**Supplementary Tables**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table S1: Additional Data Collected for the 11 measles outbreaks from 2006 through 2018** | | | | | | | | | | | | | | | | |
|  |  |  |  | |  |  | |  | |  | |  | |  |  |  |
| **Author** | **Publication Year** | **Outbreak Year** | **Imported** | **Source** | | | **Hospitalized** | | **Setting** | | **Cause** | | **Personnel** | **Personnel hours** | | **Ref** |
| Chen et al. | 2011 | 2008 | Y | Swiss traveler | | | 7 | | Two hospitals | | Primarily unvaccinated | | NR | 2,064 | | [1] |
| Coleman et al. | 2011 | 2010 | Y | Indian refugee | | | 1 | | Hospital | | NR | | NR | 387 | | [2] |
| Dayan et al. | 2010 | 2004 | Y | India | | | 0 | | Public Health | | Failure to vaccinate | | NR | 2,525 | | [3] |
| Helmecke et al. | 2014 | 2011 | N | N/A | | | 2 | | Hospital | | NR | | NR | 1,178 | | [4] |
| Marx et al. | 2017 | 2016 | Y | India | | | 1 | | Public Health | | Failure to vaccinate | | NR | 756 | | [5] |
| Marx et al. | 2017 | 2017 | Y | Thailand | | | 1 | | Public Health | | Failure to vaccinate | | NR | 435 | | [5] |
| McCullough et al. | 2018 | 2015 | N | Disneyland - CA | | | NR | | Public Health | | NR | | NR | 2,849 | | [7] |
| Parker et al. | 2006 | 2005 | Y | Romania | | | 3 | | Public Health | | Failure to vaccinate | | 99 | 3,674 | | [6] |
| Rosen et al. | 2018 | 2013 | Y | United Kingdom | | | 0 | | Public Health | | Failure to vaccinate | | 87 | 10,054 | | [8] |
| Sugerman et al. | 2010 | 2008 | Y | Switzerland | | | 1 | | Public Health | | Failure to vaccinate | | 41 | 1,745 | | [9] |
| Wendorf et al. | 2015 | 2013 | Y | Europe | | | 0 | | Outpatient clinic | | NR | | NR | NR | | [10] |
|  |  |  |  | |  |  | |  | |  | |  | |  |  |  |
| *NR=not reported* | | | | | | | | | | | | | | | | |

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| **Table S2: Costs Collected for 11 Measles Investigations from 2006 through 2018** | | | |
|  |  |  |  |
| **Perspective** | **Study** | **Costs included** | **Ref** |
| Public Health |  |  |  |
|  | Coleman et al. (2012) | CDC labor, quarantine stations, refugee case worker, laboratory time, regional epidemiologist, county public health department labor, state refugee coordinator, state public health department labor, mileage, immunologic screening tests for the parents’ exposure to measles, MMR and IG doses. | [2] |
|  | Dayan et al. (2010) | Investigation, emergency response, phone calls, mileage, MMR and IG doses. | [3] |
|  | Marx et al. (2017) | Personnel time and support, laboratory, MMR and IG doses. | [5] |
|  | Marx et al. (2017) | Personnel time and support, laboratory, MMR and IG doses. | [5] |
|  | McCullough et al. (2017) | Emergency response planning/coordination, investigation, managerial and miscellaneous, public information, mileage, MMR doses. | [7] |
|  | Parker et al. (2006) | Investigation, emergency response, laboratory, phone calls, mileage, MMR and IG doses. | [6] |
|  | Rosen et al. (2018) | Investigation, laboratory, community outreach, administration, advertising, MMR and IG doses, laboratory supplies and testing, courier service, postage, mileage. | [8] |
|  | Sugerman et al. (2010) | Investigation, emergency response, laboratory, mileage, MMR doses. | [9] |
| Provider |  |  |  |
|  | Chen et al. (2011) | Healthcare Provide (HCP) furlough time, HCP time reviewing records for evidence of immunity, time of responders in screening HCP, measles test kits, MMR doses. | [1] |
|  | Coleman et al. (2012) | Nursing supervisor, physician time, standard nurse time, medical support staff, hospital interpreter, hospitalization cost, physician visits. | [2] |
|  | Helmecke et al. (2014) | Information services, Employee health research and record retrieval, assessing the titer/vaccination history of exposed staff, IgG testing, on-call hours, overtime hours, holiday hours, MMR doses, Immunoglobulin treatment, adult visit, pediatric visit, epidemiology. | [4] |
|  | Parker et al. (2006) | Investigation, emergency response, laboratory, phone calls, MMR and IG doses. | [6] |
|  | Wendorf et al. (2015) | Identifying or contacting patients and employees, working with local public health department, employee overtime, responding to concerns, MMR vaccine administration, MMR doses, patient visits for IVIG, employee MMR doses, employee laboratory tests. | [10] |

