A sk anyone, anywhere else in the country, and they'll tell you: Things are different in New York. What goes on in the Apple, when it's not outright wicked, is probably just slightly weird.

Take David Evans. He and his associates regularly invade public places with trays urging radical lifestyle changes. They're Patrick Kinney, who has been known to deploy candies of reeds to hang out on street corners in lower-income neighborhoods, using the scene and keeping tabs on certain vehicles. Ginger Chese, known to many as cockroach collectors and breeders of a bucket containing no fewer than 800 of the creatures.

But these New Yorkers—well, faculty members at Columbia’s Mailman School of Public Health—aren’t nearly as subversive, potential car thieves, or eccentric lovers of le上来ome insects. They’re part of a dynamic effort to conquer a debilitating and often terrifying disease: asthma. While asthma hasn’t enjoyed the press and inspired the panic of, say, West Nile encephalitis, it’s far more prevalent and, like encephalitis, it’s potentially fatal—locally, nationally, and worldwide. And it has...
wrought particular devastation in New York City, which
could be viewed as a made-to-order laboratory, for the
talented and determined team of scientists planning the
successful asthma's striking prevalence. Wherever causes asthma (see the box on page 17), the
inhalation environment—what we breathe, in this case, our
air—plays a major role. Even with children, role of the air is
likely but it is largely set off by something in the air. Is
only one factor responsible, or several? What would
happen to patterns of asthma incidence if those factors
were controlled or removed?

No place could be better for investigating these ques-
tions than Columbia's own neighborhood. As The New
York Times reported in a front-page article in the fall of
1999, New York City, as a whole reports high asthma inci-
dence, and the rate of hospitalization for asthma in Har-
lem and the Bronx is 21 times higher than that in the city's
more affluent neighborhoods. Those communities and
their black and Hispanic populations are the focus of
attention for the research team headed by the Mailman
School's Division of Environmental Health Sciences.

Key to the ongoing success of the school's research
efforts, says always lead Joseph Graziano, is community
outreach. "If we had not established this partnership with
the community, our job would be far harder. We have
working partnerships not only with city agencies such as
the Board of Education but with the local school board,
with the community board, with activist groups. Our own
researchers have been instrumental in establishing this
particular relationship.

Part of that relationship is personal. Graziano himself is
one of two asthma researchers among the key investiga-
tors—and he puts it humorously: "we understand the day-
to-day problems. The challenges is proving the causes
of the problems.

"If you think about what air and dust are composed of," he points out, "it's a huge bouquet of substances.
We now believe there are critical periods in develop-
ment—the newborn period, the early childhood period,
perhaps even the months before birth— when exposure to
particular substances, especially certain allergens, may
play critical roles in predisposing to development of
asthma. We're examining exposure to those critical periods.
Certain substances, for instance, may be the
same ones that trigger asthma attacks, and we're
looking at those, as well. This is one of the first efforts to
examine the whole spectrum, both basic causes and trigg-
ers of acute attacks."

The hub of that effort is the Columbus Center for
Joseph Graziano, head of the Mailman School of
Public Health's Division of Environmental Health
Sciences and an asthma sufferer himself, has overseen
the division's efforts to build strong ties to the
community at risk in Morningside Heights,
Harlem, and the Bronx.

Children's Environmental Health (CECH), established
in 1998 with the far-reaching mission of preventing envi-
ronmentally related disease in children. It receives support
from the National Institute of Environmental Health
Science (NIEHS), the Environmental Protection Agency
(EPA), and several foundations. Its patients are the
children of southern Manhattan and the South Bronx. Its
special areas of concern are those low birthweights, cou-
ples with impaired growth and development, unusually
high, and inexplicably rare, locations of childhood can-
cer, and—perhaps most critically—perceived by re-
searchers and residents themselves, causal or
community surveys—the devastating impact of asthma.
Asthma levels in the Columbia study area are startling: In the South Bronx, 17 percent of all children—two of every dozen kids—are asthmatic.

A PIONEERING STUDY

Columbia is the first to take this approach to the examination of multiple threats to infant-child health, says CCC&H director Frederica Perera, who is also principal investigator in the cancer-risk arm of the project. The ambition of the prospective study is testing subjects, will eventually enroll a total cohort of 600 African American and Latino women and their offspring, through prenatal clinics. The babies will be followed from the womb through the first few years of life. Everything will be analyzed and taken into account, says Perera. "We know the individual mother, the other members of her family, her medical status throughout pregnancy. We know the family diet, dynamics, and socioeconomic details. The air in the home is analyzed. Continuing blood sampling and analysis is performed."

