Public Health Surveillance

The ongoing and systematic collection, analysis, and interpretation of health data in the process of describing and monitoring a health event

Purposes of Public Health Surveillance

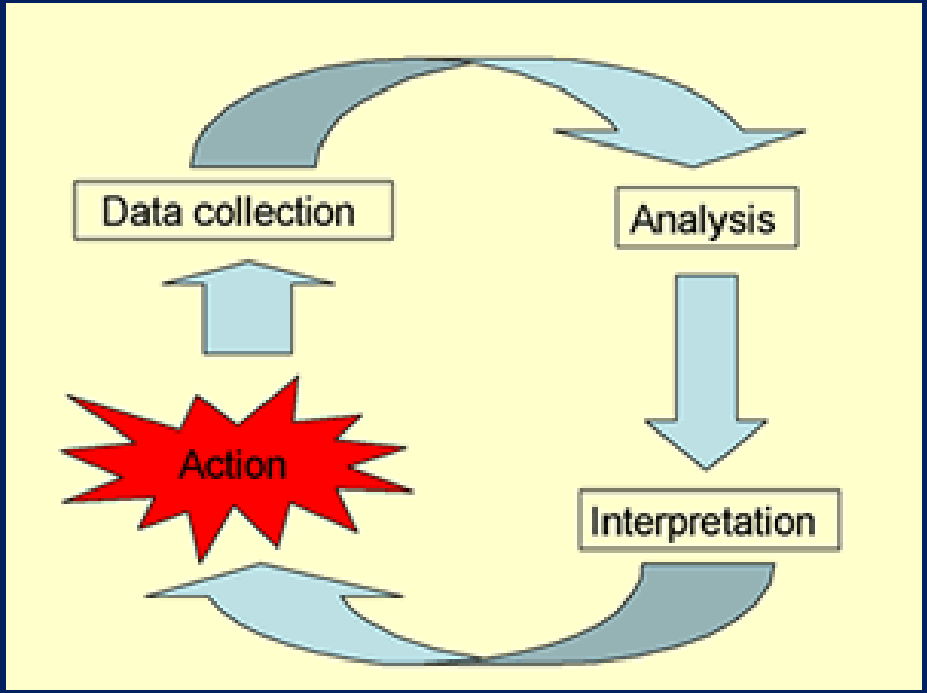
- To protect and promote health
- To prevent disease and injury, disability, and death
- Assess public health status
- Define public health priorities
- Evaluate programs
- Stimulate research

Uses of Public Health Surveillance

- Monitor trends and estimate magnitude of the problem
- Portray the natural history of a disease
- Epidemic detection and prediction
- Generate hypotheses, stimulate research
- Evaluate control measures and interventions
- Estimate future disease impact
- Monitor programme performance
- Detect changes in health practices
- Understand characteristics of health events
- Facilitate planning

Public Health Surveillance

Information for Action



Alexander Langmuir 1963

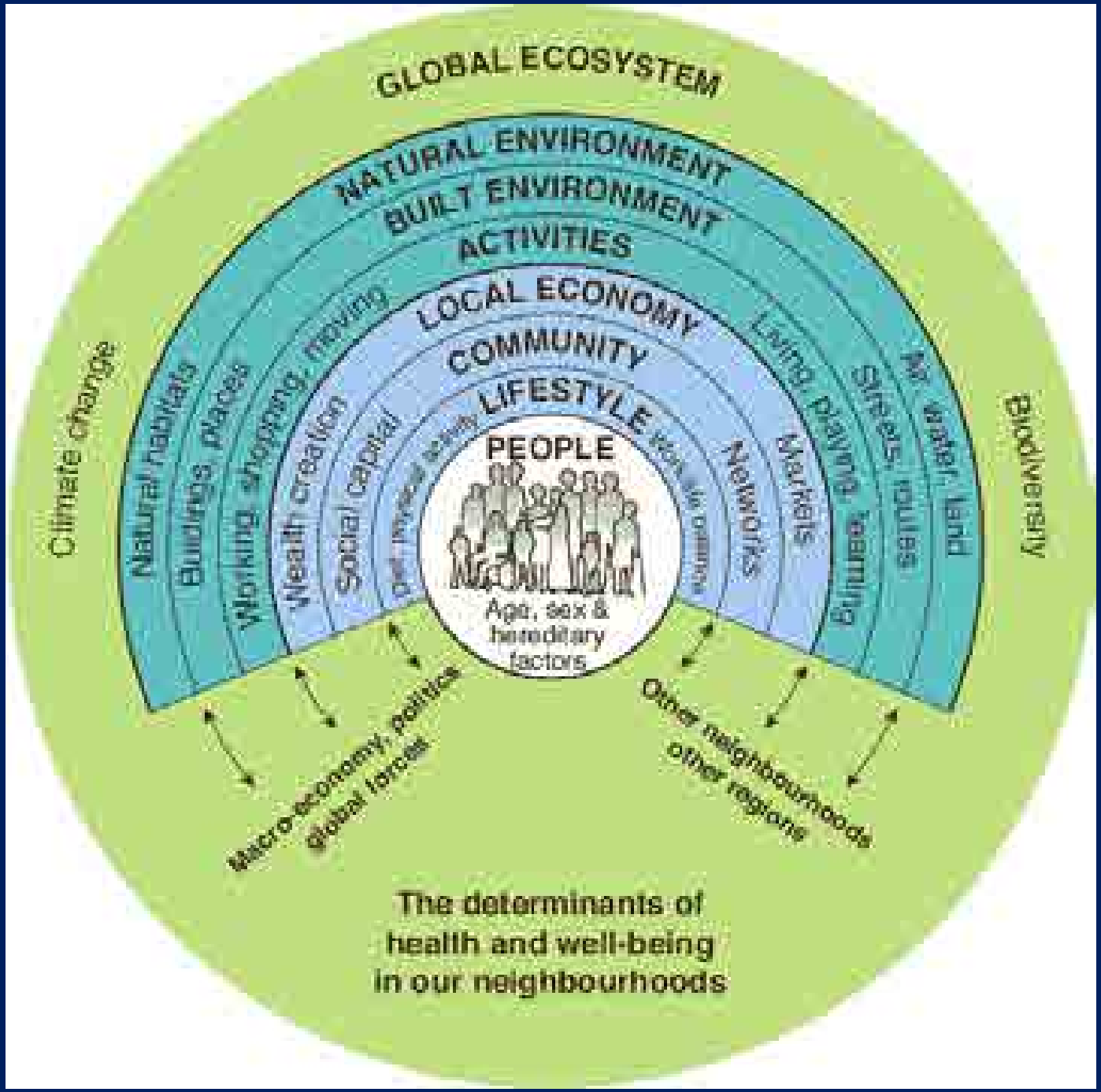
"Good surveillance does not necessarily ensure the making of right decisions but it reduces the chances of making wrong ones"

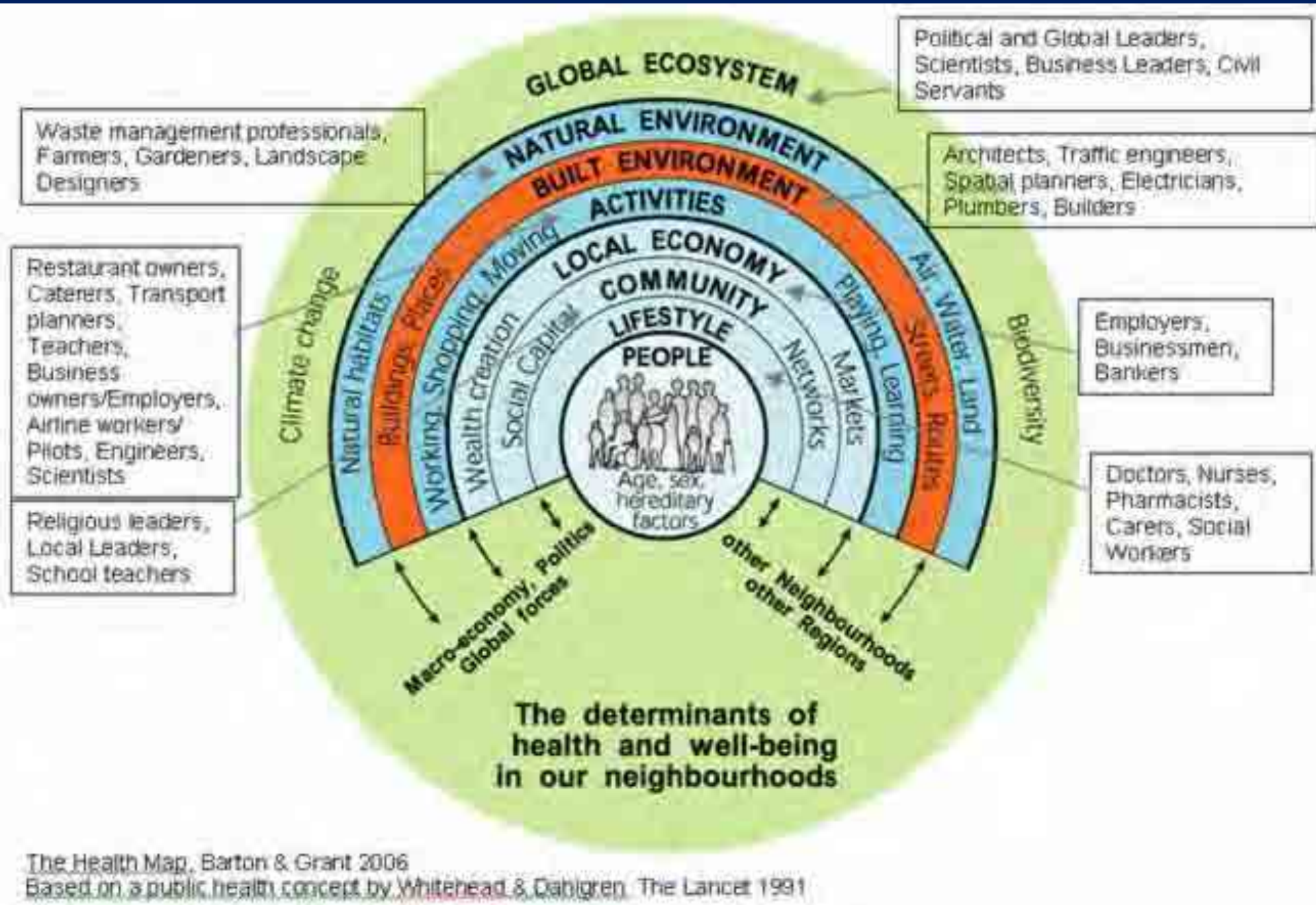
Desirable Characteristics of A Surveillance System

- acceptability
- simplicity
- flexibility
- validity
- sensitivity and specificity
- representiveness
- timeliness
- stability
- compliance

Public health surveillance

To be useful, public health surveillance must be approached as a *scientific enterprise*, *applying rigorous methods* to address critical *public health concerns*. There is also a continuous loop in data collection, *robust analysis and interpretation, dissemination and application and use of the information*.


