CHAPTER 40

IHD in Males: The Dose-Response between Medical Radiation and IHD

• Part 1. Ischemic Heart Disease, Mortality Rates, Males

• 1950, 1960: The year 1950 is the earliest one for which Grove 1968 provides data for Ischemic Heart Disease. Grove 1968 provides age-adjusted data (1940 Standard Population) for 1950 and 1960, but none for 1940. In Grove 1968, the entity was as we show it in our Chapter 4, Part 5, Entry 17 (with ICD/7 numbers):

Arteriosclerotic Heart Disease, including coronary disease (420).
Arteriosclerotic heart disease so described (420.0).
Heart Disease specified as involving coronary arteries (420.1).
Angina Pectoris without mention of coronary disease (420.2).

• 1980: The 1980 age-adjusted MortRates (1940 Standard Population) come from the 1979-81 printout supplied to us by the National Center for Health Statistics (NatCtrHS 1980). By then, the Ninth Revision of ICD numbers was operative, and the data in the printout are described as follows:

Ischemic Heart Disease (410-414).
Acute Myocardial Infarction (410).
Other Acute and Subacute Forms of Ischemic Heart Disease (411).
Angina Pectoris (413).
Old Myocardial Infarction and Other Forms of Chronic Ischemic Heart Disease (412, 414).

• 1970: For 1970, no IHD MortRate data became available to us by states or Census Divisions, for males and females separately. To obtain values for 1970, we interpolated between the 1960 and 1980 values.

• 1993: The 1993 age-adjusted MortRates (1940 Standard Population) come from the 1992-1994 printout supplied to us in 1997 by the National Center for Health Statistics (NatCtrHS 1993) for ICD numbers 410 to 414.9. Rates were supplied for each gender by states. To obtain the population-weighted male MortRate for each Census Division, we weighted the male rate for each STATE according to the fraction contributed by its state's population to the population of the entire Census Division in 1990. Female MortRates for each Census Division were obtained the same way.

• Part 2. How the Dose-Response Behaves, for Medical Radiation and IHD

In our dose-response studies, PhysPops for the Nine Census Divisions represent the relative, average accumulated doses from medical radiation. This surrogacy has been examined in Chapter 3.

As the dose, PhysPops are the x-values in our linear regression analyses. The corresponding MortRates for the Nine Census Divisions are the responses to be studied, so they are the matching y-values. Both the x and the y variables have the denominator "per 100,000 population." Chapter 40 follows the model of Chapter 6.

In Parts 2a through 2k, we regress the 1950 MortRates for Ischemic Heart Disease (from Table 40-A) upon the non-interpolated sets of PhysPop values 1921-1940 (from the Universal PhysPop Table 3-A). This work is comparable to our work with All Cancers Combined, Chapters 6 and 7, except that we were able to use 1940 MortRates for Cancers. Here, we must use 1950 MortRates for IHD, as noted in Part 1 above. In Part 2k, we regress 1950 MortRates for IHD on 1950 PhysPops. Readers are reminded that, in the regressions below, only the PhysPops reach back into earlier decades. We are exploring which PhysPop set has the strongest correlation with a SINGLE set of MortRates (1950).

A Relationship of Immense Strength

The summary-results of all the regression analyses are presented in Box 1. The strongest dose-response relationship in Box 1 has an R-squared value of 0.948 and a ratio of 11.2 for the X-Coefficient over its Standard Error. The strength of the correlation is immense.

Figure 40-A shows the strong POSITIVE relationship between PhysPop and male IHD --- which closely resembles the strong POSITIVE relationship between PhysPop and male CANCER shown in Figure 6-A. By contrast, Figure 25-A+B shows that the nonIHD noncancer causes of death have an INVERSE correlation with PhysPop.

