Yale Scientist Suggests Correlation Between Car Density and Cancer Deaths

Sven Martson

Senior Research Associate Leon Robertson has determined that the high density of motor vehicles in American cities may contribute to increased cancer deaths.

The rate of deaths from cancer in cities may be directly related to the density of motor vehicles in the urban area, according to a recent study by Leon S. Robertson, Senior Research Associate at Yale University's Center for Health Studies at the Institute for Social and Policy Studies.

The study, which was published in a recent issue of *Environmental Health Perspectives,* statistically analyzed data from the 98 largest cities in the country, including New Haven, Hartford and Bridgeport. It determined that age-adjusted cancer mortality was higher, on average, in cities which had more motor vehicles—and therefore more carcinogenic hydrocarbon emissions—per square mile. By comparing the number of motor vehicles registered in the various test cities in 1960 and correlating that with the number of cancer deaths in 1970, Mr. Robertson found that for every 1,000 more motor vehicles per square mile in one city than another, there were five more cancer deaths per 100,000 people 10 years later.

The 14 cities with the highest annual age-adjusted cancer mortality rates—between 200 and 211 deaths per 100,000—are: Gary, Indiana; Baltimore, Maryland; Cincinnati, Ohio; Birmingham, Alabama; New Orleans, Louisiana; Washington, D.C.; Cleveland, Ohio; Chattanooga, Tennessee; Jersey City, New Jersey; Buffalo, New York; Columbus, Ohio; Albany, New York; Fort Wayne, Indiana; and Providence, Rhode Island. New Haven is in the top one-third of the list with an annual mortality rate of 175 per 100,000. These high cancer rates reflect not only high concentrations of motor vehicles but also the effects of other cancer correlates studied in this research.

Mr. Robertson came to Yale in 1978 from the Insurance Institute for Highway Safety in Washington, D.C., specifically to explore causes of cancer. The Center for Health Studies is an organization of scholars and researchers from a variety of fields who look primarily at the social factors that contribute to injury and disease, and analyze public and legislative means of prevention.

Mr. Robertson's research, which was funded by grants from the Kaiser Foundation and the National Cancer Institute, began as an attempt to determine why there were large variations in cancer mortality rates between rural and urban areas and between different cities. Studies had been done before on the effects of road dust on cancer in rats, but no similar work has been done on this scale before. Gathering data from government and scientific documents in the University's libraries, Mr. Robertson selected 41 factors that seemed related to cancer rates—factors such as population density, climate, industrialization, air and water pollution. When he fed these factors into a computer to determine those with the strongest correlation, the computer selected seven which accounted for 51% of the differences between cities: motor vehicle density, length of residence in the city, amount of industrialization, quantities of barium, bicarbonate and sodium in the water supply, and climate.

The density of motor vehicles had by far the strongest correlation with the cancer rate. "I got the car registrations for the cities, and it all just fell out very nicely," says Mr. Robertson.

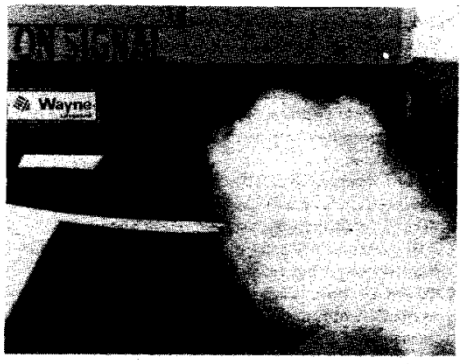
He devised an equation which weighted the effect of each of the seven factors and allowed him to isolate the motor vehicle density figure. "Unless you can control simultaneously for a number of things, you can be misled," he says. "You won't know how much each factor is really contributing to the result."

