Community acquired syndromes causing morbidity and mortality in Australia

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Abstract

Introduction: The clinical and economic burden of infectious diseases is a substantial public health problem. The determination of the relative contributions of these diseases to the overall healthcare burden can inform priority setting, planning, and decision-making in healthcare and establish a baseline for future comparisons. Few recent studies have presented definitive data on the incidence of infectious diseases requiring hospitalisation in the Southern Hemisphere. We identified the age-specific number of hospitalisations and severe infections requiring intensive care unit admissions in the Geelong region. This was then extrapolated to calculate incidence data of these selected infectious diseases in Australia.

Methods: This observational study was performed in Geelong, the second largest city in Victoria (population of 194,566 adults ≥ 20 years). University Hospital Geelong is a public hospital with the only emergency department in Geelong during the years 2011 and 2013. Patients were identified using the International Classification of Diseases, 10th Revision Australian Modification discharge codes and diagnoses were confirmed using clinical, radiological and laboratory criteria.

Results: Between 2011 and 2013, there were 1,506 admissions for community-acquired pneumonia (CAP) (245.3 per 100,000 person years), 1,613 admissions for skin and soft tissue infections (SSTIs) (271.2 per 100,000 person years), 479 for pyelonephritis (79.7 per 100,000 person years), 131 for influenza (22.4 per 100,000 person years), and 52 for meningitis (8.9 per 100,000 person years).

Conclusion: SSTI, CAP, and pyelonephritis are common syndromes responsible for admission to hospital in Australia, with an incidence that increases with age. CAP is a major cause of morbidity and mortality in the Australian population. Influenza is associated with the greatest percentage of severe infections requiring intensive care unit admission.

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Introduction

An important input to decision-making and planning in health is an accurate, consistent and comparative description of the burden of diseases and service demand.[1] While most reported data are based on the secondary use of administrative databases, there is concern about the accuracy of coded information.[2] There is a paucity of definitive data on the incidence of common infectious diseases requiring hospitalisation in the Southern Hemisphere. Additionally, while several studies have examined the epidemiology of specific diseases and syndromes, they have not been generally compared within the same population to allow for determination of the relative contributions of different infectious diseases to the overall healthcare burden.[3,4]

The Geelong region provides an ideal opportunity to study the epidemiology of disease as it has a well-defined population and is demographically similar with regards to age distribution, ethnic makeup, and socioeconomic status to the overall Australian population.[5] Epidemiological data from this population has been used in Australian studies of osteoporosis (Geelong Osteoporosis Study), diabetes (Fremantle Diabetes Study), inflammatory bowel disease, and infectious diseases internationally.[6–8]

We aimed to estimate the age-specific incidence, mortality and length of stay of selected common infectious diseases (including the incidence of severe infection) in Australia by extrapolating incidence data from the Geelong region.

Methods

Study setting

Geelong is the second largest city in Victoria with an adult population (≥ 20 years) of approximately 194,566 (Appendix 1).[5] The median age of the population is 40 years, the population is ethnically diverse, and health care is both public and private. University Hospital Geelong is a public hospital, which had the only emergency department in Geelong during the years 2011 and 2013. Discharge data for all hospital admissions are coded according to the International Classification of Diseases, 10th Revision Australian Modification (ICD-10-AM).[9]

Data collection

Patients (≥ 20 years) with community-acquired pneumonia (CAP), skin and soft tissue infection (SSTI), influenza, meningitis, and pyelonephri-

tis were identified from discharge coding at the University Hospital Geelong. Ages above 20 were included as the Australian Bureau of Statistics divides resident population in factions, allowing suitable comparison from ages ≥ 20 onwards. A list of ICD-10-AM codes for these conditions is included in Appendix 2. This study included the above diagnoses that were identified as the presenting problem (P prefix) and ICD-10-AM code.

