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CHHE
Center for Human Health
and the Environment

North Carolina Survey on Human Health and the Environment Overview Report of 2021 Data Collection

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I. Introduction

Where were North Carolinians getting their information in 2021? How did social media play a role in obtaining information about health and medicine? How much did North Carolinians trust various information sources and how does this trust connect to their environmental health literacy?

These questions, among others, motivated the 2021 Survey on Environmental Health Topics among North Carolina residents, which was conducted by the Center for Human Health and the Environment (CHHE) at NC State University. The mission of CHHE is to understand how human health, at both the individual and population level, is impacted by environmental factors and to implement this knowledge to reduce adverse impacts of environmental factors on human health. One of the aims of the Center's Community Engagement Core (CEC) is to collect social science data to inform the research activities of the center. We also aim to provide information to individuals, communities, and educators about concerns expressed by North Carolina residents.

Our goals in conducting the survey were (1) to get a sense of how residents of North Carolina obtain their information, especially on social media, and (2) to gauge their specific reactions to two major health threats facing the state in 2021. Our survey questionnaire was guided by academic literature on health communication and environmental health literacy. We included a handful of central ideas that provide benchmarks to assess how North Carolinians might encounter information about environmental health topics, whom they trust for such information, and how much they feel motivated and equipped to protect themselves from environmental health threats.

For the two topics in our second aim, we focused on COVID-19 and heart and lung health. For COVID-19, which was also a focus of our 2020 survey, we focused on the vaccination status of North Carolinians and how much trust they have in information sources. This focus builds upon the report we published from the 2020 data. For heart and lung health, which is a major focus of research among CHHE members, we wanted to gauge public views on this topic.

In this overview report, we describe how North Carolina residents reported their views on the above topics. Details on the survey methodology are included in the final section of the report.

II. Sources for News and Information

One key interest of the Community Engagement Core is establishing a better understanding of how residents of North Carolina obtain information about health and medicine, specifically through social media use. We asked participants whether they used specific social media platforms and how much attention they paid to specific news.

A. How North Carolinians Use Social Media

Among North Carolina residents, more than half of people (58.2%) reported using a social media website or app every day within the past week, while very few reported not using social media at all (13.2%). The social media platforms included in the survey were Twitter, Instagram, Facebook, Snapchat, YouTube, LinkedIn, Reddit, Tumblr, WhatsApp, TikTok, Twitch, and Parler. This report focuses on the five most popular platforms. Facebook was the most used social media platform (Figure 1), with 79.8% of respondents reporting its use. Participants reported using YouTube and Instagram quite frequently, with 66.1% and 48.3% of respondents, respectively. TikTok (34.3%) and Twitter (29.7%) had the lowest percentage of users.

There were no discernable differences in platform usage based on education level (less than a college degree v. a college degree or higher) or political ideology (liberal, moderate, conservative). The most notable demographic trend in social media use was related to age. Age is an especially relevant predictor of information seeking about health information, as people generally pay more attention to it as they age (Brodie, et al., 2003). Two platforms stood out: Facebook and TikTok (Figure 2). The age group indicating the highest use of Facebook was 65 and older (88.6%). The next two age groups (35-54 and 55-64) used Facebook at rates above 85%. In contrast, the 18-34 age group had a lower usage rate (65.6%), although this still represents most participants in that group. In contrast, TikTok was used twice as much by the youngest two age groups (around 36.0% each) compared to the oldest age group (14.1%).

Figure 1. Social media platforms used most often by survey participants (N = 1,421)

