

A P R O J E C T T E A C H A C T I V I T Y

Community representatives and staff from several agencies have been collaborating on the health study since it began in 1986. The study was undertaken to assess health outcomes as a function of crude distance from the Lipari Landfill. Governor Kean's FY '87 initiative, Project TEACH (Team for the Evaluation and Assessment of Community Health) was developed in part from the lessons learned in the communication of this health study. The purpose of Project TEACH is to enhance the Department of Health's efforts to respond to community health concerns.

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Upon compiling the data, the New Jersey State Department of Health (NJDOH) felt that a responsible public health process would entail involving the community in appointing an outside review panel which would evaluate the study methods, results, and provide comments regarding recommendations for further efforts to address community needs.

The Panel met with NJDOH study staff on January 11, 1989. A report was prepared by the Panel as a result of that meeting and the commitment made to the Lipari Health Subcommittee. Many of the specific suggestions for data presentation or interpretation made by the Panel, as well as a copy of the Review Panel's written Consensus Statement have been incorporated into the printing of the Report. A spokesperson, selected by the Panel to represent this consensus, will be present during a presentation to the community on February 2, 1989.

CITIZENS' GUIDE TO THE 1989 LIPARI HEALTH REPORT

WHY WAS THIS STUDY DONE ?

This study was done by the New Jersey Department of Health (NJDOH) at the request of the Pitman Alcyon Lake-Lipari Landfill Community Association (PALLCA). PALLCA was set up by a group of local citizens concerned about the health effects of living near the landfill. The landfill began operating in 1958 and ended in 1971 because of neighboring residents' complaints regarding odors, respiratory problems, headaches, nausea and dying vegetation. The NJDOH met with PALLCA in February of 1986 and discussed ways in which community health concerns could be addressed. The Lipari Health Subcommittee determined that the outcomes studied would be cancer and birthweight. Birth certificates and the state cancer registry records, both of which are compiled statewide by the NJDOH, were accessible for this study.

WHAT ARE THE FINDINGS ?

The study examined the number and new cases of many types of cancer, that occurred from 1980-1984 in individuals living around the landfill.

Several types of cancer that might be related to toxic chemical exposures were examined. The rates for most of these, including respiratory cancer, in the four municipalities surrounding the landfill were found to be low when compared with statewide rates. However, there is a slight increase in the number of cases of leukemia (cancer of the blood forming organs) for those living near the landfill. Because of limited information available on individual exposures, this finding is not scientifically conclusive as to whether there is an actual relationship between leukemia and living near the landfill.

The study also examined the weight of infants at birth. Birth records from three five-year periods were examined (1961-1965, 1971-1975, 1981-1985). A lower average birthweight (about 2 1/2 ounces) was found. A higher proportion of infants born after a usual nine month pregnancy weighed less than 5 1/2 pounds (considered to be low birthweight). This was found among infants born to families living close to the landfill during the period of 1971-1975.

WHAT DO THESE FINDINGS MEAN ?

These findings suggest that the most adverse health effects occurred during the 1970's, when exposures to hazardous substances were probably the heaviest. We know that certain hazardous chemicals were present in the landfill but it was not possible in this study to determine an individual's exposure to them. Most cancers have a long latency period (the time between exposure and the onset of symptoms). The latency period for cancer may be as short as a few years or as long as decades. The time period of the study was too short (1969-1984) from the period of probable exposure for most cancers to show up. Given this, it is possible that more cancer cases may occur later. Even though it may not become clear whether any are related to exposure, it may be necessary to closely monitor new cases of cancer over time.

Women giving birth between 1961-1965 probably had little or no exposure to hazardous materials from the site. Those giving birth between 1971-1975 may have been exposed during their pregnancies. Although those giving birth between 1981-1985 were probably not highly exposed during their pregnancies, they may have come in contact with toxic substances from the site at an earlier time.

It is very difficult to determine past individual exposure from the landfill over time. Also, other factors such as personal lifestyle, occupation, prenatal care, maternal health, and socioeconomic status are known to influence health outcomes but could not be studied from existing records.

WHAT IS BEING DONE TO PROTECT THE COMMUNITY AGAINST POSSIBLE EXPOSURE FROM THE SITE ?

The highest exposures are thought to have occurred in the past. Since 1982, Phase I has been initiated by the United States Environmental Protection Agency (USEPA). Clean-up during this phase, has included several activities designed to decrease exposure. These activities include the installation of a chain link fence, a slurry cutoff wall and membrane cap to limit movement of contaminants from the site, gas vents, and surface water runoff controls. The second step, Phase II, plans to clean the landfill by building an on site treatment center for the purpose of removing water-transportable contaminants present within the contained area. The third step, Phase III, off site cleanup, is designed to permanently remove landfill related contaminants in the adjacent off-site areas, including Chestnut Branch Marsh and Alcyon Lake. The New Jersey Department of Environmental Protection (NJDEP) has assisted the USEPA in planning these activities.

WHAT ARE THE FUTURE PLANS OF THE NEW JERSEY DEPARTMENT OF HEALTH ?

The NJDOH will continue to collaborate with the community in defining future activities related to this study. The NJDOH will continue monitoring the incidence of cancer and low birthweight in the four communities and municipalities around the site.

WHO WAS INVOLVED IN THIS STUDY ?

The Lipari Health Subcommittee consists of the following: Pitman Alcyon Lake-Lipari Landfill Community Association (PALLCA), New Jersey Department of Health (NJDOH) Environmental Health Services (EHS), United States Centers for Disease Control (CDC), Gloucester County Health Department, the Pitman Environmental Commission and the Pitman and Mantua Boards' of Health. The United States Environmental Protection Agency (USEPA), and the New Jersey Department of Environmental Protection (NJDEP), although not part of the Health Subcommittee, did provide assistance as needed.

