A path analysis of Anxiety among Ukrainian residents of Kiev and Zhitomyr Oblasts after Chornobyl

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2 Introduction

In this analysis we examine some plausible causal etiological paths of anxiety among residents of Zhitomyr and Kiev Oblasts in the years since Chornobyl. We will focus on omnibus measures of fit, as well as statistically significant paths, broken down into direct, indirect, and total effects. We employ path analysis to allow us to find out which variables are mediating ones and which

have direct effects. The path analysis permits us to decompose total into direct, indirect, and spurious effects. In the previous section on our path analysis of depression,we introduced the nomenclature we use and the basis for path analysis. Here we review the working assumptions we make in order to allow for a relative rich variety of paths to the outcome variable, whereupon we immerse ourselves in a discussion of the pathways to anxiety on the part of Ukrainians living in Kiev or Zhitomyr Oblasts.

3 Path analysis

Hypothesis 4 postulates that radiation dose directly predicts mental health as measured by the Brief Symptom Inventory (BSI). Hypothesis 5 postulates that perceived risk of exposure directly predicts mental health as measured by the BSI. In the two path models that follow we examine the direct and indirect effects of these and mediating variables to test these hypotheses. We constructed summary perceived Chornobyl health threat scales. The variables used for this scale construction asked the percent to which your health was affected by Chornobyl, the percent to which your family's health was affected by Chornobyl, and a percent belief that most of the cancer cases in Zhitomyr and Kiev are due to the effects of Chornobyl. We designated these summary scores crhrw1, crhrw2, and crhrw3 according to the wave in which the Choronobyl related health threat was perceived, after finding that their alpha reliabilities were respectively as 0.796, 0.832, and 8.833. These variables are used as the summary perceived risk score in our models.

4 Model structure

Because we make the working assumption that variables are fixed effects, we rely on the submodel structural equation formulation of Joreskog and Sorbom for observed variables, except that we follow Sorbom's formulation of covariance structure analysis mean with mean structures.

If and only there are no feedback loops, the models will be simplified to

$$y = \alpha + \gamma x + \zeta \tag{1}$$

with ϕ = covariance matrix among observed variables [3, 9,136-137], [5, 210].

However, in the event that our model is nonrecursive, we rely on their formulation of it as

$$y = \alpha + \beta y + \gamma x + \zeta \tag{2}$$

where α is a px1 vector of constants, β is an pxp matrix of parameter estimates for those endogenous observed variables, ξ is a nxq matrix of exogenous observed variables, and ζ= px1 vector of equation errors, with n= number of observations.

The mean of the vector is

$$y = (I - \beta)^{-1}(\alpha + \gamma\kappa) \tag{3}$$

The mean of vector ξ is denoted by vector, κ, which has an order of nx1.

When we decompose the total effects into direct and indirect effects, we have to provide the formulae by which that is computed. Direct effects are the γ coefficients for the exogenous variables and the β coefficients for endogenous variables. A total effect of η on itself in one cycle would be $\beta_{21}\beta_{12}$ and in the second cycle would be ${\beta_{21}}^2{\beta_{12}}^2$, etc. In other words,

$$\frac{\beta_{21}\beta_{12}}{1 - \beta_{21}\beta_{12}} = \beta_{21}\beta_{12} + {\beta_{21}}^2{\beta_{12}}^2 + \cdots \tag{4}$$

can be estimated by $(I - B)^{-1} - I$, as long as $\beta_{21}\beta_{12} < 1$. That is, as long as the stability index is less than unity. The total effects are for the exogenous variables are $(I - B)^{-1}\Gamma$ and the total effects for the endogenous variables are $(I - B)^{-1} - I$. Because the sum of the indirect effects are the total effects minus the direct effects, the sum of the indirect effects for the exogenous variables are $(I - B)^{-1}\Gamma$ and for the endogenous variables are $(I - B)^{-1} - I - B$[3, 31].

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5 Assumptions

Because the building blocks of path analysis consist of covariance structure analysis and regression analysis, the assumptions of linear structural equation modeling are are essential to assure statistical conclusion validity. The uncorrelated errors assumption ($E(\xi\zeta) = 0$) is an essential assumption. According to this principle, the errors of the equations are uncorrelated with the explanatory variables in the model. Otherwise, the equation errors could be driving both the explanatory and endogenous variable, rendering the explanatory variable endogenous rather than exogenous and rendering the model spurious. What is not modeled is in the error term and if there are important omitted variables correlated with the explanatory variables, the errors will be correlated with the explanatory variables, allowing for omitted variable bias or specification error that can engender the same spurious result. To minimize this type of bias, the optimal model building strategy of choice is one of a general-to-specific nature. To minimize the probability of omitted variable bias assumption violations, it would be preferable to include all possible covariates in a general unrestricted model (GUM).

There is a working model of functional form. Any model that is to be estimated must be identified. Without adequate identification the model cannot be estimated with unique solutions for its variables. If the model is non-recursive, it contains feedback loops or cyclical effects. Nonrecursive models must have enough variables from outside the loop to allow that loop to be estimated. The rank condition which is necessary and sufficient for this condition to hold should be tested for a model to be proposed.

There is also an assumption of the feedback loop is the assumption of a dynamic equilibrium is a condition that also must exist. The dynamic equilibrium is otherwise known as covariance stationarity is necessary if the model is to be estimated by non-Bayesian methods [2, 142]. Covariance stationarity requires stability of the mean, the variance, and the autocovariance. For these models to depend on the assumption of normality as they do, the components of the normal distribution must be stable across the time span of the model. For this condition of stability of the mean to obtain, level shifts in the middle of a dataset being estimated by a model of the equations require model of such shifts.

If feedback loops obtain within the model, we assume that the moduli (absolute value) of the eigenvalues are all within the unit circle so that the system is stable in the long run. Without such stability, variances could not be properly estimated. Also, without such just or over-identification, the variables in the system would not be estimable.

Although we construct our summary measures of Chornobyl related health threat from factor scores, in waves one though three, with alpha reliability coefficients in excess of 0.726, we make a simplifying working assumption in our exploratory mode that these variables are fixed effects without measurement error. This permits us to eschew use of the measurement equations of the structural equation modeling system and to rely on the submodel of Joreskog and Sorbom, plus Sorbom's formulation of mean structures [3, 9,136-137].

Regression models presume a causal direction from the exogenous to the endogenous variable and then from one to another endogenous variable. We furthermore assume that multicollinearity is not a problem in controlling for the effects of other variables, so that the effects of other variables may be controlled for in the partialling. We make a working assumption that this does not pose a problem in the estimation of the parameters.

Because these models include not only continuous variables but dichotomous ones as well, we assume that a polyserial correlation structure can be used to accommodate the covariance structure. This presumes an assumption of underlying multivariate normality within the sample space of the covariance between

Because we needed a program that could handle large data sets, we opted to use Prelis for generating the polyserial correlation input and upon this basis generated the appropriate covariance matrix from Prelis for input into the Stata program. Stata has no provision for robust modeling of such summary data input so it could not produce cluster controlled robust variances for these models. We assume that our conventional variances in such cases will not pose a problem here.

Linear structural equation models in general assume independence of observations and multivariate normality of the observed and latent variables. Sometimes joint normality is too restrictive and conditional normality or general symmetry may suffice. If too many of the variables appear to be ski jumps without clear modes or maxima, the models may not converge at all. However, there are estimation algorithms such as asymptotic distribution free (ADF) or quasi-maximum likelihood (QML) which relax this assumption. When we re-

quest ADF, we obtain a kind of weighted least square which can correct for heteroskedasticity. WHen we request cluster robust estimates, the estimation method becomes QML, which relaxes the independence of observations by allowing clustering (correlation among id) across the waves, while requiring independence of the clustered observations [5, 57].

6 Dose-Perceived Chornobyl related risk and Anxiety response models

We begin examining the relationship between the initial reconstructed cumulative external dose of radiation to which a respondent was exposed and evidence of perceived Chornobyl health risk in waves one, two, and three, as well as a number of related variables, many of which appear to be associated with self-reported anxiety symptoms in waves one and two, as well as BSI defined anxiety in wave three. In this model, we include both the cumulative external dose and the summary Chornobyl health risk summary score, in addition to a number of other variables.

This model is enriched with several potentially related variables that are deemed to be relevant and potential covariates. The nexus of associations between them can appear to be snarled unless we break down these effects neatly prominent paths among the direct, indirect, and total effects.

When we compare the relative contributions of the variables to the global path, rather than the local regressions comprising it, we will specify whether we refer to the the ordinary solutions or the standardized solutions.

Before elaborately explaining this process, it behooves us to review the names of the variables we use in this model. A variable list of those variables is contained in Table one below. In Figure 1 that follows, we present the path diagram for male respondents, and then in Table 2, we present the model output for that analysis. We will turn to the analysis of the female respondents afterward.

Table 1 Variable index for male anxiety model

variable name	type	format	label	variable label
age	double	%8.0g		* Respondent´s age
crhrw1	float	%9.0g		Chornobyl related health risk: wave 1 alpha = .726
crhrw2	float	%9.0g		Chornobyl related health risk in wave 2 alpha=.822
crhrw3	float	%9.0g		Chornobyl rleated health risk in wave 3 alpha=0.833
BSIanx	double	%9.0g		Brief symptom inventory anxiety subscale score
illw1	double	%8.0g		Total number of illnesses experienced in time period 1976-1986
illw2	double	%8.0g		Total number of illnesses experienced in time period 1987-1996
illw3	double	%8.0g		Total number of illnesses experienced in time period 1996-NOW
shhlw1	double	%8.0g		Percentage of strains and hassles related to health in 1986
shhlw2	double	%8.0g		Percentage of strains and hassles related to health in 1996
shhlw3	double	%8.0g		Percentage of strains and hassles related to health NOW
BSIanx	double	%9.0g		Brief symptom inventory anxiety subscale score
anxagw1	double	%9.0g		Average Anxiety level for wave 1
anxagw2	double	%9.0g		Average Anxiety level for wave 2
anxagw3				
fdferw1	double	%8.0g		* Level (in %) of fear of eating radioactively contaminated food in 1986
medcow1	double	%8.0g		number of medical visits for a medical condition per year 1976-1986
medcow2	double	%8.0g		number of medical visits for a medical condition per year 1987-1996
medcow3	double	%8.0g		number of medical visits for a medical condition per year 1997-now
cumdose1	double	%8.0g		Cumulative external dose in mGy for wave 1: 1986
cumdose2	double	%8.0g		Cumulative external dose in mGy for wave 1987 through 1996
cumdose3	double	%8.0g		Cumulative external dose in mGy for wave 3: 1997-time of interview

In Figure 1, a path diagram displays evidence of significant relationships among the variables in the overall male anxiety path model. Although this may at first appear to be snarled, we will try to extract order from entanglement. We explain the path diagram and then discuss near and longer term direct and

