9 Pneumonia results (standard output graphs can be found in Appendix A9)

Summary

Type of variation	Consistent across data sources?	Consistent within data sources?	Comments
Age	Yes	N/A	Peaks in extremes of age, but majority of events in the elderly.
Sex	Yes	N/A	M>F
Year on year	Could not be determined	N/A	Mortality coding changes led to doubling between 1992 and 1993. HES and GPRD consistent with no overall trend.
Week of year	Yes	N/A	Peak January, trough late summer (August and early September)
Regional	Partially	N/A	Higher in Northern areas but not always statistically significant, lower in East Anglia
Urban-rural	Partially	N/A	Urban>rural in mortality and HES, but not in GPRD
Geographical correlation	Limited	No: HES (adult vs child) Could not be determined: GPRD (adult vs child)	Poor correlations except for moderate positive correlations between emergency hospital admissions and mortality Numbers of patient consultations too small to allow within GPRD comparisons by age

The following areas are considered:

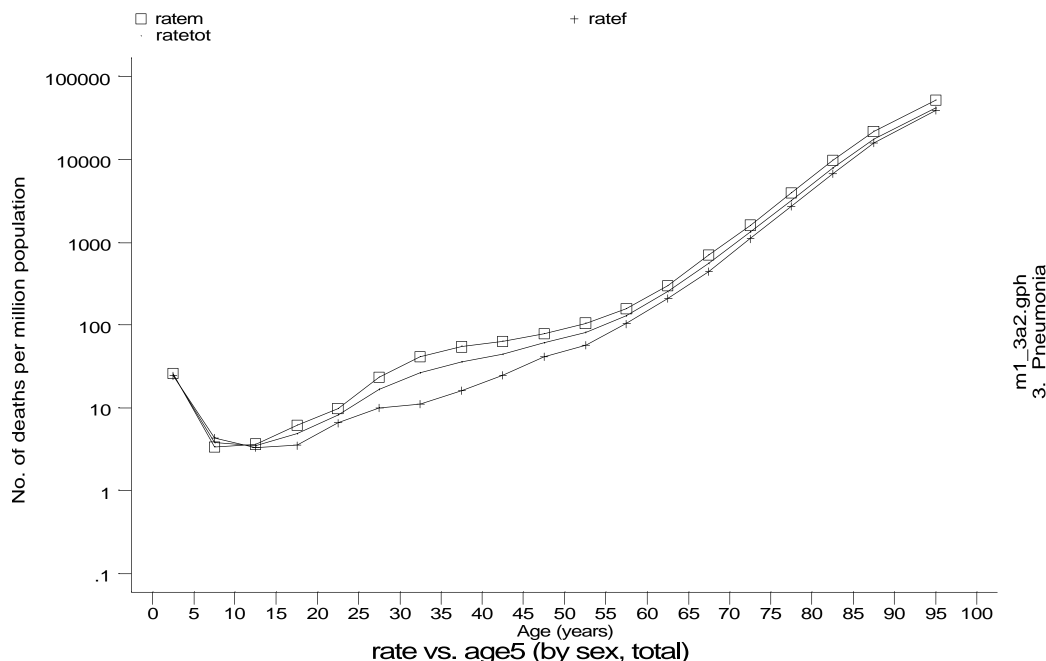
Variations by age and sex
Seasonality
Regional and urban rural distribution
Comparisons across data sources for all ages and by age group
Within database comparisons by age group

Variations by age and sex

Mortality, hospital admissions and GP consultations showed consistent age and sex patterns. The majority of deaths occurred in the elderly (Figure 9.1, note log scale), with a marked rise starting around age 65 with a peak in the most elderly. Levels were lower in earlier years, but there was a small peak in children aged 0-4 (highest in the first year of life). Male rates were generally slightly higher than females except for hospital admissions in ages 20-45 and mortality in ages 0-15 where rates were similar in both sexes.

The ratio between the crude rates from different sources varied by age group. In 0-4 years olds, hospital admissions were approximately twice as high as patient consultation rates in general practice, while mortality was two orders of magnitude smaller. In young adulthood, hospital admissions were an order of magnitude smaller than patient consultation rates and deaths were two orders of magnitude smaller. Peak death rates in the most elderly were approximately two-thirds of the patient consultation rates, while hospital admissions were approximately a fifth of the patient consultation rates.

