EUROMOMO WINTER SEASON 2015/16 MORTALITY SUMMARY REPORT

A pooled analysis of all-cause mortality from 18 European countries participating in the EuroMOMO network showed all together a moderate level of excess mortality during the winter season of 2015/16. The mortality was relatively high among those aged 15 to 64 years, but was low among the elderly. This mortality coincided with the influenza activity observed in the reporting countries.

BACKGROUND

Mortality in temperate and subtropical regions has a regular seasonal pattern, with higher mortality during the winter months compared to the summer months, see figure 1. This seasonality in mortality is driven predominately by deaths among the elderly. The pattern can be ascribed to various factors including seasonal transmission of influenza and other respiratory virus infections, as well as increased deaths from bacterial infections including bacterial pneumonia, and cardiovascular diseases. In the winter, during periods with extreme cold weather, an increase in mortality may also be explained by a direct effect of "cold snaps" on the risk of death, especially among elderly and vulnerable groups in the population.

The EuroMOMO Network monitors weekly all-cause mortality across participating European countries to detect, in a timely manner, any excess mortality compared to the expected (baseline) levels. EuroMOMO has been monitoring weekly excess all-cause mortality continuously since the H1N1 pandemic in 2009. The number of participating countries (or regions of countries) has gradually increased over the past six years and is currently 19, thus covering large geographical parts of the European region.

In addition to the weekly detection of excess mortality, annual pooled estimates of the total excess winter mortality are provided to assess the severity of seasonal epidemics compared to previous seasons.

This report provides the estimates of excess all-cause mortality for the 2015/16 winter season, as compared to previous seasons.

METHODOLOGY

A common statistical algorithm (A-MOMO) is used in each of the EuroMOMO-participating countries to generate weekly estimates of age group-specific excess number of deaths, and z-scores are used to compare across countries. The algorithm is a time-series Poisson regression model with the number of weekly deaths as dependent variable and adjusted for trend and seasonal variation. The algorithm also corrects for the delay observed between data collection and data processing in each country.

For the pooled analysis we used the stratified EuroMOMO pooled method. Locally produced data from week 20, 2013 to week 25, 2016 from 18 countries, were used to estimate pooled total and age group-specific (<5, 5–14, 15–64 and ≥65 years) weekly numbers of expected (baseline) and excess deaths, stratified by participating countries.

Population numbers were obtained from EuroSTAT and used to calculate mortality rates.

National data from the following 18 countries were included for the 2015/16 winter season estimates: Belgium, Denmark, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom (England, Scotland and Wales); the countries represent a population of 280 million inhabitants.

Definitions:

- **Winter season** is defined as the period from week 40 to week 20 the following year
- **Expected number of deaths (baseline)** for each winter season is estimated based on data from the 5 previous years. Pooled estimates are based on data received in week 26 after each season
- **Excess deaths** is defined as observed deaths minus baseline deaths
- **Excess mortality rates** allow for comparison of mortality patterns between different populations and time periods

