APPENDIX-M

Fractional Causation, 1980-1993, after an Alternative Smoking Adjustment

Part 1. Purpose of Appendix-M, and Overview of Results

- Part 2. Explanation of Table M-1: All-Cancers, Males, 1988
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Box 1. Difference Method: Fractional Causation, by Medical Radiation, of Cancer + IHD

• Part 1. Purpose of Appendix-M, and Overview of Results

Appendix-M uses an alternative method to calculate Smoking Adjusted MortRates. This alternative method can be called the Difference Method, to distinguish it from the method used in Chapters 49 through 65, which we can call the Factor Method. Appendix-M uses the alternative set of Adjusted MortRates in calculating an alternative set of Fractional Causations.

The results are summarized in Box 1 of this Appendix. Like the results summarized in Box 1 of Chapter 66, the results here strongly support Hypotheses One and Two. Our opinion is that the Factor Method is more reasonable, biologically, than the Difference Method for making the Smoking Adjustment. But we wondered if validation of Hypothesis-1 depends on that opinion. Appendix-M shows that Hypothesis-1 does NOT depend on that opinion.

• Part 2. Explanation of Table M-1: All-Cancers, Males, 1988

Column G in Table M-1 is the feature which distinguishes the Difference Method from the Factor Method. Readers who have studied the Factor Method will easily comprehend the distinction.

2a. Column G: The Essential Distinction between Methods

The header of Column G says that Col.G adds the value of +28.2 to every value in Col.F. The value of +28.2 comes from Chapter 49, for All-Cancers, males. Specifically, +28.2 is the value found for the TopTrio in Box 1, Column K, of Chapter 49. (In the successive tables of Appendix-M, one visits the comparable place in Chapter 50, 51, 52, etc.)

What is +28.2? It is the average DIFFERENCE in MortRate per 100,000 population, if one moves from the TopTrio's 1940 All-Cancer MortRates to the TopTrio's 1988 All-Cancer MortRates. The Smoking Adjustment in Table M-1 is based on the DIFFERENCE per 100K which developed between the TopTrio's Observed 1940 MortRates and its Observed MortRates in subsequent decades.

The Difference Method permits the post-1940 MortRates in the MidTrio and LowTrio Census Divisions to increase (or decrease) relative to their Observed 1940 values, but the change (in cases/100K population) will be adjusted to have the same size and direction in the MidTrio and LowTrio as in the TopTrio. The Difference Method and Factor Method each leave the Observed Post-1940 MortRates in the TopTrio intact. Thus both methods are designed to eliminate only the effect of EXTRA smoking in the MidTrio and LowTrio, relative to the TopTrio.

In Table M-1, Column G adds exactly the same value (+28.2) to the MortRates in Col.F, regardless of the PhysPop level. This is equivalent to doing what we discussed in Chapter 5, Part 6a ---- where we added +20 cases/100K to MortRates which were perfectly proportional to PhysPop. In Figure 5-C, all 20 of the additional cases became part of the Constant --- the "non-radiation rate." Likewise, when one uses the Difference Method to make the Smoking Adjustment in Table M-1, the underlying assumption is that medical radiation is NOT a co-actor in the 28.2 fatal cases/100K added in Col.G. Such cases should not be multiplied by the PhysPop Adjustment from Table 47-B. Therefore, Col.E (the PhysPop Adjustment) occurs BEFORE addition of the 28.2 cases in Col.G.

The other steps in Table M-1 are exactly like the steps in Table 49-B. We have done Difference Tables only for the most recent years, because we are confident that the most recent years must be the LEAST favorable to Hypothesis-1. Box 1 of Appendix-M summarizes the results from 16 tables, in exactly the same format as Box 1 of Chapter 66, to facilitate comparisons.

2b. Two Comments on the Output of the M-Tables

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ONE. Box 1, Column C, shows a series of very high Fractional Causations for the 1980-1993 period --- with one expected exception. The relatively low Fractional Causations for Respiratory-System Cancers (male, female) are expected because the largest impact of smoking is upon that system. Thus, Table M-3 adds 40.6 cases/100K (Col.G) to 1940 rates which are in the ballpark of 8 cases/100K (Col.D). Table M-4 adds 22.8 cases/100K to 1940 rates which are in the ballpark of 3 cases/100K. By contrast, the change for other Cancers does not even approach the magnitude of their 1940 levels. Moreover, the Difference Method assumes (mistakenly, in our opinion) that the entire impact of smoking should be distributed to the Constant (meaning no co-action between smoking and xrays). So for Respiratory-System Cancers, the Constants rise to become a large share of the 1988 National Observed MortRates, and the calculations yield relatively low Fractional Causations by medical radiation for Respiratory-System Cancers.

TWO. We note that the Smoking Adjustment by the Difference Method produces negative Constants which are large fractions of the National MortRates for two important entities: Digestive-System Cancers in 1988 (Tables M-9 and M-10) and of the National MortRates for Ischemic Heart Disease in 1993 (Tables M-15 and M-16). This occurs because both entities experience steep NET declines in their TopTrio MortRates, despite the impact of smoking. Thus, the Difference Method requires subtraction of large numbers of fatal cases/100K from the mid-century observed MortRates in the MidTrio and LowTrio. The result is a slope so steep that it intersects the y-axis below zero.

In our opinion, some negative Constants are to be expected on the basis of occasional anomalies in the observations (Chapter 22, Part 3). The presumed anomaly occurs in the observations for the TopTrio, which supplies the change-factor for the Factor Method and supplies the change-difference for the Difference Method. In Table M-15, a relatively small modification ---- reducing the change-difference from 170.8 to 130.0 in Col.G --- would eliminate the negative Constant. (Also, the modification would raise Fractional Causation to 80%, reduce R-squared to 0.6464, and reduce Xcoef/SE to 3.5770). Because we do not accept the premise of the Difference Method (which denies co-action), we do not devote any pages to modified M-tables.

• Part 3. Biological Premises: Factor vs. Difference Methods of Smoking Adjustment

In a dose-response study of medical radiation (PhysPop), the dose-cohorts (the populations of the Nine Census Divisions) must be matched for all non-xray carcinogens. If matching exists at the outset of a 50-year study like ours, various non-xray carcinogens can subsequently increase or decrease in intensity, and yet the matching persists PROVIDED that all Nine Census Divisions experience the SAME changes in the non-xray carcinogens.

Both the Factor Method and the Difference Method, for making the Smoking Adjustment, address the question: What would the post-1940 MortRates have been, if there had not been EXTRA smoking in the LowTrio and MidTrio, relative to the TopTrio? To eliminate the effect of EXTRA smoking on the LowTrio and MidTrio post-1940 MortRates, each method evaluates how much the Observed 1940 MortRates in the TopTrio changed during subsequent decades, and then applies the SAME change to the Observed 1940 MortRates of the LowTrio and MidTrio. But the Factor Method measures "change" in the TopTrio by the ratio of a later MortRate over the 1940 MortRate, while the Difference Method measures "change" by finding the difference in cases/100,000 in moving from 1940 to later years. The distinction has biological implications.

3a. The Factor Method

The underlying biological premise of the Factor Method is that an elevated level of co-actors can make each rad of medical radiation more potent --- and that a diminished level of co-actors can make each rad of medical radiation less potent. Milieu matters. The premise that carcinogenic co-actors modulate (regulate) each other's potency is not exotic. Its foundations are presented in the

Introduction (Part 4), Chapter 6 (Part 6), Chapter 49 (Part 2), and Chapter 67 (Part 2b).

If milieu matters, how does it affect expectations regarding the introduction of cigarette smoking?

Illustration: Let the Census Divisions be matched for non-xray co-actors, and let no one smoke cigarettes. Then let everything be held constant --- except that cigarette smoking joins the mix of non-xray co-actors, and joins at equal intensity per capita in all Census Divisions. Expectation: In this new milieu, each rad of medical radiation (each PhysPop unit) would become more potent in every Census Division. Therefore, the new milieu would cause cancer MortRates to rise by a greater absolute number in the high-dose Census Divisions (TopTrio) than in the low-dose Census Divisions (LowTrio).

Revision of Circumstances: Let the smoking-intensity NOT be matched across the Census Divisions. Let it be greater in the LowTrio than in the TopTrio --- which actually happened (Chapter 48). This would cause the potency of each medical rad to DIFFER across the Census Divisions --- to be higher in the LowTrio than in the TopTrio. The LowTrio would still have fewer rads than the TopTrio, but would develop more Cancer and IHD deaths than the TopTrio PER RAD (per PhysPop unit). The difference in MortRates would diminish, between TopTrio and LowTrio. For male Respiratory-System Cancers in 1940, the TopTrio MortRates very clearly exceeded the LowTrio MortRates (Figure 16-A). By about 1970, a reversal had occurred: Table 16-A shows that LowTrio MortRates actually exceed TopTrio MortRates by then. (Reminder: Mid-Atlantic is in the TopTrio; Chapter 3, Box 1, Part 2).

3b. The Difference Method

By contrast with the Factor Method, the underlying biological premise of the Difference Method is that an elevated or diminished level of non-xray carcinogens has no effect on the potency of each rad of medical radiation. Milieu does NOT matter.

Expectation: Again, let the Census Divisions be matched for non-xray carcinogens, and let no one smoke cigarettes. Then let everything be held constant --- except that cigarette smoking (matched across the Census Divisions) joins the mix. The new carcinogenic milieu remains matched across the Census Divisions. If we say (for illustrative purposes) that addition of smoking to the milieu adds +20 fatal cancers/100,000 population in the TopTrio, then addition of smoking would add +20 cases/100K in every Census Division --- in the Difference Method. This outcome is depicted in Chapter 5 by comparison of Figure 5-B with Figure 5-C. The Difference Method reflects what we regard as a biologically improbable premise: That carcinogens co-produce the cancer MortRate of each Census Division in an exclusively additive way, without co-action.

3c. Co-Action: Cigarettes Modulate Xray Potency, and Xrays Modulate Cigarette Potency

If we hold ALL non-xray carcinogenic co-actors, cigarette smoking included, constant at some level (any level), matched in all Census Divisions, while ONLY the number of PhysPop units (dose of medical radiation) differs per Census Division, then co-actors modulate the potency of each PhysPop unit by the same force in all Census Divisions. (Reminder: Per-PATIENT dose is very similar in all Census Divisions --- Chapter 5, Part 5d.) Because matching gives co-actors equal modulating force in all the Census Divisions, the potency per PhysPop unit is the SAME in all the Census Divisions --- which results in a tight linear and positive dose-response between medical radiation and cancer MortRates, by Census Divisions.

On the other hand, if the dose of medical radiation and dose of other non-smoking carcinogens are the SAME (matched) across the Census Divisions, while the dose ONLY of smoking-induced co-actors differs among the Census Divisions, one would see a positive dose-response between SMOKING and cancer MortRates. And the xray-induced mutations --- present at EQUAL frequency in all the Census Divisions --- would modulate the carcinogenic potency of each cigarette.

• Part 4. Additional Features Which Recommend the Factor Method

Our prediction, that evidence will firmly establish that carcinogenic co-actors modulate each

other's potency, is one reason that we consider the Factor Method to be superior to the Difference Method of making the Smoking Adjustment. There are two additional features (described in Parts 4a + 4b) which recommend the Factor Method.

4a. Accommodation of the "Drive" toward Equilibrium

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The Factor Method accommodates the likelihood that equilibrium has not yet been reached in 1940. Chapter 5, Part 2, explains the equilibrium concept. A new carcinogen, medical radiation, is introduced into human experience in 1896. If annual exposure to this new carcinogen AND exposure to carcinogenic co-actors occur at steady levels over time, ultimately the annual PRODUCTION-rate of radiation-induced Cancers will equal the annual DELIVERY-rate of radiation-induced Cancers (on an age-adjusted basis). This is equilibrium. Until equilibrium is attained, the radiation-induced cancer MortRate is continuously increasing (Figure 5-A).

Equilibrium is a useful concept, even though we doubt very much that annual xray doses have been steady since 1896 (Part 4b, below), and we know that exposure to carcinogenic co-actors has not been steady since 1896 (cigarette smoking constitutes a prime example).

It is likely that an approximation of equilibrium was NOT reached by 1940, because it is very likely that the carcinogenic effect from radiation-induced mutations lasts for a population's remaining lifespan (Chapter 2, Parts 8b and 8c). If so, then deliveries of Cancer --- from mutations which were induced by xrays in 1896 --- contribute to the annual cancer MortRate until virtually everyone who received medical radiation in 1896 has died. Such deliveries occur in proportion to PhysPop values, because the xray-induced mutations occur in proportion to PhysPop values.

4b. Accommodation of Changes in Averge Rads per Capita

The Factor Method also accommodates the likelihood that average annual per capita xray dose (in rads) has changed somewhat since 1940.