WHOM CAN I CALL IF I HAVE HEALTH QUESTIONS ?

We suggest that you inform your personal physician during a routine office visit or checkup that you live near or around the landfill. Any health questions regarding the Lipari landfill will be addressed by the NJDOH staff at 609-633-2043.

EXECUTIVE SUMMARY

An epidemiological study of adverse health effects from potential chemical exposures related to Lipari Landfill in Gloucester County was conducted from 1986 to 1988 through the collaboration of the following: representatives from four adjacent communities (Glassboro, Pitman, Harrison and Mantua), local government agencies and the Environmental Health Service (EHS) of the New Jersey Department of Health (NJDOH). The health status of the community was assessed using the following existing records: birth records between 1960 and 1985 and cancer registry data from 1980 to 1984. This report provides the background and history of the site and the concerns of the four communities and presents the findings and recommendations resulting from the collaborative epidemiologic study conducted around Lipari.

The Lipari Landfill, located in Mantua and bordering Pitman, Glassboro and Harrison, is ranked number one on the United States Environmental Protection Agency's (USEPA) National Priorities List (NPL). The landfill was the source of hazardous leachate which had migrated from the landfill into two nearby streams and a lake in the vicinity of residences, schools and playgrounds. Operation of the landfill began in 1958 and ended in 1971 because of residents' complaints regarding odors, respiratory problems, headaches, nausea and dying vegetation. Although the nature and quantity of the wastes that were received at the landfill are not known due to inadequate maintenance of records, numerous chemicals have been identified at the site. The finding of bis(2-chloroethyl) ether (BCEE), a known animal carcinogen and

suspected human carcinogen, was of particular environmental and public health concern. Other carcinogens identified include benzene, methylene chloride and arsenic. Pitman residents living in a nearby housing development had the highest potential for exposure, because hazardous leachate flowed into a stream behind the development for many years prior to remediation. The primary route of potential human exposure to the contaminated leachate was inhalation of contaminated ambient air. Exposure to landfill contaminants via drinking water probably did not occur, largely because most residents use public wells which have remained unaffected.

LIPARI HEALTH SUBCOMMITTEE

In June of 1985 the Pitman Alcyon Lake Lipari Landfill Community Association (PALLCA) was formed by a group of active local residents and community officials who were concerned with the possible health effects from the landfill on the four surrounding communities. They organized in order to crystallize attention and gain help from county, state and federal agencies. The Lipari Health Committee, consisting of representatives from the Centers for Disease Control (CDC) and the Agency for Toxic Substance and Disease Registry (ATSDR), USEPA (Region II), New Jersey Department of Environmental Protection (NJDEP), NJDOH, Gloucester County Health Department (GCHD) and the four communities, was called into existence in January 1986 at the request of PALLCA. Subsequently, a subcommittee to evaluate specific health-related issues was requested and the Lipari Health Subcommittee was formed in February, 1986. The Health Subcommittee consists of representatives from CDC, GCHD, NJDOH EHS, the Pitman Environmental Commission, PALLCA and Pitman

and Mantua Boards of Health. The USEPA and NJDEP, although not part of the Health Subcommittee provided assistance as needed. The Lipari Health Committee was formed [1] to keep the community informed of planned activities and their results and [2] to answer questions relating to health effects of potential exposure to chemicals from the landfill. The objectives of the Lipari Health Subcommittee included [1] to provide a forum for the public to express their health concerns to local, state and federal agencies, [2] to promote a common understanding of these concerns among all interested parties and [3] to explore how health concerns could be best addressed with available techniques. The Subcommittee met on a regular basis in an effort to keep the affected community informed about study activities and findings.

The Subcommittee decided that the possibility of exposure to toxic chemicals from the landfill warranted studies to determine if any measurable health impact had occurred. The public had been especially concerned with respiratory cancer and birth defects and requested that an exposure registry be created as a first priority. EHS presented the advantages of using existing State databases, rather than building new ones, to the rest of the Subcommittee, which agreed with this approach and chose to study [1] birth certificate data for low birthweight and [2] cancer registry data for selected cancer outcomes for evidence of exposure-related health effects. The EHS agreed to conduct the study of cancer and birthweight databases with the active participation of the other groups represented by the Subcommittee.

Although there was strong community interest in birth defects and spontaneous abortions, the existing data which were collected and reviewed

were of inconsistent quality and/or not easily accessible, which precluded their inclusion in the study. Other possible health endpoints, such as neurological or other medical problems, could not be studied due to the absence of any existing databases.

EXPOSURE ASSESSMENT

No quantitative estimates of air contaminants are available for the years prior to 1984. Meteorologic data were consistent with expectations that homes closest to the site were likely to have the most affected ambient air, in that the wind blew predominantly north to northwesterly in the winter (toward the homes), and in a south to southwesterly direction (toward unoccupied orchards and farmland) in the summer. Since inhalation is the most probable route of exposure for residents in this area, radial distance from the landfill source was chosen as a surrogate indicator of exposure. The rationale for this was the premise that as distance increases, air contaminant concentrations decrease. The putative population at risk was encompassed by two concentric rings around the source with radii of 1.0 (Area 1) and 2.5 kilometers (Area 2), creating two exposure groups. Those residents living beyond 2.5 kilometers, but still inside township borders, comprised a third group (Area 3). Wherever internal comparisons were made in the study, a relatively "exposed" group (Area 1) was compared to a relatively "unexposed" group (Areas 2 & 3). Where New Jersey statewide rates were used for comparison, Areas 1, 2, and 3 were considered cumulatively.

