When should someone be screened for cancer? How do you keep track of patients in a developing country? How do you deliver asthma education to inner-city schools? These are the questions of health-care engineers — researchers who apply analysis, statistics, simulation, and optimization methods to health-care operations. Their work involves many different settings — hospitals, rural clinics, schools — but the common goal is finding new ways to provide the best possible medical outcome.

For Gordon Hazen, professor of industrial engineering and management sciences, the best outcome is the most cost-effective. Hazen performs analyses of medical interventions (surgeries and screenings, for example) to see how cost-effective they are in various situations. His research involves stochastic and probabilistic models that aim to predict a person’s future based on whether and when a particular intervention is done.

Benjamin Armbruster, assistant professor of industrial engineering and management sciences, addresses a much more specific problem: HIV testing. Normal interventions for HIV involve screening programs; Armbruster is studying whether a different approach — interviewing infected people, learning whom they might have infected, and then seeking out and testing those people — could be more effective. Armbruster hopes to make the case for contact tracing of HIV cases in Africa. “Currently most people in Africa find out if they’re infected through screening programs,” he says. “As far as I know, nobody has done contact tracing or looked at whether this might be a worthwhile idea.”

McCormick has launched several health-care projects in Africa. Matt Glucksberg and David Kelso, professors of biomedical engineering, are involved with the Center for Innovation in Global Health Technologies and are overseeing the development of a tuberculosis tracking system in South Africa. Northwestern study abroad students are working to monitor diagnostic and treatment regimens in a Cape Town clinic, where effective patient tracking is hampered by inefficient filing and communications systems as well as a lack of incentives for patients to follow up after office visits. Students are using the ideas of both industrial engineering and organizational behavior to find solutions.

Health-care operations problems aren’t limited to developing countries, as Karen Smilowitz, associate professor of industrial engineering and management sciences and William A. Patterson Junior Professor in Transportation, has learned. With Sarang Deo in the Kellogg School of Management and her students, she is collaborating with the nonprofit Mobile CARE Foundation, which delivers asthma treatment and screening to Chicago Public Schools. Increased demands and a stagnant budget have left the foundation wondering how to do more with less. “Our students are looking at Mobile CARE’s metrics and best practices to determine areas for operational improvement,” Smilowitz says. “We’re trying to find ways to maintain the foundation’s objective of greater care for patients while addressing their operational issues.”