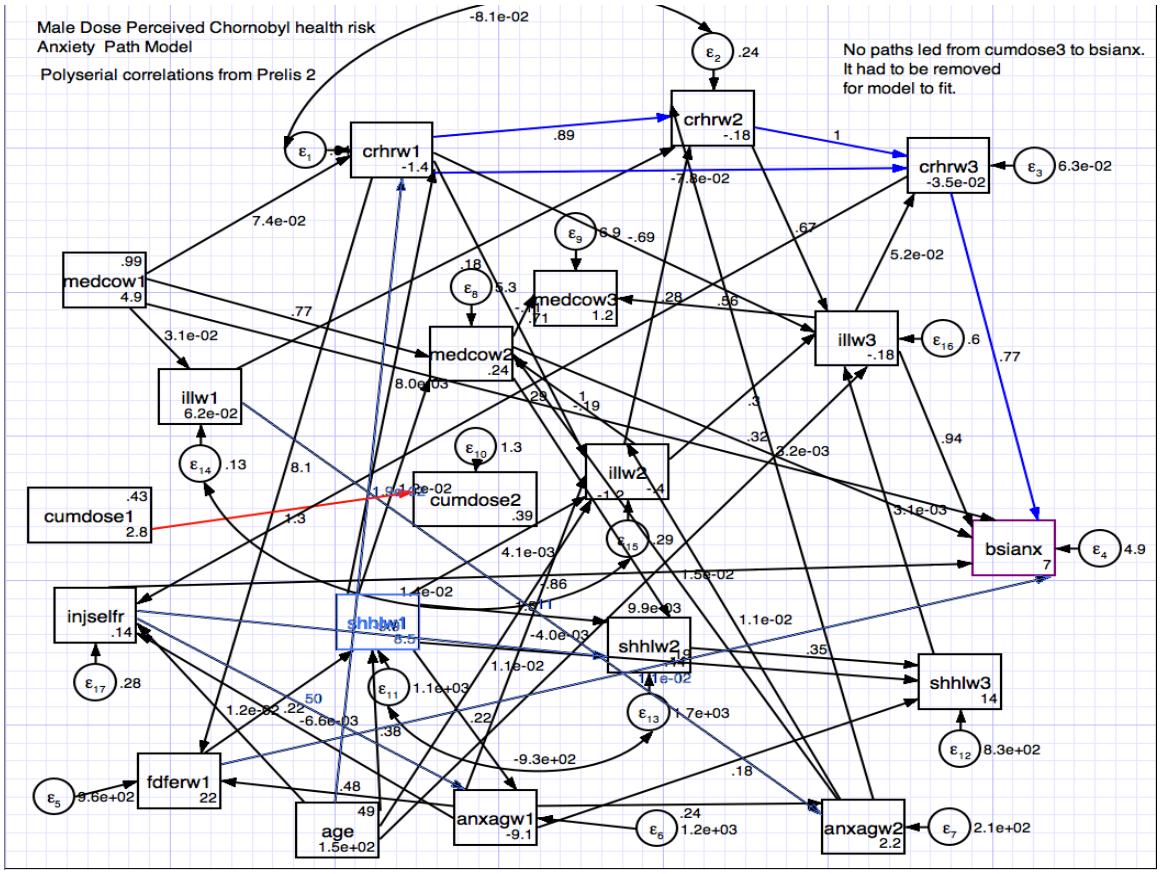

Figure 1: Pathways to male anxiety:
Red colored arrows represent paths through reconstructed cumulative dose whereas blue colored arrows are Chornobyl related health threat paths to BSI anxiety, designated by the purple box.

indirect effects. The diagram of the path model for each gender consists of a set of regression equations with observed variables indicated by rectangles containing their variable names. Arrows between these boxes represent the presumed direction of mediated effect. The number alongside the arrow represents the unstandardized path coefficient of that path. Within each regression equation is an endogenous variable. The equation arrow extends from a circle pointing to the endogenous variable for that equation. The number (often in scientific notation) along side that circle is the error variance. Within each rectangle the reader may observe some numbers in the upper and lower right hand size of the rectangle. For exogenous variables, the upper number is the mean of the variable (or blank if the mean equals zero) and in the lower right is the variance of the variable. If the rectangle is an endogenous variable, to which that circle with an arrow is attached, the number in the lower right hand side of the rectangle indicates the constant of the equation in which the endogenous variable resides.

Now we turn to an explanation of the path diagram and then to a development of the discussion of constitutes the relative magnitudes of the direct and indirect and total pathways of Chornobyl related health risk leading to clinical anxiety. Then we examine the total effects with respect to hypotheses 4 and 5, by which these hypotheses are tested.

6.1 Male anxiety path model

To facilitate reading the diagram and to provide a clear print of the path coefficients, we present the output containing the path coefficients below and continue with the explication below that.

The paths have a point of departure, a route, and a termination or destination point. We organize the paths according to their point of departure but analyze them according to their possible routes and termination points.

The first path begins with reconstructed external dose. This path extends from external wave one dose to external wave two dose. The wave three cumulative external dose exhibit paths beyond it into wave three clinical anxiety. Because there were no paths from it to clinical anxiety in wave three we removed it to fit the model.

One set of paths proceeds through perception of threat to a destination point. Reconstructed external dose proceeds from wave 1 to wave 2. At wave 3, no paths were found leading from cumulative dose at wave 3 to other variables related to clinical anxiety. Because its presence precluding a model fit, it was dropped from this model.

However, the perception of Chornobyl related health risk proceeds from a variety of several sources–including, fear of eating contaminated food, age, injury, a medical condition, as well as health related stresses and hassles. Depending upon the route taken and its mediation by other variables the form of anxiety may change. To be sure the level comprising the basis of the anxiety may differ according to the source of routes taken.

Consider Chornobyl related health risk. When combined with general anxiety in wave 1, this risk may extend to fear of consuming contaminated food in 1986. This is a source of clinical in turn is a source of clinical anxiety in wave 3.

Chornobyl related health risk also stems from having a medical condition in 1986 that may require special needs or treatment. This extends into wave two from which it also turns into clinical anxiety in wave 3. However, medical conditions in wave 3 appear to be a dead-end, so it's the medical condition in wave 2 that appears to be the source of clinical anxiety in wave 3, which may mean that much of the concern may be subsiding now.

Illness may be entwined with this condition and may follow from it and it comprises a basis for the health risk in all waves manifesting itself in wave 3 clinical anxiety.

Whether an individual was injured as a result of Chornobyl also is related to the wave 3 clinical anxiety.

Another basis of the of perceived risk may be that of the fear of consuming contaminated food, which in turn leads to health related stresses and hassles, depending to some extent on one's age, which if they culminate in wave 2 or 3 illness, as they can, they can also be a source of clinical anxiety.

The self-expressed anxious symptoms in waves one and two appear to stem from either actual injury as a result of Chornobyl and fear of contamination of the food. The stresses and hassles mediate the anxiety over this fear and stem partly from injury from Chornobyl and injury in wave three that in turn manifests itself in clinical anxiety.

The path coefficients for the above model may be found in Table 2. At the bottom of the Table, it can be observed that these paths are consistent with the data (LR χ^2= 147.54, df=133, p = .1837). Because this path model is nonrecursive, the stability index was found to be equal to .6543578, which indicates that the model meets nonetheless meets the requirements of stability. However, we will now begin to decompose those paths in the standardized direct, indirect, and total effects.

Table 2 Male Path Model for Cumulative external dose, perceived chornobyl related health risk, and anxiety
[79

Endogenous variables

Observed: crhrw1 crhrw2 crhrw3 fdferw1 illw2 illw3 bsianx injselfr cumdose2 medcow2 illw1 shhlw1 anxagw1 anxagw2 shhlw3 medcow3 shhlw2

Exogenous variables

Observed: cumdose1 medcow1 age

Structural equation model — Number of obs = 337
Estimation method = ml
Log likelihood = -16726.569

	OIM Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Structural						
crhrw1 <-						
shhlw1	.0080059	.0012966	6.17	0.000	.0054645	.0105473
medcow1	.0742673	.019775	3.76	0.000	.035509	.1130257
age	.0186532	.0036168	5.16	0.000	.0115644	.0257419
_cons	-1.412019	.1785871	-7.91	0.000	-1.762043	-1.061995
crhrw2 <-						
crhrw1	.8906941	.0647494	13.76	0.000	.7637877	1.017601
illw2	.2762522	.0492752	5.61	0.000	.1796746	.3728299
illw1	.1808405	.0756571	2.39	0.017	.0325552	.3291257
anxagw2	.0032318	.0017162	1.88	0.060	-.0001318	.0065954
_cons	-.1804859	.034824	-5.18	0.000	-.2487396	-.1122322
crhrw3 <-						
crhrw1	-.0775417	.0285331	-2.72	0.007	-.1334656	-.0216178
crhrw2	1.007787	.0295513	34.10	0.000	.9498672	1.065706
illw3	.0523545	.0167411	3.13	0.002	.0195426	.0851665
_cons	-.0353406	.016633	-2.12	0.034	-.0679407	-.0027406
fdferw1 <-						
crhrw1	8.080559	2.027968	3.98	0.000	4.105815	12.0553
anxagw1	.4795208	.0492084	9.74	0.000	.3830742	.5759675
_cons	22.07386	2.134702	10.34	0.000	17.88992	26.2578
illw2 <-						
crhrw1	-.1128078	.0368639	-3.06	0.002	-.1850598	-.0405559
shhlw1	.0041433	.0009456	4.38	0.000	.00229	.0059966
anxagw1	-.0040147	.0010354	-3.88	0.000	-.006044	-.0019854
anxagw2	.0108512	.0020118	5.39	0.000	.0069082	.0147943
age	.0105603	.0025917	4.07	0.000	.0054808	.0156399
_cons	-.3998345	.1324649	-3.02	0.003	-.6594608	-.1402081
illw3 <-						
crhrw1	-.6852586	.0837123	-8.19	0.000	-.8493317	-.5211855
crhrw2	.6741841	.0871285	7.74	0.000	.5034154	.8449528
illw2	.299661	.0788634	3.80	0.000	.1450917	.4542304
shhlw3	.0031367	.0012402	2.53	0.011	.000706	.0055675
age	.0099156	.0038209	2.60	0.009	.0024268	.0174044
_cons	-.183713	.1977659	-0.93	0.353	-.5713271	.2039011

Continued on next page ...

Table 2 continued from previous page...

