Air Toxics:
What you don't know CAN hurt you

Topics of Discussion

- Air toxics & why they matter
- How Jefferson County ranks among other counties in the country
- The major sources of industrial air toxics in Jefferson Co.
- Upset events & their impacts
- The consequences of air toxics & upsets

What are Air Toxics?

Air Toxics are the 188 Hazardous air pollutants (HAPs) identified by the Clean Air Act known or suspected to cause cancer or other serious health effects

Sources & Reporting of Air Toxics

- Industrial facilities
  - Regular operations
  - Fugitive vs. Point Source (stack emissions)
  - Upset events
- US EPA Toxic Release Inventory (TRI)
- TCEQ Emission Event Database

Why Care about Air Toxics?

- Carcinogens
- Developmental Toxicants
- Reproductive Toxicants
- Cardiovascular or Blood Toxicants
- Endocrine Toxicants
- Gastrointestinal or Liver Toxicants
- Immunotoxicants
- Kidney Toxicants
- Musculoskeletal Toxicants
- Neurotoxicants
- Respiratory Toxicants
- Skin or Sense Organ Toxicants

Air Toxics Released in the Largest Amount in Jefferson County

Known & Suspected Health Effects of Air Toxics Released in the Highest Amounts from Fugitive & Point Source Air Releases						
Top Air Toxics Released	Total Air Releases	Carcinogen	Developmental Toxicant	Neurotoxicant	Reproductive Toxicant	Respiratory Toxicant
N-Hexane	1,896,297			■		■
Toluene	839,436		■	■		■
Styrene	272,617			■		■
1,3-Butadiene	250,746	■	■	■	■	■
Benzene	244,868	■	■	■	■	■
Xylene	156,268			■		■
Methanol	110,420			■		■

Source: US EPA 2005 Toxic Release Inventory, released March 2007, and US PIRG report “Toxic Pollution and Health,” March 2007

How Does Jefferson Co. Rank?
U.S. Rankings, Chemical Releases

Health Effects	U.S. Rank Jefferson County	Total 2004 Air & Water Releases (pounds)	U.S. Rank Texas	Total 2004 Air & Water Releases (pounds)
Carcinogens	**5th**	927,624	**#1**	10,619,097
Developmental Toxicants	**8th**	1,390,937	**#2**	9,306,377
Reproductive Toxicants	**8th**	588,806	**#2**	4,856,026
Neurotoxicants	**8th**	7,089,354	**#1**	76,217,308
Respiratory Toxicants (Air only)	**29th**	8,112,647	**#4**	89,551,196

Amounts: U.S. EPA Toxic Release Inventory, 2004. Analysis: “Toxic Pollution and Health,” U.S. PIRG, March 2007.

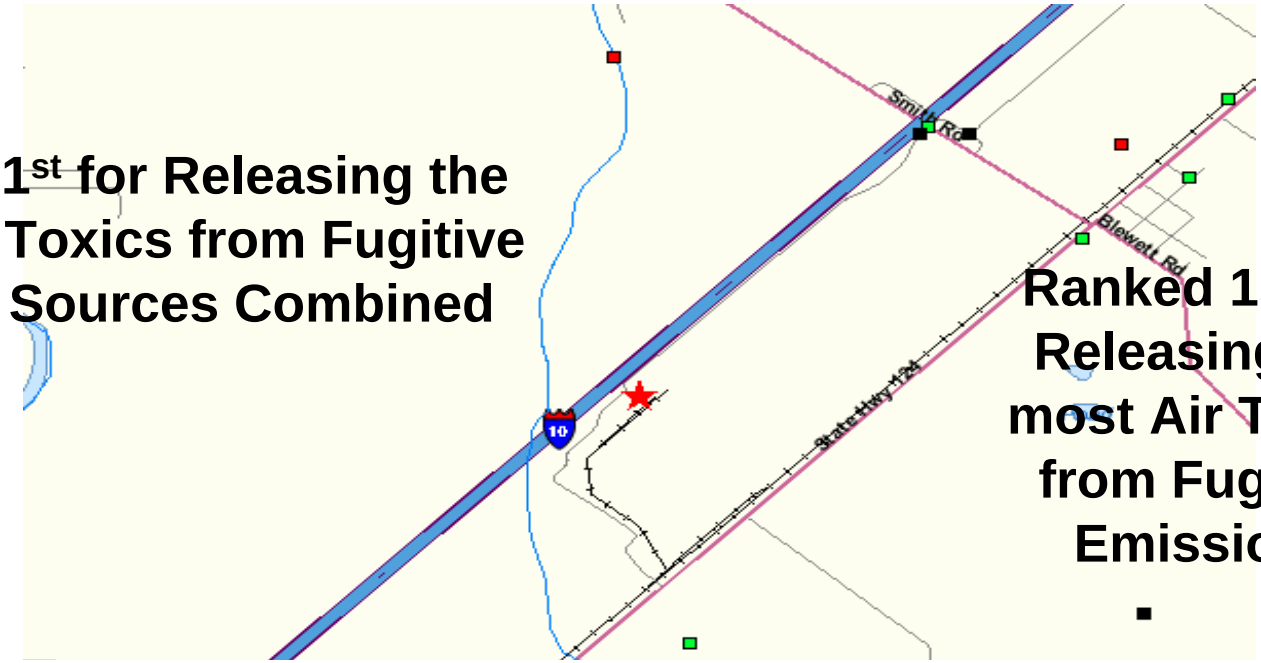
Top 5 Industrial Sources of Air Toxics in Jefferson County

