violations every year for some pollutants: PM_{10} (svifryk) exceeds the 24-hour health limit some 25 times per year.
- Lack of studies in Iceland measuring the effect of high air pollution concentrations on respiratory health.

Aim

- The overall aim of this study is to determine whether day-to-day increases in the levels of air pollution in the Capital Area of Iceland, are associated with an increase the sales of asthma medication.

Methods

Exposure ->>>

- Air pollution:

PM_{10}, NO_2, O_3, H_2S

- Source: Municipality of Reykjavík environmental department.

- **Outcome**
  - Daily number of people taking out drugs to relieve pulmonary obstruction
  - Source: Medicines registry at the Directorate of Health

Regression Covariates

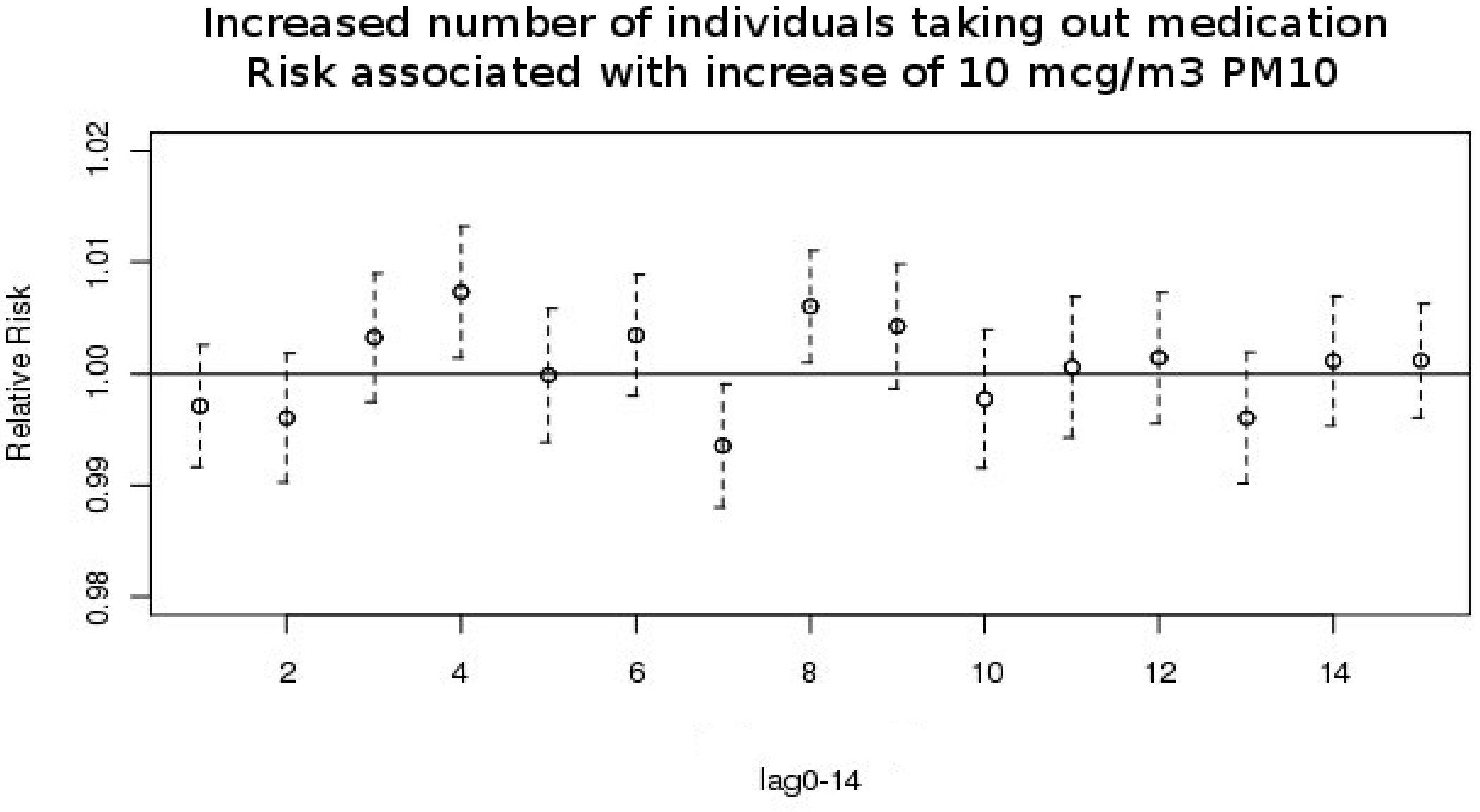
Day-of-week, seasonal trends, time trend, air humidity, temperature, influenza season and pollen

