



# **Minimizing the spread of misinformation about vaccines amongst parents of infants up to 2 years old in states with low vaccine rates**

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# Significance of Vaccination



- One study uses a mathematical model to estimate how many deaths can be averted with vaccines globally from 2021-2030 (Carter et al., 2021)
  - Uses demographic data: population size, vaccine coverage, observed mortality of vaccine-preventable diseases, etc.
  - Includes many diseases of vaccine available for infants: Hep B, measles, rotavirus, DTap, etc.
- An estimated 51.0 million deaths are prevented through vaccinations
  - Measles and Hep B (infant vaccines) contribute to the largest portions of the results with 18.8 million and 14 million of total deaths averted, respectively
  - Deaths averted by vaccines per year are estimated to increase from 4.4 million in 2021 to 5.1 million in 2030

# Significance of Vaccination (cont.)



- Majority of the averted deaths are in less developed countries
  - Likely due to underfunded healthcare system and lack of access to care
- On the other hand, 4% (2.0 million) are in high income countries like the U.S.
  - Why?
  - Vaccine Hesitancy (individual choice)?

# Vaccine Hesitancy

- Another study interviewed and selected parents (of children aged 19 months - 35 months) from 2018 and 2019 National Immunization Surveys (NIS)-Child (Nguyen et al., 2022)
- Assessment includes parental vaccine hesitancy and overall perceptions toward vaccines

Total no. parents	Hesitancy toward child vaccinations	Concerned for more than 1 vaccine administered	Concerned for long term health effects	Personally knowing someone had serious side effects from vaccines	<b>Not confident about their healthcare provider being the most trustful source about vaccines</b>
7741	23.6%	24.3%	23.2%	10.6%	12.4%

# Vaccine Hesitancy

- Socioeconomic status are analyzed in parents with **vaccine hesitancy** (23.6% of the whole sample) (Nguyen et al., 2022)

non-Hispanic Black	Hispanic	non-Hispanic White
37.0%	30.1%	16.4%

Mothers	Fathers
26.4%	15.4%

Households below poverty	Households above poverty
35.6%	18.5%

Mothers with less than high school education	Mothers with more than college education
31.9%	13.0%

# How Vaccination Status Affects Outbreak of Preventable Diseases



- In June 2019 there were 1,044 confirmed measles cases in 28 states. This is the most amount of measles cases since the endemic measles outbreak in 2000. This shows how undervaccinated populations can cause outbreaks of certain preventable illnesses.
- When looking at numbers of vaccinated vs unvaccinated individuals among the recent measles outbreak of 2019, of the 81 cases documented in Washington State, **63 were unvaccinated**, 4 were under-vaccinated, 12 were of unknown vaccination status, and only **2 cases was reported among fully immunized individuals** (Quinn et al., 2020).

# Economic and Public Health Consequences of Vaccine Hesitancy



- One study used data available from CDC in order to simulate county level MMR vaccine coverage for children age 2-11.
- A measles outbreak was “simulated” via statistics and mathematical analysis:
  - i. measles introduction into the county (with larger populated counties having higher probability)
  - ii. amount of children to catch the disease from the primary individual was calculated using the basic reproductive number (how contagious the pathogen is if the whole population has no immunity)
  - iii. the effective reproductive number (actual number of secondary infections) was calculated via basic reproductive number and with the number of children immune to the measles
  - iv. and the equation was manipulated to account for increasing vaccine hesitancy and to see how much of an effect less vaccinations will cause on measles outbreaks

# Economic and Public Health Consequences of Vaccine Hesitancy (cont.)



- Baseline national MMR coverage is 93% with a 2% rate of non-medical exemptions. With these statistics there is an average of 48 measles cases per year.
- A mere **5% decrease** in vaccine coverage would result in a **three fold increase** in annual measles cases (about 150 cases), and an extra \$2.1 million cost.
- If vaccine coverage increases to 95%, whether it is due to no longer allowing non-medical exemptions or any other reason, it would decrease annual measles cases by 20% (about 38 cases) (Lo et al., 2017).



