

Immunizing North Carolina

Debra A. Kosko

The timeliness of this edition of the *North Carolina Medical Journal* could not be more profound, as we immunize North Carolinians with the COVID-19 vaccine to address our greatest public health threat since the 1918 influenza pandemic. An examination of North Carolina's immunization history and current practices, along with recommendations for change, will better inform our path forward. Success is imperative.

Introduction

New vaccines to combat the COVID-19 pandemic are amazing scientific breakthroughs. And like all the valuable vaccines in our clinical toolbox, only when someone is immunized does the vaccine have value. In this issue of the *North Carolina Medical Journal*, we explore immunization practices in our state. We look at North Carolina's immunization history, examine current practices, and look at our path forward.

Immunizations are a tremendous success in the prevention of disease. In the United States, immunizations have resulted in record low rates of vaccine-preventable disease among children. With the introduction of newer vaccines, more diseases are being prevented or symptoms diminished following immunization, while the newest vaccines, for COVID-19, are now being launched. These successes are the result of a coordinated effort between scientists, manufacturers, legislators, our public health infrastructure, and community-based advocacy organizations.

One of our community advocacy groups is the North Carolina Immunization Coalition (NCIC). As chair, I have had the privilege of working with many of the contributors to this edition of this journal. The NCIC has assembled immunization stakeholders throughout our state for over 20 years to share best practices with the goal of increasing immunization uptake in North Carolina. NCIC works closely with the North Carolina Department of Health and Human Services (NCDHHS) Immunization Branch as well as academic centers, vaccine developers, and community-based organizations. NCIC is well positioned to play a significant role in the uptake of the COVID-19 vaccine.

History of Immunizations in North Carolina

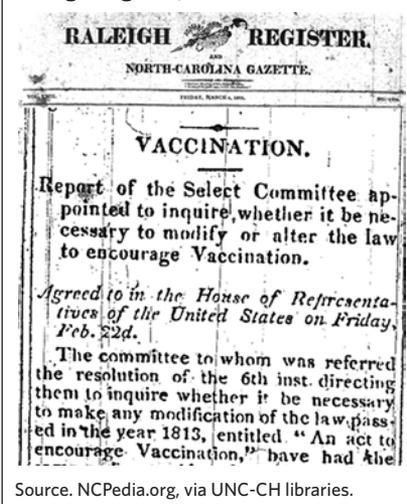
One of the earliest inoculation efforts to combat infectious diseases in North Carolina occurred in 1779, in a Moravian settlement in the Piedmont area after the Revolutionary

War, when James R. Alexander, a physician in Mecklenburg County, began immunizing his patients against smallpox. Many new vaccines were developed in the late 19th century, and our General Assembly responded by enacting the first laws to encourage immunizations against smallpox, diphtheria, and typhoid fever (Figure 1). But it was in 1939 when North Carolina enacted the first statute to require schoolchildren be immunized, for diphtheria. Then, in 1959, we became the first state in the United States to initiate compulsory inoculation with the Salk vaccine for polio, quickly followed in 1957 by a law requiring children be vaccinated against tetanus, whooping cough, and smallpox before enrollment in school. Despite these efforts, in 1962 less than half of all North Carolina's children were immunized by age 2 [1]. Therefore, in 1964 the state enacted the Immunization Activity Project and the result was that by 1968, 79% of North Carolina's children had completed their immunizations [1].

North Carolina Immunizations Rankings

United Health Foundation's annual America's Health Rankings has North Carolina ranked 13th among states for overall immunization rates [2]. Our state has been con-

FIGURE 1.
Raleigh Register, 1822



Electronically published March 1, 2021.

