

CHAPTER 58

Digestive-System Cancers, Females, 1940-1988

● In Table 58-A, Column A shows that the female National MortRate from Digestive-System Cancers fell in half in the 1940-1988 period. Box 1 shows that such rates fell much more in the TopTrio than in the LowTrio. Please see the text in Chapter 57.

● It is noteworthy that in the 1940-1988 period, female National MortRates decline for Digestive-System Cancers, rise for Respiratory-System Cancers, and remain steady for Breast Cancers. These very different behaviors are consistent with high Fractional Causation by medical radiation for all three groups of cancers, throughout the entire period. High Fractional Causation simply means that medical radiation has been a NECESSARY co-actor for most of the fatal cases, whether the MortRate was rising or falling or flat.

● An additional concept is relevant. The impact on MortRates of a carcinogen, per unit, almost certainly varies with the levels of its co-actors. If the co-actors with medical radiation rise for Respiratory Cancers, while other co-actors for Digestive Cancers fall, then each unit of medical radiation would become more likely than previously to produce Respiratory Cancers, and less likely than previously to produce Digestive Cancers — "all other things being equal."

Year	Col.A Natl MR	Col.B Frac.C	Col.C R-Sq	Col.D X-Coef	Col.E StdErr	Col.F Coef/SE	Col.G Source
1940	50.1	80%	0.7550	0.2895	0.0623	4.6442	Chap.10
1950	42.4	76%	0.7707	0.2431	0.0501	4.8506	Tab 58-B
1960	35.8	75%	0.7985	0.2048	0.0389	5.2675	Tab 58-C
1970	31.0	73%	0.8365	0.1668	0.0279	5.9850	Tab 58-D
1980	26.2	70%	0.8547	0.1271	0.0198	6.4177	Tab 58-E
1988	23.5	68%	0.8637	0.0999	0.0150	6.6597	Tab 58-F

Box 1, Chap. 58

Digestive-System Cancers, Females: 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 10-A	Col.B 1960 MortRate Tab 10-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 10-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	46.8	32.5	0.694	Avg Chg	-14.3	Avg Chg	22.8	0.487	Avg Chg	-24.0	Avg Chg
NewE	61.3	40.7	0.664	TopTrio	-20.6	TopTrio	24.7	0.403	TopTrio	-36.6	TopTrio
MidAtl	60.2	42.9	0.713	0.690	-17.3	-17.4	26.0	0.432	0.441	-34.2	-31.6
WNoCen	49.7	34.1	0.686	Avg Chg	-15.6	Avg Chg	21.8	0.439	Avg Chg	-27.9	Avg Chg
ENoCen	53.1	38.5	0.725	MidTrio	-14.6	MidTrio	24.2	0.456	MidTrio	-28.9	MidTrio
Mtn	47.7	30.5	0.639	0.684	-17.2	-15.8	21.1	0.442	0.446	-26.6	-27.8
WSoCen	34.5	29.6	0.858	Avg Chg	-4.9	Avg Chg	21.5	0.623	Avg Chg	-13.0	Avg Chg
ESoCen	36.3	29.6	0.815	LowTrio	-6.4	LowTrio	23.3	0.642	LowTrio	-13.0	LowTrio
SoAtl	37.3	30.6	0.820	0.834	-6.7	-6.0	22.8	0.611	0.625	-14.5	-13.5

Box 2, Chap. 58

Digestive-System Cancers, Females: 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 10-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 10-A	Col.B 1950 Pop'n Tab 3-B	Col.C 1950 Popn /53,964,513	Col.D Col.A * Col.C
Pacific	46.8	9,733,262	0.2129	9.97	Pacific	37.3	14,486,527	0.2684	10.01
NewEng	61.3	8,437,290	0.1846	11.31	NewEng	48.9	9,314,453	0.1726	8.44
Mid-Atl	60.2	27,539,487	0.6025	36.27	Mid-Atl	51.1	30,163,533	0.5590	28.56
1940		Sum TopTrio 45,710,039	Sum 1.0000	TopTrio 57.550	1950		Sum TopTrio 53,964,513	Sum 1.0000	TopTrio 47.016