Top 5 Facilities for Fugitive & Point Source Releases of Air Toxics			
Facility Name	Fugitive Air Emissions	Point Source Air Emissions	Total Air Emissions
Goodyear Tire & Rubber Co. (Beaumont)	1,393,053	42,159	**1,435,212**
ExxonMobil Oil Beaumont Refinery (Beaumont)	790,279	623,944	**1,414,223**
Huntsman Corp. (Port Neches)	128,899	69,547	**198,446**
ISP Synthetic Elastomers (Port Neches)	29,077	153,945	**183,022**
NAFTA Region Olefins Complex (Port Arthur)	4,146	144,591	**148,737**

Source: US EPA 2005 Toxic Release Inventory, Released March 2007

Goodyear Tire & Rubber Co.

Ranked 1st for Releasing the Most Air Toxics from Fugitive & Point Sources Combined



Ranked 1st for Releasing the most Air Toxics from Fugitive Emissions

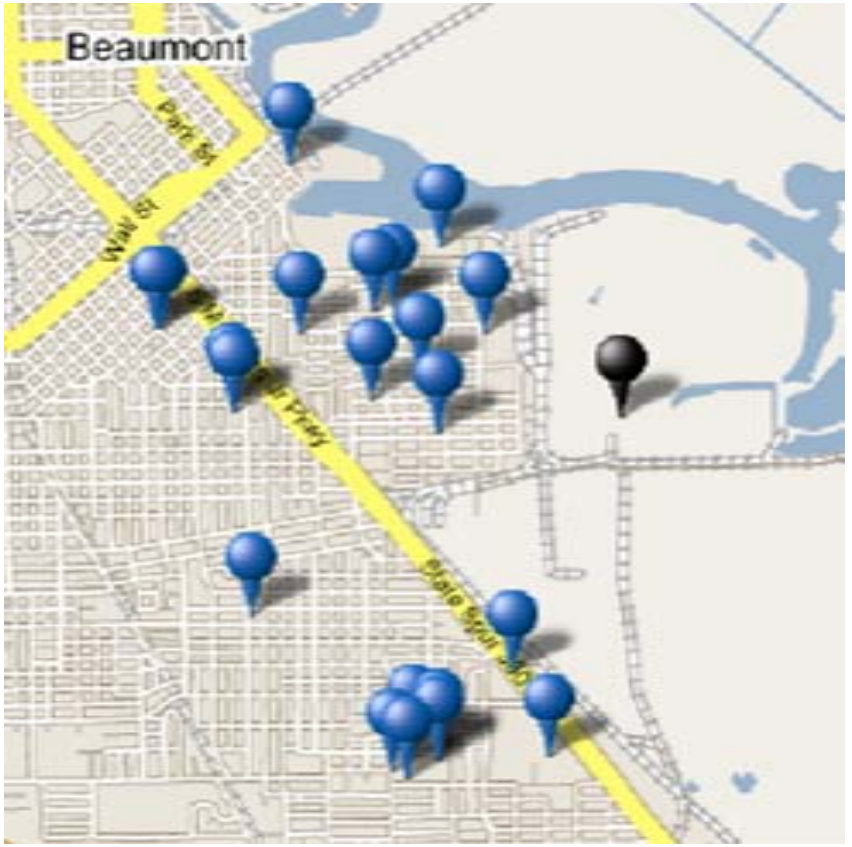
Total Releases of Air Toxics (lb/yr)	Air Toxics Released in the Largest Amounts	Carcinogen	Developmental Toxicant	Reproductive Toxicant	Neurotoxicant	Respiratory Toxicant
1,435,212	N-Hexane				■	■
	1,3-Butadiene	■	■	■	■	■
	Styrene				■	■
	Ethylbenzene	■			■	■
	Acetonitrile				■	■

