CHAPTER 21

"All-Cancer-Except-(Genital+Respiratory)": Relation with Medical Radiation

• Part 1. "All-Cancer-Except-(Genital+Respiratory)"

The group, "All-Cancer-Except-(Genital+Respiratory)," is the same as "Difference-Cancers-Minus-Genital-Cancers." With respect to our PhysPop-MortRate analysis, this chapter explores what happens to the dose-response, the Constant, and the Fractional Causation of cancer by medical radiation, if BOTH Genital and Respiratory-System cancers are subtracted from the All-Cancer MortRates.

After both subtractions are made, we are still dealing with 77.2% of all the male cancer-deaths in 1940 (Table 21-A, Row 14, at the end of the chapter). And we are still dealing with 71.9% of all the female cancer-deaths in 1940 (Table 21-A, Row 28).

• Part 2. Regression Analysis, with Estimated Fractional Causation

Below, we show the linear regression analyses for the 1940 MortRates regressed upon the 1940 PhysPops --- males first (Part 2a), then females (Part 2b). We omit the "build-up" years which use PhysPops prior to 1940. The Universal PhysPop Table 3-A, and Table 21-A, provide the input data for these regressions.

Part 2a. MALES.	1940 PhysPop	1940 MortRate
Pacific	159.72	93.7
New England	161.55	103.8
West North Central	123.14	86.7
Mid-Atlantic	169.76	108
East North Central	133.36	93.2
Mountain	119.89	76.2
West South Central	103.94	67.7
East South Central	85.83	58.3
South Atlantic	100.74	67.8

MALES: All-Minus-(Gen+Respy) Regression Output:	
Constant	11.5006
Std Err of Y Est	4.7251
R Squared	0.9350
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.5630
Std Err of Coef.	0.0561
Coefficient / S.E.	10.0324

Part 2b. FEMALES.	1940 PhysPop	1940 MortRate
Pacific	159.72	90.5
New England	161.55	108.4
West North Central	123.14	88.6
Mid-Atlantic	169.76	106.0
East North Central	133.36	95.0
Mountain	119.89	81.1
West South Central	103.94	67.4
East South Central	85.83	66.9
South Atlantic	100.74	72.0

FEMALES: All-Minus-(Gen+Respy) Regression Output:	
Constant	23.8218
Std Err of Y Est	6.2443
R Squared	0.8593
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	0.4849
Std Err of Coef.	0.0742
Coefficient / S.E.	6.5390

- • - Box 1 does not exist for this chapter.
- • - Box 2 does not exist for this chapter. There are no graphs.
- • - Box 3 shows the Fractional Causation by medical radiation.
- • - Box 4 shows the two Error-Checks on our work.
- • - Table 21-A provides the MortRates for Parts 2a and 2b.

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Box 3 of Chap. 21
Presumptive Fraction of Cancer MortRate Attributable to Medical Radiation.

Please see text in Chapter 6, Parts 4 and 6.

All-Cancer-Except-(Genital+Respiratory). MALES.

• MALE National MortRate (MR) 1940, from Table 21-A, Row 13	88.8	National MortRate
• Constant, from regression, Part 2a	11.5006	Constant
• Fractional Causation, Best Est. = (Natl MR - Constant) / Natl MR	87.0%	Frac. Causation
90% Confidence-Limits (C.L.) on Fractional Causation. See text in Chapter 6, Part 5.		
X-Coefficient, from Part 2a	0.5630	X-Coef., Best Est.
Standard Error (SE) of X-Coefficient, from Part 2a	0.0561	Standard Error
Upper 90% C.L. on X-Coef. = (Coef) + (1.645 * SE) =	0.6553	New X-Coefficient
New Constant = (Natl MR) - (New X-Coef * 1940 Natl PhysPop) =	2.2762	New Constant
Frac. Caus'n, High-Limit = (Natl MR - New Constant) / Natl MR =	97.4%	New Frac. Caus'n.
Lower 90% C.L. on X-Coef. = (Coef) - (1.645 * SE) =	0.4707	New X-Coefficient
New Constant = (Natl MR) - (New X-Coef * 1940 Natl PhysPop) =	26.6467	New Constant
Frac. Caus'n, Low-Limit = (Natl MR - New Constant) / Natl MR =	70.0%	New Frac. Caus'n.

All-Cancer-Except-(Genital+Respiratory). FEMALES.

• FEMALE National MortRate 1940, from Table 21-A, Row 27	90.7	National MortRate
• Constant, from regression, Part 2b	23.8218	Constant
• Fractional Causation, Best Est. = (Natl MR - Constant) / Natl MR	73.7%	Frac. Causation
90% Confidence-Limits (C.L.) on Fractional Causation. See text in Chapter 6, Part 5.		
X-Coefficient, from Part 2b	0.4849	X-Coef., Best Est.
Standard Error (SE) of X-Coefficient, from Part 2b	0.0742	Standard Error
Upper 90% C.L. on X-Coef. = (Coef) + (1.645 * SE) =	0.6070	New X-Coefficient
New Constant = (Natl MR) - (New X-Coef * 1940 Natl PhysPop) =	10.5571	New Constant
Frac. Caus'n, High-Limit = (Natl MR - New Constant) / Natl MR =	88.4%	New Frac. Caus'n.
Lower 90% C.L. on X-Coef. = (Coef) - (1.645 * SE) =	0.3628	New X-Coefficient
New Constant = (Natl MR) - (New X-Coef * 1940 Natl PhysPop) =	42.7905	New Constant
Frac. Caus'n, Low-Limit = (Natl MR - New Constant) / Natl MR =	52.8%	New Frac. Caus'n.

