

MAY 1976

Appendix L.

CONTROLLING CANCER IN NEW JERSEY

Let's Protect Our People



Brendan T. Byrne
Governor

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Commissioner of Health

RSV 0013403

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"PREVENTION OF CANCER SHOULD NOW TAKE TWO DIRECTIONS:
AVOIDANCE OF EXPOSURE TO CARCINOGENS IN THE FUTURE AND
IMPROVED CARE OF PEOPLE IN HIGH-RISK GROUPS TO PREVENT
OTHERWISE INEVITABLE DISEASE." ¹

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"AN EFFORT TO CURE CANCER AT THIS TIME MIGHT BE LIKE
TRYING TO LAND A MAN ON THE MOON WITHOUT KNOWING
NEWTON'S LAWS OF MOTION." ²

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"UNTIL MORE FUNDAMENTAL KNOWLEDGE IS ACHIEVED, CANCER
IS BEST VIEWED AS A PROBLEM OF DISEASE CONTROL AND
PREVENTION." ³

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INTRODUCTION

New Jersey -- the nation's most densely populated state and one of its most highly industrialized -- has taken on a new distinction in recent years; the nation's most cancer-prone state.

Cancer has long been recognized as a nationwide and a worldwide problem, and statistics such as those highlighted in Table 1⁴ (see page 2) have alerted us to the growing dangers and ever increasing incidences of certain types of cancers.

New Jersey has the highest overall mortality rate for cancer in the United States. New Jersey's cancer rates for males, females, whites and non-whites alike are in excess of the national rates (see Figure 1). For certain specific cancers, the mortality rates in New Jersey are strikingly high, particularly for cancer of the bladder, which has been shown to be related to certain chemicals such as beta-naphthylamine used in the manufacture of dyes and pesticides.

At the same time, New Jersey has one of the greatest concentrations of chemical plants in the world. One chemical, vinyl chloride (a known cause of angiosarcoma of the liver), is manufactured in 58 plants in the U.S., five of which are in New Jersey.

It is a plausible hypothesis -- although, as yet, an unproven one -- that a part of the very high cancer mortality in New Jersey may be related to environmental factors and, specifically, the occupational environment (see Table 1). The New Jersey Department of Health believes that in those instances where a cause and effect relationship could be empirically demonstrated between occupational environments and cancer, preventive measures can be instituted that would have a significant effect on the health of the public. Sometimes cancer might be prevented altogether. Certainly, alarming death rates can be reduced. When a problem is of this magnitude, a scientifically grounded, people-oriented control program is imperative. This must use all the expertise of involved and interested federal, state and local agencies with the New Jersey Department of Health as the lead agency. A discussion of such a Cancer Control Program follows.

BACKGROUND OF CANCER PROBLEM

New Jersey has among the highest rates of cancer mortality of any state in the nation. Mason and McKay⁵ showed that in the 20-year period 1950-1969, New Jersey led the nation in cancer mortality for white males, with a death rate of 205.01 per 100,000 population, compared to a national rate of 174.04. For white females, the New Jersey mortality rate of 147.92 was exceeded by only one other state, and compares to a national rate of 130.10. For non-white cancer mortality, New Jersey

TABLE 1:

The Most Common Cancers

Site	New Cases 1976 (est.)	Deaths 1976 (est.)	Change in Incidence Over Past 25 Years	5-Year Survival Rate* (All Stages)	Localized**
Stomach	23,000	14,000	-62%	13%	41%
Mortality rate has declined 40 percent over the past twenty-five years, for reasons unknown. High-risk groups: native Japanese; persons with close relatives who have had the disease; frequent consumers of smoked fish or meat, pickled vegetables, dried salted fish; some association with type A blood group. Symptoms: chronic indigestion.					
Colon-rectum	99,000	46,000	-3%	44%	71%
Occurs more frequently in urban and developed countries. Suspected dietary influence. High risk groups: persons having ulcerative colitis for more than ten years, or with close relative having such genetically influenced conditions as familial polyposis. For earliest possible detection, digital exam and proctoscopy should be included in routine checkups, especially with persons over forty. Symptoms: change in bowel habits, rectal bleeding.					
Pancreas	22,000	20,000	+22%	1%	5%
Seen most often in men fifty-five and older, particularly in blacks. High-risk groups: cigarette smokers; diabetics, especially women; professional chemists and chemical workers; persons with close relatives who have had pancreatitis. Is extremely difficult to cure because symptoms are not manifest until disease has already metastasized. Symptoms: pain in abdomen and back, weight loss, some jaundice.					
Lung	93,000	84,000	+129%	9%	33%
Leading cause of cancer deaths among men; sharply rising mortality rate in women. Possibly 80 percent of lung cancer would be prevented if cigarette smoking were stopped. (Smokers also run a higher risk of getting cancer of the larynx, oral cavity, bladder, and pancreas.) Early detection: chest X ray, sputum exam, especially for men over forty-five who smoke. Symptoms: persistent cough, lingering respiratory discomfort.					
Breast, female	88,000	33,000	+4%	64%	84%
Leading cause of cancer deaths in women. High-risk groups: women over age thirty-five, especially whites; women who have never had a child or who bore first child after age thirty; women with a mother, sister, or aunt who has had the disease; women with early menarche and/or late menopause. Cancer in one breast increases risk for other breast. Best detection: regular self-examination, annual checkup. Symptoms: lump or thickening in breast.					
Uterus	47,000***	11,000	-37%	64%	81%
Mortality rate has declined 65 percent during the past forty years probably because of wider use of Pap test. Possibly associated with early and/or frequent sexual activity. High risk: women who had first child at an early age; seen more frequently in American blacks. Effect of birth-control devices is unknown. Early detection: post-menopausal women with abnormal bleeding should get exam; every woman should have an annual pelvic exam with Pap test. Symptoms: unusual bleeding or discharge.					
Ovary	17,000	11,000	-10%	32%	76%
Mortality rate is down slightly over the past twenty-five years. Most common between ages 65-69; infrequent under 35. High-risk groups: women with close relatives who have had the disease. Symptoms: irregular menses.					
Prostate	56,000	19,000	+23%	56%	68%
Rare in men under fifty; uncommon in Orientals, Indians, Mexicans, and Filipinos. Familial risk. For early detection, checkup should include urinalysis and palpation. Symptoms: urinary difficulty, bleeding, discharge.					
Bladder	30,000	10,000	+7%	61%	72%
Over the past twenty-five years, incidence rate has increased 21 percent for men and decreased 26 percent for women. Strong association with industrial carcinogens. High risk groups: industrial chemical workers; cigarette smokers. Early diagnosis is by means of urinalysis. Symptoms: urinary difficulty, bleeding.					

* Adjusted for normal life expectancy.

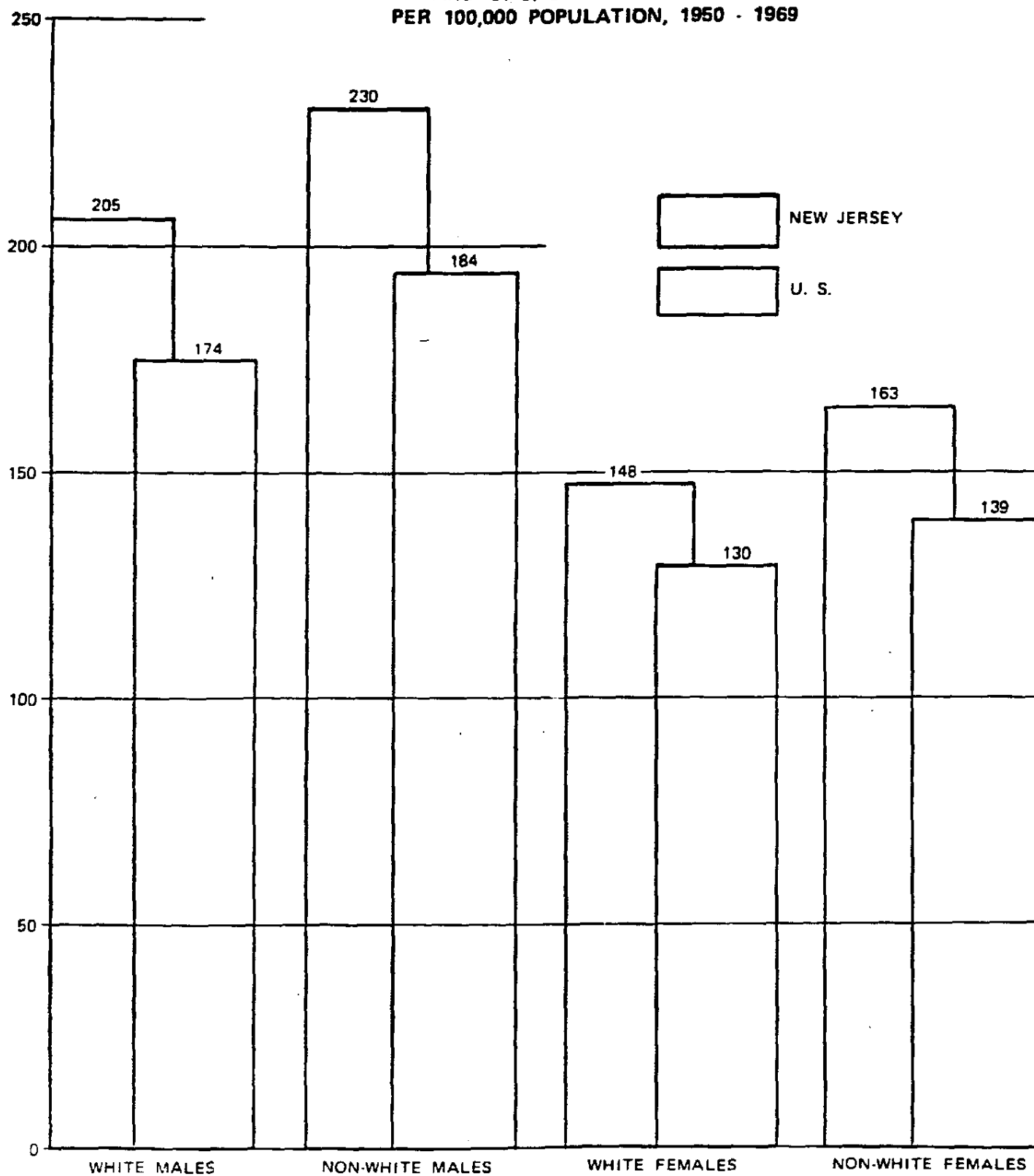
** Localized refers to cancers caught before metastasis occurs.

*** Does not include carcinomas in situ (cervical cancer), which would add 40,000 cases to the figure.

Numerical data based on figures published by the American Cancer Society. Leukemias (21,000 new cases) and lymphomas (30,000) omitted.

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**FIGURE 1: RATES OF CANCER IN NEW JERSEY
AND U. S. BY RACE AND SEX
PER 100,000 POPULATION, 1950 - 1969**



ranks fifth among the states (excluding the District of Columbia) for both males and females, with rates of 230.33 and 163.41 respectively, compared to national mortality rates of 184.28 and 139.18. Mason, et al⁶ showed that almost every county in New Jersey has overall cancer mortality in the top decile for both white males and females.

The relative ratio of New Jersey cancer rates by county as compared to the national rate, by sex and race, is exhibited in Table 2 and Figures 2-5 on the following pages. As can be seen, most cancer death rates in New Jersey are greater than the national average. These data are presented graphically for race and sex, as well as for specific cancer sites in Figures 6-15 (See Appendix I) and tabulated in tables 3-10 (See Appendix II). If the bar goes farther to the right than the ratio of 1, it shows that the New Jersey rate exceeds the national average. These data by county and cancer sites are not presented for non-whites, because some of the numbers are too small to make the comparison statistically valid. However, where the data can be compared, they suggest that the same problems exist for non-whites in New Jersey.

1) Bladder and lower urinary tract (Figure 6 Appendix I)

This is perhaps the most striking example of a high specific cancer mortality rate in New Jersey. Mason and McKay showed an adjusted white male rate of 9.68, giving New Jersey the highest mortality rate in the nation, far in excess of the national rate of 6.78. While the rate for white females is high in New Jersey, it is not nearly as striking as the male rate, with New Jersey ranking twelfth among the states (5.94 compared to a national rate of 5.05). Such sex-related information suggests the possibility of an occupational relationship among males. Among non-whites, New Jersey shows a death rate for bladder cancer that is fifth and sixth among the states for males and females respectively.

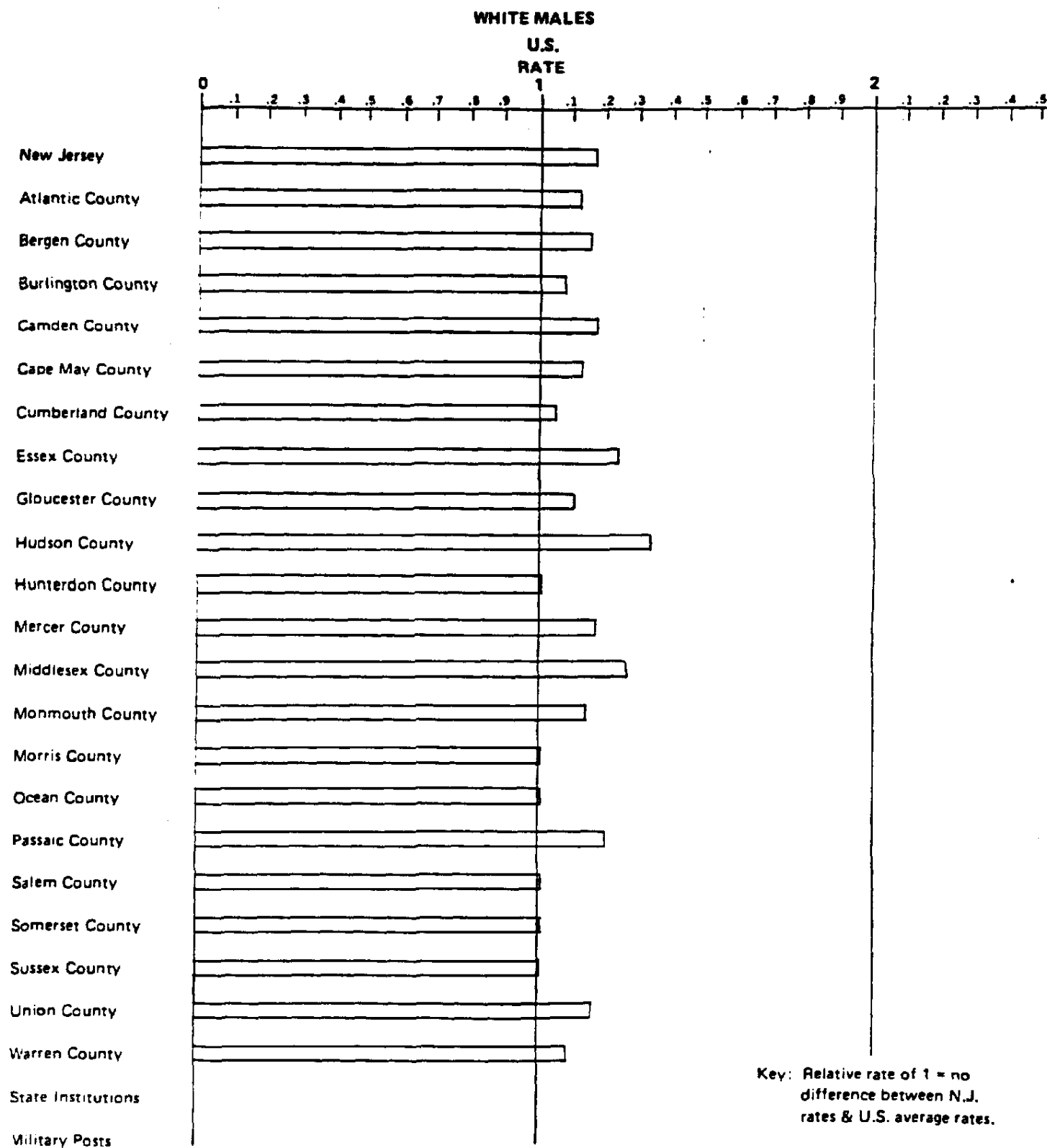
County data are even more striking. Mason et al noted that 18 of the 21 counties in New Jersey have white male bladder cancer mortality rates in the highest decile of all United States counties. The rate for Salem County (16.1) is the top of all United States counties with a population of over 10,000, and far exceeds the national rate of 6.8. Twenty-five percent of the male labor force of Salem County is employed in the chemical industry. While the Salem County rate is suspected of being related to a single large chemical plant, there is obviously a higher risk of bladder cancer in many parts of New Jersey deserving of investigation.

