The Ongoing Impact of Allergies:

Evaluating Allergy Testing Accessibility in Healthcare

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Accessibility in healthcare is crucial to ensure that medical technologies benefit everyone, and not just a select few. While innovations in medicine continue to progress, not all patients benefit equally from these advancements due to how they were designed, tested, and delivered to the public. There are several examples of this disparity in medical technologies, and one prime example is allergy testing, which is a diagnostic test that has evolved in several ways over the years (Mandel, 2019). As this paper will demonstrate, accessibility of allergy testing has historically been limited to certain demographics for a multitude of reasons, and while significant progress has been made, there is still a long way to go. The accessibility of allergy tests is shaped not only by physical technological advancements but also by socio-economic, racial, and gendered factors—just to name a few—that can influence who has access to these tools. This ongoing issue raises a critical question: How has the evolution of allergy testing addressed—or failed to address—issues of accessibility and inclusivity?

The evolution of allergy testing serves as a perfect lens through which we can examine how healthcare technologies are designed, who benefits from them, and the bigger social impacts these innovations have over time. Allergy tests have seen several significant shifts in design and function. Over the decades, as new testing methods were developed and refined, the availability of these tests has expanded to a larger demographic. Yet, despite these advancements, it is unclear whether the design of these tests has truly been inclusive or whether engineers and healthcare professionals have given adequate thought to the diverse needs of the public.

This paper begins with a background to explore the trajectory of allergy testing by focusing on how the design of these technologies has evolved over time, and how the needs of different populations have been, or haven't been, incorporated into their development. A methodology section follows, outlining the key stages in the medical device development process where inequities can emerge. This paper will also focus on the concept of responsible research and innovation (RRI), which is a framework

that emphasizes the importance of designing technologies that are socially inclusive and adaptable, to suggest its inclusion in the medical device development process (Stilgoe et al., 2013). A literature review and discussion examines specific ways RRI and allergy testing can be implemented together to improve accessibility. The key research questions guiding this research are: How has allergy testing been developed and refined over time? What are some of the challenges surrounding allergy testing accessibility? How can the RRI framework be applied to allergy testing technologies to combat accessibility issues?

To answer these questions, this paper will look into the work of biomedical engineers and healthcare professionals, both of whom play a critical role in the creation, distribution, and administration of allergy testing. Under the RRI framework, this research will argue that engineers are responsible for considering critical factors such as social status, race, gender, ease of use, pre existing medical conditions, and the potential for setbacks in their designs. By doing so, engineers can ensure that new healthcare technologies, like allergy testing, serve the needs of all individuals, not just a select few. This paper aims to shed light on the ongoing impact of allergy testing on healthcare accessibility and the moral responsibility of engineers in shaping equitable healthcare solutions through the development process.

Background & Significance

Allergy testing is an important diagnostic tool used to identify allergic reactions to various substances such as food, pollen, and animal fur/dander. There are several types of allergy tests, each having their own purpose and process. The primary types include skin tests, patch tests, and blood tests (“In Brief,” 2024). In a skin test, there are two main methods of introducing allergen to the skin: a skin prick test (SPT), where the surface of the skin is pricked with a small sharp tool that has been dipped in allergen oil, or an intradermal test, where a small amount of allergen is injected into the uppermost layers of the skin. Skin tests are considered the gold standard due to their speed and ease of administration, however, they have about a 50% false positive rate (Wasserman, 2024). In a patch test, an allergen-riddled

patch is left on the skin for 1-3 days to detect contact allergies (allergies that may take a long time to appear) with select materials like silver. Both skin tests and patch tests utilize external methods of allergy detection, making them mostly non-invasive and quick. A more invasive method is blood testing, which identifies antibodies in a patient's blood to detect the presence of an allergy, with results being more accurate than skin testing but taking about a week to obtain. Despite their widespread use, the results of these tests vary greatly due to several factors such as the type of test, the patient and their medical history, and the allergens being tested for. Therefore, due to the variability in test results and the limitations of each testing method, there is a need for a more standardized and accessible approach to allergy diagnostics, ensuring that all individuals can receive accurate and timely diagnosis to prevent serious health risks.

