

# Improving Immunization Rates During the 2019 Measles Outbreak

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## Abstract

In 2019, there were multiple outbreaks of measles in the United States. In the context of the public awareness of these outbreaks, we performed an intervention with the intent to improve the rate of measles immunization in our pediatric population. Pediatric patients that were lacking adequate measles immunization were identified by electronic medical record (EMR) survey. Charts were reviewed and updated if records were found to be incomplete. Parents of the remaining children were sent a letter, personally signed by the child's primary care provider, encouraging measles immunization. A measles fact sheet, produced by the United States Center for Disease Control, was also included with the letter. There were 44 patients in the study group whose parents received a letter and measles fact sheet. As a result, 5 of these children were brought in for a measles, mumps, and rubella (MMR) immunization. The 44 patients whose parents received a letter included 20 patients whose parents had previously expressed intent to not vaccinate their children as documented in the EMR. None of these children received an MMR immunization. Although small in scope, this project provides a glimpse into the importance of personal provider guidance to parents who are inclined to immunize their children. Unfortunately, it also demonstrated that provider advice did not change the opinions of parents who had already taken a stance against vaccination, even in the context of an urgent public health situation that had garnered widespread coverage in the lay press and social media.

## Keywords

measles, MMR, immunization, anti-vax, provider letter, vaccination

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## Introduction

There were 1282 cases of measles reported in the United States between January 1, 2019 and December 31, 2019 (Figure 1). Numerous publications and media outlets, in both medical<sup>1-4</sup> and lay person<sup>5-8</sup> arenas, informed the public about these outbreaks and the importance of ensuring adequate measles immunization. These 1282 cases were the largest number of cases in a single year since 1992.<sup>9</sup> These cases represent 22 different outbreaks of measles in the US.<sup>1</sup>

The MMR immunization is 97% effective in preventing measles when 2 doses are given.<sup>10</sup> The CDC recommends children receive their first MMR dose between 12 and 15 months of age with a second dose between 4 and 6 years of age.<sup>10</sup>

During the 2017 to 2018 school year, the median vaccination coverage for US Kindergarteners was 94.3% for 2

doses of the MMR immunization (range=81.3% [DC] to ≥99.4% [Mississippi]). In Wisconsin the rate was 91.8%.<sup>11</sup> One model concludes that a measles immunization rate of at least 95% of all age and regional sub-groups within a population needs to be achieved for elimination of measles from

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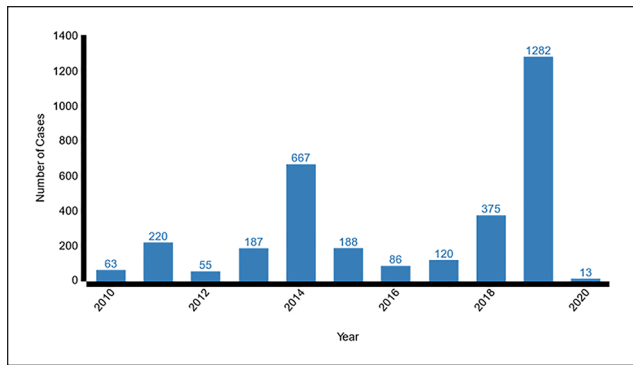
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**Figure 1.** Number of measles cases per year 2010 to 2020.<sup>9</sup>

the population.<sup>12</sup> Parental request for vaccination exemption nationally is 2.2% (range=0.1% [Mississippi] to 7.6% [Oregon]). In Wisconsin the rate is 5.2%. These numbers include medical exemptions which are 0.2% both nationally and in Wisconsin.<sup>11</sup>

One study found that physicians with over 90% of children being up to date on all recommended vaccines reported utilizing follow up phone calls for missed appointments.<sup>13</sup> Reminder systems are recognized as one recommendation to improve vaccination rates.<sup>14</sup> Parental vaccine hesitancy was cited by 91% of Canadian health care providers had a major impact on vaccination programs.<sup>15</sup>

A previous publication regarding childhood immunizations stressed the importance of “accurate, accessible, and current records are essential for maintaining a clear understanding of the immunization status and needs. . .”<sup>16</sup> The authors of this publication also found that the tone used by health care providers can leave a lasting impression in that “details of scolding by someone during the visit were remembered as long as several years as a lasting impression of the visit.”<sup>16</sup> In light of this, we strove to provide information and recommendations to parents in a positive manner.