	x	y	
● - Part 2a.	1921	1950	IHD, Males
	PhysPop	MortRate	Regression Output:
Pacific	165.11	283.2	Constant -3.8662
New England	142.24	297.1	Std Err of Y Est 37.6682
West North Central	140.93	228.4	R Squared 0.3983
Mid-Atlantic	137.29	310.3	No. of Observations 9
East North Central	136.06	258.9	Degrees of Freedom 7
Mountain	135.38	214.8	
West South Central	125.15	206.1	X Coefficient(s) 1.8415
East South Central	119.76	176.8	Std Err of Coef. 0.8556
South Atlantic	110.32	222.0	Coefficient / S.E. 2.1524
● - Part 2b.	1923	1950	IHD, Males
	PhysPop	MortRate	Regression Output:
Pacific	163.06	283.2	Constant -3.3503
New England	137.39	297.1	Std Err of Y Est 34.9379
West North Central	138.31	228.4	R Squared 0.4823
Mid-Atlantic	138.92	310.3	No. of Observations 9
East North Central	131.82	258.9	Degrees of Freedom 7
Mountain	130.51	214.8	
West South Central	119.16	206.1	X Coefficient(s) 1.8893
East South Central	113.16	176.8	Std Err of Coef. 0.7398
South Atlantic	106.79	222.0	Coefficient / S.E. 2.5539
● - Part 2c.	1925	1950	IHD, Males
	PhysPop	MortRate	Regression Output:
Pacific	161.67	283.2	Constant 6.1273
New England	138.31	297.1	Std Err of Y Est 32.4561
West North Central	133.92	228.4	R Squared 0.5533
Mid-Atlantic	134.36	310.3	No. of Observations 9
East North Central	127.54	258.9	Degrees of Freedom 7
Mountain	122.30	214.8	
West South Central	112.83	206.1	X Coefficient(s) 1.8764
East South Central	107.22	176.8	Std Err of Coef. 0.6373
South Atlantic	103.61	222.0	Coefficient / S.E. 2.9443
● - Part 2d.	1927	1950	IHD, Males
	PhysPop	MortRate	Regression Output:
Pacific	157.83	283.2	Constant -3.7561
New England	137.50	297.1	Std Err of Y Est 27.6261

West North Central	131.54	228.4
Mid-Atlantic	138.40	310.3
East North Central	126.18	258.9
Mountain	118.75	214.8
West South Central	108.25	206.1
East South Central	102.07	176.8
South Atlantic	102.13	222.0

R Squared	0.6763
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	1.9876
Std Err of Coef.	0.5197
Coefficient / S.E.	3.8246

• - Part 2e.

	1929 PhysPop	1950 MortRate
Pacific	156.64	283.2
New England	138.46	297.1
West North Central	128.72	228.4
Mid-Atlantic	138.49	310.3
East North Central	126.51	258.9
Mountain	118.68	214.8
West South Central	105.60	206.1
East South Central	99.41	176.8
South Atlantic	100.86	222.0

IHD, Males
Regression Output:

Constant	-1.1046
Std Err of Y Est	25.7335
R Squared	0.7192
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	1.9828
Std Err of Coef.	0.4683
Coefficient / S.E.	4.2338

• - Part 2f.

	1931 PhysPop	1950 MortRate
Pacific	159.97	283.2
New England	142.35	297.1
West North Central	126.50	228.4
Mid-Atlantic	140.82	310.3
East North Central	128.59	258.9
Mountain	118.89	214.8
West South Central	105.95	206.1
East South Central	96.73	176.8
South Atlantic	99.59	222.0

IHD, Males
Regression Output:

Constant	13.5791
Std Err of Y Est	23.9871
R Squared	0.7560
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	1.8540
Std Err of Coef.	0.3981
Coefficient / S.E.	4.6569

• - Part 2g.

	1934 PhysPop	1950 MortRate
Pacific	160.09	283.2
New England	148.60	297.1
West North Central	125.96	228.4
Mid-Atlantic	149.62	310.3
East North Central	129.36	258.9
Mountain	117.16	214.8
West South Central	104.68	206.1
East South Central	92.00	176.8
South Atlantic	98.41	222.0

IHD, Males
Regression Output:

Constant	27.5355
Std Err of Y Est	18.7380
R Squared	0.8511
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	1.7318
Std Err of Coef.	0.2738
Coefficient / S.E.	6.3254

• - Part 2h.

