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 BioCrossroads®  
**LIFE SCIENCES  
SUMMIT**

# SUMMIT REPORT

**TRANSFORMING HEALTHCARE:**  
Indiana's Role in Revolutionizing Diabetes  
and Obesity Management

November 7, 2024

# TRANSFORMING HEALTHCARE: INDIANA'S ROLE IN REVOLUTIONIZING DIABETES AND OBESITY MANAGEMENT

## The Impact of Obesity

Obesity impacts more than one billion people worldwide, including 134 million adults in the United States.

In Indiana alone, nearly two million adults live with obesity, which the World Health Organization defines as having “abnormal or excessive fat accumulation that presents a risk to health.”

Between 1990 and 2022, adult obesity more than doubled, while adolescent obesity grew fourfold. By 2035, more than half of the global population is projected to be living with obesity.

This chronic disease disproportionately affects low-income and minority populations, who already face insurmountable political, economic, and social barriers to health.

Obesity puts people at an increased risk for more than 200 health complications, including heart disease, cancer, musculoskeletal conditions, mental health disorders, and type 2 diabetes.

Obesity is currently the fifth-leading risk factor for global deaths, resulting in nearly three million deaths per year.



“Despite being declared a disease by the American Medical Association more than a decade ago, obesity is still seen by many as a lifestyle choice and not the chronic complex disease it is,” said Patrik Jonsson, President of Cardiometabolic Health at Eli Lilly and Company and President of Lilly USA.

“Many people with obesity face intense weight stigma from those around them, often preventing them from getting access to the care they so badly need.”

Indiana’s obesity rate is currently the 12th highest in the U.S., impacting one in three Hoosiers and keeping 65,000 adults from participating in the labor force. Regardless of these obstacles, Indiana plays a commanding role in the fight against diabetes, one of the most common conditions associated with obesity.

*“Obesity is still seen by many as a lifestyle choice and not the chronic complex disease it is.”*

**Patrik Jonsson, President of  
Cardiometabolic Health at Eli Lilly and  
Company and President of Lilly USA**



The 2024 BioCrossroads Life Sciences Summit in November explored the groundbreaking advancements in diabetes and obesity care management happening in Indiana and impacting people around the world.

The one-day summit at the Biltwell Event Center in Indianapolis brought together a panel of leading experts from Indiana and beyond who are pioneering new treatments, improving drug development and delivery, and advocating for the patients who need access to the latest therapies.

The summit focused on challenges that remain, such as the deeply ingrained stigma and bias faced by those living with obesity, as well as the myriad barriers to accessing the latest care and treatment options.

“Indiana is at the heart of the fight against obesity, and Lilly’s breakthrough treatment and pipeline are strong, but we must do better for those who can benefit the most from these treatments, helping to advocate for better coverage and fight against the stigma surrounding diseases like obesity,” Jonsson said.



## A 50-Year Journey

For the summit's keynote address, Dr. Richard DiMarchi, Distinguished Professor of Chemistry and Linda & Jack Gill Chair in Biomolecular Sciences at Indiana University, talked about his deep history with diabetes and obesity research. His work has been pivotal to the advancements in macromolecular medicines, transforming the collective understanding of metabolic conditions.

Dr. DiMarchi is a member of the National Academy of Medicine and the National Inventors Hall of Fame. He formerly served as Group Vice President at Lilly and later at Novo Nordisk. His academic work has shaped the understanding of glucagon physiology and diabetes treatment innovations with more than 100 U.S. patents and more than 250 scientific publications. He has co-founded six biotech companies since 2003.

Despite the progress made over the past decade, Dr. DiMarchi thinks of the present as the "end of the beginning," because the future holds so much potential.

"I want to share with you this morning how we got to this point, so you have a better comprehension of how we get to the next level," he said.

Dr. DiMarchi first came to Indiana University as a graduate student 50 years ago to study and make molecules.

"The chemistry simply did not exist to make peptides and proteins," he said. "These were academic disciplines. The few therapeutics were isolated from blood extracted from glands such as the pancreas in pigs and cows to give you insulin."

"But the world changed by virtue of individuals," he added. "Molecules are the software, but the hardware are the individuals who actually changed the world."

Dr. DiMarchi completed his fellowship at the Rockefeller University in New York under famed biochemist Bruce Merrifield, who won the Nobel Prize in chemistry in 1984 for the invention of solid-phase peptide synthesis (SPPS).



“Bruce was not a synthetic chemist, and yet his work was transformational to synthetic chemistry because he designed the ability to do synthesis on a solid support and not have to characterize all of the intermediates,” Dr. DiMarchi said.

“It's the only way you can make something of the complexity of tirzepatide (more commonly known as Lilly's Monjouro® for type 2 diabetes and Zepbound® for obesity). 30-plus synthetic steps and more than 30 asymmetric centers just couldn't be done in that period of time.”

In the 1970s, a research paper by Graeme Bell was published in *Nature* describing the cloning expression of a pre-protein that included a couple of additional gene products that looked like glucagon.

