

# OAK RIDGE/MULTI-FACILITY

## ORMULA01 Data File Set

### Description

This analytic data file set consists of one file generated for a study, published in *Archives of Environmental Health* in 1981, of welders employed at one or more of the three Oak Ridge facilities.

This study examined mortality from various diseases, including cancer of the respiratory system, in a cohort of 1,059 white male welders exposed to nickel compounds. The study also examined the long-term health effects of exposure to several other compounds (dust, fumes, and gases) among welders. A subgroup of these welders was exposed to nickel oxides at the Oak Ridge K-25 Facility, formerly known as the Oak Ridge Gaseous Diffusion Plant (ORGDP). These workers were subjected to air concentrations of nickel higher than proposed standards. However, standardized mortality ratios for lung cancer and diseases of the respiratory system were not higher among K-25 welders than among other welders.

The single analytic file (ANALYSIS) in this data file set contains demographic and vital status data for 1,062 individuals. There is one record per person; three individuals were not included in the final analyses. Radiation monitoring data were not used in the analysis.

The study cohort of 1,059 white male welders was determined by examining work histories (payroll records) that specified job titles and job codes indicative of welding. Industrial hygienists at the plant were consulted to avoid possible exclusion of job titles and job codes associated with welding on a full-time basis. Vital status was ascertained for approximately 92% of the study cohort through December 31, 1974, the study end date. There were 173 deaths identified, and death certificates were obtained for 166 (95.9%) of these deaths. Personal radiation monitoring data were not used; however, some air monitoring data and smoking history data were analyzed. Smoking data were obtained for 356 (33.6%) of the 1,059 welders. ♦♦

# OAK RIDGE/ MULTI-FACILITY

ORMULA01 Data File Set

## Citations

Polednak, A. 1981. Mortality among welders, including a group exposed to nickel oxides. *Archives of Environmental Health* 36(5).

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
ANALYSIS	11	demographic; vital status

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female †
Infectious & Parasitic Diseases	1	
All Malignant Neoplasms	69	
Lip, Oral Cavity & Pharynx	0	
Digestive Organs & Peritoneum	15	
Respiratory System	33	
Bone & Connective Tissue	0	
Skin	0	
Breast	1	
Genitourinary System	5	
Brain/Central Nervous System (CNS)	3	
Other & Unspecified Sites, Except Brain/CNS	8	
Lymphatic/Hematopoietic	4	
All Benign Neoplasms	0	
All Neoplasms, Unspecified	0	
Endocrine, Nutritional & Metabolic Diseases	1	
Diseases of Blood & Blood-Forming Organs	0	
Mental Disorders	0	
Diseases of Nervous System & Sense Organs	3	
Diseases of Circulatory System	149	
Diseases of Respiratory System	28	
Diseases of Digestive System	17	
Diseases of Genitourinary System	2	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	0	
Diseases of Musculoskeletal System & Connective Tissue	1	
Congenital Anomalies	0	
Symptoms & Ill-Defined Conditions	11	
Accidents, Poisoning & Violence (External Causes)	43	
Deaths, With ICD Code	325	
Deaths, No ICD Code	9	
Total Deaths, All Causes	334	

† No females were included in this study.

Variables for Analytic File  
**ANALYSIS**  
74 KB

Name	Description
<b>id</b>	identification number
<b>birth</b>	birth date of individual
<b>fwhire</b>	first hire as a welder
<b>vstat</b>	vital status
<b>ldate</b>	last date status date
<b>icd8x</b>	the underlying cause of death
<b>k25days</b>	number of days worked at K-25
<b>othdays</b>	days as a welder not at K-25
<b>birthyr</b>	the year of birth
<b>fwhireyr</b>	first hire year as a welder
<b>latency</b>	latency time

ORMJL01



# OAK RIDGE/MULTI-FACILITY

## ORMULA02 Data File Set

### Description

This analytic data file set consists of one file generated for a study, published in *Radiation Research* in 1990, of white males who worked at the Oak Ridge facilities during World War II (WWII).

This study demonstrated that Poisson regression methods can effectively describe the effect of multiple risk factors on cause-specific mortality. The cohort was defined as 28,008 white males who were employed for at least 1 month at any one of the three Oak Ridge facilities. During WWII (1943-1947), two of the facilities, Y-12 and K-25, produced enriched uranium. The third facility, Oak Ridge National Laboratory, was a research and development facility. During WWII, radiation monitoring programs were in developmental stages; only persons considered likely to be exposed, or those who were thought to be representative samples of workers likely to be exposed, were monitored. The paper discusses how a modified version of the traditional standardized mortality ratio (SMR) analysis was used to compare the cause-specific mortality experience of these workers with the U.S. population. The SMR for all causes was 1.11, and there was a significant upward trend of 0.74% per year. The excess mortality was primarily due to lung cancer and diseases of the respiratory system.

The single analytic file (PHASE1B) in this data file set contains 28,008 records, one for each person in the cohort. Each record consists of demographic, vital status, and work history data and external exposure indicators. The indicators were used as surrogates for external exposure data and were determined by analyzing job title and department combinations, categorizing each combination by risk of exposure.

The cohort included only those workers who were hired at one of the facilities between the start of operations at that respective facility and December 31, 1947. Each person was considered to have entered the cohort on January 1, 1950. Vital status was ascertained for 98.1% of the cohort through December 31, 1979, the study end date. There were 11,671 deaths identified, and death certificates were obtained for 96.8% of these deaths.

Because radiation monitoring programs were still in developmental stages, complete personal monitoring data for this cohort were not available during the time period. Therefore, exposure indices based on job title and department combinations were developed as surrogates for monitoring data. ❖

# OAK RIDGE/ MULTI-FACILITY

## ORMULA02 Data File Set

### Citations

Frome, E. L., D. L. Cragle, and R. W. McLain. 1990. Poisson regression of the mortality among a cohort of World War II nuclear industry workers. *Radiation Research* 123:138-152.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
PHASE1B	21	demographic; vital status; work history; time at exposure level

### Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female †
Infectious & Parasitic Diseases	150	
All Malignant Neoplasms	2,188	
Lip, Oral Cavity & Pharynx	75	
Digestive Organs & Peritoneum	486	
Respiratory System	877	
Bone & Connective Tissue	22	
Skin	33	
Breast	5	
Genitourinary System	255	
Brain/Central Nervous System (CNS)	67	
Other & Unspecified Sites, Except Brain/CNS	174	
Lymphatic/Hematopoietic	194	
All Benign Neoplasms	7	
All Neoplasms, Unspecified	25	
Endocrine, Nutritional & Metabolic Diseases	151	
Diseases of Blood & Blood-Forming Organs	9	
Mental Disorders	81	
Diseases of Nervous System & Sense Organs	76	
Diseases of Circulatory System	5,727	
Diseases of Respiratory System	790	
Diseases of Digestive System	470	
Diseases of Genitourinary System	147	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	6	
Diseases of Musculoskeletal System & Connective Tissue	25	
Congenital Anomalies	13	
Symptoms & Ill-Defined Conditions	338	
Accidents, Poisoning & Violence (External Causes)	1,046	
Deaths, With ICD Code	11,249	
Deaths, No ICD Code	367	
Total Deaths, All Causes	11,616	

† No females were included in this study.

Variables for Analytic File

PHASE1B

3 MB

Name	Description
id	identification number
ca8	cancer cause if not underlying
dob	birth date
ldate	last date known alive
len_emp	length of employment in days
fhire	date of first hire
term_47	last termination date before 1/1/48
hire_48	hire date if after 1/1/48
status	vital status of individual
ydays	number of days at yes exposure level
ndays	number of days at no exposure level
sdays	number of days at Substitute Alloy Material (SAM) Laboratory
udays	number of days at unknown level
icd8	underlying cause of death code
fac	facility of employment
dur_emp	category of duration of employment
maxses	highest socioeconomic status reached
firstses	first socioeconomic status
exposed	exposed on job
age_45	age category at 1945
diff	this variable was not used in analyses





# OAK RIDGE/MULTI-FACILITY

## ORMULA03 Data File Set

### Description

This analytic data file set consists of one file generated for a study, published in the *American Journal of Public Health* in 1992, examining ill-defined causes of death of white males at the three Oak Ridge facilities.

This study determined the association between various factors and a recorded ill-defined cause of death. A matched pair case-control study was conducted, with one control per case and within an occupational cohort of workers at three Oak Ridge facilities (Y-12, K-25, and Oak Ridge National Laboratory). The study found a strong association between the ill-defined classification given as a cause of death and particular certifiers, especially if the certifier was a medical examiner. Results from other cohort mortality studies of workers at the Oak Ridge facilities have indicated unusual increases in the rate of deaths due to unexplained or unspecified causes. In this study, the standardized mortality ratio for deaths coded to these categories was 3.05 (338 observed versus 110.92 expected).

The single analytic file in this data file set contains 1,216 records, one for each case and each matched control. The file contains demographic, work history, and cause-of-death data, plus codes for the different certifiers. Each individual in this cohort must have worked for more than 30 days at any Oak Ridge facility between 1943 and 1982 and must have died between 1945 and 1982. Death certificates were obtained for 608 cases in which deaths were due to unexplained or unspecified causes. Based on cause of death and matching birth and death dates within 2 years (plus or minus), a control was selected for each case. The control also had to work at the same facility as the case.

Considerable data, in addition to cause of death, were abstracted from death certificates obtained for all 1,216 cases and controls.

Personal or environmental radiation monitoring data were not used in this study. ❖

# OAK RIDGE/ MULTI-FACILITY

ORMULA03 Data File Set

## Citations

Cragle, D. L., and A. Fetcher. 1992. Risk factors associated with the classification of unspecified and/or unexplained causes of death in an occupational cohort. *American Journal of Public Health* 82(3):455-457.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
ANALYSIS	38	demographic; work history; death certificate data

**Note:** *Summary Death Tables do not apply to this data file set*

Variables for Analytic File ANALYSIS		203 KB	
Name	Description		
id	identification number	cert	death certificate certifier
case	case/control indicator	phy_a	death certificate physician attending
set_	set number	cert_n	code indicating name of certifier
fac	facility first employed	aut	autopsy code
mult	worked at more than one facility indicator	aut_dc	autopsy used to complete death certificate
fhire	first hire date at any Oak Ridge facility	cc	case/control indicator
lterm	last term date from any Oak Ridge facility	stdeath	was state of death Tennessee
jobdays	number of days employed at Oak Ridge	stateres	was state of last residence Tennessee
cont	continuous employment indicator	stbirth	was state of birth Tennessee
dob	date of birth	easttn_d	East Tennessee county of death
dod	date of death	easttn_r	East Tennessee county of residence
icd8	cause of death	emplst	employment duration
job_or	last job title	mob	mobility indicator
st_d	state of death		
tnco_d	code for Tennessee county of death		
st_b	state of birth		
st_r	state of last known residence		
tnco_r	code for Tennessee county of residence		
res	place of last residence		
pod	place of death		
hosp_n	code for hospital name		
hosp_t	type of hospital		
hosp_s	code for hospital status		
mar_s	marital status		
job_dc	job classification per death certificate		

# OAK RIDGE/MULTI-FACILITY

## ORMULA04 Data File Set

### Description

This analytic data file set consists of one file generated for a retrospective cohort mortality study of white males employed at the K-25, X-10, or Y-12 facilities in Oak Ridge, Tennessee.

A previous study (Polednak, 1981. *Archives of Environmental Health*, 57:1-17) of 1,059 white male welders employed between 1943 and 1973 in these three plants compared the mortality experiences of welders employed at K-25, who had potential for nickel oxide exposure, with those employed only at the other sites, who were not exposed to nickel oxides. Based on deaths through 1974, there was an elevated lung cancer standardized mortality ratio (SMR) of 1.88 for K-25 welders employed for at least 50 weeks, but this was based on only five observed deaths. The current update was based on deaths through 1989 for 1,211 white male welders employed between 1943 and 1985, including the subgroup of 683 K-25 employees with potential for nickel oxide exposure. There were 18,790 person-years of follow-up and 237 deaths for the K-25 subgroup, with 15,992 person-years and 226 deaths for the second subgroup employed at the other facilities. Results for the combined cohort showed statistically significant SMRs for lung cancer and prostate cancer. Investigating SMRs separately for the two subgroups, the only statistically significant SMR was for prostate cancer among those welders without potential exposure to nickel oxide, although the prostate cancer SMR for K-25 welders was also elevated. There

did not appear to be notable differences between the mortality patterns of the welders with and without potential exposure to nickel oxides. No deaths from nasal sinus cancer were found in either group, and the healthy worker effect was not evident.

The single analytic file (COHORT) contains a record, which includes vital status as of January 1, 1990, for each of the 1,211 members of the cohort. The last Social Security Administration (SSA) submission for this population provided "alive" status as of January 1, 1985; the "alive" category is no longer obtainable from SSA. However, the National Death Index (NDI) provides a record of all deaths occurring since January 1, 1979. If not identified as deceased by SSA or NDI, individuals last known to be alive before January 1, 1979, were considered lost to follow-up on the last date known alive, while those known to be alive after January 1, 1979, were considered alive at the end of the study. There were 463 deaths from all causes with death certificates available for 98.5% of these individuals.