Table 2

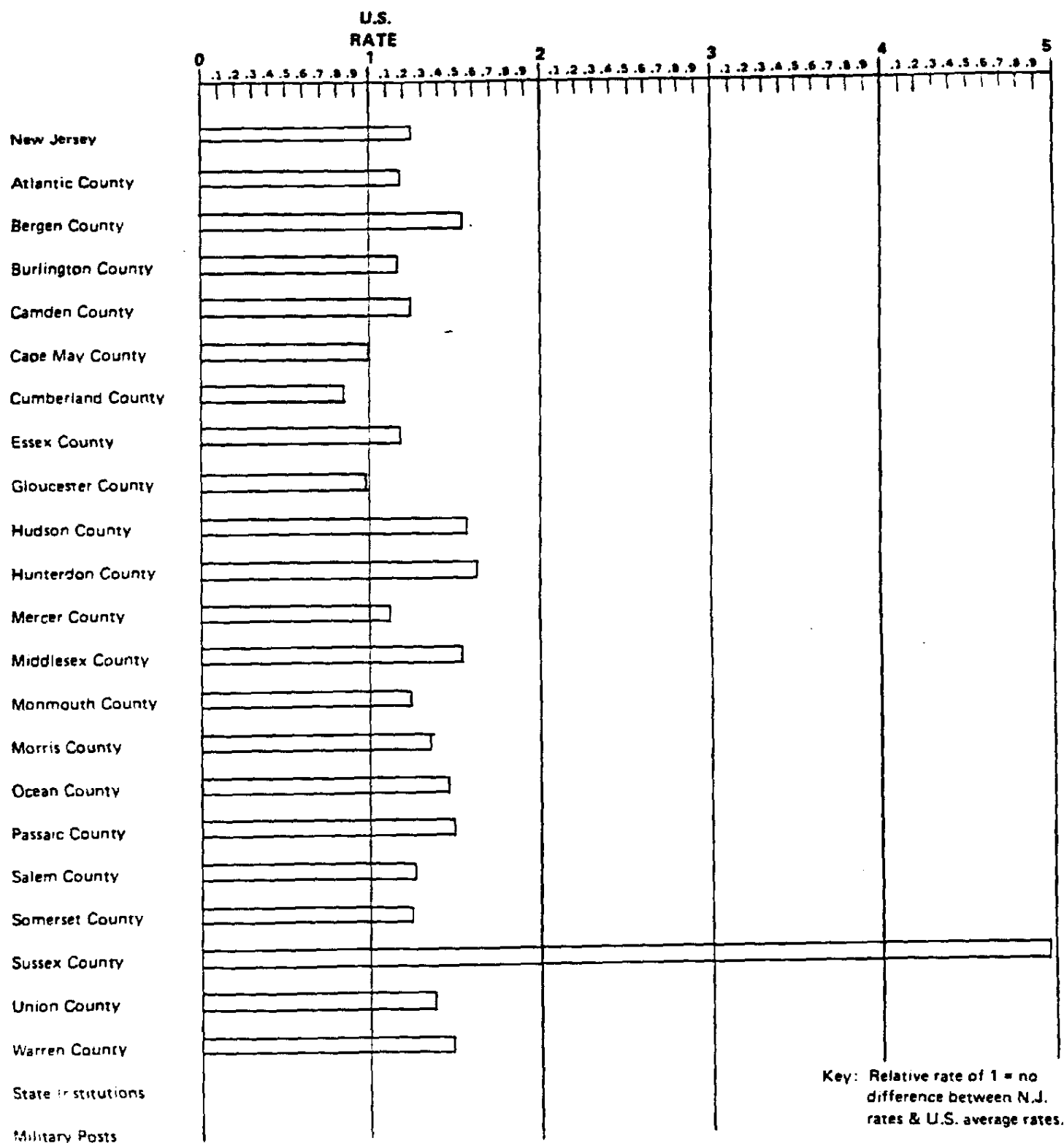
Ratios of New Jersey County Mortality Rates to the
United States Mortality Rate: All Malignant Neoplasms - 1950-1969

	White Males	Nonwhite Males	White Females	Nonwhite Females
New Jersey	1.18	1.25	1.14	1.17
Atlantic County	1.12	1.19	1.12	1.08
Bergen County	1.16	1.53	1.14	1.38
Burlington County	1.08	1.17	1.08	1.01
Camden County	1.18	1.24	1.14	1.27
Cape May County	1.12	1.00	1.10	1.27
Cumberland County	1.04	0.85	1.08	1.04
Essex County	1.24	1.19	1.19	1.11
Gloucester County	1.10	0.99	1.09	1.05
Hudson County	1.33	1.57	1.18	1.42
Hunterdon County	1.01	1.61	1.10	2.18
Mercer County	1.18	1.10	1.12	1.08
Middlesex County	1.27	1.51	1.15	1.50
Monmouth County	1.14	1.22	1.13	0.97
Morris County	1.03	1.35	1.04	1.22
Ocean County	1.07	1.44	1.05	1.66
Passaic County	1.20	1.47	1.14	1.31
Salem County	1.07	1.26	1.13	1.16
Somerset County	1.05	1.23	1.04	1.64
Sussex County	1.04	4.96	1.08	3.34
Union County	1.17	1.37	1.17	1.19
Warren County	1.09	1.49	1.14	1.35

**FIGURE 2: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: ALL MALIGNANT NEOPLASMS 1950 - 1969**



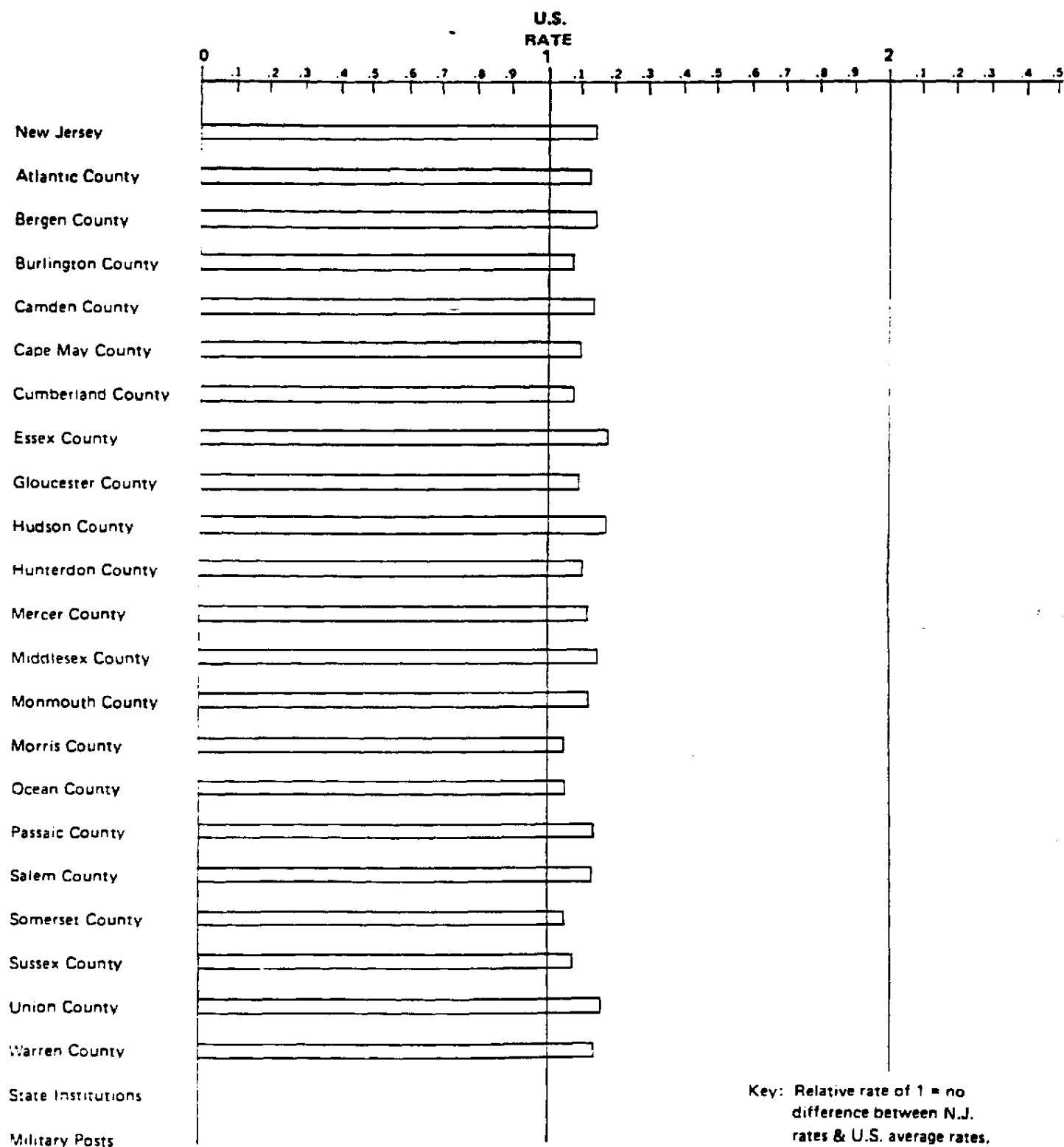
**FIGURE 3: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: ALL MALIGNANT NEOPLASMS 1950 - 1969
NON WHITE MALES**



Prepared by the Public Health Statistics Program
New Jersey State Department of Health

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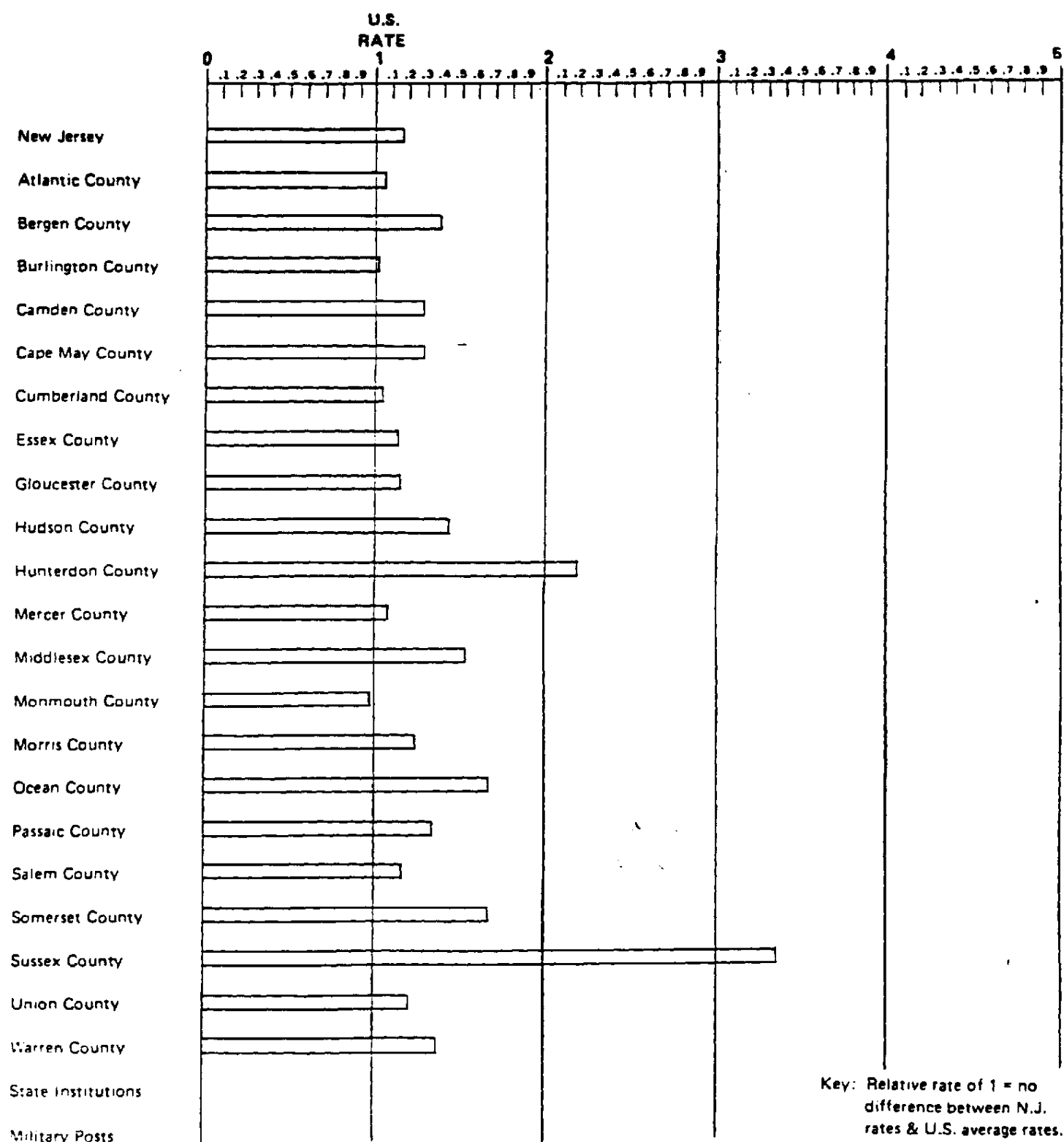
**FIGURE 4: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: ALL MALIGNANT NEOPLASMS 1950 - 1969
WHITE FEMALES**



Prepared by the Public Health Statistics Program
New Jersey State Department of Health

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**FIGURE 5: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: ALL MALIGNANT NEOPLASMS 1950 - 1969
NON WHITE FEMALES**



Prepared by the Public Health Statistics Program
New Jersey State Department of Health

2) Gastrointestinal tract and associated organs
(Figures 7-13 Appendix I)

The cancer mortality for almost all of the gastrointestinal tract and associated organs is exceedingly high in New Jersey. For cancer of the esophagus, New Jersey ranks fourth and fifth among the states for white male and female rates respectively; for stomach cancer, New Jersey is third and fourth among the states for white males and females; for large intestine, except rectum, New Jersey is second and first for white males and females. The rates for non-whites are not as striking, but are still high, particularly for cancer of the rectum, where the non-white female rate for New Jersey is highest in the country.