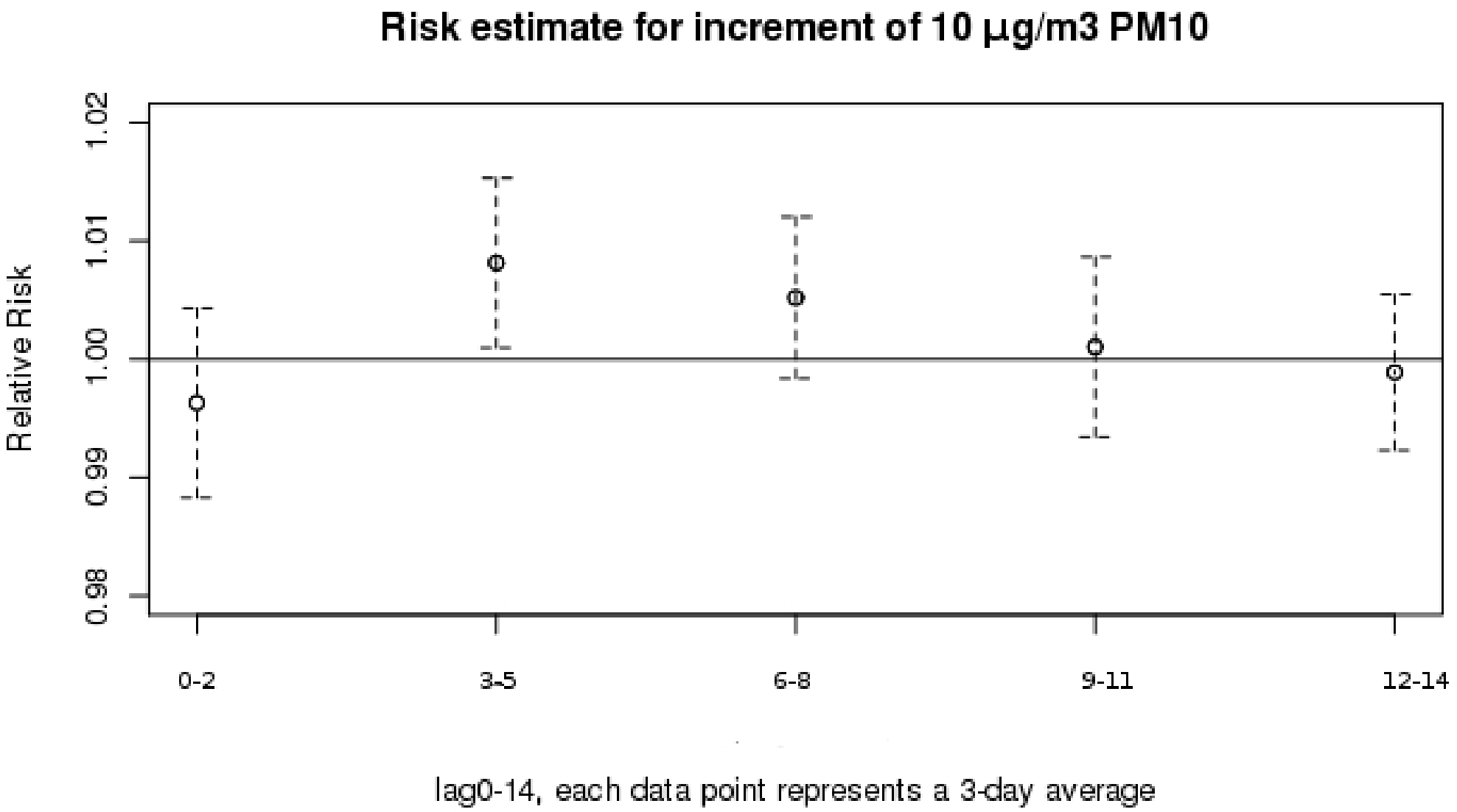
Descriptive statistics

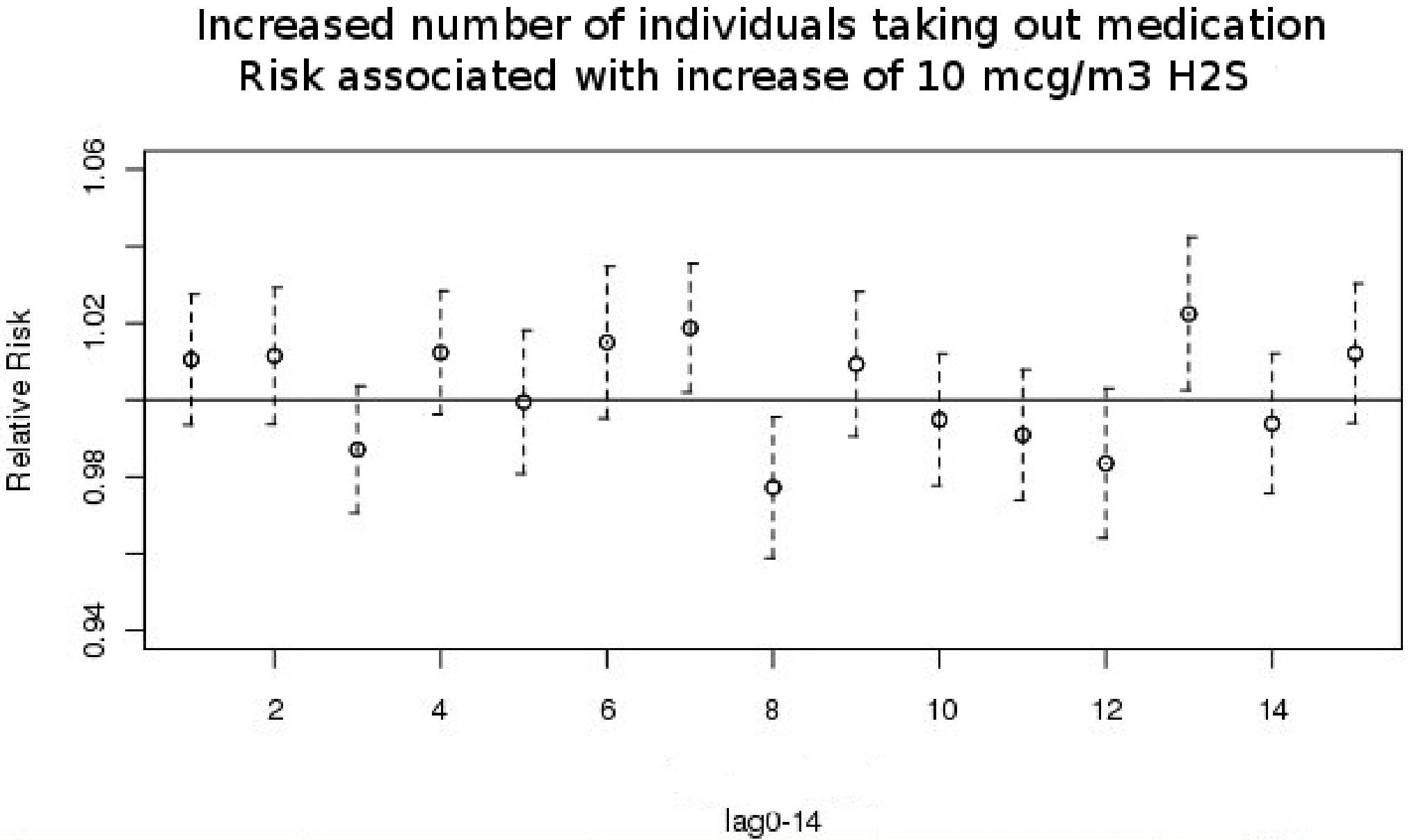
Pollutants	Daily 24-hr mean (range)	Standard deviation	24-hour health limit
PM10 (µg/m3)	22,95 (3,23 – 261,60)	21,78	50
NO2 (µg/m3)	23,00 (2,76 – 111,60)	13,83	75
O3 (µg/m3)	41,11 (1,20 – 91,49)	13,37	120*
H2S (µg/m3)	3,626 (0,02 – 58,93)	6,1	-

