

# Reporting rates of influenza-like illness (ILI) consultations from General Practitioners in Scotland – technical document

## Season 2018/19

Version 1.0 – January 2019

### Background

Influenza virus infections can cause a range of symptoms which are non-specific and resemble the clinical picture of a variety of other pathogens. A clinical diagnosis is often referred to as Influenza-like Illness (ILI) by General Practitioners (GP).

In Scotland, the recommended surveillance case definition for ILI is an individual presenting in primary care with an acute respiratory illness with physician-diagnosed fever or complaint of feverishness in the previous 7 days. It is important to note that:

- The surveillance case definition for ILI is not necessarily intended to capture all cases but to describe trends over time;
- The individual diagnosis and clinical electronic recording of ILI is at clinical discretion of the GP.
- ILI is not the same as a laboratory confirmation of influenza and any clinical diagnosis based on signs and symptoms will miss some influenza infections and include some non-influenza infections.

Health Protection Scotland regularly reports consultation rates for ILI in primary care. This is the key measure of influenza activity in the community and is used to gauge the severity of influenza seasons in Scotland each winter. It is also used for comparison of influenza activity across the UK and Europe.

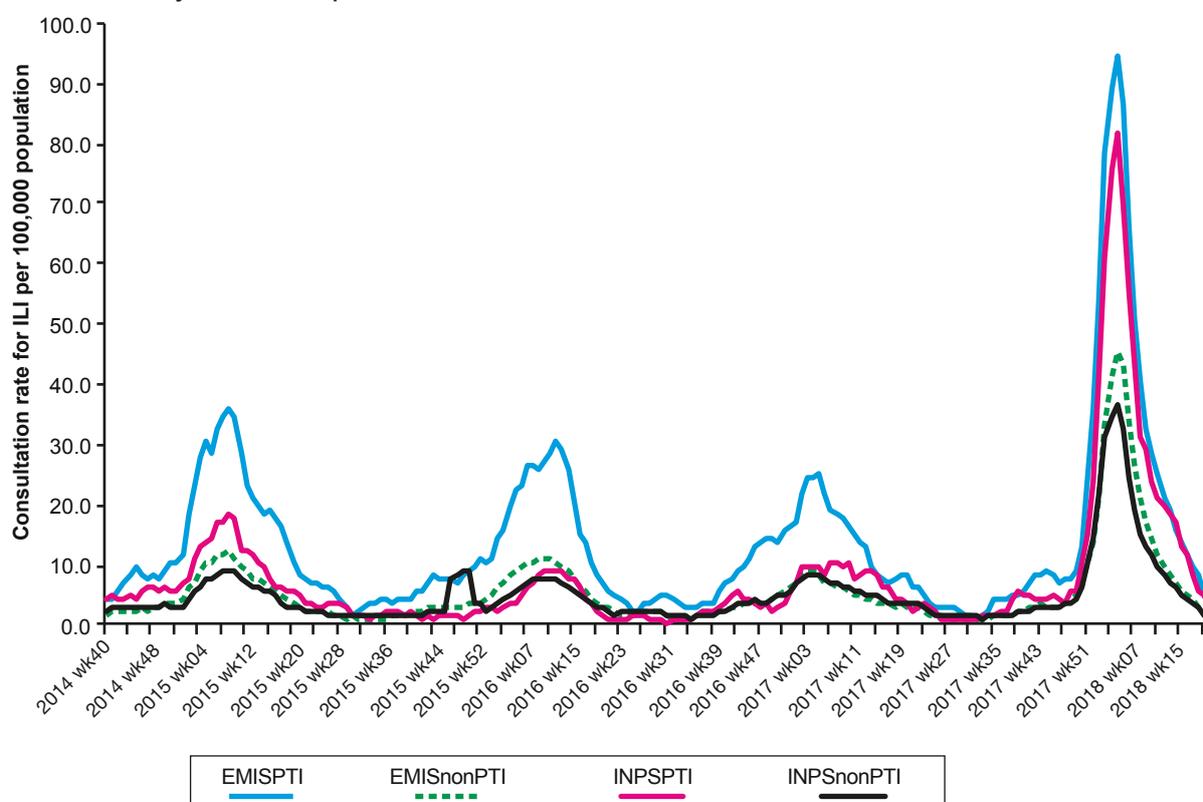
Since 1972, rates of ILI seen by general practitioners have been monitored every week across Scotland. The way in which this influenza data is captured has changed over the years (see [HPS website](#)) but the common method of presentation has remained constant and has been to express GP consultations as a rate per hundred thousand population. Typically an all-Scotland consultation rate is presented but consultation rates by age and by Health Board can also be monitored.

