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OAK PARK HEALTH STUDY

BY

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Table of Contents

List of Tables and Figures..... i
Executive Summary.....ii
Introduction..... 1
Purpose of Study.....12
Methodology.....12
Results.....14
Discussion.....21
Summary.....24
Appendix
Appendix A Questionnaire.....25

Tables
Table 1 Age and Sex Distribution of the Study Areas.....15
Table 2 Percentage of Population in Study Areas by Age and Sex....16
Table 3 Area by Length of Residence in Years.....16
Table 4 Number of Deaths per 100,000 Population by Area.....17
Table 5 Average Age at Death by Area.....17
Table 6 Pregnancy Outcomes of Surveyed Women Residing in CT 424...18
Table 7 Most Common Health Conditions in Study Area-August 1984...19

Figures
Figure 1 Map of Study Area.....11

EXECUTIVE SUMMARY

The residents of Oak Park have expressed concerns for many years regarding the perceived detrimental effects to their health from chemical discharges into the environment from the Reilly Tar and Chemical (RTCC) manufacturing facility located in their neighborhood.

To address these concerns of increased risk of adverse health effects, a collaborative health study between the Indiana State Board of Health and the Marion County Health Department was undertaken, to ascertain the types and frequencies of illnesses, disease symptoms, cancers, and adverse reproductive outcomes reported by the residents in this community and compare them to similar residential areas not exposed to the contaminants prevalent in the Oak Park area.

A cross-sectional study was designed to elucidate the prevalence of perceived adverse health outcomes, self-reported physician diagnosed health problems, and adverse reproductive outcomes in the study population. A cross-sectional survey of the entire population of census tract 424 was undertaken in August 1984. Three hundred ninety-three households comprising 1,101 individuals participated in the survey. This was a response rate of 69% of the available households.

A review of the mortality experience of each of the study areas was performed. Due to the limited number of deaths, no disease specific mortality rates could be tabulated, and only all cause mortality data were reviewed. There was not a significant difference in the mortality experience of the Oak Park residents, Area E, when compared to the non-exposed populations.

An original concern of the Oak Park residents was an increased rate of birth defects and miscarriages. The data in this study would not support these concerns. In fact data would suggest for miscarriages, abortions, and birth defects, the rate of occurrence for these adverse reproductive outcomes while living in this area is equal to or less than these same women's reproductive history while living outside of the study area.

As listed in the report, many adverse health conditions were reported. However, the Oak Park area had rates of adverse health outcomes equal to or less than all other areas of the entire study population, including those areas that were not exposed to either groundwater, air, or both routes of contamination.

Although it was not possible to correlate any adverse health outcomes with exposure to contaminated groundwater, this fact should not lessen the importance of eliminating and/or cleaning up this possible source of contamination. Data correlating low level human exposures and resultant possible adverse health outcomes are lacking for most if not all chemicals presently in our environment. The lack of finding an association may be a result of an extended latency period (the time from exposure to the onset of symptoms and/or disease). This could result in the onset of adverse health outcomes in those exposed, at some future point in time.

As knowledge and awareness grow regarding the hazards of the many chemicals prevalent in our environment, people are becoming concerned and alarmed as to the possible adverse impact these chemicals have on their health and environment. The potential for acute injury has become more evident with accidents such as the methyl isocyanate leak at a Union Carbide facility in India, in late 1984. However, the effects from chronic, low level exposure to chemicals discharged into the environment from chemical and industrial manufacturing facilities are still unclear.

Marion County, with a population of approximately 765,000 (1980 Census), is the most populous county in the state. The southwest section of the county is comprised of both heavy industry and residential areas. There has been a great deal of industrial development in this area, with the manufacturing of copper metal products, mechanical drives, jet engines, and speciality chemicals being the dominant industries near these neighborhoods. The various industries included the Chrysler Foundry, Detroit Diesel Allison, Bridgeport Brass, and Reilly Tar and Chemical (RTCC).

The residents of Oak Park have expressed concerns for many years, regarding the perceived detrimental effects to their health from chemical discharges into the environment from the RTCC manufacturing facility located in their neighborhood.

During the preceeding years numerous complaints have been made to the Indiana State Board of Health (ISBH) and the Marion County Health Department (MCHD) by residents in the neighborhoods. In September 1983, the president of the Oak Park Civic League sent a letter to the

mayor of Indianapolis, expressing the concerns of the residents regarding the perceived health hazards from residing in the vicinity of RTCC. Included in the letter was a list of people who either were ill or had died from cancer, heart disease, cysts, hypertension, various pulmonary conditions, liver disease, and kidney disease. This letter was only the latest public expression of concern by the citizens of Oak Park. In 1980 the citizens conducted their own health survey since they felt they were being harmed from discharges of chemicals into the air and the groundwater by RTCC. Unfortunately, their survey was based on anecdotal information and no standard questionnaire was used. Data gathered by the Oak Park Civic League from this survey were uninterpretable.

To address these concerns of increased risk of adverse health effects, a collaborative health study between the ISBH and the MCHD was undertaken, to ascertain the types and frequencies of illnesses and disease symptoms reported by the residents in these communities and compare them to similar residential areas not exposed to the contaminants prevalent in the Oak Park area.

REILLY TAR AND CHEMICAL

The RTCC facility is situated on approximately 120 acres of land. The site consists of two parcels of land. The southern parcel contains approximately 83 acres while the northern parcel contains approximately 41 acres. On the southern parcel of this complex is an active drum storage area, several abandoned landfill areas, treatment tanks, and storage tanks. The northern parcel contains the active manufacturing facility, an abandoned landfill, and an operational lime pond.

RTCC began operations at the present site in the early 1920's with a coal tar refining and wood treatment (creosote) facility. This operation was contained on the south parcel of the complex and was closed in 1972. Very little information is available regarding this facility which operated under the name of Republic Creosoting Company.

The RTCC manufacturing facility on the northern parcel of land began operation in the early 1950's. Since then the facility has been engaged in the synthetic production of pyridine, alkyl pyridines, niacinamide, vinyl pyridine, alpha picoline, beta picoline, and gamma picoline. Selective catalysts like ammonia, acetaldehyde, formaldehyde, methanol, caustic soda, and sodium are used under proprietary procedures to produce various pyridine derivatives.

The wastes and pollutants found at the RTCC site are the products and by-products of their past and present coal-tar refining processes, wood preservation, and pyridine production. Ground water contamination near RTCC was first documented in 1955 in private wells east of this facility along Centennial Street. Due to past disposal practices and the threat of contamination to the groundwater, the RTCC southern parcel was placed on the National Priority List (Superfund) in October of 1984.

Many of the known chemical identified at the RTCC plant can cause substantial health hazards in low concentrations. Pyridine and benzene are the most noteworthy, having permissible exposure limits of 5 and 1 parts per million (PPM) respectively, with the major route of exposure being through inhalation.

Although there have been numerous complaints of persistent odors emitted by RTCC, there are no regulations governing odors from a pyridine manufacturing facility. Odors accompanied by headache,

disorientation, , and nausea have been experienced by ISBH staff inspecting the site and the surrounding communities.

POLLUTANTS DETECTED

Pyridine and most of its family are highly soluble in water. As an example, pyridine, methylpyridines, and piperidine are miscible at all concentrations in water. In general, most of these compounds are degraded under proper environmental conditions by a reduction of 99.5 percent in 21 days. Pyridine has a very strong, unpleasant odor that to some people can be overpowering and can cause headaches and nausea. Daily exposure of 6 to 12 ppm can cause mild nervous conditions while higher levels of 15 to 300 ppm can cause insomnia, nervousness, and abdominal pain. At this time pyridine has not been proven to have carcinogenic properties but it is still under investigation. Based upon the LD 50 levels on rats, and other toxicological studies, pyridine is considered, at this time to be a moderately toxic compound. The permissible exposure level (PEL) is 5 ppm in air (ACGIH 1977). Its major exposure routes are inhalation, contact with skin, eyes, and ingestion. The effects are irritating to the eyes, skin, and the lining of the respiratory tract. Exposures of 15 to 300 ppm may also cause nausea, weakness, headaches, dizziness, and sleeping difficulties. In more severe cases, damage may occur to the central nervous system, liver, and kidney. Workers exposed to 125 ppm levels have experienced nausea, anorexia, and urinary discomfort. Because pyridine is highly soluble, spills, leaks, or other exposure to surface or groundwater allows pyridine to move rapidly with the water.

