



May 24, 1985

**POLICY ISSUE**  
**(Notation Vote)**

SECY-85-185

**For:** Commissioners

**From:** William J. Dircks  
Executive Director for Operations

**Subject:** STAFF ACTIONS FROM THE MARCH 7, 1985 COMMISSIONERS' MEETING WITH THE ADVISORY PANEL ON TMI-2 CLEANUP (M850307A)

**Purpose:** To respond to Acting Secretary Hoyle's March 29, 1985 Staff Requirements Memorandum (M850307A) regarding TMI - related epidemiological studies undertaken to date and a recommendation for further studies.

**Discussion:** Acting Secretary Hoyle's March 29, 1985 memorandum requests that the staff provide the Commission with an overview of all epidemiological studies undertaken to date. This memorandum also requests the staff to include a recommendation as to whether further studies should be done and what individuals or organizations would be appropriate to conduct further studies.

Enclosure (1) to this memorandum provides a brief summary of findings of the health-related studies done to date. Enclosure (2) contains more detailed information on the purpose, description, and findings of each of these health-related studies. Only those studies that are generally accepted by the scientific community are described in these enclosures. The studies described are designed to assess the impact of the TMI accident and reflect the existing epidemiological knowledge regarding biological effects of low level ionizing radiation and of severe emotional stress. The studies have not found any short-term evidence for significant physical health effects due to radiation exposure associated with the 1979 accident.

The Pennsylvania Department of Health has recently initiated two new studies: one to study the cancer mortality and incidence rate of all residents living within 5, 10, and 20 miles of TMI, and one to implement a base-line health information system on the populations surrounding the 6 nuclear plants in Pennsylvania. The staff is also

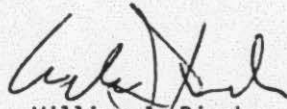
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aware of a proposed study of cancer cases around TMI to be done by researchers at Columbia University. This study will be funded by the TMI Public Health Fund. We will keep the Commission apprised of any new developments that are a result of these and other ongoing TMI health-related studies.

On the basis of the above mentioned findings, as well as the findings from the numerous dose assessment studies completed, the staff's recommendation is that there is no need for any additional studies on TMI-related health effects other than those studies which are already planned.

The staff requests Commission concurrence with these recommendations. If the Commission concurs with the staff recommendations, we recommend that the Commission forward these findings to the Advisory Panel for the Decontamination of Three Mile Island Unit 2. Enclosure (3) is a proposed letter of transmittal to the Chairman of the Advisory Panel.



William J. Dircks  
Executive Director for Operations

Enclosures:

1. History and Findings of TMI Health-Related Studies
2. Description of TMI Health-Related Studies
3. Draft letter from Palladino to Morris

Commissioners' comments or consent should be provided directly to the Office of the Secretary by c.o.b. Monday, June 10, 1985.

Commission Staff Office comments, if any, should be submitted to the Commissioners NLT Monday, June 3, 1985, with an information copy to the Office of the Secretary. If the paper is of such a nature that it requires additional time for analytical review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

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ENCLOSURE 1

HISTORY AND FINDINGS OF TMI HEALTH-RELATED STUDIES

Shortly after the March 28, 1979 accident at the Three Mile Island (TMI) nuclear plant, the Governor of Pennsylvania designated the Director of the Bureau of Health Research to coordinate and manage all health-related research activities relative to TMI. At the same time, a special Advisory Panel was commissioned by the Secretary of Health to oversee and guide all TMI-related health studies administered by the Bureau of Health Research.

Within a few months after the accident, the Pennsylvania Department of Health initiated nearly a dozen epidemiological and other health studies to evaluate the possible health effects of the TMI accident. A description of each of the completed or currently ongoing studies initiated by the Pennsylvania Department of Health is given in Enclosure 2. One of the first projects initiated shortly after the accident was a special census of all persons living within 5 miles of TMI. This "TMI Population Registry" will provide a basic framework for future short- and long-term epidemiologic studies of the effects of the accident. One of the most important studies developed shortly after the accident was to determine if the TMI accident had any measurable impacts upon pregnancy outcome and infant health. Findings from the completed pregnancy outcome portion of this study show that the impact of the TMI accident upon pregnancy outcome was negligible, if any.