"This is a pioneering study," she adds. "There has not been any prior project of this scope and detail. We're examining prenatal and perinatal elements not only through analysis of the home environment but by exposure analysis backed by biomarkers, using blood and other appropriate body subtractions. Reported exposure to environmental tobacco smoke, for example, is being verified by assessment of cotinine levels. (Cotinine, found in the urine, is a biomarker for nicotine exposure.) The coverage in the study, who are between the ages of 18 and 38 and are themselves nonsmokers, must spend a minimal number of hours daily in the home environment, where air and dust samples are repeatedly analyzed; portable air monitors are used to obtain samples of exposures inside the home. And of course their babies' health status is being followed closely from the moment of birth."

While Columbia is well ahead of the game, Perera recognizes the impact. "We—the research community—have been slow in coming to this. There have been many indications that the fetus is very sensitive to toxic exposures. They don't have the same defense mechanisms; they can't repair genetic damage; their immune systems are very immature, just beginning to develop, and so very vulnerable. We really do need to know what's happening during these first few months of life, in this window of susceptibility."

"Yet, until recently, technology lagged. "Only now," she points out, "can we do thorough routine studies. What are the airborne substances under suspicion? Are they the commonly cited air pollutants—the ozone that spoils our summer skies, the oxides of sulfur and nitrogen? We don't know for sure—but it's notable that the levels of these pollutants, with the stricter standards adopted nationwide, have in fact decreased over the same period of time that asthma's prevalence has climbed, an anomaly noted by scientists discussing pediatric asthma at last
spring’s meeting of the American Thoracic Society, the medical arm of the American Lung Association. Involvement of these diminishing gases seems unlikely.

Such familiar pollutants as ozone and oxides are, in any case, routinely monitored by New York State agencies, whose programs include a network of monitors in the CCEH study area, says pollution epidemiologist Patrick Kinney, who heads up the exposure assessment and of the research. Principal suspect in the CCEH studies those tangible contaminants called particulates, which, in their gross, macro form, are the smog and soot that seem to show up just about everything. Particulate matter—known in the trade simply as PM—broadly includes all small airborne solids, ranging in size from visible smokelike effluent to the finest microscopic bits. It’s the latter category that worries pulmonary specialists and public-health researchers, in particular those particles known as PM2.5, that designation denotes those with a diameter of 2.5 microns or less. Larger particles, as irritating as they are, are relatively harmless, since they’re readily trapped, coughed up or blown out of the nose. The smaller particles, though, can easily penetrate the smallest tubes and even the lungs’ smallest passageways. Researchers have repeatedly found these particulates statistically associated with markedly higher risks of disease and death.

"Without question," says Kinney, "the major outdoor threat is diesel exhaust, which includes both particles and organic compounds. It’s been shown to exacerbate allergic reactions in asthma, although we don’t yet know for sure exactly what the effect may be and we don’t understand how it causes trouble. And by the way, these small particulates from outdoor sources readily penetrate indoors, although the primary indoor particulate sources are smoking and cooking." Diesel exhaust is a concern all over New York City, and no sector is totally immune, but it’s a special focus with the Columbia researchers for a particular reason. The main sources, aside from truck routes that lead through the city from north to south, are the city’s own vehicles, which place an inordinate respiratory burden on those who live in the study area.

Patrick Kinney has mobilized teams of local teenage volunteers with backpack monitors to measure the levels of dangerous particle concentrations in the air where city buses and truck traffic is heaviest.

As Kinney notes, "The major sources are the bus depots and the sanitation truck transfer stations. Many of the latter and seven out of eight bus depots are in northern Manhattan. And we’ve recently completed, but haven’t yet published, a study of the streets. Point probe delivery area in the South Bronx; not surprisingly, particle concentrations were highest on the streets with the highest diesel truck traffic. And it’s important to mention that those trucks don’t always follow the designated truck routes, but instead cut through the community’s residential areas."

This was a pilot study, and Kinney’s street-smart crews—consisting in part of the aforementioned teen-age volunteers, keeping an eye on the monitors and checking diesel traffic—will be pursuing the question further in the future. Many of the teenagers, as well as other community volunteers, have been enrolled through Columbia’s community-partner in research, West Harlem Environmental Action (WHEA), a determined band of activists (as seen and quoted Environmental Justice) that has also collaborated with CCEH in education, communication, and public relations efforts.
Asthma

Ginger Chew studies breathable indoor allergens that might contribute to the development of asthma and trigger attacks. Community and research partners are preparing for the next step—removing those elements from homes and schools.