Since the mid 1960's there have been numerous cases of pollutants detected in groundwater samples by various state and federal agencies,

and many complaints by the local citizenry regarding actual or perceived air and water pollution problems.

In August of 1955, homeowners east of RTCC complained about the alleged contamination. Investigation by health officials indicated foul odors and offensive tastes of well water. Analysis of private wells indicated the presence of pyridine and ammonia in the part per million levels.

Samples taken by the Indiana Stream Pollution Control Board in 1964, from 3 private wells located east of RTCC indicated appreciable amounts of pyridine, picoline, and ammonia.

During 1980 there were numerous complaints from residents in the Oak Park neighborhood regarding odors emanating from the plant. An analysis of a private well in the 1500 block of Centennial Avenue also showed levels of pyridine in the high ppb to ppm range.

In June 1980, a soil sample from RTCC's southern parcel (the former site of Republic Creosote) was tested and found to contain methyl ethyl keytone, trichloroethylene, toluene, m-xylene, o-xylene, p-xylene, and creosol. At the same time two liquid samples were also taken. One of these samples contained benzene, xylene, and toluene.

Four years later, four private residential wells were tested in the Oak Park Neighborhood. Only 1, 1, 1-trichloroethane at 80 ppb (parts per billion) was found in one well.

In 1982 the Indianapolis Air Pollution Control Division positively identified pyridine, picolines, toluene, and xylene in the air.

GEOLOGY AND WATER QUALITY

Marion County is covered by generally thick deposits of Pleistocene age glacial deposits. The most common glacial deposit

found in the county is till, a heterogeneous mixture of silt, sand, gravel, and boulders in a clay matrix. Glacial outwash deposits, consisting of stratified sand and gravel, are generally found along the White River and its tributaries.

Both glacial tills and outwash deposits are found at the RTCC site. These deposits range from 60 to 70 feet thick in the southern part of the property to about 55 feet thick in the northern part. Studies by the ISBH geology section indicates that a profile at the site generally consists of 4 to 8 feet of clay fill overlying 30 to 52 feet of sand and gravel over 8 to 30 feet of clay over 3 to 11 feet of gravel.

There are numerous small lakes and ponds near the site. These surface water impoundments were formed by the flow of groundwater into abandoned sand and gravel quarries. There have been no reports of contamination of these bodies of water, however wells between RTCC and these bodies of water are contaminated. At the present time no testing of the water from these lakes and ponds has been performed. In addition no aquatic organisms from these surface waters have been tested for contamination.

Groundwater flow near the RTCC site is thought to be to the southeast; however, the large volumes of water pumped from some of the industrial wells can, and in the case of the wells at the Detroit Diesel Allison Plant, have reversed the general direction of the groundwater flow. Besides RTCC and Detroit Diesel Allison, other industries, active and inactive landfills, underground and surface mining activities and a municipal wastewater treatment plant affect groundwater flow and quality in the general area.

Several geologic profiles of the hydrogeology have been theorized

based on information obtained from well boring logs. These profiles usually result in a generalization of the actual subsurface conditions. In each of these profiles there is sand and gravel underlying the RTCC site. In the northern east-west profile, there appears to be a clay barrier to prevent groundwater flow to the east from RTCC and shale bedrock to prevent movement into the underlying limestone aquifers.

In the second profile, the southern east-west profile, the primary material encountered was sand and gravel. Although some rather large clay lenses were found, they would not prevent groundwater movement to the east. Results of sampling from a test well showed that the limestone was in direct contact with the sand and gravel, indicating that there may not be protection of the limestone aquifer from the contamination.

The third, the north-south profile, shows that the groundwater could move to the south but might be inhibited by clay lenses from moving to the north. Sand was encountered at the bottom of a test well, but its thickness and lateral extent is unknown.

Based on available data, the glacial outwash aquifer and the underlying bedrock aquifers are hydraulically connected. If this is true, the potential may exist for deep wells situated in lower aquifers to subsequently become contaminated thus affecting a larger portion of the populace.

Groundwater contamination near RTCC was first documented in 1955 in private wells east of the site along Centennial Street. These wells were rendered unfit for human consumption, thus forcing those residents to establish connections with the Indianapolis Water Company facilities. Presently, continued groundwater contamination has forced

the MCHD to take action to condemn additional residential wells and several wells used by businesses within the contaminated aquifer. Many of the private wells appear to still be in use, at least for watering lawns and gardens.

The MCHD recently conducted a survey to determine the extent and type of water use from private wells in the Oak Park and Maywood neighborhoods, located east, north, and south of the RTCC site respectively. Of the 400 persons responding, 21 had both city water and wells, 9 households relied entirely on wells supplemented with bottled water, and 3 commercial establishments relied on well water or well water supplemented with bottled water for drinking.

The major groundwater users near RTCC are the industries that operate production water wells to augment their water needs. In addition, Detroit Diesel Allison, which employs several thousand people, depends entirely on well water. Due to documented contamination with ammonia, Detroit Diesel Allison does provide some water treatment before use. The source of ammonia has not been determined, but could be from industrial sources other than RTCC. Bridgeport Brass, which is located near the RTCC complex, regularly tests water from monitoring wells located on their property, however these test results are not available.

AIR QUALITY

The RTCC site is in an area of Marion County that does not meet all the primary National Ambient Air Quality Standards (NAAQS) for the criteria pollutants. The area cannot be classified or is better than the national standards for carbon monoxide (CO) and nitrogen dioxide (NO2). The area does not attain the standards for ozone (o3), sulfur dioxide (SO2) and total suspended particulates (TSP).

POPULATION

The community surrounding the RTCC industrial complex makes up the entire population of census tract 424. According to the 1980 census, there are 1928 people who live in this census tract. Within this area, there are five distinct neighborhoods. Each neighborhood is segregated from each other by distinct manmade and natural geographical boundaries which facilitates comparisons between them. A description of each of the 5 study areas and their relationship to RTCC and the type of water service available are listed below:

AREA A lies west of the heavy industrial section and Interstate Highway 70 and was selected to act as a control group for this study. The primary wind direction in Indianapolis is from the Southwest. This area would not usually be affected by emissions of the heavy industry in this study area. Hydrologic studies suggest that the groundwater flows in a northwest to southeast direction. Although most of the homes in this area are on private wells, these wells would be located up-gradient from the possible sources of contamination. Area A lies approximately 1.1 miles from the RTCC industrial complex.

AREA B is sandwiched between the RTCC facility on the south and other industries and Interstate Highway 70 to the west and north. Homes in this area have always been serviced by the Indianapolis Water Company. Therefore, these residences would not have been affected by groundwater contamination. However, this area does lie downwind from the RTCC complex as well as other industrial sources.

AREA C is immediately adjacent to the east of area B, and lies east and slightly north of the RTCC complex. It is also bounded on the north by Interstate Highway 70 and on the east by Eagle Creek. Area C lies approximately 0.4 mile from the RTCC facility. Homes in this area have always had water service via the Indianapolis Water Company.

AREA D lies south of the RTCC facility and other heavy industries located in this area. This area is situated over the suspect contaminated aquifer which flows from the northwest to the southeast. Some of the houses in this area are still on private wells and residents have been ordered to connect to the Indianapolis Water Company system because of the known contamination of this aquifer. This area would be up gradient of the usual air emissions from the industries located in this section. Area D lies approximately 1.2 miles from the RTCC facility.

AREA E is located approximately 0.2 miles directly east of the RTCC facility. Some of the homes in this area have wells in addition to water service by the Indianapolis Water Company. The owners have been ordered to stop using these wells because of the known contamination. Residents in this area would be directly affected by airborne emissions from the RTCC facility, and less frequently from the other industrial complexes located in this area. Area E is formally known as Oak Park.

