

**Health screening profile of a community near the Escambia Wood Treatment Co.  
Superfund site in Pensacola, FL.**

Deeya A. Davis<sup>1</sup>, Patricia A. Wilson<sup>1</sup>, and John J. Lanza<sup>1</sup>

<sup>1</sup> Florida Department of Health Escambia County Health Department, 1295 W. Fairfield Drive  
Pensacola, FL 32501

## INTRODUCTION

Between December 2002 and May 2004, the Florida Department of Health, Escambia County Health Department (ECHD), in conjunction with the University of West Florida and the University of South Florida, conducted a toxicological health study of 228 persons who had been potentially exposed to chemical contaminants at the Escambia Wood Treatment Co. (ETC) Superfund site in Pensacola, FL. Contamination at the ETC site arose primarily from the use of creosote and pentachlorophenol (PCP), and the primary contaminants of concern at the site include dioxin (by-product associated with PCP), arsenic, lead, and benzo(a)pyrene. As described previously, the targeted population included residents from the neighborhood surrounding the ETC site and former workers of the plant and their family members.

A preliminary census and study, the Community Environmental Health Project (CEHP), a State of Florida-funded collaboration between the ECHD and Citizens Against Toxic Exposure (CATE), was initiated in 2000 and identified eligible workers/residents of the focus area. These eligible citizens were invited to participate in a health screening, which included a health and exposure history/survey, routine blood and urine analysis, and a screening chest x-ray for clients >39 years old. Two-hundred twenty-eight of these initial participants were subsequently invited to participate in an additional study (Partnership for Environmental Research and Community Health; PERCH) funded by the Centers for Disease Control and Prevention (CDC), which included a physical exam conducted by a physician and blood sampling for analysis of contaminant profiles. In the present report, we describe the health screening profile of these 228 participants (ETC cohort). The results of the contaminant screening are presented separately.

## METHODS

The initial health screening and survey of the PERCH participants was conducted under the CEHP. During the CEHP project, participants were queried about their medical history using a fixed panel of questions (see Appendix A). These questions investigated demographics, exposure history, and health conditions such as cancer, hypertension, diabetes, alcohol usage, and smoking history, among others. Blood and urine specimens were collected for routine tests (Complete Metabolic Profile, lipid panel, thyroid panel, Complete Blood Count with differential, urinalysis, hepatitis panel, and prostate specific antigen) and analyzed by a commercial laboratory, Laboratory Corporation of America (Labcorp, Pensacola, FL). These data were provided to physicians affiliated with the PERCH study who reviewed these data and performed additional physical examinations on the 228 PERCH participants.

## RESULTS

Demographics of the 228 PERCH participants are summarized in Table 1. The majority of the participants were African-American, closely reflecting national census data for the neighborhood surrounding the ETC site (ATSDR, 1995). Participant age ranged from 14 to 88 years (mean = 57 years) and length of exposure ranged from 1 to 69 years (mean= 21.0 years).

**Table 1. Demographic profile of the 228 participants in the present study.**

Characteristic	# of Participants	% of Participants
Race		
Caucasian	26	11.4%
African American	202	88.6%
Gender		
Female	137	60.1%
Male	91	39.9%
Length of Exposure (years)		
< 10	56	24.6%
11-20	72	31.6%
21-30	46	20.2%
31-40	34	14.9%
41-50	10	4.4%
>50	10	4.4%
Age (years)		
<20	8	3.5%
20-40	22	9.6%
41-60	96	42.1%
>60	102	44.7%
Client Qualification		
Worker	27	11.8%
Resident / Family member of worker	201	88.2%

*Cancer.* Cancer is the second leading cause of death in the United States. More than 500,000 Americans die of cancer each year, and twice that number are newly diagnosed with cancer annually. The most common cancers in the U. S. are lung, breast, colon, prostate, and skin. The National Cancer Institute, Cancer Control & Population Sciences, estimates that as of January 1, 2001 there are 9.8 million cancer survivors, which represents 3.5% of the population (NCI, 2004). In the ETC cohort, 29 participants initially reported a previous diagnosis of cancer. Three additional cases were identified during the current investigation. Thus, the cancer

prevalence in the ETC population was 14%. Table 2 presents a demographic breakdown of the cancer cases in the ETC cohort, and Table 3 delineates the types of cancers that were reported. Three of the participants reported more than one type of cancer. The proportion of most cancer types in the ETC cohort was similar to that reported nationally, with the exception of prostate and uterine/cervical. Florida-specific prevalence data are not available.