Allergy testing early in life is important for both early identification of infants at increased risk for later development of allergic diseases and for specific allergy treatment, including specific allergen avoidance measures, relevant pharmacotherapy, and specific allergy vaccination (Høst et al., 2003). Undiagnosed allergies can lead to severe, sometimes life-threatening reactions, such as anaphylaxis. Allergy testing is not only important for providing relief to individuals suffering from allergies, but it also plays a crucial role in public health. Beyond individual health, broader access to allergy testing could lead to a reduction in healthcare costs by providing early intervention and preventing more serious allergic reactions that would require emergency treatment. The need for equitable access to these tests is therefore a significant public health issue. This growing recognition of allergy testing's importance in both individual and public health has driven the evolution of these diagnostic methods over time.

The evolution of allergy testing began in the early 1900s with the development of skin prick tests that introduced an allergen to the surface of the skin via a prick or scratch. Other methods included inducing sneezing by placing an allergen oil at the base of the nose. These early tests were rudimentary but marked the beginning of a systematic approach to diagnosing allergies (Bahna, 2024). Over the decades, advancements were made, including the introduction of more precise blood testing methods in

the 1960s, which offered an alternative to skin testing for patients with severe skin reactions or other medical concerns. However, this method also brought new challenges, including affordability for such a precise and involved test. Despite these advancements, allergy testing technology has plateaued in certain areas. For example, while new allergens are continuously being discovered, tests have struggled to keep pace with the growing complexity of allergic reactions, and the expansion of tests to include a wider range of allergens has been slow (*Challenges in Allergy Diagnostics and Solutions Worth Considering - EMJ*, n.d.). Additionally, it has been shown that interpreting physical allergic reactions (such as redness, a wheal, or a flare) on dark skin patients is challenging and can lead to a misinterpretation of results, but there have been very few successful and affordable advancements in this area to combat this challenge and make allergy testing more reliable for a wider range of skin tones (Nassir Redjal, 2014). Furthermore, allergy tests have remained expensive for many, limiting access to the technology. These gaps in testing accuracy and access further underline the disparities in healthcare, where certain populations, especially those with darker skin tones and lower socio-economic status, face greater difficulties in receiving proper allergy diagnosis and treatment.

Historically, access to allergy testing has been shaped by socio-economic factors. Those with higher incomes, particularly in developed countries, have had greater access to the latest allergy testing methods. In contrast, underserved communities, including racial and ethnic minorities, people in rural areas, and individuals with lower incomes, have had less access to these tests. This disparity in access has resulted in unequal healthcare outcomes, with some populations receiving better diagnosis and treatment while others remain undiagnosed or misdiagnosed. This highlights the need for equitable allergy testing, which must be prioritized from the very beginning of the medical device development process all the way to administration of the test.

Methodology

In approaching this research question of how to create and maintain equitable allergy testing, and more broadly, equitable healthcare, we must first understand where the gap originates—in other words, where is the inequity born? The answer to this question lies within each major step of the medical device process: design and production, testing, and integration into the public.

In the first step of this process, design and production, engineers must be considerate of the several opportunities for inequities to form through the creation of the product. This includes preliminary research to understand the needs of those who will be using the device. A diverse population must be included in this process to ensure the device meets the needs of the entire relevant population and not just a portion of it (Kelsey et al., 2022). For allergy testing, this population would include both nurses who are administering the test and patients who are receiving it. In the physical creation of the device, certain materials used for the design may be expensive, increasing the final cost of the fully developed product and limiting the members of society that can afford access to it.

Once a prototype is created, it needs to be tested to understand if it works as intended. This is one of the biggest areas for inequities to arise. Clinical research studies must include racially and ethnically diverse participants to ensure generalizability of research findings and equitable access to medical advances (Anagnostou et al., 2025). The populations included in testing should reflect those that will be using the product, but some may be easier to engage than others. Opting for convenience should not be more important than their inclusion in the testing process, as their participation is a key way to prevent inequities in the product.

Finally, attempting to deliver the product to the public can create several inequities. Physical location can be a barrier, as many people may not have access and/or means to get to a store that sells the product (Report & Swift, 2002). Specifically for allergy testing, which is more commonly conducted in hospital settings than at home, people may face limitations in accessing hospitals that offer the latest tests,

and some may still be unable to reach those locations. Besides an in-person method of obtaining the product, there may be an online store, but this also creates new challenges. People may not have access to a computer or device with which to purchase the product, and there is a possibility that additional shipping costs could be a financial barrier for some. Additionally, since allergy testing must be administered by a healthcare professional, additional challenges arise to adequately train the team of healthcare workers to acknowledge and combat biases towards different demographics. A prime example of this is conducting skin prick allergy tests on those with dark skin. Since most professionals are trained to read results of fair skinned individuals, results on dark skinned patients can be hard to interpret, and studies show that some races are more susceptible to a reaction than others, making this process even more difficult (Wegienka et al., 2013). However, this barrier should be challenged through proper education and training, which is a vital part of integrating a device into the public.