We excluded the following: those not admitted to hospital overnight, those transferred from other regional hospitals, and those with a postcode of residence outside the Geelong region. Data from those transferred to private hospitals was utilised for estimates of infection incidence but not used to estimate the total length of stay or presence of severe infections. The medical records of patients were examined manually by researchers (SS, ES) to confirm community onset and diagnosis against defined study criteria. Patients were excluded if they were subsequently admitted to any hospital within 14 days of the current admission, or if they developed infection within 14 days of an interventional procedure (e.g. pneumonia post gastroscopy). Individual patients were represented in the data more than once for separate incidents of infection over the study period. Data extracted included; age, gender, length of hospital stay, admission to an intensive care unit (ICU), mortality, and postcode of residence.

Definitions

Severe and prolonged infection

Severe infection was defined as an admission to ICU secondary to CAP, SSTI, influenza, meningitis, or pyelonephritis. Prolonged infection was defined as a hospital stay of more than 14 days.

Community-acquired pneumonia

A diagnosis of CAP met the following criteria:[10]

1. A history of at least 2 of the following: new onset purulent sputum, change in character of sputum or increased respiratory secretions, new onset or worsening cough, dyspnea or tachypnea, rales or bronchial breath sounds, worsening gas exchange or oxygen saturation or increased oxygen requirements.
2. At least 1 of the following 3: fever > 38.0°C, leukopenia (white cell count < 4,000 cells per mm3) or leukocytosis (white cell count ≥ 12,000 cells per mm3). If patient age was greater than 70 years, altered mental status with no other recognisable cause also met this criterion.

Evidence of new infiltrates, consolidation, and/or cavitation on chest x-ray.

Skin and soft tissue infections

Patients with a clinical diagnosis of cellulitis, erysipelas, abscesses, furuncles and carbuncles, necrotising infections, and infections associated with bites (human and animal) according to the Infectious Diseases Society of America criteria were included.[11] Surgical site infections were excluded.

Infected skin ulcers were only included if antibiotic therapy was initiated. Patients with isolated bursitis without overlying cellulitis were excluded. Patients were excluded if the sole site of infection involved bone (osteomyelitis) or muscle. If patients also had additional superficial infection (for example osteomyelitis in the setting of superficial SSTI) they were included. Patients with wounds secondary to bites were excluded if they were admitted for repair and washout prophylactically to prevent infection, however, patients who presented with an infected bite wound without prior intervention were included.

Pyelonephritis

Patients with pyelonephritis were included if they met the following criteria.

1. Temperature > 38.0°C or < 36.0°C and/or bacteraemia with a uro-pathogen.
2. The documented presence of symptoms referable to the upper or lower urinary tract including flank and/or costo-vertebral angle tenderness, and symptoms of cystitis (dysuria, frequency, supra pubic tenderness) and/or confusion in patients over 70 years of age OR a positive urine culture (with no more than 2 species of organism, at least 1 of which was quantified as 10^5 colony forming units per milliliter of urine.

Patients with an indwelling catheter or ureteric stent in situ were excluded.

Influenza

All laboratory-confirmed influenza A or B cases (by nucleic acid testing or culture from an appropriate upper respiratory tract swab specimen) were included. Data on patients with confirmed influenza at the University Hospital Geelong are collected annually for a national sentinel surveillance program.[12]

Meningitis

Patients were diagnosed with meningitis if they had either positive growth of a pathogen in the cerebrospinal fluid; OR clinical findings consistent with meningitis, i.e. fever, nuchal rigidity, and/or change in mental status with cerebrospinal fluid findings consistent with meningitis (i.e., elevated white blood cell count, diminished glucose concentration, and elevated protein concentration).

Statistical analysis

Age-specific incidence was calculated for 2011 to 2013 based on the number of cases and the person-time at risk in 10-year age groups. Denominator information for the Geelong (statistical area level 4) statistical region was obtained for the mid-interval population (2012) from the Australian Bureau of Statistics.[5] Incidence rates for each infection, by age group, were calculated using Microsoft Excel. Age- and sex-stratified incidence was calculated and extrapolated using the Australian Census annual population estimates for the year 2012. Standard errors for age stratified strata was calculated using the Poisson distribution, using the method of Rothman implemented in Stata 14.1 (College Station, Texas).[13] The standard error for directly standardised counts was estimated using the weighted sum of the age-specific variances.

