**Supplemental Digital Content**

Newcomer SR, Daley MF, Narwaney KJ, et al. Order of live and inactivated vaccines and risk of non-vaccine-targeted infections in U.S. children ages 11-23 months.

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**eTable 1.** International Classification of Diseases, 9th Revision, Clinical Modification diagnosis codes indicating potential medical contraindication to immunization

|  |  |
| --- | --- |
| **ICD-9-CM code** | **Description** |
| 011.x – 0.18x | Tuberculosis |
| 031.0 | Pulmonary diseases due to other mycobacteria |
| 042.x | Human immunodeficiency virus |
| 052.x | Chickenpox (varicella)a |
| 136.3 | Pneumocystosis |
| 140.x-172.x, 174.x- 208.x | Neoplasms |
| 238.4 | Polycythemia vera |
| 279.x | Disorders involving the immune mechanism |
| 287.31 | Immune thrombocytopenic purpura |
| 357.0 | Acute infective polyneuritis |
| 446.1 | Acute febrile mucocutaneous lymph node syndrome |
| 560.0 | Intussusception |
| 795.71 | Nonspecific serologic evidence of human immunodeficiency virus |
| 999.4 | Anaphylactic shock due to serum |
| V08 | Asymptomatic human immunodeficiency virus infection status |
| V14.7 | Personal history of allergy to serum or vaccine |
| V15.03 | Allergy to eggs |
| V15.07 | Allergy to latex |
| V42.81 | Bone marrow replaced by transplant |
| V42.82 | Peripheral stem cells replaced by transplant |
| V64.03 | Vaccination not carried out because of immune compromised state |
| V64.04 | Vaccination not carried out because of allergy to vaccine or component |

Abbreviation: ICD-9-CM: International Classification of Diseases, 9th edition, Clinical Modification

a Children with a diagnosis of chickenpox (varicella) before age 18 months were excluded from the study

**eTable 2.** Inactivated and live vaccines recommended by the U.S. Advisory Committee on Immunization Practices from birth through age 23 months for U.S. children born 2003-2013

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Birth** | **1**  **month** | **2 months** | **4 months** | **6 months** | **12 months** | **15 months** | **18 months** | **19-23 months** |
| ***Inactivated Vaccines***a | | | | | | | | | |
| Hepatitis Bb | 1st dose | 2nd dose | |  | 3rd dose | | | |  |
| Diphtheria-tetanus-acellular pertussis |  |  | 1st dose | 2nd dose | 3rd dose |  | 4th dose | |  |
| *Haemophilus* *influenzae* type bc |  |  | 1st dose | 2nd dose | 3rd dose | 4th dose | |  |  |
| Pneumococcal conjugate |  |  | 1st dose | 2nd dose | 3rd dose | 4th dose | |  |  |
| Poliovirus |  |  | 1st dose | 2nd dose | 3rd dose | | | |  |
| Hepatitis Ad |  |  |  |  |  | *2 dose series* | | | |
| Seasonal influenzae |  |  |  |  | *Annual vaccination, 1 or 2 doses* | | | | |
| 2009 pandemic H1N1 influenza |  |  |  |  | *Vaccination during 2009 pandemic, 1 or 2 doses* | | | | |
| ***Live Vaccines***f | | | | | | | | | |
| Rotavirusg |  |  | 1st dose | 2nd dose | 3rd dose |  |  |  |  |
| Measles-mumps-rubella |  |  |  |  |  | 1st dose | |  |  |
| Varicellah |  |  |  |  |  | 1st dose | |  |  |

aTheHepatitis B (HepB), diphtheria-tetanus-acellular pertussis (DTaP), *Haemophilus* *influenzae* type b, and poliovirus vaccines are available for use in U.S. children as individual vaccines and in combination vaccines (e.g., HepB-DTaP-Poliovirus combination vaccine).

b Children may receive four hepatitis B vaccine doses if hepatitis B-containing combination vaccines are used at 2, 4 and 6 months.

c *Haemophilus* *influenzae* type b vaccine at age 6 months is not indicated if PedvaxHib® or Comvax® brand vaccines are administered for the first two doses.

