

Similar Exposure Groups (SEGs) and the importance of clearly defining them

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Defining SEGs for Monitoring Programs

- Common to encounter problems
 - Particularly when based on historical data
- Shortcomings can include:
 - inappropriately grouped data;
 - use invalid samples or those not representative of exposure
 - failure to identify and evaluate the effectiveness of controls;
 - failure to identify a job correctly due to a person doing multiple jobs in one shift;
 - failure to sample in such a way that all possible exposures are likely to be covered

NIOSH Occ Exp Strategy Manual

- Published 1977
- Currently under review
- Available on the internet
- Refers to random sampling of a “homogeneous risk group of workers”


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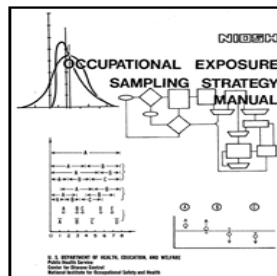
Occupational Exposure Sampling Strategy Manual

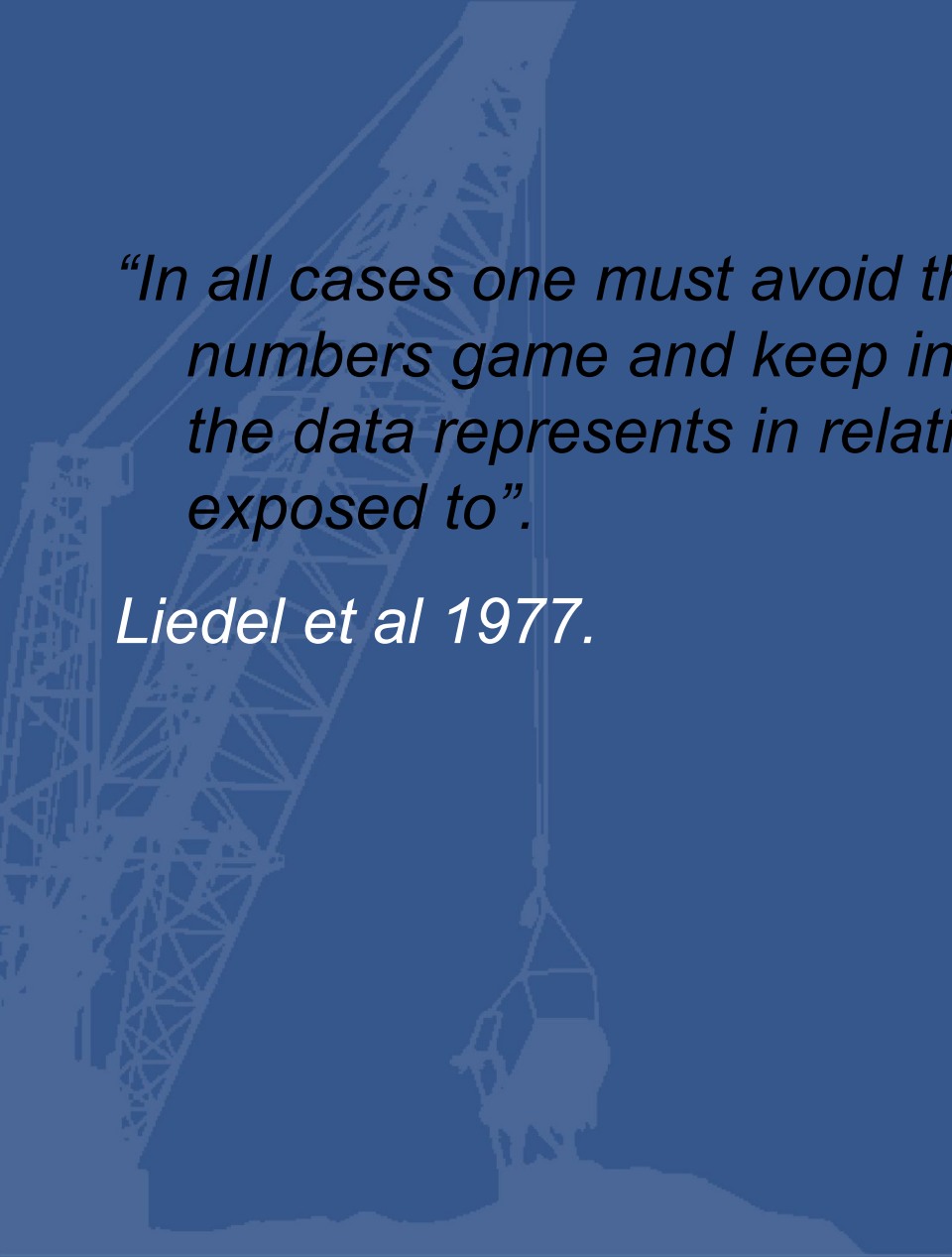
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Entire Document	77-173.pdf (150 pages, 5,326K)
Introduction and Table of Contents	77-173-a.pdf (21 pages, 486K)
1. Background to Monitoring Employee Exposure to Occupational Atmospheres	77-173-b.pdf (28 pages, 1,189K)
2. Determination of Need for Exposure Measurements	
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A faint, light blue background image of a crane lifting a car. The crane is on the left side of the frame, and the car is suspended in the air, being lowered towards the ground. The background is a solid dark blue.