New Jersey also shows particularly high death rates among some groups for cancers of the liver, biliary tract and pancreas. The State is fourth in the nation in white male liver and biliary passage cancer mortality; fourth in the nation in white male pancreas cancer mortality; and third in the nation in white female cancer mortality.

3) Respiratory tract (Figure 14 & 15 Appendix I)

In both the upper and lower respiratory tract, New Jersey has high cancer mortality. In cancers of the tongue, mouth and oral pharynx, New Jersey ranks sixth for both white and non-white males. Similarly, high rates are seen for laryngeal cancer in males, where New Jersey ranks fifth and third for white and non-white males respectively. For nasopharynx, New Jersey is seventh for white males and fourth in rank for white females.

Mortality in New Jersey for cancer of the trachea, bronchus and lung, is high "across the board." New Jersey ranks third for white males, fifth for non-white males, fourth for white females and sixth for non-white females. In county profiles, while almost all New Jersey counties have high white male mortality rates, it is particularly striking in the more industrial northern portion of New Jersey, in counties such as Passaic, Bergen, Essex and Hudson.

4) Breast (Table 7 Appendix II)

New Jersey has particularly high rates for breast cancer, both male and female. In all

race-sex categories, New Jersey ranks third among the states for breast cancer mortality, except for non-white females, where New Jersey is fourth. The high rate of breast cancer in females is especially marked in counties near the cities of New York and Philadelphia.

5) Other Cancer

Relatively high mortality is present in New Jersey for uterine cancer, excluding the cervix uteri, where New Jersey ranks third among white females, and for the ovary, fallopian tube and broad ligament cancer, where the State is first for white females and fifth for non-white females.

New Jersey also has high cancer mortality for some categories of endocrine cancers. In thyroid cancers among whites, the State is sixth and third for males and females respectively. For other endocrine glands, the State is fourth for white females. New Jersey also has a high relative mortality for neoplasms of bone in non-whites, ranking third and second for males and females respectively.

CANCER CONTROL

From the long range point of view, the most effective method of cancer control is prevention. This is best accomplished by identifying the causes of cancer and curtailing their presence in the environment. In today's state of knowledge, several factors have been thought to be causative of cancer, some of which may be interrelated. These include genetic factors, viruses and environmental factors. It is now believed that environmental factors play a much larger role in causing cancer than was previously thought.

Preventive aspects of cancer control can be divided into two areas; namely, 1) collecting evidence of what causes cancer; and 2) controlling known or suspected cancer causes.

The collection of evidence, supported by scientific findings, will necessarily require a multi-faceted approach. On the one hand, compounds with known cancer causing effects must be located in our personal environments (high-risk areas must be identified). On the other hand, rates of cancers must be defined. We must know in whom, where and when cancers of various sites of the body occur (development of a cancer registry). From the basic data, it is possible to scientifically "zero-in" on why cancer rates are high in certain groups and not in others. The working hypotheses can be tested (epidemiological investigation). Armed with this new knowledge of the causes of cancer, programs of prevention, control and protection can be designed.

1. Cancer Registry

One of the highest priority needs in New Jersey at the moment is a simple cancer registry. This is basic to all the information gathering systems that will be needed. There is no method now in use to determine the occurrence of cancer in New Jersey. The only method we have of any knowledge of cancer in New Jersey is mortality data. This is insufficient for the development of adequate data. A registry of the occurrence of cancer in specific populations is need.

As an example, the State Health Department at present is involved in the study of bladder cancer through a grant from the National Cancer Institute. Cases for the study are based on the only registry we now have available -- the death certificate registry. Since the causal exposure may have occurred two decades prior to the diagnosis of the cancer, it is obvious that interviewing live patients available through an incidence cancer registry would be much more valuable and productive than the minimal data available on a death certificate.

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The data generated by a cancer registry will be most valuable in at least two instances. First, major variations in rates of cancer may be pinpointed. This information will generate hypotheses that can be tested. Secondly, an increased rate of disease in a particular location such as near an industry, in a particular work setting, or in the delivery pattern of a water supply, should trigger a search for carcinogens in the environment by the Department of Environmental Protection. If particular industries display a pattern of cancer higher than that in populations nearby, a whole armamentarium of occupational health expertise should be set in motion.

The Public Health Council has the power to make cancer a reportable disease. They are prepared to do so. But simply to make cancer a reportable disease without the resources to effectively use the data that would be generated by this reporting system would be of little value. What is obviously necessary is the establishment of a system of data utilization.

It is anticipated that reporting of cancer from diagnostic laboratories will be a wholly adequate method for New Jersey. Almost every cancer is diagnosed, at some point, in a laboratory. In the climate of laboratory reporting that has already been generated in New Jersey, it is estimated that 95 percent of the cancers could reach the registry by this route alone. The addition of other methods of reporting would get the last 5 percent, but would so greatly add to the cost of registry that it would not be cost effective.

The data from the registry would be available to State and other qualified investigators. Methodology will have to be established to insure confidentiality for individuals, and at the same time provide necessary data for proper investigation.

The cancer registry is necessary to provide the correlations between the occurrence of cancer cases and possible environmental factors. It is also necessary for proper evaluation of cancer treatment and prevention measures that are currently in progress, or will be initiated in the future. The question to be answered is: has the incidence of a particular cancer decreased with the institution of early detection, adequate treatment and follow-up programs for that particular cancer?

2. Epidemiologic Investigations

The New Jersey State Department of Health is in a position to lead other interested state and federal agencies in investigating possible environmental relationships to high cancer mortality in our state, and to institute appropriate preventive measures and controls. This Department

has demonstrated over the years an expertise in epidemiology -- the "detective work" of public health -- that has become nationally known and respected.

The current example of this ability is the identification by the New Jersey Department of Health of the "Swine" influenza outbreak at Fort Dix; but other examples in the infectious disease field -- in hepatitis and in virus disease spread by mosquitoes -- are abundant. In the noninfectious disease area, investigations into relationships of phenothiazines to encephalopathies and possible adverse effects on human health of pesticides have been conducted.

Since the expertise required for cancer epidemiology is essentially the same as that which we have already demonstrated in studying infectious and noninfectious diseases, this Department is confident that it can expand into this new area if adequate resources are provided.

The State Department of Health has custody of, or direct access to, vital records and hospital and laboratory reports that are critical to good epidemiologic research. In addition, we have developed a close relationship with hospitals allowing review of necessary records, and reporting, that has allowed epidemiologic investigations throughout the State. The Department also has regulatory authority over hospitals and laboratories to assure access to data.

Thus, we are uniquely qualified, competent and able to investigate the problem of Cancer in New Jersey.

Epidemiology is the study of the occurrence, distribution and cause(s) of disease. With the information gained through the registry, epidemiological investigation may begin.

Two areas of investigation are indicated: 1) the study of distribution of the cancer and 2) the search for the causes of the observed distribution. The first activity would describe the type and site of cancer in terms of age, sex, race, residence, occupation, family history, personal habits such as smoking, diet, cultural factors, and would point out variations in the distribution.

The second area would attempt to explain why the distribution is different in one population group than in another. Hypotheses will be developed as to potential cause and statistical methods utilized to test the significance of these hypotheses.

These types of investigations and information provide the scientific basis for measures to control cancer.

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In other words these studies allow us to pinpoint the at-risk population and environment, and to institute indicated controls.

3. Identification of High Risk Areas

Fourteen chemical agents have already been recognized as probable or proven human carcinogens by HEW's National Institute of Occupational Safety and Health (NIOSH). The chemicals and their uses are tabulated in Table 11 on the following page.

We do not now know what quantities of these known carcinogens are manufactured, used, or imported into the state. We do not know what plants use them, manufacture them, or produce them as by-products of some process. We know nothing of the identity, or numbers of workers who come in contact with them, nor of the levels to which they are exposed. We do not have the necessary knowledge of the industrial screening and medical services available to the workers exposed to these substance, or the protections offered them. We have little idea whether humans acquire cancer from exposure to these substances by repeated occupational contact, or by their release through sewage, air, or other means, including even transport by workers' clothing into their households.

These known significant carcinogens must be traced through New Jersey. We must know how much is imported and how much is produced, who is exposed and what are the consequences of such exposures.

Specific knowledge that carcinogens are utilized in a particular industry will suggest searching the cancer registry for excess cases working in that industry. Failure to identify excess cases will justify re-directing attention to the next highest priority carcinogen. However, documentation of increased risk will mandate further analysis such as length of exposure, adequacy of customary protective devices, interactions with other cancer risks such as smoking, etc. Suspicious findings from the registry in the environs of an industry using a carcinogen will mandate a search for environmental contamination.

We view this cataloging as an ongoing process. As suspicious agents are suggested, industries utilizing the agent must be catalogued by the Department of Labor and Industry. Carcinogen-use cataloging by the Department of Labor and Industry will be a new endeavor. The law on which this effort will be based will have to be reviewed and the mechanism for its implementation will have to be developed.

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TABLE 11: KNOWN (OR PROBABLE) CARCINOGENS AND THEIR USES

AGENT	USES
4-Nitrobiphenyl	Analytical standard
Alpha Naphthylamine	In manufacture of herbicides, dyestuffs, food colors and color film, paint, plastics, rubber and petroleum products.
4,4-Methylene bis (2 - chloroaniline)	Curing agent for epoxy and other polyurethane resins.
Methyl chloromethyl ether	In manufacture of ion exchange resins, textiles, and drugs.
3,3-Dichlorobenzidine	In manufacture of printing inks, dyes, plastics and crayons.
Bis-chloromethyl ether	In manufacture of ion exchange resins.
Beta Naphthylamine	In manufacture of dyes and pesticides, in photography, and as a chemical reagent.
Benzidine	In production of dyes, rubber and plastics, printing ink, fire proofing and in medical laboratories.
4-Aminodiphenyl	As an antioxidant in rubber manufacture and as an intermediate chemical in dye production.
Ethyleneimine	In paper and textile industries in herbicides, resins, drugs, and jet fuel.
Beta Propiolactone	In plastic manufacture.
2-Acetylaminofluorene	Potentially as a herbicide
4-Dimethylaminoazobenzene	As a dye.
N-Nitrosodimethylamine	As an industrial solvent and in synthesis of rocket fuel.

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The registry, therefore, will be used to evaluate the extent of the potential problem created by industrial use of carcinogens. Most carcinogens will be adequately contained, but when rates generated by the registry suggest, and epidemiological studies confirm that the carcinogen is actually responsible for cases in a specific locale, controls will have to be instituted to limit the exposure. The laws necessary for such control activities will have to be reviewed, and supplemented where necessary.

Thus, by homing-in on agents demonstrated to be actually carcinogenic, in regions where the registry has identified high cancer rates rather than sampling hither and yon, from the long list of potential carcinogens, we will both most effectively expend our resources and protect the public's health.

In summary then, based upon the epidemiological investigations of the State Department of Health alluded to above, certain environmental and biological specimens will be obtained from "high-risk" areas and "at-risk" persons by the Department of Environmental Protection and the State Department of Health respectively. The laboratory testing of these specimens will indicate what particular chemicals are polluting the environment, particularly in the work place, and indicate that engineering techniques must be changed to control and prevent the release of these materials, or that known protective measures must be vigorously employed.

The laboratory testing is an integral part of a meaningful occupational health and safety program to insure the well-being of our work force. Currently, due to Federal malaise and historically due to weak state leadership no statewide program of occupational health and safety exists. Such a program should be re-established in the State Department of Health, initially as part of our Cancer Control Program.

The epidemiological investigations that pinpoint the areas to be studied by laboratory methods will lead to true primary prevention, i.e. finding a population with a high frequency of a particular cancer, identifying the determinants of that cancer and instituting the necessary regulations and controls to prevent the people from being exposed to or coming in contact with the causal agent.

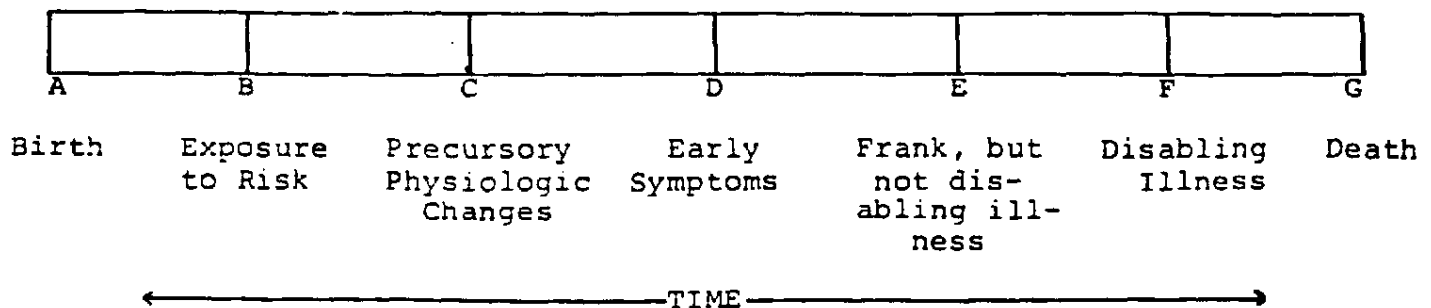
4. Early Detection--Screening

Certain cancers in the early stages are amenable to mass or selected screening programs which are now sometimes provided by various agencies at various times without coordination. There should be a coordinated effort led by the New Jersey Department of Health utilizing the expertise of the Medical and Osteopathic Societies, American Cancer Society, local health departments, hospital clinics, neighborhood and family health centers and industrial medical programs to provide for early identification of rectal cancer by rectal exam, cervical cancer by pap smear, oral cancer by oral exam and breast cancer through self examination, regular palpation and possible thermography or mammography.

The Department will utilize and encourage those screening techniques that have been found to be cost-effective and technically sound in identifying potential cancers and will continually evaluate newly proposed methods by limited clinical trials before embarking on a mass screening technique. The Department, in essence, will be involved in the evaluation of the effectiveness of screening techniques, and then the encouragement to the local agencies to utilize the effective methods, rather than "jumping-on-the-bandwagon" for any newly described procedure.

The purpose of any screening program is to intervene as early as possible in the course of disease. If we look at the model⁷ below of the natural history of untreated disease in an individual and deal with cancer—the disease in question—then we can see that during the periods C-D (early physiologic changes) and D-E (early symptoms), are the times when screening techniques for cancer would be most effective i.e. before the cancer has progressed too far.