# Specific Priority Groups



## Which at-risk groups need to be addressed to reduce childhood vaccine hesitancy?

- Our priority groups include families who are choosing not to vaccinate their children due to:
  - Lack of trust of the healthcare system
  - Religious or philosophical beliefs
  - Fear of side effects
  - Perceived low disease risk
- Vaccine hesitancy is affecting these target populations by allowing outbreaks of diseases that were long believed to have been eradicated

## Specific Priority Groups



### Higher level of disease in communities with low immunization rates

- Investigations during October 1, 2018–April 30, 2019, identified 242 laboratory-confirmed and epidemiologically linked measles cases in New York, excluding New York City, and during October 17, 2018–November 30, 2018, identified 33 in New Jersey. **The cases of measles were primarily in members of orthodox Jewish communities.** (McDonald et al., 2019)
- There were ultimately 242 cases in New York State including 206 in Rockland county where most patients resided in Orthodox Jewish neighborhoods with **very low immunization rates**
- In 2017-2018 the NYS Immunization survey for measles vaccination for students from Pre-1A through 12th Grade was **98%** versus **78%** surveyed in schools where the outbreaks were happening in Rockland County



## Higher level of disease in communities with low immunization rates (cont.)

- National Immunization Survey-Child (NIS-Child) collects data on types of vaccinations received, number of doses, and dates
  - Religious exemptions allowed
  - Philosophical exemptions allowed
- Ohio is below national rates in DTaP, MMR and Varicella
- 90.4% of children 24 months old have 1 or more dose of MMR vaccine in Ohio
  - Community Immunity Threshold (CIT) for measles is 92-94%
- Measles outbreak present currently in Ohio that started in November 2022 (AAPA, 2022).

# More States and their Vaccination Rates

- The MMR vaccination rate in Washington state in the 2019-2020 school year was 90.8% while the national average was closer to 93.5%. This gave rise to a measles outbreak in 2019 where 87 cases were discovered.
- In Minnesota the situation was and still is much worse. The MMR vaccination childhood series have declined expeditiously from 85.0% in 2018 to 78.7% in 2021. Unfortunately, this also gave rise to a measles outbreak in 2022 that amounted to 13 cases statewide.
- In Texas the children who were completely vaccinated for the MMR vaccine has been dropping steadily from 2018 as seen on this chart. In 2019 there were six measles cases that were found and as of three weeks ago, they found another case of measles by Fort Worth, TX. (dshs.texas.gov, 2022)

Year	Percent Completed
2018/2019	96.93%
2019/2020	96.92%
2020/2021	95.29%
2021/2022	94.04%