	OIM Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Structural						
bsianx <-						
crhrw3	.7669106	.1639374	4.68	0.000	.4455991	1.088222
fdferw1	.010975	.0034836	3.15	0.002	.0041473	.0178027
illw3	.9385255	.1354536	6.93	0.000	.6730413	1.20401
injselfr	-.8597707	.2773908	-3.10	0.002	-1.403447	-.3160946
medcow2	.3221325	.0495757	6.50	0.000	.2249659	.4192991
medcow1	-.1877382	.0688362	-2.73	0.006	-.3226547	-.0528217
_cons	6.988632	.2399589	29.12	0.000	6.518321	7.458943
injselfr <-						
crhrw3	.2919037	.0464705	6.28	0.000	.2008232	.3829842
anxagw1	-.0066051	.0021142	-3.12	0.002	-.0107488	-.0024614
age	.0118494	.0027538	4.30	0.000	.0064521	.0172467
_cons	.1369804	.1320623	1.04	0.300	-.1218569	.3958177
cumdose2 <-						
cumdose1	1.339358	.0368063	36.39	0.000	1.267218	1.411497
_cons	.3898304	.0636154	6.13	0.000	.2651466	.5145143
medcow2 <-						
illw2	1.016285	.223306	4.55	0.000	.5786131	1.453956
shhlw1	.0116801	.0036414	3.21	0.001	.004543	.0188172
anxagw2	.0151701	.0074542	2.04	0.042	.0005601	.0297801
medcow1	.7744249	.0571921	13.54	0.000	.6623304	.8865194
_cons	.2449637	.1864984	1.31	0.189	-.1205665	.6104938
illw1 <-						
medcow1	.0306305	.0087534	3.50	0.000	.0134741	.0477869
_cons	.0615394	.0212232	2.90	0.004	.0199427	.1031361
shhlw1 <-						
fdferw1	.2228828	.0466116	4.78	0.000	.1315259	.3142398
age	.3779554	.119106	3.17	0.002	.1445119	.6113989
_cons	8.529275	6.506787	1.31	0.190	-4.223792	21.28234
anxagw1 <-						
injselfr	50.14168	8.108925	6.18	0.000	34.24848	66.03488
shhlw1	.2173994	.0606841	3.58	0.000	.0984607	.3363382
_cons	-9.10391	4.314818	-2.11	0.035	-17.5608	-.6470209
anxagw2 <-						
illw1	11.11178	2.192092	5.07	0.000	6.815357	15.4082
anxagw1	.2363291	.0213617	11.06	0.000	.1944609	.2781972
_cons	2.239394	.9526355	2.35	0.019	.3722626	4.106525
shhlw3 <-						
shhlw1	.1911269	.0589682	3.24	0.001	.0755515	.3067024
anxagw1	.1826757	.0457462	3.99	0.000	.0930147	.2723367
shhlw2	.3528602	.0509306	6.93	0.000	.2530381	.4526824
_cons	14.3201	2.465613	5.81	0.000	9.487589	19.15262

Table 2 continued from previous page...

	OIM Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
medcow3 <-						
illw3	.5579917	.152083	3.67	0.000	.2599144	.856069
medcow2	.712216	.0469156	15.18	0.000	.6202631	.8041689
_cons	1.153655	.1795854	6.42	0.000	.8016746	1.505636
shhlw2 <-						
injselfr	-9.855634	3.608025	-2.73	0.006	-16.92723	-2.784035
medcow2	-1.195185	.5459845	-2.19	0.029	-2.265295	-.1250754
shhlw1	1.509394	.2378408	6.35	0.000	1.043234	1.975553
_cons	.4445597	8.095626	0.05	0.956	-15.42258	16.3117
Variance						
e.crhrw1	.6376536	.0493554			.5478989	.7421115
e.crhrw2	.237388	.0213181			.1990758	.2830733
e.crhrw3	.0628699	.0048434			.054059	.0731169
e.fdferw1	958.7608	74.22072			823.7891	1115.847
e.illw2	.2867554	.0221854			.2464091	.3337078
e.illw3	.6041885	.0465453			.5195147	.702663
e.bsianx	4.926172	.3794981			4.2358	5.729064
e.injselfr	.2815117	.0503747			.1982346	.399773
e.cumdose2	1.278476	.0984901			1.099306	1.486849
e.medcow2	5.271801	.4061243			4.532991	6.131025
e.illw1	.1262766	.0097281			.1085796	.146858
e.shhlw1	1054.817	83.21863			903.6961	1231.209
e.anxagw1	1194.763	135.1405			957.1983	1491.289
e.anxagw2	210.7123	16.24694			181.1582	245.0878
e.shhlw3	832.3859	64.12477			715.7321	968.0527
e.medcow3	6.888963	.5307059			5.923518	8.011761
e.shhlw2	1706.729	477.5314			986.2891	2953.419
Covariance						
e.crhrw1						
e.crhrw2	-.080872	.0482121	-1.68	0.093	-.1753661	.013622
e.illw2						
e.illw1	.0135534	.0108457	1.25	0.211	-.0077037	.0348106
e.shhlw1						
e.shhlw2	-931.3906	279.6513	-3.33	0.001	-1479.497	-383.2841

LR test of model vs. saturated: chi2(133) = 147.54, Prob > chi2 = 0.1837

6.2 Direct paths to clinical anxiety among males

To compare the relative strength of the direct paths, we present both the non-standardized and standardized path coefficients of those paths in Table two. We focus first on the target variable, anxiety defined by the BSI, in the top panel. There is no direct path stemming from reconstructed external dose measured in milliGrays. Nor is there any direct path from 1986 perceived Chornobyl related health risk. The same can be said of any perceived Chornobyl related health threat from the decade after 1986. The direct path appears to come from

recently perceived Chornobyl related health risk.

Table 3 Nonstandardized and standardized direct path coefficients

```
. estat teffects, standardized
Direct effects
```

bsianx <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	.7669106	.1639374	4.68	0.000	.2517181
fdferw1	.010975	.0034836	3.15	0.002	.1529036
illw2	0	(no path)			0
illw3	.9385255	.1354536	6.93	0.000	.3143941
injselfr	-.8597707	.2773908	-3.10	0.002	-.1539267
medcow2	.3221325	.0495757	6.50	0.000	.3498365
illw1	0	(no path)			0
shhlw1	0	(no path)			0
anxagw1	0	(no path)			0
anxagw2	0	(no path)			0
shhlw3	0	(no path)			0
shhlw2	0	(no path)			0
medcow1	-.1877382	.0688362	-2.73	0.006	-.1487136
age	0	(no path)			0

In previous wave self-expressed anxious symptoms appear to have directly come from from injury to oneself from Chornobyl, some illness count in 1986, or general anxiety in 1986.

Among the direct paths, the one with maximum magnitude relates to a medical condition in the decade after the disaster. Second largest is that of a recent illness and third largest is the recently perceived Chornobyl related health threat. The next three direct effects are of about the same magnitude, regardless of their sign. They are fear of eating contaminated food, the frequency of medical visits for a condition and an injury to oneself as a result of Chornobyl. The inverse relationships due to self- injury stemming from Chornobyl and the frequency of medical visits per year in 1986 owing to a medical condition may deflect attention from Chornobyl being an probable source of problems in 1986. Most of the respondents, reflecting a representative sample of the two Oblasts, did not live very close to Chornobyl at the time nuclear incident.

Although our hypotheses ask about direct paths, we may also wish to understand the source of the Chornobyl related health risk. The direct paths to that are given in Table 4 below.

Table 4 Direct paths to perceived Chornobyl related health risk

	OIM Coef.	Std. Err.	z	P>|z|	Std. Coef.
Structural					
crhrw1 <-					
crhrw1	0	(no path)			0
crhrw3	0	(no path)			0
fdferw1	0	(no path)			0
injselfr	0	(no path)			0
shhlw1	.0080059	.0012966	6.17	0.000	.3057955
anxagw1	0	(no path)			0
medcow1	.0742673	.019775	3.76	0.000	.1768395
age	.0186532	.0036168	5.16	0.000	.2444273
crhrw2 <-					
crhrw1	.8906941	.0647494	13.76	0.000	.9011884
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
fdferw1	0	(no path)			0
illw2	.2762522	.0492752	5.61	0.000	.1771018
illw3	0	(no path)			0
injselfr	0	(no path)			0
illw1	.1808405	.0756571	2.39	0.017	.0713547
shhlw1	0	(no path)			0
anxagw1	0	(no path)			0
anxagw2	.0032318	.0017162	1.88	0.060	.0626484
medcow1	0	(no path)			0
age	0	(no path)			0
crhrw3 <-					
crhrw1	-.0775417	.0285331	-2.72	0.007	-.0785927
crhrw2	1.007787	.0295513	34.10	0.000	1.009552
crhrw3	0	(no path)			0
fdferw1	0	(no path)			0
illw2	0	(no path)			0
illw3	.0523545	.0167411	3.13	0.002	.0534334
injselfr	0	(no path)			0
medcow2	0	(no path)			0
illw1	0	(no path)			0
shhlw1	0	(no path)			0
anxagw1	0	(no path)			0
anxagw2	0	(no path)			0
shhlw3	0	(no path)			0
shhlw2	0	(no path)			0
medcow1	0	(no path)			0
age	0	(no path)			0

The relative magnitude of these direct effects shows what the male respondents believed was directly impacting them.

6.3 Limitations of direct effects

There is an encompassing problem with a regression model that merely uses direct main effects. A simple regression model with BSI anxiety as the endogenous variable, and the remaining variables used as explanatory variables

including Chornobyl related health risk in wave one, all of the other variables peculiar each wave plus age, injury resulting from Chornobyl and the fear of consuming contaminated food or fluid in 1986, the *adjusted* R^2 for these models which yield the direct effects are all less than 0.264. Even if we added the variables by wave and provided cluster robust variances to control for the id clustered across the waves, the *adjusted* R^2 would only equal 0.31. In short, a model for mere direct main effects is not the most encompassing of models. It does not augur well for an an endeavor to use simple regression analysis as the only means of explaining or predicting clinical anxiety measured by the BSI.

In this analysis, we address hypothesis 4 and 5. Although these hypotheses refer to general mental health as indicated by the BSI, we address the direct portion of it relating to the BSI anxiety subscale within these data. Judging from the proportion of variance explained of the target endogenous variable explained, it appears that mere direct main effects do not yield a complete explanation. Hypothesis 4, that radiation dose directly explains mental health insofar as measured by the BSI anxiety is not consistent with these data for male respondents. Hypothesis 5, that perceived Chornobyl health risk as external dose exposure in 1986 predicts BSI anxiety is partly consistent with these data. Although we observe a direct relationship between perceived Chornobyl health risk in 1986 and BSI anxiety, this does not extend from perceived Chornobyl health risk in waves two or three to BSI anxiety. In search of a more complete perspective, we turn to a consideration of the sum of the indirect paths to obtain a perspective of the totality of indirect effects.

6.4 Indirect paths to male anxiety

Direct paths are not the only paths that can be taken to the target endogenous variable. The effects presumably can be transmitted through links of paths, only if all path coefficients of those connected links are statistically significant, by taking the product of those linked paths can provide an resulting coefficient the indirect route to the target endogenous variable as well. If a variable has several routes to the target variable, then the sum of the products of those different routes is computed to obtain the standardized coefficients in Table 5.