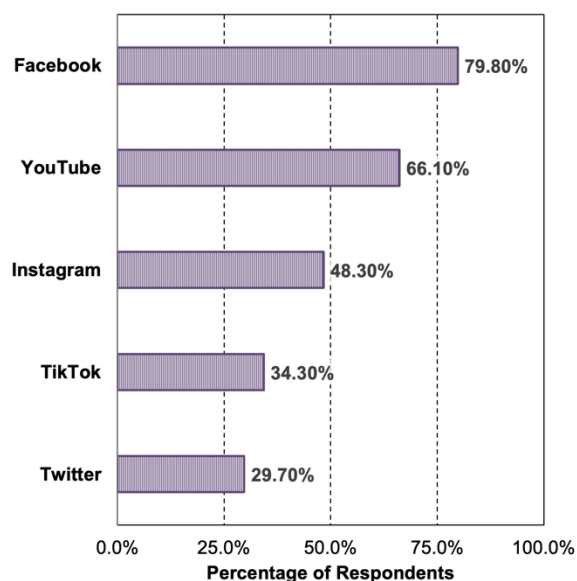
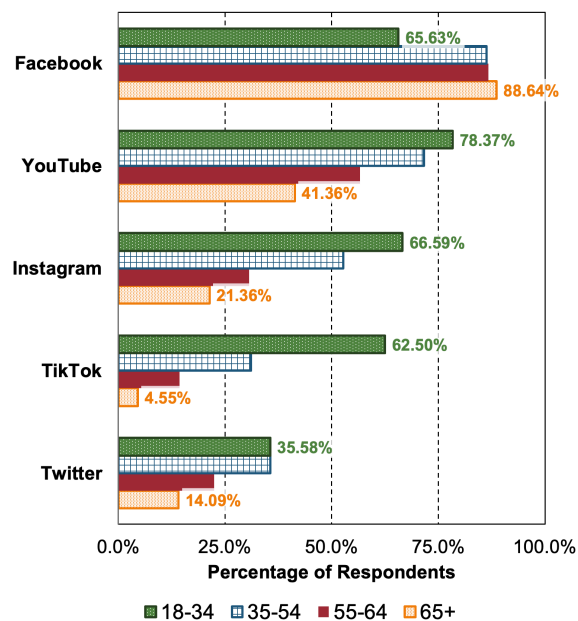


Figure 2. Social media platforms used most often by different age groups (N = 1,421)



The responses by age for the other social media platforms are almost all skewed, with younger North Carolina residents using the platforms more than older groups, with Facebook as an exception.

Whereas many of the participants in our survey reported using social media on a regular basis, about half (51.3%) of these social media users indicated they used social media for news. This use of social media varied by age, with those aged 35-54 reading or watching news on social media the most (59.7%) and those aged 65 or older using it the least (40.0%). In between were those aged 55 to 64 (58.2%) and 18 to 34 (45.9%). **These**

findings highlight the importance of a varied communication strategy for health information. Information on social media might reach younger audiences, however only half of social media users are paying attention to news.

B. Attention to News About Health and Medicine

In addition to overall social media use, we observed a relatively even distribution for those using social media for health news with a moderate amount to a great deal of attention. Among respondents, just under one-third of participants in the two younger groups (59.2% among those 18-34; 59.6% among those 35-54) reported paying high levels of attention to health and medicine headlines on social media. A greater share of those in older groups (68.4% among 55-64; 63.6% among 65 and older) paid a moderate to a great deal of attention (Figure 3).

Traditional news sources, like television and newspapers, also differed by age. Of those aged 18-34, 70.7% said they pay a moderate to a great deal of attention to health news in

Figure 3. Levels of attention to news about health and medicine by medium (N = 1,421)

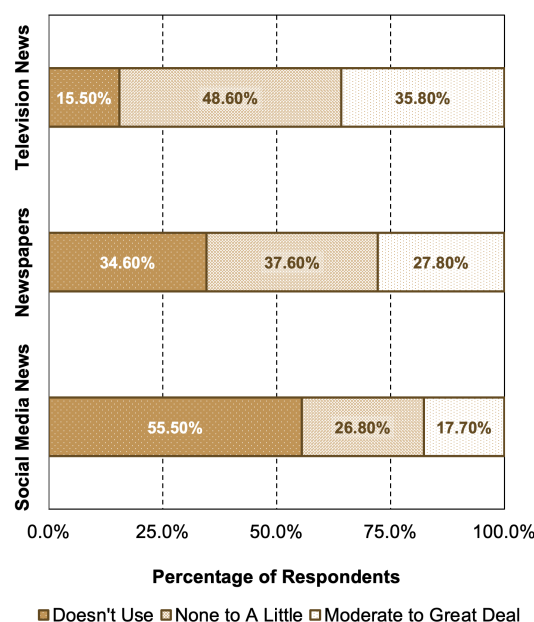
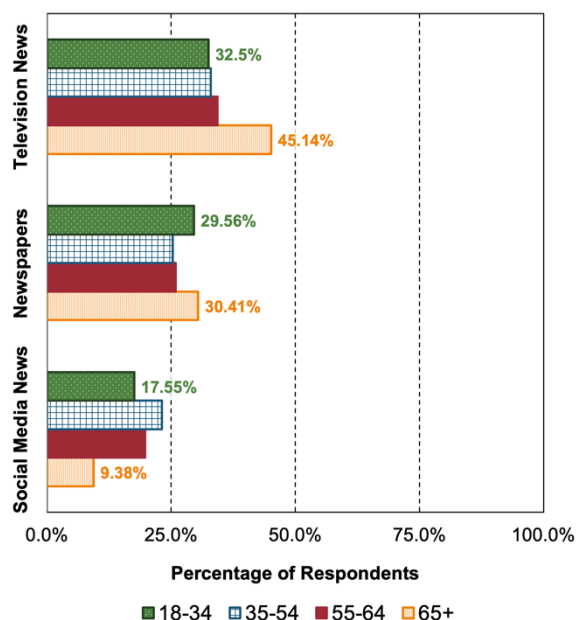


