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

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1 Acknowledgements

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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. In our presentation of the PTSD models we were able to generate both conventional and robust models. Although we graph the conventional model, we rely on robust standard errors wherever possible, so tables for both types of standard error are presented.

3 Path analysis

Hypothesis 3 postulates that radiation dose directly predicts post-traumatic stress disorder (PTSD) symptoms Hypothesis 6 posits perceived risk of exposure directly predicting Chornobyl PTSD. The meaning of direct in this context refers to a direct effect in a path model. We will examine these two hypotheses with path models for men and women separately. By decomposing the effects into direct, indirect, and total, we will endeavor to ascertain the extent to which direct effects can explain or predict Chornobyl PTSD symptoms.

We use standardized scales where available and especially where different metrics are used in the computation of an estimate. In cases involving recollection of past situations, where standardized scales were not available, we use self-reported PTSD symptoms (PTSDw1, PTSDw2, and PTSDw3). However, for the current estimates of PTSD, we measure Chornobyl PTSD symptoms with the revised civilian version of the Mississippi Chornobyl PTSD scale (MiPTSD). This Chornobyl PTSD scale is meant to properly apply only to more or less current application, not to self-expressed PTSD symptoms.

We measure reconstructed external radiation dose with the cumulative external dose in milliGrays. These variables are respectively called cumdose1, cumdose2, and cumdose3. We also measure perceived risk of exposure by a factor score of three variables–the percent to which you believe your health has been affected by Chornobyl, the extent to which your believe your family's health has been affected by Chornobyl, and the percent to which you believe that the number of cancer cases in Zhitomyr and Kiev Oblasts are due to Chornobyl. With alpha reliabilities extending upwards of 0.726 for wave 1, 0.822 for wave 2, and 0.834 for wave three, we proceed to use these scale scores as measures of perceived risk of exposure. These variables are crhtw1, crhtw2, and crhtw3, predecessors of and identical to crhrw1, crhrw2, and crhrw3, respectively.

Model building with full-information maximum likelihood can be complex with large models. Model building entails testing sundry plausible alternative paths between variables and pruning out paths that appear to be not statistically significant. Because changing one path can change all paths, model fitting is done on the basis of a global fit index. When the model comprising significant paths is not inconsistent with the data, the likelihood ratio χ^2 for the number of degrees of freedom identifying those paths minus the constraints, will no longer be statistically significant. A model may not unique. Depending on the variables in the model, it is possible for several combinations of paths to provide a fit. The one that offers the best fit is usually deemed the optimal model, if the paths correspond to theoretical reality. However, such model building usually proceeds non-optimally from specific-to-general.

4 Assumptions and Model structure

We rely on the same assumptions and model structure explained in our Hypothesis 4 and 5 discussion on path models.

Path models generally assume unidirectional causality, unless arrows from two variables point to one another, in which case, the model assumes that the index of stability is less than one. In short, there is no reverse causality. If is a feedback loop in the presumed causal structure, the model must be identified for the parameters to be uniquely estimable.

We should add however that path analysis assumes a closed system, that all of the relevant variables are in the model. If there is a missing variable, it could be an antecedent variable between two of the key variables in the model, which could generate a spurious relationship on which much of the model is then based. I that case, a large portion of the model could be predicted on a spurious basis, leading to all kind of erroneous conclusions. Specification error or omitted variable bias can propagate other biases throughout a model. For this reason, we will perform some auxiliary regressions to show that any variable not included in the model does not pose such a threat.

5 Limitations of path models

Structural equation models are not designed to distinguish direct from indirect effects but they are not always optimal for handling a large network of variables. Unless the paths have a strong signal/noise ratio, models may rapidly become fragile and intractable if too many variables are entered. Ideally, we should have about 15 variables in our structural equation models if our sample size = 360, according to the Joreskog Sorbom formula for sample size in structural equation models ($n = 1.5p + 1.5p^2$), where p = the number of variables in the model) [7, 2-8]. This requirement would keep the number of variables in the model below 15 level with our gender-specific data. To omit important variables, however, could lead to a biased and potentially spurious solution. To such specification error, we included the apparently relevant variables. This mandated inclusion of the variables necessary for testing the hypothesis plus those potentially related to the primary target endogenous variable. After fitting the model, we used clustered robust standard error estimates to control for heteroskedasticity and serial correlation between waves. To help confirm that we have not omitted important variables, we added a supplementary regression analysis to determine whether other important related variables were related that were not included.

If variables are not in the model, they are in the error term. If omitted variables are correlated with explanatory variables in the model, specification error can bias the parameters and significance levels of the included variables. The better models control for all relevant variables. When models contain a small fraction of the relevant variables, it is likely to be susceptible to omitted variable bias.

Structural equation models are not necessarily unique models. However, the fact that several different combinations of variables may provide a fit of the data does not mean that this fit is optimal and the best of all possible possible combinations of paths.

Robert Lucas in 1976 complained that econometric models lacked deep structure and were the products of policy decisions that would change the rule of the game by which the models, which did not depend upon deep structure, would no longer be valid [9, 1]. Christopher Sims, in his article, Macroeconomics and Reality (1980), claimed that these models do not allow the data to properly express themselves by testing a large number of dynamic variables likely to interact at once. He suggested a Bayesian vector autoregression would provide a more realistic framework from which to develop models [10].

These models do not permit the optimal general-to-specific modeling strategy advocated by the Hendry and Richard (1982). For these among other reasons, dependent upon the theory of reduction, one should not rely solely on overly simplified models but should proceed from general-to-specific in the modeling procedure [5, 358]. As George Box wrote, "All models are wrong. But some are useful" If that is true, oversimplification would be one way to predispose the model to be less likely to be reliable. For this reason, we will attempt a general to specific regression analysis and then test any variables we could not include with supplementary or auxiliary analysis.

6 Model input qualification

We have a variable, called `injselfr`, which is a binary indicator of whether a respondent was injured as a result of the Chornobyl disaster. We attempted to generate polyserial correlations for part of the input to the program, but when paired with other variables, missing values in one of the two categories prevented computation of that correlation coefficient. The resulting matrix was non-positive definite. With a small model we might have been able to generate those correlations, but with more than 20 variables in the model, a few of the polyserial correlations could not be computed, leaving us with a non-positive definite covariance matrix, and a computational *cul-de-sac*. Therefore, we made a working assumption that the differences between conventional estimates and those that we would have obtained had we been able to substitute the polyserial correlations for the appropriate pairs of variables were not going yield substantially different results and proceeded with the standard maximum likelihood estimation using that variable, along with the others, which were not binary in coding.

7 Model estimation

We had originally planned on estimating our models with OLS or two-stage least squares (TSLS). However, we use maximum likelihood estimation where we can rather than two stage least squares (TSLS) for several reasons. Although TSLS may outperform ML in small samples, we have large samples in our analysis. Although TSLS are not unbiased in finite samples, it is consistent. Maximum likelihood estimation is also biased for finite samples, but is preferred because it is consistent, invariant to reparameterization, computable, asymptotically normal, as well as asymptotically more efficient because it uses all of the information available. ML can outperform TSLS in obtaining asymptotically efficient estimates and can also be used for nonlinear applications if observations are independent and identically distributed as well as asymptotically symmetric, as long as they are not on the boundaries of the parameter space [1, 108], [3, 245-247,253-258]. More importantly if there are autoregressive errors in the model, which are common with repeated measures, ML can provide an estimate that is stationary [3, 347], which in this case is necessary.

8 Male model variables

Before elaborately explaining this process, it behooves us to review the names of the variables we use in this model. Table 1 presents 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 PTSD model

variable name	type	format	variable label
crhrw1	float	%9.0g	Chornobyl related health risk: wave 1 alpha = .796
crhrw2	float	%9.0g	Chornobyl related health risk: wave 2 alpha = .822
crhrw3	float	%9.0g	Chornobyl related health risk: wave 3 alpha = .834
airw1	byte	%8.0g	consider hazardous (in percent) - air and water pollution in 1986
airw2	byte	%8.0g	consider hazardous (in percent) - air and water pollution in 1996
airw3	byte	%8.0g	consider hazardous (in percent) - air and water pollution NOW
depagw1	byte	%9.0g	Depression aggregated to wave 1 in 1986
depagw2	double	%9.0g	Depression aggregated to wave 2: 1987 thru 1996
depagw3	double	%9.0g	Depression aggregated to wave three:1997 thru 2009
anxagw1	byte	%9.0g	Average Anxiety level for wave 1
anxagw2	double	%9.0g	Average Anxiety level for wave 2
anxagw3	double	%9.0g	Average Anxiety level for wave 3
injselfr	byte	%9.0g	Were u injured because of the Chornobyl accident in 1986?
BSIdep	byte	%9.0g	Brief symptom inventory depression subscale score
BSIanx	byte	%9.0g	Brief symptom inventory anxiety subscale score
PTSDw1	byte	%9.0g	Average PTSD level in percent in wave 1
PTSDw2	double	%9.0g	Average PTSD level in percent in wave 2
PTSDw3	double	%9.0g	Average PTSD level in percent in wave 3
MiPTSD	byte	%9.0g	Mississippi post-traumatic stress disorder scale
cataw1	byte	%8.0g	Total number of disasters experienced in time period 1976-1986
cumdose1	float	%9.0g	cumulative external dose in mGys in wave 1
cumdose2	float	%9.0g	cumulative external dose in mGys in wave 2
cumdose3	float	%9.0g	cumulative external dose in mGys in wave 3
fdferw1	byte	%8.0g	* Level (in %) of fear of eating radioactively contaminated food in 1986
fdferw2	byte	%8.0g	* Level (in %) of fear of eating radioactively contaminated food in 1987-1996
whpel	float	%9.0g	Weighted Health profile Energy level subscale
whpsleep	float	%9.0g	Weighted Health profile sleep subscale

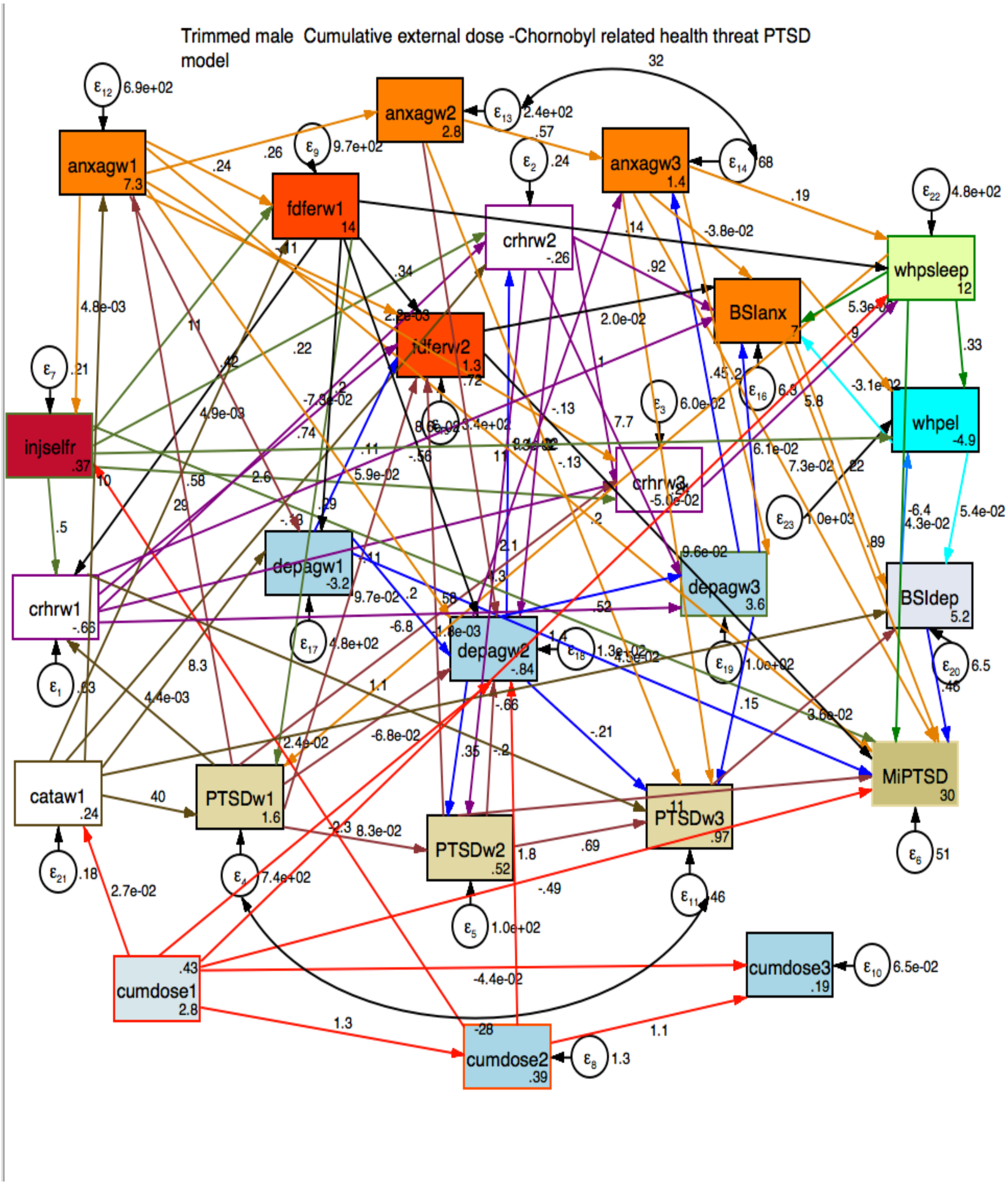

Figure 1: Pathways to PTSD among male respondents

In Figure 1, the path diagram illustrates the paths that were found be be statistically significantly interrelated. Table 2 lists the parameter estimates in detail depicted in this path diagram, and Table 3 and 4 respectively present their robust and non-robust direct effects. Table 5 and 6 present the sum of the indirect effects, and Table 7 and 8 list the standardized robust and non-robust total effects. 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 3 and 6, by which these hypotheses are tested.

Figure 1 is color coded to aid interpretation of the paths. Cumulative external radiation dose have blue fill and red arrows emanating from them. Chornobyl related health risk variables are boxes that have a white fill with purple border and purple arrows emanating from them. Injury from Chornobyl is filled with a red color bordered with forest green. The arrows emanating it are also forest green. A catastrophic experience in 1986 is designated by a white box with olive arrows projected from it. Self-reported anxiety symptoms and BSI anxiety are represented by dark orange boxes with dark orange arrows stemming from them. Self-reported PTSD symptoms are signified by light khaki colored box with maroon borders and arrows stemming from them. MiPTSD is represented by a sand-colored box with a maroon arrow coming from it. Self-reported depressive symptoms have blue colored boxes with medium blue arrows extending from them. Fear of consuming contaminated food are designated by red-colored boxes with black borders and arrows. Nottingham weighted health profile sleep is a lime colored box with a green border and arrows, whereas the energy level scale is a cyan colored box with cyan arrows stemming from it. The BSI depression box is a light blue-gray box with a black border and dark blue arrows extending from it. Correlations with double-headed arrows are color coded according to the variables they connect. The color coding helps the reader understanding the links which would otherwise appears to be a new representation of quantum entanglement. The path diagram in Figure 1 illustrates statistically significant paths discovered in Table 2, where the reader can find detailed supporting information.

9 Male PTSD path model

We will examine this model from several perspectives. We begin our discussion by addressing some basic omnibus characteristics of the model, relating to its goodness of fit and its stability as a dynamic model. We then address the model in relation to hypothesis 3, which postulates that radiation directly predicts Chornobyl PTSD. Next, we turn to a discussion of it in relation to hypothesis 6, which submits that perceived exposure risk directly predicts Chornobyl PTSD. It should be noted that we also show connections between PTSD and some of the BSI scales of psychological health–in this case, those for anxiety and depression (Hypothesis 4 and 5). Moreover, show how these are related to scales of health behavior – including energy level and sleep (hypothesis 8). We not only discuss a strict interpretation of these hypotheses, but a broader one as well, where we consider indirect and total effects.

We see that the model fits the data well. The model is fitted with conventional standard errors, for goodness of fit statistics are not available for robust models. Once the model is fit and the goodness of fit criteria are satisfied, we proceed to compute the robust estimates which control for heteroskedasticity and serial correlation. We take the standardized version of those and assess the paths with this version. After the model is fit, there appears to be no statistically significant difference between the global model and the data (Likelihood ratio χ^2, = 185.04, df = 177, $p > \chi^2$=.3241). If we examine the model closely, we observe several feedback loops. One of these exists between self-reported depression and self- reported PTSD in wave 2. Another exists between energy level and BSI depression at the current time. Because the model is non-recursive, we have to test the stability by computing the stability index. We find that it is to equal 0.721. Because the stability index is less than unity, the model, including its reciprocal path, satisfies the condition of stability (stationarity) for the model. We will examine these feedback loops later in our model analysis. Meanwhile, we can say that having assessed the global model characteristics, we can now examine the nature of the paths to test the relevant hypotheses, and we can now turn to the hypothesis testing of direct effects.

```
Table 2  Pathways to male Chornobyl PTSD
Endogenous variables
Observed:  crhrw1 crhrw2 crhrw3 PTSDw3 fdferw2 BSIanx depagw3 PTSDw2 depagw2
           MiPTSD whpsleep PTSDw1 anxagw1 injselfr fdferw1 whpel cumdose2
           cumdose3 cataw1 depagw1 BSIdep anxagw2 anxagw3
Exogenous variables
Observed:  cumdose1
Structural equation model                       Number of obs      =       339
Estimation method  = ml
Log likelihood     = -23420.414

------------------------------------------------------------------------------
             |                 OIM
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
Structural   |
  crhrw1 <-  |
      PTSDw1 |   .0044334   .0014436     3.07   0.002      .001604    .0072627
    injselfr |   .5022598   .0928237     5.41   0.000     .3203287     .684191
     fdferw1 |   .0048419   .0014302     3.39   0.001     .0020387     .007645
       _cons |  -.6606247   .0650612   -10.15   0.000    -.7881423    -.533107
  -----------+----------------------------------------------------------------
  crhrw2 <-  |
      crhrw1 |   .7450505   .0324663    22.95   0.000     .6814177    .8086832
     depagw2 |   .0125571    .001773     7.08   0.000     .0090821    .0160321
    injselfr |   .2177726   .0593136     3.67   0.000       .10152    .3340251
      cataw1 |  -.1333445   .0653141    -2.04   0.041    -.2613578   -.0053312
       _cons |  -.2618457   .0452166    -5.79   0.000    -.3504686   -.1732228
  -----------+----------------------------------------------------------------
  crhrw3 <-  |
      crhrw1 |  -.1069182   .0255139    -4.19   0.000    -.1569246   -.0569118
      crhrw2 |   1.021222   .0260643    39.18   0.000     .9701365    1.072307
      PTSDw1 |  -.0018353   .0005102    -3.60   0.000    -.0028353   -.0008352
     anxagw1 |   .0022458   .0005328     4.22   0.000     .0012015      .00329
    injselfr |   .0586227   .0309458     1.89   0.058    -.0020299    .1192753
       _cons |  -.0504728   .0226092    -2.23   0.026     -.094786   -.0061597
  -----------+----------------------------------------------------------------
  PTSDw3 <-  |
      crhrw1 |   .9081771   .4338294     2.09   0.036     .0578871    1.758467
     depagw3 |   .1433997   .0402245     3.56   0.000     .0645611    .2222383
      PTSDw2 |   .6889117   .0355662    19.37   0.000     .6192033    .7586202
     depagw2 |  -.2092571   .0370319    -5.65   0.000    -.2818383   -.1366758
    whpsleep |    .027339   .0177574     1.54   0.124    -.0074649    .0621429
       whpel |   .0076987   .0147515     0.52   0.602    -.0212137    .0366112
     anxagw2 |  -.1315924   .0428961    -3.07   0.002    -.2156671   -.0475177
     anxagw3 |   .2433362   .0462445     5.26   0.000     .1526987    .3339738
       _cons |   .4177114   .5351991     0.78   0.435    -.6312596    1.466682
  -----------+----------------------------------------------------------------
  fdferw2 <- |
      crhrw1 |   2.600747   1.229359     2.12   0.034     .1912488    5.010246
      PTSDw2 |   .5822353   .0918093     6.34   0.000     .4022922    .7621783
      PTSDw1 |     .09739   .0407258     2.39   0.017     .0175688    .1772111
     anxagw1 |  -.1093828   .0437683    -2.50   0.012    -.1951671   -.0235985
     fdferw1 |   .3418001   .0355036     9.63   0.000     .2722143    .4113858
     depagw1 |   .1133618   .0460785     2.46   0.014     .0230495    .2036741
       _cons |   1.248338   1.451185     0.86   0.390    -1.595932    4.092608
  -----------+----------------------------------------------------------------
             |
```

Table 2 continued...

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
BSIanx <-						
crhrw1	-.5660398	.2913343	-1.94	0.052	-1.137045	.0049649
crhrw2	.9940806	.3311571	3.00	0.003	.3450246	1.643137
fdferw2	.0215831	.0064342	3.35	0.001	.0089723	.0341938
depagw3	.0640123	.0165323	3.87	0.000	.0316097	.096415
whpsleep	.0556111	.0116489	4.77	0.000	.0327797	.0784424
injselfr	-.2365205	.340741	-0.69	0.488	-.9043605	.4313195
whpel	-.0296262	.0162458	-1.82	0.068	-.0614674	.0022151
BSIdep	-.0993914	.1422903	-0.70	0.485	-.3782752	.1794924
anxagw3	-.0388097	.0139393	-2.78	0.005	-.0661303	-.0114891
_cons	7.782163	1.134781	6.86	0.000	5.558033	10.00629
depagw3 <-						
crhrw1	-6.770881	1.071252	-6.32	0.000	-8.870496	-4.671266
crhrw2	7.71403	1.172391	6.58	0.000	5.416185	10.01187
depagw2	.5214054	.0503703	10.35	0.000	.4226814	.6201294
anxagw3	.199653	.0570502	3.50	0.000	.0878366	.3114694
_cons	3.620845	.7196448	5.03	0.000	2.210367	5.031323
PTSDw2 <-						
crhrw2	2.143647	.6618091	3.24	0.001	.8465251	3.440769
depagw2	.3508448	.044858	7.82	0.000	.2629248	.4387649
PTSDw1	.0827642	.0158765	5.21	0.000	.0516469	.1138816
_cons	.5131751	.7596705	0.68	0.499	-.9757517	2.002102
depagw2 <-						
crhrw2	-3.007071	.8667478	-3.47	0.001	-4.705865	-1.308276
PTSDw2	-.2045039	.0850544	-2.40	0.016	-.3712076	-.0378003
PTSDw1	-.0677519	.0252563	-2.68	0.007	-.1172534	-.0182504
anxagw1	-.0730472	.0289718	-2.52	0.012	-.1298308	-.0162635
fdferw1	.0858126	.0224611	3.82	0.000	.0417897	.1298355
cumdose2	1.829456	.554584	3.30	0.001	.7424918	2.916421
depagw1	.2016508	.029141	6.92	0.000	.1445354	.2587661
anxagw2	.7160621	.0459629	15.58	0.000	.6259765	.8061476
cumdose1	-2.322514	.8382701	-2.77	0.006	-3.965494	-.6795354
_cons	-.8382339	.9964866	-0.84	0.400	-2.791312	1.114844

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Table 2 continued...

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
MiPTSD <-						
crhrw3	.9265827	.5982047	1.55	0.121	-.2458769	2.099042
fdferw2	.084011	.0195769	4.29	0.000	.0456409	.1223811
BSIanx	.8534371	.1866137	4.57	0.000	.487681	1.219193
PTSDw2	.0990713	.0397437	2.49	0.013	.0211752	.1769674
whpsleep	.0479777	.038492	1.25	0.213	-.0274653	.1234207
PTSDw1	.0235933	.013698	1.72	0.085	-.0032542	.0504409
injselfr	3.877101	.9079832	4.27	0.000	2.097486	5.656715
depagw1	.0541886	.0161025	3.37	0.001	.0226283	.085749
BSIdep	.4879512	.1685042	2.90	0.004	.1576891	.8182133
anxagw3	.0699084	.0249191	2.81	0.005	.0210679	.1187489
cumdose1	-.5146597	.2434339	-2.11	0.035	-.9917813	-.0375381
_cons	30.33896	1.630195	18.61	0.000	27.14384	33.53408
whpsl~p <-						
crhrw3	6.072753	1.869199	3.25	0.001	2.409189	9.736316
MiPTSD	-.1044498	.3243357	-0.32	0.747	-.7401362	.5312365
fdferw1	.143674	.0459548	3.13	0.002	.0536042	.2337438
whpel	.0218113	.1133543	0.19	0.847	-.2003591	.2439818
anxagw3	.2074532	.0841215	2.47	0.014	.0425782	.3723282
cumdose1	1.38756	.7318945	1.90	0.058	-.046927	2.822047
_cons	15.63596	13.41046	1.17	0.244	-10.64805	41.91998
PTSDw1 <-						
whpsleep	.1880159	.0704542	2.67	0.008	.0499281	.3261037
fdferw1	.28519	.0524534	5.44	0.000	.1823832	.3879967
cataw1	40.51288	3.963429	10.22	0.000	32.7447	48.28106
_cons	1.823227	2.144056	0.85	0.395	-2.379046	6.0255
anxagw1 <-						
PTSDw1	.5804276	.047936	12.11	0.000	.4864748	.6743804
cataw1	10.26741	4.166429	2.46	0.014	2.101362	18.43346
_cons	7.300335	1.725699	4.23	0.000	3.918028	10.68264
injse~r <-						
anxagw1	.0048361	.0006665	7.26	0.000	.0035299	.0061424
cumdose2	.0243989	.0098745	2.47	0.013	.0050451	.0437526
_cons	.3680128	.030618	12.02	0.000	.3080026	.428023
fdferw1 <-						
anxagw1	.2400062	.0642798	3.73	0.000	.1140201	.3659924
injselfr	10.9671	3.734708	2.94	0.003	3.647205	18.28699
cataw1	29.03937	4.63959	6.26	0.000	19.94594	38.1328
_cons	13.69174	2.54361	5.38	0.000	8.706359	18.67713

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Table 2 continued...

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
whpel <-						
BSIanx	8.588682	3.407708	2.52	0.012	1.909696	15.26767
whpsleep	.2698927	.1967462	1.37	0.170	-.1157227	.6555081
injselfr	10.70551	4.041185	2.65	0.008	2.784934	18.62609
BSIdep	-5.07152	3.747168	-1.35	0.176	-12.41583	2.272794
_cons	-11.13058	14.37156	-0.77	0.439	-39.29832	17.03717
cumdo~2 <-						
cumdose1	1.339597	.0366997	36.50	0.000	1.267667	1.411527
_cons	.3879549	.0632438	6.13	0.000	.2639992	.5119105
cumdo~3 <-						
cumdose2	1.087217	.0123079	88.34	0.000	1.063094	1.11134
cumdose1	-.0439337	.0184663	-2.38	0.017	-.080127	-.0077403
_cons	.1920846	.0151063	12.72	0.000	.1624768	.2216924
cataw1 <-						
cumdose1	.026806	.0139758	1.92	0.055	-.000586	.0541981
_cons	.2362584	.0240842	9.81	0.000	.1890543	.2834626
depagw1 <-						
anxagw1	.4238279	.0399446	10.61	0.000	.3455379	.5021178
fdferw1	.2022402	.0384094	5.27	0.000	.1269591	.2775213
cataw1	8.248037	3.230209	2.55	0.011	1.916943	14.57913
_cons	-3.221154	1.572737	-2.05	0.041	-6.303662	-.1386468
BSIdep <-						
PTSDw3	.0278794	.0135641	2.06	0.040	.0012943	.0544645
BSIanx	.3270164	.2059083	1.59	0.112	-.0765565	.7305892
whpel	.0472716	.0222511	2.12	0.034	.0036602	.090883
_cons	4.389215	1.126849	3.90	0.000	2.180631	6.597798

Continued on the next page...

Table 2 continued...

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
anxagw2 <-						
anxagw1	.2836689	.025132	11.29	0.000	.234411	.3329267
cataw1	-3.78469	2.127582	-1.78	0.075	-7.954675	.3852952
_cons	3.271453	1.022453	3.20	0.001	1.267483	5.275424
anxagw3 <-						
depagw3	.4470789	.0473468	9.44	0.000	.3542809	.5398768
depagw2	-.128568	.0461275	-2.79	0.005	-.2189762	-.0381599
anxagw2	.5729767	.0507101	11.30	0.000	.4735868	.6723666
_cons	1.383457	.6380559	2.17	0.030	.1328904	2.634024
Variance						
e.crhrw1	.6256054	.0480658			.5381482	.7272757
e.crhrw2	.2440655	.0189335			.2096399	.2841442
e.crhrw3	.0599914	.0046082			.0516066	.0697387
e.PTSDw3	45.03216	3.475449			38.71057	52.38609
e.fdferw2	339.1827	26.05249			291.7785	394.2885
e.BSIanx	6.790083	1.620949			4.252788	10.84118
e.depagw3	104.024	9.897765			86.32626	125.3501
e.PTSDw2	103.2359	8.104198			88.51361	120.407
e.depagw2	129.8849	12.60951			107.3797	157.1069
e.MiPTSD	50.74334	3.918232			43.61663	59.03452
e.whpsleep	476.5394	58.27183			374.9841	605.5985
e.PTSDw1	740.8901	58.47954			634.6981	864.8491
e.anxagw1	686.7185	53.29199			589.8237	799.5309
e.injselfr	.2065407	.0158796			.1776488	.2401315
e.fdferw1	966.0051	77.68338			825.1411	1130.917
e.whpel	938.6311	316.8933			484.3049	1819.16
e.cumdose2	1.271465	.0976606			1.093765	1.478035
e.cumdose3	.0652934	.0050152			.056168	.0759014
e.cataw1	.1843879	.0141628			.1586179	.2143448
e.depagw1	478.5914	36.76042			411.7034	556.3465
e.BSIdep	6.151276	1.240966			4.142312	9.134561
e.anxagw2	237.6101	18.25329			204.3974	276.2196
e.anxagw3	67.64365	6.252733			56.43455	81.07911
Covariance						
e.PTSDw3						
e.PTSDw1	-26.46588	10.97818	-2.41	0.016	-47.98272	-4.949044
e.anxagw2						
e.anxagw3	32.46422	12.97284	2.50	0.012	7.037913	57.89052

LR test of model vs. saturated: chi2(177) = 185.04, Prob > chi2 = 0.3241

Stability analysis of simultaneous equation systems

stability index = .7214802
All the eigenvalues lie inside the unit circle.
SEM satisfies stability condition.

