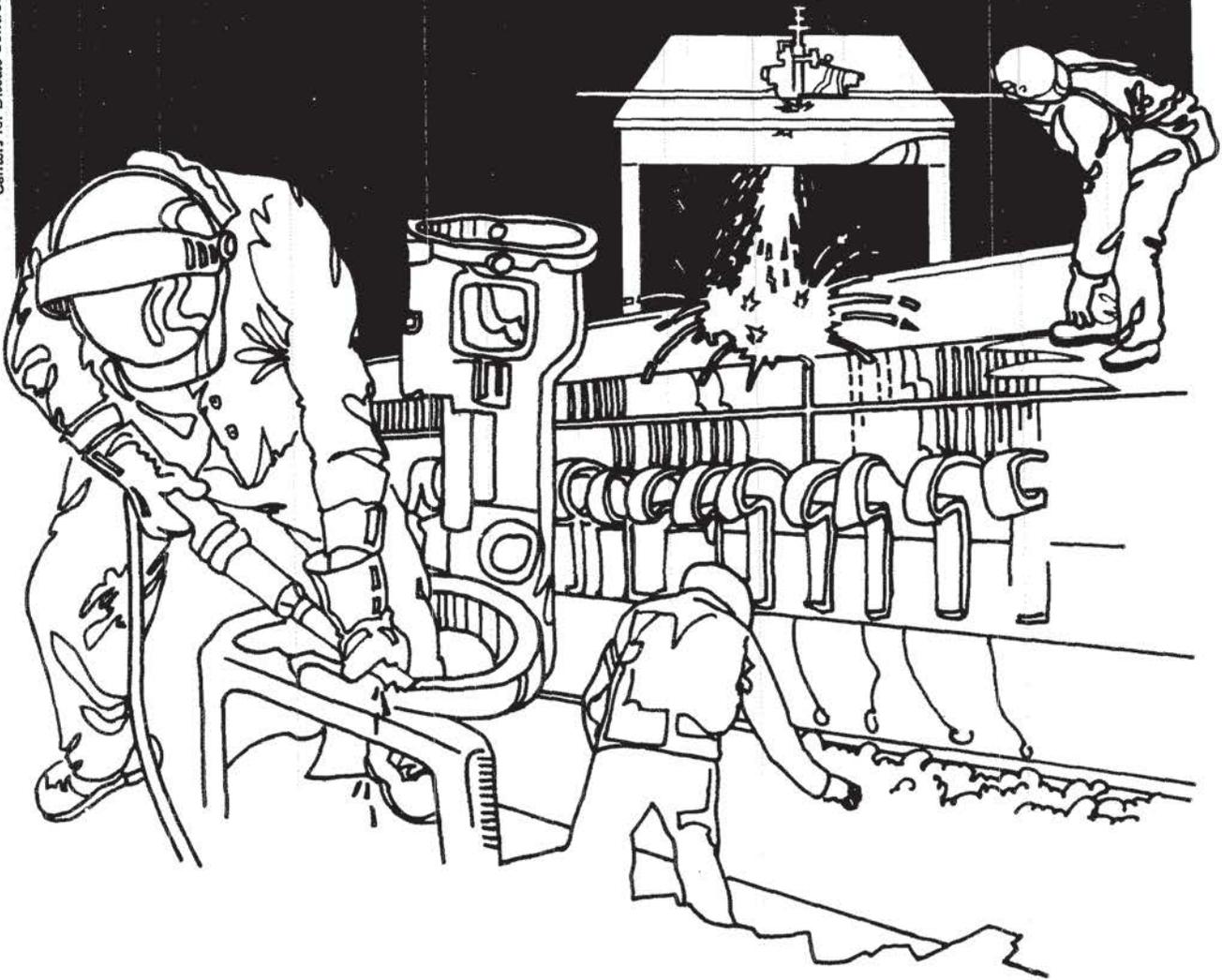


NIOSH



Health Hazard Evaluation Report

HETA 81-266-998
BIBB COUNTY DEPARTMENT OF
FAMILY AND CHILDRENS SERVICES
MACON, GEORGIA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HETA 81-266-998
NOVEMBER 1981
BIBB COUNTY DEPT. OF FAMILY
AND CHILDRENS SERVICES
MACON, GEORGIA

NIOSH INVESTIGATOR:
S. Salisbury, CIH
T. McKinley

I. SUMMARY

On May 19, 1981, the National Institute for Occupational Safety and Health (NIOSH) conducted a health hazard evaluation for the Bibb County Department of Family and Childrens Services (DFCS) in Macon, Georgia. NIOSH had been asked to investigate the cause for complaints of respiratory problems, headache, and eye irritation experienced by Bibb County DFCS personnel working in the "Downtown Square" office building. The DFCS staff was concerned that these symptoms and an increase in illness among employees were possibly caused by the office environment.