PhysPop is approximately proportional to average per capita dose from medical radiation. Table 47-A reveals that the Averaged PhysPops of the Nine Census retained their 1940 proportions very well over the subsequent 50 years. Those proportions were only minimally affected by the dramatic rise, after the mid-1960s, in the absolute number of physicians per 100,000 population. But steady PhysPop PROPORTIONS do not rule out the likelihood that the average per capita radiation dose (in rads per year), caused per physician, changed from its 1940 level. Some post-1940 forces would help to lower the average annual population dose per capita, and others would help to raise it (Chapter 2, Part 3). It is not possible to quantify the net change. Whatever the net result (probably somewhat downward), the resulting cancer MortRates would remain proportional to PhysPop values.

4c. Proportionality with the Nine PhysPop Values

Parts 4a and 4b indicate that it is likely that NOT ALL of the observed change in the TopTrio's cancer MortRate, 1988 compared with 1940, is due to post-1940 changes in various non-xray co-actors. The post-1940 changes in the TopTrio's 1940 MortRate are probably the NET effect of (a) upward pressure from the "drive" toward equilibrium, (b) downward pressure from a somewhat reduced annual per capita dose from medical radiation, (c) upward pressure from smoking-induced co-actors, and (d) pressures both upward and downward from changes in other non-xray co-actors.

Nonetheless, the observed change-FACTORS in the TopTrio's post-1940 cancer MortRates (relative to the TopTrio's 1940 MortRates) are reasonable guides to what would have happened to cancer MortRates in the LowTrio and MidTrio --- if non-xray co-actors had been matched with the TopTrio. In that case, the effects of (a), (b), (c), and (d) in every Census Division would each be proportional to the Division's PhysPop value. Thus, when we use the Factor Method to adjust the MidTrio and LowTrio MortRates --- by multiplying their Observed 1940 MortRates by the same change-factor observed in the TopTrio --- we appropriately accommodate (a), (b), (c) and (d) --- at the same time that we eliminate the effect of EXTRA smoking in the MidTrio and LowTrio.

Box 1 of Appendix-M Difference Method: Fractional Causation, by Medical Radiation, of Cancer and Ischemic Heart Disease.									
• – The range • – Again, Co	of values below repress lumn C strongly suppor	ents the earliest year and the ts the validity of Hypothes	 ne most recent year wes-1 & 2 as it o	named in Col.A. loes in Chapter 6	66, Box 1.				
Col. A: M = Male. F = Fem.	Col.B: Nat'l Age-Adjusted Mortality Rate	 Col.C: Frac. Causation by Medical Radn	 Col.D: R-squared 	Col.E: X-Coefficient	Col.F: Ratio of XCoef/Std.Error				
Ch49, 1940-88, All-Cancer: M	Big net rise. 115.0 —> 162.7	 90% —> 58% 	 0.95> 0.91	0.76> 0.58	11.6> 8.3				
Ch50, 1940-88, All-Cancer: F	Net decline. 126.1> 111.3	 58%> 56% 	0.86> 0.86	0.53> 0.38	6.6> 6.6				
Ch51, 1940-88, Resp'y Ca: M	Enormous rise. 11.0> 59.7	 ~100% —> 27% 	 0.87 —> 0.81 	0.12> 0.10	6.8> 5.5				
Ch52, 1940-88, Resp'y Ca: F	Enormous rise. 3.3> 24.5	 97%> 11% 	 0.96> 0.52 	0.02> 0.02	13.4> 2.7				
Ch53, 1940-88, Diff-Ca: M	Approx. flat. 104.0> 103.0	 84%> 75% 	 0.93> 0.90 	0.64> 0.48	10.0> 8.1				
Ch54, 1940-88, Diff-Ca: F	Big decline. 122.8> 86.8	 57%> 69% 	 0.85> 0.85 	0.50> 0.37	6.3> 6.3				
Ch55, 1940–90, Breast–Ca: F	Flat. 23.3> 23.1	 ~100%> 82% 	0.92> 0.89	0.19> 0.14	8.7> 7.7				
Ch56, 1940-80, AllExcGen: F	Flat. 94.0> 94.8	75%> 66% 	 0.87> 0.92 	0.51> 0.43	6.8> 8.8				
Ch57, 1940-88, Digest-Ca: M	Big decline. 60.4> 38.8	 97%> 73% 	0.91> 0.87	0.43 -> 0.32	8.3> 6.9				
Ch58, 1940-88, Digest-Ca: F	Big decline. 50.1> 23.5	80%> 69%	0.76> 0.86	0.29> 0.21	4.6> 6.4				
Ch59, 1940-80, Urinary-Ca: M	Approx. flat. 7.4> 8.2	~100%> 81% 	0.92> 0.89	0.08> 0.07	9.0> 7.6				
Ch60, 1940-80, Urinary-Ca: F	Decline. 4.0> 3.0	86%> 79%	0.94> 0.92	0.02> 0.02	10.4> 9.0				
Ch61, 1940-90, Genital-Ca: M	Some rise. 15.2> 16.9	79%> 53%	0.77> 0.84	0.09> 0.06	4.9> 6.1				
Ch63, 1940-80, Buccal-Phar: M	Approx. flat. 5.1> 4.6	~100%> 79%	0.72> 0.70	0.04> 0.03	4.3> 4.1				
Ch64, 1950-93, IHD: M	Enormous fall. 256.4> 131.0	79%> 62% 	0.95> 0.87	1.49> 1.18	11.2> 6.9				
Ch65, 1950–93, IHD: F	Enormous fall. 126.5> 64.7	97%> 57%	0.87> 0.84	0.90> 0.69	6.8> 6.2				

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=====	Table M-1											
		All-Cor	core Mal	ec 1988 • Alternat	ive Smoking Adiu and Fractional Courstion							
		All-Uar	ncers, Mai	les, 1900: Allernat		ing Auju						
This MidTr Chap.	table is like io and LowTri 49, Box 1, Co	Table 49 o MortRat l.K. Of)-F, excep tes by a t course, (ot for the Smoking A factor; we adjust th Col.E below keeps th	Adjustmer nem by th ne PP Adj	nt. Here ne DIFFERE iu (see Ta	in Part 1 NCE (+28. ND 47-B &	, we do r 2 cases) Chap.49,	not multiply the which we obtain Box 2, Part 2, C	1940 from ol.D).		
Part	1. Calculati	on of the	e Alterna	tive Smoking Adjustm	ment (Col	.G) and t	he Nation	al Adjus	ted MortRate (Col	.1).		
		Col P					Col C-					
Thia	1000	1088		10/0 MPs	DD Adiu	D * F			A * H			
500	BonErac	Obe MP	A * P	Mid Low	Factor	0 2	+ 28 2	MortPate	<u> </u>			
seq.	Tob ZaP	Tab 6-A	A B	Tab 6-4 1	Tab 47-R		(TopTrio	MOTINALE				
Pac	0 1535	148 5	22 795				Bx1 ColK)	148.5	22.795			
NouEn	0.1555	140.5	8 806				UN I, COLKY	167 1	8 806			
Midae	y 0.0527	168 /	25 715					168 4	25 715			
HIGAL	- 0.0721	100.4	11 2/0	110.0	0.0/	10/ 2	172 /	172 //4	0.5/0			
WNOLE	n 0.0721	100.9	11.240	110.9	0.94	104.2	1/0 /	132.440	9.349			
ENOCE	n 0.1713	1/1.2	29.321	119.6	0.94	112.4	140.0	140.024	24.009			
Mtn	0.0543	139.1	7.553	99.8	0.94	93.8	122.0	122.012	6.625			
WSoCe	n 0.1087	172.9	18.794	86.9	1.07	93.0	121.2	121.183	13.173			
ESoCe	n 0.0621	188.2	11.687	73.6	1.07	78.8	107.0	106.952	6.642			
SoAtl	0.1725	175.8	30.325	88.9	1.07	95.1	123.3	123.323	21.273			
Weigh	ted avg. Col.	C =	166.2						Sum =			
1988	Obs.Natl MR,	Tab 6-B=	162.7			1988 Natl	. Adju MR	=	138.6666			
	_											
Part	2											
	Col.A	Col.B		(Col.C		Col.D			Col.E		
	Mean1940	1988		All-Cancers, Males:	:		1940		All-Cancers, Mal	es:		
	thru1990	AcljuMRs		1988 Adjusted Morth	Rates		PPs from		1988 Adjusted Mo	rtRates		
Trio-	PPs from	Col.H		regressed on			Table 3-A		regressed o	n		
Seq.	Tab 47-A	Part 1		Mean 1940 thru 1990	0 PhysPop	os	TrioSeq.		1940 PhysPops			
	x′			Regression	n Output:	:	x''		Regress	ion Output:		
Pac	191.97	148.5		Constant	44.6445		159.72		Constant	48.3344		
NewEn	g 208.20	167.1		Std Err of Y Est	6.9167		161.55		Std Err of Y Est	6.2743		
MidAt	l 204.72	168.4		R Squared	0.9075		169.76		R Squared	0.9239		
WNoCe	n 141.14	132.446		No. of Observation	9		123.14		No. of Observati	on 9		
ENoCe	n 146.19	140.624		Degrees of Freedom	7		133.36		Degrees of Freed	lom 7		
Mtn	145.91	122.012					119.89					
WSoCe	n 126.28	121.183		X Coefficient(s)	0.5834		103.94		X Coefficient(s)	0.6870		
ESoCe	n 113.28	106.952		Std Err of Coef.	0.0704		85.83		Std Err of Coef.	0.0745		
SoAtl	142.93	123.323		XCoef / S.E. =	8.2894		100.74		XCoef / S.E.	9,2201		
Part	3-A.				ł	Part 3-B.						
Calcu	lation of Fra	ctional (Causation		i	Calculati	ion of Fra	ctional	Causation			
from	Averaged Phys	Pops			i	from 1940) PhysPops	•				
1 1	opradiction -	ata in A	divetad		1	1 Noner	distion r	ato ic A	diusted			
1. 1				// 4//E		Conc	stant (Der			19 37//		
	constant (Par	τ 2, τοι	.() =	44.0443		Cons	stant (Pai	1 2, 000	.2) -	40.3344		
2 Padiation rate is Natl Adjusted						المده (tion		Adjusted			
с. к	NortRate (Part 1 Col. I = 138.6666)					2. Kaula		t 1 Oct				
	MortRate (Part 1, Col.I = 138.6666)					MORI	(Rate (Par	τ 1, τοι	1 = 138.0000			
	mınus Nonradi	ation ra	te (44.64	45) = 94.0221	l	m1 nu	us Nonradi	ation ra	τe (48.5544) =	90.3322		
					ļ		_ .					
3. 1988 Fractional Causation is radiation					ļ	5. 1988	Fractiona	il Causat	ion is radiation			
rate (94.0221) divided by OBSERVED				ļ	rate	e (90,3322) divide	d by OBSERVED				
	Natl MR Part	1,Col.C=	162.7	= 0.58		Nati	l MR Part	1, Col.C	= 162.7	0.56		
4. C	omparable est	. = 0.74	from Tab	le 49-F.	I							