9.1 Direct effects on Chornobyl PTSD among males

9.1.1 Direct dose effects on Chornobyl PTSD

To test the hypotheses, we examine the clustered-robust direct effects estimates in Table 3. These estimates are robust to violations of residual heteroskedasticity and serial correlation. They computed and decomposed into standardized direct, indirect, and total effects, so we may compare them to one another in order to obtain a sense of relative impact on the target endogenous variable. Table 4 contains the indirect standardized coefficients, and Table 5 contains the total effects. We will examine the hypotheses with respect to not just the direct, but also the indirect and total coefficients.

In order to review the results of the hypothesis tests, we have to examine Table 3, which presents the standardized direct effects for the male PTSD model. When we turn to the MiPTSD panel of page 3, we do find a path proceeding directly from cumulative external dose to PTSD as measured by the Mississippi civilian revised Chornobyl PTSD scale. What appears to be counterintuitive is that the relationship defined by the path appears to be an inverse one. The larger the dose, the less the PTSD ($stdized\ \beta = -0.0689\ p = 0.077$). Yet this path is not statistically significant at the 0.05 level when estimated by the robust standard errors, although by the conventional standard errors it is (non-standardized b = -.49, p = 0.038). This is an example of where the path diagram illustrates the conventional standard errors where our decomposition of effects uses robust estimates. There are no direct paths from the wave 2 or 3 reconstructed cumulative dose estimates. Therefore, we can say that there is borderline partial evidence of a relationship in the first wave. But the inverse nature of the relationship gives us cause for pause. We might be inclined to doubt such a relationship unless it was the product of propaganda, downplaying a real problem. Perhaps the robust estimates are those on which we should rely here. If that is the case, we would say that there is no empirical evidence of a relationship at any wave if we were to insist on a 0.05 level of statistical significance. In the case where we were to say that there is partial empirical evidence of an effect, we would have to explain why the inverse relationship might be a plausible one. We can now consider the next hypothesis relating to PTSD.

Table 3 Clustered-robust standardized direct effects among males

Direct effects

(Std. Err. adjusted for 339 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
Structural					
crhrw1 <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
depagw3	0	(no path)			0
depagw2	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	.0044121	.0013258	3.33	0.001	.1864785
anxagw1	0	(no path)			0
injselfr	.5023105	.0949574	5.29	0.000	.2706778
fdferw1	.0048526	.0014109	3.44	0.001	.2038836
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
anxagw2	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0
crhrw2 <-					
crhrw1	.7449572	.0396891	18.77	0.000	.7602991
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
PTSDw2	0	(no path)			0
depagw2	.0125681	.001725	7.29	0.000	.2344856
whpsleep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
injselfr	.2176428	.0675456	3.22	0.001	.1196955
fdferw1	0	(no path)			0
cumdose2	0	(no path)			0
cataw1	-.1333292	.0575889	-2.32	0.021	-.06329
depagw1	0	(no path)			0
anxagw2	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0

Continued on the next page...

Table 3 Robust standardized direct effects among males--continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
crhrw3 <-					
crhrw1	-.1069227	.0363357	-2.94	0.003	-.1094733
crhrw2	1.021244	.0320138	31.90	0.000	1.024506
crhrw3	0	(no path)			0
depagw3	0	(no path)			0
PTSDw2	0	(no path)			0
depagw2	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	-.0018375	.0008773	-2.09	0.036	-.0795151
anxagw1	.0022461	.0009474	2.37	0.018	.0939336
injselfr	.0586275	.0301739	1.94	0.052	.032346
fdferw1	0	(no path)			0
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
depagw1	0	(no path)			0
anxagw2	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0
PTSDw3 <-					
crhrw1	1.130106	.4103234	2.75	0.006	.0886786
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
depagw3	.1470071	.0859801	1.71	0.087	.218696
PTSDw2	.6947169	.0754654	9.21	0.000	.7409545
depagw2	-.208665	.086442	-2.41	0.016	-.2993253
whpsleep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
injselfr	0	(no path)			0
fdferw1	0	(no path)			0
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
depagw1	0	(no path)			0
anxagw2	-.1251624	.0904003	-1.38	0.166	-.1959159
anxagw3	.2442526	.08799	2.78	0.006	.3865898
cumdose1	0	(no path)			0

Continued on the next page...

Table 3 Robust standardized direct effects among males--continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
fdferw2 <-					
crhrw1	2.601032	1.17332	2.22	0.027	.0859616
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
depagw3	0	(no path)			0
PTSDw2	.5822178	.1238681	4.70	0.000	.2615342
depagw2	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	.0968002	.0536143	1.81	0.071	.1352125
anxagw1	-.1093807	.0656236	-1.67	0.096	-.147654
injselfr	0	(no path)			0
fdferw1	.3420649	.0519005	6.59	0.000	.4749763
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
depagw1	.1134291	.0724487	1.57	0.117	.1300592
anxagw2	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0
BSIanx <-					
crhrw1	-.5616942	.4097536	-1.37	0.170	-.1890779
crhrw2	.9217338	.4324499	2.13	0.033	.3040138
crhrw3	0	(no path)			0
PTSDw3	0	(no path)			0
fdferw2	.0201349	.0059306	3.40	0.001	.2050842
BSIanx	0	(no path)			0
depagw3	.0609834	.0150023	4.06	0.000	.3891843
PTSDw2	0	(no path)			0
depagw2	0	(no path)			0
whpsleep	.0525287	.0119487	4.40	0.000	.4708741
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
injselfr	0	(no path)			0
fdferw1	0	(no path)			0
whpel	-.0305773	.016308	-1.87	0.061	-.3336236
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
depagw1	0	(no path)			0
BSIdep	0	(no path)			0
anxagw2	0	(no path)			0
anxagw3	-.0381585	.0118018	-3.23	0.001	-.2590858
cumdose1	0	(no path)			0

Continued on the next page...

Table 3 Robust standardized direct effects among males--continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
depagw3 <-					
crhrw1	-6.778716	1.693582	-4.00	0.000	-.3575565
crhrw2	7.727792	1.792831	4.31	0.000	.3993921
crhrw3	0	(no path)			0
depagw3	0	(no path)			0
PTSDw2	0	(no path)			0
depagw2	.5226681	.1076878	4.85	0.000	.5039846
whpsleep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
injselfr	0	(no path)			0
fdferw1	0	(no path)			0
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
depagw1	0	(no path)			0
anxagw2	0	(no path)			0
anxagw3	.1977497	.1362709	1.45	0.147	.2103898
cumdose1	0	(no path)			0
PTSDw2 <-					
crhrw1	0	(no path)			0
crhrw2	2.144766	.5989456	3.58	0.000	.1546119
crhrw3	0	(no path)			0
depagw3	0	(no path)			0
PTSDw2	0	(no path)			0
depagw2	.3509714	.1039011	3.38	0.001	.4720433
whpsleep	0	(no path)			0
PTSDw1	.0825223	.0228532	3.61	0.000	.2566073
anxagw1	0	(no path)			0
injselfr	0	(no path)			0
fdferw1	0	(no path)			0
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
depagw1	0	(no path)			0
anxagw2	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0

Continued on the next page...

Table 3 Robust standardized direct effects among males--continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
depagw2 <-					
crhrw1	0	(no path)			0
crhrw2	-3.009576	.8530713	-3.53	0.000	-.1613088
crhrw3	0	(no path)			0
depagw3	0	(no path)			0
PTSDw2	-.2046803	.1590593	-1.29	0.198	-.1521829
depagw2	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	-.0679973	.0314195	-2.16	0.030	-.1572096
anxagw1	-.0730796	.033841	-2.16	0.031	-.1632855
injselfr	0	(no path)			0
fdferw1	.0859511	.0262049	3.28	0.001	.197543
cumdose2	1.829368	.5915571	3.09	0.002	.2699243
cataw1	0	(no path)			0
depagw1	.2016955	.0547684	3.68	0.000	.3827892
anxagw2	.7162691	.1072489	6.68	0.000	.7815884
anxagw3	0	(no path)			0
cumdose1	-2.322135	.7185374	-3.23	0.001	-.2283653
whpsl~p <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	5.791183	1.545774	3.75	0.000	.2124035
depagw3	0	(no path)			0
PTSDw2	0	(no path)			0
depagw2	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
injselfr	0	(no path)			0
fdferw1	.135392	.0400439	3.38	0.001	.2136143
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
depagw1	0	(no path)			0
anxagw2	0	(no path)			0
anxagw3	.1930909	.0838674	2.30	0.021	.1462534
cumdose1	1.435637	.3443175	4.17	0.000	.0969202

Continued on the next page...

Table 3 Robust standardized direct effects among males--continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
PTSDw1 <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
depagw3	0	(no path)			0
PTSDw2	0	(no path)			0
depagw2	0	(no path)			0
whpsleep	.2010257	.0730212	2.75	0.006	.1266594
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
injselfr	0	(no path)			0
fdferw1	.2855579	.0658979	4.33	0.000	.2838685
cumdose2	0	(no path)			0
cataw1	40.42334	5.161098	7.83	0.000	.4448439
depagw1	0	(no path)			0
anxagw2	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0
anxagw1 <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
depagw3	0	(no path)			0
depagw2	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	.579743	.0715404	8.10	0.000	.5998902
anxagw1	0	(no path)			0
injselfr	0	(no path)			0
fdferw1	0	(no path)			0
cumdose2	0	(no path)			0
cataw1	10.3038	5.337529	1.93	0.054	.1173299
anxagw2	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0

Continued on the next page...

Table 3 Robust standardized direct effects among males--continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
MiPTSD <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
PTSDw3	0	(no path)			0
fdferw2	.0958507	.0215308	4.45	0.000	.226269
BSIanx	.8937167	.233593	3.83	0.000	.2071322
depagw3	0	(no path)			0
PTSDw2	.1051952	.052399	2.01	0.045	.1115497
depagw2	0	(no path)			0
whpsleep	.0429731	.0232257	1.85	0.064	.0892797
PTSDw1	0	(no path)			0
anxagw1	.0340758	.0178512	1.91	0.056	.1085874
injselfr	4.25927	.8250288	5.16	0.000	.1790623
fdferw1	0	(no path)			0
whpel	0	(no path)			0
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
depagw1	.0448226	.0209667	2.14	0.033	.1213231
BSIdep	.4586312	.228283	2.01	0.045	.1103019
anxagw2	0	(no path)			0
anxagw3	.0729744	.0435246	1.68	0.094	.1148341
cumdose1	-.4914048	.2778971	-1.77	0.077	-.0689231
injse~r <-					
crhrw3	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	.0048274	.0005954	8.11	0.000	.36591
injselfr	0	(no path)			0
fdferw1	0	(no path)			0
cumdose2	.0244062	.0087602	2.79	0.005	.1221674
cataw1	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0
fdferw1 <-					
crhrw3	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	.2389014	.0807061	2.96	0.003	.232252
injselfr	10.9778	4.01941	2.73	0.006	.1407963
fdferw1	0	(no path)			0
cumdose2	0	(no path)			0
cataw1	29.08253	5.244532	5.55	0.000	.3219472
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0

Continued on the next page...

Table 3 Robust standardized direct effects among males--continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
whpel <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
PTSDw3	0	(no path)			0
fdferw2	0	(no path)			0
BSIanx	8.988803	2.752297	3.27	0.001	.8238426
depagw3	0	(no path)			0
PTSDw2	0	(no path)			0
depagw2	0	(no path)			0
whpsleep	.3302337	.1271801	2.60	0.009	.2713139
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
injselfr	10.99386	3.786126	2.90	0.004	.1827738
fdferw1	0	(no path)			0
whpel	0	(no path)			0
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
depagw1	0	(no path)			0
BSIdep	-6.366454	3.306797	-1.93	0.054	-.6054965
anxagw2	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0
cumdo~2 <-					
cumdose1	1.339597	.2873117	4.66	0.000	.8928449
cumdo~3 <-					
cumdose2	1.087217	.0775735	14.02	0.000	1.019854
cumdose1	-.0439337	.0846185	-0.52	0.604	-.0274676
cataw1 <-					
cumdose1	.026806	.0063253	4.24	0.000	.1036125
depagw1 <-					
crhrw3	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	.4233572	.0645043	6.56	0.000	.4984191
injselfr	0	(no path)			0
fdferw1	.2023291	.0524029	3.86	0.000	.2450221
cumdose2	0	(no path)			0
cataw1	8.263722	4.300695	1.92	0.055	.1107835
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0

Continued on the next page...

Table 3 Robust standardized direct effects among males--continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
BSIdep <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
PTSDw3	.0358387	.0133578	2.68	0.007	.1481567
fdferw2	0	(no path)			0
BSIanx	.2169863	.1759288	1.23	0.217	.2091032
depagw3	0	(no path)			0
PTSDw2	0	(no path)			0
depagw2	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
injselfr	0	(no path)			0
fdferw1	0	(no path)			0
whpel	.0543647	.0202832	2.68	0.007	.5716141
cumdose2	0	(no path)			0
cataw1	-.6578439	.3593291	-1.83	0.067	-.0992542
depagw1	0	(no path)			0
BSIdep	0	(no path)			0
anxagw2	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0
anxagw2 <-					
crhrw3	0	(no path)			0
whpsleep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	.263082	.0352984	7.45	0.000	.5386919
injselfr	0	(no path)			0
fdferw1	0	(no path)			0
cataw1	0	(no path)			0
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0

Continued on the next page...

Table 3 Robust standardized direct effects among males--continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
anxagw3 <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
depagw3	.4495292	.1050094	4.28	0.000	.4225219
PTSDw2	0	(no path)			0
depagw2	-.12943	.1063669	-1.22	0.224	-.1173052
whpsleep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
injselfr	0	(no path)			0
fdferw1	0	(no path)			0
cumdose2	0	(no path)			0
cataw1	0	(no path)			0
depagw1	0	(no path)			0
anxagw2	.5721935	.1071283	5.34	0.000	.565884
anxagw3	0	(no path)			0
cumdose1	0	(no path)			0

9.1.2 Direct Perceived risk effects on male PTSD

If we examine the same panel of Table 3 relating to direct effects on Chornobyl PTSD, we observe no direct path from perceived risk of exposure at any wave. Therefore, we find no empirical evidence to support Hypothesis 6, which relates to direct effects.

9.1.3 Other direct effects on male PTSD

What does explain Chornobyl PTSD with direct effects? If we sort the standardized effects according to their magnitude excluding those effects which are not statistically significant according to the robust standard errors, we find that the four largest direct effects on Chornobyl PTSD in descending order are 1) fear of consuming contaminated food in wave 2 ($stdized\ \beta = 0.226\ p = 0.000$), 2) BSI anxiety ($stdized\ \beta = 0.207,\ p = 0.000$), and 3) having injured oneself because of Chornobyl ($stdized\ \beta = 0.179\ p = 0.000$) and 4) self-reported symptoms of depression in 1986 ($stdized\ \beta = 0.121\ p = 0.000$). Perhaps the delay in official admission of what had happened and the danger the delay posed to the public gave many a residents a fear of having injured themselves by consuming food that they could not know was contaminated by the fallout from the first few days. Any secrecy that posed a risk to the public could undermine legitimacy of the government once the truth became public.

The next two significant robust direct effects on PTSD in descending order, after self-expressed 1986 depressive symptoms, are: 5) self-reported PTSD symptoms in wave 2 ($stdized\ \beta = 0.112\ p = 0.045$), and 7) BSI depression ($stdized\ \beta = 0.112,\ p = 0.045$). None of the remainder were statistically significant robust estimates at the 0.05 level.

9.2 Indirect effects on male PTSD

9.2.1 Indirect effects originating with cumulative external dose

To learn what happened with respect to indirect effects, we turn to the MiPTSD panel in Table 4. We find statistically significant indirect robust effects from cumulative external dose in wave 1 (cumdose1 $stdized\ \beta = 0.087\ p = 0.002$) and wave 2 ($cumdose2\ stdized\ \beta = 0.079\ p = 0.000$). There was no indirect effect originating with cumdose3. Both indirect effects had positive signs indicating they contribute to PTSD indirectly. There are more than five alternative paths of cumulative external dose leading to MiPTSD, and the reader can trace them if (s)he is interested using Figure 1.

9.2.2 Indirect effects originating with perceived risk of exposure

We find statistically significant indirect effects originating with perceived risk of exposure only in waves 2 ($crhrw2\ stdized\ \beta = 0.226\ p = 0.000$) and 3 ($crhrw3\ stdized\ \beta = 0.226\ p = 0.000$)in the MiPTSD panel of Table 4. The wave 1 effect (crhrw1 stdized $\beta = .058$, p = 0.11) is not a statistically significant robust estimate. There are more than seven indirect paths leading from perceived risk of exposure to MiPTSD, and the reader can trace them using Figure 1 if (s)he wishes to do so.

Table 4 Clustered-robust standardized Indirect effects among males

(Std. Err. adjusted for 339 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
Structural					
crhrw1 <-					
crhrw1	.0049051	.0004702	10.43	0.000	.0049051
crhrw2	.0090021	.0003952	22.78	0.000	.0088204
crhrw3	.0082452	.0022008	3.75	0.000	.0080531
depagw3	.0001356	.0000317	4.28	0.000	.0025715
depagw2	.0001353	.0000322	4.21	0.000	.0024727
whpsleep	.0014238	.0005172	2.75	0.006	.0379141
PTSDw1	.0026703	.0003301	8.09	0.000	.1128609
anxagw1	.0046146	.000765	6.03	0.000	.1884876
injselfr	.0829455	.028631	2.90	0.004	.0446965
fdferw1	.0022562	.000471	4.79	0.000	.0947925
cumdose2	.0145313	.0051156	2.84	0.005	.0391959
cataw1	.5396109	.053282	10.13	0.000	.2509791
anxagw2	.0002695	.0000283	9.52	0.000	.0053767
anxagw3	.0003017	.0001229	2.45	0.014	.0060861
cumdose1	.0356609	.0109138	3.27	0.001	.0641104
crhrw2 <-					
crhrw1	-.0245676	.001352	-18.17	0.000	-.0250736
crhrw2	-.030817	.0099658	-3.09	0.002	-.030817
crhrw3	.0073717	.0019676	3.75	0.000	.0073482
PTSDw2	-.0023315	.0018118	-1.29	0.198	-.0323424
depagw2	-.0011771	.0002409	-4.89	0.000	-.0219621
whpsleep	.0012729	.0004624	2.75	0.006	.0345955
PTSDw1	.0063321	.0010593	5.98	0.000	.2731384
anxagw1	.007131	.0008064	8.84	0.000	.2972694
injselfr	.4315533	.0743058	5.81	0.000	.2373384
fdferw1	.0069202	.0010994	6.29	0.000	.2967415
cumdose2	.0366827	.008143	4.50	0.000	.1009832
cataw1	.5537941	.0583409	9.49	0.000	.2628805
depagw1	.0022975	.0006239	3.68	0.000	.0813517
anxagw2	.0083133	.0012079	6.88	0.000	.1692485
anxagw3	.0002698	.0001099	2.45	0.014	.0055534
cumdose1	.0357871	.0180978	1.98	0.048	.0656624

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Table 4 Clustered-robust standardized Indirect effects continued among males:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
crhrw3 <-					
crhrw1	.7348947	.0391561	18.77	0.000	.7524253
crhrw2	-.0329376	.0101581	-3.24	0.001	-.0330428
crhrw3	.0061856	.0016511	3.75	0.000	.0061856
depagw3	.0001018	.0000238	4.28	0.000	.0019752
PTSDw2	-.0023765	.0018468	-1.29	0.198	-.0330723
depagw2	.0116109	.0017523	6.63	0.000	.2173194
whpsleep	.0010681	.000388	2.75	0.006	.0291221
PTSDw1	.0071508	.0010394	6.88	0.000	.3094395
anxagw1	.0070289	.0007712	9.11	0.000	.2939472
injselfr	.598751	.093036	6.44	0.000	.3303429
fdferw1	.006181	.0009641	6.41	0.000	.2658893
cumdose2	.0372848	.0082783	4.50	0.000	.1029686
cataw1	.3776911	.0844215	4.47	0.000	.1798589
depagw1	.0023419	.0006359	3.68	0.000	.0831875
anxagw2	.0084461	.0012337	6.85	0.000	.1724997
anxagw3	.0002264	.0000922	2.45	0.014	.0046748
cumdose1	.0346423	.0184518	1.88	0.060	.0637649
PTSDw3 <-					
crhrw1	.4479028	.492316	0.91	0.363	.0351466
crhrw2	3.197124	.5987082	5.34	0.000	.2458137
crhrw3	.1060151	.0282974	3.75	0.000	.0081251
depagw3	.1365986	.0319093	4.28	0.000	.2032117
PTSDw2	-.0351837	.0273416	-1.29	0.198	-.0375254
depagw2	.3805608	.0725391	5.25	0.000	.5459059
whpsleep	.0183063	.0066496	2.75	0.006	.0382532
PTSDw1	.0910644	.0158012	5.76	0.000	.3020159
anxagw1	.0716853	.0082598	8.68	0.000	.2297605
injselfr	2.130637	.3581502	5.95	0.000	.0900927
fdferw1	.0579297	.0076694	7.55	0.000	.1909877
cumdose2	.3664616	.1006073	3.64	0.000	.0775645
cataw1	5.96474	.6783423	8.79	0.000	.2176948
depagw1	.0346706	.0094145	3.68	0.000	.0943884
anxagw2	.2969963	.0286018	10.38	0.000	.4648863
anxagw3	.0596177	.0388556	1.53	0.125	.0943597
cumdose1	.2779178	.1661838	1.67	0.094	.039206

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Table 4 Clustered-robust standardized Indirect effects among males continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
fdferw2 <-					
crhrw1	.5725269	.032793	17.46	0.000	.0189215
crhrw2	.8420651	.3487302	2.41	0.016	.0272679
crhrw3	.2507613	.0669328	3.75	0.000	.0080943
depagw3	.0041252	.0009636	4.28	0.000	.0025847
PTSDw2	-.0412275	.0320383	-1.29	0.198	-.0185195
depagw2	.2014237	.0561254	3.59	0.000	.1216925
whpsleep	.0433005	.0157286	2.75	0.006	.0381083
PTSDw1	.1185978	.0156463	7.58	0.000	.1656598
anxagw1	.2372114	.0397032	5.97	0.000	.3202136
injselfr	6.98808	1.93493	3.61	0.000	.1244507
fdferw1	.1312538	.0168974	7.77	0.000	.1822532
cumdose2	.5390308	.1255684	4.29	0.000	.0480516
cataw1	24.95035	2.758535	9.04	0.000	.383524
depagw1	.0406263	.0110317	3.68	0.000	.0465826
anxagw2	.1495244	.0211437	7.07	0.000	.0985751
anxagw3	.0091767	.0037388	2.45	0.014	.0061173
cumdose1	.9853346	.3105369	3.17	0.002	.0585436
BSIanx <-					
crhrw1	.7331251	.10875	6.74	0.000	.2467851
crhrw2	.3366393	.1077923	3.12	0.002	.1110331
crhrw3	.2299269	.0613717	3.75	0.000	.0755949
PTSDw3	.0044192	.0016471	2.68	0.007	.0189576
fdferw2	-.0029667	.0008738	-3.40	0.001	-.0302176
BSIanx	-.1473424	.0697113	-2.11	0.035	-.1473424
depagw3	-.014937	.0025368	-5.89	0.000	-.0953253
PTSDw2	.0043872	.0064926	0.68	0.499	.0200728
depagw2	.0424006	.0066376	6.39	0.000	.2609197
whpsleep	-.0128258	.0022905	-5.60	0.000	-.1149719
PTSDw1	.0065167	.001906	3.42	0.001	.0927153
anxagw1	.0121468	.0022943	5.29	0.000	.1670126
injselfr	.3769024	.1417531	2.66	0.008	.0683676
fdferw1	.0197096	.0022191	8.88	0.000	.2787553
whpel	.0112089	.0036062	3.11	0.002	.1222987
cumdose2	.0867651	.0248053	3.50	0.000	.0787809
cataw1	.79966	.158047	5.06	0.000	.1251996
depagw1	.0104994	.0027423	3.83	0.000	.1226203
BSIdep	.1233079	.0640473	1.93	0.054	.1279565
anxagw2	.0214146	.0055673	3.85	0.000	.1437958
anxagw3	.0234737	.0073024	3.21	0.001	.15938
cumdose1	.096205	.0372923	2.58	0.010	.0582204

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Table 4 Clustered-robust standardized Indirect effects among males continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
depagw3 <-					
crhrw1	4.18168	.3018764	13.85	0.000	.2205708
crhrw2	-1.213401	.5360444	-2.26	0.024	-.0627117
crhrw3	.0452326	.0120734	3.75	0.000	.0023303
depagw3	.0983116	.0229655	4.28	0.000	.0983116
PTSDw2	-.1198516	.093138	-1.29	0.198	-.0859261
depagw2	.062887	.0262821	2.39	0.017	.060639
whpsleep	.0078106	.0028371	2.75	0.006	.0109711
PTSDw1	.0388537	.0224535	1.73	0.084	.0866186
anxagw1	.172666	.0244186	7.07	0.000	.3720054
injselfr	.9258301	.5995283	1.54	0.123	.0263153
fdferw1	.073775	.0169012	4.37	0.000	.1634973
cumdose2	1.093792	.3452718	3.17	0.002	.1556205
cataw1	5.602694	1.183713	4.73	0.000	.1374519
depagw1	.1181039	.0320699	3.68	0.000	.2161319
anxagw2	.5445532	.0553814	9.83	0.000	.5729721
anxagw3	.0209492	.0134889	1.55	0.120	.0222883
cumdose1	.2669018	.4034908	0.66	0.508	.0253096
PTSDw2 <-					
crhrw1	.8053613	.0433957	18.56	0.000	.0592525
crhrw2	-1.025123	.2983861	-3.44	0.001	-.073899
crhrw3	.131503	.0351006	3.75	0.000	.0094496
depagw3	.0021633	.0005053	4.28	0.000	.0030174
PTSDw2	-.0698064	.0542473	-1.29	0.198	-.0698064
depagw2	-.0099205	.0077111	-1.29	0.198	-.0133426
whpsleep	.0227074	.0082483	2.75	0.006	.0444889
PTSDw1	.0304356	.01238	2.46	0.014	.0946409
anxagw1	.0967239	.0131895	7.33	0.000	.2906665
injselfr	1.561274	.3532211	4.42	0.000	.0618979
fdferw1	.0824702	.0117265	7.03	0.000	.2549279
cumdose2	.6620126	.2001669	3.31	0.001	.1313764
cataw1	8.380369	.8995336	9.32	0.000	.2867715
depagw1	.0687885	.0186788	3.68	0.000	.1755857
anxagw2	.2470379	.0363304	6.80	0.000	.3625564
anxagw3	.0048124	.0019607	2.45	0.014	.0071415
cumdose1	.3521079	.2710404	1.30	0.194	.0465724

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Table 4 Clustered-robust standardized Indirect effects among males continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
depagw2 <-					
crhrw1	-2.281313	.1215423	-18.77	0.000	-.1247931
crhrw2	-.0417315	.132926	-0.31	0.754	-.0022367
crhrw3	.037628	.0100436	3.75	0.000	.0020104
depagw3	.000619	.0001446	4.28	0.000	.000642
PTSDw2	.0210136	.0163299	1.29	0.198	.0156239
depagw2	-.1026655	.0191747	-5.35	0.000	-.1026655
whpsleep	.0064975	.0023602	2.75	0.006	.0094649
PTSDw1	.1003189	.0162114	6.19	0.000	.2319371
anxagw1	.2777032	.0279527	9.93	0.000	.6204862
injselfr	-.5696842	.5285947	-1.08	0.281	-.0167927
fdferw1	.026834	.009944	2.70	0.007	.0616731
cumdose2	-.2017169	.0601902	-3.35	0.001	-.0297634
cataw1	8.597489	1.451283	5.92	0.000	.2187431
depagw1	-.0207072	.0056228	-3.68	0.000	-.0392993
anxagw2	-.0727482	.011083	-6.56	0.000	-.0793824
anxagw3	.001377	.000561	2.45	0.014	.0015193
cumdose1	2.658593	1.073619	2.48	0.013	.2614535
whpsl~p <-					
crhrw1	3.497669	.3352724	10.43	0.000	.1313444
crhrw2	6.419083	.2818256	22.78	0.000	.2361852
crhrw3	.0881901	.0235396	3.75	0.000	.0032346
depagw3	.0967196	.0225936	4.28	0.000	.0688573
PTSDw2	-.0197417	.0153415	-1.29	0.198	-.0100763
depagw2	.0964512	.0229356	4.21	0.000	.0662117
whpsleep	.0152283	.0055316	2.75	0.006	.0152283
PTSDw1	.0757532	.0116881	6.48	0.000	.1202307
anxagw1	.1368055	.0184771	7.40	0.000	.2098368
injselfr	5.56563	.9725201	5.72	0.000	.1126231
fdferw1	.0528928	.0071688	7.38	0.000	.0834514
cumdose2	.3122809	.069297	4.51	0.000	.031631
cataw1	9.252524	1.259492	7.35	0.000	.1616031
depagw1	.0194538	.0052825	3.68	0.000	.0253451
anxagw2	.1921968	.0201805	9.52	0.000	.143971
anxagw3	.0220667	.0133888	1.65	0.099	.0167141
cumdose1	.4642435	.1742482	2.66	0.008	.0313412