## Methods

### General Methods

Institutional review board exemption was granted within our organization due to the quality improvement nature of this project. Our multispecialty group provides medical care to a rural and small community-based population in Western Wisconsin. This group includes 28 primary care providers whose practice includes children. Eight of the 28 providers (6 family medicine providers and 2 pediatric providers) agreed to participate in this study. A patient was determined to be lacking adequate measles protection if they were more than 12 months and less than 5 years of age and had no measles immunizations or if they were 5 years of age and older and did not have 2 measles immunizations.

A list of pediatric patients that were due for MMR immunization was provided to each of the 8 participating providers. Each of these providers reviewed the state of Wisconsin immunization registry information to determine if the EMR reflected all measles immunizations that patient had received. The EMR was updated if found to be incomplete. After this review, one of the providers did not have any patients that were still found to be lacking adequate measles protection. Four of the providers (1 from pediatrics and 3 from family medicine) sent a hand signed letter (attachment 1) that went by US Mail to the parents of children needing measles immunization. A fact sheet from the CDC (attachment 2) was mailed along with the letter. This group of patients formed the study group for this pilot project. Three of the providers (1 from pediatrics and 2 from family medicine) did not complete the second phase of the study (ie, mailing reminder letters). These patients were used as a comparison group. The records of this comparison group were reviewed at the completion of the study period for measles immunization. The study group included 1 provider that had recently moved his practice from another health system to ours. He had a larger number of patients whose immunization record was not complete in the electronic medical record at the start of the project than any of the other 8 providers. Practice patterns, immunization promotion, and provider practice styles were otherwise deemed to be similar among all 9 providers. The letters and fact sheets were sent between June 1, 2019 and August 31, 2019. Detailed electronic record review was performed in January 2020 to determine the response rate to the letters.

### Inclusion Criteria

Patients between 1 and 18 assigned to one of the participating providers throughout the study period.

### Excluding Criteria

Patients who turned 18 during the study period (May 1, 2019-December 31, 2019).

## Results

At the start of the study (May 1, 2019), the 5 providers in the study group had a total of 855 patients who were at least age 1 but less than 18 years old. Ninety-five patients (11.1%) lacked adequate measles protection according to the EMR. However, 27 (3.2% of the cohort) of the 95 patients were found to have adequate measles immunization after review of medical record and state immunization registry. Additionally, 18 patients (2.1% of the cohort) already had well child visits scheduled during the study period. The records of these patients were reviewed at the conclusion of

<b>Total pediatric patients ages 1-17 years</b>	<b>855</b>
Number lacking measles immunization	95 (11.1%)
Number lacking measles immunization after chart review and parent interview	68 (7.9%)
Number receiving immunization during study without prompt	18 (2.1%)
<b>Number lacking measles protection without appt scheduled</b>	<b>50 (5.8%)</b>
Number receiving letter and measles info	44
Number receiving immunization after prompting letter	5
<b>Number lacking immunization post-study</b>	<b>45 (5.3%)</b>

**Figure 2.** Breakdown of study participants.

	Pediatric population	Lacking documentation of measles immunization	Adequately immunized after record review	Received without a letter	Received after letter	Number unimmunized at end of study	Cohort Immunization rate before study	Cohort Immunization rate after study
Study group	855	95 (11%)	27	18	5	45	89%	95%
Comparison group	1303	224(17%)	8	16	N/A	200	83%	85%

**Figure 3.** Study versus comparison groups.

PROVIDER	Lacking MMR	Letter sent	Received MMR
1	12	11	2
2	3	2	0
3	4	4	2
4	31	27	1
<b>TOTAL</b>	<b>50</b>	<b>44</b>	<b>5</b>

**Figure 4.** Study participants according to PCP.

the study, but their parents did not receive a letter or fact sheet. This left 50 patients in need of vaccination and without a scheduled well child visit.