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Table M-2 All-Cancers, Females, 1988: Alternative Smoking Adju and Fractional Causation This table is like Table 50-F, except for the Smoking Adjustment. Here in Part 1, we do not multiply the 1940 MidTrio and LowTrio MortRates by a factor; we adjust them by the DIFFERENCE (-23.0 cases) which we obtain from Chap.50, Box 1, Col.K. Of course, Col.E below keeps the PP Adju (see Tab 47-B & Chap.50, Box 2, Part 2, Col.D). Part 1. Calculation of the Alternative Smoking Adjustment (Col.G) and the National Adjusted MortRate (Col.I). Col.B Col.D = Col.E= Col.F= Col.G= Col.H= Col.I = Col.A Col.C 1990 1988 Trio-1940 MRs PPAdju D * E Adju A * H Col.F PopFrac ObsMR A * B Mid,Low Factor - 23.0 MortRate Seq. Tab 3-B Tab 7-A Tab 7-A Tab47-B (TopTrio, 111.5 17.115 Pac 0.1535 Bx1,ColK) 111.5 17.115 NewEng 0.0527 116.4 6.134 116.4 6.134 MidAtl 0.1527 118.6 18.110 118.6 18.110 0.0721 106.8 7.700 120.1 0.94 112.9 89.894 89.894 WNoCen 6.481 0.1713 116.5 19.956 131.4 0.94 123.5 100.516 100.516 17.218 ENoCen 111.8 Mtn 0.0543 100.4 5.452 0.94 105.1 82.092 82.092 4.458 99.8 109.8 11.935 WSoCen 0.1087 1.07 106.8 83.786 83.786 9,108 ESoCen 0.0621 112.7 6.999 102.5 1.07 109.7 86.675 86.675 5.383 SoAtl 0.1725 111.6 19.251 106.9 1.07 114.4 91.383 91.383 15.764 Weighted avg. Col.C = 112.7 Sum = 1988 Obs.Natl MR, Tab 7-B= 111.3 1988 Natl Adju MR = 99.7707 Part 2. -----Col.A Col.B Col.C Col.D Col.E Mean1940 1988 All-Cancers, Females: 1940 All-Cancers, Females: thru1990 AdjuMRs 1988 Adjusted MortRates PPs from 1988 Adjusted MortRates Table 3-A Trio-PPs from Col.H regressed on regressed on TrioSeq. Seq. Tab 47-APart 1Mean 1940 thru 1990 PhysPops 1940 PhysPops x' x'' Regression Output: Regression Output: 191.97 111.5 Pac Constant 37,3965 159.72 Constant 41.8295 208.20 116.4 Std Err of Y Est 5.6859 NewEng 161.55 Std Err of Y Est 6.5349 204.72 118.6 MidAtl 0.8624 0.8182 R Squared 169.76 R Squared No. of Observation 9 WNoCen 141.14 89.894 123.14 No. of Observation 9 146.19 100.516 ENoCen Degrees of Freedom 7 133.36 Degrees of Freedom 7 Mtn 145.91 82.092 119.89 126.28 83.786 WSoCen X Coefficient(s) 0.3831 103.94 X Coefficient(s) 0.4356 113.28 86.675 Std Err of Coef. 0.0579 ESoCen 85.83 Std Err of Coef. 0.0776 142.93 91.383 SoAtl XCoef / S.E. = 6.6225 100.74 XCoef / S.E. 5.6126 -----Part 3-A. Part 3-B. Calculation of Fractional Causation Calculation of Fractional Causation from 1940 PhysPops from Averaged PhysPops 1. Nonradiation rate is Adjusted 1. Nonradiation rate is Adjusted 37.3965 Constant (Part 2, Col.C) = Constant (Part 2, Col.E) = 41.8295 2. Radiation rate is Natl Adjusted 2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.I = 99.7707) MortRate (Part 1, Col.I = 99.7707) minus Nonradiation rate (37.3965) = 62.3743 minus Nonradiation rate (41.8295) = 57.9412 Т 3. 1988 Fractional Causation is radiation 3. 1988 Fractional Causation is radiation rate (62.3743) divided by OBSERVED rate (57.9412) divided by OBSERVED Natl MR Part 1,Col.C= 111.3 = 0.56 Natl MR Part 1, Col.C= 111.3 0.52 4. Comparable est. = 0.50 from Table 50-F.

	App.M	dical) in the Pathogenes	is of Can	cer and Isc	hemic Hear	John W. Gofman				
					Table M-				E3222222222222222222222	
	Respir	atory-Sys	tem Canc	ers Males 1988: /	Alternat	j ive Smoki	ng Adiu ar	d Fracti	onal Causation	
				********************	=======			========		
This ta MidTrio Chap.51	ble is like and LowTri . Box 1. Co	e Table 51 o MortRat	-FF, exc es by a course. 1	ept for the Smoking factor; we adjust t Col.E below keeps ti	Adjustm hem by t he PP Ac	ment. Her he DIFFER liu (see T	e in Part ENCE (+40, ab 47-8 &	1, we do 6 cases) Chap.51	not multiply the 1 which we obtain fr Box 2 Part 2 Col	940 om
								••••••••••		
Part 1.	Calculati	on of the	Alterna	tive Smoking Adjust	ment (Co	ol.G) and	the Nation	nal Adjus	ted MortRate (Col.I).
Teio-	Col.A 1000	Col.B	Col.C	Col.D =	Col.E =	Col.F =	Col.G =	Col.H =	Col.1 =	
500	DopEpac	1900 Obc MP	A * D	1940 MKS	PP Adju	0 ° E		Aaju	А́́Н	
seq.	Tab 3-B	Tab 16-A	А "В	Tab 16-A 1	racion Tob 47-P		+ 40.0	Mortkate		
Pac	0 1535	50 7	7 782				Ry1 Colk	507	7 782	
NewFna	0,0527	56.3	2.967				UN 1, COLK,	, JU.7 56 3	2 967	
MidAtl	0,1527	57.5	8.780					57 5	8.780	
WNoCen	0.0721	56.2	4_052	77	0.04	. 7 2	47 A	47 RTR	3.440	
ENoCen	0.1713	62.3	10.672	10.6	0.94	10.0	50.6	50.564	8.662	
Mtn	0.0543	44.2	2.400	7.8	0.94	7.3	47.9	47.932	2.603	
WSoCen	0.1087	67.9	7.381	7.6	1.07	8.1	48.7	48.732	5.297	
ESoCen	0.0621	79.1	4.912	4.9	1.07	5.2	45.8	45.843	2.847	
SoAtl	0.1725	68.5	11.816	8.3	1.07	8.9	49.5	49.481	8.535	
Weighte	d avg. Col.	C =	60.8						Sum =	
1988 Ob	s.Natl MR,	Tab 16- B =	59.7			1988 Nat	l Adju MR	=	50.9226	
D										
Part 2.	Col A									
	LOL.A Moor19/0	1099		Booningtony-Co. Mal			10/0		Dession to Ma	COL.E
	theu1000	AdjuMPo		1098 Adjusted Month	les:		1940 DDo foom		Respiratory-La, Ma	les:
Trio-	PPe from	Col H		regressed on	ales				1900 Adjusted Mort	Kates
Sec	Tab 47-4	Part 1		Mean 1940 thru 1990) PhysPo	ne	TrioSec		19/0 PhysRops	
	x'			Regression	n Output	·•	11103eq		Regressio	
Pac	191.97	50.7		Constant	34 5305	•	150 72		Constant	36 1380
NewEna	208.20	56.3		Std Frr of Y Est	1 8044		161 55		Std Err of Y Fet	2 1820
MidAtl	204.72	57.5		R Squared	0.8135		169.76		R Squared	0 7273
WNoCen	141.14	47.838		No. of Observation	ç	•	123.14		No. of Observation	0.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
ENoCen	146.19	50.564		Degrees of Freedom	7	,	133.36		Degrees of Freedom	7
Mtn	145.91	47.932			•		119.89			•
WSoCen	126.28	48.732		X Coefficient(s)	0,1014		103.94		X Coefficient(s)	0.1120
ESoCen	113.28	45.843		Std Err of Coef.	0.0184		85.83		Std Err of Coef.	0.0259
SoAtl	142.93	49.481		XCoef / S.E. =	5.5257	,	100.74		XCoef / S.E.	4.3206
	•••••			•••••••••••••••••••••••••••••••••••••••					• • • • • • • • • • • • • • • • • • • •	
Part 3-	Α.					Part 3-B	•			
Calcula	tion of Fra	ctional Ca	ausation		1	Calculat	ion of Fra	octional	Causation	
from Av	eraged Phys	Pops				from 194	0 PhysPops	1		
1 Non	radiation -	ato ic Ad	iustad			1	adiation -	nto i- *	diustod	
1. NON	madiation r	+ 2 Col (justed	7/ 5705		I. NONF	adiation r	ate is Ad	ajusted	7/ 4700
LO	nstant (Par	τ 2, ιοι.	() =	34.5305		Con	stant (Par	rt 2, Col	.E) =	36.1389
2 000	liation rate	ie Natl /	Adjusted			2 844	ation not	in Matt	Adjusted	
2. Kaŭ Ma	nation fate rtRate (Par	t 1 Col	1 = 50 0'	2261		2. Kaula Mon	acion rate tPata /Daa	t is Natl	nujusted 1 - 50 02241	
mi	nus Nonradi	ation rate	e (34.53)	05) = 16.3922		min	us Nonradi	ation ra	te (36.1389) =	14.7838
3 109	8 Eractions	L Causati	on ic re-	distion	1	7 1000	Ennetion	1 Courses	ion in madiation	
J. 190	U FIBULIONA	Lausati(3. 1988	rractiona	i Lausati	I UN IS FACIATION	
ra No	t MD Doot		DY UBSER			rati	e (14.7838 1 MD Daat	1 0-1 0		0.05
на 4 Со-	narable ect	= 0.74	J7./ from Tabl	- U.27		Nat	и мк магт	1, 101.0	-),,/	0.25
4. LOW	parable est	0.74		le pirr.						

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ADD.M Radiation (Medical) in the Pathogenesis of Cancer and Ischemic Heart Disease John W. Gofman Table M-4 Respiratory-System Cancers, Females, 1988: Alternative Smoking Adju and Fractional Causation This table is like Table 52-F, except for the Smoking Adjustment. Here in Part 1, we do not multiply the 1940 MidTrio and LowTrio MortRates by a factor; we adjust them by the DIFFERENCE (+22.8 cases) which we obtain from Chap.52, Box 1, Col.K. Of course, Col.E below keeps the PP Adju (see Tab 47-B & Chap.52, Box 2, Part 2, Col.D). _____ Part 1. Calculation of the Alternative Smoking Adjustment (Col.G) and the National Adjusted MortRate (Col.I). Col.A Col.B Col.C Col.D = Col.E= Col.F= Col.G= Col.H= Col.I = Trio-1990 1988 1940 MRs PPAdju D * E Col.F Adju A * H Seq. PopFrac Obs MR A * R Mid,Low Factor + 22.8 MortRate Tab 3-B Tab 17-A Tab 17-A Tab47-B (TopTrio, Pac 0.1535 27.8 4.267 Bx1,ColK) 27.8 4.267 NewEng 0.0527 26.9 1.418 26.9 1.418 MidAtl 0.1527 25.8 3.940 25.8 3.940 WNoCen 0.0721 23.1 1.666 3.1 0.94 2.9 25.714 25.714 1.854 ENoCen 0.1713 26.4 4.522 3.2 0.94 3.0 25.808 25.808 4.421 Mtn 0.0543 22.2 1.205 2.9 0.94 2.7 25.526 25.526 1.386 WSoCen 0.1087 26.6 2.891 2.4 1.07 2.6 25.368 25.368 2.758 ESoCen 0.0621 26.6 1.652 2.4 1.07 2.6 25.368 25.368 1.575 SoAtl 0.1725 26.6 4.589 2.4 1.07 2.6 25.368 25.368 4.376 Weighted avg. Col.C = 26.1 Sum = 1988 Obs.Natl MR, Tab 17-B= 24.5 1988 Natl Adju MR = 25,9944 Part 2. -----Col.A Col.B Col.C Col.D Col.F Mean1940 1988 Respiratory-Ca, Females: 1940 Respiratory-Ca, Females: thru1990 AdjuMRs 1988 Adjusted MortRates PPs from 1988 Adjusted MortRates Trio-PPs from Col.H regressed on Table 3-A regressed on Seq. Tab 47-A Part 1 Mean 1940 thru 1990 PhysPops TrioSeq. 1940 PhysPops x/ Regression Output: x'' Regression Output: Pac 191.97 27.8 Constant 23.2229 159.72 Constant 23.3763 NewEng 208.20 Std Err of Y Est 0.6223 26.9 161.55 Std Err of Y Est 0.6274 MidAtl 204.72 25.8 R Squared 0.5175 169.76 R Squared 0.5095 WNoCen 141.14 25.714 No. of Observation 9 123.14 No. of Observation 9 ENoCen 146.19 25.808 Degrees of Freedom 7 133.36 Degrees of Freedom 7 Mtn 145.91 25.526 119.89 WSoCen 126.28 25.368 X Coefficient(s) 0.0173 103.94 X Coefficient(s) 0.0201 ESoCen 113.28 25.368 Std Err of Coef. 0.0063 85.83 Std Err of Coef. 0.0075 SoAtl 142.93 25.368 XCoef / S.E. = 2.7400 100.74 XCoef / S.E. 2.6964 Part 3-A. Part 3-B. Calculation of Fractional Causation Calculation of Fractional Causation from Averaged PhysPops from 1940 PhysPops 1. Nonradiation rate is Adjusted 1. Nonradiation rate is Adjusted Constant (Part 2, Col.C) = 23.2229 Constant (Part 2, Col.E) = 23.3763 2. Radiation rate is Natl Adjusted 2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.I = 25,9944) MortRate (Part 1, Col.I = 25.9944) minus Nonradiation rate (23.2229) = 2.7715 minus Nonradiation rate (23.3763) = 2.6181 3. 1988 Fractional Causation is radiation 3. 1988 Fractional Causation is radiation rate (2.7715) divided by OBSERVED rate (2.6181) divided by OBSERVED Natl MR Part 1,Col.C= 24.5 -0.11 Natl MR Part 1, Col.C= 24.5 0.11 4. Comparable est. = 0.83 from Table 52-F.

