

CHAPTER 53

Difference-Cancers, Males, 1940-1988

● Difference-Cancers are, of course, All-Cancers Minus Respiratory Cancers. Table 53-A, Column A, shows that male National MortRates for Difference-Cancers are approximately steady in the 1940-1988 period. Box 1 looks at the rates by Census Divisions.

● Box 1 shows that, while Difference-Cancer MortRates are GROWING in the LowTrio compared with 1940, they are FALLING in the TopTrio compared with 1940. A falling rate produces a ratio (fraction) below 1.0, as noted in Chapter 50. For the TopTrio, we find ratios below 1.00 in Columns D and I, and negative numbers in Columns F and K. By contrast, ratios in the LowTrio are above 1.0 and values in Columns F and K are positive. The facts in Box 1 mean that a carcinogenic co-actor which can contribute to male MortRates, from Difference Cancers, is operating more strongly in the LowTrio than in the TopTrio (Chapter 48, Part 5b). Our opinion is that the identity of this co-actor is cigarette smoke.

● Abundant studies implicate cigarette smoking in several types of cancer outside the respiratory system, including adult leukemia, colo-rectal cancer, breast cancer, and male bladder cancer. Some of these studies have been characterized as inconclusive. Box 1 in this chapter, and Boxes 1 in the subsequent chapters, lend support to the strong suspicion that cigarette smoke elevates mortality from many non-respiratory types of cancer. However, we need not "settle" the issue here, because we must match the Census Divisions for the co-actor, regardless of its identity.

Table 53-A  
Difference-Cancers, Males: Fractional Causation by Medical Radiation over Time

Year	Col.A Natl MR	Col.B Frac.C	Col.C R-Sq	Col.D X-Coeff	Col.E StdErr	Col.F Coef/SE	Col.G Source
1940	104.0	84%	0.9342	0.6388	0.0641	9.9695	Chap.18
1950	111.2	80%	0.9099	0.6722	0.0799	8.4103	Tab 53-B
1960	110.5	78%	0.9153	0.6603	0.0759	8.6991	Tab 53-C
1970	107.8	75%	0.9167	0.5975	0.0681	8.7784	Tab 53-D
1980	105.1	75%	0.9113	0.4858	0.0573	8.4805	Tab 53-E
1988	103.0	72%	0.9158	0.4622	0.0530	8.7250	Tab 53-F

Box 1, Chap. 53

Difference-Cancers, Males: Post-1940 Change in MortRates by Census Trios

1960 vs. 1940, by Trios: Col.D expresses change by ratios. Col.F expresses change by subtraction.

1988 vs. 1940, by Trios: Col.I expresses change by ratios. Col.K expresses change by subtraction.

MRs change inversely with PP. High-PP Trio has lowest growth-factor. Low-PP Trio has highest growth-factor.

	Col.A 1940 MortRate Tab 18-A	Col.B 1960 MortRate Tab 18-A	Col.C Ratio Col.B /Col.A	Col.D Input from Col.C	Col.E Diff: Col.B minus A	Col.F Input from Col.E	Col.G 1988 MortRate Tab 18-A	Col.H Ratio Col.G /Col.A	Col.I Input from Col.H	Col.J Diff: Col.G minus A	Col.K Input from Col.J
Pacif	110.9	105.8	0.954	Avg Chg	-5.1	Avg Chg	97.8	0.882	Avg Chg	-13.1	Avg Chg
NewE	122.0	126.5	1.037	TopTrio	4.5	TopTrio	110.8	0.908	TopTrio	-11.2	TopTrio
MidAtl	123.8	123.4	0.997	0.996	-0.4	-0.3	110.9	0.896	0.895	-12.9	-12.4
WNoCen	103.2	107.2	1.039	Avg Chg	4.0	Avg Chg	99.7	0.966	Avg Chg	-3.5	Avg Chg
ENoCen	109.0	115.0	1.055	MidTrio	6.0	MidTrio	108.9	0.999	MidTrio	-0.1	MidTrio
Mtn	92.0	93.2	1.013	1.036	1.2	3.7	94.9	1.032	0.999	2.9	-0.2
WSoCen	79.3	98.9	1.247	Avg Chg	19.6	Avg Chg	105.0	1.324	Avg Chg	25.7	Avg Chg
ESoCen	68.7	96.1	1.399	LowTrio	27.4	LowTrio	109.1	1.588	LowTrio	40.4	LowTrio
SoAtl	80.6	101.4	1.258	1.301	20.8	22.6	107.3	1.331	1.414	26.7	30.9