“Glucagon is the counterregulatory hormone to insulin, something that raises your glucose where insulin lowers it, and it became known as glucagon-like peptide-1 and two (GLP-1 and GLP-2),” Dr. DiMarchi said.

“We'd been looking for this substance in the gastrointestinal tract that signals that you're having a meal to prepare the pancreas for this nutrient load and also to signal to the brain by the gut-brain axis that it's time to stop eating, to suppress your appetite.”

In 1979, a few micrograms of human insulin were synthesized for the first time. Within five years, Dr. DiMarchi said Lilly was able to synthesize 100 kilograms. By 1982, Lilly produced the first commercially available synthetic human insulin.

“It really is a heroic achievement by Lilly to have accomplished this, and it was only Lilly that could do it because they had the insulin expertise and the fermentation technology,” Dr. DiMarchi said. “I personally think this is as big a contribution the state of Indiana has made to the global community as there is.”

By the early 1980s, the U.S. population was growing about one percent annually, while the population of those using insulin was growing by five-to-six percent.

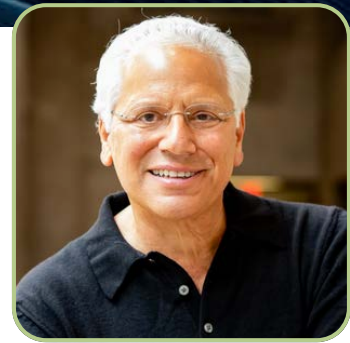
“That was a formula for where we would have to ration insulin, if not for the development of this technology that gave us access to an unlimited supply of insulin,” Dr. DiMarchi said. “But what was driving the diabetes prevalence was obesity. This was the beginning of the obesity epidemic and with that increased body weight came the increased diagnosis of diabetes.”

*“This is what proved that we could manage excess weight in the way that we’re pharmacologically managing excess blood pressure, excess glucose, and excess lipids.*

***This is where we stand today.”***

**Dr. Richard DiMarchi**

Distinguished Professor, Indiana University;  
Linda & Jack Gill Chair in Biomolecular Science



In 1996, physician scientist Dr. Stephen Bloom performed a study where he infused GLP-1 into people with type 2 diabetes and obesity over a four-week period. The study showed that people with the GLP-1 infusion decreased their body weight by 3.8 kilograms. This led to Lilly securing a patent covering all GLPs for the treatment of obesity. However, the science wasn’t advanced for another 20 years.

In 2015, Novo published their work around Saxenda, a chemically modified form of GLP-1 that can be administered on a daily basis.

“The decrease in body weight was about 8 to 9 percent in the treated groups relative to the placebo,” Dr. DiMarchi said. “But importantly, if you look at the magnitude of the improvement, about a third of the subjects lost more than 10% of their body weight and 14% lost more than 15% of their body weight.”

Dr. DiMarchi said it established the precedent that GLP-1s can be used to control diabetes and led to the development of tirzepatide and retatrutide, which is being studied by Lilly as another treatment for obesity.

“I’ve been quoted in the New York Times and elsewhere as saying this is what broke the sound barrier,” Dr. DiMarchi said. “This is what proved that we could manage excess weight in the way that we’re pharmacologically managing excess blood pressure, excess glucose, and excess lipids. This is where we stand today.”



## Indiana's Life Science Resurgence

Indiana's life sciences sector plays a profound role in developing new treatments for obesity, diabetes management, and other conditions. In 2023 alone, the life sciences sector contributed \$95 billion to the state's economy.

Indiana is home to global leaders like Lilly that are making a profound impact throughout the state, as well as home to leading R1 research institutions including Indiana University, Indiana University School of Medicine, Purdue University, and the University of Notre Dame.

Indiana currently ranks No.1 in pharmaceutical exports in the U.S. and No. 2 in life science exports.

In October, Lilly announced an additional \$4.5 billion investment in the LEAP Research and Innovation District in Lebanon, Indiana, bringing the total investments in the area to more than \$13 billion. Lilly's latest investment establishes the Lilly Medicine Foundry, which combines research and manufacturing in a single site. The LEAP District state-of-the-art facilities are expected to generate 1,500 high-paying jobs and more than 5,000 construction jobs.

As a strong advocate for life sciences in Indiana, U.S. Senator Todd Young joined the Summit to speak about another significant investment and his landmark legislation, the CHIPS and Science Act of 2022, which unleashed significant investments to advance key sectors, including life sciences.

The legislation is designed to “strengthen American manufacturing, supply chains, and national security, and invest in research and development, science and technology, and the workforce of the future to keep the United States the leader in the industries of tomorrow, including nanotechnology, clean energy, quantum computing, and artificial intelligence.”

In July 2024, the Biden administration awarded a combined \$504 million to establish 12 new regional technology and innovation hubs or “Tech Hubs.”

Indiana's Heartland BioWorks received \$51 million—the highest in the nation—to develop a new training facility at 16 Tech Innovation District in Indianapolis, train the next generation of biomanufacturing employees, and further support the state's life sciences ecosystem.

