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THE NAVY'S OCCUPATIONAL HEALTH INFORMATION  
MANAGEMENT SYSTEM: EPIDEMIOLOGICAL RESEARCH  
CONSIDERATIONS

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**THE NAVY'S OCCUPATIONAL HEALTH INFORMATION MANAGEMENT  
SYSTEM: EPIDEMIOLOGICAL RESEARCH CONSIDERATIONS**

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SUMMARY

The functional objectives of the Navy's Occupational Health Information Management System (NOHIMS) designed to support and coordinate the components of the Navy's occupational safety and health program are presented. The components of NOHIMS are discussed in terms of important epidemiological and baseline occupational information that they will provide. Potential research applications of NOHIMS data and the importance of exposure information, in addition to medical data, are presented. Finally, possible limitations of automated information systems are discussed.

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## INTRODUCTION

Historically, epidemiological research has usually focused on disease and the description of disease occurrence in terms of person, place and time-related variables. Recently, however, the emphasis has shifted to the study of exposed persons rather than diseased persons. The long-term effects of exposure to some substance are clearly as important as the antecedents of some disease. Persons working in Navy industrial environments have daily contact with large numbers of chemical, physical or biological exposures. Some of these exposures are known to cause disease in humans; others have been shown to be harmful to animals in varying doses; while others have no known adverse health effects. This paper will provide an overview of the Navy's Occupational Health Information Management System (NOHIMS) and describe specific functional areas that will provide epidemiological support to evaluate potential occupationally related health effects. → See #1422

## FUNCTIONAL OBJECTIVES OF NOHIMS

The primary goals of NOHIMS are to provide an information system that will coordinate the components of the Navy's occupational safety and health program in order to meet the requirements of the OSHA Act of 1970 and Department of Defense<sup>(1)</sup> and Navy directives<sup>(2-4)</sup> to develop a comprehensive workplace monitoring plan and personnel medical surveillance program.<sup>(5-9)</sup>

To meet these goals, the functional objectives of NOHIMS are to:

- (1) Identify individuals exposed to hazards in the workplace;
- (2) Insure that potentially exposed persons are examined periodically;
- (3) Provide medical personnel with exposure histories and a list of recommended tests and procedures;
- (4) Store and retrieve medical and environmental data;
- (5) Generate management reports;
- (6) Insure the recording of sufficient information for epidemiological studies.

Figure 1 indicates three types of input requirements or data base needs that have been identified to help satisfy these objectives:

- (1) Environmental Data - workplace environments, hazards identification, survey data;
- (2) Personnel data - occupational histories, demographic information, worker identification and location;
- (3) Medical data - medical histories, physical exams and laboratory tests.

These types of raw data need to be entered into the system on an ongoing basis. Reference tables have been developed from authoritative sources, to make it possible to interpret and evaluate the significance of a particular element of data and provide an aid in recommending appropriate action. These reference tables include a table of job titles, a Threshold Limit Value (TLV) table, a table specifying the required medical surveillance for a particular substance, and tables giving normal and abnormal ranges for various laboratory test results. For example, a measured amount of a contaminant in a workplace can be compared to the TLV table to determine if

the exposure level presents a health risk to workers. These tables are dynamic because they can be readily modified to reflect any changes in recognized standards or to add entirely new categories of data.

#### COMPONENTS OF NOHIMS

As shown in Figures 1 and 2, NOHIMS consists of two principal subsystems: (1) a Medical Component and (2) an Occupational Health Information Component. The medical component provides the user with a choice of 11 primary system options. The first five of these options relate to system functions performed on patient data. Within the Enter Medical Data module, the Medical History Form<sup>(10)</sup> requests information on past individual and family medical history, personal history including questions on smoking, alcohol consumption, and exercise habits, and a comprehensive review of body and organ systems. Epidemiological data relating to exposures that tend to occur either through individual behavior or cultural habits, such as smoking, drug use, and diet may be important secondary or modifying variables that could contribute to a better understanding of disease process and etiology. The sixth option allows the user to generate standard or individually tailored reports. The last primary system option, Occupational Health Information, takes the user to the second level menu occupational component.