Toxic Homes

Ginger Chew, the cockroach collector, is another key participant in the CCEH’s efforts to reduce indoor allergens. “We’re looking at all the breathables in the home,” she explains. “Anything the mother encounters before the baby’s birth, everything the baby breathes after birth. Many of them are—or may be—allergens, substances that set off the asthma process or trigger attacks: dust mites, clumps of dust, cat dander, jackfruit, and even scents, odors, odors, odors.” Dust mites, incidentally, are ubiquitous microscopic creatures, and their presence doesn’t necessarily reflect actual allergic sensitivity: they reside in soft surfaces—beds, eye chairs, couches—in all of our homes.

Special vacuum equipment collects air and dust samples from study participants’ homes, with particular attention to beds (which harbor many dust mites) and kitchens (for reasons obvious to anyone who cooks) and kids’ clothes and book bags, often carriers of wood allergens from school and other young children’s homes. The samples are then specially prepared in Chew’s laboratory, assayed and analyzed, with assays of allergens levels. In the next stage, the results will be correlated with the study subjects’ blood-level assays of reaction-triggering allergens.

In a second stage, Chew and Kinney will embark on an intervention effort, with severely homes targeted in a determined effort to rid virtually all the indoor environment of allergens, with measures ranging from setting up traps or seating cracks into sprays, which add to the burden of allergen sources, are avoided. The intervention’s goal will be assessed, with new measures and analyses of environmental conditions, blood-levels, and clinical states of the participants.

Finally, says Chew, “We’re looking for funding for an innovative pilot project—looking at levels of allergens in the public schools and determining their association with the development of allergies in general and asthma in particular. That’s never been done—before no one has previously looked at this situation in the New York schools.”

Chew’s most recent arrival on the CCEH team emphasizes the collaborative nature of their work. “I’m impressed with the networking between our school and the community here. In some places, there seems to be a real divide between the school and the community. Here, it’s different. The academic environment isn’t isolated. You really need that community involvement—and that’s the reason for science to help people. And the people in our community take an active part, both as groups and as individuals. When Jean Ford gives a talk at a neighborhood center, parents show up and ask questions.”

Solving a Complex Puzzle

Jean Ford, M.D., is the lead investigator on the CCEH asthma project. He is also chief of pulmonary medicine at Harlem Hospital, head of the Harlem Asthma Research Team (HART), which oversees—-in affiliation with Columbia—under a grant from the National Institutes of Health is a member of the National Heart, Lung, and Blood Institute’s expert panel on asthma management, sits on the board of PFAC, and sometimes finds time to see patients and to give those neighborhood talks.

Ford views the CCEH project as an urgent priority. He observes, “Asthma affects 7 percent of the U.S. popu-
Asthma: Not Just “Panting”

Asthma attacks a pair of essential organs—the lungs. The lungs are a continual hub of vital activity far more complex than the oversize sponges they’re often depicted as resembling. They’re the site of an ongoing exchange: oxygen is delivered to the bloodstream, to be carried to the rest of the body; carbon dioxide and other discards are filtered out. During one 24-hour period, an adult’s lungs process eight to ten thousand liters of blood.

The lungs are also our interface with our environment—internal organs, yet continuously coping with the myriad substances that crowd our atmosphere and enter our bodies with each breath, from dust and pollens to toxic chemicals and infectious agents. Dozens of kinds of specialized lung cells defend us from these assaults.

When the lungs falter, we’re in very serious trouble. Asthma is lung trouble, big time. In its asthmatics, the bronchial tubes—paired conduits that lead from the windpipe in the throat to the smaller tubules deep within the lungs—are constantly subject to inflammation, with attendant swelling and constriction. And asthmatic bronchi are hyperreactive: A variety of encounters and events (they range from the vast array of airborne substances to exercise, stress, and low temperatures) can trigger the terror of a full-blown asthma attack, with heightened inflammation and extreme constriction of the airways.

The word asthma comes from the Greek, and it translates simply as “panting.” That translation is deceptive. Asthma is not mere panting. It is desperate gasping for breath, and it is a threat to life. No one who has ever seen a child experience such an attack will ever forget it.

Asthma is treated in two ways: with regular medications to deter the chronic inflammation that poses the primary threat, and with crisis rescue agents in the case of acute attack. The first category includes bronchodilators and, prominent in recent years, corticosteroids that control inflammatory reactions. Crisis medications may include these and others. Much recent attention in the area of continuing prophylaxis has focused on agents that inhibit or counter substances called leukotrienes, which are formed by the body in the inflammatory process and are now believed to be especially important in the persistence of that process in the airways of those with asthma.

