14th European ALARA Network

4 - 6 September 2012

The role of reference levels in removing long-term controls: – Post-Chernobyl sheep restrictions in the UK

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1986

- 26 April – Accident at Chernobyl
- May – Plume passes over UK
- Coincides with heavy rainfall in upland areas – peat soils – low mineral content → Radiocaesium readily available for uptake by plants
- Sheep farming predominant activity
- June – Restrictions put in place

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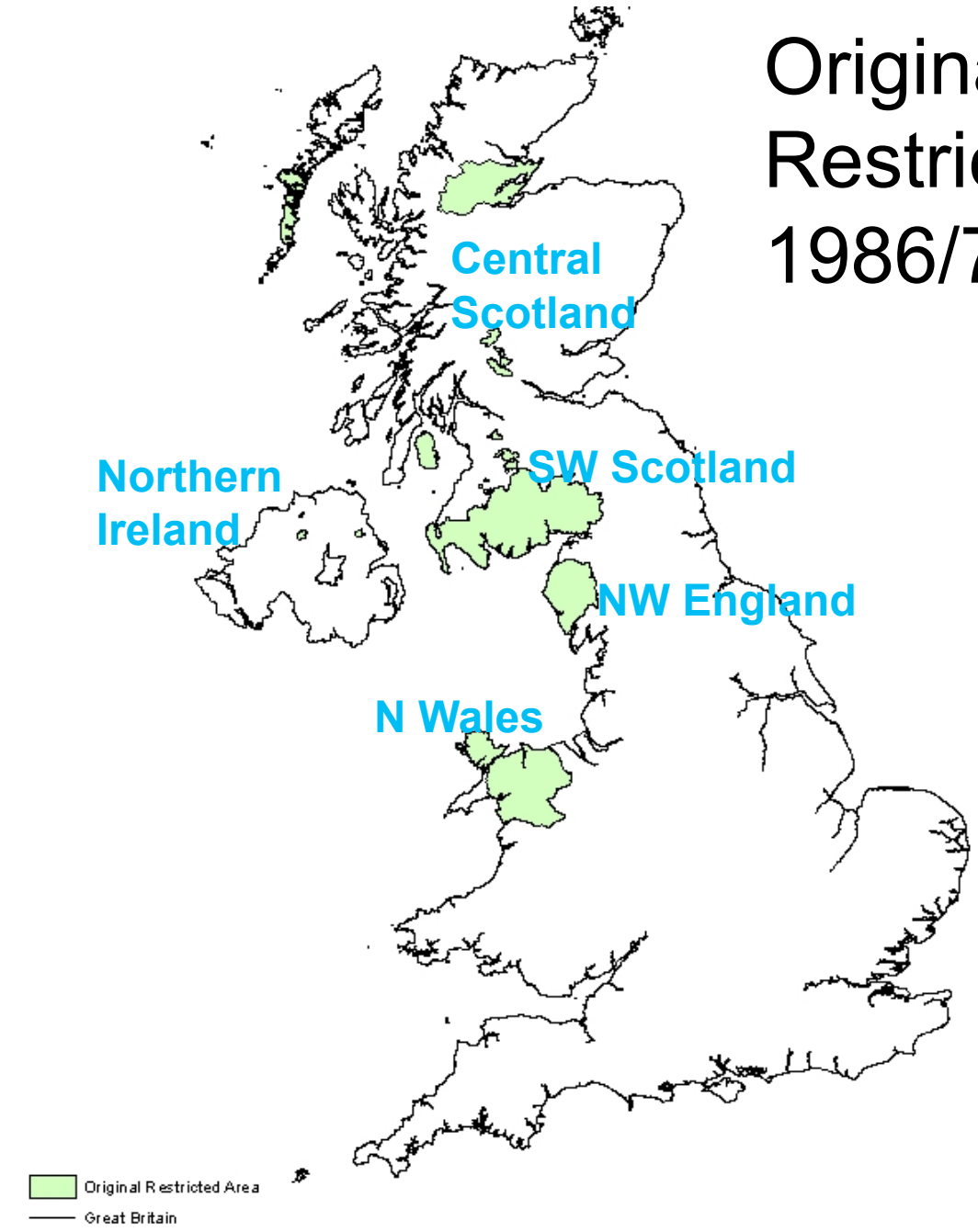
Original Restricted Areas 1986/7



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‘FEPA Orders’

- Restrictions using powers under the Food & Environment Protection Act 1985
- Defines geographic areas
- Prohibits the slaughter of sheep within the area or the movement of sheep out of the area
- Gives Food Standards Agency powers to issue “Consents” to permit movement of sheep