	1936 PhysPop	1950 MortRate
Pacific	158.44	283.2
New England	150.18	297.1
West North Central	126.14	228.4
Mid-Atlantic	155.05	310.3
East North Central	130.42	258.9
Mountain	119.80	214.8
West South Central	103.52	206.1
East South Central	89.94	176.8
South Atlantic	99.16	222.0

IHD, Males
Regression Output:

Constant	30.6794
Std Err of Y Est	16.6019
R Squared	0.8831
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	1.6965
Std Err of Coef.	0.2333
Coefficient / S.E.	7.2723

• - Part 2i.

	1938 PhysPop	1950 MortRate
Pacific	157.62	283.2
New England	154.08	297.1
West North Central	124.95	228.4
Mid-Atlantic	160.69	310.3
East North Central	131.98	258.9
Mountain	119.88	214.8
West South Central	102.79	206.1
East South Central	88.21	176.8
South Atlantic	99.26	222.0

IHD, Males
Regression Output:

Constant	38.7532
Std Err of Y Est	14.0452
R Squared	0.9163
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	1.6225
Std Err of Coef.	0.1853
Coefficient / S.E.	8.7563

• - Part 2j.	1940 PhysPop	1950 MortRate
Pacific	159.72	283.2
New England	161.55	297.1
West North Central	123.14	228.4
Mid-Atlantic	169.76	310.3
East North Central	133.36	258.9
Mountain	119.89	214.8
West South Central	103.94	206.1
East South Central	85.83	176.8
South Atlantic	100.74	222.0

IHD, Males

Regression Output:	
Constant	53.0895
Std Err of Y Est	11.1218
R Squared	0.9475
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	1.4852
Std Err of Coef.	0.1321
Coefficient / S.E.	11.2446

• - Part 2k.	1950 PhysPop	1950 MortRate
Pacific	148.60	283.2
New England	162.51	297.1
West North Central	120.06	228.4
Mid-Atlantic	168.71	310.3
East North Central	123.69	258.9
Mountain	119.38	214.8
West South Central	101.34	206.1
East South Central	83.05	176.8
South Atlantic	99.07	222.0

IHD, Males

Regression Output:	
Constant	57.5900
Std Err of Y Est	12.6311
R Squared	0.9323
No. of Observations	9
Degrees of Freedom	7
X Coefficient(s)	1.4908
Std Err of Coef.	0.1518
Coefficient / S.E.	9.8212

• Part 3. Maximum Relationship: Best-Fit Equation and Graph

The regression analysis of Part 2j produces the strongest correlation. From the output, we can write the best-fit equation, as we have throughout Sections Two and Three of the book. (Reminder: We use the symbol * to denote multiplication.)

• - Ischemic Heart Disease MortRate, Males = (X-Coefficient * PhysPop) + Constant.
• - Ischemic Heart Disease MortRate, Males = (1.4852 * PhysPop) + 53.09.

Using the equation of best fit, we can calculate a best-fit MortRate for any value of PhysPop. In Box 2, we show best-fit MortRates which have been calculated for the nine actual PhysPop values of Part 2j, and also for lower PhysPop values, down to zero PhysPop (Chapter 5, Part 5e).

Figure 40-A shows the line of best fit --- which connects these pairs of x,y values (various PhysPops, best-fit MortRates). The graph also shows nine boxy symbols (the nine actual observations from Part 2j). Per 100K means per 100,000. Chapter 6, Part 3, discusses how to know which boxy symbol "belongs with" which Census Division.

• Part 4. Best Estimate: 79 % of Male IHD MortRate due to Medical Radiation, 1950

The data have revealed a linear relationship in 1950 of immense strength between medical radiation and male IHD mortality. The reasonable presumption, in the absence of a better explanation, is that the relationship is TRULY CAUSAL --- in other words, a dose-response. So then one must ask:

"What would be the estimated male IHD mortality-rate in 1950 if there were NO dosage of medical radiation?"

No medical irradiation would occur if there were NO PHYSICIANS per 100,000 population. So we want to know the value of the y-variable (IHD MortRate) when the value of the x-variable (PhysPop) is equal to zero. This value is, of course, called the Constant in the regression output of Part 2j. On the graph, the Constant is the value of the MortRate where the line of best-fit intersects the y-axis. This "intercept" occurs where the value of PHYSPOP equals zero. No medical radiation at all.

