Environmental Public Health Surveillance in England

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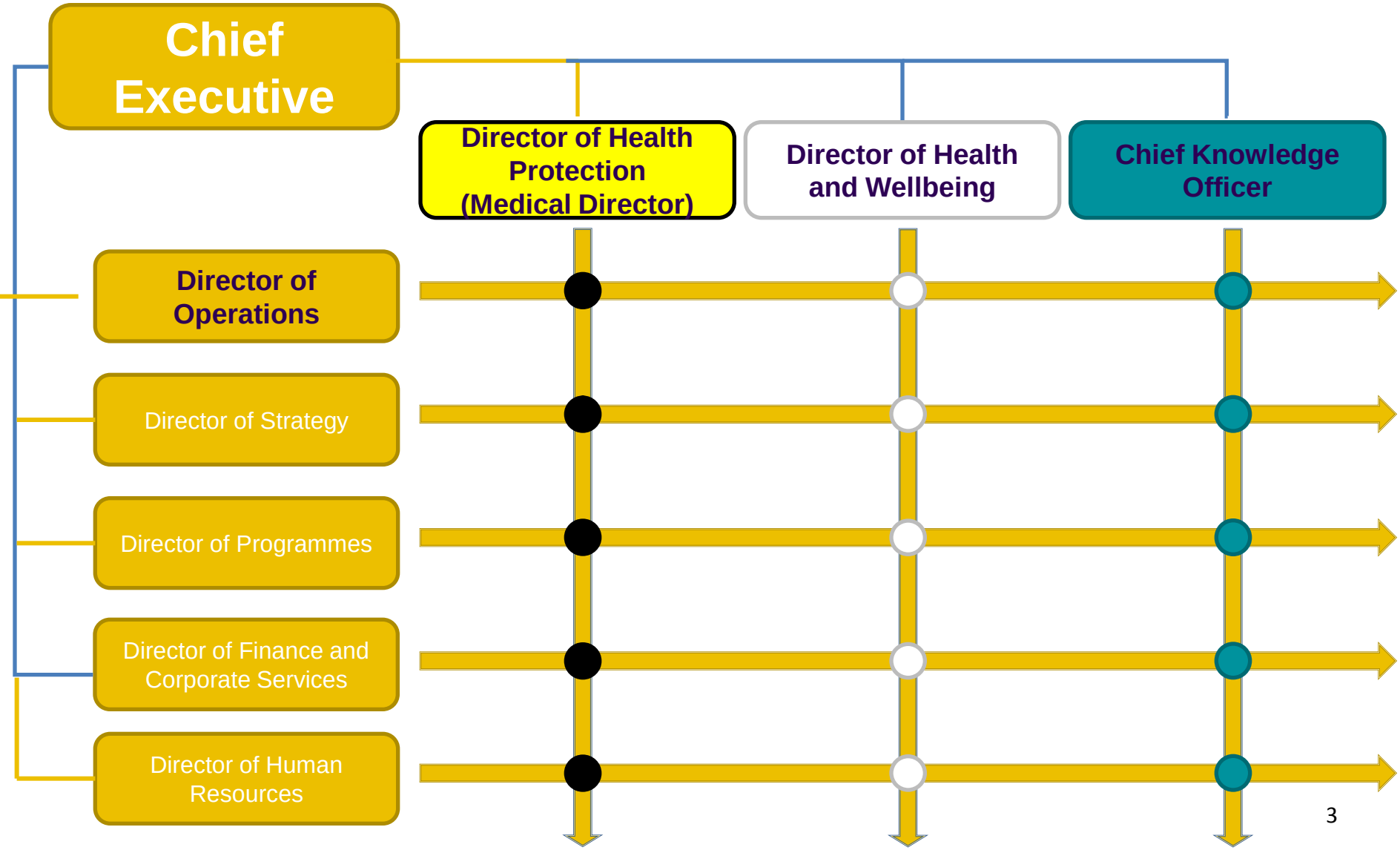
Environmental Public Health Surveillance in England

The ***Health Protection Agency*** is an Independent Arms Length Body directly answerable to the Secretary of State for Health of UK Government.

0n 01 April 2013 the Agency will be subsumed into a new organisation, ***Public Health England***, sponsored by the Department of Health but will retain role of providing independent advice to Government and public.

Public Health England



Environmental Public Health Surveillance in England

CHALLENGE: New organisation with multiple sender organisations all with different understanding of "surveillance" and its uses.

TASK 1: Share and embed concept of prevention better than cure across new component parts of Public Health England.

TASK 2: Create clear and meaningful appreciation of role and function of environmental public health surveillance and its multiple user/ multi purpose needs.