GLOBAL ECOSYSTEM
NATURAL ENVIRONMENT
BUILT ENVIRONMENT
ACTIVITIES
LOCAL ECONOMY
COMMUNITY
LIFESTYLE
PEOPLE
Age, sex & hereditary factors
Natural habitats
Buildings, places
Working, shopping, moving
Wealth creation
Social capital
Markets
Networks
Living, playing, learning
Streets, routes
Air, water, land
Climate change
Biodiversity
Macro-economy, politics
global forces
Other neighbourhoods
other regions
The determinants of
health and well-being
in our neighbourhoods



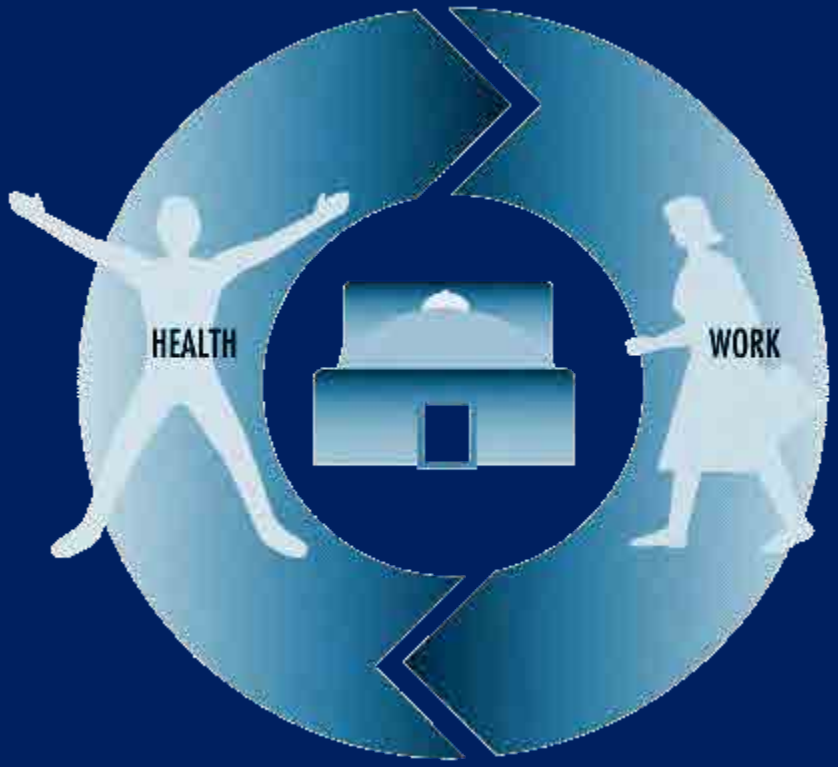
The Health Map, Barton & Grant 2006
Based on a public health concept by Whitehead & Dahlgren, The Lancet 1991

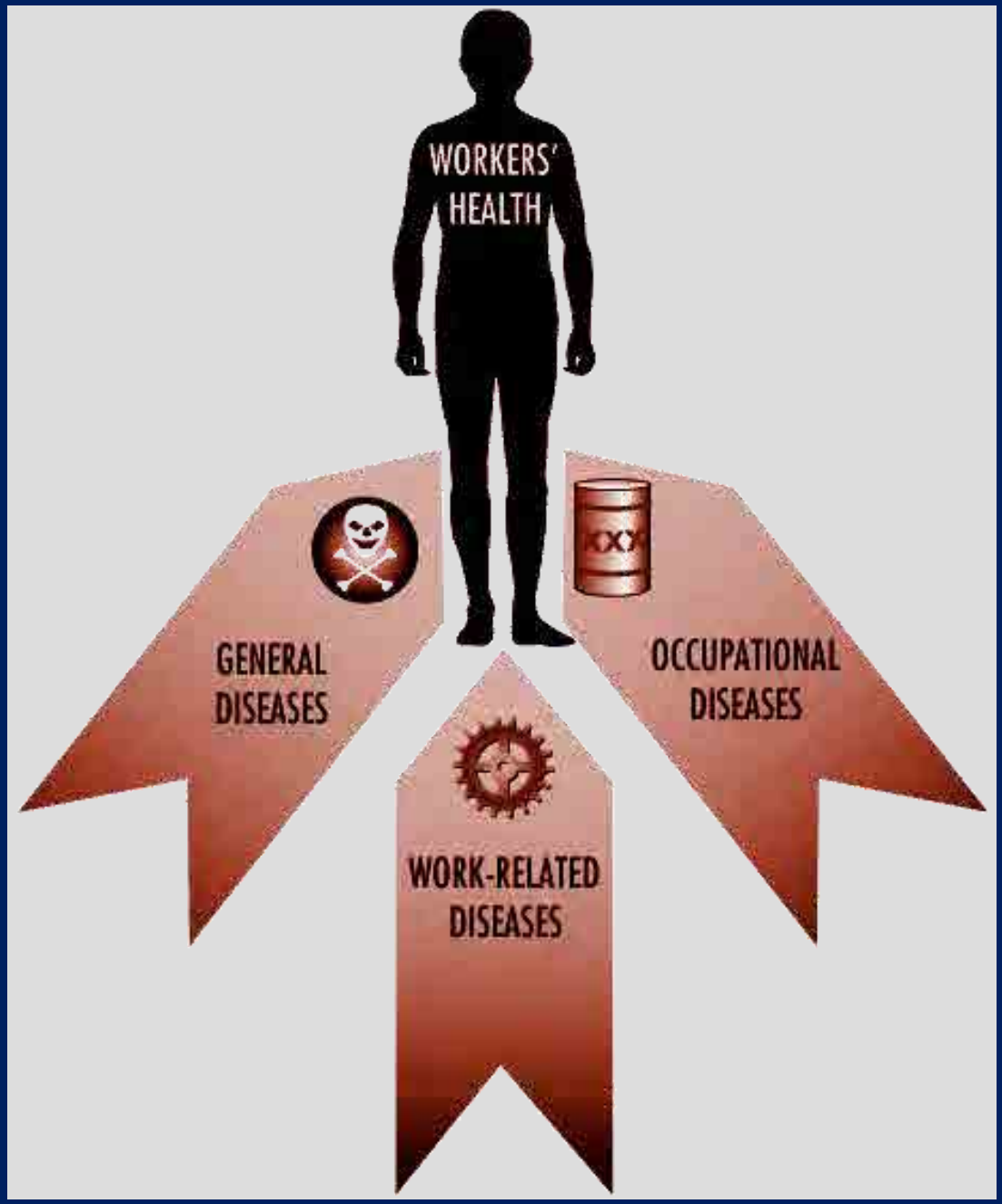
"Peoples' health should be no worse at the end of a working day than it was at the start"

MJ Harrington, 1997

Health and Work

- Work may have an adverse or beneficial effect on health
- The health status of the worker has an impact on work and productivity.