Since the 2010/11, season the main source of this data for general practice has been the Scottish Influenza Surveillance Reporting Scheme (SISRS). This scheme began in August 2009, providing consultation rates for ILI and acute respiratory illness (ARI), by practice, age and sex. Typically, around 950 practices (99% of all practices in Scotland) routinely report into this scheme. ILI rates, rather than ARI rates are reported every week to make Scottish data more comparable to data from the rest of the UK and beyond.

Since August 2009 and up to week 34 2017, almost all practices in Scotland (99%) have submitted electronic consultation data to Health Protection Scotland (HPS) every day. From week 35 2017, practices changed to submission of consultation data on a weekly basis. The SISRS extract is automatically generated in each practice based on the previous week's consultations for ILI and ARI. Consultations for ILI and ARI are identified by searching for ILI or ARI specific Read codes generated by, and stored in, the practice software system.

Practices in Scotland use one of two GP software systems, EMIS or INPS. It is recognised that the quality of coding between practices and software systems varies and that this contributes to differences in consultation rates between practices. Of particular note, are the differences in consultation rates when each software system and PTI (Practice Team Information) status is compared (Figure 1) (a see note below on PTI). This may reflect the way in which the information is captured by the software and educational instruction for the coding of such information.

**Figure 1** - Four-week moving average ILI GP consultation rates per 100,000 population from SISRS by software provider and PTI status



Whilst the absolute levels of ILI consultation rates within each software system may differ, there is broad consistency in the patterns of ILI rates observed. The effect of these differences is that any difference in consultation rates observed between practices or NHS boards, may not be attributable to different rates of illness but rather may be due to differences in software system recording by practices.

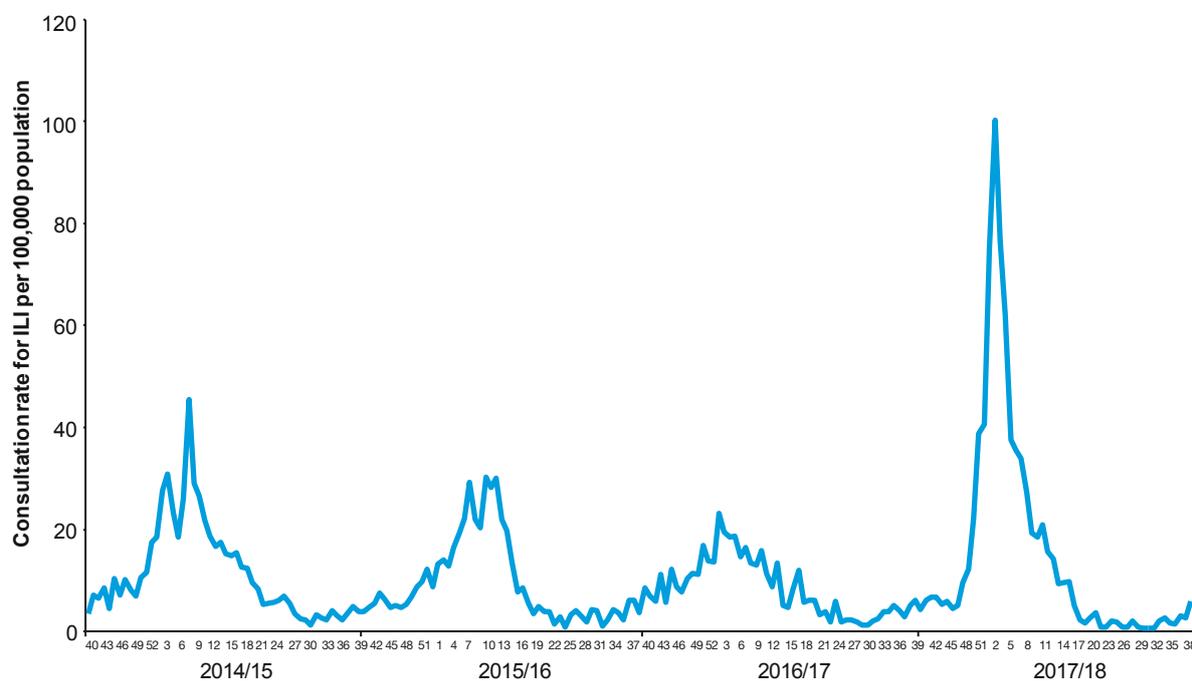
a The Practice Team Information (PTI) scheme ran up to September 2013 and involved around sixty practices in Scotland. The scheme was administered by NSS Information Services Division (ISD). These practices aimed to record all consultation information through Read codes and data from these practices was acknowledged to be of the highest standard. As the coding used routinely by PTI practices was embedded in their practice software systems, these practices continued to code consultations differently to other non-PTI practices after September 2013.