Although these indirect paths are organized according to the original source or point of departure, it is helpful to examine the relative magnitude of their indirect effect on clinical anxiety in wave three. In Table 5, we examine the sum of indirect effects according to the resulting standardized coefficients to clinical anxiety from their points of origin. It is noteworthy that all of these effects are statistically significant, and therefore should not be discarded merely because they are not direct.

Table 5 Sum of indirect path coefficients to BSI anxiety

Indirect effects

	OIM				
	Coef.	Std. Err.	z	P>|z|	Std. Coef.
bsianx <-					
crhrw1	.4711283	.1294277	3.64	0.000	.1567314
crhrw2	1.328548	.0871091	15.25	0.000	.4368245
crhrw3	-.0998412	.0158945	-6.28	0.000	-.0327702
fdferw1	.0035885	.0007505	4.78	0.000	.0499947
illw2	.9847889	.1238237	7.95	0.000	.2075822
illw3	.0349241	.0111675	3.13	0.002	.0116991
injselfr	.5177359	.0855538	6.05	0.000	.0926915
medcow2	-.0012877	.0005883	-2.19	0.029	-.0013985
illw1	.4607905	.1094249	4.21	0.000	.0597806
shhlw1	.0161003	.0018131	8.88	0.000	.2045829
anxagw1	.0105372	.0014673	7.18	0.000	.1413344
anxagw2	.019847	.0038596	5.14	0.000	.1265
shhlw3	.0030535	.0012073	2.53	0.011	.0398989
shhlw2	.0010774	.0001555	6.93	0.000	.0152964
medcow1	.2975738	.0453993	6.55	0.000	.2357181
age	.0308723	.006669	4.63	0.000	.1345807

We need to recognize that all of these sums of indirect effects are statistically significant. However, cumulative external dose is not among them, although perceived Chornobyl related health risk is located in several places in the ranks. If we sort indirect standardized coefficients in descending order, we observe that the largest standardized coefficient among them is the Chornobyl related health risk in wave 2 ($\beta = 0.437$.) Second largest is a medical condition in wave 1 ($\beta = 0.236$).and an third largest is an illness in the decade following Chornobyl ($\beta = 0.208$). Next on the list are the health related stresses and hassles of 1986 ($\beta = .205$), and fifth is the perceived Chornobyl related health risk in 1986 ($\beta = .157$). Fifteenth in magnitude is the Chornobylrelated health risk in wave three (in the years since 1997 to the time of the interview) ($\beta = -0.03$). The smaller magnitude and the change in sign might indicate that this clinical anxiety has dissipated and lessened in recent years. This might also explain why the variable did not fit in well with the other relationships. Whether perceived health risk from Chornobyl stems from recent years or the decade before then determines the Chornobyl related health risk has the most or least size of the sum of the indirect effects. Depending upon the time frame, the perceived Chornobyl related health risk is first, fifth, or last in the amount of standardized indirect effect. Therefore, it is helpful to appreciate not only the direct, but the indirect, and total effects on the target endogenous variable, which in this case, is clinical anxiety, measured by the BSI.

This has implications for our answers to hypotheses four and five, relating to relationships between exposure to reconstructed external dose and perceived Chornobyl related health risk, on the one hand, and their ability to explain or predict clinical anxiety, among other things, on the other hand. It means

that the indirect effect is statistically significant and that from wave two is of paramount importance among the indirect effects. This was the period of Gorbachev's glasnost and perestroika. The institutions of the Soviet Union were disintegrating as centralized planning and control were failing. Many people who had been privileged before were suffering economic hardships and deprivation.

If we sort the potential sources of anxiety from highest to lowest magnitude of the sum of the indirect effects, we obtain 1) a medical condition in 1986, 2) an illness in the decade following Chornobyl, 3) health related stresses and hassles in 1986, 4) age, 5) injury because of Chornobyl, and 6) fear of contaminated consumption in 1986.

Although these paths are organized according to their point of origin, we have to be careful about thinking that the paths to clinical anxiety are mutually exclusive or collectively exhaustive. Depending upon the route they take and the variables that mediate the journey from point of embarkation to the manifestation of clinical anxiety, they may have to be treated in different ways and with appropriate means. Therefore another way to interpret the path diagram is that anxiety can have different triggers and different modulators before it manifests itself as clinical anxiety.

Depending upon the mediating variables, the levels of anxiety which have evolved over the years may be aggravated or mitigated. Persons who were injured in the midst of the evacuation and relocation, depending upon the nature of the injury, may require psychological as well as medical evaluation, diagnosis, and treatment. Others already having a medical condition may have special needs for periodic treatment in addition to treatment for any illness following from the potential interruption of it. Individuals whose resources were exhausted by health related stresses and hassles may need continued survivor support or just extended rest and recuperation, depending upon their individual circumstances.

Readers interested in the sum of indirect impacts on the exogenous summary scores of perceived Chornobyl related health risk may find those coefficients in Table 6.

Table 6 Indirect paths to Chornobyl related health risk in waves one, two, and three

	OIM Coef.	Std. Err.	z	P>|z|	Std. Coef.
crhrw1 <-					
crhrw1	.0227313	.0038682	5.88	0.000	.0227313
crhrw3	.0098502	.0015681	6.28	0.000	.0097185
fdferw1	.0018606	.0003891	4.78	0.000	.0779196
injselfr	.0337448	.0054581	6.18	0.000	.0181602
shhlw1	.0003419	.0000523	6.54	0.000	.0130584
anxagw1	.0006731	.0001129	5.96	0.000	.0271385
medcow1	.0017669	.0006419	2.75	0.006	.0042073
age	.0040157	.001191	3.37	0.001	.0526207
crhrw2 <-					
crhrw1	-.0049865	.0110797	-0.45	0.653	-.0050453
crhrw2	.014598	.0004186	34.88	0.000	.014598
crhrw3	.013995	.002228	6.28	0.000	.0139706
fdferw1	.0018862	.0003945	4.78	0.000	.0799225
illw2	0	(no path)			0
illw3	.0007327	.0002343	3.13	0.002	.0007465
injselfr	.047944	.0077548	6.18	0.000	.0261057
illw1	.072897	.0139012	5.24	0.000	.0287632
shhlw1	.0084627	.0011852	7.14	0.000	.32705
anxagw1	.0009563	.0003625	2.64	0.008	.0390121
anxagw2	.003091	.000565	5.47	0.000	.0599184
medcow1	.0735505	.0176134	4.18	0.000	.177196
age	.0232573	.0036246	6.42	0.000	.3083503
crhrw3 <-					
crhrw1	.8840963	.0697059	12.68	0.000	.8960795
crhrw2	.049527	.004642	10.67	0.000	.0496138
crhrw3	.0136427	.0021719	6.28	0.000	.0136427
fdferw1	.0017959	.0003756	4.78	0.000	.0762322
illw2	.3079166	.0522755	5.89	0.000	.1977472
illw3	0	(no path)			0
injselfr	.0467369	.0076559	6.10	0.000	.025493
medcow2	-.0000702	.0000321	-2.19	0.029	-.0002323
illw1	.2662899	.0813164	3.27	0.001	.1052547
shhlw1	.0080578	.0010942	7.36	0.000	.3119488
anxagw1	.0009436	.0003888	2.43	0.015	.0385619
anxagw2	.0067572	.0019208	3.52	0.000	.1312183
shhlw3	.0001665	.0000658	2.53	0.011	.006627
shhlw2	.0000587	8.48e-06	6.93	0.000	.0025407
medcow1	.0680029	.0162436	4.19	0.000	.1641178
age	.022422	.0034382	6.52	0.000	.2977958

6.5 Analysis of total effects among males

Another way to consider the impact of one variable upon the BSI measured clinical anxiety is to consider the total effect, defined as the the arithmetic sum of the direct and composite indirect effects, listed in Table 7. As in the previous decomposition analysis, we use the standardized coefficients. Among the 15 points of origin, the total effect with the largest magnitude is that of perceived

Chornobyl related health risk from the decade after Chornobyl ($\beta = 0.437$). Of second highest magnitude is that of a medical condition during that same decade ($\beta = 0.348$). The third greatest total effect is that of the annual frequency of recent illnesses. ($\beta = 0.326$) Fourth largest impact out of all fifteen rankings is that of recently (wave 3) perceived Chornobyl related health risk ($\beta = 0.219$) In terms of total impact, whether it is the decade following Chornobyl or more recently, the perception of this health risk is among those having the most impact on clinical anxiety for male respondents.

Table 7 Total effects on wave 3 BSI anxiety

	OIM				
	Coef.	Std. Err.	z	P>|z|	Std. Coef.
Structural					
bsianx <-					
crhrw1	.4711283	.1294277	3.64	0.000	.1567314
crhrw2	1.328548	.0871091	15.25	0.000	.4368245
crhrw3	.6670694	.1647062	4.05	0.000	.2189479
fdferw1	.0145634	.0035635	4.09	0.000	.2028983
illw2	.9847889	.1238237	7.95	0.000	.2075822
illw3	.9734496	.1359132	7.16	0.000	.3260932
injselfr	-.3420347	.2902846	-1.18	0.239	-.0612353
medcow2	.3208447	.0495792	6.47	0.000	.348438
illw1	.4607905	.1094249	4.21	0.000	.0597806
shhlw1	.0161003	.0018131	8.88	0.000	.2045829
anxagw1	.0105372	.0014673	7.18	0.000	.1413344
anxagw2	.019847	.0038596	5.14	0.000	.1265
shhlw3	.0030535	.0012073	2.53	0.011	.0398989
shhlw2	.0010774	.0001555	6.93	0.000	.0152964
medcow1	.1098357	.0591888	1.86	0.063	.0870045
age	.0308723	.006669	4.63	0.000	.134580

The total effects, the sum of the direct and indirect effects, are presented in Table 4. If we consider the statistically significant effects, we find that there are only 12. Although in arithmetic this type of cancellation of effect can occur because a direct effect with one sign may be added to an indirect effect of the opposite sign to cancel one another out, in the minds of a person it is more likely to generate a situation of cognitive dissonance which may not be so easily resolved as it is with arithmetic. which appears to have been the case for the early perceived Chornobyl related health risk in 1986 and health related stresses and hassles in the decade after Chornobyl. If we can make the assumption that effects with conflicting signs cancel themselves out psychologically as neatly as they do arithmetically, we can examine the statistically significant total effects without digression.

We examine the total effects in terms of their absolute impact on anxiety defined by the BSI. Self-reported illness and whether a person was injured as a result of Chornobyl are among the top three total effects. The count of illness in the decade following 1986 and the self-count of illness in 1986 have the greatest total effect. Fourth down the the ladder of total impact on anxiety is 1986 self-expressed symptoms of anxiety. Fifth is age. Sixth is self-described

symptoms of anxiety in 1987 though 1996. Seventh in size of total effect is the perceived Chornobyl related risk in that same decade. Eighth out of 12 is the total effect of reconstructed cumulative external dose in milliGrays. Ninth out of the significant 12 is the perceived Chornobyl health risk at the time of the interview (from 2009 into 2011). Tenth is the self-reported count of illnesses recently. Eleventh is the health related stresses and hassles of 1986 and last and least of the significant total impacts is the fear of eating contaminated food in the year of Chornobyl. Table 5 presents the standardized direct paths the overall path model.