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Table 4 Clustered-robust standardized Indirect effects among males continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
PTSDw1 <-					
crhrw1	.7388238	.0708207	10.43	0.000	.0174807
crhrw2	1.355923	.0595309	22.78	0.000	.0314341
crhrw3	1.241919	.331491	3.75	0.000	.0286994
depagw3	.0204304	.0047725	4.28	0.000	.0091643
PTSDw2	-.0041701	.0032406	-1.29	0.198	-.0013411
depagw2	.0203737	.0048448	4.21	0.000	.0088122
whpsleep	.0134242	.0048763	2.75	0.006	.0084581
PTSDw1	.0667786	.0084275	7.92	0.000	.0667786
anxagw1	.1164833	.0283866	4.10	0.000	.1125712
injselfr	4.469619	1.378171	3.24	0.001	.0569862
fdferw1	.0542718	.0096717	5.61	0.000	.0539507
cumdose2	.1463576	.0392105	3.73	0.000	.0093405
cataw1	13.63592	1.81192	7.53	0.000	.1500582
depagw1	.0041093	.0011158	3.68	0.000	.0033732
anxagw2	.0405983	.0042628	9.52	0.000	.0191612
anxagw3	.0454484	.0185166	2.45	0.014	.0216895
cumdose1	1.905735	.3578779	5.33	0.000	.0810621
anxagw1 <-					
crhrw1	.428328	.0410578	10.43	0.000	.0104865
crhrw2	.7860871	.0345126	22.78	0.000	.018857
crhrw3	.7199936	.1921796	3.75	0.000	.0172165
depagw3	.0118444	.0027668	4.28	0.000	.0054976
depagw2	.0118115	.0028087	4.21	0.000	.0052863
whpsleep	.1243258	.0451605	2.75	0.006	.0810557
PTSDw1	.0387144	.0048858	7.92	0.000	.0400598
anxagw1	.0675304	.0164569	4.10	0.000	.0675304
injselfr	2.591231	.7989852	3.24	0.001	.0341854
fdferw1	.1970139	.0411249	4.79	0.000	.2026544
cumdose2	.0848498	.022732	3.73	0.000	.0056033
cataw1	31.34048	3.280995	9.55	0.000	.3568759
anxagw2	.0235366	.0024713	9.52	0.000	.0114946
anxagw3	.0263484	.0107349	2.45	0.014	.0130113
cumdose1	1.38104	.2814803	4.91	0.000	.0607852

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Table 4 Clustered-robust standardized Indirect effects among males continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
MiPTSD <-					
crhrw1	.7484477	.4679926	1.60	0.110	.0583916
crhrw2	2.291691	.4717003	4.86	0.000	.1751828
crhrw3	.6532031	.174352	3.75	0.000	.0497735
PTSDw3	.0172225	.0064192	2.68	0.007	.0171232
fdferw2	.0194712	.0057351	3.40	0.001	.0459644
BSIanx	.0733172	.091158	0.80	0.421	.0169924
depagw3	.0981253	.0165545	5.93	0.000	.1451351
PTSDw2	.0541606	.0206937	2.62	0.009	.0574323
depagw2	.1218808	.0178453	6.83	0.000	.1738274
whpsleep	.0698195	.0141379	4.94	0.000	.1450551
PTSDw1	.1002848	.0136296	7.36	0.000	.330678
anxagw1	.1076367	.0144653	7.44	0.000	.3430001
injselfr	2.128306	.4987474	4.27	0.000	.0894753
fdferw1	.1141531	.0107971	10.57	0.000	.37418
whpel	-.003444	.0178541	-0.19	0.847	-.0087089
cumdose2	.3788617	.0844096	4.49	0.000	.0797268
cataw1	8.893848	1.111045	8.00	0.000	.3227269
depagw1	.0376637	.0112059	3.36	0.001	.1019457
BSIdep	.0219258	.0113885	1.93	0.054	.0052732
anxagw2	.1317571	.0114766	11.48	0.000	.2050494
anxagw3	.0084896	.0227199	0.37	0.709	.0133594
cumdose1	.6248363	.1995943	3.13	0.002	.0876378
injse~r <-					
crhrw3	.0034757	.0009277	3.75	0.000	.0062997
whpsleep	.0006002	.000218	2.75	0.006	.0296591
PTSDw1	.0029855	.0003686	8.10	0.000	.2341641
anxagw1	.000326	.0000794	4.10	0.000	.02471
injselfr	.0125088	.003857	3.24	0.001	.0125088
fdferw1	.0009511	.0001985	4.79	0.000	.0741533
cumdose2	0	(no path)			0
cataw1	.2010318	.030899	6.51	0.000	.1735167
anxagw3	.0001272	.0000518	2.45	0.014	.004761
cumdose1	.0393613	.0174551	2.26	0.024	.1313185
fdferw1 <-					
crhrw3	.2101627	.0560963	3.75	0.000	.0048855
whpsleep	.0362901	.0131821	2.75	0.006	.0230012
PTSDw1	.1805247	.0222905	8.10	0.000	.1815991
anxagw1	.0727056	.0096135	7.56	0.000	.0706819
injselfr	.7563677	.2332199	3.24	0.001	.0097008
fdferw1	.0575074	.0120041	4.79	0.000	.0575074
cumdose2	.2926941	.1025089	2.86	0.004	.0187908
cataw1	12.15576	1.868364	6.51	0.000	.1345658
anxagw3	.007691	.0031335	2.45	0.014	.0036922
cumdose1	1.54162	.3332317	4.63	0.000	.0659644

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Table 4 Clustered-robust standardized Indirect effects among males continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
whpel <-					
crhrw1	1.576299	2.075562	0.76	0.448	.048632
crhrw2	8.175372	2.156037	3.79	0.000	.247137
crhrw3	2.752173	.7346058	3.75	0.000	.0829317
PTSDw3	-.1445251	.0538675	-2.68	0.007	-.0568234
fdferw2	.0970239	.0285776	3.40	0.001	.0905739
BSIanx	-4.170118	.750662	-5.56	0.000	-.3822001
depagw3	.2363487	.070015	3.38	0.001	.1382418
PTSDw2	-.0919356	.0356723	-2.58	0.010	-.0385524
depagw2	.2346127	.0399754	5.87	0.000	.1323211
whpsleep	.1450013	.0915723	1.58	0.113	.1191304
PTSDw1	.0643602	.013977	4.60	0.000	.0839233
anxagw1	.1321454	.0183013	7.22	0.000	.1665255
injselfr	.4096914	1.646823	0.25	0.804	.0068112
fdferw1	.1555255	.0211762	7.34	0.000	.2015995
whpel	-.3665767	.1179355	-3.11	0.002	-.3665767
cumdose2	.7075108	.1584363	4.47	0.000	.0588778
cataw1	10.53116	1.843947	5.71	0.000	.1511181
depagw1	.0583257	.0152535	3.82	0.000	.0624311
BSIdep	2.333794	1.212195	1.93	0.054	.2219609
anxagw2	.1399744	.0308899	4.53	0.000	.0861446
anxagw3	-.080673	.0893502	-0.90	0.367	-.0502022
cumdose1	1.367541	.4128034	3.31	0.001	.0758508
cumdo~2 <-					
cumdose1	0	(no path)			0
cumdo~3 <-					
cumdose2	0	(no path)			0
cumdose1	1.456433	.2682484	5.43	0.000	.9105718
cataw1 <-					
cumdose1	0	(no path)			0
depagw1 <-					
crhrw3	.3473365	.0927105	3.75	0.000	.0097781
whpsleep	.0599768	.0217862	2.75	0.006	.0460355
PTSDw1	.2983539	.0368395	8.10	0.000	.3634591
anxagw1	.0916366	.0247478	3.70	0.000	.1078839
injselfr	3.47118	1.197697	2.90	0.004	.0539138
fdferw1	.0950427	.0198393	4.79	0.000	.1150974
cumdose2	.0951423	.0300902	3.16	0.002	.0073969
cataw1	25.97411	3.255166	7.98	0.000	.348209
anxagw3	.0127109	.0051787	2.45	0.014	.0073898
cumdose1	1.118105	.2422671	4.62	0.000	.0579378

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Table 4 Clustered-robust standardized Indirect effects among males continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
BSIdep <-					
crhrw1	.1794469	.1969927	0.91	0.362	.058211
crhrw2	.832082	.2047052	4.06	0.000	.2644736
crhrw3	.2033115	.0542676	3.75	0.000	.0644159
PTSDw3	-.0068982	.0025711	-2.68	0.007	-.0285169
fdferw2	.0089999	.0026509	3.40	0.001	.0883385
BSIanx	.229995	.1088162	2.11	0.035	.2216394
depagw3	.0330045	.007879	4.19	0.000	.2029763
PTSDw2	.0195907	.005041	3.89	0.000	.086378
depagw2	.0281155	.0045307	6.21	0.000	.1667283
whpsleep	.0351071	.0046738	7.51	0.000	.3032712
PTSDw1	.0081766	.0014109	5.80	0.000	.1121045
anxagw1	.0123888	.001709	7.25	0.000	.1641517
injselfr	.7780922	.1425908	5.46	0.000	.1360131
fdferw1	.0148079	.0017596	8.42	0.000	.2018218
whpel	-.0241315	.0085437	-2.82	0.005	-.2537292
cumdose2	.0704239	.017007	4.14	0.000	.0616204
cataw1	.959807	.1348524	7.12	0.000	.1448138
depagw1	.0066916	.0017315	3.86	0.000	.075311
BSIdep	-.1924782	.099975	-1.93	0.054	-.1924782
anxagw2	.0184146	.0039386	4.68	0.000	.1191594
anxagw3	.0033181	.008813	0.38	0.707	.0217108
cumdose1	.0875471	.0361079	2.42	0.015	.0510561
anxagw2 <-					
crhrw3	.1894174	.050559	3.75	0.000	.0092744
whpsleep	.0327079	.0118809	2.75	0.006	.043664
PTSDw1	.162705	.0200901	8.10	0.000	.3447359
anxagw1	.017766	.0043295	4.10	0.000	.0363781
injselfr	.6817062	.2101987	3.24	0.001	.0184154
fdferw1	.0518308	.0108192	4.79	0.000	.1091683
cataw1	10.95586	1.683937	6.51	0.000	.2554508
anxagw3	.0069318	.0028241	2.45	0.014	.0070091
cumdose1	.3633269	.0878062	4.14	0.000	.0327445
anxagw3 <-					
crhrw1	-.8076958	.8453258	-0.96	0.339	-.0400439
crhrw2	3.441672	.8936172	3.85	0.000	.1671879
crhrw3	.1238466	.0330569	3.75	0.000	.005997
depagw3	.0458968	.0107214	4.28	0.000	.0431394
PTSDw2	-.0304687	.0236776	-1.29	0.198	-.0205318
depagw2	.2782902	.0510062	5.46	0.000	.2522206
whpsleep	.0213854	.0077681	2.75	0.006	.028234
PTSDw1	.1063813	.0156103	6.81	0.000	.2229129
anxagw1	.2118334	.0257212	8.24	0.000	.4289713
injselfr	.8799897	.3206797	2.74	0.006	.0235097
fdferw1	.0482235	.0082055	5.88	0.000	.1004504
cumdose2	.2937974	.0872422	3.37	0.001	.039289
cataw1	7.674674	1.262273	6.08	0.000	.1769723
depagw1	.0300244	.0081528	3.68	0.000	.0516441
anxagw2	.1650447	.0143288	11.52	0.000	.1632248
anxagw3	.1020997	.0677441	1.51	0.132	.1020997
cumdose1	.2843257	.1377458	2.06	0.039	.025342

9.2.3 Major indirect effects on male PTSD

If we sort the standardized indirect effects according to the magnitude of the path coefficients, we can find out which indirect effects have the largest impact, assuming that they are statistically significant. When we do so, we find that of all of the indirect effects, that of fear of consuming contaminated food in 1986 is the largest ($fdferw1$ $stdized$ $\beta = 0.374$ $, p = 0.000$). Next largest is the self-reported anxiety symptoms in 1986 ($anxagw1$ $stdized$ $\beta = 0.343$ $, p = 0.000$). The third largest is that of self-reported PTSD symptoms in 1986 ($cataw1$ $stdized$ $\beta = 0.323$ $, p = 0.000$). All four indirect effects of greatest impact on PTSD originate in 1986. The fear of eating contaminated food appears to predominate over the source of this haunting concern, and it may derive from the delay in divulging the nature of the danger to the public to protect their health. When the government is discovered to use secrecy to cover up catastrophic mistakes at the expense of the public health, the trust in government will suffer. Despite official assurances of safety, the crisis of official confidence may persist.

The next three major effects all originate in the decade after 1986. These effects are, in declining order of magnitude, 5) self-reported symptoms of anxiety, 6) perceived risk of exposure to radiation, and 7) self-reported symptoms of depression in wave 2.

The indirect effects from reconstructed exposure in mGys in wave 1 is 12th on the list, and in wave 2, 13th on the list, in order of declining magnitude. Even among the mediated effects, the impact of the psychological effects dominate the actual exposure on male PTSD.

It is noteworthy that the indirect robust effects of BSI anxiety, BSI depression, and Nottingham energy level on PTSD are not statistically significant at the 0.05 level, as can be seen from the MiPTSD panel of Table 4.

9.3 Total effects on male PTSD

To fully test the effects of hypothesis 3 and 6, we should turn to Table 5 to see the total effects on PTSD. When we turn to the MiPTSD panel of Table 5, we find the total effects upon Chornobyl PTSD as measured by the revised Mississippi civilian PTSD scale.

9.3.1 The statistical and the psychological calculus of total effects

To statistically compute total effects, we add the direct to the sum of the products of coefficients within each path. In statistical path analysis, the total effects are defined as the sum of the direct and indirect effects, where an indirect effect is the sum of the indirect effects for all of the alternative paths by which an effect can travel from its source to its destination. For each of the alternative paths the indirect effect is the product of the standardized coefficients for each of the linked paths. However, in psychological calculus of total effects, the total may equal more than sum of its parts. This can occur if there is a synergy between two or more parts which reinforces and enhances them in connection with one another. There may, however, be a different sort of effect that weakens them when they are conjoined. This can occur with a partial or complete neutralization of the individual effects when two opposing units are combined. Although this results might be similar to a reinforcing or suppressing interaction effect, it may be an additive rather than a multiplicative one. Perhaps another example might be one where there was a trauma fixating the person on an event. If another observed the disaster, he or she might not be traumatized and might not respond the same way. However, the fixation of the event and the abreactions that follow may not be amenable to elementary arithmetic processing. Responses may effects taken to a power or some exponential rather than linear ones. Instead of being linear and additive, and easily amenable to linear structural equation analysis, they may nonlinear or multiplicative, or even intrinsically nonlinear.

9.3.2 Total effects of cumulative external dose on male PTSD

According to the results in the MiPTSD panel of Table 5, the total effect of cumulative external dose in milliGrays on average PTSD from 1986 is not statistically significant by our robust estimates ($cumdose1\ standardized\ \beta = 0.0187,\ z = 0.30,\ p = 0.768$). However, after a decade following Chornobyl, the reconstructed cumulative dose effect on PTSD is found to be statistically significant according to our robust estimates ($cumdose2\ standardized\ \beta = 0.080, z = 4.49, p = 0.000$.) This appears counterintuitive until we recall that there was no direct effect path for cumdose2 and that the total effect consists of a sum of products of multiple alternative paths through which this effect could travel and that the total effect of cumdose2 is actual a hybrid total effect of a variety of more than seven mediated paths.

9.3.3 Total effects of perceived risk of exposure on male PTSD

To the extent that the total effects are comprised of mediated effects, these results could be the end-result of a myriad of mediations through which effects can find their way to PTSD appearing to be latent for some time until they emerge as statistically significant. One way to do this could be to examine the wave 1 mediators and compare them to the wave 2 mediators to discover whether the wave 2 mediators potentiate the effect, where some of the wave 1 mediators might suppress the effect.

9.3.4 Other interesting total effects on male PTSD

We sort the total effects according to decreasing size and observe which ones require more pressing attention. How can we compare the effects. We see that the top four effects are all wave 1 effects. The next three effects down the list are all wave 2 effects. The wave three effects are scattered through the remainder of the list.

For the sake of a rough comparison, we arbitrarily assume arguendo that these total effects are independent of one another, even though they are not unconnected. We can, given that assumption, we tally their sums and compare them according to wave. We also assume that the BSI and Nottingham scales represent the current time. When we tally their sums, we find that the current time sums comprise the smallest of all of the waves.

Therefore, we divide all other sums by the sum of the current time total effects on PTSD and find that the wave 1 effects would be about 9.7 times the size of the current BSI and whp effects. The wave 2 effects would be approximately 4.2 times that size, and the wave 3 effects would be about 1.3 times that size. This gives us a very rough approximation of the total impact from each wave, with the current time total effects serving as a baseline for the ratios.

9.3.5 Self-reported male Depressive - PTSD symptoms cycle: Implications for persistence

We might ask whether the dynamics of these models contribute to the persistence of effects, apart from the qualitative nature of trauma itself. Are there impulse-response effects that feedback upon themselves to contribute to a gradual attenuation of an effect among males rather than an immediate one? We relax the assumption that the waves possess the same length of time, so we can graph the feedback effect. For simplification of presentation, we can also assume that there is an impulse of one unit through each of the variables in the loop at time 0, to observe the decay.

If we re-examine Figure 5, we find two feedback loops that could account for some persistence of effect owing to an autoregressive feedback process underway. The first of these cyclical processes occurs in the decade following Chornobyl between self-expressed depressive symptoms (depagw2) and self-reported PTSD systems also in wave 2 (PTSDw2), whereas the second one occurs between Nottingham energy level (whpel) and BSI depression (BSIdep) at the current time.

Let us consider the first depression-PTSD cycle in wave 3. Variables in feedback loops have indirect effects upon themselves. Therefore, in a cyclical analysis, we examine the decay of the cycle of an impulse-response of a variable upon itself over each wave. So Figure 2 represents the decay of an single impulse.

In the Depression-Anxiety analysis, we examined exclusively the decay rate of cyclical impact of the variable upon itself, and we display that decay rate is in Figure 2. However, if we include not only the direct effect of the impulse of the other variable but the feedback as an indirect effect through the other variable of the variable back onto itself, and then look at the feedback of the total effects, we display that decay in Figure 3.

The differences between the effects are miniscule. The negative product after one wave generates an undulation around the zero level over time. Waves 4 and 5 would be considered forecasts. What is important for us is to see how the level changes after 1 or 2 waves to obtain a general notion of how the response to the cyclical impulses are generally and approximately experienced over time.

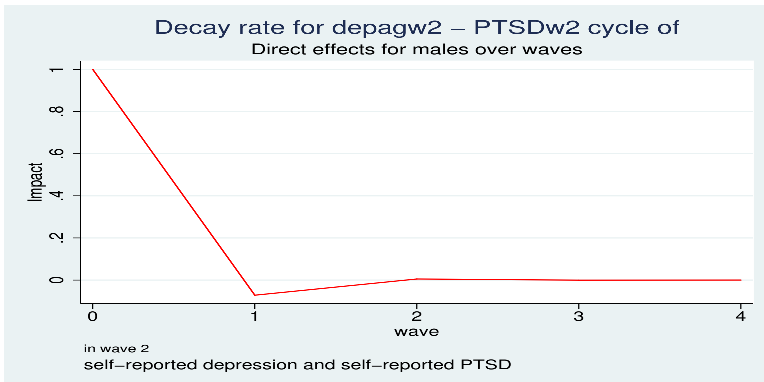

Figure 2: Decay rate of direct effects in Depressive-PTSD wave 2 feedback

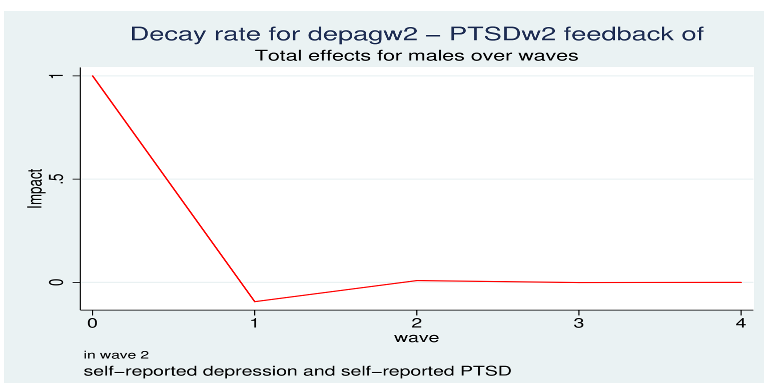

Figure 3: Decay rate of total effects in Depressive-PTSD wave 2 feedback

Table 5 Total standardized effects among males--continued:

(Std. Err. adjusted for 339 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
Structural					
crhrw1 <-					
crhrw1	.0049051	.0004702	10.43	0.000	.0049051
crhrw2	.0090021	.0003952	22.78	0.000	.0088204
crhrw3	.0082452	.0022008	3.75	0.000	.0080531
depagw3	.0001356	.0000317	4.28	0.000	.0025715
depagw2	.0001353	.0000322	4.21	0.000	.0024727
whpsleep	.0014238	.0005172	2.75	0.006	.0379141
PTSDw1	.0070824	.0013522	5.24	0.000	.2993395
anxagw1	.0046146	.000765	6.03	0.000	.1884876
injselfr	.585256	.1000563	5.85	0.000	.3153743
fdferw1	.0071088	.0014733	4.83	0.000	.2986761
cumdose2	.0145313	.0051156	2.84	0.005	.0391959
cataw1	.5396109	.053282	10.13	0.000	.2509791
anxagw2	.0002695	.0000283	9.52	0.000	.0053767
anxagw3	.0003017	.0001229	2.45	0.014	.0060861
cumdose1	.0356609	.0109138	3.27	0.001	.0641104
crhrw2 <-					
crhrw1	.7203896	.0383842	18.77	0.000	.7352255
crhrw2	-.030817	.0099658	-3.09	0.002	-.030817
crhrw3	.0073717	.0019676	3.75	0.000	.0073482
PTSDw2	-.0023315	.0018118	-1.29	0.198	-.0323424
depagw2	.0113909	.0017186	6.63	0.000	.2125235
whpsleep	.0012729	.0004624	2.75	0.006	.0345955
PTSDw1	.0063321	.0010593	5.98	0.000	.2731384
anxagw1	.007131	.0008064	8.84	0.000	.2972694
injselfr	.6491961	.0988498	6.57	0.000	.3570339
fdferw1	.0069202	.0010994	6.29	0.000	.2967415
cumdose2	.0366827	.008143	4.50	0.000	.1009832
cataw1	.4204649	.0807248	5.21	0.000	.1995904
depagw1	.0022975	.0006239	3.68	0.000	.0813517
anxagw2	.0083133	.0012079	6.88	0.000	.1692485
anxagw3	.0002698	.0001099	2.45	0.014	.0055534
cumdose1	.0357871	.0180978	1.98	0.048	.0656624

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Table 5 standardized Total effects among males- continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
crhrw3 <-					
crhrw1	.627972	.0454634	13.81	0.000	.642952
crhrw2	.9883062	.0337185	29.31	0.000	.9914633
crhrw3	.0061856	.0016511	3.75	0.000	.0061856
depagw3	.0001018	.0000238	4.28	0.000	.0019752
PTSDw2	-.0023765	.0018468	-1.29	0.198	-.0330723
depagw2	.0116109	.0017523	6.63	0.000	.2173194
whpsleep	.0010681	.000388	2.75	0.006	.0291221
PTSDw1	.0053133	.0012808	4.15	0.000	.2299244
anxagw1	.009275	.0012846	7.22	0.000	.3878808
injselfr	.6573785	.0979871	6.71	0.000	.3626889
fdferw1	.006181	.0009641	6.41	0.000	.2658893
cumdose2	.0372848	.0082783	4.50	0.000	.1029686
cataw1	.3776911	.0844215	4.47	0.000	.1798589
depagw1	.0023419	.0006359	3.68	0.000	.0831875
anxagw2	.0084461	.0012337	6.85	0.000	.1724997
anxagw3	.0002264	.0000922	2.45	0.014	.0046748
cumdose1	.0346423	.0184518	1.88	0.060	.0637649
PTSDw3 <-					
crhrw1	1.578008	.6218551	2.54	0.011	.1238252
crhrw2	3.197124	.5987082	5.34	0.000	.2458137
crhrw3	.1060151	.0282974	3.75	0.000	.0081251
depagw3	.2836057	.0861123	3.29	0.001	.4219078
PTSDw2	.6595332	.0817287	8.07	0.000	.7034292
depagw2	.1718958	.0960032	1.79	0.073	.2465807
whpsleep	.0183063	.0066496	2.75	0.006	.0382532
PTSDw1	.0910644	.0158012	5.76	0.000	.3020159
anxagw1	.0716853	.0082598	8.68	0.000	.2297605
injselfr	2.130637	.3581502	5.95	0.000	.0900927
fdferw1	.0579297	.0076694	7.55	0.000	.1909877
cumdose2	.3664616	.1006073	3.64	0.000	.0775645
cataw1	5.96474	.6783423	8.79	0.000	.2176948
depagw1	.0346706	.0094145	3.68	0.000	.0943884
anxagw2	.1718339	.0837632	2.05	0.040	.2689704
anxagw3	.3038704	.0982668	3.09	0.002	.4809496
cumdose1	.2779178	.1661838	1.67	0.094	.039206

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Table 5 standardized Total effects among males- continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
fdferw2 <-					
crhrw1	3.173559	1.173769	2.70	0.007	.1048831
crhrw2	.8420651	.3487302	2.41	0.016	.0272679
crhrw3	.2507613	.0669328	3.75	0.000	.0080943
depagw3	.0041252	.0009636	4.28	0.000	.0025847
PTSDw2	.5409904	.1182905	4.57	0.000	.2430147
depagw2	.2014237	.0561254	3.59	0.000	.1216925
whpsleep	.0433005	.0157286	2.75	0.006	.0381083
PTSDw1	.215398	.058728	3.67	0.000	.3008723
anxagw1	.1278306	.0777872	1.64	0.100	.1725596
injselfr	6.98808	1.93493	3.61	0.000	.1244507
fdferw1	.4733186	.0546597	8.66	0.000	.6572295
cumdose2	.5390308	.1255684	4.29	0.000	.0480516
cataw1	24.95035	2.758535	9.04	0.000	.383524
depagw1	.1540554	.0743716	2.07	0.038	.1766418
anxagw2	.1495244	.0211437	7.07	0.000	.0985751
anxagw3	.0091767	.0037388	2.45	0.014	.0061173
cumdose1	.9853346	.3105369	3.17	0.002	.0585436
BSIanx <-					
crhrw1	.1714309	.3664705	0.47	0.640	.0577072
crhrw2	1.258373	.3820003	3.29	0.001	.4150469
crhrw3	.2299269	.0613717	3.75	0.000	.0755949
PTSDw3	.0044192	.0016471	2.68	0.007	.0189576
fdferw2	.0171682	.0050568	3.40	0.001	.1748666
BSIanx	-.1473424	.0697113	-2.11	0.035	-.1473424
depagw3	.0460464	.0131615	3.50	0.000	.293859
PTSDw2	.0043872	.0064926	0.68	0.499	.0200728
depagw2	.0424006	.0066376	6.39	0.000	.2609197
whpsleep	.0397029	.0116977	3.39	0.001	.3559022
PTSDw1	.0065167	.001906	3.42	0.001	.0927153
anxagw1	.0121468	.0022943	5.29	0.000	.1670126
injselfr	.3769024	.1417531	2.66	0.008	.0683676
fdferw1	.0197096	.0022191	8.88	0.000	.2787553
whpel	-.0193684	.0139271	-1.39	0.164	-.211325
cumdose2	.0867651	.0248053	3.50	0.000	.0787809
cataw1	.79966	.158047	5.06	0.000	.1251996
depagw1	.0104994	.0027423	3.83	0.000	.1226203
BSIdep	.1233079	.0640473	1.93	0.054	.1279565
anxagw2	.0214146	.0055673	3.85	0.000	.1437958
anxagw3	-.0146848	.0136875	-1.07	0.283	-.0997058
cumdose1	.096205	.0372923	2.58	0.010	.0582204

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Table 5 standardized Total effects among males- continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
depagw3 <-					
crhrw1	-2.597037	1.868347	-1.39	0.165	-.1369857
crhrw2	6.51439	2.017146	3.23	0.001	.3366804
crhrw3	.0452326	.0120734	3.75	0.000	.0023303
depagw3	.0983116	.0229655	4.28	0.000	.0983116
PTSDw2	-.1198516	.093138	-1.29	0.198	-.0859261
depagw2	.5855551	.1147044	5.10	0.000	.5646237
whpsleep	.0078106	.0028371	2.75	0.006	.0109711
PTSDw1	.0388537	.0224535	1.73	0.084	.0866186
anxagw1	.172666	.0244186	7.07	0.000	.3720054
injselfr	.9258301	.5995283	1.54	0.123	.0263153
fdferw1	.073775	.0169012	4.37	0.000	.1634973
cumdose2	1.093792	.3452718	3.17	0.002	.1556205
cataw1	5.602694	1.183713	4.73	0.000	.1374519
depagw1	.1181039	.0320699	3.68	0.000	.2161319
anxagw2	.5445532	.0553814	9.83	0.000	.5729721
anxagw3	.218699	.1497455	1.46	0.144	.2326781
cumdose1	.2669018	.4034908	0.66	0.508	.0253096
PTSDw2 <-					
crhrw1	.8053613	.0433957	18.56	0.000	.0592525
crhrw2	1.119643	.5987017	1.87	0.061	.0807128
crhrw3	.131503	.0351006	3.75	0.000	.0094496
depagw3	.0021633	.0005053	4.28	0.000	.0030174
PTSDw2	-.0698064	.0542473	-1.29	0.198	-.0698064
depagw2	.341051	.0964725	3.54	0.000	.4587007
whpsleep	.0227074	.0082483	2.75	0.006	.0444889
PTSDw1	.1129579	.0227482	4.97	0.000	.3512482
anxagw1	.0967239	.0131895	7.33	0.000	.2906665
injselfr	1.561274	.3532211	4.42	0.000	.0618979
fdferw1	.0824702	.0117265	7.03	0.000	.2549279
cumdose2	.6620126	.2001669	3.31	0.001	.1313764
cataw1	8.380369	.8995336	9.32	0.000	.2867715
depagw1	.0687885	.0186788	3.68	0.000	.1755857
anxagw2	.2470379	.0363304	6.80	0.000	.3625564
anxagw3	.0048124	.0019607	2.45	0.014	.0071415
cumdose1	.3521079	.2710404	1.30	0.194	.0465724