Sources: US EPA 2005 Toxic Release Inventory, Facility Report; EPA EnviroMaps; “Toxic Pollution and Your Health,” US PIRG, March 2007.

ExxonMobil Oil Beaumont Refinery:
Largest Emitter of Air Toxics from Point Sources

There are 21 schools within 2-miles of the refinery

- Ranked 2nd overall for the most releases of air toxics
- Ranked 1st for the most air toxics from point sources
- Ranked 2nd for the most air toxics from fugitive releases



Sources: US EPA 2005 Toxic Release Inventory, Facility Report and www.PlanetHazard.com

Huntsman Corp. Port Neches

Ranked 3rd for total releases of air toxics from fugitive & point sources

Ranked 3rd for fugitive releases of air toxics

6 schools are located less than 2 miles from the Huntsman facility

19 schools are located less than 4 miles away

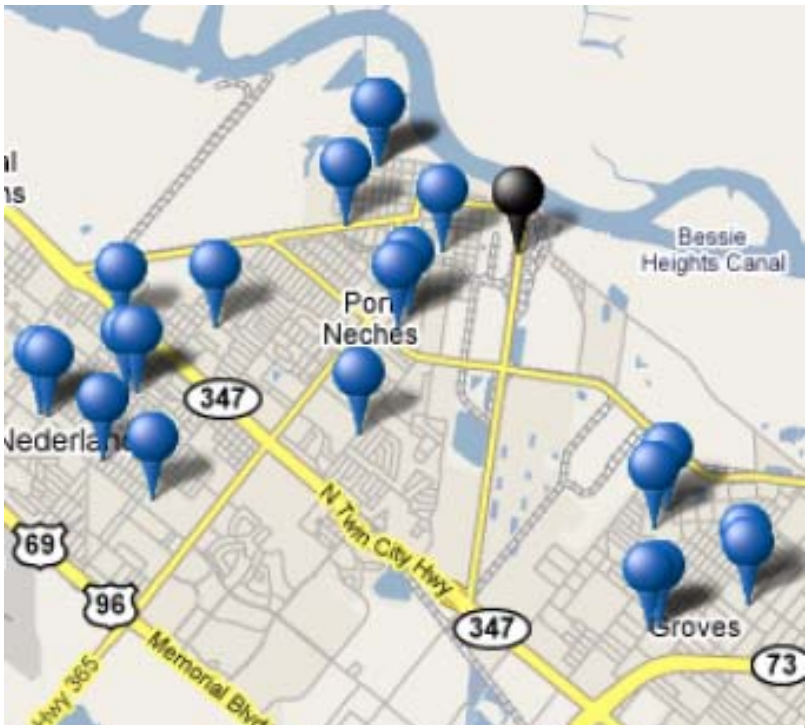
Total Releases of Air Toxics (lb/yr)	Air Toxics Released in the Largest Amounts	Carcinogen	Developmental Toxicant	Reproductive Toxicant	Neurotoxicant	Respiratory Toxicant
198,446	1,3-Butadiene	◙	◙	◙	◙	◙
	Ethylene Oxide	◙		◙	◙	◙
	Ethylene Glycol				◙	◙
	Methanol				◙	◙
	Phenol				◙	◙

Sources: US EPA 2005 Toxic Release Inventory, Facility Report; www.PlanetHazard.com; "Toxic Pollution and Your Health," US PIRG, March 2007.