Nickel-oxide exposure occurred at K-25 when workers welded mild steel pipes that were coated with nickel; these pipes were widely used throughout this facility. Nickel-coated pipes were not used at the other sites. Materials welded at Y-12 and X-10 included mild steel and aluminum. In addition, stainless steel was sometimes used at Y-12. ❖

# OAK RIDGE/ MULTI-FACILITY

ORMULA04 Data File Set

## Citations

Watkins, J. P., et al. 1993. *Data collection, validation, and description for the Oak Ridge Nuclear Facilities Mortality Study*. ORISE 93/J-42.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
COHORT	37	vital status; work history; demographic; exposure risk

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female †
Infectious & Parasitic Diseases	2	
All Malignant Neoplasms	107	
Lip, Oral Cavity & Pharynx	0	
Digestive Organs & Peritoneum	16	
Respiratory System	51	
Bone & Connective Tissue	0	
Skin	1	
Breast	0	
Genitourinary System	14	
Brain/Central Nervous System (CNS)	5	
Other & Unspecified Sites, Except Brain/CNS	11	
Lymphatic/Hematopoietic	9	
All Benign Neoplasms	0	
All Neoplasms, Unspecified	0	
Endocrine, Nutritional & Metabolic Diseases	5	
Diseases of Blood & Blood-Forming Organs	1	
Mental Disorders	2	
Diseases of Nervous System & Sense Organs	4	
Diseases of Circulatory System	215	
Diseases of Respiratory System	38	
Diseases of Digestive System	17	
Diseases of Genitourinary System	5	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	0	
Diseases of Musculoskeletal System & Connective Tissue	3	
Congenital Anomalies	0	
Symptoms & Ill-Defined Conditions	13	
Accidents, Poisoning & Violence (External Causes)	44	
Deaths, With ICD Code	456	
Deaths, No ICD Code	7	
Total Deaths, All Causes	463	

† No females were included in this study.

Variables for Analytic File  
**COHORT**

195 KB

Name	Description
<b>bflag</b>	flag for estimated month and/or day
<b>birth</b>	birth date
<b>birthflg</b>	flag indicating another birth
<b>ca8</b>	rev. icd code—any cancer cause
<b>ca8flag</b>	verified status with no date of death
<b>fac1</b>	first facility as a welder
<b>fac2</b>	second facility as a welder
<b>fac3</b>	third facility as a welder
<b>fac4</b>	fourth facility as a welder
<b>fac5</b>	fifth facility as a welder
<b>fac6</b>	sixth facility as a welder
<b>gdate1</b>	start date as welder at fac1
<b>gdate2</b>	start date as welder at fac2
<b>gdate3</b>	start date as welder at fac3
<b>gdate4</b>	start date as welder at fac4
<b>gdate5</b>	start date as welder at fac5
<b>gdate6</b>	start date as welder at fac6
<b>icd8</b>	ICD death code, 8th revision
<b>icd8flag</b>	verified status with no date of death
<b>id</b>	identification number

<b>jobdays1</b>	number of days as welder at fac1
<b>jobdays2</b>	number of days as welder at fac2
<b>jobdays3</b>	number of days as welder at fac3
<b>jobdays4</b>	number of days as welder at fac4
<b>jobdays5</b>	number of days as welder at fac5
<b>jobdays6</b>	number of days as welder at fac6
<b>ldate</b>	last date known alive
<b>race</b>	race—always w for white
<b>sex</b>	sex—always m for male
<b>status</b>	vital status
<b>type1</b>	exposure risk at fac1; 1=low, 2=high
<b>type2</b>	exposure risk at fac2; 1=low, 2=high
<b>type3</b>	exposure risk at fac3; 1=low, 2=high
<b>type4</b>	exposure risk at fac4; 1=low, 2=high
<b>type5</b>	exposure risk at fac5; 1=low, 2=high
<b>type6</b>	exposure risk at fac6; 1=low, 2=high
<b>whire</b>	1st date person was welder > 30 days



# OAK RIDGE/MULTI-FACILITY

## ORMULA05 Data File Set

### Description

This analytic data file set consists of six files generated for a retrospective cohort mortality study of all workers employed at the K-25, X-10, or Y-12 facilities in Oak Ridge, Tennessee, who were hired before January 1, 1983, and employed for at least 30 days.

This study, an update of a previous study by Frome (data file set ORMULA02), is based on deaths through 1984 for 106,020 workers of both genders. There were 2,810,000 person-years of follow-up with 65% from white males, 30% from white females, 3% from nonwhite males, and 2% from nonwhite females. The study involved three stages of analysis. First, standardized mortality ratios (SMRs) were calculated for each of the four race/gender groups for a series of causes of death. Next, a comparison of mortality among the facilities for selected causes of death was conducted by race/gender group. Finally, a dose-response analysis for cumulative external dose was carried out for white male employees from Y-12 after mid-1947 and X-10. A summary of study findings will appear in CEDR after the study's publication in a peer-reviewed journal, expected late in 1995.

The analytic file (DEMGR) contains a record for each of the 118,588 workers hired by one of the Oak Ridge facilities before January 1, 1983. For the study cohort 12,568 were eliminated from this group, including 11,002 who were employed for fewer than 30 days and the remainder who had "critical errors" in their data. This file contains demographic, work history, and vital status information as of December 31, 1984. Of the 27,982 deaths, 22,724 were white males. There are three exposure files (X10EXP, Y12EXP, and K25EXP) that contain, for the designated facility, annual unadjusted external radiation doses, annual indicator variables for internal radiation exposure, and annual flags that specify employment in

that facility during the year. White males received 93% of the annual recorded doses, which totalled 405.5 sieverts (Sv). There are two additional exposure files. Annual adjusted doses for X-10 are contained in X10ADJ, along with data used to compute these values, including annual values for days worked, department, and type of adjustment. Doses through 1956 were adjusted upward to compensate for potential bias in recorded doses due to monitoring policies and practices at X-10 during early years of plant operation. Early Y-12 doses were adjusted because of the large number of nonmonitored person-years at Y-12 through 1960. The adjusted dose file for Y-12 (Y12ADJ) contains annual adjusted doses as well as flags to specify type of adjustment.

The Oak Ridge National Laboratory began operation at X-10 early in 1943 as a research and development facility. Potential exposures to X-10 employees included external radiation, a variety of radionuclides, lead, beryllium, and chemicals associated with a research and development laboratory. From 1943 through mid-1947, Y-12 produced enriched uranium by the electromagnetic separation process and was operated by Tennessee Eastman Corporation. Potential exposures at Y-12 included uranium dust, some external radiation, and a variety of chemicals, including solvents and lubricants. After mid-1947, Y-12 was managed by Union Carbide Corporation Nuclear Division and changed operations to nuclear materials fabrication. At that time, potential exposures at Y-12 expanded to include metals and asbestos. K-25 began in 1945 to produce enriched uranium using a gaseous diffusion process. Uranium dust was a potential exposure at K-25 along with some external radiation exposure, uranium compounds, metals, solvents, and chemicals. ♦♦

# OAK RIDGE/ MULTI-FACILITY

ORMULA05 Data File Set

## Citations

Frome, E. L., D. L. Cragle, and R. W. McLain. 1990. Poisson regression of the mortality among a cohort of World War II nuclear industry workers. *Radiation Research* 123:138-152.

Number of Analytic Files: 6		
File Name	Number of Variables	Type of Data
DEMGR	32	demographic; work history; vital status
X10EXP	130	internal & external exposure
Y12EXP	114	internal & external exposure
K25EXP	128	internal & external exposure
X10ADJ	179	adjusted internal & external exposure
Y12ADJ	77	adjusted internal & external exposure

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female
Infectious & Parasitic Diseases	405	62
All Malignant Neoplasms	5,671	1,381
Lip, Oral Cavity & Pharynx	156	32
Digestive Organs & Peritoneum	1,286	263
Respiratory System	2,323	221
Bone & Connective Tissue	54	12
Skin	97	28
Breast	9	298
Genitourinary System	671	266
Brain/Central Nervous System (CNS)	165	34
Other & Unspecified Sites, Except Brain/CNS	428	96
Lymphatic/Hematopoietic	482	131
All Benign Neoplasms	15	12
All Neoplasms, Unspecified	60	13
Endocrine, Nutritional & Metabolic Diseases	370	110
Diseases of Blood & Blood-Forming Organs	45	14
Mental Disorders	193	21
Diseases of Nervous System & Sense Organs	180	31
Diseases of Circulatory System	13,512	1,796
Diseases of Respiratory System	1,982	244
Diseases of Digestive System	1,065	214
Diseases of Genitourinary System	362	78
Complications of Pregnancy & Childbirth	0	13
Diseases of Skin & Subcutaneous Tissue	18	9
Diseases of Musculoskeletal System & Connective Tissue	52	34
Congenital Anomalies	38	11
Symptoms & Ill-Defined Conditions	911	146
Accidents, Poisoning & Violence (External Causes)	2,816	350
Deaths, With ICD Code	27,695	4,539
Deaths, No ICD Code	607	201
Total Deaths, All Causes	28,302	4,740



Variables for Analytic File  
**DEMGR**

18 MB

Name	Description
<b>id</b>	identification number
<b>birth</b>	birth date
<b>ldate</b>	last known date for status
<b>khire</b>	first hire at K-25
<b>thire</b>	first hire at TEC
<b>xhire</b>	first hire at X-10
<b>yhire</b>	first hire at Y-12
<b>indate2</b>	second date of hire
<b>hire</b>	1st hire date at 1st Oak Ridge facility
<b>fac</b>	1st Oak Ridge facility of employment
<b>kdays</b>	total number of days worked at K-25
<b>tdays</b>	total number of days worked at TEC
<b>xdays</b>	total number of days worked at X-10
<b>ydays</b>	total number of days worked at Y-12
<b>bflag</b>	flag on estimated birth dates
<b>birth_fl</b>	conflicting birth date flag
<b>race</b>	race code
<b>race_fl1</b>	flag indicating problem with race data
<b>sex</b>	sex code
<b>sex_fl1</b>	flag indicating problem with sex data
<b>status</b>	vital status
<b>icd8</b>	ICD8 code from death file/nosologist

<b>icd8flag</b>	flag indicating ICD code verification
<b>ca8</b>	CA8 code from death file
<b>pay</b>	1st pay code at any Oak Ridge facility
<b>pay_flag</b>	flag indicating problem with pay status
<b>tflag</b>	consecutive work days
<b>kflag</b>	consecutive work days
<b>yflag</b>	consecutive work days
<b>xflag</b>	consecutive work days
<b>errcode</b>	error codes
<b>lterm</b>	last term date

Variables for Analytic File  
**X10EXP**

8 MB

Name	Description
<b>id</b>	identification number
<b>xyr43</b>	flag of x if not employed by year, 1943-1985
<b>xyr85</b>	
<b>xintl43</b>	internal exposure code by year, 1943-1985
<b>xintl85</b>	
<b>xextl43</b>	external exposure dose in mrem by year, 1943-1985
<b>xextl85</b>	

Variables for Analytic File  
**Y12EXP**

6 MB

Name	Description
<b>id</b>	identification number
<b>yr47</b>	flag of x if not employed by year, 1947-1984
<b>yr84</b>	
<b>intl47</b>	internal exposure code by year, 1947-1984
<b>intl84</b>	
<b>extl48</b>	external exposure dose in mrem by year, 1948-1984
<b>extl84</b>	

Variables for Analytic File

K25EXP

13 MB

Name	Description
id	identification number
kyr43	flag of x if not employed by year, 1943-1985
kyr85	
kintl43	internal exposure code by year, 1943-1985
kintl85	
kextl45	external exposure dose in mrem by year, 1945-1985
kextl85	

Variables for Analytic File

X10ADJ

9 MB

Name	Description
id	identification number
xnflag43	adjustment flag for year 1943
days43	number of days worked by year, 1943-1984
days84	
oldext44	dose prior to adjustment by year, 1944-1956
oldext56	
dept44	prominent dept by year, 1944-1956
dept56	
xyr44	employment flag by year, 1944-1956
xyr56	
xextl43	external exposure dose in mrem by year, 1943-1984
xextl84	
nflag44	adjustment flag by year, 1944-1984
nflag84	
perc44	percent by year, 1944-1956
perc56	

Variables for Analytic File

Y12ADJ

5 MB

Name	Description
id	identification number
ynflag47	adjustment flag by year, 1947-1984
ynflag84	
extl47	external exposure dose in mrem by year, 1947-1984
extl84	

# OAK RIDGE/X-10

## ORX10A01 Data File Set

### Description

This analytic data file set consists of four files generated for the cohort mortality study, published in the *British Journal of Industrial Medicine* in 1985, of white males employed at Oak Ridge National Laboratory (ORNL).

The publication focuses on 8,375 white males employed at ORNL for at least 1 month (30 days) between 1943 and 1972. The study presents internal comparisons of mortality (standardized rate ratios) between subgroups of the cohort according to radiation dose level and duration of employment in various job categories. No consistent gradients of cause-specific mortality were assessed with respect to radiation exposure. Among monitored workers, deficits in mortality due to arteriosclerotic heart disease and all cancers were found. However, elevated (but not statistically significant) standardized mortality ratios were seen for all leukemias, cancer of the prostate, and Hodgkin's disease.

There are four analytic files in the ORX10A01 data file set. The first file (X1CH0210) provides information for 12 employment groupings, which were based on an examination of each individual's work history and on the calculation of a 10-year latency period for each person. The second file (X1CH0810) contains external radiation doses as assessed from external monitoring data. The third file (X1CH1201) contains all demographic data and summary exposure data pertaining to the cohort. This file contains one record per individual in the cohort, whereas the other files may contain several or no records per individual, depending on the availability of monitoring data for those individuals. The fourth file (CUMEXP) contains all internal monitoring data pertinent to the cohort.

Vital status was ascertained for 92.2% of the cohort of 8,375 white males through December 31, 1977, the study end date. There were 966 deaths identified, and death certificates were obtained for 939 (97.2%) of these deaths. External and internal exposures to radiation were examined.