A study on the occurrence of hypothyroidism in infants near TMI documented one case of congenital hypothyroidism among infants living within a 10 mile radius of TMI during the year period following the accident. This incidence rate is well within the normal range of expectation for the infant population studied. The Radiation Dose Assessment Study estimated that the maximum possible whole-body gamma radiation dose to anyone offsite was no more than 175 mrem, while the average maximum possible gamma dose to those within 5 miles of the plant was approximately 25 mrem. When shielding and evacuation corrections were applied, the highest "likely" dose assigned to an individual offsite was 80 mrem and the average "likely" gamma dose to those within 5 miles of the plant was 9 mrem. Among the findings of the Health Behavioral (Stress) Study were that persons who are younger, more educated, married, and female were most distressed during the accident. Also, the increased level of anxiety experienced following the accident persisted for approximately one year, but declined substantially by October 1980 (when the final survey of this study was performed). The Mental Health Study found that, among the three "high-risk" groups near TMI, only TMI mothers had higher incidences of depression than the control group. The Infant Mortality Study found no evidence that the TMI accident had any significant impact upon infant mortality. The Health Economics Study indicated that stress symptoms caused by the accident did affect the

health-related behavior of area residents. Of the costs examined, the economic costs of work days lost and physician visits were the largest cost items.

Several of the studies mentioned above have been completed. Apart from the substantial psychological effects described above and adverse effects upon low birthweight of excess medications taken by pregnant women to cope with their anxiety and stress, the study findings have not found any short-term evidence for significant physical health effects from the 1979 accident. Nor are such significant physical health effects expected from the officially-reported low-levels of radiation released from the damaged TMI facility. However, there is a possibility that the psychological stress from the accident will cause some adverse effects upon the local population. In order to measure the long-term effects of psychological stress and the need to study potential effects of very low dose radiation on humans, several of the ongoing studies are designed to run for a twenty year period or more. In addition, the Pennsylvania Department of Health has recently initiated two new studies - one to study the cancer mortality and incidence rate of the TMI population, and one to implement a baseline health information system on the populations living within 20 mile radii of the 6 nuclear plants in Pennsylvania. On the basis of the findings from the already completed and currently ongoing

TMI-related health studies, the Staff finds no need for any additional future studies on TMI-related health effects other than those studies which are already planned.



ENCLOSURE 2

Description of TMI Health-Related Studies

TMI Census (Ref: 42, 64, 70)

Time Span:

Initiated June 1979 Duration: 20 years or more

Sponsors:

Pennsylvania Department of Health, Centers for Disease Control, U.S. Bureau of Census

Primary Purpose:

To develop a population profile (TMI Population Registry) which would provide a basic framework for future studies of morbidity and mortality.

Description:

Shortly after the accident, the 3 sponsor agencies took a census of the 35,930 persons who were living within 5 miles of TMI at the time of the accident. Data collected included information on age, race, name, address, SS#, marital status, smoking habits, medical history, recent pregnancy experience, medical and occupational radiation exposure, and detailed whereabouts during the first 10 days following the accident.

Population mobility, morbidity, and mortality will be studied yearly by matching the TMI Population Registry with postal records, cancer registry records, and death certificate data. Health and behavioral resurveys of the population will be conducted approximately every 5 years.

Duration:

The Pennsylvania Department of Health will monitor this population for 20 years or more to detect possible health effects of the TMI accident.

Pregnancy Outcome Study (Ref: 42, 44, 55, 62, 65, 67, 70, 74)

Time Span:

Initiated August, 1979. Will be studied every 5 years

Sponsors:

Pennsylvania Department of Health

Primary Purpose:

To determine if the TMI accident had any measurable impacts on pregnancy outcome near TMI.

