A comparison of hazard based assignment with administrative assignment to medical surveillance programs at a large nuclear weapons clean-up site.

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Hanford Occupational Health Process (HOHP)

- Comprehensive contractor effort to link work planning, hazard identification, exposure monitoring, and occupational medicine in a systematic manner.
- Data source is the Employee Job Task Analysis (EJTA), includes essential job functions, physical activities, and potential exposures. .
- The EJTA, is completed by supervisors with input from the employee and the industrial hygienist.
- Data used by the Risk Management Medical Surveillance (RMMS) computer program to assign employees to medical surveillance programs.

HOHP Rationale

- Prior to 1998, assignment to medical surveillance at Hanford was generally administrative and not based upon hazard or exposure risk.
- HOHP designed to move the Site from administrative medical program assignments to risk based program assignments
- Risk based placement should provide better assurance that:
  - workers who have significant exposures are in appropriate surveillance
  - workers who are not exposed do not get unnecessary medical monitoring exams.

Employee Job Task Analysis (EJTA) Components

The EJTA is a computer-based form with three main sections: Physical Job Demands, Medical Qualification Exams, Potential Exposure Hazards.

Physical Job Demands

These questions relate to physical activities performed by the employee. The following frequency ranking is used:

0 - the activity is never performed
1A - the activity is rarely performed (< 1% of time or 20 hours/year)
1B - the activity is occasionally performed (1 - 9% of time)
1C - the activity is occasionally performed (10 - 20% of time)
2 - the activity is occasionally performed (20 - 33% of time)
3 - the activity is frequently performed (> 33% of time)
4 - the activity is also repetitive
5 - the activity is also a qualification or requirement

Employee Job Task Analysis (EJTA) Components

Medical Qualification Exams

Yes/no questions asking about medical examinations required to qualify for various jobs.

Examples:

- nuclear reactor operator
- firefighter
- security patrol
- commercial driver
- underwater diver

Employee Job Task Analysis (EJTA) Components

Potential Exposure Hazards

This is a list of chemical, physical, biological exposure hazards with corresponding exposure level rating scale:

0 - does not work with or around

1A - works around, but not directly with material

1B - exposure level < 10% of exposure criteria

1C - exposure level ranging from 10% of criteria to criteria level

2 - exposure level >= criteria for < 30 days a year

3 - exposure level >= criteria for > 30 days a year

QD - quantitative data available HZ - works at HazWaste site

Validation Study

- Determine how well data collected by the EJTA compares to a best estimate of the true exposure potential
- Determine whether the EJTA collects the information necessary to determine medical placement and surveillance, and
- Determine whether the EJTA works equally well for different types of work activities.

Validation Study Methods

- Study employees from stratified random sample from all Hanford prime contractor population.
- Stratification based upon estimated exposure (high, medium, or low exposure)
  - Weighting scheme: 80% medium or high likelihood
    20% low likelihood exposures
- 722 employees selected
- 491 participated

Validation StudyMethods (2)
Distribution by Occupational Categories

Occupational Category	Sample Count	Sample Percent	Total Count*	Percent of Total
'C' Crafts	51	10	941	8
'E' Engineers	87	18	2357	19
'G' Administrative	29	6	1502	12
'L' Laborers	33	7	837	7
'M' Managers	46	9	1477	12
'P' Professional	70	14	2012	16
'R' Operators	52	11	731	6
'S' Scientists	39	8	1033	8
'T' Technicians	84	17	1404	11
Total	491	100	12294	100

Validation Study Methods (3)

- Subjects interviewed by a University of Washington industrial hygienist team (blinded to the supervisor EJTA):
  - to determine the nature of work and potential exposures
  - review of workplace health and safety documents
  - review of worker exposure records
  - workplace visit when appropriate
- QA team industrial hygienist completed a new EJTA (QA EJTA)
- The QA EJTA is compared to the supervisor EJTA

- Comparison study, focusing on rationale for disagreements.
- Method is used for lack of a true exposure "gold standard"

Validation Study Analysis

- Agreement of the QA EJTA and Supervisor EJTA assessed using:
  - overall percent agreement,
  - Kappa statistic
  - sensitivity/specificity analysis
- Not all statistical methods appropriate for each section.
- The **overall percent disagreement** based upon a level of detection of 20% or more, with potential for disagreement due to chance $\leq$ 5%.
- The **Kappa statistic**, unlike percent agreement, corrects for chance-expected agreement and the level of agreement. A Kappa of 0.5 is generally considered adequate agreement for data sources for instrument testing.

Validation Study Analysis (2)
Kappa Test Agreement

Value of Kappa	Strength of Agreement
<0	Poor
0-.20	Slight
.21-.40	Fair
.41-.60	Moderate
.61-.80	Substantial
.81-1.00	Almost perfect

Validation Study Analysis (3)

- Sensitivity/specificity analysis for:
  - the Medical Qualification examinations,
  - Other Exposures,
  - RMMS Medical Surveillance Placement sections.
- Low sensitivity results in greater worker risk and increased liability.
- low specificity results in extra cost for unnecessary programs.
- Sensitivity of 90% or greater is desirable.

