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**An Exploration of Equity in Epidemiology: Meet Dr. Akinyemiju**

While heroes are often imagined leaping into danger to protect their city, one rises to action in her cozy home office. As sunlight filters through the blinds and illuminates her organized desk, she battles inequities in cancer treatment: her computer as her sword, her wine glass as her shield. She's strategic and poised, generating research grants and publications with apparent ease. One might think her mind reflects her surroundings. Yet, the Duke University cancer epidemiologist Dr. Tomi Akinyemiju claims that her mind reflects *Get Out,* the "ruthlessly smart" Jordan Peele horror film.

"Not the killing people," she clarifies. "Sometimes I feel my brain is just a jungle. *Get Out* really reflects how in life, there's just a lot going on below the surface…everything looks calm and serene on the outside but dig a little bit deeper and it's a whirlwind in there. So, again, nobody's getting hurt."

Indeed, what we see isn't always reality. Sometimes you need to look beyond the surface to find the truth. This is especially true in Dr. Akinyemiju's line of work. She explained her field, global health, through a historical context. Here's the scenario: central London struggles to find the cause and solution of a pervasive sickness. With people dying and many becoming seriously ill, nobody knows where this illness originates or what can be done to help people. Where would you look?

These events transpired centuries ago, so COVID-19 is not to blame. As it turns out, the cause of the problem wasn't a virus, but *social determinants* of health. Poor community infrastructures, the lack of proper sanitary education, and pollution can contribute to worsening health just as much as a pathogen or bacteria. In this case, all three factors apply. The shared well in central London was not properly separated from a sewer, and as a result, it was infected with cholera - this is the poor and polluted community infrastructure. The well was not checked regularly for water quality, and due to a lack of proper sanitary education, the infection was exacerbated. One doctor found the solution by observing geographic infection rates. By taking a step back and looking at disease from another angle, he realized that infections were most common near this well. He blocked the well, and the affliction was eradicated.

With this blueprint in mind, global health scientists go beyond treating individual infections - they identify what aspects of everyday life (what *social determinants*) might worsen health. Dr. Akinyemiju specifically examines how these determinants manifest in cancer patients and cause disease burden, a term that refers to the negative effects of disease on a patient's lifestyle. She enjoys the challenge of analyzing the social aspects of noncommunicable conditions in minority populations, as they often are caused by social determinants that are even more hidden than

London's well. Poverty, lack of education, residential segregation, racial discrimination, and lack of social support are determinants that are difficult to quantify in relation to cancer burden. Fortunately, Dr. Akinyemiju is inspired to address this complexity through extensive global health research. However, it took some time for her to get to this point. Like every superhero, she has an origin story.

Born and raised in Nigeria, Dr. Akinyemiju graduated medical school before moving to the United States to continue her education. However, she noticed that this country needs more than additional medical degrees. In the United States, there are around two or three medical schools per state, churning out an enormous amount of doctors. You would think such a well-resourced country would have everything figured out. However, minorities in the US receive care at lower rates than the national average. How does a country with so many doctors lack equitable healthcare? Dr. Akinyemiju realized that the solution would likely be found in another field.

At first, Dr. Akinyemiju thought the solution might be economic - this led her to work for a health insurance company. However, she realized that the company was not directly helping patients. Looking at the healthcare system from a birds-eye view, there seems to be a lack of resources and studies on societal policies, especially when analyzing disease prevention in a socially-oriented way. After looking at different angles to the healthcare puzzle, she found the missing piece. Research. She switched paths again, and she hasn't looked back since. From overseeing genetically-focused research to using statistical methods to highlight health disparities, Dr. Akinyemiju identifies potential contributing factors to cancers, particularly the cancers that disproportionately impact women and people of color.

"I found a niche that I really enjoyed…just following [my] passion and following [my] interest," said Dr. Akinyemiju. She did a Ph.D. at the University of Michigan and then a post-doctorate at Columbia University in molecular oncology. She merged her training in oncology and epidemiology, connecting the social to the biological and applying them to policy, and continues to do this at Duke University.

Changes in policies are meant to have a sweeping effect on society, but the different demographic contexts make it difficult to eliminate an issue at a single source. For example, in the past few decades, survival rates for white patients with ovarian cancer have improved while those for Black patients have decreased. Many social determinants are at play here, complicating this seemingly simple issue. Dr. Akinyemiju finds that the most effective change can be implemented after conducting a thorough analysis.

The first step is data sourcing, which means identifying existing datasets or gathering samples. With this data, Dr. Akinyemiju generates models that map out the trends. These models can either be multivariable logistic regression or multiple linear regression, meaning that they display

the relationship between one independent variable and multiple dependent variables or vice versa. With either option, Dr. Akinyemiju observes trends in a multitude of social determinants.

For example, in a recent cohort study, she gathered data from a group of patients 45+ years old for 10 years to analyze the different factors affecting cancer mortality. She discovered that social determinants such as low education, low income, zip code poverty, poor public health infrastructure, lack of health insurance, and social isolation were all significantly associated with cancer mortality for both white and Black patients. However, Black patients had a higher chance of having multiple social determinants: in this specific study, 43.6% of Black patients had over two social determinants while this was true for only 23.9% of white patients. Dr. Akinyemiju concluded that cancer treatment facilities should factor multiple determinants over just one.