Pollutants	Max daily 1-hr mean (range)	Standard deviation	1-hour health limit
PM10 (µg/m3)	79,05(0,00-1779,00)	130.33	-
NO2 (µg/m3)	51,47(0,00-209,60)	28,11	110-200
O3 (µg/m3)	58,30 (0,00-136,25)	13,48	-
H2S (µg/m3)	14,61(0,00-176,55)	26,04	-
			*8 hour health limit

Health outcome	Mean (range)	std.dev.
Dispensed individuals per	72,41 (2 – 151)	37,9


Increased number of individuals taking out medication
Risk associated with increase of 10 mcg/m3 PM10
Relative Risk
0.98
0.99
1.00
1.01
1.02
2
4
6
8
10
12
14
lag0-14


Risk estimate for increment of 10 µg/m3 PM10
Relative Risk
0.98
0.99
1.00
1.01
1.02
0-2
3-5
6-8
9-11
12-14
lag0-14, each data point represents a 3-day average


Increased number of individuals taking out medication
Risk associated with increase of 10 mcg/m3 H2S
Relative Risk
0.94
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4
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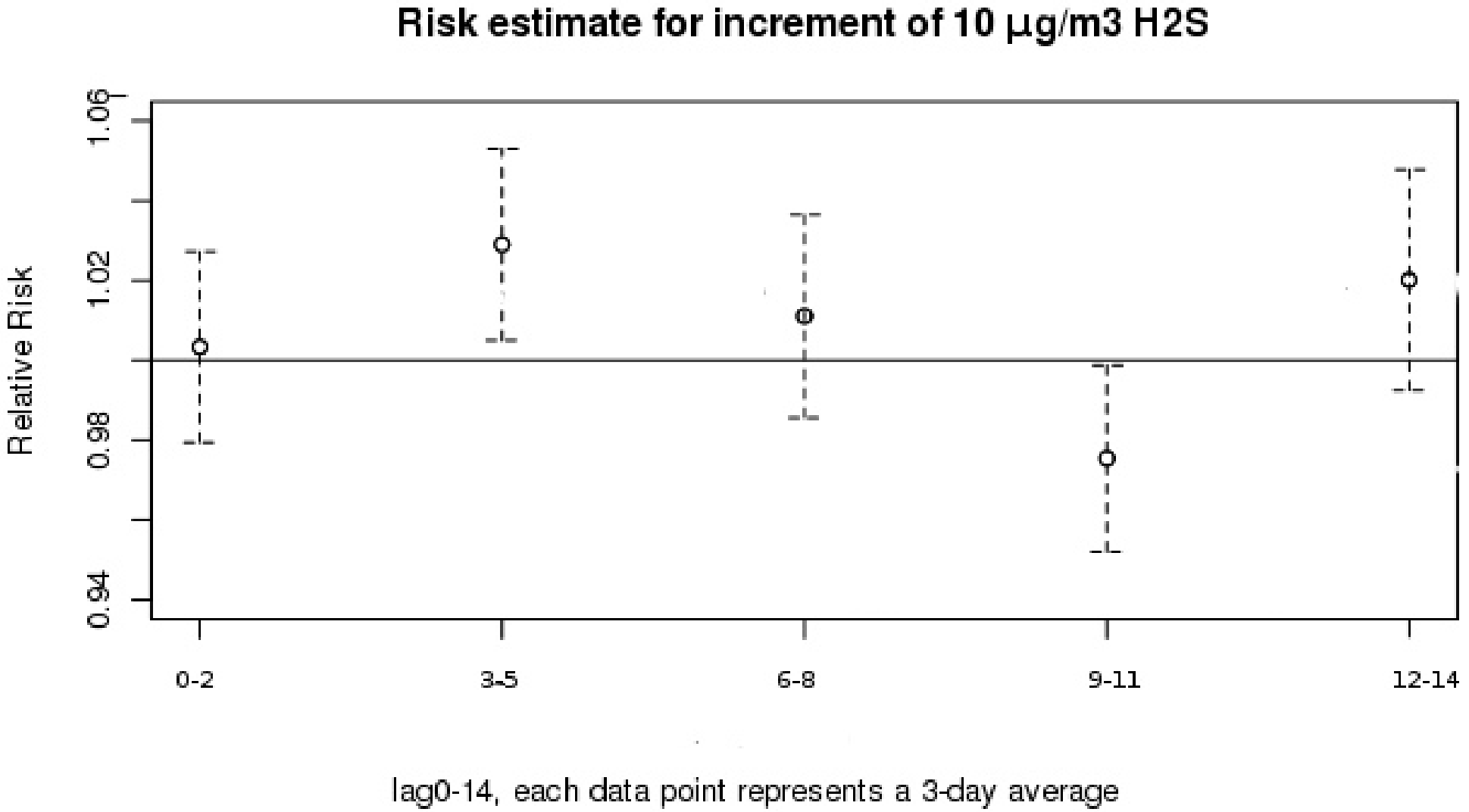
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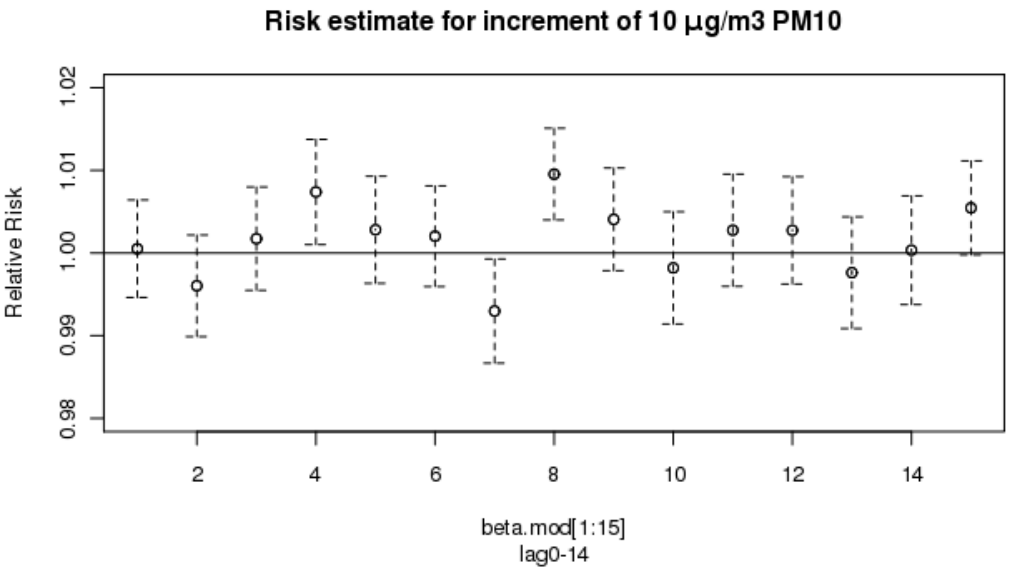
Conclusion