Description:

This study evaluated the health status of two cohorts of mothers and their infants/fetuses living within a 10-mile radius of the TMI plant during the time of the accident. The first cohort included approximately 4000 pregnant women who delivered between 3/28/79 and 3/27/80. The control cohort consisted of approximately 4000 women in the same area who delivered exactly one year after the study cohort, i.e., 3/28/80-3/27/81.

Short Term

The effects of radiation exposure and psychological stress on the following pregnancy outcome measures were studied: fetus death, hebdomadal death, neonatal death, pre-maturity, immaturity, congenital abnormalities, and low Apgar score.

Long-Term

Approximately 3800 mother-child pairs in each of the groups have been consolidated into a TMI Mother-Child Registry. The physical, psychological, and behavioral effects of each of these groups will be studied every 5 years.

Findings:

Short-Term

When pregnancy outcome measures were compared between the exposed study cohort and the unexposed control cohort, no significant differences were noted for any of the various outcome measures under study, indicating that the impact of the TMI nuclear accident upon pregnancy outcome was negligible, if any. After adjusting for the influences of the many maternal and provider characteristics described earlier, the incidences of fetal and neonatal mortalities, congenital anomalies, prematurity,

immaturity, and of low Apgar score within the study cohort were not significantly different from those within the control cohort.

Long-Term

The first 5 year study of the test cohort of 3800 mother-child pairs is currently underway (this study cost \$300,000). The 5 year study of the control group will take place next year (5 years after the 3/80-3/81 period). Both studies are 1 year late due to limited funding.

Resurveys of each cohort will be conducted every 5 years.

Congenital/Neonatal Hypothyroidism Study (Ref: 42, 51, 56, 67, 70, 74)

Time Span:

Annually

Sponsors:

Pennsylvania Department of Health

Primary Purpose:

To examine the incidence of congenital/neonatal hypothyroidism among newborn infants living within a 10-mile radius of TMI.

Description:

Radioactive iodine can cause hypothyroidism. This study involves screening all infants living within a 10-mile radius of TMI for hypothyroidism (by Pennsylvania law, all newborn babies in the state must be screened for hypothyroidism after 7/78). This survey will be done annually.

Findings:

For the group born in the test area between March 28, 1979 and March 27, 1980, there was only one case of congenital hypothyroidism identified

among approximately 4000 newborn infants. This incidence rate is well within a normal range of expectation.

There was an apparent concentration of 7 cases of congenital hypothyroidism in Lancaster County (mostly beyond the 10-mile radius) in 1979. This study concluded that these reported cases of congenital hypothyroidism were not related to the TMI nuclear accident, i.e., these types of anomalies are not expected to have resulted from direct or indirect exposure of the fetus to radioiodine. This conclusion was also supported by an independent Hypothyroidism Investigative Committee organized by the State Health Department, which included expertise in the fields of epidemiology, pediatric endocrinology, obstetrics, medical genetics, biostatistics, and radiation physics.



Radiation Dose Assessment Study (Ref: 42, 59, 66, 67, 70)

Time Span:

1979-1984 (Complete)

Sponsors:

Department of Radiation Health - University of Pittsburg

Survey performed by: Pennsylvania Department of Health, Centers for Disease Control, and U.S. Bureau of the Census

Primary Purpose:

Evaluate the extent to which local residents may have been exposed to radiation from TMI.

Description:

Establishment of a radiation dose assessment for every resident within the 5-mile radius of TMI during the 10 days following the accident and every pregnant woman resident within the 10-mile radius during the same period. The study has been done over a 4 year period.