DATA COLLECTION AND ANALYSIS

CANCER

Information on cancer was obtained from all available cancer incidence data (New Jersey Cancer Registry data, 1980-1984) allowing for a latency period of approximately 15 years. Although this is sufficient for short latency cancers such as leukemia, many cancers (e.g. lung cancer) are thought to take longer than 15 years to develop after initiation of exposure. Nevertheless, cancer incidence in the study areas relative to expectations of cancers (based on cancer rates found in the entire state) were calculated for the high and low exposure groups in the form of Standardized Incidence Ratios (SIRs). Total cancer and nine site-specific cancers were evaluated for each study area designation; three of these were statistically significantly lower than expected and none were significantly elevated based on comparison with the average New Jersey rates.

In the area closest to the dump site, the highest but not statistically significant SIR was for leukemia [SIR = 1.97, 95% Confidence Interval (CI) = 0.72, 4.29]. This ratio was based on six observed cases, compared to 3.044 expected. Leukemia, a cancer with the shortest time between exposure and effect of all the cancer types examined, might be expected to have the highest rate if exposure-related carcinogenesis were occurring. The absence of important information on factors that may affect the rate (including migration patterns of residents, utilization of health care services out-of-state, and lifestyle risk factors) weakens the evaluation of these results. This, in addition to the short fifteen-year lag between onset of exposure and evaluation of cancer outcomes, makes it necessary to continue

surveillance and to conduct follow-up studies should any new cancer patterns become apparent.

LOW BIRTHWEIGHT

Low birthweight is a known risk factor for health problems in early life, and low birthweight is also believed by environmental health scientists to be a plausible indicator of health effects which may be due to exposure to toxic substances. Birth certificates were collected for children born during the first five years of the 1960's, 1970's and 1980's respectively. Due to few births among non-whites, only white births could be analyzed. The birth certificates did not provide information on several very important predictors of birthweight such as smoking, height and weight of the mother, maternal illnesses, parental occupation, socioeconomic status and drinking habits. Therefore, these factors could not be included in the study, and a spurious result may have occurred due to the impact of one or more of these unmeasured factors. In all analyses, statistical adjustments were made for the following factors available on the birth certificate: sex and gestational age of the child, maternal age, education, parity and prenatal care, previous stillborns and complications during pregnancy.

During the period 1961-65, when exposure from the site was probably minimal, if at all, there was no statistically significant ($p > 0.10$) difference between the two areas (Area 1 versus Areas 2 & 3 combined) on average birthweight. Differences between the two areas in proportions of low birthweight were not consistent across the sexes.

However, in the 1970's, when exposure may have been heaviest, average birthweights for both births over 27 weeks of gestation and for term births (38 - 42 weeks gestation) in Area 1 were lower (about 66 and 74 grams or 2.3 and 2.5 ounces respectively) than average birthweights in Areas 2 & 3. These results were statistically significant ($p < 0.05$ in the multiple regressions) and are consistent with the hypothesis that exposure to contaminants from the site is associated with lower average birthweight. In addition, a higher proportion of low birthweight babies occurred both among births over 27 weeks of gestation and among term births in Area 1 than in Areas 2 & 3 (OR = 1.6, 90% CI = 1.0, 2.6; OR = 2.0, 90% CI = 1.1, 4.0 respectively), consistent with the hypothesis that exposure to contaminants from the site is associated with low birthweight when other potential risk factors are controlled.

In the 1980's, conflicting results occurred among male and female term babies. For example, among term births, males in Area 1 had an average 47 grams (1.7 ounces) lower birthweight than in Areas 2 & 3, but females in Area 1 had an average 76 grams (2.7 ounces) higher birthweight than in Areas 2 & 3. Area 1 compared to Areas 2 & 3 had higher proportions of low birthweight among males born over 27 weeks gestation (OR = 2.2, 90% CI = 1.1, 4.2) and among term births (OR = 1.7, 90% CI = 0.7, 3.8) but not among females born over 27 weeks of gestation (OR = 0.5, 90% CI = 0.2, 1.5). These results are difficult to interpret. It is not clear why an exposure to environmental contaminants would affect birthweight among males differently than among females. If exposure to the landfill is related to adverse health outcomes, we would expect to find a smaller difference between the two areas (regardless of sex) during this period than during the 1970's, since remedial

measures were taken in the middle of the 1981-85 period. Most likely, the finding of birthweight differences between the two areas during the 1981-85 period is a spurious one.

The analysis of birthweight overall indicates that, during the period when exposure to site contaminants was probably the heaviest, babies born to residents living close to the site (Area 1) had a lower average birthweight than babies born to residents living further from the site (Areas 2 & 3). This finding may be explained by factors which could not be studied in this investigation.