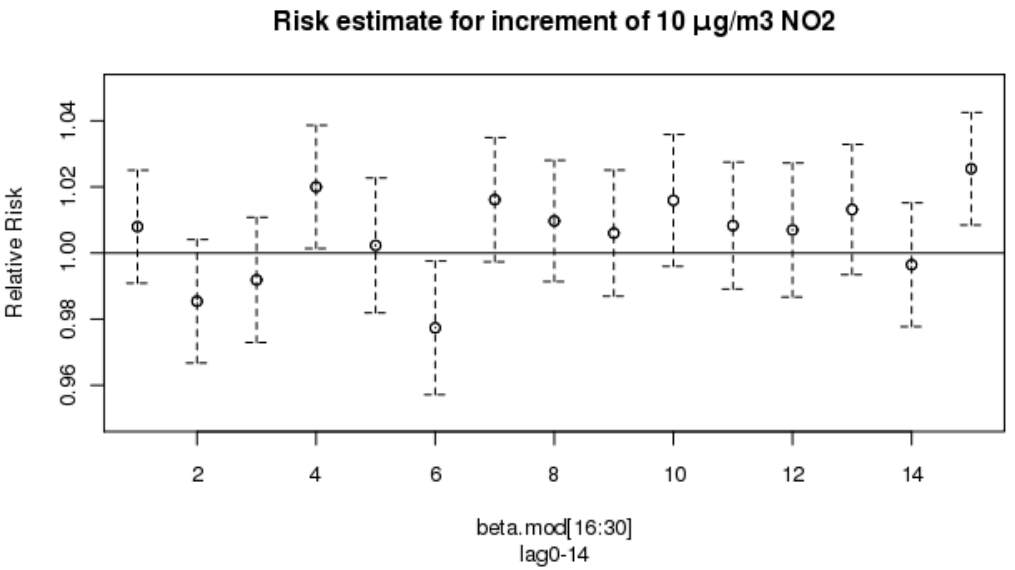
- Increases in levels of air pollution are associated with increased dispensing of drugs to relieve pulmonary obstruction during the following days in multi-pollutant poisson regression models
- Size of the effect and the longevity of the association differs between pollutants.
- In studies abroad, similar, positive associations are seen at lag2-10 (Laurent et al 2009, Pitard et al 2004)
- This is the first study in Iceland on health effects of air pollution using the population-based pharmaceutical database
- Further analysis of the data is ongoing.