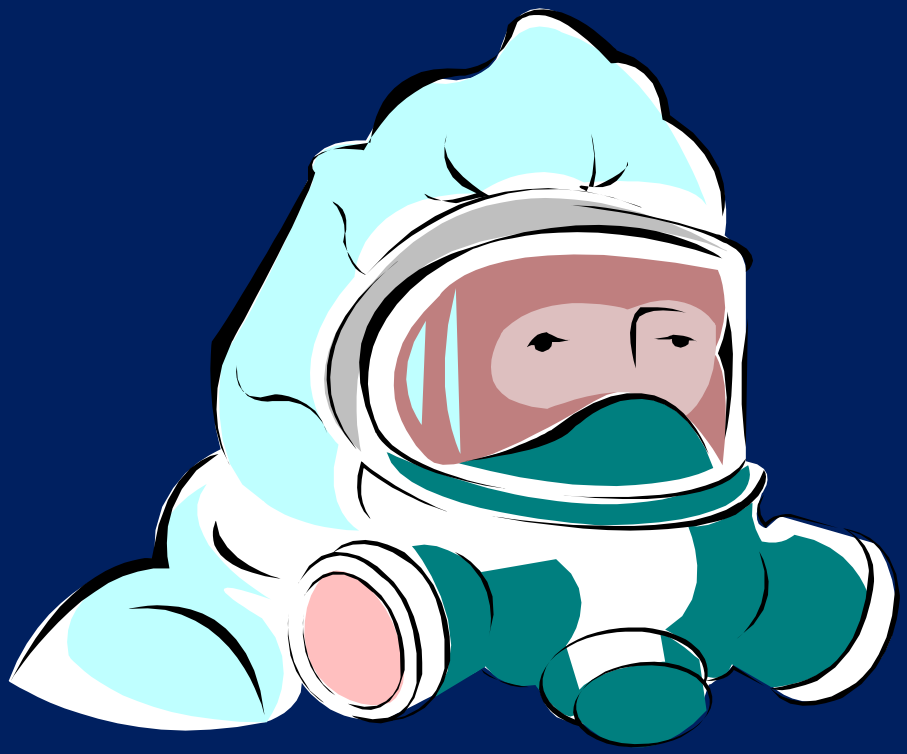



WORKERS' HEALTH
XXX
GENERAL DISEASES
OCCUPATIONAL DISEASES
WORK-RELATED DISEASES

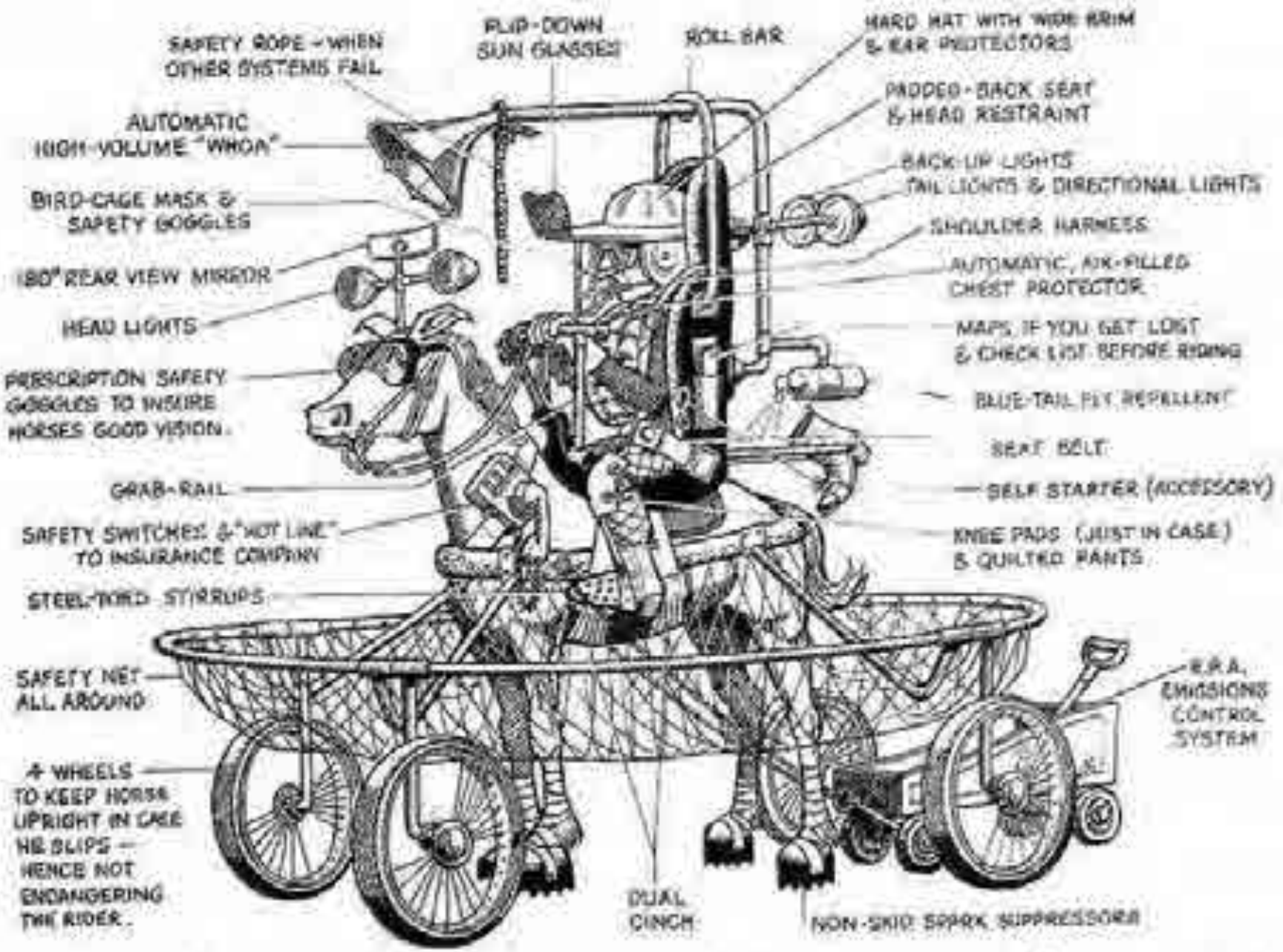
Sources of Occupational Ill-Health

- Chemicals
- Gasses
- Dusts
- Particles
- Light
- Heat
- Noise
- Vibration
- Stress
- Radiation
- Slips, trips, falls
- Working hours
- Ergonomics

Occupational Disease Is Preventable



- By removing the worker from exposure
- By removing the exposure from the workplace



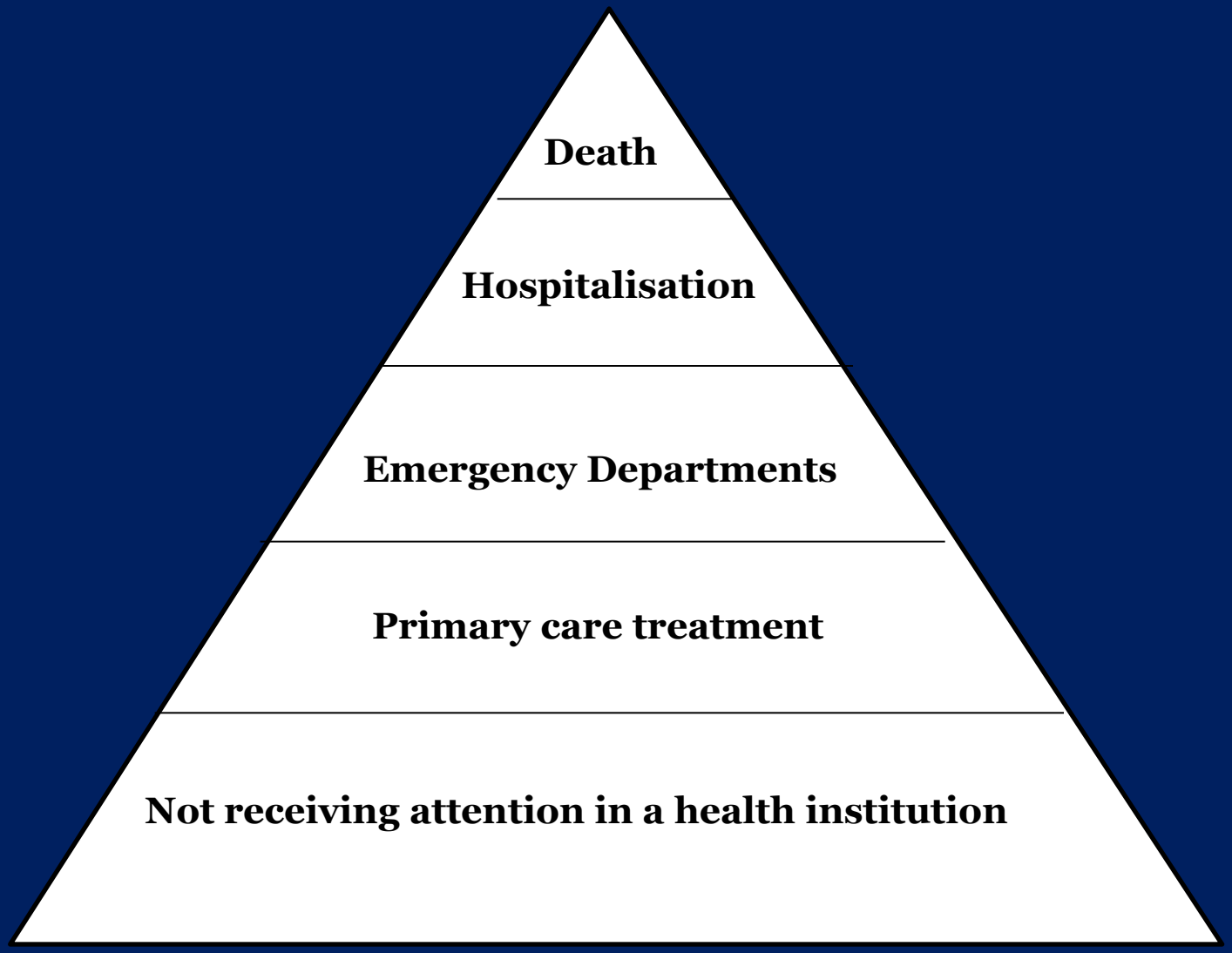
Cowboy after O.S.H.A. Inspection

Use of Occupational Health Surveillance Systems

- Develop knowledge to identify risks and risk groups.
- Identify trends and changes over the years, awareness of and compliance with legal requirements.
- Support prevention, developing preventive policies, identifying preventive structures.
- Set priorities for activities and supporting labour inspections
- Evaluate or control the effect or the efficiency of actions or measures, monitoring interventions, outcomes, the progress of actions, costs of absenteeism.
- Benchmarking
- Provide a basis for discussions between social partners
- Suggest additional studies and research
- Report

Source: Smulders 2003

Occupational Injury and Disease Data Pyramid

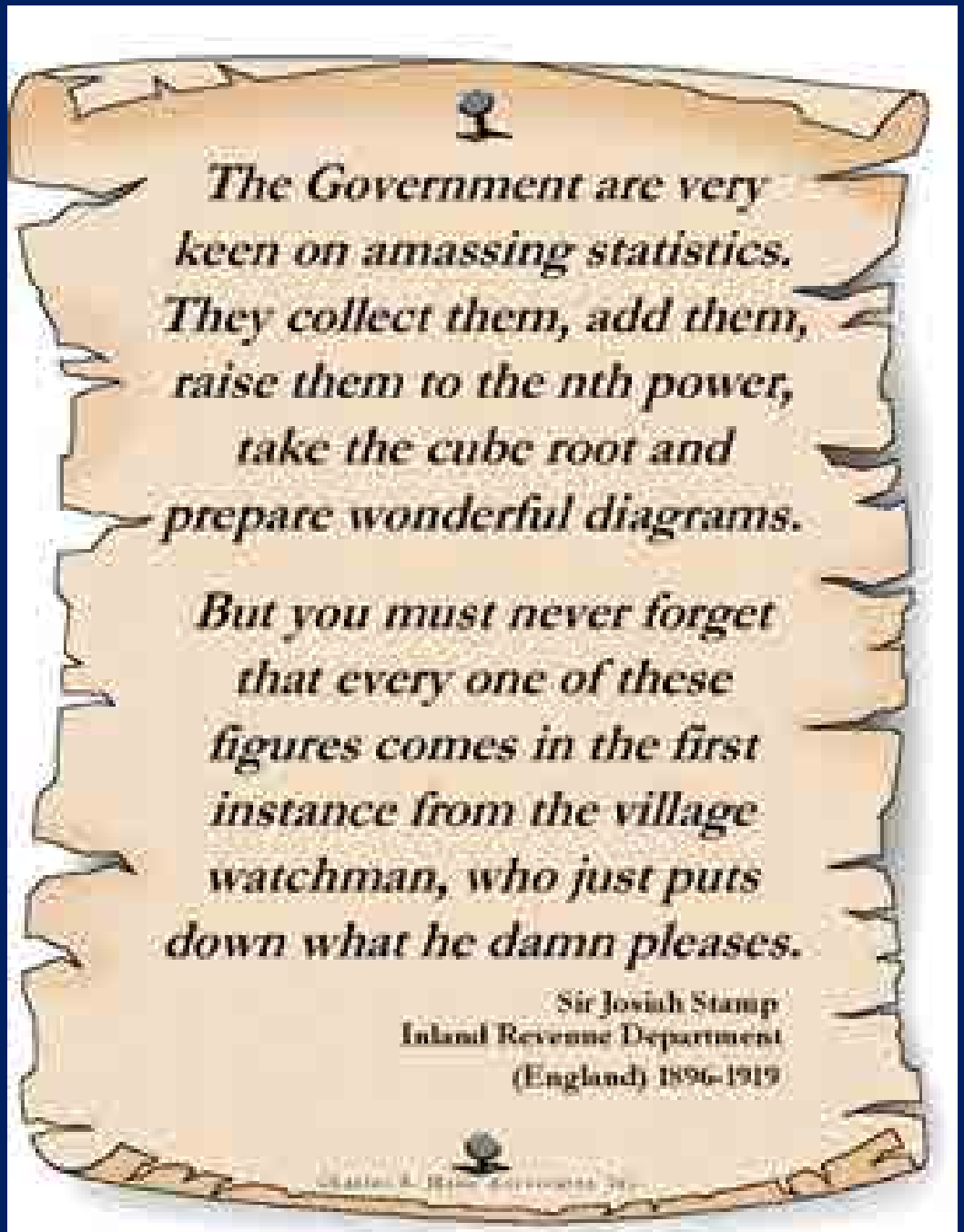


NOHSAC Identified Weakness of Current Occupational Disease Surveillance

- separate non-integrated systems collecting various data
- unable to identify most occupational disease cases
  - poor coding of occupation and work-relatedness
  - limited capture of exposure to known risk factors
- under-reporting of occupational disease (eg, work-related cancers
- poor coding of industry and ethnicity in most databases
- very little information on the costs of work-related disease

"Masses of data untouched by human thought"