ISP Synthetic Elastomers
Port Neches

7 schools are located within 2 miles of the ISP facility

21 schools are within 4 miles of the facility



Total Releases of Air Toxics (lb/yr)	Air Toxics Released in the Largest Amounts	Carcinogen	Developmental Toxicant	Reproductive Toxicant	Neurotoxicant	Respiratory Toxicant
183,022	Styrene				◙	◙
	1,3-Butadiene	◙	◙	◙	◙	◙

Sources: US EPA 2005 Toxic Release Inventory, Facility Report; www.PlanetHazard.com; "Toxic Pollution and Your Health," US PIRG, March 2007.

NAFTA Region Olefins Complex – Port Arthur

There are 19 schools located within 4 miles of the complex

Total Releases of Air Toxics (lb/yr)	Air Toxics Released in the Largest Amounts	Carcinogen	Developmental Toxicant	Reproductive Toxicant	Neurotoxicant	Respiratory Toxicant
148,737	1,3-Butadiene	◙	◙	◙	◙	◙
	Benzene	◙	◙	◙	◙	◙
	N-Hexane				◙	◙
	Toluene		◙		◙	◙
	Xylene (mixed isomers)				◙	◙

Sources: US EPA 2005 Toxic Release Inventory, Facility Report; www.PlanetHazard.com; "Toxic Pollution and Your Health," US PIRG, March 2007.

Upset Events

- Allegedly unpreventable emission events at industrial facilities
- Cause plants to emit more pollution than allowed by their permits
- Can equal 50 times the emissions from annual routine operations
- Not included in permit reviews so not evaluated for health impacts and may avoid federal requirements such as installment of pollution controls
- Thousands of upsets a year release thousands of tons of additional pollution into our air
- Duration varies from minutes to weeks, releasing various quantities and concentrations of air toxics
- Persistent, intermittent concentrations of toxics give rise to both acute & chronic health effects
- Cumulative exposures over time increase risk of harmful effects

Examples of upset events at Motiva Refinery in Port Arthur

Air Contaminants Emitted (quantities in pounds)	*Upset emissions caused by electric transformer failure*[69]	*Upset emissions caused by Wet Gas Compressor Shutting down*[70]	*Upset emissions caused by human error*[71]
	4/14/03, 4:39pm - 4/15/03, 5:19pm; 4/19/03, 10:58pm - 4/20/03, 4:42am	**4/15/03, 7:46pm- 4/16/03, 11:38pm**	**4/25/03, 12:01pm - 4/26/03, 11:31am**
Butadiene	432		
1,3-BUTADIENE	2	4	
Butane	1,035	245	
Butene	25,605.2	308	
Butylene	13		
Carbon Monoxide	2,122.5	280	
Cis-2-butene	0.2		
Ethane	3,071		
Ethylene	2,201	64	
Heptane	29,424		
Hexane	107,692	946	
Hydrogen	168.6		
Hydrogen sulfide	1,960	36	
Isobutane	11,886		428
Isobutylene	0.2		3,852
Isopentane	22		
Methane	1,925		
Nitrogen dioxide	34.5	4	428
Nitrogen oxide	318	34	3,852
Particulate Matter	17,800		
Pentane	37,727	354	
Pentene	288	177	
Propane	5,272	155	
Propylene	15,945	283.5	
Sulfur dioxide	13,753	1,610	
Trans-2-butene	0.3		
Opacity	15%		
Totals (lbs.)	**278,697.5**	**4,500.5**	**4,280**
Totals (tons)	**139.35**	**2.25**	**2.14**

107,692 lbs. of hexane was emitted on April 14, 2003 in only 18 minutes; totaling 54% of the annual hexane emissions from routine operations.

During these upset events, Motiva emitted 46,138 pounds of highly reactive volatile organic compounds (HRVOCs) and 108,660 pounds of volatile organic compounds (VOCs). HRVOCs and VOCs are contributors to ozone formation.