Letters were sent to the parents of 44 of the 50 remaining children (Supplemental Material 1) along with a CDC measles fact sheet (Supplemental Material 2). Of the 6 patients lacking adequate measles immunization whose parents did not receive a letter, 4 were missed due to an anticipated well child visit that did not occur and 2 children had contraindications to MMR (1 due to previous serious reaction to MMR and 1 due to immunodeficiency). After receiving the letter and information, 5 of these 44 children (11.4%) were brought in for measles immunization (Figure 2).

Twenty of the 50 patients in the study group that were not adequately immunized came from families with parent(s) that had previously expressed a desire to avoid all immunizations for their children. These 20 patients represented 2.3% of the total patients and 40% of the patients lacking adequate measles immunization. None of them were brought in for immunization. However, none of these parents voiced objection to the letter or indicated an intention to change to another provider or clinic.

The 3 providers in the comparison group had a total of 1303 patients between 1 and 17, with 224 (17%) that lacked documented measles protection. Upon review of the state immunization record, 8 of them were found to have been previously immunized for measles. Sixteen of the remaining 216 patients had measles immunization given during a well child visit. None of the children in this group were brought in for measles immunization solely as the result of publicity in the media about the measles outbreaks (Figure 3).

## Analysis

Sending letters to parents made a small improvement in the immunization rate with 5 of 44 children needing immunization receiving MMR during the study period ( $P=.125$ ) (Figure 4).

This reduction in the number of patients needing the MMR immunization after mailing letters was not found to be statistically significant (Wilcoxon Signed-Rank  $P$ -value = .1250). However, after record review and intervention the measles immunization rate in our study cohort increased from 88.9% to 94.7%.

## Discussion

In comparison to the COVID-19 outbreak of 2020, 1282 cases of an infectious disease seem insignificant. However, during the spring and summer of 2019, there was substantial media coverage of this disease and multiple sources recommending measles immunization.<sup>5-8</sup> We strove to capitalize on this publicity to help improve the immunization rate for

measles in our pediatric population. We hypothesized that some parents that had previously chosen to not immunize their children might consider immunizing their children in light of the increased risk. We also hoped that offering these parents a single immunization, without expecting them to catch up on all other immunizations that the child lacked, would cause less parental reluctance. Unfortunately, no children in families with an anti-vaccine stance were brought in for immunization during the study period.

Some themes were identified in this study of the 2019 measles outbreaks that proved to hold true in the larger Covid-19 pandemic that was to come. During the measles outbreak in general, and in this study, there was resistance to vaccination within a small proportion of the population.<sup>11</sup> In our study group, this resistance was not impacted by coverage of the outbreak in the lay media. There was no change in immunization acceptance when immunization against a single disease was recommended by the child's PCP without expectation that all immunizations that the child lacked would be given. Information and recommendations from the CDC did not have an impact on these parents. Fortunately, we did not find that broaching the subject of vaccination caused any of the families to change to a different provider or health system. For parents that intend to have their children receive recommended vaccines, we found that a letter may serve as a reminder and encouragement to follow through on this intention. It is a relatively simple step that resulted in an improved rate of immunization.

Although the immunization rate for measles improved from 89% to 95% in our study population, we do not intend to imply that this rate accurately reflects immunization rate in our patient population. We followed a specific cohort over a 7-month period. We excluded patients that moved out of the area or changed to providers outside of the study group but did not include patients that moved into the area or changed to providers within the study group. We excluded patients that turned 18 during the study period but did not include patients that turned 12 months during that same interval.

## Conclusion

A small, but notable, proportion of parents will bring their children in for immunization with a reminder and information from the child's primary care provider. In this study, this group represented 10% of the children that were overdue for immunization (5 of 50).

None of the parents that had previously indicated a decision to not have their children vaccinated changed their minds after receiving the letter and fact sheet. Neither publicity in the lay media<sup>5-8</sup> or specific information from the CDC or a personal recommendation from their child's PCP resulted in a change of measles immunization status for

these patients. Providing immunizations to this group of patients remains a challenge for health providers and public health professionals.

The results of this study were not found to be statistically significant ( $P$  value .1250), likely due to small sample size. However, even a small increase in MMR immunization rates can be considered a success.

## Declaration of Conflicting Interests

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## Supplemental Material

Supplemental material for this article is available online.

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