



## Vaccination patterns of the northeast Ohio Amish revisited<sup>☆</sup>

Ethan M. Scott<sup>a,b,\*</sup>, Rachel Stein<sup>c</sup>, Miraides F. Brown<sup>d</sup>, Jennifer Hershberger<sup>a</sup>, Elizabeth M. Scott<sup>a</sup>, Olivia K. Wenger<sup>a,b</sup>

<sup>a</sup> New Leaf Center Clinic for Special Children, 16014 E Chestnut St, Mt Eaton, OH 44659, United States

<sup>b</sup> Akron Children's Hospital, Department of Pediatrics, 214 W Bowery St, Akron, OH 44308, United States

<sup>c</sup> West Virginia University, Department of Sociology and Anthropology, 307 Knapp Hall, Morgantown, WV 26506, United States

<sup>d</sup> Akron Children's Hospital, Rebecca D Considine Research Institute, 214 W Bowery St, Akron, OH 44308, United States



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### ABSTRACT

**Objectives:** The Holmes County Amish have low vaccination rates, an increasingly diverse population, and have an increased incidence of certain inherited diseases. The objectives were to evaluate; the rate and influences of vaccine hesitancy compared to a decade ago, vaccination patterns between Amish affiliations, vaccine practices of Amish special needs children, and the Amish's acceptance of a COVID-19 vaccine.

#### Study design.

In April of 2020, a survey assessing vaccination patterns and beliefs were mailed to 1000 Amish families, including ultra-conservative Amish sects and special needs families.

**Results:** The response rate was 39%. Among 391 respondents, 59% did not vaccinate their children, compared to only 14% that refused all vaccinations reported by Wenger et al in the same community only a decade ago. The ultra-conservative Amish rejected vaccines more often. Amish special needs children were more likely to receive vaccines than healthy Amish children. 75% responded they would reject a COVID-19 vaccine. Fear of adverse effects was the most common reason to reject vaccines. Families that accepted vaccines were more likely to cite a healthcare worker as the primary influence to vaccinate. Wives were more likely to cite their spouse as the primary influence to vaccinate. Families that rejected vaccines were more likely to state their bishop was the most influential person on vaccination.

**Conclusion:** The Holmes County Amish have decreasing vaccine acceptance. Efforts to improve vaccination will require a targeted focus on the primary influences and beliefs of sub-populations within the Amish. Physician advocacy, peer mentorship, father-directed education, and close partnership with Church leadership will be needed to limit vaccine-preventable disease. The Amish may be at risk for low uptake of a COVID-19 vaccine.

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## 1. Introduction

The Amish are a religious, separatist society who are descendants of the 16th century Anabaptist movement [1,2]. The Amish have lower vaccination rates and higher vaccine-preventable disease rates than the general population [3–9]. It is frequently presumed that the Amish reject vaccines due to religious objections; however, this is a rare reason cited by the Amish [3,4,7,10]. Vaccine hesitancy in the Amish has previously been shown to be primarily

due to concerns about vaccine safety and access to vaccines [3,4,11].

As a society, America's Amish are increasingly diverse, encompassing divergent approaches to child-rearing, health care, education, employment, and engagement with the outside world [2,12–17]. One of the most conservative church affiliations are the Swartzentruber Amish [17]. The Swartzentruber Amish are challenging to study on a population level because they do not participate in the *Amish Church Directory* [13]. Previous studies on vaccination patterns in the Amish have not included Swartzentruber families [3,4,6]. However, the inclusion of Swartzentruber Amish in cultural studies is important because they constitute a significant proportion of the Ohio Amish population, and their views and practices cannot be assumed to be congruent with more progressive groups [12,13,17,18].

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\* Corresponding author at: New Leaf Center Clinic for Special Children, 16014 E Chestnut St, Mt Eaton, OH 44659, United States.

E-mail address: [Escott@newleafclinic.org](mailto:Escott@newleafclinic.org) (E.M. Scott).

Children with chronic disease and rare genetic conditions, in the general population, are more likely to be unvaccinated or have vaccination delays than healthy children [19–21]. In the general population, common reasons for vaccine refusal in children with chronic disease are fear of adverse effects and worsening of the underlying disease [19,22]. The Amish experience an increased incidence of certain inherited diseases due to relative geographical and genetic isolation resulting from a small group of “founders” who migrated to the United States in the 18th century [1,23,24]. Special needs Amish children are a population that we hypothesize are at high risk for vaccine hesitancy based on low vaccination rates of children with chronic disease and within the Amish community [3,4,6,7,19–21].