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App.M Radiation (Medical) in the Pathogenesis of						Cancer and Ischemic Heart Disease John W. Gofman				
		=========		=======================================		*******				*******
			_	Te	able M-5	moking Ac	liu and E	ectional	Causation	
	Di	fference	Cancers,	Males, 1988: Alter	rnative s		=============	========		
This tak MidTrio Chap.53,	ole is like and LowTric Box 1, Col	Table 53- MortRate .K. Of c	F, excep s by a f ourse, C	t for the Smoking Adactor; we adjust the old of the second s	djustment em by the e PP Adju	DIFFEREN (see Tab	in Part 1, ICE (-12.4 5 47-B & 1	, we do n 4 cases) Chap.53,	ot multiply the 194 which we obtain fro Box 2, Part 2, Col	40 om .D).
Part 1.	Calculatio	on of the	Alternat	ive Smoking Adjustm:	ent (Col.	.G) and th	ne Nation	al Adjust	ed MortRate (Col.1)).
	Col.A	Col.B	Col.C	Col.D =	Col.E=	Col.F=	Col.G=	Col.H=	Col.I =	
Trio-	1990	1988		1940 MRs	PPAdju	D * E	Col.F	Adju	A * H	
Seq.	PopFrac	Obs MR	A * B	Mid,Low	Factor		-12.4 i (TopTrio	могткате		
	Tab 3-B	rab 18-A	45 040	Tab 18-A	1 8047-8		(TOPETTO, Ry1 ColK)	97 8	15.012	
Pac	0.1535	97.8	15.012				BAT, COLK	110.8	5.839	
NewEng	0.0527	110.8	7.037					110.9	16.934	
MIDATI	0.1527	00.7	7 188	103 2	0.94	97.0	84.608	84.608	6.100	
WNoCen	0.0721	108 0	18 655	109.0	0.94	102.5	90.06	90.060	15.427	
ENOCEN	0.1713	06.9	5 153	92.0	0.94	86.5	74.08	74.080	4.023	
HLN USoCen	0.0043	105.0	11.414	79.3	1.07	84.9	72.451	72.451	7.875	
ESoCen	0.0621	109.1	6.775	68.7	1.07	73.5	61.109	61.109	3.795	
Soati	0.1725	107.3	18.509	80.6	1.07	86.2	73.842	73.842	12.738	
Weighte	d avg. Col.	C =	105.5						Sum ≠	
1988 Ob	s.Natl MR,	Tab 18-B=	103.0			1988 Natl	Adju MR	=	87.7440	
Part 2.										
	Col.A	Col.B		C	Col.C		Col.D			Col.E
	Mean1940	1988		Difference-Ca, Male	es:		1940		Difference-Ca, Mal	les:
	thru1990	AdjuMRs		1988 Adjusted Morth	Rates		PPs from		1988 Adjusted Mort	trates
Trio-	PPs from	Col.H		regressed on			Table 3-A	N .	regressed on	
Seq.	Tab 47-A	Part 1		Mean 1940 thru 1990	0 PhysPop	S	TrioSeq.		1940 PhysPops	on Output:
	x'			Regression	n Output:		150 72		Constant	12 1956
Pac	191.97	97.8		Constant	10.1140 F 9907		129.72		Std Err of Y Est	4 4832
NewEng	208.20	110.8		Std Err of f Est	0.0003		160.76		P Squared	0.9434
MidAtl	204.72	110.9		K Squared	0.9020		123 14		No. of Observation	n 9
WNoCen	141.14	84.008		No. of Upservation	, 7		133.36		Degrees of Freedom	n 7
ENOCen	140.19	76 080		begrees of freedom	•		119.89			
Mth	143.91	79.000		X Coefficient(s)	0.4819		103.94		X Coefficient(s)	0.5751
wsouen	117 28	61 100		Std Err of Coef.	0.0598		85.83		Std Err of Coef.	0.0532
SoAtl	142.93	73.842		XCoef / S.E. =	8.0547		100.74		XCoef / S.E.	10.8008
	•		•••••		 I	Part 3-B				
Part 5	M. 	ectional C	evention	, ,	l l	Calculat	ion of Fr	actional	Causation	
from A	veraged Phys	sPops	ausation	•		from 1940	0 PhysPop	s		
						4			diustod	
1. No	nradiation	rate is Ac	ljusted			1. Nonra		rate is A		12 1056
C	onstant (Pa	rt 2, Col.	C) =	10.1140	1	Con	stant (Pa	rt 2, Col		12.1950
2	diation rate	e is Natl	Adjusted	ł	i	2. Radi	ation rat	e is Natl	Adjusted	
2. Ka	ortRate (Pa	rt 1. Col.	1 = 87.7	- 7440)	i	Mor	tRate (Pa	rt 1, Col	.I = 87.7440)	
m	inus Nonrad	iation rat	te (10.1	140) = 77.6300		min	us Nonrad	iation ra	ate (12.1956) =	75.5484
.				distion		3 1099	Fraction	al Causat	tion is radiation	
5. 19	od Fraction	al causati	1011 15 16 1 bu 0001		1		6 (75 548	4) divide	ed by OBSERVED	
r 	ate (//.030	1 Col C-	107 UBS1 107 (I I	Nat	L MR Part	1, Col.	:= 103.0	0.73
N 4. Co	ali mk Part mparable es	t. = 0.72	from Tal	ble 53-F.	1			.,		

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1	App.M	Radi	ation (Medical) ir	the Pathogenes	sis of Cance	r and Isch	emic Heart	Disease	John W. (Gofman
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		Differen	ce-Cancers, Fer	nales, 1988:	Table M-ć Alternati	ve Smokir	ng Adju ar	nd Fract	ional Causation	
	=================	========================	*===============			========			=======================================	==========
This ta MidTrio Chap.54	able is li and LowTr , Box 1, (ke Table 54 nio MortRat Col.K. Of	4-F, except for tes by a factor course, Col.E	the Smoking; we adjust t below keeps t	Adjustmen them by th the PP Adj	nt. Here e DIFFERE u (see Ta	in Part 1 NCE (-45. ab 47-B &	1, we do .8 cases Chap.54	not multiply the) which we obtain , Box 2, Part 2, (1940 from Col.D).
rart I.		ion of the	e Alternative S	moking Adjust	tment (Col	.G) and t	he Nation	nal Adjus	sted MortRate (Co	l. I).
Trio-	1990	LOL.8 1088	Col.C	Col.D =	Col.E=	Col.F=	Col.G=	Col.H=	• Col.I =	
Sea.	PopFrac	Ohe MP	A * D	1940 MRs	PPAdju	D * E	Col.F	Adju	1 A * H	
4.	Tab 3-8	Tab 10-4	А.В	Mid, Low	Factor		-45.8	MortRate	!	
ac	0,1535	83 7	12 8/R	Tad 19-A	Tab47-B		(TopTrio,			
lewEng	0.0527	89.5	4 717				Bx1,ColK)	83.7	12.848	
lidAtl	0.1527	92.8	14, 171					89.5	4.717	
NoCen	0.0721	83.7	6 035	117 0	o o/			92.8	14.171	
NoCen	0.1713	90.1	15 434	117.0	0.94	110.0	64.180	64.180	4.627	
ftn	0.0543	78.2	4 246	128.2	0.94	120.5	74.708	74.708	12.797	
SoCen	0.1087	83.2	9.240	108.9	0.94	102.4	56.566	56.566	3.072	
SoCen	0.0621	86.1	5 3/7	97.4	1.07	104.2	58.418	58.418	6.350	
oAtl	0.1725	85.0	14 663	100.1	1.07	107.1	61.307	61.307	3.807	
eightec	avg. Col	C =	86.5	104.5	1.07	111.8	66.015	66.015	11.388	
988 Obs	s.Nati MR	Tab 10.8-	94.9						Sum =	
	indee na,		00.0		1	988 Natl	Adju MR =	=	73.7763	
art 2.	••••••									
	Col.A	Col.B			· · · · · · · · · · · · · · · · · · ·					
	Mean1940	1988	Differ				Col.D			Col.E
	thru1990	AdiuMRs	1088 A	divoted Meeter	ites:		1940		Difference-Ca, Fe	emales:
rio-	PPs from	Col.H	1700 A	agreesed or	ates	P	Ps from		1988 Adjusted Mor	tRates
eq.	Tab 47-A	Part 1	Mean 1	9/0 +bey 1000	Dh	I	able 3-A		regressed or	n
	x′		Heart 1	Pograajan	PhysPops	T	rioSeq.		1940 PhysPops	
вс	191.97	83.7	Consta	nt	1/ 177/		X''		Regressi	on Output
ewEng	208.20	89.5	Std En	n of V Eat	14.1/30		159.72		Constant	18.4532
idAtl	204.72	92.8	R Squa	red	0.0049		161.55		Std Err of Y Est	6.4698
loCen	141.14	64.180	No of	Observation	0.0519		169.76		R Squared	0.8069
loCen	146.19	74.708	Degree		y 7		123.14		No. of Observatio	n 9
:n	145.91	56.566	003/00.		/		133.36		Degrees of Freedo	m 7
SoCen	126.28	58.418	X Coef	ficient(a)	0 7/50		119.89			
ioCen	113.28	61.307	Std Fr		0.0576		103.94		X Coefficient(s)	0.4155
Atl	142.93	66.015	¥Coef	(S E -	0.00/0		85.83		Std Err of Coef.	0.0768
				J.E	0.3460		100,74	1	KCoef / S.E.	5.4076
rt 3-A.	,									
lculati	on of Frac	tional Cau	usation			rt 5-8.				
om Aver	aged PhysP	ops			La fr	om 1940 P	n of Fract hysPops	tional Ca	ausation	
Nonra	diation ra	te is Adiu	isted							
Cons	tant (Part	2. Col.C)	=	1/ 177/	1.	Nonradi	ation rat	e is Adj	iusted	
		-,,	_	14.1750	1	Consta	nt (Part	2, Col.E	() =	18.4532
Radia	tion rate	is Natl Ad	liusted			.				
Mort	Rate (Part	1. Col. T	= 73,77631		2.	Radiati	on rate i	s Natl A	djusted	
minu	s Nonradia	tion rate	- 13.1103) (16 1734) -	50 (000	1	MortRa	te (Part	1, Col.I	= 73.7763)	
1000	Frank!		(14.1750) =	JA.0058		minus	Nonradiat	ion rate	(18.4532) =	55.3231
1968	rractional	Causation	is radiation		3.	1988 Fra	actional	Causatio	n is radiation	
	(59.6028)	divided by	OBCEDUED		:				. is rouldligh	
rate	VP -	a. riaca p	Y UBSERVED			rate (55.3231)	divided	hy OBSERVED	
Nati	MR Part 1	,Col.C=	86.8 =	0.69	1	rate (! Natl Mi	55.3231) (R Part 1	divided	by OBSERVED	• • • •