Census Div.	Col.A 1960 MR Tab 10-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 10-A	Col.B 1970 Pop'n Tab 3-B	Col.C 1970 Popn /75,017,000	Col.D Col.A * Col.C
Pacific	32.5	21,198,044	0.3218	10.46	Pacific	28.9	26,087,000	0.3477	10.05
NewEng	40.7	10,509,367	0.1595	6.49	NewEng	34.7	11,781,000	0.1570	5.45
Mid-Atl	42.9	34,168,452	0.5187	22.25	Mid-Atl	36.5	37,149,000	0.4952	18.08
1960		Sum TopTrio 65,875,863	Sum 1.0000	TopTrio 39.202	1970		Sum TopTrio 75,017,000	Sum 1.0000	TopTrio 33.574

Census Div.	Col.A 1980 MR Tab 10-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 10-A	Col.B 1990 Pop'n Tab 3-B	Col.C 1990 Popn /88,495,000	Col.D Col.A * Col.C
Pacific	25.4	31,523,000	0.3910	9.93	Pacific	22.8	37,837,000	0.4276	9.75
NewEng	28.7	12,322,000	0.1528	4.39	NewEng	24.7	12,998,000	0.1469	3.63
Mid-Atl	30.1	36,770,000	0.4561	13.73	Mid-Atl	26.0	37,660,000	0.4256	11.06
1980		Sum TopTrio 80,615,000	Sum 1.0000	TopTrio 28.048	1988		Sum TopTrio 88,495,000	Sum 1.0000	TopTrio 24.441

● 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 Col.A * ppAdju Tab 47-B	Col.E = Col.C * Col.D	DIGESTIVE-SYSTEM CANCERS. Females.
MidTrio						
1950	47.016	57.550	0.817	0.99	0.81	= MidTrio Adjustment Factor, 1950
1960	39.202	57.550	0.681	0.97	0.66	= MidTrio Adjustment Factor, 1960
1970	33.574	57.550	0.583	0.95	0.55	= MidTrio Adjustment Factor, 1970
1980	28.048	57.550	0.487	0.94	0.46	= MidTrio Adjustment Factor, 1980
1988	24.441	57.550	0.425	0.94	0.40	= MidTrio Adjustment Factor, 1988
LowTrio						
1950	47.016	57.550	0.817	1.00	0.82	= LowTrio Adjustment Factor, 1950
1960	39.202	57.550	0.681	1.01	0.69	= LowTrio Adjustment Factor, 1960
1970	33.574	57.550	0.583	1.02	0.60	= LowTrio Adjustment Factor, 1970
1980	28.048	57.550	0.487	1.04	0.51	= LowTrio Adjustment Factor, 1980
1988	24.441	57.550	0.425	1.07	0.45	= LowTrio Adjustment Factor, 1988

Table 58-B

Digestive-System Cancers, Females: 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 10-A	Col.C A * B	Col.D 1940 MR Mid,Low Tab 10-A	Col.E AdjuFact Bx2,Pt2 Col.E	Col.F 1950 Adju MortRates	Col.G A * F
Trio-Sequence							
Pacific	0.0961	37.3	3.585			37.3	3.585
New England	0.0618	48.9	3.022			48.9	3.022
Mid-Atlantic	0.2002	51.1	10.230			51.1	10.230
WestNoCentral	0.0933	40.4	3.769	49.7	0.81	40.26	3.756
EastNoCentral	0.2017	44.7	9.016	53.1	0.81	43.01	8.675
Mountain	0.0337	34.8	1.173	47.7	0.81	38.64	1.302
WestSoCentral	0.0965	33.3	3.213	34.5	0.82	28.29	2.730
EastSoCentral	0.0762	34.5	2.629	36.3	0.82	29.77	2.268
SouthAtlantic	0.1406	34.9	4.907	37.3	0.82	30.59	4.300
		Sum =	41.5			Sum =	
1950	Observed MR from Table 10-B		42.4	1950 Natl Adjusted MR =		39.8687	

Part 2.