NIOSH conducted an inspection of the building, interviewed workers through distribution of a self-administered questionnaire, evaluated sick leave records, tested air quality, and studied the design and operation of the building ventilation and air conditioning system.

Although there was no evidence of occupational exposure to toxic chemicals, health complaints and related symptoms were reported by 81% of the employees. There was also a problem with excessive use of sick leave. Employees had used an average of 12.6 days of sick leave per person per year.

At the time of this investigation, NIOSH discovered that outside air dampers on all air conditioning units were fully closed, a configuration not in accordance with initial design specifications which called for 2050 cubic feet per minute (CFM) of outside air for the 2nd floor and 1200 CFM of outside air for the first floor. Ventilation fans were also set to shut off automatically when air conditioning units cycled off.

Based on the findings of this investigation, NIOSH believes that the most likely cause of symptoms and discomfort experienced by Bibb County DFCS employees in the Downtown Square office building was the lack of sufficient outside air and shutdown of air circulation when air conditioners cycled off. Indoor air quality was further reduced by the significant number of smokers (37%) who work in the building. Recommendations have been provided in this report for improving indoor air quality through increased circulation of outside air and additional control of smoking habits.

KEYWORDS: SIC 8321, indoor air pollution, tight building syndrome, ventilation, office buildings

II. INTRODUCTION

On April 6, 1981, the National Institute for Occupational Safety and Health (NIOSH) was asked to investigate the cause for complaints of respiratory problems, headache, and eye irritation experienced by Bibb County Department of Family and Childrens Services personnel working in the Downtown Square Office Building in Macon, Georgia. The Acting Director of Bibb County DFCS was concerned about the frequency of illnesses, some serious, which had been experienced by the employees.

In response to this request, an industrial hygienist from the NIOSH Regional Office in Atlanta, Georgia, and an epidemiologist from the Division of Public Health, Georgia Department of Human Resources (DHR) visited the Bibb County DFCS on May 19, 1981.

An opening conference was held with the Bibb County DFCS Policy and Procedures Staff. During this meeting, staff members expressed their concern for the increase in illnesses reported by their employees since moving to the Downtown Square Building in January, 1979.

III. BACKGROUND

The Bibb County DFCS is housed in a two-story building formerly used as a retail department store by Sears, Roebuck and Company. Built in 1948, the building remained vacant for approximately 5 years after Sears moved its store to a suburban shopping mall in the early 1970s. In 1978 the building was completely renovated for use as an office building. New roof mounted air conditioning systems were installed, and existing windows were sealed shut to conserve energy. The building is owned and maintained by the Georgia Power Company which has its' Macon offices next door. The Bibb County DFCS, with 160 people assigned, is the principal tenant occupying all 23,350 square feet of the 2nd floor and 1296 square feet on the first floor. The Social Security Administration, with 40-50 employees, was located in a single story extension of the building which had formerly been used by Sears as a garden store. Approximately 5 employees who administer the Macon area Women, Infant and Children Feeding Program (WIC) for the Georgia DHR also work in an office located on the first floor of the main building. The basement was only partially renovated for the lobby atrium and has not been used since the Sears store was relocated. Bibb County DFCS administers welfare and food stamp programs for the State. Case workers employed are responsible for determining the eligibility of recipients for these programs. Location and identification of offices on the 2nd floor are shown in Figure 1. 151 people work on the 2nd floor which was the principal area of concern. Only 9 people from Bibb County DFCS worked on the first floor and were assigned to the Food Stamps Issuance Section.

IV. ACTIONS TAKEN

To determine the extent of the problem, all employees were asked to complete a self-administered questionnaire which was designed to obtain information on individual smoking history, type and frequency of adverse health symptoms experienced, and whether the employees associated these symptoms with their work environment (Attachment 1). Personnel records were reviewed and data were tabulated regarding the frequency and duration of sick leave accrued by each employee from July, 1980, to May, 1981. A walk-through tour of all offices was conducted with the assistance of the Bibb County DFCS Property and Supply Supervisor. Information on the design and operation of the heating, ventilation and air conditioning (HVAC) systems was provided by the Property and Management Supervisor and the Georgia Power Co. employee responsible for building maintenance. HVAC system installation design drawings and specifications were also reviewed to determine design requirements for fresh outside air supplied to the building for ventilation.