- 1st yr -  $WB\gamma$  for people within 10-mile radius
- 2nd yr - pregnant women doses and fetal  $WB\gamma$  - 10-mile radius
- 3rd yr - thyroid tissue dose to general population (within 5 miles)  
thyroid tissue dose to mother and child (10 miles)
- 4th yr - total skin dose ( $\gamma + \beta$ ) (skin dose =  $2 \frac{1}{2} - 3x WB\gamma$ )

For each of the doses ( $WB\gamma$ , thyroid and total skin dose), the maximum possible dose (assuming no shielding and no evacuation over the 10-day period) and the likely dose (assuming evacuation and clothing) were calculated.

Study covered approximately 34,000 people within a 5-mile radius of TMI.

Findings:

Based on the findings of this study, it is estimated that the maximum possible whole-body gamma radiation dose to anyone off site was no more than 175 mrem, and the average maximum possible gamma dose to those within 5 miles of the plant was approximately 25 mrem. Because these estimates make no allowances for shielding, they are generally considered to represent over-estimates. The highest "likely" dose assigned to an individual off site was 80 mrem and the average "likely" gamma dose to those within 5 miles of the plant was 9 mrem. Additional exposure of the population came from the beta radiation dose to the skin and from the inhalation dose to the lung. It

is estimated that the total dose to the skin could have been much larger than the whole-body gamma dose by a factor of 3 to 4 if the protective effects of shelter and clothing are neglected. The inhalation dose is estimated to have constituted no more than 3% to 7% of the dose to the whole body.

The findings from the total skin dose part of the study have not yet been published.

The publication of the Beyea report in 1984 may prompt additional studies in this area.

Health Behavioral (Stress) Study (Ref: 30, 38, 41, 42, 49, 67, 70)

Time Span:

3 surveys taken (7/79, 1/80, 10/80) completed 1981

Sponsors:

Pennsylvania Department of Health

Primary Purpose:

To describe how persons living in the vicinity of TMI reacted during the crisis, as well as 3, 9 and 18 months later.

Description:

Several phone surveys were made at 3, 9, and 18 months after the accident to obtain the information needed to study the stress on people living near TMI. The surveys conducted were: (1) 7/79 Penn State survey of 692 persons within 5 miles of TMI; 7/79 NRC survey of 1506 persons within 55 miles of TMI (2) 1/80 Penn State survey of same group, and (3) 10/80 Penn State survey of households within 5 miles and 41-55 miles of TMI. Five distress indices studied were:

1. How upset the respondent was about the situation at Three Mile Island.
2. How serious a threat the respondent felt TMI was to safety.

3. Frequency of "behavioral symptoms" during a two week period (i.e., lack of appetite, overeating, sleeplessness, feeling shaky, trouble thinking, irritability and anger).
4. Frequency of "somatic symptoms" (i.e., stomachaches, headaches, diarrhea, frequent urination, rash, abdominal pain, and sweating spells) during a 2 week period.
5. For those persons who reported either behavioral or somatic symptoms, whether they attributed those symptoms to the situation at Three Mile Island.

Findings:

The major impact of the accident was felt during the few weeks immediately following the accident. While some effects persisted over the following year, long-term effects were of a low magnitude. Overall, this study indicated (a) persons who are younger, more educated, married and females were most distressed during the crisis; (b) those who reside within 15 miles of TMI had more stress than did those who reside farther out; (c) the use of sleeping pills and/or tranquilizers to deal with anxiety, as well as certain psychosomatic symptoms increased among certain individuals; (d) the increased level of anxiety experienced following the accident persisted

for approximately one year, but declined substantially in October, 1980; and (e) persons with more social support tended to be less distressed than others during the crisis.

Mental Health Study (Ref: 42, 67, 70)

Time Span:

1979 - 1980 completed 1980

Sponsors:

Western Psychiatric Research Institute

Primary Purpose:

To study the mental health impact of 3 "high-risk" groups near TMI: TMI employees, mothers with small children, and mental health clinic patients.

Description:

Surveys of 3 "high-risk" groups near TMI: 1) TMI employees, 2) mothers with small children, and 3) mental health clinic patients, were taken at 9 months and one year following the accident. People residing near the Shippingport nuclear plant in western Pennsylvania were used as controls.

