A Growing Effort:

Sweeping child obesity study expands, seeds new inquiries into heart health and COVID impacts

A three-year-old climbs inside his very own rocket ship. In the process, he gives us data on how to prevent one of the most serious epidemics facing American children.

It's a fresh approach by a multidisciplinary team of experts at UNC Greensboro who have joined forces to combat childhood obesity.

Obesity affects 14.7 million children and adolescents in the United States, according to the Centers for Disease Control and Prevention, and is associated with some of the leading causes of death worldwide, including death from diabetes, heart disease, stroke, and some forms of cancer.

"Once a child becomes overweight or obese, it's very difficult to reverse that trajectory," says Jefferson-Pilot Excellence Professor Esther Leerkes. "There's more attention now on what you can do early in life to prevent weight problems."

Dr. Leerkes is principal investigator on the $3 million NIH-funded "iGrowUP" study, which is tracking children from ages three through five – a time in their lives when they begin developing independent self-regulatory behaviors.

The study is an expansion of UNCG's prestigious $2.8 million iGrow – Infant Growth and Development – study, which followed approximately 300 children from the womb to age two, along with their families, and broke ground as one of the first research studies to simultaneously examine the biological, psychological, and social factors that could raise obesity risk from infancy through toddlerhood.

For the new project, nutrition's Dr. Lenka Shriver, kinesiology's Dr. Laurie Wideman and Dr. Jessica Dollar, and human development and family studies' Leerkes are following many of the same children from the original study, now during the critical time when they start learning how to control their own behavior.

The unprecedentedly detailed dataset around families and the development of healthy – or unhealthy – weights at the earliest stages of life is already producing diverse findings, but, ultimately, the researchers are focused on how they can aid families.

> " *We could create a toolbox for parents that can be tweaked and individualized based on the child's characteristics, the environment, and what's going on within the family.* "
> - Dr. Lenka Shriver

DATA TROVE Leerkes (center) and Dr. Kierra Sattler (right), seen here working with graduate student Shourya Negi and a toddler, are using iGrow data for a spin-off study on how the pandemic influenced parent and child well-being.

THEIR *FAVORITE* ROCKET SHIP

iGrowUP study participants will revisit the iGrow lab in the UNCG Stone Building, where they can record their responses to tasks that involve food and tasks that do not. A device called the Bod Pod will measure their body composition.

"It looks like a big egg," says Wideman, UNCG's first Safrit-Ennis Distinguished Professor. "We tell the kids that it's like a rocket ship. It's fun, and we make it interactive for them."

Researchers will also gather information on the children's social environments, including exercise and what foods are within reach at home. They'll collect data using surveys, behavioral observations, and accelerometers.

"We'll have one of the only datasets in the world that has co-assessed parent-child physical activity in kids that young," Wideman says.

Working with such young research participants is no easy task, but Leerkes says, "We are all mothers ourselves, and we're familiar with these struggles."

THE BOD POD, operated here by Wideman, records a participant's weight and volume to learn their body density and fat percentage.

THE 1ST IGROW STUDY, which included Leerkes and Shriver (above center), followed kids from womb to age two.

KIDS IN CONTROL

Self-regulation is something we all do, often with very little thought about it. It's what happens when we breathe deeply to relax when we're angry and when a child is able to wait patiently for their turn to play with a toy.

"We think about self-regulation, at a high level, as a child's ability to control how they feel and behave," says Dollar, who is also part of UNCG's Center for Women's Health and Wellness. "Their inner states, their behavior, their ability to cope with whatever is happening in their environment. A child's ability to self-regulate is reflected by their ability to meet the challenges of the moment."

The iGrowUP proposal is built on what scientists already know, that a child's ability to self-regulate can predict obesity.

Now the UNCG team wants to know if general self-regulation is enough for a child or if there are regulation skills that are specific to food. Is choosing not to raid the junk food drawer within easy reach motivated by the same self-regulation skills as not stealing a toy from a sibling's hands?