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TASK 1: "Prevention is better than cure"

Burden of Disease Attributable to Environmental Hazards

- Largest part of the burden of disease in developed countries can be explained by the impact of age, gender, genetics, deprivation and personal lifestyle factors
- Growing evidence of contribution of environmental influences on chronic disease outcomes
- Estimate of the burden of disease due to environmental effects up to 10% of congenital anomalies and 25% of cancers
- UK estimate 14% of total burden = 99,400 deaths

Country profiles of Environmental Burden of Disease – UK Estimates; WHO: Public Health and the Environment Geneva 2009

http://www.who.int/quantifying_ehimpacts/national/countryprofile/unitedkingdom.pdf

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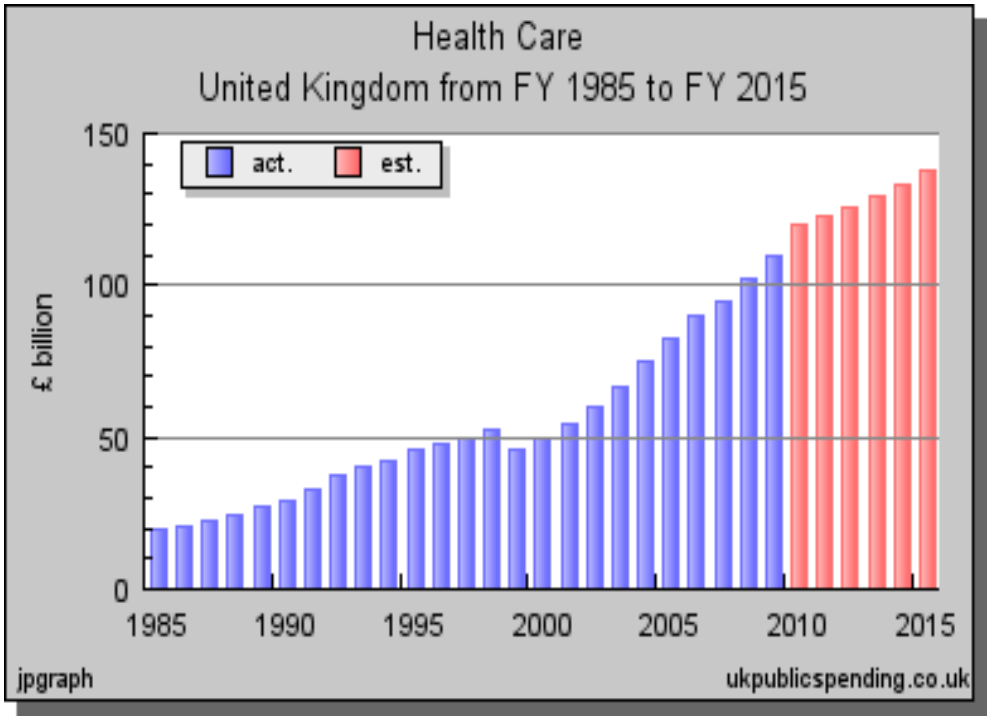
- National Health Service spend 2013 = £126 billion
- Total burden of environmental diseases @ 14% = £17 billion



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TASK 2:

Common understanding of role and purpose of surveillance

Public health surveillance is used to:

- Inform public health action
- Plan and evaluate programmes
- Formulate research hypotheses.

All things to all people?

Public Health England Surveillance Strategy

Definition: Encompasses the processes of data collection, analysis, interpretation and dissemination that are:

(a) undertaken on an ongoing basis (i.e. there is a defined but not time-limited cycle of processing);

(b) provide measures of population or group health status or determinants of health (hazards, exposures, behaviours) against historical or geographical baselines/comparators or defined levels/triggers for action; and

(c) for which there is an agreed and explicit set of actions, timeframes and accountabilities for taking those actions, that will be initiated or informed by the outputs.

PHE Surveillance Strategy 2012

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CHALLENGE: Establish an integrated environmental public health surveillance system for first time

TASK 3: Scope, design and procure systems and processes to deliver a stakeholder driven *environmental public health surveillance system*

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Information Technology Strategy

Surveillance systems will be stakeholder driven

Information will only be gathered:

- If it has a purpose or clearly identified need and will be used by stakeholders for action or intervention;
- Once by PHE and made available (with necessary safeguards) to anyone who has a valid need including external stakeholders and partners

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CHALLENGE: Design a surveillance system to support delivery of the environmental public health tracking concept:

"The ongoing collection, integration, analysis, and interpretation of data about:

- ***Environmental hazards;***
- ***Exposure to environmental hazards;***
- ***Human health effects potentially related to exposure to environmental hazards.***

and including dissemination of information learned from these data"

Centre for Disease Control and Prevention http://ephtracking.cdc.gov/showAbout.action

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Aim of EPHT:

- Identify populations at risk from exposure to significant environmental hazards
- ***Establish relationships between hazard and disease***
- Optimise intervention and prevention strategies
- Inform public health policy making
- Generate hypotheses for further research.

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Objectives of EPHT:

- Develop surveillance of environmental hazards and potential environmental insults;
- Investigate specific allegations of relationships between environmental contamination and health effects;
- Develop exposure models e.g. methodology for quantifying risks posed to human health through exposure to contaminated land;
- Develop routine surveillance of health outcomes at small area level and identify areas of excess for further investigation.

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WHERE DO WE START?

- Risk prioritisation to allocate scarce resources and focus on most significant hazards!

- Most risk ranking approaches are qualitative and use the expert panel approach.

TASK 4: Development of a systematic quantative model using multi criteria decision analysis approach to inform priorities

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Currently EPHS only covers:

Non infectious environmental hazards
Non communicable diseases

Proposed:

Life style diseases and behavioural risk factors
(e.g. type 2 diabetes/ obesity)

TASK 5: Develop integrated approach to include life style diseases, many of which have environmental components. Engage non infectious environmental disease foci e.g. Legionnaires' disease, cryptosporidium, E.coli 0157 etc.