ORNL began monitoring personnel for exposure to penetrating external radiation, primarily gamma rays, in 1943. Pocket chambers were used until June 1944, when film dosimeters (film badges) became the primary dosimeters. Film dosimeters were used for personnel monitoring until 1975, when they were replaced with thermoluminescent dosimeters. From 1943 until the early 1950s, the usual practice was to provide personal dosimeters to only those workers entering designated areas where the potential for exposure was presumed to exist. Subsequently, all workers at ORNL were monitored for exposure to radiation. In 1951, based primarily on the potential for contamination from their work area, some workers began to be monitored by urine bioassays for internal exposure to radionuclides. Additional workers were monitored to evaluate exposures incurred during incidents. Internal exposures were determined by results of urine and fecal bioassays and whole-body counting. For purposes of the study, internal monitoring results were used to place the worker into one of three exposure categories each year. Quantitative dose estimates due to internally deposited radionuclides are not available because they usually were not required to be calculated in the past, and all of the basic data needed to compute doses for the many radionuclides used at ORNL are not computerized. However, knowledgeable plant health physicists and dosimetrists state that the majority of internal monitoring results for this cohort suggest small internal doses, especially when compared with external doses. ♦

# OAK RIDGE/ X-10

ORX10A01 Data File Set

## Citations

Checkoway, H., R. M. Mathew, C. M. Shy, J. E. Watson, W. G. Tankersley, S. H. Wolf, J. C. Smith, and S. A. Fry. 1985. Radiation, work experience, and cause-specific mortality among workers at an energy research laboratory. *British Journal of Industrial Medicine* 42:525-533.

Number of Analytic Files: 4		
File Name	Number of Variables	Type of Data
X1CH0210	49	work history
X1CH0810	71	external radiation dose
X1CH1201	38	demographic; summary exposure; vital status
CUMEXP	71	internal monitoring

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female †
Infectious & Parasitic Diseases	6	
All Malignant Neoplasms	194	
Lip, Oral Cavity & Pharynx	4	
Digestive Organs & Peritoneum	45	
Respiratory System	61	
Bone & Connective Tissue	4	
Skin	4	
Breast	0	
Genitourinary System	22	
Brain/Central Nervous System (CNS)	9	
Other & Unspecified Sites, Except Brain/CNS	15	
Lymphatic/Hematopoietic	30	
All Benign Neoplasms	0	
All Neoplasms, Unspecified	1	
Endocrine, Nutritional & Metabolic Diseases	12	
Diseases of Blood & Blood-Forming Organs	2	
Mental Disorders	3	
Diseases of Nervous System & Sense Organs	6	
Diseases of Circulatory System	472	
Diseases of Respiratory System	42	
Diseases of Digestive System	26	
Diseases of Genitourinary System	15	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	1	
Diseases of Musculoskeletal System & Connective Tissue	1	
Congenital Anomalies	1	
Symptoms & Ill-Defined Conditions	28	
Accidents, Poisoning & Violence (External Causes)	129	
Deaths, With ICD Code	939	
Deaths, No ICD Code	27	
Total Deaths, All Causes	966	

† No females were included in this study.

Variables for Analytic File  
X1CHO210

4 MB

Name	Description
id	identification number
sumdur01	total time spent in grp 01
sumdur02	total time spent in grp 02
sumdur03	total time spent in grp 03
sumdur04	total time spent in grp 04
sumdur05	total time spent in grp 05
sumdur06	total time spent in grp 06
sumdur07	total time spent in grp 07
sumdur08	total time spent in grp 08
sumdur09	total time spent in grp 09
sumdur10	total time spent in grp 10
sumdur11	total time spent in grp 11
sumdur12	total time spent in grp 12
first01	date first worked in grp 01
first02	date first worked in grp 02
first03	date first worked in grp 03
first04	date first worked in grp 04
first05	date first worked in grp 05
first06	date first worked in grp 06
first07	date first worked in grp 07
first08	date first worked in grp 08
first09	date first worked in grp 09
first10	date first worked in grp 10
first11	date first worked in grp 11
first12	date first worked in grp 12
doel0101	1-yr date of eligibility into grp 01
doel0102	1-yr date of eligibility into grp 02
doel0103	1-yr date of eligibility into grp 03
doel0104	1-yr date of eligibility into grp 04

doel0105	1-yr date of eligibility into grp 05
doel0106	1-yr date of eligibility into grp 06
doel0107	1-yr date of eligibility into grp 07
doel0108	1-yr date of eligibility into grp 08
doel0109	1-yr date of eligibility into grp 09
doel0110	1-yr date of eligibility into grp 10
doel0111	1-yr date of eligibility into grp 11
doel0112	1-yr date of eligibility into grp 12
doel1001	10-yr date of eligibility into grp 01
doel1002	10-yr date of eligibility into grp 02
doel1003	10-yr date of eligibility into grp 03
doel1004	10-yr date of eligibility into grp 04
doel1005	10-yr date of eligibility into grp 05
doel1006	10-yr date of eligibility into grp 06
doel1007	10-yr date of eligibility into grp 07
doel1008	10-yr date of eligibility into grp 08
doel1009	10-yr date of eligibility into grp 09
doel1010	10-yr date of eligibility into grp 10
doel1011	10-yr date of eligibility into grp 11
doel1012	10-yr date of eligibility into grp 12

Variables for Analytic File  
X1CHO810

4 MB

Name	Description
id	identification number
dose43	annual film badge dose by year, 1943-1977
⋮	
dose77	
cum43	cumulative film badge dose by year, 1943-1977
⋮	
cum77	

Variables for Analytic File  
X1CH1201

1 MB

Name	Description
id	identification number
int_hi	highest internal exposure code
ivgs_hi	code for highest in vivo value
ba_hi	highest bioassay value ever
times	number of times individual was hired
currnt	current employee
termdate	final termination date of individual
sex	sex code
race	race code
facility	number of facilities
hiredate	first date of hire at ORNL
duration	duration of employment at ORNL
duration	exposure to mercury
beryllium	beryllium exposure indicator
lead	exposure to lead
birthdte	birth date
dod	date of death
vs1	vital status
dagstat	DAG code
cum_neut	cumulative neutron dose
firstneu	year of earliest neutron record
neutrecs	number of neutron records
neutflag	neutron exposure flag

ORX10A01

<b>dlo</b>	date of last observation
<b>totdose</b>	total film badge dose at ORNL
<b>totcount</b>	total number of film badge records
<b>ttlo</b>	days from final term to date last observation
<b>fb_flag</b>	film badge error flag
<b>exp_yr</b>	year of first exposure at ORNL
<b>lof</b>	length of follow-up in years
<b>ivgs_fy</b>	first year in vivo monitoring
<b>ivgs_rc</b>	total number of in vivo records
<b>ba_fy</b>	first monitoring year of bioassay
<b>ba_rc</b>	total number of bioassay records
<b>int_flag</b>	status of internal monitoring
<b>int_ex</b>	earliest internal monitoring year
<b>icda8</b>	underlying cause of death
<b>other_ca</b>	other cancers

Variables for Analytic File  
**CUMEXP**

1 MB

Name	Description
<b>id</b>	identification number
<b>intexp43</b>	highest annual internal exposure code by year, 1943-1977
<b>intexp77</b>	
<b>cumexp43</b>	highest cumulative internal exposure code by year, 1943-1977
<b>cumexp77</b>	

# OAK RIDGE/X-10

## ORX10A02 Data File Set

### Description

This analytic data file set consists of three files that were used in updated analyses, presented in two papers, of white males employed at the Oak Ridge National Laboratory (ORNL).

Both papers analyzed data for a cohort of 8,318 white males employed at ORNL for at least 30 days between 1943 and 1972. In the first paper (JAMA 1991), two types of analyses were performed. The first was a cause-specific mortality analysis comparing the study population with the mortality of white males in the U.S. The second was an analysis of the relationship between protracted exposure to low levels of external penetrating ionizing radiation and mortality within the study population. Compared with the mortality experience of all U.S. white males, relatively low mortality was observed for most causes of death. However, mortality from leukemia was elevated in the total cohort and in workers who had at some time been monitored for exposure to internally deposited radionuclides. The second publication (AJIM 1993) examines the role of possible selection and confounding factors not previously studied. Risks associated with length of time in 15 job categories were considered as proxies for the effects of other occupational carcinogens. The findings suggest that selection factors and potential for chemical exposure do not account for the previously noted association of external radiation dose with cancer mortality.

There are three analytic files in the ORX10A02 data file set. The first file (X1UPGEN2) contains demographic and some work history data for the entire cohort. The original study (ORX10A01) contained 8,375 males, but further investigation revealed that 57 individuals in the original cohort were not white males. The second file (X1UPFLAT) contains annual and cumulative external whole-body doses for each individual. The third file (X1UPJTGB) contains a record for each individual, including the unique job

title of the individual and the number of days, by year, that the person retained the job title.

Vital status was ascertained for 91.8% of the cohort (96.5% of potential person-years of follow-up), and 1,524 deaths were identified by the end of 1984, the study end date. Death certificates were obtained for 1,490 (97.8%) of these deaths. External radiation monitoring data were used to compile annual and cumulative whole-body doses. For the 4.9% of the work-years for which external monitoring data were not available, doses were estimated. By using internal monitoring data qualitatively as a "yes/no" indicator of potential exposure to internal radiation, workers who had at some time been monitored for internal exposure (N = 3,763) generally had higher external doses; 50% of those ever monitored, but only 8% of those never monitored, for internal exposure had cumulative external doses greater than 1 rem (10 millisieverts).

ORNL began monitoring personnel for exposure to external penetrating radiation, primarily gamma rays, in 1943. Pocket chambers were used until June 1944, when film dosimeters (film badges) became the primary dosimeter. Film dosimeters were used for personnel monitoring until 1975, when they were replaced with thermoluminescent dosimeters. From 1943 until the early 1950s, the usual practice was to provide personal dosimeters to only those workers entering designated areas where there was a potential for exposure. Subsequently, all workers at ORNL were monitored.

Based primarily on the potential for contamination from their work area, some workers were monitored for internal exposure to radionuclides beginning in 1951. Additional workers were monitored to evaluate exposures incurred during incidents.

# OAK RIDGE/X-10

ORX10A02 Data File Set

Internal exposures were determined by examining results of urine and fecal bioassays and whole-body counting. Quantitative dose estimates due to internally deposited radionuclides are not available because, in the past, they usually were not required to be calculated. Also, all of the basic data needed to compute doses for the many radionuclides used at ORNL are not computerized. However, knowledgeable plant health physicists and dosimetrists state that the majority of internal monitoring results for this cohort suggest small internal doses, especially when compared with external doses. ❖



# OAK RIDGE/ X-10

ORX10A02 Data File Set

## Citations

Wing, S., C. M. Shy, J. Wood, S. Wolf, D. Cragle, and E. L. Frome. 1991. Mortality among workers at Oak Ridge National Laboratory. *The Journal of the American Medical Association* 265(11):1397-1402.

Wing, S., C. M. Shy, J. Wood, S. Wolf, D. Cragle, W. Tankersley, and E. L. Frome. 1993. Job factors, radiation and cancer mortality at Oak Ridge National Laboratory: follow-up through 1984. *American Journal of Industrial Medicine* 23:265-279.

Number of Analytic Files: 3		
File Name	Number of Variables	Type of Data
X1UPGEN2	24	demographic; work history
X1UPFLAT	90	annual and cumulative external, whole-body dose
X1UPJTGB	46	work history

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female †
Infectious & Parasitic Diseases	6	
All Malignant Neoplasms	345	
Lip, Oral Cavity & Pharynx	6	
Digestive Organs & Peritoneum	94	
Respiratory System	101	
Bone & Connective Tissue	5	
Skin	8	
Breast	0	
Genitourinary System	41	
Brain/Central Nervous System (CNS)	15	
Other & Unspecified Sites, Except Brain/CNS	26	
Lymphatic/Hematopoietic	49	
All Benign Neoplasms	1	
All Neoplasms, Unspecified	1	
Endocrine, Nutritional & Metabolic Diseases	15	
Diseases of Blood & Blood-Forming Organs	2	
Mental Disorders	5	
Diseases of Nervous System & Sense Organs	9	
Diseases of Circulatory System	738	
Diseases of Respiratory System	73	
Diseases of Digestive System	45	
Diseases of Genitourinary System	16	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	2	
Diseases of Musculoskeletal System & Connective Tissue	2	
Congenital Anomalies	2	
Symptoms & Ill-Defined Conditions	55	
Accidents, Poisoning & Violence (External Causes)	172	

Deaths, With ICD Code	1,489	
Deaths, No ICD Code	34	
Total Deaths, All Causes	1,523	

† No females were included in this study.

ORX10A02

Variables for Analytic File  
X1UPGEN2

1 MB

Name	Description
int_hi	highest internal exposure index
int_flag	status of internal monitoring
int_ex	earliest year for internal monitoring
sex	sex code of individual
race	race code of individual
facility	number of facilities worked at
hiredate	first hire date at ORNL
birthdte	birth date
deletes	flag indicating deleted from study
vs_84	vital status of individual
icda8	underlying cause of death
other_ca	other cancers
dlo	date of last observation
dod	date of death
studyend	cutoff date of study (12/31/84)
currnt	flag indicating current employee
termdate	last termination date from ORNL
times	number of times hired at ORNL
duration	number of days employed at ORNL
oldid	old ID number
lof	length of follow-up
datemon	date of first internal monitoring

paycode pay code  
id identification number

Variables for Analytic File  
X1UPFLAT

5 MB

Name	Description
dose43 :	annual whole-body dose by year, 1943-1984
dose84	
cum43 :	cumulative body dose by year, 1943-1984
cum84	
id	identification number
avgqtr	missing quarter was estimated
nearby	missing years estimated by nearby years
meddept	missing years estimated from department median
medplant	missing years estimated from plant median
totalyr	number of years of data for person

Variables for Analytic File  
X1UPJTGB

5 MB

Name	Description
id	identification number assigned by CER
jtg3_pad	job title grouping code
_type_	variable created by SAS procedure
_freq_	variable created by SAS procedure
sumcd43 :	duration in job by year, 1943-1984
sumcd84	

# OAK RIDGE/X-10

## ORX10A03 Data File Set

### Description

This analytic data file set consists of one file generated for a doctoral dissertation completed in 1983 that examined the cancer mortality of workers at Oak Ridge National Laboratory (ORNL).