Due to these differences, an adjustment is made to the consultation rates. The adjustment is based upon a poisson regression statistical model, which estimates the ratios of the consultation rates between the PTI and non-PTI practices and between the practices on EMIS and INPS systems. These ratios are pooled estimates adjusting for NHS board, age and gender differences. The consultation rates for the practices are then standardised to an EMIS/INPS PTI practice. As outlined above, this group of practices was chosen as the reference group because of the high quality of coding recording, and also to allow comparability to rates in England and Wales, which uses RCGP (Royal College of General Practice) clinical data. A separate adjustment is carried out each week, to ensure that week on week changes between NHS boards are not masked by the adjustment – this provides comparable data for each NHS board.

It has also been noted that practice populations or list sizes recorded in SISRS fluctuated over time and for many practices (predominantly INPS practices) a steady increase was observed. This had the effect of inflating the NHS board and Scotland level populations, so an additional adjustment was introduced to account for this between 2014 and mid-2017. This issue has now been solved and the adjustment stopped being applied to data since Q3 2017.

Populations by NHS board, age and sex are adjusted to the corresponding quarterly populations recorded on the Community Health Index (CHI). Using these adjusted populations, NHS board level rates are calculated from individual practice data. In addition to the above, the data are adjusted for the number of days in the week to account for public holidays. The adjusted all-Scotland weekly data since October 2014 is shown in Figure 2.

**Figure 2** - GP consultation rates for ILI in Scotland; weekly rates per 100,000 population, October 2014 to September 2018

