

Review of SRS Refined Construction Trade Worker Stratification Comparisons for Plutonium

Bob Barton, SC&A

Advisory Board on Radiation and Worker Health Meeting
December 11, 2019, Oakland, CA

Background

- **Key Question:** Do subcontractor construction trade workers (CTWs) have the same exposure potential as prime contractor CTWs?
- NIOSH analysis compares the relative magnitude of plutonium results for the two CTW groups
- First presented to SRS Work Group in October 2017

Background (cont.)

- **NIOSH October 2017 evaluation concluded:**
 - “for most years there is little difference in the 95 percentile urinary excretion between DuPont CTWs and Subcontractor CTWs. The exception appears to be in the later 1970s and 1980s. This observation is somewhat supported by contemporary interviews with subcontractor CTWs. Subcontractor CTW indicated that they were called in for more contaminated work to save the exposure of the onsite CTWs. For some years (1977-1979 and 1984-1986) this appears to be the case in that the 95th percentile of the subcontractor CTWs is a factor of 2-5 higher.”

Background (cont.)

- Due to noted differences between DuPont CTWs and subcontractor CTWs in the years 1977, 1979, 1985, and 1986, NIOSH pursued a more rigorous analysis
- Urinalysis data evaluated for the years 1974, 1977, 1980, 1983, and 1986, and intakes were derived for two time periods (1973–1978 and 1979–1987)
- Results presented in 2019 white paper, “Savannah River Site Plutonium Construction Trade Worker Stratification Refinement”

Calculated Intakes Based on NIOSH's 2019 Pu Stratification Evaluation

Years, solubility type	Geometric mean DuPont CTW intake rate (dpm/d)	Geometric mean subcontract CTW intake rate (dpm/d)	Geometric mean ratio (DuPont/Sub)	95th percentile DuPont CTW intake rate (dpm/d)	95th percentile subcontract CTW intake rate (dpm/d)	95th percentile ratio (DuPont/Sub)
1973–1978, M	0.7732	0.325	2.38	14.349	8.00	1.79
1973–1978, S	15.71	6.97	2.25	268.7	169.4	1.59
1979–1987, M	1.426	1.293	1.10	16.215	19.17	0.85
1979–1987, S	26.38	22.65	1.17	279.2	326.1	0.86

Background (cont.)

- Refined 2019 analysis concludes:
 - “As can be seen by examination of the tables above, the geometric mean (GM) of the results for the DuPont CTWs are higher than that for the subcontractor CTWs for all years evaluated. For the 1973 through 1978 period, the 95th percentile intake results for the DuPont CTWs are higher as well. For the 1979 through 1987 period, the subcontractor CTWs do have a higher 95th percentile due to the higher geometric standard deviation (GSD) of the data....
NIOSH believes it is reasonable to combine all CTWs into a single stratum for assignment of intakes in the SRS internal dose coworker study.”

SC&A Review – General Comments

- **Finding 1:** In SC&A's opinion, the conclusion that subcontractor construction trade workers had higher excretion rates and derived intakes at the 95th percentile is significant from the standpoint of stratification because the 95th percentile is what is proposed for assignment to unmonitored subcontract construction workers.

SC&A Review – General Comments (cont.)

Observation 1: The evaluation in NIOSH's 2019 white paper was limited to 5 years during the DuPont Era (1972–1989), and additional data (beyond previously captured NOCTS data) were coded for only subcontractors during 3 of these 5 years. Given that subcontract construction workers showed higher derived intakes at the 95th percentile from 1979 through 1987, a more rigorous analysis during the SEC period may be appropriate to determine the extent to which such differences exist in other years, which may further prompt the need for stratification.

SC&A Review – Subcontractor Determination

- Subcontractors were identified by payroll ID in NIOSH analysis
- SC&A examined 35 randomly selected claims that were identified as subcontractors
 - 13 of 35 (~37%) exhibited evidence that the subcontractor designation may have been incorrect (Finding 2)
 - Remaining 22 of 35 all exhibited evidence of employment with subcontractors
 - Additional review of 25 claims designated as prime contractors all appear to be correctly categorized

SC&A Review – Additional Data Coding

- Revised NIOSH evaluation included additional data coding for nonclaimant subcontractors in 1974, 1983, and 1986.
- All other evaluated data were based solely on claimant records.
- **Key Question:** Does the addition of nonclaimant data for subcontractors in these years bias the results?

SC&A Review – Additional Data Coding (cont.)

- **Observation 2:** The urinary excretion rates for claimant subcontractors at the average and lognormal geometric mean suggest a higher exposure potential than nonclaimant subcontractors for the years in which nonclaimant data were used to supplement the evaluation (1974, 1983, and 1986). Because nonclaimant data dominate the evaluated subcontractor population in these years, this could have a significant effect on the combined subcontractor analysis and subsequent comparison to prime contract workers.

