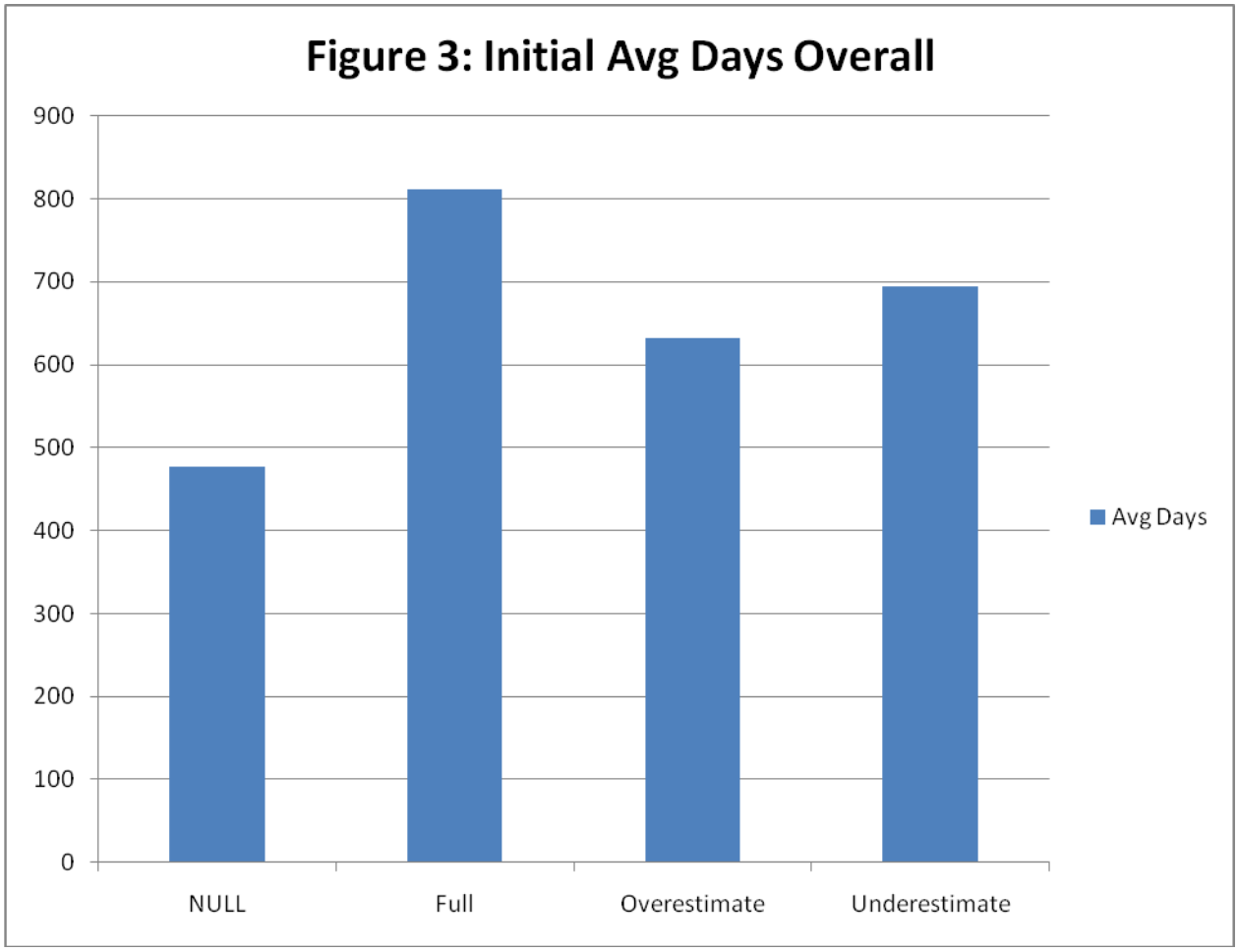
b. Time to Complete Claims

Figure 3[8] shows the average number of days to complete an initial dose reconstruction based on the Dose Estimate Technique.