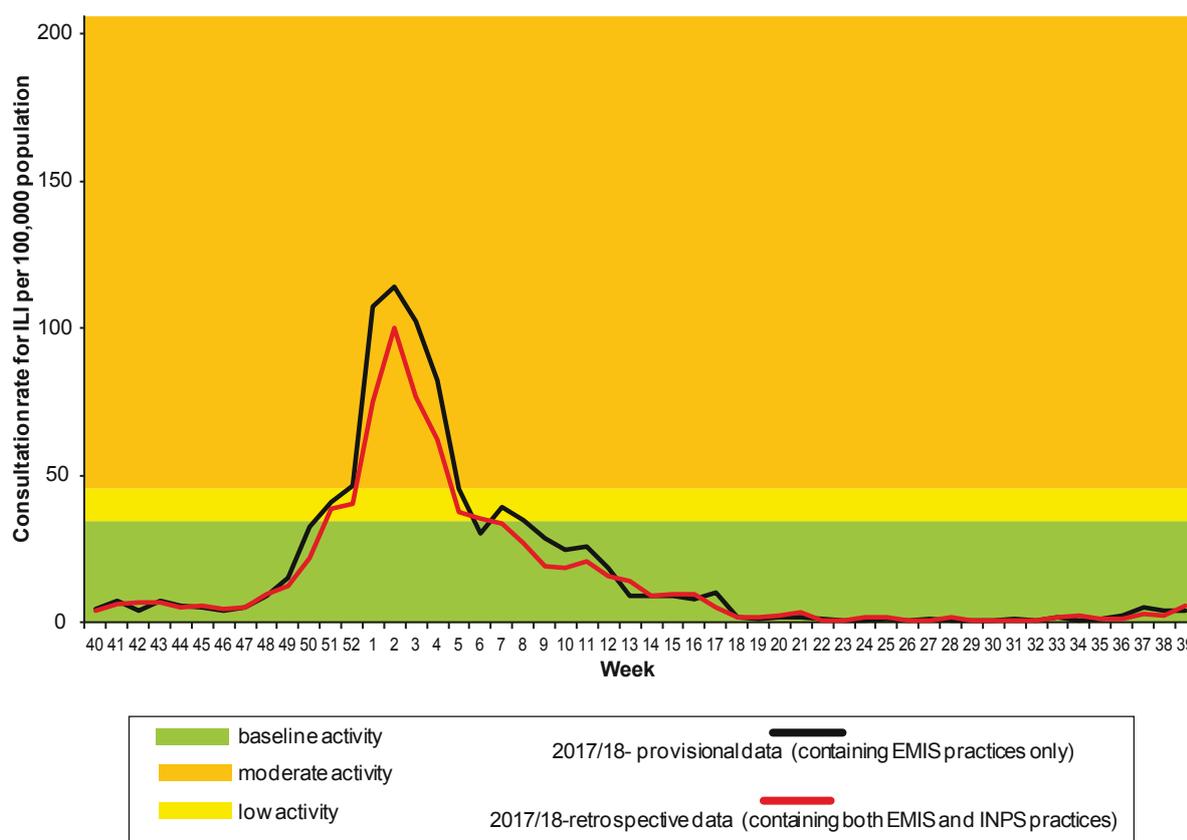


## Description of the 2017/18 data issues and end of season revision of ILI consultation rates

Due to a GP software provider issue during the 2017/18 season, data on ILI consultations was only available from approximately 50% of practices (EMIS practices only). Therefore, further

adjustments were temporarily implemented to account for this. This provisional data on ILI rates for all-Scotland was reported in HPS weekly reports between week 40 2017 and week 39 2018 to inform influenza activity monitoring. Throughout the 2017/18 season, HPS worked with INPS to overcome this issue and obtain 2017/18 retrospective data. Retrospective analysis of data from both EMIS and INPS was undertaken in autumn 2018. This analysis showed higher all-Scotland ILI rates around the peak and following weeks (weeks 52 - 11) for the provisional data (containing EMIS practices only) compared to the retrospective data (containing both EMIS and INPS practices) (Figure 3). The larger number of PTI practices with EMIS software might be a possible explanation for the increase in ILI consultation rates on the provisional data.

**Figure 3** - Comparison between ILI provisional data (containing EMIS practices only) and ILI retrospective data (containing both EMIS and INPS practices), with MEM thresholds for 2017/18



## Moving Epidemic Method (MEM) for the calculation of epidemic and intensity thresholds

Threshold setting helps 1) to characterise influenza activity levels, 2) to indicate when the influenza season has begun and 2) to detect periods of increased activity or atypical activity. Knowing influenza activity levels allows comparisons over time and across countries.

Since 2011/12, the European Centre for Disease Prevention and Control (ECDC) has adopted the Moving Epidemic Method (MEM) as the standard methodology for setting thresholds and classifying influenza activity using primary care consultation rates. The methodology is described in detail elsewhere<sup>1,2</sup> but in brief, it can be divided in three main steps:

- First, the MEM models historical data to determine the typical timing and duration of an epidemic. The length of the epidemic period for each season is determined by finding the shortest duration that included the most activity, i.e. by determining the minimum number of consecutive weeks with the maximum cumulative rate. Each season is then split in three periods: a pre-epidemic, an epidemic and a post-epidemic period.
- Second, the epidemic threshold (or seasonal threshold) is then calculated as the upper limit of a specified 1-sided confidence interval of the 30 highest values occurring before the epidemic period. The number of values used from each season is determined by dividing 30 by the number of seasons included in the analysis and rounding to the nearest integer.
- Third, the intensity thresholds are estimated as the upper limits of the 40%, 90% and 97.5% 1-sided confidence intervals of the geometric mean of the 30 highest values occurring during the epidemic period (medium, high and very high thresholds, respectively). Similarly to the epidemic threshold, the number of values used from each season is determined by dividing 30 by the number of seasons included in the analysis and rounding to the nearest integer.