The dissertation investigated the relationship between cancer mortality and occupational exposure to radiation among the male employees at ORNL. The study was based on a case-control study nested in a cohort study, using two controls per case. Results indicated that certain subgroups encountered excess cancer mortality risk in relation to radiation exposure.

The single analytic file (NAIMA) in this data file set contains data relating to demographics, work history, exposure index rankings, internal hazard codes based on urine bioassay data, vital status, and causes of death. There are 1,785 records in this file, including one record for each of the 423 cases and one record for each of the 846 matched controls (the case-control

group), plus one record for each of the remaining 516 workers in the overall cohort. A case was defined to be any male employee who died between January 1943 and December 1977, whose death certificate indicated cancer as the cause of death. Controls were selected from the "population at risk" at ORNL, excluding those who died of cancer. The controls could be either dead or alive.

Vital status was ascertained for 91.7% of the male controls and for 66.5% of the female controls through December 31, 1977, the study end date.

Personal monitoring data were used to place workers into exposure classes; doses were not calculated. Groups based on job title were also formed for the analysis. Smoking histories were obtained for a sample (25%) of the cohort. Exposures to lead, beryllium, and mercury were also considered in the analysis. ❖

# OAK RIDGE/ X-10

ORX10A03 Data File Set

## Citations

Elghany, N. A. 1983. An epidemiological study of cancer mortality among workers exposed to occupational low levels of ionizing radiation. Ph.D. diss., University of North Carolina, Chapel Hill.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
NAIMA	110	demographic; work history; exposure index ranking; internal hazard code; vital status, cause of death

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female †
Infectious & Parasitic Diseases	1	
All Malignant Neoplasms	499	
Lip, Oral Cavity & Pharynx	8	
Digestive Organs & Peritoneum	115	
Respiratory System	162	
Bone & Connective Tissue	6	
Skin	13	
Breast	1	
Genitourinary System	76	
Brain/Central Nervous System (CNS)	18	
Other & Unspecified Sites, Except Brain/CNS	32	
Lymphatic/Hematopoietic	68	
All Benign Neoplasms	0	
All Neoplasms, Unspecified	0	
Endocrine, Nutritional & Metabolic Diseases	4	
Diseases of Blood & Blood-Forming Organs	1	
Mental Disorders	0	
Diseases of Nervous System & Sense Organs	2	
Diseases of Circulatory System	210	
Diseases of Respiratory System	24	
Diseases of Digestive System	5	
Diseases of Genitourinary System	9	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	1	
Diseases of Musculoskeletal System & Connective Tissue	0	
Congenital Anomalies	2	
Symptoms & Ill-Defined Conditions	15	
Accidents, Poisoning & Violence (External Causes)	8	
Deaths, With ICD Code	781	
Deaths, No ICD Code	0	
Total Deaths, All Causes	781	

† No females were included in this study.

Variables for Analytic File  
**NAIMA**

950 KB

Name	Description
------	-------------

id	identification number
flag	flag indicating completeness of job title grouping
autopsy	autopsy performed
smoker	smoking code
ja40x41	current vital status
id08x13	cumulative film badge reading
id15x18	total film badge record count
id20x25	film badge readings with no errors
id27x30	total film badge record count, no error
id32x37	film badge readings with minor errors
id39x42	total film badge record count, minor
id44x49	film badge readings with serious errors
id51x54	cum. "serious" badge record count yr. exp.
id56x61	unusable film badge readings
id63x66	total film badge record count, unusable
id68x73	film badge, minor errors, pending
id75x78	total film badge record count, minor pending
ie08x13	film badge, serious errors, pending
ie15x18	total film badge record count, serious pending
ie20x25	film badge, unusable, pending

ie27x30	total film badge record count, unusable pending
ie32x37	film badge with unknown code
ie39x42	total film badge record count, unknown
orderx3	used to get random order sort
aa18	number of facilities
ab14x20	date of birth
eb31x36	entry date into the study
eg21x26	exit date from the study
ha20x23	ICD code for underlying cause of death
ha24x27	cancer code
ha12x13	year of death
ha14x15	month of death
ha16x17	day of death
ha20x22	ICD code for underlying cause of death
ha24x26	cancer code
timex3	this variable not used in analysis
newone	first use in population
id2	identification number—last 2 digits
startyr	start year at ORNL
stopyr	stop year at ORNL
yob	year of birth
wkstart	date began work at ORNL
wkstop	date ended work at ORNL
dob	date of birth
dod	date of death
mstatus	mortality status
yod	year of death
case	person is a case

dead	cancer death
fustop	stop date of follow-up
fustart	start date of follow-up
yoh	year of first hire
matchon2	match criteria 2
matchon3	match criteria 3
sex	sex code
race	race code
cancer	type of cancer (if applicable)
eligible	eligible for inclusion
cancer3	one of 3 cancers
typex3	case/control category by race
matchgrp	match group code
control	type of control
casecntl	description if case or control
deathdat	date of death
hireage	age at first hire at ORNL
doemp	duration of employment at ORNL in years
cum_78	cumulative external exposure thru 1978
cum_77	cumulative external exposure thru 1977
haz	internal hazard code
bhaz	internal hazard code from bioassay
ihaz	internal hazard code
mercury	person exposed to mercury
beryllium	exposed to beryllium
lead	person exposed to lead
termage	age at last termination
enddate1	the date 12/31/77 in SAS format
enddate2	the date 12/31/79 in SAS format

age_77	age at death or age on 12/31/77
age_79	age at death or age on 12/31/79
yot	year of last termination
latent77	latency based on 1977 date
latent79	latency based on 1979 date
jtg_code	job title grouping code
d_jtg	duration of job with job title grouping
c_jtg	cumulative duration of all jobs at ORNL
ei	exposure index (EI)
tot_emp	total duration of employment at ORNL
tot_scr	total exposure score
dur_ei1	total job days at EI level 1
dur_ei2	total job days at EI level 2
dur_ei3	total job days at EI level 3
tot_int	number of employment periods at ORNL
tot_jc	number of different jobs at ORNL
hire_dt	date of first hire
term_dt	date of last termination
emp_stat	employment status
exp_scr1	total exposure score in EI level 1
exp_scr2	total exposure score in EI level 2
exp_scr3	total exposure score in EI level 3
cum_exp1	cumulative dose score in EI level 1
cum_exp2	cumulative dose score in EI level 1,2

ORX10A03

**cum\_exp3** cumulative dose score  
in EI level 1,2,3  
**ob\_num** observation number  
**doe** duration of employ-  
ment at ORNL in  
months  
**d\_jt** duration of job title  
group in months  
**dur\_e1** duration at EI level 1  
**dur\_e2** duration at EI level 2  
**dur\_e3** duration at EI level 3  
**firstpc** first pay code  
**lastpc** last pay code

# OAK RIDGE/X-10

## ORX10A04 Data File Set

### Description

Workers exposed to low-level radiation at Oak Ridge National Laboratory (ORNL) were found to have higher cancer mortality than workers from other Department of Energy installations exposed to similarly low levels of cumulative radiation (Wing et al., 1991). The purpose of this dissertation was to re-analyze existing data to explore methodologic approaches that may determine whether excess cancer mortality in the ORNL cohort can be explained by time-related factors not previously considered; grouping of cancer outcomes; selection bias due to choice of method selected to incorporate an empirical induction period (EIP); or the type of statistical model chosen.

Cancers have an EIP that is usually quantified as time from first exposure until death. Radiation epidemiology studies have not used consistent approaches to incorporate an EIP. It was determined that removing the first five years of deaths and person-years in the cohort (i.e. adjusting for latency) and lagging dose five years results in the same parameter estimate as lagging dose for 10 years when all person-years and deaths are retained. The deviance difference is greatest at lag=20 for all cancer outcomes evaluated, except lung cancer.

Twelve cancer outcome groups were evaluated. Cumulative radiation exposure was not significantly associated with lung cancers (lag=20,  $p=0.593$ ), leukemias (lag=10,  $p=0.18$ ), or leukemias excluding chronic lymphocytic leukemia (lag=10,  $p=0.629$ ). Cumulative dose was significantly associated with the following cancer outcomes after adjusting for time-related factors: all cancers (lag=20,  $p<0.01$ ), solid cancers (lag=20,  $p<0.01$ ), smoking related cancers ( $p<0.01$ ), and smoking-related cancers excluding lung cancers (lag=20,  $p=0.01$ ).

Two deaths in the highest dose category (one esophageal and one larynx) received doses similar to the Atomic bomb survivor cohort ( $> 500$  mSv). When these two cancers were removed from the cohort, the effect of cumulative dose was no longer significant at lag=20 ( $p=0.07$ ). ❖

# OAK RIDGE/ X-10

ORX10A04 Data File Set

## Citations

Lea, Cary Suzanne. Evaluation of Cancer Mortality in a Cohort of Workers Exposed to Low-Level Radiation. Dissertation, Univ. of California at Berkeley. 1995.

## Additional References

Wing S, Shy CM, Wood JL, Wolf S, Cragle DL, and Frome EL. Mortality among Workers at Oak Ridge National Laboratory: Evidence of Radiation Effects in Follow-up through 1984. *Journal of the American Medical Association* 1991; 265(11):1397-1402.

Wing S, Shy CM, Wood JL, Wolf S, Cragle DL, and Frome EL. Mortality among Workers at Oak Ridge National Laboratory: Evidence of Radiation Effects in Follow-up through 1984, Supplementary Document. National Auxiliary Publication Service, document #04849, 19 pages. Microfiche Publications, New York. 1991.

Wing S, Shy CM, Wood JL, Wolf S, Cragle DL, Tankersley W, and Frome EL. Job Factors, Radiation and Cancer Mortality at Oak Ridge National Laboratory: Follow-up through 1984. *American Journal of Industrial Medicine* 1993; 23:265-279.

Number of Analytic Files: TBD		
File Name	Number of Variables	Type of Data
		intermediate analytic files derived from ORX10A02

**Note:** No Summary Death Table currently available



# OAK RIDGE/ X-10

## ORX10A05 Data File Set

### Description

This data file set consists of one analytic file containing data for study of radiation-mortality association among an expanded cohort of ORNL workers.

This analytical data set consists of one file used for a NIOSH-funded study of mortality among workers at Oak Ridge National Laboratory, located in Oak Ridge, TN. This study examined a cohort of 14095 workers hired between 1943 and 1972 who worked at least 30 days at ORNL, for whom there was complete information on gender, race, dates of birth and hire, and who had no more than two years of missing annual whole body dosimetry data from employment at other DOE facilities. The cohort included 3389 women and 1071 non-white workers. Vital status had been ascertained for 94% of the cohort in follow-up through 1990, identifying 3269 deaths. Personal monitoring data for whole body exposure to ionizing radiation were available for the period 1943-1985. Annual whole body radiation doses were estimated for work-years at ORNL with missing dose data using dose estimates in adjacent time periods and average values for similar workers. Analyses of these data focused on time-related factors which might influence radiation-mortality associations. Positive associations were observed between low level exposure to ionizing radiation and mortality among workers at ORNL. These associations were larger for doses received after age 45, larger under longer lag assumptions, and primarily due to cancer causes of death. ❖

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female
Infectious & Parasitic Diseases	22	5
<b>All Malignant Neoplasms</b>	<b>688</b>	<b>121</b>
Lip, Oral Cavity & Pharynx	15	3
Digestive Organs & Peritoneum	184	23
Respiratory System	213	25
Bone & Connective Tissue	6	0
Skin	19	4
Breast	1	23
Genitourinary System	99	23
Brain/Central Nervous System (CNS)	23	1
Other & Unspecified Sites, Except Brain/CNS	50	7
Lymphatic/Hematopoietic	78	12
All Benign Neoplasms	5	1
All Neoplasms, Unspecified	3	0
Endocrine, Nutritional & Metabolic Diseases	44	9
Diseases of Blood & Blood-Forming Organs	5	1
Mental Disorders	19	2
Diseases of Nervous System & Sense Organs	30	5
Diseases of Circulatory System	1,339	122
Diseases of Respiratory System	150	17
Diseases of Digestive System	91	10
Diseases of Genitourinary System	38	7
Complications of Pregnancy & Childbirth	0	1
Diseases of Skin & Subcutaneous Tissue	3	1
Diseases of Musculoskeletal System & Connective Tissue	4	3
Congenital Anomalies	4	1
Symptoms & Ill-Defined Conditions	93	10
Accidents, Poisoning & Violence (External Causes)	277	42
<b>Deaths, With ICD Code</b>	<b>2,815</b>	<b>385</b>
<b>Deaths, No ICD Code</b>	<b>75</b>	<b>21</b>
<b>Total Deaths, All Causes</b>	<b>2,890</b>	<b>379</b>

# OAK RIDGE/ X-10

ORX10A05 Data File Set

## Citations

Richardson, David Barrie. Time-related Factors in Radiation-Cancer Associations Among Workers at Oak Ridge National Laboratory. Dissertation, submitted to the University of North Carolina at Chapel Hill, 1997.