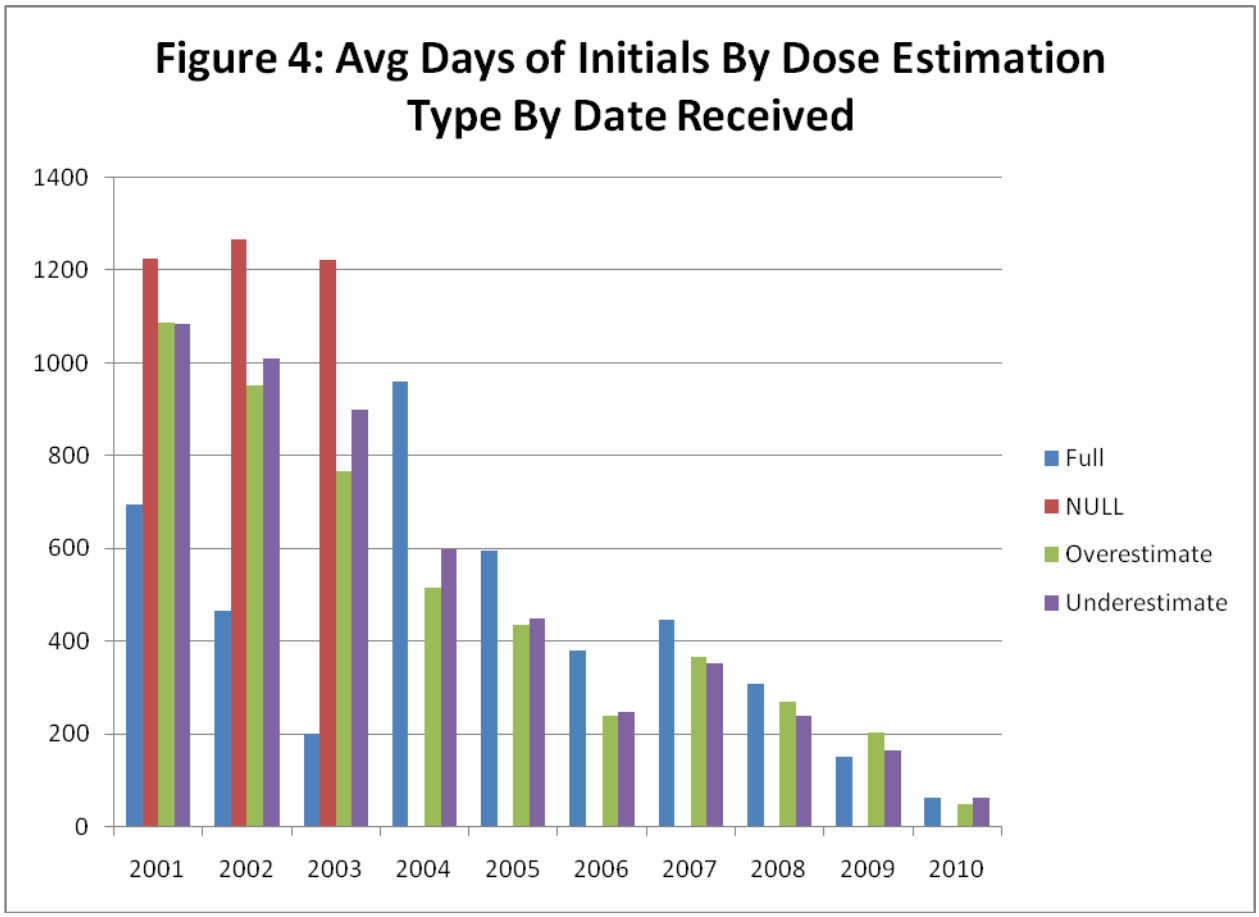


[8] The null bar captures claims that were worked before records were kept of such designations

The findings and conclusions expressed in this report are exclusively those of the author(s) and do not necessarily represent the views or position of the National Institute for Occupational Safety and Health (NIOSH), the Centers for Disease Control and Prevention (CDC), or the Department of Health and Human Services (HHS). This document is only one of many inputs that the NIOSH Director may consider in the ten-year review of NIOSH's performance under the Energy Employees Occupational Illness Compensation Program.

Dose Reconstruction

Figure 4[9] shows the average number of days to complete an initial dose reconstruction by Dose Estimate Technique by year based upon the year the dose reconstruction was received.



[9] The null bar captures claims that were worked before records were kept of such designations

Dose Reconstruction

Table 7 shows the average number of days to complete an initial individual dose reconstruction based on the Dose Estimate Technique by year based upon the year in which the claim was received from DOL.

Table 7: Average Days By Dose Estimation Type By Date Received

	Full	NULL[10]	Overestimate	Underestimate
2001	696	1224	1086	1083
2002	465	1267	950	1008
2003	200	1223	766	900
2004	960	0	515	598
2005	596	0	436	449
2006	379	0	240	247
2007	447	0	365	352
2008	308	0	271	239
2009	152	0	203	166
2010	63	0	49	63

Author's Observations and Conclusions:

1. Both Figure 4 and Table 7 point out the significant improvements that have been made in the time to complete individual dose reconstructions.