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Table 5 standardized Total effects among males- continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
depagw2 <-					
crhrw1	-2.281313	.1215423	-18.77	0.000	-.1247931
crhrw2	-3.051307	.7853225	-3.89	0.000	-.1635455
crhrw3	.037628	.0100436	3.75	0.000	.0020104
depagw3	.000619	.0001446	4.28	0.000	.000642
PTSDw2	-.1836667	.1427294	-1.29	0.198	-.136559
depagw2	-.1026655	.0191747	-5.35	0.000	-.1026655
whpsleep	.0064975	.0023602	2.75	0.006	.0094649
PTSDw1	.0323216	.0319603	1.01	0.312	.0747274
anxagw1	.2046236	.0331791	6.17	0.000	.4572007
injselfr	-.5696842	.5285947	-1.08	0.281	-.0167927
fdferw1	.1127851	.0251261	4.49	0.000	.2592161
cumdose2	1.627651	.5315925	3.06	0.002	.2401609
cataw1	8.597489	1.451283	5.92	0.000	.2187431
depagw1	.1809884	.0491456	3.68	0.000	.34349
anxagw2	.6435209	.0961667	6.69	0.000	.702206
anxagw3	.001377	.000561	2.45	0.014	.0015193
cumdose1	.3364579	.5937437	0.57	0.571	.0330882
whpsl~p <-					
crhrw1	3.497669	.3352724	10.43	0.000	.1313444
crhrw2	6.419083	.2818256	22.78	0.000	.2361852
crhrw3	5.879373	1.569313	3.75	0.000	.2156381
depagw3	.0967196	.0225936	4.28	0.000	.0688573
PTSDw2	-.0197417	.0153415	-1.29	0.198	-.0100763
depagw2	.0964512	.0229356	4.21	0.000	.0662117
whpsleep	.0152283	.0055316	2.75	0.006	.0152283
PTSDw1	.0757532	.0116881	6.48	0.000	.1202307
anxagw1	.1368055	.0184771	7.40	0.000	.2098368
injselfr	5.56563	.9725201	5.72	0.000	.1126231
fdferw1	.1882848	.0408561	4.61	0.000	.2970657
cumdose2	.3122809	.069297	4.51	0.000	.031631
cataw1	9.252524	1.259492	7.35	0.000	.1616031
depagw1	.0194538	.0052825	3.68	0.000	.0253451
anxagw2	.1921968	.0201805	9.52	0.000	.143971
anxagw3	.2151576	.0876595	2.45	0.014	.1629675
cumdose1	1.899881	.3817047	4.98	0.000	.1282614

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Table 5 standardized Total effects among males- continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
PTSDw1 <-					
crhrw1	.7388238	.0708207	10.43	0.000	.0174807
crhrw2	1.355923	.0595309	22.78	0.000	.0314341
crhrw3	1.241919	.331491	3.75	0.000	.0286994
depagw3	.0204304	.0047725	4.28	0.000	.0091643
PTSDw2	-.0041701	.0032406	-1.29	0.198	-.0013411
depagw2	.0203737	.0048448	4.21	0.000	.0088122
whpsleep	.2144499	.0778974	2.75	0.006	.1351175
PTSDw1	.0667786	.0084275	7.92	0.000	.0667786
anxagw1	.1164833	.0283866	4.10	0.000	.1125712
injselfr	4.469619	1.378171	3.24	0.001	.0569862
fdferw1	.3398297	.0709364	4.79	0.000	.3378192
cumdose2	.1463576	.0392105	3.73	0.000	.0093405
cataw1	54.05926	5.659396	9.55	0.000	.5949021
depagw1	.0041093	.0011158	3.68	0.000	.0033732
anxagw2	.0405983	.0042628	9.52	0.000	.0191612
anxagw3	.0454484	.0185166	2.45	0.014	.0216895
cumdose1	1.905735	.3578779	5.33	0.000	.0810621
anxagw1 <-					
crhrw1	.428328	.0410578	10.43	0.000	.0104865
crhrw2	.7860871	.0345126	22.78	0.000	.018857
crhrw3	.7199936	.1921796	3.75	0.000	.0172165
depagw3	.0118444	.0027668	4.28	0.000	.0054976
depagw2	.0118115	.0028087	4.21	0.000	.0052863
whpsleep	.1243258	.0451605	2.75	0.006	.0810557
PTSDw1	.6184575	.0763646	8.10	0.000	.63995
anxagw1	.0675304	.0164569	4.10	0.000	.0675304
injselfr	2.591231	.7989852	3.24	0.001	.0341854
fdferw1	.1970139	.0411249	4.79	0.000	.2026544
cumdose2	.0848498	.022732	3.73	0.000	.0056033
cataw1	41.64428	6.400806	6.51	0.000	.4742058
anxagw2	.0235366	.0024713	9.52	0.000	.0114946
anxagw3	.0263484	.0107349	2.45	0.014	.0130113
cumdose1	1.38104	.2814803	4.91	0.000	.0607852

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Table 5 standardized Total effects among males- continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
MiPTSD <-					
crhrw1	.7484477	.4679926	1.60	0.110	.0583916
crhrw2	2.291691	.4717003	4.86	0.000	.1751828
crhrw3	.6532031	.174352	3.75	0.000	.0497735
PTSDw3	.0172225	.0064192	2.68	0.007	.0171232
fdferw2	.1153219	.0216662	5.32	0.000	.2722334
BSIanx	.9670339	.2444442	3.96	0.000	.2241245
depagw3	.0981253	.0165545	5.93	0.000	.1451351
PTSDw2	.1593558	.0544208	2.93	0.003	.1689821
depagw2	.1218808	.0178453	6.83	0.000	.1738274
whpsleep	.1127927	.02798	4.03	0.000	.2343348
PTSDw1	.1002848	.0136296	7.36	0.000	.330678
anxagw1	.1417125	.024817	5.71	0.000	.4515875
injselfr	6.387576	.9735941	6.56	0.000	.2685376
fdferw1	.1141531	.0107971	10.57	0.000	.37418
whpel	-.003444	.0178541	-0.19	0.847	-.0087089
cumdose2	.3788617	.0844096	4.49	0.000	.0797268
cataw1	8.893848	1.111045	8.00	0.000	.3227269
depagw1	.0824863	.0251596	3.28	0.001	.2232688
BSIdep	.480557	.2287406	2.10	0.036	.1155751
anxagw2	.1317571	.0114766	11.48	0.000	.2050494
anxagw3	.081464	.045934	1.77	0.076	.1281935
cumdose1	.1334315	.4519766	0.30	0.768	.0187147
injse~r <-					
crhrw3	.0034757	.0009277	3.75	0.000	.0062997
whpsleep	.0006002	.000218	2.75	0.006	.0296591
PTSDw1	.0029855	.0003686	8.10	0.000	.2341641
anxagw1	.0051534	.0006332	8.14	0.000	.3906201
injselfr	.0125088	.003857	3.24	0.001	.0125088
fdferw1	.0009511	.0001985	4.79	0.000	.0741533
cumdose2	.0248158	.0088648	2.80	0.005	.1242177
cataw1	.2010318	.030899	6.51	0.000	.1735167
anxagw3	.0001272	.0000518	2.45	0.014	.004761
cumdose1	.0393613	.0174551	2.26	0.024	.1313185
fdferw1 <-					
crhrw3	.2101627	.0560963	3.75	0.000	.0048855
whpsleep	.0362901	.0131821	2.75	0.006	.0230012
PTSDw1	.1805247	.0222905	8.10	0.000	.1815991
anxagw1	.3116069	.087933	3.54	0.000	.302934
injselfr	11.73417	4.251796	2.76	0.006	.1504972
fdferw1	.0575074	.0120041	4.79	0.000	.0575074
cumdose2	.2926941	.1025089	2.86	0.004	.0187908
cataw1	41.2383	5.549991	7.43	0.000	.456513
anxagw3	.007691	.0031335	2.45	0.014	.0036922
cumdose1	1.54162	.3332317	4.63	0.000	.0659644

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Table 5 standardized Total effects among males- continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
whpel <-					
crhrw1	1.576299	2.075562	0.76	0.448	.048632
crhrw2	8.175372	2.156037	3.79	0.000	.247137
crhrw3	2.752173	.7346058	3.75	0.000	.0829317
PTSDw3	-.1445251	.0538675	-2.68	0.007	-.0568234
fdferw2	.0970239	.0285776	3.40	0.001	.0905739
BSIanx	4.818685	2.279836	2.11	0.035	.4416426
depagw3	.2363487	.070015	3.38	0.001	.1382418
PTSDw2	-.0919356	.0356723	-2.58	0.010	-.0385524
depagw2	.2346127	.0399754	5.87	0.000	.1323211
whpsleep	.475235	.0700974	6.78	0.000	.3904443
PTSDw1	.0643602	.013977	4.60	0.000	.0839233
anxagw1	.1321454	.0183013	7.22	0.000	.1665255
injselfr	11.40355	2.545791	4.48	0.000	.1895849
fdferw1	.1555255	.0211762	7.34	0.000	.2015995
whpel	-.3665767	.1179355	-3.11	0.002	-.3665767
cumdose2	.7075108	.1584363	4.47	0.000	.0588778
cataw1	10.53116	1.843947	5.71	0.000	.1511181
depagw1	.0583257	.0152535	3.82	0.000	.0624311
BSIdep	-4.03266	2.094602	-1.93	0.054	-.3835356
anxagw2	.1399744	.0308899	4.53	0.000	.0861446
anxagw3	-.080673	.0893502	-0.90	0.367	-.0502022
cumdose1	1.367541	.4128034	3.31	0.001	.0758508
cumdo~2 <-					
cumdose1	1.339597	.2873117	4.66	0.000	.8928449
cumdo~3 <-					
cumdose2	1.087217	.0775735	14.02	0.000	1.019854
cumdose1	1.412499	.3182587	4.44	0.000	.8831041
cataw1 <-					
cumdose1	.026806	.0063253	4.24	0.000	.1036125
depagw1 <-					
crhrw3	.3473365	.0927105	3.75	0.000	.0097781
whpsleep	.0599768	.0217862	2.75	0.006	.0460355
PTSDw1	.2983539	.0368395	8.10	0.000	.3634591
anxagw1	.5149938	.0703423	7.32	0.000	.6063031
injselfr	3.47118	1.197697	2.90	0.004	.0539138
fdferw1	.2973718	.0539637	5.51	0.000	.3601195
cumdose2	.0951423	.0300902	3.16	0.002	.0073969
cataw1	34.23784	5.60484	6.11	0.000	.4589925
anxagw3	.0127109	.0051787	2.45	0.014	.0073898
cumdose1	1.118105	.2422671	4.62	0.000	.0579378

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Table 5 standardized Total effects among males- continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
BSIdep <-					
crhrw1	.1794469	.1969927	0.91	0.362	.058211
crhrw2	.832082	.2047052	4.06	0.000	.2644736
crhrw3	.2033115	.0542676	3.75	0.000	.0644159
PTSDw3	.0289405	.0107867	2.68	0.007	.1196398
fdferw2	.0089999	.0026509	3.40	0.001	.0883385
BSIanx	.4469813	.10625	4.21	0.000	.4307426
depagw3	.0330045	.007879	4.19	0.000	.2029763
PTSDw2	.0195907	.005041	3.89	0.000	.086378
depagw2	.0281155	.0045307	6.21	0.000	.1667283
whpsleep	.0351071	.0046738	7.51	0.000	.3032712
PTSDw1	.0081766	.0014109	5.80	0.000	.1121045
anxagw1	.0123888	.001709	7.25	0.000	.1641517
injselfr	.7780922	.1425908	5.46	0.000	.1360131
fdferw1	.0148079	.0017596	8.42	0.000	.2018218
whpel	.0302332	.0173792	1.74	0.082	.3178849
cumdose2	.0704239	.017007	4.14	0.000	.0616204
cataw1	.3019631	.3169121	0.95	0.341	.0455596
depagw1	.0066916	.0017315	3.86	0.000	.075311
BSIdep	-.1924782	.099975	-1.93	0.054	-.1924782
anxagw2	.0184146	.0039386	4.68	0.000	.1191594
anxagw3	.0033181	.008813	0.38	0.707	.0217108
cumdose1	.0875471	.0361079	2.42	0.015	.0510561
anxagw2 <-					
crhrw3	.1894174	.050559	3.75	0.000	.0092744
whpsleep	.0327079	.0118809	2.75	0.006	.043664
PTSDw1	.162705	.0200901	8.10	0.000	.3447359
anxagw1	.2808481	.035398	7.93	0.000	.5750699
injselfr	.6817062	.2101987	3.24	0.001	.0184154
fdferw1	.0518308	.0108192	4.79	0.000	.1091683
cataw1	10.95586	1.683937	6.51	0.000	.2554508
anxagw3	.0069318	.0028241	2.45	0.014	.0070091
cumdose1	.3633269	.0878062	4.14	0.000	.0327445
anxagw3 <-					
crhrw1	-.8076958	.8453258	-0.96	0.339	-.0400439
crhrw2	3.441672	.8936172	3.85	0.000	.1671879
crhrw3	.1238466	.0330569	3.75	0.000	.005997
depagw3	.495426	.1157309	4.28	0.000	.4656613
PTSDw2	-.0304687	.0236776	-1.29	0.198	-.0205318
depagw2	.1488602	.0997498	1.49	0.136	.1349153
whpsleep	.0213854	.0077681	2.75	0.006	.028234
PTSDw1	.1063813	.0156103	6.81	0.000	.2229129
anxagw1	.2118334	.0257212	8.24	0.000	.4289713
injselfr	.8799897	.3206797	2.74	0.006	.0235097
fdferw1	.0482235	.0082055	5.88	0.000	.1004504
cumdose2	.2937974	.0872422	3.37	0.001	.039289
cataw1	7.674674	1.262273	6.08	0.000	.1769723
depagw1	.0300244	.0081528	3.68	0.000	.0516441
anxagw2	.7372382	.1112117	6.63	0.000	.7291088
anxagw3	.1020997	.0677441	1.51	0.132	.1020997
cumdose1	.2843257	.1377458	2.06	0.039	.025342

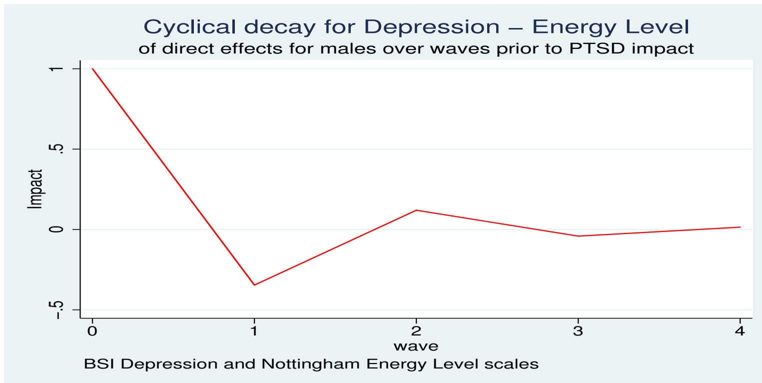

Figure 4: Decay rate of direct effects in Depressive-PTSD wave 2 feedback

9.3.6 Energy level- BSI depression cyclical implications for persistence

Another cyclical effect that we want to consider is the impulse - response feedback at the current time between Nottingham energy level and BSI depression. BSI depression is important because it directly impacts MiPTSD. We will examine the cyclical decay of the direct effects and then the cyclical decay of the total effects as we have just one with our wave 2 vicious cycle.

In the BSI depression WHP energy level cycle, the direct effect contains a negative impulse from the BSI depression while the energy level input does not. This generates an undulation in the cyclical decay of the direct effects.

However, when considering the total effect cycle, we find that the total effect inputs both have negative impulses which cancel out the negative signs in the attenuation of the impact. The effect is a more gradual attenuation over the lags (waves), which could account for greater persistence of the depression effect, prior to its impact on PTSD.

Because the stability index is less than unity, these effects attenuate until they become negligible, whether or not they undulate. Nonetheless, the presence of two depression cycles–one with PTSD in wave 2 and the other with energy level at the current time provide for persistence of the effects over time.

9.4 A sequential non-nested alternative perspective

Another approach that may be used to assess the impact of these variables. based on a sequence of non-nested regressions. The problem is that our dependent variable is not the same over all three waves. Nor is our cumulative external dose, because in the later model, the newer variable (e.g., MiPTSD replaces PTSDw3 and cumdose2 replaces the cumdose1 and later cumdose3 replaces cumdose2). This non-nesting make nested comparisons inappropriate.

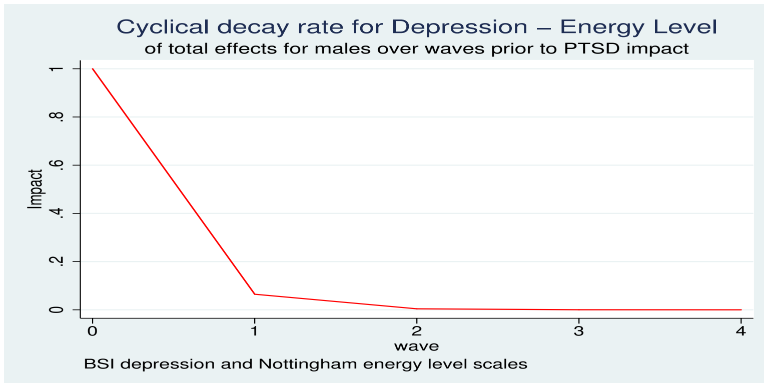

Figure 5: Decay rate of total effects in Depressive-PTSD wave 2 feedback

Nevertheless, there is heuristic value in observing parameter stability, with respect to significance and with respect to persistence, and with respect to sign and magnitude.

Several aspects of this model remain stable over time, regardless of wave. The constant is positive and significant throughout the three waves of the model. Cumulative external dose remains unrelated to any of the other variables in the model at the 0.05 level of significance. Self-reported PTSD symptoms generally serve as precursors of the PTSD in the next wave, although this may not be so between self-reported PTSD and current PTSD as defined by the BSI.

The important thing to notice is that these models explain a substantial amount of the variance in the target endogenous variable, although this is less so for wave 2, which means that these models explain much of the PTSD reported and defined by the BSI.

Table 6 Supplementary male PTSD regressions with cluster robust standard errors

	mptsd1 b/t/p	mptsd2 b/t/p	mptsd3 b/t/p	mptsdbsi b/t/p
crhrw1	3.667* (2.276) (0.023)	0.508 (0.566) (0.572)	1.485# (1.732) (0.084)	-0.832 (-1.038) (0.300)
depagw1	0.001 (0.019) (0.985)	0.020 (0.527) (0.598)	-0.016 (-0.603) (0.547)	0.049* (2.288) (0.023)
anxagw1	0.455*** (5.691) (0.000)	-0.004 (-0.134) (0.893)	0.008 (0.413) (0.680)	0.026 (1.075) (0.283)
injselfr	0.843 (0.289) (0.773)	0.323 (0.357) (0.722)	1.262# (1.800) (0.073)	3.478*** (3.982) (0.000)
fdferw1	0.209*** (3.573) (0.000)	-0.034# (-1.715) (0.087)	0.018 (0.857) (0.392)	-0.008 (-0.464) (0.643)
cumdose2	-0.118 (-0.332) (0.740)	0.154 (0.515) (0.607)	1.766 (1.331) (0.184)	2.353 (1.089) (0.277)
cataw1	23.533*** (4.884) (0.000)	-0.764 (-0.387) (0.699)	1.336 (1.118) (0.264)	-0.469 (-0.401) (0.689)
PTSDw1		0.051 (1.595) (0.112)	-0.035# (-1.934) (0.054)	0.020 (0.888) (0.375)
crhrw2		0.573 (0.574) (0.567)	-0.280 (-0.237) (0.813)	-1.524 (-0.908) (0.364)
depagw2		0.167* (2.131) (0.034)	-0.217* (-2.483) (0.014)	0.008 (0.150) (0.881)
anxagw2		0.107 (1.333) (0.183)	-0.136 (-1.512) (0.131)	-0.059 (-0.879) (0.380)
cumdose1		-0.676# (-1.938) (0.053)	-0.457# (-1.814) (0.071)	-1.047# (-1.909) (0.057)
fdferw2		0.152** (3.198) (0.002)	0.014 (0.493) (0.623)	0.099*** (3.621) (0.000)
PTSDw2			0.686*** (8.868) (0.000)	0.108# (1.848) (0.065)
crhrw3			-0.685 (-0.818) (0.414)	3.058* (2.034) (0.043)
depagw3			0.166# (1.772) (0.077)	-0.072 (-1.212) (0.226)
anxagw3			0.249** (2.772) (0.006)	0.143# (1.691) (0.092)
cumdose3			-1.280 (-1.023) (0.307)	-1.845 (-0.977) (0.329)

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Table 6 continued:

	mptsd1 b/t/p	mptsd2 b/t/p	mptsd3 b/t/p	mptsdbsi b/t/p
PTSDw3				0.011
				(0.153)
				(0.878)
BSIdep				0.440#
				(1.879)
				(0.061)
BSIanx				0.842***
				(3.474)
				(0.001)
whpel				0.030
				(1.603)
				(0.110)
whpsleep				0.026
				(0.964)
				(0.336)
_cons	1.029	0.202	0.010	30.956***
	(0.489)	(0.284)	(0.015)	(18.476)
	(0.625)	(0.777)	(0.988)	(0.000)
r2	0.642	0.435	0.696	0.658
r2_a	0.635	0.412	0.678	0.633
ll	-1547.994	-1244.248	-1121.317	-1138.587
bic	3142.597	2570.061	2353.328	2416.999
N	339	339	339	339

# p<.1, * p<.05, ** p<.01, *** p<.001

9.5 Hypothesis tests for males recapitulated

With respect to hypothesis 3 that radiation as measured by our reconstructed external cumulative dose, we do not find evidence that such exposure explains Chornobyl PTSD on the part of a representative sample of Ukrainian male residents of Kiev and Zhitomyr Oblasts according to the test of our robust estimates. The red arrow from cumdose1 to MiPTSD represents a non-robust estimate of a direct path, and even when the non-robust path appeared to be statistically significant, it was an inverse relationship. Because we insist on the robust estimates, to handle the serial correlation between waves, and probable heteroskedasticity, we use our robust estimates for our hypothesis testing and the p-value of that arrow was ($p = 0.077$).

As for hypothesis 6, we find that in terms of the direct effects on PTSD, there is no evidence of a statistically significant relationship between the summary score for perceived Chornobyl health risk and Chornobyl PTSD. The evidence suggesting such effects derives from hybrid indirect paths mediated by many other variables at later times, which leads to a significant regression result of perceived risk of exposure being significantly related to MiPTSD. The total effects are comprised to some extent of these hybrid effects, which could be misleading.

To be sure that we had included all of the principal variables in the model that we could and that no variable that we had omitted from this model might be responsible for a spurious model. Such a result could be based on a relationship of antecedent variable related to our one exogenous variable, cumdose1. Therefore, we regressed this cumdose1 on a set of variables that might have predated Chornobyl that might be related to some of our endogenous variables. To test the exogeneity of cumdose1, we regressed it on perceived residential distance from Chornobyl, perceived, perceived work distance from Chornobyl, smoking, drinking beer and hard liquor, distance from Chornobyl in 1986, a general measure of psychological health, the BSI total score, among others. The regression results are shown below in Table 7. From these results, we find no statistically significant result indicating that our one exogenous variable in the male model is other than exogenous, such that our model could be the result of a spurious regression condition.

Table 7 Exogeneity test for male model

	cumdose1 b/t/p
polprw1	0.003
	(1.235)
	(0.218)
ecprw1	-0.000
	(-0.232)
	(0.817)
BSIsoma	-0.045
	(-0.989)
	(0.323)
BSItotal	0.018
	(0.722)
	(0.471)
BSIdep	-0.073
	(-0.739)
	(0.461)
BSIanx	0.021
	(0.657)
	(0.512)
havmil	0.002
	(0.792)
	(0.429)
kmwork	-0.001
	(-0.425)
	(0.671)
kmacc	-0.001
	(-1.045)
	(0.297)
beerw1	0.014
	(0.643)
	(0.520)

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Vodkaw1	0.028
	(1.117)
	(0.265)
smokw1	-0.001
	(-0.313)
	(0.754)
pillw1	0.014
	(0.514)
	(0.607)
medcow1	-0.043
	(-1.541)
	(0.124)
hospw1	0.008
	(1.190)
	(0.235)
MiPTSD	-0.027
	(-0.782)
	(0.435)
PTSDw1	0.004
	(0.639)
	(0.523)
whpsleep	0.007
	(1.089)
	(0.277)
whpel	0.003
	(0.661)
	(0.509)
_cons	1.018
	(1.241)
	(0.216)
r2	0.061
r2_a	0.004
ll	-636.789
bic	1389.800
N	334.000

* p<.05, ** p<.01, *** p<.001

There remains another question. Do we have superexogeneity? Can we use this as a basis for prediction. We use the nowcasting approach to test the weak nowcast rationality as a basis for ascertaining whether we might be able to use it for forecasting. We would also ascertain whether the errors are correlated across the equations to allow forecasting.

10 Female PTSD path model

In Figure 6, we present the path diagram for the female Chornobyl PTSD model. This diagram shows the statistically significant paths that extend to PTSD among the females in our sample. To facilitate explanation the paths have been color-coded. Boxes represent variables and arrows represent paths. The blue boxes with black borders in the middle are self-reported depression, whereas the blue boxes along the bottom are cumulative external dose variables. The latter

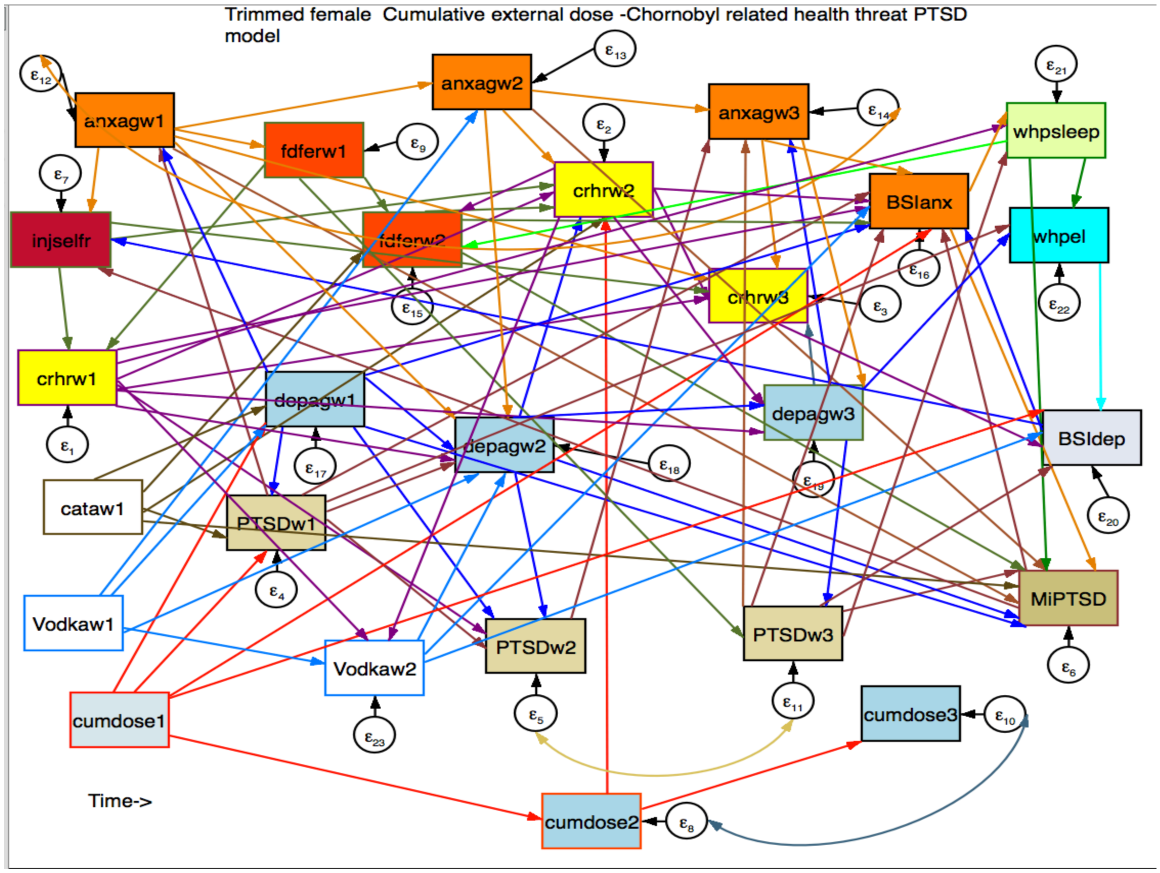

Figure 6: Pathways to PTSD among females residents of Kiev and Zhitomyr Oblasts

have red arrows projecting from them, whereas the former have blue arrows heading out of them. Anxiety variables are orange. Perceived risk of exposure area yellow boxes with purple arrows, whereas PTSD are light-kakhi or sand-colored boxes. Catastrophic experience is white with an olive border, whereas vodka consumption is white with a blue border. Fear of consuming contaminated food is colored red with forest green arrows emanating from them. Two BSI measures of psychological health are included-namely, BSIanx, colored orange, and BSI depression, colored stone. The Nottingham weighted health profile measures of physical health behavior include sleep and energy level, colored lime and cyan, respectively. The path coefficients, which define this model, are contained in Table 8. The clustered-robust versions for robust direct, indirect, and total effects, are respectively contained in Tables 9, 10, and 11.