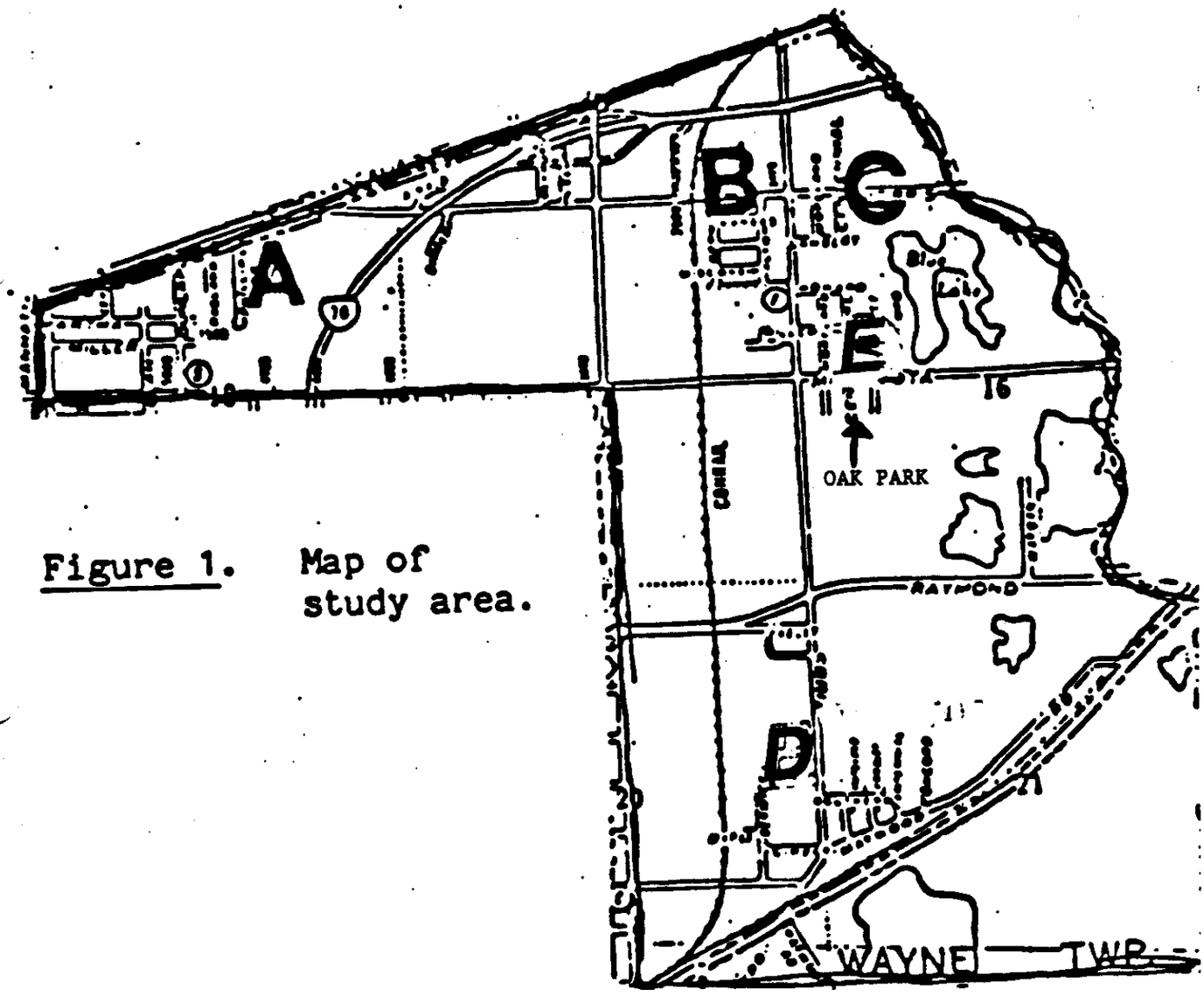

Figure 1. Map of study area.

PURPOSE

The purpose of this study was to ascertain whether individuals residing in the Oak Park area (Area E) had higher rates of perceived symptoms of disease, putative adverse health outcomes, greater mortality of all causes and specific causes, and a greater rate of birth defects than other comparable residential areas in Census Tract 424.

METHODOLOGY

A cross-sectional study was designed to elucidate the prevalence of perceived adverse health outcomes, self-reported physician diagnosed health problems, and adverse reproductive outcomes in the study population. A cross-sectional survey of the entire population of census tract 424 was undertaken. The only requirement for inclusion in the study was that the study participants had to have lived in the study area for at least one year.

The personnel selected to conduct the interviews, regularly interview patients as part of their jobs as public health nurses, sanitarians, or epidemiologists. All interviewers attended a one-day training seminar to familiarize themselves with the survey questionnaire in addition to the general study methodology. Role playing using the survey questionnaire was an integral part of the training session.

One week prior to the beginning of the survey a flyer announcing the survey was delivered to every home in the study area. The actual survey was conducted during a three week period in August of 1984.

One adult member of each residence was questioned regarding all people who lived at that address. All questions were asked for each

permanent resident at that address.

The questionnaire related to length of residence in the study area, occupation, known chemical exposures, smoking history, alcohol history, type of water supply, physician diagnosed or perceived long term adverse health conditions, and reproductive history. A copy of the questionnaire is included in Appendix A. This broad range of questions was necessary since there are no health outcomes that could specifically be associated with exposure to all previously identified chemicals.

During the three weeks that the survey was conducted, door hangers were placed at homes where there was no answer. The resident was requested to call a central number and arrange for an interview. Repeat visits to residences where no one was home were made at different hours of the day (morning, afternoon, and evening), in order to include as many people as possible in the survey and to eliminate any possible biases from excluding persons who might normally work during the day or early evening. In an attempt to minimize the effect of interview bias in one particular study area, interviewers were assigned to different study areas each day, as well as being scheduled to perform interviews during different hours of the day.

A list of 726 addresses was obtained from the Indianapolis Suburban Directory. Fourteen of these addresses later were found to be businesses and were deleted from the study. A total of 712 residential addresses, comprised the study population.

Attempts to contact all residences included at least three visits to the address, with at least one visit during the morning, afternoon, and evening hours. If the resident had not been interviewed or had not called back in response to the door hangers, after these numerous

attempts, the latest telephone number, corresponding to that address in the city directory was secured. Telephone calls were then placed to the resident in an effort to either set an appointment for interviewing or to perform the interview at that time over the telephone. Only after all these attempts was a resident deemed to be unavailable to participate in the study.

RESULTS

Of the 712 residential addresses confirmed, 174 were eventually eliminated from the study due to vacancy, no answer, and/or had lived in the study area for less than one year. There were an additional 145 households who declined to participate in the study. Three hundred ninety-three (393) households comprising 1,101 individuals did participate in the study.

The population of the entire census tract surveyed, was evenly distributed by age and sex across the five study areas (see Table 1). The entire population of Census Tract 424 was caucasian, therefore stratifying results by race was not considered.

Table 1

Age and Sex Distribution of the Study Areas

AREA		0-14	15-24	25-34	35-44	45-54	55-64	65+	Total	%
A	Males	35	34	25	16	11	22	11	154	
	Females	36	16	26	22	19	15	17	151	
									305	27.7%
B	Males	31	15	14	14	15	22	9	120	
	Females	16	19	11	15	20	20	13	114	
									234	21.3%
C	Males	9	7	7	5	7	13	7	55	
	Females	4	8	9	5	4	13	12	55	
									110	10.0%
D	Males	26	12	14	11	14	12	20	109	
	Females	21	16	19	7	14	22	18	117	
									226	20.5%
E	Males	28	16	18	11	12	14	10	109	
	Females	27	16	17	12	12	17	16	117	
									226	20.5%
TOTAL	Males	129	84	78	57	59	83	57	547	49.7%
	Females	104	75	82	61	69	87	76	554	50.3%
									1101	

