

Letters

RESEARCH LETTER

Trends in County-Level Childhood Vaccination Exemptions in the US

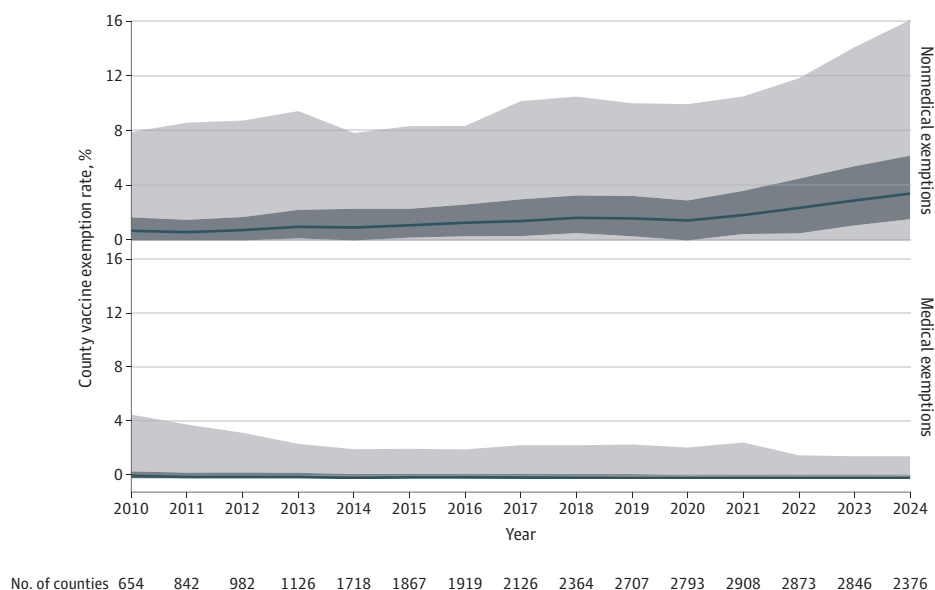
US childhood vaccination rates are declining, posing the risk that vaccine-preventable infectious diseases will resurge.^{1,2} Nonmedical exemptions to school-based childhood vaccination requirements are associated with lower vaccination coverage and increased risk of outbreaks, and the American Academy of Pediatrics has advocated that states eliminate such exemptions.³⁻⁵ Although vaccination data are often tracked at the state level, county-level data are more relevant to population immunity and infectious disease risk.^{1,6} The objective of this study was to describe US county-level trends in nonmedical and medical exemptions to childhood vaccination requirements.

Methods | We obtained county-level data on nonmedical and medical exemptions to childhood vaccination requirements (defined as exemption from any vaccine, except as noted in [Supplement 2](#)) from 2010 to 2024, predominantly for entering kindergarteners. Nonmedical exemptions included those granted for personal belief or religious reasons. Data were

obtained by sending data requests to all 50 US states and the District of Columbia or using publicly available data. Most states reported county-level percentages of students with a vaccine exemption. [Supplement 2](#) provides a detailed description of the dataset for each state, including outcome measure, years of data, age group, data processing steps, and relevant data notes. Statistically significant temporal trends were assessed using quantile regression ([Supplement 1](#)). The Stanford University Institutional Review Board deemed this project not human subjects research. Analytic code (R version 4.4.2 [R Foundation]) and data are available ([Supplement 3](#)). Analyses were 2 sided, and significance is defined in [Supplement 1](#). We followed the Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) guideline.

Results | Vaccine exemption data from 3053 counties (or substate administrative units, eg, school districts, parishes, health department jurisdictions) across 45 US states and the District of Columbia were analyzed, of which 91.1% included at least 5 years of data and 98.0% included at least 1 year of data from 2021 to 2024. The median (IQR) county-level nonmedical exemption rate increased from 0.6% (0.0%-1.6%) in 2010-2011 to 3.1% (1.3%-5.8%) in 2023-2024, while medical exemptions remained stable ([Figure 1](#)). The median nonmedical exemption