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CHALLENGE – Create clear understanding of principles of Environmental Public Health Tracking

TASK 6: Deliver two "proof of concept" studies to demonstrate hazard and health outcome tracking

Carbon Monoxide in Private Dwellings
An EPHT proof of concept study

Environmental Public Health Tracking

Health outcome tracking

Disease → Cause

e.g. Carbon monoxide poisoning in private dwelling houses

Hazard tracking

Cause → Disease

e.g. Arsenic in private drinking water supplies

Outcome tracking - Carbon monoxide

- Carbon monoxide is a common environmental hazard
- Known cause of fatalities and hospital admissions from accidental poisoning
- Over 50 deaths a year in UK from accidental poisoning
- Morbidity is often undiagnosed

Sources

- Any carbon-based fuel, eg gas, diesel, wood, charcoal

- Cooking and heating devices
  - Faulty
  - Incorrectly installed
  - Poorly maintained or ventilated

- Vehicle exhausts
- Smoking
- Woodchip

Examples

Incomplete combustion

Cooking techniques

Health Protection Agency

5 June 2012 Last updated at 13:08

Carbon monoxide poisoning at Hitchin 'indoor' barbecue

Six people suffered carbon monoxide poisoning from fumes from a charcoal barbecue they are believed to have been using in their conservatory.

Ambulance crews were called to a house in Gosmore Road, Hitchin, on Monday night after a man in his 50s collapsed and five other people had fallen ill.

The six, who were all said to be breathing normally, were taken to the Lister Hospital, Hertfordshire.

The ambulance service warned people about the use of charcoal barbecues.

An East of England Ambulance Service spokeswoman said:
"Unfortunately at this time of year we do start to see incidents relating to the use of charcoal barbecues and want to take this opportunity to emphatically warn people to use them safely and properly.

"Last July we were called to a woman who sadly died after inhaling carbon monoxide fumes from a barbecue in her tent in Norfolk and we do not want to see a repeat of that tragedy.

"Please make absolutely sure your barbecue is used and stored, even after the heat has died down, in a clear open space to ensure enough ventilation."

Top Storie

Sixth guilty over
LinkedIn passwo
Airport could 'run
Author Ray Bradb

Features &

Carbon monoxide health effects

Acute CO poisoning

–Immediate

- Nausea & vomiting
- Headache
- Dizziness, confusion, SOB, blurred vision, LOC, fits, death

–Long-term

- Post-traumatic stress disorder
- Brain damage
- Damage to heart muscle, skeletal muscle, kidney damage & renal failure

Carbon monoxide health effects

Chronic CO poisoning

–Immediate

- Flu-like illness, sore throat, cough
- Impaired memory, confusion, tiredness

–Long-term

- Emotional, physical, mental disability
- Poor memory, concentration, poor effort tolerance, apathy, lethargy

Examples of the use of the data sources

Data source	Brief description of data	Uses of data	Limitations of data
Office for National Statistics Mortality data	Statutory requirement for all suspected or confirmed deaths from CO poisoning to be reported to the Coroner	To identify deaths caused by CO poisoning Data on source is not available in the published information	Based on ICD10 codes, several codes may apply to CO poisoning. Includes fire-related and work-related deaths
Local authority housing records	Inspection reports of Individual unfit and sub standard houses	Facilitates detailed comparison of houses and tenure to identify common types of heating appliances, design layouts and other potentially hazardous aspects	May not be updated regularly or in sufficient detail to identify hazards such as types of heating appliances or other gas equipment which may be implicated

Routine health data sources

- Office for National Statistics Mortality data
- CO Gas Safety Society Database
- Hospital episode statistics (HES)
- Emergency Department attendance data (Department of Health experimental dataset)
- Health and Safety Executive data
- NHS Pathology Departments' data
- Primary care data

Routine environmental data sources

- English House Conditions Survey – Department of Communities and Local Government
- Local authority housing records
- Local authority complaints registers
- Housing association maintenance and repair records
- Gas safety inspection reports