Table 2

Percentage of Population in Study Areas by Age and Sex

MALES	AREAS				
AGE	A	B	C	D	E
0-14	11.6	13.4	8.3	11.7	12.4
15-24	11.2	6.5	6.4	5.4	7.1
25-34	7.9	5.6	6.4	6.3	8.0
35-44	5.3	6.1	4.6	4.9	4.9
45-54	3.6	6.5	5.5	6.3	5.3
55-64	7.3	9.5	11.9	5.4	6.2
65-74	2.0	3.5	5.5	6.3	3.1
75-84	0.7	0.4	0.9	2.2	1.3
85+	0.3	0	0	0.5	0
FEMALES					
0-14	11.9	6.9	3.7	9.4	12.0
15-24	5.3	8.2	7.3	6.7	7.1
25-34	8.6	4.3	8.3	8.5	7.5
35-44	7.3	6.5	4.6	2.7	5.3
45-54	6.3	8.2	3.7	5.8	5.3
55-64	5.0	8.7	11.9	9.9	7.5
65-74	3.6	3.9	5.5	3.6	5.3
75-84	2.0	0.9	5.5	4.0	1.3
85+	0	0.9	0	0.5	0.4

Table 3

Area by Length of Residence in Years

AREA	LENGTH OF RESIDENCE IN YEARS				
	0-4	5-9	10-14	15-19	20+
A	18.8%	29.9%	14.5%	10.2%	26.6%
B	27.5%	21.9%	8.2%	4.7%	37.8%
C	35.5%	13.6%	20.0%	7.3%	23.6%
D	24.9%	23.5%	11.3%	6.3%	33.9%
E	26.6%	18.1%	13.3%	9.3%	32.7%

Mortality:
A review of the mortality experience of each of the study areas was performed. Due to the limited number of deaths, no disease specific mortality rates could be tabulated, and only all cause mortality data were reviewed. Area C had the highest mortality rate at 1209 deaths per 100,000 population, which was statistically significant, P-value = 0.037 when compared to all other areas of the census tract. No other area had a statistically significant mortality rate, see Table 4 and Table 5. There were no differences in the average age at death for all areas studied.

Table 4

Number of Deaths per 100,000 Population by Area

AREA	POPL'N SIZE	# OF DEATHS	RATE PER 100,000	P-VALUE
A	3204	11	343.3	NS
B	2460	15	609.8	NS
C	1158	14	1209.0	.037
D	2376	23	968.0	NS
E	2376	20	841.8	NS
TOTAL	11568	83	717.5	

Table 5

Average Age at Death by Area

AREA	AVERAGE AGE AT DEATH
A	60.3 Years
B	68.6
C	69.4
D	75.4
E	67.2
TOTAL	68.2

Reproductive Outcomes:
There were 554 females who participated in the survey. Of these, 347 gave pregnancy histories. There were 7 sets of twins included in the 1078 pregnancies listed. Three hundred and forty-three (343) or 31.8 percent of the pregnancies occurred during the time these women lived in the study area. Of these 343 pregnancies, two (2) babies were born with birth defects. One of these children had cerebral palsy and the other had an unspecified heart disease. An additional child was born with an RH incompatibility and subsequently died. A complete listing of the pregnancy history for all women in the study area is provided in Table 6. It should be noted that this table is for pregnancies occurring over multiple years and therefore these data cannot be compared to yearly national, state, or county data of live births and still births.

Table 6

Pregnancy Outcomes of Surveyed Women Residing in Census Tract 424.00
August 1984

MOTHER'S RESIDENCE AT TIME OF PREGNANCY	TOTAL PREG	NORMAL BIRTHS	PREMATURE BIRTHS	STILL-BIRTHS	MISCARR	ABORT	BIRTH DEFECTS
In Study Area	343	310	4	5	22 (64.1)	1 (2.92)	2 (5.83)
Out of Study Area	735	617	25	9	64 (87.1)	3 (4.1)	23 (31.3)
Total	1078	927	29	14	86	4	25

Note: The numbers in parenthesis represent the rate of this event per 1,000 total pregnancies.

Disease Morbidity:
Next all data reporting either physician diagnosed self reported health conditions or the prevalence of these health conditions although not physician diagnosed were tablulated. The prevalence rate of these conditions in each of the study areas was computed and these rates of occurrence were compared to the mean rate of occurrence for the entire study area. Rates were compared via T-test methodologies. The results are reported in Table 7.

Table 7

Most Common Health Conditions in Study Area - August 1984

HEALTH CONDITION	RATE OF OCCURRENCE IN AREAS A	B	C	D	E	P-VALUE
High Blood Pressure	141.0	158.1	190.9	177.0	185.8	NSD
Headache	101.6	183.8	190.9	106.2	150.4	NSD
Urinary Tract Dis.	98.4	149.6*	118.2	115.0	97.3	.025
Chron. Respir. Dis.	82.0	98.3	200.0*	115.0	115.0	.019
Allergies	114.8	119.7	181.8*	75.2	70.8	.028
Blood Disorders	72.1	119.6	190.9*	79.6	84.1	.021
Swelling Hands/Feet	65.6	102.6	127.3	75.2	66.4	NSD
Insomnia	59.0	94.0	145.4*	26.6	97.4	.041
Heart Disease	59.0	94.0	118.2*	72.2	39.8	.041
Dizziness	62.3	89.7	100.0*	48.7	62.0	.030
Anxiety	49.2	81.2	109.1*	44.2	79.6	.041
Ringing in Ears	29.2	81.2	109.1*	39.8	62.0	.040
Angina	45.9	81.2	118.2*	44.2	31.0	.048
Rash	85.3*	51.3	54.6	39.8	35.4	.023
Excess Watery Eyes	29.5	64.1	100.0*	31.0	53.1	.029
Liver Disease	29.5	72.6	45.4	70.8	26.5	NSD
Cataracts	39.3	42.7	63.6	66.4	35.4	NSD
Eye Infections	32.8	42.7	118.2*	35.4	48.7	.016
Asthma	36.1	42.7	63.6*	44.2	48.7	.024
Ovarian Cysts	32.8	42.7	100.0*	39.8	35.4	.018
Diabetes	42.6	55.6	54.6	39.8	13.3	NSD
Paralysis	23.0	64.1	81.8*	22.1	26.6	.040
Cancer	19.7	59.8	72.7	17.7	44.2	NSD

NSD = no significant differences between the mean rates of occurrence
* = indicates a P-value greater than 0.95%

A series of 2 X 2 contingency tables was constructed for the eleven (11) key target organ systems and specific diagnostic entities comparing the prevalence of self reported physician diagnosed health problems based on the a priori geographic classifications of exposure. Using these a priori exposure risk classifications, there were several significant findings. In comparing area B to the remaining areas, the key target organ systems of Headache (RR=1.45, 95% C.I. = 1.05 - 2.01). Nervous Conditions (RR = 1.65, 95% C.I. + 1.28 - 2.13) were also noted. Area C had significant findings for Nervous Conditions (RR + 2.01, 95% C.I. = 1.48 - 2.73), Eye Problems (RR = 1.62, 95% C.I. = 1.12 - 2.35), Skin Problems (RR - 1.62, 95% C.I. = 1.14 - 2.29), Respiratory Conditions (RR = 1.7, 95% C.I. = 1.24 - 2.32), Cancer (RR = 2.15, 95% C.I. = 1.02 - 4.55) and Blood Disorders (RR = 2.17, 95% C.I. = 1.37 - 3.42). The only other significant findings were found in Area E for High Blood Pressure (RR = 1.53, 95% C.I. = 1.15 - 2.04).

We also conducted a series of analyses comparing the group of individuals reporting physician diagnosed health problems versus those not reporting any of these problems. In order to control for potential confounding variables we performed logistic regression analyses for the self-reported physician diagnosed health problems regressed on smoking history, alcohol history, area of residence, and length of residence in that specific area, while stratifying on age.

The model using eye problems as the dependent variable was significant only for the variable "area of residence", P = value of .0149, beta .565639, for an increase in risk of 1.76 times.

The model testing the dependent variable of nervous conditions in those under 45 years of age and those greater than or equal to 45 years of age also showed significant results. In those under 45 years of age

the variables of smoking, P-value .0227, beta .267376; and the variable "area of residence" P-value .0214, beta .549031, were also significant. While in those 45 years of age or older, the only variables significant were for "length of residence", P- value, .0212, beta .595398, and a negative association with smoking, P-value .0004, beta .530702. The association of smoking with nervous conditions are most likely non-independent events, and these results are not surprising. However, it does appear that in those individuals under 44 years of age the area of residence is important in the reporting of nervous system problems. In addition, the data suggest that the older one gets, the less important it is where one lives but the length of time an individual has lived in the study area. The greater the length of residence the greater the risk of nervous system problems, an increase risk of 1.81 times.