“When we think about health, I think most of us think about our human health, perhaps even animal health if you're in the AG sector,” Young said. “I'm going to talk about economic health and where it meets human health in Indiana. We want our citizens to have access to the types of careers in the life sciences industry that will incentivize them to stay here and will incentivize great minds and hardworking people to relocate here.”

*"We lead the nation in pharmaceutical exports. Our medical device industry is among the five largest in the country. We're home to the largest medical school in the United States. We have global names like Lilly, Corteva, and Elanco. I expect we'll have more global names in the coming years."*

**U.S. Sen. Todd Young**  
Indiana



Young touted the "great minds in the Midwest" and said the Tech Hub program aims to make the heartland more competitive and scale investments in the life science sector.

"Too often, the dollars to support ideas and talent flow to the coasts," Young said. "We want that to continue to flow, but it helps as we've learned through our own economic history to prime the pump a bit. And that's what we intend to do through the Tech Hub program."

Looking ahead, Young said his job is to fully implement the CHIPS Act and serve as a cheerleader for continued development and innovation across the state.

"It always seemed to me like the most logical fit was putting our chips, no pun intended, behind the proven life sciences industry right here in Central Indiana," Young said. "We lead the nation in pharmaceutical exports. Our medical device industry is among the five largest in the country. We're home to the largest medical school in the United States. We have global names like Lilly, Corteva, and Elanco. I expect we'll have more global names in the coming years."





## An Evolution from Stigma to Disease

Beyond the health complications caused from obesity, people with the disease face stigma, humiliation, and biases that people with other diseases seldom experience.

"If we were here talking about cancer, I think we'd all agree that cancer is bad, but we have compassion for people with cancer," said Joseph Nadglowski, President and CEO of the Obesity Action Coalition. "But we're here talking about obesity. And somehow in our world where we made obesity bad, we've made the people with obesity bad as well."

He explained how these negative attitudes cause real harm and often prevent people from seeking the help they need. He stressed how the problem only grows worse when society blames and shames people for being overweight.

"I don't think most people are cruel, but I think society has told us that, 'Hey, if I make fun of you, that's going to motivate you to address your obesity,'" Nadglowski said. "The reality is, 90-plus percent of the time, the opposite is true. If you stigmatize someone because of their body weight, they're going to gain weight, not lose weight, because what do they do?"

They turn back to some of those behaviors that might have contributed to their obesity in the first place."

Dr. Robyn Pashby, clinical psychologist and founder of Health Psychology Partners, used a clothing analogy to explain why people stigmatize others living with obesity.

"When I look around here today, everyone's wearing business casual clothing. We know what's expected of us, and we show up accordingly," Dr. Pashby said. "If I sat up here today with my education, my experience, but I was wearing shorts and a T-shirt, you'd think things about me that might not be true. You would think I didn't respect this group. You would think that maybe I was lazy, disorganized. You might think I didn't care about what I'm doing right now."

"When you live with obesity, you don't always have that option. People are going to perceive you based on their own history, their own experiences, the messages they've been told," she adds.

Nadglowski explained how biases surrounding obesity are deeply embedded in society and the media frequently portrays overweight people in a negative light.

*"The more we accept that obesity is a chronic disease, then we give people the ability to ask for help if they want it."*

**Dr Robyn Pashby**

Director, Health Psychology Partners, Washington, D.C.



"We have data that shows if you are normal weight and you're featured in a picture around a news article, you're almost always shown in professional clothing. But if you're someone living with obesity, you're shown dressed slovenly," Nadglowski said. "We've turned those people into inanimate objects instead of real people."

As if societal pressure isn't hard enough, most people living with obesity face harsh internal biases. It causes them to forgo needed care out of embarrassment or feeling shamed by their medical providers.

"I see patients everyday living with obesity, and the story I hear mostly is, 'I don't go to the doctor anymore. As a woman living with obesity, I certainly avoid things like routine pelvic exams, mammograms, and things that are already shaming and vulnerable. I'm not even going to address things like knee pain, shoulder pain, or sore throats, because often when I do, I leave with a pamphlet about metabolic surgery or told to eat less and move more,'" Dr. Pashby said.

Obese people also face what Dr. Pashby refers to as bootstrapping bias.

"There's this idea of the American dream that no matter where you come from or what you're struggling with, if you just work hard enough, if you just commit your effort and your energy and you stay morally correct, you will succeed," Dr. Pashby said. "This doesn't work in economics, and it certainly doesn't work in health and medicine, and yet it's part of the fabric of how we do things here in the United States."

Nadglowski said anyone who lives with obesity remembers the first time a doctor spoke to them about their weight. As someone who formerly struggled with obesity, he remembers precisely the first time a doctor "wagged his finger and told him to lose 20 pounds" before walking out of the room without offering any tangible advice or support. There's not only stigma around obesity, but also stigma around needing help for obesity.

"The reality is that it has influenced every visit I've had with a provider," Nadglowski said. "I'm like, 'The first thing a doctor is going to do is judge me based on my weight instead of having a real conversation with me based on my health issues.' It has jaded every visit since, and it takes me working up courage to go and engage with a provider."

These internal biases manifest themselves in everyday activities and cause anxieties that people of average weight seldom consider. Yet, they play on a feedback loop in the obese person's mind, impacting every decision.