“In all cases one must avoid the trap of falling into a numbers game and keep in proper perspective of what the data represents in relation to what the worker is exposed to”.

Liedel et al 1977.

Why are SEGs Useful?

“a group of workers having the same general exposure profile for the agent(s) being studied because of the similarity and frequency of the tasks they perform, the materials and processes with which they work and the similarity of the way they perform the tasks”

(Mulhausen et al, 1998)

Can make use of a small data set, especially with statistical analysis

Significant savings in resources

Steps to define a SEG

- Observation
- Sampling
- Confirmation (stats)
- Review and Re-define where necessary

Observation

- Professional judgement / experience
- Literature suggests:
 - Classification by task and environmental agent;
 - Classification by task, process, and environmental agent;
 - Classification by task, process, job classification (description), and environmental agent;
 - Classification by work teams; and
 - Classification by non-repetitive work tasks or jobs.(Mulhausen et al, 2006)
- Common approach = by task, process, job description, agent

Sampling

- Collection of samples to define SEG – baseline sampling
- Review of historical data

Are there sufficient samples?

Statistical confidence?

Quality of records

Combined Observation and Sampling

- Most practical approach
- Not always possible to observe all variations
- New or existing data sets are often small

Confirmation

Step	Description
1	Identify the SEG. “Minimum variation” .
2	Randomly select workers and times.
3	Measure exposures.
4	Carry out statistical analysis .
5	Log normal, normal, non-parametric.
6	Calculate parametric statistics.
7	Decide on acceptability of exposure profile. Geometric standard deviation.
8	Redefine SEG if necessary.

Source: Spear J (2004), Industrial Hygiene Exposure Assessments.

Real World Approaches to Defining an SEG

SAMOHP:

- Predefined activity codes
- Exhaustive list

Step	Description
1	Sub-divide the mine into sampling areas.
2	Subdivide sampling areas into Activity Areas - prescribed activity codes.
3	Ensure adequate measurements are taken or already exist.
4	Compare data (measured or historical) from each Activity Area with occupational exposure limit (OEL) values.
5	Categorise Activity Areas into classification bands based on extent of exposure.

CONTAM:

- Pre-defined codes for – occupation, contaminant, drilling method, equipment, location
- Sample result linked to applicable codes

SAMOHP / CONTAM:

- Neither requires statistical review of data
- Is the SEG identified correctly????

A Common Approach?

SAMOHP / CONTAM use consistent SEG classification

- Allows confident comparison
- Within organisation & industry wide
- Benchmarking
- Identification of best practice

National ANZIC / ANZSCO job codes:

- Too generic
- Do not 'drill down' deep enough

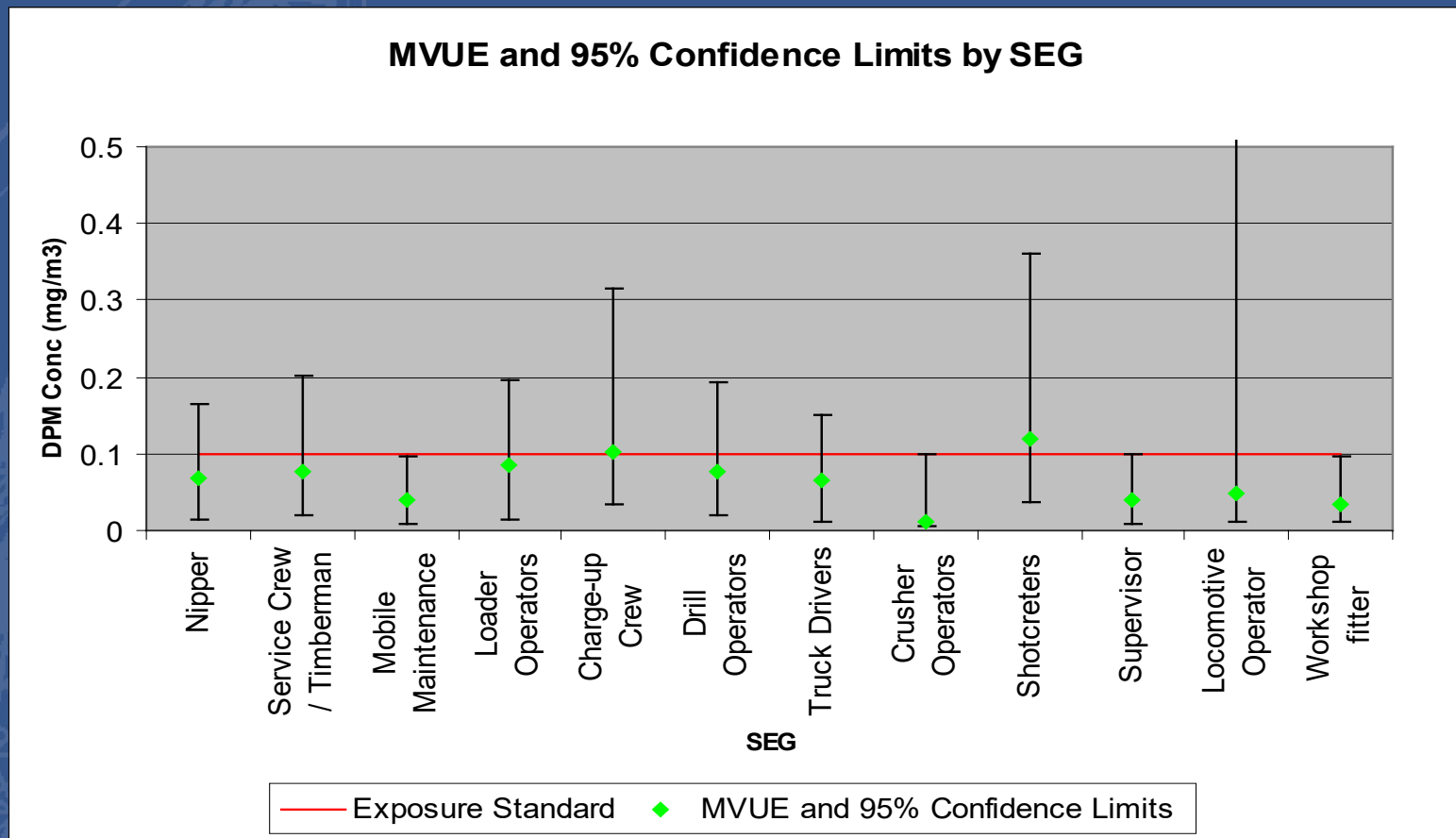
Queensland Mining (common descriptors)	South African Mines Occupational Hygiene Programme (SAMOHP)	DOCEP	ANZSIC Industry classifications	ANZSCO Occupation classifications
Open cut coal	07 (activity code)	200 – 900 (location codes)	Division B Mining Sub division 11 Coal Mining 1101 Black Coal Mining	7-72-721-7219-721999
Drag line operator	21102 drag line operator	343000 Dragline operator		
Underground Coal	01, 02, 03 (activity code)	120 (location code)		
Chock / Shield operators	Difficult to match	212000 Coal Miner UG		

Some industry leaders have initiated detailed coding approach to data collection

- BHP Billiton – QMIHSC conf Townsville 2008.
SAP database

Some projects have also involved the use of predefined SEGs

Diesel particulate (measured as EC) for SEG at selected metal mines in Queensland.



Source: Irving G (2006), Diesel particulate matter in Queensland's underground metal mines.

What to record?

Record quality is of particular value when assessing historical data

Descriptive information very important

Easier to apply profession judgement with more information

Rely on statistical analysis in the absence of it

**The more information / observations recorded
the better!**



A faint, light blue silhouette of a crane is visible in the background on the left side of the slide.