6.6 Limitations in the analysis of total effects

There is a potential limitation in using this assessment of the total effect as a criterion for analysis. There may not be a one-to-one mapping of total effects in path modeling onto total effects in mental modeling, for the sum of direct and indirect effects is arithmetic in the former, whereas in the latter it may lead to dysfunctional cognitive dissonance (according to Dr. Rose Marie Perez Foster) in the other. If the conflict between the positive and the negative cannot be satisfactorily and easily resolved, it may aggravate some forms of anxiety, so that the sum of effects with opposing signs could be greater than the cancellation of the positive and negative components, in the magnitude of the result.

We have to be careful to distinguish the nature of the relationship from a positive or negative consequence. If a relationship is direct, the sign is positive. If a relationship is inverse, the sign is negative. If the complete nature of this were linear and additive, then one might cancel the other out. But if they are not linear and additive, this might not hold.

Where formerly significant direct and indirect effects are no longer statistically significant, as appears to be the case, in the computation of some total effects, an indirect sign may have changed as a result of an odd number of negative signs of mediating paths. In the case of self-injury due to Chornobyl, the sign seams to have changed from a negative direct effect to a positive indirect effect possibly as a result of an even number of negative links in the indirect path. The resulting positive sign in the sum of the indirect paths tends to cancel the inverse direct effect, leaving a questionable statistically non-significant result. A new calculus for potential cancellation might be considered in the case of the mapping of total effects from arithmetic addition to psychological cognitive dissonance. This could be an area for the direction of future research.

Moreover, it might mean that the tendency to discount the injury resulting from Chornobyl as no longer statistically significant might actually be one of importance.

6.7 Hypothesis tests

With respect to hypothesis four that radiation as measured by our reconstructed external cumulative dose, we do not find evidence that this explains clinical

anxiety on the part of a representative sample of Ukrainian male residents of Kiev and Zhitomyr Oblasts.

In connection with the next hypothesis, we find that in terms of the direct effects on BSI mental health, as far as the anxiety subscale is concerned, there is evidence of a direct dose anxiety response from the initial dose that is consistent with the data. Although there is partial confirmation of the hypothesis that our summary score for perceived Chornobyl health risk explains and predicts clinical anxiety, the linear main direct effects only explain approximately a third of the variance of clinical anxiety. Other forms of analysis are necessary to obtain a more complete perspective on the total effects.

6.8 Female anxiety path model

In the sections that follow, we address hypotheses 4 and 5 for the female respondents. First we examine the path diagram, supported by the data in Table 8. We examine the hypotheses in connection with the direct, indirect, and total effects in Tables 9, 10, and 11. Because the path diagrams need an explanatory discussion, we include the path output of Table 8, containing the nonstandardized path coefficients for this model.

6.9 Direct effects for females

What we observe in the female model differs from what is shown in the male model. Whereas in the male model, we saw no evidence of a statistically significant direct main effect on the part of cumulative external dose and anxiety. On the part of the females, we observe a statistically significant direct effect from cumulative external dose in 1986, colored red in Figure 2 ($stdized\ \beta = 0.794$). Unlike the male model, in which we found a direct effect from perceived Chornobyl health risk in wave 3, we observe in the female model no statistically significant direct effect from this perceived health risk to clinical anxiety as measured by the BSI.

In Table 9, we observe that he direct main effects on BSI anxiety come primarily, as shown by the standardized coefficients, in this model, from illnesses in 1986 and the decade following it. Wave three health related stresses and hassles account for the next largest direct effect. Of approximately equal magnitude are the direct main effects of self-expressed anxiety symptoms in waves one and two. Finally, the direct effect of reconstructed external dose had the least largest direct effect in terms of relative magnitude on BSI anxiety.

6.10 Limitations of direct effects

How well can these variable predict BSI anxiety with a model consisting of direct main effects. A simple regression model with clinical anxiety as the endogenous variable, and the remaining variables as independent variables including Chornobyl related health risk in wave one, all of the other variables peculiar each wave plus age, injury resulting from Chornobyl and the fear of consuming

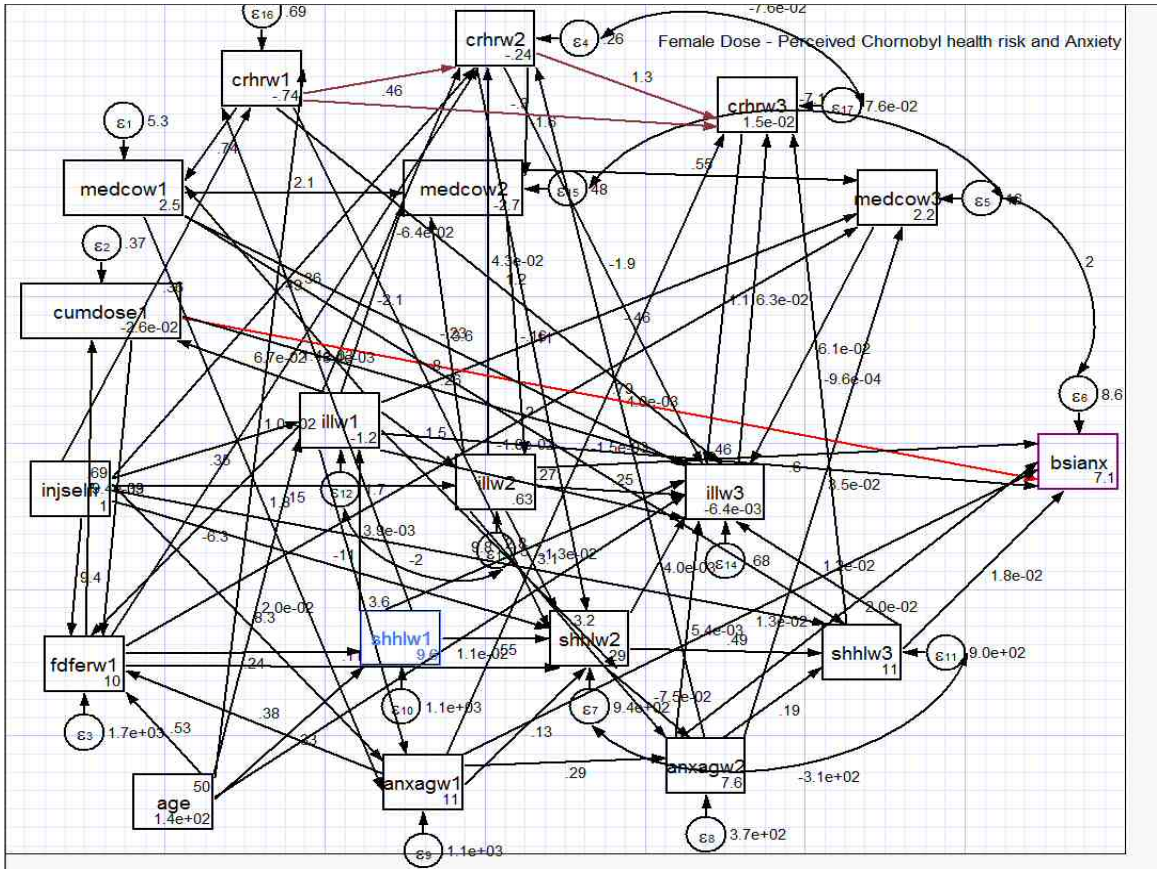

Figure 2: Pathways to anxiety among females residents of Kiev and Zhitomyr Oblasts

contaminated food or fluid in 1986, the *adjusted* R^2 for these models which yield the direct effects are all less than 0.25. Even if we added the variables by wave and provided cluster robust variances to control for the id clustered across the waves, the *adjusted* R^2 would only equal 0.39. In short, a model for mere direct main effects is not the most encompassing of models. It does not augur well for an an endeavor to use simple regression analysis as the only means of explaining or predicting clinical anxiety measured by the BSI.

6.11 Indirect effects for females

To obtain a broader perspective we examine the indirect path coefficients to clinical anxiety in Table 11. In this case we note that is a statistically significant indirect path extending from external cumulative dose to BSI anxiety that is negative in sign (*stdized* $\beta = -.305$). We need to examine the signs of the mediating variables and the implications for the indirect paths. We find that one of the several indirect paths through through which this effect can travel has a negative relationship extending from cumulative dose in wave 1 to a mediating variable, fear of consuming contaminated food or fluids, also in wave 1. The remainder of the linking paths through health related stresses and hassles all the way to BSI anxiety are positive. Therefore, the indirect path of cumulative external dose is shown to have a negative indirect relationship on anxiety. It might be better to consider whether this may be one of the exceptional cases where the sign should remain positive. It appears that if the sign of an indirect effect undergoes a reversal, that the path has to be examined for re-evaluation, preparatory to computing total effects. Another case where there might be a red-flag for re-evaluation is when a significant effect turns statistically non-significant. We will reserve judgment until we consider the implications for the total effects.

Hypothesis 5 postulated that the perceived risk summary score explains or predicts BSI anxiety has to be considered through its indirect effects because there are no direct paths proceeding from any of the different waves. From wave one, the indirect path from the summary score is negative ($\beta = -0.0726$), whereas from wave two, the indirect path from the summary score is positive ($\beta = 0.197$). All of the indirect path coefficients are statistically significant. So we have to ask ourselves which was the mediating variable that flipped the sign and whether this sign change is appropriate. One of the indirect paths through which an effect could be transmitted is from the medical condition in wave one to illness in wave three (*stdized* $\beta = 0.360$). The sign between these two variables is negative. This could flip the sign of the indirect path from wave 1 summary score to wave 1 medical condition to wave 3 illness to wave 3 BSI anxiety, because all of the other links to this indirect path are positive. A medical condition diagnosed as something unrelated to potential radioactive contamination can surely create an inverse relationship between cumulative dose and anxiety and probably would reverse the direction of the relationship in this case. However, now we have a negative indirect effect of cumulative external dose and a positive direct effect. If these relationships were linear and additive

they might be able to cancel one another out. A trauma however may render the relationship more fixed and constant and not amenable to such additivity.

However, there is no indirect path from the wave 3 summary perceived risk score to BSI anxiety. Although there might be a basis for explanation and prediction from waves 1 and 2, there is no evidence that wave 3 BSI anxiety could be predicted a concurrent perceived risk summary score. For explanation and/or prediction to hold, the R^2 of a BSI model containing these explanatory variables would have to be more substantial than one that only explains approximately a third of the variance of the target endogenous variable. It would take more than expert judgment to make up the 61% difference between the variance of the target endogenous variable and the proportion that our regression models can explain. But we have to begin somewhere if we are going to understand this phenomenon.

