Rhode Island Cancer Registry
Rhode Island Department of Health
Safe and Healthy Lives in Safe and Healthy Communities

Memo

To: Ms. Helen Drew, Office of the Director

From: John P. Fulton, PhD

CC: Robert Vanderslice, PhD; Patricia A. Nolan, MD, MPH

Date: 02/07/2004

Re: Preliminary Cancer Incidence Rates, Warwick, Rhode Island

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Preliminary Information

Per your request, the Rhode Island Cancer Registry has constructed age-adjusted cancer incidence rates by census tract, for the City of Warwick, Rhode Island, using cancer case reports for calendar years 1987-2000. The data reveal a pattern of higher-than-state cancer incidence rates in certain areas of the City, caused in the main by elevated lung cancer rates, as indicated on the enclosed census tract map.

For your information, I also enclose the underlying lung cancer incidence rates. Caution must be exercised in their interpretation, as most are not differentiable from state rates at the $P < 0.05$ probability level.

<u>Please note that the data accompanying this memo are still undergoing quality assurance checks</u>.

I would be glad to discuss these findings further, at your convenience.

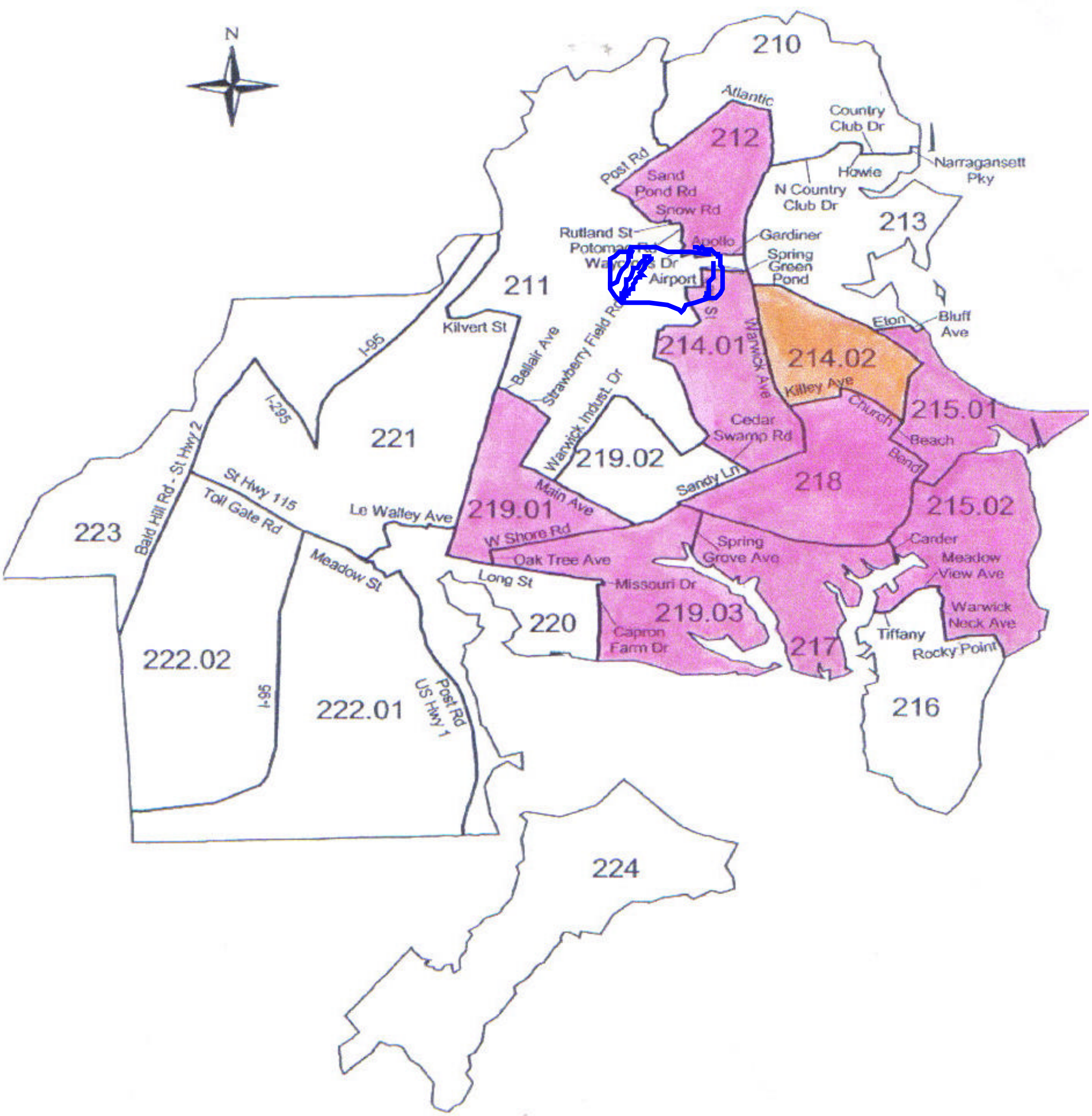
Attachments

- Map: Elevated lung cancer incidence by census tract, City of Warwick, Rhode Island
- Spreadsheet: Lung cancer incidence by census tract, City of Warwick, Rhode Island
- Methods used for rate construction