Kerr White 1974

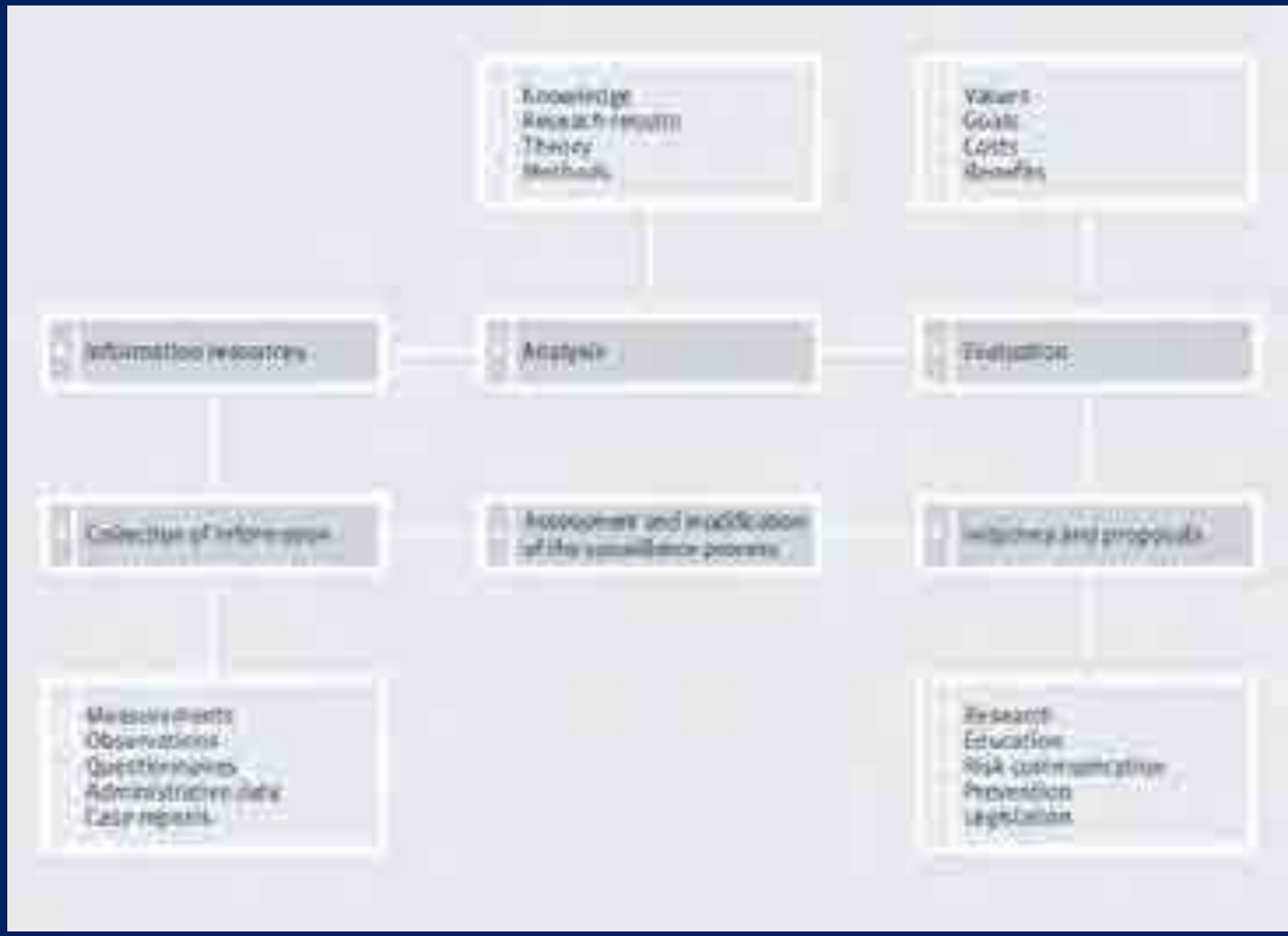

The Government are very keen on amassing statistics. They collect them, add them, raise them to the nth power, take the cube root and prepare wonderful diagrams.
But you must never forget that every one of these figures comes in the first instance from the village watchman, who just puts down what he damn pleases.
Sir Josiah Stamp
Inland Revenue Department
(England) 1896-1919

Data-driven Surveillance

- Feasible
- Data can be obtained
- Incomplete
- Lack relevance & reliability
- Collected for purposes other than surveillance

Concept-driven Surveillance

- Science based, irrespective of availability of data



Occupational Disease Surveillance (ODS)

- Concept driven, not data driven
- Develop robust set of indicators feasible and valid for the monitoring of occupational disease in New Zealand
- Develop computer based occupational disease surveillance system using existing data sets to describe the trends and prevalence of occupational disease
- Test ODS with data on one long latency disease (cancer) and one shorter latency disease (dermatitis).

Mortality, 1998-2008

	Female	Male	Total	%
Total	25772	39304	65076	
Homemaker	3577	26	3603	5.5
Nr	1446	1645	3091	4.7
Beneficiary	976	1690	2666	4.1
Housewife	2120	6	2126	3.3
Student	641	1018	1659	2.5
Sickness beneficiary	446	1033	1479	2.3
Retired	451	587	1038	1.6
Unemployed	179	750	929	1.4
Farmer	143	777	920	1.4
Truck driver	10	787	797	1.2
Company director	221	548	769	1.2
Labourer	14	747	761	1.2
Mother	646	1	647	1.0
Caregiver	493	94	587	0.9
Builder	1	567	568	0.9
Invalid	202	349	551	0.8
Teacher	363	147	510	0.8
Home executive	467	21	488	0.7
Carpenter	1	406	407	0.6
Engineer	2	379	381	0.6
Freezing worker	18	361	379	0.6

Hospitalisations, September-December 2010

Occupation	Female	Male	Total	%
Total	26921	19143	46064	
Student	1366	870	2236	4.9
Unemployed	883	1151	2034	4.4
Beneficiary	898	1042	1940	4.2
Mother	1604		1604	3.5
Other	775	676	1451	3.1
Corporate Managers or Managing Directors	461	628	1089	2.4
Retired	596	448	1044	2.3
Manager	555	478	1033	2.2
Houseperson/Homemaker	924	10	934	2.0
Farmer	176	565	741	1.6
Labourer	131	553	684	1.5
Student School	302	205	507	1.1
Housewife	476		476	1.0
Nursing and Midwifery Professionals	452	19	471	1.0
House Person/Homemaker	428	7	435	0.9
Building and Related Workers	3	422	425	0.9
Household Duties	395	10	405	0.9
Sales and Marketing Managers	244	161	405	0.9
Builder	3	346	349	0.8
Salespersons and Demonstrators	210	119	329	0.7
Office Clerks	305	21	326	0.7

Hospitalisation for Dermatitis, 2000-09

- 28,207 admissions

Age Group	Asian	European	Maori	Other	Pacific	Unknown
15-24	15.3	8.9	23.1	11.4	19.9	12.3
25-44	42.4	20.7	35.7	31.0	36.7	20.4
45-64	22.8	22.9	27.7	28.7	25.7	22.7
65+	19.5	47.6	13.5	29.0	17.8	44.5
Total	4.7	70.3	13.5	3.3	6.5	1.8

Dermatitis Pharmaceuticals and Hospitalised, 2010

- 354 admissions
- 59% European; 29% Maori
- 59% female
  - Maori female 66%; Pacific 38%
- 47% from Counties-Manakau, Northland, Waikato, and Waitemata

Dermatitis Pharmaceuticals and Hospitalised, 2010

	Total	%
Total	354	
Unemployed	26	7.3
Student	22	6.2
Bemeficiary	18	5.1
Other	15	4.2
Mother	14	4.0
Houseperson/Homemaker	12	3.4
Corporate Managers or Managing Directors	11	3.1
House Person/Homemaker	10	2.8
Sales and Marketing Managers	7	2.0
Retired	6	1.7
Student School	6	1.7
Labourers	5	1.4
Primary Teaching Professionals	5	1.4
Caregiver	4	1.1
Cooks	4	1.1
Manager	4	1.1
Nurse / Midwife	4	1.1
Office Clerks	4	1.1

Asthma Pharmaceuticals and Hospitalised, 2010

Occupation	2010	%
Total	737	
Student	47	6.4
Unemployed	33	4.5
Beneficiary	24	3.3
Mother	19	2.6
Other	19	2.6
Corporate managers or managing directors	18	2.4
Houseperson/homemaker	18	2.4
Student school	18	2.4
Manager	17	2.3
Salespersons and demonstrators	14	1.9
Sales and marketing managers	13	1.8
Primary teaching professionals	12	1.6
Retired	11	1.5
Nursing and midwifery professionals	10	1.4
Cooks	9	1.2

Annual Deaths Attributable to Occupational Exposures, 2007-08

Disease with well established link with occupation	Males	Females	Total	
	2007-08	2007-08	2007-08	1999
Malignant neoplasms				
Liver, specified as primary	6	4	10	4
Nasal cavities, middle ear and accessory	2	0	2	1
Larynx	3	0	3	2
Trachea bronchus and lung	108	18	126	122
Other malignant neoplasm of skin	11	1	12	8
Bladder	18	4	22	20
Kidney and other unspecified urinary	6	1	6	5
Leukaemia	28	3	32	30
Diseases of circulatory system				
Ischaemic heart disease	88	11	99	246
COPD	115	29	144	151
Asthma	3	6	10	39
Other				
Asbestosis	15	1	15	10
Nephritis, nephritic syndrome and nephrosis	25	4	29	8

Annual Deaths Attributable to Occupational Exposures, 2007-08

Disease with less established link with occupation	Males	Females	Total 2007-08	cf 1999
Oesophagus	10	0	10	7
Stomach	18	6	24	28
Colon	23	0	23	20
Rectum, rectosigmoid junction and anus	8	0	8	7
Pancreas	26	7	*33*	*25*
Melanoma of skin	8	0	9	6
Female breast	0	11	11	11
Ovary and other uterine adnexa	0	5	5	4
Prostate	37	0	*37*	*33*
Brain	12	1	13	13
Non-Hodgkin's lymphoma	12	2	*14*	*28*
Senile and pre-senile organic psychotic conditions	15	7	22	<34
Parkinson's disease	17	5	22	18
Cerebrovascular disease	19	12	*31*	*40*
Pneumonia	2	1	3	4
Ulcer of stomach and duodenum	4	1	5	4