This is a rather large task, which Dr. Akinyemiju tackles with the help of backup. “It's a lot of collaborators,” says Dr. Akinyemiju. “And it's a lot of recognizing where your own limitation is, and then finding a collaborator that's an expert in that area.”

Dr. Akinyemiju was exposed to the importance of collaboration as a student; her abilities to connect the work of her professors have paved the path for her career. “My Ph.D. mentor was [a] cancer epidemiologist, so I learned that from him. My other Ph.D. mentor was a social epidemiologist…So I was the person that put that [those two disciplines] together.”

Ashwini Joshi is an M.P.H. and Associate in Research who has worked with Dr. Akinyemiju for almost two years. Joshi has seen Dr. Akinyemiju “efficiently lead a team of junior researchers, associates, biostatisticians, clinical research staff, and several undergraduate and graduate students.” She acts not just as an instructor, but also as a guide. “Beyond the mentoring,” Joshi says, “she showed me how to juggle ups and downs, navigate difficult situations, and always be kind and empathetic towards others. She inspires me every day to become a better person and a better leader.”

Dr. Akinyemiju is a mentor and a mother who maintains responsibilities beyond the workplace. She always allocates time to be with her two young boys. When her children were in elementary school, she spent fewer hours at work so that she could be more involved in their lives. However, to her, this meant that she needed to be more successful and productive. “When I was in the office, I was in the office and I gave it 110%,” Dr. Akinyemiju explained. She published papers, wrote grants, and stayed on schedule during short working hours, all while raising two children.

Dr. Akinyemiju has a lot of responsibilities. Her work is stressful, but it’s also necessary. How does she manage it?

*Compartmentalization is key:* “at five o'clock, if that's your hour, you shut it down: you go do something else until the next day.”

At work, Dr. Akinyemiju studies disparities. When she’s off the clock, she seeks out more optimistic, “inspirational” material. After a long day of work, she tunes in to Spotify, a glass of wine at hand. Perhaps she borrowed notes from Adele’s song, “I Drink Wine.” Dr. Akinyemiju is a fan of Adele, Sam Smith, Sia, and other ballad singers with “big voices.”

Dr. Akinyemiju is a fan of musicals and historical fiction - knowing this, it’s no surprise that she’s a fan of *Hamilton*. When she worked at Columbia, New York City complemented this interest. Dr. Akinyemiju would make full use of the location, “going to Broadway and buying half-off tickets.” However, her interests are not limited to concrete jungles. Dr. Akinyemiju also loves the outdoors - more specifically, the beach. When she moved from New York to North Carolina, her downtime shifted from theaters to coastlines. She didn’t pick North Carolina for its beaches, but ultimately, the environment was conducive to a work-rest balance.

Motivation, work ethic, and stress reduction - it seems like Dr. Akinyemiju has everything it takes to change the world. However, the woman who dedicates herself to recognizing insufficiency in healthcare understands that her individualistic efforts are not enough.

“Individual change is difficult,” she told us, and “societal change is even more difficult.” Dr. Akinyemiju realizes that her work will not be finished within her career. “It's necessary to pass on the skills and the knowledge to the next generation and get them thinking about this critically.” Once again, she sees a gap, and she is working to address it: Dr. Akinyemiju is passing on her passion to her mentees. Joshi clarifies that working *for* Dr. Akinyemiju is more like working *with* Dr. Akinyemiju, since “she makes sure that there is no hierarchy and we work together as a team towards a common goal which is helping people gain better and equitable access to healthcare and improve disparities in disease outcomes.” Indeed, Dr. Akinyemiju wants her mentees to take on her project as their own.

Dr. Akinyemiju also addresses disparities within her own field. “I recognize that for underrepresented minorities, the road is not as easy as for other groups,” she said. “And so there's a need for both a nurturing environment, one where you recognize that ‘okay, we didn't all have the same level of support before we got here,’ a need to meet each person where they are, while at the same time holding up that high standard…it has to be a combination of that nurturing support and holding people to high expectations because that's the only way to really succeed here.”

In the future, Dr. Akinyemiju wants to focus on the increased rate of triple-negative breast cancer in women of West-African descent. Triple-negative breast cancer is aggressive and has limited

treatment options. During a Women's Reproductive Health Panel, Dr. Akinyemiju explains that the nature of this disease, as well as factors such as the dysregulation of the body's chemistry, unique ancestral environments, and accumulated chronic stress (or *allostatic stress*), has resulted in a 40% higher mortality rate for Black women than white women in the US. The inability to administer proper cancer treatment can have adverse effects on other health issues, such as reproductive health. Dr. Akinyemiju is en route to a scientific "muckraking:" exposing and publicizing a massive health disparity on social and scientific levels.

In central London, cholera could be tracked to one well. Unfortunately, cancer has multiple "wells:" a huge variety of causes and exacerbators. Thankfully, Dr. Akinyemiju is tracking those wells one by one. She tirelessly works to find the different factors that contribute to cancer, in the hopes that her research will inspire large-scale policy change. Dr. Akinyemiju compared her mind to a "whirlwind;" clearly, that whirlwind is also a generator, constantly spinning with new ideas on where to look next. Ingenuity, and altruism are essential for a task so daunting; thankfully, we have the right woman for the job. As we speak, this laptop-wielding superhero is attacking deadly cancers from new angles.