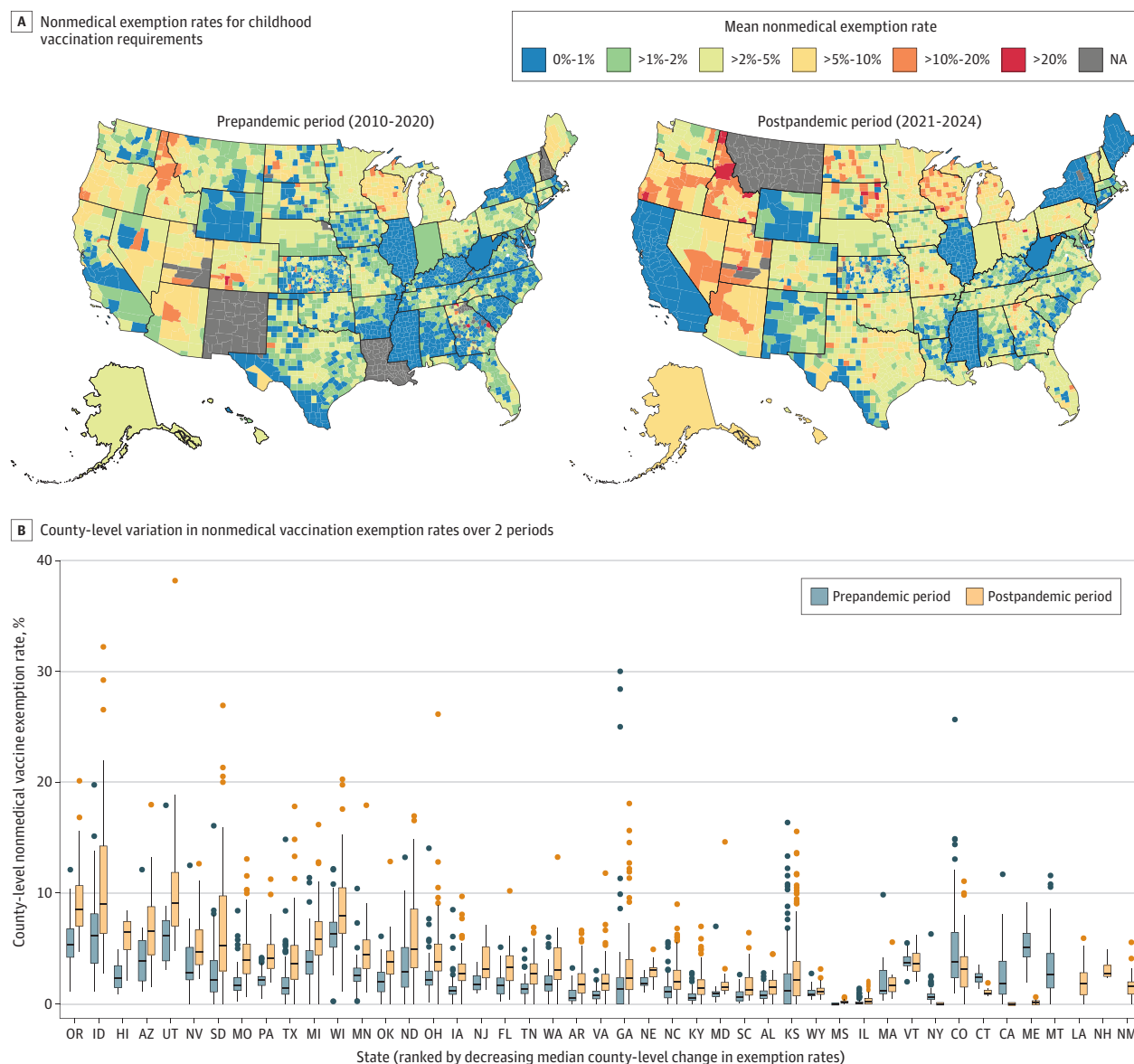
Figure 1. Temporal Trends in County-Level Nonmedical and Medical Vaccine Exemptions in the US



Estimated median annual county-level nonmedical and medical exemption rates to childhood vaccination requirements over the study period. The line represents the median, the dark shading represents the IQR, and the light shading represents the middle 95th percentile. Data reporting varied by state in terms of definition and availability of vaccine exemptions, reporting systems, and other data factors ([Supplement 2](#)). The availability of county-level data

generally increased over the study period, and therefore the number of counties (or substate administrative units) was included over time. Increasing nonmedical exemptions were observed (annual median rate of rise increased during the 2021-2024 postpandemic period, see eAppendix in [Supplement 1](#)), while medical exemptions remained stable over time. States with only state-level data and suppressed counties were excluded.

Figure 2. Spatial and Temporal Trends in County-Level Nonmedical Exemptions



A, Data reporting varied by state in terms of definition and availability of nonmedical exemptions, reporting systems, and other data factors (see eAppendix in Supplement 1). B, Boxes indicate the middle 50% of values, the horizontal line inside the box represents the median estimate, the dots represent outliers, and error bars indicate 95% CIs. The prepandemic period

included 2020 given timing of childhood vaccine receipt may precede their entry into kindergarten. A trend toward increasing nonmedical exemptions was observed in the postpandemic period. States with only state-level data, states with few counties (<5), and suppressed counties were excluded. NA indicates not available.

rate increased by 0.11 (95% CI, 0.10-0.12) percentage points annually from 2010 to 2020 and by 0.52 (95% CI, 0.48-0.57) percentage points annually from 2021 to 2024. Substantial variation was observed in county-level nonmedical exemption rates over 2 periods and in county-level variation by state (Figure 2). From 2021 to 2024, compared with 2010 to 2020, 53.5% of the 2842 counties included in the study with data available over both periods reported an increase in nonmedical exemptions greater than 1%, and 5.3% of counties reported an increase greater than 5%. Utah, Idaho, Oregon, Wisconsin, and Arizona had the highest rates of nonmedical exemptions from

2021 to 2024. States that eliminated nonmedical exemptions during this period (California, Connecticut, Maine, New York) had declines.