Address correspondence to Debra A. Kosko (debrakosko@gmail.com).
N C Med J. 2021;82(2):109-112. ©2021 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved.
0029-2559/2021/82204

sistently successful with childhood vaccinations, currently ranked 7th in the nation [2]. One area for improvement is HPV vaccines, in which we are ranked 38th [2]. According to the Kaiser Family Foundation, North Carolina's influenza vaccine rate for 2019-2020 was 17th among all states, at 55.8%, which was above the national average of 51.8% [3]. All these rankings were conducted before the COVID-19 pandemic. In May of 2020 the Centers for Disease Control and Prevention (CDC) identified a dramatic decrease in childhood immunizations throughout the United States as a result of the pandemic [4], which was also addressed by our NCDHHS Immunization Branch. This has raised concern about a future dual pandemic of COVID-19 and, perhaps, measles or another vaccine-preventable disease among our children. There is also concern about adults not receiving routine immunizations, especially older adults not receiving pneumonia vaccines that are especially critical during this pandemic.

Vaccine Exemptions

Vaccine exemptions for state-required childhood immunizations have become increasingly contentious around the country. Dr. Gerri Mattson, pediatric medical consultant at the North Carolina Division of Public Health, provides an overview in "A Rare Indication: Immunization Exemptions in North Carolina" [5]. Our state law allows for both medical and religious exemptions. Although the number of medical exemptions has remained low and steady, the number of religious exemptions has steadily been rising. In 2013, less than 1% of children had a religious exemption, while in 2018-2019 the percentage rose to 1.5% [6]. Some have raised the concern that while a medical exemption requires a form completed by a physician and a medical review by the state, a religious exemption requires no form and is not submitted to the state. Rather, a parent requests the religious exemption in writing and submits it to the entity that is requiring immunizations, such as a child care agency or school. Five states—West Virginia, Mississippi, New York, Maine, and California—have removed religious exemptions following communicable disease outbreaks [7]. Often it is a cluster of exemptions in close physical proximity that results in a communicable disease outbreak. In North Carolina, most of our religious exemptions are in western counties.

Given the ease by which one can request and receive a religious exemption for required immunizations, our legislature may consider other avenues to ensure the religious exemption is used appropriately. A standardized form that could include the child's religious denomination may be a first step. Perhaps the form would need to be notarized. Requiring the parent or legal guardian to review educational materials about the value and safety of vaccines in order to obtain the exemption could serve our state well.

Vaccine Development

COVID-19 has brought vaccine development to the public's attention as it has never been before, and also created

some confusion and skepticism. Drs. Emmanuel Walter and Anthony Moody provide an important overview of vaccine development, clinical trials, and dissemination protocols in "Vaccine Development: Steps to Approval of an Investigational Vaccine" [8]. This commentary walks through the lengthy process of vaccine development before human trials begin, from the recognition of an infectious disease to the identification of antigens that can illicit an immune response. The authors describe the various platforms from which vaccines are developed. In the case of our first COVID-19 vaccines, the platforms had already been developed for other infectious diseases, contributing to the seemingly rapid development of vaccines for COVID-19. Importantly, the authors also discuss the process for implementing immunizations following approval from the Federal Drug Administration (FDA).

A Legend Among Us

Dr. Sam Katz, a pediatrician and virologist who has devoted his career to vaccine development, is an international treasure living here in North Carolina, having co-developed the measles vaccine that has saved millions of lives globally. I had the privilege of working with Dr. Katz at Duke University and he has been working among us in North Carolina for most of his esteemed career. Dr. Coleen Cunningham provides a tribute to Dr. Katz in the Tar Heel Footprint column in this issue [9].

Childhood Immunizations

We can be proud that North Carolina does a good job of vaccinating our children compared to other states, with room for improvement. The continual efforts made at collaboration and sharing best practices among providers and stakeholders in our state are detailed by Elizabeth Hudgins, executive director of the North Carolina Pediatric Society, in "North Carolina Has Strong Infrastructure to Get Even Better on Childhood Vaccines" [10]. Hudgins suggests the high rate of participation in the Vaccines for Children program as a contributing factor to solid childhood immunization rates. Although our pediatric vaccine rates are high, Dr. Peter Morris, editor-in-chief of this journal, points out in "We Have Met the Enemy, and He is Us: Falling Childhood Immunization Rates," that many of the pediatric immunization series are received off schedule [11]. Morris suggests improvement of childhood immunization rates in our state can be achieved through open dialogue with parents/guardians that includes listening and addressing concerns both authoritatively and by directing parents/guardians to reputable and accessible vaccine information.