d In 2006, the Advisory Committee on Immunization Practices expanded recommendation for Hepatitis A vaccination to include routine recommendation of all children greater than 1 year of age.

eTwo doses of seasonal influenza vaccine are recommended for previously unvaccinated children, and one vaccine is indicated per season thereafter. A live, attenuated seasonal influenza vaccine was also approved during the study observation period; however, this vaccine was only approved for use in children ages 24 months and older.

f The measles-mumps-rubella and varicella vaccines are available for use in U.S. children as individual vaccines and as a combination vaccine.

g Rotavirus vaccine was re-introduced in the U.S. immunization schedule in 2006. The third dose of rotavirus vaccine is not indicated if the Rotarix® brand vaccine is administered for the first two doses.

h In 2007, the recommended age for varicella vaccine changed from 12-18 months to 12-15 months.

**eTable 3.** International Classification of Diseases, 9th Revision, Clinical Modification diagnosis codes for non-vaccine-targeted infections identified in study cohort

|  |  |  |
| --- | --- | --- |
| **ICD-9-CM Code** | **Description** | **Category** |
| 001.x – 009.x | Intestinal infectious diseases | Gastrointestinal infections |
| 020.x – 027.x | Zoonotic bacterial diseases | Other infections |
| 031.8 | Other specified mycobacterial diseases | Other infections |
| 034.0 | Streptococcal sore throat | Upper respiratory |
| 034.1 | Scarlet fever | Other infections |
| 036.x | Meningococcal infection | Other infections |
| 038.x | Septicemia | Other infections |
| 040.x | Other bacterial diseases | Other infections |
| 041.x, excluding 041.5 | Bacterial infection in conditions classified elsewhere and of unspecified site | Other infections |
| 047.x | Meningitis due to enterovirus | Other infections |
| 048 | Other enterovirus diseases of central nervous system | Other infections |
| 049.x | Other non-arthropod-borne viral diseases of central nervous system | Other infections |
| 053.20 | Herpes zoster dermatitis of eyelid | Other infections |
| 054.x | Herpes simplex | Other infections |
| 057.x | Other viral exanthemata | Other infections |
| 058.x | Other human herpesvirus | Other infections |
| 060.x-066.x | Arthropod-borne viral diseases | Other infections |
| 074.x | Specific diseases due to Coxsackie virus | Other infections |
| 075 | Infectious mononucleosis | Other infections |
| 077.x | Other diseases of conjunctiva due to viruses and Chlamydiae | Other infections |
| 078.x | Other diseases due to viruses and Chlamydiae | Other infections |
| 079.0 | Adenovirus infection in conditions classified elsewhere and of unspecified site | Other infections |
| 079.1 | Echo virus infection in conditions classified elsewhere and of unspecified site | Lower respiratory |
| 079.2 | Coxsackie virus infection in conditions classified elsewhere and of unspecified site | Upper respiratory |
| 079.3 | Rhinovirus infection in conditions classified elsewhere and of unspecified site | Upper respiratory |
| 079.59 | Other specified retrovirus | Other infections |
| 079.6 | Respiratory syncytial virus | Lower respiratory |
| 079.8 | Other specified viral and chlamydial infections | Other infections |
| 079.83 | Parvovirus B19 | Other infections |
| 079.89 | Other specified viral infection | Other infections |
| 079.9 | Unspecified viral and chlamydial infections | Other infections |
| 080.x-088.x | Rickettsioses and other arthropod-borne diseases | Other infections |
| 090.x-099.x | Syphilis and other venereal diseases | Other infections |
| 100.x-104.x | Other spirochetal diseases | Other infections |
| 110.x-118.x | Mycoses | Other infections |
| 120.x-129.x | Helminthiases | Other infections |
| 130.x-136.x | Other infectious and parasitic diseases | Other infections |
| 320.x-326.x, excluding 320.0 | Bacterial meningitis | Other infections |
| 372.x, excluding 372.06 | Disorders of conjunctiva | Other infections |
| 373.x, excluding 373.8 and 373.9 | Inflammation of eyelids | Other infections |