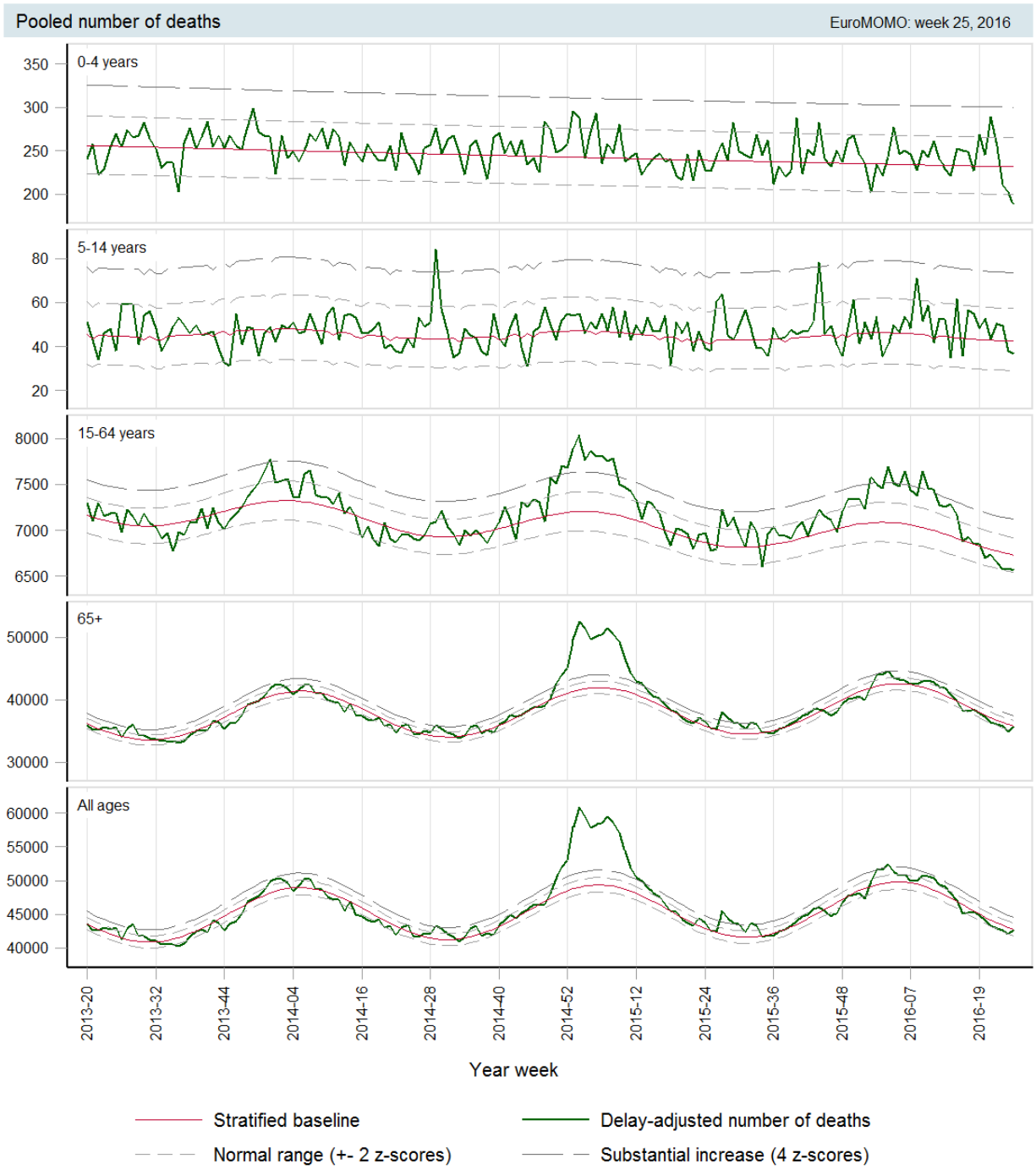
FINDINGS

Figure 1 shows the seasonal variation in pooled estimates of all-cause mortality over the three winter seasons from 2013/14 to 2015/16 based on data extracted by week 25, 2016 i.e. received by week 26, 2016.

Table 1 shows estimated excess mortality rates in total and by age groups for the six winter seasons from 2009/10 to 2015/16, and number of participating countries by season. The number of reporting countries increased over the period from 8 to 19. Some countries only provided limited data (only z-scores, but without numbers) and thus cannot be included in the pooled analyses. It is important to note that the estimates in Table 1 may be different from the visual deviations from the baseline as seen in Figure 1, and different from graphs shown at the EuroMOMO website. This is due to the methods applied for the results in Table 1, i.e. all estimates are calculated on the previous five years without any conditioning on the future.