Routine exposure data sources

Missing Link = Exposure data

Source – Pathology Department Reports

- Threshold excedences

Challenge – Establish collection as routine

- Methodologies for integration and evaluation

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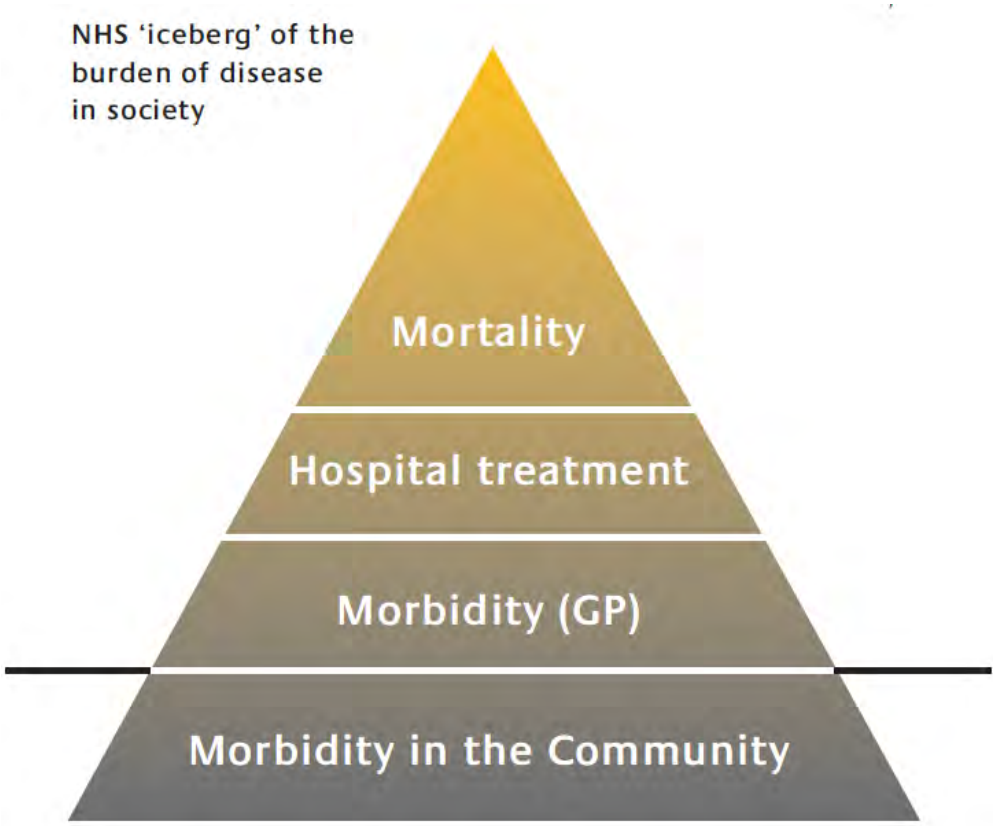
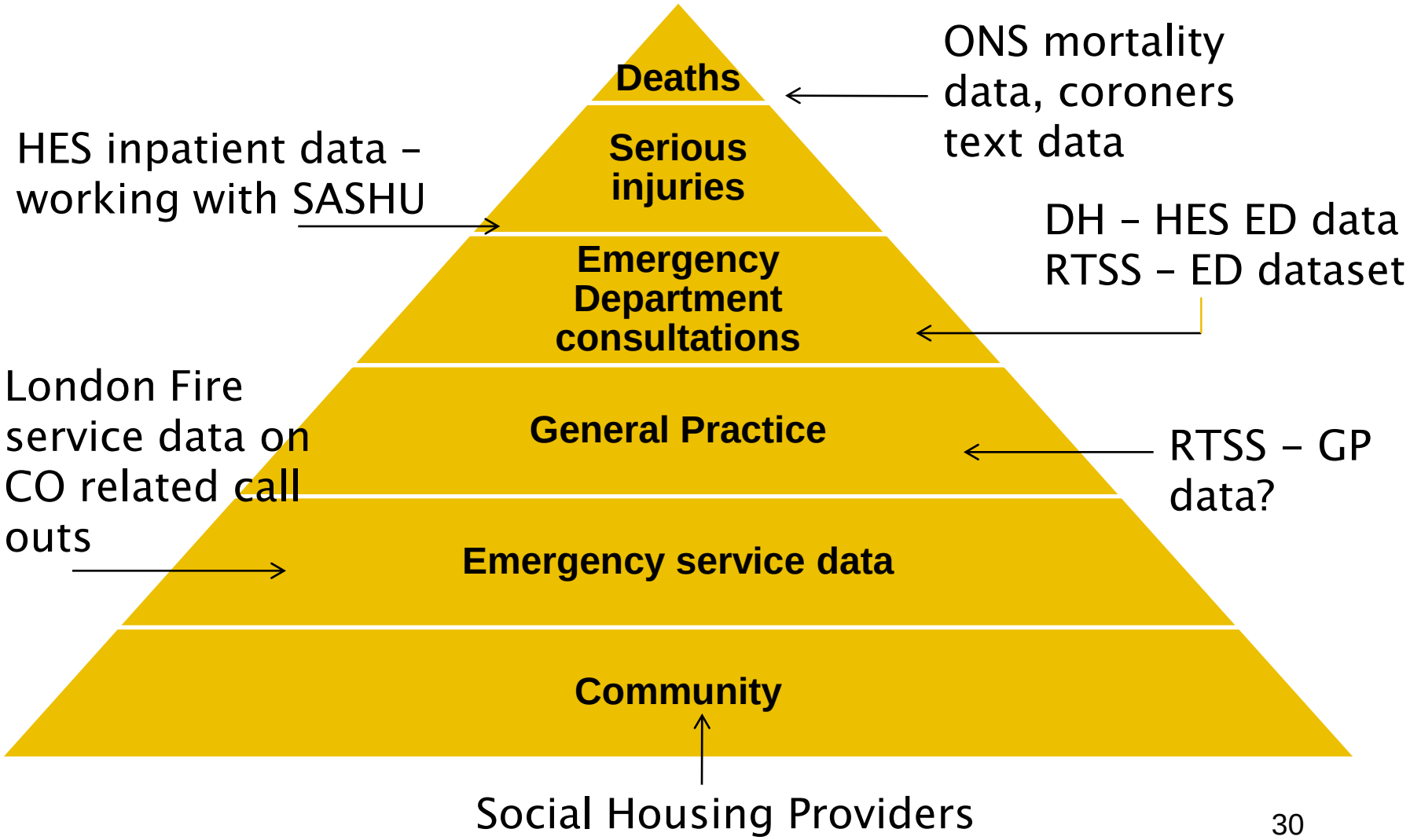


Health Protection in 21st Century: Understanding the Burden of Disease. HPA 2005

Practical examples – Carbon monoxide in private dwelling houses



Need for CO surveillance

Support public health intervention & prevention by

- Measuring and monitoring the burden of CO poisoning over time
- Identification of acute incidents where potential ongoing exposure
- Identify high-risk groups, settings, modifiable factors
- Examine contribution of exposure sources

Systematic use of existing CO information sources

- Collection, analysis, interpretation, timely dissemination
- Combine health and environmental information

Current difficulties

- Lacks links to clinicians
- No current access to haematology and pathology data
- Difficulties in accessing coroners data
- Need for accurate death certification and diagnostic coding

Arsenic in Private Drinking Water Supplies
An EPHT proof of concept study

Arsenic poisoning – what we know

Acute:

- Soluble inorganic arsenic is acutely toxic
- Ingestion of large doses leads to:

  - gastrointestinal symptoms
  - disturbances of cardiovascular and nervous system functions
  - eventually death.