In December 2019, the global COVID-19 pandemic began. Although pediatric cases are typically milder than adults, critical illness and death have been reported in certain high-risk groups, including children with underlying chronic health conditions, however it is important to note that this data is limited [25–28]. In December 2020, both Pfizer-BioNTech and Moderna were granted FDA emergency use authorization for their respective vaccines against COVID-19 and vaccination of high risk individuals has begun [29,30]. Understanding segments of the population that are unlikely to receive a COVID-19 vaccine may help target educational efforts to limit the pandemic.

This study’s first objective was to evaluate the prevalence, reasons, and primary influences of the Holmes County settlement Amish’s vaccine hesitancy. The second objective was to assess vaccination practices between multiple Amish church affiliations, specifically the Swartzentruber Amish, an ultraconservative Amish sect. The third objective was to evaluate vaccine practices and beliefs of Amish parents with special needs children. The fourth objective was to study the Amish’s likelihood of accepting a vaccine for the novel COVID-19 virus.

## 2. Methods

### 2.1. Sample and instrument

This study consisted of a 32-question survey mailed to Amish parents in the Holmes County settlement. Survey questions were multiple-choice, modified from a previous study of Amish attitudes towards vaccines [3]. The survey included demographic information, church affiliation, family vaccination history, attitudes towards vaccines, religious influence on immunizations, reasons for or against vaccination, and attitudes towards a COVID-19 vaccine. Families were asked to answer the questions concerning their youngest child or their special needs child if one lived in the home. Akron Children’s institutional review board approved the study.

There were multiple primary sources used to generate the mailing list for the survey. The first source was the patient database of New Leaf Center Clinic for Special Children. New Leaf Center Clinic for Special Children cares for over 600 active patients from the Amish and Mennonite community with rare inherited diseases. Two hundred fifty-six surveys were mailed to families with special needs children. The second source was the 2020 *Ohio Amish Directory*. The *Directory* includes most Amish families living in the Holmes County settlement. Addresses were selected at random but only included families who had children born after 1990. A total of 410 surveys were mailed to families from the *Directory*. Two hundred ninety-six surveys were sent to Swartzentruber families. Swartzentruber addresses were obtained by driving through the Holmes County settlement identifying suspected Swartzentruber homes. The identifying characteristics of Swartzentruber homes have been previously described and include; mud lanes, dark red barns, multiple out-buildings, and handwritten addresses

on metal mailboxes [12,13]. Suspected Swartzentruber addresses were recorded and then cross-checked against addresses obtained from the *Directory*. Thirty-eight surveys were mailed to an Old Order Mennonite district, a culturally similar but distinct group. A total of 1000 surveys were mailed. The survey was sent with a cover letter and a self-addressed stamped reply envelope. No incentive was offered for survey completion. All surveys were anonymous.

### 2.2. Statistical analysis

This study used percentages, median, and interquartile range values as descriptive statistics. Group comparisons were made using  $\chi^2$  statistics or Fisher’s exact test, as appropriate. Statistical analyses were completed using SAS (version 9.4; SAS Institute Inc., Cary, NC, USA). All statistical tests were two-tailed, and significance was defined as  $P < .05$ .

## 3. Results

### 3.1. Demographics

Of the 1000 surveys distributed, 391 completed surveys were returned for a response rate of 39%. Demographic characteristics included; gender (67% female), age (median [IQR], 38 [14]), church affiliation (Swartzentruber 17.1%, Dan 10.4%, Old Order 61.9%, New Order 1.8%, Other 1.0%, and Mennonite 6.7%), number of children under 18 years old living at home median [IQR], 4 [3]) and special needs children living at home (26.9% of families). **Table 1** includes the diagnoses of special needs children included in the study.

### 3.2. Vaccine hesitancy

Most parents, 59.3%, responded that they did not give their child any vaccines, compared to 21.5% who gave their children some vaccines, and only 17.7% who gave their children all the recommended vaccines. This is in contrast to over 85% of families

**Table 1**  
Diagnoses of Special Needs Children.

	n	%
Down syndrome	15	13
Cartilage Hair Hypoplasia (CHH) Dwarfism	15	13
Epilepsy	13	11
Autism	10	8
GM3 synthase deficiency	8	7
Congenital heart disease	7	6
Galloway-Mowat	5	4
Glycogen storage disease	5	4
PMRED	5	4
Behavioral	5	4
Chromosomal duplication/deletion	4	3
Global developmental delay	4	3
IUGR	2	2
SCID	2	2
Achondroplasia	2	2
MASD	2	2
Myelomeningocele	2	2
Cystic fibrosis, Propionic acidemia, Sotos, Kabuki, GM2 synthase deficiency, CHARGE, Troyer Syndrome, PKU, Russel-Silver, Turner Syndrome, Septo-Optic-Dysplasia, Osteogenesis Imperfecta	1	<1