Examples of upset events at BASF in Port Arthur

Air Contaminants Emitted (quantities in pounds)	*Upset emissions caused by lightning storms*		As a % of Annual Routine Emissions	*Upset emissions caused by human error*		As a % of Annual Routine Emissions	*Upset emissions from flaring poor-quality product*
	7/30/04 - 8/02/04[77]	9/23/04 - 9/25/04[78]		9/30/04 - 10/02/04[79]	10/15/04 - 10/17/04[80]		11/10/04 - 11/12/04
1,2-Butadiene	16						
1,3-BUTADIENE	5,834	4,550	**652%**	4,613	5,616	**643%**	
1-Butene	52						
1-Butyne	22						
Acetylene		232	**176%**	16	595	**463%**	
Benzene	712	3,432	**167%**		4,870	**197%**	
Butane	346		**465%**		1		
Butane, N-	1,669	1,524		1,621	1,872	**459%**	
Butylene	9,826	7,513		7,560	9,278		
Cis-2-butene	11						
Carbon Monoxide	92,508	52,428	**32.30%**	15,336	55,616	**16%**	5,500
Ethylene	14,055	22,815	**146%**	2,389	24,384	**106%**	
Hexane		2,940	**193%**	66	3,769	**231%**	
Hexane, n	643	52		0	519		
Isobutane	12						
Isobutene	52						
Methyl Acetylene		505	**865%**	105	543.2	**1110%**	
Nitrogen dioxide	639	203	**2%**	106	383	**0.80%**	70
Nitrogen oxide	12,133	6,867		2,017	7,285		750
Pentene	3,957	4,610		18	6,175		
Propadiene		505		105	543.2		
Propane	275	1,682	**367%**	1,868	3,341	**977%**	2,020
Propylene	9,361	12,843	**116%**	2,424	11,800	**74%**	9,000
Styrene		118	**237%**		170	**341%**	
Sulfur dioxide		404	**31%**		583	**44%**	
t-2-butene	15						
Toluene	31	3,227	**99%**		4,656	**141%**	
Vinylacetylene	46						
Xylene		561	**771%**		810	**1113%**	
Totals (pounds)	**152,215**	**127,011**		**38,244**	**142,809.40**		**17, 340**
Totals (tons)	**76.12**	**63.51**		**19.122**	**71.41**		**8.67**

Examples of upset events at TOTAL Petrochemcials (Atofina) in Port Arthur

Three leaks caused the release of **11,103 lbs**. of **hydrogen sulfide** in less than 7 days. This amount equals 81% of the total hydrogen sulfide emissions released in 2003 through routine operations.

Air Contaminants Emitted (quantities in pounds)	*Upset emissions caused from a leak in the Sulfur Recovery Unit*[84]	*Upset emissions caused from two leaks in the Sulfur Recovery Unit*[85]
	6/12/03, 2:00pm - 6/18/03 1:00am	**6/14/03 8:20am – 6/19/03 8:20am**
Hydrogen sulfide	7,162.3	3,941
Nitrogen dioxide	0.06	
Nitrogen oxide	56.75	83.24
Sulfur dioxide	256,193.4	354,255.3
Totals (lbs.)	**263,412.51**	**358,279.54**
Totals (tons)	**131.71**	**179.14**