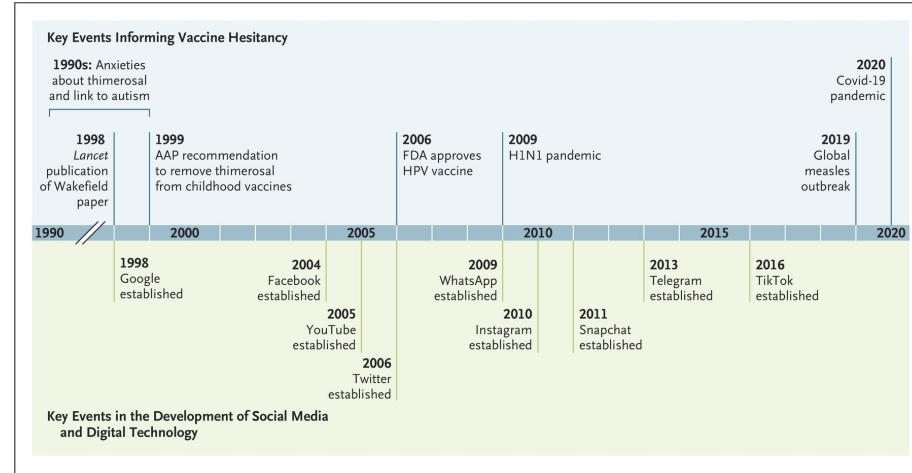
# Childhood Vaccination Rates



- In 2021 the number of infants who did not receive their regularly childhood vaccines amounted to 25 million globally (Peck, 2022)
- This was an increase of 2 million infants as compared to 2020 and 6 million compared to 2019
- These figures indicate a concerning decline in infant vaccination rates
- Based on a US national survey that was taken in 2019 it was discovered that the parents that were asked about vaccinating their infants with the MMR vaccine, roughly a quarter of them expressed significant reservations
- In regards to vaccine hesitancy, misperceptions about vaccine safety are thriving among a vast amount of unscientific theories and the rapid spread of information that isn't credible, most often on social media websites. In addition, parents are raising concerns about a crowded vaccination schedule in which they feel their child is receiving too many vaccines at any one time or even over a brief period of time. Many parents are requesting custom, alternative schedules that are not evidence-based, often after reading emotionally charged stories of extremely rare adverse reactions that are elevated by an abundance of negative media coverage. (Olson et al., 2020)

# What behavior needs to be addressed?

- In 2019, WHO named vaccine hesitancy as one of the top 10 threats to global health
- The launch of Google in 1998, followed by new social media technologies, enabled widespread access to information including misinformation, and fueled the spread of questioning about vaccines
- After the Wakefield article that was published in 1998, parents already feared that the MMR vaccine was linked to autism
- Then people started to focus on thimerosal in vaccines as a possible cause of autism
- Because data showed a 38% decrease in the number of hospitals routinely offering infants hepatitis B vaccine which contained thimerosal
- As a precautionary measure, The U.S. Public Health Service and the American Academy of Pediatrics recommended removing thimerosal from vaccines routinely given to infants (Larson et al., 2022)



# What behavior needs to be addressed?

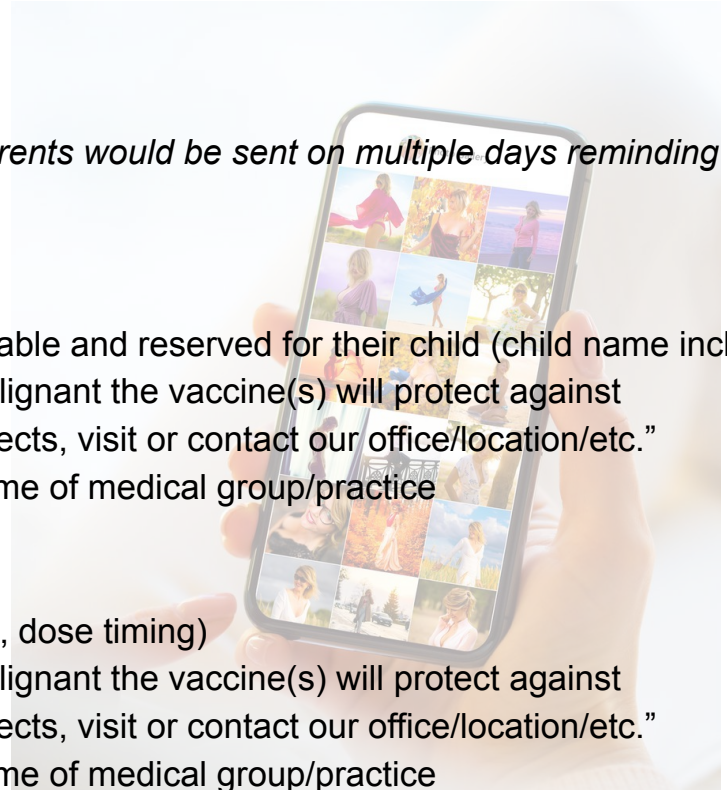
- Parents acquired vaccine information from a variety of sources.
- Regardless of whether parents were vaccine compliant or vaccine hesitant, healthcare was the most common and trusted source of vaccine information.
- Internet/social media was placed as second as a commonly used and trusted source, mostly among vaccine-hesitant parents, indicating its persuasive influence among parents, who frequently use social media. Facebook, Twitter, Instagram, and YouTube served as the principal media for public communication.
- Healthcare providers can use social media as an educational tool, a vaccine scheduler, an appointment reminder, and an advertisement platform (Novilla et al., 2023)