Ethical considerations

This study was approved by the Barwon Health Human Research and Ethics Committee (local reference number 14/89).

Results

Community acquired pneumonia

During the study period, there were 1,506 admissions with CAP occurring among 1,432 patients (4.9% were recurrent admissions) and 1,880 admissions identified using ICD-10-AM criteria that did not meet inclusion criteria. The mean length of hospital stay was 7 days (median 5 days; range 1–54 days) and 11.3% of admissions were prolonged. CAP was associated with the highest inpatient mortality and the highest number of ICU admissions compared with the other infectious diseases in this study, with 118 deaths (8.2% of admissions) and 148 ICU admissions (9.8% of admissions) over the 3 years (Table 1).

Patients were of mean age 69.3 years (median 75; range 20–102 years) (Table 1). The annual incidence of CAP was 245.3 per 100,000 person years. The incidence of CAP increased with age, with an incidence in those over 80 years of age of 1,453.6 per 100,000 person years (Table 2 and Figure).

Skin and soft tissue infection

During the study period, there were 1,613 admissions due to SSTI occurring among 1,583 patients. This included 1,133 diagnoses of cellulitis, 292 cases of abscess, 146 infected ulcers, and 42 necrotising soft tissue infections. A total of 2,598 admissions were excluded, as they did not meet the criteria. The mean length of hospital stay was 5.3 days (median 3 days; range 1–49 days) and 7.0% of patients had a prolonged length of stay. A total of 24 patients (1.5%) were admitted to ICU and 19 patients (1.2%) died.

The annual incidence of SSTI was 271.2 per 100,000 person years and rose from 136.8 per 100,000 in the 20–29-years age group to 716.2 per 100,000 in persons aged over 80 years (Figure). Overall, SSTIs were estimated to result in 45,999 admissions to hospital each year (Table 2).

Pyelonephritis

During the study period, there were 479 admissions among 465 patients with a diagnosis of pyelonephritis (Table 1). A total of 3,962 admissions were excluded based on the defined criteria for pyelonephritis. The average length of stay was 6.6 days (median 4 days; range 1–48 days).

The incidence of pyelonephritis progressively increased after the age of 70 years with a much higher incidence among women than men (98.3 versus 59.9 per 100,000 person years in men) (Figure). The average age of patients presenting with pyelonephritis was 69.8 years, the highest compared with any other infection reviewed (median 73; range 20–93 years) (Table 1).

Figure: Estimated annual incidence of selected community-acquired infectious diseases in Australia, 2011 to 2013. Stratified according to age group

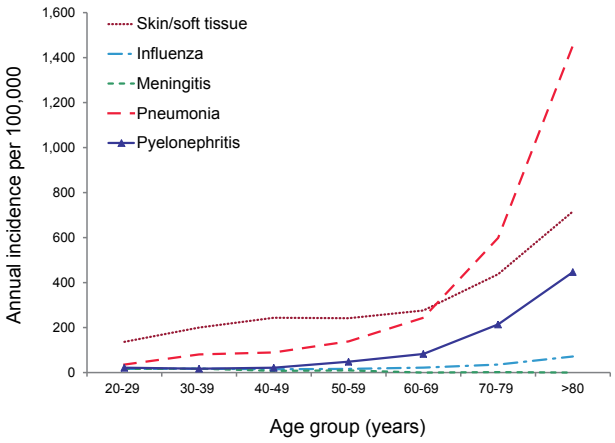

Table 1: Selected community acquired infections in people aged >20 years, Geelong Region, 2011 to 2013