In the model using headache as the dependent variable, in those under 45 years of age, the only variable significant were smoking, P-value .0001, beta .516928; and the area of residence, P-value, .0041, beta 0.686312. In those individuals greater than or equal to 45 years of age the only significant variable was smoking, P-value .0190, beta 0.34164, which would suggest that smoking may be associated with headache in all ages, however, in the younger ages that area of residence, living in areas B and C, are associated with the prevalence of this problem.

Discussion

In regard to the mortality data, it should be noted that both the actual number of deaths identified and the size of the underlying

population were relatively small. Fluctuations in either of these parameters could result in non-significant findings. It should also be noted as previously stated, that the actual numbers of deaths were so few that only all cause mortality could be evaluated. No specific patterns of mortality (i.e. cancer, atherosclerotic heart disease, etc.) were identified.

An original concern of the residents in this area was an increased rate of birth defects and miscarriages. Our data would not support these concerns. In fact data would suggest for miscarriages, abortions, and birth defects, the rate of occurrence for these adverse reproductive outcomes while living in the study area is equal to or less than these same women's reproductive history while living outside of the study area. It is our opinion therefore, that living in Census Tract 424, thus being exposed to groundwater and air emissions from RTCC as well as the other industrial complexes in the area, do not cause an increase in birth defects, miscarriages, and spontaneous abortions.

As listed in Table 7, many adverse health conditions were reported. Additional data from the contingency tables as well as the logistic regression analyses revealed statistically significant increases in several specific symptoms and/or organ systems. The study areas most often affected were Areas B and C. The resultant health problems in Areas B and C are those which would be more indicative of an exposure to some type of an airborne irritant and/or allergen. These findings would be consistent with the fact that individuals residing in these areas have always been on public water and whose only exposure to the previously mentioned chemical contaminants would be via the ambient air.

These risks do not appear to be related to a specific point source. Instead, they represent a portion of the total risk associated with the comlex pollutant mixtures typical of urban ambient air.

It is of interest, that the Oak Park or study Area E whose residents expressed the greatest concern of putative health problems from living close to the RTCC facility, had rates of adverse health outcomes equal to or less than all other areas of the entire census tract, including those areas that were not exposed to either groundwater, air, or both routes of contaminants.

This study was limited by the fact that only one household member was asked about the other members in the household. In many instances both adult household members were interviewed, however, in the instances where only one adult member was questioned, that person may or may not have been knowledgeable about other household member's occupation(s) and/or occupational exposures to chemicals in the work environment, lifestyle habits, and/or past or present health problems.

In addition, reported individual health conditions were not validated with that individual's health care provider. No physical examinations or invasive procedures were done to validate health conditions or to ascertain any body burdens of those chemicals in the study participants.

Although we were unable to correlate any adverse health outcomes with exposure to contaminated groundwater, this fact should not lessen the importance of eliminating and/or cleaning up this possible source of contamination. Data correlating low level human exposures and resultant possible adverse health outcomes are lacking for most if not all chemicals presently in our enviroment. The lack of finding an

association may be a result of an extended latency period (the time from exposure to the onset of symptoms and/or disease). This could result in the onset of adverse health outcomes in those exposed at a future point in time.

Summary

In summary, no adverse health outcomes could be correlated with exposure to contaminated groundwater. However, Areas B and C, did show statistically significant increased rates of illnesses when compared to other sections of the study area. Since both of these areas are served by a public water supply, the probable route of exposure was via the ambient air. We could not identify a single source of pollution which could possibly cause the adverse health outcomes reported. It is our opinion that these adverse health outcomes are probably the result of an exposure to a mixture of pollutants emanating from many industrial/residential sources.

APPENDIX A

Participant Study Number: ___ ___ ___

COMPLETE BEFORE INTERVIEW:

Interviewer ID Number: ___ ___

Date of Interview: ___ ___ ___ ___ ___ ___
Mo. Day Yr.

Time of Interview:

Begin: ___ ___ : ___ ___ (circle) AM PM
End: ___ ___ : ___ ___ AM PM

Name of Respondent: _____/_____/_____
Last First Middle

What is the participants race? (circle one)

1 = White, Non-hispanic
2 = White, Hispanic
3 = Black, Non-hispanic
4 = Black, Hispanic
5 = Asian or Pacific Islander
6 = American Indian or Alaskan Native
7 = Refused

What is your home telephone number? (_____)_____-_____

What is the total number of persons living in your household including yourself? _____
(probe: Does this include any babies or other persons who usually live here but are away now? Circle 1 = Yes, 2 = No)

Now I need some information about all the people who live in your household. Let's list them by age, beginning with the oldest, please and including yourself. (RECORD RESPONSES IN THE FOLLOWING TABLE. REPEAT A - C UNTIL ALL HOUSEHOLD MEMBERS HAVE BEEN LISTED IN TABLE 1)

A: What is the full name of the oldest person who lives in your home? Who is the next oldest? and the next? ETC.

B: Circle the code for sex. (Ask if necessary)
1 = Male, 2 = Female

C: On what date were you (was he/she) born?

TABLE 1

Person Number	NAME Last	First	Middle	SEX M F	BIRTHDATE mo./day/yr.
01				1 2	___/___/___
02				1 2	___/___/___
03				1 2	___/___/___
04				1 2	___/___/___
05				1 2	___/___/___
06				1 2	___/___/___
07				1 2	___/___/___
08				1 2	___/___/___
09				1 2	___/___/___
10				1 2	___/___/___

Now I need some information about where you currently live and all previous addresses. Let's begin with the most recent.
(REPEAT A - C FOR ALL ADDRESSES. RECORD RESPONSES TO A - C IN TABLE 2. REMEMBER THEY MUST HAVE LIVED AT EACH ADDRESS FOR AT LEAST 1 YEAR).

A. What is your current address? What was your address before that?

B. From what year to what year did you live there?

C. What map area was it in?

TABLE 2

	ADDRESS Street	City	State	Zip	Years From	To	Map Area
1.					___ ___/___	___	1 2 3 4 9
2.					___ ___/___	___	1 2 3 4 9
3.					___ ___/___	___	1 2 3 4 9
4.					___ ___/___	___	1 2 3 4 9
5.					___ ___/___	___	1 2 3 4 9
6.					___ ___/___	___	1 2 3 4 9
7.					___ ___/___	___	1 2 3 4 9
8.					___ ___/___	___	1 2 3 4 9

Have you ever changed your residence or home because of a health problem? 1 = Yes, 2 = No

If YES, list the number of that residence _____, and specify as to the nature of the health problem. _____

_____

Now I want to ask you some questions about jobs that you or he/she have had. Please start with the present or most recent job and then list in order each job before that.

A. What is the name and address of the place where you work(ed)?
Please only include jobs that you have held for more than 1 year.

B. What is or was your (his/her) job description, or what kind of job did you (he/she) do? (Examples of job descriptions are machinist, secretary, salesman, plumber, etc.

C. From what year to what year did you/he/she work there?

D. What kind of industry is this?

_____

TABLE 3

Person # Job #
01 01 Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # Job #
01 02 Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # Job #
01 03 Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # 01 Job # 04

Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # 01 Job # 05

Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # 02 Job # 01

Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # 02 Job # 02

Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # 02 Job # 03

Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # 02 Job # 04

Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # 02 Job # 05

Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # 03 Job # 01

Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # 03 Job # 02

Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # 03 Job # 03

Co. Name: _____

Address: _____

Job Description: _____

Years Worked: From ___ ___ To ___ ___

Type of Industry: _____

Person # Job #
03 04 Co. Name: ______________________

Address: ______________________

Job Description: ______________________

Years Worked: From __ __ To __ __

Type of Industry: ______________________

Person # Job #
03 05 Co. Name: ______________________

Address: ______________________

Job Description: ______________________

Years Worked: From __ __ To __ __

Type of Industry: ______________________

Has anyone in your family ever changed jobs or work assignments because of any health problems or injuries? 1 = Yes, 2 = No. If YES list which person, which job by job number, and describe illness.