The responsibility of maintaining equity throughout the three major steps of the medical device development process falls on engineers and healthcare workers, who play a key role in creating and administering allergy tests. Proactively preventing these inequities from ever being created in the development, testing, and delivery of a product is the responsibility of engineers—a concept detailed in the RRI framework. The RRI framework suggests that designing for social good requires engineers to anticipate future issues, be reflexive, practice inclusion, and respond to social realities (Stilgoe et al., 2013). It aims to create a positive conversation between questions of responsibility and innovation, focusing not just on the outcomes of innovation, but also on its purpose. This framework helps scientists and decision-makers learn from past experiences, rather than starting from scratch every time a new technology emerges. In examining allergy testing through the framework of RRI, the rest of this paper will highlight how the integration of responsibility and innovation can lead to more inclusive and equitable healthcare solutions by understanding which groups are impacted the most and analyzing cases where RRI was proven successful.

Literature Review

In trying to understand how the RRI framework can be applied to allergy testing, we first must examine both of these concepts individually. Allergy testing as a technology has a lot of room for improvement, especially regarding accessibility, which includes affordability, cultural accessibility, and technological accessibility. The RRI framework has a lot of potential to tackle accessibility issues, and although there is some ambiguity around the framework itself, there is concrete evidence where RRI is shown to address the needs of the community and foster inclusivity within the design and development process, as will be explored in this section. Although there is limited research connecting these two concepts to real-world applications, examining them together from a theoretical perspective will allow us to draw conclusions about the potential benefits of incorporating RRI into allergy testing technologies. The following part of this literature review examines several sources to understand which groups of people are impacted by the accessibility of allergy testing and allergies themselves, and what about the technology makes it inaccessible.

One group of people severely impacted by allergies are women. Women with allergies often face skepticism, leading to doubts about their condition's legitimacy (Pitcher, 2003). This causes them to downplay symptoms to avoid judgment, which can be emotionally draining and result in their concerns being dismissed or viewed as exaggerated. The design of allergy testing can contribute to women's insecurity and hesitation. Medical systems often fail to consider how women uniquely experience and present their symptoms, leaving them feeling excluded from the process. A lack of supportive environments discourages women from seeking testing without a fear of being judged. This cycle leads to their health concerns being dismissed, symptoms downplayed, and access to testing hindered by systemic barriers. As a result, women may not receive the care they need, reinforcing the idea that their allergies aren't serious. This hesitation reflects a broader lack of support and understanding in both medical and social contexts.

While Pitcher's study makes important strides in highlighting the exclusion of women in allergy testing, its participant pool was composed of 95% white women and only 5% women of other racial backgrounds, underscoring a significant lack of diversity in the research. A significant portion of studies, particularly in areas like clinical trials and medical research, often do not report enrollment data by race or ethnicity, or fail to adequately account for racial and ethnic disparities (National Academies of Sciences et al., 2022). Gaps in accessibility can be traced back to the product development and testing process, and allergy testing technologies are no exception. For example, a study analyzed the racial and ethnic distribution of participants in food allergy immunotherapy trials (Suffian et al., 2024) and found that 72% of participants were White, with significant underrepresentation of Black and Hispanic individuals. These findings highlight critical gaps in clinical trials (the testing part of the product development process) particularly for treatments intended for broad populations where significant race- and ethnicity-related disparities persist.

Another group affected by access to allergy testing are individuals with low socio-economic status. These patients often lack the financial means to access affordable healthcare, limiting their ability to consult healthcare providers who can guide them in making informed decisions about allergy testing. This process, known as shared decision-making (SDM), is highly recommended for allergy testing, as it ensures that a patient's values, preferences, and financial concerns are considered alongside a clinician's expertise in selecting the most appropriate test (Conway et al., 2024). However, the rising complexity of allergy tests, such as recombinant allergens and allergen challenge tests, further extends the barriers for those with lower incomes. Although these tests have promising benefits, including improved safety and standardization, they remain resource-intensive and impractical for widespread use, particularly in clinical settings with limited resources (*In Vivo Diagnosis of Allergic Diseases—Allergen Provocation Tests - Agache - 2015 - Allergy - Wiley Online Library*, n.d.). As allergy tests become increasingly sophisticated, they also become more expensive, leaving individuals with lower socio-economic status unable to access

the technology they need. Until allergy testing becomes more affordable and accessible, these patients will continue to face significant challenges in managing their health.