FIGURE 16: The Natural History of Untreated Disease



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Several screening techniques that are accepted and/or in the developmental stages will be discussed briefly.

Cytological Screening

For a number of years the use of cytology (the microscopic examination of body cells) has been advocated and studied as a selective screening procedure to identify early cancer in various sites.

Cervical Cytology

The most widely accepted and one of the most easily accessible sites for this technique has been the uterine cervical smear (Pap test). Cervical cancer discovered early in its course (in-situ) by this technique has an almost 100% cure rate. The rate drops when the cancer becomes invasive. All women, over the age of 30 years, should have a Pap test at least annually in order to detect the disease as early as possible. A recent study in Massachusetts⁸ however, indicates that the most important age groups to test, are not being reached. Routinely, women in the childbearing ages are given Pap tests prenatally, early in pregnancy, in family planning clinics or during their annual check-up. The study showed that only 44% of the total number of Paps were performed on women over 35 years of age. Women in this age group accounted for 97.5% of the deaths due to cervical cancer and more importantly the death rate increased steadily with age while the proportion of women who had Pap tests decreased with age.

The means for early detection and virtual elimination of cervical cancer through proper treatment is readily available, yet thousands of women nationally, and hundreds in New Jersey, annually die needlessly of this disease. In fact, a study in British Columbia screened 80% of the women over 20 years of age and the mortality for this group fell from 11.4 deaths per 100,000 population in 1958 to 6.9 deaths per 100,000 in 1970. The incidence of clinical cancer of the cervix in the screened group was only 14% of the unscreened population.⁹

The State Department of Health has recently submitted an application to the Department of Health, Education and Welfare's National Cancer Institute to support a statewide program of cervical cancer screening and follow-up in the high-risk populations. This is one of the few programs of cancer control which NCI budget presently supports. With the proper word from Congress, which "watch-dogs" NCI's budget, some programs of environmentally related cancer control might also be supported in States such as New Jersey.

Bladder Cytology

Certain industrial processes are associated with a high incidence of bladder cancer. Selective urinary cytological screening of this population is of value to identify bladder tumors in their early stages. Such a selective screening program is indispensable in any work setting where the hazard of occupational exposure to potential bladder carcinogens exists. Urinary cytology is also indicated for patients presenting with any symptoms suggestive of urinary tract cancer.¹⁰

Lung Cytology

Several researchers have advocated that heavy smokers with a productive cough be screened cytologically.¹⁰ If the sputum shows abnormal cells, then the fiberoptic bronchoscope, would allow visualization of all major areas of the lung and possibly locate an operable cancer.

Colon and Rectal Cancer Screening

Over 2,000 New Jerseyans die annually from cancer of this site yet the American Cancer Society contends that approximately 75% of these patients might be saved through early diagnosis and treatment. One method being advocated annually for all patients over 40 years of age and those with a history of cancer, ulcerative colitis, polyps or familial polyposis is a take-home specially prepared slide-packet to test for occult blood in stool specimens. On three successive days--because gastrointestinal bleeding may be intermittent--the individual patient smears thin fecal samples on a paper slide and then mails the slides to the physician or lab. The addition of a specially prepared mixture to the sample by the physician or technician produces a bluish-ring on the slide paper if any blood cells are present. Persons must be on a meat-free, high-residue diet. They must not take medications containing iron or aspirin during the testing period, nor be bleeding from hemorrhoids or menses prior to taking the specimens. This test has been well received by patients. It can be used as a mass screening device by labor groups and community organizations, with cooperating physicians and laboratories. It does not provide conclusive evidence of the presence or absence of pathology, but it raises the index-of-suspicion and helps the physician to decide whether and which diagnostic procedures are indicated.¹¹

A recent report on a 25-year follow-up study of 18,000 persons older than 50 years emphasizes the value of periodic proctoscopic exams for colon and rectal cancer. Those individuals who had received the periodic exams had a cancer rate of only 15% of that expected if exams had not been done regularly.¹²

Experimental Techniques

Active research has led to techniques for identifying potentially carcinogenic agents much earlier than is presently possible. Animal studies have proved meaningful. It has also proven useful in identifying persons in the population that may be more prone to develop cancer due to inherited traits.

Mutagenesis

If a chemical is carcinogenic (capable of producing cancer) then it might also be mutagenic (capable of producing a genetic change in a cell). It has been found that when such an agent is "fed" to microbiologic (bacteria cells etc.) systems, genetic changes may occur in the cells. Individual cell duplication can be visualized and changes identified more rapidly than from present methods of research on the interaction of agents with animal tissues. This gives researchers a new method to identify potential carcinogens. Controls can then be applied more rapidly, to protect individuals from contact and exposure to the particular agent. This is an important screening technique to which the State's laboratory could be adapted.

Differing Susceptibility to Cancer

Susceptibility to cancer appears to be inherited, or at least a predisposition to develop cancer under the right conditions seems to be inherited. Some persons have a higher susceptibility to develop cancer than others.¹³

Studies indicated, in the past, that particular types of cancer tended to occur in families. Newer studies, however, show that relatives of cancer victims even appear to be at increased risk for completely different cancers.¹⁴

Growing evidence indicates that the metabolite(s) of a chemical rather than the parent chemical may be carcinogenic and that the human body reaction to a specific metabolite depend upon certain enzyme levels in the body. One such enzyme which increases markedly with certain chemical exposures is aryl hydrocarbon hydroxylase (AHH). The levels of this enzyme activity appears to be genetically determined. Susceptibility to lung cancer, for example, is associated with higher levels of AHH activity. If this work can be further substantiated, then future screening programs might include tests for "AHH inducibility." Those persons found to have highly inducible enzyme activity would require closer and more frequent screening and possibly even exclusion from the hazardous environment.¹⁵ Work placement physical examinations are used in enlightened industries. Certain workers can do certain things, and should not be introduced to other activities. Placement by standards of physiologic protection does not exclude people from the work place, but rather ensures the use of their talents for a greater number of productive years.

This potential screening technique could identify susceptible individuals before they become exposed to potential carcinogens and prevent the occurrence of disease.

These techniques are in the developmental stages, but emphasize the fact that through scientifically grounded programs we may be able to effectively and efficiently identify potentially hazardous chemicals and potentially susceptible individuals. Then, through these techniques effect a change in environmental contamination and individual exposure in order to prevent cancer.

5. Follow-up and Treatment

All screening programs must provide the mechanism whereby a positive screenee and his physician is notified and proper action instituted.

It is, incumbent upon the State in conjunction with the organizations and individuals mentioned above, to make maximum use of present means for detecting cancer in its early stages and insure prompt definitive follow-up and treatment.

It is not the role of the State to carry out treatment but it is the State's role to assure the quality and effectiveness of the therapy in each institution after appropriate referral is made. This assurance is accomplished through the State's responsibility to set standards for the operations and staffing of health facilities. Also, the certificate-of-need process ensures that there is a documented need for the specific cancer treatment modality in a specific area of the State and that the expertise to operate such a facility does indeed exist.

Furthermore, through the development of the cancer registry, institutions would be encouraged to develop active evaluation committees to study the effectiveness of their diagnostic methods and treatments of specific cancers. Once the registry is established and statistics are available, we will be able to define that certain cancers in certain hospitals are diagnosed much later in their course than in other areas of the State because the five-year survival rate for a specific cancer is markedly different from one area of the State to another. This will tend to push hospitals to be more effective in increasing their survival rate because they will not want to look "bad" compared to other New Jersey hospitals.

The New Jersey Cancer Institute once fully established will have an integral role in assuring that up-to-date, effective means of diagnosis and treatment are instituted throughout the State, and will depend on the registry to conduct their own scientific investigations of the effectiveness in diagnosis and treatment in various institutions.

6. Laboratory Support

Cancer investigators will be searching for carcinogens in human and environmental samples. Control programs, in part, will be based on eliminating exposure to carcinogens. Laboratory facilities capable of analyzing for carcinogens at levels of parts per billion are a necessary part of this effort. Essential to this laboratory effort is a gas chromatograph and support personnel. The Chemistry Laboratory of the State Department of Health has had experience in the field of gas chromatography, primarily in a pesticide research project, using equipment loaned by the Federal Government. This experience should be expanded.

As mutagenesis testing becomes an accepted screening technique for identifying potential carcinogens, then the State Department of Health Laboratory should be equipped to augment studies performed at the Federal level for chemicals peculiar or common in New Jersey.

The State Department of Health Laboratory role in other laboratory services, (cytological examinations and AHH enzyme activity) is to insure the quality of the independent and hospital laboratory services through the States' Clinical Laboratory Improvement Program.

7. Health Education

If there is to be control of existing disease as well as prevention of occurrence and progression of cancer, then Health Education must be an integral part of each aspect of the program.

The incidence and mortality from various types of cancer, but especially lung cancer, are broadly the result of the use of tobacco, especially cigarette smoking.

If we are really to effectuate a change in cancer incidence and mortality then this one factor must be attacked vigorously.

Tobacco-related cancer can best be avoided, of course, by avoiding the cigarette habit. Education programs must be developed and directed to sensitive and susceptible age groups especially the young school-age child. This is very important because the younger the individual is when he begins smoking, the greater the chance of developing lung cancer and other related diseases.

For the established smoker other possibilities exist. First, is enticing the individual into participating in "smoke-ending" clinics and programs by

interesting him more intimately in his personal health and assuring him that the effects of cigarette smoking, are not irreversible except after very long, excessive use.

Second, is through the release of information on the tar and nicotine content of cigarettes to give smokers the alternative of smoking cigarettes with lower concentrations of these substances. The tobacco industry appears to have been motivated through this technique to decrease the levels of nicotine and tar, because of the potential competition for sales. Ultimately, State and Federal legislation or regulations with maximum allowable concentrations for tar and nicotine may be enacted and promulgated.

Uppermost, in cancer control and in any control program is the prevention and early detection of disease. In order for this to occur, there must be a high-index-of-suspicion in the professional and lay community. The Cancer Control Program must by necessity address the health education activities outlined in Table 12 on the following page:

8. Role of State Agencies

Several state agencies are necessary for the implementation of an effective Cancer Control Program. The tasks of each of these agencies as they relate to the entire program follows:

Department of Health

- 1) Registry - A cancer incidence registry of diagnosed cases in New Jersey patients.
- 2) The epidemiologic process - Define in whom, where, and when, cancer rates in New Jersey are high. From these data, establish through further investigation why the cancer rates are high in certain groups and not in others. From this knowledge, programs of prevention, control and protection can be designed.
- 3) Prevention
 - . primary - curtail the known carcinogens in relation to populations at risk;
 - . secondary - develop methods, or apply known methods for early detection;
 - . develop and apply workable health education methods to change human behavior to reduce exposure to carcinogens.

RSV 0013430

TABLE 12: HEALTH EDUCATION ACTION, ACTIVITIES, AND AGENCY INVOLVEMENT IN CANCER CONTROL

ACTION	TYPES OF ACTIVITIES	TYPES OF AGENCIES INVOLVED
Individual action and behavior change	-early attitudinal and value formation as regards one's health (school curricula) -adult education program relating to: •seven danger signals for cancer •smoking withdrawal •avoidance of undue exposure to sun •breast self-exam •change of dietary practices -occupational programs relating to: •wearing protective clothing and equipment and observing protective measures •avoidance of known hazards	Schools, Voluntary Organizations, Labor Unions, Management, Community Groups, Professional Groups, Local Health Departments
Medical and Health Professionals Education	-training and continuing education to improve expertise in •counselling •early detection, treatment, control of cancer •preventive techniques for high-risk population •educating patients	Academy of Medicine, Medical Schools, Nursing Schools, Other Health Training Schools, Voluntary Organizations, New Jersey Cancer Institute
Community Action	-control the physical and biologic environment by developing the climate for environmental pollution control, environmental design and safety engineering, and human factors engineering. -control the social environment through: •dissemination of information •smoking control codes •provision of smoking withdrawal resources	Community and Civic Organizations, Elected Representatives, Local Health Departments, Special Interest groups (consumer groups).

4) Human Surveillance

Extend the present health protection of workers and others at risk, through surveillance, screening, laboratory back-up and follow-up.

5) Referrals to treatment and rehabilitation

Assist in the development of the appropriate network and ensure referral of patients detected to have cancer to it.

6) Program and facility standards - Through the planning and regulatory process, provide New Jersey with selected high quality cancer treatment sites.

7) Food and products safety enforcement - Continue cooperation with FDA to ensure elimination of carcinogens from food and drug products stored and distributed in New Jersey.

8) Health education - Community based programs, and assistance to Department of Education in teacher training and curriculum development.

Department of Labor and Industry

1) Industrial mapping - Relate potentially hazardous industrial processes and emissions to geographic areas.

2) Historical data - Define relevant industries active in New Jersey during the last five decades.

3) Process surveys - Locate and inventory suspected carcinogenic substances in the occupational environment. (carcinogen-use cataloging)

Department of Environmental Protection

1) Carcinogenicity testing - Provide aggregate samples of air, water, etc. to the appropriate research laboratory to be tested for their carcinogenic and mutagenic properties.

2) Monitor - Determine the presence and concentrations of carcinogenic substances in the environments, particularly those to which Department of Health studies point as suspect.

3) Inventory - Determine the use, production, transport and waste products known or suspect of being carcinogenic.

- 4) Emission Standards - Establish standards to limit the emission of carcinogenic substances into the air and water, or through improper disposal of wastes.
- 5) Cluster monitoring - Monitor extensively and comprehensively at sites where Department of Health studies show cancer cases to be clustered.
- 6) Permit review - Review of existing and new permit applications to ensure that carcinogenic substances are not emitted to the environment.

Department of Higher Education

- 1) Training of industrial hygiene, occupational health and safety specialists, and continuing education for those currently employed.
- 2) Training of medical and allied professional manpower for cancer control, treatment and rehabilitation, and continuing education.
- 3) Industrial Research and Development performs a feasibility study on the academic basing in New Jersey of an industrial R & D Institute to be involved in training, and also in the testing of processes prior to their introduction into the work environment to determine their safety to humans, or alterations which will make them safe. Also test current processes suspected of hazard, for alteration.

Department of Agriculture

- 1) Investigation of food production - to determine presence or absence of use of carcinogens as in animal and poultry feeding.
- 2) Enforcement - enforce the elimination of carcinogens from food production.

Department of Education

- 1) Develop curricula for a total health education program to teach children to develop positive attitudes toward health, self-responsibility, and appropriate decision making skills relative to cancer prevention, detection and periodic exams.
- 2) Mandate teaching of the developed curricula in all schools by qualified, capable teachers.

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9. FEDERAL AGENCIES

OSHA

Congress' goal in enacting the 1970 Occupational Safety and Health Act was "to assure as far as possible every working man and woman in the nation safe and healthful working conditions..." This act created the Occupational Safety and Health Administration in the U.S. Department of Labor to set mandatory safety and health standards and to enforce these. OSHA, unfortunately, is woefully understaffed. There is only one inspector for each several thousand workplaces. OSHA has primarily directed its attention to the more visible and sudden safety hazards and has not, by and large, addressed itself to the more chronic concerns of health hazards such as occupational carcinogenesis. OSHA is neither staffed with medical competence, nor can it examine workers. It is constrained to look only at the industrial environment. The New Jersey experience with OSHA supports these contentions.