He solved the equation, leaving out the vehicle density figure, and then compared the result, a prediction of the number of cancer deaths in each city, with actual census figures. The difference between the two, known as the "residual," represents the number of deaths related exclusively to motor vehicle density. When Mr. Robertson plotted this residual against age-corrected cancer mortality rates in each of his 98 cities, he found a strong relationship. Then, to make sure the important factor was vehicle density and not just population, the Yale researcher plotted population density against cancer and against motor vehicle density. The cancer rate does not continue to rise with increasing population, but it does continue to rise with increasing motor vehicle density.

"Researchers don't usually do the residual calculation. To me, it's much stronger evidence that it's the cars, and not some other correlate of population density, which cause cancer," Mr. Robertson says. And, in his study he states, "It is suggested that population density affects motor vehicle density which, in turn, affects cancer. Motor vehicles appear to be a substantial part of the 'urban factor' in cancer."

Mr. Robertson's research comes at a time when several states, including Connecticut and New York, are facing the issue of motor vehicle inspections to ensure that emissions remain within federally set limits. And, according to the Yale researcher, if the correlation between motor vehicles and cancer is correct, the U.S. Department of Transportation's estimates that carcinogenic hydrocarbon emissions will be cut by 85% by 1990 should significantly decrease cancer mortality, provided that an effective inspection system can be instituted.

In the future, when new census data become available, Mr. Robertson hopes to correlate better measurements of air pollution, obtained in recent years, to cancer mortality rates in 1980.



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Pollutants expelled by motor vehicles, such as this bus, become a significant cause of cancer in areas of high vehicle density, according to Robertson's study.

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Research Links Cars and Cancer

Epidemiologist Sees an Alarming Consequence of Traffic Density

By ALLAN PARACHINI, *Times Staff Writer*

Think back for a moment to the 1960s, a decade that was, among other things, a boom time for automobile companies, whose block-long yachtlike products flooded highways and parking lots like water from a burst dam.

Nowhere was this event more publicized than in Southern California. In Los Angeles County, motor-vehicle registrations jumped from 3.3 million in 1960 to 4.6 million a decade later. Put another way, the concentration of cars increased from 761 per square mile in the county to 1,069.

Now, says a medical researcher at Yale University, there appears to be an unanticipated consequence to stuffing all these additional cars into not only Los Angeles County but dozens—and perhaps hundreds—of other communities nationwide.

For every 1,000 cars added to the densities of these communities in the 1960s, says epidemiologist Leon Robertson, five additional people for every 100,000 of population have died as a result of the pollution they cause.

The same thing will probably be true of many of the cars bought in the 1970s, Robertson says, though it will be a decade before it is known if pollution-control devices that became mandatory on autos actually have—as they should—cut emissions.

But for the moment, vehicle emissions hang over American cities like a death cloud, part,

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Robertson says, of a cancerous complex of lethal factors in the urban environment.

Medically, this kind of research is most accurately described as risky business. Except for cigarette smoking, unquestionably identified as a direct cause of cancers of many different organs and not just the lungs, few environmental factors have been positively fingered as actually cancerous.

This is because, Robertson and other experts say, cancers often don't appear until 10 to 15 years after first exposure to what may cause them. Because making a positive association is so difficult—not to mention frequently controversial—many researchers tend to avoid the field.

Not Robertson.

About two years ago, he decided to embark on what is, in terms of his field, a Herculean endeavor. He got research money from the National Cancer Institute and the Kaiser Foundation to examine the relationship between cancer deaths in 98 American cities and such other, different variables as the amount of migration into and out of the communities, the proportion of adults employed in basic industry there, the levels of barium, bicarbonate and sodium in the drinking water, seasonal temperature levels and, finally, the concentrations of motor vehicles.

"Epidemiological research in cancer is among the most difficult (fields) because of the time lag after exposure," Robertson said. "It's especially difficult when you're dealing with a nonspecific thing like stuff that's in the air.

"It's easier (to do this kind of research) in the workplace, where everything is concentrated and measurable, than to try to study a more general exposure. A lot of epidemiologists just don't like this kind of ecologic study."