—D.S.
In fact, it’s downright misleading: ‘Is it lack of exercise? Or is that related to the increase in prevalence, or is it that children are spending more time indoors watching TV—and inhaling indoor allergens?’ Has there been a genetic shift in which we’re now afraid of being allergic to junk food but concerned about watching TV? Of course smoking is a concern—but that has probably not increased in recent years. There are theories about lifestyle factors and that is the suspect list here—but why, then, is there so much less asthma in certain developing countries where smoking is even more widely used? And in some developing countries, where the use of pesticides is rising, especially in rural environments, the prevalence of asthma is rising, as well—though not to U.S. levels. In general, teens and Western-style living often seem to parallel an increase in asthma—but not consistently. And in general, in the U.S. at least, the rates of asthma have gone up even as the rates of outdoor air pollution have gone down.’

Ford adds that even the incidence figures must be questioned, to a degree, by the scrupulous researcher: ‘Many patients don’t even come to medical attention. People often self-diagnose and self-prescribe. One story by the Harlem Prevention Center revealed that nearly half of those with distinctly asthma-like symptoms had never been diagnosed by a physician.’

**EDUCATING THE COMMUNITY**

Columbia and the community aren’t waiting for final figures, of course. In addition to the analysis of the study subjects, their children, and their environment indoors and out, a continuing educational intervention effort has been underway, led by CCCHS’s David Evans, who works closely with the ACT executive director Peggie Shepard in a campaign called “Healthy Home—Healthy Child.” A multimedia, multifaceted effort, HHHC encompasses take-home tip sheets (covering health measures from safe pet control and smart eating in the kitchen to smoking), community meetings, audiovisuals, and street fairs and other special events, with continual feedback from focus groups and questionnaires.

It was Evans who, working with the American Lung Association, helped launch the ALS Open Airways for Schools program in New York City’s public schools, with Columbia and the organization working in concert with the city’s Board of Education and Department of Health. The program, now in operation in nearly 700 schools, trains teachers in facilitation to teach risk-through-fifth-graders asthma’s signs and symptoms and treatment basics, and how to recognize a crisis and get adult help for themselves or their children.

Hicks, who teaches at both the School of Public Health and PHS and has an office at Robert Hospital, started the current program not by handing out answers but by asking questions: ‘We began by interviewing 550 women of childbearing age living in one study area to find out what they know, and what they want and need to know about health risks to their kids. Then, after we formulated a tentative list of topics that seemed important, we invited to focus groups involving slightly more than 100 women, to explore their concerns. We told them we wanted to give them information about a safer environment for themselves and their children.’

(continued on page 18)
Asthma

David Evans helped design a campaign called "Healthy Home—Healthy Child," a multifaceted outreach program that organizes community meetings, street fairs, and other special events to educate the community about the dangers of environmental hazards.

"We found," Evans reports, "that the term environment is seen as a broad one. Their concepts include alcohol, street drugs, the people who sell them, rats and roaches, proliferating garbage, lead poisoning, air pollution—not necessarily what we might have originally meant by the word, but all seen as immediate environmental threats to their youngest's health and safety. We incorporated these concerns into our materials, combining community perspectives with the scientists' perspectives."

The result is an approach that takes into account both residents' questions and expectations and the researchers' goals. Pest control, for example—a major concern mentioned by respondents—is covered, but the advice is based on the scientists' good public health approach: engineering what Evans calls "habitat loss" (deny the critters food and shelter by using secure containers, mopping up spills, and so on), rather than introducing further environmental contamination by way of pesticides.

The team is also carefully reaching out to physicians in the community, says Evans. While these doctors may not see themselves as being in need of education, there is a message the CCCHL needs to convey: "Primary care physicians tend to treat asthma as an episodic illness rather than approaching it preventively. We can understand that: Almost everything they see is acute, and they must respond to the need of the moment, especially if a young patient is in a crisis situation. But it's important that they somehow find time to work with the patient and the family on a regular basis, to prevent problems. We've found that often physicians can and do change the way they practice. Remember that they're trained in communication and educational skills, too, so guide their patients; when they change their focus, emphasizing preventive medicine, the patients also get that message and they become a preventive-medicine partnership."

"Partnership" is one word division head Joseph Graziano uses to describe the relationship of the school in general, and his division's research team in particular, with the community of which it is a part; others include "connection" and "rapport." Words that come to mind in conversations with him and his people include: prominently, caring and dedication.

"The community," says Graziano, "has one of the highest asthma death rates in the United States. We need to put our knowledge to work to find out who—and to do something about it. Our close relationship with the community is the key. We feel that we must respond to the community's call for help, that we must use all our skills in tackling this threat to our neighborhood's children. No one should die from asthma.