Box 2, Chap. 53

Difference-Cancers, Males: Calculation of Adjustment Factor

This adjustment is discussed fully in Chapter 49.

- Part 1: Calculate average population-weighted MortRate for the combined TopTrio Census Divs.

Census Div.	Col.A 1940 MR Tab 18-A	Col.B 1940 Pop'n Tab 3-B	Col.C 1940 Popn /45,710,039	Col.D Col.A * Col.C	Census Div.	Col.A 1950 MR Tab 18-A	Col.B 1950 Pop'n Tab 3-B	Col.C 1950 Popn /53,964,513	Col.D Col.A * Col.C
Pacific	110.9	9,733,262	0.2129	23.61	Pacific	106.1	14,486,527	0.2684	28.48
NewEng	122.0	8,437,290	0.1846	22.52	NewEng	128.8	9,314,453	0.1726	22.23
Mid-Atl	123.8	27,539,487	0.6025	74.59	Mid-Atl	127.6	30,163,533	0.5590	71.32
1940		Sum TopTrio 45,710,039	Sum 1.0000	TopTrio 120.721	1950		Sum TopTrio 53,964,513	Sum 1.0000	TopTrio 122.036

Census Div.	Col.A 1960 MR Tab 18-A	Col.B 1960 Pop'n Tab 3-B	Col.C 1960 Popn /65,875,863	Col.D Col.A * Col.C	Census Div.	Col.A 1970 MR Tab 18-A	Col.B 1970 Pop'n Tab 3-B	Col.C 1970 Popn /75,017,000	Col.D Col.A * Col.C
Pacific	105.8	21,198,044	0.3218	34.05	Pacific	103.0	26,087,000	0.3477	35.82
NewEng	126.5	10,509,367	0.1595	20.18	NewEng	119.8	11,781,000	0.1570	18.81
Mid-Atl	123.4	34,168,452	0.5187	64.01	Mid-Atl	118.4	37,149,000	0.4952	58.63
1960		Sum TopTrio 65,875,863	Sum 1.0000	TopTrio 118.231	1970		Sum TopTrio 75,017,000	Sum 1.0000	TopTrio 113.265

Census Div.	Col.A 1980 MR Tab 18-A	Col.B 1980 Pop'n Tab 3-B	Col.C 1980 Popn /80,615,000	Col.D Col.A * Col.C	Census Div.	Col.A 1988 MR Tab 18-A	Col.B 1990 Pop'n Tab 3-B	Col.C 1990 Popn /88,495,000	Col.D Col.A * Col.C
Pacific	100.2	31,523,000	0.3910	39.18	Pacific	97.8	37,837,000	0.4276	41.82
NewEng	113.0	12,322,000	0.1528	17.27	NewEng	110.8	12,998,000	0.1469	16.27
Mid-Atl	113.4	36,770,000	0.4561	51.72	Mid-Atl	110.9	37,660,000	0.4256	47.19
1980		Sum TopTrio 80,615,000	Sum 1.0000	TopTrio 108.177	1988		Sum TopTrio 88,495,000	Sum 1.0000	TopTrio 105.284

- Part 2: Take ratios of these TopTrio MortRates, with 1940 as the denominator of each ratio.  
Col.D modifies Col.C by separate PhysPop adjustments for MidTrio and LowTrio Census Divisions.