**eTable 3,** continued

|  |  |  |
| --- | --- | --- |
| **ICD-9-CM Code** | **Description** | **Category** |
| 380.x | Disorders of external ear | Upper respiratory |
| 381.x, excluding 381.04 | Nonsuppurative otitis media and eustachian tube disorders | Upper respiratory |
| 382.x | Suppurative and unspecified otitis media | Upper respiratory |
| 383.x | Mastoiditis and related conditions | Upper respiratory |
| 422.90 | Acute myocarditis, unspecified | Other infections |
| 422.91 | Idiopathic myocarditis | Other infections |
| 461.x | Acute sinusitis | Upper respiratory |
| 462 | Acute pharyngitis | Upper respiratory |
| 463 | Acute tonsillitis | Upper respiratory |
| 464.x | Acute laryngitis and tracheitis | Upper respiratory |
| 465.x | Acute upper respiratory infections of multiple or unspecified sites | Upper respiratory |
| 466.x | Acute bronchitis and bronchiolitis | Lower respiratory |
| 473.x | Chronic sinusitis | Upper respiratory |
| 480.x – 486.x, excluding 484.3 | Pneumonia | Lower respiratory |
| 510.x | Empyema | Lower respiratory |
| 511.x | Pleurisy | Lower respiratory |
| 513.0 | Abscess of lung | Lower respiratory |
| 577.0 | Acute pancreatitis | Other infections |
| 597.80 | Urethritis, unspecified | Other infections |
| 680.x | Carbuncle and furuncle | Other infections |
| 681.x | Cellulitis and abscess of finger and toe | Other infections |
| 682.x | Other cellulitis and abscess | Other infections |
| 683 | Acute lymphadenitis | Other infections |
| 684 | Impetigo | Other infections |
| 686.x | Other local infections of skin and subcutaneous tissue | Other infections |
| 711.0x | Pyrogenic arthritis | Other infections |
| 711.4x | Arthropathy associated with other bacterial diseases | Other infections |
| 730.x | Osteomyelitis periostitis and other infections involving bone | Other infections |
| 790.8 | Viremia, unspecified | Other infections |
| 995.91 | Sepsis | Other infections |
| 997.09 | Other nervous system complications | Other infections |

Abbreviation: ICD-9-CM: International Classification of Diseases, 9th Revision, Clinical Modification

**eTable 4.** Procedure codes indicating exclusion from outcome definitiona

|  |  |
| --- | --- |
| ***Current Procedure Terminology codes*** | |
| **Code** | **Description** |
| 00120 | Anesthesia for procedures on external, middle, and inner ear including biopsy; not otherwise specified |
| 00124 | Anesthesia for procedures on external, middle, and inner ear including biopsy; otoscopy |
| 00126 | Anesthesia for procedures on external, middle, and inner ear including biopsy; tympanotomy |
| 69399 | Unlisted procedure, external ear |
| 69420 | Myringotomy including aspiration and/or eustachian tube inflation |
| 69421 | Myringotomy including aspiration and/or eustachian tube inflation requiring general anesthesia |
| 68433 | Tympanostomy, local or topical anesthesia |
| 69436 | Tympanostomy, general anesthesia |
| 69604 | Revision mastoidectomy, resulting in tympanoplasty |
| 69645 | Tympanostomy with mastoidectomy, radical or complete, without ossicular chain reconstruction |
| 92550 | Tympanostomy and reflex threshold measurements |
| 92567 | Tympanometry |
| ***International Classification of Diseases, 9th Revision, Clinical Modification Procedure codes*** | |
| **Code** | **Description** |
| 18.09 | Other incision of external ear |
| 18.29 | Excision or destruction of other lesion of external ear |
| 18.9 | Other operations on external ear |
| 19.4 | Myringoplasty |
| 19.6 | Revision of tympanoplasty |
| 19.9 | Other repair of middle ear |
| 20.01 | Myringotomy with insertion of ear tube |
| 20.09 | Other myringotomy |
| 20.1 | Removal of tympanostomy tube |
| 20.59 | Other excision of external ear |
| 98.11 | Removal of intraluminal foreign body from ear without incision |

a Diagnoses for non-vaccine-targeted infections were excluded from the outcome definition if they occurred in an inpatient setting on the same day as one of these procedure codes. This decision was based on findings from a sample medical record review that found inpatient diagnoses of otitis media occurring on the same day as preventive surgeries for chronic otitis media.