"If I bring my mom who lives with obesity to a show at the Kennedy Center in Washington, D.C., the first question she asks is, 'Will I fit in the seat?' Not, 'What show are we going to?' So, think about that on the metro, in the cab, in the doctor's office waiting room. These are questions people live with every day," Dr. Pashby said.

Even when people try to show compassion and empathy toward someone living with obesity, it can often come off leaving the person feeling stigmatized. Dr. Pashby shared a story about how one of her patients lost a considerable amount of weight but still struggles with obesity. After gaining the courage to attend a fitness class, the patient felt humiliated by the experience.

"The fitness instructor came over and said, 'You're doing such an amazing job, look at you go,' with all this shock and awe," Dr. Pashby said. "My patient never went back. I believe the fitness instructor was trying to be encouraging and helpful and supportive, but it landed as patronizing and embarrassing and singling out."



To combat these biases, Dr. Pashby and Nadglowski said society needs to move away from treating obesity as a fault or form of laziness and instead treat it like the chronic disease it is.

"The more we accept that obesity is a chronic disease, then we give people the ability to ask for help if they want it," Dr. Pashby said. "And guess what? You can seek treatment and care for your obesity and still accept your body as it is. You can actually do both of those things."

Nadglowski said society needs to make large-scale changes to accommodate people living with obesity and feels hopeful about recent improvements.

"We need to make sure we have seating that accommodates people. We need to make sure that when you go to the doctor's office there's a gown that fits you or a blood pressure cuff that fits you. We want to make sure when you go to the hospital, there's a bed you can fit in. We're seeing that improve pretty dramatically," Nadglowski said.

## **Living with Obesity: From the Patient's Point of View**

Dr. Pasbhy helped in leading the panel discussion that included three patients who've made tremendous progress in their fight against obesity. All of the panelists talked about their lifelong struggle to lose weight, from trying countless fad diets, cleanses, and exercise routines to meeting with dietitians and nutritionists.

Panel host Dr. Pashby asked the panel about what finally worked.

Brad Gillum of Carmel, Indiana shared how he was always a "husky kid," and continued to gain weight in his adult life, reaching 336 pounds. He tried "every diet you can think of" and always looked for a "magic solution." He frequently appealed to his doctor for help, but always felt his concerns fell on deaf ears.

In 2021, Gillum went for an annual physical and his doctor was unavailable, so he met with a nurse practitioner. When he asked the NP for help, he received a much different response.

"She said, 'Would you mind seeing a bariatric specialist?' I was like, 'I don't want to see a bariatric specialist. I'm not having surgery.' And she said, 'Good, I'm going to refer you to someone who doesn't really do surgery. She doesn't really believe in surgery,'" Gillum said. "So, she introduced me to Dr. Whitney Blakley. She understands that obesity is a chronic disease."

Gillum said Dr. Blakley became his biggest champion in his weight-loss journey and helped him find a medication that works for him. Now three years later, Gillum has shed over 110 pounds.

Kelly Roby of Bloomington, Indiana shared how she dealt with her weight most of her life, but really began to struggle during menopause, reaching 257 pounds. She felt so ashamed, she kept her actual weight a secret from her husband.

"I could barely work. I was so miserable, and I felt awful because of my weight, because of my hot flashes," Roby said. "I wasn't sleeping, and I had a whole bunch of things going on. I would talk to both my doctors, and I would get the, 'Well, you need to lose weight, move more, eat less. You just have to get through it.' I really got sick of hearing that answer, so I did some searching and talked to people at work."

Roby eventually found Dr. Matthew Andry, who she credits with saving her life.

"He got me help for my menopause symptoms, and we started working on my weight, and it has been a wonderful journey," Roby said. "Knowing my family history with strokes and heart problems, I don't know if I could have kept going the way I was going, and this has truly turned it around for me."

Brett Voorhies of Speedway, Indiana struggled with obesity since childhood. Even at a young age, he had trouble keeping up with his friends.

Weight gain continued into adult life, and his job as a union leader made it hard to eat healthy food because he was always on the road. Voorhies developed type 2 diabetes, and in 2015, he suffered a widowmaker heart attack while Black Friday shopping. With kids and grandchildren in his life, he reached out to his doctor and said he was ready to get serious about losing weight.

Voorhies has since lost more than 40 pounds with the goal of shedding more weight in the future.

“He hooked me up with an amazing endocrinologist and she’s been working with me for the last few years,” Voorhies said. “Once a day, I take my Jardiance for my heart, and then on Fridays I take my Mounjaro for my diabetes plus my weight management. It’s part of my lifestyle now.”

Voorhies has since lost more than 40 pounds with the goal of shedding more weight in the future.

## **Insurance Obstacles Create a Barrier**

Finding a medication that works can be challenging for people living with obesity, but getting insurance to cover the drugs can often prove even more difficult. In fact, a study by the Kaiser Family Foundation found fewer than 20% of employers cover GLP-1 medications. Out-of-pocket costs for common GLP-1 drugs can range from \$936 to \$1,349, according to KFF.