Table 8 Anxiety path model for female respondents

Endogenous variables

Observed: medcow1 anxagw1 shhlw3 illw3 medcow2 cumdose1 fdferw1 bsianx
crhrw2 medcow3 shhlw2 shhlw1 illw1 crhrw1 crhrw3 anxagw2 illw2

Exogenous variables

Observed: age injselfr

Structural equation model Number of obs = 360
Estimation method = ml
Log likelihood = -18766.794

Standardized	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
Structural						
medcow1 <-						
illw1	.2716786	.0471774	5.76	0.000	.1792126	.3641446
crhrw1	.2737505	.0470931	5.81	0.000	.1814498	.3660512
_cons	.9825811	.0632962	15.52	0.000	.8585228	1.106639
anxagw1 <-						
medcow1	.1315861	.0523606	2.51	0.012	.0289613	.2342109
illw1	.143648	.0528259	2.72	0.007	.0401112	.2471849
injselfr	.234396	.0506984	4.62	0.000	.1350291	.333763
_cons	.3158994	.0792668	3.99	0.000	.1605392	.4712595
shhlw3 <-						
medcow1	-.1570558	.0470419	-3.34	0.001	-.2492563	-.0648553
shhlw2	.576103	.0710153	8.11	0.000	.4369156	.7152905
anxagw2	.1281071	.0484945	2.64	0.008	.0330597	.2231546
injselfr	.2970223	.0482826	6.15	0.000	.2023902	.3916543
_cons	.334642	.1267695	2.64	0.008	.0861784	.5831057
illw3 <-						
medcow1	-.3600252	.0386658	-9.31	0.000	-.4358087	-.2842418
shhlw3	.2496162	.0315875	7.90	0.000	.1877059	.3115266
cumdose1	.0904774	.0280757	3.22	0.001	.03545	.1455049
crhrw2	-1.03825	.1307718	-7.94	0.000	-1.294558	-.7819418
medcow3	.196997	.0319418	6.17	0.000	.1343923	.2596018
shhlw2	.0968393	.0349467	2.77	0.006	.028345	.1653337
shhlw1	-.2747333	.033531	-8.19	0.000	-.3404529	-.2090137
illw1	.2362866	.0408522	5.78	0.000	.1562178	.3163553
crhrw1	.7235546	.0399971	18.09	0.000	.6451617	.8019475
crhrw3	.5958691	.1280409	4.65	0.000	.3449136	.8468245
anxagw2	.0753997	.0300498	2.51	0.012	.0165032	.1342961
illw2	.2536525	.0356945	7.11	0.000	.1836926	.3236124
age	.0785939	.0296282	2.65	0.008	.0205237	.1366642
_cons	-.0039611	.1323586	-0.03	0.976	-.2633793	.255457
medcow2 <-						
medcow1	.7566559	.0636574	11.89	0.000	.6318897	.8814221
crhrw2	-.2029027	.0640051	-3.17	0.002	-.3283503	-.0774551
illw1	-.4147542	.0817496	-5.07	0.000	-.5749804	-.2545279
illw2	.834443	.1171391	7.12	0.000	.6048546	1.064031
_cons	-.3782924	.0909473	-4.16	0.000	-.5565458	-.200039

Continued...

Table 8 - continued...

cumdose1 <-						
fdferw1	.6446869	.1481162	4.35	0.000	.3543844	.9349894
illw1	.1711717	.059814	2.86	0.004	.0539383	.288405
_cons	-.0481638	.1652236	-0.29	0.771	-.3719961	.2756685
fdferw1 <-						
anxagw1	.3540199	.0683643	5.18	0.000	.2200283	.4880116
cumdose1	-.5654492	.1708253	-3.31	0.001	-.9002607	-.2306377
illw1	-.2326164	.0634512	-3.67	0.000	-.3569785	-.1082543
age	.1648503	.0650967	2.53	0.011	.0372632	.2924374
injselfr	.2480344	.064058	3.87	0.000	.122483	.3735858
_cons	.264652	.2639817	1.00	0.316	-.2527427	.7820466
bsianx <-						
anxagw1	.1296637	.0504464	2.57	0.010	.0307905	.2285369
shhlw3	.1664869	.0442191	3.77	0.000	.079819	.2531548
cumdose1	.1197071	.043327	2.76	0.006	.0347878	.2046264
illw1	.1772652	.0494699	3.58	0.000	.080306	.2742244
anxagw2	.1211844	.0492251	2.46	0.014	.0247049	.2176639
illw2	.2726469	.047611	5.73	0.000	.1793311	.3659627
_cons	1.9542	.1151494	16.97	0.000	1.728512	2.179889
crhrw2 <-						
fdferw1	.0593206	.0276255	2.15	0.032	.0051756	.1134656
illw1	-.1026199	.0308444	-3.33	0.001	-.1630738	-.042166
crhrw1	.4938834	.0318303	15.52	0.000	.4314971	.5562698
anxagw2	.1040487	.0284472	3.66	0.000	.0482933	.1598041
illw2	.0804366	.0334262	2.41	0.016	.0149223	.1459508
injselfr	.4102276	.0337212	12.17	0.000	.3441353	.47632
_cons	-.2743557	.0429381	-6.39	0.000	-.3585129	-.1901986
medcow3 <-						
medcow2	.7562234	.046784	16.16	0.000	.6645285	.8479183
fdferw1	-.1307034	.0395193	-3.31	0.001	-.2081598	-.053247
illw1	-.1230236	.0474881	-2.59	0.010	-.2160986	-.0299486
anxagw2	.1541136	.0408327	3.77	0.000	.0740828	.2341443
_cons	.4270221	.0659855	6.47	0.000	.2976929	.5563513
shhlw2 <-						
anxagw1	.1183836	.0448284	2.64	0.008	.0305215	.2062457
fdferw1	.107319	.0440105	2.44	0.015	.02106	.1935779
crhrw2	.253283	.0687803	3.68	0.000	.118476	.38809
shhlw1	.4866378	.0387679	12.55	0.000	.410654	.5626215
illw1	.0999345	.0471378	2.12	0.034	.007546	.192323
crhrw1	-.1948533	.0554137	-3.52	0.000	-.3034622	-.0862445
illw2	.1332703	.0462704	2.88	0.004	.0425818	.2239587
injselfr	-.2851072	.0567773	-5.02	0.000	-.3963886	-.1738257
_cons	.7508673	.0860051	8.73	0.000	.5823005	.9194342
shhlw1 <-						
fdferw1	.270556	.0499711	5.41	0.000	.1726144	.3684976
age	.1145461	.0504045	2.27	0.023	.0157551	.2133372
_cons	.281083	.2242178	1.25	0.210	-.1583759	.7205419

Continued...

Table 8 continued...

illw1 <-						
shhlw1	.0955846	.0411112	2.33	0.020	.0150082	.176161
age	.1716241	.0484615	3.54	0.000	.0766413	.2666069
injselfr	.2503704	.0493841	5.07	0.000	.1535793	.3471615
_cons	-.8749828	.2098224	-4.17	0.000	-1.286227	-.4637384
crhrw1 <-						
shhlw1	.1242533	.047041	2.64	0.008	.0320546	.216452
age	.1256642	.0481935	2.61	0.009	.0312066	.2201217
injselfr	.3872768	.0437096	8.86	0.000	.3016075	.4729461
_cons	-.7891943	.2001631	-3.94	0.000	-1.181507	-.3968819
crhrw3 <-						
anxagw1	-.0579839	.0154368	-3.76	0.000	-.0882395	-.0277283
shhlw3	-.0351485	.0159662	-2.20	0.028	-.0664416	-.0038554
illw3	.1137064	.0244085	4.66	0.000	.0658665	.1615462
crhrw2	1.260313	.040549	31.08	0.000	1.180839	1.339788
crhrw1	-.3106332	.0349119	-8.90	0.000	-.3790591	-.2422072
_cons	.01639	.0240557	0.68	0.496	-.0307583	.0635382
anxagw2 <-						
anxagw1	.4558037	.0419814	10.86	0.000	.3735216	.5380858
shhlw2	-.1287122	.0471769	-2.73	0.006	-.2211773	-.0362472
illw2	.2325717	.0463065	5.02	0.000	.1418127	.3233307
_cons	.3351682	.0782223	4.28	0.000	.1818553	.488481
illw2 <-						
medcow2	-.6651186	.1121927	-5.93	0.000	-.8850123	-.4452248
illw1	1.29982	.3785213	3.43	0.001	.5579322	2.041708
injselfr	.0881506	.1415711	0.62	0.534	-.1893236	.3656249
_cons	.3794991	.1085922	3.49	0.000	.1666624	.5923358

Continued on the next page...

Table 8 continued...

Variance						
e.medcow1	.826107	.0354143			.7595323	.898517
e.anxagw1	.8594871	.0327986			.7975481	.9262363
e.shhlw3	.8237702	.0550277			.7226798	.9390013
e.illw3	.2607528	.023195			.2190338	.310418
e.medcow2	.9590291	.1161983			.756307	1.216089
e.cumdose1	1.225578	.1508186			.9629257	1.559873
e.fdferw1	1.211849	.2077339			.8660369	1.695745
e.bsianx	.6446309	.0393854			.5718798	.7266368
e.crhrw2	.3372058	.0269129			.2883762	.3943036
e.medcow3	.588933	.0410177			.5137854	.6750719
e.shhlw2	.6251651	.0390797			.5530765	.7066498
e.shhlw1	.9136049	.0282017			.8599695	.9705855
e.illw1	.8746659	.0318348			.8144442	.9393404
e.crhrw1	.7782011	.0363165			.7101802	.8527369
e.crhrw3	.0937927	.0133546			.0709531	.1239844
e.anxagw2	.7298752	.0395669			.6563033	.8116947
e.illw2	2.078602	.7065663			1.067647	4.04683
Covariance						
e.shhlw3						
e.shhlw2	-.3411604	.0778267	-4.38	0.000	-.4936979	-.1886228
e.medcow2						
e.medcow3	-.2571915	.0661764	-3.89	0.000	-.386895	-.1274881
e.bsianx						
e.medcow3	.174507	.0499471	3.49	0.000	.0766125	.2724015
e.crhrw2						
e.crhrw3	-.5463066	.0680377	-8.03	0.000	-.679658	-.4129551
e.illw1						
e.illw2	-.6498701	.1462871	-4.44	0.000	-.9365875	-.3631526

LR test of model vs. saturated: chi2(89) = 102.80, Prob > chi2 = 0.1505

Stability analysis of simultaneous equation systems

Eigenvalue stability condition
stability index = .7492314
All the eigenvalues lie inside the unit circle.
SEM satisfies stability condition.