Since every Census Division has physicians, there can be no real-world datapoint in our study for the male IHD MortRate when PhysPop = zero. But the calculated or "estimated" MortRate, if PhysPop were zero, certainly does not come out of thin air. It is extrapolated from nine real-world observations which reflect a very strong linear relationship. It merits emphasis that the raw data which

reveal this relationship are neutral --- by which we mean they were collected long ago by people having no conceivable bias with respect to the studies in this monograph.

4a. Percentage Attributable to Medical Radiation: "Fractional Causation"

Using our strongest dose-response result, we propose that the Ischemic Heart Disease mortality (male) attributable to medical radiation at approximately mid-century is the total National IHD MortRate in 1950 for males, minus the MortRate indicated by the Constant. The fraction attributable to medical radiation is (1950 National MortRate minus the Constant) / (1950 National MortRate).

Calculation of the Fractional Causation by medical radiation is summarized in Box 3 --- a box very familiar from Chapters 6-19 of this book.

When we subtract the Constant of 53.09 (Part 2j) from the National MortRate of 256.4 (Table 40-B), we have the rate of 203.31 per 100,000 from medical irradiation. The fraction of the total is thus (203.31 / 256.4), or 0.793. In other words, the "best estimate" which falls out of the data is that 79 % of Ischemic Heart Disease MortRate, in males, at approximately mid-century, is attributable to medical radiation. Box 3 calculates 90 % confidence limits on the central estimate, in the same manner explained by Chapter 6, Parts 4b-4d.

4b. Looking for Consistencies: Error-Checks on Input and Output

In Box 4, we use input and output generated in this chapter, to calculate the male National IHD MortRate by two separate methods. If each calculation yields a rate which is close to the National Rate provided from Vital Statistics in our Table 40-B, then we can assure ourselves and readers that we have made no serious errors here. Box 4 was introduced and explained in greater detail in Chapter 6, Part 5.

• Part 5. Not True That "79% Leaves Only 21% for OTHER Causes!"

The estimate, that 79 % of the male National IHD MortRate is caused by medical radiation, may result in readers thinking, "You leave too little room for other causes!" Not so, if co-action is taken into account.

Both Ischemic Heart Disease and Cancer are well established as multi-cause diseases. There is convincing evidence that several different causes increase the death-rate from Ischemic Heart Disease, and likewise, that several different causes increase the death-rate from Cancer. It is highly likely that each single case of IHD (or Cancer) has more than one contributing cause. And if an agent contributes to the outcome, it must be NECESSARY to the outcome --- for if the outcome would have been the same without its presence, then it contributes nothing to the outcome.

The concept of NECESSARY co-actors is an old one. For instance, in the famous 1964 "Surgeon General's Report" on cigarette smoking as a cause of Lung Cancer, the authors wrote (SurgeonGen 1964, p.31): "It is recognized that often the co-existence of several factors is required for the occurrence of a disease, and that one of the factors may play a dominant role; that is, without it, the other factors (such as genetic susceptibility) seldom lead to the occurrence of the disease."

Any contributing agent can be appropriately called "the cause" of a case, if the case would not have occurred in the absence of help from that specific agent. Thus, our finding that 79% of male IHD deaths (USA) in 1950 were caused by medical radiation does not restrict other causes to a small role. The Introduction (Part 5) of this monograph illustrates the point quantitatively.

When cases of Ischemic Heart Disease have more than one cause per case, then reducing exposure to one of the contributing co-actors reduces the impact of all its partners. The evidence in this book, that exposure to medical radiation is an important atherogen, points to a major opportunity for reducing future mortality-rates from Ischemic Heart Disease.

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Box 1 of Chap. 40

Summary: Regression Outputs, Male IHD MortRates Regressed on PhysPop.

We are searching for the maximum correlation between PhysPops of 1921-1950 and the male Ischemic Heart Disease MortRates of 1950. Even the maximum correlation will tend to understate the true correlation (Chapter 5, Part 8b). Below are the summary-results from all the calculations of Part 2, for the 1950 MortRates regressed on PhysPops of 1921-1950.