10.1 New variables

As the reader may have noticed, there are a few extra variables in the female model–including, Vodkaw1 and Vodkaw2, which are the average number of vodka drinks per week during wave 1 and wave 2. These variables have implications for hypotheses 12 and 20, both of which pertain to substance abuse.

10.2 Model goodness of fit

To help the reader interpret the path coefficients, Table 8 lists the parameter estimates from which the path diagram was developed. The non-robust version of the model is consistent with the data (LR $\chi^{239} = 246.50$, $prob > \chi^2 = 0.2036$). Inspection of the path diagram reveals the presence of some feedback cycles, so the model is nonrecursive. Therefore, we have to check the stability index to be sure the model is neither globally nonstationary nor chaotic. All moduli reside within the unit circle, with the stability index = 0.5519. Thus, the model satisfies the condition for stability.

Table 8 PTSD path model for female respondents

Endogenous variables

Observed: crhrw1 crhrw2 crhrw3 PTSDw2 BSIanx depagw2 depagw3 whpsleep
Vodkaw2 fdferw2 BSIdep PTSDw1 anxagw1 whpel anxagw3 MiPTSD
injselfr cumdose2 depagw1 cumdose3 fdferw1 PTSDw3 anxagw2

Exogenous variables

Observed: cumdose1 cataw1 Vodkaw1

Structural equation model   Number of obs   =   362
Estimation method = ml
Log likelihood   = -25843.881

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
Structural						
crhrw1 <-						
injselfr	.6576961	.1046066	6.29	0.000	.4526709	.8627214
fdferw1	.0026003	.0012525	2.08	0.038	.0001455	.0050551
_cons	-.4166371	.0910439	-4.58	0.000	-.5950798	-.2381943
crhrw2 <-						
crhrw1	.5557786	.0318209	17.47	0.000	.4934108	.6181463
depagw2	.0059531	.0018117	3.29	0.001	.0024023	.0095039
fdferw2	.0068558	.0013528	5.07	0.000	.0042045	.0095072
injselfr	.4710579	.0653966	7.20	0.000	.3428829	.5992329
cumdose2	.0405558	.0203668	1.99	0.046	.0006375	.0804741
anxagw2	.0030472	.0015435	1.97	0.048	.0000221	.0060724
cataw1	-.4706	.0897229	-5.25	0.000	-.6464537	-.2947463
_cons	-.4070694	.0566271	-7.19	0.000	-.5180565	-.2960822
crhrw3 <-						
crhrw1	-.0729162	.02221	-3.28	0.001	-.116447	-.0293853
crhrw2	.9731001	.0258313	37.67	0.000	.9224717	1.023729
depagw3	.0021063	.0010458	2.01	0.044	.0000566	.004156
anxagw1	-.0014094	.0004313	-3.27	0.001	-.0022547	-.000564
anxagw3	.0021135	.0009343	2.26	0.024	.0002823	.0039447
injselfr	.1413229	.0353419	4.00	0.000	.0720541	.2105917
_cons	-.1090629	.0281035	-3.88	0.000	-.1641447	-.053981
PTSDw2 <-						
crhrw1	1.330322	.3372839	3.94	0.000	.669258	1.991387
depagw2	.2369381	.0201514	11.76	0.000	.1974421	.2764341
PTSDw1	.0614851	.0112428	5.47	0.000	.0394496	.0835205
depagw1	-.0478394	.0151007	-3.17	0.002	-.0774364	-.0182425
_cons	.5017973	.4299977	1.17	0.243	-.3409827	1.344577

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Table 8 Female PTSD model continued:

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
BSIanx <-						
crhrw1	-1.178736	.2587176	-4.56	0.000	-1.685814	-.6716591
crhrw2	.8587632	.3009953	2.85	0.004	.2688233	1.448703
Vodkaw2	.3768461	.1792932	2.10	0.036	.025438	.7282542
fdferw2	.0163029	.0073878	2.21	0.027	.001823	.0307827
BSIdep	.5065969	.0555243	9.12	0.000	.3977712	.6154226
PTSDw1	.0128756	.005781	2.23	0.026	.0015451	.0242062
anxagw3	.027766	.0077271	3.59	0.000	.0126211	.0429109
MiPTSD	-.1092733	.0336938	-3.24	0.001	-.1753119	-.0432348
depagw1	.0206398	.0070381	2.93	0.003	.0068454	.0344342
PTSDw3	.0750765	.0230172	3.26	0.001	.0299636	.1201894
cumdose1	.6210384	.3081484	2.02	0.044	.0170785	1.224998
_cons	7.670506	1.299364	5.90	0.000	5.123799	10.21721
depagw2 <-						
crhrw1	-1.970204	.7496915	-2.63	0.009	-3.439572	-.5008355
Vodkaw2	4.203216	1.715742	2.45	0.014	.8404231	7.566008
PTSDw1	-.0627807	.0258007	-2.43	0.015	-.1133491	-.0122123
anxagw1	-.1170076	.0282521	-4.14	0.000	-.1723807	-.0616345
depagw1	.3889646	.0329925	11.79	0.000	.3243005	.4536288
anxagw2	.4840471	.034858	13.89	0.000	.4157266	.5523676
Vodkaw1	-4.974908	1.580665	-3.15	0.002	-8.072954	-1.876862
_cons	3.367731	.8778324	3.84	0.000	1.647211	5.088251
depagw3 <-						
crhrw1	-5.759557	1.037326	-5.55	0.000	-7.792678	-3.726436
crhrw2	5.909336	1.145852	5.16	0.000	3.663508	8.155164
depagw2	.6115399	.0505189	12.11	0.000	.5125247	.7105551
anxagw3	.1370719	.0490175	2.80	0.005	.0409993	.2331445
_cons	5.109525	.8334672	6.13	0.000	3.475959	6.743091
whpsl~p <-						
crhrw1	6.090748	1.477543	4.12	0.000	3.194818	8.986678
BSIanx	3.999585	.4342677	9.21	0.000	3.148436	4.850734
PTSDw3	.3640397	.1719562	2.12	0.034	.0270118	.7010676
_cons	-12.22224	3.988682	-3.06	0.002	-20.03992	-4.40457
Vodkaw2 <-						
crhrw1	-.1086225	.0311274	-3.49	0.000	-.169631	-.0476139
crhrw2	.0711203	.0341007	2.09	0.037	.0042842	.1379565
Vodkaw1	.8175431	.0210272	38.88	0.000	.7763305	.8587556
_cons	.115395	.0226688	5.09	0.000	.070965	.159825

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Table 8 Female PTSD model continued:

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
fdferw2 <-						
crhrw2	-3.916082	1.837447	-2.13	0.033	-7.517413	-.3147513
whpsleep	-.0030177	.042179	-0.07	0.943	-.085687	.0796516
fdferw1	.3587042	.0336285	10.67	0.000	.2927935	.4246148
cataw1	6.563734	3.858697	1.70	0.089	-.9991721	14.12664
_cons	1.799721	1.903489	0.95	0.344	-1.931049	5.530491
BSIdep <-						
crhrw3	.5961001	.2110932	2.82	0.005	.182365	1.009835
Vodkaw2	.7709773	.1778658	4.33	0.000	.4223667	1.119588
whpel	.0342601	.0051169	6.70	0.000	.0242311	.0442891
PTSDw3	.0557317	.0196994	2.83	0.005	.0171216	.0943417
cumdose1	.8228591	.3040649	2.71	0.007	.2269028	1.418815
_cons	7.627618	.2557405	29.83	0.000	7.126376	8.12886
PTSDw1 <-						
depagw1	.5460726	.0510132	10.70	0.000	.4460885	.6460567
cumdose1	5.452116	2.591673	2.10	0.035	.3725301	10.5317
cataw1	32.62637	4.368667	7.47	0.000	24.06394	41.1888
_cons	5.575064	1.708699	3.26	0.001	2.226076	8.924052
anxagw1 <-						
PTSDw1	.3374817	.0496883	6.79	0.000	.2400945	.4348689
depagw1	.5403306	.058489	9.24	0.000	.4256942	.654967
_cons	9.5359	1.627132	5.86	0.000	6.346779	12.72502
whpel <-						
depagw3	.1948576	.0734313	2.65	0.008	.0509348	.3387804
whpsleep	.4719271	.0516158	9.14	0.000	.370762	.5730922
PTSDw1	.1557906	.0463251	3.36	0.001	.064995	.2465862
_cons	14.11707	2.192513	6.44	0.000	9.819824	18.41431
anxagw3 <-						
PTSDw2	-.3633742	.0831721	-4.37	0.000	-.5263886	-.2003598
depagw3	.4367973	.0391892	11.15	0.000	.3599879	.5136067
PTSDw3	.2174371	.0810189	2.68	0.007	.058643	.3762312
anxagw2	.6678959	.0346864	19.26	0.000	.5999118	.7358799
_cons	.9586395	.7258899	1.32	0.187	-.4640787	2.381358

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Table 8 Female PTSD model continued:

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
MiPTSD <-						
BSIanx	1.931204	.2509805	7.69	0.000	1.439292	2.423117
depagw2	.1223538	.0358835	3.41	0.001	.0520235	.1926841
whpsleep	.0811321	.0181991	4.46	0.000	.0454625	.1168017
fdferw2	.0871967	.0196431	4.44	0.000	.048697	.1256965
anxagw1	.0599898	.0192288	3.12	0.002	.0223021	.0976775
depagw1	-.0791003	.0246045	-3.21	0.001	-.1273242	-.0308764
PTSDw3	.1937151	.0621261	3.12	0.002	.0719502	.31548
anxagw2	-.1436947	.0293405	-4.90	0.000	-.201201	-.0861885
cataw1	-3.782129	1.523037	-2.48	0.013	-6.767228	-.7970309
_cons	28.40848	1.945887	14.60	0.000	24.59461	32.22235
injse~r <-						
BSIdep	.0134193	.0075807	1.77	0.077	-.0014387	.0282772
anxagw1	.0020282	.0006885	2.95	0.003	.0006788	.0033776
MiPTSD	.0063218	.0023597	2.68	0.007	.0016969	.0109466
_cons	.1990348	.1063606	1.87	0.061	-.0094282	.4074977
cumdo~2 <-						
cumdose1	2.188894	.0649526	33.70	0.000	2.061589	2.316199
_cons	.1613576	.0418234	3.86	0.000	.0793853	.2433299
depagw1 <-						
cumdose1	11.71117	2.509191	4.67	0.000	6.793248	16.6291
cataw1	12.05375	4.301514	2.80	0.005	3.622934	20.48456
Vodkaw1	6.995877	1.350607	5.18	0.000	4.348736	9.643017
_cons	4.983128	1.697213	2.94	0.003	1.656653	8.309604
cumdo~3 <-						
cumdose2	1.231235	.0130516	94.34	0.000	1.205654	1.256816
_cons	.0990387	.0195777	5.06	0.000	.060667	.1374104
fdferw1 <-						
anxagw1	.2979369	.0541364	5.50	0.000	.1918316	.4040422
_cons	30.74794	2.262812	13.59	0.000	26.31291	35.18297
PTSDw3 <-						
depagw3	.1545432	.0182439	8.47	0.000	.1187858	.1903006
fdferw1	.0331416	.0094638	3.50	0.000	.014593	.0516903
_cons	1.482088	.5671076	2.61	0.009	.3705775	2.593598

Continued on the next page...

Table 8 Female PTSD model continued:

	Coef.	OIM Std. Err.	z	P>|z|	[95% Conf.	Interval]
anxagw2 <-						
anxagw1	.2843984	.029989	9.48	0.000	.225621	.3431758
Vodkaw1	2.24764	1.037063	2.17	0.030	.2150335	4.280246
_cons	4.49094	1.254067	3.58	0.000	2.033015	6.948866
Variance						
e.crhrw1	.7841716	.0582996			.6778415	.9071812
e.crhrw2	.2790506	.0209757			.240824	.3233449
e.crhrw3	.0706829	.0052541			.0611001	.0817686
e.PTSDw2	47.63018	3.542152			41.16994	55.10414
e.BSIanx	8.686013	1.236643			6.571029	11.48174
e.depagw2	170.2361	12.65807			147.1498	196.9444
e.depagw3	162.4846	14.47872			136.4467	193.4912
e.whpsleep	688.7552	51.20422			595.3658	796.7937
e.Vodkaw2	.1634084	.0121527			.1412441	.1890507
e.fdferw2	501.3491	39.52553			429.569	585.1235
e.BSIdep	9.673893	.72541			8.35166	11.20546
e.PTSDw1	680.1664	50.55637			587.9574	786.8365
e.anxagw1	724.1014	53.83758			625.9098	837.697
e.whpel	826.4126	61.64158			714.0134	956.5056
e.anxagw3	116.3804	8.869843			100.2319	135.1305
e.MiPTSD	78.77391	6.815102			66.48765	93.33056
e.injselfr	.1893972	.0141727			.1635602	.2193157
e.cumdose2	.4605615	.0342333			.398124	.5327911
e.depagw1	672.1855	49.96316			581.0585	777.6039
e.cumdose3	.0890991	.0067161			.076862	.1032845
e.fdferw1	1319.752	98.09638			1140.835	1526.728
e.PTSDw3	59.59658	4.431567			51.51414	68.94713
e.anxagw2	392.1095	29.14527			338.9519	453.6038
Covariance						
e.PTSDw2						
e.PTSDw3	27.06788	3.148783	8.60	0.000	20.89638	33.23938
e.anxagw1						
e.anxagw3	-50.48829	17.30841	-2.92	0.004	-84.41215	-16.56444
e.cumdose2						
e.cumdose3	.0427649	.0124315	3.44	0.001	.0183995	.0671303

LR test of model vs. saturated: chi2(229) = 246.50, Prob > chi2 = 0.2036
stability index = .5518545
All the eigenvalues lie inside the unit circle.
SEM satisfies stability condition.

10.3 Direct external dose effects for females

10.3.1 Hypothesis 3 Dose-PTSD tests

We examine the direct robust effects in Table 9 on page 72 to test hypothesis 3 for females. Like the male model for PTSD, where we find no evidence of a statistically significant clustered-robust direct effect originating with cumulative external dose and pointing to Chornobyl PTSD , we observe no statistically significant direct effect stemming from cumulative external and extending to Chornobyl PTSD on page 72 either. There is no direct path from cumdose1 and no direct path from cumdose2. There is no path from cumdose3 either. Hence, we find no evidence in this model to support hypothesis 3 among females, which postulates a direct relationship between cumulative external dose in mGys and MiPTSD.

10.4 Direct perceived risk of exposure- PTSD effects for females

10.4.1 Hypothesis 6 Perceived risk - PTSD tests

Hypothesis 6 posits a direct relationship between perceived Chornobyl health risk and Chornobyl PTSD. If we examine the MiPTSD panel on page 72 in Table 9 for women, we find not direct path from perceived risk of exposure, regardless of the time periods covered by our study. Therefore, we find no evidence to support hypothesis 6 that Chornobyl related health risk explains or predicts PTSD among our female respondents.

10.5 Direct effects predicting substance abuse

10.5.1 Hypothesis 12 Radiation directly explains/predicts substance abuse

Vodka consumption in wave 1 is an exogenous variable, for which reason there is no Vodkaw1 panel in Table 9.Our testing of this hypothesis has to be done, therefore, with vodka consumption in wave 2. If we examine the Vodka2 panel in Table 9 (page 69) for women, we find no evidence in support of hypothesis 12 that radiation direct predicts substance abuse. There is no path coming from cumulative external dose in wave 1 or later to support this hypothesis. Therefore, hypothesis 12 appears to be inconsistent with our data.

10.5.2 Hypothesis 16 Perceived risk of exposure explaining/predicting substance abuse

If we examine the Vodka2 panel in Table 9 (page 69) for women, we find one statistically significant direct path from perceived risk of exposure in wave 1 ($crhrw1\ stdized\ \beta = -0.110,\ p = 0.020$). The relationship is a statistically significant inverse rather than a direct one. Vodka consumption appears to dulls the awareness of perceived risk. Perhaps the more one drinks the less one is aware of any risk in the midst. The path emanating from perceived Chornobyl health risk in the following decade is not statistically significant ($crhrw2$ $stdized$ $\beta = 0.067$, $p = 0.123$). Moreover, there is no supporting a relationship in wave 3. Therefore, hypothesis 6 appears partly supported by the evidence. After 1986 this concern seems to have disappeared. Although there may have been such an inverse relationship in 1986, there appears to be no evidence of it in later years. For a more comprehensive perspective, we have to consider indirect effects as well.

10.6 Predominant direct effects on PTSD among women

If we examine the top third, in terms of the absolute value of their effect, on PTSD among women we discover a combination of anxiety, depression, and fear of consuming contaminated food directly affecting female PTSD. In declining magnitude of the absolute value of the direct effect, we find 1) BSI anxiety, 2) self-reported anxiety symptoms in wave 2, 3) sleep measured by the Nottingham health profile, 4) self-reported depressive symptoms in wave 2, 5) fear of consuming contaminated food, 6) self-reported depressive symptoms in 1986, and 7) self-reported anxiety in 1986 are the dominant effects. These are the pure effects, without mediation by other variables, contributing in some way to the type or severity of PTSD experienced by the women.

Table 9 Clustered-robust direct effects for Female PTSD model
(Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
Structural					
crhrw1 <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	0	(no path)			0
depagw3	0	(no path)			0
whpsleep	0	(no path)			0
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
whpel	0	(no path)			0
anxagw3	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	.6576961	.0971155	6.77	0.000	.3229772
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	.0026003	.0013115	1.98	0.047	.1046694
PTSDw3	0	(no path)			0
anxagw2	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0
crhrw2 <-					
crhrw1	.5557786	.0405624	13.70	0.000	.6029688
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
PTSDw2	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	.0059531	.0014544	4.09	0.000	.1328492
depagw3	0	(no path)			0
whpsleep	0	(no path)			0
Vodkaw2	0	(no path)			0
fdferw2	.0068558	.0014163	4.84	0.000	.202745
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
whpel	0	(no path)			0
anxagw3	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	.4710579	.0756845	6.22	0.000	.2509654
cumdose2	.0405558	.0145498	2.79	0.005	.0646088
depagw1	0	(no path)			0
fdferw1	0	(no path)			0
PTSDw3	0	(no path)			0
anxagw2	.0030472	.0011932	2.55	0.011	.0792063
cumdose1	0	(no path)			0
cataw1	-.4706	.0884024	-5.32	0.000	-.1721186
Vodkaw1	0	(no path)			0

Table 9 Female Direct effects continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
crhrw3 <-					
crhrw1	-.0729162	.0279019	-2.61	0.009	-.0772479
crhrw2	.9731001	.0289963	33.56	0.000	.9502266
crhrw3	0	(no path)			0
PTSDw2	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	0	(no path)			0
depagw3	.0021063	.0011741	1.79	0.073	.04953
whpsleep	0	(no path)			0
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	-.0014094	.0005308	-2.66	0.008	-.056437
whpel	0	(no path)			0
anxagw3	.0021135	.0011668	1.81	0.070	.0551605
MiPTSD	0	(no path)			0
injselfr	.1413229	.0367969	3.84	0.000	.0735228
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	0	(no path)			0
PTSDw3	0	(no path)			0
anxagw2	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0
PTSDw2 <-					
crhrw1	1.330322	.3740763	3.56	0.000	.1493717
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	.2369381	.0587759	4.03	0.000	.547232
depagw3	0	(no path)			0
whpsleep	0	(no path)			0
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	.0614851	.0133549	4.60	0.000	.2439593
anxagw1	0	(no path)			0
whpel	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	-.0478394	.0191019	-2.50	0.012	-.1609487
fdferw1	0	(no path)			0
PTSDw3	0	(no path)			0
anxagw2	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0

Continued....

Table 9 Female Direct effects continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
BSIanx <-					
crhrw1	-1.178736	.3584256	-3.29	0.001	-.3038144
crhrw2	.8587632	.3909255	2.20	0.028	.2040197
crhrw3	0	(no path)			0
PTSDw2	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	0	(no path)			0
depagw3	0	(no path)			0
whpsleep	0	(no path)			0
Vodkaw2	.3768461	.1823407	2.07	0.039	.0962581
fdferw2	.0163029	.0083609	1.95	0.051	.114539
BSIdep	.5065969	.0593657	8.53	0.000	.5206616
PTSDw1	.0128756	.0067983	1.89	0.058	.1172727
anxagw1	0	(no path)			0
whpel	0	(no path)			0
anxagw3	.027766	.0089447	3.10	0.002	.1763083
MiPTSD	-.1092733	.040853	-2.67	0.007	-.3515461
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	.0206398	.0089234	2.31	0.021	.1593995
fdferw1	0	(no path)			0
PTSDw3	.0750765	.0280259	2.68	0.007	.1750784
anxagw2	0	(no path)			0
cumdose1	.6210384	.368549	1.69	0.092	.0935083
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0
depagw2 <-					
crhrw1	-1.970204	.7981652	-2.47	0.014	-.0957824
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	0	(no path)			0
depagw3	0	(no path)			0
whpsleep	0	(no path)			0
Vodkaw2	4.203216	1.461451	2.88	0.004	.2025059
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	-.0627807	.039816	-1.58	0.115	-.1078542
anxagw1	-.1170076	.0446634	-2.62	0.009	-.2150121
whpel	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	.3889646	.0633926	6.14	0.000	.5665978
fdferw1	0	(no path)			0
PTSDw3	0	(no path)			0
anxagw2	.4840471	.0705009	6.87	0.000	.5637969
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	-4.974908	1.404925	-3.54	0.000	-.2624018

Continued....

Table 9 Female Direct effects continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
depagw3 <-					
crhrw1	-5.759557	1.291332	-4.46	0.000	-.2594855
crhrw2	5.909336	1.261574	4.68	0.000	.2453972
crhrw3	0	(no path)			0
PTSDw2	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	.6115399	.0738923	8.28	0.000	.5667274
depagw3	0	(no path)			0
whpsleep	0	(no path)			0
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
whpel	0	(no path)			0
anxagw3	.1370719	.0844807	1.62	0.105	.1521387
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	0	(no path)			0
PTSDw3	0	(no path)			0
anxagw2	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0
whpsl~p <-					
crhrw1	6.090748	1.489647	4.09	0.000	.1847073
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
PTSDw2	0	(no path)			0
BSIanx	3.999585	.4354082	9.19	0.000	.4705834
depagw2	0	(no path)			0
depagw3	0	(no path)			0
whpsleep	0	(no path)			0
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
whpel	0	(no path)			0
anxagw3	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	0	(no path)			0
PTSDw3	.3640397	.1741633	2.09	0.037	.0998846
anxagw2	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0

Table 9 Female Direct effects continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
Vodkaw2 <-					
crhrw1	-.1086225	.0466771	-2.33	0.020	-.109607
crhrw2	.0711203	.046087	1.54	0.123	.0661484
crhrw3	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	0	(no path)			0
depagw3	0	(no path)			0
whpsleep	0	(no path)			0
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
whpel	0	(no path)			0
anxagw3	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	0	(no path)			0
PTSDw3	0	(no path)			0
anxagw2	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	.8175431	.0762921	10.72	0.000	.8950273
fdferw2 <-					
crhrw1	0	(no path)			0
crhrw2	-3.916082	1.925495	-2.03	0.042	-.1324222
crhrw3	0	(no path)			0
PTSDw2	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	0	(no path)			0
depagw3	0	(no path)			0
whpsleep	-.0030177	.0422916	-0.07	0.943	-.0036506
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
whpel	0	(no path)			0
anxagw3	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	.3587042	.0427352	8.39	0.000	.5297007
PTSDw3	0	(no path)			0
anxagw2	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	6.563734	4.404484	1.49	0.136	.0811776
Vodkaw1	0	(no path)			0

Table 9 Female Direct effects continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
BSIdep <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	.5961001	.2245103	2.66	0.008	.1411091
PTSDw2	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	0	(no path)			0
depagw3	0	(no path)			0
whpsleep	0	(no path)			0
Vodkaw2	.7709773	.2405446	3.21	0.001	.1916115
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
whpel	.0342601	.0055341	6.19	0.000	.3146108
anxagw3	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	0	(no path)			0
PTSDw3	.0557317	.0235449	2.37	0.018	.1264553
anxagw2	0	(no path)			0
cumdose1	.8228591	.3407019	2.42	0.016	.1205491
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0
PTSDw1 <-					
depagw1	.5460726	.0759595	7.19	0.000	.4630247
cumdose1	5.452116	2.579781	2.11	0.035	.0901298
cataw1	32.62637	5.547596	5.88	0.000	.3112542
Vodkaw1	0	(no path)			0
anxagw1 <-					
PTSDw1	.3374817	.0701669	4.81	0.000	.3155096
depagw1	.5403306	.0815862	6.62	0.000	.4283272
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0

Continued....

Table 9 Female Direct effects continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
whpel <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
PTSDw2	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	0	(no path)			0
depagw3	.1948576	.0737078	2.64	0.008	.1181154
whpsleep	.4719271	.0545683	8.65	0.000	.4249863
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	.1557906	.0508209	3.07	0.002	.1503457
anxagw1	0	(no path)			0
whpel	0	(no path)			0
anxagw3	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	0	(no path)			0
PTSDw3	0	(no path)			0
anxagw2	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0
anxagw3 <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
PTSDw2	-.3633742	.1267096	-2.87	0.004	-.1313637
BSIanx	0	(no path)			0
depagw2	0	(no path)			0
depagw3	.4367973	.0799781	5.46	0.000	.3935398
whpsleep	0	(no path)			0
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
whpel	0	(no path)			0
anxagw3	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	0	(no path)			0
PTSDw3	.2174371	.1089414	2.00	0.046	.0798552
anxagw2	.6678959	.0607314	11.00	0.000	.649534
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0

Table 9 Female Direct effects continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
MiPTSD <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
PTSDw2	0	(no path)			0
BSIanx	1.931204	.3005108	6.43	0.000	.6002887
depagw2	.1223538	.0448187	2.73	0.006	.2016353
depagw3	0	(no path)			0
whpsleep	.0811321	.0200862	4.04	0.000	.21434
Vodkaw2	0	(no path)			0
fdferw2	.0871967	.0244781	3.56	0.000	.190424
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	.0599898	.02089	2.87	0.004	.1816666
whpel	0	(no path)			0
anxagw3	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	-.0791003	.0249581	-3.17	0.002	-.1898855
fdferw1	0	(no path)			0
PTSDw3	.1937151	.0712583	2.72	0.007	.1404183
anxagw2	-.1436947	.0427616	-3.36	0.001	-.2758194
cumdose1	0	(no path)			0
cataw1	-3.782129	1.584694	-2.39	0.017	-.1021511
Vodkaw1	0	(no path)			0
injse~r <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
crhrw3	0	(no path)			0
PTSDw2	0	(no path)			0
BSIanx	0	(no path)			0
depagw2	0	(no path)			0
depagw3	0	(no path)			0
whpsleep	0	(no path)			0
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	.0134193	.0069123	1.94	0.052	.108964
PTSDw1	0	(no path)			0
anxagw1	.0020282	.0005743	3.53	0.000	.1561139
whpel	0	(no path)			0
anxagw3	0	(no path)			0
MiPTSD	.0063218	.0022038	2.87	0.004	.1606825
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	0	(no path)			0
PTSDw3	0	(no path)			0
anxagw2	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0

Table 9 Female Direct effects continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
cumdo~2 <-					
cumdose1	2.188894	.0836046	26.18	0.000	.8708001
depagw1 <-					
cumdose1	11.71117	4.252571	2.75	0.006	.2283232
cataw1	12.05375	4.692115	2.57	0.010	.1356172
Vodkaw1	6.995877	2.674015	2.62	0.009	.2533139
cumdo~3 <-					
cumdose2	1.231235	.0359156	34.28	0.000	.9679575
cumdose1	0	(no path)			0
fdferw1 <-					
PTSDw1	0	(no path)			0
anxagw1	.2979369	.0570277	5.22	0.000	.2797733
depagw1	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0
PTSDw3 <-					
crhrw1	0	(no path)			0
crhrw2	0	(no path)			0
PTSDw2	0	(no path)			0
depagw2	0	(no path)			0
depagw3	.1545432	.0452219	3.42	0.001	.3791308
whpsleep	0	(no path)			0
Vodkaw2	0	(no path)			0
fdferw2	0	(no path)			0
BSIdep	0	(no path)			0
PTSDw1	0	(no path)			0
anxagw1	0	(no path)			0
anxagw3	0	(no path)			0
MiPTSD	0	(no path)			0
injselfr	0	(no path)			0
cumdose2	0	(no path)			0
depagw1	0	(no path)			0
fdferw1	.0331416	.0099758	3.32	0.001	.1474448
PTSDw3	0	(no path)			0
anxagw2	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0
anxagw2 <-					
PTSDw1	0	(no path)			0
anxagw1	.2843984	.0468098	6.08	0.000	.4486842
depagw1	0	(no path)			0
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	2.24764	1.416104	1.59	0.112	.1017825

10.7 Indirect effects for females

10.7.1 Hypothesis 3 Indirect external dose effects on females

For evidence of indirect effects among female respondents, we turn to MiPTSD panel in Table 10 on page 83. Hypothesis 3 refers to direct effects on PSTD originating with cumulative external dose. Is there auxiliary evidence tending to support Hypothesis 3 via hybrid indirect effects, mediated by other variables? We discover evidence of indirect positive effects of cumulative external dose in 1986 ($cumdose1$ $stdized$ $\beta = 0.155,\ p = 0.000$) as well as during the decade thereafter ($crhrw2$ $stdized$ $\beta = 0.012,\ p = 0.005$). Significant mediated effects, originate with cumulative external dose and impact female PTSD. Insofar as these signs are positive, they exhibit a direct, as distinguished from an inverse, relationship in waves 1 and 2. This auxiliary evidence is complements the direct effects posited by Hypothesis 3.