Box 4 of Chap. 21

Error-Check on Our Own Work: All-Cancer-Except (Gen+Respy).

Please see text in Chapter 6, Part 5.

Below, Columns A, C, E, and G come directly from the regression input in Parts 2a (males) and 2b (females). Column B, the fraction of the whole 1940 population in each Census Division, comes from Table 3-B in Chapter 3. Each Column-D entry is the product of (B-entry times C-entry). Each Column-F entry is the product of (B-entry times E-entry). Each Column-H entry is the product of (B-entry times G-entry). PhysPops and MortRates are each "per 100,000."

The Weighted-Avg. Nat'l PhysPop, 1940, is the sum of Column-D entries = 132.04

The Weighted-Avg. Nat'l MALE MortRate of 1940 is the sum of Column-F entries = 86.99
The Nat'l Male MortRate is also (X-Coef * 1940 Nat'l PhysPop) + Constant = 85.84
Comparison: The National MALE MortRate of 1940, in Table 21-A, Row 13 = 88.80

The Weighted-Avg. Nat'l FEM. MortRate of 1940 is the sum of Column-H entries = 88.59
The Nat'l Female MortRate is also (X-Coef * 1940 Nat'l PhysPop) + Constant = 87.85
Comparison: The National FEM. MortRate of 1940, in Table 21-A, Row 27 = 90.70

(A) Census Division	(B) Pop'n Fraction	(C) PhysPop 1940	(D) Weighted PhysPop	(E) MALE MortRate 1940	(F) MALE Weighted MortRate	(G) FEM. MortRate 1940	(H) FEM. Weighted MortRate
Pacific	0.0739	159.72	11.80	93.7	6.92	90.5	6.69
New England	0.0641	161.55	10.36	103.8	6.65	108.4	6.95
West No. Central	0.1027	123.14	12.65	86.7	8.90	88.6	9.10
Mid-Atlantic	0.2092	169.76	35.51	108.0	22.59	106.0	22.18
East No. Central	0.2022	133.36	26.97	93.2	18.85	95.0	19.21
Mountain	0.0315	119.89	3.78	76.2	2.40	81.1	2.55
West So. Central	0.0992	103.94	10.31	67.7	6.72	67.4	6.69
East So. Central	0.0819	85.83	7.03	58.3	4.77	66.9	5.48
South Atlantic	0.1354	100.74	13.64	67.8	9.18	72.0	9.75
Sums	1.0000		132.04		86.99		88.59

This chapter contains no graph.

Table 21-A.
All-Cancer-Except-(Genital+Respiratory) MortRates: Males, Females.

"All-Cancer-Except-(Genital+Respiratory) male mortality rates (MRs) below are the same as "Difference-Cancers-Minus-Genital" male MortRates. So the male entries below are the rates from Table 18-A+B (Diff-Cancers, Male) minus the corresponding rates in Table 13-A+B (Genital Cancers, Male). Rates are annual deaths per 100,000 male population, USA, age-adjusted to the 1940 reference year. There are no exclusions by color or "race." The female rates below derive from Tables 19-A+B and 14-A+B.

MALES

Census Division Row	Males	1940	1950	1960	1970	1980	1990
1	Pacific	93.7	92.1	92.4	89.1	85.8	81.9
2	New England	103.8	112.2	110.8	104.6	98.2	94.2
3	West North Central	86.7	92.2	91.8	88.0	84.1	83.4
4	Mid-Atlantic	108.0	113.4	109.8	104.2	98.6	94.1
5	East North Central	93.2	101.4	99.9	96.4	92.8	91.7
6	Mountain	76.2	77.8	78.0	77.3	76.6	78.3
7	West South Central	67.7	80.4	84.3	85.0	85.8	88.3
8	East South Central	58.3	75.3	80.2	84.1	87.9	91.6
9	South Atlantic	67.8	81.8	86.8	88.2	89.8	88.7
	.....						
10	Natl, All-Cancer MR	115.0	132.8	145.7	155.1	164.5	162.7
11	Natl, Resp'y-Canc MR	11.0	21.6	35.2	47.3	59.4	59.7
12	Natl, Genital-Canc MR	15.2	14.9	14.6	14.8	15.0	16.9
13	Natl, All-But-(Gen+Rsp)	88.8	96.3	95.9	93.0	90.1	86.1
14	Percent, Row 13/Row 10	77.2%	72.5%	65.8%	60.0%	54.8%	52.9%

FEMALES

Census Division Row	Females	1940	1950	1960	1970	1980	1990
15	Pacific	90.5	87.8	84.2	80.0	75.9	--
16	New England	108.4	102.9	95.1	89.8	84.5	--
17	West North Central	88.6	88.9	84.6	78.6	72.7	--
18	Mid-Atlantic	106.0	104.8	99.2	91.9	84.7	--
19	East North Central	95.0	94.7	90.5	85.0	79.4	--
20	Mountain	81.1	78.2	78.5	73.4	68.3	--
21	West South Central	67.4	77.6	75.6	73.0	70.3	--
22	East South Central	66.9	75.9	75.4	73.7	71.9	--
23	South Atlantic	72.0	78.7	78.4	76.0	73.6	--
	.....						
24	Natl, All-Cancer MR	126.1	123.2	114.9	111.7	108.5	111.3
25	Natl, Resp'y-Canc MR	3.3	4.6	5.3	11.7	18.0	24.5
26	Natl, Genital-Canc MR	32.1	27.2	22.4	18.0	13.7	--
27	Natl, All-But-(Gen+Rsp)	90.7	91.4	87.2	82.0	76.8	--
28	Percent, Row 27/Row 24	71.9%	74.2%	75.9%	73.4%	70.8%	--