Chronic:

- Causally related to increased risks of cancer in the skin, lungs, bladder and kidney
- Skin changes such as hyperkeratosis and pigmentation changes

WHO Environmental Health Criteria for Arsenic and Arsenic Compounds III. Series
ISBN 92 4 157224 8 (NLM Classification: QV 294) ISSN 0250-863X

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Arsenic in Private Drinking Water Supplies

- Over one million people in England rely on private sources of drinking water including streams, springs and boreholes
- These are in the main distributed around sparsely populated rural areas where no public distribution system is available
- Although there is a regulatory system for control it exempts single household supplies unless there is a public health threat.

Private Water Supply Regulations 2009

Local authorities responsible for:

- Regulating PWS used for drinking, cooking and washing
- Ensuring PWS meet standards laid out in Regulations.
- Completing risk assessment of PWS within 5 years
- Categorising sites
- Monitoring supplies

Aims of the arsenic in private drinking water study

1. Review the relationship between consumption of private drinking water supplies, exposure to arsenic and related health outcomes in study population
2. Explore methodology for risk assessment of exposure to arsenic in drinking water based on underlying geology

Study aim 1

"Review the relationship between consumption of private drinking water supplies, exposure to arsenic and related health outcomes in study population"

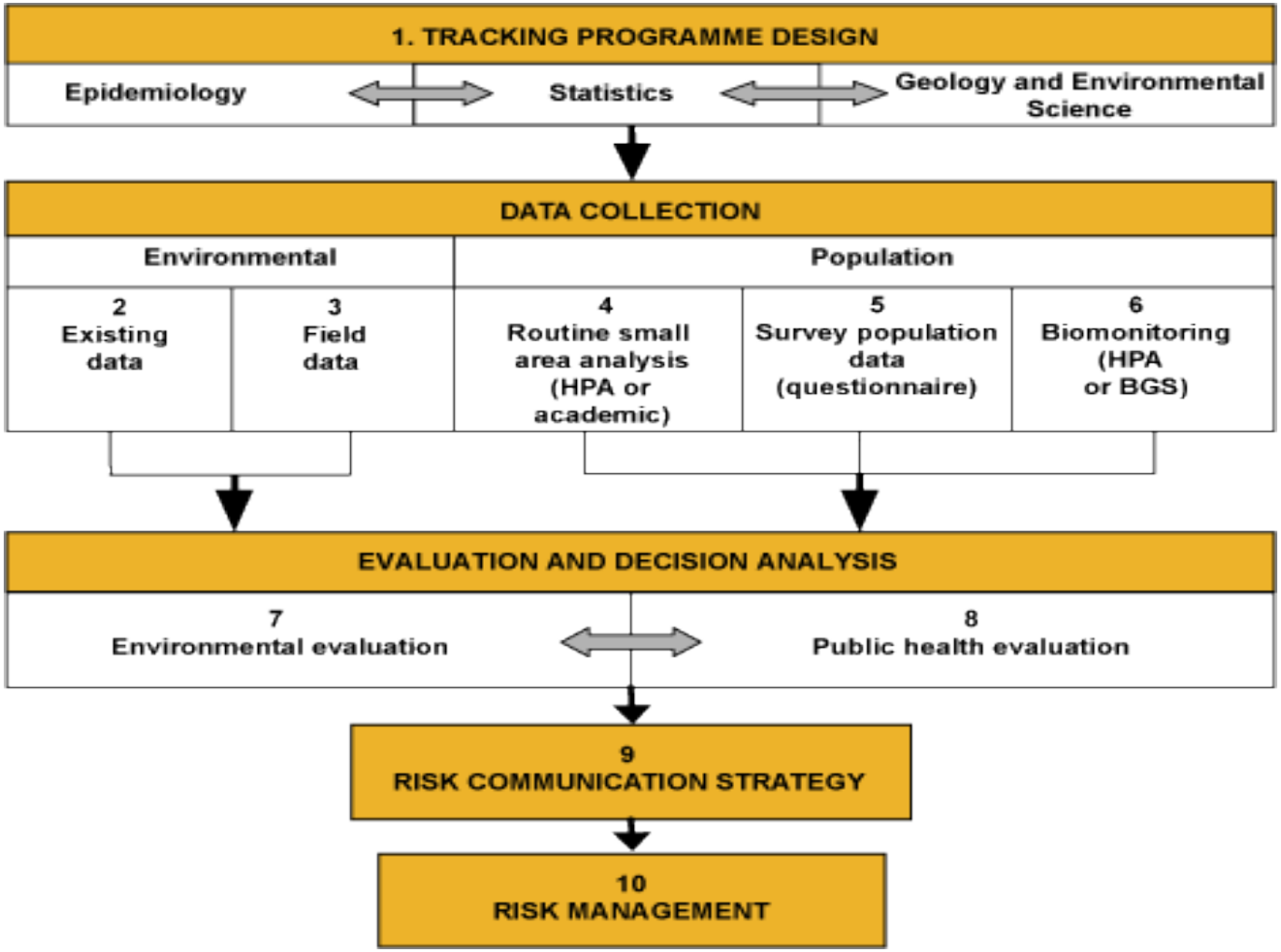
- Quantify exposure to arsenic from ingestion of drinking water from private supplies
- Exposure assessment based on consumption
- Speciation (with BGS)
- Development of robust non-intrusive biomonitoring methodologies
- Validation against urine samples
- Population level health assessment for relevant disease outcomes
- Detailed epidemiological studies