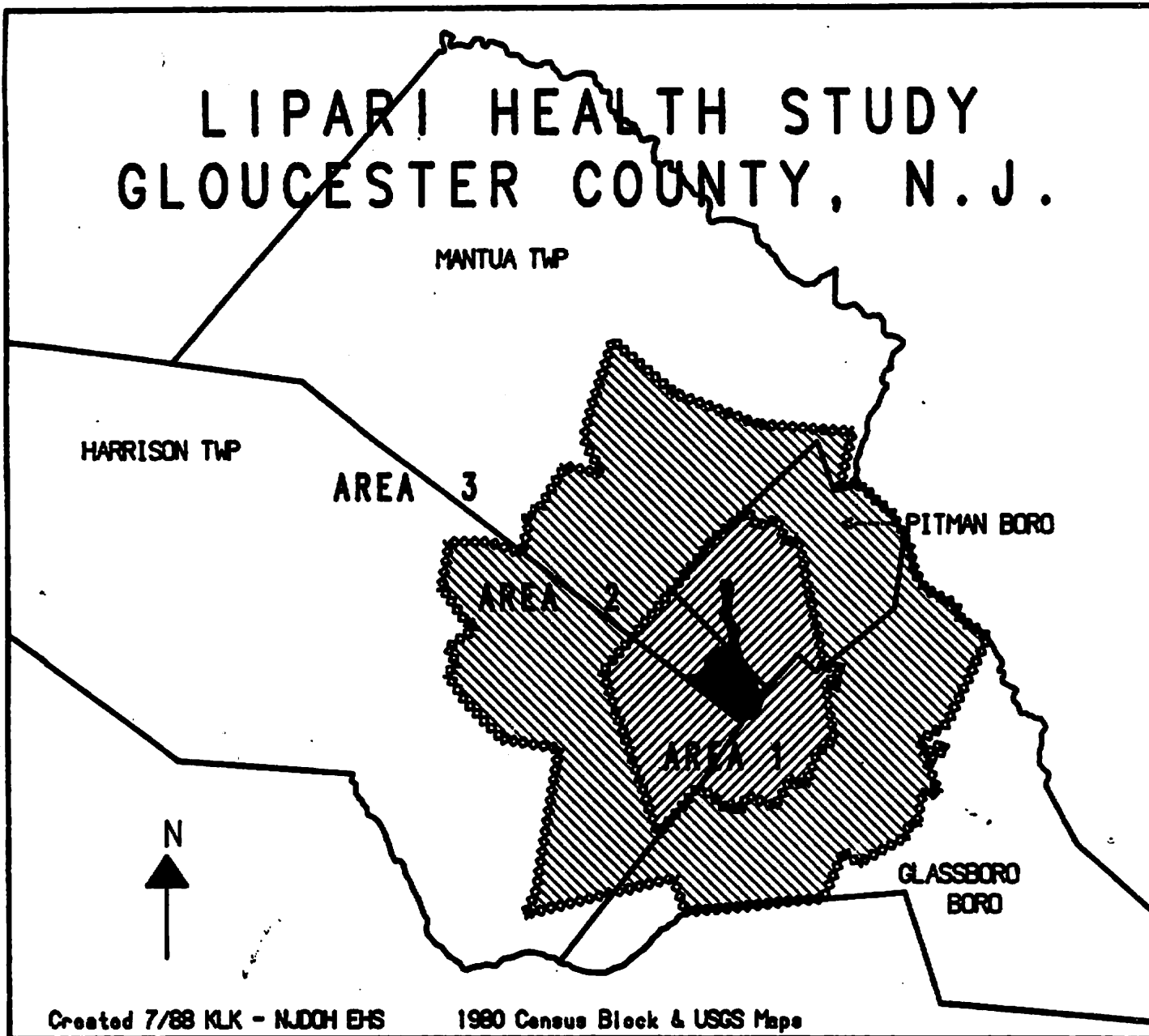
CONCLUSIONS AND RECOMMENDATIONS

No adverse health outcomes could be conclusively linked to exposure to contaminants from the Lipari Landfill in this study. The largely negative cancer findings cannot be relied upon to indicate an absence of hazard because of the insufficient period of observation for most cancers except leukemia, the possibility of underreporting and the crude proxy exposure areas used. Further, the inability to collect information on smoking, alcohol use, and other such factors which can greatly influence birthweight prevent any strong conclusions about the relationship of the landfill to birthweight in its vicinity. However, the findings on leukemia and low birthweight suggest the possibility that exposure-related adverse outcomes may have occurred among residents near the landfill during the period 1971-75 when exposures were probably heaviest.

Considering the toxicity of many of the contaminants involved, the NJDOH recommends that all further remediations, presently proposed by the USEPA, be carried out in a timely manner and with careful monitoring to limit further exposure. The NJDOH is committed to continuing surveillance of cancer, low birthweight and birth defects around the Lipari site and plans to initiate further discussions with the local community and the Subcommittee in order to define exactly what activities should be pursued.

Given the suggestive but non-conclusive nature of the results of this study, medical counseling on related issues will be available to area residents, but no special diagnostic or other clinical procedures are indicated.

LIPARI HEALTH STUDY GLOUCESTER COUNTY, N.J.



1.0 Km



2.5 Km



Lipari Landfill,
Alcyon Lake and
marsh areas.



