**Supplemental Appendix**

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**Supplemental Figure 1:** Flow diagram of KPNW members with medically attended acute gastroenteritis with index encounters July 1, 2014 – June 30, 2016—Metropolitan Portland, Oregon, United States. \*Excludes episodes for persons who have a diagnostic code for a chronic condition associated with diarrhea, unless these persons also presented with vomiting.



**Supplemental Table 1: International Classification of Disease – Clinical Modification (ICD – CM), version 9 and 10, codes used to define Medically Attended Gastroenteritis Encounters**

|  |  |  |
| --- | --- | --- |
| **Diagnosis** | **ICD-9**  | **ICD-10** |
| Cause unspecified |  |  |
|  Presumed infectious | 009.0-009.3 | A09 |
|  Presumed noninfectious | 558.9 | K52.9 |
|  Symptom: Diarrhea NOS | 787.91 |  |
| Cause specified |  |  |
|  Viral | 008.61-008.8 | A08.0-A08.5 |
|  Rotavirus | 008.61 | A08.0 |
|  Adenovirus | 008.62 | A08.2 |
|  Norwalk | 008.63 | A08.1 |
|  Other viral enteritis | 008.64-008.69 | A08.3, A08.5 |
|  Other not elsewhere classified | 008.8 | A08.4 |
|  Bacterial | 001.0-005.9, 008.0-008.5 | A00.0-A05.9 |
|  Cholera | 001.0-00.9 | A00.0-A00.9 |
|  Typhoid/Paratyphoid | 002.0-002.9 | A01.0-A01.4 |
|  Salmonella | 003.0-003.9 | A02.0-A02.9 |
|  Shigella | 004.0-004.9 | A03.0-A03.9 |
|  Other bacterial food poisoning | 005.0-005.9 | A05.0-A05.9 |
|  E. coli | 008.0 | A04.0-A04.4 |
|  Other/unspecified bacteria | 008.1-008.5 | A04.5-A04.9 |
|  Parasitic | 006.0-006.2, 006.9-007.9 | A06.0-A07.9 |
|  Amoeba | 006.0-006.2, 006.9 | A06.0-A06.2 |
|  Other protozoal | 007.0-007.9 | A07.0-A07.9 |