New Jersey may be able to augment OSHA's activity by calling for its increased funding. New Jersey must also make clear that the message is for more and vigorous activity in New Jersey, rather than a shying from delicate situations. As the New Jersey cancer control program delineates carcinogenic exposures that must be eliminated, OSHA must be called on for enforcement. Failing an augmentation in OSHA's activity, a state program may have to be reinstituted.

NIOSH

National Institute of Occupational Safety and Health is a division of the Center for Disease Control, DHEW. Its primary responsibility is to establish, through research, occupational hazards that are to be controlled by OSHA. NIOSH has only research capability, and no regulatory power. NIOSH also responds to requests by labor or management to investigate potential health hazards in the work place. NIOSH is staffed with five physicians to respond to Health Hazard Evaluation for the entire United States.

New Jersey's relationship to NIOSH is again two-fold. On the one hand, we must encourage proper funding so that NIOSH can adequately respond without unreasonable delay to Health Hazard Evaluation. On the other hand, NIOSH is a potential partner in demonstration programs of

occupational health services that can be launched by the New Jersey Health Department's Cancer Control Program. They are not only a potential funding source, if their budget is adequate to respond to our requests, but also a source of consultation and expertise.

NCI

The National Cancer Institute has several missions. It not only conducts clinical treatment research and development, but also more basically, seeks to expose the etiology of cancer. For twenty years, the National Cancer Institute has explored infectious agents relationships to causes of cancer. It has explored "biology gone wrong" at the molecular level. Their efforts have not been bent toward actually controlling cancer. If the NCI is to be a further partner with New Jersey, their budget and program priorities must be re-examined.

RSV 0013435

SUMMARY

The appalling statistics presented certainly give New Jersey the distinction as "Cancer-State-U.S.A." Why is New Jersey's cancer death rate so high for so many different types of cancer?

These statistics are merely the "tip-of-the-iceberg." How many of our citizens have, as yet, undiscovered cancers, and how many are being exposed on a daily basis to high levels of carcinogenic substances in the occupational setting, and other environments?

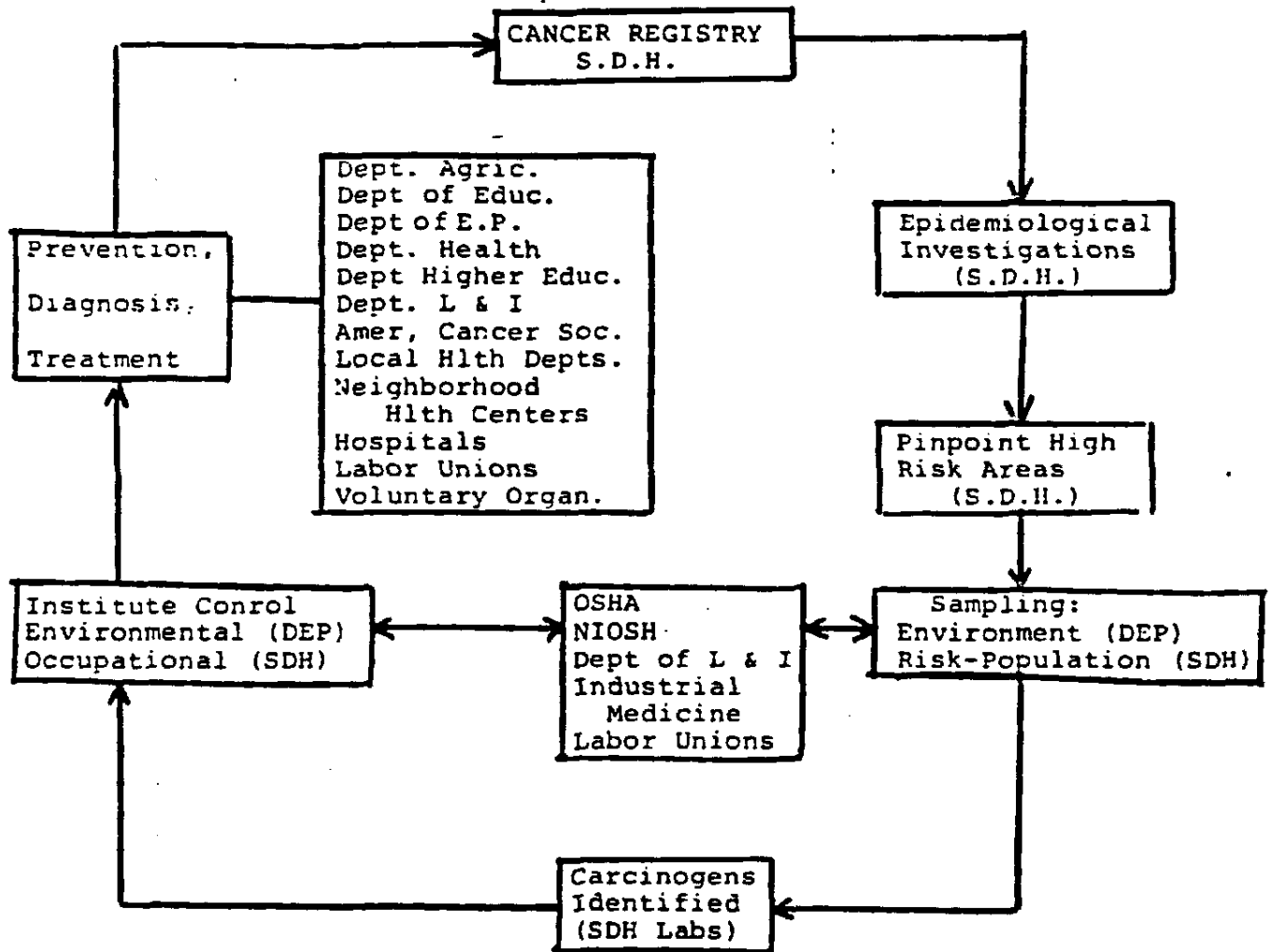
These are the questions that must be answered if we are to truly control and prevent cancer.

Accurate information is essential, if we are to answer these questions. This information must be obtained through a registry of cancer patients as soon as they are diagnosed, not after they succumb to the disease. Also, we must pinpoint areas of the state where known carcinogenic substances are produced, used, stored or given off as by-products in order to know what population groups are most at-risk.

Then, based upon this information, we can undertake vigorous on-going epidemiologic investigations to answer essential questions. The information gathering, epidemiologic studies, and education are the cornerstone of a Cancer Prevention Program. When linked with screening, early diagnosis, treatment and follow-up, these activities constitute a total Cancer Control Program. Such a Control Program for New Jersey has been outlined in the previous pages.

Finally, a "Cancer Control Cycle," which in essence is a flow chart summarizing a New Jersey Cancer Control Program follows:

FIGURE 17: CANCER CONTROL CYCLE



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NEW JERSEY STATE HEALTH DEPARTMENT CANCER CONTROL BUDGET

Personnel including, but not limited to a Director of Cancer Control, Epidemiologists (M.D. and non-M.D.), Research Assistants, Statistician, Cancer Registrar, Public Health Nurse(s), Nurse Consultants or Project Nurse(s), Field Personnel, Health Educator(s), Media Specialist(s), Curriculum (Specialist(s), Industrial Hygenists(s), Occupational Health and Safety Experts and Clerical Staff.....\$ 350,000
20% Fringe..... 70,000

Other Costs

Travel	\$10,000	
Equipment	5,000	
Furniture	5,000	
Telephones	2,000	
Supplies	2,000	
Conferences, Seminars	10,000	
Printing	10,000	
	<u>\$44,000</u>	44,000
Grants-in-Aid to local agencies on matching basis and subject to meeting standards of performance.....		500,000
Initial Laboratory Support.....		350,000
Registry Costs.....		<u>200,000</u>
	TOTAL	\$1,514,000

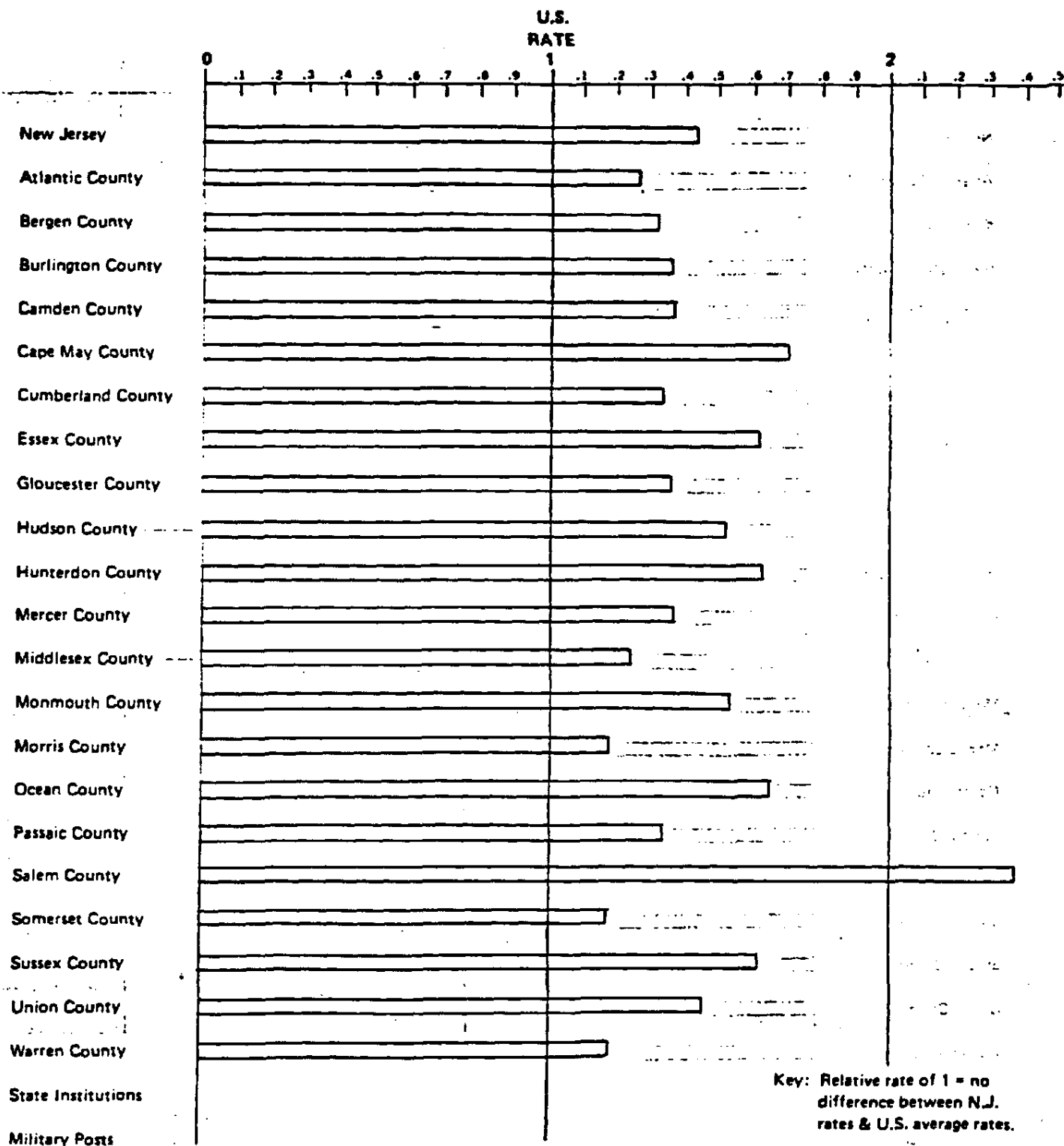
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APPENDIX I

RSV 0013440

**FIGURE 6: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: CANCER OF THE BLADDER 1950- 1969**

WHITE MALES

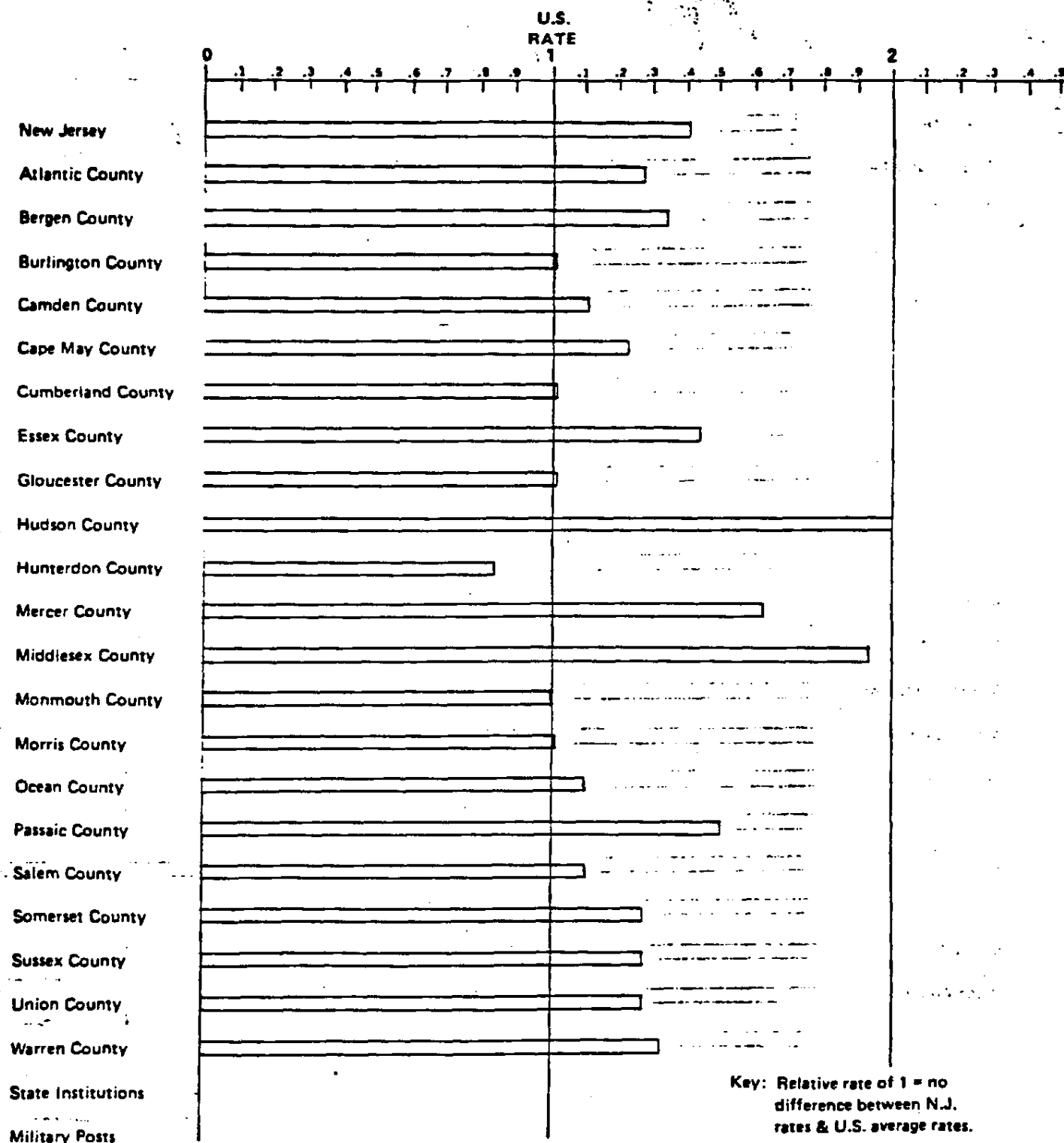


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**FIGURE 7: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: CANCER OF THE ESOPHAGUS 1950 - 1969**