*Diabetes.* Diabetes mellitus is a chronic metabolic disorder marked by hyperglycemia

**Table 2. Demographic profile of cancer cases in the ETC cohort.**

Group	No. of Cases	Sample size	% of subgroup
Caucasian	13	26	50.0%
African American	19	202	9.4%
Male	16	91	17.6%
Female	16	137	11.7%
Workers	10	27	37.0%
Residents	22	201	10.9%

**Table 3. Types of cancer reported in the ETC cohort. U.S. data were obtained from the National Cancer Institute (NCI, 2004).**

Cancer Type	PERCH Cohort		U.S. data
	No. of Cases	% of Cases	% of cases
Uterine/Cervical	5	15.6%	10% (gynecologic)
Soft Tissue	1	3.1%	NA
Breast	7	21.9%	22%
Skin	10	31.3%	NA
Prostate	9	28.1%	17%
Leukemia	1	3.1%	7% (hematologic)
Lung	2	6.3%	4%

(Venes and Thomas, 1997). The National Center for Chronic Disease Prevention and Health Promotion at the CDC found that in 2003, 7.2% of adults nationwide and 8.5% of adult Floridians reported being diagnosed with diabetes. The National Diabetes Information Clearinghouse at the National Institutes of Health (NIH) reported that in 2002, the prevalence of diabetes among those aged 20–39 years was 2.2%, among those aged 40–59 years the prevalence was 9.7%, and among those aged 60 years and older, 18.3% (NIDDKD 2003). In those aged 20 and older, the prevalence among whites was 8.4% and among African-Americans 11.4%. In comparison, of the 228 participants in the PERCH study, 48 (21.1%) reported a previous diagnosis of diabetes. Of the 48 affirmative reports of diabetes, four were previous employees of the Superfund site companies and the rest were residents of the adjacent neighborhoods.

Commonly, members of the general population may be unaware of diseases they have and, thus, do not report their occurrence. Therefore, to better estimate the actual number of individuals that were diabetic in the ETC cohort, fasting blood glucose levels were measured on two occasions. The American Diabetes Association recommends the following screening levels for a fasting blood glucose test: 70 to 99 mg/dL (3.9 to 5.4 mmol/L) -normal glucose tolerance, 100 to 125 mg/dL (5.5 to 6.9 mmol/L) - impaired fasting glucose (pre-diabetes), 126 mg/dL (7.0 mmol/L) and above - probable diabetes. Of the 228 participants, 101 clients exhibited impaired fasting blood glucose level (100 to 125 mg/dL) on at least one occasion, and 55 clients had a blood glucose level  $\geq 126$  on at least one occasion. A demographic breakdown of these data is presented in Table 4.

**Table 4. Prevalence of elevated blood glucose levels in the ETC cohort.**

Group (Sample size)	70 to 99 mg/dL*	100 to 125 mg/dL**	126 mg/d & above**
All clients (228)	92 (40%)	103 (45%)	55 (24%)
African Americans (202)	83 (41%)	88 (44%)	51 (25%)
Caucasians (26)	9 (35%)	15 (58%)	4 (15%)
Females (137)	60 (44%)	57 (42%)	33 (24%)
Males (91)	32 (35%)	46 (51%)	22 (24%)
Workers (27)	11 (41%)	12 (44%)	5 (19%)
Residents (201)	81 (40%)	91 (45%)	50 (25%)

\* Number of people for whom both readings were in this range.

\*\* Number of people for whom at least one reading was in this range.

Diabetes can be controlled and treated by implementing healthy lifestyle changes (weight loss, balanced diet, exercise) and/or utilizing medications such as insulin or hypoglycemic drugs. Diet and weight control are frequently prescribed to newly diagnosed patients, before resorting to medication therapy. In the ETC cohort, 38 of the 228 (16.7%) participants reported taking medication to lower their blood sugar and control their diabetes: 18.8% of African Americans (38), 0.0% of Caucasians (0), 16.1% of females (22), 17.6% of males (16), 14.8% of workers (4), and 16.9% of residents (34) reported use of medication for diabetes treatment.

*Hypertension.* Hypertension (HTN) is defined as a condition in which the blood pressure (BP) is higher than 140 mm Hg systolic or 90 mm Hg diastolic on three separate readings recorded several weeks apart (Venes and Thomas, 1997). During the initial screening phase of the study, all PERCH participants were asked if they had been previously diagnosed with HTN or high blood pressure. Of the 228 total participants, 133 clients answered affirmatively (58.3%). Nationwide prevalence for a person being told that they have high blood pressure was 24.8% in

2003, with 25.8% of whites and 31.4% of African Americans reporting a diagnosis (CDC, 2003a). In Florida, the prevalence of hypertension was 26.5% in 2002, with 27.9% of whites and 33.3% of African Americans reporting a diagnosis of hypertension (CDC, 2003a). In 2002, 25.9% of females and 27.2% of males in Florida reported hypertension (CDC, 2003a). Table 5 summarizes the demographic profile of hypertension in the ETC cohort.