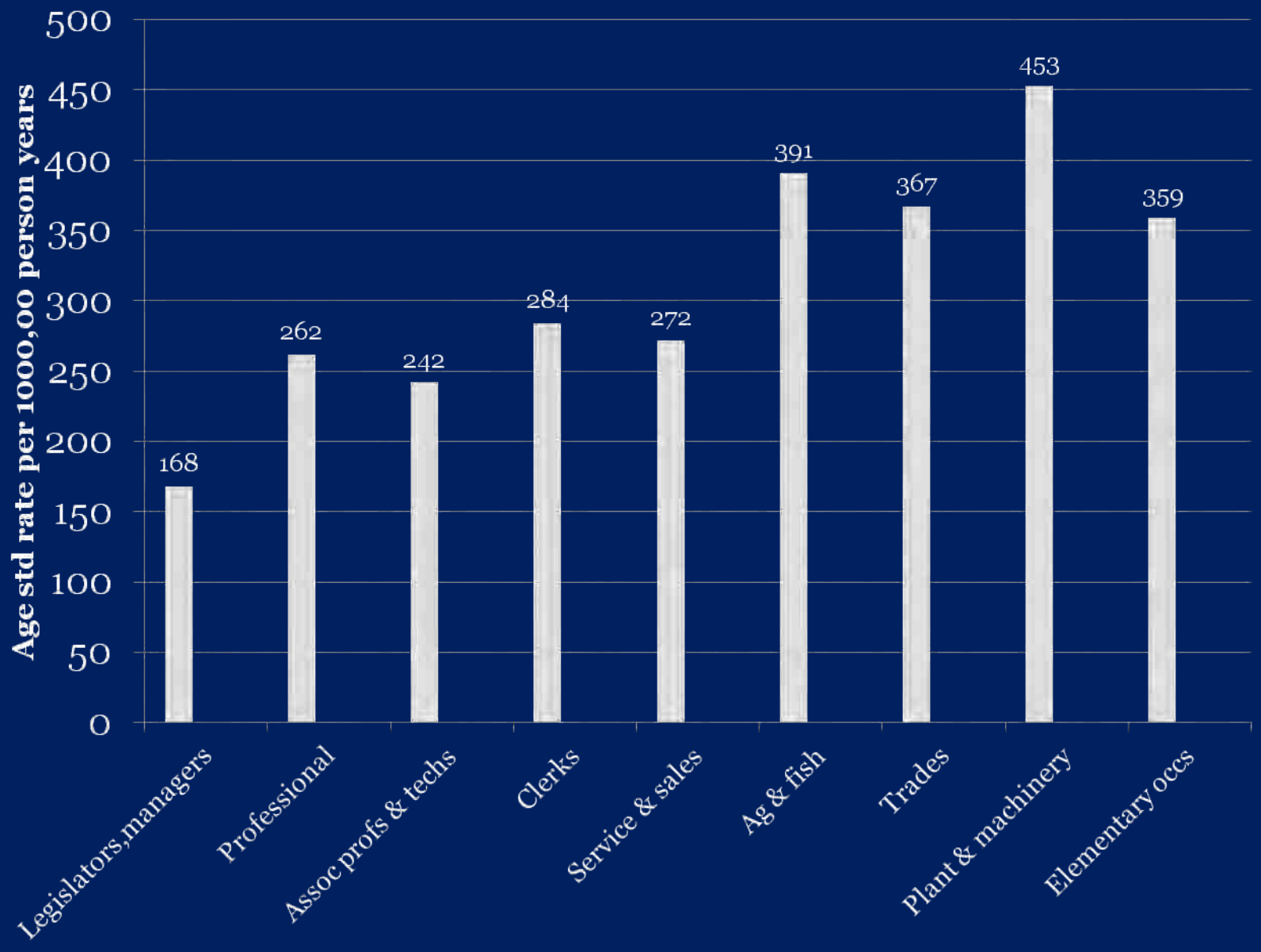
Annual Hospitalisations Attributable to Occupational Exposures, 2007-08

Disease with well established link with occupation	Males	Females	Total
Ischaemic heart disease	855	189	1043
COPD	798	215	1013
Other malignant neoplasm of skin	696	138	834
Asthma	147	358	504
Leukaemia	257	22	279
Nephritis, nephritic syndrome and nephrosis	232	23	255
Trachea bronchus and lung	193	37	230
Bladder	173	32	205
Pleura including mesothelioma	30	4	33
Liver, specified as primary	13	9	22
Kidney and other unspecified urinary	20	2	22
Larynx	15	0	15
Nasal cavities, middle ear and accessory	9	1	10
Asbestosis	10	0	10

Occupational group *(males 15-64, 2001-05)*	Relative risk vs all employed	Relative risk vs deprivation quintile
Legislators and Administrators	0.67	0.89
Corporate Managers	0.57	0.62
Physical, Mathematical and Engineering Science Professionals	0.61	0.70
Life Science and Health Professionals	0.99	1.23*
Teaching Professionals	0.76	0.83
Other Professionals	0.69	0.82
Physical Science and Engineering Associate Professionals	0.96	1.02
Life Science and Health Associate Professionals	**2.04***	**2.50***
Other Associate Professionals	0.79	0.86
Office Clerks	1.01	0.95
Customer Services Clerks	0.88	0.95
Personal and Protective Services Workers	**1.33***	**1.26***
Salespersons, Demonstrators and Models	0.49	0.48
Market Oriented Agricultural and Fishery Workers	**1.26***	**1.37***
Building Trades Workers	**1.10***	**1.06**
Metal and Machinery Trades Workers	**1.25***	**1.15***
Precision Trades Workers	**1.72***	**1.67***
Other Craft and Related Trades Workers	**2.86***	**2.69***
Industrial Plant Operators	**4.08***	**2.91***
Stationary Machine Operators and Assemblers	**1.95***	**1.58***
Drivers and Machinery Operators	**1.13***	**0.95**
Building and Related Workers	**1.94***	**1.76***
Labourers and Related Elementary Service Workers	**1.23***	1.03