Another group affected by allergy testing accessibility are individuals with pre-existing conditions. These patients often face additional challenges because tests must be interpreted alongside their clinical history, which can be limiting for those who don't undergo frequent testing or have access to standard tests (Haidar et al., 2025). Without knowledge of their own health conditions, patients may not fully benefit from allergy testing, as their pre-existing conditions could influence the results. This lack of awareness and access to general healthcare can exacerbate the gap in technology access, as patients may not seek medical care until symptoms become severe, making it difficult to obtain accurate, useful allergy test results.

Allergy testing technology has the potential to improve health outcomes, but significant barriers to accessibility persist for diverse groups, including women, racial and ethnic minorities, individuals with lower socio-economic status, and those with pre-existing conditions. These challenges highlight the need for more inclusive, accessible, and culturally sensitive approaches to the development of allergy testing. The Responsible Research and Innovation framework offers a unique perspective in addressing the gaps in accessibility in allergy testing and healthcare in general. In order to understand the potential benefit of RRI, the next part of this literature review will focus on two case studies where the RRI framework has demonstrated success.

The first case offers a compelling example of how the RRI framework can successfully address accessibility and inclusivity in the development of technology by including the local community’s needs in its making. In the case of Lira, a small coastal community in Galicia, Spain, RRI was applied to foster cooperation between various stakeholders, including industry, universities, and regional authorities (Piñeiro-Antelo & and Lois-González, 2019). This collaboration led to the creation of new governance models for marine resources and more inclusive technology development processes. By integrating local

community needs and perspectives into the decision-making process, the innovation became more responsive to those who were most impacted. Additionally, the involvement of diverse institutions and the support from European fisheries funds ensured that the technology development was not only sustainable but also equitable. This example highlights the potential of RRI to address the gaps in accessibility, ensuring that the development of technologies considers the unique needs of all involved, a principle that could be applied to improve allergy testing technologies as well.

The second case demonstrates how the RRI framework can be applied to foster community-led innovation, drawing from the lived experiences and values of local communities. In their study, Macdonald et al. explore the responsible use of drone technology for environmental management in Kakadu National Park, a biocultural landscape in northern Australia owned by the Jawoyn people (Macdonald et al., 2021). Rather than imposing Western models of innovation, they co-developed protocols in collaboration with local communities to guide the use of drones. This process carefully addressed concerns related to privacy, data ownership, and ethical implications of surveillance, ensuring that Traditional Owners remained in control over how and when the technology would be used. This approach highlights the importance of community-led decision-making, which ensures that technology development aligns with the needs and values of local people. The collaboration of researchers, community members, and environmental scientists shows how RRI can create inclusive, relevant solutions that stem from the perspectives of those directly impacted. Just as this model has proven effective in environmental management, similar inclusive approaches could be applied to allergy testing to ensure that all voices, especially those from underserved groups, are heard and integrated into the development of healthcare technologies.

Discussion

The Responsible Research and Innovation (RRI) framework has significant potential to address the accessibility issues present in allergy testing technologies. Through its focus on inclusivity, diverse

representation in research, community involvement, and training for healthcare professionals, RRI can contribute to the development of allergy testing methods that are more accessible and affordable. This discussion will examine how RRI can combat accessibility challenges in allergy testing by drawing on evidence from theoretical perspectives and real-world applications of RRI.

The exclusion of diverse perspectives in allergy testing design, often through the lack of racial and ethnic diversity in research, limits the ability of the technology to meet the needs of all potential users. This gap in representation worsens issues of access and creates disparities in healthcare. RRI can address these issues by promoting the inclusion of diverse voices in both the design and testing phases of allergy technologies, ensuring that the unique needs and perspectives of women, minorities, and underserved populations are central to the development process. Additionally, the application of RRI principles could encourage the development of more affordable, resource-conscious testing technologies that prioritize accessibility for those who need them most. For example, the integration of shared decision-making (SDM) into the testing process ensures that patients' financial constraints are considered, alongside clinical expertise, in selecting appropriate testing methods. RRI could further support SDM by ensuring that healthcare providers are trained to communicate the potential challenges and limitations of allergy testing for individuals from lower socio-economic backgrounds.