Part	PhysPop	R-squared	Constant	X-Coef	Std Err	X-Coef/SE
2a	1921	0.3983	-3.87	1.8415	0.8556	2.1524
2b	1923	0.4823	-3.35	1.8893	0.7398	2.5539
2c	1925	0.5533	6.13	1.8764	0.6373	2.9443
2d	1927	0.6763	-3.76	1.9876	0.5197	3.8246
2e	1929	0.7192	-1.10	1.9828	0.4683	4.2338
2f	1931	0.7560	13.58	1.8540	0.3981	4.6569
2g	1934	0.8511	27.54	1.7318	0.2738	6.3254
2h	1936	0.8831	30.68	1.6965	0.2333	7.2723
2i	1938	0.9163	38.75	1.6225	0.1853	8.7563
2j --->	1940 Max	0.9475	53.09	1.4852	0.1321	11.2446
2k	1950	0.9323	57.59	1.4908	0.1518	9.8212

Related text = Part 2.

Box 2 of Chap. 40

Input-Data for Figure 40-A. Ischemic Heart Disease. Males.

Part 2j, Best-Fit Equation: Calc. MortRate = (1.4852 * PhysPop) + (53.09)

Census Divisions	1940 Observed PhysPops	1950 Observed MortRates	Best-Fit Calc. MortRates
Pacific	159.72	283.2	290.306
New England	161.55	297.1	293.024
West No. Central	123.14	228.4	235.978
Mid-Atlantic	169.76	310.3	305.218
East No. Central	133.36	258.9	251.156
Mountain	119.89	214.8	231.151
West So. Central	103.94	206.1	207.462
East So. Central	85.83	176.8	180.565
South Atlantic	100.74	222.0	202.709
Additional PhysPops	70.00		157.054
--- not "observed" ---	60.00		142.202
down to zero PhysPop	50.00		127.350
(zero medical radiation).	40.00		112.498
For each, we calculate	30.00		97.646
a best-fit MortRate.	20.00		82.794
These additional x,y pairs	10.00		67.942
are also part of the	0		53.090
best-fit line (Chap 5, Part 5e).			

Related text = Part 3.

Box 3 of Chap. 40
Percent of IHD MortRate Attributable to Medical Radiation.

Please see text in Chapter 40, Parts 4 and 5.

IHD. MALES. * denotes multiplication.

• MALE National MortRate (MR) 1950, from Table 40-B	256.4	National MortRate
• Constant, from regression, Part 2j	53.0895	Constant
• Fractional Causation, Best Est. = (Natl MR - Constant) / Natl MR	79.3%	Frac. Causation

90% Confidence-Limits (C.L.) on Fractional Causation. See text in Chapter 6, Parts 4b-d, please.

X-Coefficient, from Part 2j	1.4852	X-Coef., Best Est.
Standard Error (SE) of X-Coefficient, from Part 2j	0.1321	Standard Error
Upper 90% C.L. on X-Coef. = (Coef) + (1.645 * SE) =	1.7025	New X-Coefficient
New Constant = (Natl MR) - (New X-Coef * 1940 Natl PhysPop) =	31.6013	New Constant
Frac. Caus'n, High-Limit = (Natl MR - New Constant) / Natl MR =	87.7%	New Frac. Caus'n.
Lower 90% C.L. on X-Coef. = (Coef) - (1.645 * SE) =	1.2679	New X-Coefficient
New Constant = (Natl MR) - (New X-Coef * 1940 Natl PhysPop) =	88.9871	New Constant
Frac. Caus'n, Low-Limit = (Natl MR - New Constant) / Natl MR =	65.3%	New Frac. Caus'n.

Related text = Part 4a.

Box 4 of Chap. 40
Error-Check on Our Own Work: Ischemic Heart Disease, Males.

Please see text in Chapter 6, Part 5.

Below, Columns A, C, and F come directly from the regression input in Part 2j. Columns B and E, fractions of the whole 1940 and 1950 population in each Census Division, come from Table 3-B in Chapter 3. Each Column-D entry = (B * C). Each Column-G entry = (E) * (F). MortRates and PhysPops are each "per 100,000."