**eTable 5.** Injury diagnosis codes indicating exclusion from outcome definitiona

|  |  |
| --- | --- |
| ***International Classification of Diseases, 9th edition, Clinical Modification diagnosis codes*** | |
| 800.x – 829.x | Fractures |
| 830.x – 839.x | Dislocation |
| 840.x – 848.x | Sprains and strains of joints and adjacent muscles |
| 850.x – 854.x | [Intracranial injury, excluding those with skull fracture](http://icd9cm.chrisendres.com/index.php?action=child&recordid=8995) |
| 860.x – 869.x | [Internal injury of thorax, abdomen and pelvis](http://icd9cm.chrisendres.com/index.php?action=child&recordid=9030) |
| 870.x – 897.x | Open wounds |
| 900.x – 904.x | Injury to blood vessels |
| 905.x – 909.x | Late effects of injuries, poisoning, toxic effects, and other external causes |
| 910.x – 919.x | Superficial injuries |
| 920.x - 929.x | Contusions |
| 930.x – 939.x | Foreign bodies |
| 940.x - 949.x | Burns |
| 950.x - 957.x | Other injuries |
| 958.x – 959.x | Certain traumatic complications and unspecified injuries |
| 980.x – 989.x | Toxic effects of substances chiefly nonmedicinal as to source |

a Diagnoses for non-vaccine-targeted infections were not considered as an outcome if they occurred within an emergency department encounter with one of these injury diagnosis codes. This decision was based on a sample medical record review that found examples of emergency department encounters for injuries where mild non-vaccine-targeted infections, usually upper respiratory infections, were noted and diagnosed upon clinical examination.

**eTable 6.** International Classification of Diseases, 9th Revision, Clinical Modification diagnosis codes for chronic conditions identified in study cohort before age 11 months

|  |  |
| --- | --- |
| **ICD-9-CM code** | **Description** |
| 046.2 | Subacute sclerosing panencephalitis |
| 173.x | Other malignant neoplasm of skin |
| 237.x | Neurofibromatosis |
| 240.x – 246.x | Disorders of thyroid gland |
| 250.x | Diabetes mellitus |
| 252.x | Disorders of parathyroid gland |
| 253.x | Disorders of the pituitary gland and its hypothalamic control |
| 255.x | Disorders of adrenal glands |
| 260 | Kwashiorkor |
| 261 | Nutritional marasmus |
| 262 | Other severe protein-calorie malnutrition |
| 263.x | Other and unspecified protein-calorie malnutrition |
| 268.0 | Rickets, active |
| 270.x | Disorders of amino-acid transport and metabolism |
| 271.x | Disorders of carbohydrate transport and metabolism |
| 272.x | Disorders of lipid metabolism |
| 273.x | Disorders of plasma protein metabolism |
| 275.x | Disorders of mineral metabolism |
| 277.x | Other and unspecified disorders of metabolism |
| 281.x | Other deficiency anemias |
| 282.x | Hereditary hemolytic anemias |
| 283.x | Acquired hemolytic anemias |
| 284.x | Aplastic anemia and other bone marrow failure syndromes |
| 286.x | Coagulation defects |
| 288.x | Diseases of white blood cells |
| 291.81 | Alcohol withdrawal |
| 292.0 | Drug withdrawal |
| 292.89 | Other specified drug-induced mental disorders |
| 293.0 | Delirium due to conditions classified elsewhere |
| 293.9 | Unspecified transient mental disorder in condition classified elsewhere |
| 294.8 | Other persistent mental disorders due to conditions classified elsewhere |
| 294.9 | Unspecified persistent mental disorders due to conditions classified elsewhere |
| 298.9 | Unspecified psychosis |
| 299.10 | Childhood disintegrative disorder |
| 299.80 | Other specified pervasive developmental disorders |
| 300.4 | Dysthymic disorder |
| 300.7 | Hypochondriasis |
| 300.82 | Undifferentiated somatoform disorder |
| 301.51 | Chronic factitious illness with physical symptoms |
| 303.93 | Other and unspecified alcohol dependence, in remission |
| 304.x | Drug dependence |
| 305.x | Nondependent abuse of drugs |
| 306.x | Physiological malfunction arising from mental factors |
| 307.1 | Anorexia nervosa |
| 308.1 | Predominant disturbance of consciousness |
| 310.2 | Post-concussion syndrome |
| 315.x | Specific delays in developmenta |
| 318.2 | Profound intellectual disabilities |
| 319.x | Unspecified intellectual disabilitiesa |