Findings:

TMI mothers had an excess risk of experiencing clinical episodes of anxiety and depression during the year after the accident. They also reported more symptoms of anxiety and depression at subclinical levels.

TMI workers were essentially similar to control workers (Beaver Valley Nuclear Plants) with respect to mental health indicators under study both at the clinical and subclinical levels.

Mental health clinic patients expressed similar level of symptoms or anxiety at both TMI area and Beaver Valley area selected as control.

Overall, TMI mothers had higher incidences of depression than the control group. There were little or no differences in the other two "high-risk" groups.



Infant Mortality Study (Ref: 51, 55, 70)

Time Span:

1979, 1980 & annually

Sponsors:

Pennsylvania Department of Health

Primary Purpose:

To determine if the TMI accident had any measurable influence upon infant mortality in the vicinity of the plant.

Description:

The infant mortality data were analyzed by calender quarter for a 10-mile radius around TMI for the years 1977, 1978, and 1979. These data were compared with similar data for the State of Pennsylvania.

Findings:

The infant mortality rate was not significantly different between the 10-mile area with or without Harrisburg, and the State of Pennsylvania for any of the 3 years under consideration.

The infant mortality rate within the 10-mile radius, including Harrisburg, was already considerably high (19.3 per 1,000 live births) during the first quarter of 1979 immediately following the accident, but declined substantially during the third (12.7) and fourth (13.4) quarters. This temporal pattern of change in the rate is consistent with the view that the TMI accident has had no measurable impact upon infant mortality. Otherwise, the infant mortality rate would have increased steadily (or, at least, would have remained high as a result of interaction between seasonal downward trend and TMI-related upward trend), particularly during the third and early fourth quarters.

Within the 10-mile radius of TMI, the 1979 infant mortality rate (16.1) was not significantly different from the 1977 rate (12.5). The 1978 infant mortality rate (10.8) in the same area was somewhat atypical and unusually low, particularly within the immediately surrounding communities outside of Harrisburg (8.4). This is largely because of the small population, wherein marked statistical variations from year to year are not at all uncommon with no particular epidemiologic significance. For this reason, the 1978 infant mortality rate should not be used as a normal base for comparison.

Having considered both cross-sectional and temporal analysis of the available vital statistics data compiled by the State Health Department, there is no evidence that the TMI nuclear accident has had any significant impact upon infant mortality.

Health Economics Study (Ref: 67a, 70)

Time Span:

1979 - 1982 complete

Sponsors: Pennsylvania State University and the USNRC

Primary Purpose:

To estimate the economic costs incurred by individuals or communities as a result of a change in physical or mental health status and/or a change in health care services due to TMI.

Description:

Three phone surveys were conducted soon after the accident of households within a 55-mile radius of TMI. Data collected included information on social and psychological effects of the accident, evacuation costs, health care utilization patterns after the accident, and decisions to evacuate.

Findings:

The findings indicate that stress symptoms caused by the TMI accident did affect the health-related behaviors of area residents. Based on regression analysis, it is estimated that the cost of the changes in health-related

behaviors was about \$178,419 for a period of 10 months within a 5-mile ring of TMI. Of the costs examined, the economic costs of work days lost and physician visits are the largest cost items. The results also show that there are significant effects of the stress on the increased consumption of cigarettes, alcohol, and tranquilizers after the accident.

Residential Mobility Study (Ref: 60, 67)

Time Span: 1979 - 1982 complete

Sponsors:

Pennsylvania Department of Health

Primary Purpose:

To determine the effect of the 1979 TMI accident on residential mobility and subsequent population composition.

Description:

The entire population living within 5 miles of TMI was registered shortly after the accident and traced one year later to identify movers.

Findings:

The rate at which people moved remained the same the year after the accident as before, and that approximately 15% of those who moved (changed address) gave TMI as the main reason for their decision to move. The study also found that those moving because of TMI had attributes highly associated with mobility in general. When those attributes were controlled in analysis, attitudes about TMI were virtually the same among movers and

nonmovers. On the other hand, demographic characteristics of new people moving into the area were not different from those who had moved out. However, attitudes about TMI were significantly more positive among the newly moved-in people than among the moved-out people.