**Table 5. Prevalence of reported hypertension in the ETC cohort.**

Group	Sample Size	# Reported	Percent
African Americans	202	119	58.9%
Caucasians	26	14	53.8%
Females	137	78	56.9%
Males	91	55	60.4%
Workers	27	23	85.2%
Residents	201	110	54.7%

In addition to the self-reported hypertension data that were collected, each participant had their blood pressure checked at least twice during the study. Over the course of the study, 116 of the 228 clients exhibited a high blood pressure reading (>140 mm Hg systolic and/or at >90 mm Hg diastolic) on at least one occasion (50.9%) and 44 clients in the ETC cohort exhibited elevated BP at both screenings (19.3%). Table 6 summarizes the demographic profile of the 44 clients that exhibited elevated BP on both occasions.

**Table 6. Demographic profile of participants with elevated BP on both occasions (n=44).**

Group	Sample Size	# Reported	Percent
African Americans	202	38	18.8%
Caucasians	26	6	23.1%
Females	137	20	14.6%
Males	91	24	26.4%
Workers	27	13	48.1%
Residents	201	31	15.4%

Hypertension can be controlled and treated by implementing healthy lifestyle changes (weight loss, balanced diet, exercise) and/or medication such as antihypertensive drugs. In the ETC cohort, 116 of the 228 (50.9%) participants reported being prescribed antihypertensive medications by their physician: 52.0% of African Americans (105), 42.3% of Caucasians (11), 51.8% of females (71), 49.5% of males (45), 70.4% of workers (19), and 48.3% of residents (97).

*Hepatitis / Liver Disease.* According to data collected by the Florida Hepatitis and Liver Failure Prevention and Control Program and the Florida Department of Health, hepatitis A is the most common form of acute viral hepatitis in the United States, and it is one of the 10 most commonly reported infectious diseases in the U.S (Katz, 1999). The CDC reports that 33%,

**Table 7. Prevalence of hepatitis A, B, and C in the ETC cohort.**

Group	Sample size	Hepatitis A		Hepatitis B		Hepatitis C	
		# Infected	% Infected	# Infected	% Infected	# Infected	% Infected
All clients	228	153	67.1%	42	18.4%	13	5.7%
African Americans	202	141	69.8%	42	20.8%	13	6.4%
Caucasians	26	12	46.2%	0	0.0%	0	0.0%
Females	137	93	67.9%	27	19.7%	5	3.6%
Males	91	60	65.9%	15	16.5%	8	8.8%
Workers	27	20	74.1%	2	7.4%	0	0.0%
Residents	201	133	66.2%	40	19.9%	13	6.5%

4.9%, and 1.8% of the US population has been infected with hepatitis A, B, and C, respectively (CDC, 2004b). During the initial health screening of the CATE/CEHP program, PERCH clients were screened with a hepatitis panel, including hepatitis A antibody, hepatitis B core antibody, and hepatitis C antibody. The results of the screen indicate that the prevalence of infection for all hepatitis strains was higher in the ETC cohort than observed nationally. Table 7 summarizes hepatitis A, B, and C prevalence data collected during the current study.

Hepatitis B (formerly know as serum hepatitis) is a fairly common liver disease that is caused by a virus spread through contact with infected body fluids. A curative therapy for acute hepatitis B infection has not yet been identified, although several drugs have exhibited limited efficacy in treating chronic infection (Janowski, 2000). Management of chronic infection includes screening for development of liver disease and treatment of ensuing symptoms.

Approximately 10 percent of infected people may become long-term carriers of the virus (Janowski, 2000). The hepatitis C virus (HCV) typically produces a liver infection that may eventually cause severe liver disease, including liver cancer and cirrhosis. Most people who become infected are unaware that they have the disease. The disease progress is slow - within 20 to 30 years after infection, up to 20% of those with chronic hepatitis C will develop cirrhosis, and up to 5% will develop liver cancer (Katz, 2000). Based on national estimates, approximately 220,000 Floridians are chronically infected with the hepatitis C virus, and approximately 2,000 new cases occur each year in Florida (Katz, 2000). HCV is the most common chronic blood-borne infection in the United States.

In addition to the hepatitis blood tests, ETC participants also received a panel of tests to determine liver status. Clients received a laboratory test for AST (aspartate aminotransferase), ALT (alanine aminotransferase), and GGT (gamma glutamyl transferase). AST and ALT are intracellular enzymes that are involved in amino acid and carbohydrate metabolism (Venes and Thomas, 1997). These enzymes may be elevated in any condition that involves liver cell injury, such as cirrhosis, hepatitis, Reye syndrome, and hemochromatosis (Vaughn, 1999). Other factors, such as alcohol ingestion and medication use (acetaminophen, hypolipidemics, heparin) can also raise the enzyme levels. GGT is also an enzyme that regulates amino acid transport, and this test is often used in conjunction with AST and ALT when evaluating hepatic status. GGT elevations can occur with cirrhosis, alcoholism, chronic hepatitis, cancer, lupus, and medication use (Vaughn, 1999). The analytical facility, Labcorp, considers AST and ALT to be elevated at >40 IU/L and GGT to be elevated at >65 IU/L. Elevated AST was observed in 17 PERCH clients