Figure 4. High levels of attention (moderate to a great deal of attention) to news about health and medicine by age group and medium (N = 1,421)



newspapers, which is higher compared to the 64.1% of 35–54-year-olds, 61.3% of 55-64-year-olds, and 63% of those 65 or older. When it comes to television news about health topics, three of the four age groups reported around 50% low attention, while 44.2% of those aged 65 and older indicated low attention. However, this same age group had the highest percentage of people (45.1%) who paid a high level of attention to health news on television (Figure 4). **As with the previous section, sharing information through a variety of media channels will reach different audiences, and information should therefore be tailored to those audiences accordingly.**

III. Trust in Information Sources

A key component of seeking reliable information about environmental health threats is trust in *sources* of information. **In 2021, as in 2020, residents of North Carolina continued to express moderate to complete levels of trust in scientists working at universities (78.0%) and state-level departments overseeing health and the environment—DHHS (73.7%) and DEQ (71.4%) (Figure 5).** For 2021, we introduced a new category: trust in people on social media. Only 24.8% of participants reported these high levels of trust in social media users as sources of information.

For each age group (18-34, 35-54, 55-64, and 65 or older), the ranking of information sources was consistent. The biggest

Figure 5. High levels of trust (moderate to complete trust) in different information sources (N = 1,421)

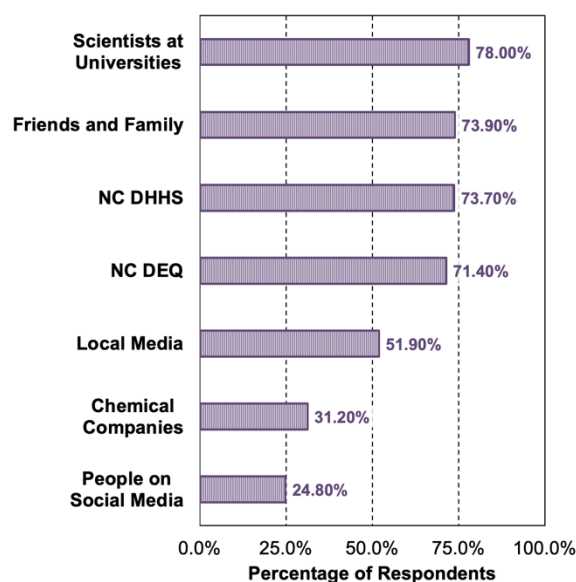
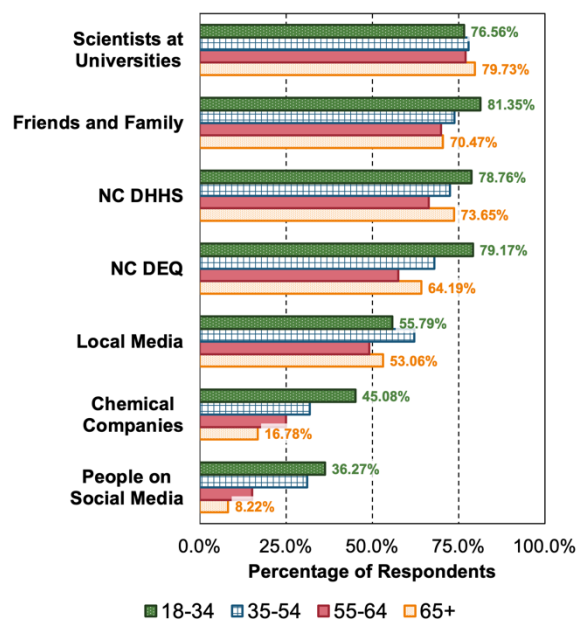


Figure 6. High levels of trust (moderate to complete trust) in different information sources by age groups (N = 1,421)



differences we observed were in the sources of information that these age groups trusted the least: chemical companies and people on social media. The youngest age group had the highest share of people trusting these two sources moderately to completely (45.1% for chemical companies, 36.3% for people on social media). In contrast, these proportions fell substantially as the groups got older; only 16.8% of those in the oldest age group had high trust in chemical companies and only 8.2% had high trust in people on social media (Figure 6).