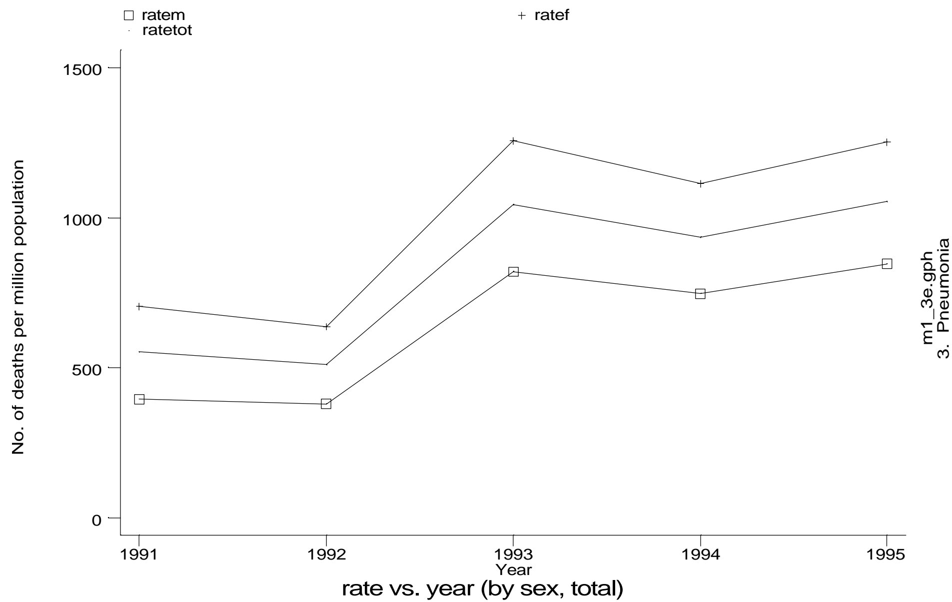
Figure 9.1 Crude mortality rates for pneumonia by age and sex for 1991-1995 (log scale on y axis)



Cohort effect: No cohort effects were seen.

Time trends: Coding changes in mortality led to an artefactual rise in deaths coded to pneumonia between 1992 and 1993 (Figure 9.2). GP consultations, emergency admissions and other years for mortality showed similar patterns with an ‘up and down’ pattern (dip in 1992, rise in 1993, dip in 1994 and rise in 1995) but no overall trend.

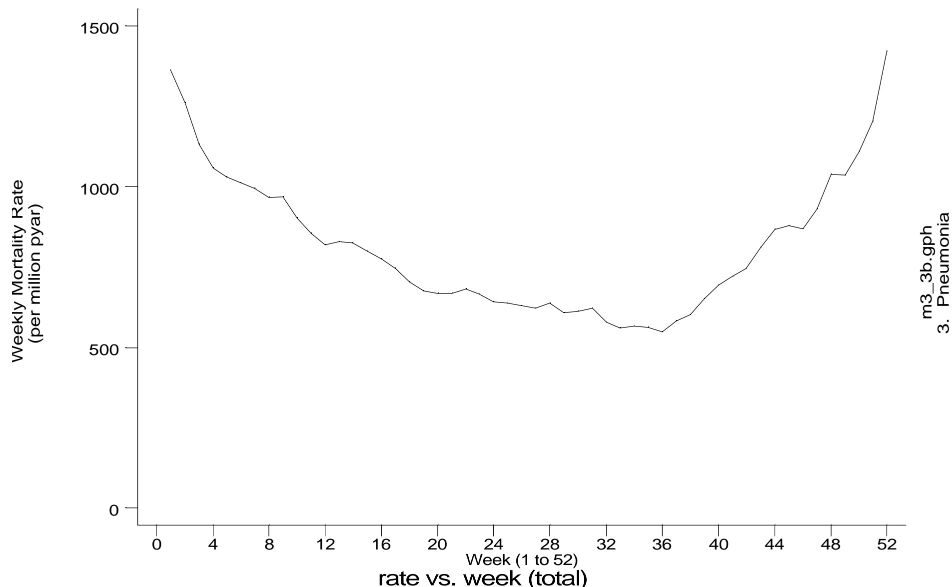
Figure 9.2 Crude mortality rates by year and sex for 1991-1995



Seasonality

A clear seasonal pattern was seen, with highest rates in the winter months of December and January and lowest rates in the summer in late August and early September (Figure 9.3). This was pattern was consistent across years and across data sources but more marked in children and the elderly than in mid life (ages 15-64).