**Supplemental Table 2: Prevalence of viruses in medically attended acute gastroenteritis by age group and healthcare setting, Kaiser Permanente Northwest, July 2014–June 2016**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Healthcare setting and Age Group** | **Total MAAGE Episodes** | **No. Tested** | **Norovirus** | **Rotavirus\*** | **Sapovirus** | **Astrovirus** |
| *Remote* |
| < 6 months | 7 | 2 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 6 – 11 months | 8 | 2 | 1 (50%) | 0 (0%) | 1 (50%) | 0 (0%) |
| 12 – 17 months | 14 | 2 | 0 (0%) | 0 (0%) | 1 (50%) | 0 (0%) |
| 18 – 23 months | 11 | 2 | 2 (100%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 24 – 59 months | 45 | 10 | 4 (40%) | 0 (0%) | 2 (20%) | 0 (0%) |
| 5 – 17 years | 112 | 2 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 18 – 44 years | 783 | 17 | 2 (12%) | 0 (0%) | 1 (6%) | 0 (0%) |
| 45 – 64 years | 929 | 24 | 2 (8%) | 0 (0%) | 2 (8%) | 1 (4%) |
| 65 – 74 years | 521 | 17 | 1 (6%) | 0 (0%) | 4 (24%) | 1 (6%) |
| 75 – 84 years | 333 | 15 | 1 (7%) | 0 (0%) | 0 (0%) | 1 (7%) |
| ≥ 85 years | 186 | 5 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| *Outpatient* |
| < 6 months | 363 | 47 | 7 (15%) | 1 (2%) | 3 (6%) | 0 (0%) |
| 6 – 11 months | 727 | 135 | 39 (29%) | 0 (0%) | 15 (11%) | 7 (5%) |
| 12 – 17 months | 726 | 132 | 34 (26%) | 0 (0%) | 16 (12%) | 9 (7%) |
| 18 – 23 months | 528 | 101 | 32 (32%) | 2 (2%) | 10 (10%) | 9 (9%) |
| 24 – 59 months | 1577 | 259 | 44 (17%) | 8 (3%) | 27 (10%) | 22 (8%) |
| 5 – 17 years | 3640 | 194 | 48 (25%) | 6 (3%) | 15 (8%) | 15 (8%) |
| 18 – 44 years | 10463 | 331 | 47 (14%) | 3 (1%) | 22 (7%) | 9 (3%) |
| 45 – 64 years | 8752 | 427 | 32 (7%) | 3 (1%) | 11 (3%) | 12 (3%) |
| 65 – 74 years | 4673 | 297 | 23 (8%) | 6 (2%) | 14 (5%) | 4 (1%) |
| 75 – 84 years | 2544 | 317 | 20 (6%) | 1 (0%) | 13 (4%) | 5 (2%) |
| ≥ 85 years | 1075 | 71 | 5 (7%) | 1 (1%) | 6 (8%) | 0 (0%) |
| *Emergency Department* |
| < 6 months | 27 | 4 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 6 – 11 months | 69 | 8 | 1 (13%) | 0 (0%) | 2 (25%) | 0 (0%) |
| 12 – 17 months | 56 | 8 | 3 (38%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 18 – 23 months | 35 | 6 | 1 (17%) | 1 (17%) | 0 (0%) | 0 (0%) |
| 24 – 59 months | 97 | 13 | 3 (23%) | 1 (8%) | 1 (8%) | 1 (8%) |
| 5 – 17 years | 244 | 13 | 5 (38%) | 2 (15%) | 2 (15%) | 0 (0%) |
| 18 – 44 years | 1254 | 40 | 13 (33%) | 0 (0%) | 3 (8%) | 1 (3%) |
| 45 – 64 years | 753 | 33 | 5 (15%) | 1 (3%) | 1 (3%) | 0 (0%) |
| 65 – 74 years | 297 | 19 | 1 (5%) | 0 (0%) | 1 (5%) | 0 (0%) |
| 75 – 84 years | 227 | 39 | 6 (15%) | 0 (0%) | 2 (5%) | 0 (0%) |
| ≥ 85 years | 110 | 8 | 1 (13%) | 0 (0%) | 1 (13%) | 0 (0%) |
| *Inpatient* |
| < 6 months | 7 | 1 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 6 – 11 months | 8 | 4 | 2 (50%) | 0 (0%) | 0 (0%) | 1 (25%) |
| 12 – 17 months | 6 | 1 | 1 (100%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 18 – 23 months | 1 | 0 | NC | NC | NC | NC |
| 24 – 59 months | 11 | 1 | 1 (100%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 5 – 17 years | 40 | 1 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 18 – 44 years | 95 | 1 | NC | 0 (0%) | NC | NC |
| 45 – 64 years | 235 | 11 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 65 – 74 years | 198 | 2 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 75 – 84 years | 152 | 6 | 2 (33%) | 0 (0%) | 0 (0%) | 0 (0%) |
| ≥ 85 years | 118 | 5 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| *All Healthcare settings* |
| < 6 months | 404 | 54 | 7 (13%) | 1 (2%) | 3 (6%) | 0 (0%) |
| 6 – 11 months | 812 | 149 | 43 (29%) | 0 (0%) | 18 (12%) | 8 (5%) |
| 12 – 17 months | 802 | 143 | 38 (27%) | 0 (0%) | 17 (12%) | 9 (6%) |
| 18 – 23 months | 575 | 109 | 35 (32%) | 3 (3%) | 10 (9%) | 9 (8%) |
| 24 – 59 months | 1730 | 283 | 52 (18%) | 9 (3%) | 30 (11%) | 23 (8%) |
| 5 – 17 years | 4033 | 210 | 53 (25%) | 8 (4%) | 17 (8%) | 15 (7%) |
| 18 – 44 years | 12603 | 389 | 62 (16%) | 3 (1%) | 26 (7%) | 10 (3%) |
| 45 – 64 years | 10667 | 495 | 39 (8%) | 4 (1%) | 14 (3%) | 13 (3%) |
| 65 – 74 years | 5668 | 335 | 25 (7%) | 6 (2%) | 19 (6%) | 5 (1%) |
| 75 – 84 years | 3250 | 377 | 29 (8%) | 1 (0%) | 15 (4%) | 6 (2%) |
| ≥ 85 years | 1486 | 89 | 6 (7%) | 1 (1%) | 7 (8%) | 0 (0%) |

\*RT-PCR and EIA positive.

**Supplemental Table 3: Norovirus genotypes detected among patients with medically attended acute gastroenteritis, by age group, Kaiser Permanente Northwest, July 2014–June 2016 (N = 389)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | **Children <5 years old** | **Children 5 – 17 years old** | **Persons 18 – 74 years old** | **Persons ≥75 years old** |
| **Genotype** | *N (%)* | *N (%)* | *N (%)* | *N (%)* |
| GI | 3 (1.7%) | 0 (0%) | 3 (2.4%) | 1 (2.9%) |
| GII.2\* | 11 (6.3%) | 9 (17%) | 9 (7.1%) | 0 (0%) |
| GII.3\*\* | 19 (10.9%) | 2 (3.8%) | 3 (2.4%) | 0 (0%) |
| GII.4 New Orleans | 0 (0%) | 0 (0%) | 1 (0.8%) | 0 (0%) |
| GII.4 Sydney\*\*\* | 60 (34.3%) | 4 (7.5%) | 20 (15.9%) | 14 (40%) |
| GII.4 Untypeable | 11 (6.3%) | 1 (1.9%) | 8 (6.3%) | 5 (14.3%) |
| GII.6B | 9 (5.1%) | 7 (13.2%) | 8 (6.3%) | 3 (8.6%) |
| GII.7 | 2 (1.1%) | 3 (5.7%) | 4 (3.2%) | 1 (2.9%) |
| GII.17 Kawasaki | 0 (0%) | 1 (1.9%) | 3 (2.4%) | 0 (0%) |
| Other GII | 1 (0.6%) | 1 (1.9%) | 0 (0%) | 1 (2.9%) |
| No Norovirus Genotype Data | 59 (33.7%) | 25 (47.2%) | 67 (53.2%) | 10 (28.6%) |
|  Co-infection, no Norovirus genotype available | 6 (3.4%) |  (0%) | 6 (4.8%) | 0 (0%) |
|  High Ct Value | 36 (20.6%) | 12 (22.6%) | 49 (38.9%) | 6 (17.1%) |
|  Genotyping unsuccessful | 15 (8.6%) | 11 (20.8%) | 8 (6.3%) | 4 (11.4%) |
|  Genotyping not performed | 2 (1.1%) | 2 (3.8%) | 4 (3.2%) | 0 (0%) |
| **TOTALS** | 175 | 53 | 126 | 35 |
| \*Includes one GI/GII.2 co-infection. \*\*Includes one GII.3B. \*\*\*Includes one GII.4 Sydney – astrovirus co-infection. |