For levels of education, the data suggested that having a college degree does not make a substantial difference

in trust. The biggest educational disparity emerged from one source: scientists at universities. Even so, among those with less than a college degree, 74.3% reported holding moderate to complete trust in scientists. In contrast, a considerably higher percentage (83.6%) of people with at least a bachelor's degree expressed high trust.

For political ideology, there were several noteworthy differences. Liberals (85.5%) and moderates (77.7%) tend to report moderate to high levels of trust in scientists at universities. In contrast, conservatives share this level of trust at a lower level (69.1%), signaling a noticeable ideological divide. Respondents across ideological groups also place high levels of trust in their family and friends (71.2% for liberals, 76.8% for moderates, and 85.5% for conservatives). However, when it comes to trust in people on social media, responses indicate generally low levels across the board. People on social media received the lowest levels of trust from all ideological groups: around one-third (31.8%) of liberals expressed high trust in people on social media, followed by 25.4% of moderates, and 17.2% of conservatives. For comparison, each ideological group expressed similarly low levels of trust in chemical companies, with liberals showing the highest level of trust (33.3%) and conservatives slightly lower levels (27.8%).

Overall, these results suggest that personal networks (like family and friends) and established institutions (like scientists at universities) still hold high levels of trust among residents of North Carolina. Less familiar sources of information, such as people on social media and chemical companies, inspire far lower levels of trust.

IV. Two Important Issues Facing North Carolinians in 2021

In addition to gauging people's social media use, attention to health and medical news, and trusting sources of information, we sought to investigate how North Carolinians were responding to two major concerns in 2021: COVID-19 and heart and lung health.

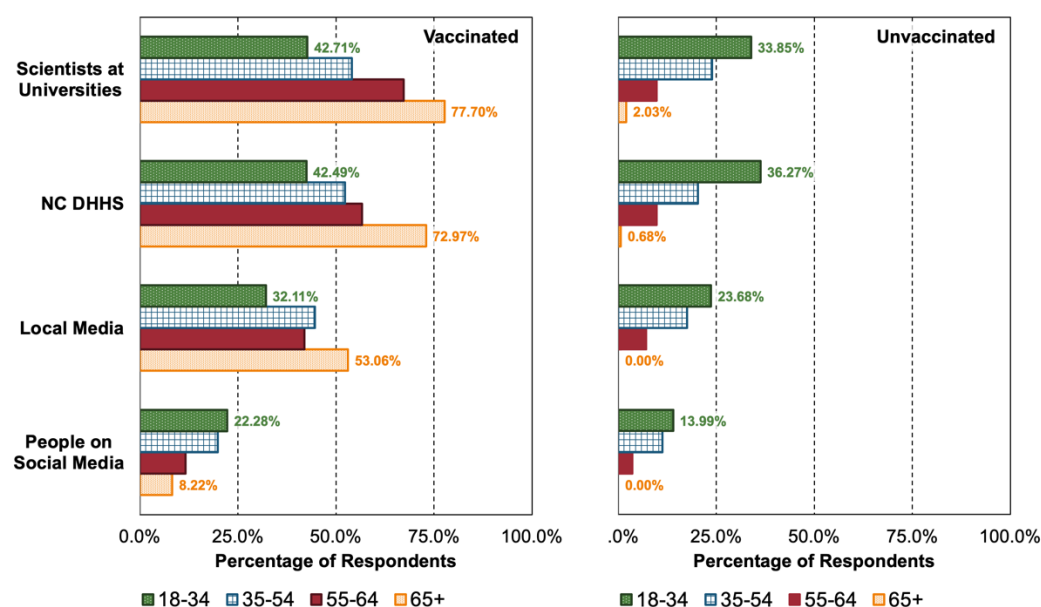
A. COVID-19

The sharing of high-quality information played a crucial role amid the public debate on how to contain the spread of COVID-19 and reduce infection rates. Since we previously reported on environmental health literacy related to COVID-19 in both the 2020 survey report (May, et al., 2020) and a research article (Binder, et al., 2022), this report focused on differences between vaccinated and unvaccinated residents of North Carolina.

Our data indicated a trend in vaccination rates across different age groups. **Vaccination rates rose with age, from 43% in the youngest group to 63.7% in the oldest, suggesting older adults may perceive larger personal risks to COVID-19.** Conversely, younger individuals, aged 18-34, had the highest percentage of unvaccinated people at 38.3%, while older adults, aged 65 and older, had only 6.7%.