\*There was one reported case of each of these diseases. PMRED, psychomotor retardation, epilepsy, and craniofacial dysmorphism; Behavioral included patients with attention deficit hyperactivity disorder, oppositional defiant disorder, and mood disorders; IUGR, intrauterine growth restriction; SCID, severe combined immune deficiency; MASD, macrocephaly anxiety seizure developmental delay; PKU, phenylketonuria.

from the same settlement who said they would receive at least some vaccines in a similar study conducted just a decade ago [3].

A summary of the vaccination pattern by church affiliation is included in Tables 2A and 2B. Swartzentruber Amish were significantly more likely to refuse all vaccines than other Amish affiliations (97% vs. 52.4%,  $P < .001$ ).

Parents of special needs children across affiliations were significantly more likely to give all the recommended vaccines (24.3% vs. 15.3%) or some vaccines (32.0% vs. 18.4%) than parents with only healthy children ( $P < .001$ ).

### 3.3. Reasons for vaccination acceptance and refusal

Reasons for vaccine acceptance, hesitancy, and refusal are included in Table 3. Parents who gave all recommended vaccines to their children most frequently stated that the reason for giving all the vaccinations was a belief that vaccines were protective against disease. The most common reason for only giving some of the vaccines was that parents believed that too many vaccines were recommended. Parents who declined all recommended vaccines most frequently responded that vaccinations have too many side effects.

Swartzentruber Amish were significantly more likely to respond that vaccinations disagreed with their religious beliefs compared to other Amish affiliations (31.9% vs. 6.5%,  $P < .001$ ).

There were no significant differences in reasons for vaccine acceptance or refusal between families with special needs children and those with only healthy children.

### 3.4. Primary influences

A summary of primary influences on the decision to vaccinate is included in Table 4. Families that gave all recommended vaccines were significantly more likely to state their doctor or nurse was the most influential person in their decision to vaccinate than those who declined all vaccines (52.2% vs. 2.6%  $P < .001$ ). Families that refused all vaccines were more likely to state their bishop or minister was the most influential person in the decision to vaccinate than families who gave vaccines (4.4% vs. 0.0%  $P = .003$ ).

Wives were significantly more likely than husbands to state that their spouse was the most influential person regarding vaccine decisions (50.4% vs. 31.2%  $P < .001$ ).

More parents of special needs children responded that their doctor or nurse was the most influential person regarding vaccines than those without special needs children (23.8% vs. 15.1%  $P = .05$ ).

### 3.5. COVID-19 vaccine

Most respondents stated that they did not intend to have their children receive a COVID-19 vaccine if one became available (75.7%). There were no significant differences in the plan to get a COVID-19 vaccine between families with special needs children and those without special needs children (14.8% vs. 7.6%  $P = .053$ ), although more parents of special needs children planned to get their child vaccinated against COVID-19. Swartzentruber

**Table 2A**  
Vaccination Plan by Church Affiliation.

	All Church Affiliations, n (%)						Total
	Swartzentruber	Dan Amish	Old Order Amish	New Order Amish	Other Amish	Mennonite	
Yes, all of them	0	10 (25.0)	48 (19.8)	3 (42.9)	0	8 (33.3)	69
Yes, some of them	2 (3.0)	12 (30.0)	56 (23.1)	2 (28.6)	1 (25.0)	11 (45.8)	84
No, none of them	65 (97.0)	18 (45.0)	138 (57.0)	2 (28.6)	3 (75.0)	5 (20.8)	231
<b>Total</b>	67	40	242	7	4	24	384

Respondents were asked whether they would receive all of the recommended vaccines, some of the vaccines, or none of the recommended vaccines.