The calculation of the MEM threshold is dependent on sufficient consistent historical data and is updated each year with data from the season just past. To note, MEM threshold calculations do not include data from the pandemic year 2009/10 as this season had two waves of activity and considerable non-winter season activity.

The activity levels based on the MEM uses 4 thresholds (Epidemic, Medium, High and Very high) and are categorised as:

- **No activity or baseline activity:** when activity is below epidemic threshold;
- **Low activity:** when activity is between epidemic and medium thresholds;
- **Moderate activity:** when activity is between medium and high thresholds;
- **High activity:** when activity is between high and very high thresholds;
- **Extraordinary activity:** when activity is above very high threshold.

The MEM thresholds can be calculated using R programme<sup>3</sup> with either the R package ('mem' package)<sup>4</sup> or Rshiny application ('memapp' package).<sup>5</sup>

To date, the MEM has been applied to several types of influenza data such as influenza-like illness (ILI) GP consultation rates,<sup>1,2,6,7,8,9,10</sup> Goldstein index,<sup>7,11</sup> acute respiratory illness (ARI) GP consultation rates,<sup>1,2</sup> oseltamivir prescription counts,<sup>12</sup> influenza laboratory reports,<sup>8,10,11</sup> hospital staff influenza-like absence,<sup>13</sup> pneumonia and influenza-related mortality,<sup>8</sup> influenza-related hospitalisations<sup>8,10</sup> and influenza-related syndromic surveillance.<sup>10</sup>

Each country determines its own MEM thresholds, based on its own previous data. The weeks of activity below and above different thresholds is comparable between countries, regardless of the actual consultation rates themselves. This method has been adopted by countries all over Europe and is used by all devolved administrations in the UK.<sup>9</sup> In addition to identifying the start of the influenza season, this MEM methodology has been shown to allow comparison of influenza intensity between seasons or countries. This analysis has been shown to be important in understanding patterns in seasonal epidemics.<sup>1</sup>

## Application of MEM to Scottish ILI consultation rate data

MEM thresholds have increased certainty with more seasons of data; between five and ten seasons of data is preferable. Scotland has a particular issue providing data across time due to the different reporting schemes that have been in place during different seasons. From 2005/06 until 2008/09, GP consultation rates were reported as ILI/ARI rates from the Pandemic Influenza Primary Care Reporting (PIPeR Level 4) scheme. Since the 2010/11 influenza season data from the SISRS has been used to determine ILI consultation rates. This means that no one reporting scheme covers the required time period for past data for MEM threshold calculations.

In order to provide comparable historic data, the weekly ILI/ARI rates from PIPeR Level 4 have been adjusted to simulate the ILI consultation rates that SISRS would have provided from 2005/06 to 2008/09.

Applying MEM to Scottish data from the last ten winter seasons (excluding 2009/10) results in a baseline threshold of **31.3 consultations per 100,000 population** for 2018/19. This is slightly lower than the baseline threshold calculated for 2017/18 (34.5 consultations per 100,000 population) and 2016/17 (36.1 consultations per 100,000 population). Table 1 show the MEM intensity thresholds and Table 2 show the correspondent activity level for seasons 2017/18 and 2018/19.