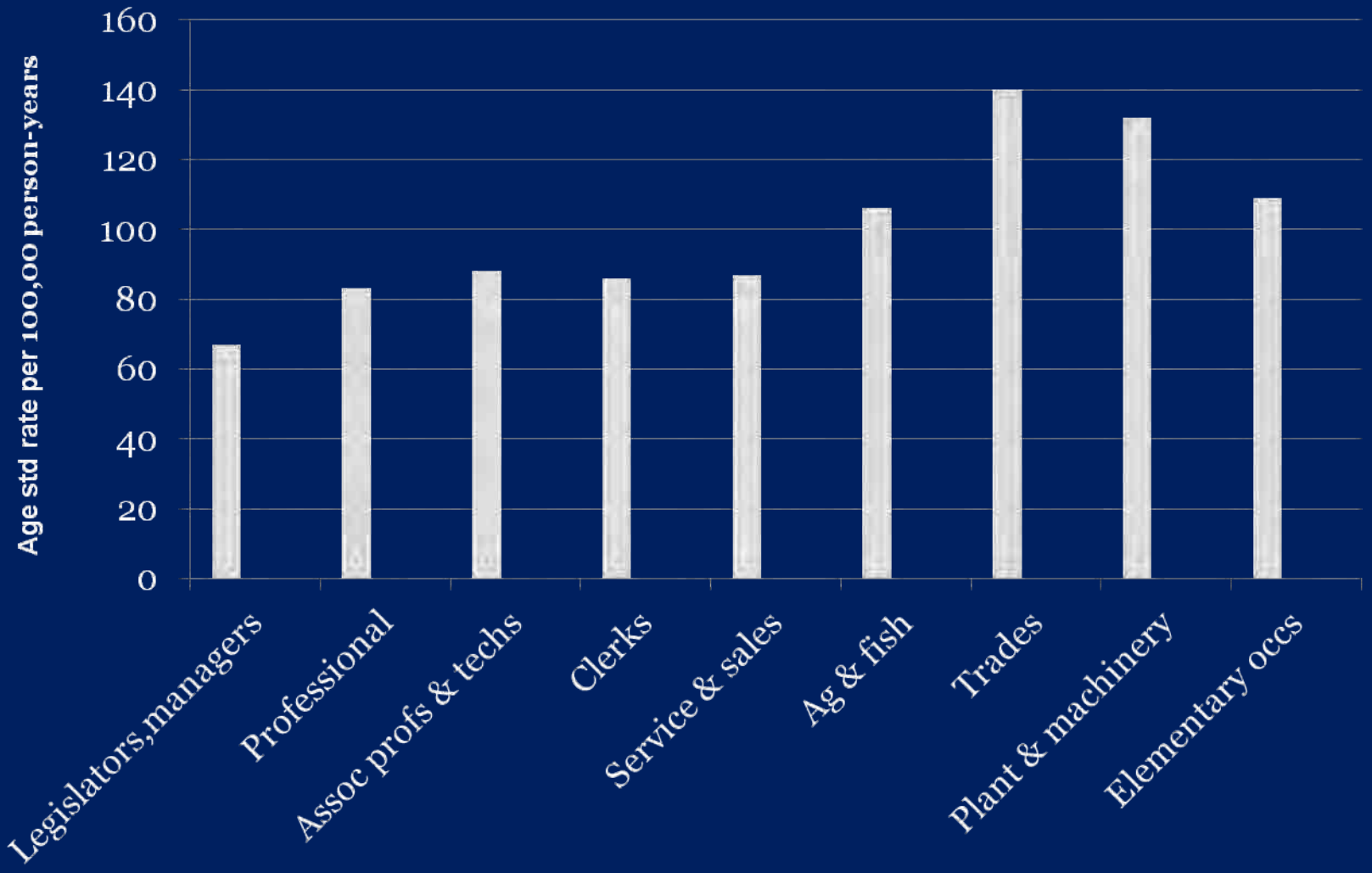
Holmes et al, NZMJ 2011;124

Male Mortality, 15-64yrs, 2001-05

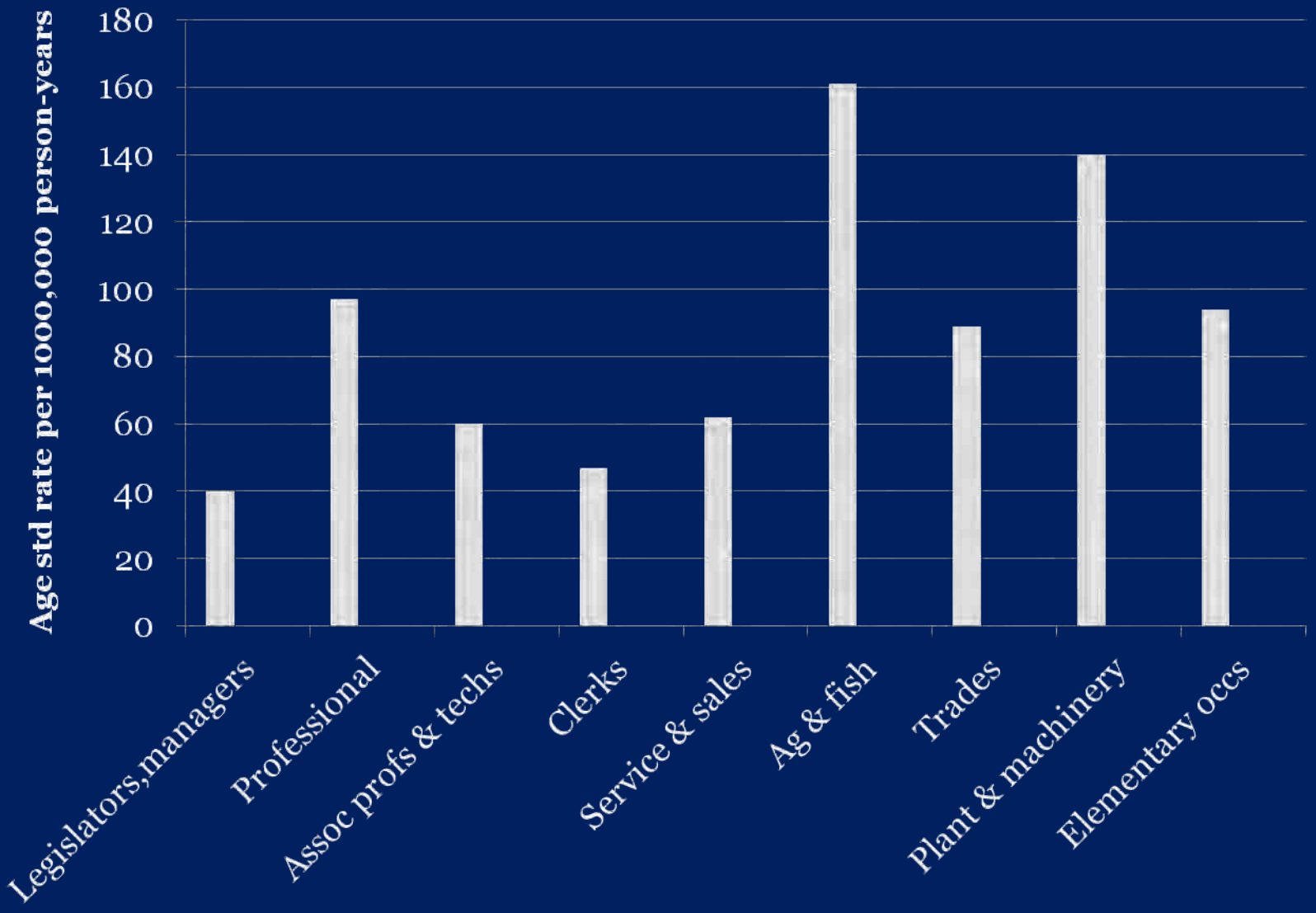


Holmes et al, NZMJ 2011;124

Male Cancer Mortality), 15-64yrs, 2001-05



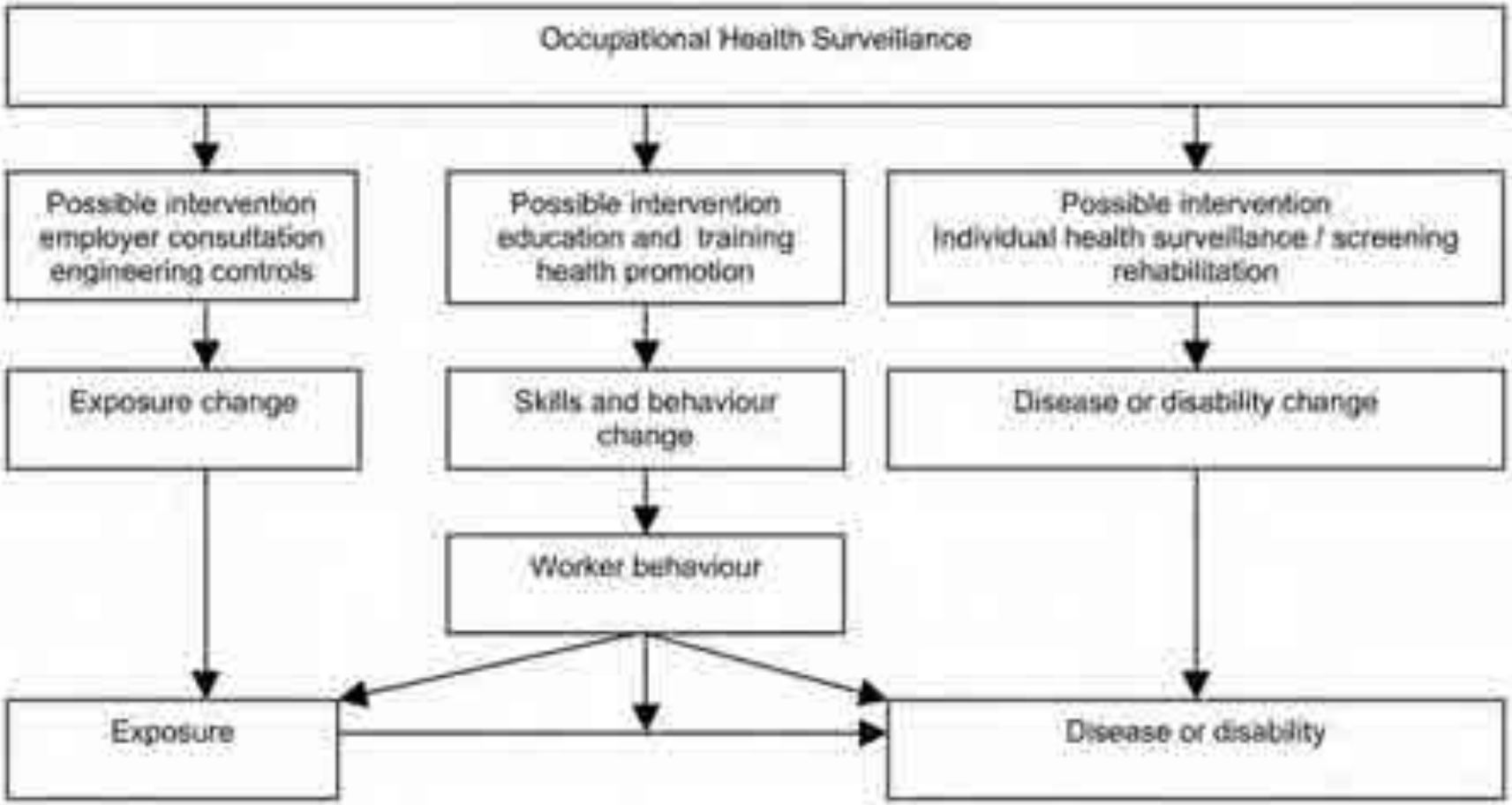
Male Mortality, 15-64yrs, 2001-05, External Causes



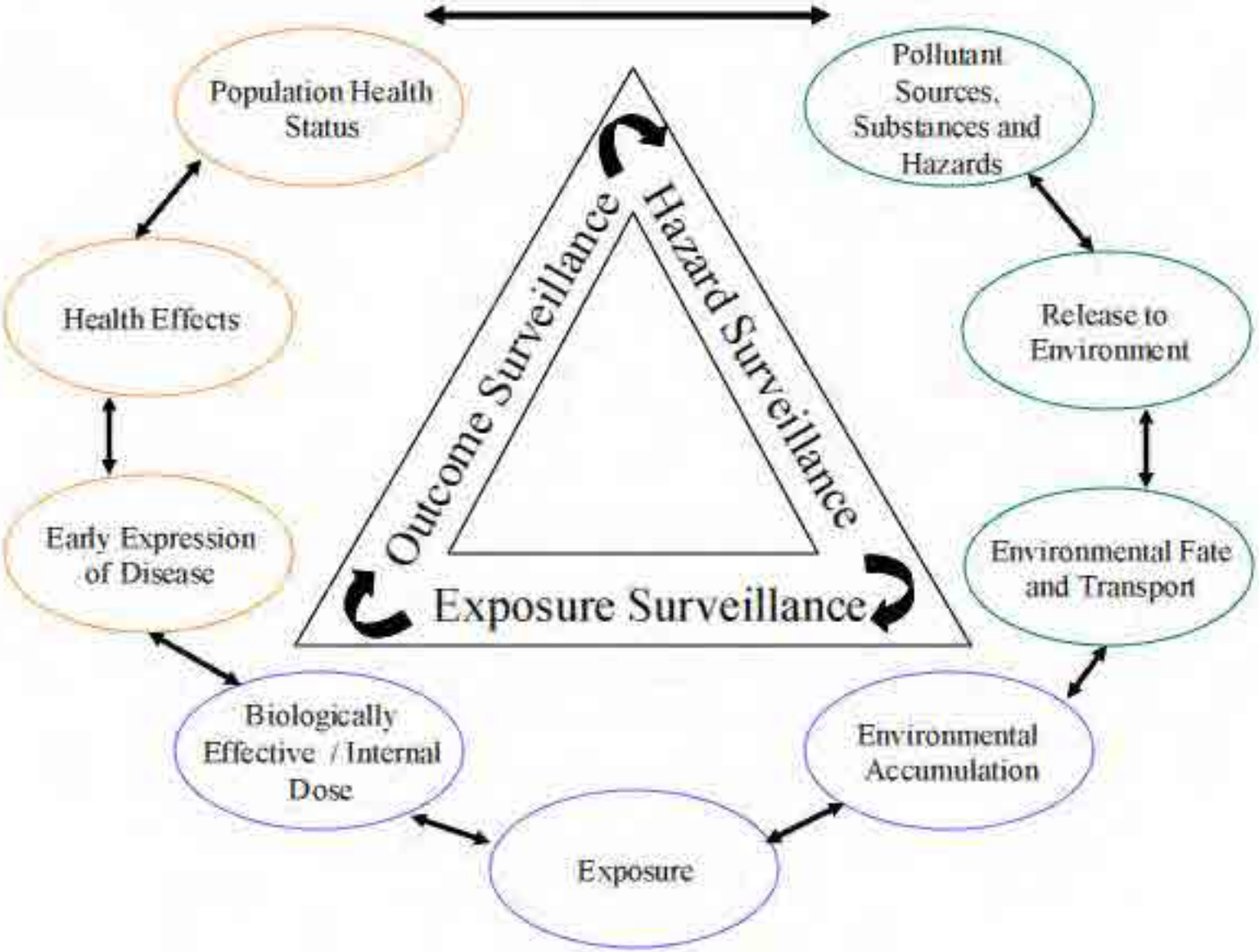
Rationale for Disease Surveillance

- The disease(s) is of public health importance
- Caution:
  - Is it worth the effort – resources
  - Are relevant data easily available
  - Can action be taken

Implementation:



Bridging the Chasm



Occupational Ill-Health in NZ

- Occupational injury
  - Obvious
  - attribution
  - Regular reporting
  - Claims for compensation
  - Compliance monitoring

- Occupational Disease
  - Latent period

Occupational Disease in NZ

- Annual estimates
  - 700-1000 deaths from occupational disease, (esp, cancer, respiratory disease, and ischaemic heart disease)
  - 17-20,000 new cases of work-related disease
- Large amount of data collected by various agencies
- Surveillance incomplete, uncoordinated, creating major gaps in the evidence base for policy development.