Among young adults (18-34) who were vaccinated, 42.7% expressed moderate to high levels of trust in scientists at universities compared to just 33.85% among their unvaccinated peers (Figure 7). Overall, vaccinated young adults were about 10% more trusting of various information sources. The pattern was quite different among

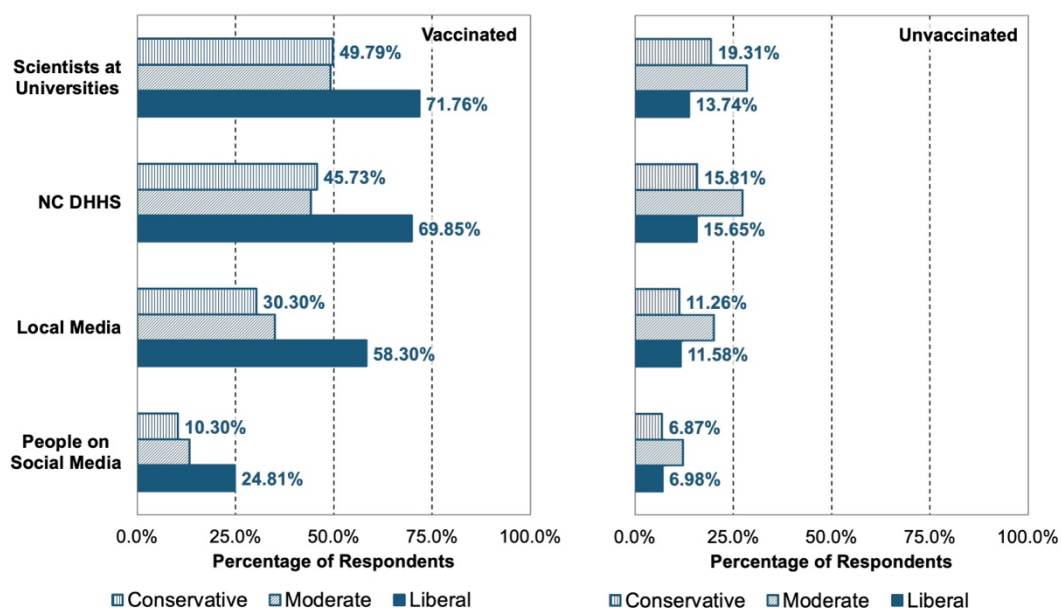
Figure 7. High levels of trust (moderate to complete trust) in different information sources by age groups among vaccinated (n = 456; left panel) and unvaccinated (n = 222; right panel)



participants ages 65 and older. Among vaccinated adults in this age group, 77.7% had moderate to complete trust in university scientists, versus only 2.0% of unvaccinated peers. Whereas 8.2% of vaccinated older adults trusted people on social media, none of the unvaccinated older adults were trusting of people on social media.

We conducted a similar comparison of levels of trust in information sources according to political ideology and vaccination status. The share of people trusting scientists (71.76%), North Carolina Department of Health and Human Services (NC DHHS) (69.85%), and local media (58.30%) was largest among those with a liberal political ideology who were vaccinated (Figure 8). Those with a conservative or moderate political ideology shared roughly the same lower percentage of trust in scientists (49.79%), NC DHHS (45.73%), and local media (30.30%).

Figure 8. High levels of trust (moderate to complete trust) in different information sources by political ideology groups among vaccinated (n = 456; left panel) and unvaccinated (n = 222; right panel)



We were mildly surprised to find a completely different dynamic when looking at these patterns among those who remained unvaccinated. For NC DHHS, local media, and people on social media, those in the unvaccinated liberal group and those in the unvaccinated conservative group had *identically* low percentages of trust in these information sources. **In other words, when it came to trusting these information sources, those on the extremes of the political ideology spectrum were equally distrustful.** The moderates who were unvaccinated, in contrast, expressed higher levels of trust in information sources but still low compared to the vaccinated group.

Overall, with these findings, we can add to the knowledge we gained from residents of North Carolina at the height of the pandemic in 2020 (see May, et al., 2020) in several ways. Most importantly, after the vaccine against COVID-19 became widely available, we observed patterns in levels of trust in information sources across groups based on age, political ideology, and vaccination status. (While not reported here, we also looked at education levels, but there were no notable differences.) Given the extensive commentary on the role of misinformation in the COVID-19 pandemic (for example, see Alba, 2021), it may not be surprising to learn that unvaccinated individuals are least trusting in information sources. However, for young people, their level of trust was less directly tied to their vaccination status. Similarly, political liberals were more trusting than political conservatives, but only among those who were vaccinated.

