Estimates of the Public Health Impact of Norovirus Vaccination for Older Adults in the United States

BACKGROUND

- Norovirus (NoV) is the most common cause of acute gastroenteritis (AGE)¹
- Most NoV-AGE disease burden is among older adults, immunocompromised individuals, and those with other underlying medical conditions, as well as young children^{2,3}
- In the US, most NoV-AGE deaths occur among older adults^{2,3} • Currently, there is no approved prophylactic vaccine to prevent
- NoV-AGE, but candidates are in development

OBJECTIVES

 This study assessed the potential public health impact of NoV vaccination, focusing on adults aged 60 years and older in the US

METHODS

- A static health-outcomes model with a decision-tree structure (Figure 1) and a 1-year time horizon was developed to evaluate the incremental impact of vaccination in US adults aged 60 years and older
- The model compares hypothetical **vaccination** (assumed 65% efficacy against NoV-AGE of any severity) versus no vaccination
- Data to inform NoV-AGE incidence, resource use, and mortality were obtained from published literature, publicly available data, and clinical expert opinion (**Table 1**)
- Input data were calibrated to ensure modeled annual NoV-AGE incidence, resource use, and deaths align with high-quality publications
- Health outcomes produced from the model included annual NoV-AGE cases, medically-attended NoV-AGE cases, NoV-AGErelated hospitalizations, and NoV-AGE-related deaths
- Number needed to vaccinate (NNV) to prevent 1 NoV-AGE case, 1 NoV-AGE-related hospitalization, or 1 NoV-AGE-related death were calculated
- Deterministic (one-way) sensitivity analyses were conducted to assess the impact of parameter uncertainty and modeling assumptions

Figure 1. Model Structure



^bA NoV case for a vaccinated individual is defined as a breakthrough case.

^cA percentage of all NoV cases may have complications (eg, post-infection irritable bowel syndrome).

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Table 1. Key Model Inputs

lal input	Age group					
iei iliput	60 - 74 years	≥75 years	Sources			
ulation size	56,500,854	24,482,238	2023 US population; US Census Bureau (2025)⁴			
emiological inputs						
ual NoV-AGE dence (%)	5.0%	5.0%	O'Brien et al. (2015) ⁵ ; Grytdal et al. (2016) ⁶			
NoV-AGE es non- lically–attended	90.00%	56.92%	Schmidt et al. (2022) ⁷ ; Hallowell et al			
NoV-AGE cases lically-attended	10.00%	43.08%	et al. (2023) ⁸ ; Scallan et al. (2006) ⁹			
Itpatient care	8.16%	32.97%				
nergency partment visit	1.14%	5.35%	Rurko ot al			
spitalization	$(2021)^{1};$ Grytdal et al.					
Community- Icquired case	0.45%	3.04%	(2016)°			
lospital-acquired ase	0.25%	1.72%				
NoV-AGE– ed mortality ong hospitalized ents	2.17%	2.17%	Cates et al. (2023) ¹⁰			
cine characteristi	CS					
cine coverage (%)	50%	50%	Assumption			
cine efficacy eduction in all -AGE cases)	65%	65%	Assumption			
thly % reduction accine protection to waning from 12 months	0%	0%	Assumption			

Table 2. Base Case Results for NoV Vaccination Versus No Vaccination

	Age group		
Health outcome prevented	60 - 74 years	≥75 years	ars
NoV-AGE cases	918,139	397,836	1,315
Medically-attended NoV-AGE cases	91,814	171,381	263,
NoV-AGE-related hospitalizations	6473	18,948	25,4
NoV-AGE-related deaths	141	411	55
NoV-AGE, norovirus acute gastroenteritis. •Discrepancies observed in total values from the sum of row values is due to rounding.		1	

Figure 2. Impact of Varying Key Parameters on Annual NoV-AGE Case Outcomes Avoided Due to Vaccination

Ν
Annual NoV-AGE incidence (2.8% - 7.6%)
Vaccine coverage rate (30% - 70%)
Vaccine efficacyª (52% - 78%)
-7
NoV-A
Annual NoV-AGE incidence (2.8% - 7.6%)
Vaccine coverage rate (30% - 70%)
Vaccine efficacyª (52% - 78%)
-1

NoV-AGE, norovirus acute gastroenteritis. ^aVaccine efficacy represents a percent reduction in all NoV-AGE cases

NoV-AGE, norovirus acute gastroenteritis

*Presenting author.