Trio-Seq.	Col.A Mean1940 thru1950 PPs from Tab 47-A	Col.B 1950 Adju MRs Part 1 x'	Col.C Digestive Cancers, Females: 1950 Adjusted MortRates regressed on Mean 1940 thru 1950 PPs Regression Output: Constant Std Err of Y Est R Squared No. of Observation Degrees of Freedom X Coefficient(s) Std Err of Coef. XCoef / S.E. =	Col.D 1940 PPs from Table 3-A (TrioSeq) x''	Col.E Digestive Cancers, Females: 1950 Adjusted MortRates regressed on 1940 PhysPops Regression Output: Constant Std Err of Y Est R Squared No. of Observation Degrees of Freedom X Coefficient(s) Std Err of Coef. XCoef / S.E. =
Pac	154.16	37.3	7.7959	159.72	8.1574
NewEng	162.03	48.9	4.1853	161.55	4.4162
MidAtl	169.24	51.1	0.7707	169.76	0.7447
WNoCen	121.60	40.26	9	123.14	9
ENoCen	128.53	43.01	7	133.36	7
Mtn	119.64	38.64		119.89	
WSoCen	102.64	28.29	0.2431	103.94	0.2370
ESoCen	84.44	29.77	0.0501	85.83	0.0524
SoAtl	99.91	30.59	4.8506	100.74	4.5188

Part 3-A.

Calculation of Fractional Causation from Averaged PhysPops

1. Nonradiation rate is Adjusted
Constant (Part 2, Col.C) = 7.7959
2. Radiation rate is Natl Adjusted
MortRate (Part 1, Col.G = 39.8687)
minus Nonradiation rate (7.7959) = 32.0728
3. 1950 Fractional Causation is radiation
rate (32.0728) divided by OBSERVED
Natl MR Part 1, Col.C= 42.4 = 0.76

Part 3-B.

Calculation of Fractional Causation from 1940 PhysPops

1. Nonradiation rate is Adjusted
Constant (Part 2, Col.E) = 8.1574
2. Radiation rate is Natl Adjusted
MortRate (Part 1, Col.G = 39.8687)
minus Nonradiation rate (8.1574) = 31.7112
3. 1950 Fractional Causation is radiation
rate (31.7112) divided by OBSERVED
Natl MR Part 1, Col.C= 42.4 = 0.75

Table 58-C
Digestive-System Cancers, Females: 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.

Trio-Sequence	Col.A 1960 PopFrac Tab 3-B	Col.B 1960 Obs MR Tab 10-A	Col.C A * B	Col.D 1940 MR Mid,Low Tab 10-A	Col.E AdjuFact Bx2,Pt2 Col.E	Col.F 1960 Adju MortRates	Col.G A * F
Pacific	0.1182	32.5	3.842			32.5	3.842
New England	0.0586	40.7	2.385			40.7	2.385
Mid-Atlantic	0.1905	42.9	8.172			42.9	8.172
WestNoCentral	0.0858	34.1	2.926	49.7	0.66	32.80	2.814
EastNoCentral	0.2020	38.5	7.777	53.1	0.66	35.05	7.079
Mountain	0.0382	30.5	1.165	47.7	0.66	31.48	1.203
WestSoCentral	0.0945	29.6	2.797	34.5	0.69	23.81	2.250
EastSoCentral	0.0672	29.9	2.009	36.3	0.69	25.05	1.683
SouthAtlantic	0.1448	30.6	4.431	37.3	0.69	25.74	3.727
		Sum =	35.5			Sum =	
1960	Observed MR from Table 10-B		35.8	1960 Natl Adjusted MR =		33.1547	

Part 2.