B. Heart and Lung Health

Many researchers affiliated with CHHE conduct research that explicitly focuses on understanding how environmental exposures impact heart and lung health. North Carolina has a history of industrial air pollution, with agriculture (e.g., hog and chicken operations), wood pellet facilities, and smoke from wild and prescribed forest fires contributing the most air pollutants (Wiegand, et al., 2022). Historical data shows that one-ninth of deaths in North Carolina are attributed to pulmonary (11.1%) diseases and one-third to cardiovascular (33.7%) illnesses (2002 to 2013 data; Son, et al., 2020).

In our survey, 62% of participants expressed strong concern about outdoor air contaminants affecting their health, families and their communities. Even more participants (71.6%) reported feeling that indoor air contaminants (e.g., household chemicals, dust, pet dander, pesticides, and smoke) pose a moderate amount to a great deal of harm to their health.

Budling on our earlier work (Binder, et al., 2022), we proposed to think of environmental health literacy in terms of three dimensions: knowing the facts, feeling ready to decide, and believing that preventive behaviors work. For the first dimension of knowing the facts, our survey questionnaire included three true/false questions to measure participants' factual knowledge. Most participants demonstrated strong knowledge about heart and lung health, including the harms of contaminants and pesticides.

Whereas 85.4% correctly answered that pesticides harm non-targeted species, only 57.9% recognized that eating organic foods is not the only way to avoid pesticides. Notably these answers changed by age but not by level of education. Older adults (55-64 and 65+) scored highest, especially when asked about pesticides (up to

95.3% correct), while younger adults (18-34) scored lower, particularly on vaping (56.3%) and organic food (42.3%) questions. The youngest group showed differences of 31.0% and 29.0% on these questions, respectively, compared to the older age groups. They also performed relatively worse on the third question, with 73.6% answering the pesticides question correctly, a 21.7% difference from older groups (Figure 9).

For the second dimension of feeling ready to decide, we measured subjective knowledge, which varies from person to person but also reflects a level of readiness that other indicators of environmental health literacy (like factual knowledge) do not. We assessed individuals' subjective knowledge on a 0 to 100 scale

Figure 9. Percentage of participants giving correct answer to true/false questions about environmental threats to heart and lung health (N = 704).

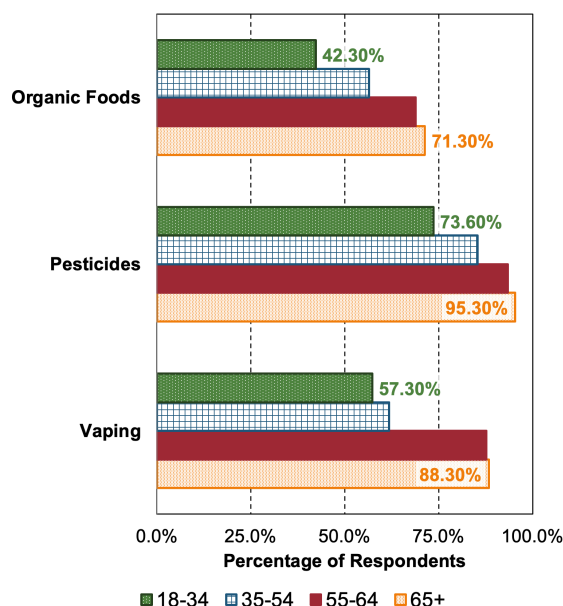
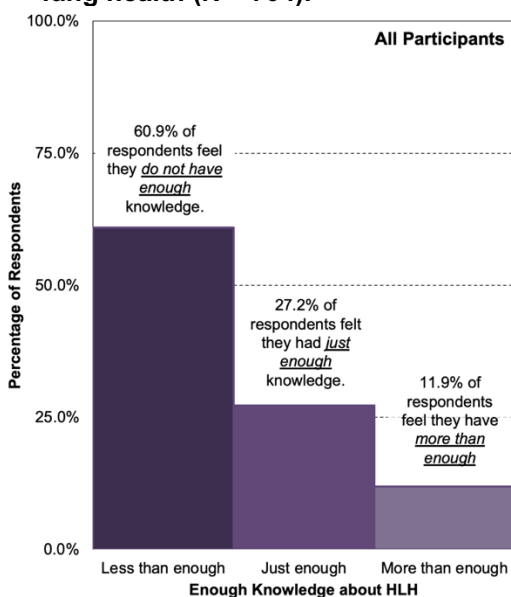


Figure 10. Percentage of participants feeling like they have more than enough, just enough, or not enough knowledge to make a decision about their heart and lung health (N = 704).