2. While Full Best Estimate dose reconstructions take longer, as measured by calendar time passed, than Overestimates and Underestimates (in the majority of years evaluated) that difference is not that great particularly in recent years, 2006 through 2008. For that reason NIOSH needs to explore whether or not it should continue to use Overestimating and Underestimating techniques given the confusion that their use causes with claimants (see Author's Comment 3 in section 1 above). Note: At this writing the author did not have data to determine the man hours consumed by the various types of Dose Estimate Techniques, such data would need to be considered in making any decisions on the continued use of Overestimating and Underestimating Techniques.

[10] The null captures claims that were worked before records were kept of such designations

5. Statistics concerning the number of partial dose reconstructions and the POC's of partial dose reconstructions.

As discussed in **Section I. Background** partial dose reconstructions are performed after the granting of an SEC for individual cases that are covered, at least in part, by that SEC. These cases would be for cancers not included in the congressionally determined list of 22 cancers. All DR's that were completed after the establishment of an SEC, which had employment in that SEC period, were queried. There were 5,011 such cases. 1,300 cases or 27% had a POC greater than or equal to 50% and 3,561 cases or 73% had a POC less than 50%. One needs to be mindful of the fact that multiple cancer sites were involved in some of these cases and that employment in some of these cases straddles SEC and non SEC periods.

Author's Observations and Conclusions:

1. Unless partial dose reconstruction is attempted for cases that are in part covered by an SEC but are for a cancer not on the list of 22, that individual would have no hope of being considered for compensation. Therefore the process of partial dose reconstruction should be continued and if possible expanded upon, i.e. with a more precise definition of the doses that cannot be reconstructed in an SEC definition it would be possible to include more components of dose in a partial dose reconstruction.
2. The percentage of partial dose reconstructions that have resulted in a POC greater than or equal to 50% of 27% is not that different from the percentage of all dose reconstructions with a POC greater than or equal to 50% of 28.5% (see Table 8 below).
3. NIOSH should be commended for its efforts to perform partial dose reconstructions. All scientifically supportable efforts to further expand the process should be explored, such as more precise SEC class definitions that specify exactly the doses that cannot be reconstructed and therefore what doses can be used for partial dose reconstructions.
4. The Advisory Board should be commended for its efforts to recommend SEC class definitions that allow to the degree scientifically supportable, partial dose reconstructions.
5. All parties, NIOSH, the Advisory Board, and the Department of Labor should undertake a detailed review of past SEC class definitions to determine, (1) how to better define classes in the future (that would allow for robust partial dose reconstructions) and, (2) if any of those class definitions could be rewritten to allow for the consideration of addition dose in a partial dose reconstruction.
6. The Department of Labor should be consulted with in the development of SEC class definitions to better ensure that such class definitions can be effectively administered.

Dose Reconstruction

6. The percent of dose reconstructions that have resulted in a POC of greater than or equal to 50%

Table 8 shows the number of individual dose reconstructions that resulted in POC's arrayed in 10% intervals from 0% to greater than or equal to 50%.

Table 8: Number of DR's by POC Range for All NIOSH DR's (26,707 cases as of 4/30/2010)

POC Range	Number	% of Total
0-10%	6690	25.0%
11-20%	3478	13.0%
21-30%	3072	11.5%
31-40%	3451	12.9%
41-50%	2401	9.0%
Greater Than or Equal to 50%	7615	28.5%
All Ranges	26707	99.9%

Author's Observations and Conclusions:

1. Care must be taken not to read too much into the data reported in the ranges below 50% as the dose reconstructions in these ranges can be the result of efficiency measure-dose reconstructions.
2. The current percentage of DR's greater than or equal to 50% of 28.5% is larger than this author's recollection of estimates of compensation rate during the planning and start up of the dose reconstruction activities (10% or less). This seems reasonable owing to the fact that the available data upon which to base dose reconstructions is (in the opinion of the author) more complex, and based upon monitoring methods of less accuracy than those in use today and therefore more suspect and incomplete particularly in the early years (40's and 50's) of the weapons programs than was thought to be the case at the start of the program.
3. Given the fact that the percentage of DR's with a POC greater than or equal to 50% is a function of, among other factors, the availability and reliability of data from sites across the DOE complex, I am not aware of a method to more rigorously evaluate whether the current value of 28.5% is reasonable.