PARENTAL EMPOWERMENT

Since many of the children and parents who participated in iGrow will participate in iGrowUP, findings from the new study can be connected to findings from the original. For example, Shriver says, "With our iGrow data from earlier, we'll be able to look at predictors of these self-regulation skills."

The researchers have already observed links between stressors faced by new parents – such as lack of sleep and food insecurity – and their feeding practices. An exhausted parent suffering from poor sleep, for example, was more likely to use food to soothe their baby when they became upset. A parent for whom food insecurity was a reality might urge an infant to continue feeding after they were full, out of concern for food waste.

They also saw it was possible for parents to temper their child's feeding urges. Parents can be empowered with strategies to mindfully address their stressors and in turn reduce the chances that babies develop relationships with food that lead to overeating later in life.

They stress that their research will not be judgmental of parents. In fact, nuanced findings could help parents feel that they're not being crammed into a "one-size-fits-all" model.

"There might be parents with a permissive feeding style that is generally considered a negative," says Shriver. "But if that style is used with a child who has very good appetite regulation or general self-regulation, the obesity risk might still be low."

A ROBUST TOOLKIT

Leerkes, Shriver, Wideman, and Dollar couldn't be happier to conduct this study together. Dollar says, "We genuinely enjoy one another's company. We work well together."

"And having the opportunity to learn from each other has been really fun," says Leerkes. "Most people would just come to it from one perspective. We've been able to integrate all of ours together."

In the end, the researchers hope the big winners will be the kids.

"I'd love to see us move the needle on childhood obesity," Shriver says. "That would be the dream – that there will be constructs and interventions based on what we found out from the study that would make a difference for children."

Methodological Rigor

At ages three and five, child participants visit the lab in UNCG's Stone Building and carry out various tasks. Each food-related task is paired with a non-food related task.

"We'll code the children's behavior," says Leerkes. "How interested they seem to be, if they appear to get upset. We'll code the strategies for how they cope. We'll also measure their physiology, so we'll have multiple levels of regulation."

To get meaningful measurements on their levels of food and non-food regulation, Dollar says they made those tasks as similar as possible. If a child can't reach a toy, it must be as challenging and similar in design as the task in which they can't reach a piece of candy. That rules out whether the child's frustration levels are skewed by another factor such as physical exertion.

"That's a real strength of this study," says Dollar (below, in the iGROW lab). "We went to great lengths to design tasks across all the different types of regulation, and to make them parallel to one another."

Childbearing & HEART *HEALTH*

Dr. Forgive Avorgbedor understands that keeping families healthy extends beyond efforts to prevent childhood obesity. And that many parents face additional barriers putting them at high risk of serious health issues.

Last year, the nursing faculty member joined forces with Leerkes and Wideman to use iGrow data to better understand how structural racism influences the health of childbearing parents, particularly during and after childbirth. They're particularly interested in how pregnancy-related heart and metabolic issues can lead to future heart disease.

Arterial stiffness – a strong predictor of heart disease – affects 47.3 percent of African American women, according to the National Institutes of Health.

When Avorgbedor learned of the iGrow study, it was a perfect opportunity to study a population of parents from a diverse area. According to the 2022 Census, Greensboro was 43.1 percent Black or African American.

"The sample distribution in the iGrow study mirrors this population in Greensboro," Avorgbedor says. "Greensboro also has a very unique history based on landscape, historical laws including zoning, and restrictive practices. It's a unique environment for us to measure and understand how the environment impacts Black maternal health."

Over the next three years, with $500,000 in funding from the Gordon and Betty Moore Foundation, Avorgbedor's team will examine structural racism using multiple pathways, at both the contextual and individual level. They will use surveys and publicly available data to study residential segregation, socioeconomic deprivation or vulnerability, minority health, food security, neighborhood crime, neighborhood walkability, education level, and household income ratio.

While she says researchers already have some knowledge of how discrimination contributes to adverse outcomes in Black women, this study aims to provide a deeper understanding of the specific risk of cardiovascular disease that Black women face due to their environment.

Original iGrow project data includes information on various biomarkers and hormone levels in childbearing parents during prenatal visits, as well as recordings like BMI and waist circumference.