Richardson D., Wing S. Methods for investigating age differences in the effects of prolonged exposures. *American Journal of Industrial Medicine* 1998 33:123-130. Note: The methods reported here are illustrated using the subcohort of white male workers employed only at ORNL.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
ORX10A05	56	demographic, vital status, cause of death annual whole body dose

## Variables for Analytic File ORX10A05

950 KB

Name	Description
id	identification number
birthdte	year of birth
datemon	year of first internal monitoring
dlo	date of last observation as of 12-31-90
dose43 : :	annual whole body, ionizing radiation doses (mrem) for 1943
dose85	
facility	number of doe facilities worked;
icda8	underlying cause of death
other_ca	cancer cause - not underlying cause of death
paycode	paycode
race	race
startdte	date of hire at ornl
sex	sex
termdate	last termination
vs_90	vital status

# OAK RIDGE/Y-12

## ORY12A01 Data File Set

### Description

This data file set consists of three analytic files for the cohort mortality study, published in the *American Journal of Epidemiology* in 1988, of white males employed at the Y-12 Facility.

This study examines the mortality of a cohort of 6,781 white males who worked at the Y-12 Facility for at least 30 days between May 4, 1947 and December 31, 1974. This cohort included workers who were known to have worked only at Y-12. Individuals who worked at Y-12 when Tennessee Eastman Corporation operated the facility (which was before May 4, 1947) or who worked at any other DOE-owned or operated facility were excluded. Workers in this cohort were exposed to low levels of alpha and gamma radiation while working with uranium compounds at an enriched nuclear materials fabrication plant. Relative to U.S. white males, the cohort experienced mortality deficits from all causes of death combined, from cardiovascular diseases, and from most site-specific cancers. When compared with national and state rates, excess mortality due to cancer of the lungs, brain, and central nervous system were seen. Dose-response trends, which diminished in magnitude when a 10-year latency assumption was applied, were detected for lung cancer mortality with respect to cumulative alpha and gamma radiation. The most pronounced trend associated with gamma doses was among workers who received doses equal to or greater than 5 rems of alpha radiation. There were 22 workers who received greater than or equal to 10 rems of external radiation, including 8 workers involved in a criticality accident at the facility in 1958.

There are three analytic files in this data file set. The first file (LDBEST01) contains annual and cumulative lung doses for each person for the years 1947 through 1979. Estimates of doses

delivered to the lungs were based on results of urinalysis measurements and in vivo counting of internally deposited uranium. The second file (Y1ANGE14) contains demographic, work history, and vital status data for the cohort. The third file (Y1ANFB03) contains annual and cumulative penetrating doses that were compiled from external personnel monitoring information. Periods in which a worker was not in the monitoring program were assigned doses of zero, under the assumption that only workers with a reasonable likelihood of exposure had been monitored.

Vital status was ascertained for 6,477 workers (95.5% of the cohort) through December 31, 1979, the study end date. There were 862 deaths identified (12.7%), and death certificates were obtained for 846 (98.1%) of these deaths. Eighty-five percent of the cohort was followed for at least 10 years. The median duration of follow-up was 20.6 years, and the cohort contributed 133,535 person-years of observation.

Workers at Y-12 were exposed to radiation resulting from external sources (primarily gamma radiation from the uranium decay series) and from internal deposition of uranium (primarily alpha particles). Personal monitoring for external exposure began in 1948 with the use of film dosimeters. They were used for personnel monitoring until the late 1970s, when they were replaced with thermoluminescent dosimeters. Monitoring for internal exposure to uranium began in 1950, but was not in full effect until 1953. By 1961, the internal monitoring program included in vivo measurements, such as lung counting. Metabolic models were used to convert urinalysis and in vivo measurements to lung doses for each worker. ❖

# OAK RIDGE/ Y-12

ORY12A01 Data File Set

## Citations

Checkoway, H., N. Pearce, D. J. Crawford-Brown, and D. L. Cragle. 1988. Radiation doses and cause-specific mortality among workers at a nuclear materials fabrication plant. *American Journal of Epidemiology* 127(2):255-266.

Number of Analytic Files: 3		
File Name	Number of Variables	Type of Data
LDBEST01	77	annual and cumulative lung dose
Y1ANGE14	27	demographic; work history; vital status
Y1ANFB03	77	annual and cumulative penetrating dose

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female†
Infectious & Parasitic Diseases	3	
All Malignant Neoplasms	197	
Lip, Oral Cavity & Pharynx	1	
Digestive Organs & Peritoneum	38	
Respiratory System	94	
Bone & Connective Tissue	0	
Skin	3	
Breast	0	
Genitourinary System	16	
Brain/Central Nervous System (CNS)	14	
Other & Unspecified Sites, Except Brain/CNS	12	
Lymphatic/Hematopoietic	19	
All Benign Neoplasms	0	
All Neoplasms, Unspecified	3	
Endocrine, Nutritional & Metabolic Diseases	7	
Diseases of Blood & Blood-Forming Organs	3	
Mental Disorders	5	
Diseases of Nervous System & Sense Organs	7	
Diseases of Circulatory System	382	
Diseases of Respiratory System	37	
Diseases of Digestive System	29	
Diseases of Genitourinary System	8	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	0	
Diseases of Musculoskeletal System & Connective Tissue	0	
Congenital Anomalies	0	
Symptoms & Ill-Defined Conditions	35	
Accidents, Poisoning & Violence (External Causes)	129	
Deaths, With ICD Code	845	
Deaths, No ICD Code	16	
Total Deaths, All Causes	861	

† No females were included in this study.

**Variables for Analytic File  
Y1ANFBO3**  
3 MB

Name	Description
id	identification number
id2	2-digit identification number
yob	year of birth
yin	year of first hire at Y12
yout	year of last termination at Y12
yrin	year follow-up started
yrou	year follow-up ended
status	vital status of individual
pndose47	annual penetrating dose by year, 1947-1979
:	
pndose79	
pncum47	cumulative penetrating dose by year, 1947-1979
:	
pncum79	
pn_years	total number of years with pen. data
icod	3-digit ICD code
pn_dose	total cumulative penetrating dose

**Variables for Analytic File  
Y1ANGE14**  
1 MB

Name	Description
id	identification number
id2	2-digit identification number
totpen	total penetrating dose
dlo	date last observation
yob	year of birth
vit_stat	vital status of individual
yin	year of first hire
hiredate	date of first hire at Y-12
yout	year of last termination
sex	sex code
yrin	year follow-up started
race	race code
yrou	year follow-up ended
birthdte	birth date of individual
status	status of individual in study
termdate	last termination date at Y-12
duration	number of days employed at Y-12
currnt	current employment indicator
vs2	recoded vital status
los	length of company service
lof	length of follow-up
hireage	age at first hire at Y-12
firstpc	first pay code at Y-12
lastpc	last pay code known for an individual
icda8	cause of death

ca8 cancer code (ICD) if applicable  
icod cause of death-numeric

**Variables for Analytic File  
LDBEST01**  
5 MB

Name	Description
id	identification number
id2	2-digit identification number
yob	year of birth
yin	date of first hire at Y12
yout	year of termination at Y12
yrin	year follow-up started
yrou	year follow-up ended
status	status of individual in study
iddose47	annual lung dose by year, 1947-1979
:	
iddose79	
idcum47	cumulative lung dose by year, 1947-1979
:	
idcum79	
id_years	total number of years of internal exp.
id_dose	total cumulative lung dose
icod	ICD8 death code

ORY12A01



# OAK RIDGE/Y-12

## ORY12A02 Data File Set

### Description

This analytic data file set consists of one file generated for a study, published in the *Journal of Occupational Medicine* in 1984, of white males exposed to elemental mercury at the Oak Ridge Y-12 Facility.

This study examined the mortality experience of a group of white male workers who were exposed to elemental mercury and mercury vapors. The mortality experience of the mercury workers was examined with respect to mercury-sensitive systems, including lung, liver, and kidney organs, and the central nervous system (CNS). Statistically significant excesses of deaths from cancer of the lung, brain, and CNS were observed in the group not involved in the mercury process. Exposure to mercury vapors at Y-12 was not found to be related to any excess of deaths from diseases or cancers of target organs for mercury, but an excess of lung cancer was observed in the mercury worker group. No excesses were found when level of exposure and length of exposure were considered.

The single analytic file (MERANAL2) in this data file set contains demographic, vital status, and employment data and results of urinalysis monitoring (for mercury). There is one record for each

of 5,664 workers; one individual was not included in the final analyses.

The overall population was defined as all white males who worked at least 4 months at Y-12 between January 1, 1953, and April 30, 1958. These criteria allowed 5,663 individuals to enter the study. The study group was separated into two smaller ones. The first group consisted of 3,530 workers for whom no urinalysis results were recorded and who were presumed as never having been monitored for mercury exposure. The remaining 2,133 were placed into the mercury worker group because their records contained results of mercury urinalyses.

Vital status was ascertained for all 5,663 workers through December 31, 1978, the study end date. There were 1,140 deaths identified, and death certificates were obtained for 1,125 (98.7%) of these deaths.

Records indicating participation in a mercury urinalysis program were used to classify the individual as a mercury worker. Personal radiation monitoring data were not used in the study. ❖

# OAK RIDGE/ Y-12

ORY12A02 Data File Set

## Citations

Cragle, D. L., D. R. Hollis, J. Qualters, W. G. Tankersley, and S. A. Fry. 1984. A mortality study of men exposed to elemental mercury. *Journal of Occupational Medicine* 26(11):817-821.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
MERANAL2	18	demographic; vital status; work history; results of urinalysis monitoring

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female <sup>†</sup>
Infectious & Parasitic Diseases	3	
All Malignant Neoplasms	274	
Lip, Oral Cavity & Pharynx	4	
Digestive Organs & Peritoneum	54	
Respiratory System	123	
Bone & Connective Tissue	3	
Skin	4	
Breast	0	
Genitourinary System	26	
Brain/Central Nervous System (CNS)	18	
Other & Unspecified Sites, Except Brain/CNS	18	
Lymphatic/Hematopoietic	24	
All Benign Neoplasms	0	
All Neoplasms, Unspecified	3	
Endocrine, Nutritional & Metabolic Diseases	10	
Diseases of Blood & Blood-Forming Organs	3	
Mental Disorders	3	
Diseases of Nervous System & Sense Organs	7	
Diseases of Circulatory System	536	
Diseases of Respiratory System	59	
Diseases of Digestive System	39	
Diseases of Genitourinary System	10	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	1	
Diseases of Musculoskeletal System & Connective Tissue	1	
Congenital Anomalies	2	
Symptoms & Ill-Defined Conditions	45	
Accidents, Poisoning & Violence (External Causes)	128	

Deaths, With ICD Code	1,124	
Deaths, No ICD Code	15	
Total Deaths, All Causes	1,139	

<sup>†</sup> No females were included in this study.



Variables for Analytic File  
**MERANAL2**

595 KB

Name	Description
<b>id</b>	identification number
<b>y12lemp</b>	length of employment at Y-12
<b>lemp5357</b>	length of employment between 1953-1957
<b>icd</b>	underlying cause of death (3 digits)
<b>status</b>	vital status
<b>icd8</b>	underlying cause of death
<b>ca8</b>	cancer cause of death
<b>ldate</b>	last date known alive
<b>birth</b>	birth date
<b>yhire</b>	first hire date at Y-12 facility
<b>ohire</b>	Oak Ridge first hire
<b>yterm</b>	last termination date from Y-12
<b>oterm</b>	Oak Ridge last term
<b>mondate</b>	date of first mercury monitoring
<b>paldate</b>	first mercury monitoring date > p.a.l.
<b>meradd</b>	added mercury worker
<b>merearl</b>	early mercury worker
<b>merwkr</b>	mercury workers

ORY12A02



# OAK RIDGE/Y-12

## ORY12A03 Data File Set

### Description

This analytic data file set consists of one file generated for a cohort mortality study, published in *Journal of Occupational Medicine* in March 1981, of white males at the Oak Ridge Y-12 Facility.

The study examined the mortality experience of white male workers employed at a uranium enrichment facility (Y-12) between June 1943 and May 1947. During this time, Y-12 was operated for the government by the Tennessee Eastman Corporation (TEC). In May 1947, Union Carbide Corporation Nuclear Division became the operating contractor. With this transition, significant changes were made to plant processes, and most of the Y-12 work force was replaced. These occurrences led epidemiologists to study the Y-12 workers employed by TEC (the TEC cohort) separately from those working at Y-12 after May 1947 (the Y-12 cohort). The TEC cohort was selected for this mortality study because (1) a long period of follow-up was available, (2) data were available showing that average levels of airborne uranium dust were high in certain departments, (3) the size of the sample was large, and (4) data were limited on the possible long-term health effects of uranium exposure in human populations.

Standardized mortality ratios (SMRs) for various causes of death in the entire cohort were generally less than 1.00; however, after correction for missing death certificates and unascertained deaths, the SMR for lung cancer was 1.22. Other causes of particular interest, including bone cancer, leukemia, and diseases of respiratory and genitourinary systems, did not exhibit high SMRs. The authors suggested that an increased number of

lung cancer deaths occurred in chemical workers who were 45 or more years old when first hired.

The single analytic file (FROMEPOL) in this data file set contains 38,521 records, i.e., one record for each person who had a payroll record at the plant when TEC was the operating contractor. Application of the cohort selection criteria reduced the cohort under study to 18,869 white males. The records excluded from the analysis pertained to females (about 18,100), non-white males, individuals who worked less than 2 days at Y-12, and those lacking essential vital status and demographic data. Records for the study cohort can be determined by examining the published manuscript for all the criteria and checking certain variables in the file. The file contains demographic, work history, vital status, and some urinalysis data.

Vital status was ascertained for 97.6% of the cohort through December 31, 1973, the study end date. There were 5,394 deaths identified in this cohort, and death certificates were obtained for 5,133 (95.2%) of these deaths. The study had 494,742 person-years of follow-up.