Overall, the reported excess all-cause mortality from the participating countries for the winter season 2015/16 was at the same low level as in the seasons 2010/11 and 2011/12, corresponding to estimated 15,054 (95% CI: 11,648-18,463) excess deaths. Nonetheless, a relative large excess in mortality was observed in the age group of 15-64 years, with a mortality rate of 4.9 per 100,000 people above the baseline, corresponding to 8,732 (95% CI: 8,051-9,414) excess deaths in the participating countries. By contrast, the observed excess mortality among the elderly (65+) was relative low with an estimated number of 7.849 (95% CI: 4,705-10,995) excess deaths in the 2015/16 winter season. The observed excess mortality had two waves, one from week 49, 2015 to week 7, 2016, and later followed by a second wave from week 7 to 15, 2016. This coincided with an initial predominance of influenza A activity, followed by an subsequent circulation of influenza B in the reporting countries.

Figure 1. Pooled estimates of weekly total number of all-cause deaths in the winter seasons 2013/14, 2014/15 and 2015/16; shown in total and by age group.



Participating countries:
Belgium, Denmark, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Netherlands, Norway
Portugal, Spain, Sweden, Switzerland, UK (England), UK (Scotland), UK (Wales)

Table 1. Pooled analysis of excess mortality (number of deaths per 100,000 population) during the winter seasons from week 40 to week 20 for the years 2009/10 until 2015/16; shown in total and by age group.

Season	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**
Main influenza type	A(H1N1)pdm09	A(H1N1)pdm09	A(H3N2)	Mixed + B	Mixed	A(H3N2)	A(H1N1)pdm09 + B
Age groups	**Excess mortality per 100,000 population**						
0-4	1.24 (-0.07;2.56)	1.77 (0.74;2.81)	1.64 (0.73;2.55)	1.14 (0.36;1.92)	1.76 (1.00;2.52)	1.38 (0.62;2.14)	2.42 (1.70;3.14)
5-14	0.72 (0.43;1.01)	0.77 (0.52;1.02)	0.65 (0.44;0.86)	0.49 (0.31;0.67)	0.18 (0.02;0.35)	0.51 (0.35;0.67)	0.50 (0.34;0.66)
15-64	1.76 (1.10;2.42)	-0.13 (-0.67;0.41)	-3.49 (-3.98;-3.00)	2.09 (1.66;2.53)	1.67 (1.22;2.12)	5.94 (5.53;6.35)	4,85 (4.47;5.23)
65+	104.12 (93.95;114,30)	29,57 (21.26;37.89)	51.34 (43.47;59.21)	88.20 (81.42;94.99)	-12.46 (-20.11;-4.79)	214.17 (207.60;220.74)	14.71 (8.82;20.60)
Total	18.66 (16.82;20.49)	5.42 (3.89;6.96)	6.73 (5.26;8.21)	17.25 (15.96;18.55)	-1.39 (-2.96;0.18)	43.63 (42.30;44.96)	5.37 (4.15;6.58)
No. of countries reporting	8	11	12	14	18	18	19
Number of countries included	7	9	11	12	17	17	18

Excess mortality is defined as the observed number of deaths minus baseline per 100,000 population produced by the EuroMOMO pooling algorithm. Numbers in brackets are 95% confidence intervals.

COMMENTARY

Seasonal influenza was in the 2015/16 winter season dominated by circulation of influenza A(H1N1)pdm09 viruses. Influenza B virus circulation increased following the decline of influenza A virus circulation. There was a good antigenic match between circulating A(H1N1)pdm09 viruses and the applied vaccine strain. However, vaccine effectiveness against this subtype remained suboptimal. Circulating B viruses were antigenically similar to the quadrivalent vaccine strain, but belonged to another lineage than the strain included in most commonly used trivalent vaccine.

Previous seasons dominated by influenza A H1N1 (pdm09) have similarly been characterized by a low mortality in the elderly population, which is usually the main driver of excess mortality during the winter seasons. Influenza B circulation is similarly only rarely associated with excess mortality in the elderly. The mortality pattern seen in 2015/16 is in line with a mixed influenza A H1N1(pdm09) and influenza B season, including the pattern of low excess mortality overall, but with a relatively higher number of excess deaths in the younger population (i.e., less than 65 years of age) relative to the elderly population.

This report represents the third brief descriptive winter excess mortality summary provided by the EuroMOMO network. It is our aim to present these report in a more timely manner in the future in agreement with our aim to provide real time mortality surveillance.