The Weighted-Avg. Nat'l PhysPop, 1940, is the sum of Column-D entries =	132.04
Weighted-Avg. Nat'l Male MortRate, 1950, is sum of Col.G entries =	253.04
Nat'l Male MortRate is also (X-Coef * 1940 Nat'l PhysPop) + Constant =	249.20
Comparison: The Nat'l Male MortRate, 1950, in Table 40-B =	256.40

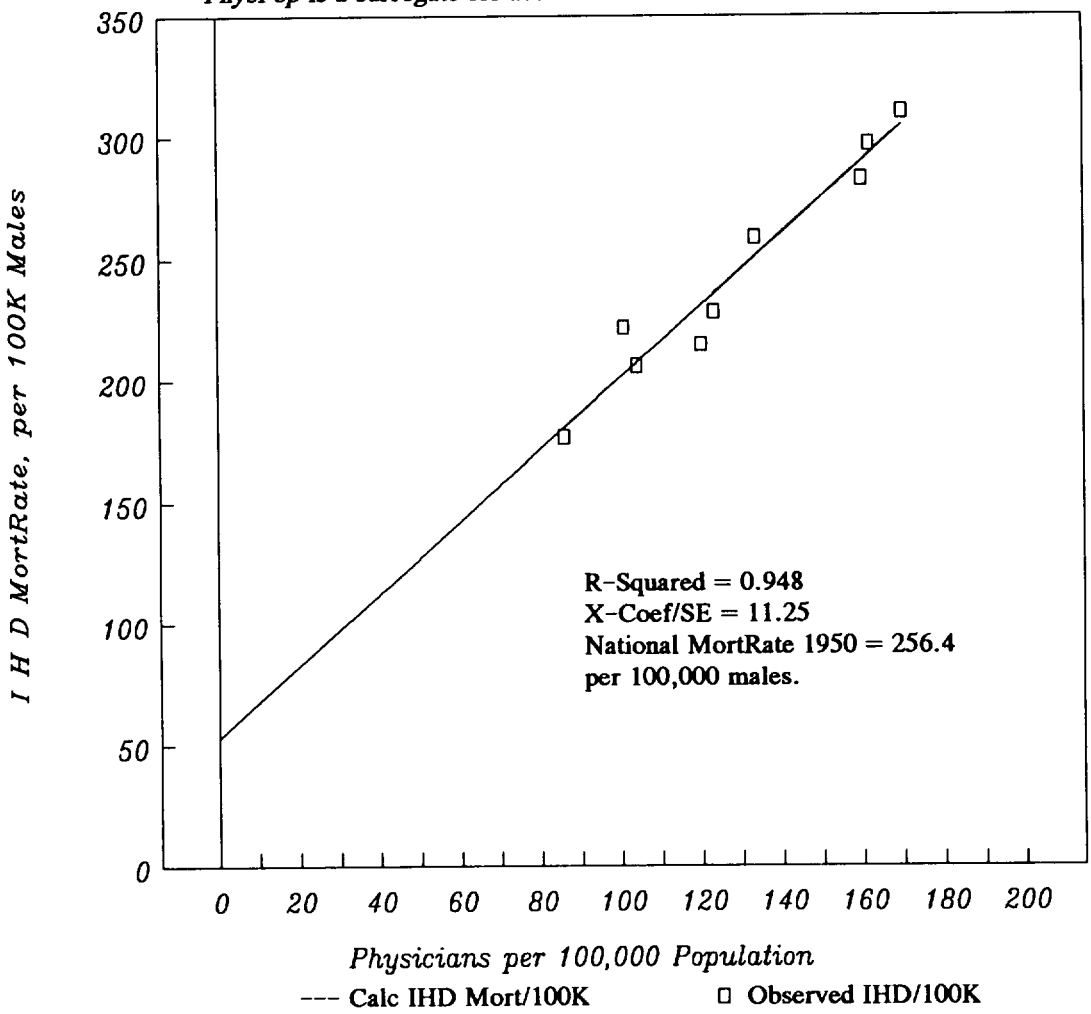
(A) Census Division	(B) 1940 Pop'n Fraction	(C) PhysPop 1940	(D) 1940 Weighted PhysPop	(E) 1950 Pop,n Frac'n	(F) MortRate 1950	(G) Weighted MortRate
Pacific	0.0739	159.72	11.80	0.0961	283.2	27.22
New England	0.0641	161.55	10.36	0.0618	297.1	18.36
West No. Central	0.1027	123.14	12.65	0.0933	228.4	21.31
Mid-Atlantic	0.2092	169.76	35.51	0.2002	310.3	62.12
East No. Central	0.2022	133.36	26.97	0.2017	258.9	52.22
Mountain	0.0315	119.89	3.78	0.0337	214.8	7.24
West So. Central	0.0992	103.94	10.31	0.0965	206.1	19.89
East So. Central	0.0819	85.83	7.03	0.0762	176.8	13.47
South Atlantic	0.1354	100.74	13.64	0.1406	222.0	31.21
Sums	1.0000		132.04	1.0001		253.04

Related text = Part 4b.