The TEC cohort did not wear personal dosimeters (film badges); however, exposure to penetrating external (gamma) radiation was low due to the nature of plant operations. The primary radiological hazard for the TEC cohort was inhalation of uranium compounds. Some urinalysis for uranium was performed for individuals working in areas of airborne material, and these data were used in the analysis. ❖

# OAK RIDGE/ Y-12

ORY12A03 Data File Set

## Citations

Polednak, A. P., and E. L. Frome. 1981. Mortality among men employed between 1943 and 1947 at a uranium-processing plant. *Journal of Occupational Medicine* 23 (3):169–178.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
FROMEPOL	26	demographic; work history; vital status; results of some urinalysis monitoring

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female
Infectious & Parasitic Diseases	115	14
All Malignant Neoplasms	933	291
Lip, Oral Cavity & Pharynx	30	6
Digestive Organs & Peritoneum	227	47
Respiratory System	354	26
Bone & Connective Tissue	11	4
Skin	18	10
Breast	1	63
Genitourinary System	101	67
Brain/Central Nervous System (CNS)	32	15
Other & Unspecified Sites, Except Brain/CNS	72	20
Lymphatic/Hematopoietic	87	33
All Benign Neoplasms	2	6
All Neoplasms, Unspecified	14	4
Endocrine, Nutritional & Metabolic Diseases	61	24
Diseases of Blood & Blood-Forming Organs	11	4
Mental Disorders	39	6
Diseases of Nervous System & Sense Organs	41	8
Diseases of Circulatory System	2,682	355
Diseases of Respiratory System	355	52
Diseases of Digestive System	236	51
Diseases of Genitourinary System	73	20
Complications of Pregnancy & Childbirth	0	7
Diseases of Skin & Subcutaneous Tissue	3	4
Diseases of Musculoskeletal System & Connective Tissue	11	9
Congenital Anomalies	9	6
Symptoms & Ill-Defined Conditions	167	27
Accidents, Poisoning & Violence (External Causes)	683	111
Deaths, With ICD Code	5,435	999
Deaths, No ICD Code	306	125
Total Deaths, All Causes	5,741	1,124

Variables for Analytic File  
FROMEPOL

4 MB

Name	Description
<b>id</b>	identification number
<b>birthyr</b>	year of birth
<b>bdate</b>	birth date
<b>sex</b>	sex code
<b>race</b>	race code
<b>hireyear</b>	year of first hire at plant
<b>hdate</b>	first date of hire at plant
<b>multhire</b>	multiple hire/term from plant
<b>termyear</b>	termination year
<b>tdate</b>	last termination date from plant
<b>alpha1</b>	worked in alpha 1
<b>alpha2</b>	worked in alpha 2
<b>beta1</b>	worked in beta 1
<b>beta2</b>	worked in beta 2
<b>electr</b>	worked in electrical department
<b>office</b>	worked in office
<b>othdepts</b>	worked in other departments
<b>a1_dur</b>	duration in weeks in alpha 1
<b>b1_dur</b>	duration in weeks in beta 1
<b>status</b>	vital status code
<b>dthdate</b>	date of death
<b>icd8</b>	code for underlying cause of death
<b>ca8</b>	underlying cancer cause of death
<b>urn_no</b>	urinalysis test number
<b>urn_date</b>	date of urinalysis

urn\_res    urinalysis test results

ORY12A03



# OAK RIDGE/Y-12

## ORY12A04 Data File Set

### Description

This analytic data file set consists of one file generated for a study, published in *Environmental Research* and in *Toxicology and Industrial Health*, of white males exposed to phosgene at the Oak Ridge Y-12 Facility from 1943 to 1945.

Studies of humans and animals indicate that exposure to high levels of phosgene result in short-term health effects that include emphysema, pulmonary edema, pneumonitis, and other possible effects. This study examined the mortality experience of workers exposed to phosgene gas while working at Y-12 from 1943 through 1945. The study population consisted of 18,869 white males employed at Y-12 while Tennessee Eastman Corporation was the operating contractor (1943-1945). There were two groups of interest: the first group included 699 white males that received daily exposure to low levels of phosgene, and the second group consisted of 106 men with definite acute exposures and symptoms that indicated exposure to levels as high as 50 ppm or higher. No evidence of excess overall mortality or mortality from diseases to the respiratory system was found. Pneumonitis was diagnosed in 23.6% of the 106 workers in the

second group. The primary author analyzed updated information for this cohort approximately 5 years after the initial study. The major finding in the updated study was the occurrence of 5 deaths in the second group of 106 workers due to respiratory diseases (1.88 deaths expected), although the standardized mortality ratio did not reach statistical significance. There were no deaths due to lung cancer in the second group despite 33 to 35 years of follow-up.

The single analytic file (ANALYSIS) consists of 106 records, one for each person in the second group. The file contains demographic and work history data.

Vital status was ascertained through December 31, 1973, for the initial study and through December 31, 1978, for the updated study. There were 29 deaths identified in the highly exposed group for the first study, and 41 deaths found for the group in the updated study.

No personal monitoring data were used in either study. ❖

# OAK RIDGE/ Y-12

ORY12A04 Data File Set

## Citations

Polednak, A. P. 1980. Mortality among men occupationally exposed to phosgene in 1943-1945. *Environmental Research* 22:357-367.

Polednak, A. P., and D. R. Hollis. 1985. Mortality and causes of death among workers exposed to phosgene in 1943-1945. *Toxicology and Industrial Health* 1(2):137-148.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
ANALYSIS	10	demographic; work history

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female <sup>†</sup>
Infectious & Parasitic Diseases	0	
All Malignant Neoplasms	3	
Lip, Oral Cavity & Pharynx	0	
Digestive Organs & Peritoneum	2	
Respiratory System	0	
Bone & Connective Tissue	0	
Skin	0	
Breast	0	
Genitourinary System	1	
Brain/Central Nervous System (CNS)	0	
Other & Unspecified Sites, Except Brain/CNS	0	
Lymphatic/Hematopoietic	0	
All Benign Neoplasms	0	
All Neoplasms, Unspecified	0	
Endocrine, Nutritional & Metabolic Diseases	1	
Diseases of Blood & Blood-Forming Organs	0	
Mental Disorders	2	
Diseases of Nervous System & Sense Organs	0	
Diseases of Circulatory System	18	
Diseases of Respiratory System	5	
Diseases of Digestive System	3	
Diseases of Genitourinary System	0	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	0	
Diseases of Musculoskeletal System & Connective Tissue	0	
Congenital Anomalies	0	
Symptoms & Ill-Defined Conditions	1	
Accidents, Poisoning & Violence (External Causes)	7	

Deaths, With ICD Code	40	
Deaths, No ICD Code	0	
Total Deaths, All Causes	40	

<sup>†</sup> No females were included in this study.



Variables for Analytic File

# ANALYSIS

8 KB

Name	Description
<b>id</b>	identification number
<b>sex</b>	sex code
<b>race</b>	race code
<b>status</b>	vital status code
<b>icd</b>	cause-of-death code
<b>birthdte</b>	birth date
<b>phosdte</b>	date first exposed to phosgene
<b>hiredte</b>	date of first hire at TEC
<b>termdte</b>	last termination date from TEC
<b>deathdte</b>	death date of the individual

ORY12A04



# OAK RIDGE/Y-12

## ORY12A05 Data File Set

### Description

This analytic data file set consists of two files generated for a cohort mortality study, published in the American Journal of Industrial Medicine in 1996, of male and female workers at the uranium enrichment facility (Y-12) plant in Oak Ridge, Tennessee.

This cohort mortality study of Y-12 workers presents updated results from a long-term mortality study of workers at Y-12 between 1947 and 1974, with follow-up of white men through 1990 and data reported for the first time for women and men of other races. The Y-12 plant is part of a nuclear production and research complex at Oak Ridge, Tennessee. Workers at Y-12 were exposed to low doses of internal, alpha radiation, and external, penetrating radiation, as well as to beryllium, mercury, solvents, and other industrial agents.

Vital status was determined through searches of the National Death Index and other records, and the workers' mortality was compared to the national population's using standardized mortality ratios (SMRs). Total mortality was low for all Y-12 workers and total cancer mortality was as expected. Among the 6,591 white men, there were 20% more lung cancer deaths than expected. Death rates from brain cancer and several lymphopoietic system cancers were also elevated among white men, with SMRs of 1.28 and 1.46. Mortality from cancer of the pancreas, prostate, and kidney was similarly elevated. There was evidence of excess breast cancer among the 1,073 female workers. ❖

# OAK RIDGE/ Y-12

ORY12A05 Data File Set

## Citations

Loomis DP; Wolf SH. Department of Epidemiology, University of North Carolina School of Public Health, Chapel Hill 27599-7400, USA. Mortality of workers at a nuclear materials production plant at Oak Ridge, Tennessee, 1947-1990 *American Journal of Industrial Medicine*, 1996 Feb, 29(2):131-41.

Number of Analytic Files: 2		
File Name	Number of Variables	Type of Data
Y2AN0102	13	Y12-only cohort
Y2AN0103	14	Y12/TEC cohort

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female
Infectious & Parasitic Diseases	10	2
All Malignant Neoplasms	730	97
Lip, Oral Cavity & Pharynx	12	2
Digestive Organs & Peritoneum	160	15
Respiratory System	308	17
Bone & Connective Tissue	5	1
Skin	15	1
Breast	2	22
Genitourinary System	92	19
Brain/Central Nervous System (CNS)	24	2
Other & Unspecified Sites, Except Brain/CNS	49	11
Lymphatic/Hematopoietic	63	7
All Benign Neoplasms	1	1
All Neoplasms, Unspecified	8	0
Endocrine, Nutritional & Metabolic Diseases	43	2
Diseases of Blood & Blood-Forming Organs	7	1
Mental Disorders	19	4
Diseases of Nervous System & Sense Organs	22	4
Diseases of Circulatory System	1,357	87
Diseases of Respiratory System	209	12
Diseases of Digestive System	90	10
Diseases of Genitourinary System	25	8
Complications of Pregnancy & Childbirth	0	0
Diseases of Skin & Subcutaneous Tissue	1	1
Diseases of Musculoskeletal System & Connective Tissue	2	1
Congenital Anomalies	2	2
Symptoms & Ill-Defined Conditions	110	9
Accidents, Poisoning & Violence (External Causes)	252	17
Deaths, With ICD Code	2,695	258
Deaths, No ICD Code	28	15
Total Deaths, All Causes	2,916	273

Variables for Analytic File  
Y2ANO102

515 KB

Name	Description
<b>id</b>	identification number
<b>birthdte</b>	date of birth
<b>dlo</b>	date of last observation
<b>fac1</b>	doe facility worked
<b>numfac</b>	number doe study facilities worked
<b>hiredate</b>	hire date at Y-12
<b>icda8</b>	underlying cause of death
<b>other_ca</b>	non-underlying cancer cause of death
<b>paycode</b>	paycode
<b>race</b>	race
<b>sex</b>	gender
<b>termdate</b>	termination date
<b>vs_90</b>	vital status

Variables for Analytic File  
Y2ANO103

683 KB

Name	Description
<b>id</b>	identification number
<b>birthdte</b>	date of birth
<b>dlo</b>	date of last observation
<b>fac1</b>	doe facility worked
<b>fac2</b>	doe facility worked
<b>numfac</b>	number doe study facilities worked
<b>hiredate</b>	hire date at Y-12
<b>icda8</b>	underlying cause of death
<b>other_ca</b>	non-underlying cancer cause of death
<b>paycode</b>	paycode
<b>race</b>	race
<b>sex</b>	gender
<b>termdate</b>	termination date
<b>vs_90</b>	vital status

ORY12A05



# PANTEX

## PXSMRA01 Data File Set

### Description

This data file set consists of one file generated for a cohort mortality study, published in *Health Physics* in 1985, of white male workers at the Pantex Plant in Texas.

This cohort mortality study of white male Pantex workers was conducted to determine if there was an association between employment at the plant and mortality from various causes. A sub-analysis examined the association between mortality and exposure to external radiation. The published analysis focused on 3,564 white and presumed white males who were ever employed by the prime contractor operating the plant between the start of plant operations in 1951 and December 31, 1978, the study end date. The sub-analysis focused on the 209 workers who were exposed to 1 rem or more through 1978. Total and cause-specific mortality was compared with expected mortality based on U.S. death rates. Significantly fewer deaths than expected from all causes of death, all cancers, digestive cancers, lung cancer, arteriosclerotic heart disease, and digestive diseases were observed. No causes of death occurred significantly more frequently than expected. Analyses of worker mortality by duration of employment, time since first employment, and cumulative radiation exposure greater than 1 rem produced similar results. No evidence was found that

mortality from any cause of death was increased as a result of employment at the Pantex Plant.

The single analytic file (ANFILE) contains demographic and exposure data for 5,438 male and female workers employed either by the prime contractor or by one of several subcontractors from the beginning of plant operations through 1981. Exposure data in the file include exposure monitoring status and cumulative external radiation doses (in millirems) through 1980.

Vital status was ascertained for 97% of the 3,564 white male Pantex workers included in the analysis. Death certificates were obtained for 96% (257) of the 269 known employee deaths.