The occupational component contains 6 module options: (1) Agency Data; (2) Personnel Data; (3) Environment Data; (4) Survey Data; (5) Hazard Data, and (6) Maintenance Functions. Several of these modules will provide important background epidemiological and baseline occupational information.

One of the most critical elements in any occupational health information system is the ability to track individuals through their exposure experiences in order to build as accurate and complete an exposure history as possible. Within the Personnel Data module, the Occupational History Form<sup>(10)</sup> is designed to ascertain an individual's occupational and non-occupational exposures for all jobs held since high school. Such exposure histories are needed in the individual case to infer possible etiology as a basis for treatment and at the aggregate or group level to support epidemiologic investigations of suspected health hazards.

The Survey Data module handles all information about work environments collected by industrial hygienists, including specific chemicals or agents present, methods of measurement, concentrations, usage rates, and protective equipment.

The Hazard Data module manages entry, storage, and retrieval of information about potentially hazardous substances that are used at the facility, including Threshold Limit Values, exposure limits and action levels, agent synonyms, medical monitoring requirements for each agent, CAS number, and agent classification.

## NOHIMS AS A SOURCE OF EPIDEMIOLOGIC DATA

The ascertainment of an individual's previous medical, occupational health care and job experience histories requires a full understanding of a worker's current health status and the potential impact on health risk and future job performance. Cogent and timely use of such information would contribute to more informed medical and administrative decision-making in terms of job placement and health risk.

The extensive cross-referencing feature of NOHIMS is one of the major characteristics of the system that assures maximum flexibility and adaptability. The NOHIMS file structure provides pointers from one type of data element to another so that it is possible to track workers by social security number through their entire work history and medical encounters. Thus, it is possible to retrieve data from all environments in which an employee has worked, the dates and time spent in each work environment, hazards existing in these various work places, protective gear issued to the worker, levels of exposure to hazardous substances and agents, medical surveillance required for the worker, plus medical history and the results of physical exams and laboratory tests.

NOHIMS will facilitate the requirement for the maintenance of records and health information for some exposures for specified periods of time,<sup>(3)</sup> e.g., asbestos environmental and personnel air sampling records, x-ray interpretations, x-ray films and correspondence--50 years following termination of service or employment; reference and monitoring audiograms--40 years after the date of last entry. Thus, NOHIMS will provide epidemiologists the means to define cohorts of industrial populations and to evaluate any adverse health effects retrospectively, cross-sectionally or prospectively.

The potential epidemiologic research applications from the data base that NOHIMS will create is large. The questions that might be addressed are many and include the following:

- (1) What is the population-at-risk that is potentially exposed to a particular hazardous agent?
- (2) Of those workers exposed, in what work environment were they exposed, at what levels of exposure, at what time and for how long?
- (3) What are the medical effects of this exposure and what organ systems or body parts are affected?
- (4) Among those workers exposed, who received required physical examinations and were appropriate personal protective equipment provided?
- (5) Do the exposed workers have common risk factors that are not present in the rest of the population-at-risk?

Several of these questions are very similar to the objectives stated earlier. That is not by coincidence, however, because epidemiologic research considerations became an integral part of the conceptual design of NOHIMS during the early stages of system development.

Two epidemiologic investigations which were recently completed at the Naval Health Research Center (NHRC) utilized Inpatient Medical Data and Enlisted Career History files maintained at

NHRC.<sup>(11-12)</sup> In the first of these studies,<sup>(11)</sup> it was hypothesized that occupational, social, and medical factors may contribute to an increased risk of Hodgkin's disease in naval personnel as compared to the general population, and that the risk may vary by occupation and length of service. The second study<sup>(12)</sup> was undertaken to assess whether excess morbidity and mortality, previously associated with analagous nitrated ester compounds, would be found in Navy occupational groups potentially exposed to the torpedo propellant Otto Fuel II.