Figure 9.3 Seasonal mortality pattern for pneumonia, 1991-1995



Regional and urban rural distribution

Looking at all years combined, there were significant differences between regions, with a suggestion of higher SERs in northern areas. However, these were not consistent across data sources (Appendix A9), with the exception of East Anglia which had significantly lower standardised event ratios than average in all data sources. SERs for 1994 (Table 9.1) also suggested that northern areas experienced higher SERs in all data sources, but again these were not always statistically significant. East Anglia and Wessex had consistently and statistically significant lower SERs than average in 1994 in all data sources.

Oxford had a markedly lower number and rate of hospital admissions than expected mainly due to exceptionally low figures in 1994. In contrast, the standardised admission ratio for Oxford (ages 0-84) in 1993 was 100.9 (95% confidence interval 96.8 to 105.2, based on 2,248 admissions).

Table 9.1 Numbers of events and SERs for pneumonia ranked (high-low) following order of hospital admission SERs in 1994

Region	Mortality		HES: Emergency admissions		GPRD: consultations	
	Number	SMR	Number	SER	Number	SER
NW Thames	1,445	116.4*	3,252	128.4*	231	82.2*
Northern	1,334	102.9	3,074	118.2*	280	107.5
N Western	2,025	106.5*	4,450	118.2*	258	109.4
Yorkshire	1,793	105.7*	3,293	117.7*	146	111.6
Mersey	1,367	126.9*	2,442	113.9*	221	103.2
Trent	2,117	96.0	4,730	109.5*	327	109.0
NE Thames	1,879	114.7*	3,499	105.0*	66	89.1
S Western	1,202	66.2*	3,337	102.5	273	104.5
SE Thames	2,030	110.6*	3,510	101.7	71	75.4*
SW Thames	1,492	101.0	2,674	97.0	261	86.1*
W Midlands	2,170	92.3*	4,362	92.4*	558	103.7
Wessex	1,488	91.8*	2,583	86.5*	274	136.6*
E Anglia	1,059	83.7*	1,347	55.5*	218	81.9*
Oxford	1,035	101.9	601	27.8*	76	75.8*

* SER significantly different from 100 ($p<0.05$)

Time trends: The year on year trends in regional SERs were similar to national patterns in both mortality and hospital admissions, but regional trends in GP consultations were more variable.

Urban rural: A significant urban rural gradient (highest SER in conurbations) was seen in mortality and hospital admissions (Figure 9.4), but not in GP consultations (Figure 9.5). GP consultations were significantly lower than average in rural areas, higher than average in mixed areas, but average in urban and conurbation areas.

Figure 9.4 Urban rural pattern for age and sex standardised emergency hospital admission SERs for pneumonia, 1991-1994

