

High Estimated Incidence of Encephalitis in England

Technical Appendix

Technical Appendix Table 1. Hospital Episode Statistics codes for identifying encephalitis and etiological groupings*

| Infection type | Codes |
|---|---|
| Viral | |
| Herpes simplex virus | B004 |
| Varicella-zoster virus | B011, B020 |
| Enterovirus | A850 |
| Adenovirus | A851 |
| Measles | B050 |
| Mumps | B262 |
| Rabies | A820 A821 A829 |
| Arboviruses | A830 A831 A832 A833 A834 A835 A836 A922 A838 A839 A852 A840 A841 A848 A849 |
| Rubella | B060 <u>AND</u> G051 |
| Influenza | J108/J118 <u>AND</u> G051 |
| Polio | A800/A801/A802/A803/A804/A809 <u>AND</u> G051 |
| Lymphocytic choriomeningitis virus | A872 <u>AND</u> G051 |
| Cytomegalovirus | B258 <u>AND</u> G051 |
| HIV | B220 <u>AND</u> G051 |
| Progressive multifocal leukoencephalopathy | A812 |
| Other specified viral encephalitis (encephalitis lethargica, Von Economo-Crucchet disease) | A858 |
| Subacute sclerosing panencephalitis | A811 |
| Bacterial | |
| Listeria | A321 <u>AND</u> G050 |
| Meningococcal infection | A398 <u>AND</u> G050 |
| Syphilis | A504/A521 <u>AND</u> G050 |
| Tuberculosis | A178 <u>AND</u> G050 |
| Streptococcal infection | A491 <u>AND</u> G050 |
| Lyme disease | A692 <u>AND</u> G050 |
| Cat-scratch disease | A281 <u>AND</u> G050 |
| Actinomycosis | A428 <u>AND</u> G050 |
| Bacterial meningoencephalitis and meningomyelitis, not elsewhere classified | G042 |
| Parasitic | |
| Trypanosomiasis | B560 B561 B569 B574 |
| Toxoplasma | B582 |
| Amoebic | |
| Naegleriasis (primary amoebic meningoencephalitis) | B602 |
| Angiostrongyliasis due to <i>Parastrongylus cantonensis</i> (eosinophilic meningoencephalitis) | B832 |
| Fungal | |
| Cryptococcosis | B451 <u>AND</u> G052 |
| Immune-mediated | |
| Acute disseminated encephalomyelitis | G040 |
| Acute and subacute haemorrhagic leukoencephalitis | G361 |
| Systemic lupus erythematosus | M321 <u>AND</u> G058 |
| Paraneoplastic limbic encephalopathy | G131 |
| Myxoedema coma | |
| Unknown | |
| Unspecified viral encephalitis | A86; G050 G051 G052 G058 IF no other code specified |
| Encephalitis, myelitis, and encephalomyelitis, unspecified—ventriculitis (cerebral) not otherwise specified | G049 |
| Other (includes other encephalitis, myelitis and encephalomyelitis, postinfectious encephalitis, and encephalomyelitis not otherwise specified) | G048 |

Technical Appendix Table 2. Main effects negative binomial regression model assessing variation in incident encephalitis admissions by year, sex, age, and region, England, April 2005–February 2009*

| Level | No. (%) incident admissions, n = 8,848 | Crude incidence per 100,000 population/year | Multivariable | | |
|--------------------------|--|---|---------------|-----------|---------|
| | | | Adjusted IRR | 95% CI | p value |
| Year | | | | | |
| 2005–6 | 1,991 (22) | 3.89 (3.40–4.44) | 1.00 | – | 0.002 |
| 2006–7 | 2,304 (26) | 4.5 (3.97–5.14) | 1.15 | 1.07–1.24 | |
| 2007–8 | 2,176 (25) | 4.27 (3.69–4.82) | 1.09 | 1.02–1.18 | |
| 2008–9 | 2,369 (27) | 4.63 (3.86–5.48) | 1.07 | 1.00–1.15 | |
| Missing | 8 (0.1) | | | | |
| Sex | | | | | |
| Male | 4,525 (51) | 4.50 (3.93–5.14) | 1.00 | – | 0.002 |
| Female | 4,322 (49) | 4.15 (3.61–4.75) | 0.92 | 0.88–0.97 | |
| Missing | 1 (0.0001) | | | | |
| Age group | | | | | |
| <1 | 300 (3) | 11.63 (9.75–13.89) | 3.66 | 3.22–4.17 | <0.001 |
| 1–4 | 581 (7) | 6.06 (5.14–7.13) | 1.89 | 1.71–2.09 | |
| 5–19 | 1,077 (13) | 2.86 (2.43–3.39) | 0.91 | 0.84–0.99 | |
| 20–44 | 2,326 (27) | 3.23 (2.78–3.80) | 1.00 | – | |
| 45–64 | 2,259 (26) | 4.46 (3.86–5.08) | 1.41 | 1.31–1.51 | |
| ≥65 | 1,973 (23) | 6.06 (5.28–6.75) | 1.94 | 1.80–2.08 | |
| Missing | 332 (4) | | | | |
| Region | | | | | |
| North West | 1,222 (14) | 4.33 (2.64–6.49) | 1.00 | – | <0.001 |
| South West | 879 (10) | 4.22 (2.66–6.10) | 0.93 | 0.84–1.03 | |
| London | 1,692 (19) | 5.51 (3.93–7.61) | 1.22 | 1.11–1.34 | |
| North East | 413 (4) | 3.93 (1.97–6.32) | 0.92 | 0.82–1.05 | |
| South East | 1,272 (15) | 3.76 (2.61–5.29) | 0.87 | 0.79–0.95 | |
| West Midlands | 822 (9) | 3.78 (2.61–5.18) | 0.87 | 0.78–0.97 | |
| East Midlands | 710 (8) | 3.99 (2.20–6.28) | 0.90 | 0.81–1.01 | |
| East of England | 817 (9) | 3.50 (2.30–5.22) | 0.80 | 0.72–0.89 | |
| Yorkshire and the Humber | 873 (10) | 4.18 (2.75–6.18) | 0.84 | 0.76–0.93 | |
| Missing | 126 (1) | | | | |

*IRR, incidence rate ratio; HSV, herpes simplex virus; VZV, varicella-zoster virus.

Technical Appendix Table 3. Comparison of the aetiological classification of the 59 cases that matched between HES and the HPA study*

| HPA diagnosis | HES diagnosis | | | | | | | | | | |
|-----------------------|---------------|----------|---------------|-----------|-----------|----------|----------|-----------------|-----------|-------------|-----------|
| | HSV | VZV | Other viruses | Bacterial | Parasitic | Amoebic | Fungal | Immune-mediated | Unknown | Other mixed | Total |
| HSV | 13 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 16 |
| VZV | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Other specified viral | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 |
| Bacterial | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 3 |
| Parasitic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amoebic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fungal | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Immune-mediated | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 8 | 2 | 18 |
| Unknown | 2 | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 8 | 1 | 16 |
| Other mixed | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| Total | 15 | 3 | 5 | 4 | 0 | 0 | 0 | 8 | 21 | 3 | 59 |

*HES, Hospital Episode Statistics; HPA, Health Protection Authority; HSV, herpes simplex virus; VZV, varicella-zoster virus.