These investigations utilized data files that provided medical and personal information and only indirect exposure information by inference from occupational codes. The lack of exposure data in these databases points out a significant design feature of NOHIMS to provide comprehensive environmental survey and medical surveillance information in addition to medical and personal data.

#### POTENTIAL LIMITATIONS

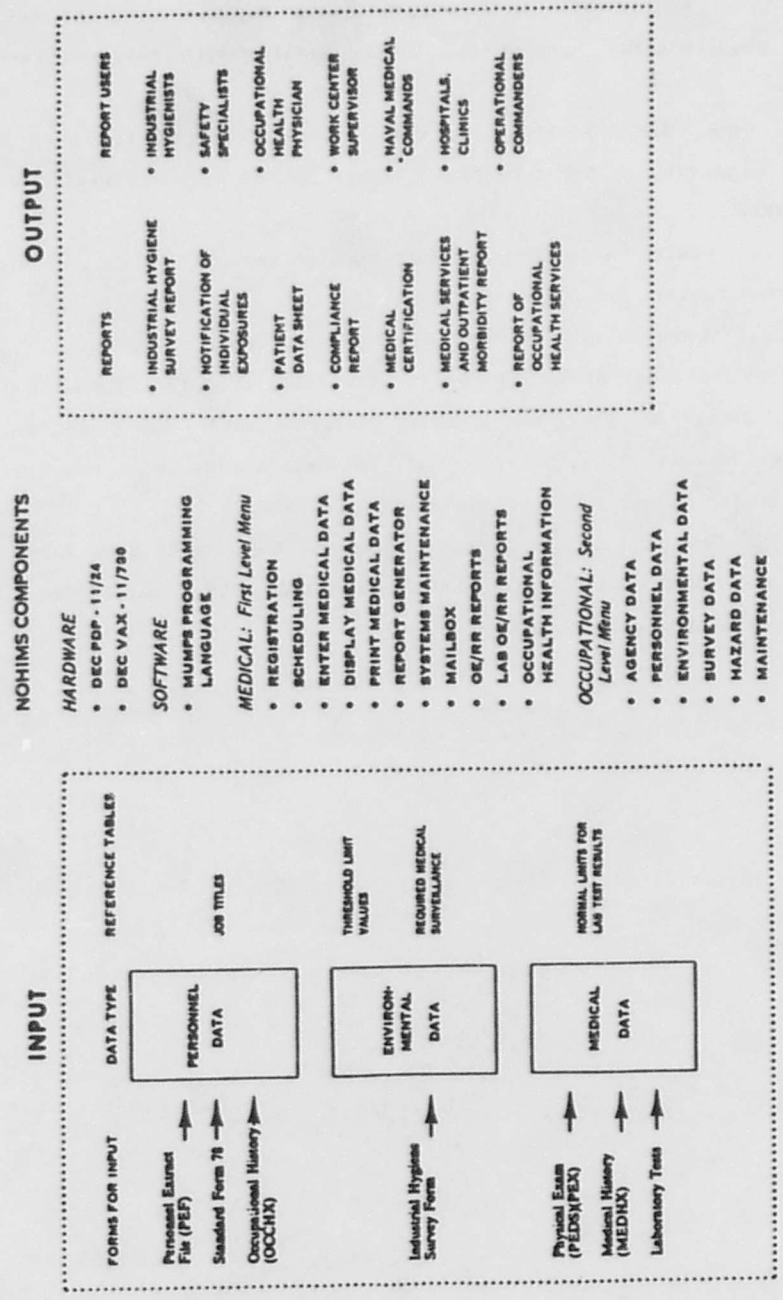
Automated information systems such as NOHIMS augment the efficient collection, processing and storage of voluminous amounts of data on human populations. Because health researchers may have ready access to data collected by others and perform instant analysis, inherent system data collection weaknesses may not be as readily apparent to the user. Therefore, there is a continual need for careful analysis and cautious interpretation of epidemiologic data.