Both the National Cancer Institute and the California Air Resources Board—both agencies officially curious about any link between motor vehicles and cancer—agree that research in the field, so far, has led to tenuous conclusions, at best.

Robertson knew that the case he would build probably would amount to identification of nothing more positive than circumstantial evidence.

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Nonetheless, he started gathering data from his target cities and feeding the information to his computer

Measurements and estimates came from such cities as Birmingham, Ala., Phoenix, Fresno, Los Angeles, Oakland, San Francisco, Denver, Hartford, Conn., Washington, D.C., Miami, Atlanta, Chicago, Gary, Ind., Topeka, Kan., Baltimore, Boston, St. Louis, Minneapolis, Newark, New York, Cleveland, Erie, Pa., Nashville, Dallas, Seattle, Milwaukee and a few communities as removed from routine medical inquiry as Lincoln, Neb., and Yonkers, N.Y.

Robertson obtained cancer-death-rate data for each city, as well, getting the computer to look for evidence of relationships between environmental factors quantified starting in 1960 and cancer mortality 10 years later.

What Robertson found was a trend identified in a handful of earlier studies on three different continents but never fully documented. Of all the factors Robertson studied, motor-vehicle concentration appeared to be the most significant.

When results of his study were published in November of 1980, Robertson reported that in the 10-year period from 1960 to 1970, "for every 1,000 more motor vehicles per square mile in a city relative to the others in 1960, there were about five more cancer deaths per 100,000 population in 1970," taking all of the other environmental factors into account.

That is not to say, Robertson emphasized, that vehicle pollution is the biggest cancer killer in cities. Direct exposure to carcinogens at work, and smoking—both factors

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that were not included in his study of the more subtle environmental meld—probably are more directly responsible for significant numbers of deaths, Robertson said.

The interrelationship of the factors is subtle. Los Angeles, for instance, with an estimated city—as opposed to county—vehicle concentration of 2,850 per square mile, had an estimated 1970 city cancer death rate of 170 per 100,000 population. Southern California's warm climate and the comparatively low percentage—9.6—of adult employment in basic industry apparently affected the rate.

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Washington, D.C., where almost no one works in basic industry—1.7%—had a higher cancer rate, 206, and a far higher concentration of cars. That was estimated by Robertson at 4,234.

The vehicle estimates attempt to take into account the reality that any given city may have a vehicle concentration far higher than car registrations might indicate, because of commuter and tourist traffic. Miami, with an estimated 5,462 vehicles per square mile—has a cancer rate of 196, with only 2.9% of the population employed in basic industry.

Chicago's car concentration is lower than Miami's—4,464—but 21.4% of adults work in industry. Chicago's cancer rate was estimated at 191. Gary, Ind., with few cars—1,701 per square mile—but enormous steel works and a cold climate, had a cancer death rate of 211, according to Robertson's figures.

Robertson found some reason for optimism, even though his data fingered the motor vehicle—a commodity that is unlikely to disappear from the urban scene.

He said that though city auto populations are unlikely to shrink—though in Los Angeles, like other cities, they have begun to level off—increasingly effective pollution devices added to cars in the last few years will start to measurably decrease the cancer responsibility of autos in the next 15 years.

Hydrocarbon Emissions

Potentially, Robertson said, big drops in vehicle-caused cancer could happen this way: the U.S. Department of Transportation estimates that, by 1990, hydrocarbon emissions from vehicles—the key exhaust ingredient tagged as carcinogenic—may decrease by 85%, compared to their levels before devices were strictly required in 1972.

That means, Robertson said, that during the decade of the 1990s, there should be a payoff from the effective pollution control, as people exposed to emissions age in an era in which the worst-polluting vehicles from the '60s and early '70s largely have been retired from service. It is, however, Robertson concedes, a rather long time to wait.