**Table 2B**  
Comparison of vaccine acceptance between Swartzentruber and other Amish affiliations.

	Church Affiliation, n(%)		Total
	Other affiliations	Swartzentruber	
Yes, all of them	69 (21.8)	0	69
Yes, some of them	82 (25.9)	2 (3.0)	84
No, none of them	166 (52.4)	65 (97.0)	231
<b>Total</b>	317	67	384

**Table 3**  
Reasons for Vaccine Acceptance and Refusal in Ohio's Amish n (%).

Reasons for vaccine acceptance		
Baby shots are protective against diseases	62	89.9
My doctor/nurse recommends them	10	14.5
My parents gave me baby shots	7	10.1
Other	4	5.8
Other families in my district give their children the baby shots	0	0.0
Reasons for giving some shots		
There are too many baby shots recommended	37	46.8
The diseases baby shots prevent are not a problem in out community	18	22.7
Babies are too young to handle shots	17	21.5
Shots have too many side effects to be worth the risk of getting them	10	12.7
Other	3	3.8
Shots are made from aborted fetal tissue	2	2.5
It is too hard to get to doctor's office	2	2.5
We can't afford to get all the baby shots	0	0.0
Reasons for vaccine refusal		
Shots have too many side effects to be worth the risk of getting them	193	83.9
Shots could have dangerous preservatives or chemicals in them	106	46.0
If I give my children shots, it means I am not putting faith in God to take care of them	30	13.0
Shots inject children with dangerous germs like Polio or whooping cough	22	9.6
Other families in my district do not give shots	16	7.0
The diseases baby shots prevent are not a problem in our community	14	6.1
Shots are not effective	8	3.5
Other	8	3.5
The minister in my district disagree with giving shots	8	3.5
Shots are too expensive	5	2.2
Shots are made from aborted fetal tissue	4	1.7
It is too hard to get to the clinic for shots	3	1.3
It is better to have natural immunity	3	1.3

Amish were significantly less likely to plan to get a COVID-19 vaccine than other Amish affiliations (0.0% vs. 11.7%,  $P < .001$ ).

## 4. Discussion

We found that the Amish in the Holmes County settlement are more likely to reject all vaccines than accept even some vaccines. This was true even when the ultra-conservative Swartzentruber

**Table 4**  
The primary influence on parents' decision to vaccinate.

	Did your child get all the recommended shots n (%)			P
	Yes, all of them	Yes, some of them	No, none of them	
School	1 (1.5)	2 (2.4)	0	0.06
My spouse	31 (44.9)	40 (47.6)	100 (42.7)	0.73
My parents/my spouse's parents	14 (20.3)	19 (22.6)	56 (23.9)	0.83
The Budget, Family Life, or other magazines and papers	0	2 (2.4)	11 (4.7)	0.16
My nurse/doctor	36 (52.2)	24 (28.6)	6 (2.6)	<0.001
My midwife	0	2 (2.4)	13 (5.6)	0.1
My chiropractor	0	2 (2.4)	6 (2.6)	0.53
My minister/bishop	0	0	10 (4.3)	0.03
Personal Opinion	0	8 (9.5)	18 (7.7)	0.04
Alternative Medicine Practitioner or Resource	0	2 (2.4)	14 (5.9)	0.03
Friends	0	0	6 (2.6)	0.10
Story of Adverse Reaction	0	1 (1.1)	6 (2.6)	0.26
Other	0	2 (2.4)	1 (0.4)	NA

Amish were removed from the analysis. This is a significant change in vaccine acceptance compared to a similar study, within the same settlement, published only a decade ago ago [3]. This decline mirrors what has been seen in the US and Europe over the same time, which has only accelerated during the COVID-19 pandemic [31–34]. This increased skepticism of vaccines shared between the Amish and outside world may reflect increasing interaction and exchanging ideas and beliefs [2,16].

The most frequently cited reasons for rejecting some or all the vaccines are that too many vaccines are given and concern for adverse events. This has been shown previously in the Amish and the general population [3,4,35]. Importantly, the belief that vaccines work to prevent disease was cited by parents that accepted all vaccines for their children. This highlights the critical role of education about the effectiveness and safety of vaccines.

We evaluated the most influential people on a parent's decision to vaccinate. Overall, there was considerable overlap between parents who accepted all vaccines, some vaccines or declined all vaccines. However, a couple of crucial differences were found. Families who received all vaccines and some vaccines were significantly more likely to recognize their doctor or nurse as the most influential people when making vaccines decisions. Since families report that healthcare workers frequently influence their decision making, doctors and nurses need to continue to spend dedicated time informing Amish families about the importance and benefits of vaccines. Previous work as shown that there have been successful education campaigns within the Amish following outbreaks of vaccine-preventable disease [36]. Despite overall declining vaccination rates, this extra time spent on education may be more critical now than ever

Wives, more often than husbands, cited their spouse as the most influential person regarding vaccine decisions. Understanding that wives frequently seek input from their husbands before deciding about vaccines means that vaccine education may need to be targeted at fathers both on an individual and community level, such as peer-to-peer educators for improved uptake.