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| **Table S3: Breakdown of Costs Reported in Coleman et al. (2012)\*** |  |
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| ***Public Health Perspective - Response Costs – investigation and containment*** |  |
| CDC labor | $1,397 |
| Quarantine stations | $279 |
| Refugee case worker | $2,650 |
| Lab time (medical and clinical laboratory) | $30 |
| Regional epidemiologist | $1,522 |
| County PHD (medical and public health social worker) | $4,068 |
| State refugee coordinator (asocial and community | $612 |
| State PHD (medical and public health social worker) | $1,594 |
| Mileage | $205 |
| Immunologic screening tests for the parents’ exposure to measles | $240 |
| **Subtotal** | **$12,597** |
|  |  |
| ***Public Health Perspective - Response Costs - vaccination*** |  |
| Vaccines | $1,766 |
| **Subtotal** | **$1,766** |
|  |  |
| ***Provider Perspective - Direct Medical*** |  |
| Nursing supervisor | $104 |
| Physician time | $235 |
| Standard nurse time | $601 |
| Medical support staff | $181 |
| Hospital interpreter | $213 |
| Hospitalization cost | $9,431 |
| Physician costs | $294 |
| **Subtotal** | **$11,058** |
|  |  |
| **Total costs** | **$25,421** |
|  |  |
| \*Costs directly from paper. Not updated to 2018 dollars. |  |

References

1. Chen, S.Y., et al., *Health care–associated measles outbreak in the United States after an importation: challenges and economic impact.* Journal of Infectious Diseases, 2011. **203**(11): p. 1517-1525.

2. Coleman, M.S., et al., *Direct costs of a single case of refugee-imported measles in Kentucky.* Vaccine, 2012. **30**(2): p. 317-321.

3. Dayan, G.H., et al., *The cost of containing one case of measles: the economic impact on the public health infrastructure—Iowa, 2004.* Pediatrics, 2005. **116**(1): p. e1-e4.

4. Helmecke, M.R., et al., *Measles investigation: a moving target.* American journal of infection control, 2014. **42**(8): p. 911-915.

5. Marx, G.E., et al., *Public health economic burden associated with two single measles case investigations—Colorado, 2016–2017.* 2017. **66**(46): p. 1272.

6. Parker, A.A., et al., *Implications of a 2005 measles outbreak in Indiana for sustained elimination of measles in the United States.* New England Journal of Medicine, 2006. **355**(5): p. 447-455.

7. Mac McCullough, J., et al., *Cost Analysis of 3 Concurrent Public Health Response Events: Financial Impact of Measles Outbreak, Super Bowl Surveillance, and Ebola Surveillance in Maricopa County.* 2019.

8. Rosen, J.B., et al., *Public health consequences of a 2013 measles outbreak in New York City.* 2018. **172**(9): p. 811-817.

9. Sugerman, D.E., et al., *Measles outbreak in a highly vaccinated population, San Diego, 2008: role of the intentionally undervaccinated.* Pediatrics, 2010. **125**(4): p. 747-755.

10. Wendorf, K.A., et al., *Cost of measles containment in an ambulatory pediatric clinic.* The Pediatric infectious disease journal, 2015. **34**(6): p. 589-593.