	Col.A TopTrio Mean MR	Col.B 1940 TopTrio Mean MR	Col.C = Col.A / Col.B	Col.D ppAdju Tab 47-B	Col.E = Col.C * Col.D	DIFFERENCE CANCERS. Males.
MidTrio						
1950	122.036	120.721	1.011	0.99	1.00	= MidTrio Adjustment Factor, 1950
1960	118.231	120.721	0.979	0.97	0.95	= MidTrio Adjustment Factor, 1960
1970	113.265	120.721	0.938	0.95	0.89	= MidTrio Adjustment Factor, 1970
1980	108.177	120.721	0.896	0.94	0.84	= MidTrio Adjustment Factor, 1980
1988	105.284	120.721	0.872	0.94	0.82	= MidTrio Adjustment Factor, 1988
LowTrio						
1950	122.036	120.721	1.011	1.00	1.01	= LowTrio Adjustment Factor, 1950
1960	118.231	120.721	0.979	1.01	0.99	= LowTrio Adjustment Factor, 1960
1970	113.265	120.721	0.938	1.02	0.96	= LowTrio Adjustment Factor, 1970
1980	108.177	120.721	0.896	1.04	0.93	= LowTrio Adjustment Factor, 1980
1988	105.284	120.721	0.872	1.07	0.93	= LowTrio Adjustment Factor, 1988

Table 53-B

Difference Cancers, Males: Fractional Causation in 1950

Part 1.

Calculation of the 6 Adjusted MortRates (Col.F) and the National Adjusted MortRate (Col.G).

The last six entries in Part 1, Col.F, are the products of (Col.D \* Col.E), as discussed in Chap. 49.

	Col.A 1950 PopFrac Tab 3-B	Col.B 1950 Obs MR Tab 18-A	Col.C A * B	Col.D 1940 MR Mid,Low Tab 18-A	Col.E AdjuFact Bx2,Pt2 Col.E	Col.F 1950 Adju MortRates	Col.G A * F
Trio-Sequence							
Pacific	0.0961	106.1	10.196			106.1	10.196
New England	0.0618	128.8	7.960			128.8	7.960
Mid-Atlantic	0.2002	127.6	25.546			127.6	25.546
WestNoCentral	0.0933	108.8	10.151	103.2	1.00	103.20	9.629
EastNoCentral	0.2017	116.5	23.498	109.0	1.00	109.00	21.985
Mountain	0.0337	91.4	3.080	92.0	1.00	92.00	3.100
WestSoCentral	0.0965	93.7	9.042	79.3	1.01	80.09	7.729
EastSoCentral	0.0762	90.0	6.858	68.7	1.01	69.39	5.287
SouthAtlantic	0.1406	96.5	13.568	80.6	1.01	81.41	11.446
		Sum =	109.9			Sum =	
	1950 Observed Natl MR from Table 18-B =		111.2	1950 Natl Adjusted MR =		102.8778	

Part 2.

	Col.A Mean1940 thru1950 PPs from Tab 47-A	Col.B 1950 Adju MRs Part 1	Col.C Difference Cancers, Males: 1950 Adjusted MortRates regressed on Mean 1940 thru 1950 PPs Regression Output:	Col.D 1940 PPs from Table 3-A (TrioSeq) x''	Col.E Difference Ca, Males: 1950 Adjusted MortRates regressed on 1940 PhysPops Regression Output:
Trio-Seq.	x'				
Pacific	154.16	106.1	Constant 14.4291	159.72	Constant 14.6584
NewEng	162.03	128.8	Std Err of Y Est 6.6738	161.55	Std Err of Y Est 7.1929
MidAtl	169.24	127.6	R Squared 0.9099	169.76	R Squared 0.8954
WNoCen	121.60	103.20	No. of Observation 9	123.14	No. of Observation 9
ENoCen	128.53	109.00	Degrees of Freedom 7	133.36	Degrees of Freedom 7
Mtn	119.64	92.00		119.89	
WSoCen	102.64	80.09	X Coefficient(s) 0.6722	103.94	X Coefficient(s) 0.6612
ESoCen	84.44	69.39	Std Err of Coef. 0.0799	85.83	Std Err of Coef. 0.0854
SoAtl	99.91	81.41	XCoef / S.E. = 8.4103	100.74	XCoef / S.E. = 7.7407

Part 3-A.