Census block
boundaries

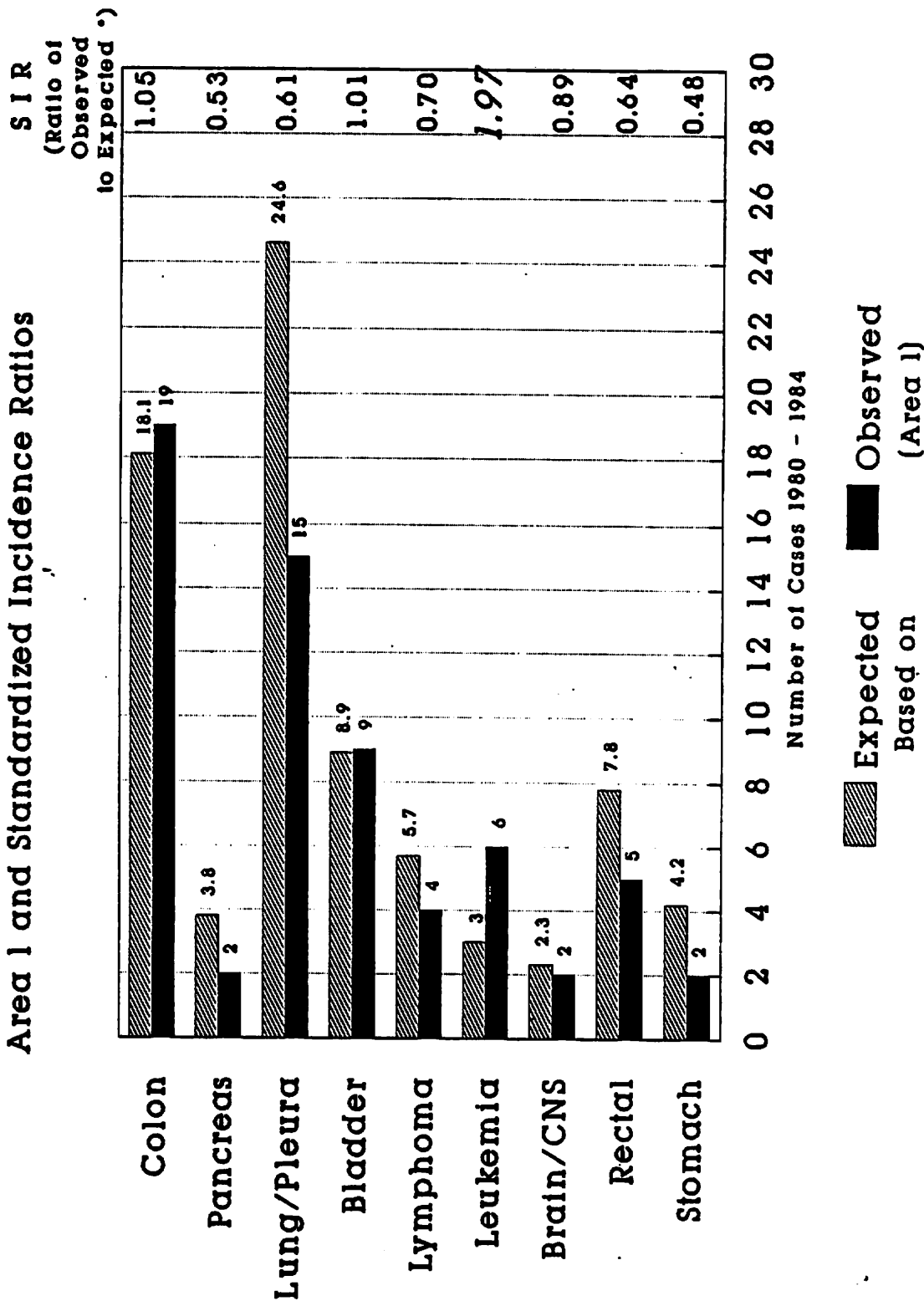


Municipal
boundaries

Scale 1:24,000

Health Study of Residents Living Near the Lipari Landfill

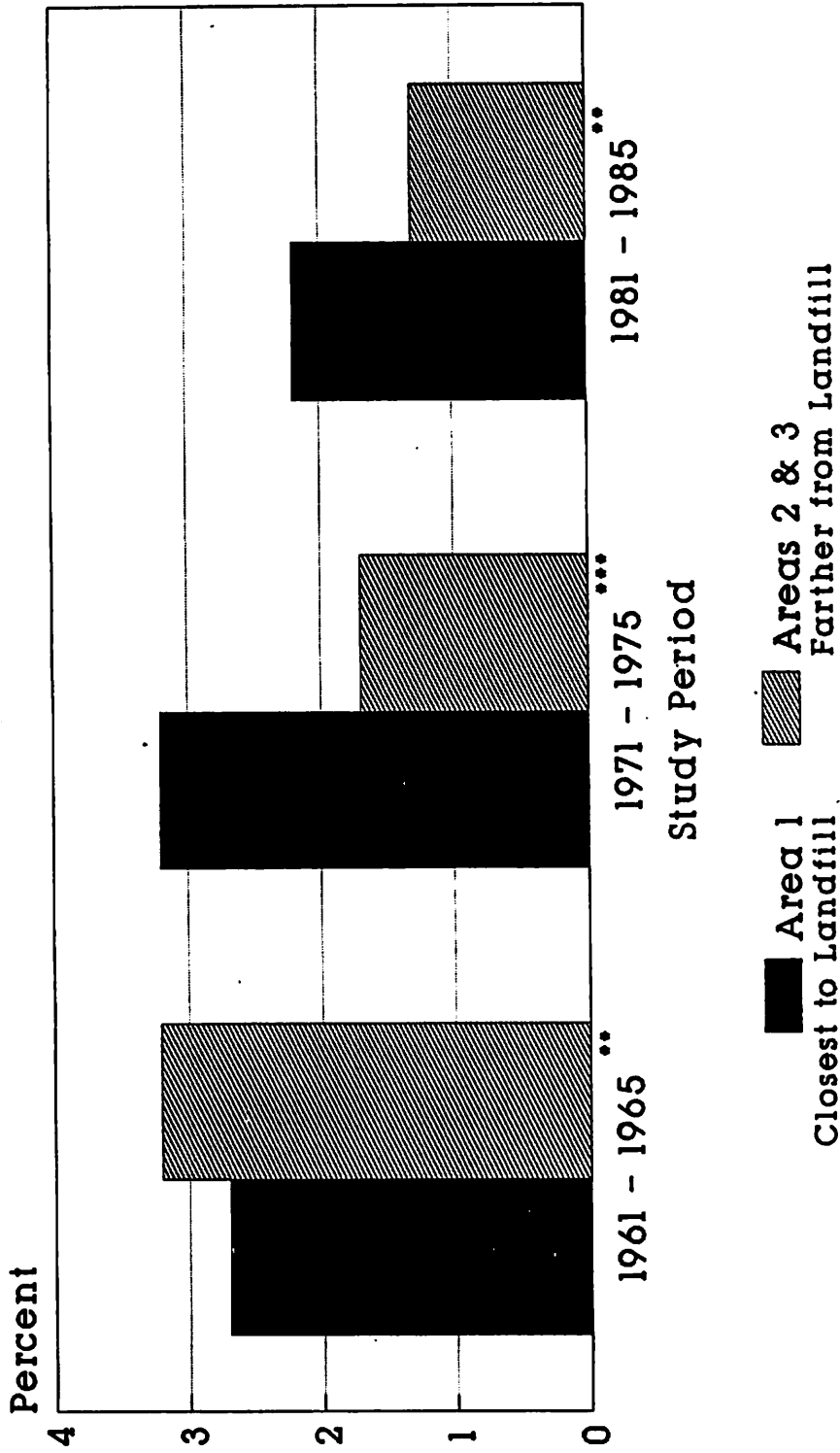
Number of Cases Observed & Expected in Area 1 and Standardized Incidence Ratios