Process – type / operation

Environment – weather, age of plant

Temporal – work cycles / season

Behavioural – training / practices

Incidental – spills / maintenance

Sampling – method

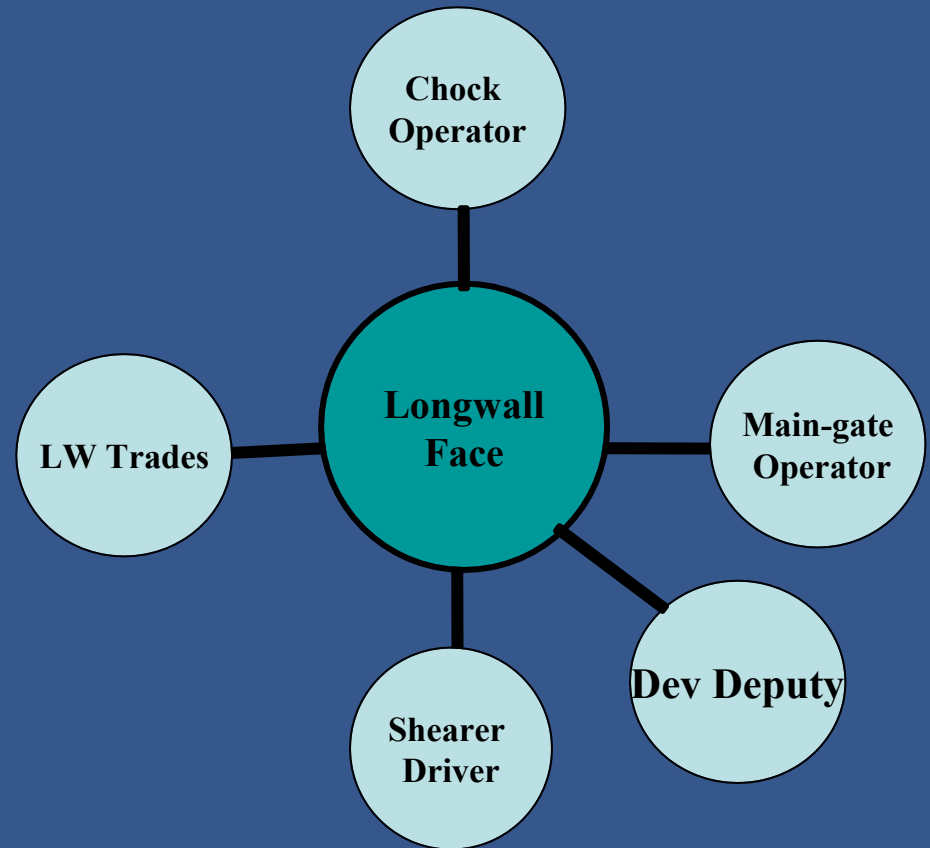
The Pitfalls

Job rotation

Assign to the dominate
SEG

Group in to higher level
SEG.

eg, underground coal
workers rotating as
shearer driver, chock
op and maingate op. =
Longwall op



The Pitfalls

Well defined SEG with
outliers

Censor data

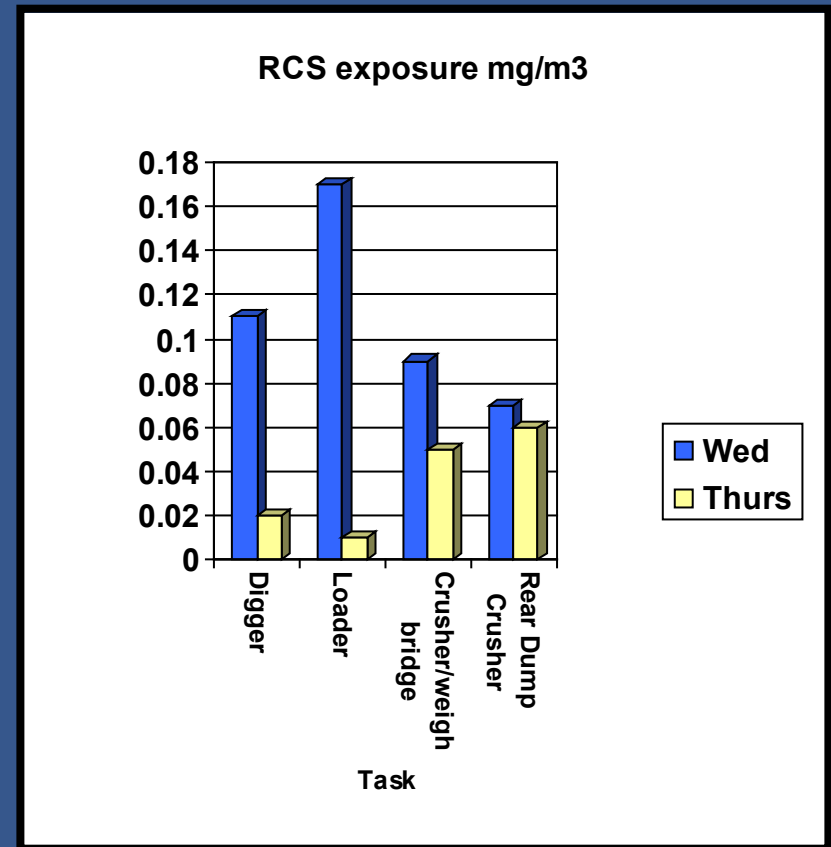
Follow-up with targeted
controls

Historical Decision Making
– **how applicable is
the data??**

New technologies

Sampling method

Sampling program



Assessing / Reviewing SEGs

A critical step!

- Sample Size
- GSD
 - 1.5-2.5 indicates acceptably defined SEG
 - >2.5 poorly defined SEG or process out of control
- Software available to help
- Bayesian analysis

- AIHA provides free on line software at <http://www.aiha.org/1documents/committees/EASC-IHSTAT.xls>



Summary

Accurate collection and recording of relevant sampling data is essential

SEGs need to be assessed / reviewed regularly

Common SEG coding approach, across “an industry”, can facilitate benchmarking, epidemiological studies and setting national priorities.

Inconsistencies between existing coding systems – some do not ‘drill down’ enough