**eTable 6,** continued

|  |  |
| --- | --- |
| **ICD-9-CM code** | **Description** |
| 330.x – 335.x | Hereditary and degenerative diseases of the central nervous system |
| 340.x | Multiple sclerosis |
| 343.x | Infantile cerebral palsy |
| 344.x | Other paralytic syndromes |
| 345.x | Epilepsy and recurrent seizures |
| 352.6 | Multiple cranial nerve palsies |
| 356.x | Hereditary and idiopathic peripheral neuropathy |
| 359.x | Muscular dystrophies and other myopathies |
| 365.14 | Glaucoma of childhood |
| 369.x | Blindness and low visiona |
| 389.x | Hearing lossa |
| 394.x | Diseases of mitral valve |
| 395.9 | Other and unspecific rheumatic aortic diseases |
| 393.x – 398.x | Chronic rheumatic heart disease |
| 424.1 | Aortic valve disorders |
| 424.3 | Pulmonary valve disorders |
| 425.x | Cardiomyopathy |
| 446.x | Polyarteritis nodose and allied conditions |
| 493.81 | Exercise induced bronchospasm |
| 496.x | Chronic airway obstruction, not elsewhere classified |
| 516.x | Other alveolar and parietoalveolar pneumonopathy |
| 531.x | Gastric ulcer |
| 532.x | Duodenal ulcer |
| 533.x | Peptic ulcer, site unspecified |
| 555.x | Regional enteritis |
| 556.x | Ulcerative enteritis |
| 571.x | Chronic liver disease and cirrhosis |
| 579.0 | Celiac disease |
| 571.1 | Tropical sprue |
| 581.x | Nephrotic syndrome |
| 582.x | Chronic glomerulonephritis |
| 583.x | Nephritis and nephropathy, not specific as acute or chronic |
| 580.x-589.x | Nephritis, nephrotic syndrome, and nephrosis |
| 694.x | Bullous dermatoses |
| 710.x | Diffuse diseases of connective tissue |
| 714.x | Rheumatoid arthritis and other inflammatory polyarthropathies |
| 720.x | Ankylosing spondylitis and other inflammatory spondylopathies |
| 728.x (except 728.87 and 728.9) | Disorders of muscle, ligament, and fascia |
| 728.87 | Muscle weakness (generalized)a |
| 728.9 | Unspecified disorder of muscle, ligament, and fasciaa |
| 730.1x | Chronic osteomyelitis |
| 732.x | Osteochondropathies |
| 740.x – 759.x (except 745.5, 753.29, 756.0) | Congenital anomalies |
| 745.5 | Ostium secundum type atrial septal defecta |
| 753.29 | Other obstructive defects of renal pelvis and uretera |
| 756.0 | Anomalies of skull and face bonesa |
| 760.71 | Alcohol affecting fetus or newborn via placenta or breast milk |
| 770.7 | Chronic respiratory disease arising in the perinatal period |
| 771.1 | Congenital cytomegalovirus infection |

**eTable 6,** continued

|  |  |
| --- | --- |
| **ICD-9-CM code** | **Description** |
| 771.2 | Other congenital infections specific to the perinatal period |
| 854.x | Intracranial injury of other and unspecified nature |
| 994.1 | Drowning and nonfatal submersion |

Abbreviation: ICD-9-CM: International Classification of Diseases, 9th Revision, Clinical Modification

a Two diagnosis codes on separate days were required.