**Table 8. Demographic profile of ETC participants with elevated levels of AST, ALT, and GGT.**

Group	Sample size	AST>40 (%)	ALT>40 (%)	GGT>60 (%)
All clients	228	17 (7.5%)	27 (11.8%)	37 (16.2%)
African Americans	202	15 (7.4%)	23 (11.4%)	34 (16.8%)
Caucasians	26	2 (7.7%)	4 (15.4%)	3 (11.5%)
Females	137	6 (4.4%)	8 (5.8%)	12 (8.8%)
Males	91	11 (12.1%)	19 (20.9%)	25 (27.5%)
Workers	27	2 (7.4%)	4 (14.8%)	3 (11.1%)
Residents	201	15 (7.5%)	23 (11.4%)	34 (16.9%)

(7.5%) and elevated ALT was observed in 27 clients (11.8%). Likewise, 37 participants (16.2%)

exhibited elevated GGT. Table 8 summarizes the demographic profile of participants with elevated liver function tests.

*Renal Function.* Blood urea nitrogen (BUN) is defined as nitrogen in the blood in the form of urea, the metabolic product of the breakdown of amino acids used for energy production (Venes and Thomas, 1997). The level of BUN provides a rough estimate of kidney function. BUN levels may be increased in response to dehydration, decreased renal functioning, upper gastrointestinal bleeding, or treatment with drugs such as steroids or tetracyclines (Venes and Thomas, 1997). Creatinine, is the decomposition product of phospho-creatine metabolism, a source of energy for muscle contraction (Venes and Thomas, 1997). Although it is a normal, alkaline constituent of urine and blood, increased creatinine levels are observed in advanced stages of renal disease. Major causes of decreased renal functioning are hypertension, diabetes and hyperlipidemia (Uphold and Graham, 1998).

Most clinicians prefer a single creatinine/BUN test to assess renal function and the combined usage of BUN and creatinine (BUN/creatinine ratio) may provide a better understanding of a patient's prognosis (Vaughn, 1999). A consistent increase in the BUN/creatinine ratio suggests deteriorating renal function. Rapid changes suggest acute illness or exacerbation of a chronic disorder and reduction may indicate improvement. Therefore, the BUN/creatinine ratio is best used in comparison to previous BUN/creatinine ratio tests. Laboratory reference ranges, considered normal in the present study, were as follows: BUN 5-26 mg/dl, creatinine 0.5-1.5 mg/dl, and BUN/creatinine ratio 8-27.

Out of 228 ETC participants, 213 exhibited creatinine levels within normal limits and 15 participants exhibited elevated creatinine levels (1.6-7.4 mg/dl). Table 9 summarizes the demographics of the 15 clients with elevated creatinine. One participant with elevated creatinine

(1.8 mg/dl) was diagnosed with possible nephritis, a second participant (3.6 mg/dl) reported a kidney transplant, and the client with the highest creatinine level (7.4 mg/dl) was assessed with renal insufficiency. The most common cause of renal insufficiency is associated with diabetes. Most studies have not shown any direct correlation between renal disease and dioxin exposure

**Table 9. Demographic profile of ETC participants with elevated creatinine levels.**

Group	Sample size	# Elevated	Percent
All clients	228	15	6.6%
African Americans	202	15	7.4%
Caucasians	26	0	0.0%
Females	137	6	4.4%
Males	91	9	9.9%
Workers	27	3	11.1%
Residents	201	12	6.0%

(ATSDR, 1998).

*Anemia.* The term “anemia” generally refers to a reduction of hemoglobin, hematocrit and the number of red cells (erythrocytes) to below normal levels (Vaughn, 1999). The presence of anemia usually suggests an underlying pathophysiologic process, although a definitive diagnosis can be difficult because of the numerous possible etiologies that result in anemia. A red blood cell (RBC) is a cellular component of blood that delivers oxygen to the body (Venes and Thomas, 1997). Hemoglobin (HGB) is the iron-containing pigment of the RBC that carries oxygen and hematocrit (HCT) is a term used to describe the volume of RBC’s in a given volume

of blood (Venes and Thomas, 1997). The actual levels of each component are important for diagnosing anemia. Low red blood cell counts, hematocrit, or hemoglobin tests indicate that the blood does not contain enough healthy red blood cells, and this leads to an inability to supply the body with enough oxygen.

Of the 228 ETC participants, 46 individuals reported having a history of anemia. During the initial CATE/CEHP screening phase, the ETC clients were tested for RBCs, HGB, and HCT. Table 10 summarizes the data gathered from the lab tests. The thresholds for low RBC were  $<3.8 \times 10^6/\mu\text{l}$  in females and  $<4.1 \times 10^6/\mu\text{l}$  in males, for low HGB  $<11.5 \text{ g/dL}$  in females and  $<12.5 \text{ g/dl}$  in males, and for low HCT  $<34\%$  in females and  $<36\%$  in males. The worldwide most common cause of anemia is low body iron status.