* all ratios are not significant (p < 0.05)

Health Study of Residents Living Near the Lipari Landfill

**Percentage of Low Birthweight*
in each study period**

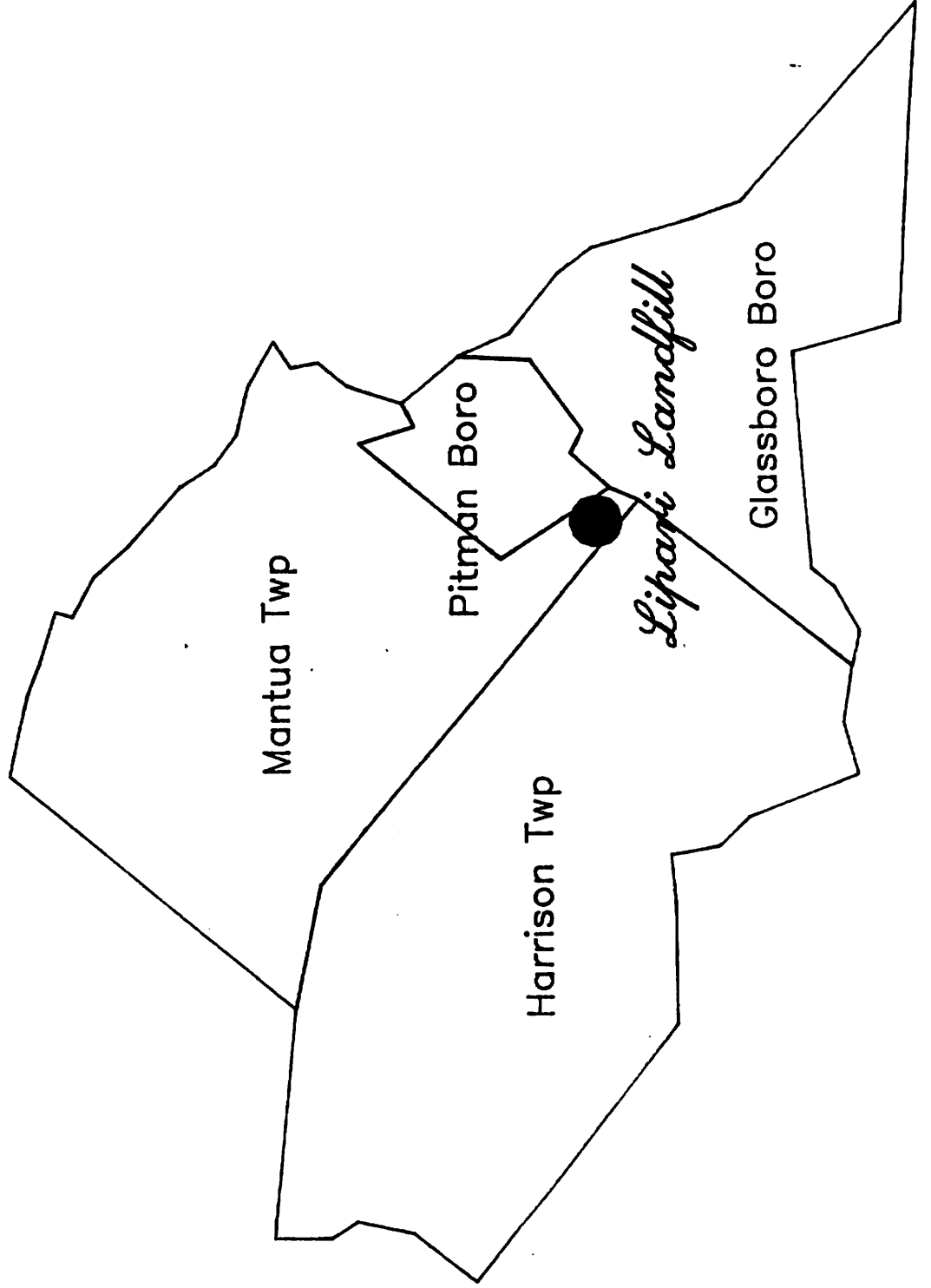


* Low Birthweight is (< 2500 g (5.5 lb))

