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Assessing the burden of influenza and other respiratory infections in England and Wales

R.J. Pitman*, A. Melegaro, D. Gelb, M.R. Siddiqui, N.J. Gay, W.J. Edmunds

Statistics, Modelling and Bioinformatics Department, Health Protection Agency, Centre for Infections, 61 Colindale Avenue, London NW9 5EQ, UK

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Summary Objectives: To estimate the burden of influenza in England and Wales, in terms of general practice consultations, hospital admissions and deaths.

Methods: Multivariable regression was used to estimate the influenza attributable fraction of general practice consultations recorded in the general practice research database, of hospital admissions from hospital episode statistics and of deaths recorded by the Office of National Statistics.

Results: An estimated 779,000 (95%CI \pm 258,000)–1,164,000 (95%CI \pm 425,000) general practice consultations, 19,000 (95%CI \pm 5000)–31,200 (95%CI \pm 11,000) hospital admissions and 18,500 (95%CI 2500)–24,800 (95%CI \pm 2500) deaths annually are attributable to influenza infections. In primary care, the bulk of the burden falls on those under the age of 45, whereas the elderly are more likely to be hospitalised and to die.

Conclusions: Although there are significant uncertainties, and considerable year on year variations, it is clear that the burden of influenza is considerable. Although much of this burden falls on the elderly, significant numbers of general practice consultations, hospitalisations and even some deaths occur annually in children in England and Wales.

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Introduction

The aim of this paper is to estimate the current health burden of influenza in England and Wales. The health burden is measured in terms of GP consultations, hospitalisations and deaths.

* Corresponding author. Tel.: +44 020 83277451; fax: +44 020 83277868.

E-mail address: richard.pitman@hpa.org.uk (R.J. Pitman).

Background

Documenting the burden of influenza is not straightforward, morbidity resulting from influenza infection may be complicated by secondary bacterial infections and recorded under non-specific syndromes such as pneumonia. Only a tiny fraction of cases are investigated microbiologically, and even if they were all tested, the sensitivity and specificity are never 100%. Most previous attempts to estimate the burden of influenza have looked for “excess”

morbidity occurring during epidemic periods above a “baseline” incidence.^{1–3} Such a baseline can be defined using incidence in summer, or preferably from winter incidence in influenza non-epidemic years, or when influenza is not circulating.^{2,3} However, since a number of organisms (and other factors) may contribute to this baseline, each of which may have varying temporal patterns (including year to year variation), the uncertainty in defining the baseline limits the accuracy of estimates of excess morbidity and mortality.

Recently statistical techniques have been developed which utilise the underlying temporal pattern in the occurrence of individual organisms (as recorded by laboratory surveillance systems, for example) to attribute non-specific (syndromic) incidence data to the various causative agents.^{4,5} When these estimates have been compared to data derived from exhaustive laboratory investigations, they have provided similar results,⁶ suggesting that these techniques can provide robust estimates of the burden attributable to individual infections.

Methods

Data sources

The following were obtained:

- National laboratory reports from the Health Protection Agency (HPA) Centre for Infections (Cfi) (1990–2004)
- Consultation rates from the General Practice Research Database (GPRD) (2002–2003)
- Hospitalisation data from the Hospital Episode Statistics (HES) (1996–2003)
- Mortality data from the Office of National Statistics (ONS) (1990–2000)
- Population data from ONS (1990–2004)

Laboratory reports

The Health Protection Agency national laboratory reporting scheme is the main data source for the ascertainment of the temporal pattern of infectious diseases throughout the years. The system is based on voluntary weekly reports to Cfi of all clinically significant isolates from public health and non-public health laboratories around England and Wales. Each record corresponds to an individual episode of illness and contains information such as patient’s date of birth, sex, age, reporting laboratory, date of first specimen, and nature of specimen or specimens from which the organism was isolated.

Weekly counts (by date of first specimen) of the number of reports of the following organisms for the period 1990–2004 were extracted from the LabBase computer system at HPA Cfi: influenza A, influenza B, respiratory syncytial virus (RSV), parainfluenza, rhinovirus, adenovirus, *Streptococcus pneumoniae*, *Mycoplasma pneumoniae* and *Haemophilus influenzae*. Unfortunately influenza A reports are not stratified by sub-type in this database.

Where required, the weekly count was converted into weekly rates by dividing by the population estimates for

England and Wales for the appropriate years. Weekly rates were also derived for the following age groups: 0–4, 5–14, 15–44, 45–64, and 65+ years.

GPRD consultation rates

The General Practice Research Database (GPRD) is a computerised database of anonymised patient data including demographics, medical diagnoses, prescription information, referral and treatment outcomes. It is hosted by the Medicines and Healthcare products Regulatory Agency (MHRA) and covers approximately 35 million patient years of data. The GPRD currently collects data on about 3 million patients, equivalent to 5% of the UK population.

The GPRD database uses the Read/OXMIS coding system. Codes describing acute respiratory illness related consultations were identified from the 2002/2003 databases (see appendix for code list) and weekly consultation counts, by age and sex, were extracted. If two consultations were recorded for a patient on the same day, only one was counted.

Hospital episode statistics

Data on hospital admissions for acute respiratory illness were derived from hospital episode statistics (HES) (<http://www.dh.gov.uk/Home/fs/en>). This is a computerised hospital discharge database that collates output from all National Health Service hospitals in England. It contains information on individual episodes of illness, together with patient’s details (age, date of birth, postcode, sex), clinical conditions, number of days spent in the hospital and admissions to intensive care unit (ICU).

Line listings of admissions for respiratory illness (ICD10 J00–J99) were extracted for the years 1996–2003. Only the first episode of each hospitalisation was retained as the first reported diagnosis was more likely to be related to the cause of the admission rather than subsequent complications.

As HES statistics are only available for England, the final number of admissions attributed to each infection was scaled up to correspond to a population equal to that of England and Wales.

Mortality data

Doctors have been required to certify the cause of death for patients under their care since the early 1840s.⁷ The certifying doctor is required to explicitly state the condition that led directly to death in Part I of the certificate, whereas the disease or condition, which started the sequence, is reported in the lowest line (defined as the underlying cause of death). All certified deaths are notified to the Office for National Statistics (ONS), and coded according to ICD codes 9th revision (ICD9) until 1999 and 10th revision for 2000 and onward.

Mortality data were available for the period 1980–2002, with date of occurrence, age, sex and final underlying cause of death. There is some debate over the causes of death to which influenza may contribute, whether this is limited to deaths coded as respiratory disease or whether influenza may also impact on other classifications such as circulatory disease. To avoid our results being influenced by

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