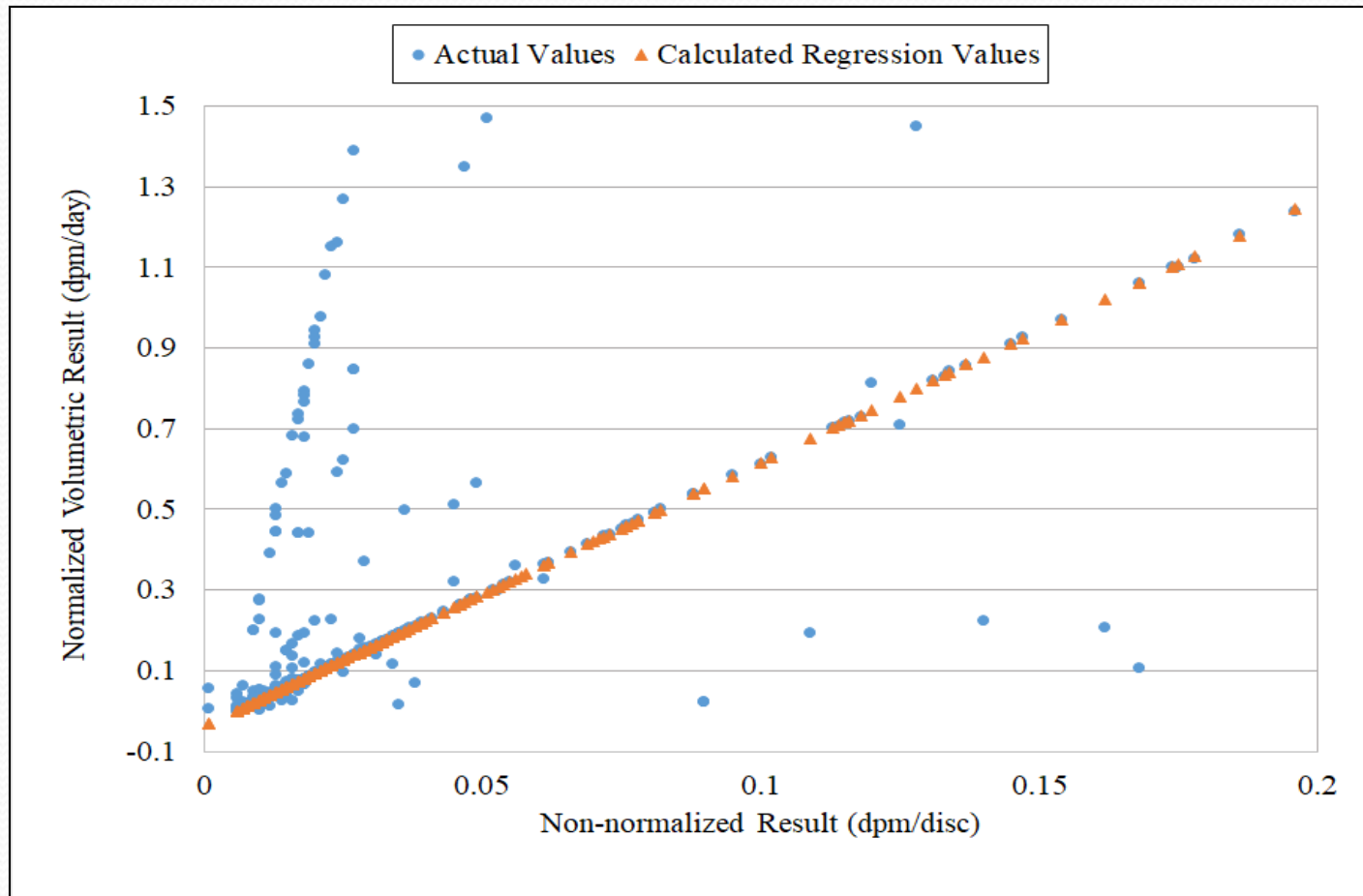
SC&A Review – Regression Analysis

- Hardcopy data often only contained an unnormalized bioassay result (activity per measurement disc rather than activity per volume)
- Conversion of unnormalized results to volumetric sample not straightforward without knowledge of aliquot amount
- NIOSH assumes a linear relationship to convert activity per measurement to activity per volume

SC&A Review – Regression Analysis (cont.)

- SC&A also identified situations in which a zero or negative result given in activity per disc resulted in a positive reported volumetric result
 - Raises the question of whether a linear regression or any meaningful numerical relationship would actually apply (SC&A Observation 3)
 - Some of these data pairs were found to be transcription errors: What quality assurance assessment was applied? (SC&A Finding 3)

SC&A Review – Comparison of Actual Bioassay to Linearly Fit Bioassay for 1986



SC&A Review – Regression Analysis (cont.)

- **Finding 4:** The use of a regression analysis to convert raw bioassay results (dpm/disc) to a volumetric result (dpm/1.5 L) has not been technically justified and does not appear scientifically defensible.

Conclusions

- Refined analysis is limited to a handful of years.
- Evidence suggests payroll ID numbers alone may not be sufficient to correctly identify subcontractors.
- Quality assurance of additional data coding is not addressed.
- Use of linear regression to convert urinalysis values to a normalized volume is questionable.

Conclusions (cont.)

- As SC&A indicated previously, the NIOSH analysis still shows that subcontractors had higher intakes at the 95th percentile for 1979–1987.
- Therefore, SC&A does not agree that the NIOSH analysis demonstrates subcontractor CTWs and prime contractor CTWs are part of the same exposure strata.

Potential Path Forward

- Expand analysis to remaining years of SEC-00103.
- Utilize all available logbook data (not just claimant data for prime contractors).
- Document quality assurance on transcription errors.
- Confirm subcontractor designations beyond payroll ID methodology.
- Discontinue use of regression methods for samples with unnormalized results and reevaluate using only normalized results.



Questions?