Infection	Number of admissions	Number of patients	Annual incidence per 100,000 person years	Mean patient age (median; range) in years	Mean length of stay (median; range) in days	Overall mortality		Number of ICU admissions		Percentage of prolonged stay
						n	%	n	%	
CAP	1,506	1,432	245.3	69.3 (75; 20–102)	7 (5; 1–65)	118	7.8	148	9.8	10.7
SSTI	1,613	1,583	271.2	56.4 (56; 20–97)	5.3 (3; 1–49)	19	1.2	24	1.5	7.0
Pyelonephritis	479	465	79.7	69.8 (73; 20–93)	6.6 (4; 1–48)	10	2.1	3	0.6	10.2
Influenza	131	131	22.4	57.4 (59; 20–97)	5.8 (4; 1–54)	6	4.6	22	16.8	5.4
Meningitis	52	52	8.9	35.7 (33; 20–78)	4.9 (3; 1–21)	0	0.0	6	11.5	5.8

CAP = community-acquired pneumonia

SSTI = skin and soft tissue infection

ICU = intensive care unit

Table 2: Annual incidence of selected common community-acquired infections in the Geelong Region 2011 to 2013 and estimated number of Australian hospital admissions per year

Infection/age group (years)	Geelong population	Number of admissions	Incidence per 100,000 person years		Australian population	Estimated Australian cases	
			%	95% CI*		n	95% CI
CAP	583,698	1,432	245.3	232.7–258.0	16,961,179	36,624	30,117–43,131
20–29	32,643	35	35.7	24.9–49.7	3,315,513	1,185	825–1,648
30–39	32,638	79	80.7	63.9–100.6	3,143,423	2,536	2,008–3,161
40–49	35,715	96	89.6	72.6–109.4	3,166,479	2,837	2,298–3,464
50–59	34,594	144	138.8	117.0–163.4	2,890,170	4,010	3,382–4,721
60–69	28,605	209	243.5	211.6–278.9	2,248,930	5,477	4,760–6,272
70–79	17,759	319	598.8	534.8–668.2	1,328,080	7,952	7,103–8,874
>80	12,612	550	1,453.6	1,334.7–1,580.4	868,584	12,626	11,593–13,727
SSTI	583,698	1,583	271.2	257.9–284.5	16,961,179	43,773	37,542–50,004
20–29	32,643	134	136.8	114.6–162.1	3,315,513	4,537	3,801–5,373
30–39	32,638	196	200.2	173.1–230.2	3,143,423	6,293	5,442–7,238
40–49	35,715	261	243.6	214.9–275.0	3,166,479	7,714	6,806–8,708
50–59	34,594	251	241.9	212.9–273.7	2,890,170	6,990	6,152–7,910
60–69	28,605	237	276.2	242.1–313.7	2,248,930	6,211	5,445–7,054
70–79	17,759	233	437.3	383.0–497.2	1,328,080	5,808	5,086–6,604
>80	12,612	271	716.2	633.5–806.8	868,584	6,221	5,502–7,008