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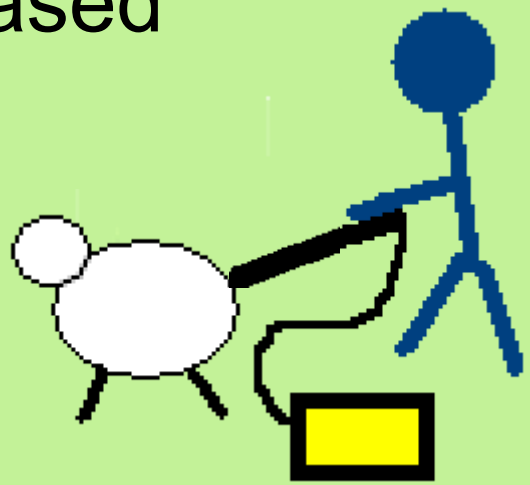
‘Mark and Release’

- Sheep monitored 3 times
- If average below 1000 Bq/kg of Cs-137 (at 97.5th% confidence level), sheep released



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‘Mark and Release’

- If assessed above 1000 Bq/kg, sheep marked and prevented from going to slaughter for minimum 3 months

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De-restriction

- 1986 :- 9,792 farms / 4.3 million sheep
- Restrictions gradually removed where **full-flock** surveys demonstrate all sheep below 1000 Bq/kg
- All controls removed
  2000 :- Northern Ireland
  2010 :- Scotland
- 2011 :- N Wales :- 330 farms
  NW England :- 8 farms

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Problems

- 1000 Bq/kg limit does not consider dose
- Gives impression of step-change in risk
- Consumers do not (in general) eat from single sheep so true intake is closer to mean levels in sheep not the extremes
- Resource intensive
- Practicalities in maintaining consistent monitoring

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New Survey Design

- Survey to establish more realistic dose → Actual risk to consumers
- Surveys in summer 2010 and 2011
- Farms :- NW England – 6 out of 8
  :- N Wales – 72 random selection
- 10% of flock (min 40 sheep) monitored or greater where resource permitted

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Targeted at peak period

- When levels of Cs-137 in sheep peak
  - Late spring / early summer
  - 24 - 48 hours of sheep being gathered from uplands
- Typical farming practice
  - Lambs slaughtered late summer / autumn
  - Fattened on lowland pasture for ~2 months
  - Biological $t_{1/2}$ of Cs-137

    10-12 days lambs / 20 days ewes

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Probabilistic Dose Model

- Assessed data from individual farm
- Established probability distribution considering 2 categories of variability:
  - Radiocaesium concentration within flock
  - Consumer characteristics (age, consumption rates and purchasing habits)
- Assumed normal distribution in most cases

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Representative Person

- Source meat from single farm
- Three exposure groups identified:
  - "Farmer" – Annual consumption sourced from single animal **1**
  - "Bulk Buyer" – Purchase "freezer packs" four times per year **4**
  - "Frequent Buyer" – Purchases fortnightly **26**

* Number of animals represented by purchasing habit

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Representative Person

- For each exposure group considered age category and consumption rate

Age Category	*Consumption at mean (kg /yr)*	*Consumption at 95th % (kg/yr)*	*Consumption at 97.5th % (kg/yr)*
Infant (1 year)	0.8	2	3
Child (10 years)	4	10	10
Adult	8	20	25

- Assessed all 27 sub-populations

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Representative Person

- An **adult frequent buyer** who sources all their meat from the monitored farm and who consumes at the **95th % consumption rate (20 kg/yr)** at the **97.5th% of the radiocaesium distribution** in their sheep meat intake

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Acceptable Levels

- Reference levels (ICRP)
  - 1 to 20 mSv/yr for existing exposures
  - Typically lower end of range used
- Comparison to 1000 Bq/kg
  - Controls assume all meat could be safely consumed at 1000 Bq/kg
  - Representative person (consuming 20 kg per year) could receive theoretical dose of 0.26 mSv/yr

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Results

- Doses to the representative person
  - Range <0.05 to 0.21mSv/yr
  - Mean <0.09 mSv/yr
- Less than 1 mSv/yr
- Less than 0.26 mSv/yr – "tolerated dose" of 1000 Bq/kg policy