Avorgbedor's team will also test parents in the study for risk of cardiovascular disease using an advanced instrument called the Vicorder®. The device tracks pulse wave velocity, a measure of arterial stiffness.

In the past, assessing arterial stiffness typically involved an ultrasound machine, but the Vicorder® fits in the palm of a researcher's hand. Avorgbedor, who trained on the instrument during her postdoc, says, "We are trying to see if measuring sub-clinical levels of arterial stiffness could give us any information about risks of cardiometabolic complications."

Avorgbedor envisions using the study's results to design an easily implemented intervention. Rather than waiting for childbearing parents to be diagnosed with hypertensive disorders in pregnancy or postpartum, arterial stiffness might be discovered early enough to prevent heart disease. "I want to contribute to the solution, and anytime I find an avenue or a medium that can lead to a solution, I pursue it passionately," she says.

"We have a lot of complications and mortality in this population, and we don't really have solutions right now," says Dr. Avorgbedor.

NEW TECH Avorgbedor demonstrates the use of a Vicorder® on Ph.D. student Favour Omondi.

" *Does where you live, where you work, where you receive care put you at a higher risk?* "

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DATA COLLECTION paused in March 2020 but resumed in July, with stringent COVID-safe procedures modeled on those launched by pediatric offices.

COVID — IMPACTS

Dr. Kierra Sattler understands firsthand how the global pandemic changed the landscape of motherhood. In 2020, she had a two-year old son and had just given birth to her daughter.

"Having a young child at that point in time made it so salient. It really did change so much," says Sattler, a faculty member in human development and family studies.

Sattler has teamed up with Leerkes and Dr. Cheryl Buehler, another member of the original iGrow team, to research how parent and child well-being has been influenced by the COVID-19 pandemic.

"The iGrow study started with a cohort of pregnant women, and the way in which the pandemic coincided with data collection, it ended up with two cohorts of pregnant women – those who were pregnant before and those who were pregnant during COVID," Sattler explains.

She realized that the data collected offered unprecedented insight into how parents' psychological, social, and economic outcomes changed in response to COVID experiences and how a parent's outcomes were related to their children's development.

Up to this point, Sattler says, much of the research around this topic didn't look at the different aspects of the pandemic's long-term effects on parents or how it impacted their overall well-being, beyond some preliminary evidence of adverse effects on the behavioral and mental health of both children and adults.

"I think researchers did the best they could, but given the holistic multisystem nature of the pandemic, how do you decide what questions are most important if you can only give a very short questionnaire because your subjects are busy balancing well-being, childcare, and elder care all while worrying if it's safe to go to the grocery store?"

The iGrow study was one of the first studies of its kind to restart data collection following the outbreak of COVID-19. For Sattler, it provided the ideal population for studying multidimensionality in the pandemic.

Families in the iGrow study come from all income levels, across the socioeconomic spectrum, and offer a racially diverse sample. "We're able to see differences in experiences in the pandemic across different family configurations and different levels of resources," Sattler says.

In a testament to the need for these insights, the researchers secured $1.6 million in NIH funding last year. With the funding, they are reaching out to iGrow participants and conducting interviews with parents and coparents to create timelines of COVID's impacts on these families.

Their Covid And Resilience Experiences Survey project is called "iGrowCARES."

In order to get a bigger picture of the pandemic's influence, Sattler's team came up with questions related to economic outcomes, caregiving responsibilities, and physical and mental health. To include a whole family perspective, the team is also interviewing co-parents, which could include a partner not biologically related to the child or a grandparent.

"We have so much rich info from iGrow on children at birth, at two months, six months, one year, and two years," she says. "Now we can specifically go back and add contextual information about COVID and how that was influencing the whole family."

Sattler's goal for the study is to provide information for public health professionals that can be used for future pandemics and multi-system disasters.

"I am hoping that by collecting this really rich, in-depth longitudinal information on the pandemic and how it influenced parents and children, we will be able to learn valuable information to support families in the future."

by Janet Imrick & Elizabeth L. Harrison

iGrowUP is seeking additional 2-year-old participants! Learn more at *igrow.uncg.edu*