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Neighborhood Archetypes and Patient Outcomes in Pediatric ALL and AML

Announcer:
You're listening to *On the Frontlines of AML and ALL* on ReachMD. And now, here's your host, Dr. Charles Turck.

Dr. Turck:
This is *On the Frontlines of AML and ALL* on ReachMD. I'm Dr. Charles Turck, and today I'm joined by Dr. Lena Winestone to discuss her research on how neighborhood archetypes may influence overall mortality in young patients with acute leukemia.

Dr. Winestone is a pediatric blood and bone marrow transplant specialist and an Associate Professor of Pediatrics at UCSF Benioff Children's Hospital. Dr. Winestone, welcome to the program.

Dr. Winestone:
Hi. Thanks so much for having me today.

Dr. Turck:
To start us off, Dr. Winestone, what motivated your team to look beyond traditional socioeconomic measures and examine neighborhood archetypes and their potential associations with acute leukemia outcomes?

Dr. Winestone:
It's been well documented that children and young adults living in lower SES neighborhoods have worse survival after leukemia diagnosis. But those studies usually rely on a metric of neighborhoods' socioeconomic status that takes into account one dimension of a neighborhood, or sometimes multiple dimensions, but all within the realm of socioeconomic status. And so what motivated us here was the recognition that neighborhoods are much more complex than just socioeconomic status. Really, we wanted to reflect a combination of factors related to, for example, housing stability, racial and ethnic composition, access to food, green space, transportation, commuting patterns, and others.

These domains interact with one another in ways that likely shape families' lived experiences during cancer treatment and are often very closely intertwined with one another. Rather than looking at characteristics one at a time, we used a neighborhood archetype approach—a method that groups neighborhoods based on patterns across 39 social and built environment attributes. The goal was to better capture the real-world context in which children with leukemia are receiving care and to see whether those contextual patterns relate to survival.

Dr. Turck:
And what can you tell us about the methods? How did you conduct your study?

Dr. Winestone:
So, we used population-based data from the California Cancer Registry and included nearly 9,000 patients between the ages of 0 and 39 who were diagnosed with ALL or AML between 2006 and 2016—so over a decade. Each patient's address at diagnosis was geocoded, which means we used the census tract to identify where a patient lives, and then we linked that to one of nine neighborhood archetypes, which used these 39 attributes to create a variety of common combinations of different social and built attributes. Then, we compared that to survival overall for patients.

We incorporated other factors that might have an influence on outcome as well. So, we accounted for things like age, insurance status, treatment, and whether they were treated at a pediatric or adult center. And then finally, the last piece of our methods is that we stratified by age because we know children and young adults have distinct survival patterns with these diagnoses and then also have distinct

impacts of social determinants of health.

Dr. Turck:
For those just joining us, this is *On the Frontlines of AML and ALL* on ReachMD. I'm Dr. Charles Turck, and I'm speaking with Dr. Lena Winestone about the impact of neighborhood archetypes on overall mortality among young patients with acute leukemia.

Now, Dr. Winestone, let's turn to your findings. Among patients with ALL, what were the key survival differences across neighborhood archetypes?

Dr. Winestone:
So, we found the neighborhood archetype context mattered a lot, even after adjusting for individual-level characteristics like race and ethnicity, insurance, and where patients were treated. Specifically, we found that two archetypes in particular—those living in either Hispanic small towns or mixed SES suburban neighborhoods—had significantly higher mortality compared to those living in upper-middle-class suburban neighborhoods that we used as our reference group here.

I think what's particularly notable about these neighborhoods is that we weren't just looking at whether those families were living in poverty or not; they were characterized by a combination of lower SES with higher proportions of minoritized residents and features like, for example, unhealthy food.

Dr. Turck:
Now, some of the strongest signals appeared in pediatric ALL. And what factors do you think contribute to the associations that you saw, especially since they weren't seen in young adults with ALL or in patients with AML?