Dose Reconstruction

7. Individual dose reconstruction compensation results based on the cancer model used

Table 9 shows the Rank by Compensation Rate for the top ten ranked NIOSH-IREP Models for claims with a single primary cancer. Also shown is the percent compensated and not compensated as well as the percent of the total number of claims and the percentage of the total number of claims. The ten NIOSH-IREP Cancer Models listed were the only NIOSH-IREP Cancer models with a percent compensated above the overall program average of 28.5%. Only claims that involve a single cancer are included as multiple cancer claims would mask the actual compensation rate for individual cancers.

Table 9: Rank by Compensation Rate for Ten NIOSH-IREP Cancer Models

Rank by Compensation Rate	NIOSH-IREP Cancer Model (ICD-9 Code)	Percent Compensated (PC greater than or equal to 50%)	Percent Not Compensated (PC less than 50%)	Number of Claims with this ICD-9 Code	Percent of Claims with this ICD-9 Code of the Total Number Of Claims
1	Lung (162)	70.2	29.8	3438	22.5
2	Chronic Myeloid Leukemia (205.1)	59.7	40.3	67	0.4
3	Non-melanoma Skin Basal Cell (173)	57.8	42.2	1108	7.3
4	Acute Lymphocytic Leukemia (204.0)	56.9	43.1	65	0.4
5	Liver (155.0)	48.2	51.8	112	0.7
6	Acute Myeloid Leukemia (205.0)	41.6	58.4	149	1.0
7	Malignant Melanoma (172)	38.8	61.2	405	2.7
8	Lymphoma & Multiple Myeloma(200-203)	38.1	61.9	1161	7.6
9	Leukemia, excl. CLL (204-208, excl 204.1)	35.4	64.6	99	0.6
10	Other respiratory (160,161,163-165)	34.9	65.1	436	2.9

One question that comes to mind when reviewing the data in Table 9, is whether or not this rank by compensation rate "makes sense"?

Dose Reconstruction

In an attempt to address that question NIOSH provided to the author the analysis that follows:

> *"Evaluation of Reasonableness of Program Relative Compensation Rates*
>
> *Two factors influence the relative compensability of the IREP cancer models, the relative radiation risks of the individual cancers and the typical magnitude of doses received by the target organs for each of the IREP models. While radiation risks have been studied extensively, the discussion of relative doses received by various target organs will necessarily be somewhat general.*
>
> *In 2006 the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) published a summary of radiation risks for 22 specific types of cancers as well as for all solid tumors. Data from that report are reproduces in Table A. The data includes not only the central estimate for the radiation risk, but also the range of the 90% confidence interval. The cancers in this table do not coincide exactly with the cancer models in IREP, but they can generally be related to IREP models.*

Table A. Excess Relative Risk per Sievert (ERR/Sv) for Various Cancers

Cancer risk values reported in UNSCEAR 2006 - All values based on RERF incidence data

(Values extracted from tables 19 through 44)

		90% Conf. Interval		
Cancer	**ERR/Sv**	**Low**	**High**	**Cases**
All solid cancers	*0.62*	*0.55*	*0.69*	*7851*
Salivary gland	*2.55*	*0.87*	*5.72*	*23*
Esophagus	*0.51*	*0.14*	*0.99*	*152*
Stomach	*0.37*	*0.26*	*0.49*	*2095*
Colon	*0.64*	*0.42*	*0.9*	*671*
Rectum	*0.18*	*<0*	*0.46*	*376*
Liver	*0.41*	*0.22*	*0.63*	*645*
Pancreas	*0.29*	*<0*	*0.72*	*229*
Lung	*0.69*	*0.49*	*0.92*	*789*
Bone and connective tissue (males)	*3.34*	*0.9*	*9.69*	*4*
Breast (female)	*1.49*	*1.17*	*1.85*	*572*
Uterus	*0.1*	*<0*	*0.32*	*504*
Ovaries	*1.18*	*0.39*	*2.31*	*103*
Prostate	*0.12*	*<0*	*0.51*	*156*
Urinary Bladder	*0.92*	*0.46*	*1.5*	*222*
Kidney	*0.16*	*<0*	*0.78*	*70*
Brain and CNS	*0.55*	*0.16*	*1.07*	*137*
Thyroid	*1.59*	*1.1*	*2.19*	*265*
non-Hodgkin's lymphoma	*0.08*	*<0*	*0.62*	*76*
Multiple myeloma	*0.2*	*<0*	*21.7*	*30*
Leukemia	*4.84*	*3.59*	*6.44*	*141*
Malignant melanoma	*<0*	*<0*	*0.74*	*7*
Non-melanoma skin cancer (male)	*1.27*	*0.65*	*2.17*	*66*

Dose Reconstruction

Since compensability is determined by the 99th percent confidence limit of the probability of compensation statistic, the upper range of the 90th percentile in the UNSCEAR data serves as a better source of comparison of relative radiation risk than the central estimate. In addition, cancers with few observations in the UNSCEAR data were not used to develop individual dose models in IREP. Rather cancers with few observations were grouped into broader models in IREP. Therefore the radiation risk values for salivary gland, bone and connective tissue, and malignant melanoma do not translate to associated cancers in IREP.