The outcome for the mid- to late 1990s could be different, however, Robertson warned. He said that if large numbers of pollution devices on today's and tomorrow's cars are tampered with, vehicle cancer rates will continue to rise, unnecessarily.

While it is uncertain how many devices such as catalytic converters are being secretly disconnected, Robertson said that the number of vehicle owners tinkering with their pollution systems—with the shortsighted goal of increasing performance—is possibly quite large. During the 1970 gasoline shortage, huge numbers of cars are thought to have used leaded gasoline instead of unleaded—a practice that may have ruined the effectiveness of catalytic converters.

The totality of smog may be amorphous for these car owners, Robertson says. Cancer should not be.

All of these observations depend, Robertson concedes, on the assumption that his belief that there is a strong connection between urban motor-vehicle pollution and cancer deaths is accurate. He concedes the evidence is not yet in the category of the aphoristic smoking pistol.

"The circumstantial evidence is very good," Robertson said, "and when you put all the circumstantial evidence together, you have reasonable evidence, but certainly not absolute proof."

Robertson's work was published in a journal called Environmental Health Perspectives, published by the federal government's National Institute of Environmental Health Sciences.

While "circumstantial evidence" may be the most apt description of Robertson's work and while it may have been generally overlooked in the popular press, it nevertheless follows a variety of earlier—and equally ignored—research studies. All have been tentative and many of those have been equivocal.

In 1977, for instance, researchers in Switzerland reported that they had surveyed pollution and its effects near roadways of a small Swiss mountain village. They discovered an apparent relationship between traffic on the village's main highway and high levels of hydrocarbons in soil.

The result, reported the team, "indirectly suggests" a relationship between automobile traffic and cancer mortality

Ambiguous Results

In June of this year, a Seattle researcher reported that a survey exploring the possible relationship between the amount of traffic on streets where cancer victims lived and their disease had yielded ambiguous results.

But Lincoln Polissar, a biostatistician at the Fred Hutchinson Cancer Research Center, said that while the results—which showed a slightly higher cancer incidence in women that may have been traffic volume-ralated—were inconclusive, the suspicion is logical, though incredibly difficult to prove conclusively.

There has been more research on the more specialized question of the cancer effect of diesel exhaust. Several studies in the last five years have explored the suspicion. A summary of one such study concluded that the evidence "is suggestive," but that "the existing data are sparse and contradictory."

Indicative of the problems of this work is a study conducted in Nagoya, Japan, and published in 1977. Researchers tried to establish a link between traffic jams in Nagoya, which had begun 15 years before, and cancer. But lag times between exposure and onset of cancer and a host of other subtle variables played havoc with the research, which turned out to be inconclusive.

"It makes sense, but it's not yet established," said a National Cancer Institute spokesman.

The American Medical Assn.'s Council on Scientific Affairs has gone even further in expressing doubt.

Two months ago, the council cast aspersions on the entire field of environmental cancer research, expressing doubt about the quality of the science involved. The criticism focused primarily on testing to identify carcinogenic substances in food and in the workplace.

Robertson, however, is resolute. The cancer epidemiologist, in his perception, plays the role of a lonesome sentinel with better vision than anyone in the town he is protecting. His warnings are questioned or ignored, often until it is too late.

He sees three major options: better mass transportation; tamper-proof pollution devices or effective persuasion of a public wont to tinker with the equipment, or reduced use of cars.

It galls Robertson that the commuter bus service he uses to get to work at Yale recently upped its fares by 80%, and that leaded gasoline is still cheaper than unleaded—a stupid temptation, he says, for motorists to cut short-term fuel costs and increase the prospect they may die of lead-related pollution.

"One thing that this points out," he said reflectively, "is that perhaps you don't need to wait for all of the evidence before you do something about it."

Scientist Calls Auto Fumes Cancer Cause

By STEVE GRANT

A Yale University scientist said Wednesday his research has led him to conclude that auto exhaust is an important contributor to cancer deaths, and he urged federal environmental control officials to ensure that Connecticut reduces that pollution promptly.