Ap	p.M	Radiat	ion (Medi	cal) in the Pathogenesis	of Cancer	and Ische	<u>mic Heart I</u>	Disease	John W. Gofn	nan
=========		==========	*******		********					
			_	Ta	able M-7	oking Ad	iu and Fra	ctional	Causation	
	8	ireast-Can	cers, Fe	males, 1990: Alterr	hative Sm	ering waj		==========	=======================================	=======
*******	=============		=========							
This tabl MidTrio a Chap.45,	e is like nd LowTric Box 1, Col	Table 55- MortRate	F, excep es by a f course, C	t for the Smoking Ad actor; we adjust the ol.E below keeps the	djustment em by the e PP Adju	DIFFERE	in Part 1, NCE (-3.5 b 47-B & C	we do na cases) wi hap.45, 1 	ot multiply the 194 hich we obtain from Box 2, Part 2, Col. ed MortRate (Col.I)	0) D).
Part 1.	Calculatio	on of the	Alternat	ive smoking Aujustin						
	Col.A	Col.B	Col.C	COL.D =	DDAdiu	01.F-	Col.F	Adiu	A * H	
Trio-	1990	1990		1940 MKS	Fragu		-3.5 1	lortRate		
Seq.	PopFrac	Obs MR	А*В	MIC,LOW			(TopTrin			
	Tab 3-B	Tab 8-A		Iad O-A			Ry1 ColK)	22.7	3.484	
Pac	0.1535	22.7	5.484				unijuunij	24.3	1.281	
NewEng	0.0527	24.3	1.281					25.8	3,940	
MidAtl	0.1527	25.8	5.940	27 4	0.0/	21.2	17.744	17,744	1.279	
WNoCen	0.0721	22.6	1.629	22.0	0.94	21.2	19.342	19,342	3.313	
ENoCen	0.1713	24.1	4.128	24.3	0.94	17 5	13 084	13.984	0.759	
Mtn	0.0543	21.0	1.140	18.6	1 07	16.2	12 657	12.657	1.376	
WSoCen	0.1087	20.8	2.261	10.1	1.07	16.2	12 657	12.657	0.786	
ESoCen	0.0621	21.4	1.329	12.1	1.07	10.2	16 081	16 081	2.774	
SoAtl	0.1725	22.6	3.899	18.5	1.07	19.0	10.001	10.001	Sum =	
Weighted	avg. Col.	C =	23.1			1000 Not	Adiu MD	-	18 9925	
1990 Obs	.Natl MR,	Tab 8-B=	23.1			1990 Nati	L AGJU MK	-	10:7723	
Part 2.										 Col.E
	Col.A	Col.B					1940		Breast Cancer, Fem	ales:
	Mean1940	1990		Breast Cancer, Feik			DDe from		1990 Adjusted Mort	Rates
	thru1990	AdjuMRs		1990 Adjusted Morti	kates		Table 3-4		regressed on	
Trio-	PPs from	Col.H		regressed on			TrioSed		1940 PhysPops	
Seq.	Tab 47-A	Part 1		Mean 1940 thru 199	u PhysPop		vii		Regressio	n Output:
	x'			Kegressio	7 1207	•	150 72		Constant	-2.1643
Pac	191.97	22.7		Constant	- 3.120/		161 55		Std Frr of Y Est	1.6787
NewEng	208.20	24.3		Std Err of Y Est	1.1210		160.76		R Squared	0.9015
MidAtl	204.72	25.8		R Squared	0.8944		107.10		No of Observation	n 9
WNoCen	141.14	17.744		No. of Observation	7		177 76		Degrees of Freedom	n 7
ENoCen	146.19	19.342		Degrees of Freedom	1 /		133.30		Degrees of freedo.	
Mtn	145.91	13.984					107.07		V Coofficient(s)	0 1595
WSoCen	126.28	12.657		X Coefficient(s)	0.1362		103.94		Std Err of Coef	0.1575
ESoCen	113.28	12.657		Std Err of Coef.	0.01//		07.03		VCoof / S E	8 0026
SoAtl	142.93	16.081		XCoef / S.E. =	7.7005				xcoer / 3.c.	
Dent 7					I.	Part 3-B				
Calandar	n. Hinn of Fo	actional	Causatio	h	i	Calculat	ion of Fr	actional	Causation	
from Ave	eraged Phy	sPops	Jausatio		ļ	from 194	0 PhysPop	S		
4	nadiatiat	rato io A	diveted			1. Nonr	adiation	rate is /	Adjusted	
1. Non Co	nstant (Pa	rate is A int 2, Col	.C) = NE	G = 0.0	İ	Cor	nstant (Pa	rt 2, Col	l.E) = NEG =	0.0
n n	intin	o ie No+1	Adjuste	Ч		2. Radi	iation rat	e is Nat	l Adjusted	
2. Kad	ation rat	e is Nall		~ 9925)	i	Mo	rtRate (Pa	rt 1, Co	l.I = 18.9925)	
Mo mi	rikate (Pa nus Nonrac	iation ra	ite (0.0)	= 18.9925		mir	nus Nonrad	iation r	ate (0.0) =	18.9925
7 100	0 Erection	nal Caucat	ion is r	adiation		3. 199) Fraction	al Causa	tion is radiation	
J. 199	U FIELLIOF			ERVED	i	га	te (18.992	5) divid	ed by OBSERVED	
ra N-	118 (10.994 +) MD Do-4		- 27	1 = 0.82		Na	tl MR Part	1, Col.	C= 23.1	0.82
N8	nt MK Part	ι ι, υστ. υ- s+ <u>μ</u> Ω 27		ble 55-F.						
4. LON	parable es	s 0.0.	, 11 ON 10		 .					

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					Table M-8					======
	All-C	ancers-Exc	ept-Genital,	Females, 1980;	Alterna	tive Smok	ing Adiu	and Frac	tional Caucation	
=======		===========	=======================================	=======================================	*******	==========				
This ta	ble is lik	e Table 56	-E, except fo	or the Smoking	Adjustmen	t. Here	in Part 1	, we do	not multiply the '	1940
MidTrio	and LowTr	io MortRat	es by a facto	or; we adjust t	hem by the	e DIFFERE	NCE (-4.6	cases)	which we obtain fi	°0m
Chap.56	, Box 1, C	ol.K. Of	course, Col.E	below keeps t	he PP Adji	u (see Ta	Ь 47-В &	Chap.56,	Box 2, Part 2, Co	al.03.
		• • • • • • • • • • •						•••••		
Part 1.	Calculat	ion of the	Alternative	Smoking Adjust	ment (Col	.G) and t	he Nation	al Adjus	ted MortRate (Col.	D.
			0.1.0							
Trio-	1080	1090	001.0	Col.D =	Col.E=	Col.F=	Col.G=	Col.H=	Col.I =	
Sea	DepEnce	1900		1940 MRs	PPAdju	D * E	Col.F	Adju	A * H	
sey.	Tob Z.P	UDS MK	A * B	Mid,Low	Factor		-4.6	MortRate		
Pag	1 aD 3-8	1aD 20-A	47 5 77	Tab 20-A	Tab47-B		(TopTrio,			
NovEna	0.1398	97.1	13.575			I	Bx1,ColK)	97.1	13.575	
MENENG	0.0546	103.0	5.624					103.0	5.624	
	0.1630	103.2	16.822					103.2	16.822	
wnocen	0.0759	87.7	6.656	91.7	0.94	86.2	81.598	81.598	6.193	
ENOCEN	U.1846	97.5	17.999	98.2	0.94	92.3	87.708	87.708	16.191	
¶th	0.0502	83.2	4.177	84.0	0.94	79.0	74.360	74.360	3.733	
SoCen	0.1049	87.6	9.189	69.8	1.04	72.6	67.992	67.992	7.132	
ESoCen	0.0646	88.9	5.743	69.3	1.04	72.1	67.472	67.472	4.359	
SoAtl	0.1624	91.5	14.860	74.4	1.04	77.4	72.776	72.776	11.819	
leightec	d avg. Col.	C =	94.6						Sum =	
1980 Obs	s.Natl MR,	Tab 20-A=	94.8		1	980 Nati	Adiu MR =	=	85 // 60	
_										
Part 2.		• • • • • • • • • •								
	Col.A	Col.B		(Col.C		Col.D			Col
	Mean1940	1980	All-E	xcept-Genital,	Fems:		1940		All-Except-Genital	l Feme
	thru1980	AdjuMRs	1980	Adjusted Morth	Rates	Р	Ps from		1980 Adjusted Mor	tPatos
rio-	PPs from	Col.H		regressed on		т	able 3-A		regressed on	charces
ieq.	Tab 47-A	Part 1	Mean	1940 thru 1980) PhysPops	т	rioSeq.		1940 PhysPops	
	x′			Regression	Output:		x''		Regressio	
ac	177.35	97.1	Const	ant	22.5894		159.72		Constant	27 04
ewEng	185.86	103.0	Std E	rr of Y Est	4.4334		161 55		Std Enn of V Eat	23.00
idAtl	186.11	103.2	R Squ	ared	0.9176		169 76			3.44
NoCen	128.82	81.598	No. o	f Observation	9		123 14		k squareu No. of Observatier	0.95
NoCen	133.71	87.708	Degre	es of Freedom	7		133 36		No. of Observation	1
tn	133.45	74.360	- · ·		•		110 90		vegrees of Freedon	ł
SoCen	114.66	67.992	X Coe	fficient(s)	0.4298		103 0/		V Coofficients	• •
SoCen	99.46	67.472	Std F	rr of Coef.	0.0487		85 97	•	A COETTICIENT(S)	0.47
oAtl	124.62	72.776	XCoef	/ S.E. =	8 8271		100 7/		Std Err of Coef.	0.04
							100.74		KLOET / S.E.	11.54
art 3-A.					l De					
alculati	ion of Fra	ctional Ca	usation							
rom Aver	raged Phys	Pops				10/0 -	I UT FFAC	cional Ca	ausation	
	, o				1 1	UN TY4U F	nysPops			
Nonra	adiation ra	ate is Adu	usted			N ···				
Cons	stant (Pari) =	22 590/		Nonradi	ation rat	te is Ad	justed	
		,,		22.3094	I	Consta	ant (Part	2, Col.E	=) =	23.065
. Radia	ation rate	is Noti A.	liveted		-					
Mort	Pata /Dane				2.	Radiati	ion rate i	is Natl A	djusted	
minu	in Norradi-	i, LOLI	- 03.4409)	(a	1	MortRa	ate (Part	1, Col.1	= 85.4469)	
mi nu	as monragia	nion rate	(22.5894) =	62.8575	ļ	minus	Nonradiat	tion rate	(23.0656) =	62.381
			•							
1000	F	<u> </u>			1 7	1000 -		C		
1980	Fractional	Causation	n is radiation	ו	1 .	1980 FL	actional	causatic	M 1S radiation	
1980 rate	Fractional (62.8575)	Causation divided b) is radiation by OBSERVED	1	3.	1960 Fr rate (62.3813)	divided	by OBSERVED	
. 1980 rate Natl	Fractional (62.8575) MR Part 1	Causatior divided b ,Col.C=	y OBSERVED 94.8 =	0.66	3.	rate (Natl M	62.3813) R Part 1.	divided Col.C=	by OBSERVED 94.8	0 4

App.M Radiation (Medical) in the Pathogenesis of						f Cancer and Ischemic Heart Disease John W. Gofman				
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	Dige	stive-Svs	tem Cance	rs, Males, 1988: A	lternativ	e Smoking	g Adju and	d Fractio	nal Causation	
========	===============	=========		==============================	========		********	******	*****************	
				t for the Smaking A	diustment	Hore	in Part 1	we do n	ot multiply the 19	240
This tab	le is like and LouTri	Table 57 o MortRati	-r, excep es by a f	actor: we adjust th	em by the	DIFFERE	NCE (-29.4	4 cases)	which we obtain fr	om
Chap.57,	Box 1, Co	L.K. Of	course, C	ol.E below keeps th	e PP Adju	i (see Tal	547-B&	Chap.57,	Box 2, Part 2, Col	l.D).
	·····	• • • • • • • • • • •	••••••							
Part 1.	Calculati	on of the	Alternat	ive Smoking Adjustm	ent (Col.	.G) and t	he Nation	al Adjust	ed Mortkate (Lol.)	
	Col.A	Col.B	Col.C	Col.D =	Col.E=	Col.F=	Col.G=	Col.H=	Col.I =	
Trio-	1990	1988		1940 MRs	PPAdju	D * E	Col.F	Adju	A * H	
Seq.	PopFrac	Obs MR	A * B	Mid,Low	Factor		-29.4	MortRate		
_	Tab 3-B	Tab 9-A	5 570	Tab 9-A	Tab4/-B		(iopirio, By1 Colk)	36.3	5.572	
Pac	0.1535	36.3	5.5/2				BAT,COLK)	42.1	2.219	
NewEng	0.0527	42.1	6 612					43.3	6.612	
UNOCen	0.1527	35.8	2.581	59.9	0.94	56.3	26.906	26.906	1.940	
ENoCen	0.1713	40.2	6.886	64.9	0.94	61.0	31.606	31.606	5.414	
Mtn	0.0543	33.0	1.792	52.1	0.94	49.0	19.574	19.574	1.063	
WSoCen	0.1087	36.5	3.968	42.3	1.07	45.3	15.861	15.861	1.724	
ESoCen	0.0621	38.0	2.360	38.2	1.07	40.9	11.474	11.474	0.713	
SoAtl	0.1725	38.5	6.641	43.4	1.07	46.4	17.038	17.038	2.939	
Weighted	avg. Col.	C =	38.6			1088 Nati	Adiu MR	-	28,1952	
1988 069	s.Nati MR,	1aD 9-B=	30.0			1700 Marci				
Part 2.										
	Col.A	Col.B		C	Col.C		Col.D			Col.E
	Mean1940	1988		Digestive-Ca, Males	s:		1940		Digestive-Ca, Mal	es:
	thru1990	AdjuMRs		1988 Adjusted Morth	Rates		Toble 3-4		1900 Adjusted Mon	INDIES
Trio-	PPs from	Col.H		regressed on Moor 10/0 thru 199		c		•	1940 PhysPops	
Seq.	1ab 4/-A	Parti		Regression	n Output:	3	x''		Regressi	on Output:
Pac	191.97	36.3		Constant	-23.0444		159.72		Constant	-22.9761
NewEng	208.20	42.1		Std Err of Y Est	4.5486		161.55		Std Err of Y Est	2.5486
MidAtl	204.72	43.3		R Squared	0.8708		169.76		R Squared	0.9594
WNoCen	141.14	26.906		No. of Observation	9		123.14		No. of Observatio	an 9
ENoCen	146.19	31.606		Degrees of Freedom	7		133.36		Degrees of Freedo	xm /
Mtn	145.91	19.574		N. 0 (() (.)	0 7170		107.04		Y Coefficient(s)	0 3894
WSoCen	126.28	15.861		X COEfficient(S)	0.0463		85.83		Std Frr of Coef.	0.0303
Esocen	113.28	17 038		Staren of Coer.	6.8682		100.74		XCoef / S.E.	12.8668
50ALL	142.75									
Part 3-	Α.				1	Part 3-B				
Calcula	tion of Fra	actional	Causatior	l i i i i i i i i i i i i i i i i i i i	1	Calculat	ion of Fra	actional	Causation	
from Av	eraged Phy	sPops			ļ	from 1940) PhysPop	S		
A N -			divoted			1 Nonc	adiation	rate is A	diusted	
1. NON Co	radiation	rate is Au	C) = NFG	= 0.0		Con	stant (Pa	rt 2, Col	.E) = NEG =	0.0
	nstant (Pa	11 2, 000	.c) - NCC	- 0.0	Ì					
2. Rad	liation rat	e is Natl	Adjusted	1	i	2. Radi	ation rat	e is Natl	Adjusted	
Mo	rtRate (Pa	rt 1, Col	.1 = 28.1	952)	ĺ	Mor	tRate (Pa	rt 1, Col	.1 = 28.1952)	
mi	nus Nonrad	iation ra	te (0.0)	= 28.1952	1	min	us Nonrad	iation ra	te (0.0) =	28.1952
					ļ				ion in mediatio-	
3. 198	8 Fraction	al Causat	ion is ra	diation		5. 1988	+Faction	ai Causat 21 Aiui -	TUD IS FACIATION	
ra	ite (28.195	2) divide	a by OBSE	KVED - 0.77		rat Not	e (20.193 MR Dart		= 38.8	0.73
Na 4 Com	nti MK Part	= 0.82	from Tabl	e 57-F.		nat		.,		
		V.UL		· - • · · ·						