The Pantex Plant is a large facility that has been engaged in the assembly and disassembly of nuclear weapons since 1951. Sources of occupational exposures include external radiation, both gamma and neutron, from nuclear weapons components. Workers may also be exposed to x-rays while using industrial radiographic equipment. All exposure readings in the file are film badge measurements and were available only for workers employed after 1963. ❖

# PANTEX

PXSMRA01 Data File Set

## Citations

Acquavella, J. F., L. D. Wiggs, R. J. Waxweiler, D. G. Macdonnell, G. L. Tietjen, and G. S. Wilkinson. 1985. Mortality among workers at the Pantex Weapons Facility. *Health Physics* 48: 735-746.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
ANFILE	16	demographic; exposure

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female
Infectious & Parasitic Diseases	2	0
All Malignant Neoplasms	62	4
Lip, Oral Cavity & Pharynx	1	0
Digestive Organs & Peritoneum	15	1
Respiratory System	18	2
Bone & Connective Tissue	0	0
Skin	0	0
Breast	0	0
Genitourinary System	6	1
Brain/Central Nervous System (CNS)	4	0
Other & Unspecified Sites, Except Brain/CNS	9	0
Lymphatic/Hematopoietic	9	0
All Benign Neoplasms	0	0
All Neoplasms, Unspecified	1	0
Endocrine, Nutritional & Metabolic Diseases	6	0
Diseases of Blood & Blood-Forming Organs	0	0
Mental Disorders	0	0
Diseases of Nervous System & Sense Organs	3	1
Diseases of Circulatory System	163	8
Diseases of Respiratory System	14	1
Diseases of Digestive System	11	1
Diseases of Genitourinary System	3	0
Complications of Pregnancy & Childbirth	0	0
Diseases of Skin & Subcutaneous Tissue	0	0
Diseases of Musculoskeletal System & Connective Tissue	0	0
Congenital Anomalies	1	0
Symptoms & Ill-Defined Conditions	4	2
Accidents, Poisoning & Violence (External Causes)	60	3
Deaths, With ICD Code	330	20
Deaths, No ICD Code	1	0
Total Deaths, All Causes	331	20



Variables for Analytic File

# ANFILE

470 KB

Name	Description
<b>id</b>	identification number
<b>hiredate</b>	date of first hire at the Pantex Plant
<b>termdate</b>	final termination date from Pantex Plant
<b>bdate</b>	date of birth
<b>ddate</b>	date of death
<b>pyears</b>	person years
<b>icda8</b>	cause of death—ICDA 8th revision
<b>st_ssa81</b>	results—1981 SSA search
<b>cvs</b>	current vital status as of 9/82
<b>sex</b>	sex
<b>race</b>	race
<b>educ</b>	education level
<b>bstate</b>	state of birth
<b>cumext</b>	cumulative external radiation thru 1980
<b>extflag</b>	monitored for external ionizing radiation
<b>dstate</b>	state of death



# ROCKY FLATS

## RFANLA02 Data File Set

### Description

The RFANLA02 data file set consists of two analytic files. These were constructed from a single file created by Los Alamos National Laboratory in August of 1993 in anticipation of a study of workers at the Rocky Flats Plant (RFP).

The first file, RFANALYT, contains data for 9,490 people of all races (9,025 white, 328 black, and 137 other) and includes 7,938 males and 1,552 females. It represents those people hired at RFP from March 1951 through December 1978. It does not include contractors (2), Credit Union employees (1), or those who failed to report to work after being hired (20).

Annual readings of whole-body penetrating dose for external ionizing radiation are available from 1951-1989. The data from August 1976 through December 1989 were taken from computerized dosimetry badge readings provided by RFP. The

data from 1952-1978 were abstracted from microfiche records also provided by the RFP.

The second file, RFINTEXP, contains internal exposure data for americium and plutonium, but not uranium. Exposures are listed by sample date and percent of maximum permissible body burden for the years 1952-1989.

Vital status is included from different sources: Rocky Flats (RFSTAT), the Social Security Administration (SSA), and the National Death Index (NDI). The Rocky Flats vital status shows 7,639 living, 1,033 dead, and 764 unaccounted for as of May 1, 1992. There were 1,324 workers reported dead as of December 31, 1990, by the NDI and SSA.

A study end date of December 31, 1989, was assigned to the file based on the years covered by the dosimetry data. ❖

# ROCKY FLATS

RFANLA02 Data File Set

## Contact

Dr. Laurie Wiggs  
Los Alamos National Laboratory

Number of Analytic Files: 2		
File Name	Number of Variables	Type of Data
RFANALYT	51	demographic; exposure
RFINTEXP	3	internal exposure

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female
Infectious & Parasitic Diseases	8	0
All Malignant Neoplasms	337	31
Lip, Oral Cavity & Pharynx	6	0
Digestive Organs & Peritoneum	95	5
Respiratory System	99	7
Bone & Connective Tissue	2	0
Skin	9	0
Breast	0	8
Genitourinary System	46	5
Brain/Central Nervous System (CNS)	21	1
Other & Unspecified Sites, Except Brain/CNS	25	4
Lymphatic/Hematopoietic	34	1
All Benign Neoplasms	4	2
All Neoplasms, Unspecified	6	1
Endocrine, Nutritional & Metabolic Diseases	16	0
Diseases of Blood & Blood-Forming Organs	3	0
Mental Disorders	11	1
Diseases of Nervous System & Sense Organs	17	0
Diseases of Circulatory System	548	17
Diseases of Respiratory System	92	7
Diseases of Digestive System	40	4
Diseases of Genitourinary System	12	0
Complications of Pregnancy & Childbirth	0	0
Diseases of Skin & Subcutaneous Tissue	0	0
Diseases of Musculoskeletal System & Connective Tissue	1	1
Congenital Anomalies	2	0
Symptoms & Ill-Defined Conditions	19	0
Accidents, Poisoning & Violence (External Causes)	132	12
Deaths, With ICD Code	1,248	76
Deaths, No ICD Code	30	2
Total Deaths, All Causes	1,278	78

Variables for Analytic File  
RFANALYT

6 MB

Name	Description
<b>id</b>	identification number
<b>hiredate</b>	employee date of hire
<b>termdate</b>	termination date
<b>sex</b>	sex of worker
<b>race</b>	race of worker
<b>birth</b>	date of birth
<b>ddate</b>	date of employee's death
<b>icda8</b>	cause of death
<b>ndistat</b>	vital status as of 12/31/90
<b>rfstat</b>	vital status per Rocky Flats, 5/1/92
<b>ltype</b>	date-line type
<b>accumexp</b>	prior accumulated external exposure
<b>extexp51</b>	total external exposure by year, 1951-1989
<b>:</b>	
<b>extexp89</b>	

Variables for Analytic File  
RFINTEXP

4 MB

Name	Description
<b>id</b>	identification number
<b>sampdate</b>	internal exposure sample date
<b>result</b>	internal exposure sample result



# ROCKY FLATS

## RFPLUA01 Data File Set

### Description

This analytic data file set consists of one file generated for a cohort mortality study, published in the *American Journal of Epidemiology*, of white males employed at the Rocky Flats Plant (RFP).

A cohort mortality study of RFP workers was conducted to test for an association between mortality and exposure to plutonium. The analysis described in the publication focused on 5,413 white male workers employed for 2 or more years between 1951 and 1979. Fewer deaths than expected were found for all causes of death, all cancers, and lung cancer. No bone cancer was observed. An excess of brain tumors was found. Elevated rate ratios for all causes of death and all lymphopietic neoplasms were found when workers with plutonium body burdens greater than or equal to 2 nanocuries (nCi) were compared to those with body burdens less than 2 nCi. No elevated rate ratios were noted for bone and liver cancers.

The single analytic file (ANFILE) in this data file set contains demographic and exposure data for 7,616 white males initially employed by RFP between 1951 (construction phase) and the end of 1979. Females, nonwhite males, and workers with missing sex or race were not included in the analytic file. Data pertaining

to each worker's exposure to external ionizing radiation include: monitoring status and the date it was determined, date of first monitoring, and dates of achieving 1 rem, 5 rems, and 10 rems cumulative external whole-body doses through 1978. Dates of exposure to plutonium-239 cover years 1952 (partial year) through 1977 and include monitoring status, date of first urine bioassay sample, dates of first achieving body burdens of 2 nCi and 5 nCi, and the fraction of maximum permissible body burdens of plutonium acquired as of December 1977.

Vital status was ascertained for 98.9% of the 5,413 white males employed for 2 or more years through December 31, 1979, the study end date. There were 409 deaths identified in this group.

RFP has been a weapons production facility since 1952. Sources of occupational exposure include external radiation, both gamma and neutron, and potential for internal deposition of plutonium-239. Film dosimeters and thermoluminescent dosimeters were used to monitor for external radiation. Formal bioassay programs to monitor for internal exposures were begun in 1952. Results of both types of monitoring programs reflect technological improvements and changes in concepts and models during these years. ❖

# ROCKY FLATS

RFPLUA01 Data File Set

## Citations

Wilkinson, G. S., G. L. Tietjen, L. D. Wiggs, W. A. Galke, J. F. Acquavella, M. Reyes, G. Voeltz, and R. J. Waxweiler, 1987. Mortality among plutonium and other radiation workers at a plutonium weapons facility. *American Journal of Epidemiology* 125:231-250.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
ANFILE	22	demographic; work history; vital status; summary whole-body external ionizing radiation dose; plutonium body burden results

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female <sup>†</sup>
Infectious & Parasitic Diseases	4	
All Malignant Neoplasms	180	
Lip, Oral Cavity & Pharynx	3	
Digestive Organs & Peritoneum	47	
Respiratory System	60	
Bone & Connective Tissue	2	
Skin	4	
Breast	0	
Genitourinary System	24	
Brain/Central Nervous System (CNS)	12	
Other & Unspecified Sites, Except Brain/CNS	12	
Lymphatic/Hematopoietic	16	
All Benign Neoplasms	3	
All Neoplasms, Unspecified	6	
Endocrine, Nutritional & Metabolic Diseases	10	
Diseases of Blood & Blood-Forming Organs	1	
Mental Disorders	6	
Diseases of Nervous System & Sense Organs	8	
Diseases of Circulatory System	358	
Diseases of Respiratory System	49	
Diseases of Digestive System	25	
Diseases of Genitourinary System	6	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	0	
Diseases of Musculoskeletal System & Connective Tissue	1	
Congenital Anomalies	2	
Symptoms & Ill-Defined Conditions	13	
Accidents, Poisoning & Violence (External Causes)	96	
Deaths, With ICD Code	768	
Deaths, No ICD Code	6	
Total Deaths, All Causes	774	

<sup>†</sup> No females were included in this study.



Variables for Analytic File

**ANFILE**

845 KB

Name	Description
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<b>id</b>	identification number
<b>bdate</b>	date of birth
<b>hiredate</b>	date of first hire
<b>termdate</b>	date of final termination prior to 1980
<b>ddate</b>	date of death
<b>icda8</b>	cause of death—ICDA 8th revision
<b>cvs</b>	current vital status as of 12/31/79
<b>sex</b>	sex of worker
<b>race</b>	race of worker
<b>educ</b>	education level
<b>date2nci</b>	first achieve 2 nCi body burden
<b>mpbbpu</b>	fraction of MPBB for plutonium, 12/77
<b>puflag</b>	plutonium monitoring flag
<b>ach1rem</b>	date cumulative external radiation dose reached 1 rem
<b>ach5rem</b>	date cumulative external radiation dose reached 5 rem
<b>ach10rem</b>	date cumulative external radiation dose reached 10 rem
<b>cumext</b>	cumulative external radiation dose as of 12/78
<b>extflag</b>	monitored for external radiation
<b>date5nci</b>	first achieve 5 nCi body burden

<b>firstpu</b>	first plutonium sample date
<b>firstext</b>	estimated date for first measurement of external radiation dose
<b>dstate</b>	state of death



# SAVANNAH RIVER

## SRC88A01 Data File Set

### Description

This analytic data file set consists of one file generated for a retrospective cohort mortality study, published in the *American Journal of Industrial Medicine* in 1988, of white males employed at the Savannah River Site (SRS).

The published paper describes the overall and cause-specific mortality for a cohort of 9,860 white males who were hired between 1952 (when the facility began operation) and December 31, 1974, and who were employed at SRS for at least 90 days during this time. Exposures to radiation or chemicals were not considered. Separate analyses were presented for hourly employees (6,687) and salaried employees (2,745) by time period of first hire and by length of employment. These workers experienced mortality comparable to that of U.S. males and, in fact, exhibited fewer deaths than expected in many categories of diseases. Specifically, fewer deaths were noted in the categories of all causes, all cancers, cancer of the digestive organs, lung cancer, brain cancer (hourly workers only), diabetes, all diseases of the circulatory system, all respiratory diseases, all digestive system diseases, all diseases of the genitourinary system (hourly workers only), and all external causes of death. A statistically significant, and as yet unexplained, increase in leukemia

mortality appeared in a subset of the hourly workers who were first hired before 1955 and were employed between 5 and 15 years.

The one analytic file (SRANA4) in this data file set contains one record per person in the cohort, including demographic, work history, and vital status data on all members of the cohort.

Hourly employees were judged to be those employees who worked for 90 or more consecutive days at an hourly classification and less than 90 consecutive days at a salaried classification. Salaried employees were judged to be those employees who worked 90 or more consecutive days in a salaried classification and less than 90 days in an hourly classification. A third category consisted of those who worked 90 or more days consecutively in both classifications. Vital status was ascertained for 94.2% (N = 9,288) of the cohort through December 31, 1980, the study end date. There were 1,091 deaths identified, and death certificates were obtained for 96.9% of these deaths.

No personal monitoring data were used in this analysis. ❖

# SAVANNAH RIVER

SRC88A01 Data File Set

## Citations

Cragle, D., R. McLain, J. Qualters, J. L. S. Hickey, G. Wilkinson, W. G. Tankersley, and C. C. Lushbaugh. 1988. Mortality among workers at a nuclear fuels production facility. *American Journal of Industrial Medicine* 14:379-401.

Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
SRANA4	15	demographic; work history; vital status

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female <sup>†</sup>
Infectious & Parasitic Diseases	7	
All Malignant Neoplasms	215	
Lip, Oral Cavity & Pharynx	7	
Digestive Organs & Peritoneum	49	
Respiratory System	84	
Bone & Connective Tissue	2	
Skin	5	
Breast	0	
Genitourinary System	17	
Brain/Central Nervous System (CNS)	7	
Other & Unspecified Sites, Except Brain/CNS	12	
Lymphatic/Hematopoietic	32	
All Benign Neoplasms	4	
All Neoplasms, Unspecified	1	
Endocrine, Nutritional & Metabolic Diseases	13	
Diseases of Blood & Blood-Forming Organs	1	
Mental Disorders	4	
Diseases of Nervous System & Sense Organs	9	
Diseases of Circulatory System	518	
Diseases of Respiratory System	27	
Diseases of Digestive System	42	
Diseases of Genitourinary System	5	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	1	
Diseases of Musculoskeletal System & Connective Tissue	1	
Congenital Anomalies	1	
Symptoms & Ill-Defined Conditions	16	
Accidents, Poisoning & Violence (External Causes)	191	

Deaths, With ICD Code	1,056	
Deaths, No ICD Code	34	
<b>Total Deaths, All Causes</b>	<b>1,090</b>	

<sup>†</sup> No females were included in this study.

Variables for Analytic File

# SRANA4

1 MB

Name	Description
<b>birth</b>	birth date
<b>chire</b>	hire date into construction category
<b>cjdays</b>	number of days in construction
<b>cterm</b>	termination date from construction category
<b>ldate</b>	last date known alive
<b>ohire</b>	hire date into hourly category
<b>ojdays</b>	number of days in hourly
<b>oterm</b>	termination date from hourly category
<b>shire</b>	hire date into salaried category
<b>sjdays</b>	number of days in salaried category
<b>stern</b>	termination date from salaried category
<b>id</b>	identification number
<b>vstat</b>	status of person
<b>icd8x</b>	underlying cause of death
<b>ca8x</b>	cancer cause of death

SRC88A01



# SAVANNAH RIVER

## SRC94A02 Data File Set

### Description

This analytic data file set consists of two files generated for a retrospective cohort mortality study of white males employed at the Savannah River Site (SRS) in Aiken, South Carolina.

A previous study (Cragle *et al*, 1988. *American Journal of Industrial Medicine* 14: 379-401) of 9,860 white males was descriptive in nature because radiation doses were not accessible for dose-response analysis. Men first hired from the plant opening in 1952 through 1974 entered the study 90 days after hire and were followed up through 1980. For hourly workers, there were 13 leukemia deaths versus the 7.95 expected based on U.S. white male rates. Overall there was a strong healthy worker effect evident with standardized mortality ratios (SMRs) significantly below one for all causes (0.80) and all cancers (0.72). The current update was based on deaths through 1986 for the same cohort of workers. With the 6 additional years, there was a total of 290,000 person-years of follow-up. For hourly workers, there were 19 leukemia deaths, giving an SMR of 1.34 with a 95% confidence interval from 0.80 to 2.09. The healthy worker effect was still evident with SMRs significantly below one for all causes (0.78) and all cancers (0.82). Dose-response analysis was performed for all cancers, lung cancer, leukemia, colon cancer, and pancreatic cancer. There was no indication of a dose-response relationship except for leukemia. However, the leukemia dose-response relationship was based on only 20 deaths, including two nonunderlying causes of death and excluding chronic lymphocytic leukemia, which has not been linked to radiation exposure.

There are two analytic files for this cohort. DLC9860 contains a record, which includes vital status as of January 1, 1987, for each member of the cohort. The last Social Security Administration (SSA) submission for this population provided “alive” status as of January 1, 1985; the “alive” category is no longer obtainable from SSA. However, the National Death Index (NDI) provides a record of all deaths occurring since January 1, 1979. If not identified as deceased by SSA or NDI, individuals last known to be alive before January 1, 1979, were considered lost to follow-up on the last date known alive while those known to be alive after January 1, 1979, were considered alive at the end of the study. There were 1,722 deaths from all causes with death certificates available for 97.9% of these individuals. The exposure file (SRSEXPOS) contains yearly dose values for all monitored workers, including 9,757 of the workers for external radiation exposure and 455 for internal exposures due to transuranics or fission products. The annual external doses are more accurately “deep” doses resulting from exposures to photons, neutrons, and tritium.

SRS was built after World War II and was specifically designed for nuclear operations. Operations at SRS have included uranium processing, nuclear fuel fabrication, nuclear reactor operation and maintenance, nuclear fuel reprocessing, and thorium processing. The site contains five large production reactors, two chemical separation facilities, a heavy water extraction plant, nuclear fuel and target fabrication facilities, test reactors, research and development laboratories, power plants, and administration buildings. ❖

# SAVANNAH RIVER

SRC94A02 Data File Set

## Contact

Dr. Donna Cragle

Oak Ridge Institute for Science and Education

Number of Analytic Files: 2		
File Name	Number of Variables	Type of Data
DLC9860	14	vital status; work history
SRSEXPOS	8	annual internal & external exposure

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female†
Infectious & Parasitic Diseases	15	
All Malignant Neoplasms	413	
Lip, Oral Cavity & Pharynx	14	
Digestive Organs & Peritoneum	94	
Respiratory System	176	
Bone & Connective Tissue	4	
Skin	12	
Breast	2	
Genitourinary System	33	
Brain/Central Nervous System (CNS)	11	
Other & Unspecified Sites, Except Brain/CNS	19	
Lymphatic/Hematopoietic	48	
All Benign Neoplasms	5	
All Neoplasms, Unspecified	2	
Endocrine, Nutritional & Metabolic Diseases	19	
Diseases of Blood & Blood-Forming Organs	7	
Mental Disorders	12	
Diseases of Nervous System & Sense Organs	15	
Diseases of Circulatory System	807	
Diseases of Respiratory System	60	
Diseases of Digestive System	63	
Diseases of Genitourinary System	9	
Complications of Pregnancy & Childbirth	0	
Diseases of Skin & Subcutaneous Tissue	2	
Diseases of Musculoskeletal System & Connective Tissue	2	
Congenital Anomalies	2	
Symptoms & Ill-Defined Conditions	24	
Accidents, Poisoning & Violence (External Causes)	229	

Deaths, With ICD Code	1,686	
Deaths, No ICD Code	36	
Total Deaths, All Causes	1,722	

† No females were included in this study.



Variables for Analytic File

DLC9860

800 KB

Name	Description
<b>birth</b>	birth date
<b>fhire</b>	first hire date at Savannah River
<b>ldate</b>	last vital status date known
<b>lterm</b>	last termination date at Savannah River
<b>ldate86</b>	last date known based on 12/31/86
<b>status86</b>	vital status code based on ldate and status
<b>id</b>	identification number
<b>otherfac</b>	number of DOE facilities worked at
<b>status</b>	vital status code
<b>icd8</b>	underlying cause of death (ICD 8th rev.)
<b>ca8</b>	additional cancer code
<b>fpay</b>	first pay code at Savannah River
<b>lpay</b>	last pay code at Savannah River
<b>tdays</b>	total days worked at Savannah River

Variables for Analytic File

SRSEXPOS

6 MB

Name	Description
<b>aede</b>	annual effective dose equivalent
<b>deep</b>	whole-body external exposure
<b>expyr</b>	year of exposure
<b>file_flg</b>	file flag indicator
<b>id</b>	identification number
<b>int_flag</b>	internal flag
<b>stat</b>	dose adjustment flag
<b>totdose</b>	total whole-body dose

SRC94A02



# ZIA

## ZARADA01 Data File Set

### Description

This analysis, soon to be published, sought to determine whether mortality among 5,424 radiation-monitored Zia Company (Zia) workers differed significantly from the general population in the United States, and whether the subgroup of this cohort exposed to radiation was at an increased risk of dying from cancer when compared with the unexposed group. Additional analyses were undertaken to examine mortality for the Hispanic subgroup of this population (51%). Zia was the principal subcontractor to Los Alamos National Laboratory (LANL) from 1946 to June of 1986. Zia performed construction and maintenance functions at LANL. The group at Zia responsible for construction was called LACI, and data for LACI workers are also included in this file.

The one analytic file contains demographic and exposure data for 5,424 Zia employees hired before January 1, 1979, and monitored either for external radiation or plutonium as of December 31, 1984. There are data for 365 females; 11 are Native Americans and the rest are white (unknown race assumed white). There are 94 native American males, 10 black males, 1 Oriental male, and 4,954 white males. Demographic data were abstracted from four primary record sources provided by Zia and supplemented with data from LANL records.

Vital status was ascertained for 97% of the 5,424 workers through December 31, 1984, the study end date. There were 1,197 deaths identified in this cohort as of the end of the study. An additional 51 workers were identified as dead with no certificate, giving a 96% recovery rate for death certificates. Vital status was determined from information provided by the Social Security Administration valid through December 31, 1984. Some deaths after the study end date are recorded.

The sources of occupational radiation exposures for Zia were external radiation, primarily gamma, and internal deposition of plutonium-238 and plutonium-239. Film dosimeters were used for personnel monitoring from 1944 through 1980, when they were replaced with thermoluminescent dosimeters (TLDs). Formal bioassay programs to monitor for internal exposures were begun in 1944.

External exposure data consist of dates (in decimalized notation) at which the worker was first monitored, first received a positive exposure, first accumulated 1 rem whole-body dose, first accumulated 5 rems whole-body dose, and first received 10 rems whole-body dose. Whole-body dose was defined as the sum of all tritium, neutron, and penetrating gamma readings. Annual penetrating external dose, based on film or TLDs, from 1944 to 1984 is also present in the file. External data were available through 1984. Data pertaining to internal plutonium exposure include isotope, dates (in decimalized notation) of first and last samples, and estimated body burdens (in units of both nCi and nCi-years) of plutonium-239 and plutonium-238 combined. Dates that body burdens reached 2, 5, and 10 nCi are also presented as separate readings for plutonium-238 and plutonium-239. Body burdens were estimated as of December 31, 1984, or death date and as of the last sample date. The computer code PUQFUA was used to generate body burden data. Dosimetry data were provided by the health physics group at LANL, which is responsible for monitoring all Zia (and other subcontractor) personnel in addition to LANL employees. These radiation data can include readings of workers employed at Zia, LANL, or another subcontractor of LANL; therefore, sample dates may not fall within the period worked at Zia for all workers in this file. ❖

# ZIA

## ZARADA01 Data File Set

### Contact

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Number of Analytic Files: 1		
File Name	Number of Variables	Type of Data
ZIAAFILE	77	demographic; external exposure

## Summary Death Tables

Cause of Death	No. of Deaths	
	Male	Female
Infectious & Parasitic Diseases	18	0
All Malignant Neoplasms	282	11
Lip, Oral Cavity & Pharynx	4	0
Digestive Organs & Peritoneum	92	2
Respiratory System	82	3
Bone & Connective Tissue	8	0
Skin	3	0
Breast	0	5
Genitourinary System	33	0
Brain/Central Nervous System (CNS)	6	0
Other & Unspecified Sites, Except Brain/CNS	21	0
Lymphatic/Hematopoietic	33	1
All Benign Neoplasms	2	0
All Neoplasms, Unspecified	3	0
Endocrine, Nutritional & Metabolic Diseases	28	0
Diseases of Blood & Blood-Forming Organs	3	0
Mental Disorders	25	0
Diseases of Nervous System & Sense Organs	13	0
Diseases of Circulatory System	540	13
Diseases of Respiratory System	113	2
Diseases of Digestive System	98	1
Diseases of Genitourinary System	28	0
Complications of Pregnancy & Childbirth	0	0
Diseases of Skin & Subcutaneous Tissue	1	0
Diseases of Musculoskeletal System & Connective Tissue	0	0
Congenital Anomalies	3	0
Symptoms & Ill-Defined Conditions	38	2
Accidents, Poisoning & Violence (External Causes)	182	1
Deaths, With ICD Code	1,377	30
Deaths, No ICD Code	53	1
Total Deaths, All Causes	1,430	31

Variables for Analytic File

ZIAAFILE

3 MB

**Name Description**

<b>sex</b>	sex of the worker
<b>race</b>	race of the worker
<b>hiredate</b>	date of first known hire at Zia
<b>termdate</b>	latest termination date from Zia
<b>bdate</b>	date worker was born
<b>dla</b>	date last known to be alive
<b>ddate</b>	date of death
<b>icda8</b>	cause of death—ICDA 8th revision
<b>vs84</b>	vital status at study end date 12/31/84
<b>ethnic</b>	ethnicity of the worker
<b>numsamp</b>	number of bioassay samples for worker
<b>valsamp</b>	number of valid bioassay readings
<b>nciys</b>	body burden (12/31/84) in nCi-years
<b>lsamdate</b>	date of last urine bioassay
<b>ncils</b>	body burden in nCi at last sample date
<b>nciyls</b>	body burden last sample date nCi-years
<b>prevbb</b>	body burden as of 12/31/83 (nCi)
<b>curbb</b>	body burden as of 12/31/84 in nCi
<b>isotope</b>	isotope of plutonium measured
<b>fsamdate</b>	date of first bioassay reading

<b>p29date</b>	date exposed to 2 nCi plutonium-239
<b>p59date</b>	date exposed to 5 nCi plutonium-239
<b>p109date</b>	date exposed to 10 nCi plutonium-239
<b>p28date</b>	date exposed to 2 nCi plutonium-238
<b>p58date</b>	date exposed to 5 nCi plutonium-238
<b>p108date</b>	date exposed to 10 nCi plutonium-238
<b>id</b>	identification number
<b>fsdext</b>	date first monitored for external radiation
<b>fpsext</b>	date external radiation dose greater than (>0)
<b>d1ext</b>	date external radiation dose reached 1 rem
<b>d5ext</b>	date external radiation dose reached 5 rem
<b>d10ext</b>	date external radiation dose reached 10 rem
<b>cumext</b>	cumulative whole-body dose external
<b>lsamdte2</b>	last sample date
<b>annext43</b>	external whole-body dose by year, 1943-1984
<b>:</b>	
<b>annext84</b>	

ZARADAO1