As seen in the specific case studies regarding the use of RRI principles, the involvement of diverse stakeholders allowed for the creation of more inclusive governance models for resources, ensuring that the needs of the local community were met. This approach could be translated into allergy testing by fostering cooperation between various healthcare stakeholders—such as patients, researchers, healthcare providers, and policymakers—ensuring that the needs of underserved populations are integrated into the design and development process.

Conclusion

In conclusion, the RRI framework offers a promising approach to addressing the accessibility issues in allergy testing technologies by implementing four main strategies: 1) promoting inclusivity, 2) ensuring diverse representation in research, 3) fostering community engagement, and 4) educating healthcare professionals via training. Practicing these strategies will help create more accessible, affordable, and culturally sensitive allergy testing methods. The success of RRI in other fields provides compelling evidence that such an approach could lead to positive outcomes in the development of allergy testing technologies, ensuring that these innovations benefit all populations, particularly those who have been historically underserved or excluded from healthcare advancements.

The next step in applying the RRI framework to allergy testing is to conduct experiments that incorporate RRI principles into the development process. These studies should focus on inclusivity, diverse stakeholder input, and community engagement to evaluate if these elements actually lead to more accessible and effective allergy testing technologies. By testing the practical impact of RRI in real-world settings, it can be assessed whether this approach enhances the affordability, cultural sensitivity, and overall effectiveness of allergy testing, ultimately determining if RRI can drive meaningful improvements in addressing accessibility challenges.

References

Anagnostou, A., Wang, J., Chinthrajah, S., Gupta, R., Davis, C. M., Parrish, C., Lo, R., Groetch, M., Herbert, L., Shroba, J., Sansweet, S., Shaker, M., Rolling, C., Tam, J., & Greenhawt, M. (2025). Addressing health disparities in food allergy: A Position Statement of the AAAAI Prior Authorization Task Force. *Journal of Allergy and Clinical Immunology*, *155*(1), 53–61. https://doi.org/10.1016/j.jaci.2024.10.008

Bahna, S. L. (2024). History of food allergy and where we are today. *The World Allergy Organization Journal*, *17*(5), 100912. https://doi.org/10.1016/j.waojou.2024.100912

Challenges in Allergy Diagnostics and Solutions Worth Considering—EMJ. (n.d.). Retrieved April 23, 2025, from https://www.emjreviews.com/allergy-immunology/article/challenges-in-allergy-diagnostics-and-solutions-worth-considering/

Conway, A. E., Golden, D. B. K., Brough, H. A., Santos, A. F., & Shaker, M. S. (2024). Serologic measurements for peanut allergy: Predicting clinical severity is complex. *Annals of Allergy, Asthma & Immunology*, *132*(6), 686–693. https://doi.org/10.1016/j.anai.2024.01.018

Haidar, L. 1, Camelia, F. B. 2, Uța, C. 2, Moldovan, S. I. 2, Zimbru 3, E.-L., Zimbru, R.-I. 3, Ciurariu, E. 1, Georgescu, M. 1, Panaitescu, C. 4 1 C. of I.-P., Biotechnologies, D. of F. S., Pharmacy, 2 Eftimie Murgu Square, haidar.laura@umft.ro (L.H.), cristina.uta@umft.ro (C.U.), sandraiuliamoldovan@yahoo.com (S.I.M.), elena.zimbru@umft.ro (E.-L.Z.), razvan.zimbru@umft.ro (R.-I.Z.), ciurariu.elena@umft.ro (E.C.), georgescu.marius@umft.ro (M.G.), cbunu@umft.ro (C.P.), … Cellular Therapies in the Treatment of Cancer—OncoGen, T. C. E. C. H. "Pius B. (2025). *Pollen–Food Allergy Syndrome: Allergens, Clinical Insights, Diagnostic and Therapeutic Challenges*. 66. https://doi.org/10.3390/app15010066

Høst, A., Andrae, S., Charkin, S., Diaz-Vázquez, C., Dreborg, S., Eigenmann, P. A., Friedrichs, F., Grinsted, P., Lack, G., Meylan, G., Miglioranzi, P., Muraro, A., Nieto, A., Niggemann, B.,

Pascual, C., Pouech, M.-G., Rancé, F., Rietschel, E., & Wickman, M. (2003). Allergy testing in children: Why, who, when and how? *Allergy*, *58*(7), 559–569. https://doi.org/10.1034/j.1398-9995.2003.00238.x