Gillum shared how despite all of his progress and health improvements from taking medication, including losing 60 pounds in the first four months, his insurance company won’t cover his medications.

“It’s frustrating to know there are all sorts of options that are available and to know that my insurance company won’t cover those for me,” Gillum said. “I have a relatively clean bill of health, but my insurance company doesn’t recognize that and doesn’t see any ties to my obesity and what those drugs are doing for me and the healthy conditions that I’m living with now.”

Patients living with obesity also face obstacles from their own healthcare providers, who often discount their concerns.

“I really feel when you come in as a heavier patient, sometimes your symptoms just aren’t taken as seriously,” Roby said. “It has been a struggle for all of us.”

Gillum mentioned how the same doctor who discounted his weight concerns also lives in his neighborhood. He often sees the doctor while on walks, and despite his 100-pound weight loss, the doctor has never acknowledged his progress.

“He’s never once said anything to me. He’s never looked at me walking by and said, ‘Brad, good job. Hey, it’s great to see you out here walking like this. You look great. Nice work.’ Not one time,” Gillum said.

Despite their success with weight loss, the panelists agreed they continue to struggle with internalized biases about their body image. Mundane activities like walking into a room or shopping at the grocery store often trigger these insecurities.

"It really messes with you, and until you go through the struggle and until you go through the disease of obesity, which is a disease, you don't think about those kinds of things. It's just little quirks that you think about at times where you don't have that self-confident confidence in yourself," Voorhies said.

Roby said she still feels insecure at times while going about her daily life.

"When we fly somewhere, I still wonder 'Is this person going to hate sitting next to me?'" she said. "And I have to think, I don't have that issue right now. Not to say that I'll never gain weight again, or I'll always be this size, but you get so used to thinking in a certain way that when you don't have that problem or that issue, it's still there.

"I used to also get self-conscious in restaurants," she added. "I have to find something really small, or I have to find something that doesn't look like it's got a lot of calories. People are going to walk by me and judge me because of what I'm eating. Now I don't have that issue, but with the medication, I really don't feel like eating that much anymore. So that's a plus as well."

Dr. Pashby mentioned how patients struggling with obesity typically face two separate journeys.

"We're working on weight management, which is really all about the numbers. And then we're working on the mental journey, which is dealing with the internalized weight bias, which is this belief that what society tells us about people living with obesity, that they have less willpower, they're lazy, and people internalize that about themselves."

To close out the session, Dr. Pashby asked the panelists about their non-scale victories, which she defined as achievements not related to the numbers on a scale. Roby shared how she no longer shops in the plus-size section of department stores.

"Now I go to the regular size section where there's so many more choices," she said. "This might seem silly or not that important, but the choices that I have now when I go to a clothing store, it's amazing. I hadn't realized the change until I could start shopping in that section of clothing stores."

Gillum found a love for walking and said he now walks or hikes every day, often covering 10 miles or more. Sometimes he "slogs," a phrase he invented to describe his style of slow jogging.

"My wife likes to go with me, but she says I walk too fast, so I'll usually walk a couple of miles with her and then take her back to the house and drop her off, and then I'll go out for a while longer," he said. "And the jogging started because to do seven or eight miles, it takes you a couple hours. I needed to make it happen faster, so I started jogging a little bit. I've got a newfound hobby."

## The Societal and Human Impacts of Obesity

Obesity impacts roughly 40% of the U.S. population, with rates climbing dramatically over the last few decades.

“What used to be an incredibly rare body weight to be able to find anybody for your studies is now more than 10% of the population,” said Dr. David Allison, Dean and Distinguished Professor at IU School of Public Health. “It’s associated with stigma, and one of the best things we can do is to be kind and to try to reduce that stigma. A lot of that is tied to social class, to racial issues, to gender issues, and to age issues where stigmas are compounded.”

Social determinants of health are the conditions in which people are born, grow, live, work, and age, all of which can profoundly impact health outcomes, especially obesity. Factors like socioeconomic status, ethnicity, access to healthcare, education, neighborhood environment, crime, and social support all play significant roles in obesity rates.

“Fifty percent of the black community is obese. If you look at the black female population, at least 54.9% are obese. So, it's some incredible impact that we're seeing in certain vulnerable populations, whether it's related to social determinants or different lifestyles that impact everyone.



And we cannot forget that income and social status play a major role in this,” said Dr. Virginia Cain, Chief Medical Officer for the Marion County Public Health Department in Indianapolis and 125th President of the National Medical Association.

While socioeconomic status impacts obesity rates, Dr. Allison said the situation is far more complex among different ethnicities.

“As you go to different groups, things differ. We heard from Dr. Caine about the higher prevalence of obesity among African American women, but among African American men, the prevalence is extremely similar to what it is for European American men. Whereas for Latino people, both men and women have elevated levels of obesity,” Dr. Allison said.

Yet, socioeconomic status has a reliably inverse impact on adult white women.