WHITE MALES

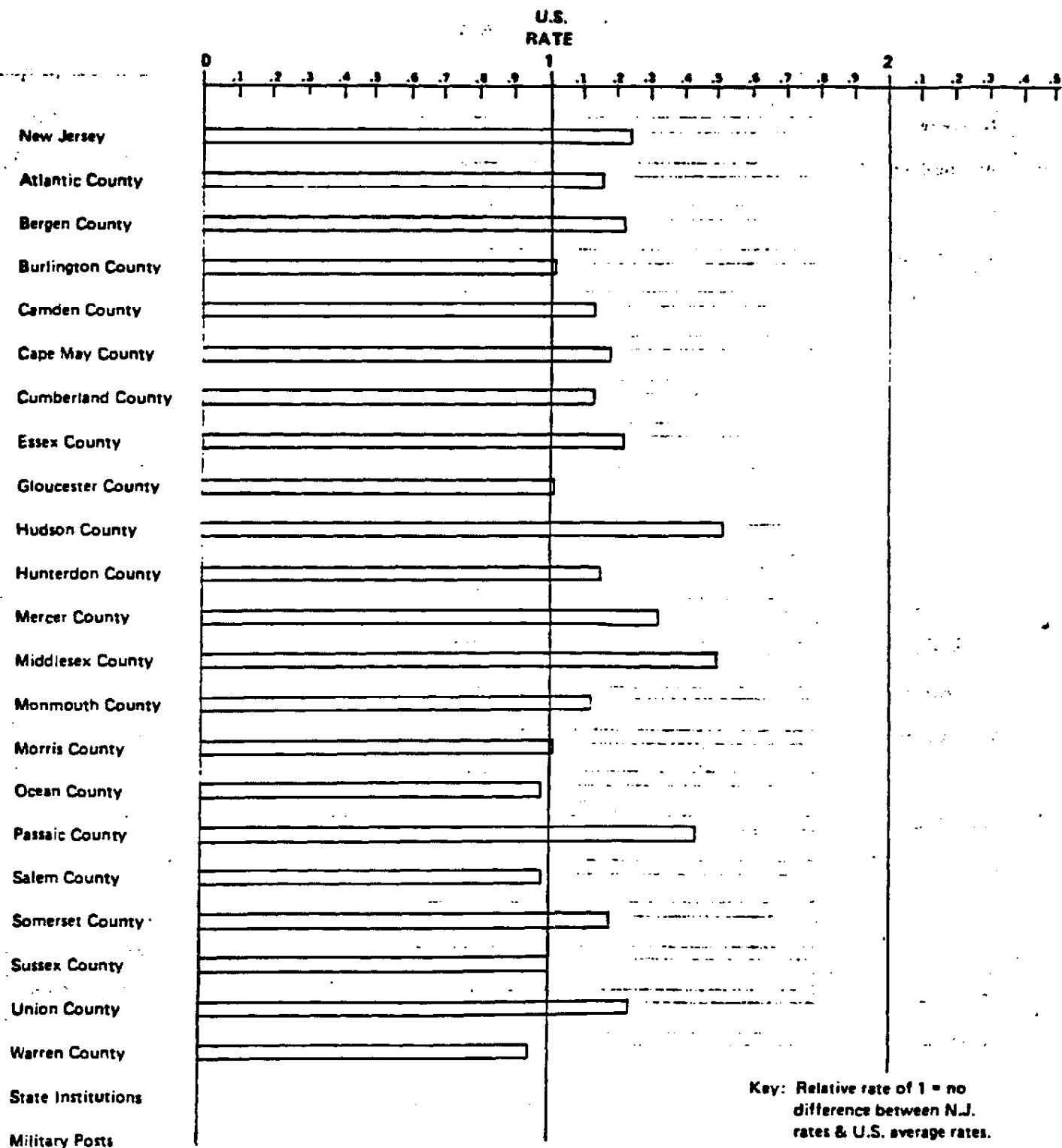


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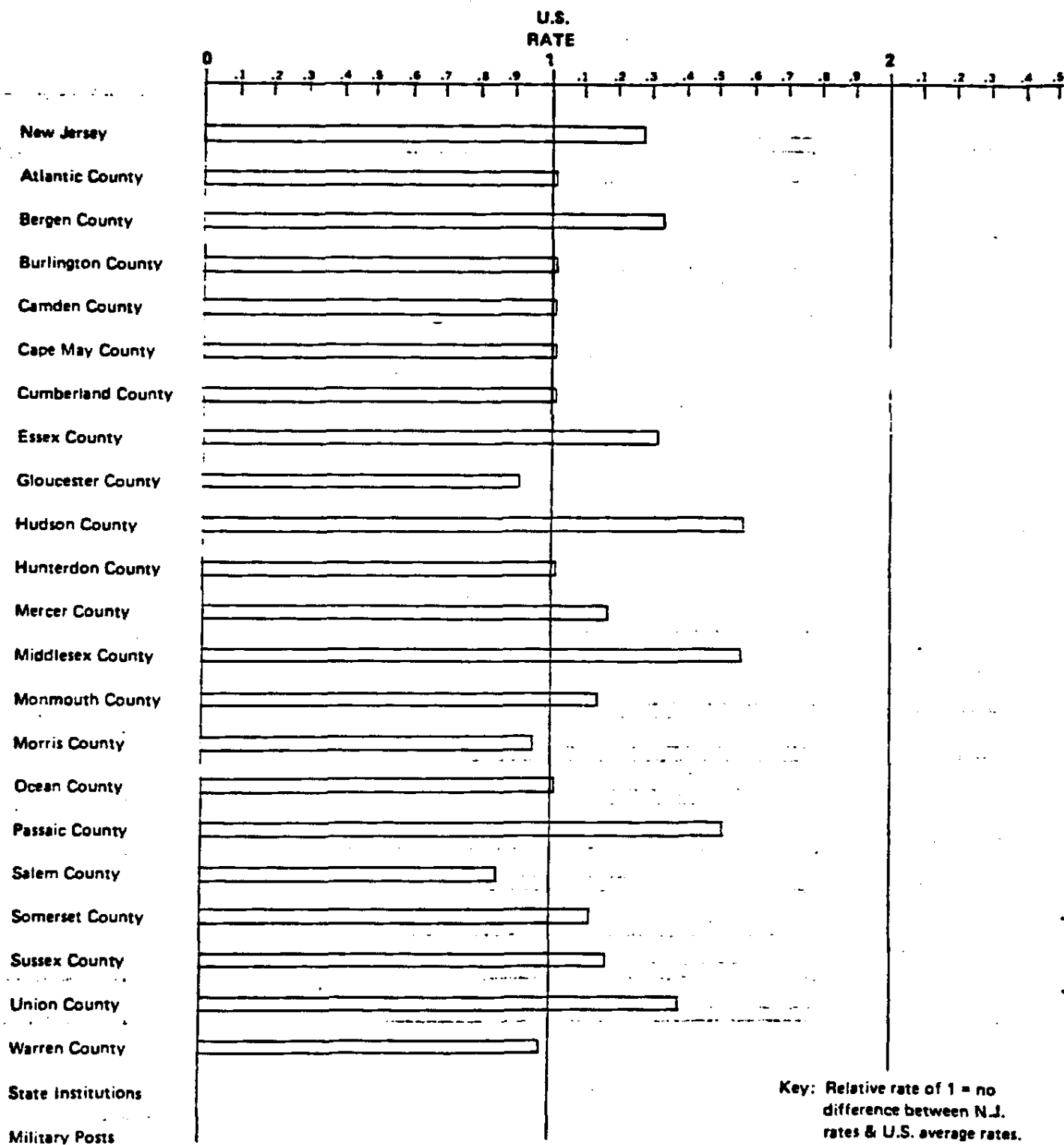
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FIGURE 8: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE U.S. MORTALITY RATE: CANCER OF THE STOMACH 1950 - 1969

WHITE MALES



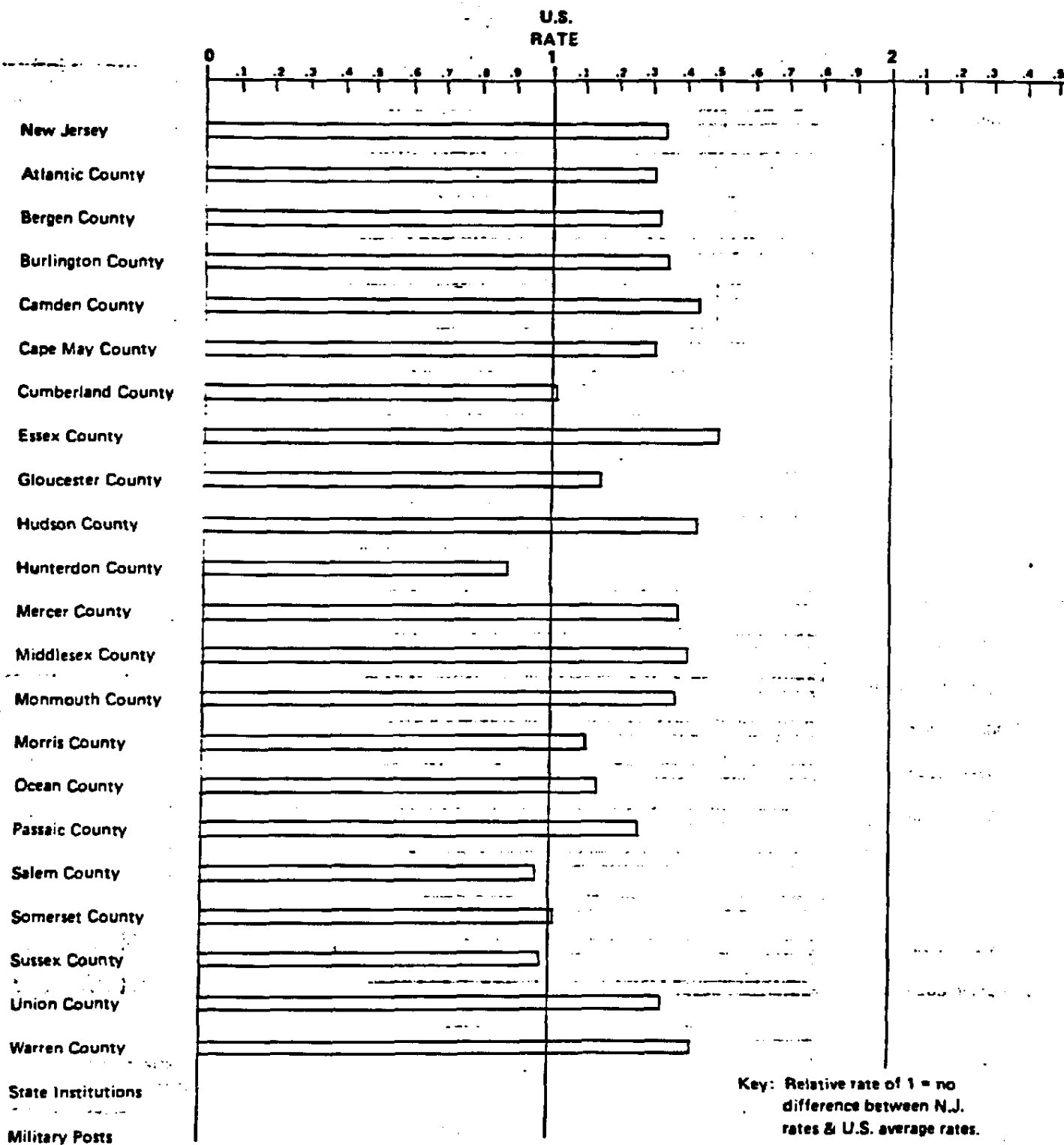
**FIGURE 9: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: CANCER OF THE STOMACH 1950 - 1969
WHITE FEMALES**



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RSV 0013444

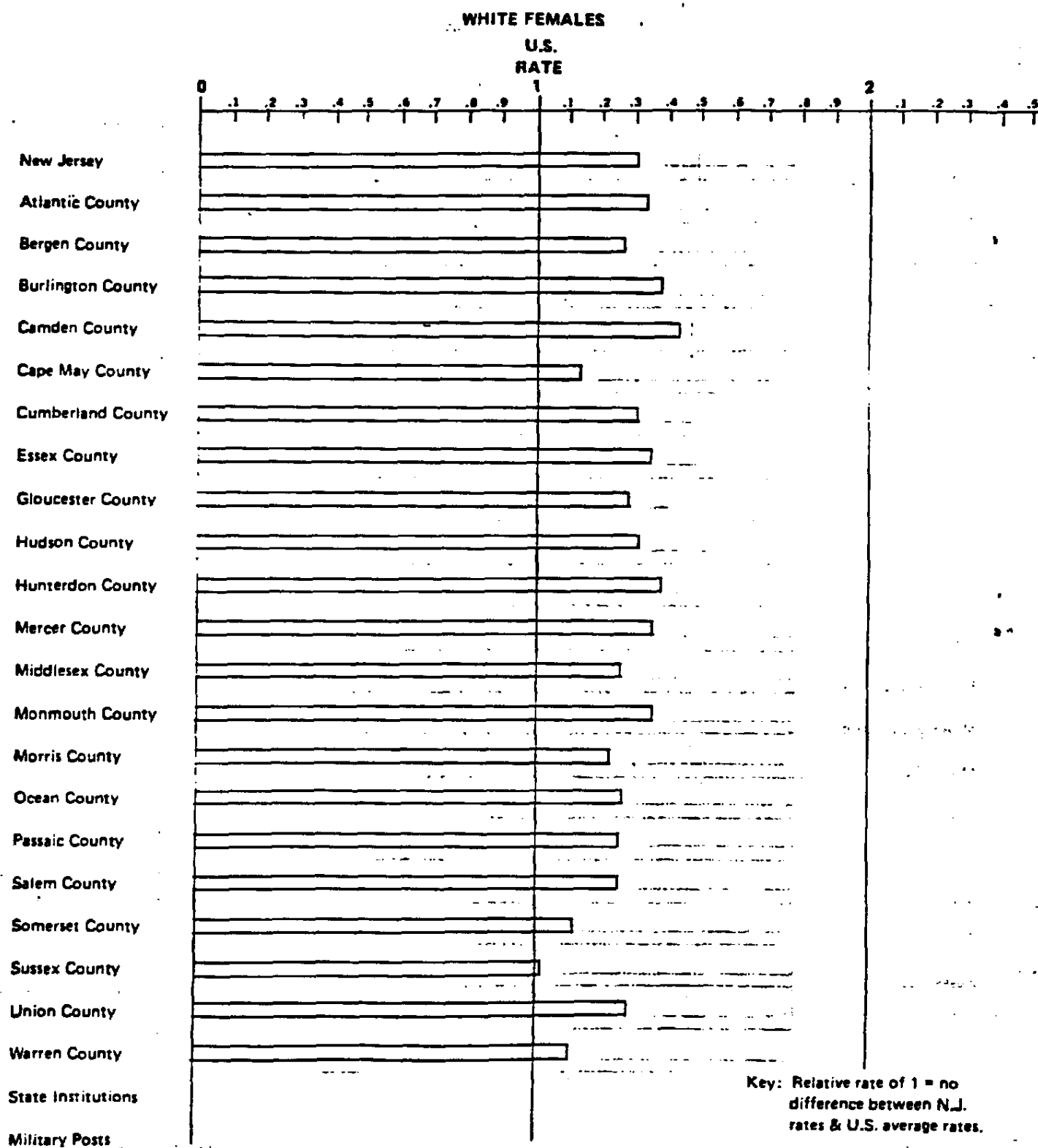
**FIGURE 10: RATIO OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: CANCER OF THE LARGE INTESTINE, EXCEPT RECTUM
1950 - 1969
WHITE MALES**