Relationship Between Supervisor and QA Determinations

		QA EJTA/QA-MD Determination	
		Yes	No
Supervisors' EJTA/RMMS Determination	Yes	Agreement (a)	Extra cost for pro-vision of unnecessary surveillance (b)
	No	Liability for inappropriate exclusion from surveillance (c)	Agreement (d)

Sensitivity = a/(a+c)
Specificity = d/(b+d)

Sensitivity: probability worker assigned to a program by supervisor and QA EJTA agreed.
Specificity: probability worker was not assigned to a program by supervisor and QA EJTA agreed.

Validation Study Results

Section of EJTA	Percent Agreement	Kappa	Sensitivity	Specificity
Physical Job Requirements	68%	0.53	NA	NA
Medical Qualification Exams	97%	0.77	81%	98%
Potential Exposure Hazards, Listed	91%	0.46	NA	NA
Potential Exposure Hazards, Write In	90%	0.16	NA	NA
Other Exposure Information	89%	0.66	75%	92%
RMMS Assignment	98%	0.71	74%	99%

N.A. – Not Applicable

Validation Study Results

Supervisor and QA-IH Potential Exposure Hazards

Percent Agreement

		QA-IH Rating				
Supervisor		0	1	2	3	Total
Rating	0	9512	226	18	5	9761
	1	578	216	59	11	864
	2	31	42	62	14	149
	3	2	6	16	4	28
Total		10123	490	155	34	10802

Kappa, weighted, = 0.46, $P \leq 0.05$

Validation Study Results

Employees Exposed at Any Level by Supervisor or QA-IH

Exposure Agent	Number Exposed per Supervisor	Number Exposed per QA-IH	Difference	
			Supervisor	QA-IH
Noise	221	241		20
Solvents (write-in)	196	145	51	
Particulates	177	174	3	
Lead	138	106	32	
Asbestos	124	128		4
Hazardous waste	108	76	32	
Paints/resins/solvent (write-in)	102	33	69	
Welding	97	52	45	
Corrosives	92	76	16	
Misc. chemicals	85	187		102
Ammonia	81	43	38	

Validation Study Results

Supervisor-EJTA/RMMS and QA-EJTA Medical Program Placements

		QA-IH and QA-MD		
		Yes	No	Total
Supervisors-EJTA	Yes	399	177	576
and RMMS	No	138	15489	15627
	Total	537	15666	16203

Sensitivity = 74%, Specificity = 99%
Agreement 98% Kappa 0.71, $P < 0.05$

HOHP Validation Study Conclusions

- 13,313 workers logged in the HOHP at time of study w/ enrollments in medical programs based upon risk as perceived by contractor industrial hygienist.
- Agreement highest where the criteria for assignment were unambiguous and directly related to the major work functions, vs. exposures or activities.
- Agreement lower where significant administrative factors present in decision-making, and for questions where significant professional judgment was required.
- Lowest agreement exposure where agents were specified or written-in, vs. picked from a list.

HOHP Validation Study Conclusions (2)

- Low agreement raises questions regarding data quality for some sections, and resulting medical placements.
- Lowest Kappas were found in the Potential Exposure Hazards sections.
- Lowest sensitivities were in the Medical Surveillance Program Placements section raising question of potentially exposed workers missing needed surveillance.
- Specificities were uniformly high: most workers who were not assigned to programs were appropriately excluded.

Medical Surveillance Programs with Highest Enrollment

Program	Enrolled Jan 1998
Bloodborne Pathogens	1472
Hazardous Waste	3792
Hearing Conservation	3070
Respirator	4412
Asbestos	808
DOT	465

Medical Program Enrollment Pre- and Post- EJTA ( )= new enrollees

Program	Jan 1998	Jan 1999	Change
BBP	1472	1482 (249)	- 10
Haz Waste	3972	193 (42)	- 3779
HCP	3070	1728 (259)	- 1342
Respirator	4412	3613 (0)	- 799
Asbestos	808	355 (92)	- 420
DOT	465	439 (58)	- 26

Medical Program Enrollment Two Years Post- EJTA ( )= new enrollees

Program	Jan 1998	Oct 2001	Change
BBP	1472	1643 (335)	+ 171
Haz Waste	3972	1465 (342)	- 2327
HCP	3070	2486 (542)	- 584
Respirator	4412	3643 (632)	- 769
Asbestos	808	406 (113)	- 402
DOT	465	365 (52)	- 100