Impact of COVID-19 Pandemic on Immunization Uptake

The COVID-19 pandemic has had an impact on our lives in many ways, including ways we may have yet to discover. However, one very serious impact of the pandemic is the sig-

nificant drop in routine immunizations for all ages. There is now a concern that communicable disease outbreaks could arise as a result. Morris describes the impact of COVID-19 on North Carolina's childhood immunization rate in his article in this issue [11]. Many factors impact why immunizations have diminished during the pandemic, but one that cannot be denied is health disparity. The disparities in our health care delivery system have been front and center during the pandemic. Those of us doing this work know that health disparities have been with us forever but that it has taken the calamity of a pandemic to put them front and center. In an effort to rectify the drop in our children's immunizations and avert communicable diseases outbreaks, we will need to address health disparities in any plan to immunize all our children.

Although immunizations are often associated with children, we have many immunizations for adolescents and adults that have significantly impacted morbidity and mortality. Dr. Susan Corbett outlines the many adult immunizations and COVID-19's impact on their uptake in "Impact of the COVID-19 Pandemic on the Administration of Adult Vaccinations" [12]. There has been a 60% decrease in immunizations among those aged 19-49 and an 83% decline among those aged 65 and older [13]. This fall in immunizations across the lifespan will have a devastating impact on the health of our state. Dr. Corbett addresses the importance of an interprofessional approach to immunization administration in North Carolina [12]. In pharmacist Ouita Gatton's commentary, "Pharmacists: Vaccine Heroes among Non-physician Providers," she discusses the need for easier access to immunizations, which can be provided by pharmacists [14]. With fewer medical offices providing immunizations, and given the greater need for immunizations throughout our state, utilizing all available providers will be crucial. The pandemic has highlighted the inequality of access to care; therefore, expanding access by utilizing all available providers and immunizers among our well-educated professionals will be an important component of North Carolina's immunization plan.

Vaccine Hesitancy

Vaccine hesitancy is pervasive and growing, not only around the United States, but here in North Carolina. The causes are multifaceted, from the historical atrocity of the Tuskegee Experiment conducted by the US Public Health Service, to health care inequities, to diminishing acceptance of science, to the pervasive work of the anti-vaccine movement [15]. Drs. Lavanya Vasudevan, Emmanuel Walter, and Geeta Swamy's commentary entitled "Vaccine Hesitancy in North Carolina: The Elephant in the Room?" is a captivating read that addresses the many causes and key approaches to combating this movement that threatens the health of North Carolinians [16]. They keenly address structural approaches from the provider and payor side of the equation. Clinical providers' recommendation to receive an immunization has

been demonstrated to weigh significantly in a patient's decision, however, research has demonstrated that nurses and physicians can have their own hesitancy and misconceptions about vaccines [16]. Education about vaccines and the role they play in the health of Americans, as well as how to best address hesitancy among patients, should be included in health care students' curricula. Today clinical encounters are measured by time, such that little time is available to counsel patients and their families about vaccines. To address this, payors/insurance companies could restructure to allow clinical providers to be reimbursed for immunization counseling.

Vaccine hesitancy is being driven, in part, by the anti-vaccine movement. The movement can be out front and in-your-face, or it can be quiet and pervasive in social media. Dr. David Tayloe's commentary entitled "Immunization Messaging, Communication, and Outreach Amidst the Growing Anti-vaccine Movement" walks us through the early movement to today with keen approaches to combating its effects in North Carolina [17]. Dr. Ellis Vaughan's sidebar entitled "Raising the Voice of Vaccines - A Community Approach in Western North Carolina" is a valuable example of a model for success in combating anti-vaccination activities in Western North Carolina [18]. The importance of community partnerships and listening to concerns is at the center of this model. These efforts take time, patience, and passion for the welfare of North Carolinians, but they can be done, and they can be successful.