Public Health Surveillance

- The ongoing and systematic collection, analysis, and interpretation of health data in the process of describing and monitoring a health event
- Essential for planning, implementing, and evaluating the effectiveness of public health interventions and programs
- closely integrated with the timely dissemination of these data to those who need to know
- The final link of the surveillance chain is the application of these data to prevention and control

Source

- Data derived from the New Zealand Health Information Service (NZHIS)
  - Mortality Collection
  - National Minimum Dataset (NMDS)
  - New Zealand Cancer Registry
  - Pharmaceutical Collection (PHARMS)

Data Extraction

- Mortality Collection
  - Deaths registered from 1998-2008 with an occupation
  - Ages 15-64 years
- NMDS
  - No. of people admitted to the hospital in 2010 with an occupation
  - No. of people admitted to the hospital from 2000-2009 and diagnosed with dermatitis or asthma
- PHARMS
  - No. of people prescribed with dermatitis or asthma medication in 2010

Data Linkage

- Encrypted NHI numbers were used to link the various datasets

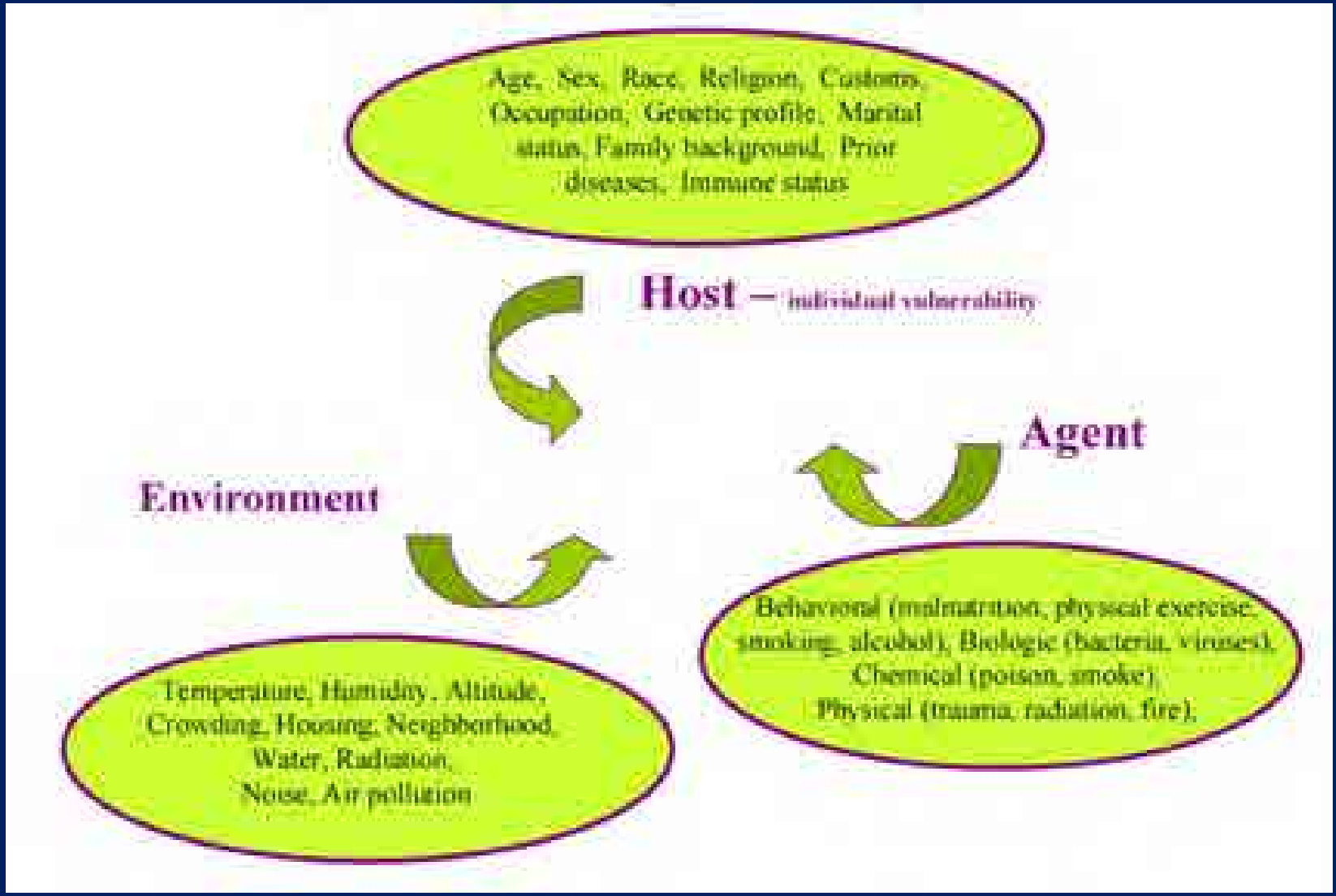
Mortality → Cancer registry

NMDS → Cancer registry

NMDS → PHARMS (dermatitis)

NMDS → PHARMS (asthma)

Epidemiological Triangle




AS SOON AS THEY COME OUT WITH VOICE RECOGNITION, PAIN FREE SITTING APPARATUS, AND RETINAL PROJECTION THEN I'LL GET STARTED ON THAT PROJECT
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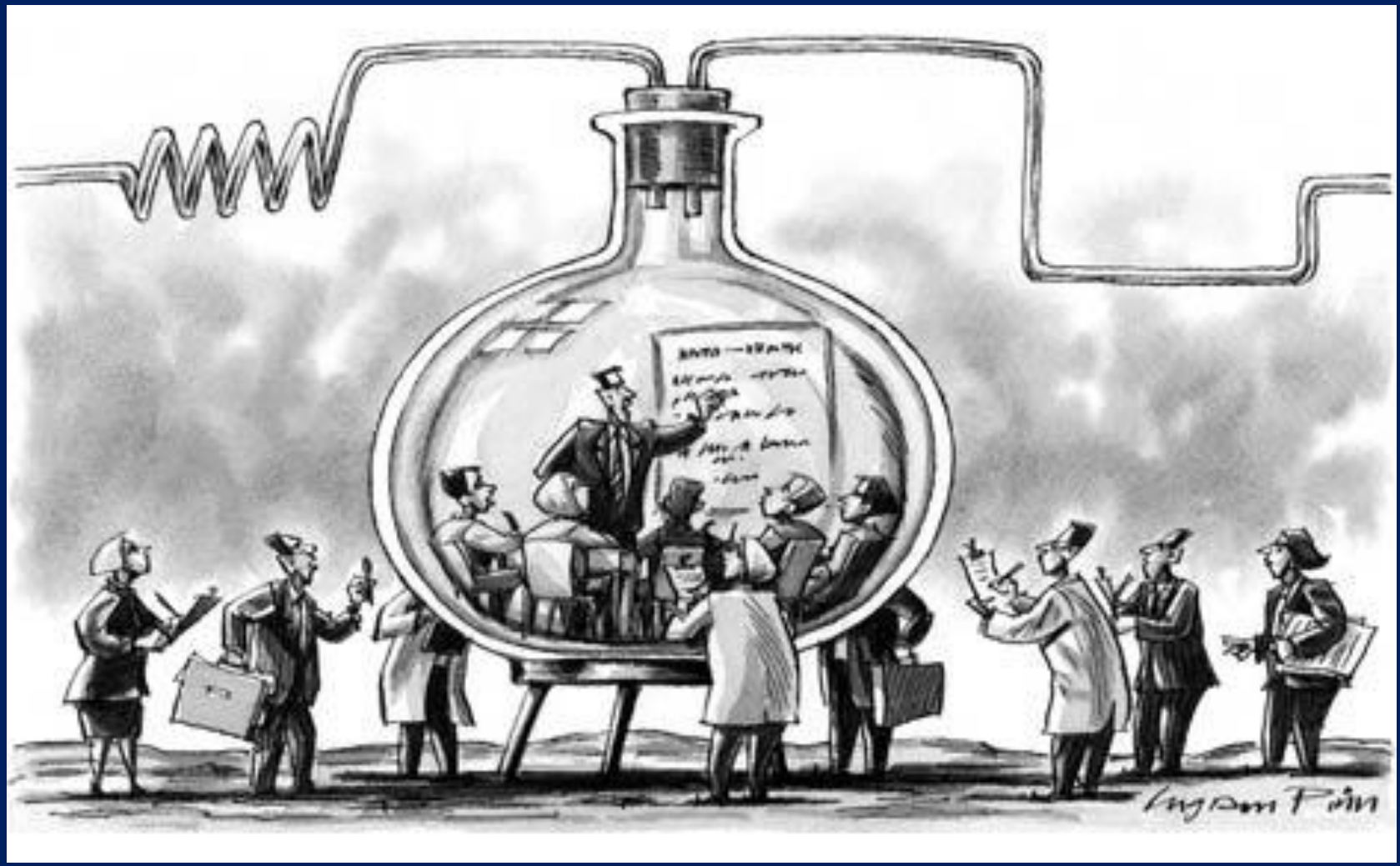
CHECK LABELS ON CHEMICAL CONTAINERS
But it's such a sweet smelling poison.
WEAPONS GRADE DEATH SYRUP
TOXIC!
EVERY CHEMICAL CONTAINER MUST HAVE A WARNING LABEL

Types of Surveillance

- Passive – data routinely collected, forwarded
- Active – data sought out
- Sentinel – only selected sites report data – rarely representative of population; used to monitor trends and collect more detailed information
- Laboratory – based on data from laboratories
- Syndromic




"I reckon everybody knows about this company's poor safety record by now !"

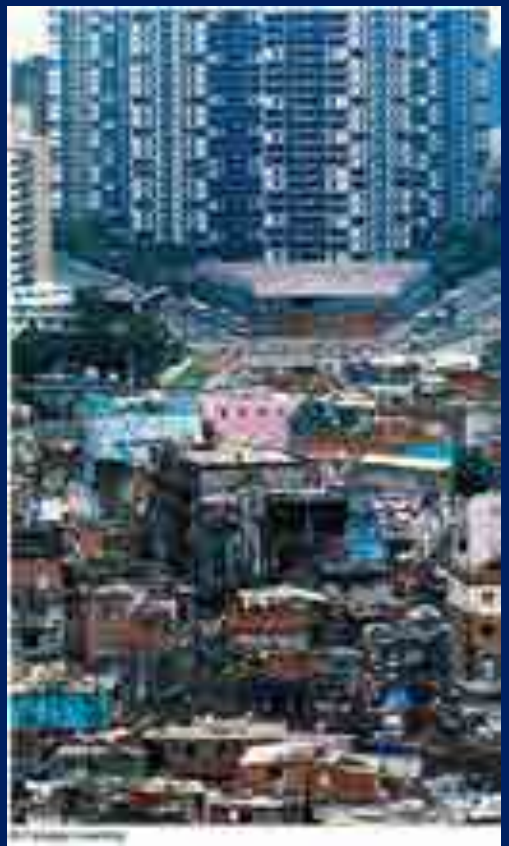
Fig. 3—Hazards in the home environment.