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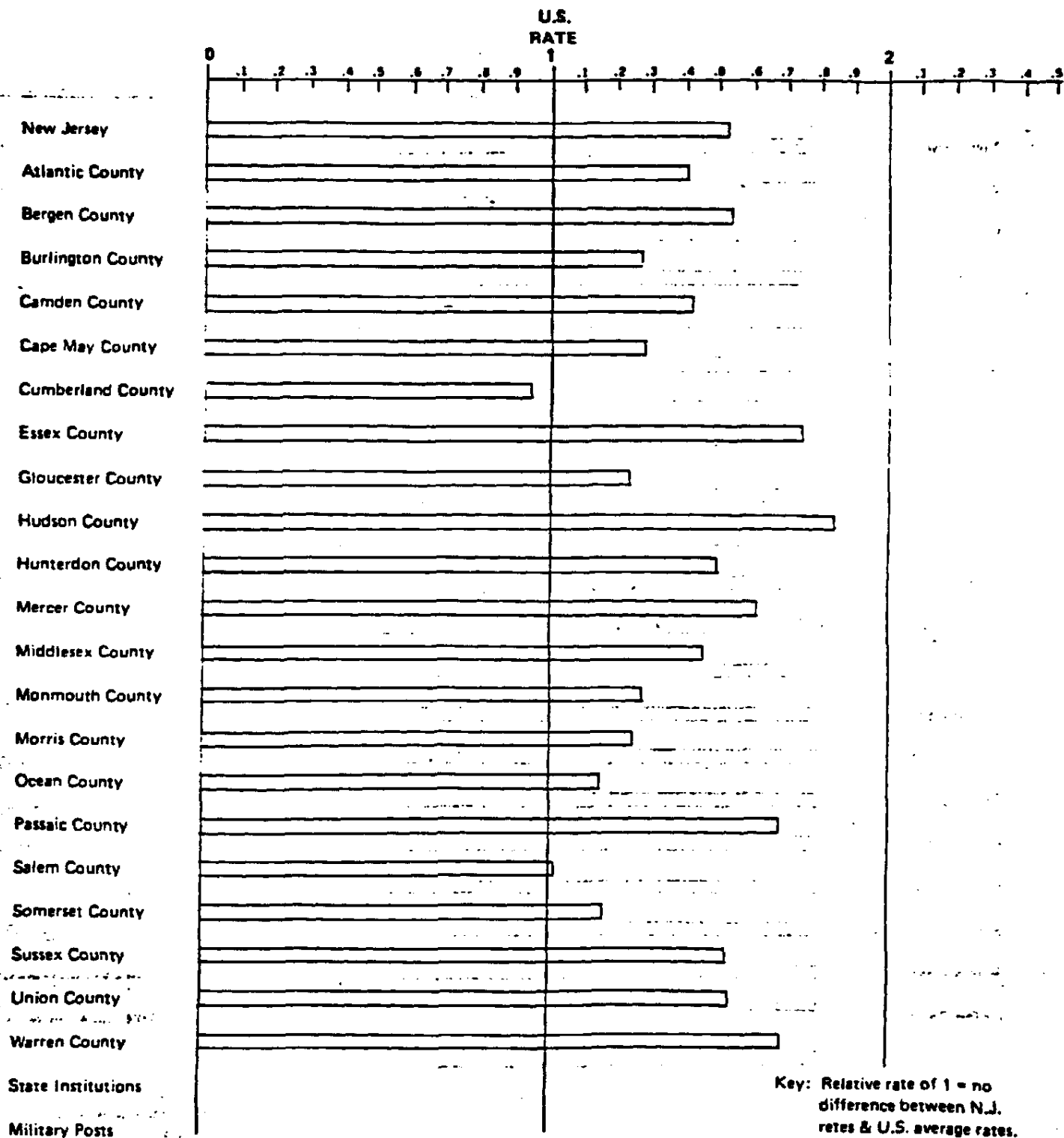
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**FIGURE 11: RATIO OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: CANCER OF THE LARGE INTESTINE, EXCEPT RECTUM
1950 - 1969**



**FIGURE 12: RATIO OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: CANCER OF THE RECTUM 1950 - 1969**

WHITE MALES

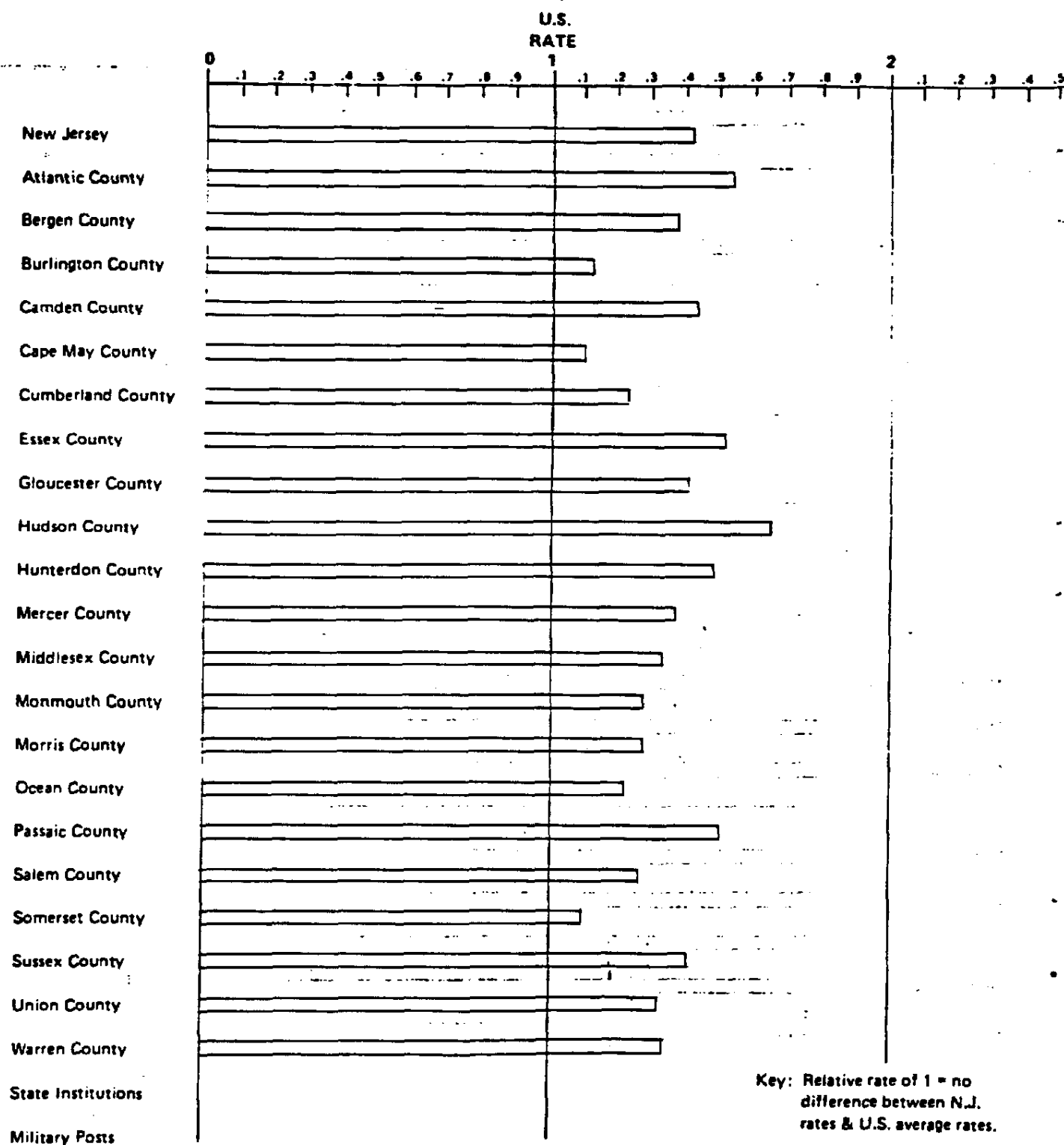


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RSV 0013447

**FIGURE 13: RATIO OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: CANCER OF THE RECTUM 1950 - 1969**

WHITE FEMALES



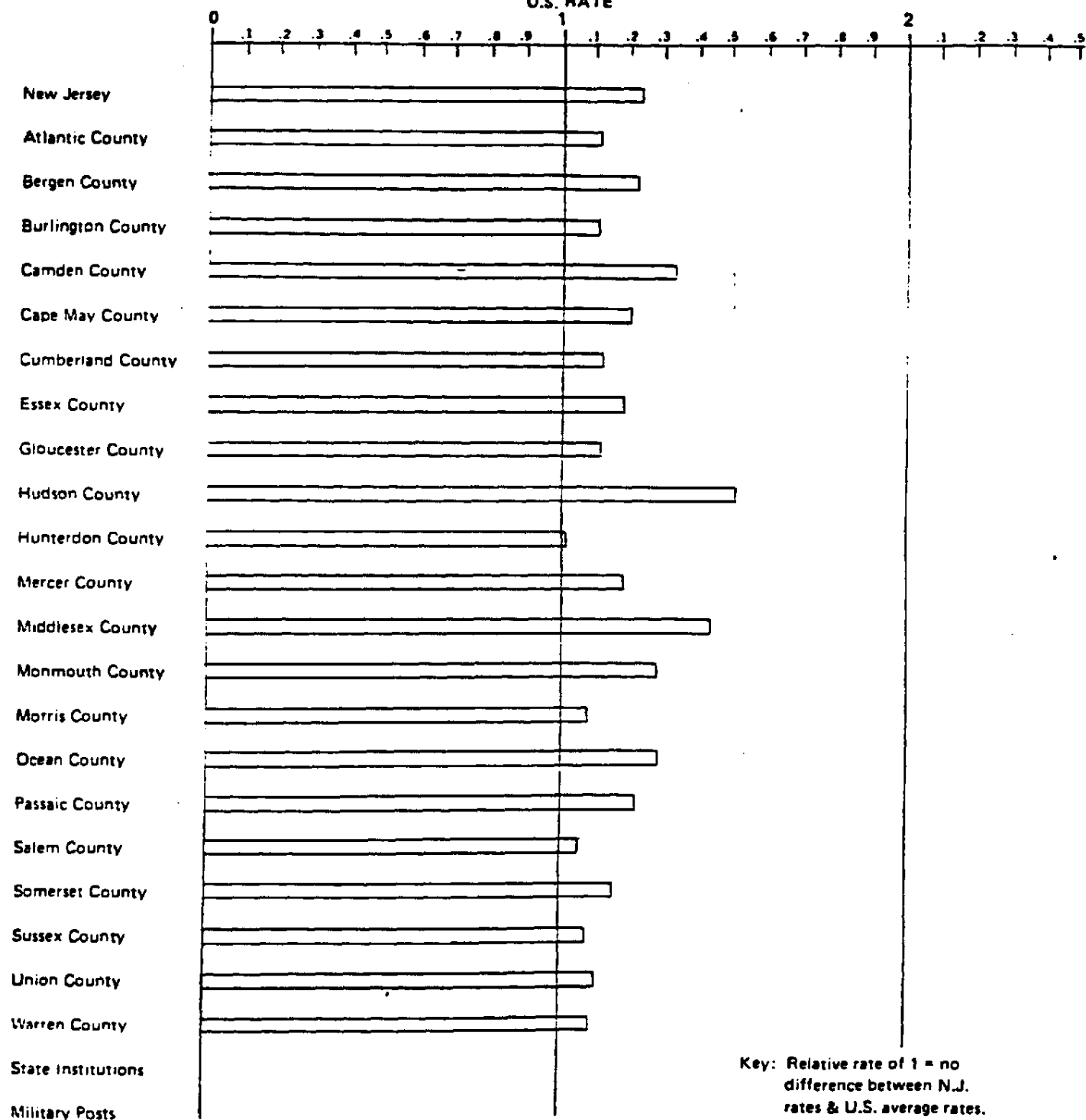
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**FIGURE 14: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: CANCER OF THE RESPIRATORY SYSTEM
(TRACHEA, BRONCHUS & LUNG) 1950 - 1969**