During the visit the air was tested for contamination by using direct reading indicator tubes which are designed to detect low level concentrations of toxic or irritating gases or vapors. The indicator tubes contain chemicals which change color in the presence of a particular toxic gas or vapor. The length of the color changed produced while pulling a known volume of air through the tube indicates the approximate concentration of the gas or vapor present.

V. EVALUATION FINDINGS

1. A brief description of the HVAC system is provided as follows:

Air conditioning systems consist of seven roof mounted single zone units equipped with manually operated outside air dampers. The second floor is served by air conditioning unit (ACU) Nos. 2-7 and the lower floor by ACU No. 1. All renovated Sears offices occupied by the Administration section have separate supply and return air vents in each office. All return vents have separate ducting. All other offices have only air supply vents. The doors for these offices have louvered openings to allow air to pass through a central air return vent. At the time of the survey ACU blower fans were set to automatically turn on and off with thermostat settings. An automatic timer is used to turn on all HVAC systems at 5:00-5:15 a.m. and off at 5:30-6:00 p.m., 5 days a week on the first floor and 6 days a week on the second floor.

Roof mounted ACUs were inspected and all fresh air dampers were found fully closed. This configuration was not in accordance with initial design specifications for outside air requirements.

Recirculated and outside air volume specifications for the 7 ACUs are presented below. All values are listed as cubic feet of air per minute (CFM).

<u>A/C Unit No.</u>	<u>Recirculated Air Vol.</u>	<u>Fresh Air Vol.</u>	<u>% Fresh Air</u>
1	4800	1200	25.0
2	3000	250	8.3
3	4800	450	9.4
4	5900	550	9.3
5	3800	350	9.2
6	7100	450	6.3
7	3600	0	0.0

According to the design specifications, the total outside air supply for the 2nd floor should be 2050 CFM or 12 CFM per 100 square feet of floor area. With 151 people working on this floor the amount of outside air provided would be 13.6 CFM per person.

2. Employee Interviews

Questionnaires were completed by 144 employees. Responses were categorized according to frequency of the most common symptoms reported. Of the 17 employees experiencing symptoms occasionally, 15 reported headache as the most common symptom. Those experiencing symptoms frequently also complained of headaches more than any other symptoms listed (45 out of 81). The 35 employees who complained of constant symptoms reported nasal congestion as the major problem. A summary of the employee questionnaire data is presented in Table 1.

3. Air Quality Measurements

Measurements for airborne contaminants were taken in the following locations using direct reading indicator tubes.

<u>Location</u>	<u>Substance Measured</u>	<u>Concentration</u>
2nd floor lounge	carbon dioxide	1100 ppm
"	oxides of nitrogen	none detected
1st floor atrium	carbon dioxide	1000 ppm
Protective Services	carbon dioxide	1000 ppm
"	carbon monoxide	1 ppm
"	formaldehyde	none detected
"	ozone	"
"	sulfur dioxide	"
"	ammonia	"
2nd fl. storage room	formaldehyde	"
outside air	carbon dioxide	400 ppm

Carbon dioxide is a normal constituent of the atmosphere at a concentration around 300 ppm. By the end of the day, levels inside office buildings around 900 to 1000 ppm are not unusual. No adverse effects on health would be expected unless the concentration exceeds 5000 ppm. No effects would be expected from carbon monoxide exposure unless concentration is greater than 35 ppm.

4. Sick Leave History

The 160 DFCS employees had 1630 episodes of sick leave for a total of 14,919 hours during an 11-month period (Table 2.). For 12 months the total leave could be estimated to be 16,162 hours. This would amount to an average of 12.6 days sick leave per person per year! The average number of sick leave episodes per employee for the 11-month period was 10.2. Sections 3, 4, 8, and 9 were the 4 sections with the highest number of sick leave episodes per employee. The Child Welfare Section on the second floor had fewer episodes of sick leave per employee than workers on the first floor who were not reported to be affected (Figure 2.).

The DFCS employees were absent on the average of 9.1 hours per episode of sick leave. The Child Welfare Section had the highest average hours sick leave per episode - 17.4 hours (Figure 3.).

Sections 8, 9, and 10 had the highest percent of employees who were absent greater than 10 days (Figure 4.). The average of 12.6 days sick leave in DFCS employees compares to an estimated annual average of 5.4 days per employee among Social Security office workers located in the same building.

IV. CONCLUSIONS

Health related complaints do appear to be a problem throughout the second floor, with 81% of the employees experiencing frequent or constant symptoms. However, 53% of these people had experienced many of these symptoms both on and off the job. Also noted was the tendency of health related symptoms to increase as the frequency of smokers increased (Table 1.). For example, the group reporting constant symptoms had the highest percentage of smokers (43%). It also appears the DFCS office has a problem with excessive use of sick leave. Whether this problem is related to the building work environment or indoor air quality could not be determined. There was no evidence of an occupational exposure to toxic chemicals.