Epidemiologic Surveillance in Pennsylvania (Ref: 71)

Time Span:

1985 - continuing

Sponsors:

Pennsylvania Department of Health with coordination of PEMA, BRP, and NRC

Primary Purposes

Develop and implement a baseline health information system which will ensure the continuous and systematic compilation, analysis, and interpretation of the health status of populations living within 20 mile radii of the 6 nuclear plants and selected control areas in Pennsylvania.

Description:

Baseline health information will be collected and computerized from the six nuclear power plants in Pennsylvania and from selected control areas. Data collected will include natality and mortality data, morbidity data, and population data. This data will be updated and monitored routinely. The Epidemiologic Surveillance System will be used to detect significant changes within or differences from norms in any health indicators under



consideration. It would also provide comparative data which could be used to assess the potential health effects of the TMI accident. Finally, the System would provide health information that would be invaluable in the event of another nuclear accident or any other health threatening event.

## REFERENCES\*

30. Houts, P., et al., "Health-Related Behavioral Impact of the Three Mile Island Nuclear Incident," report submitted to the TMI Advisory Panel on Health Research Studies of the Pennsylvania Department of Health, Part I, Apr. 8, 1980.
38. Houts, P., et al., "Health-Related Behavioral Impact of the Three Mile Island Nuclear Incident," report submitted to the TMI Advisory Panel on Health Related Studies of the Pennsylvania Department of Health, Part II, Nov. 21, 1980.
39. U.S. Nuclear Regulatory Commission, NUREG/CR-1728, "The Feasibility of Epidemiologic Investigations of the Health Effects of Low-Level Ionizing Radiation," N. Dryers, et al., Health Systems Division, Nov. 1980.
41. Houts, P., et al., "Extent and Duration of Psychological Distress of Persons in the Vicinity of Three Mile Island," in Proceedings of the Pennsylvania Academy of Science, Vol 54, No 1, 1980.
42. Tokuhata, G., "Three Mile Island Health Effects Research Program," in Proceedings of the Pennsylvania Academy of Science, Vol 54, No 1, 19-21, 1980.
44. Tokuhata, G., "Pregnancy Outcome Around Three Mile Island," presented at the conference: Linking Public Health Social Worker and Public Social Services for Comprehensive Care for Mothers and Children, University of Pittsburg, PA, Mar. 29 - Apr. 2, 1981.
49. Houts, P., et al., "Health-Related Behavioral Impact of the Three Mile Island Nuclear Incident," report submitted to the TMI Advisory Panel on Health Research Studies of The Pennsylvania Department of Health, Part III, May 12, 1981.
51. Tokuhata, G., and E. Digon, "Fetal and Infant Mortality and Congenital Hypothyroidism Around TMI," presented at the International Symposium on Health Impacts of Different Sources of Energy, Nashville, TN, June 22-26, 1981.
55. Tokuhata, G., "Impact of TMI Nuclear Accident Upon Pregnancy Outcome, Congenital Hypothyroidism and Infant Mortality," chapter prepared for Energy, Environment and the Economy published by the Pennsylvania Academy of Science, 1981.