Study aim 2

"Explore methodology for risk assessment of exposure to arsenic in drinking water based on underlying geology"

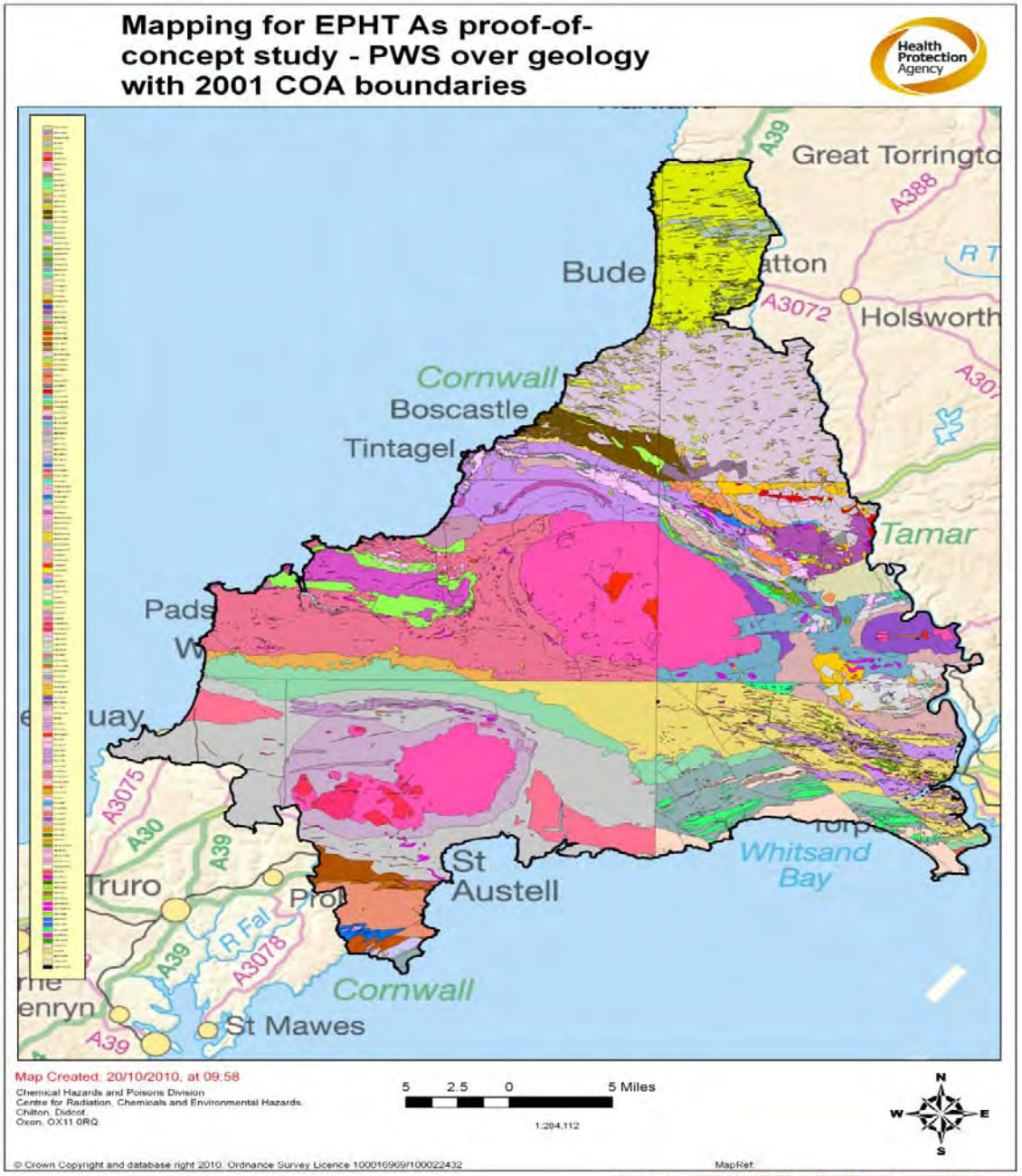
- Build a model comparing potential exposure based on water sampling results and on geology
- Use that model to estimate whether wells not measured are above or below an "action level"
- Borrows from New England study (Ayotte et al 2003)
- Similar to the approach HPA used with radon
- Provides practical risk assessment tool
- Contributes to estimate of burden of disease from environmental hazards