1950 Ischemic Heart Disease Mortality-Rates versus 1940 PhysPop Values for the 9 Census Divisions, USA.

Dose-Response Relationship

PhysPop is a surrogate for accumulated dose from medical irradiation.



On the X-axis, PhysPop values = Physicians per 100,000 Population in the Nine Census Divisions of the USA Population, Year 1940. This variable is a surrogate for accumulated radiation dose --- the more physicians per 100,000 people, the more radiation procedures are done per 100,000 people.

On the Y-axis, Ischemic Heart Disease Mortality-Rate per 100,000 males = the reported rates in USA Vital Statistics for the Nine Census Divisions, Year 1950.

Shown above is the strongest relationship between these two variables (Part 2j). The nine datapoints (boxy symbols) were collected long ago for other purposes, and are free from potential bias with respect to this dose-response study. Fractional causation is (Natl MortRate minus the Y-intercept) / (Natl MortRate).

Fractional Causation of Ischemic Heart Disease Mortality-Rate (Males) by Medical Radiation = 79 % from Best Estimate (Box 3).

65% at Lower 90% Conf. Limit (Box 3). 88% at Upper 90% Conf. Limit (Box 3).

Figure 40–B

American Heart Association℠
Fighting Heart Disease and Stroke

Heart and Stroke Facts: 1996 Statistical Supplement

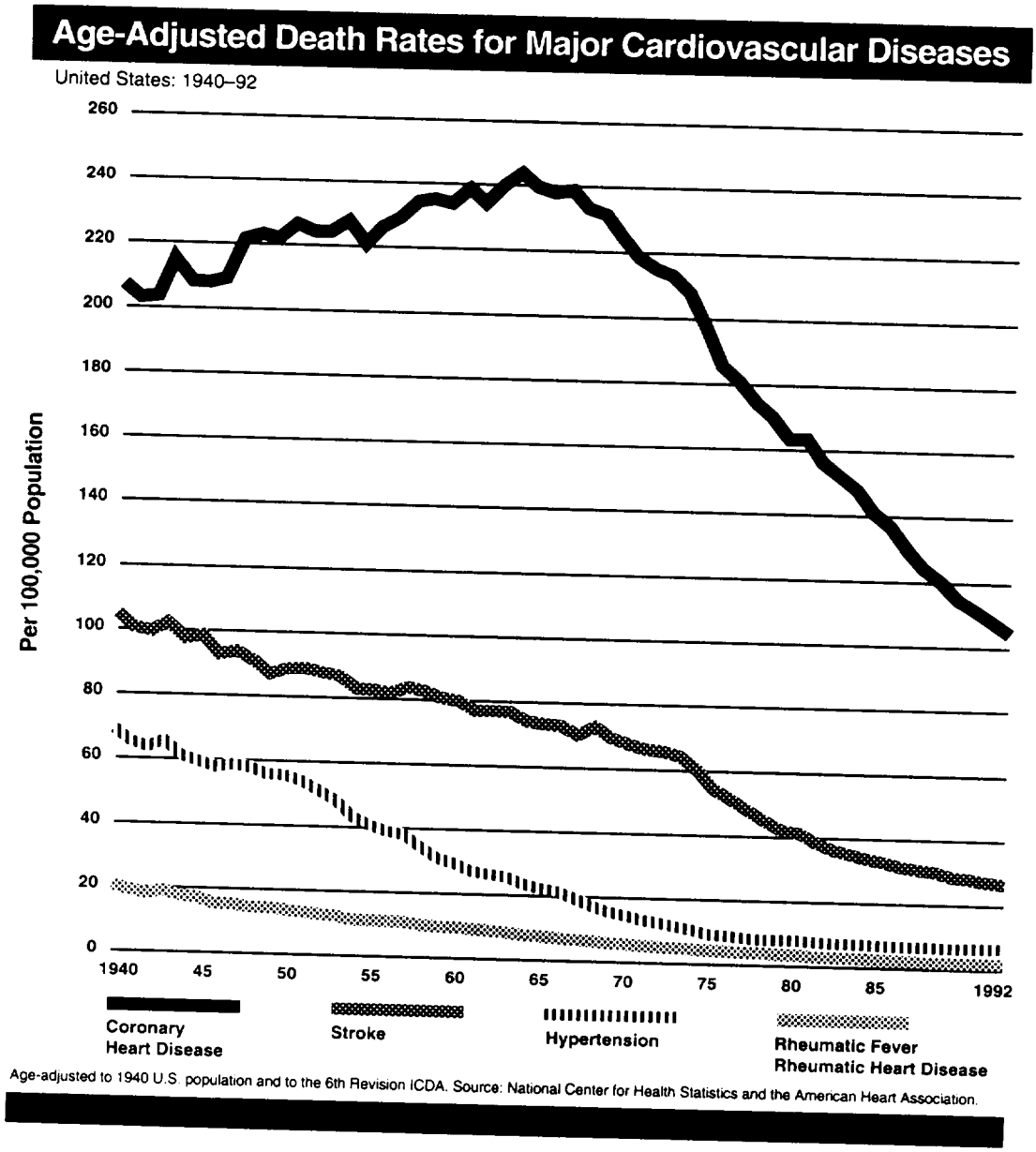


Table 40-A.

Ischemic Heart Disease: Male Mortality Rates by Census Divisions

Rates are annual deaths per 100,000 male population, USA, age-adjusted to the 1940 reference year. No exclusions by color or "race." The MortRate for each Census Division is population-weighted, whereas the averages in Table 40-A are not. Chapter 4 defines "High-5" and "Low-4."
Sources: See Table 40-B.