• The model estimated that among US adults aged 60 years and older, NoV vaccination with 50% coverage may produce a substantial public health impact (**Table 2**)

- With vaccination, a total of 1,315,975 NoV-AGE cases were prevented, including 263,195 medically-attended NoV-AGE cases, 25,420 NoV-AGE-related hospitalizations, and 552 NoV-AGE-related deaths each year, representing a population-level 32.5% reduction across health outcomes

• To prevent 1 NoV-AGE case, 1 NoV-AGE-related hospitalization, or 1 NoV-AGE-related death, a total of 62, 3186, or 146,757 adults aged 60 years and older need to be vaccinated, respectively

• Sensitivity analyses showed results to be robust when varying key parameters (NoV-AGE incidence, vaccine coverage, and vaccine efficacy) (Figure 2)



EPH178

5,975

,195

420

52

- NoV vaccination may provide significant public health benefits for older adults in the US
- Estimates should be updated with newer epidemiological and clinical data as NoV surveillance improves and vaccine development continues

ADDITIONAL INFORMATION

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References

- Burke RM, Mattison CP, Pindyck T, et al. Burden of norovirus in the United States, as estimated based on administrative data: Updates for medically attended illness and mortality, 2001-2015. Clin Infect Dis. 2021;73(1):e1-e8.
- Hall AJ, Lopman BA, Payne DC, et al. Norovirus disease in the United States. Emerg Infect Dis. 2013;19(8):1198-1205.
- Burke RM, Shah MP, Wikswo ME, et al. The norovirus epidemiologic triad: Predictors of severe outcomes in US norovirus outbreaks, 2009-2016. J Infect Dis. 2019;219(9):1364-1372.
- 4. U.S. Census Bureau. Age and sex. American Community Survey, ACS 1-year estimates subject tables, table S0101, 2023. Accessed March 20, 2025
- 5. O'Brien SJ, Donaldson AL, Iturriza-Gomara M, et al. Age-specific incidence rates for norovirus in the community and presenting to primary healthcare facilities in the United Kingdom J Infect Dis. 2015;213(Suppl 1):S15-S18.
- Grytdal SP, DeBess E, Lee LE, et al. Incidence of norovirus and other viral pathogens that cause acute gastroenteritis (AGE) among Kaiser Permanente member populations in the United States, 2012-2013. PLoS One. 2016;11(4):e0148395.
- Schmidt MA, Groom HC, Rawlings AM, et al. Incidence, etiology, and healthcare utilization for acute gastroenteritis in the community, United States. *Emerg Infect Dis*. 2022;28(11):2234-2242.
- Hallowell BD, Burke RM, Salas SB, et al. Correlates of healthcare-seeking behavior for acute gastroenteritis-United States, October 1, 2016-September 30, 2017 PLoS One. 2023;18(10):e0293739.
- Scallan E, Jones TF, Cronquist A, et al. Factors associated with seeking medical care and submitting a stool sample in estimating the burden of foodborne illness. Foodborne Pathog Dis. 2006;3(4):432-438.
- Cates J, Cardemil CV, Mirza SA, et al. Risk of hospitalization and mortality following medically attended norovirus infection-Veterans Health Administration, 2010-2018. Open Forum Infect Dis. 2023;10(11):ofad556

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Disclosures

AED, ML, AJB, and **CM** are employees of RTI Health Solutions, consultants for Moderna, Inc., and were paid for their services. MB, BJP, KBC, and POB are employees of Moderna, Inc., and hold stock/stock options in the company. **BL** is an employee of Emory University and Epidemiologic Research & Methods, LLC, consultant for Moderna, Inc., and was paid for services.