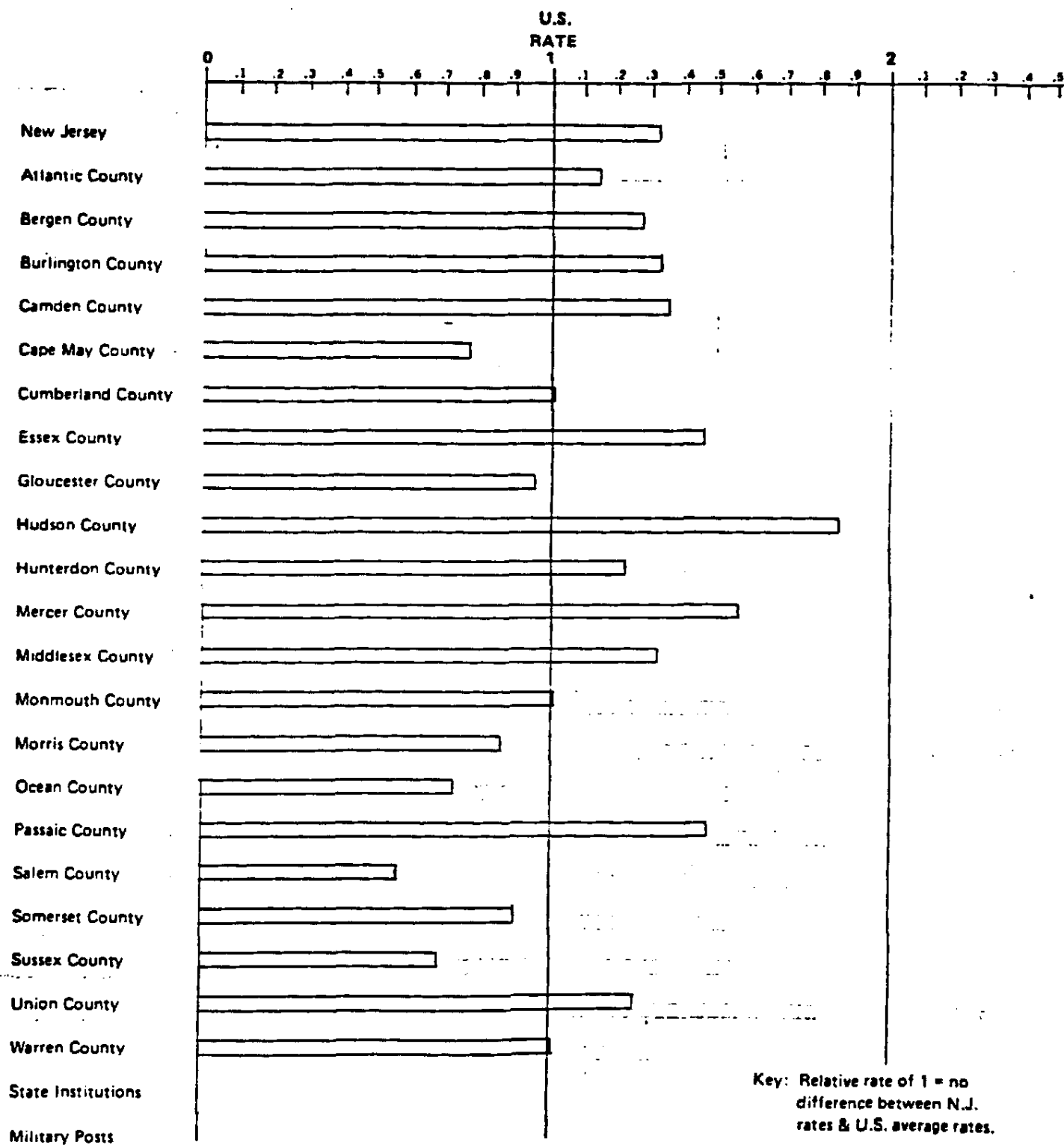
WHITE MALES

U.S. RATE



**FIGURE 15: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: CANCER OF THE MOUTH & ORAL PHARYNX 1950 - 1969**

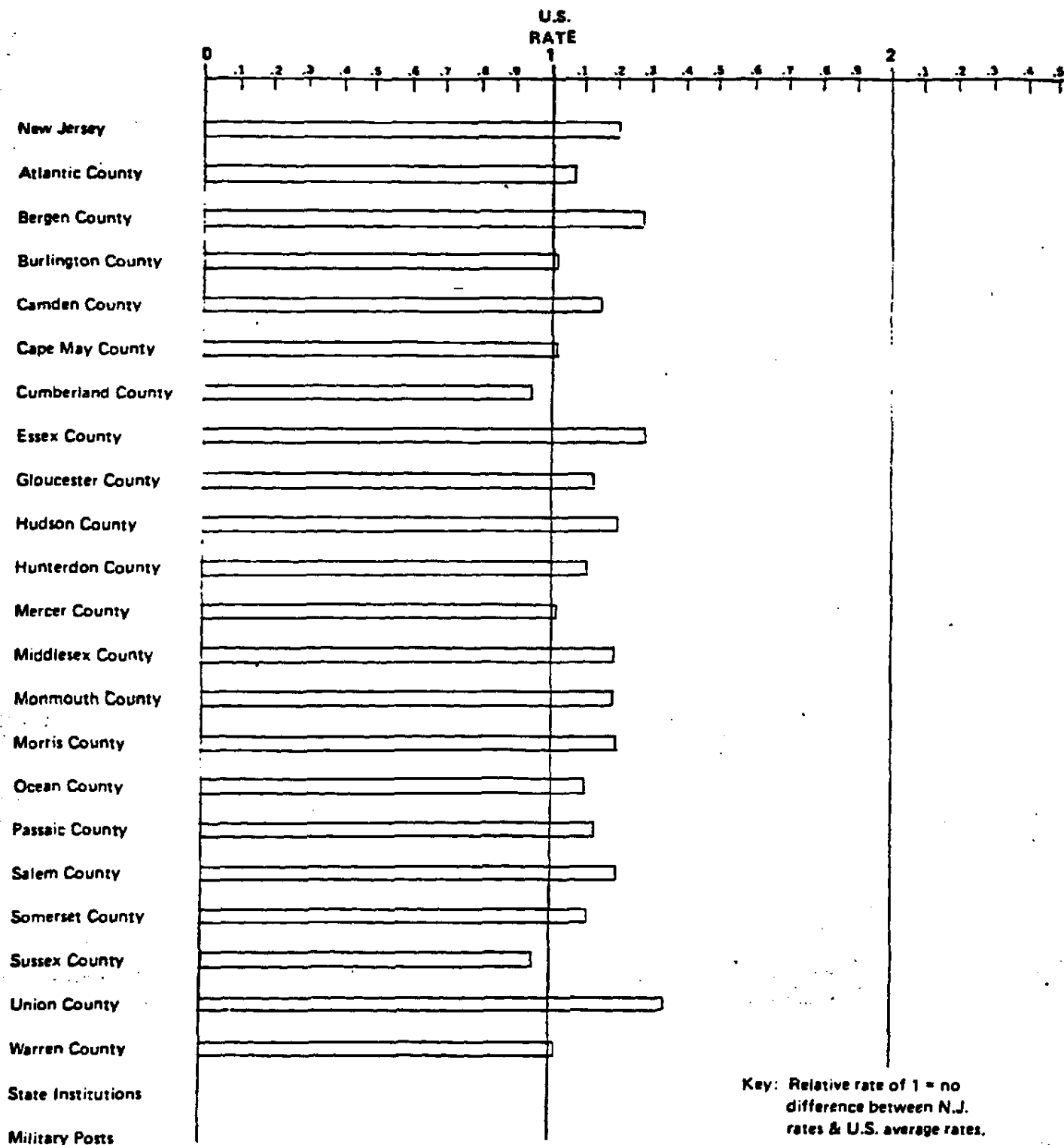
WHITE MALES



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**FIGURE 16: RATIOS OF NEW JERSEY COUNTY MORTALITY RATES TO THE
U.S. MORTALITY RATE: CANCER OF THE BREAST 1950 - 1969**

WHITE FEMALES



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RSV 0013451

APPENDIX II

RSV 0013452

TABLE 3:

Ratios of New Jersey County Mortality Rates to the
United States Mortality Rate: Cancer of the Large Intestine,
Except the Rectum - 1950-1969

	White Male	White Female
New Jersey	1.34	1.30
Atlantic County	1.31	1.32
Bergen County	1.32	1.27
Burlington County	1.35	1.38
Camden County	1.44	1.43
Cape May County	1.32	1.13
Cumberland County	1.09	1.30
Essex County	1.50	1.34
Gloucester County	1.15	1.28
Hudson County	1.44	1.31
Hunterdon County	0.89	1.38
Mercer County	1.38	1.35
Middlesex County	1.41	1.26
Monmouth County	1.38	1.37
Morris County	1.11	1.22
Ocean County	1.15	1.27
Passaic County	1.27	1.25
Salem County	0.97	1.25
Somerset County	1.08	1.13
Sussex County	0.98	1.07
Union County	1.34	1.29
Warren County	1.43	1.11

RSV 0013453

TABLE 4:

Ratios of New Jersey County Mortality Rates to the
United States Mortality Rates: Cancer of the Rectum - 1950-1969

	White Male	White Female
New Jersey	1.52	1.41
Atlantic County	1.40	1.54
Bergen County	1.53	1.39
Burlington County	1.27	1.12
Camden County	1.41	1.43
Cape May County	1.29	1.10
Cumberland County	0.94	1.22
Essex County	1.74	1.51
Gloucester County	1.23	1.41
Hudson County	1.84	1.66
Hunterdon County	1.50	1.49
Mercer County	1.61	1.37
Middlesex County	1.46	1.33
Monmouth County	1.28	1.29
Morris County	1.25	1.29
Ocean County	1.15	1.22
Passaic County	1.69	1.51
Salem County	1.07	1.27
Somerset County	1.18	1.10
Sussex County	1.53	1.41
Union County	1.54	1.33
Warren County	1.69	1.35

TABLE 5:

Ratios of New Jersey County Mortality Rates to the
United States Mortality Rate: Cancer of the Stomach - 1950-1969

	White Female	White Male
New Jersey	1.28	1.24
Atlantic County	1.08	1.16
Bergen County	1.34	1.22
Burlington County	1.04	1.05
Camden County	1.06	1.14
Cape May County	1.05	1.18
Cumberland County	1.04	1.14
Essex County	1.31	1.22
Gloucester County	0.90	1.05
Hudson County	1.57	1.52
Hunterdon County	1.04	1.15
Mercer County	1.18	1.33
Middlesex County	1.57	1.50
Monmouth County	1.14	1.12
Morris County	0.96	1.02
Ocean County	1.03	0.99
Passaic County	1.51	1.44
Salem County	0.86	0.99
Somerset County	1.12	1.19
Sussex County	1.18	1.00
Union County	1.38	1.25
Warren County	0.97	0.95

RSV 0013455

TABLE 6:

Ratios of New Jersey County Mortality Rates to the
United States Mortality Rate: Cancer of the Respiratory System
(Trachea, Bronchus and Lung) - 1950-1969

White Males	
New Jersey	1.23
Atlantic County	1.12
Bergen County	1.22
Burlington County	1.10
Camden County	1.33
Cape May County	1.20
Cumberland County	1.13
Essex County	1.18
Gloucester County	1.12
Hudson County	1.51
Hunterdon County	1.02
Mercer County	1.18
Middlesex County	1.43
Monmouth County	1.28
Morris County	1.08
Ocean County	1.28
Passaic County	1.22
Salem County	1.05
Somerset County	1.16
Sussex County	1.07
Union County	1.11
Warren County	1.10

RSV 0013456

TABLE 7:

Ratios of New Jersey County Mortality Rates to the
United States Mortality Rate: Cancer of the Breast
White Females 1950-1969

<u>New Jersey</u>	<u>1.20</u>
<u>Atlantic County</u>	<u>1.07</u>
<u>Bergen County</u>	<u>1.28</u>
<u>Burlington County</u>	<u>1.09</u>
<u>Camden County</u>	<u>1.16</u>
<u>Cape May County</u>	<u>1.03</u>
<u>Cumberland County</u>	<u>0.94</u>
<u>Essex County</u>	<u>1.29</u>
<u>Gloucester County</u>	<u>1.13</u>
<u>Hudson County</u>	<u>1.20</u>
<u>Hunterdon County</u>	<u>1.11</u>
<u>Mercer County</u>	<u>1.04</u>
<u>Middlesex County</u>	<u>1.19</u>
<u>Monmouth County</u>	<u>1.18</u>
<u>Morris County</u>	<u>1.20</u>
<u>Ocean County</u>	<u>1.10</u>
<u>Passaic County</u>	<u>1.14</u>
<u>Salem County</u>	<u>1.20</u>
<u>Somerset County</u>	<u>1.11</u>
<u>Sussex County</u>	<u>0.95</u>
<u>Union County</u>	<u>1.35</u>
<u>Warren County</u>	<u>1.04</u>

TABLE 8:

**Ratios of New Jersey County Mortality Rates to the
United States Mortality Rate: Cancer of the Bladder
White Males 1950-1969**

<u>New Jersey</u>	<u>1.43</u>
<u>Atlantic County</u>	<u>1.28</u>
<u>Bergen County</u>	<u>1.31</u>
<u>Burlington County</u>	<u>1.36</u>
<u>Camden County</u>	<u>1.37</u>
<u>Cape May County</u>	<u>1.70</u>
<u>Cumberland County</u>	<u>1.33</u>
<u>Essex County</u>	<u>1.61</u>
<u>Gloucester County</u>	<u>1.36</u>
<u>Hudson County</u>	<u>1.52</u>
<u>Hunterdon County</u>	<u>1.62</u>
<u>Mercer County</u>	<u>1.36</u>
<u>Middlesex County</u>	<u>1.24</u>
<u>Monmouth County</u>	<u>1.53</u>
<u>Morris County</u>	<u>1.19</u>
<u>Ocean County</u>	<u>1.65</u>
<u>Passaic County</u>	<u>1.33</u>
<u>Salem County</u>	<u>2.37</u>
<u>Somerset County</u>	<u>1.17</u>
<u>Sussex County</u>	<u>1.61</u>
<u>Union County</u>	<u>1.46</u>
<u>Warren County</u>	<u>1.17</u>

TABLE 9:

Ratios of New Jersey County Mortality Rates to the
United States Mortality Rates: Cancer of the Mouth
and Oral Pharynx 1950-1969

	White Males
New Jersey	1.31
Atlantic County	1.14
Bergen County -	1.28
Burlington County	1.31
Camden County	1.35
Cape May County	0.78
Cumberland County	1.02
Essex County	1.45
Gloucester County	0.95
Hudson County	1.85
Hunterdon County	1.21
Mercer County	1.57
Middlesex County	1.31
Monmouth County	1.07
Morris County	0.86
Ocean County	0.71
Passaic County	1.47
Salem County	0.57
Somerset County	0.90
Sussex County	0.69
Union County	1.26
Warren County	1.07

TABLE 10:

**Ratios of New Jersey County Mortality Rates to the
United States Mortality Rate: Cancer of the Esophagus
1950-1969**

	<u>White Males</u>
<u>New Jersey</u>	<u>1.40</u>
<u>Atlantic County</u>	<u>1.29</u>
<u>Bergen County</u>	<u>1.34</u>
<u>Burlington County</u>	<u>1.07</u>
<u>Camden County</u>	<u>1.10</u>
<u>Cape May County</u>	<u>1.22</u>
<u>Cumberland County</u>	<u>1.05</u>
<u>Essex County</u>	<u>1.44</u>
<u>Gloucester County</u>	<u>1.07</u>
<u>Hudson County</u>	<u>2.00</u>
<u>Hunterdon County</u>	<u>0.83</u>
<u>Mercer County</u>	<u>1.61</u>
<u>Middlesex County</u>	<u>1.93</u>
<u>Monmouth County</u>	<u>1.00</u>
<u>Morris County</u>	<u>1.02</u>
<u>Ocean County</u>	<u>1.10</u>
<u>Passaic County</u>	<u>1.51</u>
<u>Salem County</u>	<u>1.10</u>
<u>Somerset County</u>	<u>1.27</u>
<u>Sussex County</u>	<u>1.27</u>
<u>Union County</u>	<u>1.27</u>
<u>Warren County</u>	<u>1.32</u>

RSV 0013460