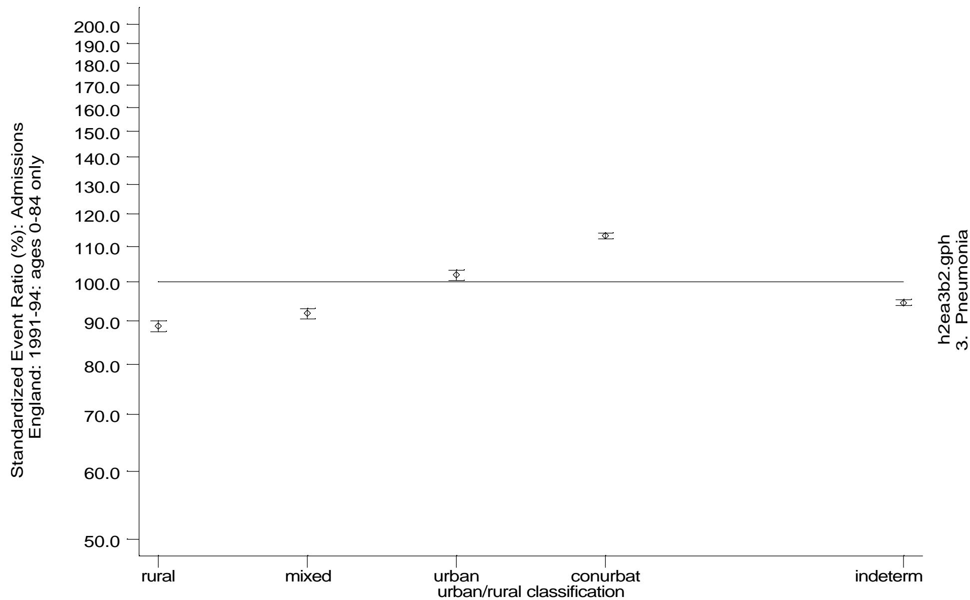
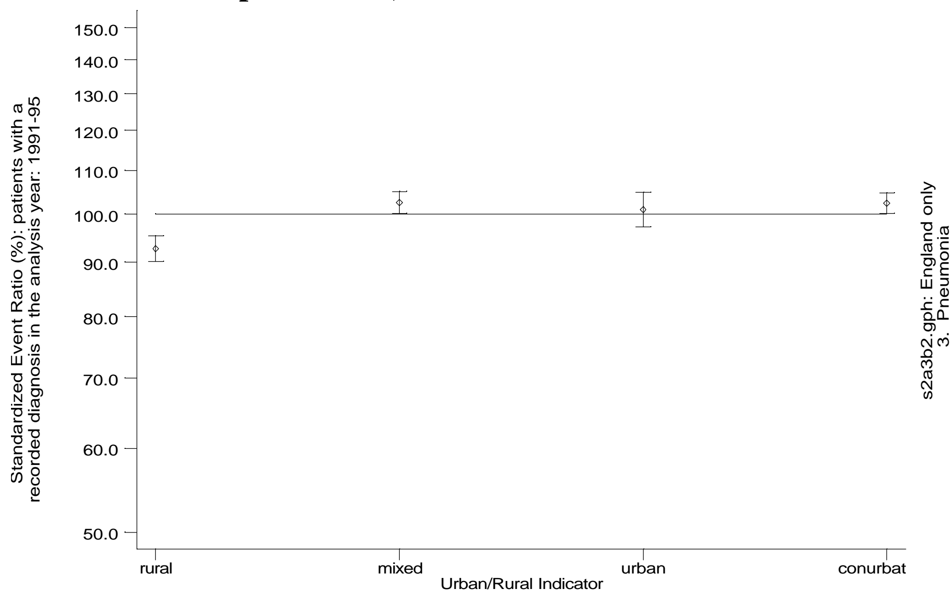


Figure 9.5 Urban rural pattern for age and sex standardised patient GP consultations for pneumonia, 1991-1995



Comparisons across data sources for all ages and by age group

Correlations

Geographical correlations were poor across different data sources, except between emergency hospital admissions and mortality which showed a moderate positive correlation (Table 9.2). Correlations between GP consultations and emergency admissions were not improved by looking at adults separately (Table 9.3). The numbers of GP patient consultations for children aged 0-14 was too small to allow meaningful rank correlations.

Table 9.2 Spearman rank correlation coefficients for comparison of standardised event ratios for pneumonia from different data sources for region+urban rural combinations in 1991 and regions in 1994: ages 0-84

	HES: emergency admissions aged 0-84		Mortality: aged 0-84	
	1991	**1994**	**1991**	**1994**
GPRD: consultations ages 0-84	0.19	0.35	-0.13	-0.22
HES: aged 0-84			0.49	0.61