10.7.2 Hypothesis 6 Indirect perceived risk effects on females

Hypothesis 6 relates to direct effects of perceived threat of exposure on female PTSD. There are three statistically significant indirect paths to Chornobyl PTSD from perceived Chornobyl health risk. For 1986, there is a statistically significant indirect path ($crhrw1$ $stdized$ $\beta = -0.124,\ p = 0.032$). The second significant indirect robust path originates in the decade after 1986. ($crhrw2$ $stdized$ $\beta = 0.178, p = 0.002$), and the third significant robust path extends from wave 3 perceived exposure to Chornobyl PTSD, ($stdized$ $\beta = 0.043, p = 0.008$). Only the first of these three paths has a negative sign. Hypothesis 6 is also complemented by the significant indirect effects originating with perceived risk of exposure that impact female Choronobyl PTSD.

If we take the top eight of these indirect effects and sort them according to their absolute value, we find that 1986 self-reported depressive symptoms has the largest indirect effect upon PTSD. Second largest is that of self-reported anxiety symptoms and third largest is that of BSI depression. Fourth is the feedback through indirect effects of MiPTSD upon itself. Fifth is perceived risk of exposure to radiation in wave 2 and sixth in indirect impact is that of self-reported depressive symptoms in wave 3. Next down the list is the average number of vodka drinks per week and after that the 1986 fear of consuming contaminated food. Depression and anxiety appear to be highly indirectly related to female PTSD.

10.7.3 Hypothesis 20: Do Nottingham health measures mediate a radiation effect on substance abuse?

Hypothesis 20 suggests that radiation predicts substance abuse through mediation of the Nottingham health scales. In the female PTSD model, we have 2 Nottingham health scales–the energy level and sleep scales. If we go to the Nottingham sleep panel in the direct effects Table 9 on page 68, we find no direct paths originating with cumulative dose in either waves 1 or 2. If we turn the the direct effects Table 9 energy level panel on page 71, we find no effects originating with cumulative external dose. Therefore, a one stop mediated journey through these Nottingham scales seems unsupported by the data.

Is it possible that there might be a more circuitous indirect route by which other effects mediate an indirect effect beginning with cumulative external traveling through either energy level or sleep to substance abuse in the form of vodka consumption?

We can backtrack the Vodka effect by turning to the indirect effects Vodkaw2 panel in Table 10 on page 80, where we find no significant indirect effect emanating from external dose of radiation ($cumdose1$ $stdized$ $\beta = 0.004$, $p = 0.257$) in 1986, but we discover a significant indirect effect on vodka consumption stemming from the decade thereafter ($cumdose2$ $stdized$ $\beta = 0.004\, p = 0.005$). There is no indirect path from cumdose3. Thus, it is possible for an indirect effect to find its way to Vodka consumption in wave 2 if it proceeds through the Nottingham energy level measure to Vodka for there is an indirect effect on Vodka from energy level $whpel$ $stdized$ $\beta\ = -0.0004,\ p = 0.000$). There is no statistically significant indirect path coming from sleep impacting Vodka consumption in wave 2 according to the Vodkaw2 panel on page 80.

To be sure that this effect was mediated by the the energy level Nottingham, we turn to the energy level panel on page 82, where we observe significant indirect effects from external dose in 1986 and the decade following it ($cumdose1$ $stdized$ $\beta = 0.090,\ p = 0.001$) and ($cumdose2$ $stdized$ $\beta = 0.006,\ p = 0.005$). Thus, we have some evidence of an indirect relationship of cumulative external dose impacting a form of substance abuse through the a Nottingham subscale for energy level, and therefore partial confirmation of hypothesis 20. Because the leg of the journey from sleep was not statistically significant at the 0.05 level, we do not have evidence of sleep as a mediator of substance abuse for hypothesis 20. In fact, the effect is so small and indirect that it would probably not provide a sound basis for prediction. Effects must be stable and relatively large to provide a good basis for explanation or prediction.

10.7.4 Hypothesis 24: Do Nottingham health measures mediate a perceived risk impact on substance abuse?

Hypothesis 24 relates to perceived risk of radiation exposure explaining or predicting substance abuse while being mediated by Nottingham health measures. In the Chornobyl female Vodkaw2 panel of indirect effects (Table 10, p. 80), we find a statistically significant robust indirect effect originating with energy level ($whpel$ $stdized$ $\beta = -0.0004,\ p = 0.000$) but not with sleep (p = 0.553). If we turn to the female whpel panel (Table 10, p.82, we find two statistically significant indirect effect originating with perceived risk of exposure in waves 2 (crhrw2 stdized $\beta\ = .089,\ p = 0.000)$ and ($crhrw3$ $stdized$ $\beta = 0.013, p = 0.008$). Therefore we have partial evidence consistent with hypothesis 24, insofar as it relates a relationship of perceived risk of exposure with vodka consumption as a substance abuse, mediated by Nottingham energy level.

Table 10 Clustered-robust indirect effects for female PTSD model
(Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
Structural					
crhrw1 <-					
crhrw1	-.0048498	.0034066	-1.42	0.155	-.0048498
crhrw2	.0172684	.0035417	4.88	0.000	.015917
crhrw3	.0078061	.00294	2.66	0.008	.0073683
BSIanx	.0082675	.0010471	7.90	0.000	.032076
depagw2	.0008395	.0001616	5.19	0.000	.0172675
depagw3	.0005919	.0001095	5.40	0.000	.013138
whpsleep	.0004772	.0000757	6.31	0.000	.0157369
Vodkaw2	.0167402	.004248	3.94	0.000	.0165898
fdferw2	.0005403	.0001037	5.21	0.000	.014727
BSIdep	.0130952	.0046241	2.83	0.005	.0522173
PTSDw1	.0009072	.0001793	5.06	0.000	.0320577
anxagw1	.0023434	.000431	5.44	0.000	.0885769
whpel	.0004486	.0000725	6.19	0.000	.0164281
anxagw3	.0003272	.0000941	3.48	0.001	.0080605
MiPTSD	.0032926	.0015057	2.19	0.029	.0410978
injselfr	.0060479	.0014414	4.20	0.000	.00297
cumdose2	.0007003	.0002513	2.79	0.005	.0010284
depagw1	.002004	.0002098	9.55	0.000	.0600466
fdferw1	.0002552	.0000358	7.13	0.000	.0102725
PTSDw3	.0022332	.0004633	4.82	0.000	.0202054
anxagw2	.0002044	.0001583	1.29	0.197	.0048961
cumdose1	.0458582	.0155511	2.95	0.003	.026789
cataw1	.0367205	.0177789	2.07	0.039	.0123792
Vodkaw1	.0239886	.0058789	4.08	0.000	.0260263
crhrw2 <-					
crhrw1	-.0337007	.0071504	-4.71	0.000	-.0365622
crhrw2	-.0033689	.0145667	-0.23	0.817	-.0033689
crhrw3	.0095553	.0035988	2.66	0.008	.0097853
PTSDw2	-.000145	.0000506	-2.87	0.004	-.0014009
BSIanx	.0100749	.0012834	7.85	0.000	.0424074
depagw2	.0008826	.0002028	4.35	0.000	.0196969
depagw3	.0007227	.0001338	5.40	0.000	.0174036
whpsleep	.0005653	.0003255	1.74	0.082	.0202226
Vodkaw2	.0448872	.0119438	3.76	0.000	.048261
fdferw2	.000494	.0001221	4.05	0.000	.014608
BSIdep	.0160297	.0056717	2.83	0.005	.0693459
PTSDw1	.0011315	.0004046	2.80	0.005	.0433782
anxagw1	.0040128	.0006796	5.90	0.000	.1645571
whpel	.0005492	.0000887	6.19	0.000	.021817
anxagw3	.000399	.0001148	3.48	0.001	.0106643
MiPTSD	.0040462	.0018463	2.19	0.028	.054792
injselfr	.343132	.0506941	6.77	0.000	.1828104
cumdose2	-.0001366	.000049	-2.79	0.005	-.0002177
depagw1	.0053398	.0005351	9.98	0.000	.1735828
fdferw1	.0040843	.0007639	5.35	0.000	.1783629
PTSDw3	.0027261	.0005654	4.82	0.000	.0267591
anxagw2	.0029836	.0005089	5.86	0.000	.0775523
cumdose1	.1766243	.0475395	3.72	0.000	.1119395
cataw1	.1358042	.0469712	2.89	0.004	.0496694
Vodkaw1	.0536018	.0148367	3.61	0.000	.0630928

Table 10 Clustered-robust indirect effects for female PTSD model continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
crhrw3 <-					
crhrw1	.4932602	.0406271	12.14	0.000	.5225632
crhrw2	.0188032	.0155377	1.21	0.226	.0183612
crhrw3	.0104058	.0039192	2.66	0.008	.0104058
PTSDw2	-.001091	.0003804	-2.87	0.004	-.0102938
BSIanx	.010976	.0013975	7.85	0.000	.0451143
depagw2	.0086935	.0013948	6.23	0.000	.1894451
depagw3	.0019951	.0002979	6.70	0.000	.0469142
whpsleep	.0006174	.0003284	1.88	0.060	.0215681
Vodkaw2	.0541355	.0147138	3.68	0.000	.0568364
fdferw2	.0073633	.0014166	5.20	0.000	.2126352
BSIdep	.0174565	.0061755	2.83	0.005	.0737431
PTSDw1	.0007067	.0004326	1.63	0.102	.0264553
anxagw1	.0046245	.0007929	5.83	0.000	.185182
whpel	.0005981	.0000966	6.19	0.000	.0232004
anxagw3	.0008889	.0003689	2.41	0.016	.0232009
MiPTSD	.0044048	.0020103	2.19	0.028	.0582464
injselfr	.7451731	.0860216	8.66	0.000	.3876738
cumdose2	.0402274	.0144319	2.79	0.005	.0625793
depagw1	.0054349	.0006239	8.71	0.000	.1725215
fdferw1	.0038512	.0006463	5.96	0.000	.1642297
PTSDw3	.0035278	.000715	4.93	0.000	.0338145
anxagw2	.008603	.0014501	5.93	0.000	.2183597
cumdose1	.176736	.0473766	3.73	0.000	.1093774
cataw1	-.3465518	.1039463	-3.33	0.001	-.1237695
Vodkaw1	.0583669	.0176115	3.31	0.001	.0670867
PTSDw2 <-					
crhrw1	-.5416786	.198768	-2.73	0.006	-.0608209
crhrw2	.0836336	.0464033	1.80	0.071	.0086556
crhrw3	.0065729	.0024756	2.66	0.008	.0006966
BSIanx	.0069582	.0008818	7.89	0.000	.0030312
depagw2	.0011182	.0001666	6.71	0.000	.0025827
depagw3	.0004983	.0000922	5.40	0.000	.0012418
whpsleep	.0004005	.0000728	5.50	0.000	.0014829
Vodkaw2	1.011725	.3486567	2.90	0.004	.1125785
fdferw2	.0009287	.000148	6.28	0.000	.0028423
BSIdep	.0110266	.0038945	2.83	0.005	.0049369
PTSDw1	-.0124582	.0094988	-1.31	0.190	-.0494314
anxagw1	.0069481	.0110324	0.63	0.529	.0294885
whpel	.0003778	.000061	6.19	0.000	.0015532
MiPTSD	.0027736	.001268	2.19	0.029	.0038872
injselfr	.5590131	.0769438	7.27	0.000	.0308234
cumdose2	.0033918	.0012168	2.79	0.005	.0005592
depagw1	.123051	.0149266	8.24	0.000	.413987
fdferw1	.0024462	.0010357	2.36	0.018	.0110557
PTSDw3	.0018799	.00039	4.82	0.000	.0019098
anxagw2	.1152707	.0168011	6.86	0.000	.3100921
cumdose1	1.168935	.4904622	2.38	0.017	.0766728
cataw1	2.462398	.6742135	3.65	0.000	.0932078
Vodkaw1	.4280787	.2949669	1.45	0.147	.0521485

Continued....

Table 10 Clustered-robust indirect effects for female PTSD model continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
BSIanx <-					
crhrw1	.5406395	.0864798	6.25	0.000	.1393476
crhrw2	.2468959	.0848552	2.91	0.004	.058656
crhrw3	.250372	.0942981	2.66	0.008	.0609137
PTSDw2	-.0098442	.0034327	-2.87	0.004	-.0225975
BSIanx	-.1745221	.0268874	-6.49	0.000	-.1745221
depagw2	.0095657	.0043165	2.22	0.027	.0507149
depagw3	.0265677	.0041898	6.34	0.000	.1519921
whpsleep	-.0004973	.0020122	-0.25	0.805	-.004227
Vodkaw2	.2982623	.1013931	2.94	0.003	.0761853
fdferw2	-.0030551	.0028555	-1.07	0.285	-.0214644
BSIdep	-.0865801	.0103844	-8.34	0.000	-.0889839
PTSDw1	.0008702	.0014696	0.59	0.554	.0079263
anxagw1	.0061673	.0024705	2.50	0.013	.0600842
whpel	.0143898	.0023244	6.19	0.000	.1358105
anxagw3	-.0006749	.0026132	-0.26	0.796	-.0042858
MiPTSD	.0199338	.0071321	2.79	0.005	.0641295
injselfr	.1365389	.1046586	1.30	0.192	.017282
cumdose2	.0448409	.0160871	2.79	0.005	.0169712
depagw1	.018495	.0029086	6.36	0.000	.1428354
fdferw1	.0055381	.0013283	4.17	0.000	.0574574
PTSDw3	-.0012912	.0121695	-0.11	0.916	-.003011
anxagw2	.0389311	.0041791	9.32	0.000	.2404081
cumdose1	.8686398	.3678904	2.36	0.018	.130789
cataw1	.8247241	.3386361	2.44	0.015	.0716611
Vodkaw1	.8656266	.1320265	6.56	0.000	.2420635
depagw2 <-					
crhrw1	-.2887275	.1956207	-1.48	0.140	-.0140366
crhrw2	.2560206	.1928965	1.33	0.184	.0114725
crhrw3	-.0160871	.0060589	-2.66	0.008	-.0007382
BSIanx	-.0170515	.0021575	-7.90	0.000	-.0032162
depagw2	6.23e-06	.0005475	0.01	0.991	6.23e-06
depagw3	-.0012204	.0002259	-5.40	0.000	-.0013169
whpsleep	-.0009892	.0001507	-6.56	0.000	-.0015857
Vodkaw2	-.0272062	.0078191	-3.48	0.001	-.0013108
fdferw2	.000886	.0004096	2.16	0.031	.0011741
BSIdep	-.0269872	.0095262	-2.83	0.005	-.0052316
PTSDw1	.0051073	.0011444	4.46	0.000	.008774
anxagw1	.1331749	.022636	5.88	0.000	.2447209
whpel	-.0009246	.0001493	-6.19	0.000	-.0016459
MiPTSD	-.0067809	.003102	-2.19	0.029	-.0041147
injselfr	-1.367363	.2199279	-6.22	0.000	-.0326441
cumdose2	.0103831	.003725	2.79	0.005	.0007412
depagw1	-.0225831	.005105	-4.42	0.000	-.0328964
fdferw1	-.0057088	.0029595	-1.93	0.054	-.0111714
PTSDw3	-.0046046	.0009552	-4.82	0.000	-.0020254
anxagw2	.0013069	.0004143	3.15	0.002	.0015222
cumdose1	3.966246	1.56179	2.54	0.011	.1126404
cataw1	2.445573	1.989661	1.23	0.219	.040081
Vodkaw1	7.068097	1.617511	4.37	0.000	.3728071

Continued....

Table 10 Clustered-robust indirect effects for female PTSD model continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
depagw3 <-					
crhrw1	1.412035	.615033	2.30	0.022	.0636165
crhrw2	.4425991	.1721438	2.57	0.010	.0183798
crhrw3	.0014333	.0005398	2.66	0.008	.000061
PTSDw2	-.0532596	.0185718	-2.87	0.004	-.0213703
BSIanx	.0012236	.0002102	5.82	0.000	.0002139
depagw2	.067489	.0102968	6.55	0.000	.0625435
depagw3	.0690196	.011811	5.84	0.000	.0690196
whpsleep	-.0000354	.0018456	-0.02	0.985	-.0000526
Vodkaw2	2.85642	.9925178	2.88	0.004	.1275344
fdferw2	.0436293	.0089978	4.85	0.000	.0535797
BSIdep	.0024044	.0009236	2.60	0.009	.000432
PTSDw1	-.0292502	.0274282	-1.07	0.286	-.0465681
anxagw1	.0492644	.033544	1.47	0.142	.0838941
whpel	.0000824	.0000133	6.19	0.000	.0001359
anxagw3	.0094977	.0058318	1.63	0.103	.0105416
MiPTSD	.000707	.000298	2.37	0.018	.0003976
injselfr	.1329836	.6350603	0.21	0.834	.0029422
cumdose2	.2576077	.0924191	2.79	0.005	.0170423
depagw1	.2772818	.0438154	6.33	0.000	.3743136
fdferw1	.0054128	.0059868	0.90	0.366	.0098162
PTSDw3	.0322196	.015976	2.02	0.044	.0131335
anxagw2	.4458294	.0487964	9.14	0.000	.4812306
cumdose1	3.654434	1.280203	2.85	0.004	.0961799
cataw1	-.3175649	1.706455	-0.19	0.852	-.0048232
Vodkaw1	1.899033	.9602502	1.98	0.048	.0928247
whpsl~p <-					
crhrw1	-2.826253	1.264211	-2.24	0.025	-.0857086
crhrw2	4.884714	1.349615	3.62	0.000	.1365398
crhrw3	1.04901	.3950906	2.66	0.008	.0300283
PTSDw2	-.0430932	.0150267	-2.87	0.004	-.0116389
BSIanx	-.6475923	.1012691	-6.39	0.000	-.0761944
depagw2	.0815741	.0179591	4.54	0.000	.0508851
depagw3	.1700077	.0322846	5.27	0.000	.1144347
whpsleep	.0009155	.0078328	0.12	0.907	.0009155
Vodkaw2	2.962815	.8564596	3.46	0.001	.0890429
fdferw2	.0587307	.0301354	1.95	0.051	.0485486
BSIdep	1.759788	.2021521	8.71	0.000	.2128016
PTSDw1	.0600708	.0239769	2.51	0.012	.0643743
anxagw1	.0453059	.011484	3.95	0.000	.0519328
whpel	.0602905	.0097388	6.19	0.000	.0669497
anxagw3	.1185919	.0345103	3.44	0.001	.0886004
MiPTSD	-.3372269	.1374477	-2.45	0.014	-.1276474
injselfr	4.596278	.4947854	9.29	0.000	.0684489
cumdose2	.1981034	.0710714	2.79	0.005	.0088217
depagw1	.1869333	.031042	6.02	0.000	.1698596
fdferw1	.0519119	.0086186	6.02	0.000	.0633683
PTSDw3	.3105255	.1220151	2.54	0.011	.0852015
anxagw2	.1820353	.0170128	10.70	0.000	.1322603
cumdose1	6.480121	1.565545	4.14	0.000	.1147985
cataw1	3.575319	1.529799	2.34	0.019	.036552
Vodkaw1	3.733317	.6888738	5.42	0.000	.1228331

Table 10 Clustered-robust indirect effects for female PTSD model continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
Vodkaw2 <-					
crhrw1	.0376571	.0027875	13.51	0.000	.0379985
crhrw2	-.0021153	.0008956	-2.36	0.018	-.0019675
crhrw3	-.0001683	.0000634	-2.66	0.008	-.0001603
BSIanx	-.0001815	.0000225	-8.08	0.000	-.0007106
depagw2	.000395	.0001011	3.91	0.000	.008198
depagw3	-.0000129	2.39e-06	-5.40	0.000	-.0002888
whpsleep	-.0000116	.0000196	-0.59	0.553	-.0003872
Vodkaw2	.001374	.000564	2.44	0.015	.001374
fdferw2	.000464	.0000977	4.75	0.000	.0127634
BSIdep	-.0002824	.0000989	-2.86	0.004	-.0011363
PTSDw1	-.0000181	.0000158	-1.15	0.252	-.0006444
anxagw1	.0000308	.0000243	1.27	0.203	.0011765
whpel	-9.67e-06	1.56e-06	-6.19	0.000	-.0003575
anxagw3	-7.16e-06	2.06e-06	-3.48	0.001	-.0001781
MiPTSD	-.0000699	.0000322	-2.17	0.030	-.0008802
injselfr	-.0141921	.0085841	-1.65	0.098	-.0070325
cumdose2	.0027986	.001004	2.79	0.005	.0041467
depagw1	.0001621	.0000252	6.43	0.000	.0049007
fdferw1	-.0000197	.0000945	-0.21	0.835	-.0008
PTSDw3	-.0000487	.0000101	-4.82	0.000	-.0004446
anxagw2	.0004067	.0000919	4.42	0.000	.0098327
cumdose1	.0075803	.0066822	1.13	0.257	.0044684
cataw1	-.0277995	.0177734	-1.56	0.118	-.0094567
Vodkaw1	.0012065	.0018009	0.67	0.503	.0013208
fdferw2 <-					
crhrw1	-2.054351	.1598719	-12.85	0.000	-.0753662
crhrw2	-.0015475	.0585151	-0.03	0.979	-.0000523
crhrw3	-.040585	.0152856	-2.66	0.008	-.0014054
PTSDw2	.0006978	.0002433	2.87	0.004	.000228
BSIanx	-.0495694	.0053585	-9.25	0.000	-.0070554
depagw2	-.0270153	.0055987	-4.83	0.000	-.0203863
depagw3	-.0033433	.00062	-5.39	0.000	-.0027224
whpsleep	-.0022164	.0012781	-1.73	0.083	-.0026813
Vodkaw2	-.1847226	.0485174	-3.81	0.000	-.0067159
fdferw2	-.0289596	.0055819	-5.19	0.000	-.0289596
BSIdep	-.0680842	.0223895	-3.04	0.002	-.0099598
PTSDw1	.0314549	.0065003	4.84	0.000	.0407781
anxagw1	.0910199	.0195833	4.65	0.000	.1262155
whpel	-.0023326	.0003768	-6.19	0.000	-.0031335
anxagw3	-.0019204	.0005528	-3.47	0.001	-.0017356
MiPTSD	-.0148276	.0073681	-2.01	0.044	-.0067897
injselfr	-3.202304	.359968	-8.90	0.000	-.0576914
cumdose2	-.1588825	.0570005	-2.79	0.005	-.008559
depagw1	.0559659	.0071908	7.78	0.000	.0615199
fdferw1	-.0161512	.003008	-5.37	0.000	-.0238505
PTSDw3	-.0127113	.0026933	-4.72	0.000	-.0042192
anxagw2	-.0241666	.0054478	-4.44	0.000	-.0212412
cumdose1	.3923366	.4917946	0.80	0.425	.0084082
cataw1	3.41049	1.082897	3.15	0.002	.0421795
Vodkaw1	.3205927	.2840002	1.13	0.259	.0127604

Table 10 Clustered-robust indirect effects for female PTSD model continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
BSIdep <-					
crhrw1	.1821674	.0703566	2.59	0.010	.0456845
crhrw2	.8205657	.0584371	14.04	0.000	.1896789
crhrw3	.0230557	.0086835	2.66	0.008	.0054578
PTSDw2	-.0021594	.000753	-2.87	0.004	-.0048229
BSIanx	.0606174	.0070976	8.54	0.000	.05898
depagw2	.0171872	.0016662	10.32	0.000	.0886601
depagw3	.0215277	.0040993	5.25	0.000	.1198317
whpsleep	.0165416	.0019713	8.39	0.000	.1367925
Vodkaw2	.1249043	.0328645	3.80	0.000	.0310426
fdferw2	.0063637	.001224	5.20	0.000	.0435014
BSIdep	.0386776	.0055138	7.01	0.000	.0386776
PTSDw1	.0064545	.0020786	3.11	0.002	.0571999
anxagw1	.0039763	.0010935	3.64	0.000	.0376923
whpel	.0013251	.000214	6.19	0.000	.0121684
anxagw3	.0059425	.0020934	2.84	0.005	.0367144
MiPTSD	-.0028697	.0028163	-1.02	0.308	-.0089828
injselfr	.5938456	.0707676	8.39	0.000	.0731339
cumdose2	.0332787	.011939	2.79	0.005	.0122549
depagw1	.0139398	.0012533	11.12	0.000	.1047476
fdferw1	.0050496	.000818	6.17	0.000	.0509743
PTSDw3	.0134645	.0038486	3.50	0.000	.030551
anxagw2	.0152012	.0016738	9.08	0.000	.0913349
cumdose1	.3407568	.0978124	3.48	0.000	.049921
cataw1	.0450769	.1665904	0.27	0.787	.003811
Vodkaw1	.7786049	.2164677	3.60	0.000	.2118472
PTSDw1 <-					
depagw1	0	(no path)			0
cumdose1	6.39515	2.454826	2.61	0.009	.1057193
cataw1	6.582221	2.724412	2.42	0.016	.0627941
Vodkaw1	3.820257	1.518111	2.52	0.012	.1172906
anxagw1 <-					
PTSDw1	0	(no path)			0
depagw1	.1842895	.0256349	7.19	0.000	.1460887
cumdose1	10.32614	3.781802	2.73	0.006	.1595893
cataw1	19.74519	4.119168	4.79	0.000	.1761044
Vodkaw1	5.069353	1.963719	2.58	0.010	.1455075

Continued....