Has anyone in your family ever worked at a job which caused you trouble breathing, such as a cough, shortness of breath, or wheezing? 1 = Yes, 2 = No. If YES, please list which person and job number.

Has anyone in your family ever worked with any substance which caused them to break out in a rash? 1 = Yes, 2 - No. If YES, please list which person, job number and if possible specify the substance.

No.	Change Job	Job #		Resp. Prob.	Job #	Rash	Job #	
1 2 3	1 2	1 2 3 4 5	______	1 2	1 2 3 4 5	1 2	1 2 3 4 5	______
1 2 3	1 2	1 2 3 4 5	______	1 2	1 2 3 4 5	1 2	1 2 3 4 5	______
1 2 3	1 2	1 2 3 4 5	______	1 2	1 2 3 4 5	1 2	1 2 3 4 5	______
1 2 3	1 2	1 2 3 4 5	______	1 2	1 2 3 4 5	1 2	1 2 3 4 5	______
1 2 3	1 2	1 2 3 4 5	______	1 2	1 2 3 4 5	1 2	1 2 3 4 5	______
1 2 3	1 2	1 2 3 4 5	______	1 2	1 2 3 4 5	1 2	1 2 3 4 5	______
1 2 3	1 2	1 2 3 4 5	______	1 2	1 2 3 4 5	1 2	1 2 3 4 5	______

Have you or any family member ever worked at a job or hobby or in any other manner, in which you came into direct contact with any of the following substances by breathing, touching, or direct exposure?

(List all that are appropriate, and list the appropriate person number, and the last date of exposure.)

01	Acids	30	Methylene Chloride
02	Alcohols	31	Moth Balls
03	Alkalis	32	Excessive Noise
04	Ammonia	33	Paint Stripper
05	Arsenic	34	Paint Thinner
06	Asbestos	35	PBB (Fireretardants)
07	Benzene	36	PCB
08	Berryllium	37	Perchloroethylene
09	Cadmium	38	Pesticides
10	Carbon Tetrachloride	39	Phenol
11	Chlorinated Naphathalenes	40	Phosgene
12	Chloroform	41	Pyridine
13	Chloroprene	42	Picoline
14	Chromates	43	Padiation
15	Coal Dust	44	Rock Dust
16	Creosote	45	Silica Powder
17	Dichlorobenzene	46	Styrene
18	Dry Cleaning Fluid	47	Talc
19	Ethylene Dibromide	48	Toluene
20	Ethylene Dichloride	49	Trichloroethylene
21	Fiberglas	50	Trinitrotoluene
22	Fireretardants	51	Turpentine
23	Halothane	52	Vibration
24	Excessive Heat	53	Vinyl Chloride
25	Isocyanates	54	Welding Fumes
26	Keytones	55	Wood Preservatives
27	Lead	56	X-Rays
28	Manganese	57	Doesn't Remember
29	Mercury	58	Denies Using Any

Per. #	Substance #	Date of Last Exposure
__ __	__ __	__ __ / __ __ / __ __
__ __	__ __	__ __ / __ __ / __ __
__ __	__ __	__ __ / __ __ / __ __
__ __	__ __	__ __ / __ __ / __ __
__ __	__ __	__ __ / __ __ / __ __
__ __	__ __	__ __ / __ __ / __ __
__ __	__ __	__ __ / __ __ / __ __
__ __	__ __	__ __ / __ __ / __ __
__ __	__ __	__ __ / __ __ / __ __
__ __	__ __	__ __ / __ __ / __ __

SMOKING HISTORY

Have you or any member of your family ever smoked at least 100 cigarettes in your (his/her) life? 1 = Yes, 2 = No

Do you (does he/she) smoke now? 1 = Yes, 2 = No, 8 = Refused, 9 = Unknown

How long ago did you (he/she) quit smoking? (code year quit)

About how many cigarettes do you (does he/she) smoke a day? (code number of cigarettes per day)

How old were you (was he/she) when you began to smoke cigarettes (code age when began)

Per. No.	Smok.	Smoke Now	Year Quit	No. Smoked	Age Started
01	1 2	1 2 8 9	__ __	__ __	__ __
02	1 2	1 2 8 9	__ __	__ __	__ __
03	1 2	1 2 8 9	__ __	__ __	__ __
04	1 2	1 2 8 9	__ __	__ __	__ __
05	1 2	1 2 8 9	__ __	__ __	__ __
06	1 2	1 2 8 9	__ __	__ __	__ __
07	1 2	1 2 8 9	__ __	__ __	__ __
08	1 2	1 2 8 9	__ __	__ __	__ __
09	1 2	1 2 8 9	__ __	__ __	__ __
10	1 2	1 2 8 9	__ __	__ __	__ __

DRINKING HISTORY

Have you or any member of your family had any beer, wine, or liquor in the past 12 months? 1 - Yes, 2 = No, 8 = Refused, 9 = Unknown. If YES,

About how often do you (does he/she) drink beer, wine, or liquor?

1 = Less than once a month
2 = 1 - 3 times per month
3 = Once per week
4 = 2 - 5 times per week
5 = Daily
8 = Refused
9 = Unknown

When you (he/she) drinks, about how many drinks on average do you (does he/she) have at any one time?
(Consider one drink to be 1 can of beer, one 4 oz. glass of wine, or 1 oz. or hard liquor.) Code the actual number of drinks per setting.

Person Number	Drinks	How Often	# of Drinks
01	1 2 8 9	1 2 3 4 5 8 9	— —
02	1 2 8 9	1 2 3 4 5 8 9	— —
03	1 2 8 9	1 2 3 4 5 8 9	— —
04	1 2 8 9	1 2 3 4 5 8 9	— —
05	1 2 8 9	1 2 3 4 5 8 9	— —
06	1 2 8 9	1 2 3 4 5 8 9	— —
07	1 2 8 9	1 2 3 4 5 8 9	— —
08	1 2 8 9	1 2 3 4 5 8 9	— —
09	1 2 8 9	1 2 3 4 5 8 9	— —
10	1 2 8 9	1 2 3 4 5 8 9	— —

Does your family use a professional pesticide service for the inside of your home? 1 = Yes, 2 = No. If YES, how often do you use them?

Does your family have a professional lawn service such as Chem-Lawn? 1 = Yes, 2 = No. If YES, how often do you use them?

Do you or any other member of your family use pesticides (insecticides and/or herbicides) around your home or garden? 1 = Yes, 2 = No
If YES, how often do you use them?
If YES, which brands do you use? (Code in Person Number doing activity and brand used. Use one brand per line and repeat person number.)

Prof. Inside	How Often	Prof. Outside	How Often
1 2	1 2 3 4 5 8 9	1 2	1 2 3 4 5 6 7

Person Number	How Often	Brand
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____
— —	1 2 3 4 5 8 9	_____

1 = Less than once a month
2 = 1 - 3 times per month
3 = Once per week
4 = 2 - 5 times per week
5 = Daily
8 = Refused
9 = Unknown

Which of the following do you have in your home?

1 = Air Conditioner
2 = Air Purifier
3 = Water Purifier
4 = Humidifier
5 = Gas Stove
6 = Fireplace
7 = Water Softener
8 = Wood Stove
0 = None

Is your household currently on or serviced by Indianapolis City Water?
(1 = Yes, 2 = No)

If YES, were you formerly on well water? (1 = Yes, 2 = No)

If YES, when did you switch to city water?

If YES, do you still access to your well water? (1 = Yes, 2 = No)

If YES, do you continue to use this water for any of the following activities?
(1 = Yes, 2 = No)

Activities
1 = Washing your car
2 = Watering the grass or garden
3 = Drinking
4 = Bathing
5 = Cleaning up around the house
(i.e., washing down the driveway)
6 = Recreational

How Often
1 = Daily
2 = More often than once a week but not daily
3 = Once a week
4 = Once every 2 or 3 weeks
5 = Once a month
6 = Less than once a month but more than once a year
7 = Once a year or less
8 = Refused
9 = Unknown

City Water	Formerly Well	Year Switch	Still Have Access	Use	Activity	How Often
1 2	1 2	___ ___	1 2	1 2	1 2 3 4 5 6	1 2 3 4 5 6 7

MEDICAL HISTORY

Now I would like to ask you some questions about your and your family's medical history. Please tell me if you and any other member of your family has ever been diagnosed by a medical person or at a medical facility as having any of the following, or if you have had these symptoms but have not sought medical care for them.
(Code the response to the right of each question with the appropriate person number of the person with this symptom or problem. If they refuse to answer code 98, if unknown code 99. If no one in the family reports this problem code 97)

If YES to any question ask questions A - D

A: When were you (he/she) first diagnosed or first developed this problem?
B: If you recovered, when did the condition get better? (If the condition still exists, record 88 under the year ended. If the condition is controlled on medication or therapy, but the person still sees a medical person for follow-up of the condition, consider that the condition still exists.)
C: Were you seen by a medical person or facility for this problem? 1 = Yes, 2 = No
D: When were you last seen by a medical person for this?