Calculation of Fractional Causation from Averaged PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.C) = 14.4291
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 102.8778) minus Nonradiation rate (14.4291) = 88.4487
3. 1950 Fractional Causation is radiation rate (88.4487) divided by OBSERVED Natl MR Part 1, Col.C= 111.2 = 0.80

Part 3-B.

Calculation of Fractional Causation from 1940 PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.E) = 14.6584
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 102.8778) minus Nonradiation rate (14.6584) = 88.2194
3. 1950 Fractional Causation is radiation rate (88.2194) divided by OBSERVED Natl MR Part 1, Col.C= 111.2 = 0.79

Table 53-C

Difference Cancers, Males: Fractional Causation in 1960

Part 1.

Calculation of the 6 Adjusted MortRates (Col.F) and the National Adjusted MortRate (Col.G).

The last six entries in Part 1, Col.F, are the products of (Col.D \* Col.E), as discussed in Chap. 49.

	Col.A 1960 PopFrac Tab 3-B	Col.B 1960 Obs MR Tab 18-A	Col.C A * B	Col.D 1940 MR Mid,Low Tab 18-A	Col.E AdjuFact Bx2,Pt2 Col.E	Col.F 1960 Adju MortRates	Col.G A * F
Trio-Sequence							
Pacific	0.1182	105.8	12.506			105.8	12.506
New England	0.0586	126.5	7.413			126.5	7.413
Mid-Atlantic	0.1905	123.4	23.508			123.4	23.508
WestNoCentral	0.0858	107.2	9.198	103.2	0.95	98.04	8.412
EastNoCentral	0.2020	115.0	23.230	109.0	0.95	103.55	20.917
Mountain	0.0382	93.2	3.560	92.0	0.95	87.40	3.339
WestSoCentral	0.0945	98.9	9.346	79.3	0.99	78.51	7.419
EastSoCentral	0.0672	96.1	6.458	68.7	0.99	68.01	4.570
SouthAtlantic	0.1448	101.4	14.683	80.6	0.99	79.79	11.554
		Sum =	109.9			Sum =	
1960 Observed Natl MR from Table 18-B =			110.5	1960 Natl Adjusted MR =			99.6373

Part 2.

	Col.A Mean1940 thru1960 PPs from Tab 47-A	Col.B 1960 Adju MRs from Col.F Part 1	Col.C Difference Cancers, Males: 1960 Adjusted MortRates regressed on Mean 1940 thru 1960 PPs Regression Output:	Col.D 1940 PPs from Table 3-A (TrioSeq) x''	Col.E Difference Ca, Males: 1960 Adjusted MortRates regressed on 1940 PhysPops Regression Output:
Trio-Seq.					
Pacific	155.69	105.8	Constant 13.5357	159.72	Constant 12.9994
NewEng	162.81	126.5	Std Err of Y Est 6.2782	161.55	Std Err of Y Est 6.0029
MidAtl	167.04	123.4	R Squared 0.9153	169.76	R Squared 0.9226
WNoCen	118.15	98.04	No. of Observation 9	123.14	No. of Observation 9
ENoCen	123.87	103.55	Degrees of Freedom 7	133.36	Degrees of Freedom 7
Mtn	117.40	87.40		119.89	
WSoCen	102.31	78.51	X Coefficient(s) 0.6603	103.94	X Coefficient(s) 0.6512
ESoCen	85.63	68.01	Std Err of Coef. 0.0759	85.83	Std Err of Coef. 0.0713
SoAtl	101.72	79.79	XCoef / S.E. = 8.6991	100.74	XCoef / S.E. = 9.1340

Part 3-A.