Infection/age group (years)	Geelong population	Number of admissions	Incidence per 100,000 person years		Australian population	Estimated Australian cases	
			%	95% CI*		n	95% CI
Pyelonephritis	583,698	465	79.7	72.4–86.9	16,961,179	11,911	8,211–15,612
20–29	32,643	21	21.4	13.3–32.8	3,315,513	711	440–1,087
30–39	32,638	17	17.4	10.1–27.8	3,143,423	546	318–874
40–49	35,715	23	21.5	13.6–32.2	3,166,479	680	431–1,020
50–59	34,594	50	48.2	35.8–63.5	2,890,170	1,392	1,034–1,836
60–69	28,605	71	82.7	64.6–104.4	2,248,930	1,861	1,453–2,347
70–79	17,759	114	214.0	176.5–257.1	1,328,080	2,842	2,344–3,414
>80	12,612	169	446.7	381.9–519.3	868,584	3,880	3,317–4,511
Influenza	583,698	131	22.4	18.6–26.3	16,961,179	3,625	1,800–5,450
20–29	32,643	16	16.3	9.3–26.5	3,315,513	542	310–880
30–39	32,638	17	17.4	10.1–27.8	3,143,423	546	318–874
40–49	35,715	16	14.9	8.5–24.3	3,166,479	473	270–768
50–59	34,594	17	16.4	9.5–26.2	2,890,170	473	276–758
60–69	28,605	19	22.1	13.3–34.6	2,248,930	498	300–778
70–79	17,759	19	35.7	21.5–55.7	1,328,080	474	285–740
>80	12,612	27	71.4	47.0–103.8	868,584	620	408–902
Meningitis	583,698	52	8.9	6.5–11.3	16,961,179	1628	592–2,663
20–29	32,643	16	16.3	9.3–26.5	3,315,513	542	310–880
30–39	32,638	17	17.4	10.1–27.8	3,143,423	546	318–874
40–49	35,715	8	7.5	3.2–14.7	3,166,479	237	102–466
50–59	34,594	10	9.6	4.6–17.7	2,890,170	279	134–512
60–69	2,8605	0	0.0	0.0–4.3	2,248,930	0	0–97
70–79	17,759	1	1.9	0.0–10.5	1,328,080	25	1–139
>80	12,612	0	0.0	0.0–9.7	868,584	0	0–85

CI: confidence intervals

CAP = community-acquired pneumonia

Of all admissions with pyelonephritis, 441 (92.0%) had positive urine microbiology results, 153 patients (32%) were bacteraemic and 27 cases were identified based on clinical symptoms and signs consistent with systemic illness. Causative pathogens isolated from blood culture, urine, or both; in order of incidence included *Escherichia coli*, *Klebsiella pneumoniae*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Morganella morganii*, *Enterobacter aerogenes*, and *Citrobacter koseri*.

A total of 3 patients were admitted to ICU (0.6%) and 10 (2.1%) died.

Influenza

During the study period, there were 131 cases of influenza. The mean age of patients was 57.4 years (median 59; range 20–97 years). Although the mean length of stay was 5.8 days, the range was 1–54 days (median 4 days). Influenza contributed to the largest percentage of admissions to ICU (17%) for any infection in this study (Table 1). In addition, 5.4% of patients had a prolonged length of stay and nearly 5% of the patients died.

The annual incidence of influenza was 22.4 per 100,000 person years. The majority of cases (95 of 131, 72.5%) occurred in the winter months of July to September. Overall, influenza is expected to result in more than 15,000 admissions to hospital in Australia annually (Table 2).

Meningitis

During the study period, 52 patients were admitted with meningitis (128 did not meet criteria). Of these, 7 cases (14.3%) had bacterial meningitis, and of the 42 patients with aseptic meningitis, a viral etiology was diagnosed in 16 cases. The mean age of patients with meningitis was the youngest of all infections at 35.7 years (median 33; range 20–78) with only 1 patient above the age of 60 years. The annual incidence of meningitis was 8.9 per 100,000 person years and the average length of stay was 4.9 days (median 3 days; range 1–21 days). A total of 6 (11.5%) required ICU admission and there were no deaths.

Discussion

In contrast with most previous population-based studies using coded data alone, the current study used clinical criteria and the results of investigations to rigorously define cases of common infectious diseases.[4] We found a considerable proportion of ICD10-AM coded infections were excluded based on clinical criteria, and therefore coded data are likely to over-estimate disease incidence. The exception to this is the incidence of influenza, which is likely an under-estimation due to missed diagnosis secondary to under-utilisation of Influenza-swabs.[14] Nevertheless, these common infections requiring hospitalisation represent a significant burden; based on age stratified incidence standardised to the Australian population, we estimate that there were over 36,000 admissions with CAP, over 43,000 admissions with SSTI, over 11,000 admissions with pyelonephritis, over 3,600 admissions with influenza, and over 1,500 admissions with meningitis in Australian adults each year (Table 2).