NIOSH has received many requests to evaluate office building environments. With few exceptions, the most frequent problem found during these evaluations has been a lack of sufficient outside air. Efforts to conserve energy have, in some cases, been counter-productive to office worker comfort. At the time of this evaluation no fresh air was being provided to the building because

all outside air dampers were fully closed. Air circulation inside the building was non-existent when ACUs cycled off because fans had been set on automatic operation. This condition is aggravated by the fact that many areas have a high density of assigned personnel, many of whom are smokers (37% overall).

VII. RECOMMENDATIONS

1. HVAC systems should be operated with outside air dampers set to provide the amount of outside air specified in the initial installation design. The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) recommends 15-25 CFM of outside air per human occupant and a minimum of 5 CFM per 100 square feet of floor area under ideal conditions. With the second floor area of 23,350 square feet, the minimum fresh air provided should be 1168 CFM. The initial design called for 2050 CFM of outside air for the second floor.
2. All ventilation fans on ACUs should be continuously operated to provide constant air circulation regardless of outside temperature or inside temperature settings on thermostats.
3. Applicants for food stamps and other welfare recipients should be asked not to smoke and case workers should also be asked not to smoke when applicants are being interviewed.
4. In July, 1982, a study of the sick leave usage should be reevaluated by Bibb County DFCS to determine if the unfavorable sick leave record has improved.

VIII. AUTHORSHIP AND ACKNOWLEDGEMENTS

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IX. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Publications Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After ninety (90) days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati, Ohio address.

Copies of this report have been sent to:

- a) Bibb County Dept. of Family and Childrens Services
- b) Georgia DHR, Division of Public Health
- c) U.S. Dept. of Labor, OSHA, Region IV
- d) NIOSH Region IV
- e) Designated State Agencies

For the purpose of informing the approximately 160 "affected employees", the employer will promptly "post" this report for a period of thirty (30) calendar days in a prominent place(s) near where the affected employees work.

1. ADMINISTRATION
2. CHILD WELFARE
3. ELIGIBILITY INTAKE #1 & FRAUD
4. GENERAL SERVICES & WIN
5. ELIGIBILITY REDETERMINATION-R
6. PROTECTIVE SERVICES
7. ELIGIBILITY INTAKE #2
8. NURSING HOME
9. ELIGIBILITY REDETERMINATION-L
& ELIGIBILITY & SERVICES
STENO POOLS
10. RECORD ROOM & COMPUTER ROOM