Calculation of Fractional Causation from Averaged PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.C) = 13.5357
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 99.6373) minus Nonradiation rate (13.5357) = 86.1016
3. 1960 Fractional Causation is radiation rate (86.1016) divided by OBSERVED Natl MR Part 1, Col.C = 110.5 = 0.78

Part 3-B.

Calculation of Fractional Causation from 1940 PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.E) = 12.9994
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 99.6373) minus Nonradiation rate (12.9994) = 86.6379
3. 1960 Fractional Causation is radiation rate (86.6379) divided by OBSERVED Natl MR Part 1, Col.C = 110.5 = 0.78

Table 53-E

Difference Cancers, Males: Fractional Causation in 1980

Part 1.

Calculation of the 6 Adjusted MortRates (Col.F) and the National Adjusted MortRate (Col.G).  
The last six entries in Part 1, Col.F, are the products of (Col.D \* Col.E), as discussed in Chap. 49.

	Col.A 1980 PopFrac Tab 3-B	Col.B 1980 Obs MR Tab 18-A	Col.C A * B	Col.D 1940 MR Mid,Low Tab 18-A	Col.E AdjuFact Bx2,Pt2 Col.E	Col.F 1980 Adju MortRates	Col.G A * F
Trio-Sequence							
Pacific	0.1398	100.2	14.008			100.2	14.008
New England	0.0546	113.0	6.170			113.0	6.170
Mid-Atlantic	0.1630	113.4	18.484			113.4	18.484
WestNoCentral	0.0759	98.3	7.461	103.2	0.84	86.69	6.580
EastNoCentral	0.1846	108.1	19.955	109.0	0.84	91.56	16.902
Mountain	0.0502	91.1	4.573	92.0	0.84	77.28	3.879
WestSoCentral	0.1049	100.1	10.500	79.3	0.93	73.75	7.736
EastSoCentral	0.0646	103.3	6.673	68.7	0.93	63.89	4.127
SouthAtlantic	0.1624	106.2	17.247	80.6	0.93	74.96	12.173
		Sum =	105.1			Sum =	
	1980 Observed Natl MR from Table 18-B =		105.1	1980 Natl Adjusted MR =		90.0598	

Part 2.

	Col.A Mean1940 thru1980 PPs from Tab 47-A	Col.B 1980 Adju MRs from Col.F Part 1 x'	Col.C Difference Cancers, Males: 1980 Adjusted MortRates regressed on Mean 1940 thru 1980 PPs Regression Output:	Col.D 1940 PPs from Table 3-A (TrioSeq) x''	Col.E Difference Ca, Males: 1980 Adjusted MortRates regressed on 1940 PhysPops Regression Output:
Trio-Seq.					
Pacific	177.35	100.2	Constant 11.6156	159.72	Constant 13.6840
NewEng	185.86	113.0	Std Err of Y Est 5.6305	161.55	Std Err of Y Est 4.0882
MidAtl	186.11	113.4	R Squared 0.9113	169.76	R Squared 0.9532
WNoCen	128.82	86.69	No. of Observation 9	123.14	No. of Observation 9
ENoCen	133.71	91.56	Degrees of Freedom 7	133.36	Degrees of Freedom 7
Mtn	133.45	77.28		119.89	
WSoCen	114.66	73.75	X Coefficient(s) 0.4858	103.94	X Coefficient(s) 0.5800
ESoCen	99.46	63.89	Std Err of Coef. 0.0573	85.83	Std Err of Coef. 0.0486
SoAtl	124.62	74.96	XCoef / S.E. = 8.4805	100.74	XCoef / S.E. = 11.9456

Part 3-A.

Calculation of Fractional Causation from Averaged PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.C) = 11.6156
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 90.0598) minus Nonradiation rate (11.6156) = 78.4442
3. 1980 Fractional Causation is radiation rate (78.4442) divided by OBSERVED Natl MR Part 1, Col.C= 105.1 = 0.75

Part 3-B.