Trio-Seq.	Col.A Mean1940 thru1960 PPs from Tab 47-A	Col.B 1960 Adju MRs Part 1 x'	Col.C Digestive Cancers, Females: 1960 Adjusted MortRates regressed on Mean 1940 thru 1960 PPs Regression Output: Constant Std Err of Y Est R Squared No. of Observation Degrees of Freedom X Coefficient(s) Std Err of Coef. XCoef / S.E. =	Col.D 1940 PPs from Table 3-A (TrioSeq) x''	Col.E Digestive Cancers, Females: 1960 Adjusted MortRates regressed on 1940 PhysPops Regression Output: Constant Std Err of Y Est R Squared No. of Observation Degrees of Freedom X Coefficient(s) Std Err of Coef. XCoef / S.E. =
Pac	155.69	32.5	6.4099	159.72	6.1060
NewEng	162.81	40.7	3.2153	161.55	3.0943
MidAtl	167.04	42.9	0.7985	169.76	0.8134
WNoCen	118.15	32.80	9	123.14	9
ENoCen	123.87	35.05	7	133.36	7
Mtn	117.40	31.48		119.89	
WSoCen	102.31	23.81	0.2048	103.94	0.2030
ESoCen	85.63	25.05	0.0389	85.83	0.0367
SoAtl	101.72	25.74	5.2675	100.74	5.5243

Part 3-A.

Calculation of Fractional Causation
from Averaged PhysPops

1. Nonradiation rate is Adjusted
Constant (Part 2, Col.C) = 6.4099
2. Radiation rate is Natl Adjusted
MortRate (Part 1, Col.G = 33.1547)
minus Nonradiation rate (6.4099) = 26.7448
3. 1960 Fractional Causation is radiation
rate (26.7448) divided by OBSERVED
Natl MR Part 1, Col.C = 35.8 = 0.75

Part 3-B.

Calculation of Fractional Causation
from 1940 PhysPops

1. Nonradiation rate is Adjusted
Constant (Part 2, Col.E) = 6.1060
2. Radiation rate is Natl Adjusted
MortRate (Part 1, Col.G = 33.1547)
minus Nonradiation rate (6.1060) = 27.0487
3. 1960 Fractional Causation is radiation
rate (27.0487) divided by OBSERVED
Natl MR Part 1, Col.C = 35.8 = 0.76

Table 58-E

Digestive-System Cancers, Females: 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.

Trio-Sequence	Col.A 1980 PopFrac Tab 3-B	Col.B 1980 Obs MR Tab 10-A	Col.C A * B	Col.D 1940 MR Mid,Low Tab 10-A	Col.E AdjuFact Bx2,Pt2 Col.E	Col.F 1980 Adju MortRates	Col.G A * F
Pacific	0.1398	25.4	3.551			25.4	3.551
New England	0.0546	28.7	1.567			28.7	1.567
Mid-Atlantic	0.1630	30.1	4.906			30.1	4.906
WestNoCentral	0.0759	24.6	1.867	49.7	0.46	22.86	1.735
EastNoCentral	0.1846	27.1	5.003	53.1	0.46	24.43	4.509
Mountain	0.0502	22.2	1.114	47.7	0.46	21.94	1.101
WestSoCentral	0.1049	23.6	2.476	34.5	0.51	17.60	1.846
EastSoCentral	0.0646	24.4	1.576	36.3	0.51	18.51	1.196
SouthAtlantic	0.1624	24.4	3.963	37.3	0.51	19.02	3.089
		Sum =	26.0			Sum =	
1980 Observed MR from Table 10-B			26.2	1980 Natl Adjusted MR =		23.5010	

Part 2.

Trio-Seq.	Col.A Mean1940 thru1980 PPs from Tab 47-A	Col.B 1980 Adju MRs Part 1 x'	Col.C Digestive Cancers, Females: 1980 Adjusted MortRates regressed on Mean 1940 thru 1980 PPs Regression Output: Constant Std Err of Y Est R Squared No. of Observation Degrees of Freedom X Coefficient(s) Std Err of Coef. XCoef / S.E. =	Col.D 1940 PPs from Table 3-A (TrioSeq) x''	Col.E Digestive Cancers, Females: 1980 Adjusted MortRates regressed on 1940 PhysPops Regression Output: Constant Std Err of Y Est R Squared No. of Observation Degrees of Freedom X Coefficient(s) Std Err of Coef. XCoef / S.E. =
Pac	177.35	25.4	5.0370	159.72	4.8931
NewEng	185.86	28.7	1.8034	161.55	1.3933
MidAtl	186.11	30.1	0.8547	169.76	0.9133
WNoCen	128.82	22.86	9	123.14	9
ENoCen	133.71	24.43	7	133.36	7
Mtn	133.45	21.94		119.89	
WSoCen	114.66	17.60	0.1271	103.94	0.1421
ESoCen	99.46	18.51	0.0198	85.83	0.0165
SoAtl	124.62	19.02	6.4177	100.74	8.5865

Part 3-A.