**Table 10. Demographic profiles of participants with low RBC, HGB, and HCT.**

Group	Sample size	Low RBC		Low HGB		Low HCT	
		No.	%	No.	%	No.	%
All clients	228	27	11.8%	32	14.0%	18	7.9%
African Americans	202	25	12.4%	31	15.3%	17	8.4%
Caucasians	26	2	7.7%	1	3.8%	1	3.8%
Females	137	14	10.2%	21	15.3%	13	9.5%
Males	91	13	14.3%	11	12.1%	5	5.5%
Workers	27	3	11.1%	2	7.4%	1	3.7%
Residents	201	24	11.9%	30	14.9%	17	8.5%

*Chest X-ray.* During the course of the CATE/CEHP and PERCH studies, participants were offered a chest x-ray (CXR) for screening purposes and to obtain more information concerning the health status of an individual's heart and lungs. CXR's were ordered for every participant over forty years of age and for younger clients with a history of lung disease or lung

disease risk factors (e.g. smoking history or asbestos exposure). The CXR's were performed at the Imaging Center of Pensacola. Because each client was responsible for having the CXR performed at a separate time and location from the ECHD health screening appointments, not every client for whom a CXR was ordered actually followed through with the test. A CXR was ordered for 202 of the 228 clients although only 185 ETC participants had the CXR performed. This group included 160 African Americans and 25 Caucasians, 107 females and 78 males, 26 workers and 159 residents. The following summarizes the CXR readings:

- 44 reports (23.8%) were normal, negative, or indicated no abnormalities.
- 84 reports (45.4%) noted that there was no “acute” or “active” disease/pathology.
- 20 reports (10.8%) showed evidence of COPD/chronic lung disease or suspected COPD.
- 38 reports (20.5%) revealed an enlarged heart, referred to as “hypertrophy,” “cardiomegaly,” or “cardiac enlargement.”
- 9 reports (4.9%) revealed a “possible” mass or nodule
- 2 reports (1.1%) stated that there was a definite mass/nodule apparent on the image.
- 1 report (0.5%) stated that the x-ray showed “pulmonary venous hypertension.”
- 1 report (0.5%) noted that the lungs showed “minimal atelectasis.”

Many reports indicated more than one diagnosis for an individual. For instance, a client could have both an enlarged heart and evidence of COPD, which accounts for the 199 CXR conclusions from only 185 participant reports. As shown in the above summaries, 71 of the 185 participants were found to have an “other than normal, negative, or nothing acute” reading. Table 11 summarizes the results for these 71 individuals.

**Table 11. Demographic profile of participants diagnosed with various CXR abnormalities.**

CXR Abnormality	African American n=160		Caucasian n=25		Female n=107		Male n=78		Worker n=26		Resident n=159	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
COPD/ chronic lung disease/ suspected COPD	15	9.4%	5	20.0%	7	6.5%	13	16.7%	5	19.2%	15	9.4%
cardiac enlargement/ hypertrophy/ cardiomegaly	34	21.3%	4	16.0%	24	22.4%	14	17.9%	8	30.8%	30	18.9%
possible or definite mass/nodule	7	4.4%	4	16.0%	6	5.6%	5	6.4%	2	7.7%	9	5.7%
pulmonary venous hypertension	1	0.6%	0	0.0%	1	0.9%	0	0.0%	0	0.0%	1	0.6%
atelectasis	1	0.6%	0	0.0%	0	0.0%	1	1.3%	0	0.0%	1	0.6%

*Lifestyle.* Many lifestyle factors can affect the health of an individual and can impact existing diseases. During the CATE/CEHP health screening and the PERCH study, clients were questioned about different lifestyle factors, and clients were weighed and measured to determine body mass index (BMI). Information was gathered regarding gender, race, height, weight, tobacco use, and alcohol consumption. According to the CDC, increases in BMI are often accompanied by increased risks for several diseases related to obesity. These include premature death, cardiovascular disease, high blood pressure, osteoarthritis, some cancers, and diabetes. BMI does not indicate that a disease is present, rather it is useful as a predictive factor for disease risk.

According to prevalence data from the CDC, 16.2% of adult Floridians in 2002 were advised by their physician to lose weight. In 2000, 11.7% of adults nationwide were instructed to reduce their weight. In 2002, 14.1% of men, 18.1% of women, 15.1% of Caucasians, and 21.0% of African Americans in Florida were advised to reduce their weight (CDC, 2003a). Normal BMI ranges from 18.5 to 24.9, BMI between 25.0 and 29.9 signifies that a person is overweight, and a BMI  $\geq$  30.0 indicates obesity. Among the participants in the PERCH study, 36 out of 228 clients