**eTable 7.** Person-years of observation time in study, by vaccine type last received

|  |  |  |
| --- | --- | --- |
| **Vaccine type last received** | **Type of live vaccine** | **Person-years of observation time** |
| Inactivated and live vaccines concurrently | MMR and/or varicella | 173,001 |
| Rotavirus | 18,135 |
| Live vaccine(s) only | MMR and/or varicella | 6,426 |
| Rotavirus | 30 |
| Inactivated vaccine(s) only | n/a | 238,401 |
| *Total person-years of observation time in study:* | | *435,993* |

**eTable 8.** Incidence rates and hazard ratios for emergency department and inpatient visits for non-vaccine-targeted infections, by most recent vaccine type, ages 11-23 months, among a sub-cohort of children with records for all recommended immunizations through age 23 monthsa

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sex** | **Most recent vaccine type** | **Events** | **Person-years** | **Unadjusted Incidence Rate per 100,000 person-years** | **Unadjusted HR**  **(95% CI)** | **Adjusted HR**b  **(95% CI)** |
| Overall  n=222,418 | Inactivated and live vaccines concurrently | 9,773 | 89,705 | 10,895 | 1.02  (95% CI: 0.98 – 1.05) |  |
| Live vaccine(s) only | 211 | 2,258 | 9,343 | 1.00  (95% CI: 0.87 – 1.15) |  |
| Inactivated vaccine(s) only | 13,268 | 134,028 | 9,899 | Reference |  |
| Females  n=108,449 | Inactivated and live vaccines concurrently | 4,103 | 44,009 | 9,323 | 0.99  (95% CI: 0.94 – 1.04) | 1.00  (95% CI: 0.96 – 1.06) |
| Live vaccine(s) only | 93 | 1,092 | 8,520 | 1.05  (95% CI: 0.85 – 1.29) | 1.16  (95% CI: 0.92 – 1.45) |
| Inactivated vaccine(s) only | 5,695 | 65,974 | 8,632 | Reference | Reference |
| Males  n=113,969 | Inactivated and live vaccines concurrently | 5,670 | 45,697 | 12,408 | 1.04  (95% CI: 0.99 – 1.08) | 0.94  (95% CI: 0.89 – 0.98) |
| Live vaccine(s) only | 118 | 1,167 | 10,112 | 0.95  (95% CI: 0.79 – 1.14) | 0.83  (95% CI: 0.67 – 1.04) |
| Inactivated vaccine(s) only | 7,573 | 68,055 | 11,128 | Reference | Reference |

Abbreviations: HR=Hazard ratio; CI=confidence interval

a Cox regression models use an age time scale and are stratified by year and month of birth and integrated health system site. Children in this sub-cohort had ≥3 Hepatitis B, 4 diphtheria-tetanus- acellular pertussis, 3 or 4 *Haemophilus influenzae* type b vaccines (depending on brand), ≥4 pneumococcal vaccines, 3 inactivated polio vaccines, 1 measles-mumps-rubella vaccine, 1 varicella vaccine, ≥2 seasonal influenza vaccines, and ≥1 Hepatitis A vaccine. Children born after re-introduction of the rotavirus vaccine at each integrated health plan after 2006 were required to have 2 or 3 rotavirus vaccines (depending on brand), and children ages 6-24 months in October 2009- March 2010 were required to have two 2009 H1N1 pandemic influenza vaccines.

b As with the primary analysis shown in Table 2, this model is adjusted forpreterm birth, presence of a chronic condition before age 11 months, number of outpatient visits in ages 1-10 months, and an interaction term of outpatient visits between ages 1 and 11 months and time. P-value for interaction between most recent vaccine type and sex was p=0.01; therefore, the interaction term was retained in the adjusted model and hazard ratios are presented separately for females and males.