*"We now have treatments that will extend longevity. I could not have said that with honesty 20 years ago, but I can today."*

**Dr. David Allison**

Dean, School of Public Health, IU School of Medicine

"The richer and more educated an adult white woman is, the less likely she is to be obese," Dr. Allison said. "There's virtually no association between socioeconomic status and obesity among adult black women. But among African American men, the prevalence is extremely similar to what it is for European American men. Whereas for Latino people, both men and women have elevated levels of obesity. We can't have simplistic explanations."

Dr. Caine said where a person lives has a significant impact on obesity and longevity. Neighborhoods lacking parks, sidewalks, or recreational facilities reduce opportunities for exercise, making physical activity less accessible, while higher crime rates and poor lighting can also contribute to a sedentary lifestyle.

"In any inner city, some communities have no sidewalks. So, if I'm going to do my physical activity, I have to walk out in the streets," Dr. Caine said. "The crime rate might be a little bit higher than we might see sometimes in our suburbs. Who wants to walk out there and put themselves at risk of some stray bullet or somebody might mug them?"

Living in a neighborhood without nearby grocery stores, known as "food deserts," limits access to affordable and nutritious foods, further increasing obesity rates. It often forces residents to shop at gas stations or convenience stores, which are chock full of processed foods.

"I sure can't get any fruits and vegetables there, but my doctor is trying to chastise me because I'm a diabetic and I'm not eating properly," Dr. Caine said.

A lack of transportation also prevents people from driving to a grocery store with more healthy food options. It's much easier to walk to the neighborhood gas station than take public transportation to a grocery store and then ride the bus home with a load of groceries.

Simply lacking insurance forces people to pay the full retail cost for needed medications to control obesity and diabetes, adding yet another barrier.

"We have to understand that we have a significant vulnerable group of people, and if we're going to address obesity in this country, we have to look at the whole perspective and add social determinants as part of our model for making a difference with our populations," Dr. Caine said.



## The Rural vs. Urban Divide

Dr. Allison noted the significant rural-urban divide for obesity in the U.S. Rural areas face shortages of healthcare providers, including primary care physicians, specialists, and mental health professionals. Those shortages often lead to delayed or inadequate care for chronic conditions like diabetes, hypertension, and obesity.

“There’s no population that is more disadvantaged these days in the U.S. than the rural population,” Dr. Allison said. “The rates of obesity and diabetes are tremendous. You may think the capital of the world for GLP-1 prescriptions might be Hollywood. It turns out to be a rural area of Kentucky, which has the highest per capita prescriptions of those drugs.”

Dr. Lindsay Weaver, professor of emergency medicine at Indiana University School of Medicine and Indiana Health Commissioner, studies obesity rates across the Hoosier state. She said state data shows considerable variance between metro and rural areas.

“We thought our most obese county was Miami County at 40%, but it’s Vermillion at 51%,” Dr. Weaver said. “Hamilton County, just north of here, has a 35% obesity rate. When you look at what are the most obese counties, it’s primarily rural communities.”

When Weaver and her team presented their data to Miami County officials, they received a sobering response.

“It was actually the sheriff that raised his hand, and he said, ‘Half of our county is shopping at a gas station. There’s no access to a grocery store,’” Dr. Weaver said. “If you have low economic status and you’re trying just to live, paying the additional money to get gas and drive there, or if your family has only one vehicle, it truly becomes an issue.”

## Downstream Effects of Obesity

Obesity not only affects physical health, but also impacts mental health, longevity, and type 2 diabetes. It can lead to joint problems like osteoarthritis and increase the risk of colon and breast cancer.

“Complications of diabetes can result in amputations, diabetic foot infections, and it can impact kidney failure,” Dr. Caine said.

“We can see as a result of obesity, how it impacts even infant mortality. We know that mothers who don’t breastfeed have a higher risk of their children having obesity at a later stage.”

Obesity also makes surgical procedures riskier as providers struggle to intubate overweight patients, increases the risk of death in automobile accidents, and can exacerbate falls.

“If you have more mass pushing on that hip and force equals mass times acceleration, guess which wins? There’s also a greater likelihood of a pubic bone fracture in an obese child whose vehicle is hit from the side. So, there are many other ways obesity affects things, and we need to be open-minded to the science of it and not just get involved in our assumptions,” Dr. Allison said.

Dr. Caine mentioned several solutions in place to combat obesity in Indiana, from helping patients access obesity and diabetes medication, to working with local food banks to connect people with more nutritious food options.

“75 percent of our pantries now in Marion County are only accepting healthy foods, and they have health educators in those pantries,” she said. “We also have a program where we pay clients who are low income, we provide them over \$200, and they can use the coupon to purchase healthy foods.”

Dr. Weaver said it takes a multimodal approach to truly make an impact on the obese population in Indiana, combining an integrated team of providers with patient education and other resources.

“We have to be able to bring the parents and the families into this and recognize that some of the most successful weight loss clinics are multimodal. You have your primary care provider, maybe you have a cardiologist, there’s a nutritionist, exercise is a part of it, a clinical pharmacist, and make sure that you have really good control of the medication and updates are made to it for that individual,” she said.

The panel agreed while stigmas remain, attitudes are shifting around obesity – both in society and in the medical community – that obesity is a complex disease, not a lifestyle choice. The solution requires more than eating less or moving more. There’s no magic solution.