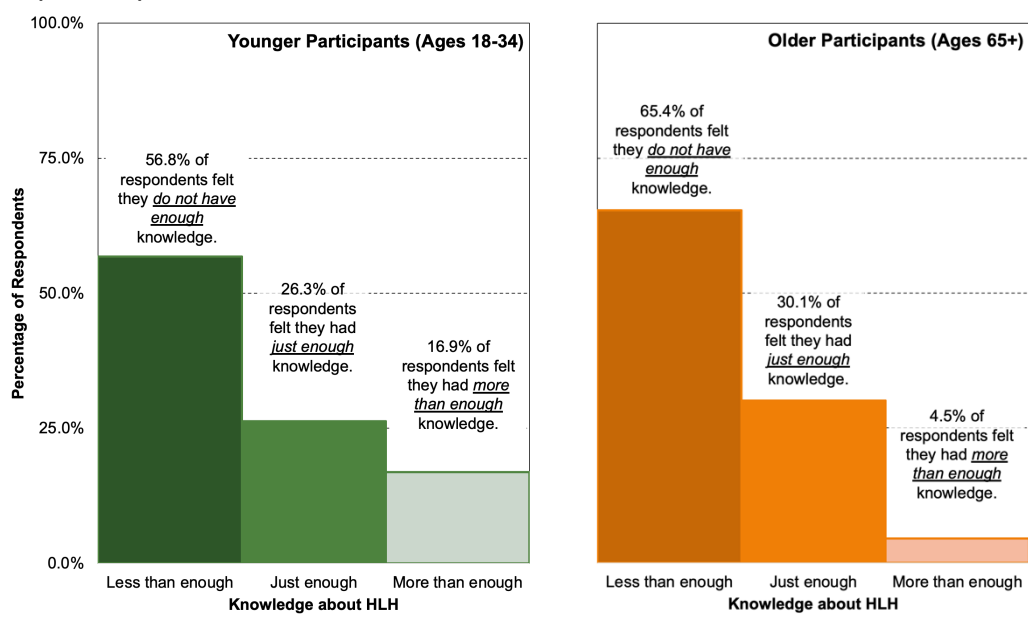


(zero knowledge to complete knowledge) with two questions: (1) how much knowledge they *felt they needed* and (2) how much knowledge they *felt they currently have* to make a good decision about their health. The difference between these self-assessed numbers (knowledge they need subtracted from knowledge they have) tells us if they fall into one of three groups.

In the case of heart and lung health, we found that a majority (60.9%) did *not* feel like they had enough information to make a good decision about their health, about half as many people felt they knew just enough to decide (27.2%), and the remainder (11.9%) reported having more than enough information (Figure 10).

Among the youngest participants, we found a slightly higher percentage (16.9%) who felt they had more than enough information, but similar percentages for the other two outcomes: knowing just enough to decide (26.3%) and not knowing enough to decide (56.8%). In participants ages 65 and older, we found far fewer (4.5%) feeling they had enough information. While more in this group (30.1%) felt they had *just enough* information compared to the youngest group, a larger percentage (65.4%) indicated they did not have enough information to make a good decision (Figure 11).

Figure 11. Percentage of participants in younger (left panel) and older (right panel) age groups who feel like they have more than enough, just enough, or not enough knowledge to make a decision about their heart and lung health (N = 704).



This pattern suggests that older residents in North Carolina are most likely to achieve a level of subjective knowledge that is close to being “just enough” to make a good decision. However, as in all age groups, many still felt they were not knowledgeable enough to make good decisions about their heart and lung health.

In previous research (Binder, et al., 2022), our analysis of the third dimension of EHL, believing that preventive behaviors work, we found a strong relationship between these beliefs (also known as “response efficacy”) and people’s willingness to engage in that behavior. This same correlation held true for the four protective behaviors we asked about for heart and lung health (Figure 12, next page): using all natural cleaning products, spending less time outdoors (to avoid air pollutants), vacuuming more regularly in the home (to avoid indoor contaminants), and moving to a different community (with cleaner air). This last item was included intentionally as an extreme measure many people were not likely to engage in, primarily to facilitate comparisons to

other environmental health threats (for example, COVID-19 and per- and polyfluoroalkyl substances).

Nevertheless, age was most strongly correlated with the idea of moving to a different community, both as an effective way to protect oneself and as a solution people believed in, with the youngest group most willing to move away (56.6%) compared to the oldest group (11.2%).