"Not everyone in our field has this need to become involved," he says. "But look at it this way: What is public health? At its best, it's a kind of democratization view, and you're very much involved, because the community is your patient. Some people have this feeling, and some people don't. I call it the public health heart."
The Demographics of Asthma—and What They Might Mean

Each year, a million and a half Americans experience asthma attacks severe enough to bring them to emergency rooms. Such attacks account for one in six ED visits by children. Additionally, asthma sufferers in the United States number some 17.3 million, according to recent estimates by the Centers for Disease Control and Prevention (CDC). Five thousand Americans die of asthma each year.

For the past two to three decades, the numbers have been rising, and no one is sure why.

And, while asthma affects people of all ages and more, the numbers have been rising disproportionately in some places and among some groups; no one is certain why that's so, either.

Figures are not quite up to date, and they can only be estimates, since asthma—unlike such highly contagious infections as tuberculosis, AIDS, and venereal diseases—is not an officially reportable disease; with non-reportable conditions, extrapolations must be made on the basis of such factors as hospitalizations and ED visits, demands on drugs, school and work absence records, broad population (self-report) surveys, and so on. But according to the CDC, the U.S. prevalence rate for asthma rose by 7 percent during the 1980s and early 1990s—among children under age four, by an astonishing 160 percent.

The change has been evident in all sections of the country and all parts of the population, and asthma is peculiar to no racial or ethnic group; while it is statistically more prevalent in African American children than in white children, the difference, says the National Institute of Allergy and Infectious Disease, is slight.

In fact, some recent data suggest that the overall prevalence of asthma among white Americans may be higher than heretofore assumed. A study in the state of Washington, published by the CDC in late 1999, found 10.8 percent of respondents in that state reporting having, or having had, asthma, the state's African American population is a mere 3.1 percent, barely a quarter of the national proportion of 12 percent.

Whatever the actual prevalence of asthma, the seriousness of the threat has certainly not been an equal-opportunity affair among all Americans. Hospitalizations related to asthma are consistently higher among blacks and Hispanics as compared to non-Hispanic whites, among people (all ages) in the northeast (but only slightly), and—not unexpectedly—among very small children; by the late 1990s, a disproportionate—impact was beginning to be noticed among over-represented Asian American population, as well. The highest incidence is in the core neighborhoods of our larger urban centers. And the highest asthma mortality rates of all are in New York City.

What do the population figures mean? Are some races or ethnic groups more susceptible to acute asthma attack than others? Is there a hereditary factor? Certainly there is a hyper-reactivity element—the common term is allergy. Asthma patients react—with rapid clogging and rising constriction of the bronchial tubes, with wheezing and frantic gargling for air—to substances that have no or little effect on non-allergic. Allergies, or predispositions to allergies, are clearly inherited (though not in the classic Mendelian pattern diagrammed in high school biology texts).

Indeed, studies have shown what physicians call "familial clustering"—evidence of asthma, possible asthma, or a history of at least some asthma-like symptoms—in close relatives of asthma patients. And it's not just a matter of respiratory allergies generally, although it's well known that such hypersensitivities run in families. A Harvard study published in 1998 compared asthmatic parents and kids with families in which parents suffered from ordinary, garden-variety allergies. Result: the odds of a child's having asthma were three times higher if one parent had asthma, six times greater if both parents were asthmatic.

"Yet scientists are more and more inclined to believe that, aside who you are (family, race) may play a part, what you do and where you live may play far more significant roles". Specializations have, postulated rates for factors ranging from city size and too many (or too few) childhood infections to junk food and use of computers that we are all, talking about the kids. The most significant factor of all may be the air you breathe, both indoors and out. The ethnic groups with the highest incidence are chiefly city dwellers. Even within broad ethnic groups, noted differences—again, particularly in acute attack data—may be suggestive. Asthma mortality rates, for example, are markedly higher among Hispanics from the Caribbean, the rate among Puerto Ricans is approximately four and one half times that of African Americans.

Part of the observed familial pattern, then, may in fact be due not to shared genes but to shared geography—among extended families, as well as among homogeneous ethnic groups. The Harvard researchers, in the study cited above, found that in youngsters under the age of five, kids' risk of asthma was significantly higher, in one-parent-with-asthma families, if that parent was the mother—with whom, of course, most children that age typically share far more time (and more of the same air).

And perhaps because hyper-reactivity depends on prior sensitization, an important part may even be played by the air those youngsters' mothers breathed even before the children were born.

—D.S.