Overcoming obesity demands more than just nutrition education and access to good food. We must address deeper societal and environmental problems, too.

By Melinda Wenner Moyer

Illustrations by A. Richard Allen
On one level, of course, obesity has a simple cause: Individuals gain weight when they store more calories than their bodies burn. But an underlying question lingers: What condition of the past two decades has created this rampant energy imbalance and what can be done to reverse the trend?

In recent years, Mailman School scientists have delved into a range of environmental drivers of weight gain including new sources of foods, urbanization, and reduced physical activity—as well as such surprising factors as stress, family violence, and exposure to pollutants. Their research suggests that to solve the problem of obesity—and, ultimately, to prevent it from plaguing future generations—policymakers must do far more than simply educate the public about nutrition and make fresh produce available to all. A range of underlying environmental and social factors must also be addressed through policies informed by a clear understanding of how and why people make the food choices they do.

To achieve these lofty goals, in May 2013 Y. Claire Wang, MD, SCD, an assistant professor of Health Policy and Management, and Andrew G. Rundle, MPH ’94, DrPH ’00, an associate professor of Epidemiology, kicked off a yearlong Obesity Prevention Initiative. With the sponsorship of Dean Linda P. Fried, MD, MPH, and the collaboration of three fellow faculty members—Jeffrey Goldsmith, PhD, Rachel C. Shelton, MPH, SCD, and Shakira F. Suglia, SCD—they will use the Initiative to make the case that obesity prevention, rather than treatment, will be the most effective public health intervention. Their investigations will also lay the foundation to promote success in the prevention of obesity. (It’s very hard for people to lose weight and keep it off and far better to have never gained it in the first place, a theme championed by the Institute of Medicine.)

Together, the team of junior faculty will identify and address gaps in knowledge about obesity to ultimately furnish new insights into what causes the disease and what can be done to end it. “Prevention involves trying to make sure that the healthy choice is the easy choice, so it can be sustained and is effortless,” Wang says. “But it takes a lot of design wisdom to achieve that.”

**Distal Causes**

Shakira Suglia, an assistant professor of Epidemiology, would probably have a very different career if she hadn’t grown up in Puerto Rico. She left when she was 18, for college at the University of Massachusetts at Amherst, but her early experiences raised lingering questions about the effect of stress on long-term health. Families who struggle to put enough food on the table or to stay safe from violence don’t always have the time or energy to exercise or eat well. “If you’re chronically exposed to stress, it has to leave its mark,” she says. “It makes total sense to me.”

In a study published in *Pediatrics* in April 2012 and funded by the National Heart, Lung, and Blood Institute, Suglia and colleagues showed that girls exposed to family stress during their preschool years have an increased risk of being obese at the age of 5. The data came from the Fragile Families and Child Wellbeing Study, an ongoing longitudinal investigation led by Columbia and Princeton universities; researchers had surveyed the mothers of 1,605 U.S. preschoolers to gauge how much stress their households were experiencing. Among other questions, the women were asked about their access to food and exposure to domestic violence, and whether the children’s fathers had spent time in prison.

Suglia and her colleagues found that girls whose households were experiencing at least two high-risk stressors when they were 1 or 3 years old had more than twice the odds of being obese at age 5 compared to girls whose households were experiencing no major stressors at those times. (Boys, she found, generally did not become obese after experiencing social stress.) Suglia says she isn’t yet certain how or why stress leads to weight gain for girls, but “these risk factors are social stressors that are affecting the parents’ ability to take care of the needs of their children,” she says. “This can directly impact what the children are eating and how much they’re exercising, or it can affect biological stress pathways, which can disrupt hormones related to appetite.”

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Obesity rates have skyrocketed over the last 20 years and the condition now afflicts more than 500 million people worldwide. In the United States, an estimated 97 million people—more than one-third of adults and 17 percent of youth—suffer from the diagnosis, which was declared an official disease in June 2013 by the American Medical Association. We’ve all heard the litany: Obesity puts a person at increased risk for heart disease, type 2 diabetes, stroke, and certain types of cancer.
The seeds of obesity can be sowed earlier, too—before babies are even born. In research published online in the *American Journal of Epidemiology* in April 2012, Andrew Rundle and colleagues asked 702 pregnant women from the Bronx and Northern Manhattan to wear special backpacks that monitored their air quality for 48 hours while they were in their third trimester. Then the researchers tracked the health of their children after birth. The kids of the mothers who had been exposed during pregnancy to the highest levels of polycyclic aromatic hydrocarbons (PAHs)—chemicals released during combustion which have been shown to affect hormone function—were 79 percent more likely to be obese at age 5 and 2.3 times more likely to be obese at age 7 compared to kids born of mothers who were exposed to the lowest levels. As co-author Frederica P. Perera, DRPH’82, PHD ’12, a professor of Environmental Health Sciences, remarked, “This is the first time that the pollutants from fossil fuel burning have been linked to obesity in children directly.”