A COVID-19 Vaccine Plan for North Carolina

The CDC, knowing there would be a limited supply of COVID-19 vaccines once they received emergency use authorization from the FDA, asked each state to develop a plan to prioritize recipients of the vaccines. In "North Carolina's Process for Developing Our COVID-19 Vaccine Plan," Drs. Elizabeth Cuervo Tilson and Charlene A. Wong and pharmacist Amanda Fuller-Moore describe how our state moved forward to establish a detailed plan for immunizing North Carolinians [19]. The state established advisory committees that represent various stakeholders, communities, and scientists to guide the development of the plan. I am proud to be serving on the COVID-19 Vaccine Advisory Committee convened by the North Carolina Institute of Medicine.

It is important to note that the COVID-19 vaccine dissemination plan is fluid, in order to address changes in vaccine supply and the evolving pandemic. In addition, the COVID-19 Vaccine Advisory Committee is addressing how best to communicate with our hardest-to-reach communities and those with greater vaccine hesitancy. The work of the advisory committee will carry on and provide regular reports to the NCDHHS.

Drs. Tilson and Fuller-Moore introduce us to North Carolina's new system for managing COVID-19 immunization data, called the COVID-19 Vaccine Management System (CVMS). This critical component of North Carolina's COVID-19 vaccine immunization plan will be central to our success.

Summary

Vaccines are among the most effective tools for preventing disease across the lifespan. However, vaccines do not save lives; vaccinations do. So how do we get these amazing vaccines, which now include the COVID-19 vaccine, into the arms of North Carolinians in greater numbers? Because of the COVID-19 pandemic, we are faced with a significant decrease in childhood, adolescent, and adult immunizations while needing to mobilize our resources to immunize our population against COVID-19. The task may appear daunting, but it is a reality we must face to save the lives and livelihoods of our citizens.

The many articles in this edition of the *North Carolina Medical Journal* demonstrate our past achievements and suggest steps for future success. We can reclaim our good work with childhood immunizations and address the health disparities that exist in our state. Health disparities impact our communities of color, immigrant communities, tribes, and our rural areas. Therefore, we should start with infrastructure changes by expanding Medicaid, followed by expanding scope of practice laws to fully leverage our health care workforce. At the same time, insurance companies should be incentivized to reimburse physicians and non-physician providers for immunization counseling.

Addressing vaccine hesitancy in all its forms will be crucial to increasing immunization uptake so that we can avert communicable disease outbreaks and improve morbidity and mortality from COVID-19. Infrastructure changes could include removal of religious exemptions for required childhood vaccines, establishing a more robust process that requires the request be made at the same level as a medical exemption—submission to the Immunization Branch via a standardized, notarized form identifying the religious denomination—and requiring the parent or guardian to review educational materials before the exemption is granted. Formalizing this process would create extra steps, perhaps discouraging those who are on the fence from applying for an exemption and/or providing important knowledge that may change their desire to do so. Another structural change would include legislation that provides governmental oversight of immunizations for children who are homeschooled. Homeschooling is on the rise in North Carolina and advocated by the anti-vaccine movement to avert immunizing children.

In addition to infrastructure changes to address vaccine hesitancy, it is critical we look to our immunization stakeholders representing various health professions as well as community-based organizations in an effort to connect with hard-to-reach communities. Organizations such as the North Carolina Immunization Coalition stand ready and able to support community-based efforts at communication and education around the value of immunizations for all North Carolinians. NCMJ

Debra A. Kosko DNP, FNP-BC, FAANP chair, North Carolina Immunization Coalition; former clinical professor, College of Nursing, and adjunct professor, Brody School of Medicine, East Carolina University, Greenville, North Carolina.

Acknowledgments

Potential conflicts of interest. D.A.K. reports no conflicts of interest.