Arsenic: proof of concept study - design

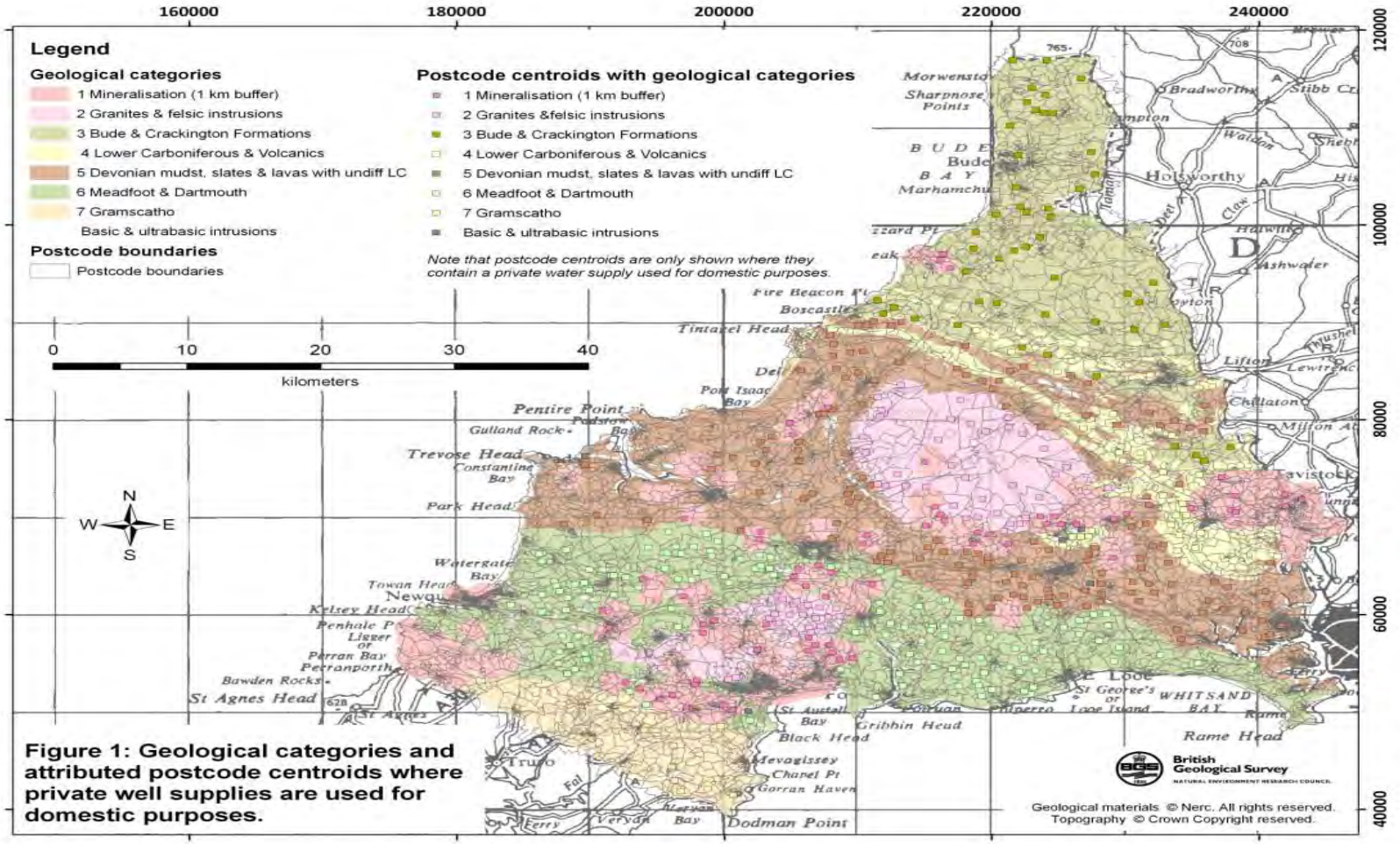


Study design components

- Geology – catchment area assessments, streams and sediments data (GBASE), geological classification maps
- Population distribution – ONS Census data
- Private supplies – Local authority PWS public register
- EA borehole register and specific As data
- South West Water catchment and abstraction data



Simplified Geological Classifications



Simplified geology

Area	Geology
1	Mineralisation
2	Granites and felsic intrusions
3	Bude and Crackington Formations
4	Lower Carboniferous and Volcanics
5	Devonian mudstone, slates and lava
6	Meadfoot & Dartmouth
7	Gramscatho
8	Basic and ultrabasic intrusions

(BGS, 2011)