Table 9 Standardized path model for anxiety among female respondents

Direct effects

	OIM Coef.	Std. Err.	z	P>|z|	Std. Coef.
bsianx <-					
medcow1	0	(no path)			0
anxagw1	.0134118	.0051588	2.60	0.009	.1296637
shhlw3	.0184092	.0049197	3.74	0.000	.1664869
medcow2	0	(no path)			0
cumdose1	.7942476	.2887301	2.75	0.006	.1197071
fdferw1	0	(no path)			0
crhrw2	0	(no path)			0
shhlw2	0	(no path)			0
shhlw1	0	(no path)			0
illw1	.4617813	.1222225	3.78	0.000	.1772652
crhrw1	0	(no path)			0
anxagw2	.0196002	.0080008	2.45	0.014	.1211844
illw2	.6010718	.1073445	5.60	0.000	.2726469
age	0	(no path)			0
injselfr	0	(no path)			0

Table 10 Direct effects impacting Summary perceived Chornobyl risk score

	OIM Coef.	Std. Err.	z	P>|z|	Std. Coef.
crhrw3 <-					
medcow1	0	(no path)			0
anxagw1	-.0014775	.0003922	-3.77	0.000	-.0579839
shhlw3	-.0009574	.0004349	-2.20	0.028	-.0351485
illw3	.0634785	.0128061	4.96	0.000	.1137064
medcow2	0	(no path)			0
cumdose1	0	(no path)			0
fdferw1	0	(no path)			0
crhrw2	1.294173	.0425507	30.41	0.000	1.260313
medcow3	0	(no path)			0
shhlw2	0	(no path)			0
shhlw1	0	(no path)			0
illw1	0	(no path)			0
crhrw1	-.2968447	.0305796	-9.71	0.000	-.3106332
crhrw3	0	(no path)			0
anxagw2	0	(no path)			0
illw2	0	(no path)			0
age	0	(no path)			0
injselfr	0	(no path)			0

Continued on the next page...

Table 10 continued...

crhrw2 <-					
medcow1	0	(no path)			0
anxagw1	0	(no path)			0
medcow2	0	(no path)			0
cumdose1	0	(no path)			0
fdferw1	.0013735	.0006377	2.15	0.031	.0593206
crhrw2	0	(no path)			0
shhlw2	0	(no path)			0
shhlw1	0	(no path)			0
illw1	-.0641317	.0193066	-3.32	0.001	-.1026199
crhrw1	.4596128	.0316304	14.53	0.000	.4938834
anxagw2	.0040372	.0011059	3.65	0.000	.1040487
illw2	.042541	.017706	2.40	0.016	.0804366
age	0	(no path)			0
injselfr	.359516	.0311972	11.52	0.000	.4102276
crhrw1 <-					
medcow1	0	(no path)			0
anxagw1	0	(no path)			0
cumdose1	0	(no path)			0
fdferw1	0	(no path)			0
shhlw1	.0034347	.0013058	2.63	0.009	.1242533
illw1	0	(no path)			0
crhrw1	0	(no path)			0
age	.0100339	.0038887	2.58	0.010	.1256642
injselfr	.3647095	.0457054	7.98	0.000	.3872768

Table 11 Indirect path coefficients impacting female BSI anxiety

Indirect effects

	OIM Coef.	Std. Err.	z	P>|z|	Std. Coef.
bsianx <-					
medcow1	-.1429521	.0249121	-5.74	0.000	-.0991499
anxagw1	.0108672	.0009831	11.05	0.000	.1050629
shhlw3	0	(no path)			0
medcow2	-.0709528	.0129279	-5.49	0.000	-.1373001
cumdose1	-.304695	.0914796	-3.33	0.001	-.0459229
fdferw1	.0078383	.001225	6.40	0.000	.0812149
crhrw2	.1973551	.0426253	4.63	0.000	.0473452
shhlw2	.0072553	.0014048	5.16	0.000	.0769364
shhlw1	.00895	.0022717	3.94	0.000	.0834648
illw1	.856055	.2159691	3.96	0.000	.328616
crhrw1	-.072737	.0257839	-2.82	0.005	-.0187506
anxagw2	.0042464	.0013265	3.20	0.001	.0262544
illw2	-.1459815	.0401396	-3.64	0.000	-.0662174
age	.0332704	.0072051	4.62	0.000	.107414
injselfr	.9486943	.1147674	8.27	0.000	.2596935

6.12 Total effects for females

When we examine the total effects of the paths on the female BSI anxiety and list these results in Table 12, we observe that among the 15 total effects considered in this model, the one that had the largest total effect, when the coefficients are standardized, are annual frequency of illness count in 1986 ($std.\ \beta = 0.506$). Accounting for about have of this effect, in standardized coefficients, was that of injury resulting from Chornobyl ($std.\ \beta = 0.260$). The third largest total effect cane from self-expressed anxiety symptoms in 1986 ($std.\ \beta = .235$). The fourth largest total effect was that of annual frequency count of illness in the decade following Chornobyl ($std.\ \beta = 0.206$). The fifth largest total effect was that of health related stresses and hassles ($std.\ \beta = 0.167$). Sixth was self-expressed anxiety symptoms from the decade after Chornobyl ($std.\ \beta = 0.147$)

How far down the list of total effects were cumulative external dose and the summary score for the three waves? Cumulative external dose ranked 10th in the ranking of size of total impact, if we assume that the effects are linear and additive. Because a negative indirect effect (composed of a linkage of a variety of different quality of effects) and a positive direct effect consisting solely of cumulative external dose to some extent cancel one another out, except insofar as one might have been traumatized by the event. In that case, the additivity assumption may have to be relaxed for one to gain proper perspective. Some effects may be more persistent than others, particularly when they have an origin in trauma. Recuperation from such affects may require more rest and focused therapy than others.

When we examine the rankings of the female perceived Chornobyl health

related risk in waves two and one for total effects, we find them respectively in rank 11 *std.* $\beta = .047$) and 12 (*std.* $\beta = .019$)below that of the cumulative external dose. The anxiety appears to have largely dissipated. Although the mediating effects contribute considerably to the explanation of the BSI anxiety. Prediction under these circumstances would be difficult, as Neils Bohr had said, particularly of the future.

6.13 Hypothesis tests recapitulation

We find limited and partial support for our hypotheses 4 and 5 with our models for males and females. Our hypothesis 4 focus on the direct effects between reconstructed external cumulative dose measured in mGys and BSI anxiety, whereas hypothesis 5 pertains to our summary score and its ability to explain and predict BSI anxiety. Among males we find no evidence to support a significant statistical relationship between cumulative external dose and BSI anxiety. Among females we find initial (1986) evidence to support such a direct relationship only (cumdosew1 stdized b = 0.120 z= 2.75 p=0.006) (Table 9).

With respect to a statistically significant relationship between the summary score of perceived Chornobyl health risk, we have formulated this score at three waves. Among males, we find no statistically significant direct main effects between this summary score at wave one or wave two, but we do find such a relationship at wave three cCrhrw3 b = .767, z=4.66 p=0.000) among the men (Table 3). Among women we find no evidence of direct paths to BSI anxiety for our summary perceived risk score at either wave one or two and none for wave three either.

We also discuss the power of these models with respect to encompassing the variance of the target endogenous variable and show that there are direct and total effects that may differ or cancel the direct effect under specific circumstances. We discuss the nature of the proportion of endogenous variance explained as an indicator of the explanatory and predictive power of the models. We also show that sometimes the sum of the parts may not equal the total when it comes to matters of psychological reality and under specific circumstances special consideration has to be given to the nature of these indirect effects to determine how they should be taken into account.

The standardized path coefficients for the female anxiety model are provided in Table 13.

Table 12 Total effects

	OIM Coef.	Std. Err.	z	P>|z|	Std. Coef.
Structural					
bsianx <-					
medcow1	-.1429521	.0249121	-5.74	0.000	-.0991499
anxagw1	.0242789	.0052516	4.62	0.000	.2347266
shhlw3	.0184092	.0049197	3.74	0.000	.1664869
medcow2	-.0709528	.0129279	-5.49	0.000	-.1373001
cumdose1	.4895526	.3028756	1.62	0.106	.0737842
fdferw1	.0078383	.001225	6.40	0.000	.0812149
crhrw2	.1973551	.0426253	4.63	0.000	.0473452
shhlw2	.0072553	.0014048	5.16	0.000	.0769364
shhlw1	.00895	.0022717	3.94	0.000	.0834648
illw1	1.317836	.2480065	5.31	0.000	.5058812
crhrw1	-.072737	.0257839	-2.82	0.005	-.0187506
anxagw2	.0238466	.0081101	2.94	0.003	.1474388
illw2	.4550904	.1136662	4.00	0.000	.2064295
age	.0332704	.0072051	4.62	0.000	.107414
injselfr	.9486943	.1147674	8.27	0.000	.2596935

Continued...

Table 12 continued

crhrw2 <-					
medcow1	-.0086221	.0015609	-5.52	0.000	-.0249279
anxagw1	.0016112	.0001524	10.57	0.000	.0649326
medcow2	-.0054842	.0009992	-5.49	0.000	-.0442369
cumdose1	-.0478901	.0143782	-3.33	0.001	-.0300872
fdferw1	.001232	.0006537	1.88	0.059	.0532094
crhrw2	.0055649	.0029697	1.87	0.061	.0055649
shhlw2	-.0003047	.0001128	-2.70	0.007	-.0134669
shhlw1	.0013692	.0005988	2.29	0.022	.0532267
illw1	-.0091935	.0258599	-0.36	0.722	-.014711
crhrw1	.4582619	.0318375	14.39	0.000	.4924319
anxagw2	.0040597	.0011121	3.65	0.000	.1046277
illw2	.0351754	.0187631	1.87	0.061	.0665098
age	.0055154	.0019435	2.84	0.005	.0742248
injselfr	.558829	.0345663	16.17	0.000	.6376549
crhrw1 <-					
medcow1	.0004245	.0001697	2.50	0.012	.0011423
anxagw1	.0002315	.0000454	5.10	0.000	.0086808
cumdose1	-.023715	.00712	-3.33	0.001	-.0138652
fdferw1	.0006101	.0001685	3.62	0.000	.0245207
shhlw1	.0034186	.0013062	2.62	0.009	.1236689
illw1	-.0043784	.0012498	-3.50	0.000	-.0065199
crhrw1	.0003127	.0000556	5.62	0.000	.0003127
age	.0114015	.0038947	2.93	0.003	.1427925
injselfr	.3709301	.0456106	8.13	0.000	.3938822
crhrw3 <-					
medcow1	-.0296409	.0021087	-14.06	0.000	-.0834549
anxagw1	.0005301	.0004628	1.15	0.252	.0208058
shhlw3	-.0001977	.0004774	-0.41	0.679	-.0072573
illw3	.068092	.0137368	4.96	0.000	.1219704
medcow2	-.0073052	.0018039	-4.05	0.000	-.0573841
cumdose1	-.0348211	.01682	-2.07	0.038	-.0213041
fdferw1	.0013598	.0008125	1.67	0.094	.057193
crhrw2	1.267435	.048109	26.35	0.000	1.234274
medcow3	.004169	.0006654	6.27	0.000	.0240278
shhlw2	-.0002425	.0001819	-1.33	0.182	-.0104399
shhlw1	.0001924	.0004442	0.43	0.665	.0072831
illw1	.0211636	.0381448	0.55	0.579	.0329788
crhrw1	.3285573	.0406512	8.08	0.000	.3438187
crhrw3	.0726784	.0150695	4.82	0.000	.0726784
anxagw2	.0055938	.0014091	3.97	0.000	.1403945
illw2	.061692	.0238151	2.59	0.010	.1135956
age	.0052431	.0016034	3.27	0.001	.0687143
injselfr	.6098267	.0336101	18.14	0.000	.6776403