A study of the global burden of disease in 2001 estimated that lower respiratory tract infection is the 4th leading cause of death in high-income countries, and responsible for 4.4% of total deaths.[15] In this study we estimated a mortality of 7.8% in hospitalised adults. This was almost double that of the other community-acquired infections in this study. Our reported incidence of CAP requiring hospitalisation is similar to that found in other population based studies, such as Marston et al. where CAP incidence was 266.8 per 100,000 overall, and 1,012.3 per 100,000 in the elderly (> 65 years).[16]

SSTI was the most common infectious disease requiring admission in this study, and the incidence was higher in males and in the elderly. Other studies have noted an increasing incidence since the 1960s.[2] The reason for this is unclear but is likely multifactorial, including increased health professional awareness, increase in healthcare associated methicillin resistant *Staphylococcus aureus*, prevalence of diabetes, the growing number of people on dialysis, injecting drug use, and travel.[17]

There is limited epidemiological data of the burden of pyelonephritis.[18] A 2005 study estimated that the annual societal cost of treatment of acute pyelonephritis was estimated to be $2.14 billion in the United States of America.[19] Our findings are similar to that of Foxman et al, who described an incidence of approximately 117 per 100,000 among women and a lower incidence of 24 per 100,000 in men.[20] Our results show an annual incidence of pyelonephritis of 98.3 per 100,000 person years among women compared with 59.9 per 100,000 person years among men. The incidence increases with age (Figure).

Of the infections studied here, patients admitted with influenza were at the highest risk of requiring ICU admission, with around 1 in 6 patients admitted to ICU. This is consistent with Australian national surveillance, in which 17% of patients with influenza admitted to hospital required an ICU stay in 2013.[12] This reinforces the need to improve influenza vaccine coverage.[21,22] While the

incidence of severe influenza in adults requiring hospitalisation varies from season to season, the observed incidence in this study is broadly similar to other studies.[23]

Albeit less common than other community-acquired infections, meningitis is of significant public health interest. Although meningitis was associated with a high percentage of ICU admissions (12%) second only to Influenza (17%), there were no deaths in this young population with a median age of 33 years. Meningitis was uncommonly diagnosed in this study with an incidence of 8.9 per 100,000 person years, and the majority of cases were under the age of 40 years. These findings are in keeping with the declining incidence and mortality of meningitis in the setting of effective immunisation programs.[24,25]

In Australia, the highest rates of meningococcal disease notification are in children under 5 years of age with a second peak in the 15–24 years age group. Death secondary to meningitis in Australia is lowest in the 5–24 year age group and highest in the over 60 years age group.[26]

Incidence data for invasive meningococcal disease in Australia reveals that the introduction of a single dose of meningococcal C conjugate vaccine in the second year of life has resulted in near elimination of serogroup C disease in all age groups in Australia.[23] Interestingly, invasive pneumococcal disease and bacterial meningitis both declined dramatically among children and adults in the United States of America when the 7-valent pneumococcal conjugate vaccine and the *Haemophilus influenzae* type b conjugate vaccine were introduced for infants, although a similar reduction was not seen in Australia with the introduction of the *H. influenzae* PRP-T conjugate vaccine among Indigenous children.[25,27]

There are limitations to this study. Although the city of Geelong is geographically separated from Melbourne, we cannot exclude the possibility that a small number of patients may have been treated at hospitals outside the region. Disease burden may have also been underestimated because we only analysed data on patients aged 20 years or over and excluded patients with these infections admitted directly to private hospitals bypassing the emergency department. We also excluded patients transferred to private hospitals from our length of stay estimates, which may have affected the results. Also of note, this study is not representative of the Indigenous population as the estimated Aboriginal or Torres Strait Islander population in the Geelong region is 0.8% compared with 2.5% Australia-wide.[28] We acknowledge that the small number of patients with meningitis limited the statistical precision of the population incidence of this disease, although declining incidence of meningitis is consistent with other Australian data.[26]

Diagnostic codes were used to identify cases, and while coded data may lack accuracy, we mitigated this limitation by analysing medical records against defined clinical, radiological and laboratory criteria. In addition, although cases were reviewed carefully on an individual basis to assess the cause of hospital admission and the eventual cause of death, given the difficulty in assigning the cause of death and length of stay to any 1 infection in a complex patient presentation, the mortality and length of stay data should be interpreted with caution.