**Table 1** - MEM intensity thresholds for seasons 2017/18 and 2018/19

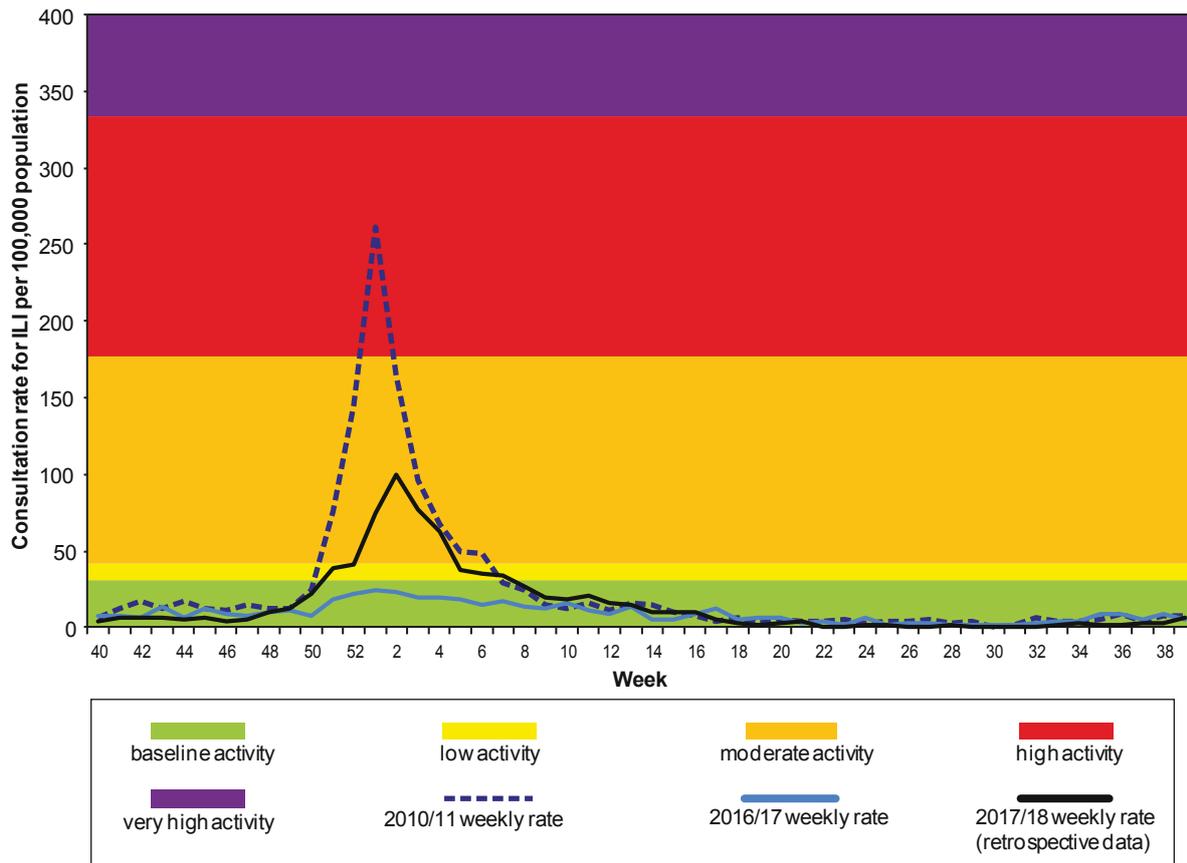
MEM intensity threshold	2017/18	2018/19
Baseline	34.5	31.3
Low	45.9	41.5
Medium	212.7	176.2
High	418.9	333.9

**Table 2** - MEM activity level for seasons 2017/18 and 2018/19

Activity level	2017/18	2018/19
baseline activity	< 34.5	< 31.3
low activity	34.5 to < 45.9	31.3 to < 41.5
moderate activity	45.9 to < 212.7	41.5 to < 176.2
high activity	212.7 to < 418.9	176.2 to < 333.9
very high activity	> 418.9	> = 333.9

In 2014/15, the seasonal threshold was only exceeded on one occasion (week 7 2015) peaking at 45.4 consultations per 100,000. 2015/16 and 2016/17 were low activity seasons for ILI consultations in primary care and the threshold for seasonal activity was not breached at an all-Scotland level at any point. The ILI consultation rates in 2017/18 breached the epidemic threshold in week 51 2017 (low activity level). The medium threshold was breached in week 1 2018 and ILI remained at moderate activity level until week 4 2018. The peak of ILI activity was in week 2 2018. The ILI rate returned and remained in baseline activity level from week 7 2018 onwards. Figure 4 shows the weekly ILI consultation rates by season with 2018/19 season threshold applied.

**Figure 4 - Weekly ILI GP consultation rates per 100,000 population by season, with MEM thresholds for 2018/19.**



## Description of the data to be used for the 2018/19 season

Overall, a good correlation was observed between the provisional data (using EMIS practices only) and the retrospective consultation rate data (using both EMIS and INPS practices) meaning that the provisional data published during the 2017/18 season was a good indicator of the influenza activity pattern seen in primary care in Scotland. The retrospective data (using both EMIS and INPS practices) for 2017/18 will be used going forward for in-season comparisons with previous and future years. Currently, there are no known issues with ILI data for season 2018/19.

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