Census Tracts with Elevated Lung Cancer Incidence Rates, City of Warwick, Rhode Island

Period of Observation: 1987-2000

297 Warwick Census Tracts 297



297 Warwick Census Tracts 297

Lung Cancer Incidence Rates, City of Warwick, Rhode Island, by Census Tract and Gender

Period of Observation: 1987-2000

- Rates are average annual, age-standardized incidence rates
- Expressed as cases per 100,000 person-years of observation
- Using the United States 2000 standard million population.

	Male Cases	Male Pers-Yrs	Std Rt	1.96SE	Lo CL	Hi CL	Female Cases	Female Pers-Yrs	Std Rt	1.96SE	Lo CL	Hi CL
State →	**6,881**	**6.85 M**	**106.8**	**2.5**	**104.3**	**109.3**	**4,850**	**7.42 M**	**55.0**	**1.6**	**53.4**	**56.6**
Wrwk CTs												
021000	54	51385	96.8	26.0	70.8	122.8	48	59337	62.9	18.4	44.5	81.3
021100	38	35752	106.0	34.7	71.2	140.7	25	39601	50.9	20.3	30.6	71.3
021200	38	27202	127.7	42.7	84.9	170.4	40	30012	89.9	29.6	60.3	119.4
021300	44	34441	90.6	27.1	63.6	117.7	39	37482	69.9	22.6	47.3	92.5
021401	45	29333	144.5	45.6	99.0	190.1	33	32579	79.8	28.0	51.8	107.8
021402	35	26552	125.5	42.5	83.0	168.0	25	28416	66.2	26.6	39.6	92.8
021501	31	22401	161.1	58.1	102.9	219.2	26	23611	110.0	42.7	67.3	152.8
021502	39	30391	181.6	62.0	119.6	243.5	26	31202	91.0	35.5	55.5	126.5
021600	7	10321	73.0	57.6	15.4	130.6	6	10075	52.6	42.9	9.7	95.5
021700	39	35904	143.6	47.4	96.3	191.0	28	37043	86.5	32.2	54.2	118.7
021800	35	26891	146.1	49.9	96.2	196.0	27	30055	75.5	29.5	46.1	105.0
021901	38	28556	138.3	44.7	93.7	183.0	29	30761	84.6	31.2	53.5	115.8
021902	24	19400	126.3	51.8	73.5	177.1	14	20159	48.2	25.9	22.3	74.1
021903	38	29333	125.9	42.9	82.9	168.8	30	31407	75.2	27.3	47.9	102.5
022000	24	24623	108.7	44.7	64.0	153.4	20	26612	64.0	28.5	35.5	92.4
022100	53	35816	95.4	26.2	69.2	121.6	41	43003	48.6	15.2	33.4	63.9
022201	27	42518	68.6	26.6	42.0	95.3	24	44743	51.9	20.9	31.0	72.8
022202	29	17553	88.3	32.3	56.0	120.6	26	24690	33.5	14.2	19.3	47.8
022300	43	25127	121.0	36.9	84.1	157.9	29	31569	53.9	22.5	31.4	76.4
022400	7	15881	41.2	30.8	10.3	72.0	10	16465	61.1	38.1	22.9	99.2
		St+10%	117.5					St+10%	60.5			
		St+20%	128.2					St+20%	66.0			
		St+30%	138.8					St+30%	71.5			

Incidence and corresponding standard errors are calculated using SEERStat, software produced for public use by the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute. The algorithms for rates, as described in SEERStat documentation, are as follows:

Crude Rate

A crude rate is the number of cases per 100,000 in a given population.

$$cruderate = \frac{count}{population} \times 100{,}000$$

Age-adjusted Rate

An age-adjusted rate is a weighted average of crude rates, where the crude rates are calculated for different age groups and the weights are the proportions of persons in the corresponding age groups of a standard population. Several sets of standard populations are included in SEER*Stat. These include the total U.S. populations (1940, 1950, 1960, 1970, 1980, and 1990), an estimate of the U.S. 2000 population, 1991 Canadian population, and the world population. The age-adjusted rate for an age group comprised of the ages x through y is calculated using the following formula:

$$aarate_{x-y} = \sum_{i=x}^{y}\left[\left(\frac{count_i}{pop_i}\right) \times 100{,}000 \times \left(\frac{stdmil_i}{\sum_{j=x}^{y} stdmil_j}\right)\right]$$

where count is the number of cases for the ith age group, pop_i is the relevant population for the same age group, and $stdmil_i$ is the standard population for the same age group.