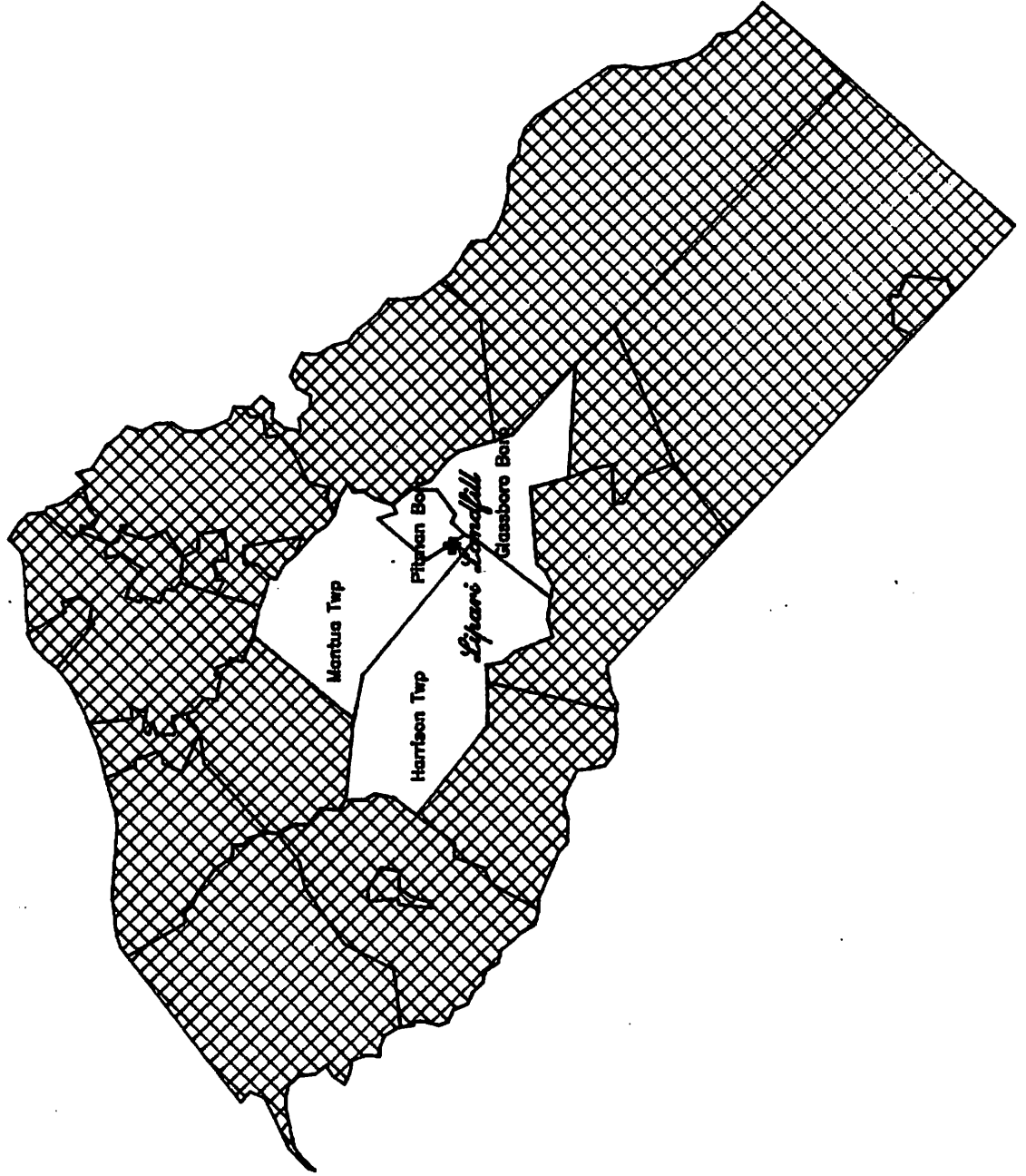
** Not Statistically Significant

*** Stat. Significant, 0.10 > p > 0.05

The Four Municipalities
Surrounding Lipari Landfill

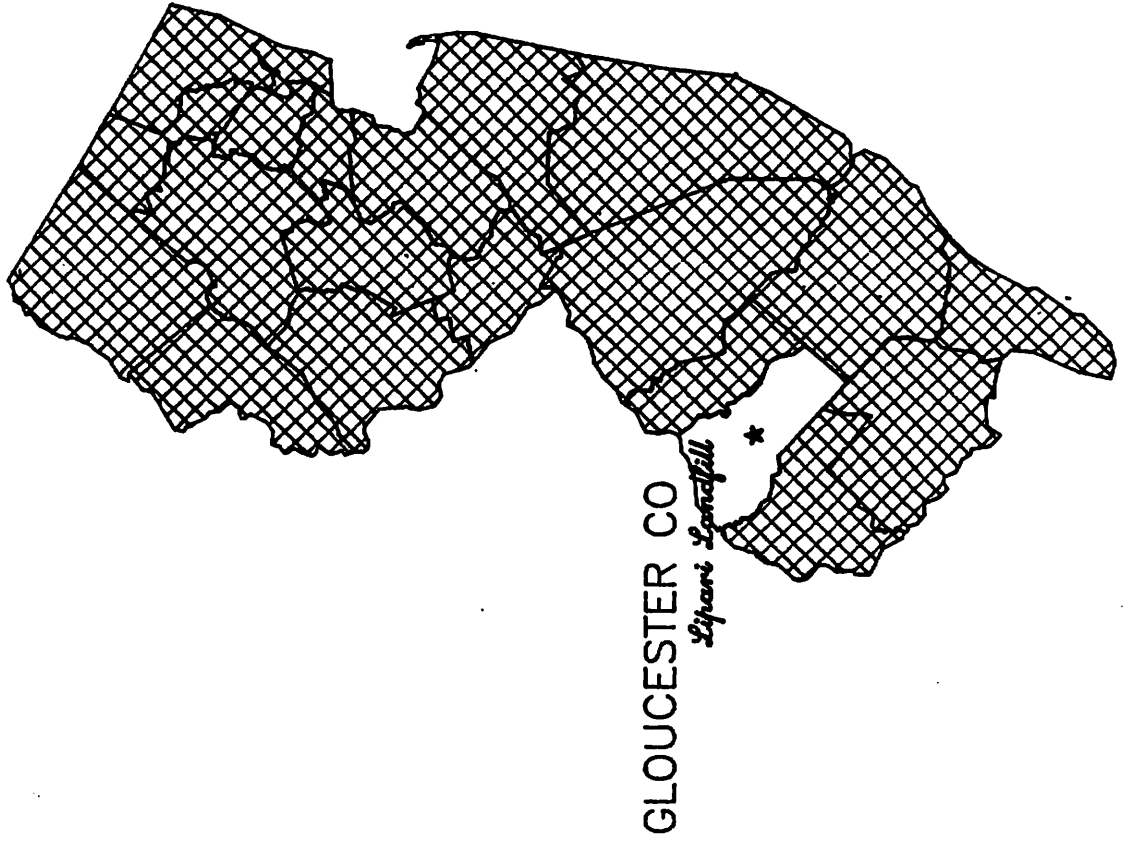


**Location of Lipari Landfill
in Gloucester County**



Location of Gloucester County and Lipari Landfill in

New Jersey



ADDENDUM

A draft of this report was reviewed in January, 1989 by a Peer Review Panel. The Panel consisted of five members and three alternates who were chosen by a consensus of the Subcommittee in the fall of 1988. The Panel was asked to critique the methodology, interpretation of results, written presentation of the study and recommendations. The panel met with NJDOH study staff on January 11, 1989. The following report was prepared by the Panel as a result of that meeting. Many of the specific suggestions for data presentation or interpretation have already been incorporated during the two weeks between January 11th and the printing of the Report.

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January 19, 1989

The Lipari Health Study Peer Review Panel met on January 11, 1989, to discuss the "Health Study of Residents Living Near the Lipari Landfill" prepared by the New Jersey Department of Health.

The panel arrived at a consensus view that the study was not able to detect an increase in risk for most of the cancers studied, because insufficient time has elapsed from exposure. Thus the study does not contribute to our understanding of possible cancer risks from the landfill.

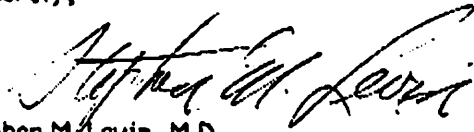
The exception to this general rule is leukemia, where the data are consistent with a biologically plausible effect. Inherent limitations in both the data and the study design, however, make it extremely difficult to conclude at this time that any excess leukemia has resulted from exposure to agents present in the landfill. Limitations in information about exposure and insufficient data on the distribution of other factors that might affect the leukemia rate, in both the exposed and unexposed areas, are the most serious problems. It is not obvious at the moment that these limitations can be overcome.