Families who rejected all vaccines were more likely to report that their primary influence on the decision to vaccinate was an alternative medicine practitioner or resource such as herbal medicine books or "Natural doctor". This is consistent with previous studies that have shown that the Amish often seek traditional or alternative therapies because they are often viewed as more "natural", safe, and are often less expensive [2,37,38].

A small percentage of families overall cited their bishop or minister as the most influential person when making vaccine decisions. Amish bishops serve as the spiritual leaders of their church district which typically consist of 30 families. Amish bishops are nominated from within their church congregation for lifetime

appointments and do not receive formal training. They will continue to work in their chosen career such as manufacturing, farming, or construction similar to their congregants [39,40]. Interestingly, only families who rejected vaccines ever stated that a Religious leader was the most influential person. This indicates that for a portion of the Amish, Religion significantly impacts vaccine decisions, which has not previously been shown. We found that 97% of the conservative Swartzentruber Amish rejected all vaccines. They were also more likely to cite that vaccines disagreed with their Religion than other Amish affiliations. This had not been shown in previous studies on Amish attitudes towards vaccines, potentially due to the difficulty in including Swartzentruber families in population-level surveys. A similar finding in the Swartzentruber Amish that has been found globally is that families who cite Religion as their reason for vaccine refusal are more likely to reject all vaccines [41]. Identifying Religion as a key component in the Swartzentruber's decisions about vaccines is essential because Religious convictions are frequently core beliefs that are difficult to change [35]. Careful consideration about how to discuss vaccines with the Swartzentruber Amish may require a different approach than in other Amish affiliations and one that may require partnering with Swartzentruber Religious and community leadership.

Unexpectedly, parents with special needs children were more likely to receive all or some vaccines than families with only healthy children. We had anticipated less acceptance of vaccines in this sub-population compared to the Amish as a whole because children with chronic disease in the general population tend to have lower vaccine rates [19–21]. They were also more likely to state that their doctor or nurse was the most influential person when making decisions about vaccines. We hypothesize this may be due to more regular interaction with the health care system and more consistent education about vaccines than most healthy Amish children receive. Most Amish children do not receive regular well-child check-ups or preventive medicine [2,42,43]. Efforts to promote more consistent well-child exams within the Amish may improve the community's vaccination rates.

Due to the ongoing COVID-19 pandemic, we evaluated how receptive the Amish would be to a COVID-19 vaccine. A small minority (8%) of respondents said they would accept a COVID-19 vaccine. This is compared to nearly 70% of the general population in the United States who recently noted in multiple studies that they either would or probably would accept a COVID-19 vaccine [44,45]. A few potential explanations for this discrepancy may be due to less media exposure in Amish homes, less of a perceived threat from the virus, an increased sense of skepticism of modern medicine, and resistance to perceived governmental encroachment [2,16].

One limitation of our sample is that it likely overrepresented special needs children and Amish Swartzentruber. This was intentional to ensure an adequate sample size for these two unique cohorts but may have led to a sampling bias. While relatively high for a mailed survey, the response rate excluded 60% of the population surveyed, which may have introduced sampling bias. Additionally, some of our findings likely have themes that could be applied to Amish settlements outside of Ohio to improve vaccination education, however generalizability may be limited due to the growing diversity of the Amish as a whole.

## 5. Conclusion

The northeast Ohio Amish seem less receptive to vaccines now compared to a decade ago. Efforts to improve vaccination coverage will likely require a multimodal approach focused on the primary influences and beliefs of sub-populations within the Amish. This approach will likely require ongoing physician advocacy, peer-to-peer mentors, father-directed education, and partnering with Church leadership to limit vaccine-preventable disease.

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## CRediT authorship contribution statement

**Ethan M. Scott:** Conceptualization, Methodology, Investigation, Data curation, Writing - original draft, Writing - review & editing. **Rachel Stein:** Conceptualization, Methodology, Resources, Writing - original draft, Writing - review & editing. **Miraides F. Brown:** Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Jennifer Hersherberger:** Data curation, Writing - original draft, Writing - review & editing. **Elizabeth M. Scott:** Conceptualization, Data curation, Writing - original draft, Writing - review & editing. **Olivia K. Wenger:** Conceptualization, Methodology, Resources, Writing - original draft, Writing - review & editing.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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