Leon S. Robertson of Yale's Center for Health Studies said his work, which involved auto and health statistics from 98 cities, including three in Connecticut, was the first conducted on a scale broad enough to suggest that auto emissions are significant in increasing the number of deaths from cancer.

But the federal officials were told by the General Assembly's Transportation Committee House chairman, Rep. Thom Serrani, D-Stamford, that a key element of a Connecticut plan to reduce auto exhaust and other kinds of air pollution could be weakened by poor enforcement.

Serrani spoke in Hartford at a hearing held by the federal Environmental Protection Agency, which asked for public comment on its proposed approval of the Connecticut plan.

He urged the EPA to make some provision to ensure that Connecticut's planned auto inspection and maintenance program works efficiently so that pollution levels actually will drop as Connecticut's plan promises.

In other testimony Wednesday, a spokesman for a highway construction group called the plan costly and unnecessary, while a mass transit advocate said the state's plan was too weak to be effective.

Federal law requires Connecticut to produce a plan demonstrating how it will meet federal air pollution laws by 1987 at the latest. The emissions testing program is one of the major steps Connecticut plans to take to reduce ozone pollution, which results in part from auto emissions.

Serrani said legislators at first expected the inspection program to be tied to motor vehicle registrations, with a requirement for yearly proof that emissions control equipment is working properly before a vehicle's registration is renewed.

But he said he was not sure that state agencies that would carry out the program would do that, especially since the legislature this year decided to have cars registered every two years instead of yearly.

Instead, motorists might be required only to post a sticker on a car to show it had been tested, Serrani said, The problem with that system is that enforcement would be left to police, and police historically have not enforced strictly laws against noise pollution or littering, he said. Therefore, he said, some people would ignore the testing law and pollution would not drop as projected.

COURANT PHOTO BY JOSEPH CANNATA JR

Charlotte Kitowski of West Hartford, a proponent of mass transit development testifies from a wheelchair at a federal hearing Wednesday on a state plan to clean up air pollution. Mrs. Kitowski, injured when her car was struck by another recently, was allowed to leave Hartford Hospital briefly to testify at the State Capitol. She complained of state plans for new highways and called for increased rail service. Holding the microphone is her daughter, Kathy.

Robertson told the officials that the emissions testing program was an important way to reduce emissions and that continued delay in implementing such programs increases the risk of cancer for all persons who live or work in Connecticut cities. The Connecticut program has been delayed several times.

Robertson estimated that auto exhaust levels today will lead to 100 more cancer deaths in Hartford, New Haven and Bridgeport 10 years from now.

He said he had considered 41 possible environmental cancer causes as part of his research, which was supported by grants from the National Cancer Institute and the Kaiser Foundation.

A representative of the state's highway builders, however, testified that it was "clear from the scientific evidence that the quality of Connecticut's outdoor air does not pose a hazard to health" and that there is no link between air pollution and chronic lung diseases or respiratory health.

Arnold L. Beizer of the Connecticut Construction Industries Association Inc. said his organization believes the steps Connecticut plans to take to clean up its air are too expensive and are unnecessary because there is no threat to public health. But Beizer said, reluctantly, that he would not oppose approval of the plan, because approval is needed before certain kinds of contruction can begin.

In testimony prepared for the hearing, Thomas J. Godar, director of the section of pulmonary disease at St. Francis Hospital and Medical Center in Hartford, said he expected the highway interests to make that claim, and he filed several reports that he said showed that ozone pollution affected not only adults but also children.

Charlotte Kitowski of West Hartford, an advocate of increased mass transit as a way to reduce air pollution, said the state plan was watered down so much it was useless. She complained that it calls for more highway building, when money should be spent to implement rail service between Hartford and Waterbury, Manchester, Middletown and Windsor Locks.