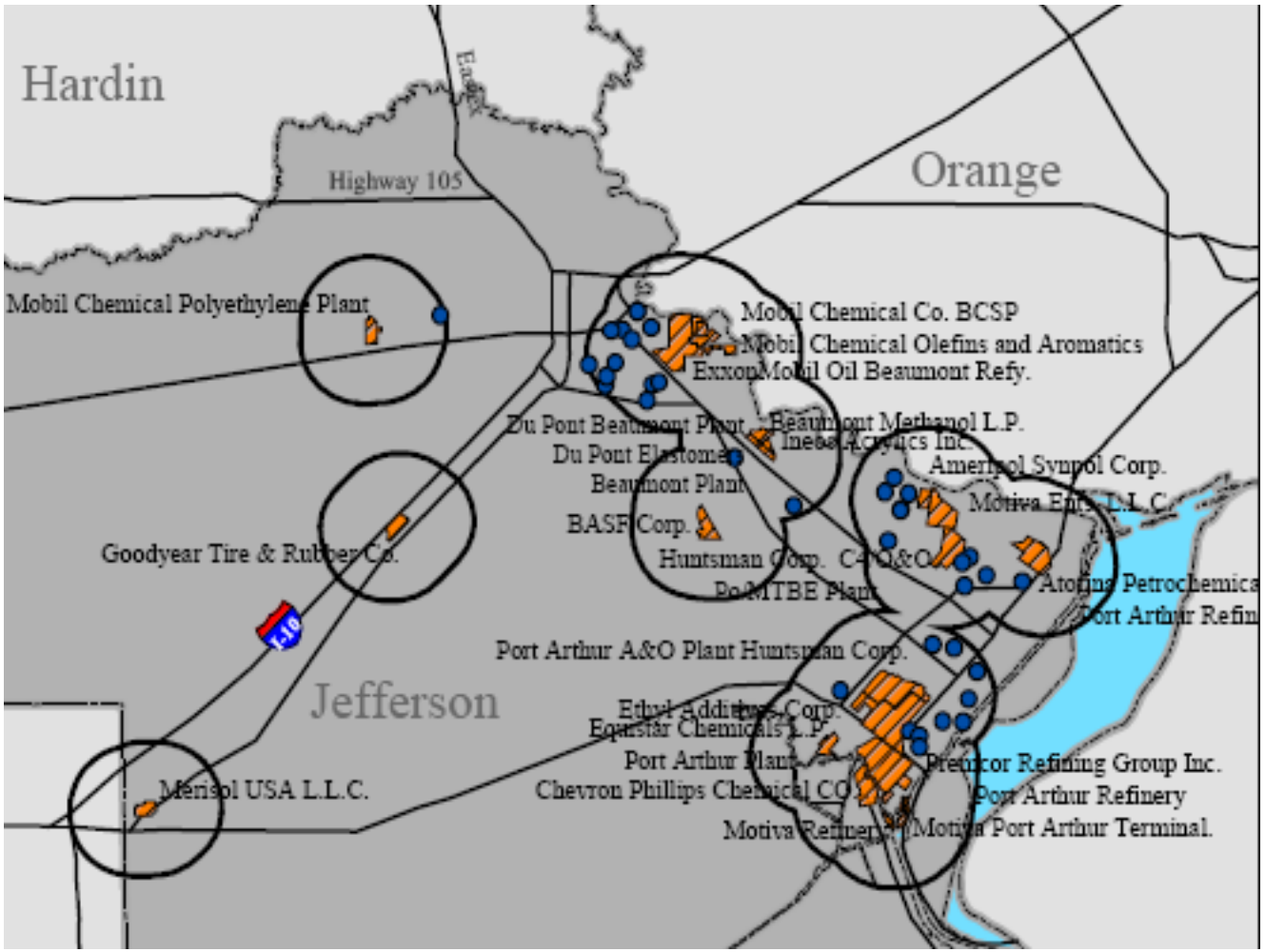
In less than 7 days, these three leaks emitted **610,449 lbs**. of **sulfur dioxide**. This amount equals 42% of the 2003 annual sulfur dioxide emissions released during routine operations.

Upsets and School Attendance

- Statistical analysis of attendance rates at nearby schools following upset events shows upsets may cause children to miss school
- All of the schools had decreases in attendance rates on days following an upset and multiple schools had dramatic decreases
- In some cases, attendance was in the lowest 5% for the school year on the days following the upset event in question

Schools near Refineries or Chemical Manufacturing Plants in Jefferson County

In 2002, 21,779 students went to 36 schools within a 2-mile radius of a refinery or chemical manufacturing plant.



Explanation

- At Risk Schools
- Refineries and Chemical Manufacturing Plants
- 2 Mile Study Area
- Highways and Interstates
- Jefferson County
- Counties
- Louisiana

Source: “A is for Air Pollution,” Refinery Reform Campaign, 2002.

Upsets & Ozone

- Industrial emissions are major sources of nitrogen oxides, volatile organic compounds (VOCs), and highly reactive volatile organic compounds (HRVOCs) that lead to ozone formation.
- Plumes containing both high hydrocarbons (especially ethylene, propylene, and butadiene) and nitrogen oxides have very high ozone productivities.
- Studies found plumes originating from the Houston Ship Channel were the primary sources of the transient high ozone events observed at ground monitors.
- These high hydrocarbon concentrations in the plumes may be due to routine emissions that currently emission inventories are not accounting for or upset events.