Discussion | This study identified an increase in nonmedical exemptions to childhood vaccination requirements from 2010 to 2024, with wide variation among counties and states and an increase following the COVID-19 pandemic, which may contribute to resurgence of vaccine-preventable diseases. This county-level analysis reveals geographically focused areas of high vaccine exemptions that are less evident at the state level.

Continuation of these increases in nonmedical exemptions could contribute to declining vaccination and resurgence of vaccine-preventable infectious diseases in the US.^{1,2} These findings support the need to reconsider policy on use of nonmedical exemptions, which are actively being debated, to address declining childhood vaccination in the US.^{1,2}

This analysis has limitations. The dataset did not cover all US counties over the entire study period, although most US counties contributed at least 1 year of data. Data were obtained from state public health and education departments, and their accuracy was not independently verified. States vary in their vaccine requirements, exemption policies, exemption definitions (any vaccine or measles, mumps, and rubella vaccine alone), data collection and reporting, and methods of estimating exemption rates. Nonmedical exemption estimates did not distinguish between personal belief vs religious exemptions. These estimates primarily reflect children in public schools, and often private schools; home-schooled children (who may have lower rates of vaccination) are often excluded.

This study found increasing nonmedical vaccine exemptions, most concentrated in a fraction of US counties, which may contribute to resurgence of vaccine-preventable diseases.

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Author Contributions: Drs Lo and Kiang, Mr Fattah, and Ms Stoffel had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Mr Fattah and Ms Stoffel contributed equally as co-first authors. Drs Kiang and Lo contributed equally as co-senior authors.

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Supervision: Kiang, Lo.

Conflict of Interest Disclosures: Mr Fattah reported participating in the reporting and analysis for NBC News of information in this article. Dr Maldonado reported receiving grants from Pfizer outside the submitted work. Dr Hotez reported being a co-inventor on non-revenue-generating patents for neglected tropical diseases owned by Baylor College of Medicine and a co-inventor of a COVID-19 recombinant protein vaccine technology owned by BCM that was licensed by Baylor Ventures nonexclusively and with no patent restrictions to several companies committed to advancing vaccines for low- and middle-income countries and receiving income for serving as author of several books. Dr Kiang reported receiving grants from National Institutes of Health outside the submitted work. Dr Lo reported receiving personal fees from World Health Organization related to guidelines on neglected tropical diseases and being supported by the National Institutes of Health outside the submitted work. No other disclosures were reported.

Data Sharing Statement: See Supplement 3.

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1. Dong E, Saiyed S, Nearchou A, Okura Y, Gardner LM. Trends in county-level MMR vaccination coverage in children in the United States. *JAMA*. 2025;334(8):730-732. doi:10.1001/jama.2025.8952
2. Kiang MV, Bubar KM, Maldonado Y, Hotez PJ, Lo NC. Modeling reemergence of vaccine-eliminated infectious diseases under declining vaccination in the US. *JAMA*. 2025;333(24):2176-2187. doi:10.1001/jama.2025.6495
3. Delamater PL, Bottenheim AM, Salmon DA, Schwartz JL, Omer SB. Kindergarten vaccination status in California after changes to medical exemption policy. *JAMA*. 2023;330(16):1585-1587. doi:10.1001/jama.2023.16995
4. Hackell JM, Brothers K, Bode S, Costello LM, Kafer LM, O'Leary ST; Committee on Practice and Ambulatory Medicine; Committee on Infectious Diseases; Committee on State Government Affairs; Council on School Health. Medical vs nonmedical immunization exemptions for child care and school attendance: policy statement. *Pediatrics*. 2025;156(2):e2025072714. doi:10.1542/peds.2025-072714
5. Bald A, Gold S, Yang YT. State repeal of nonmedical vaccine exemptions and kindergarten vaccination rates. *JAMA Pediatr*. Published online October 27, 2025. doi:10.1001/jamapediatrics.2025.4185
6. Masters NB, Eisenberg MC, Delamater PL, Kay M, Boulton ML, Zelner J. Fine-scale spatial clustering of measles nonvaccination that increases outbreak potential is obscured by aggregated reporting data. *Proc Natl Acad Sci U S A*. 2020;117(45):28506-28514. doi:10.1073/pnas.2011529117