Table 10 Clustered-robust indirect effects for female PTSD model continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
whpel <-					
crhrw1	.6934566	1.009086	0.69	0.492	.0189379
crhrw2	3.542952	.754158	4.70	0.000	.0891837
crhrw3	.4953354	.1865591	2.66	0.008	.0127688
PTSDw2	-.0307149	.0107104	-2.87	0.004	-.0074705
BSIanx	1.582135	.2025701	7.81	0.000	.1676352
depagw2	.1708109	.0200398	8.52	0.000	.0959521
depagw3	.0936802	.0163684	5.72	0.000	.0567855
whpsleep	.0004252	.0038263	0.11	0.912	.0003829
Vodkaw2	1.954828	.508176	3.85	0.000	.0529058
fdferw2	.0362181	.0145279	2.49	0.013	.0269611
BSIdep	.8309601	.0954469	8.71	0.000	.0904888
PTSDw1	.0226494	.0137336	1.65	0.099	.0218578
anxagw1	.0309806	.0106768	2.90	0.004	.0319799
whpel	.0284688	.0045986	6.19	0.000	.0284688
anxagw3	.0845269	.0292744	2.89	0.004	.056869
MiPTSD	-.1590088	.06488	-2.45	0.014	-.0542014
injselfr	2.195021	.2798302	7.84	0.000	.0294373
cumdose2	.1436872	.0515491	2.79	0.005	.0057621
depagw1	.2273223	.0215067	10.57	0.000	.186014
fdferw1	.0255534	.0039355	6.49	0.000	.0280901
PTSDw3	.3246238	.1043025	3.11	0.002	.0802103
anxagw2	.1727806	.0147022	11.75	0.000	.1130496
cumdose1	5.615932	1.63315	3.44	0.001	.0895932
cataw1	7.733741	2.52095	3.07	0.002	.071201
Vodkaw1	2.727055	.5549182	4.91	0.000	.0808005
anxagw3 <-					
crhrw1	-2.33165	.7191658	-3.24	0.001	-.0946447
crhrw2	2.957565	.6354412	4.65	0.000	.1106557
crhrw3	-.0017142	.0006456	-2.66	0.008	-.0000657
PTSDw2	-.025017	.0087235	-2.87	0.004	-.0090439
BSIanx	-.0019528	.0002266	-8.62	0.000	-.0003075
depagw2	.2329122	.0428471	5.44	0.000	.194469
depagw3	.0658892	.0118351	5.57	0.000	.059364
whpsleep	-.0001622	.0008534	-0.19	0.849	-.0002171
Vodkaw2	.976027	.3401942	2.87	0.004	.0392623
fdferw2	.0201858	.0041883	4.82	0.000	.0223345
BSIdep	-.0028757	.0009809	-2.93	0.003	-.0004655
PTSDw1	.0332543	.0195678	1.70	0.089	.0476999
anxagw1	.2127448	.0386089	5.51	0.000	.3264117
whpel	-.0000985	.0000159	-6.19	0.000	-.0001464
anxagw3	.0688464	.0424658	1.62	0.105	.0688464
MiPTSD	-.0006753	.0003209	-2.10	0.035	-.0003421
injselfr	-.1405753	.3160031	-0.44	0.656	-.0028021
cumdose2	.1199463	.0430318	2.79	0.005	.0071493
depagw1	.2422999	.0245942	9.85	0.000	.2946973
fdferw1	.0088636	.0041024	2.16	0.031	.0144822
PTSDw3	.014473	.0074938	1.93	0.053	.0053153
anxagw2	.1678321	.0170703	9.83	0.000	.163218
cumdose1	3.277893	1.211011	2.71	0.007	.0777262
cataw1	2.748808	1.596572	1.72	0.085	.0376149
Vodkaw1	3.212743	1.41395	2.27	0.023	.1414867

Table 10 Clustered-robust indirect effects for female PTSD model continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
MiPTSD <-					
crhrw1	-1.553115	.722316	-2.15	0.032	-.1244306
crhrw2	2.411442	.7745169	3.11	0.002	.1780768
crhrw3	.5631637	.2121054	2.66	0.008	.0425888
PTSDw2	-.024011	.0083727	-2.87	0.004	-.0171326
BSIanx	-.0714556	.0642488	-1.11	0.266	-.022211
depagw2	.0430651	.0103867	4.15	0.000	.07097
depagw3	.0966634	.0185856	5.20	0.000	.1718944
whpsleep	-.0014647	.0065938	-0.22	0.824	-.0038695
Vodkaw2	2.124509	.5590182	3.80	0.000	.16868
fdferw2	.0292384	.016811	1.74	0.082	.063852
BSIdep	.9447468	.1104408	8.55	0.000	.3018147
PTSDw1	.0333296	.0154401	2.16	0.031	.0943604
anxagw1	-.0119781	.0088187	-1.36	0.174	-.0362732
whpel	.0323671	.0052283	6.19	0.000	.0949542
anxagw3	.0660779	.0192419	3.43	0.001	.1304209
MiPTSD	-.2019943	.0759832	-2.66	0.008	-.2019943
injselfr	.1940389	.2378308	0.82	0.415	.0076341
cumdose2	.0977979	.0350859	2.79	0.005	.0115053
depagw1	.163996	.0201622	8.13	0.000	.3936833
fdferw1	.0506601	.0072106	7.03	0.000	.1633734
PTSDw3	.1965163	.0702312	2.80	0.005	.1424488
anxagw2	.1605775	.0147072	10.92	0.000	.3082256
cumdose1	3.322383	.8396767	3.96	0.000	.1554938
cataw1	2.504128	1.088853	2.30	0.021	.0676337
Vodkaw1	1.5458	.4129824	3.74	0.000	.1343643
injse~r <-					
crhrw1	-.0073739	.0051796	-1.42	0.155	-.0150158
crhrw2	.026256	.005385	4.88	0.000	.049282
crhrw3	.0118688	.0044702	2.66	0.008	.0228138
PTSDw2	-.0001808	.000063	-2.87	0.004	-.0032784
BSIanx	.0125703	.0015921	7.90	0.000	.0993136
depagw2	.0012764	.0002458	5.19	0.000	.0534636
depagw3	.0009	.0001666	5.40	0.000	.0406778
whpsleep	.0007256	.000115	6.31	0.000	.0487244
Vodkaw2	.0254527	.0064589	3.94	0.000	.0513652
fdferw2	.0008215	.0001577	5.21	0.000	.0455978
BSIdep	.0064915	.0007502	8.65	0.000	.0527108
PTSDw1	.0009818	.0002003	4.90	0.000	.0706502
anxagw1	.0003569	.000121	2.95	0.003	.0274693
whpel	.0006821	.0001102	6.19	0.000	.0508646
anxagw3	.0004975	.0001431	3.48	0.001	.0249569
MiPTSD	-.0013155	.0005142	-2.56	0.011	-.0334358
injselfr	.0091956	.0021916	4.20	0.000	.0091956
cumdose2	.0010648	.000382	2.79	0.005	.0031841
depagw1	.0021934	.0002563	8.56	0.000	.1338348
fdferw1	.000388	.0000544	7.13	0.000	.0318056
PTSDw3	.0033955	.0007044	4.82	0.000	.0625598
anxagw2	.0003107	.0002407	1.29	0.197	.0151593
cumdose1	.0575618	.017455	3.30	0.001	.0684744
cataw1	.0325732	.0196992	1.65	0.098	.0223613
Vodkaw1	.0305022	.0068659	4.44	0.000	.0673895

Table 10 Clustered-robust indirect effects for female PTSD model continued:

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
cumdo~2 <-					
cumdose1	0	(no path)			0
depagw1 <-					
cumdose1	0	(no path)			0
cataw1	0	(no path)			0
Vodkaw1	0	(no path)			0
cumdo~3 <-					
cumdose2	0	(no path)			0
cumdose1	2.695043	.1392837	19.35	0.000	.8428975
fdferw1 <-					
PTSDw1	.1005482	.0209053	4.81	0.000	.0882712
anxagw1	0	(no path)			0
depagw1	.215891	.022094	9.77	0.000	.1607063
cumdose1	3.076538	1.253696	2.45	0.014	.0446488
cataw1	5.88282	1.780732	3.30	0.001	.0492693
Vodkaw1	1.510347	.6474797	2.33	0.020	.0407091
PTSDw3 <-					
crhrw1	-.6718797	.2384741	-2.82	0.005	-.07426
crhrw2	.9816481	.2093807	4.69	0.000	.100006
PTSDw2	-.0082309	.0028701	-2.87	0.004	-.0081021
depagw2	.1049393	.0118427	8.86	0.000	.238576
depagw3	.0106665	.0018253	5.84	0.000	.0261675
whpsleep	-5.47e-06	.0002852	-0.02	0.985	-.00002
Vodkaw2	.4414401	.1533868	2.88	0.004	.0483522
fdferw2	.0067426	.0013905	4.85	0.000	.0203137
BSIdep	.0003716	.0001427	2.60	0.009	.0001638
PTSDw1	-.0011881	.0043853	-0.27	0.786	-.0046403
anxagw1	.0174876	.005499	3.18	0.001	.073058
anxagw3	.0226513	.0139572	1.62	0.105	.0616771
MiPTSD	.0001093	.000046	2.37	0.018	.0001507
injselfr	.0205517	.0981442	0.21	0.834	.0011155
cumdose2	.0398115	.0142827	2.79	0.005	.0064613
depagw1	.050007	.006813	7.34	0.000	.1656091
fdferw1	.0008365	.0009252	0.90	0.366	.0037216
PTSDw3	.0049793	.002469	2.02	0.044	.0049793
anxagw2	.0688999	.0075412	9.14	0.000	.1824494
cumdose1	.6667293	.2950158	2.26	0.024	.043048
cataw1	.1458889	.296515	0.49	0.623	.0054359
Vodkaw1	.343538	.1996054	1.72	0.085	.0411951
anxagw2 <-					
PTSDw1	.0959793	.0199554	4.81	0.000	.1415642
anxagw1	0	(no path)			0
depagw1	.2060808	.0210901	9.77	0.000	.2577314
cumdose1	2.936738	1.195091	2.46	0.014	.0716052
cataw1	5.615501	1.519645	3.70	0.000	.0790152
Vodkaw1	1.441716	.5980269	2.41	0.016	.0652869

10.8 Total effects on Chornobyl PTSD among females

10.8.1 Hypothesis 3: The total effect of exposure on females

In attempting to obtain a more complete picture of pure as well as hybrid mediated relationships, we turn to Table 11, which lists the total effects of the variables upon the other variables. To obtain a sense of the relative impact of these effects, we sort the total effects on PTSD among women by the absolute values of their impact. Three of the 25 effects are not statistically significant at the 0.05 level so we ignore those. There are 22 effects remaining. If we split the rankings into groups of 7, 7, and 8, we can classify the groups according to relatively high, medium, and low impact. Among the top seven, in order of their decreasing size, were 1) BSI anxiety 2) BSI depression 3) self-reported PTSD symptoms in wave 3 4) self-expressed depressive symptoms in wave 2 5) fear of consuming contaminated food in wave 2 6) Nottingham measured sleep and 7) self-expressed depressive symptoms in 1986.

The effects with middling impacts included 8) indirect effects feedback from MiPTSD upon itself, 9) perceived risk of exposure to Chornobyl radiation in wave 2 10) self-reported depressive symptoms in wave 3 11) vodka consumption in wave 2 12) fear of consuming contaminated food in 1986, 13) reconstructed exposure to radiation in wave 1 and 14) self-reported anxiety symptoms in waves 1. The remainder have much less impact. The high and middling groups are different forms of depression, anxiety, fear of consuming contaminated food, along with some PTSD symptoms. Amidst the lower levels of impact are those of injury, energy level, catastrophic experiences, and 1986 cumulative external dose. Nonetheless, clinically diagnosable (BSI) anxiety and depression are among the top four impacts on PTSD.

We can assess the hypothesis 3 with respect to total effects to obtain a more comprehensive perspective of whether radiation explains or predicts Chornobyl PTSD. In the Chornobyl PTSD panel of Table 11 on page 96, we notice a total effect of cumulative external dose in 1986 on Chornobyl PTSD ($cumdose1$ $stdized$ $\beta = 0.155$, $p = 0.000$) and in the decade after ($cumdose2$ $stdized$ $\beta = 0.012$, $p = 0.005$), but we find no such effect in originating in wave 3. In terms of total effects, relating to hypothesis 3, we find total effects of external dose for both 1986 and the following decade, so hypothesis 3 is consistent with our model and data in waves 1 and 2, but we cannot say the same for wave 3. The effects are positive and therefore the relationship is direct even if it is a combination of direct and indirect effects among females. Therefore, we have partial support for hypothesis 3 in our model and data.

10.8.2 Hypothesis 6: The total effect of perceived risk explaining/predicting PTSD

We also find partial support in our data for hypothesis 6. On page 96, in the MiPTSD panel of Table 11, we find statistically significant total effects of perceived Chornobyl health risk with Chornobyl PTSD in all three waves. From wave 1 the parameter estimate of this relationship is shown to be ($crhrw1$ $stdized$

$\beta = -0.124,\ p = 0.032$). However, this relationship is a negative one, implying an inverse relationship, which at first glance might appear counterintuitive until we recall that because there was no direct effect the total effect consists only of the hybrid mediated product of relationships one of which could easily reverse the sign. The other perceived risk of exposure relationships are positive and consistent with the hypothesis. From wave 2, it is ($stdized\ \beta = 0.178, p = 0.002$) and from wave 3 is appears to be ($stdized\ \beta = 0.043, p = 0.008$). Therefore, female total effects appear to be partly consistent with hypothesis 6, insofar as they are statistically significant.

10.8.3 Hypothesis 12: The total effect of exposure on substance abuse

Are the total effects consistent with hypotheses 12 and 16, which respectfully submit that radiation and perceived risk of exposure predict (explain) substance abuse. We examine the Vodka2 panel in Table 11, on page 92. Because 1986 vodka consumption is an exogenous variable in this model, we have no pre-existing data to show that either pre-wave radiation or perceived risk of exposure leads to such consumption. Nor do we have any concurrent paths in our model to support either hypothesis 12 or hypothesis 16 in wave one. As for wave 2, we do have a total effect of cumdose2 on vodka consumption that is significant and positive ($cumdose2\ stdized\ \beta = 0.004,\ p = 0.005$). This is partial support for hypothesis 12 insofar as it pertains only to female drinking during the decade after 1986.

10.8.4 Hypothesis 16: The total effect of perceived risk of exposure and substance abuse

If we again review the Vodka2 panel on page 92, we observe no evidence of significant wave 1 or wave 2 perceived risk of exposure from total effects on vodka consumption. The only impact that appears to be statistically significant stems from wave 3 perceived risk of exposure. We cannot have a future perceived risk (wave 3) significantly impact a wave 2 vodka consumption unless we are talking about a rational expectation, measured in wave 2 about what one might believe in wave 3. However, the wave 3 recollection pertained to wave 3 and not earlier. For this reason, what appears to be significant is rendered unacceptable by the arrow of time inherent in the model.So we disregard the impact of crhrw3 on vodkaw2. We therefore have no empirical evidence to support hypothesis 16 based on the significance of total effects.

Table 11 Clustered robust total effects for female PTSD model

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
Structural					
crhrw1 <-					
crhrw1	-.0048498	.0034066	-1.42	0.155	-.0048498
crhrw2	.0172684	.0035417	4.88	0.000	.015917
crhrw3	.0078061	.00294	2.66	0.008	.0073683
BSIanx	.0082675	.0010471	7.90	0.000	.032076
depagw2	.0008395	.0001616	5.19	0.000	.0172675
depagw3	.0005919	.0001095	5.40	0.000	.013138
whpsleep	.0004772	.0000757	6.31	0.000	.0157369
Vodkaw2	.0167402	.004248	3.94	0.000	.0165898
fdferw2	.0005403	.0001037	5.21	0.000	.014727
BSIdep	.0130952	.0046241	2.83	0.005	.0522173
PTSDw1	.0009072	.0001793	5.06	0.000	.0320577
anxagw1	.0023434	.000431	5.44	0.000	.0885769
whpel	.0004486	.0000725	6.19	0.000	.0164281
anxagw3	.0003272	.0000941	3.48	0.001	.0080605
MiPTSD	.0032926	.0015057	2.19	0.029	.0410978
injselfr	.6637441	.0966692	6.87	0.000	.3259472
cumdose2	.0007003	.0002513	2.79	0.005	.0010284
depagw1	.002004	.0002098	9.55	0.000	.0600466
fdferw1	.0028555	.0013052	2.19	0.029	.1149419
PTSDw3	.0022332	.0004633	4.82	0.000	.0202054
anxagw2	.0002044	.0001583	1.29	0.197	.0048961
cumdose1	.0458582	.0155511	2.95	0.003	.026789
cataw1	.0367205	.0177789	2.07	0.039	.0123792
Vodkaw1	.0239886	.0058789	4.08	0.000	.0260263

Continued on the next page ....

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
crhrw2 <-					
crhrw1	.5220778	.0405464	12.88	0.000	.5664066
crhrw2	-.0033689	.0145667	-0.23	0.817	-.0033689
crhrw3	.0095553	.0035988	2.66	0.008	.0097853
PTSDw2	-.000145	.0000506	-2.87	0.004	-.0014009
BSIanx	.0100749	.0012834	7.85	0.000	.0424074
depagw2	.0068357	.0014263	4.79	0.000	.1525462
depagw3	.0007227	.0001338	5.40	0.000	.0174036
whpsleep	.0005653	.0003255	1.74	0.082	.0202226
Vodkaw2	.0448872	.0119438	3.76	0.000	.048261
fdferw2	.0073498	.0014218	5.17	0.000	.2173529
BSIdep	.0160297	.0056717	2.83	0.005	.0693459
PTSDw1	.0011315	.0004046	2.80	0.005	.0433782
anxagw1	.0040128	.0006796	5.90	0.000	.1645571
whpel	.0005492	.0000887	6.19	0.000	.021817
anxagw3	.000399	.0001148	3.48	0.001	.0106643
MiPTSD	.0040462	.0018463	2.19	0.028	.054792
injselfr	.8141899	.0915425	8.89	0.000	.4337758
cumdose2	.0404191	.0145007	2.79	0.005	.0643912
depagw1	.0053398	.0005351	9.98	0.000	.1735828
fdferw1	.0040843	.0007639	5.35	0.000	.1783629
PTSDw3	.0027261	.0005654	4.82	0.000	.0267591
anxagw2	.0060308	.001387	4.35	0.000	.1567586
cumdose1	.1766243	.0475395	3.72	0.000	.1119395
cataw1	-.3347958	.1041236	-3.22	0.001	-.1224492
Vodkaw1	.0536018	.0148367	3.61	0.000	.0630928

Continued on the next page ....

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
crhrw3 <-					
crhrw1	.4203441	.0444293	9.46	0.000	.4453153
crhrw2	.9919033	.0337875	29.36	0.000	.9685878
crhrw3	.0104058	.0039192	2.66	0.008	.0104058
PTSDw2	-.001091	.0003804	-2.87	0.004	-.0102938
BSIanx	.010976	.0013975	7.85	0.000	.0451143
depagw2	.0086935	.0013948	6.23	0.000	.1894451
depagw3	.0041014	.0011667	3.52	0.000	.0964442
whpsleep	.0006174	.0003284	1.88	0.060	.0215681
Vodkaw2	.0541355	.0147138	3.68	0.000	.0568364
fdferw2	.0073633	.0014166	5.20	0.000	.2126352
BSIdep	.0174565	.0061755	2.83	0.005	.0737431
PTSDw1	.0007067	.0004326	1.63	0.102	.0264553
anxagw1	.0032151	.0009249	3.48	0.001	.1287451
whpel	.0005981	.0000966	6.19	0.000	.0232004
anxagw3	.0030024	.0012454	2.41	0.016	.0783614
MiPTSD	.0044048	.0020103	2.19	0.028	.0582464
injselfr	.886496	.0965287	9.18	0.000	.4611966
cumdose2	.0402274	.0144319	2.79	0.005	.0625793
depagw1	.0054349	.0006239	8.71	0.000	.1725215
fdferw1	.0038512	.0006463	5.96	0.000	.1642297
PTSDw3	.0035278	.000715	4.93	0.000	.0338145
anxagw2	.008603	.0014501	5.93	0.000	.2183597
cumdose1	.176736	.0473766	3.73	0.000	.1093774
cataw1	-.3465518	.1039463	-3.33	0.001	-.1237695
Vodkaw1	.0583669	.0176115	3.31	0.001	.0670867
PTSDw2 <-					
crhrw1	.7886438	.4197271	1.88	0.060	.0885507
crhrw2	.0836336	.0464033	1.80	0.071	.0086556
crhrw3	.0065729	.0024756	2.66	0.008	.0006966
BSIanx	.0069582	.0008818	7.89	0.000	.0030312
depagw2	.2380563	.058727	4.05	0.000	.5498147
depagw3	.0004983	.0000922	5.40	0.000	.0012418
whpsleep	.0004005	.0000728	5.50	0.000	.0014829
Vodkaw2	1.011725	.3486567	2.90	0.004	.1125785
fdferw2	.0009287	.000148	6.28	0.000	.0028423
BSIdep	.0110266	.0038945	2.83	0.005	.0049369
PTSDw1	.0490269	.0147373	3.33	0.001	.194528
anxagw1	.0069481	.0110324	0.63	0.529	.0294885
whpel	.0003778	.000061	6.19	0.000	.0015532
MiPTSD	.0027736	.001268	2.19	0.029	.0038872
injselfr	.5590131	.0769438	7.27	0.000	.0308234
cumdose2	.0033918	.0012168	2.79	0.005	.0005592
depagw1	.0752116	.0216367	3.48	0.001	.2530382
fdferw1	.0024462	.0010357	2.36	0.018	.0110557
PTSDw3	.0018799	.00039	4.82	0.000	.0019098
anxagw2	.1152707	.0168011	6.86	0.000	.3100921
cumdose1	1.168935	.4904622	2.38	0.017	.0766728
cataw1	2.462398	.6742135	3.65	0.000	.0932078
Vodkaw1	.4280787	.2949669	1.45	0.147	.0521485

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
BSIanx <-					
crhrw1	-.6380969	.3053973	-2.09	0.037	-.1644668
crhrw2	1.105659	.3274592	3.38	0.001	.2626757
crhrw3	.250372	.0942981	2.66	0.008	.0609137
PTSDw2	-.0098442	.0034327	-2.87	0.004	-.0225975
BSIanx	-.1745221	.0268874	-6.49	0.000	-.1745221
depagw2	.0095657	.0043165	2.22	0.027	.0507149
depagw3	.0265677	.0041898	6.34	0.000	.1519921
whpsleep	-.0004973	.0020122	-0.25	0.805	-.004227
Vodkaw2	.6751084	.2035683	3.32	0.001	.1724434
fdferw2	.0132477	.0074633	1.78	0.076	.0930746
BSIdep	.4200168	.0490334	8.57	0.000	.4316777
PTSDw1	.0137459	.0057833	2.38	0.017	.125199
anxagw1	.0061673	.0024705	2.50	0.013	.0600842
whpel	.0143898	.0023244	6.19	0.000	.1358105
anxagw3	.0270911	.0079415	3.41	0.001	.1720225
MiPTSD	-.0893396	.0337286	-2.65	0.008	-.2874166
injselfr	.1365389	.1046586	1.30	0.192	.017282
cumdose2	.0448409	.0160871	2.79	0.005	.0169712
depagw1	.0391348	.007622	5.13	0.000	.3022349
fdferw1	.0055381	.0013283	4.17	0.000	.0574574
PTSDw3	.0737854	.0300534	2.46	0.014	.1720674
anxagw2	.0389311	.0041791	9.32	0.000	.2404081
cumdose1	1.489678	.333136	4.47	0.000	.2242973
cataw1	.8247241	.3386361	2.44	0.015	.0716611
Vodkaw1	.8656266	.1320265	6.56	0.000	.2420635
depagw2 <-					
crhrw1	-2.258931	.8340322	-2.71	0.007	-.109819
crhrw2	.2560206	.1928965	1.33	0.184	.0114725
crhrw3	-.0160871	.0060589	-2.66	0.008	-.0007382
BSIanx	-.0170515	.0021575	-7.90	0.000	-.0032162
depagw2	6.23e-06	.0005475	0.01	0.991	6.23e-06
depagw3	-.0012204	.0002259	-5.40	0.000	-.0013169
whpsleep	-.0009892	.0001507	-6.56	0.000	-.0015857
Vodkaw2	4.176009	1.45968	2.86	0.004	.2011951
fdferw2	.000886	.0004096	2.16	0.031	.0011741
BSIdep	-.0269872	.0095262	-2.83	0.005	-.0052316
PTSDw1	-.0576735	.0398201	-1.45	0.148	-.0990802
anxagw1	.0161673	.0462592	0.35	0.727	.0297088
whpel	-.0009246	.0001493	-6.19	0.000	-.0016459
MiPTSD	-.0067809	.003102	-2.19	0.029	-.0041147
injselfr	-1.367363	.2199279	-6.22	0.000	-.0326441
cumdose2	.0103831	.003725	2.79	0.005	.0007412
depagw1	.3663815	.0641743	5.71	0.000	.5337014
fdferw1	-.0057088	.0029595	-1.93	0.054	-.0111714
PTSDw3	-.0046046	.0009552	-4.82	0.000	-.0020254
anxagw2	.485354	.0705698	6.88	0.000	.5653191
cumdose1	3.966246	1.56179	2.54	0.011	.1126404
cataw1	2.445573	1.989661	1.23	0.219	.040081
Vodkaw1	2.093189	1.227374	1.71	0.088	.1104054

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
depagw3 <-					
crhrw1	-4.347522	1.543091	-2.82	0.005	-.1958691
crhrw2	6.351935	1.354837	4.69	0.000	.2637771
crhrw3	.0014333	.0005398	2.66	0.008	.000061
PTSDw2	-.0532596	.0185718	-2.87	0.004	-.0213703
BSIanx	.0012236	.0002102	5.82	0.000	.0002139
depagw2	.6790289	.0766307	8.86	0.000	.6292709
depagw3	.0690196	.011811	5.84	0.000	.0690196
whpsleep	-.0000354	.0018456	-0.02	0.985	-.0000526
Vodkaw2	2.85642	.9925178	2.88	0.004	.1275344
fdferw2	.0436293	.0089978	4.85	0.000	.0535797
BSIdep	.0024044	.0009236	2.60	0.009	.000432
PTSDw1	-.0292502	.0274282	-1.07	0.286	-.0465681
anxagw1	.0492644	.033544	1.47	0.142	.0838941
whpel	.0000824	.0000133	6.19	0.000	.0001359
anxagw3	.1465696	.0903124	1.62	0.105	.1626804
MiPTSD	.000707	.000298	2.37	0.018	.0003976
injselfr	.1329836	.6350603	0.21	0.834	.0029422
cumdose2	.2576077	.0924191	2.79	0.005	.0170423
depagw1	.2772818	.0438154	6.33	0.000	.3743136
fdferw1	.0054128	.0059868	0.90	0.366	.0098162
PTSDw3	.0322196	.015976	2.02	0.044	.0131335
anxagw2	.4458294	.0487964	9.14	0.000	.4812306
cumdose1	3.654434	1.280203	2.85	0.004	.0961799
cataw1	-.3175649	1.706455	-0.19	0.852	-.0048232
Vodkaw1	1.899033	.9602502	1.98	0.048	.0928247
whpsl~p <-					
crhrw1	3.264496	1.93857	1.68	0.092	.0989987
crhrw2	4.884714	1.349615	3.62	0.000	.1365398
crhrw3	1.04901	.3950906	2.66	0.008	.0300283
PTSDw2	-.0430932	.0150267	-2.87	0.004	-.0116389
BSIanx	3.351993	.4292509	7.81	0.000	.3943889
depagw2	.0815741	.0179591	4.54	0.000	.0508851
depagw3	.1700077	.0322846	5.27	0.000	.1144347
whpsleep	.0009155	.0078328	0.12	0.907	.0009155
Vodkaw2	2.962815	.8564596	3.46	0.001	.0890429
fdferw2	.0587307	.0301354	1.95	0.051	.0485486
BSIdep	1.759788	.2021521	8.71	0.000	.2128016
PTSDw1	.0600708	.0239769	2.51	0.012	.0643743
anxagw1	.0453059	.011484	3.95	0.000	.0519328
whpel	.0602905	.0097388	6.19	0.000	.0669497
anxagw3	.1185919	.0345103	3.44	0.001	.0886004
MiPTSD	-.3372269	.1374477	-2.45	0.014	-.1276474
injselfr	4.596278	.4947854	9.29	0.000	.0684489
cumdose2	.1981034	.0710714	2.79	0.005	.0088217
depagw1	.1869333	.031042	6.02	0.000	.1698596
fdferw1	.0519119	.0086186	6.02	0.000	.0633683
PTSDw3	.6745651	.220754	3.06	0.002	.1850861
anxagw2	.1820353	.0170128	10.70	0.000	.1322603
cumdose1	6.480121	1.565545	4.14	0.000	.1147985
cataw1	3.575319	1.529799	2.34	0.019	.036552
Vodkaw1	3.733317	.6888738	5.42	0.000	.1228331

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
Vodkaw2 <-					
crhrw1	-.0709653	.0467987	-1.52	0.129	-.0716085
crhrw2	.069005	.0460847	1.50	0.134	.0641809
crhrw3	-.0001683	.0000634	-2.66	0.008	-.0001603
BSIanx	-.0001815	.0000225	-8.08	0.000	-.0007106
depagw2	.000395	.0001011	3.91	0.000	.008198
depagw3	-.0000129	2.39e-06	-5.40	0.000	-.0002888
whpsleep	-.0000116	.0000196	-0.59	0.553	-.0003872
Vodkaw2	.001374	.000564	2.44	0.015	.001374
fdferw2	.000464	.0000977	4.75	0.000	.0127634
BSIdep	-.0002824	.0000989	-2.86	0.004	-.0011363
PTSDw1	-.0000181	.0000158	-1.15	0.252	-.0006444
anxagw1	.0000308	.0000243	1.27	0.203	.0011765
whpel	-9.67e-06	1.56e-06	-6.19	0.000	-.0003575
anxagw3	-7.16e-06	2.06e-06	-3.48	0.001	-.0001781
MiPTSD	-.0000699	.0000322	-2.17	0.030	-.0008802
injselfr	-.0141921	.0085841	-1.65	0.098	-.0070325
cumdose2	.0027986	.001004	2.79	0.005	.0041467
depagw1	.0001621	.0000252	6.43	0.000	.0049007
fdferw1	-.0000197	.0000945	-0.21	0.835	-.0008
PTSDw3	-.0000487	.0000101	-4.82	0.000	-.0004446
anxagw2	.0004067	.0000919	4.42	0.000	.0098327
cumdose1	.0075803	.0066822	1.13	0.257	.0044684
cataw1	-.0277995	.0177734	-1.56	0.118	-.0094567
Vodkaw1	.8187495	.0752573	10.88	0.000	.8963481
fdferw2 <-					
crhrw1	-2.054351	.1598719	-12.85	0.000	-.0753662
crhrw2	-3.91763	1.871172	-2.09	0.036	-.1324745
crhrw3	-.040585	.0152856	-2.66	0.008	-.0014054
PTSDw2	.0006978	.0002433	2.87	0.004	.000228
BSIanx	-.0495694	.0053585	-9.25	0.000	-.0070554
depagw2	-.0270153	.0055987	-4.83	0.000	-.0203863
depagw3	-.0033433	.00062	-5.39	0.000	-.0027224
whpsleep	-.0052341	.0410578	-0.13	0.899	-.0063318
Vodkaw2	-.1847226	.0485174	-3.81	0.000	-.0067159
fdferw2	-.0289596	.0055819	-5.19	0.000	-.0289596
BSIdep	-.0680842	.0223895	-3.04	0.002	-.0099598
PTSDw1	.0314549	.0065003	4.84	0.000	.0407781
anxagw1	.0910199	.0195833	4.65	0.000	.1262155
whpel	-.0023326	.0003768	-6.19	0.000	-.0031335
anxagw3	-.0019204	.0005528	-3.47	0.001	-.0017356
MiPTSD	-.0148276	.0073681	-2.01	0.044	-.0067897
injselfr	-3.202304	.359968	-8.90	0.000	-.0576914
cumdose2	-.1588825	.0570005	-2.79	0.005	-.008559
depagw1	.0559659	.0071908	7.78	0.000	.0615199
fdferw1	.342553	.0414729	8.26	0.000	.5058501
PTSDw3	-.0127113	.0026933	-4.72	0.000	-.0042192
anxagw2	-.0241666	.0054478	-4.44	0.000	-.0212412
cumdose1	.3923366	.4917946	0.80	0.425	.0084082
cataw1	9.974225	4.056795	2.46	0.014	.1233571
Vodkaw1	.3205927	.2840002	1.13	0.259	.0127604

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
BSIdep <-					
crhrw1	.1821674	.0703566	2.59	0.010	.0456845
crhrw2	.8205657	.0584371	14.04	0.000	.1896789
crhrw3	.6191558	.2331939	2.66	0.008	.1465669
PTSDw2	-.0021594	.000753	-2.87	0.004	-.0048229
BSIanx	.0606174	.0070976	8.54	0.000	.05898
depagw2	.0171872	.0016662	10.32	0.000	.0886601
depagw3	.0215277	.0040993	5.25	0.000	.1198317
whpsleep	.0165416	.0019713	8.39	0.000	.1367925
Vodkaw2	.8958816	.2586496	3.46	0.001	.2226541
fdferw2	.0063637	.001224	5.20	0.000	.0435014
BSIdep	.0386776	.0055138	7.01	0.000	.0386776
PTSDw1	.0064545	.0020786	3.11	0.002	.0571999
anxagw1	.0039763	.0010935	3.64	0.000	.0376923
whpel	.0355852	.0057481	6.19	0.000	.3267792
anxagw3	.0059425	.0020934	2.84	0.005	.0367144
MiPTSD	-.0028697	.0028163	-1.02	0.308	-.0089828
injselfr	.5938456	.0707676	8.39	0.000	.0731339
cumdose2	.0332787	.011939	2.79	0.005	.0122549
depagw1	.0139398	.0012533	11.12	0.000	.1047476
fdferw1	.0050496	.000818	6.17	0.000	.0509743
PTSDw3	.0691962	.0256121	2.70	0.007	.1570064
anxagw2	.0152012	.0016738	9.08	0.000	.0913349
cumdose1	1.163616	.3892378	2.99	0.003	.1704701
cataw1	.0450769	.1665904	0.27	0.787	.003811
Vodkaw1	.7786049	.2164677	3.60	0.000	.2118472
PTSDw1 <-					
depagw1	.5460726	.0759595	7.19	0.000	.4630247
cumdose1	11.84727	4.232877	2.80	0.005	.1958491
cataw1	39.20859	5.376336	7.29	0.000	.3740483
Vodkaw1	3.820257	1.518111	2.52	0.012	.1172906
anxagw1 <-					
PTSDw1	.3374817	.0701669	4.81	0.000	.3155096
depagw1	.7246201	.0741567	9.77	0.000	.5744159
cumdose1	10.32614	3.781802	2.73	0.006	.1595893
cataw1	19.74519	4.119168	4.79	0.000	.1761044
Vodkaw1	5.069353	1.963719	2.58	0.010	.1455075

Continued on the next page ....