Overall, we found that these selected infectious diseases result in annual hospital admissions for an estimated 0.58% (97,561 admissions) of the total population of Australia aged 20 years or over (16,961,179).[28] More importantly, 54,495, i.e. 55.9% of these admissions are in people over 60 years of age. Of note, this study investigated the incidence of selected infections requiring hospitalisation but did not look at the direct cost burden or incidence in the community. Further studies should examine both the cost-burden of hospitalisation and the incidence of these selected infections treated in the community setting. This would help assess the true burden to the health-care system and measure the effectiveness of preventive strategies.

Conclusion

Knowledge of the burden and preventability of selected infections can inform priority setting and resource deployment in health care. This study assessed admissions to hospital and therefore health care utilisation for selected community acquired infections. Our results show that SSTI, CAP, and pyelonephritis are common infections leading to hospital admissions with an incidence that increases with age. Pneumonia is responsible for significant morbidity and mortality in Australia. Assessment of the epidemiology and incidence of common syndromes is needed to guide healthcare planning.

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Appendix 1: Adult population structure of Geelong statistical region and Australia, 2012

Age group (years)	Geelong			Australia		
	Male	Female	Total	Male	Female	Total
20–29	16,569	16,074	32,643	1,685,119	1,630,394	3,315,513
30–39	16,163	16,475	32,638	1,571,153	1,572,270	3,143,423
40–49	17,568	18,147	35,715	1,569,694	1,596,785	3,166,479
50–59	16,985	17,609	34,594	1,430,255	1,459,915	2,890,170
60–69	13,960	14,645	28,605	1,117,447	1,131,483	2,248,930
70–79	8,416	9,343	17,759	638,160	689,920	1,328,080
>80	4,912	7,700	12,612	341,239	527,345	868,584
Total	94,573	99,993	1,945,66	83,530,67	8,608,112	16,961,179

Appendix 2: Screening ICD-10 codes used to identify hospital admissions for common community-acquired infections

Skin/soft tissue infection	Cellulitis – all sites Erisipelas A26.9, A26.0, A26.7, A26.8 Gangrene, gangrenous R02 Cutaneous, spreading R02 Fournier's N49.8, female N76.8 Limb (lower) (upper) R02 Mouth A69.0 Perineum R02 Scrotum N49.2 Gas gangrene A48.0 Impetigo L40.1, H03.8, H62.4, L01.0 Wound infection with foreign body T89.01 Necrotising fasciitis – M72.4, M72.9, M72.6 Bites (animal and human) W50–W64 Abscess Ankle, foot, heel, thigh, thumb, toe (any), leg (any part), limb (lower) (upper), hand, arm (any part), axilla, wrist, web/palmar space, shoulder (region) – all L02.4 Nail L03.01, L03.02 Head L02.8 Back, groin, mons pubis, navel L02.2 Buttock L02.3 Neck (region) L02.1 Lip K13.0 Orbit, orbital H05.0 Cutaneous L02.9 Face (any part except ear, eye, nose) – L02.0 Pilonidal L05.0
Community-acquired pneumonia	J12 to J18
Meningitis	G00
Influenza	J09 – J11
Pyelonephritis	Pyelonephritis N12 Sepsis A41.9 plus Urinary T83.5 Urinary NEC T83.5 *Escherichia coli* A41.51 Gram-negative (organism) A41.50 Anaerobic A41.50 *Escherichia coli* A41.51 Pseudomonas A41.52 Specified NEC A41.58 Pseudomonas A41.52 Infection urinary (tract) NEC N39.0 Complicating pregnancy O23.4 Newborn P39.3 Puerperal (postpartum) O86.2 Tuberculous A18.1

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