Table 13 Standardized path coefficients for Female Anxiety model

Structural equation model — Number of obs = 360
Estimation method = ml
Log likelihood = -18766.794

Standardized	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
Structural						
medcow1 <-						
illw1	.2716786	.0471774	5.76	0.000	.1792126	.3641446
crhrw1	.2737505	.0470931	5.81	0.000	.1814498	.3660512
_cons	.9825811	.0632962	15.52	0.000	.8585228	1.106639
anxagw1 <-						
medcow1	.1315861	.0523606	2.51	0.012	.0289613	.2342109
illw1	.143648	.0528259	2.72	0.007	.0401112	.2471849
injselfr	.234396	.0506984	4.62	0.000	.1350291	.333763
_cons	.3158994	.0792668	3.99	0.000	.1605392	.4712595
shhlw3 <-						
medcow1	-.1570558	.0470419	-3.34	0.001	-.2492563	-.0648553
shhlw2	.576103	.0710153	8.11	0.000	.4369156	.7152905
anxagw2	.1281071	.0484945	2.64	0.008	.0330597	.2231546
injselfr	.2970223	.0482826	6.15	0.000	.2023902	.3916543
_cons	.334642	.1267695	2.64	0.008	.0861784	.5831057
illw3 <-						
medcow1	-.3600252	.0386658	-9.31	0.000	-.4358087	-.2842418
shhlw3	.2496162	.0315875	7.90	0.000	.1877059	.3115266
cumdose1	.0904774	.0280757	3.22	0.001	.03545	.1455049
crhrw2	-1.03825	.1307718	-7.94	0.000	-1.294558	-.7819418
medcow3	.196997	.0319418	6.17	0.000	.1343923	.2596018
shhlw2	.0968393	.0349467	2.77	0.006	.028345	.1653337
shhlw1	-.2747333	.033531	-8.19	0.000	-.3404529	-.2090137
illw1	.2362866	.0408522	5.78	0.000	.1562178	.3163553
crhrw1	.7235546	.0399971	18.09	0.000	.6451617	.8019475
crhrw3	.5958691	.1280409	4.65	0.000	.3449136	.8468245
anxagw2	.0753997	.0300498	2.51	0.012	.0165032	.1342961
illw2	.2536525	.0356945	7.11	0.000	.1836926	.3236124
age	.0785939	.0296282	2.65	0.008	.0205237	.1366642
_cons	-.0039611	.1323586	-0.03	0.976	-.2633793	.255457
medcow2 <-						
medcow1	.7566559	.0636574	11.89	0.000	.6318897	.8814221
crhrw2	-.2029027	.0640051	-3.17	0.002	-.3283503	-.0774551
illw1	-.4147542	.0817496	-5.07	0.000	-.5749804	-.2545279
illw2	.834443	.1171391	7.12	0.000	.6048546	1.064031
_cons	-.3782924	.0909473	-4.16	0.000	-.5565458	-.200039
cumdose1 <-						
fdferw1	.6446869	.1481162	4.35	0.000	.3543844	.9349894
illw1	.1711717	.059814	2.86	0.004	.0539383	.288405
_cons	-.0481638	.1652236	-0.29	0.771	-.3719961	.2756685

Continued...

Table 13 continued...

fdferw1 <-						
anxagw1	.3540199	.0683643	5.18	0.000	.2200283	.4880116
cumdose1	-.5654492	.1708253	-3.31	0.001	-.9002607	-.2306377
illw1	-.2326164	.0634512	-3.67	0.000	-.3569785	-.1082543
age	.1648503	.0650967	2.53	0.011	.0372632	.2924374
injselfr	.2480344	.064058	3.87	0.000	.122483	.3735858
_cons	.264652	.2639817	1.00	0.316	-.2527427	.7820466
bsianx <-						
anxagw1	.1296637	.0504464	2.57	0.010	.0307905	.2285369
shhlw3	.1664869	.0442191	3.77	0.000	.079819	.2531548
cumdose1	.1197071	.043327	2.76	0.006	.0347878	.2046264
illw1	.1772652	.0494699	3.58	0.000	.080306	.2742244
anxagw2	.1211844	.0492251	2.46	0.014	.0247049	.2176639
illw2	.2726469	.047611	5.73	0.000	.1793311	.3659627
_cons	1.9542	.1151494	16.97	0.000	1.728512	2.179889
crhrw2 <-						
fdferw1	.0593206	.0276255	2.15	0.032	.0051756	.1134656
illw1	-.1026199	.0308444	-3.33	0.001	-.1630738	-.042166
crhrw1	.4938834	.0318303	15.52	0.000	.4314971	.5562698
anxagw2	.1040487	.0284472	3.66	0.000	.0482933	.1598041
illw2	.0804366	.0334262	2.41	0.016	.0149223	.1459508
injselfr	.4102276	.0337212	12.17	0.000	.3441353	.47632
_cons	-.2743557	.0429381	-6.39	0.000	-.3585129	-.1901986
medcow3 <-						
medcow2	.7562234	.046784	16.16	0.000	.6645285	.8479183
fdferw1	-.1307034	.0395193	-3.31	0.001	-.2081598	-.053247
illw1	-.1230236	.0474881	-2.59	0.010	-.2160986	-.0299486
anxagw2	.1541136	.0408327	3.77	0.000	.0740828	.2341443
_cons	.4270221	.0659855	6.47	0.000	.2976929	.5563513
shhlw2 <-						
anxagw1	.1183836	.0448284	2.64	0.008	.0305215	.2062457
fdferw1	.107319	.0440105	2.44	0.015	.02106	.1935779
crhrw2	.253283	.0687803	3.68	0.000	.118476	.38809
shhlw1	.4866378	.0387679	12.55	0.000	.410654	.5626215
illw1	.0999345	.0471378	2.12	0.034	.007546	.192323
crhrw1	-.1948533	.0554137	-3.52	0.000	-.3034622	-.0862445
illw2	.1332703	.0462704	2.88	0.004	.0425818	.2239587
injselfr	-.2851072	.0567773	-5.02	0.000	-.3963886	-.1738257
_cons	.7508673	.0860051	8.73	0.000	.5823005	.9194342
shhlw1 <-						
fdferw1	.270556	.0499711	5.41	0.000	.1726144	.3684976
age	.1145461	.0504045	2.27	0.023	.0157551	.2133372
_cons	.281083	.2242178	1.25	0.210	-.1583759	.7205419

Continued...

illw1 <-						
shhlw1	.0955846	.0411112	2.33	0.020	.0150082	.176161
age	.1716241	.0484615	3.54	0.000	.0766413	.2666069
injselfr	.2503704	.0493841	5.07	0.000	.1535793	.3471615
_cons	-.8749828	.2098224	-4.17	0.000	-1.286227	-.4637384
crhrw1 <-						
shhlw1	.1242533	.047041	2.64	0.008	.0320546	.216452
age	.1256642	.0481935	2.61	0.009	.0312066	.2201217
injselfr	.3872768	.0437096	8.86	0.000	.3016075	.4729461
_cons	-.7891943	.2001631	-3.94	0.000	-1.181507	-.3968819
crhrw3 <-						
anxagw1	-.0579839	.0154368	-3.76	0.000	-.0882395	-.0277283
shhlw3	-.0351485	.0159662	-2.20	0.028	-.0664416	-.0038554
illw3	.1137064	.0244085	4.66	0.000	.0658665	.1615462
crhrw2	1.260313	.040549	31.08	0.000	1.180839	1.339788
crhrw1	-.3106332	.0349119	-8.90	0.000	-.3790591	-.2422072
_cons	.01639	.0240557	0.68	0.496	-.0307583	.0635382
anxagw2 <-						
anxagw1	.4558037	.0419814	10.86	0.000	.3735216	.5380858
shhlw2	-.1287122	.0471769	-2.73	0.006	-.2211773	-.0362472
illw2	.2325717	.0463065	5.02	0.000	.1418127	.3233307
_cons	.3351682	.0782223	4.28	0.000	.1818553	.488481
illw2 <-						
medcow2	-.6651186	.1121927	-5.93	0.000	-.8850123	-.4452248
illw1	1.29982	.3785213	3.43	0.001	.5579322	2.041708
injselfr	.0881506	.1415711	0.62	0.534	-.1893236	.3656249
_cons	.3794991	.1085922	3.49	0.000	.1666624	.5923358

Continued...

Variance						
e.medcow1	.826107	.0354143			.7595323	.898517
e.anxagw1	.8594871	.0327986			.7975481	.9262363
e.shhlw3	.8237702	.0550277			.7226798	.9390013
e.illw3	.2607528	.023195			.2190338	.310418
e.medcow2	.9590291	.1161983			.756307	1.216089
e.cumdose1	1.225578	.1508186			.9629257	1.559873
e.fdferw1	1.211849	.2077339			.8660369	1.695745
e.bsianx	.6446309	.0393854			.5718798	.7266368
e.crhrw2	.3372058	.0269129			.2883762	.3943036
e.medcow3	.588933	.0410177			.5137854	.6750719
e.shhlw2	.6251651	.0390797			.5530765	.7066498
e.shhlw1	.9136049	.0282017			.8599695	.9705855
e.illw1	.8746659	.0318348			.8144442	.9393404
e.crhrw1	.7782011	.0363165			.7101802	.8527369
e.crhrw3	.0937927	.0133546			.0709531	.1239844
e.anxagw2	.7298752	.0395669			.6563033	.8116947
e.illw2	2.078602	.7065663			1.067647	4.04683
Covariance						
e.shhlw3						
e.shhlw2	-.3411604	.0778267	-4.38	0.000	-.4936979	-.1886228
e.medcow2						
e.medcow3	-.2571915	.0661764	-3.89	0.000	-.386895	-.1274881
e.bsianx						
e.medcow3	.174507	.0499471	3.49	0.000	.0766125	.2724015
e.crhrw2						
e.crhrw3	-.5463066	.0680377	-8.03	0.000	-.679658	-.4129551
e.illw1						
e.illw2	-.6498701	.1462871	-4.44	0.000	-.9365875	-.3631526

LR test of model vs. saturated: chi2(89) = 102.80, Prob > chi2 = 0.1505

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