“We now have treatments that will extend longevity,” Dr. Allison said. “I could not have said that with honesty 20 years ago, but I can today. It started with bariatric surgery and then the SGLT2 inhibitors and now the GLP-1 related drugs. They have unequivocally been shown to reduce mortality rate, not just cause weight loss. We have a lot to work with, we have some new tools, and it’s an exciting time where there’s hope where there wasn’t hope before.”

## Revolutionizing Treatment: GLP-1s

GLP-1 drugs are a class of medications known as glucagon-like peptide-1 receptor agonists. They're synthetic versions of a naturally occurring hormone, GLP-1, which plays a key role in regulating blood sugar levels, insulin production, appetite, and digestion.

The demand for GLP-1 drugs has skyrocketed over the last few years for their proven benefits in weight loss, diabetes management, and cardiovascular health, along with their potential for other therapeutic uses.

To patients around the world, these treatment options are nothing short of life changing.

"They're able to control glucose with unprecedented capabilities in maturity onset type 2 diabetics," Dr. DiMarchi said. "And they do it without the risk of hypoglycemia, which is a huge limitation of insulin therapy and sulfonylureas, and they decrease body weight even from the earliest stages."



## Treating Other Conditions with GLP-1s

Beyond weight management, researchers are actively exploring how GLP-1 drugs help with comorbidities, both related and unrelated to obesity and diabetes.

The drugs show promise for lowering the risk of cardiovascular disease, heart attack, and stroke; reducing liver fat and slowing the progression of fatty liver disease; and treating mental health and addiction.

Dr. Viral Shah, Professor of Medicine and Director of Diabetes Clinical Research at the Indiana University Center for Diabetes and Metabolic Diseases, mentioned a recent study that found tirzepatide reduced the sleep apnea index—the number of times someone stops breathing during the night—by 50 percent.

"We had another trial that just came out about knee osteoarthritis, where giving the drug and reducing the weight leads to a significant improvement in a pain score," Dr. Shah said.

GLP-1s are also being investigated for their potential to slow the progression of Alzheimer's disease and to improve motor function in patients with Parkinson's disease.

"I think the interesting scientific questions that are still to be answered, and with Alzheimer's, this would be a good one, is whether the drug itself is acting to preserve neurons or change their function, or if it's the reduction in obesity and diabetes that improves the entire metabolic milieu that is the driver for the improvement with Alzheimer's," said Dr. Robert Considine, administrative director of the Indiana Biosciences Research Institute Diabetes Center. "But there are studies coming out that make it look good."

Despite the benefits, GLP-1s introduce challenges. While some insurance plans cover GLP-1 drugs for diabetes management, coverage for weight loss is limited, at best, as many insurers consider weight loss to be a lifestyle issue rather than a medical necessity.

"I feel like I'm in a partnership with my patient, but then suddenly the insurance says 'denied.' Why? Because a lot of insurance doesn't cover obesity management," said Dr. Shah. Without insurance coverage, costs for GLP-1s can range from several hundred to over a thousand dollars per month, making them unaffordable for many.

"Coverage doesn't mean that it's going to be a low-cost therapy. If you have a high-deductible plan, it's going to be super costly," Dr. Shah said. "That's why a lot of people are now going toward compounded products, which aren't safe."

## GLP-1 and Removing Stigma

Anytime a revolutionary new class of drugs comes to market, it often takes time to gain widespread acceptance by the global public.

Dr. Matthew Andry, Family Medicine Physician in Bloomington and Associate Professor at Indiana University School of Medicine, said GLP-1 drugs remind him of the introduction of SSRIs in the 1980s. At the time, the Church of Scientology publicly attacked Lilly for manufacturing Prozac.

"Before Prozac, if you were depressed and went to your family doc, you were told to pick yourself up by your bootstraps or maybe you need a new job," Dr. Andry said. "Why? Because we didn't have any medical therapies that we felt confident in and that were safe for a broad population.

"And what was really great about Prozac to me was not just that we finally had a treatment for something difficult, but it was the way all the sufferers of that condition were treated in the wake of the medication coming out. Depression went from something that was your fault to something that was considered our purview to help patients with. And the same thing is happening now."

*"I believe the GLP-1 analogs have a real potential to be used as an adjunct therapy in people with type 1 diabetes."*

**Dr. Viral Shah**

Director of Diabetes Clinical Research at the IU Center for Diabetes and Metabolic Diseases at Indiana University



Dr. Shah said obesity rates between type 1 and type 2 diabetes are roughly the same, and he's researching how GLP-1s work on type 1 diabetes. People with type 1 often experience weight gain as a side effect of taking insulin.

"There's no effective way to manage type 1 diabetes besides with insulin," Dr. Shah said.

"I believe the GLP-1 analogs have a real potential to be used as an adjunct therapy in people with type 1 diabetes. We're conducting a large clinical trial. It's a double-blind randomized control trial using GLP-1 in people with type 1 diabetes. And hopefully that result in the future will show how beneficial this drug is."