References

1. Joyner WS. Infectious Diseases. Encyclopedia of North Carolina website. <https://www.ncpedia.org/infectious-diseases>. Accessed January 5, 2021.
2. United Health Foundation: America's Health Rankings. Annual Report: North Carolina Summary 2020. America's Health Rankings website. https://www.americashealthrankings.org/explore/annual/measure/Overall_a/state/NC. Accessed January 5, 2021.
3. Kaiser Family Foundation. Flu Vaccination Rate. KFF website. <https://www.kff.org/other/state-indicator/flu-vaccination-rate/?currentTimeframe=0&sortModel=%7B%22colId%22:%22Flu%20Vaccination%20Rate%22,%22sort%22:%22desc%22%7D>. Accessed January 5, 2021.
4. Santoli JM, Lindley MC, DeSilva MB, et al. Effects of the COVID-19 pandemic on routine pediatric vaccine ordering and administration — United States, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(19):591-593. doi: 10.15585/mmwr.mm6919e2
5. Mattson GL. A rare indication: immunization exemptions in North Carolina. *N C Med J*. 2021;82(2):135-136 (in this issue).
6. Debruyen J. Across NC, More Parents Are Using Religious Exemption To Avoid Vaccinating Children. WUNC.org. <https://www.wunc.org/post/across-nc-more-parents-are-using-religious-exemption-avoid-vaccinating-children>. Published August 15, 2019. Accessed January 5, 2021.
7. Sandstrom A. Amid measles outbreak, New York closes religious exemption for vaccinations - but most states retain it. PewResearch.org. <https://www.pewresearch.org/fact-tank/2019/06/28/nearly-all-states-allow-religious-exemptions-for-vaccinations/>. Published June 28, 2019. Accessed January 5, 2021.
8. Walter EB, Moody MA. Vaccine development: steps to approval of an investigational vaccine. *N C Med J*. 2021;82(2):141-144 (in this issue).
9. Cunningham CK. Tar heel footprints in health care: Sam Katz, MD. *N C Med J*. 2021;82(2):93-94 (in this issue).
10. Hudgins ES. North Carolina has strong infrastructure to get even better on childhood vaccines. *N C Med J*. 2021;82(2):113-117 (in this issue).
11. Morris P. We have met the enemy, and he is us: falling childhood immunization rates. *N C Med J*. 2021;82(2):122-125 (in this issue).
12. Corbett S. Impact of the COVID-19 pandemic on administration of adult vaccinations. *N C Med J*. 2021;82(2):126-129 (in this issue).
13. National Foundation for Infectious Diseases. Issue Brief: The Impact of COVID-19 on US Vaccination Rates. NFIID website. <https://www.nfid.org/keep-up-the-rates/issue-brief-the-impact-of-covid-19-on-us-vaccination-rates/>. Accessed December 13, 2020.
14. Gatton O. Pharmacists: vaccine heroes among non-physician providers. *N C Med J*. 2021;82(2):138-140 (in this issue).
15. McVean A. 40 Years of Human Experimentation in America: The Tuskegee Study. McGill University Office for Science and Society website. <https://www.mcgill.ca/oss/article/history/40-years-human-experimentation-america-tuskegee-study>. Published January 25, 2019. Accessed December 12, 2020.
16. Vasudevan L, Walter E, Swamy G. Vaccine hesitancy in North Carolina: the elephant in the room? *N C Med J*. 2021;82(2):130-137 (in this issue).
17. Tayloe D. Immunization messaging, communication, and outreach amidst the growing anti-vaccine movement. *N C Med J*. 2021;82(2):118-121 (in this issue).
18. Vaughan E. Raising the voice of vaccines: a community approach in Western North Carolina. *N C Med J*. 2021;82(2):132-133 (in this issue).
19. Tilson EC, Moore AF, Wong CA. North Carolina's process for developing our COVID-19 vaccine plan. *N C Med J*. 2021;82(2):127-128 (in this issue).