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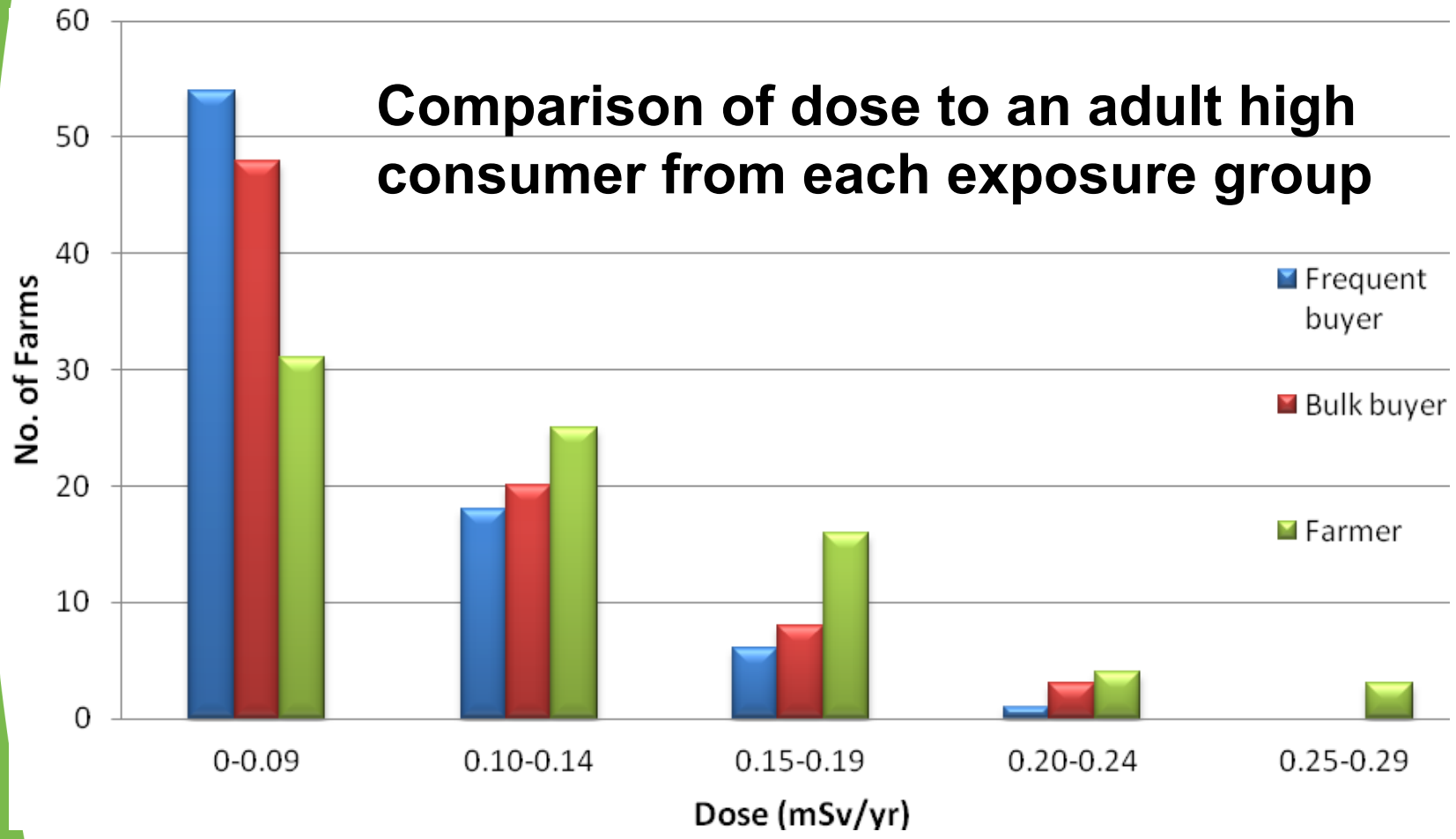
Results



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Public consultation

"by maintaining this system (that has existed for 20 years) the consumer will still have confidence and faith in the produce"

"by not continuing to scan there would be a 100% chance that a lamb with radiation would be allowed into the food chain"

"when asked if the sheep still show radioactivity, I will answer that they do but it is impossible for them to enter the food chain because of the monitoring. If the system is removed, we will no longer be able to give this reassurance in the future"

"the difference in 'low' versus 'no' risk must be considered"

"this proves there is still a risk and though it can be argued that the risk is small, it must be asked if it is a risk worth taking in the name of Welsh lamb?"

"the monitoring system in place for the last 25 years, on the whole, has worked well, ensuring that no unsafe sheep or lamb meat enters the food chain"

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Conclusions

- Majority of sheep far below 1000 Bq/kg
- Level of risk with controls removed is less than that tolerated by 1000 Bq/kg controls
- Controls are not providing a meaningful reduction in dose → Removing controls will not increase consumer risk
- Controls removed on 1 June 2012

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Thank you for your attention

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www.food.gov.uk/science/research/surveillance/radiosurv/

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