CONDITION	Per. No.	Year Diagnosed	Year Ended	Seen By Physician	Date Last Seen By Med. Person Month / Year
High Blood Pressure	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
LIVER PROBLEMS					
A. Cirrhosis	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
B. Hepatitis	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
C. Fatty Liver	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
D. Other (specify)					
_____	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
URINARY PROBLEMS					
A. Kidney or Bladder Infections	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __
	____	__	__	1 2	__ __ / __ __

CONDITION	Per. No.	Year Diagnosed	Year Ended	Seen By Physician	Date Last Seen By Med. Person Month	Year
B. Blood In The Urine	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
C. Other (specify)	____	__ __	__ __	1 2	__ __	/ __ __
_____	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
SKIN PROBLEMS						
A. Psoriasis/Eczema	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
B. Dermatitis or other Skin Rash	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
C. Acne	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
D. Darkening of skin or nails other than suntan	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
E. Hives	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
F. Unusual growth or excess of body hair	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
G. Yellow Jaundice	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
I. Recurring Cysts	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __

CONDITION	Per. No.	Year Diagnosed	Year Ended	Seen By Physician	Date Last Seen By Med. Person Month	Year
BLOOD CONDITIONS						
A. Anemia/Low Blood Ct.	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
B. High Cholesterol	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
C. High Triglycerides	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
EYE PROBLEMS						
A. Cataracts	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
B. Eye Infections or Red Eye	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
C. Chronic Excessive eye discharge not due to infection	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
D. Swelling of upper eyelids lasting more than 1 month	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
E. Excessive watering of the eye(s)	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
F. Dimness of Vision	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
G. Blurred Vision	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
NERVOUS SYSTEM PROBLEMS						
A. Seizures, fits or Epilepsy	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
B. Stroke	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __
	____	__ __	__ __	1 2	__ __	/ __ __

	CONDITION	Per. No.	Year Diagnosed	Year Ended	Seen By Physician	Date Last Seen By Med. Person Month	Year
C.	Weakness or Paralysis in arms and legs	____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
D.	Tremors	____	__ __	__ __	1 2	__ __ /	
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
E.	Dizziness	____	__ __	__ __	1 2	__ __ /	
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
F.	Mental Illness	____	__ __	__ __	1 2	__ __ /	
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
G.	Chronic Memory Loss	____	__ __	__ __	1 2	__ __ /	
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
H.	Recent Personality or temperment changes	____	__ __	__ __	1 2	__ __ /	
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
I.	Feeling Anxious or nervous most of the time	____	__ __	__ __	1 2	__ __ /	
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
J.	Insomnia	____	__ __	__ __	1 2	__ __ /	
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
K.	Ringing In the Ears	____	__ __	__ __	1 2	__ __ /	
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
L.	Staggering gait or in-coordination	____	__ __	__ __	1 2	__ __ /	
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
M.	Excessive Drowsiness or sleepiness	____	__ __	__ __	1 2	__ __ /	
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __
		____	__ __	__ __	1 2	__ __ /	__ __

CONDITION	Per. No.	Year Diagnosed	Year Ended	Seen By Physician	Date Last Seen By Med. Person Month / Year
HEART PROBLEMS					
A. History of Heart Disease	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
B. Rapid Heart Rate	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
C. Angina/Chest Pain	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
D. Other (specify)	____	__ __	__ __	1 2	__ __ / __ __
_____	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
_____	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
HEADACHES					
(Persistent)	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
If person states type write in here	____	Type Stated - _____			
	____	Type Stated - _____			
	____	Type Stated - _____			
	____	Type Stated - _____			
	____	Type Stated - _____			

CONDITION	Per. No.	Year Diagnosed	Year Ended	Seen By Physician	Date Last Seen By Med. Person Month	Year
RESPIRATORY DISORDERS						
A. Chronic Bronchitis (persistent coughing of sputum lasting more than 1 month)	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
B. Asthma	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
C. Rapid Breathing	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
D. Other Chronic Breathing Disorders	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
GENERALIZED DISORDERS						
A. Swelling in hands and feet	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
B. Rapid Weight Loss	____	__ __	__ __	1 2	__ __ /	__ __ I
DIETING	____	__ __	__ __	1 2	__ __ /	__ __ I
ILLNESS	____	__ __	__ __	1 2	__ __ /	__ __ I
UNEXPLAINED	____	__ __	__ __	1 2	__ __ /	__ __ I
C. Immune Deficiencies or other immune disorders	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
D. Repeated or Markedly prolonged infections	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
E. Nausea, persistent	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
F. Vomiting, Persistent	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
G. Allergies (specify)	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __
	____	__ __	__ __	1 2	__ __ /	__ __

CONDITION	Per. No.	Year Diagnosed	Year Ended	Seen By Physician	Date Last Seen By Med. Person Month / Year
Diabetes	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
Thyroid Diseases	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
Ovarian Cysts	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
CANCER					
A. Solid Tumors	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
B. Leukemia	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
C. Lymphoma	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __
	____	__ __	__ __	1 2	__ __ / __ __

If yes to any of the Cancers, list type of tumor(s) and the age at diagnosis.

Are you or is any member of your family currently taking any medications or drugs? 1 = Yes, 2 = No
If YES, ask A - D. If NO, go on to the next question (Ask if they have the medication available for you to get information from the bottle. If not refer to the list of common medications.

A. What is the name of the medicine?
B. For what condition is the medicine taken?
C. (TO THE INTERVIEWER, did you confirm the name and the spelling of the medicine from the bottle or prescription? If YES, circle 1 for confirmed, if NO circle 2. Please use one medicine vial per line and repeat the person number.)

MEDICATION LIST

Medicine	Per. No.	Condition	Confirmed
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2
			1 2

Now I am going to ask you some questions about your ability to have children. If you feel uncomfortable answering any of them please tell me and I will skip to a different question or end the interview.

ASK ONLY FOR MALES OVER 20 YEARS OLD: REPRODUCTIVE HISTORY

A. Have you ever tried to father a child? (1 = Yes, 2 = No, 8 = Refused, 9 = Unknown)

B. To your knowledge, have you fathered a child? (1 = Yes, 2 = No)

C. Have you been told by a medical person that you have health problems which would prevent you from fathering a child?

D. Have you noticed any loss of sex drive in the past 2 years?

Person No.	Tried to Have a Child	Have Fathered a Child	Health Problem	Sex Drive
	1 2 8 9	1 2 8 9	1 2 8 9	1 2 8 9
— —	1 2 8 9	1 2 8 9	1 2 8 9	1 2 8 9
— —	1 2 8 9	1 2 8 9	1 2 8 9	1 2 8 9
— —	1 2 8 9	1 2 8 9	1 2 8 9	1 2 8 9
— —				

ASK ONLY FOR FEMALES 12 YEARS OF AGE OR OLDER

Have you had menstrual periods? (1 = Yes, 2 = No)
If YES, continue. If no, end the Interview.
Are your periods normal?