With respect to relative doses reconstructed for target organs for the various IREP models, certain general statements can be made. Many claimants were potentially exposed to airborne actinides, most commonly uranium or plutonium that delivers large doses to lungs and respiratory tract when inhaled. What's more, bioassay methods for these radionuclides are not very sensitive, so simply missed dose calculations for one of those radionuclides results in large doses to lungs, the respiratory tract, and the pulmonary lymphatic tissue. Other target organs concentrate internal radionuclides that become systemic, resulting in relatively large doses to those target organs. Examples of those organs are bone (and therefore bone marrow), thyroid, liver, and kidney. Internal doses to other organs are generally fairly uniform, caused by radioactive materials that are in the blood supply to those organs, but do not concentrate in those organs. A slight exception is the alimentary canal, which receives additional irradiation from internal radioactive material as it is resident there. External doses are generally delivered relatively uniformly except to the skin. Beta particles, called electron dose by IREP, deliver external dose only to the skin, mainly to exposed skin. In addition, medical x-ray doses are typically higher for skin than for other organs. Consequently for many claims external doses to skin are quite a bit larger than for other target organs.

Evaluating compensability rates starting with the most highly compensated, lungs have the highest rate because of the internal dose factor discussed previously. The high compensation rate for the various leukemia models is explained by the high relative radiation risk for leukemia. The high compensation rates for non-melanoma skin – basal cell and malignant melanoma are explained largely by the higher doses to skin for many claims. The high compensation rates for liver, other respiratory organs, oral cavity and pharynx, bone, and thyroid are due to the higher doses received by those organs from internal radionuclides.

In summary there does seem to be an intuitive reasonableness to the relative compensation rates for the IREP cancer models, but definitive analysis is not likely to be available. "

Author's Observations and Conclusions:

I have no evidence to refute NIOSH's claim, "….there seems to be an intuitive reasonableness to the relative compensation rates for the IREP cancer models….", nor am I aware of any more rigorous method to investigate the situation.

Dose Reconstruction

8. Comments from the Docket

A docket was held opened on the NIOSH website to receive public comments related to the Ten Year Review. Many excellent comments were received. All public comments are contained in their entirety on the NIOSH Website for the Ten Year Review -Phase I Report Docket Number 194, http://www.cdc.gov/niosh/docket/archive/docket194.html.

In this section on Dose Reconstruction I have included all of the excerpts of comments that I think directly related to dose reconstruction. These comments are included to provide the Phase II authors with all related dose reconstruction materials in this section.

I will not offer opinion on the excerpts presented. It is possible that the Phase II authors may wish to expand or modify the Phase I report based upon their consideration of public comments.

Excerpt # 1

"In conclusion we ask that the review of the program will:

-Review all technical documents that were authored or contributed to by a person who was responsible for the dosimetry department at a site. Any site profile that was a conflict of interest with the contributors shall be deemed null and void and SEC awarded to these sites."

Excerpt # 2

"The use of Surrogate Data in Dose Reconstruction

NIOSH used surrogate data obtained from Simonds Saw and Steel in Lockport, NY as the basis for the dose reconstructions for workers at Bethlehem Steel. Even though these facilities are different in topology, ventilation, and air quality employed, and the basic steel making technologies used, NIOSH insists that it is reasonable to take data from Simonds Saw and Steel and use it to compile the Bethlehem dose reconstructions."

Excerpt # 3

"Two separate NIOSH representatives gave conflicting accounts as to whether worker oral histories, offered during CATI interviews, are given consideration when reconstructing dose. The presenter in the morning session stated, "No". However the afternoon presenter stated that NIOSH does indeed consider workers' accounts of their work experience and will sometimes attempt to verify these histories by researching Department of Energy documents.

Consequently, ANWAG questions whether NIOSH accepts and subsequently investigates work histories provided by worker/claimants during the CATI interviews or whether such accounts are ignored when reconstructing dose? Moreover, is it possible that one dose reconstruction team considers these histories while other teams