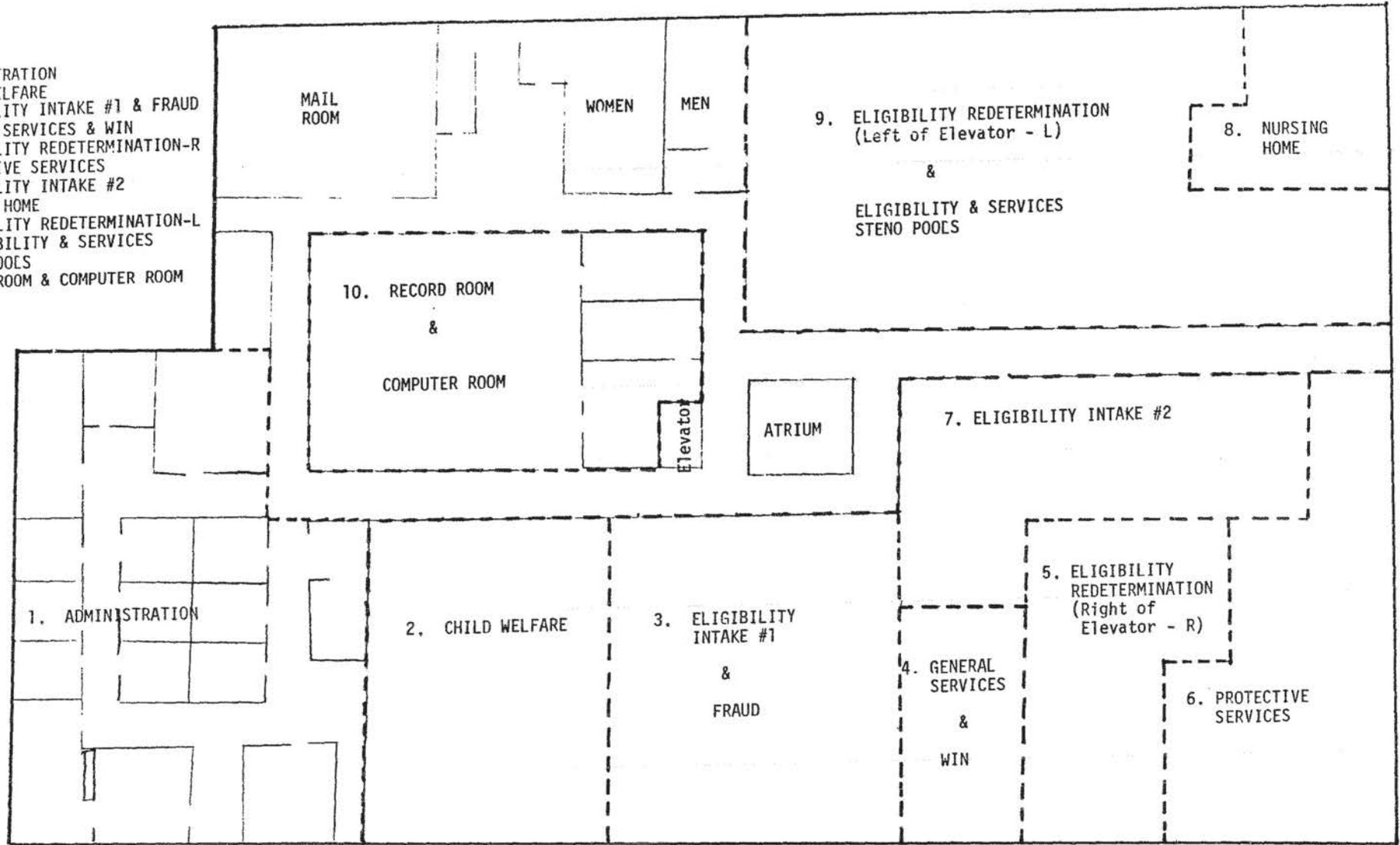


FIGURE 1
GOVERNMENT SQUARE BUILDING, SECOND FLOOR

BIBB COUNTY DFCS
MACON, GEORGIA
HETA 81-266

FIGURE 2
BIBB COUNTY DFCS
MACON, GEORGIA
HETA 81-266

EPISODES OF SICK LEAVE PER EMPLOYEE
BY FLOOR AND SECTION

July 1980 - May 1981

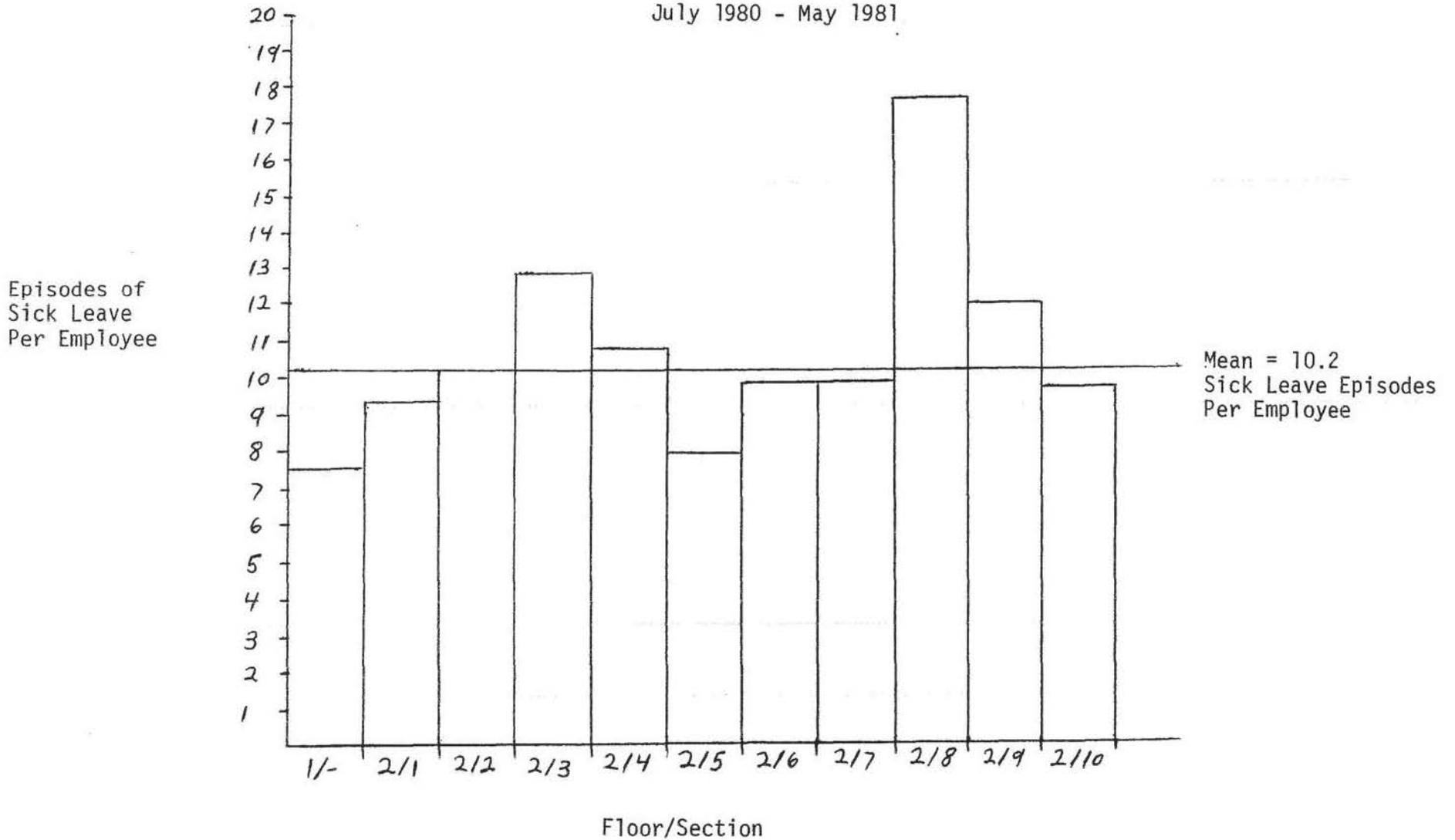


FIGURE 3
BIBB COUNTY DFCS
MACON, GEORGIA
HETA 81-266

HOURS ABSENT PER EPISODE OF SICK LEAVE
BY FLOOR AND SECTION

July 1980 - May 1981

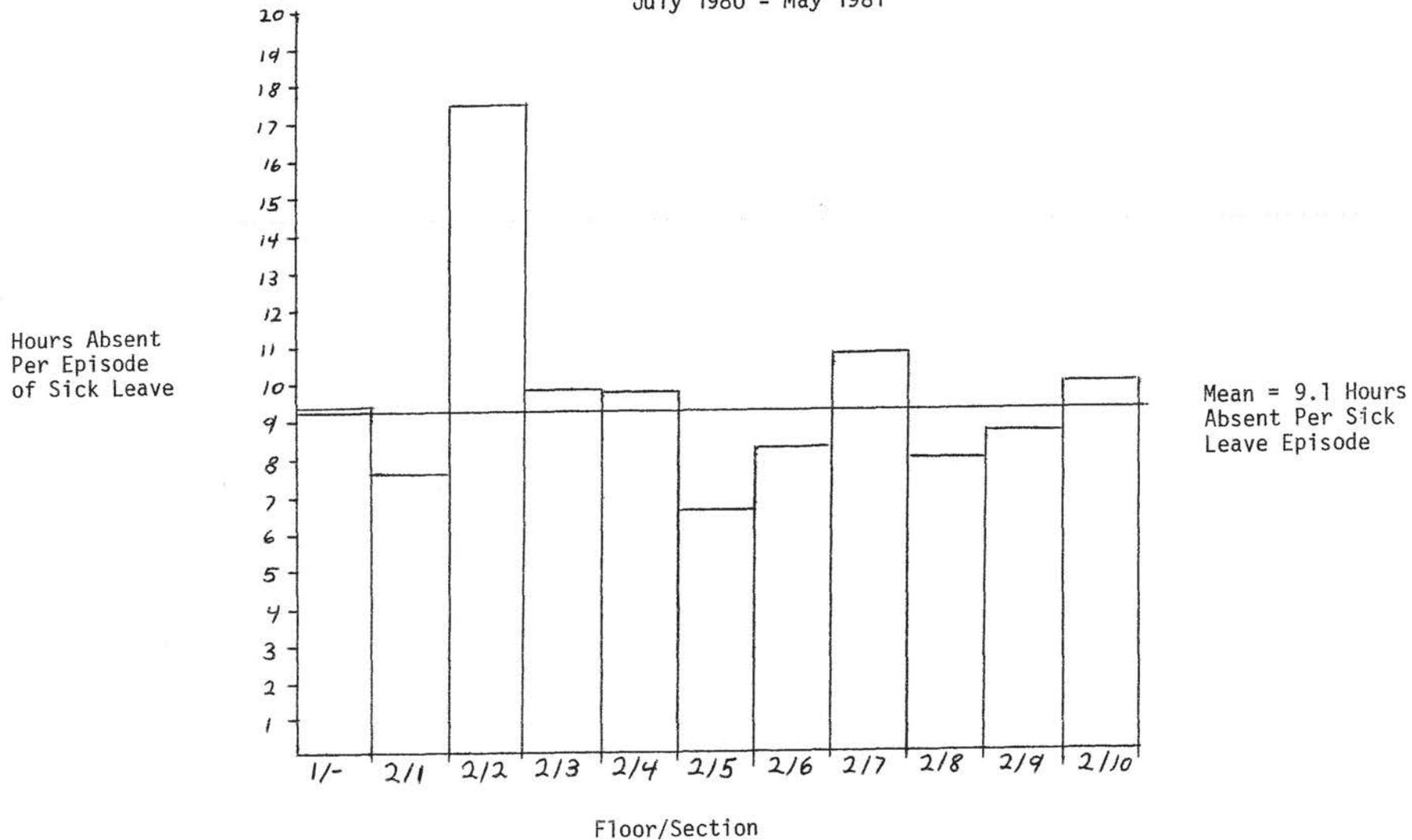


FIGURE 4
BIBB COUNTY DFCS
MACON, GEORGIA
HETA 81-266

PERCENT OF EMPLOYEES ABSENT LESS THAN OR MORE THAN
10 DAYS BY FLOOR AND SECTION

July 1980 - May 1981

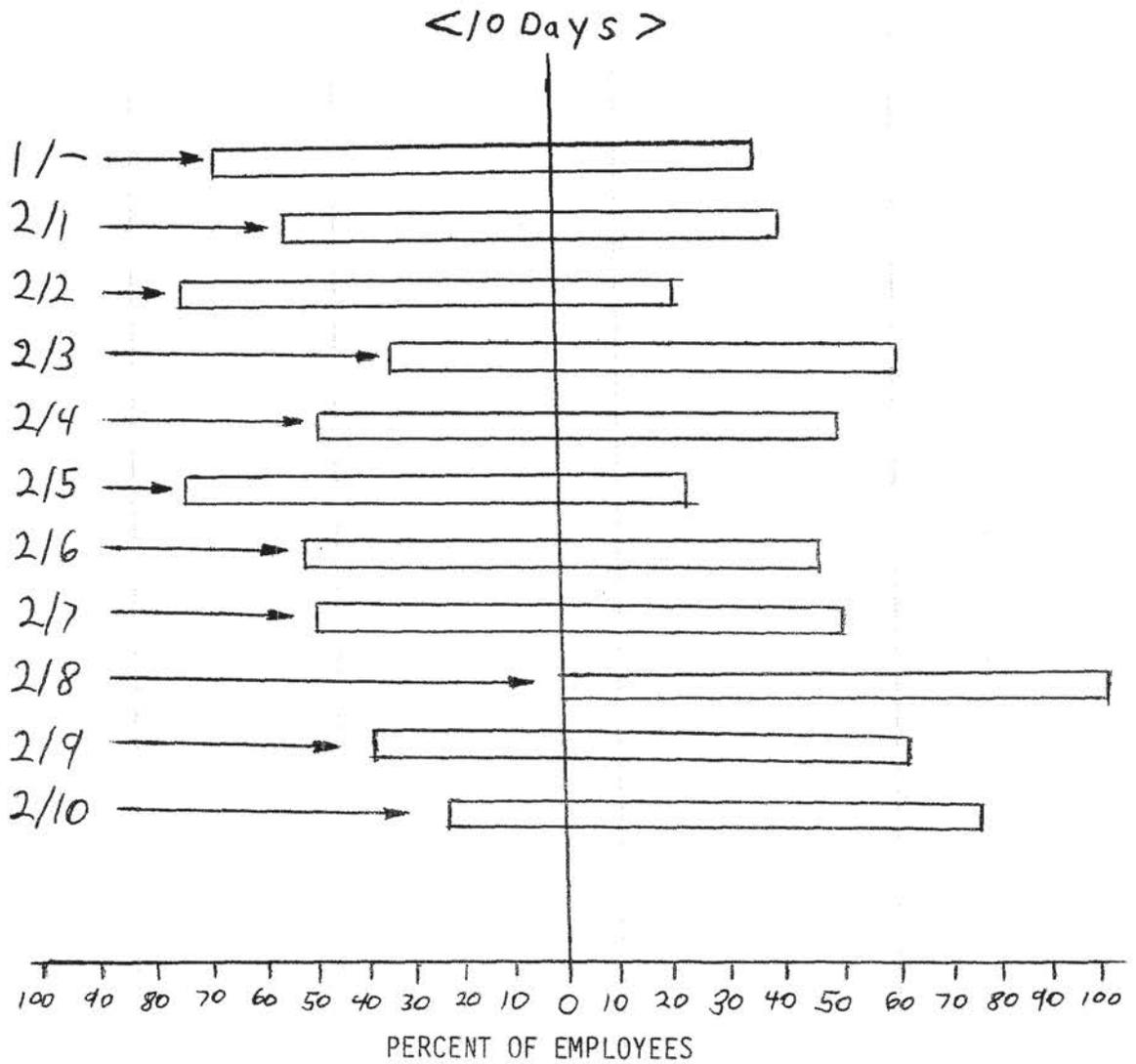


TABLE 1
 BIBB COUNTY DFCS
 MACON, GEORGIA
 HETA 81-266

EMPLOYEE QUESTIONNAIRE RESULTS

May 19, 1981

Employees Experiencing Symptoms of Health Related
 Problems Since Working in Present Job

<u>Employees Reporting</u>	<u>Never</u>	<u>Occasionally</u>	<u>Frequently</u>	<u>Constantly</u>