**Table 12. Demographic profile of ETC participants classified as overweight or obese.**

Group	Sample size	# Overweight	Percent	# Obese	Percent
All clients	228	83	36.4%	109	47.8%
African Americans	202	70	34.7%	99	49.0%
Caucasians	26	13	50.0%	10	38.5%
Females	137	41	29.9%	72	52.6%
Males	91	42	46.2%	37	40.7%
Workers	27	10	37.0%	14	51.9%
Residents	201	73	36.6%	95	47.3%
Age Groups					
18-44	44	14	31.8%	20	45.5%
45-64	97	30	30.9%	53	54.6%
65+	82	39	47.6%	36	43.9%

(15.8%) had a BMI within the normal range, 83 clients (36.4%) were classified as overweight, and 47.8% of ETC participants (109) were classified as obese. Nationally, 34% of adults are classified as overweight and 30% are classified as obese (CDC, 2003b). In Escambia County in 2002, 32.6% of the population was considered overweight and 25% was classified as obese (FDOH, 2003). The prevalence of these classifications generally increases with age. Table 12 summarizes BMI data gathered from the ETC participants who were considered either overweight or obese.

According to the U.S. Surgeon General, smoking has negative health impacts on people at all stages of life (U.S. Surgeon General, 2004). Smoking is known to harm unborn babies, infants, children, adolescents, adults, and seniors. The Surgeon General's report states the following facts:

- In 2001, chronic obstructive pulmonary disease (COPD) was the fourth leading cause of death in the United States, resulting in more than 118,000 deaths. More than 90% of these deaths were attributed to smoking.
- According to the American Cancer Society's second Cancer Prevention Study, female smokers were nearly 13 times as likely to die from COPD as women who had never smoked. Male smokers were nearly 12 times as likely to die from COPD as men who had never smoked.
- Smoking damages airways and alveoli of the lung, eventually leading to COPD.
- Smokers are more likely than nonsmokers to have upper and lower respiratory tract infections, perhaps because smoking suppresses immune function.
- In general, smokers' lung function declines faster than that of nonsmokers.

The CDC reported that in 2002, 23.0% of adults nationwide smoked cigarettes. In the same year, 22.0% of adult Floridians reported cigarette use: 23.4% of Caucasian adults, 17.5% of African American adults, 23.5% of men, and 20.7% of women were smokers(CDC, 2003a). During the PERCH study, information was gathered regarding tobacco use among the participants. Active tobacco use (cigars, cigarettes, or smokeless tobacco) was reported by 52 ETC participants (22.8%). The remaining 176 clients (77.2%) were not using tobacco at the time of the screening: 85 clients (37.3%) had never used tobacco and 91 clients (39.9%) used tobacco at one time, but had quit. Table 13 summarizes the data gathered regarding active tobacco use in the ETC cohort.

**Table 13. Demographic prevalence of active smokers in the ETC cohort.**

Group	Sample size	Active Smokers	Percent
All clients	228	52	22.8%
African Americans	202	47	23.3%
Caucasians	26	5	19.2%
Females	137	24	17.5%
Males	91	28	30.8%
Workers	27	8	29.6%
Residents	201	44	21.9%

The CDC's National Center for Chronic Disease Prevention and Health Promotion has reported that approximately 85,000 deaths in 2000 were attributable to either excessive or risky drinking in the U.S., making alcohol the third leading actual cause of death (CDC, 2004a). Heavy alcohol consumption is the cause of approximately 40% of the deaths from unspecified liver disease in the United States. Additionally, several cancers have been linked to excessive alcohol consumption including oral-pharyngeal, esophageal, prostate, liver, and breast. In general, the risk of cancer increases with increasing amounts of alcohol consumption. Compared to non-drinkers, women who consume an average of 1 alcoholic drink per day increase their risk of breast cancer by approximately 7% (CDC, 2004a). Women who consume an average of 2 to 5 drinks per day increase their risk of developing breast cancer by approximately 50% compared to that of non-drinkers (CDC, 2004a).

According to the CDC's prevalence data, 58.8% of adults nationwide in 2003 reported that they had at least one drink of alcohol in the previous 30 days (CDC, 2004a). In Florida, the 2003 prevalence was 57.5%. For adult Floridians, 65.0% of males, 50.6% of females, 61.4% of

Caucasian adults, and 41.6% of African Americans reported drinking alcohol within the previous 30 days (CDC, 2003a). In the ETC population, 18.4% of participants (42 of 228) reported drinking at least one alcoholic drink per week, 18 clients (7.9%) reported that they were drinkers at one time, but have quit, and the remaining 168 participants (73.7%) reported that they did not drink alcohol at all or did not drink at a level of at least one drink per week. Table 14 summarizes the data gathered from the ETC participants that drink at least one drink per week.