IV. Conclusions

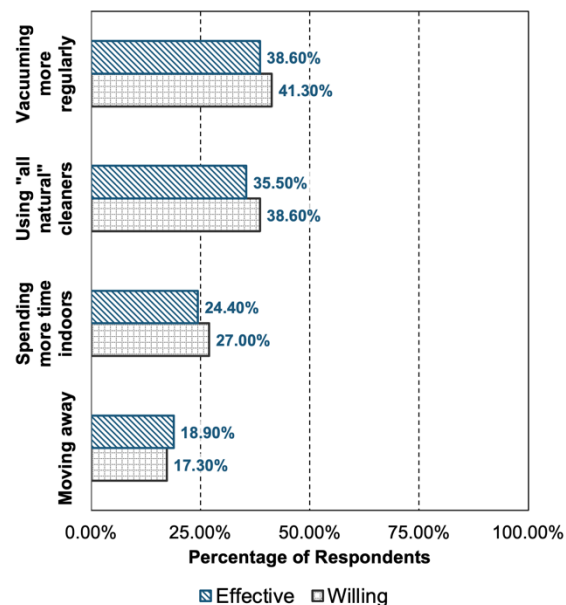
The results of our 2021 survey of North Carolina residents provided valuable information and insights into how well North Carolinians pay attention to and trust sources of health information. This information helps the Center for Human Health and the Environment (CHHE) and its Community Engagement Core (CEC) better understand public knowledge, attitudes, and behavior related to environmental health.

We saw shifts that influence the accuracy and reliability of health information people receive by examining how different age groups seek news. Whereas a substantial share of respondents used social media for health and medical news, the bulk of their attention to this information concentrates on television news and newspapers, which highlights an opportunity to reach public audiences in these traditional news venues.

One of the key findings focused on trust in information sources and variations according to age. **This raises an important question for policymakers and public health officials: if younger populations primarily get their health information from social media but distrust official institutions, how can we bridge this gap?**

This study also highlighted two major health concerns in North Carolina: COVID-19 and heart and lung health. While both issues pose risks, the way people engage with them differs greatly. There is an opportunity to provide all generations, especially younger age groups, with better information through curriculum and informal learning in addition to engaging young audiences on social media. Addressing such disparities requires targeted messaging strategies that acknowledge these differences and work to rebuild trust in evidence-based guidance.

Figure 12. Participant evaluations of protective behaviors they might engage in (N = 704).



V. Methodological Notes

These survey data were collected from July 14 to August 11, 2021, at North Carolina State University using the Qualtrics survey platform. The Center for Human Health and the Environment at NC State University contracted with Dynata, a survey research firm, to recruit participants who reside in North Carolina through programs that offer rewards points for completion of survey questionnaires and other activities. This nonprobability-based sampling approach provides a representative sample of North Carolina residents through the use of quota for sex, age, race, and ethnicity based on U.S. Census population estimates for 2020 in the state of North Carolina. The total sample size of verified (through ZIP code) North Carolina residents was 1,421, yielding a margin of sampling error of +/- 2.600%. The total sample was split between the two topics COVID-19 (N = 716, margin of error +/- 3.662%) and heart and lung health (N = 705, margin of error +/- 3.691%).

VI. References

Alba, D. (2021, August 11). [Virus misinformation spikes as delta cases surge](#). *The New York Times*, 4B.

Binder, A. R., May, K., Murphy, J., Gross, A., & Carlsten, E. (2022). Environmental health literacy as knowing, feeling, and believing: Analyzing linkages between race, ethnicity, and socioeconomic status and willingness to engage in protective behaviors against health threats. *International Journal of Environmental Research and Public Health*, 19(5), 2701. <https://doi.org/10.3390/ijerph19052701>

Brodie, M., Hamel, E.C., Altman, D., Blendon, R., & Benson, J.M. (2003). Health News and the American Public, 1996-2002. *Journal of Health Politics, Policy and Law*, 28(5), 927-950. <https://muse.jhu.edu/article/47744>

May, K., Binder, A. R., & Gross, A. (2020). *Public views on environmental health topics in North Carolina: Public opinion survey results from June 2020*. Center for Human Health and the Environment, North Carolina State University. <https://www.doi.org/10.17605/OSF.IO/V6JDS>

Son, J., Lane, K. J., Miranda, M. L., & Bell, M. L. (2020). Health disparities attributable to air pollutant exposure in North Carolina: Influence of residential environmental and social factors. *Health & Place*, 62, 102287. <https://doi.org/10.1016/j.healthplace.2020.102287>

Wiegand, R., Battye, W. H., Myers, C. B., & Aneja, V. P. (2022). Particulate matter and ammonia pollution in the animal agricultural-producing regions of North Carolina: Integrated ground-based measurements and satellite analysis. *Atmosphere*, 13(5), 821. <https://doi.org/10.3390/atmos13050821>