**Supplemental Table 4: Incidence (95% CI) per 1000 person-years of medically attended acute gastroenteritis by virus, age group, and healthcare setting, Kaiser Permanente Northwest, July 2014–June 2016**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Norovirus** | **Rotavirus\*** | **Sapovirus** | **Astrovirus** |
| **Remote** |
| < 5 years | 0.7 (0.3–1.1) | NA | 0.4 (0.1–0.8) | NA |
| 5 – 17 years | NA | NA | NA | NA |
| 18 – 64 years | 0.3 (0.1–0.5) | NA | 0.2 (0.0–0.4) | 0.1 (0.0–0.2) |
| ≥ 65 years | 0.3 (0.0–0.8) | NA | 0.6 (0.1–1.3) | 0.3 (0.0–0.7) |
| All Ages | 0.2 (0.1–0.4) | NA | 0.2 (0.1–0.4) | 0.1 (0.0–0.2) |
| **Outpatient** |
| < 5 years | 18.1 (15.8–20.5) | 1.3 (0.6–2.2) | 8.2 (6.5–10.2) | 5.5 (4.1–7.0) |
| 5 – 17 years | 5.8 (4.4–7.3) | 0.7 (0.2–1.3) | 1.8 (1.0–2.7) | 1.8 (1.0–2.7) |
| 18 – 64 years | 3.3 (2.6–4.0) | 0.2 (0.1–0.5) | 1.4 (0.9–1.9) | 0.8 (0.5–1.2) |
| ≥ 65 years | 3.5 (2.6–4.5) | 0.7 (0.3–1.2) | 2.4 (1.6–3.3) | 0.6 (0.2–1.1) |
| All Ages | 4.4 (3.9–4.9) | 0.4 (0.3–0.6) | 2 (1.6–2.3) | 1.1 (0.9–1.4) |
| **Emergency Department** |
| < 5 years | 1.2 (0.4–1.8) | 0.3 (0.0–0.8) | 0.5 (0.0–1.0) | 0.1 (0.0–0.6) |
| 5 – 17 years | 0.6 (0.2–1.1) | 0.2 (0.0–0.6) | 0.2 (0.0–0.6) | NA |
| 18 – 64 years | 0.8 (0.5–1.1) | 0 (0.0–0.1) | 0.2 (0.0–0.3) | 0 (0.0–0.2) |
| ≥ 65 years | 0.4 (0.1–0.7) | NA | 0.2 (0.0–0.5) | NA |
| All Ages | 0.7 (0.5–0.9) | 0.1 (0.0–0.1) | 0.2 (0.1–0.3) | 0 (0.0–0.1) |
| **Inpatient** |
| < 5 years | 0.4 (0.1–0.6) | NA | NA | 0 (0.0–0.0) |
| 5 – 17 years | NA | NA | NA | NA |
| 18 – 64 years | NA | NA | NA | NA |
| ≥ 65 years | 0.3 (0.0–0.7) | NA | NA | NA |
| All Ages | 0.1 (0.0–0.1) | NA | NA | 0 (0.0–0.0) |
| **All Healthcare Settings** |
| < 5 years | 20.4 (17.9–23.0) | 1.6 (0.8–2.5) | 9.2 (7.2–11.4) | 5.7 (4.3–7.4) |
| 5 – 17 years | 6.6 (5.1–8.1) | 1 (0.4–1.8) | 2.1 (1.2–3.1) | 1.9 (1.0–2.8) |
| 18 – 64 years | 4.3 (3.5–5.2) | 0.3 (0.1–0.5) | 1.7 (1.2–2.3) | 0.9 (0.6–1.3) |
| ≥ 65 years | 4.5 (3.3–5.7) | 0.7 (0.3–1.3) | 3.3 (2.3–4.4) | 0.8 (0.4–1.3) |
| All Ages | 5.5 (4.8–6.1) | 0.5 (0.3–0.7) | 2.4 (2.0–2.8) | 1.3 (1.0–1.6 |

\*RT-PCR and EIA positive.