From this

To This

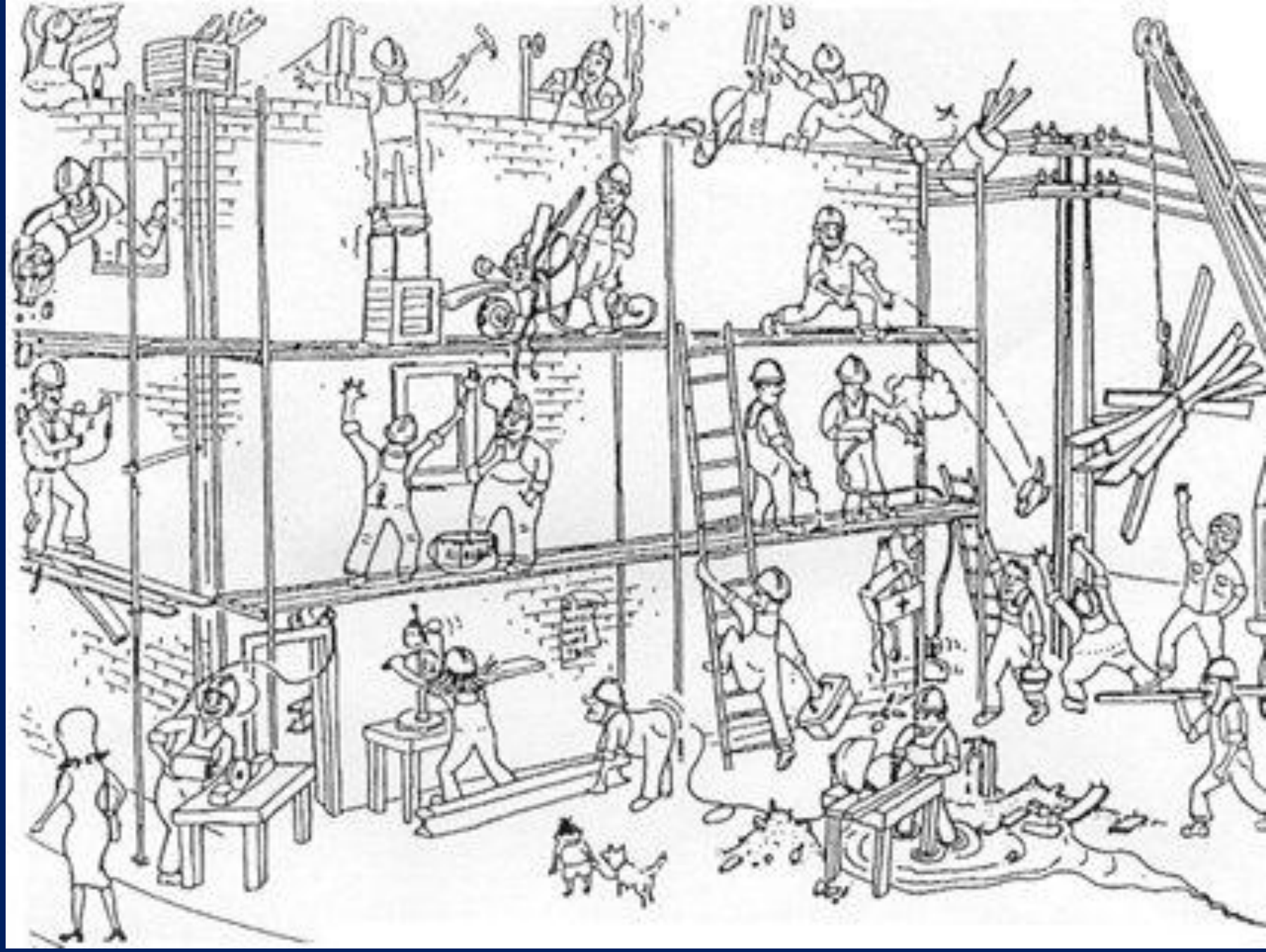
1800's

21st Century



18th Century Workplace

21st Century Workplace



Not just the crappy jobs. . .

US professor dies of mercury poisoning

Injury and Ill-health Pyramid

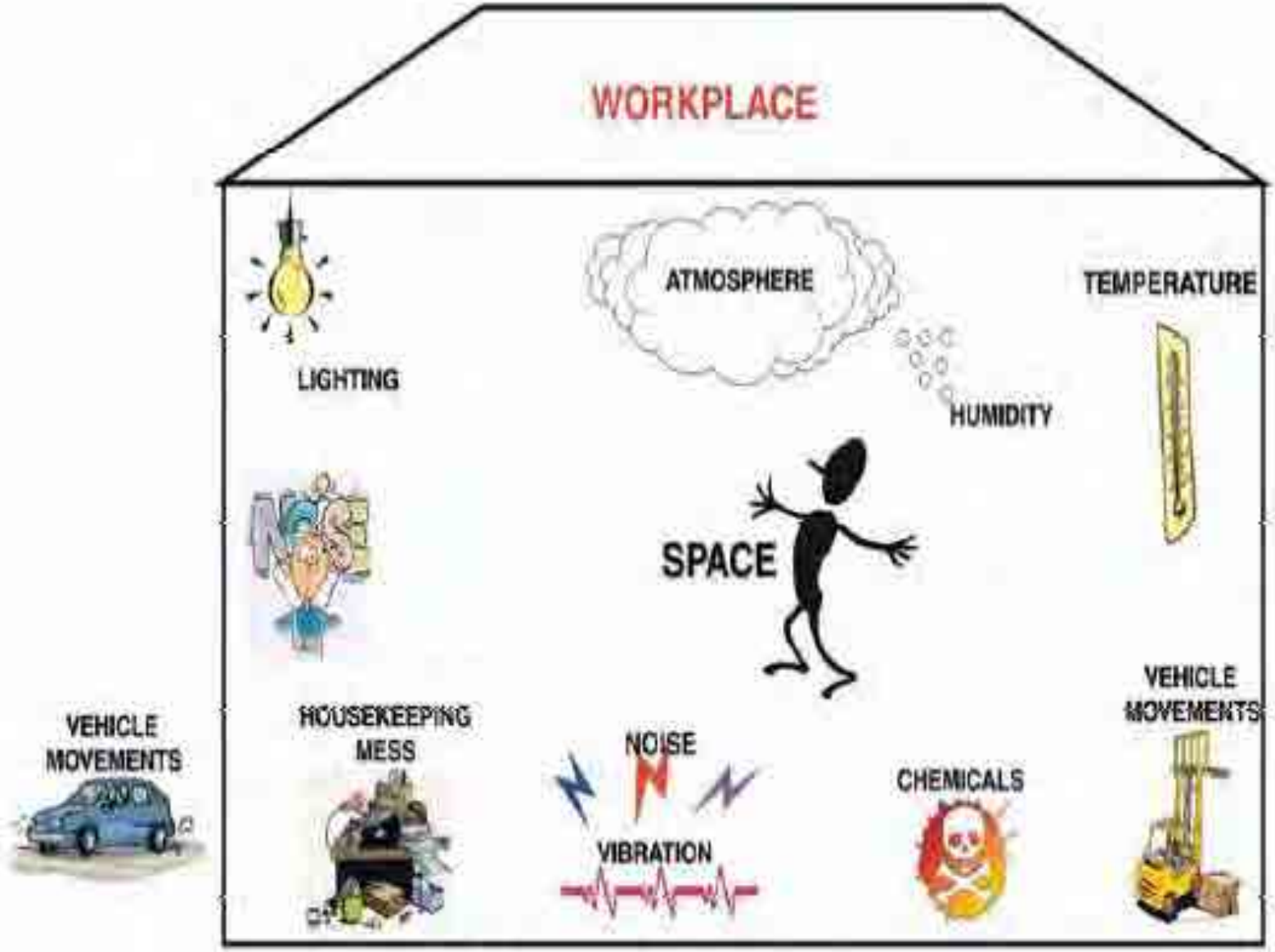
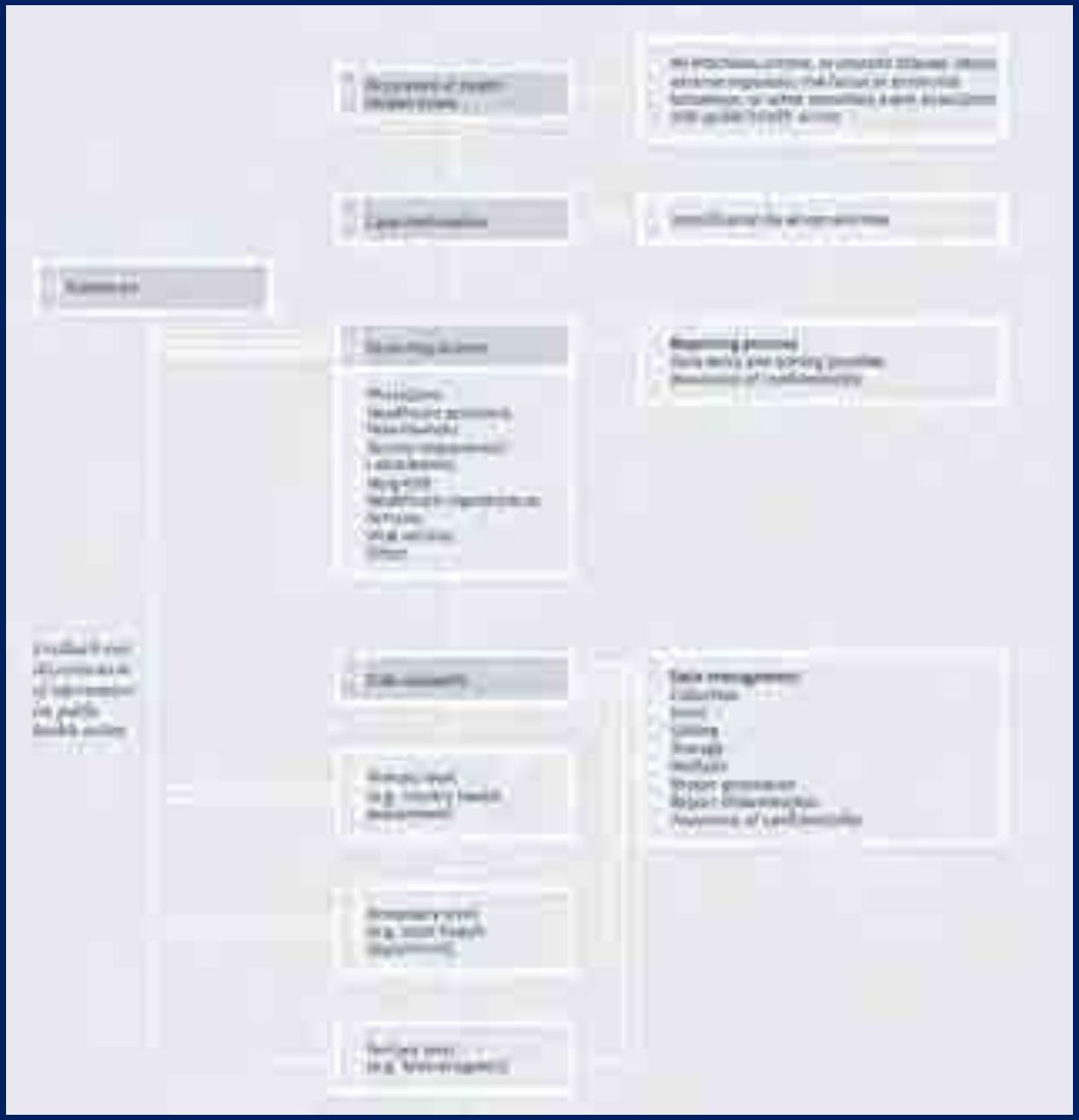


Fig. 2—Hazards in the workplace.

Source: Smulders 2003



Some Carcinogens in the Workplace

Carcinogen	Occupation	Type of Cancer
Arsenic	Mining, pesticide workers	Lung, skin, liver
Asbestos	Construction workers	Lung, mesothelioma
Benzene	Petroleum, rubber, chemical workers	Leukemia
Chromium	Metal workers, electroplaters	Lung
Leather dust	Shoe manufacturing	Nasal, bladder
Naphthylamine	Chemical, dye, rubber workers	Bladder
Radon	Underground mining	Lung
Soots, tars, oils	Coal, gas, petroleum workers	Lung, skin, liver
Vinyl chloride	Rubber workers, polyvinyl chloride manufacturing	Liver
Wood dust	Furniture manufacturing	Nasal

Occupational Injury and Disease Data Pyramid