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
whpel <-					
crhrw1	.6934566	1.009086	0.69	0.492	.0189379
crhrw2	3.542952	.754158	4.70	0.000	.0891837
crhrw3	.4953354	.1865591	2.66	0.008	.0127688
PTSDw2	-.0307149	.0107104	-2.87	0.004	-.0074705
BSIanx	1.582135	.2025701	7.81	0.000	.1676352
depagw2	.1708109	.0200398	8.52	0.000	.0959521
depagw3	.2885378	.0787651	3.66	0.000	.1749009
whpsleep	.4723523	.0561759	8.41	0.000	.4253692
Vodkaw2	1.954828	.508176	3.85	0.000	.0529058
fdferw2	.0362181	.0145279	2.49	0.013	.0269611
BSIdep	.8309601	.0954469	8.71	0.000	.0904888
PTSDw1	.17844	.0551612	3.23	0.001	.1722035
anxagw1	.0309806	.0106768	2.90	0.004	.0319799
whpel	.0284688	.0045986	6.19	0.000	.0284688
anxagw3	.0845269	.0292744	2.89	0.004	.056869
MiPTSD	-.1590088	.06488	-2.45	0.014	-.0542014
injselfr	2.195021	.2798302	7.84	0.000	.0294373
cumdose2	.1436872	.0515491	2.79	0.005	.0057621
depagw1	.2273223	.0215067	10.57	0.000	.186014
fdferw1	.0255534	.0039355	6.49	0.000	.0280901
PTSDw3	.3246238	.1043025	3.11	0.002	.0802103
anxagw2	.1727806	.0147022	11.75	0.000	.1130496
cumdose1	5.615932	1.63315	3.44	0.001	.0895932
cataw1	7.733741	2.52095	3.07	0.002	.071201
Vodkaw1	2.727055	.5549182	4.91	0.000	.0808005

Continued on the next page ....

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
anxagw3 <-					
crhrw1	-2.33165	.7191658	-3.24	0.001	-.0946447
crhrw2	2.957565	.6354412	4.65	0.000	.1106557
crhrw3	-.0017142	.0006456	-2.66	0.008	-.0000657
PTSDw2	-.3883912	.1354331	-2.87	0.004	-.1404077
BSIanx	-.0019528	.0002266	-8.62	0.000	-.0003075
depagw2	.2329122	.0428471	5.44	0.000	.194469
depagw3	.5026865	.0861033	5.84	0.000	.4529038
whpsleep	-.0001622	.0008534	-0.19	0.849	-.0002171
Vodkaw2	.976027	.3401942	2.87	0.004	.0392623
fdferw2	.0201858	.0041883	4.82	0.000	.0223345
BSIdep	-.0028757	.0009809	-2.93	0.003	-.0004655
PTSDw1	.0332543	.0195678	1.70	0.089	.0476999
anxagw1	.2127448	.0386089	5.51	0.000	.3264117
whpel	-.0000985	.0000159	-6.19	0.000	-.0001464
anxagw3	.0688464	.0424658	1.62	0.105	.0688464
MiPTSD	-.0006753	.0003209	-2.10	0.035	-.0003421
injselfr	-.1405753	.3160031	-0.44	0.656	-.0028021
cumdose2	.1199463	.0430318	2.79	0.005	.0071493
depagw1	.2422999	.0245942	9.85	0.000	.2946973
fdferw1	.0088636	.0041024	2.16	0.031	.0144822
PTSDw3	.2319101	.1164345	1.99	0.046	.0851705
anxagw2	.835728	.0635175	13.16	0.000	.8127521
cumdose1	3.277893	1.211011	2.71	0.007	.0777262
cataw1	2.748808	1.596572	1.72	0.085	.0376149
Vodkaw1	3.212743	1.41395	2.27	0.023	.1414867

Continued on the next page ....

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
MiPTSD <-					
crhrw1	-1.553115	.722316	-2.15	0.032	-.1244306
crhrw2	2.411442	.7745169	3.11	0.002	.1780768
crhrw3	.5631637	.2121054	2.66	0.008	.0425888
PTSDw2	-.024011	.0083727	-2.87	0.004	-.0171326
BSIanx	1.859749	.2484236	7.49	0.000	.5780777
depagw2	.1654189	.0378372	4.37	0.000	.2726052
depagw3	.0966634	.0185856	5.20	0.000	.1718944
whpsleep	.0796674	.0170213	4.68	0.000	.2104705
Vodkaw2	2.124509	.5590182	3.80	0.000	.16868
fdferw2	.1164351	.0238874	4.87	0.000	.2542761
BSIdep	.9447468	.1104408	8.55	0.000	.3018147
PTSDw1	.0333296	.0154401	2.16	0.031	.0943604
anxagw1	.0480117	.0183231	2.62	0.009	.1453934
whpel	.0323671	.0052283	6.19	0.000	.0949542
anxagw3	.0660779	.0192419	3.43	0.001	.1304209
MiPTSD	-.2019943	.0759832	-2.66	0.008	-.2019943
injselfr	.1940389	.2378308	0.82	0.415	.0076341
cumdose2	.0977979	.0350859	2.79	0.005	.0115053
depagw1	.0848957	.0296994	2.86	0.004	.2037978
fdferw1	.0506601	.0072106	7.03	0.000	.1633734
PTSDw3	.3902314	.074859	5.21	0.000	.2828671
anxagw2	.0168827	.0368647	0.46	0.647	.0324061
cumdose1	3.322383	.8396767	3.96	0.000	.1554938
cataw1	-1.278002	1.38743	-0.92	0.357	-.0345174
Vodkaw1	1.5458	.4129824	3.74	0.000	.1343643

Continued on the next page ....

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
injse~r <-					
crhrw1	-.0073739	.0051796	-1.42	0.155	-.0150158
crhrw2	.026256	.005385	4.88	0.000	.049282
crhrw3	.0118688	.0044702	2.66	0.008	.0228138
PTSDw2	-.0001808	.000063	-2.87	0.004	-.0032784
BSIanx	.0125703	.0015921	7.90	0.000	.0993136
depagw2	.0012764	.0002458	5.19	0.000	.0534636
depagw3	.0009	.0001666	5.40	0.000	.0406778
whpsleep	.0007256	.000115	6.31	0.000	.0487244
Vodkaw2	.0254527	.0064589	3.94	0.000	.0513652
fdferw2	.0008215	.0001577	5.21	0.000	.0455978
BSIdep	.0199107	.0070308	2.83	0.005	.1616748
PTSDw1	.0009818	.0002003	4.90	0.000	.0706502
anxagw1	.0023851	.0005922	4.03	0.000	.1835832
whpel	.0006821	.0001102	6.19	0.000	.0508646
anxagw3	.0004975	.0001431	3.48	0.001	.0249569
MiPTSD	.0050063	.0022893	2.19	0.029	.1272467
injselfr	.0091956	.0021916	4.20	0.000	.0091956
cumdose2	.0010648	.000382	2.79	0.005	.0031841
depagw1	.0021934	.0002563	8.56	0.000	.1338348
fdferw1	.000388	.0000544	7.13	0.000	.0318056
PTSDw3	.0033955	.0007044	4.82	0.000	.0625598
anxagw2	.0003107	.0002407	1.29	0.197	.0151593
cumdose1	.0575618	.017455	3.30	0.001	.0684744
cataw1	.0325732	.0196992	1.65	0.098	.0223613
Vodkaw1	.0305022	.0068659	4.44	0.000	.0673895
cumdo~2 <-					
cumdose1	2.188894	.0836046	26.18	0.000	.8708001
depagw1 <-					
cumdose1	11.71117	4.252571	2.75	0.006	.2283232
cataw1	12.05375	4.692115	2.57	0.010	.1356172
Vodkaw1	6.995877	2.674015	2.62	0.009	.2533139
cumdo~3 <-					
cumdose2	1.231235	.0359156	34.28	0.000	.9679575
cumdose1	2.695043	.1392837	19.35	0.000	.8428975
fdferw1 <-					
PTSDw1	.1005482	.0209053	4.81	0.000	.0882712
anxagw1	.2979369	.0570277	5.22	0.000	.2797733
depagw1	.215891	.022094	9.77	0.000	.1607063
cumdose1	3.076538	1.253696	2.45	0.014	.0446488
cataw1	5.88282	1.780732	3.30	0.001	.0492693
Vodkaw1	1.510347	.6474797	2.33	0.020	.0407091

Continued on the next page ....

Table 11 Clustered robust total effects for female PTSD model-continued:

Total effects (Std. Err. adjusted for 362 clusters in id)

	Coef.	Robust Std. Err.	z	P>|z|	Std. Coef.
PTSDw3 <-					
crhrw1	-.6718797	.2384741	-2.82	0.005	-.07426
crhrw2	.9816481	.2093807	4.69	0.000	.100006
PTSDw2	-.0082309	.0028701	-2.87	0.004	-.0081021
depagw2	.1049393	.0118427	8.86	0.000	.238576
depagw3	.1652097	.0454796	3.63	0.000	.4052983
whpsleep	-5.47e-06	.0002852	-0.02	0.985	-.00002
Vodkaw2	.4414401	.1533868	2.88	0.004	.0483522
fdferw2	.0067426	.0013905	4.85	0.000	.0203137
BSIdep	.0003716	.0001427	2.60	0.009	.0001638
PTSDw1	-.0011881	.0043853	-0.27	0.786	-.0046403
anxagw1	.0174876	.005499	3.18	0.001	.073058
anxagw3	.0226513	.0139572	1.62	0.105	.0616771
MiPTSD	.0001093	.000046	2.37	0.018	.0001507
injselfr	.0205517	.0981442	0.21	0.834	.0011155
cumdose2	.0398115	.0142827	2.79	0.005	.0064613
depagw1	.050007	.006813	7.34	0.000	.1656091
fdferw1	.0339782	.010171	3.34	0.001	.1511664
PTSDw3	.0049793	.002469	2.02	0.044	.0049793
anxagw2	.0688999	.0075412	9.14	0.000	.1824494
cumdose1	.6667293	.2950158	2.26	0.024	.043048
cataw1	.1458889	.296515	0.49	0.623	.0054359
Vodkaw1	.343538	.1996054	1.72	0.085	.0411951
anxagw2 <-					
PTSDw1	.0959793	.0199554	4.81	0.000	.1415642
anxagw1	.2843984	.0468098	6.08	0.000	.4486842
depagw1	.2060808	.0210901	9.77	0.000	.2577314
cumdose1	2.936738	1.195091	2.46	0.014	.0716052
cataw1	5.615501	1.519645	3.70	0.000	.0790152
Vodkaw1	3.689356	1.560993	2.36	0.018	.1670695

10.9 Cyclical contribution to persistence

10.9.1 Wave 3 self-reported depression - anxiety cycle

When review Figure 6 on page 56, we can identify two feedback cycles. The first of these cycles exists between expressions of anxiety in wave 3 and self-reports of depression in the same wave. The second is the relationship between BSI anxiety and the Chornobyl MiPTSD at the time of the interview. Ordinarily, we assume that there is no reverse causation in the path diagram, except in cases where we find arrows pointing to the other of two variables. If one arrow is called β_1 and the other arrow is called β_2, these two arrows identify a situation of reciprocal causation. Under these circumstances, the feedback, holding all other effects constant, is defined by

$$(I - \beta_1\beta_2)^{-1} = 1 + \beta_1\beta_2 + (\beta_1\beta_2)^2 + (\beta_1\beta_2)^3 + \cdots \quad (1)$$

We can graph the decay rate of these effects. First consider the wave 3 cycle between self-reported depression and self-reported anxiety. We can examine the reciprocal effects on the reciprocal effects of a unit impulse on the β_i parameters.

On page 95 and 91, respectively, we find

anxagw3 = 0.453*depagw3
depagw3 = 0.163*anxagw3

which generates the direct effect decay depicted in Figure 7.

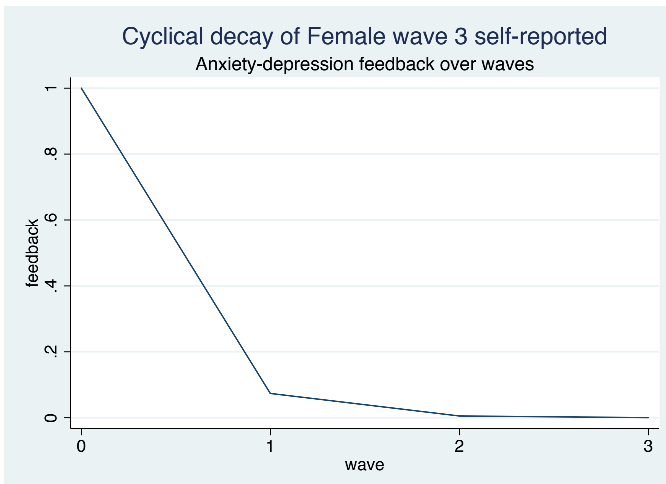

Figure 7: Wave 3 Depression anxiety cyclical decay among women

If we make the assumption that the indirect effects of a variable upon itself through other variables are more or less immediate and occur during the same wave, we may observe feedback of those direct effects along with the indirect effects of the variable upon itself. If we add to those direct effects, the indirect effects of the variable upon itself mediated by other variables, with an assumption of a unit impulse on both depagw3 and anxagw3 on pages 91 and 95 we observe the decay depicted in Figure 8 which boosts the fist impulse to delay the decay slightly.

(1- 0.069)anxagw3 = .453*depagw3
(1-0.069)depagw3 = .163*anxagw3

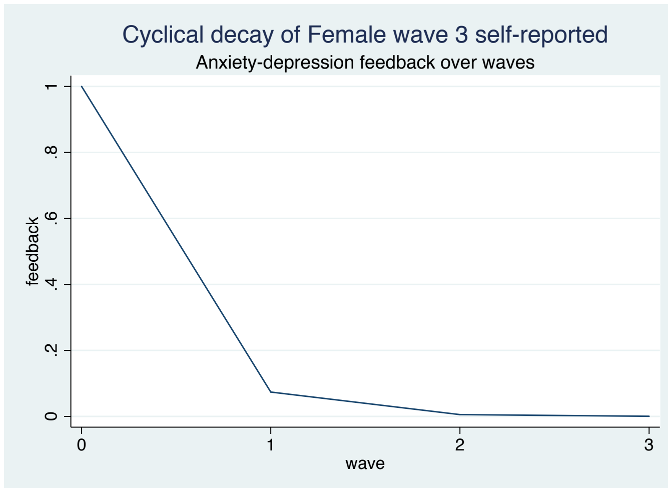

Figure 8: Wave 3 Feedback of depression- anxiety total effects cyclical decay among women

The assumption required for recycling the total rather than the direct effects requires that the indirect effects of the variable upon itself through other variables takes place during the same wave, an assumption that may not be warranted. Be that as it may, the delay in decay provides for persistence of the effects on women that has implications for the recovery of victims of these effects.

10.9.2 Current BSI anxiety- MiPTSD cycle

From pages 90 and 96, we can obtain the standardized coefficients needed for formulation of persistence of reciprocal direct effects.

$$(I - \beta_1\beta_2)^{-1} = 1 + \beta_1\beta_2 + (\beta_1\beta_2)^2 + (\beta_1\beta_2)^3 + \cdots \quad (2)$$

and they are

$$\begin{aligned} BSIanx &= -0.287 * MiPTSD \\ MiPTSD &= 0.578 * BSIanx \end{aligned} \quad (3)$$

If we partial out the cyclical effect from others in the model, the decay should resemble an exponentially declining undulation owing to the negative sign before the effects by graphically approximating $(1 + (-.287) * (.578) + \{(-.287) * (.578)\}^2 + \{(-.287) * (.578)\}^3 + \cdots$ depicted in Figure 9. Usually negative feedback reduces persistence and contributes to a more short-lived effect.

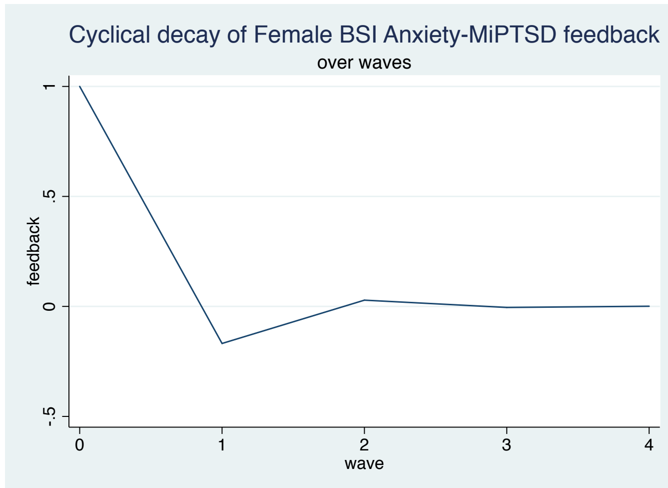

Figure 9: Undulating decay of Anxiety-PTSD feedback cycle among women

Because the assumption required to add the indirect effects of the variable upon itself mediated by others may well require a delay, we will not belabor the delayed decay of the reciprocal effect at this point.

10.10 Spurious relationship tests

The target endogenous variable in this model is the civilian Mississippi PTSD revised specifically for application to Chornobyl. There are three exogenous variables in this model. We wanted to be sure that they were not creating a spurious relationship between Chornobyl PTSD and BSI anxiety, which we found to be increasing PTSD persistence. Therefore, we tested several direct causal links which might artificially construct a common cause for those two reciprocally linked endogenous variables. The resulting models of direct relationships that fit the data revealed no basis for concern.

First, we examined the relationship between vodka consumption and the two reciprocally linked variables. Although it is possible for Vodka consumption to be related to cumulative external 1986 exposure, as shown in Figure 10, it is not realistic to believe that this would be the case. Vodka consumption does not lead to cumulative external dose unless it causes one to loose one's bearings and to meander into the exclusion zone. Although this could lead to a statistically significant link between Vodka and the cumdose1 variable, such events would not be commonplace among the populace. We observe no link extending from Vodka consumption in 1986 to external cumulative dose in the same year in Figure 6, nor do we find any arrow extending from such vodka consumption to MiPTSD in Figure 6 either. Therefore, vodka consumption is not likely to be a common cause of exposure to radiation in that year and anxiety or contemporary

Chornobyl PTSD.

/Users/robertyaffee/Documents/data/rptfigs/vodkawX1.pdf

Figure 10: Possible but unrealistic

It is more likely that vodka consumption in 1986 is not exogenous after all, but really follows from anxiety in the first wave.

We also examined the relationship between catastrophe during the first wave to determine whether that could engender a spurious relationship between BSI anxiety and MiPTSD, but found no linking relationship extending from such catastrophic experience to either MiPTSD or BSI anxiety in a model depicted in Figure 11.

We also wondered whether cumulative external dose could create a spurious relationship between contemporary Chornobyl PTSD and BSI anxiety. In Table, we performed some non- nested regression analysis using self-reported PTSD symptoms and then MiPTSD as a dependent variable, with clustered robust standard errors, to ascertain whether reconstructed cumulative external dose in 1986 could directly affect both MiPTSD and BSI measured anxiety. The parameter estimates generated suggested no direct link from cumulative external reconstructed dose to MiPTSD. Without such a link, there cannot be a direct spurious relationship resulting from our exogenous variable, reconstructed cumulative external dose.

Merely because there is no direct spurious effect does not mean that there cannot be an indirect spurious effect. If we re-examine Figure 6, for example, we

/Users/robertyaffee/Documents/data/rptfigs/spurCatCumdose1.pdf

Figure 11: Test of spuriousness of relationship based on 1986 catastrophic experience

observe a direct effect emanating from cumulative external dose to BSI anxiety, a connection that is reasonable if the individual knew of actual exposure it would be surprising if he or she were not anxious about it. Although we see no direct link from cumulative external 1986 dose to MiPTSD, we do find one extending to self-expressed depression in 1986 and from there directly to MiPTSD. Could this indirect relationship be the basis of an indirect or proximate spurious reciprocal relationship? With the total effects standardized coefficients from cumdose1 impacting MiPTSD (cumdose1 stdized $\beta = .155,\ p = 0.000) andBSIanx(\beta = .224, p = .015$) being so small, that would be quite unlikely.

10.11 Non-nested sequential regression alternative perspective

None of the variables remains significant over all three waves. The magnitudes of the direct effects change from wave to wave. For the first three waves, the dependent variables are self-reported PTSD symptoms for the specific waves. The regression model on the far right is the civilian Mississippi PTSD revised for Chornobyl. Hence, the models are not nested under the same dependent variable. Nevertheless, it is helpful to be able to track the changes in the direct effects coefficients over the waves and to compare them with those of a model for clinical PTSD, even if they do not reveal the mediated effects revealed by structural equation path models with clustered robust effects.

Table 12 Female PTSD regression analysis with clustered robust standard errors

	wave1ptsd b/t/p	wave2ptsd b/t/p	wave3ptsd b/t/p	currentptsd b/t/p
cumdose1	0.394 (0.808) (0.420)	-0.402# (-1.715) (0.087)	-0.386 (-1.337) (0.182)	-0.321 (-0.489) (0.625)
depagw1	0.233*** (3.461) (0.001)	-0.002 (-0.100) (0.920)	0.001 (0.050) (0.960)	-0.013 (-0.718) (0.473)
anxagw1	0.353*** (6.143) (0.000)	-0.009 (-0.499) (0.618)	0.019 (1.482) (0.139)	0.051** (3.099) (0.002)
crhrw1	1.327 (1.227) (0.220)	1.933** (3.132) (0.002)	-0.074 (-0.140) (0.888)	-1.206# (-1.840) (0.066)
fdferw1	0.099** (2.971) (0.003)	-0.017 (-1.415) (0.157)	0.012 (0.986) (0.324)	0.014 (1.234) (0.218)
cataw1	26.786*** (7.333) (0.000)	0.313 (0.232) (0.816)	0.975 (1.102) (0.271)	-1.175 (-1.237) (0.217)
injselfr	0.105 (0.052) (0.959)	-0.151 (-0.251) (0.802)	0.919 (1.545) (0.123)	3.488*** (5.109) (0.000)
Vodkaw1	-0.462 (-1.392) (0.164)	0.509 (1.124) (0.261)	0.128 (0.446) (0.656)	0.893* (2.153) (0.032)
PTSDw1		0.058** (3.178) (0.002)	-0.037** (-2.961) (0.003)	0.014 (0.912) (0.362)
cumdose2		0.011 (0.052) (0.958)	0.325 (0.333) (0.739)	2.386 (1.321) (0.187)
depagw2		0.202*** (4.255) (0.000)	-0.182*** (-3.918) (0.000)	0.084* (2.264) (0.024)
anxagw2		0.055# (1.655) (0.098)	-0.107** (-2.674) (0.008)	-0.117** (-2.608) (0.009)
crhrw2		-0.663 (-1.031) (0.303)	0.549 (0.546) (0.585)	0.439 (0.330) (0.742)
Vodkaw2		-0.316 (-0.663) (0.508)	-0.050 (-0.156) (0.876)	-0.637 (-1.382) (0.167)
fdferw2		0.092** (3.227) (0.001)	0.024 (1.095) (0.274)	0.057# (1.836) (0.067)
PTSDw2			0.663*** (8.363) (0.000)	0.051 (0.966) (0.334)
cumdose3			-0.021 (-0.024) (0.981)	-2.202 (-1.294) (0.196)
anxagw3			0.159*** (3.371) (0.001)	0.063 (1.484) (0.138)

crhrw3			-0.704	1.751
			(-0.789)	(1.551)
			(0.430)	(0.121)
depagw3			0.142**	-0.053
			(2.796)	(-1.425)
			(0.005)	(0.155)
fdferw3			0.005	0.046
			(0.198)	(1.329)
			(0.843)	(0.184)
cataw2			-0.695	2.114
			(-0.642)	(0.451)
			(0.521)	(0.652)
Vodkaw3			0.001	0.197
			(0.007)	(0.922)
			(0.995)	(0.357)
PTSDw3				0.166**
				(3.103)
				(0.002)
BSIanx				1.225***
				(8.989)
				(0.000)
_cons	1.612	0.002	-0.072	32.456***
	(1.114)	(0.003)	(-0.135)	(27.180)
	(0.266)	(0.998)	(0.892)	(0.000)
r2	0.532	0.365	0.576	0.551
r2_a	0.526	0.351	0.561	0.535
bic	6549.524	5090.842	4819.724	5084.934
N	701.000	701.000	701.000	701.000

# p<.1, * p<.05, ** p<.01, *** p<.001

Some observations about these unstandardized regression coefficients are noteworthy. Because these models are not nested under the same dependent variable, comparison of the adjusted R^2 as a measure of relative fit of the models is not warranted.Perhaps a rough comparison of the first three models where the dependent variable is a self-report of PTSD symptoms with the last model, where the dependent variable is a clinical measure would make more sense. Nevertheless, all of the models exhibit respectable measures goodness of fit.

The parameter estimates are unstandardized regression coefficients, whose standard errors are clustered robust, as in the path models, to control not only for heteroskedasticity but also for serial correlation between the waves of the study. We find that reconstructed external dose does not significantly predict or explain any of the PTSD measures. There seems to be no statistically significant direct effect of actual exposure to radiation on any of the PTSD measures. It may be a relief to many who thought that they had suffered some damage to their biological systems to discover that this, for the general public, is probably not the case.

Nevertheless, self-reported PTSD in the previous wave is usually a significant explanatory variable (predictor) for self-reported PTSD in the next wave. Fear of consuming contaminated foods plagues the female respondents. It is a significant predictor in waves 1 and 2, but by wave 3 it is no longer statistically significant. It is possible that many may fear injury by Chornobyl from having consumed contaminated food or liquids. Perceived risk of exposure to radiation in 1986 significantly predicts self-reported PTSD in the following decade. It also significantly predicts clinically diagnosable PTSD at the time of the interview.

Substance abuse in the form of excessive liquor consumption is found to be statistically significant insofar as vodka consumption in 1986 appears to predict the revised civilian Mississippi PTSD. However, in waves 2 and 3 this variable exhibits no direct effects on the PTSD dependent variables.

10.12 Hypothesis recapitulation

In the female model we observe no evidence to support hypothesis 3 that radiation directly predicts Chornobyl PTSD as measured by the revised civilian Mississippi PTSD scale.

Nor did we find evidence to support hypothesis 6 that perceived risk of exposure predicts PTSD either.

Moreover, we find no evidence in support of hypothesis 12 that radiation direct predicts substance abuse. There is no path coming from cumulative external dose in wave 1 or later to support this hypothesis.

In support of hypothesis 16, that perceived risk of exposure predicts substance abuse, we find one statistically significant direct path from perceived risk of exposure in wave 1 ($crhrw1\ stdized\ \beta = -0.110,\ p = 0.020$). The relationship is a statistically significant inverse rather than a direct one. Vodka consumption appears to dulls the awareness of perceived risk. Perhaps the more one drinks the less one is aware of any risk in the midst. The path emanating from perceived Chornobyl health risk in the following decade is not statistically significant ($crhrw2\ stdized\ \beta = 0.067,\ p = 0.123$). Moreover, there is no supporting a relationship in wave 3. Therefore, hypothesis 16 appears partly supported by the evidence in 1986. After 1986 this concern seems to have disappeared.

Hypothesis 24 suggests that perceived risk of exposure indirectly predicts substance abuse through the mediation of the Nottingham health measures. If this were so, there might be direct effects from the perceived risk on the Nottingham measures of sleep and energy level. Perceived risk in wave 1 does directly impact sleep (stdized $\beta = .185, p = 0.000$) but this is not so for energy level. But there are no direct paths from sleep to Vodka2 or Vodka1. Nevertheless, there are tiny but significant indirect paths from the energy level on vodka consumption in wave 2. But only wave 2 has an indirect path in to energy level from perceived risk of exposure that is statistically significant. This effect would be an unlikely source of prediction for it would be too indirect and too small to be used for such a purpose.

11 Directions for future research

The impulse response functions characterizing the cyclical decay of effects are the products of linear effects. In future time, we could examine possible nonlinear relationships contributing to these cycles. A Granger Causality tests between self-reported anxiety and PTSD suggest that simultaneous equation models would be needed between anxiety and PTSD at every wave. Granger causality tests between self-reported depression and PTSD suggest reciprocal relationships might exist at waves 2 and 3 between these factors. The same holds for reciprocal relationships between anxiety and depression at waves 2 and 3. There appears to be a basis for believing that these cycles are multivariable in nature and we should explore these relationships in greater detail in future research.

In future research, we would explore the cyclical differences at every wave in these reciprocal relationships.

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