Calculation of Fractional Causation from Averaged PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.C) = 5.0370
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 23.5010) minus Nonradiation rate (5.0370) = 18.4639
3. 1980 Fractional Causation is radiation rate (18.4639) divided by OBSERVED Natl MR Part 1, Col.C= 26.2 = 0.70

Part 3-B.

Calculation of Fractional Causation from 1940 PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.E) = 4.8931
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 23.5010) minus Nonradiation rate (4.8931) = 18.6079
3. 1980 Fractional Causation is radiation rate (18.6079) divided by OBSERVED Natl MR Part 1, Col.C= 26.2 = 0.71

Table 58-F

Digestive-System Cancers, Females: 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 10-A	Col.C A * B	Col.D 1940 MR Mid,Low Tab 10-A	Col.E AdjuFact Bx2,Pt2 Col.E	Col.F 1988 Adju MortRates	Col.G A * F
Trio-Sequence							
Pacific	0.1535	22.8	3.500			22.8	3.500
New England	0.0527	24.7	1.302			24.7	1.302
Mid-Atlantic	0.1527	26.0	3.970			26.0	3.970
WestNoCentral	0.0721	21.8	1.572	49.7	0.40	19.88	1.433
EastNoCentral	0.1713	24.2	4.145	53.1	0.40	21.24	3.638
Mountain	0.0543	21.1	1.146	47.7	0.40	19.08	1.036
WestSoCentral	0.1087	21.5	2.337	34.5	0.45	15.53	1.688
EastSoCentral	0.0621	23.3	1.447	36.3	0.45	16.34	1.014
SouthAtlantic	0.1725	22.8	3.933	37.3	0.45	16.79	2.895
		Sum =	23.4			Sum =	
1988 Observed MR from Table 10-B			23.5	1988 Natl Adjusted MR =		20.4769	

Part 2.

Trio-Seq.	Col.A Mean1940 thru1990 PPs from Tab 47-A	Col.B 1988 Adju MRs Part 1 x'	Col.C Digestive Cancers, Females 1988 Adjusted MortRates regressed on Mean 1940 thru 1990 PPs Regression Output:	Col.D 1940 PPs from Table 3-A (TrioSeq) x''	Col.E Digestive Cancers, Females 1988 Adjusted MortRates regressed on 1940 PhysPops Regression Output:
Pac	191.97	22.8	Constant 4.4992	159.72	Constant 4.6537
NewEng	208.20	24.7	Std Err of Y Est 1.4736	161.55	Std Err of Y Est 1.0129
MidAtl	204.72	26.0	R Squared 0.8637	169.76	R Squared 0.9356
WNoCen	141.14	19.88	No. of Observation 9	123.14	No. of Observation 9
ENoCen	146.19	21.24	Degrees of Freedom 7	133.36	Degrees of Freedom 7
Mtn	145.91	19.08		119.89	
WSoCen	126.28	15.53	X Coefficient(s) 0.0999	103.94	X Coefficient(s) 0.1213
ESoCen	113.28	16.34	Std Err of Coef. 0.0150	85.83	Std Err of Coef. 0.0120
SoAtl	142.93	16.79	XCoef / S.E. = 6.6597	100.74	XCoef / S.E. 10.0845

Part 3-A.

Calculation of Fractional Causation from Averaged PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.C) = 4.4992
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 20.4769) minus Nonradiation rate (4.4992) = 15.9777
3. 1988 Fractional Causation is radiation rate (15.9777) divided by OBSERVED Natl MR Part 1, Col.C= 23.5 = 0.68

Part 3-B.

Calculation of Fractional Causation from 1940 PhysPops

1. Nonradiation rate is Adjusted Constant (Part 2, Col.E) = 4.6537
2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.G = 20.4769) minus Nonradiation rate (4.6537) = 15.8232
3. 1988 Fractional Causation is radiation rate (15.8232) divided by OBSERVED Natl MR Part 1, Col.C= 23.5 = 0.67