Summary of Medical Program Enrollment Pre, Immediately Post, 2 Years Post- EJTA

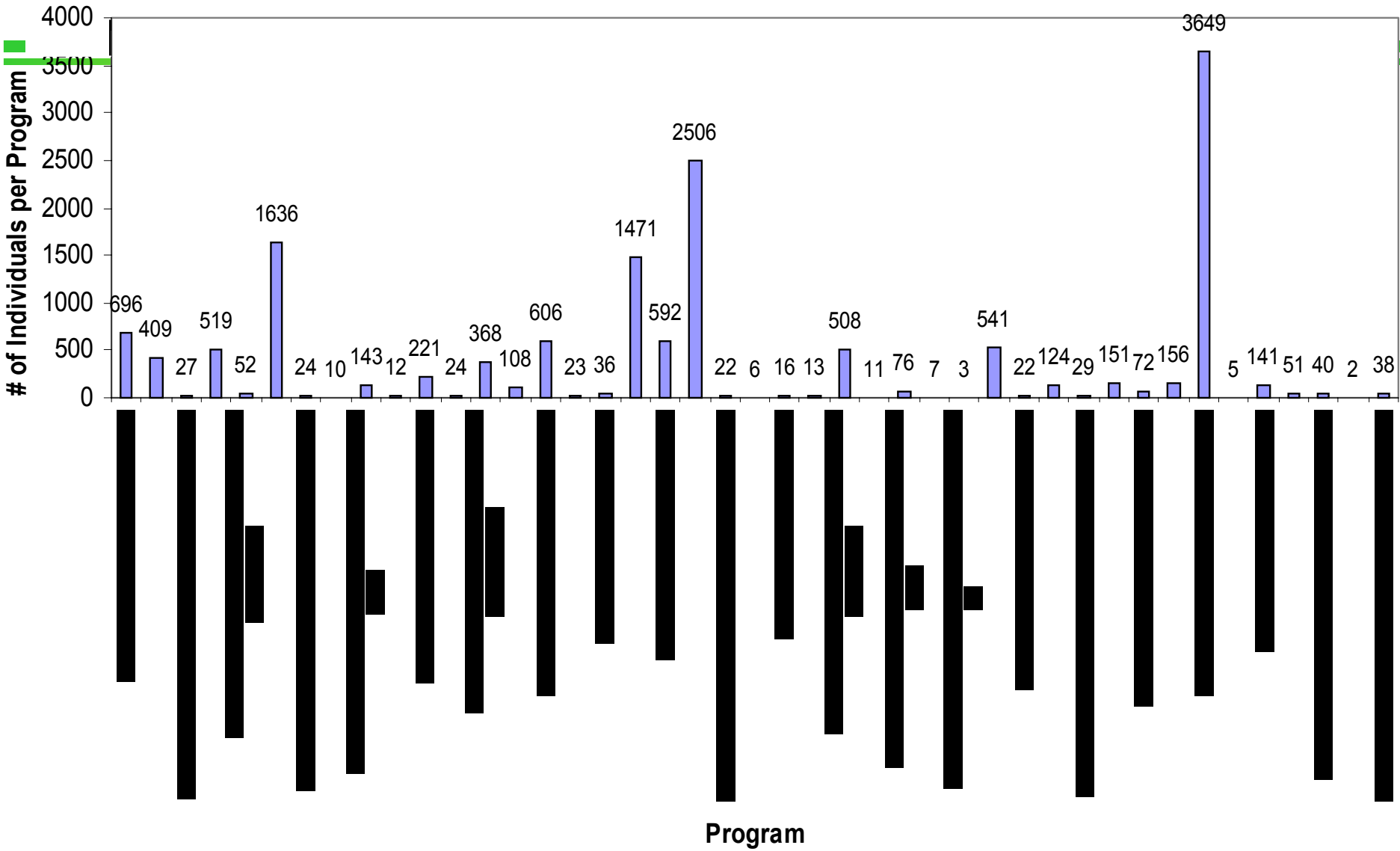
Program	Jan 98	Jan 99	Oct 01
BBP	1472	1482	1643
HazWaste	3972	193	1465
HCP	3070	1728	2486
Respirator	4412	3613	3643
Asbestos	808	355	406
DOT	465	439	365
Beryllium	-	154 (142/12)	575 (523/52)

Total Numbers* of Medical Surveillance Program Enrollments Pre- and Post- EJTA

Total Number of:	**Jan 1998**	**Jan 1999**	**Oct 2001**
Program Enrollments	15537	9074	11658
EJTAs	11443	12798	12947
Employees (including subcontractors)	14876	14857	15310
Employees (excluding subcontractors)	10140	10430	10790

* Includes enrollment in 9 largest programs only (77% of all in 2001). Employees may be enrolled in more than one program

EJTA Program Data
After De-Enrollment (Includes Status Quo In and Assigns) 9/25/01



HOHP Conclusions

- A large, diverse and mobile workforce in multi-contractor hazardous waste site can be assigned to medical monitoring based upon risk.
- Considerable savings accrued by eliminating unnecessary exams particularly for hazardous waste worker exams.
- Ongoing QA is required to assure exposed workers get adequate monitoring.
- Accurate roster required: The next challenge for the HOHP is to assure that all sub-contractor workers are included in the system as required under Hanford's Integrated Safety Management System.