Total	11	17	81	35
Smokers	3 (27%)	6 (35%)	29 (36%)	15 (43%)
Chronic health problems	1 (9 %)	9 (53%)	24 (30%)	19 (54%)
Symptoms away from work	N/A	4 (24%)	52 (64%)	24 (69%)
Headache	-	15 (88%)	45 (57%)	5 (14%)
Nose or throat irritation	-	11 (65%)	23 (29%)	9 (26%)
Sneezing	-	11 (65%)	22 (28%)	4 (11%)
Runny nose/watery eyes	-	10 (59%)	30 (24%)	7 (20%)
Fatigue	-	9 (53%)	33 (41%)	10 (29%)
Nasal congestion	-	8 (47%)	29 (37%)	11 (31%)

TABLE 2
 BIBB COUNTY DFCS
 MACON, GEORGIA
 HETA 81-266

TOTAL EPISODES AND HOURS OF SICK LEAVE
 BY FLOOR AND SECTION

July 1980 - May 1981

<u>Floor</u>	<u>Section</u>	<u>Total Employees</u>	<u>Total Episodes</u>	<u>Total Hours Leave</u>
1	-	9	68	626
2	1	19	177	1353
2	2	13	76	1325
2	3	15	192	1829
2	4	19	204	1922
2	5	12	95	613
2	6	13	126	1017
2	7	6	58	621
2	8	5	88	699
2	9	37	441	3796
2	10	<u>12</u>	<u>114</u>	<u>1118</u>
	Total	160	1639	14919