Testing of samples

Samples collected from 258 homes

Total 325 water samples

Samples analysed for 64 metals and minerals

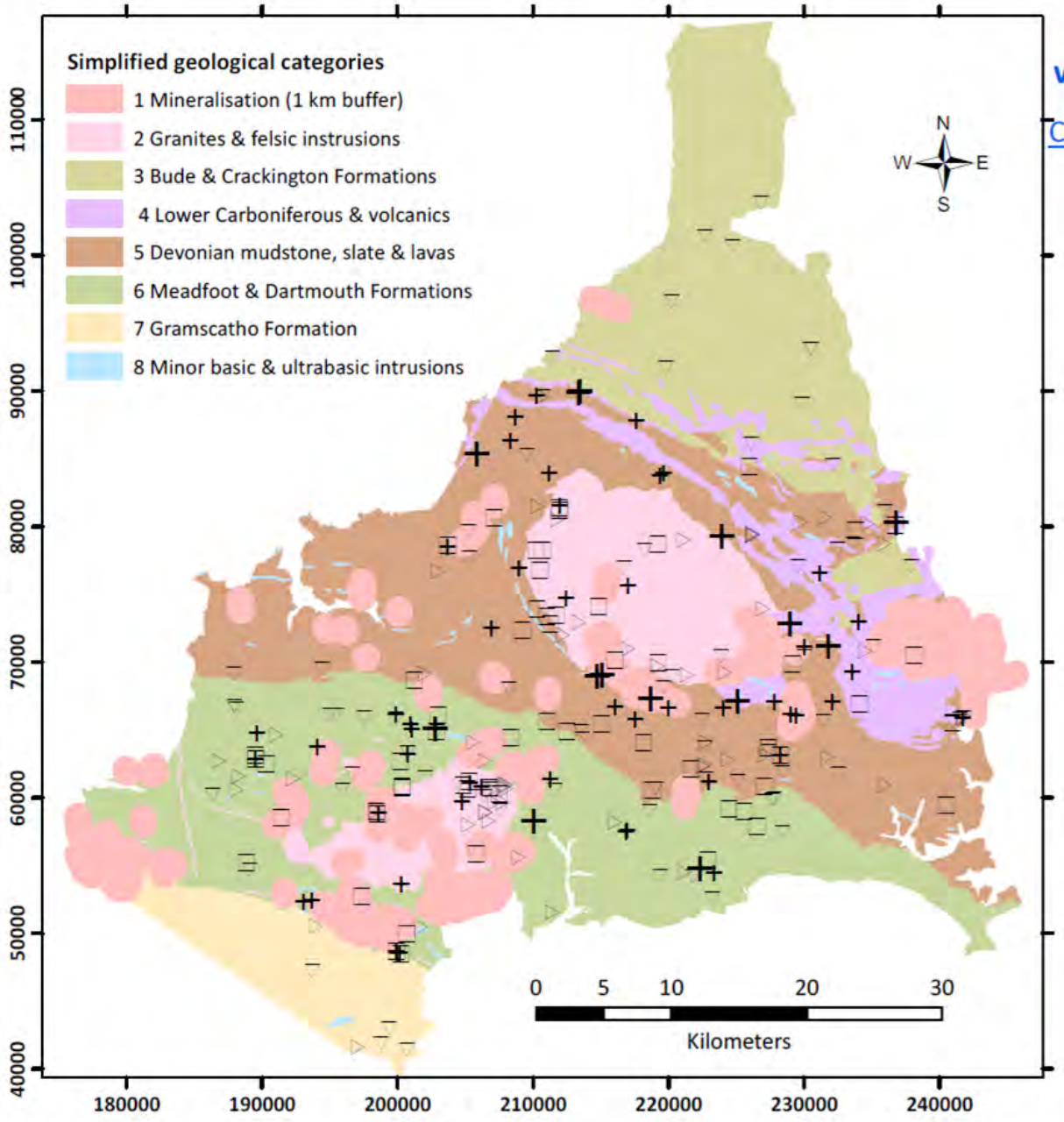
Trace element analyses will be undertaken by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) for 56 elements (Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cu, Cs, Dy, Er, Eu, Fe, Ga, Gd, Hf, Ho, K, La, Li, Lu, Mg, Mn, Mo, Na, Nb, Nd, Ni, P, Pb, Pr, Rb, S, Sb, Se, Si, Sm, Sn, Sr, Ta, Th, Ti, Tl, Tm, U, V, W, Y, Yb, Zn, Zr) on return of the samples to the laboratories.

Speciation was carried out on 10% of samples

Sample results – exceedances of PWS Regs. PCVs

Parameter	PCV	Number of tap sample exceeding PCV	Tap Exceedance range
Aluminium	200µg/litre	14	201-740
Arsenic	**10µg/litre**	**17***	**12-435**
Copper	2.0 mg/litre	1	2.27
Iron	200µg/litre	9	211-2890
Lead	25µg/litre	1	29.8
Manganese	50µg/litre	29**	50.8-1340
Nickel	20µg/litre	6	26.7-47.7
Nitrates	50mg/litre	15***	50.4-97.2

***2 of these samples are from the same households, therefore 15 properties have exceeded**
****2 of these samples are from the same households, therefore 27 properties have exceeded**
***** 1 sample is from the same households, therefore 14 properties have exceeded**



The chemistry of private drinking water supplies: north and east Cornwall

Concentration data for drinking water samples

Arsenic (µg/L)

PCV	11 - 435
75th percentile	1.7 - 10
50th percentile	0.41 - 1.6
25th percentile	0.21 - 0.40
	<0.20

Parameter	Arsenic (As)
Prescribed concentration or value (PCV) - maximum concentration	10 µg/L
Total number of samples	257
Samples above the PCV	15
Percentage of samples above the PCV	6%

Samples collected March-April 2011.
Analysis by ICP-MS.
Map compiled October 2011.

Health Protection Agency

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Classification information missing: tap samples for geological classification is missing.

Initial conclusions

- Successful field data collection, good cooperation of local residents and multi-agency partners
- Results show some As excedences in drinking water
- Possible risk variation by geology category found, but additional analysis and larger sample is required
- Environmental assessment will be further informed by data on springs, reservoirs, upland catchment areas, streams and sediment (GBASE) and FSA project (*Survey of arsenic and arsenic speciation in fruit and vegetables from geogenically enriched areas of SW England*)

Next steps

•Additional sampling to build statistical confidence (second field study March 2013)

•Evaluating the public health outcomes and data gathering

•Combined environmental and public health outcomes evaluation

•Risk assessment and communication

•Burden of disease estimates

•Scoping study for combined exposure assessment (food, air, drinking water)

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QUESTIONS?