Are your periods more frequent or less frequent than once a month? (circle 1 = Yes, 2 = No, 8 = Refused, 9 = Unknown)

Person No.	Had Periods	Normal Periods	How Frequent
	1 2 8 9	1 2 8 9	1 2 8 9
— —	1 2 8 9	1 2 8 9	1 2 8 9
— —	1 2 8 9	1 2 8 9	1 2 8 9
— —	1 2 8 9	1 2 8 9	1 2 8 9
— —	1 2 8 9	1 2 8 9	1 2 8 9

ASK FOR EACH FEMALE OVER THE AGE OF 15

Have you ever tried to become pregnant? (1 = Yes, 2 = No, 8 = Refused, 0 = Unknown)

Did it take more than 1 year of active trying for you to become pregnant? (1 = Yes, 2 = No, 8 = Refused, 9 = Unknown)

When did this problem occur? (code specific years)

Have you ever been pregnant? (1 = Yes, 2 = No, 8 = Refused, 9 = Unknown)

Were you pregnant within the last 20 years? (1 = Yes, 2 = No, 8 = Refused, 9 = Unknown)

Are you currently pregnant? (1 = Yes, 2 = No, 8 = Refused, 9 = Unknown)

When is your due date? (Fill in dates)

Is this your first pregnancy? (code 1 = Yes, 2 = No, 8 = Refused, 9 = Unknown)

Person No.	Tried Preg.	Time Span	Year Prob.	Been Preg.	20 Yr. Preg.	Curr. Preg.	Due Date	First Preg.
__ __	1 2 8 9	1 2 8 9	__ __to__ __	1 2 8 9	1 2 8 9	1 2 8 9	__ __/__ __	1 2 8
__ __	1 2 8 9	1 2 8 9	__ __to__ __	1 2 8 9	1 2 8 9	1 2 8 9	__ __/__ __	1 2 8
__ __	1 2 8 9	1 2 8 9	__ __to__ __	1 2 8 9	1 2 8 9	1 2 8 9	__ __/__ __	1 2 8
__ __	1 2 8 9	1 2 8 9	__ __to__ __	1 2 8 9	1 2 8 9	1 2 8 9	__ __/__ __	1 2 8
__ __	1 2 8 9	1 2 8 9	__ __to__ __	1 2 8 9	1 2 8 9	1 2 8 9	__ __/__ __	1 2 8

Are you currently breast-feeding a baby? (1 = Yes, 2 = No, 8 = Refused, 9 = Unknown)

Person No.	Breast Feed
__ __	1 2 8 9
__ __	1 2 8 9
__ __	1 2 8 9
__ __	1 2 8 9
__ __	1 2 8 9

PLEASE GIVE THE FOLLOWING INFORMATION ON EACH PREGNANCY STARTING WITH THE FIRST

Person Number	Pregnancy Number	Outcome	Year Ended	Birthweight	Birth Defects
____	01	1 2 3 4 5 6	__ __	__ __ __ __	____
____	02	1 2 3 4 5 6	__ __	__ __ __ __	____
____	03	1 2 3 4 5 6	__ __	__ __ __ __	____
____	04	1 2 3 4 5 6	__ __	__ __ __ __	____
____	05	1 2 3 4 5 6	__ __	__ __ __ __	____
____	06	1 2 3 4 5 6	__ __	__ __ __ __	____
____	07	1 2 3 4 5 6	__ __	__ __ __ __	____
____	08	1 2 3 4 5 6	__ __	__ __ __ __	____
____	09	1 2 3 4 5 6	__ __	__ __ __ __	____
____	10	1 2 3 4 5 6	__ __	__ __ __ __	____
____	01	1 2 3 4 5 6	__ __	__ __ __ __	____
____	02	1 2 3 4 5 6	__ __	__ __ __ __	____
____	03	1 2 3 4 5 6	__ __	__ __ __ __	____
____	04	1 2 3 4 5 6	__ __	__ __ __ __	____
____	05	1 2 3 4 5 6	__ __	__ __ __ __	____
____	__ __	1 2 3 4 5 6	__ __	__ __ __ __	____
____	__ __	1 2 3 4 5 6	__ __	__ __ __ __	____
____	__ __	1 2 3 4 5 6	__ __	__ __ __ __	____
____	__ __	1 2 3 4 5 6	__ __	__ __ __ __	____
____	__ __	1 2 3 4 5 6	__ __	__ __ __ __	____
____	__ __	1 2 3 4 5 6	__ __	__ __ __ __	____
____	__ __	1 2 3 4 5 6	__ __	__ __ __ __	____
____	__ __	1 2 3 4 5 6	__ __	__ __ __ __	____
____	__ __	1 2 3 4 5 6	__ __	__ __ __ __	____
____	__ __	1 2 3 4 5 6	__ __	__ __ __ __	____

CODE PREGNANCY OUTCOME
1 = Normal Outcome
2 = Premature Livebirth
3 = Stillborn
4 = Miscarriage
5 = Therapeutic Abortion
6 = Other (specify)

Did the father of any of these children serve for the military in Vietnam? 1 = Yes, 2 = No. If YES list the child number and person number of the father and the number of years on this duty assignment.

Military	Child Number	Father Number	Years on Duty
1 2	__ __	__ __	From __ __ To __ __
	__ __	__ __	From __ __ To __ __
	__ __	__ __	From __ __ To __ __
	__ __	__ __	From __ __ To __ __
	__ __	__ __	From __ __ To __ __
	__ __	__ __	From __ __ To __ __

THIS ENDS THE INTERVIEW, THANK THE RESPONDENT FOR PARTICIPATING IN THIS STUDY.

EXAMPLES OF COMMON MEDICATIONS

A. Blood Pressure Medicines: hydrochlorthiazide, diruril, dyazide, aldomet, proranolol (inderal), guanethidine (ismelin), clonidine, lopressor, serpasil (reserpine), prazocin (minipress), lasix.

B. Antihistamines: benadryl, actifed, chlortrimeton, sinus decongestants (many over the counter brands), tacaryl, dimetapp, phenergan, vistaril, triaminic.

C. Heart Medicines: digoxin, lanoxin, quinidine, propranolol, nitro-glycerine cardilate, isordil, pronestyl, corgard.

D. Anticoagulants (blood thinners): heparin, coumadin.

E. Antibiotics: tetracycline, penicillin, ampicillin, gantrisin, sulfa drugs, septra, bactrim.

F. Steroids: cortisone, prednisone, prednisolone, hydrocortisone, aristocort, decadron, beclovent inhaler, vanceril inhaler.

G. Diabetes Pills or Insulin: orinase, idabenese, tolinase, dymelor.

H. Sleeping Pills: valium, dalmane, chloral hydrate, barbiturates, nembutal.

I. Birth Control Pills

J. Multiple Vitamin Supplements

K. Thyroid Medications: thyroid extract or tablets, synthroid, cytomel, proloid.

L. Sedatives of Tranquilizers

M. Radiation Therapy

N. Other (please specify)

O. Non-Prescription Drugs: Aspirin, Tylenol, Cough Medicines, Cold Capsules

INFORMED CONSENT STATEMENT

I understand that I am being asked to participate in a study of community health being conducted by the Indiana State Board of Health and the Marion County Health Department. The purpose of the study is to determine the possibility of persons in areas of Marion County being exposed to hazardous chemicals in the air or ground water. I understand that the study will be in the form of an interview during which information will be collected concerning my family's health history, occupations and other activities thought to be affected by exposure to a variety of hazardous materials. The interview will take 30 minutes to an hour.

I understand there are no risks to me or my family from participating in this study. No blood samples or other tests will be done. I understand that the study is designed to gather information and will not specifically benefit me.

I understand that my participation in the study is voluntary and that I may refuse to participate or decline to answer specific questions as I see fit. I also understand that I am free to withdraw my/my family's participation in the study, and that my refusal to participate or withdrawal from the study will not affect medical care or services ordinarily available to me or my family.

If I have any questions concerning this study I may call Mr. Gregory Steele, Chronic Disease Epidemiologist, Indiana State Board of Health, phone (317) 633-8554 or Mrs. Martha Bennington, Senior Nurse Epidemiologist, Marion County Health Department, phone (317) 633-9717.

I understand that all information gathered in this study will be protected in accordance with the 1974 Federal Privacy Act, and I have been assured that neither I nor any member of my family will be identified in any manner in reports of this study. I understand that my address and phone number will be kept confidential in a locked file and will be used only for contacting me to clarify my responses if necessary and to verify to the investigators that all families in the area have been contacted.

I have read this consent form and had opportunities to ask questions concerning the study. I agree to participate in the study by being interviewed.

_____ _____

Participant Signature *Interviewer Signature*

_____

Date