### **Can GLP-1s Work for Kids?**

There's growing interest in the potential use of GLP-1 drugs for children and adolescents with obesity and type 2 diabetes, which increasingly affect younger populations.

"Liraglutide was approved for kids in 2020. So, we have now four years of experience, and most of the studies out there show that it's safe and efficacious," Dr. Considine said.

"Parents are still concerned about the risk. Do we know? Again, the studies don't see any risk, although the parents are concerned that a child would be on this for a long period of time, or importantly later, is it going to affect their reproductive capacity?"

"The take-home message at this point is that they're safe and effective in kids, and they're approved for kids 10 to 12," Dr. Considine added. "There are studies coming out where they're effective in kids younger than 10. It hasn't been approved yet, but I think the data looks like eventually that's going to happen."

## The Next Generation

The final session of the 2024 Life Sciences Summit focused on the future of obesity and diabetes care, specifically how Indiana's life sciences ecosystem is leading the charge.

The panel included Dr. Karen Wurster, CEO of Adipo Therapeutics, Dr. Michael Dorato, Senior Vice President of Discovery and Nonclinical Development at MBX Biosciences, and Dr. Ruth Gimeno, Group Vice President, Diabetes, Obesity, and Cardiometabolic Research and Early Clinical Development at Lilly.

To kick off the discussion, moderator Dr. Janel Gordon asked the panelists to share the latest innovations at their companies and how they're addressing treatment gaps for obesity and diabetes.

Wurster shared how her organization is working on a new treatment to work in conjunction with GLPs and specifically address metabolism.

At Adipo Therapeutics, we're developing a new treatment that actually addresses the energy expenditure or resting metabolism side of weight loss," Dr. Wurster said.

"We're developing a new treatment that could be used in combination with the GLPs for patients who plateaued but could also be used independently for patients for whom their main cause of their weight is slowed metabolism."

Dr. Gimeno mentioned how Lilly is researching the multiple comorbidities associated with obesity.

"It's really important to us to understand which ones are we addressing already, and how well are we addressing them?" Dr. Gimeno said. "As we think about the next generation of obesity therapies, we're looking for things that address unmet medical needs."

Dr. Gordon asked the panelists if the publicity and success surrounding GLP-1s has increased funding for research and development

"It absolutely revolutionized the market. When I started in this job four and a half years ago, I was actually told, 'Don't even talk about obesity, just focus on the diabetes portion of what your drug can do,'" Wurster said. "We've seen this market expand, it's absolutely opened up investment opportunities, opened up the market, opened up the value of the company, and that's all been fantastic."

Gimeno agreed about the uptick in investment and mentioned how the prevalence of GLP-1 drugs is shifting the perceptions around obesity.

“The current therapies show us what's possible and really demonstrate that this is a disease, not a disease of willpower. It's a sort of real pathophysiology,” Dr. Gimeno said. “It has been really exciting to see much more investment going into this area. There are a lot more biotechs trying to address obesity from all sorts of different angles, and from our perspective, the competition is really good because it means more ideas are getting tried and we're more likely to find the next generation of therapies.”

The panel discussion shifted to treating the more than 200 comorbidities associated with obesity and diabetes.

“As we develop obesity therapies, we always ask ourselves, ‘What are the comorbidities we should be studying? Which mechanism is best suited to really provide the most benefit?’ This is something we're really committed to,” Dr. Gimeno said. “We already mentioned the studies we've done with tirzepatide in heart failure and obstructive sleep apnea, and we're looking forward to some cardiovascular outcome studies with retatrutide, which is in phase three now. We actually built in a study with osteoarthritis. So, it's a really important component.”

Dr. Gimeno said the FDA creates complexities because the agency still treats comorbidities as independent entities.

“When we run large outcome trials, it's actually very difficult to get agreement on endpoints for all of the comorbidities,” she said. “I think there's more work that needs to be done to really integrate drug development, but then hopefully also treatment of patients.”

Looking ahead to the future, Wurster said she sees the market following two paths. First, she expects GLP-1s will become widespread, similar to SSRIs for depression, as physicians become more comfortable prescribing the drugs and societal stigmas lessen.

“There's still only about 10% of people with obesity that are getting pharmaceutical treatments,” Wurster said. “I think we'll see that grow as the stigma goes away and physicians are willing to see obesity as a real disease.”

Second, she said there's greater recognition of the different aspects of obesity and each one needs to be treated differently utilizing all of the available treatments.

“We're just at the infancy of this market right now, and I see the diagnosis improving and I see the number of treatments addressing different areas increasing as well.”

## Closing Thoughts

Nadglowski returned to the stage to deliver closing remarks and elaborate on some observations from the day.

“We need to change this from a disease of blame to a disease of biology and really recognize that biology is at the heart of this, and we each experience hunger a little differently,” he said. “We experience food cravings differently and we have different core metabolism. All of those things contribute to what people who are struggling with their weight are going through every day.

“And unless people have access to these medicines, they're not game-changers,” he added. “We talk about there are 100 million-plus people in the U.S. who have obesity and there are a billion people around the world. There are only a couple million people right now who have access to these medicines. We're not nearly helping enough people.”