**eTable 9.** Incidence rates and hazard ratios for emergency department and inpatient visits for non-vaccine-targeted infections, by most recent vaccine type and separating live rotavirus vaccine exposure from measles-mumps-rubella or varicella vaccine exposurea, ages 11-23 months

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sex** | **Most recent vaccine type** | **Events** | **Person-years** | **Unadjusted Incidence Rate per 100,000 person-years** | **Unadjusted HR**  **(95% CI)** | **Adjusted HR**b  **(95% CI)** |
| Overall  n=428,608 | Rotavirus, with or without inactivated vaccine(s) concurrently | 2,276 | 18,164 | 12,530 | 0.99  (95% CI: 0.94 - 1.04) |  |
| MMR/Varicella with inactivated vaccine(s) concurrently | 17,714 | 173,001 | 10,239 | 0.99  (95% CI: 0.96 - 1.01) |  |
| MMR/Varicella only | 562 | 6,426 | 8,745 | 0.93  (95% CI: 0.85 - 1.01) |  |
| Inactivated vaccine(s) only | 23,523 | 238,401 | 9,867 | Reference |  |
| Females  n=209,449 | Rotavirus, with or without inactivated vaccine(s) concurrently | 913 | 8,857 | 10,308 | 0.93  (95% CI: 0.85 - 1.01) | 1.44  (95% CI: 1.32 - 1.57) |
| MMR/Varicella with inactivated vaccine(s) concurrently | 7,612 | 85,292 | 8,925 | 0.98  (95% CI: 0.95 - 1.02) | 0.91  (95% CI: 0.88 - 0.94) |
| MMR/Varicella only | 248 | 3,129 | 7,926 | 0.96  (95% CI: 0.85 - 1.09) | 0.99  (95% CI: 0.86 - 1.13) |
| Inactivated vaccine(s) only | 10,108 | 117,434 | 8,607 | Reference | Reference |
| Males  n=219,159 | Rotavirus, with or without inactivated vaccine(s) concurrently | 1,363 | 9,307 | 14,645 | 1.04  (95% CI: 0.97 - 1.11) | 1.14  (95% CI: 1.05 - 1.23) |
| MMR/Varicella with inactivated vaccine(s) concurrently | 10,102 | 87,709 | 11,518 | 0.99  (95% CI: 0.96 - 1.02) | 0.89  (95% CI: 0.87 - 0.92) |
| MMR/Varicella only | 314 | 3,297 | 9,522 | 0.90  (95% CI: 0.80 - 1.01) | 0.82  (95% CI: 0.72 - 0.93) |
| Inactivated vaccine(s) only | 13,415 | 120,968 | 11,090 | Reference | Reference |

**eTable 9,** continued

aMMR/Varicella indicates that either vaccine was administered, or both were administered together. Overall, there were only 2 events that occurred when rotavirus was last administered alone (i.e., without any other vaccines on the same day). Cox regression models use an age time scale and are stratified by year and month of birth and integrated health system site.

b As with the primary analysis shown in Table 2, this model is adjusted forpreterm birth, presence of a chronic condition before age 11 months, number of outpatient visits in ages 1-10 months, and an interaction term of outpatient visits between ages 1 and 11 months and time. Since an interaction between most recent vaccine type and sex was statistically significant (p<0.0001), the interaction term was retained in the adjusted model and hazard ratios are presented separately for females and males.

**eTable 10.** Mean and median number of days from receipt of last vaccine to non-vaccine-targeted infection diagnosis date in an emergency department or inpatient setting, by vaccine type last received, ages 11-23 monthsa

|  |  |  |
| --- | --- | --- |
| **Most recent vaccine type** | **Mean (standard deviation)** | **Median** |
| Rotavirus, with or without inactivated vaccine(s) concurrently | 181.4 (53.8) | 170 |
| MMR/Varicella with inactivated vaccine(s) concurrently | 88.8 (69.8) | 74 |
| MMR/Varicella only | 74.4 (61.9) | 60.5 |
| Inactivated vaccine(s) only | 87.8 (66.5) | 75 |

a Among n=44,075 individuals who had an non-vaccine-targeted infection diagnosis in an emergency department or inpatient setting.