The panel further wished to emphasize that the study is necessarily silent about other outcomes that might or might not be pertinent. The health outcomes that were studied were chosen, in large part, because they could be studied by looking at vital event data. Hence the study presents a limited inquiry into the health effects issue. Because answers to important public health questions may not be possible, even with unlimited resources, the panel wished to go on record as saying that remedial activity should proceed with all deliberate speed, independent of findings of this or any future study, so as to prevent any further existing or potential exposure from this site.

The study suggested a possible adverse effect of exposure to toxins from the landfill upon average birth weight for one of the three time periods studied (1971 - 75). The decrease in average birth weight among the exposed was small (2.5 oz [74 gm]), however, and may have been due to the effect of other variables that are known to contribute to low birthweight (such as smoking and alcohol consumption), about which no information is available. We cannot conclude, therefore, that the observed effect is attributable to exposure to agents in the landfill.

Given the limitations inherent in the available data and the relatively short time period of exposure which could be analyzed, the study reflected a serious effort to address the community's concerns. The report could be strengthened, however, by providing a better description of the population exposed (eg. age, sex, occupation, migration and socioeconomic characteristics), the geoclimatic characteristics (soil and wind) and the medical facilities available to diagnose cases. Also, the standard used for comparison should include rates from regions closest to that of the study site rather than New Jersey as a whole.

Sincerely,

A handwritten signature in cursive script, appearing to read "Stephen M. Levin".

Stephen M. Levin, M.D.
Spokesperson for the Peer Review
Committee

CITIZEN'S GUIDE
and
EXECUTIVE SUMMARY

for

**A REPORT ON THE
HEALTH STUDY OF RESIDENTS
LIVING NEAR THE LIPARI LANDFILL**

New Jersey Department of Health
Division of Occupational & Environmental Health
Environmental Health Service



February 1989

Thomas H. Kean
Governor

Molly Joel Coye, M.D., M.P.H.
Commissioner of Health