**Table 14. Profile of ETC participants who consumed at least one drink per week.**

Group	Sample size	# of Participants	Percent
All clients	228	42	18.4%
African Americans	202	38	18.8%
Caucasians	26	4	15.4%
Females	137	19	13.9%
Males	91	23	25.3%
Workers	27	8	29.6%
Residents	201	34	16.9%

*Physician Assessments.* After a PERCH participant completed the initial CATE/CEHP health screening and received the PERCH toxicological laboratory tests, the client was scheduled to return to the health department to meet with a physician. The purpose of this visit was for the physician to examine the client, to review the test results with the client, and to provide any necessary feedback or conclusions. Mostly, the physicians charted on these clients utilizing the standard SOAP note process, with “A” indicating the assessment portion of their notes, and with “P” indicating the plan or conclusion portion of the notes. The physicians spent approximately

40-50 minutes with each client, thoroughly examining and discussing outcomes with each client. The physicians answered questions that the client asked, as well as gave suggestions to the client regarding any current health problems or findings.

Many clients raised concerns about the results of their toxicological laboratory tests. The physicians not only discussed the toxicological test results with each client, but also reviewed the other screening laboratory tests with the participants. The physicians discussed elevated liver function tests, elevated renal function tests, elevated glucose, abnormal electrolyte levels, and positive hepatitis panels. Clients were instructed to follow-up with their personal physicians for re-checks or monitoring of the abnormal laboratory tests.

In the remainder of the physician's assessments, the doctors summarized or reiterated individual clinical diagnoses. The physicians discussed a diagnosis of hypertension and elevated BP with 104 clients. During the physical exam, the physicians made notes of 12 clients presenting with a heart murmur and six clients with an irregular heart rate. Other notes included previous diagnoses of CVA/stroke (n=7) and MI/heart attack (n=9). All of these clients were referred back to their primary care physician (PCPh) and/or a cardiologist for routine follow-up and treatment of these conditions. Many clients were instructed on the importance of compliance with their PCPh recommendations of frequent BP monitoring and medication administration.

With respect to neurological disorders, the physicians made note of and discussed the following diagnoses with clients: headaches/migraines (n=9); neurofibromatosis (n=1); seizure disorder (n=5); Parkinson's (n=1); peripheral neuropathy (n=1); and narcolepsy (n=1). These clients were instructed to follow-up with their PCPh as directed, and seven clients were referred to see a neurologist for further treatment. In 17 instances, the physicians discussed a participant's history of depression and/or anxiety. The physicians encouraged clients to discuss their mental

health with their PCPh; 14 clients were referred for counseling and/or to see a psychiatrist.

In discussing previous diagnoses of cancer with participants, the physicians documented that 10 clients had prostate cancer, 7 clients had breast cancer, 3 were diagnosed with skin cancer, 2 clients had lung cancer, and one client had uterine/cervical cancer. In concluding the client visit, the physicians stressed the importance of follow-up with the PCPh or cancer specialist for continued treatment and monitoring.

During the physical exams of the participants, the physicians performed a thorough inspection of the skin. The exam revealed no findings of chloracne. However, the following diagnoses were documented by the MDs: onychomycosis (n=8), xerosis (n=6), seborrheic keratosis (n=5), tinea in various locations (n=5), acne (n=3), psoriasis (n=3), rosacea (n=2), and eczema (n=2). The physicians educated clients regarding their specific skin disorder and encouraged appropriate use of medications for treatment. Clients were referred to their PCPh for continued follow-up for these conditions; 10 clients were referred to a dermatologist.

With regard to fertility status, a diagnosis of infertility was not made for any client following the physical exam by the physician. One of the physicians indicated that a client had a number of miscarriages (3), but she was not considered infertile.

The physicians discussed diagnoses of diabetes and obesity with the participants. Clients with diabetes were encouraged to follow a diabetic diet, and the physicians stressed the importance of compliance with their diabetic treatment regimen, i.e. oral medications to lower glucose and/or insulin. Clients were made aware of the necessity of receiving regular check-ups with their doctor for diabetes monitoring. The diabetics and the obese clients were both instructed to consume a healthy, balanced diet to achieve and maintain a desirable weight.

Lastly, the physicians discussed the importance of practicing preventive care to

encourage good health. The physicians encouraged the participants to follow up with their primary care physicians for routine annual exams (prostate screenings, mammograms, pap smears, and colonoscopies). Clients were instructed to live a healthy lifestyle, to include eating a balanced diet, exercising as indicated, taking medications as prescribed by their doctor, curtailing the use of tobacco, and reducing/ceasing the ingestion of alcohol.