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						Table M-10						
	Digest	tive-Syste	m Cancers	s, Females,	1988:	Alternati	ve Smokir	ng Adju ar	d Fracti	onal Causation		
=======			********		=======					***************		
This tab MidTrio Chap.58,	ole is like and LowTri , Box 1, Co	e Table 58 io MortRat ol.K. Of	-F, excep es by a f course, (ot for the factor; we Col.E below	Smoking adjust t keeps t	Adjustmer hem by th he PP Adj	nt. Here Ne DIFFERE Nu (see Ta	in Part 1 NCE (-31. b 47-B &	, we do 6 cases) Chap.58,	not multiply the ' which we obtain t Box 2, Part 2, Ca	1940 from ol.D).	
Part 1.	Calculati	ion of the	Alternat	ive Smokin	g Adjust	ment (Col	.G) and t	he Nation	al Adius	ted MortRate (Col	. 1).	
					yy							
	Col.A	Col.B	Col.C	1	Col.D =	Col.E=	Col.F=	Col.G=	Col.H=	Col.I =		
Trio-	1990	1988		11	940 MRs	PP Adju	D * E	Col.F	Adju	A * H		
Seq.	PopFrac	Obs MR	A * B	I	Mid,Low	Factor		-31.6	MortRate			
-	Tab 3-B	Tab 10-A		Т	ab 10- A	Tab47-B		(TopTrio,				
Pac	0.1535	22.8	3.500					Bx1,ColK)	22.8	3.500		
NewEng	0.0527	24.7	1.302						24.7	1.302		
MidAtl	0.1527	26.0	3.970						26.0	3.970		
WNOCen	0.0721	21.8	1.572		49.7	0.94	46.7	15.118	15.118	1.090		
ENOCEN	0.1/13	24.2	4.145		55.1	0.94	49.9	18.314	18.314	3.137		
MTN	0.0543	21.1	1.146		47.7	0.94	44.8	13.238	13.238	0.719		
wsolen	0.1087	21.5	2.337		34.5	1.07	36.9	5.315	5.315	0.578		
Esolen	0.0021	23.3	1.447		30.3	1.07	38.8	7.241	7.241	0.450		
Joinhan	0.1725	22.0	3.933		37.3	1.07	39.9	8.311	8.311	1.434		
1088 064	Noti ND	.L = .Tab 10-0-	23.4				1000 11-11			Sum =		
1900 005	o.Mali MK,		23.5				1988 Nati	Adju MK	=	16.1/88		
Part 2.							- 					
	Col.A	Col.B				Col.C		ColD			Col E	
	Mean1940	1988		Digestive-	Ca. Fema	les:		1940		Digestive-Ca Fee	ales	
	thru1990	AdjuMRs		1988 Adjust	ted Mort	Rates		PPs from		1988 Adjusted Mor	tRates	
Trio-	PPs from	Col.H		regree	ssed on			Table 3-A		regressed or	1	
Seq.	Tab 47-A	Part 1		Mean 1940	thru 199	0 PhysPop	S	TrioSea.		1940 PhysPops	•	
	х′			Re	egressio	n Output:		x''		Regressi	on Output:	
Pac	191.97	22.8		Constant		-17.0424		159.72		Constant	-17.0334	
NewEng	208.20	24.7		Std Err of	Y Est	3.1585		161.55		Std Err of Y Est	1.9494	
MidAtl	204.72	26.0		R Squared		0.8559		169.76		R Squared	0.9451	
WNoCen	141.14	15.118		No. of Obse	ervation	9		123.14		No. of Observatio	n 9	
ENoCen	146.19	18.314		Degrees of	Freedom	7		133.36		Degrees of Freedo	xm 7	
Mtn	145.91	13.238						119.89				
WSoCen	126.28	5.315		X Coefficie	ent(s)	0.2072		103.94		X Coefficient(s)	0.2542	
ESoCen	113.28	7.241		Std Err of	Coef.	0.0321		85.83		Std Err of Coef.	0.0232	
SoAtl	142.93	8.311		XCoef / S.E	. =	6.4489		100.74		XCoef / S.E.	10.9799	
7 A					•••••	•••••		•••••	•••••	•••••		
Part 3-A							Part 3-B.					
	100 OT Fra	CTIONAL C	ausation				Calculatio	on of Fra	ctional (Causation		
TFOR AVE	raged Phys	Pops					from 1940	PhysPops				
1 None	adiation r	ata is Ad	ivetod				1			1		
Con	stant (Par	t 2 Col I		_	0.0	!	I. Nonrad	diation r	ate is Ac	Justed		
001	stant (rai	. 2, 000	C) - NEG	-	0.0		Cons	tant (Par	τ Ζ, ΰοι.	E) = NEG =	0.0	
2. Radi	ation rate	is Natl /	diusted				2 Padia	tion coto	ic Notl	Adjusted		
Mor	tRate (Par		1 = 16.17	881			L. Kaula Monti	Doto (Doo	IS NALL	Aujusteu		
min	us Nonradi	ation rate	• (0 0) =	1	6 1788	1	minu	Nonnodi	t I, LOL. Ation not	1 = 10.1700	1/ 1700	
			- (0.0) -		0.1700	1	40 T T KUS	s NOTES())	acion rat	e (0.0) =	10.1/88	
3. 1988	Fractiona	l Causatio	on is rad	iation			3. 1988	Fractione	Causati	on is radiation		
rat	e (16.1788) divided	by OBSER	VED			rate	(16.1788) divided			
Nat	l MR Part	1.Col.C=	23.5	=	0.69	1	Nati	MR Part		23 5	0 40	
4. Comp	arable est	. = 0.68	from Tabl	e 58-F.		i			.,	23.3	0.07	

	App.	М		
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				Nalaa 1090, Alt	able M-1	1 Craking	Adiu and	Frention	. Counction	
	Urir	hary-Syste	m Lancers	S, Males, 1960: Alt	ernative	Sinicking	Aciju anci	Fractiona	al Lausation	
This tab MidTrio Chap.59, Part 1.	ole is like and LowTri Box 1, Co Calculati	e Table 59 io MortRat ol.K. Of ion of the	-EE, exce es by a f course, (Alternat	ept for the Smoking f factor; we adjust th Col.E below keeps th tive Smoking Adjustm	Adjustme em by th e PP Adj 	nt. Here e DIFFERE u (see Ta G) and t	in Part NCE (-0.3 b 47-B & 	1, we do case) wh Chap.59, al Adjust	not multiply the nich we obtain fro Box 2, Part 2, Co ted MortRate (Col.	1940 m l.D).
	Col.A	Col.B	Col.C	Col.D =	Col.E=	Col.F=	Col.G=	Col.H=	Col.I =	
Trio-	1980	1980		1940 MRs	PPAdju	D * E	Col.F	Adju	A * H	
Seq.	PopFrac	Obs MR	A * B	Mid,Low	Factor		-0.3	MortRate		
_	Tab 3-B	Tab 11-A		Tab 11-A	Tab47-B		(TopTrio,		4 07/	
Pac	0.1398	7.7	1.076				BX1,COLK)	1.1	1.076	
NewEng	0.0546	9.5	0.519					9.5	0.519	
MidAtl	0.1630	9.2	1.500					9.2	1.500	
WNoCen	0.0759	7.9	0.600	6.7	0.94	6.3	5.998	5.998	0.455	
ENoCen	0.1846	8.7	1.606	8.1	0.94	7.6	7.514	7.314	1.350	
Mtn	0.0502	7.0	0.351	6.5	0.94	6.1	5.810	5.810	0.292	
WSoCen	0.1049	7.0	0.754	4.3	1.04	4.5	4.172	4.172	0.438	
ESoCen	0.0646	7.5	0.472	3.0	1.04	5.1	2.820	2.820	0.182	
SoAtl	0.1624	7.8	1.267	5.5	1.04	5.5	5.212	5.212	0.846	
Weighted	avg. Col.	.C = 	8.1			1000 Nati	A of the MID	_	SUM =	
1980 UDS	S.NATI MR,	1aD 11-8=	8.2			1960 Nati	Adju MK	-	0.0001	
Dont 2										
Part 2.	Col A			c						
	Mean10//	1080		Uninary-System Ca.	Nales		1940		Uninary-System Ca	· Males
	thru1080	ActiuMPe		1080 Adjusted Month	ates		PPs from		1980 Adjusted Mor	tPates
Trio.	DDs from	Col H		regressed on	ates		Table 3-A		regressed on	trates
Sea	Tab 47-4	Dart 1		Mean 1940 thru 1980	PhysPor	16	TrioSea		1040 PhysPons	
seq.	100 41 X ¥1	raiti		Regression		,	¥11		Rearessi	on Output.
Pac	177 35	77		Constant	-2 9136	1	159 72		Constant	-2 8529
NewEng	185 86	95		Std Frr of Y Est	0.7785		161.55		Std Err of Y Est	0.6428
MidAtl	186.11	9.2		R Squared	0.8931		169.76		R Squared	0.9271
WNoCen	128 82	5 998		No. of Observation	9		123 14		No. of Observatio	n 9
ENoCen	133.71	7.314		Degrees of Freedom	. 7		133.36		Degrees of Freedo	m 7
Mtn	133.45	5.810					119.89			
WSoCen	114.66	4.172		X Coefficient(s)	0.0654		103.94		X Coefficient(s)	0.0720
ESoCen	99.46	2.820		Std Err of Coef.	0.0086		85.83		Std Err of Coef.	0.0076
SoAtl	124.62	5.212		XCoef / S.E. =	7.6461		100.74		XCoef / S.E.	9.4354
Part 3-	۱.				1	Part 3-B.				
Calculat	tion of Fra	actional C	ausation		i	Calculati	on of Fra	ctional (Causation	
from Ave	eraged Phys	sPops			Ì	from 1940	PhysPops			
1. Nonr	radiation	rate is Ad	justed			1. Nonra	diation r	ate is A	djusted	
Cor	nstant (Pai	rt 2, Col.	C) = NEG	= 0.0	1	Cons	stant (Par	t 2, Col	.E) = NEG =	0.0
2. Radi	iation rate	e is Natl	Adjusted		ļ	2. Radia	ition rate	is Natl	Adjusted	
MortRate (Part 1, Col.1 = 6.6581)						Mort	Rate (Par	t 1, Col	.I = 6.6581)	
minus Nonradiation rate (0.0) = 6.6581						ຓຠຒ	is Nonradi	ation ra	te (0.0) =	6.6581
7 4000 Franking I Countries is andisting						7 4000	F			
3. 1980 Fractional Causation is radiation						5. 1980 Fractional Causation is radiation				
rate (6.6581) divided by OBSERVED						rate	(0.0001)			0.04
Na1	ti MK Part	i,LOL.U= ► = ∩ 07	0.2	= 0.81	l	Nati	MK Part	i, LOL.C	= 0.2	0.81
-+. comp		U.03		le J7-EE.						