Est. Average Annual Sick Leave Days/Employee = 12.6

Date:

HE/TA:

NIOSH Investigator:

Location:

NIOSH
HEALTH HAZARD EVALUATION INITIAL SURVEY
EMPLOYEE INTERVIEW
(Confidential)

Name _____ Sex _____ Age _____

Job Title _____

Job Description _____

Work shift? _____

How long have you worked your present job? Date: From _____ To _____

What was your previous job? _____

How long did you work that job? Date: From _____ To _____

Do you smoke? No _____ Yes _____ Cigarettes? _____ Pipe? _____ Cigar? _____

How many packs per day? _____ Number of pipefulls? _____ Number of cigars? _____

Have you ever smoked? No _____ Yes _____ Your age when starting _____ when quitting _____

Have you experienced any symptoms of health related problems since working your present job? Yes _____ NO _____

If yes, complete the remainder of this form:

Symptom or symptoms	Frequency			
	Never	Occasionally	Frequently	Constantly
Headache-----	_____	_____	_____	_____
Eye irritation-----	_____	_____	_____	_____
Nose or throat irritation-----	_____	_____	_____	_____
Dry throat-----	_____	_____	_____	_____
Nausea-----	_____	_____	_____	_____
Skin rash-----	_____	_____	_____	_____
Dizziness-----	_____	_____	_____	_____
Runny nose, or watery eyes-----	_____	_____	_____	_____
Sneezing-----	_____	_____	_____	_____
Nasal congestion-----	_____	_____	_____	_____
Fatigue-----	_____	_____	_____	_____
Numbness in hands or feet-----	_____	_____	_____	_____
Shortness of breath-----	_____	_____	_____	_____
Cough-----	_____	_____	_____	_____
Wheezing-----	_____	_____	_____	_____
Chest pain-----	_____	_____	_____	_____
Nervousness-----	_____	_____	_____	_____
Nose bleeds-----	_____	_____	_____	_____
Loss of appetite-----	_____	_____	_____	_____
Diarrhea-----	_____	_____	_____	_____
Metallic taste-----	_____	_____	_____	_____
Insomnia-----	_____	_____	_____	_____
Fever-----	_____	_____	_____	_____