## DISCUSSION

In the present evaluation of the 228 person ETC cohort, we found elevated prevalence of diabetes, hypertension, and hepatitis A, B, and C, relative to national levels. Obesity is a known risk factor for both diabetes and hypertension, and the prevalence of overweight and obese persons in the ETC cohort exceeded national averages. Thus, a major influence on the prevalence of these diseases in this group is likely related to excess weight. Nationally, among people diagnosed with type 2 (noninsulin-dependent) diabetes, 67% have a BMI  $\geq 27$  and 46% have a BMI  $\geq 30$  (NIDDKD, 2005). Of the 48 persons previously diagnosed as diabetic in the ETC cohort, 17 (52.1%) had a BMI  $\geq 25$  and  $< 30$  (overweight) and 29 (60.4%) had a BMI  $\geq 30$  (obese). Likewise, the age-adjusted prevalence of hypertension in overweight U.S. men is 22.1% for BMI  $> 25$  and  $< 27$ , 27.0% for BMI  $\geq 27$  and  $< 30$ , and 41.9% for BMI  $> 30$  (NIDDKD, 2005). In the ETC cohort, 25 of 55 hypertensive men (45.5%) had a BMI  $\geq 25$  but  $< 30$  and 24 had a BMI  $\geq 30$  (43.6%). For women, the prevalence of hypertension is 27.7% for BMI  $\geq 25$  and  $< 27$ , 32.7% for BMI  $\geq 27$  and  $< 30$ , and 37.8% for BMI  $> 30$  (NIDDKD, 2005). In comparison, of the 78 women classified as hypertensive in the ETC cohort, 20 (25.6%) had a BMI  $\geq 25$  but  $< 30$  and 47 (60.3%) had a BMI  $\geq 30$ .

The ATSDR has concluded that exposure to high concentrations of dioxin-like

compounds may induce long-term alteration in glucose metabolism (ATSDR, 1998). However, in a separate analysis of the toxicological profile of a subset of the ETC cohort, we did not find any significant relationships between the presence of diabetes and serum dioxin levels, although a correlation with serum dioxin-like PCB levels was found (Karouna-Renier et al., 2005). In contrast, the relationship between dioxin exposure and cardiovascular disease, including hypertension, is inconclusive (ATSDR, 1998). The toxicological profile analysis did identify a correlation between the presence of hypertension and dioxin levels in a subset of the ETC cohort (Karouna-Renier et al., 2005). However, the potential impact of being overweight and obese on disease prevalence in the PERCH cohort cannot be overlooked.

Although we found that the prevalence of hepatitis A, B, and C was higher in the ETC cohort than seen nationally among all races, the CDC has reported that the prevalence of these forms of hepatitis is higher in African-Americans than in whites (CDC, 2003c). For example, the rate of hepatitis C in blacks is 3.2% compared to 1.5% in whites. Likewise, the prevalence of antibodies against HBV core antigen (anti-HBc) is lowest among non-Hispanic Whites (2.6%), followed by Mexican-Americans (4.4%), and non-Hispanic Blacks (11.9%) (Kim et al., 2004). Anti-HAV prevalence is highest among Mexican-Americans (70%), compared with blacks (39%) and whites (23%) (CDC, 2005). However, analysis of hepatitis by race showed that the prevalence of hepatitis A, B, and C was higher in African-Americans in the ETC cohort than the corresponding national rates. Likewise, the prevalence of hepatitis A in whites in the ETC cohort was also higher than the national rate. A potential confounding factor in these analyses is the age of the ETC cohort (mean = 57 y). The prevalence of both hepatitis A and B has been shown to increase with age (CDC, 2003c), which may account at least in part, for the higher rates observed in the ETC cohort. Studies have shown mixed results regarding dioxins and their ability to affect

the immune system (ATSDR, 1998). Thus the effects of contaminant exposures on the immune response to viruses such as hepatitis A, B, and C are unclear.

Overall, the ETC population exhibited a higher prevalence rate of uterine/cervical and prostate cancer than national levels. However, the carcinogenic risk (the probability of developing cancer) depends on many factors and individuals may respond differently to similar exposures depending on their age, sex, nutritional status, overall health, and genetics. According to the American Cancer Society, environmental cancer risk factors may include smoking, diet, infectious diseases as well as chemicals, which cause an estimated three-quarters of all cancer deaths in the United States (American Cancer Society, 2003). The degree of risk from pollutants depends on the concentration, intensity, and the duration of the exposure. Substantial increases in risk have been shown in settings where workers have been exposed to high concentrations of certain chemicals, metals, and other substances. With widespread exposure, low doses of exposures may present a small risk to individuals but can still cause serious ill health across a population (American Cancer Society, 2003). Epidemiological studies of human exposure and cancer are difficult. The studies must depend on natural, not experimental, individual human exposures and consider a multitude of factors that may affect cancer prevalence in addition to the exposure under study (USDHHS, 2005). Dioxins, one of the contaminant types identified at the ETC site, have been associated with the occurrence of soft-tissue sarcomas, non-Hodgkin's lymphoma, and cancer of the respiratory tract (tracheal/bronchial/lung) (ATSDR, 1998). However, the small number of cases of each type of cancer in the present study limits any analysis or comparison by type. In light of these difficulties, we were unable to establish a direct link between the cancer prevalence and exposure to environmental contaminants from the ETC site. Overall, it appears that the ETC population suffers from the same diseases as do similar

populations in terms of demographics and lifestyle.

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