- 55a. Houts, P., et al., "Psychological and Social Effects on the Population Surrounding Three Mile Island After the Nuclear Accident on March 28, 1979," chapter prepared for Energy, Environment and the Economy published by the Pennsylvania Academy of Science, 1981.
57. Goldhaber, M., and J. Lehman, "Crisis Evacuation During the Three Mile Island Nuclear Accident: The TMI Population Registry," presented at the 1982 Annual meeting of the American Public Health Association, Montreal, Quebec, Nov. 16, 1982.
- 58a. Bromet, E., et al., "Mental Health of Residents Near the Three Mile Island Reactor: A Comparative Study of Selected Groups," in Journal of Preventive Psychiatry, Vol. 1, No. 3, 1982.
59. Rao, G., et al., "The TMI Population: A Closer Look," in Proceedings of the Pennsylvania Academy of Science, Vol 56, No 1, 1982.
60. Goldhaber, M., et al., "Moving After the Crisis-A Prospective Study of Three Mile Island Area Population Mobility," Environment and Behavior, Vol 15, No 1, 93-120, Jan. 1983.
62. Goldhaber, M., et al., "Spontaneous Abortions After the Three Mile Island Nuclear Accident: A Life Table Analysis," Am Journ of Public Health, Vol 73, No 7, 752-759, July 1983.
64. Goldhaber, M., et al., "The Three Mile Island Population Registry," Public Health Reports, Vol 98, No 6, 603-609, Nov.-Dec. 1983.
65. Bratz, J., "The Three Mile Island Mother-Child Registry," Health Reporter, Vol 4, No 12, 1,4, Dec. 1983.
66. Gur, D., et al., "Radiation Dose Assignment to Individuals Residing Near the Three Mile Island Nuclear Station," in Proceedings of the Pennsylvania Academy of Science, Vol 57, No 1, 1983.
67. Tokuhata, G., "Three Mile Island Nuclear Accident and Its Effect on the Surrounding Population," Pennsylvania Department of Health, Division of Epidemiology Research, Jan. 1984.
- 67a. Hu, T., et al., "Health-Related Economic Costs of the Three-Mile Island Accident," Socio-Economic Planning Science, Vol. 18, No. 3, 183-193, Jan. 21, 1984.

68. Houts, P., et al., "Utilization of Medical Care Following the Three Mile Island Crisis," Am Journ of Public Health, Vol 74, No 2, 140-142, Feb. 1984.
70. Tokuhata, G., "Health Studies in the Three Mile Island Area," presented at the special session on Health Effects of Radiation at the annual meeting of the American Nuclear Society, Miami Beach, FL, June 7-12, 1981.
71. Tokuhata, G., "Epidemiologic Surveillance in Pennsylvania: A Case of Nuclear Power Plants," Pennsylvania Department of Health, June 1984.
74. Tokuhata, G., "Three Mile Island (TMI) Nuclear Accident and Pregnancy Outcome," to be presented at the XII International Biometric Conference, Sept. 2-7, 1984.
75. Tokuhata, G., "Three Mile Island: An Environmental and Public Health Emergency," presented at the National Conference on Environmental Public Health, Oct. 16, 1984.

\*Reference numbers refer to Enclosure 1 (Chronological Bibliography) of letter from W. Dircks to the Commissioners, "Staff Actions from the August 15, 1984 Commission Meeting on TMI (MR40815)," Aug. 31, 1984.

ENCLOSURE 3

The Honorable Arthur R. Morris, Chairman  
The Advisory Panel for the Decontamination  
of Three Mile Island Unit 2  
Mayor of Lancaster  
120 North Duke Street  
Lancaster, PA 17602

Dear Mayor Morris:

At our March 7, 1985 meeting here in Washington, DC, I suggested that the NRC staff provide the Commission with an overview of all studies associated with radiation releases during the TMI-2 accident undertaken to date. Subsequent to the meeting, I asked the staff to include in the review a recommendation as to whether further studies should be done.

Enclosed is a copy of the staff review providing a detailed listing of various epidemiological and other studies conducted as a result of the accident. Only studies that are generally accepted by the scientific community are included. Also included is a description of the studies and the results if known at this time.

The studies described are designed to assess the impact of the TMI accident and reflect the existing epidemiological knowledge regarding biological effects of low level ionizing radiation and of severe emotional stress. The study findings have not found any short-term evidence for significant physical effects due to radiation exposure associated with the 1979 accident.

The Commission has reviewed the staff's analysis and concurs in the staff's conclusions.

Sincerely,

Nunzio J. Palladino