# What is the implementation plan?

## Intervention:

- 1) *Reminder/recall system: Texts from stakeholders to parents would be sent on multiple days reminding them to vaccinate their infants*
  - Texts include:
    - Name of vaccine(s) indicated at that time
    - Mention that indicated vaccine(s) is/are available and reserved for their child (child name included)
    - Brief information about what infectious or malignant the vaccine(s) will protect against
    - “If you have any questions about adverse effects, visit or contact our office/location/etc.”
    - Closing signature with physician name or name of medical group/practice
- 2) *Social media posts on platforms of stakeholders*
  - Posts include:
    - Name of vaccine(s) and when indicated (age, dose timing)
    - Brief information about what infectious or malignant the vaccine(s) will protect against
    - “If you have any questions about adverse effects, visit or contact our office/location/etc.”
    - Closing signature with physician name or name of medical group/practice





# What is the implementation plan? (cont'd.)

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## *Who will carry it out?*

Stakeholders: clinical care delivery system

- Pediatric healthcare facilities
- Family medicine healthcare facilities
- Pharmacies
- Health centers



# What is the implementation plan? (cont'd.)



***When will the intervention be implemented?***

As soon as possible.

***For how long will it be maintained?***

For as long as we see improvement in vaccination rates.

# What is the implementation plan? (cont'd.)

## *What resources are needed?*

- Inexpensive.
  - Text message communication is common practice for many healthcare offices (e.g. confirm appointments, provide links for new-patient forms, etc.)
  - Minimal (social media manager) to no new staff would be needed.



# What is the implementation plan? (cont'd.)

## *Who should know what about this?*

- Parents of patients
- Healthcare facilities that deliver pediatric care, in particular:
  - Owners and partners
  - Clinical staff
  - Administrative staff



# What is the implementation plan? (cont'd.)

## *What are the data collection methods?*

- Analyzing text messages
- Analyzing vaccination records
- Time-of-visit surveys asking:
  - *“Were you hesitant about getting the vaccine?”*
  - *“Did you receive the vaccine?”*
    - Coded answers: 1 - YES, 2 - NO
    - *“If ‘1 - YES’, what made you change your mind?”*
      - Coded answers: 1 - text messages, 2 - facility’s social media account, 3 - information received at visit, 4 - other

# What is the implementation plan? cont'd.



## *How will you measure success?*

- Number of infants whose parents received the text message intervention that subsequently received the vaccinations in those text messages compared to number of infants whose parents did not receive text message intervention that subsequently received the vaccinations in those text messages.
- Number of '2 - facility's social media account' survey responses.

# Vaccine Communication Techniques for Providers



- Providers need to take control of the appointment when they are with vaccine hesitant parents
- When communicating with parents about vaccine hesitancy or refusal, the provider should take an approach that assumes the infant will be getting a vaccination that day by making a presumptive announcement rather than a questioning approach, like by saying...
  - *Now that your child is 1 years old, 3 vaccines are on the schedule to be administered today. We will vaccinate against Measles, Mumps and Rubella, Hepatitis B, and influenza.*
  - *Compared to - Are you okay with the vaccines recommended today?*
- If there is some push back from the caregiver, the provider can start by asking open-ended questions (*What questions do you still have after doing your own research?*), utilize reflective listening (*I hear you saying that you are really concerned about the side effects this vaccine might have*), and try to assess the caregivers readiness to change their stance (*Now that we've discussed this, how does that affect your decision?*)

# Barriers and/or Limitations

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- Lack of consistent access to SMS-capable mobile devices or internet (e.g. low SES)
- Changing numbers/service providers
- Providing false numbers
- Disregarding text messages/social media posts
- Pediatrician awareness of false information
- Religious exemptions
- Language barriers







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