**SMART CHOICES MADE SIMPLE**

If obesity is driven by many social and environmental factors—and so early in life—how can policymakers ever hope to eliminate it? “You can’t just tell someone, ‘You need to eat more healthily,’ because that person may not have the available financial or physical resources to eat better or exercise more,” Suglia says. “Obesity may fall down at the end of a long list of other issues that they need to resolve first.”

Yet for society, delay poses its own hazard. With increasing rates of childhood obesity, the nation edges ever deeper into a classic public health conundrum: Obese children risk severe consequences for long-term ill health and drastically lowered productivity. Society as a whole suffers when long-term health and productivity decline. The risk is too great to defer to individual action—a collective response beckons.

One option is to re-shape people’s environments so that healthy choices are effortless and economical. In 2012, Wang authored an analysis in *Health Affairs* on the potential health benefits of a penny-per-ounce excise tax on sugar-sweetened beverages like sodas and sports drinks—a 12-cent tax, say, on a 12-ounce Coke. “Sugar-sweetened beverages have no nutritional value whatsoever,” says Wang. “They’re sugar water.”

Taxes on unhealthy products like these would preserve consumers’ free choice, yet give people an incentive to avoid buying them and, by extension, make it easier on the wallet to purchase healthier beverages like milk or water. In a 2010 report for New York City’s Department of Health and Mental Hygiene, Wang suggested that such a tax could reduce consumption of sugar-sweetened beverages in New York state by up to 20 percent, ultimately preventing 145,000 adults from becoming obese and saving $2.1 billion in medical costs attributable to obesity over the course of a decade. (While the tax was ultimately rejected in the Empire State, similar taxes are currently being considered in nine other states.)

Another option would be a cap on sugar-sweetened beverage sales, such as the June 2012 proposal by New York City Mayor Michael Bloomberg to ban the sale by restaurants and other food establishments of such beverages in serving sizes larger than 16 ounces. (Research has shown that people consume more calories when they are served more calories.)

In a study published online in the June 2013 *American Journal of Clinical Nutrition*, Wang and her colleagues found that such a ban would not, as some people feared, disproportionately affect low-income individuals. Instead, the scientists found that the ban—which was blocked by a judge in March 2013, a decision subsequently upheld by an appeals court—would target overweight individuals as hoped, reducing their consumption of sugar-sweetened beverages by about 60 calories a day, or 22,000 calories a year.

Such calorie reductions could go a long way toward obesity prevention. Previous research by Wang and her colleagues—published by the *American Journal of Preventive Medicine*—found that a reduction of just 64 calories per day is all that’s needed to reach the country’s Healthy People 2020 goal for reducing obesity.

The effort also gets a boost when families cultivate the habit of serving healthy foods...
COUNTING CALORIES IS USUALLY the domain of solitary dieters. Professor Y. Claire Wang has applied the practice to population health. Instead of adding muffins and subtracting time sweating on an elliptical machine, Wang’s Caloric Calculator (CaloricCalculator.org) weighs the effect of policy on childhood obesity.

Select a target population (middle-school-aged boys, for example) and the website displays their rate of obesity (18 percent) and the average daily calorie cuts required to turn back the clock to levels from the year 2000 or, more ambitiously, the early 1970s (109 and 237 calories, respectively). Next, choose from a menu of 15 interventions. Add 30 minutes of daily physical education classes, for example, and burn 49 calories. Not enough. Eliminate one can of soda for 136 calories. Year 2000, here we come. Reduce television time by an hour and whittle away another 106 calories. Hello, slim ’70s!

To develop the tool, Wang and her colleagues reviewed the scientific literature on physical activity, dietary, and other preventive measures to estimate their influence on children’s “energy gap”—the difference between average daily calorie consumption and the number of calories required to support normal growth and physical activity. The team detailed their methods in the August issue of the American Journal of Preventive Medicine.

“Our goal is to put policymakers—the foundations that fund programs, the professional societies that issue guidelines, and elected officials—in a mindset of comparative effectiveness,” says Wang. “We wanted a yardstick that would rank interventions that affect either energy intake or energy expenditure to promote systematic solutions.” —Tim Paul

Do the Math