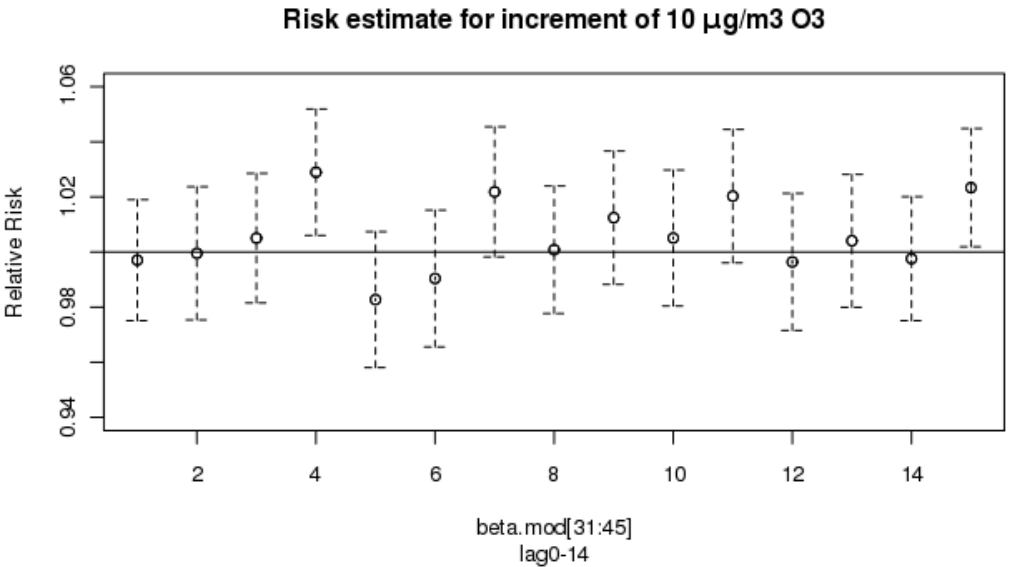
Takk

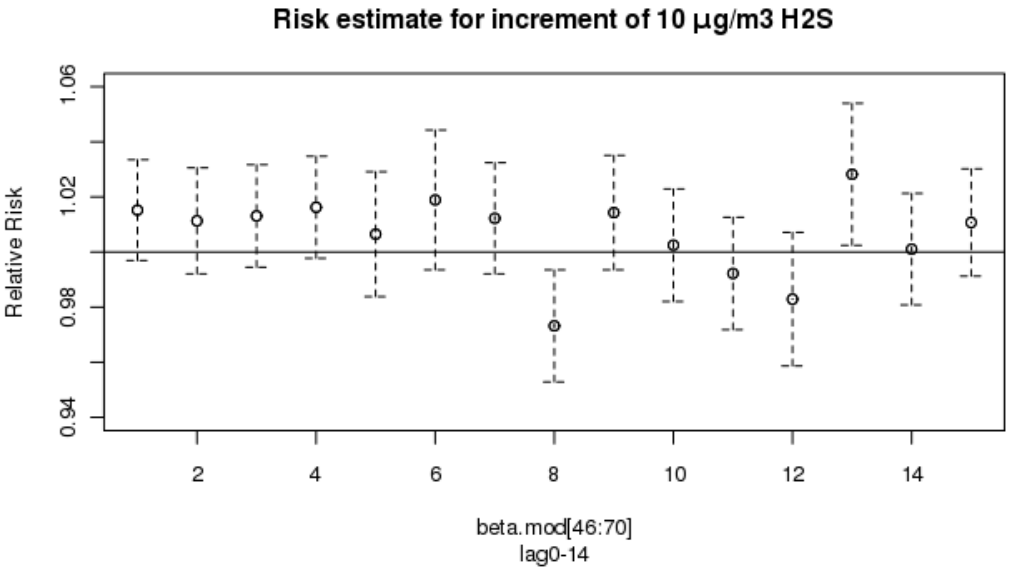
- Oddsjóður & Astma- og ónæmisfélag Íslands

Continuous input model









Methods II

- **Data**
  - Daily dispensings from the pharmaceutical registry of The Directorate of Health
    - Daily dispensings of adult in the denser populated capital area by individual, number of prescriptions and volume.
  - Pollution data from the environmental and traffic department of the city of Reykjavík
    - 30-minute data on concentrations of pollutants and climate.

- **Poisson regression**
  - Poisson regression used to models counts (non-negative discrete variable)
  - Lags – delays in effect
    - Dispensing of drugs on the same day as the pollution event (lag0), one day after(lag1), two days after (lag2) and so on.

$$Daily\ drug\ dispensings = \alpha + \beta_1 * Air\ pollution + \beta_2 * Day\text{-}of\text{-}week + \beta_3 * Seasonal\ trends + \beta_5 * pollen + \beta_5 * Climate + \beta_6 * Influenza$$