Standard Error for a Crude Rate

This calculation assumes that the cancer counts have Poisson distributions.

$$SE_{crude} = \frac{\sqrt{count}}{population} \times 100{,}000$$

Standard Error for an Age-adjusted Rate

This calculation assumes that the cancer counts have Poisson distributions. Suppose that the age-adjusted rate is comprised of age groups x through y.

$$SE_{AArate} = \left[\sum_{i=x}^{y} \left(\frac{stdmil_i}{\sum_{j=x}^{y} stdmil_j} \right)^2 \times \left(\frac{count_i}{population_i^2} \right) \right]^{1/2} \times 100{,}000$$

Crude Rate Confidence Intervals

The endpoints of a p x 100% confidence interval are calculated as:

$$CI_{low} = \frac{\left(\frac{1}{2} \left(ChiInv\left(\frac{p}{2}, 2 \times count \right) \right) \right)}{population} \times 100{,}000$$

$$CI_{high} = \frac{\left(\frac{1}{2} \left(ChiInv\left(1 - \frac{p}{2}, 2 \times (count + 1) \right) \right) \right)}{population} \times 100{,}000$$

where Chi Inv(p,n) is the inverse of the chi-squared distribution function evaluated at p and with n degrees of freedom, and we define Chi Inv (p,0) = 0.

Although the normal approximation may be used with the standard errors to obtain confidence intervals when the count is large, we use the above exact method that holds even with small counts (see Johnson and Kotz, 1969, or Fay and Feuer, 1997). When the count is large the 2 methods produce similar results.

Age-adjusted Rate Confidence Intervals

Suppose that the age-adjusted rate is comprised of age groups x through y, and let:

$$w_i = \frac{stdmil_i}{\left(pop_i \times \sum_{j=x}^{y} stdmil_j \right)}$$

$$w_m = \max(w_i)$$

$$v = \sum_{i=x}^{y} \left(w_i^2 \times count_i \right)$$

The endpoints of a p x 100% confidence interval are calculated as:

$$CI_{low} = \left(\frac{v}{2 \times rate}\right) \times \left(ChiInv\left(\frac{p}{2}, \frac{(2 \times rate^2)}{v}\right)\right) \times 100{,}000$$

$$CI_{high} = \left(\frac{v + w_m^2}{2(rate + w_m)}\right) \times \left(ChiInv\left(1 - \frac{p}{2}, \frac{2(rate + w_m)^2}{(v + w_m^2)}\right)\right) \times 100{,}000$$

This method for calculating the confidence interval was developed in Fay and Feuer (1997). The method produces similar confidence limits to the standard normal approximation when the counts are large and the population being studied is similar to the standard population. In other cases, the above method is more likely to ensure proper coverage.

Note

"Rate" used in the above formulas is not per 100,000 population.

Source

SEERStat Version 5.0.20, September, 2003.

WHY WE SHOULD BE CONCERNED ABOUT THE LUNG CANCER RATES IN WARWICK

by Rev. Duane Clinker, former Chair Subcommittee on Quality of Life, SRC
member, Concerned Airport Neighborhoods

The Department of Health of RI has released a long awaited study of the incidence of lung cancer in Warwick which shows **significantly higher than average rates of lung cancer in many airport neighborhoods.** Although a few public officials are already rushing in to discount any connection between the airport and these higher rates of cancer, the report is very troubling. Here's why.

The Dept. of Health's long term study (1987-2000) shows rates of lung cancer up to 50% higher than average in airport neighborhoods to the east and south of T.F. Green. Rates this high did not show up in other Warwick neighborhoods. The distribution of these cases is very troubling.

While their are many known causes of lung cancer, **soot and particulate matter from aircraft engines is a known cause of lung cancer.**

IF the increased cancers are caused by particulate matter from the jet engines, one might expect a high impact east and south of the airport if the prevailing winds are to the east and south east. This is exactly what we see in the study.

There may be much higher rates of lung cancer in the future. It takes 10-20 years to get cancer after exposure. Therefore, the Department of Health's study is based on cancer resulting from unknown exposures 1967 and 1990. **IF** the increased lung cancer rates in airport neighborhoods are the result of particulate matter from the airport, **THEN** this study is really a measure of damage done to the public from the much smaller airport before 1996. Today's rates could be much, much higher.

If these higher rates of lung cancer were caused by tobacco, we would expect to see, not just higher rates of lung cancer, but also higher rates of pancreatic cancer in the same pattern. This we do not see.

While this study does not provide absolute scientific proof of an airport connection, it does provide evidence that **something is wrong and that precautions must be taken.** Instead, **the Airport Corporation reneged on a promise made to the public in 2003** to fund a first time actual study of what particulate matter was being released on neighborhoods. **The Governor reneged on a written promise made to Concerned Airport Neighborhoods in 2002** to fund similar health studies.

Meanwhile the Governor and the Airport Corporation continue to spend multiple millions of dollars for development which may result in significant health problems.

There are easy and simple studies to better evaluate the impact of airport pollution on the public. These must be done and evaluated now, before planning for airport expansion. Otherwise we risk perhaps hundreds of lives and untold financial resources on development which may be harmful to life and health in our neighborhoods.

February 2004