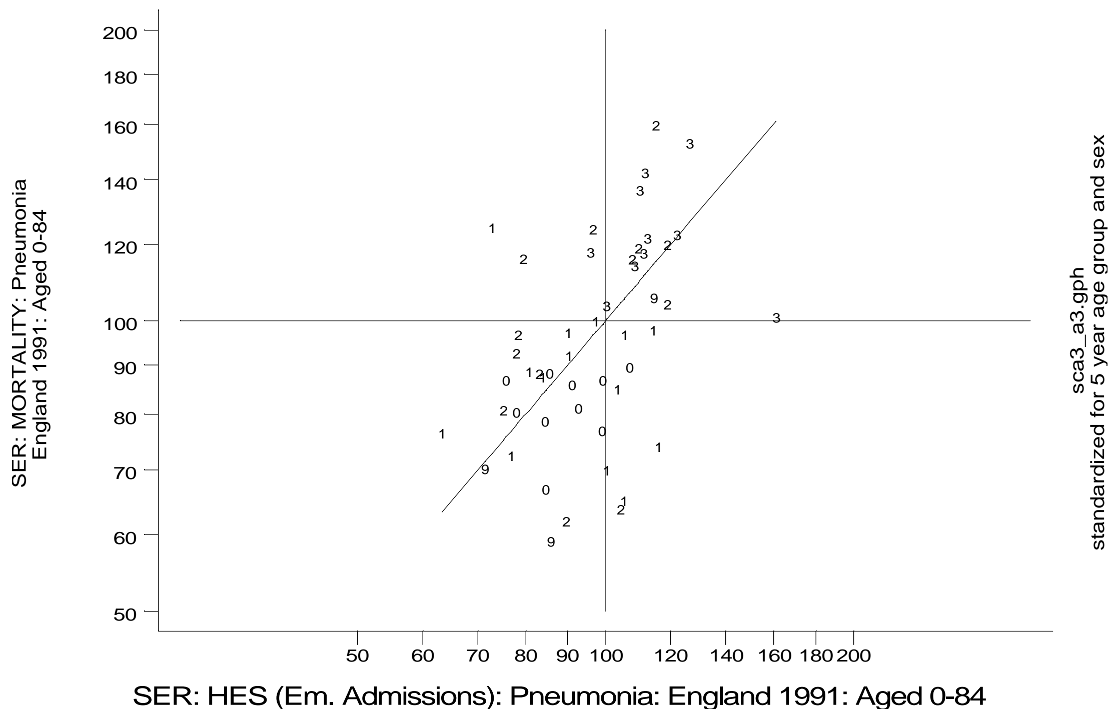
Table 9.3 Spearman rank correlation coefficients for comparison of standardised event ratios for region+urban rural combinations in 1991 and regions in 1994: comparing adults ages 15-84

	HES: emergency admissions	
	1991	**1994**
GPRD: consultations ages 15-84	0.22	0.32

Scatterplots

Scatterplots for 1991 combinations of region and urban rural showed an approximate 2 ½ fold difference in SERs for GP consultations (from 61.2 to 144.8) , hospital admissions (from 63.3 to 160.8) and mortality (from 58.4 to 157.9). Scatterplots including mortality suggested that conurbations and urban areas (represented by symbols '2' and '3, Figure 9.6) generally had higher levels of mortality than GP consultations or hospital admissions as they were above the line of equivalence while rural areas generally had lower levels of mortality then hospital admissions (represented by symbol '0' below the line of equality). Figure 9.6 also shows that conurbations had both higher SMRs and hospital admission SERs than the national average (symbol '3' is concentrated in the right upper quadrant).

Figure 9.6 SMRs for pneumonia (ages 0-84) compared with emergency hospital admissions SERs for pneumonia (ages 0-84)*



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* Footnote: The line added to scatterplot graphs is the line of equivalence.
Key to points: 0 = rural, 1 = mixed, 2 = urban, 3 = conurbations, 9 = indeterminate

Within database comparisons by age group

Correlations

There was poor geographical correlation between emergency hospital admissions for children ages 0-14 and for adults aged 15-84 (Table 9.4).

Table 9.4 Spearman rank correlation coefficients for within data source comparison of standardised event ratios for pneumonia from HES for region+urban rural combinations in 1991 and regions in 1994: comparing children ages 0-14 and adults ages 15-84

	HES: emergency admissions ages 15-84	
	1991	**1994**
HES: emergency admissions ages 0-14	0.08	0.25