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Table M-12

Urinary-System Cancers, Females, 1980: Alternative Smoking Adju and Fractional Causation

This table is like Table 60-E, except for the Smoking Adjustment. Here in Part 1, we do not multiply the 1940 MidTrio and LowTrio MortRates by a factor; we adjust them by the DIFFERENCE (-1.4 case) which we obtain from Chap.60, Box 1, Col.K. Of course, Col.E below keeps the PP Adju (see Tab 47-B & Chap.60, Box 2, Part 2, Col.D). ------

Part 1. Calculation of the Alternative Smoking Adjustment (Col.G) and the National Adjusted MortRate (Col.I).

	Col.A	Col.B	Col.C	Col.D =	Col.E=	Col.F=	Col.G=	Col.H=	Col.I =
Trio-	1980	1980		1940 MRs	PPAdju	D * E	Col.F	Adju	A * H
Seq.	PopFrac	Obs MR	A * B	Mid,Low	Factor		-1.4	MortRate	
	Tab 3-B	Tab 12-A		Tab 12-A	Tab47-B		(TopTrio,	,	
Pac	0.1398	2.8	0.391				Bx1,ColK)	2.8	0.391
NewEng	0.0546	3.4	0.186					3.4	0.186
MidAtl	0.1630	3.2	0.522					3.2	0.522
WNoCen	0.0759	3.0	0.228	3.7	0.94	3.5	2.078	2.078	0.158
ENoCen	0.1846	3.0	0.554	4.1	0.94	3.9	2.454	2.454	0.453
Mtn	0.0502	2.5	0.126	3.5	0.94	3.3	1.890	1.890	0.095
WSoCen	0.1049	2.8	0.294	3.1	1.04	3.2	1.824	1.824	0.191
ESoCen	0.0646	2.8	0.181	2.7	1.04	2.8	1.408	1.408	0.091
SoAtl	0.1624	2.9	0.471	3.0	1.04	3.1	1.720	1.720	0.279
Weighted	avg. Col	.C =	3.0						Sum =
1980 Obs	.Natl MR,	Tab 12-B=	3.0			1980 Nat	l Adju MR	=	2.3659

Part 2.						••••••	
	Col.A	Col.B	с	ol.C	Col.D		Col.E
	Mean1940	1980	Urinary-System Ca:	Females	1940	Urinary-System Ca:	Females
	thru1980	AdjuMRs	1980 Adjusted MortR	ates	PPs from	1980 Adjusted Mort	Rates
Trio-	PPs from	Col.H	regressed on		Table 3-A	regressed on	
Seq.	Tab 47-A	Part 1	Mean 1940 thru 1980	PhysPops	TrioSeq.	1940 PhysPops	
	x′		Regression	Output:	x''	Regressio	n Output:
Pac	177.35	2.8	Constant	-0.6480	159.72	Constant	-0.6026
NewEng	185.86	3.4	Std Err of Y Est	0.2105	161.55	Std Err of Y Est	0.1852
MidAtl	186.11	3.2	R Squared	0.9199	169.76	R Squared	0.9380
WNoCen	128.82	2.078	No. of Observation	9	123.14	No. of Observation	9
ENoCen	133.71	2.454	Degrees of Freedom	7	133.36	Degrees of Freedom	n 7
Mtn	133.45	1.890			119.89		
WSoCen	114.66	1.824	X Coefficient(s)	0.0207	103.94	X Coefficient(s)	0.0226
ESoCen	99.46	1.408	Std Err of Coef.	0.0023	85.83	Std Err of Coef.	0.0022
SoAtl	124.62	1.720	XCoef / S.E. =	8.9631	100.74	XCoef / S.E.	10.2876

Part 3-A.		Part 3-B. Calculation of Fractional Causation					
Calculation of Fractional Causation							
from Averaged PhysPops		from 1940 PhysPops					
1. Nonradiation rate is Adjusted		 1. Nonradiation rate is Adjusted					
Constant (Part 2, Col.C) = NEG =	0.0	Constant (Part 2, Col.E) = NEG =	0.0				
2. Radiation rate is Natl Adjusted		 2. Radiation rate is Natl Adjusted					
MortRate (Part 1, Col.I = 2.3659)		MortRate (Part 1, Col.I = 2,3659)					
minus Nonradiation rate (0.0) =	2.3659	minus Nonradiation rate (0.0) = 2.3	659				
3. 1980 Fractional Causation is radiation		 3. 1980 Fractional Causation is radiation					
rate (2.3659) divided by OBSERVED		rate (2.3659) divided by OBSERVED					
Natl MR Part 1,Col.C= 3.0 =	0.79	Natl MR Part 1, Col.C= 3.0 0).79				
 Comparable est. = 0.78 from Table 60-E. 							
••••••	• • • • • • • • • • • • • • • • • • • •	• • • • • • • • • • • • • • • • • • • •					

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		0			Table M-1	5 			·····	
		Genital C	ancers, I	Males, 1990: Alter	native Sm	King Adj	u and Fra	ctional (Causation	

This ta MidTria Chap.6	able is like b and LowTr 1, Box 1, Ce	e Table 61 io MortRat ol.K. Of	-F, exce es by a course, (pt for the Smoking factor; we adjust t Col.E below keeps t	Adjustmer hem by th he PP Adj	nt. Here Ne DIFFERE U (see Ta	in Part 1 NCE (-0.6 b 47-B &	, we do i case) wi Chap.61,	not multiply the 194 nich we obtain from Box 2, Part 2, Col.	40 .D).
Part 1	. Calculat	ion of the	Alterna	tive Smoking Adjust	ment (Col	.G) and t	he Nation	al Adjus	ted MortRate (Col.I)).
	Col.A	Col.B	Col.C	Col.D =	Col.E=	Col.F=	Col.G=	Col.H=	Col.I =	
1110-	1990	1990		1940 MKS	PP Adju	D * E	LOL.F	Adju	A * H	
seq.		UDS MK	A * B	Mid,LOW	Factor		-U.0	могткате		
Dee	180 3-8	1aD 13*A	2 //1		18047-8		CIOPICIO,	15.0	2 //1	
NeuEna	0.1555	12.9	0 975				BXT, COLK)	12.9	0.975	
NewEng	0.0527	16.0	0.075					10.0	0.0/2	
UNICOD	0.1327	16.0	1 175	14 5	0.0/	15 5	1/ 01	1/ 010	1 075	
ENoCon	0.0721	17.2	2 0/6	15.8	0.74	1/ 0	14.71	14.252	2.661	
ENOLEN	0.1713	16.6	0 001	15.8	0.74	14.7	14.252	14.252	0 77/	
USoCen	0.0043	16.0	1 815	11.6	1 07	12 4	11 812	11 812	1 284	
ESoCen	0.1007	17.5	1 087	10.4	1.07	11 1	10 528	10 528	0.654	
Soatl	0.0021	18.6	3 200	12.8	1.07	13 7	13 096	13 006	2 259	
Veight	ed avg. Col	.C =	17.0	.2.0			101070	1310/0	Sum =	
1990 0	os Nati MR	Tab 13-R=	16.9			1990 Nati	Adiu MR	=	14 3679	
			1017			1770 Nutt			14.3077	
Part 2										
	Col.A	Col.B			Col.C		Col.D		1	Col.E
	Mean1940	1990		Genital-Ca. Males:			1940		Genital-Ca. Males:	
	thru1990	AdiuMRs		1990 Adjusted Mort	Rates		PPs from		1990 Adjusted Morti	Rates
Trio-	PPs from	Col.H		regressed on			Table 3-A		regressed on	
Seq.	Tab 47-A	Part 1		Mean 1940 thru 199	0 PhysPop	s	TrioSeq.		1940 PhysPops	
-	x'			Regressio	n Output:		x''		Regression	n Output:
Pac	191.97	15.9		Constant	5.3635		159.72		Constant	5.4998
NewEng	208.20	16.6		Std Err of Y Est	0.9080		161.55		Std Err of Y Est	0.7170
MidAtl	204.72	16.8		R Squared	0.8411		169.76		R Squared	0.9009
WNoCen	141.14	14.910		No. of Observation	n 9		123.14		No. of Observation	9
ENoCen	146.19	14.252		Degrees of Freedom	ı 7		133.36		Degrees of Freedom	7
Mtn	145.91	14.252					119.89			
WSoCen	126.28	11.812		X Coefficient(s)	0.0562		103.94		X Coefficient(s)	0.0679
ESoCen	113.28	10.528		Std Err of Coef.	0.0092		85.83		Std Err of Coef.	0.0085
SoAtl	142.93	13.096		XCoef / S.E. =	6.0861		100.74		XCoef / S.E.	7.9766
	• • • • • • • • • • • • • • • •					•••••			•••••	
Part 3	- A.					Part 3-B.				
Calcula	ation of Fra	actional C	ausation			Calculati	on of Fra	ctional (Causation	
from A	veraged Phys	sPops				from 1940	PhysPops			
1. No	nradiation	rate is Ad	justed			1. Nonra	diation r	ate is Ad	djusted	
Ce	onstant (Pa	rt 2, Col.	C) =	5.3635		Cons	tant (Par	t 2, Col	.E) =	5.4998
		• • • •						• •		
2. Radiation rate is Natl Adjusted						2. Radia	tion rate	is Natl	Adjusted	
M	ortRate (Pa	rt 1, Col.	1 = 14.50	5/9) 5. 0.00//		Mort	Rate (Par	t 1, Col.	I = 14.3679	
m.	Inus Nonrad	lation rat	e (5.363)	5) = 9.0044	ļ	ທາກມ	s Nonradi	ation rai	te (5.4998) =	8.8681
7 40	0 [on in	distion		7 4000	Enechi -		ton to realizate	
J. 195	FU FFBCT1004	a (Lausati	UN IS CA			3. 1990	rractiona	L Lausat	ion is radiation	
гі м.	ate (7.0044) ati MR Doct		JY UDSER	- 0.57		rate	ND Doot		UY UBSERVED	0 53
Ni 4 C~	nnarable ees	1,001.0=	10.Y from Tabl	- U.C.S ما		Nati	мк магт	,	- 10.9	0.52
					۱ 					

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Table M-14

Buccal-Pharynx Cancers, Males, 1980: Alternative Smoking Adju and Fractional Causation

This table is like Table 63-EE, except for the Smoking Adjustment. Here in Part 1, we do not multiply the 1940 MidTrio and LowTrio MortRates by a factor; we adjust them by the DIFFERENCE (-1.2 case) which we obtain from Chap.63, Box 1, Col.K. Of course, Col.E below keeps the PP Adju (see Tab 47-B & Chap.63, Box 2, Part 2, Col.D). _____ Part 1. Calculation of the Alternative Smoking Adjustment (Col.G) and the National Adjusted MortRate (Col.I).

	Col.A	Col.B	Col.C	Col.D =	Col.E=	Col.F=	Col.G=	Col.H=	Col.I =
Trio-	1980	1980		1940 MRs	PPAdju	D * E	Col.F	Adju	A * H
Seq.	PopFrac	Obs MR	A * B	Mid,Low	Factor		-1.2	MortRate	
	Tab 3-B	Tab 15-A		Tab 15-A	Tab47-B		(TopTrio,	,	
Pac	0.1398	4.2	0.587				Bx1,ColK	4.2	0.587
NewEng	0.0546	5.7	0.311					5.7	0.311
MidAtl	0.1630	5.1	0.831					5.1	0.831
WNoCen	0.0759	3.5	0.266	4.6	0.94	4.3	3.124	3.124	0.237
ENoCen	0.1846	4.6	0.849	4.8	0.94	4.5	3.312	3.312	0.611
Mtn	0.0502	2.9	0.146	2.8	0.94	2.6	1.432	1.432	0.072
₩SoCen	0.1049	4.2	0.441	4.0	1.04	4.2	2.960	2.960	0.311
ESoCen	0.0646	4.4	0.284	3.3	1.04	3.4	2.232	2.232	0.144
SoAtl	0.1624	5.0	0.812	4.3	1.04	4.5	3.272	3.272	0.531
Weighte	d avg. Col	.C =	4.5						Sum =
1980 Ob	s.Natl MR,	Tab 15-B=	4.6			1980 Nat	l Adju MR	=	3.6361