In brief: What kinds of allergy tests are there? (2024). In *InformedHealth.org [Internet]*. Institute for Quality and Efficiency in Health Care (IQWiG). https://www.ncbi.nlm.nih.gov/books/NBK367583/

In vivo diagnosis of allergic diseases—Allergen provocation tests—Agache—2015—Allergy—Wiley Online Library. (n.d.). Retrieved April 23, 2025, from https://onlinelibrary.wiley.com/doi/full/10.1111/all.12586

Kelsey, M. D., Patrick-Lake, B., Abdulai, R., Broedl, U. C., Brown, A., Cohn, E., Curtis, L. H., Komelasky, C., Mbagwu, M., Mensah, G. A., Mentz, R. J., Nyaku, A., Omokaro, S. O., Sewards, J., Whitlock, K., Zhang, X., & Bloomfield, G. S. (2022). Inclusion and Diversity in Clinical Trials: Actionable Steps to Drive Lasting Change. *Contemporary Clinical Trials*, *116*, 106740. https://doi.org/10.1016/j.cct.2022.106740

Macdonald, J. M., Robinson ,Cathy J., Perry ,Justin, Lee ,Maria, Barrowei ,Ryan, Coleman ,Bessie, Markham ,Joe, Barrowei ,Aaron, Markham ,Billy, Ford ,Henry, Douglas ,Jermaine, Hunter ,Jatbula, Gayoso ,Elijah, Ahwon ,Tyron, Cooper ,Dennis, May ,Kadeem, Setterfield ,Samantha, & and Douglas, M. (2021). Indigenous-led responsible innovation: Lessons from co-developed protocols to guide the use of drones to monitor a biocultural landscape in Kakadu National Park, Australia. *Journal of Responsible Innovation*, *8*(2), 300–319. https://doi.org/10.1080/23299460.2021.1964321

Mandel, T. (2019, August 20). *The Interesting History, Present and Future of Allergy Testing*. South Florida Sinus and Allergy Center. https://www.southfloridasinusandallergy.com/history-future-allergy-testing/

Nassir Redjal, T. J. (2014). Variability in Measurement of Allergen Skin Testing Results among Allergy-Immunology Specialists. *Journal of Allergy & Therapy*, *05*(01).

https://doi.org/10.4172/2155-6121.1000160

National Academies of Sciences, E., Affairs, P. and G., Committee on Women in Science, E., Research, C. on I. the R. of W. and U. M. in C. T. and, Bibbins-Domingo, K., & Helman, A. (2022). Key Trends in Demographic Diversity in Clinical Trials. In *Improving Representation in Clinical Trials and Research: Building Research Equity for Women and Underrepresented Groups*. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK584392/

Piñeiro-Antelo, M. Á., & and Lois-González, R. C. (2019). The role of European fisheries funds for innovation and regional development in Galicia (Spain). *European Planning Studies*, *27*(12), 2394–2410. https://doi.org/10.1080/09654313.2019.1635996

Pitcher, S. M. (2003). The Everyday Life of Treatments: Women, Allergies and a Doubting Public. *Conference Papers - American Sociological Association*, 1–20.

Report, I. of M. (US) C. on G. for D. a N. H. D., & Swift, E. K. (2002). GEOGRAPHY AND DISPARITIES IN HEALTH CARE. In *Guidance for the National Healthcare Disparities Report*. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK221045/

Stilgoe, J., Owen, R., & Macnaghten, P. (2013). Developing a framework for responsible innovation. *Research Policy*, *42*(9), 1568–1580. https://doi.org/10.1016/j.respol.2013.05.008

Suffian, H., Pandya, A., Davidson, L., Staggs, V., & Jones, B. L. (2024). Racial and Ethnic Representation in Food Allergen Immunotherapy Trial Participants: A Systematic Review. *JAMA Network Open*, *7*(9), e2432710. https://doi.org/10.1001/jamanetworkopen.2024.32710

Wasserman, R. L. (2024). A diagnostic approach to IgE-mediated food allergy: A practical algorithm. *Journal of Food Allergy*, *6*(1), 15–20. https://doi.org/10.2500/jfa.2024.6.240007

Wegienka, G., Johnson, C. C., Zoratti, E., & Havstad, S. (2013). Racial Differences in Allergic Sensitization: Recent Findings and Future Directions. *Current Allergy and Asthma Reports*, *13*(3), 255–261. https://doi.org/10.1007/s11882-013-0343-2