Dr. Winestone:
I think that's one of the most striking components of our findings. First of all, as you mentioned, when we stratified by age, the association between neighborhood archetype and survival was substantially stronger in children with ALL. For example, we saw nearly double the risk of death in those living in Hispanic small towns compared to those living in upper-middle-class suburbs, specifically in the pediatric population. And I think that's attributable to a few things, but most likely, neighborhood is much more impactful for young children because they're less likely to be moving around and less likely to be exposed to multiple different environments in their daily lives versus, you can imagine, a 25-year-old or a 30-year-old who has the environment in which they live, and that's potentially different than the environment in which they work, and they may or may not have lived in that neighborhood for a prolonged period of time. So, we think that may be why neighborhood is more influential among children compared to the young adult population.

And then, to answer the second part of your question about why we see more differences in ALL compared to patients with AML, I think that most likely relates to differences in the treatment structure for these two different types of leukemia. So, ALL therapy, particularly in children, involves a prolonged maintenance phase that relies heavily on outpatient care and daily oral chemotherapy adherence. And we know that patients who struggle with adherence have substantially worse outcomes. So, that means the families have to have consistent access to pharmacies, the caregivers have to make sure that they're taking the medication every day, and they have to attend frequent outpatient visits. Therefore, transportation, work flexibility, and social support are really critical in a patient with ALL, more so than in the setting of AML, where, in contrast, treatment is more intensive and largely inpatient-based. That may reduce the impact of the neighborhood context on day-to-day receipt of care and ability to access care.

Dr. Turck:
And from a practical standpoint, how should clinicians caring for children with acute leukemia incorporate awareness of neighborhood archetypes into everyday practice?

Dr. Winestone:
I think that's a great question, and what we always want to come back to is how we can take our findings and use them to improve the care of patients and decrease disparities as we're finding them. So, this study really reinforces that where our patients live shapes how they experience treatment. Probably, that's not surprising to any clinician.

Clinically, it doesn't mean that we need to label neighborhoods, but what it does mean is that we need to ask better questions of our patients and collect better data specifically from patients. So, does a family have reliable transportation? Is pharmacy access a barrier for them? Do they have stable housing? Is food insecurity present? Is language isolation affecting communication? Understanding that certain neighborhood contexts are associated with higher risk can prompt earlier involvement of social work, navigation, support, financial counseling, or adherence support programs. So, for example, there have been text-based adherence interventions in the pediatric population. There's also psychosocial resilience programs that can reduce stress and improve treatment engagement, particularly for a population that is so vulnerable. Thinking about how we can integrate neighborhood context into our risk assessment is

really an essential piece of the care we provide.

Dr. Turck:
And finally, Dr. Winestone, if we look ahead, what next steps do you think are needed to address the disparities this study identified?

Dr. Winestone:
Well, first, I think we need deeper investigation into the mechanisms that underlie these differences that we've found. We've identified specific neighborhoods that have higher risk, but now, understanding the specific barriers in Hispanic small towns or in mixed SES suburbs that are driving these associations is really essential.

And second, we need to actually start thinking about interventions that target high-risk neighborhoods and are really tailored to the population that lives there. As I mentioned, that could be enhanced care coordination or transportation support partnerships with pharmacies, but really thinking outside the box about how we can support families that are coming from neighborhoods that have been identified as higher risk.

And then lastly, we need to be thinking about policy engagement. Many of the factors in these archetypes are structural issues, and so addressing survival disparities ultimately involves investment in these communities at the systems level. So, while our study helps to identify which neighborhood types may benefit from tailored interventions, the next challenge is really translating this knowledge into equitable care delivery for our patient population.

Dr. Turck:
An important perspective as we come to the end of today's program. I want to thank my guest, Dr. Lena Winestone, for joining me to discuss her research on neighborhood archetypes and overall mortality in acute leukemia. Dr. Winestone, it was great having you on the program.

Dr. Winestone:
Thanks so much for having me.

Announcer:
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