Census Division	1940	1950	1960	1970	1980	1993
Pacific	--	283.2	284.2	231.0	177.7	112.4
New England	--	297.1	347.1	285.3	223.5	117.8
West North Central	--	228.4	284.1	245.1	206.1	129.9
Mid-Atlantic	--	310.3	355.0	300.8	246.6	147.9
East North Central	--	258.9	320.8	274.1	227.4	140.5
Mountain	--	214.8	256.8	215.2	173.6	101.2
West South Central	--	206.1	269.4	232.0	194.5	137.6
East South Central	--	176.8	254.4	236.8	219.2	145.8
South Atlantic	--	222.0	286.4	248.7	210.9	128.7
Average, ALL	--	244.2	295.4	252.1	208.8	129.1
Average, High-5	--	275.6	318.2	267.3	216.3	129.7
Average, Low-4	--	204.9	266.8	233.2	199.6	128.3
Ratio, Hi5/Lo4	--	1.34	1.19	1.15	1.08	1.01

Related text = Part 1.

Table 40-B.

Ischemic Heart Disease: National Mortality Rates, USA.

Rates are age-adjusted to the 1940 reference year. Both sexes: Deaths per 100,000 population (males + females). Males: Deaths per 100,000 male population. Females: Deaths per 100,000 female population. No exclusions by color or "race."

	Both Sexes	Male	Female
1940	--	--	--
1950	190.0	256.4	126.5
1960	225.5 #	306.5	152.5
1970	186.8	259.7	124.9
1979-81	148.1	212.8	97.2
1992-94	94.9	131.0	64.7

The peak rate occurred in 1963 (AHA 1995).

Related text = Part 4a. Also Box 3.

- 1950, 1960: All rates are from Grove 1968, Table 67, Pages 720-722, "Arteriosclerotic Heart Disease, including coronary disease (420)" ICD/7.
- 1970: Rates are interpolations between 1960 and 1980 (Chap. 4, Parts 2b, 2c).
- 1980: All rates (ICD/9, 410-414) come from the reference NatCtrHS 1980.
- 1990: The 1993 rates (ICD/9, 410-414.9) come from the reference NatCtrHS 1993; please see Chap.4, Part 2b. Exception: The 1993 Rate for both sexes (combined) comes from AHA 1996, p.8.