Calculation of Fractional Causation from 1940 PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.E) = 13.6840
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 90.0598) minus Nonradiation rate (13.6840) = 76.3758
3. 1980 Fractional Causation is radiation rate (76.3758) divided by OBSERVED Natl MR Part 1, Col.C= 105.1 = 0.73

Table 53-F

Difference Cancers, Males: Fractional Causation in 1988

Part 1.

Calculation of the 6 Adjusted MortRates (Col.F) and the National Adjusted MortRate (Col.G).

The last six entries in Part 1, Col.F, are the products of (Col.D \* Col.E), as discussed in Chap. 49.

	Col.A 1990 PopFrac Tab 3-B	Col.B 1988 Obs MR Tab 18-A	Col.C A * B	Col.D 1940 MR Mid,Low Tab 18-A	Col.E AdjuFact Bx2,Pt2 Col.E	Col.F 1988 Adju MortRates	Col.G A * F
Trio-Sequence							
Pacific	0.1535	97.8	15.012			97.8	15.012
New England	0.0527	110.8	5.839			110.8	5.839
Mid-Atlantic	0.1527	110.9	16.934			110.9	16.934
WestNoCentral	0.0721	99.7	7.188	103.2	0.82	84.62	6.101
EastNoCentral	0.1713	108.9	18.655	109.0	0.82	89.38	15.311
Mountain	0.0543	94.9	5.153	92.0	0.82	75.44	4.096
WestSoCentral	0.1087	105.0	11.414	79.3	0.93	73.75	8.017
EastSoCentral	0.0621	109.1	6.775	68.7	0.93	63.89	3.968
SouthAtlantic	0.1725	107.3	18.509	80.6	0.93	74.96	12.930
		Sum =	105.5			Sum =	
1988 Observed Natl MR from Table 18-B =			103.0	1988 Natl Adjusted MR =			88.2089

Part 2.

	Col.A Mean1940 thru1990 PPs from Tab 47-A	Col.B 1988 Adju MRs Part 1	Col.C Difference Cancers, Males: 1988 Adjusted MortRates regressed on Mean 1940 thru 1990 PPs Regression Output:	Col.D 1940 PPs from Table 3-A (TrioSeq) x''	Col.E Difference Ca, Males: 1988 Adjusted MortRates regressed on 1940 PhysPops Regression Output:
Trio-Seq.					
Pac	191.97	97.8	Constant 13.8764	159.72	Constant 16.4360
NewEng	208.20	110.8	Std Err of Y Est 5.2069	161.55	Std Err of Y Est 4.3199
MidAtl	204.72	110.9	R Squared 0.9158	169.76	R Squared 0.9420
WNoCen	141.14	84.62	No. of Observation 9	123.14	No. of Observation 9
ENoCen	146.19	89.38	Degrees of Freedom 7	133.36	Degrees of Freedom 7
Mtn	145.91	75.44		119.89	
WSoCen	126.28	73.75	X Coefficient(s) 0.4622	103.94	X Coefficient(s) 0.5472
ESoCen	113.28	63.89	Std Err of Coef. 0.0530	85.83	Std Err of Coef. 0.0513
SoAtl	142.93	74.96	XCoef / S.E. = 8.7250	100.74	XCoef / S.E. 10.6659

Part 3-A.

Calculation of Fractional Causation from Averaged PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.C) = 13.8764
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 88.2089) minus Nonradiation rate (13.8764) = 74.3325
3. 1988 Fractional Causation is radiation rate (74.2335) divided by OBSERVED Natl MR Part 1, Col.C= 103 = 0.72

Part 3-B.

Calculation of Fractional Causation from 1940 PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.E) = 16.4360
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 88.2089) minus Nonradiation rate (16.4360) = 71.7729
3. 1988 Fractional Causation is radiation rate (71.7729) divided by OBSERVED Natl MR Part 1, Col.C= 103 = 0.70