Health Effects: Asthma

- In 2001, diseases of the respiratory system were the fourth most common reason, by body system, for hospitalizations in Texas
- Chronic obstructive pulmonary disease was one of the ten most frequent causes of hospitalization through the emergency room

Respiratory Diseases are Statistically Significantly HIGHER in the 4-County Region Compared to the State

Risk-Adjusted Hospital Admissions per 100,000 Population			
County	Chronic Obstructive Pulmonary Disease	Adult Asthma	Pediatric Asthma
Jefferson	**389.8****	**101.9**	136.5
Liberty	**698.8****	**140.9****	**315.7****
Hardin	**391.1****	67.9	**181.2**
Orange	**612.0****	**117.9**	163.2
State of Texas	259	95.2	170.4

**Risk adjusted admission rate is significantly HIGHER (based on 99% confidence interval) than Texas average.

*Risk adjusted admission rate is significantly LOWER (based on 99% confidence interval) than Texas average.

Source: Department of State Health Services, Center for Health Statistics, Texas Health Care Information Collection. Texas Inpatient Hospital Discharge Data, 2002.

Financial Impacts: Asthma

Texas Figures

- 1.1 million Texans have asthma
- In 2002, asthma accounted for 25,500 hospitalizations
- Asthma is a one of the top ten reasons for hospitalization in children 1-17 yrs.
- In 1998, total costs of asthma were $763 million, including $435 million direct medical expenses and $328 million indirect costs
- In 1999, Texas Medicaid program treated more than 123,000 asthma patients costing the state $41.6 million

	Estimated Prevalence (per 1,000 population)	Persons with Asthma	Direct Medical Expenditures ($1,000)	Indirect Costs ($1,000)	Total Costs ($1,000)
State of Texas	5.52	1,015,100	434,915	328,065	**762,979**
Jefferson County	7.14	6,800	2,647	1,643	**4,290**

Source: The Asthma & Allergy Foundation of America

Cancer Rates

- Jefferson County has statistically significantly higher incidence rates for all cancer sites combined in males compared to the state
- Liberty County ranks 3rd in the state for counties with the highest incidence and death rates of Lung & Bronchus cancers
- Liberty County ranks 7th in the state for counties with the highest incidence rates for all cancer sites combined and 3rd for death rates
- Liberty County ranks 7th for highest incidence rates of leukemia

Death rates in Jefferson County for cancers of the respiratory system are **much higher than the state**. For all races in Jefferson County, the death rates of respiratory system cancers are higher for males and females during all but one year between 1990 and 2000.

Myeloid leukemia death rates in Jefferson County were higher than the state average for every year they were calculated between 1990 and 2000. In some years they were more than **double the state average**.

Source: National Cancer Institute, State Cancer Profiles, Incidence & Death Rates Reports, Incidence rate period 2000-2002, Death rate period 1979-2003.

Financial Impacts: Cancer

The Cost of Cancer in Texas (1998 figures)

Direct Costs = $4,884,100,000

Indirect Costs = $9,118,300,000

Total Costs = $14,002,400,000

There is a tremendous economic burden from cancer. The estimated $14.0 billion in 1998 due to cancer represents a significant portion of health care costs to the state. Of the medical costs associated with cancer in Texas, Medicare paid 42% and Medicaid covered 5%[103].

Source: "The Cost of Cancer in Texas: A report to the Texas Comprehensive Cancer Control Coalition on the Economic Impact of Cancer, The LBJ School of Public Affairs, The University of Texas at Austin, and the Texas Health Care Information Council, December 2001, www.tdh.state.tx.us/txcccp.

Financial Impacts: NAAQS

The Annual Impacts of Health-Related Costs and Related Losses Associated with Non-Compliance of the Clean Air Act Amendments on Business Activity in Texas[7]

Low Case Scenario[8]	High Case Scenario[9]
$6.3 billion in Total Expenditures	**$13.7 billion** in Total Expenditures
$3.2 billion in Gross Product	**$7.0 billion** in Gross Product
$2.2 billion in Personal Income	**$4.8 billion** in Personal Income
56,356 Permanent Jobs	**123,763** Permanent Jobs
$157.4 million in State Fiscal Revenue	**$345.7 million** in State Fiscal Revenue

Source: The Perryman Group, November 2002