Part 2.							
	Col.A	Col.B	С	ol.C	Col.D	(:ol.E
	Mean1940	1980	Buccal-Pharynx Ca:	Males	1940	Buccal-Pharynx Ca:	Males
	thru1980	AdjuMRs	1980 Adjusted MortR	ates	PPs from	1980 Adjusted MortF	ates
Trio-	PPs from	Col.H	regressed on		Table 3-A	regressed on	
Seq.	Tab 47-A	Part 1	Mean 1940 thru 1980	PhysPops	TrioSeq.	1940 PhysPops	
	х′		Regression	Output:	x''	Regression	1 Output:
Pac	177.35	4.2	Constant	-1.4889	159.72	Constant	-1.1135
NewEng	185.86	5.7	Std Err of Y Est	0.7775	161.55	Std Err of Y Est	0.8659
MidAtl	186.11	5.1	R Squared	0.7039	169.76	R Squared	0.6327
WNoCen	128.82	3.124	No. of Observation	9	123.14	No. of Observation	9
ENoCen	133.71	3.312	Degrees of Freedom	7	133.36	Degrees of Freedom	7
Mtn	133.45	1.432			119.89		
WSoCen	114.66	2.960	X Coefficient(s)	0.0348	103.94	X Coefficient(s)	0.0357
ESoCen	99.46	2.232	Std Err of Coef.	0.0085	85.83	Std Err of Coef.	0.0103
SoAtl	124.62	3.272	XCoef / S.E. =	4.0797	100.74	XCoef / S.E.	3.4728

Part 3-A. Calculation of Fractional Causation from Averaged PhysPops		Part 3-B. Calculation of Fractional Causation from 1940 PhysPops				
 Nonradiation rate is Adjusted Constant (Part 2, Col.C) = NEG = 	0.0	 Nonradiation rate is Adjusted Constant (Part 2, Col.E) = NEG = 	0.0			
 Radiation rate is Natl Adjusted MortRate (Part 1, Col.I = 3.6361) minus Nonradiation rate (0.0) = 	3.6361	2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.I = 3.6361) minus Nonradiation rate (0.0) =	3.6361			
 1980 Fractional Causation is radiation rate (3.6361) divided by OBSERVED Natl MR Part 1,Col.C= 4.6 = Comparable est. = 0.81 from Table 63-EE. 	0.79	 1980 Fractional Causation is radiation rate (3.6361) divided by OBSERVED Natl MR Part 1, Col.C≖ 4.6 	0.79			

4	App.M	Ra	diation (Me	dical) in the	Pathogene	sis of Cance	er and Ische	mic Heart l	Disease	Jol	nn W. Gofr	nan
******	=============											
	I	schemic H	eart Dise	ase, Males	, 1993:	Table M-15 Alternativ	e Smoking	Adju and	Fractiona	l Causati	ion	
App.M Radiation (Medical) in the Pathogenesis of Cancer and Ischemic Heart Disease John W. Gofman Table M-15 Table M-15 Ischemic Heart Disease, Males, 1993: Alternative Smoking Adju and Fractional Causation This table 64-E, except for the Smoking Adjustment. Here in Part 1, we do not multiply the 1940 MidIrio and LowTrio MortRates by a factor; we adjust them by the DIFFERENCE (-170.8 cases) which we obtain from Chap.64, Box 1, Col.K. Of course, Col.E below keeps the PP Adju (see Tab 47-B & Chap.64, Box 2, Part 2, Col.D). Part 1. Calculation of the Alternative Smoking Adjustment (Col.G) and the National Adjusted MortRate (Col.I). Col.A Col.B Col.C Col.D Col.F= Col.F= <t< td=""><td></td></t<>												
This tab MidTrio Chap.64,	ele is like and LowTr Box 1, Ce	e Table 6 io MortRa ol.K. Of	4-E, exce tes by a course, l	pt for the factor; we Col.E belo	Smoking adjust t w keeps t	Adjustment hem by the he PP Adju	. Here in DIFFEREN (see Tab	n Part 1, CE (-170.8 47-8 & Ch	we do not 3 cases) w 1ap.64, Bo	: multiply which we do ox 2, Pari	/ the 1940 obtain fro t 2, Col.D))m)).
Part 1.	Calculat	ion of th	e Alterna	tive Smoki	ng Adjust	ment (Col.	G) and the	e National	Adjusted	l MortRate	e (Col.I).	
			Col.A 1990 PopFrac	Col.B 1993 Obs MR	Col.C A * B		Col.D 1950 MR Mid.Low	Col.E= PP Adju Factor	Col.F= D * E	Col.G= Col.F -170.8	Col.H= Adju MortRate	Col.I =
Trio-Seq	uence		Tab 3-B	Tab 40-A			Tab 40-A	Tab 47-B		(TopTrio	,	
	Pacific		0.1535	112.4	17.253					Bx1,ColK) 112.4	17.253
	New Engla	and	0.0527	117.8	6.208						117.8	6.208
	Mid-Atlan VestNoCer	ntic	0.1527	147.9	22.304		228 /	0.04	21/ 404	/7 00	147.9	22.584
	EastNoCer	ntral	0.1713	140.5	24.068		258.9	0.94	214.090	43.90	43.090	3.107
	Mountain		0.0543	101.2	5.495		214.8	0.94	201.912	31.11	31.112	1.689
	WestSoCer	ntral	0.1087	137.6	14.957		206.1	1.07	220.527	49.73	49.727	5.405
	EastSoCer	ntral	0.0621	145.8	9.054		176.8	1.07	189.176	18.38	18.376	1.141
	SouthAtla	antic	0.1725	128.7	22.201		222.0	1.07	237.540	66.74	66.740	11.513
199	3 Observed	d Natl MR	from Tab	Sum = le 40-B =	131.2 131.0				1993 Nati	Adjusted	imr =	Sum 81.3898
Part 2.												
	Col.A	Col.B			1	Col.C		Col.D				Col.E
	Mean1940	1993		IHD, Male	s:			1940		IHD, Male	es:	
	thru1990	Adju MRs		1993 Adju	sted Mort	Rates		PPs from		1993 Adju	sted Mort	Rates
Tr10-	PPs from	from Col	.H	regro	essed on	0.00.		Table 3-A		regr	essed on	
seq.	1aD 4/-A	Part I		Mean 1940	thru 199	U PPS		(TrioSeq)		1940 Phys	Pops	
Pac	191.97	112.4		Constant	(egi essi o	-112.3211		159 72		Constant	Regressio	-07 0234
NewEng	208.20	117.8		Std Err o	f Y Est	16.7476		161.55		Std Err o	of Y Est	20.3378
MidAtl	204.72	147.9		R Squared		0.8720		169.76		R Squarec	1	0.8112
WNoCen	141.14	43.896		No. of Obs	servation	9		123.14		No. of Ob	servation	9
ENoCen	146.19	72.566		Degrees o	f Freedom	7		133.36		Degrees o	of Freedom	n 7
Mtn	145.91	31.112						119.89				
wsoten ESoCon	120.28	49.727		X Coeffic	ient(s)	1.1765		103.94		X Coeffic	ient(s)	1.3245
SoAtl	142.93	66.740		XCoef / S	F =	6 9045		85.85		Std Err o VCoof / S	t Coet.	0.2415
											····	J.4039
Part 3-A	•						Part 3-B.					
Calculat from Ave	ion of Fra raged Phys	actional (Pops	Causation			Ì	Calculati from 1940	ion of Fra) PhysPops	ctional C	ausation		
1. None	adiation r	ate is Ar	diusted				1 Nonne	distion a				
Con	stant (Par	t 2, Col	C) = NEG.	. =	0.0000		Cons	stant (Par	t 2, Col.	E) = NEG.	=	0.0
2. Radi	ation rate	e is Natl	Adjusted			Ì	2. Radia	ation rate	is Natl	Adjusted		
Mor	tRate (Par	rt 1, Col	. i = 81.38	398)		İ	Mort	Rate (Par	t 1, Col.	1 = 81.38	98)	
min	us Nonradi	ation rai	te (0.0) =	:	81.3898		minu	ıs Nonradi	ation rat	e (0.0) =		81.3898
3. 1993	Fractiona	al Causat	ion is rad	liation		i	3. 1993	Fractiona	l Causati	on is rad	iation	
rat	e (81.3898	3) divided	d by OBSER	RVED		1	rate	(81.3898) divided	by OBSER	VED	
Nat	L MR Part	1,Col.C=	131.0	=	0.62	1	Natl	MR Part	1, Col.C=	131.0		0.62
4. Comp	arable est	:. = 0.63	Trom Tabl	.e 64-E.		I						

Table M-16

Ischemic Heart Disease, Females, 1993: Alternative Smoking Adju and Fractional Causation

This table is like Table 65-E, except for the Smoking Adjustment. Here in Part 1, we do not multiply the 1940 MidTrio and LowTrio MortRates by a factor; we adjust them by the DIFFERENCE (-85.1 cases) which we obtain from Chap.65, Box 1, Col.K. Of course, Col.E below keeps the PP Adju (see Tab 47-B & Chap.65, Box 2, Part 2, Col.D). Part 1. Calculation of the Alternative Smoking Adjustment (Col.G) and the National Adjusted MortRate (Col.I).

	Col.A	Col.B	Col.C	Col.D	Col.E=	Col.F=	Col.G=	Col.H=	Col.I =
	1990	1993		1950 MR	PP Adju	D * E	Col.F	Adju	
	PopFrac	Obs MR	A * B	Mid,Low	Factor		-85.1	MortRate	A * G
Trio-Sequence	Tab 3-B	Tab 41-A		Tab 41-A	Tab 47-B		(TopTrio	,	
Pacific	0.1535	57.7	8.857				Bx1,ColK)	57.7	8.857
New England	0.0527	55.7	2.935					55.7	2.935
Mid-Atlantic	0.1527	78.8	12.033					78.8	12.033
WestNoCentral	0.0721	58.3	4.203	104.1	0.94	97.854	12.754	12.754	0.920
EastNoCentral	0.1713	70.2	12.025	124.2	0.94	116.748	31.648	31.648	5.421
Mountain	0.0543	46.3	2.514	96.2	0.94	90.428	5.328	5.328	0.289
WestSoCentral	0.1087	66.5	7.229	94.0	1.07	100.580	15.480	15.480	1.683
EastSoCentral	0.0621	67.7	4.204	84.7	1.07	90.629	5.529	5.529	0.343
SouthAtlantic	0.1725	61.6	10.626	103.4	1.07	110.638	25.538	25.538	4.405
		Sum =	64.6						Sum =
1993 Observed Natl I	MR from Tab	le 41-B =	64.7			1993 Natl	Adjusted	IMR =	36.8866

 Part 2.
 Col.A
 Col.B
 Col.C
 Col.D
 Col.E

 Mean1940
 1993
 IHD, Females:
 1940
 IHD, Females:

 thru1990
 Adju MRs
 1993
 Adjusted MortRates
 PPs from
 1993
 Adjusted MortRates

Trio-	PPs from	from Col.H	regressed on		Table 3-A	regressed on	
Seq.	Tab 47-A	Part 1	Mean 1940 thru 1990	PPs	(TrioSeq)	1940 PhysPops	
	x'		Regression	Output:	x''	Regressio	on Output:
Pac	191.97	57.7	Constant -	77.5231	159.72	Constant	-68.8802
NewEng	208.20	55.7	Std Err of Y Est	11.0499	161.55	Std Err of Y Est	12.7956
MidAtl	204.72	78.8	R Squared	0.8449	169.76	R Squared	0.7920
WNoCen	141.14	12.754	No. of Observation	9	123.14	No. of Observation	n 9
ENoCen	146.19	31.648	Degrees of Freedom	7	133.36	Degrees of Freedor	n 7
Mtn	145.91	5.328			119.89	-	
WSoCen	126.28	15.480	X Coefficient(s)	0.6942	103.94	X Coefficient(s)	0.7845
ESoCen	113.28	5.529	Std Err of Coef.	0.1124	85.83	Std Err of Coef.	0.1520
SoAtl	142.93	25.538	XCoef / S.E. =	6.1745	100.74	XCoef / S.E.	5.1625

Pa	rt 3-A.		Part 3-B.				
Ca	culation of Fractional Causation		Calculation of Fractional Causation from 1940 PhysPops				
fr	xm Averaged PhysPops						
1.	Nonradiation rate is Adjusted		 1. Nonradiation rate is Adjusted				
	Constant (Part 2, Col.C) = NEG. =	0.0	Constant (Part 2, Col.E) = NEG. = 0.0				
2.	Radiation rate is Natl Adjusted MortRate (Part 1, Col.I = 36.8866) minus Nonradiation rate (0.0) =	36.8866	 2. Radiation rate is Natl Adjusted MortRate (Part 1, Col.I = 36.8866) minus Nonradiation rate (0.0) = 36.8866				
3.	1993 Fractional Causation is radiation rate (36.8866) divided by OBSERVED Natl MR Part 1 Col C= 64 7 =	0.57	3. 1993 Fractional Causation is radiation rate (36.8866) divided by OBSERVED Nath MP Date 1, Cal Causation				
4.	Comparable est. = 0.78 from Table 65-E.	0.57					
		•••••					