In the final analysis, one must keep in mind that the ultimate goal of NOHIMS is to contribute to a safe and healthful working environment for all workers and that a reasonable balance must be struck between scientific objectives and practical considerations of system application.

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**NOHIMS COMPONENTS**

**HARDWARE**

- DEC PDP - 11/24
- DEC VAX - 11/780

**SOFTWARE**

- MUMPS PROGRAMMING LANGUAGE

**MEDICAL: First Level Menu**

- REGISTRATION
- SCHEDULING
- ENTER MEDICAL DATA
- DISPLAY MEDICAL DATA
- PRINT MEDICAL DATA
- REPORT GENERATOR
- SYSTEMS MAINTENANCE
- MAILBOX
- OE/RR REPORTS
- LAB OE/RR REPORTS
- OCCUPATIONAL HEALTH INFORMATION

**OCCUPATIONAL: Second Level Menu**

- AGENCY DATA
- PERSONNEL DATA
- ENVIRONMENTAL DATA
- SURVEY DATA
- HAZARD DATA
- MAINTENANCE

**INPUT - OUTPUT INTERFACE IN NOHIMS**

Figure 1

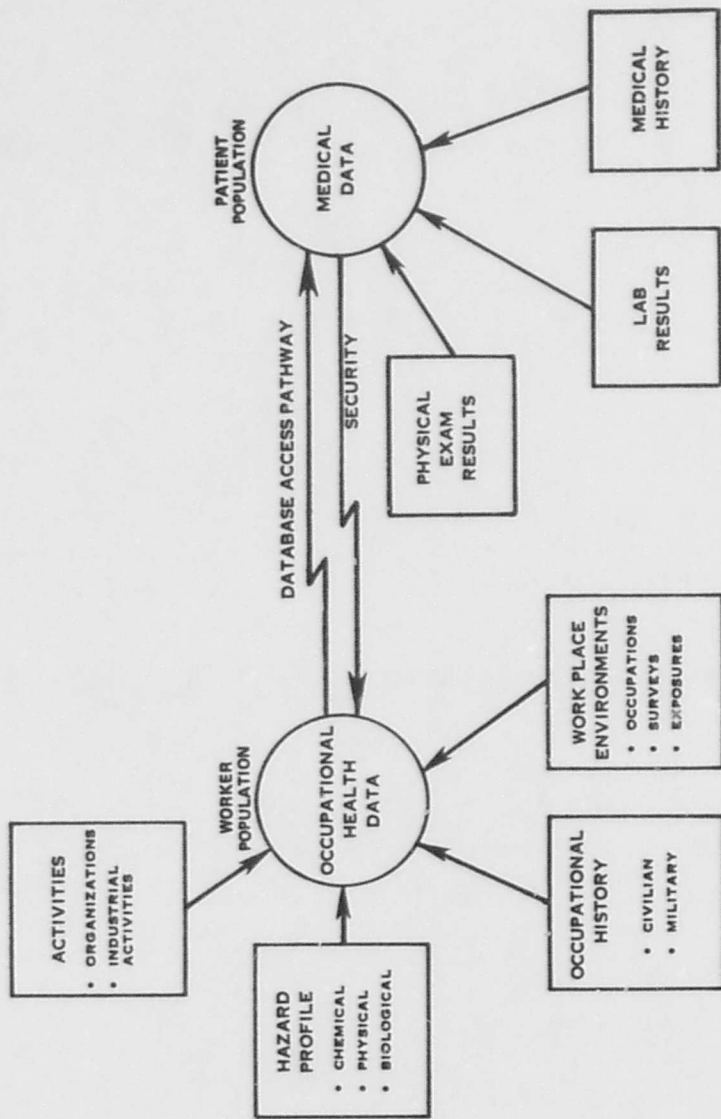


Figure 2  
**TYPES OF INFORMATION CONTAINED IN THE NOHIMS DATABASE**