

# Forecasting the Nation's Health

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# Forecasting the Nation's Health

## ■ Aim

- To predict significant fluctuations (events) in NHS workload

## ■ Objectives

- To track daily changes of workload
- To identify expected workload from each postcode by day and month
- To establish impact that external factors (RSV , temperature) have on admission rates and length of stay



# Why the Met Office?

- Largest supercomputers in Europe
- Good at data handling
- Understands forecasting
- Understands the weather
- Massive operational backup

# It's all to do with Weather (almost)

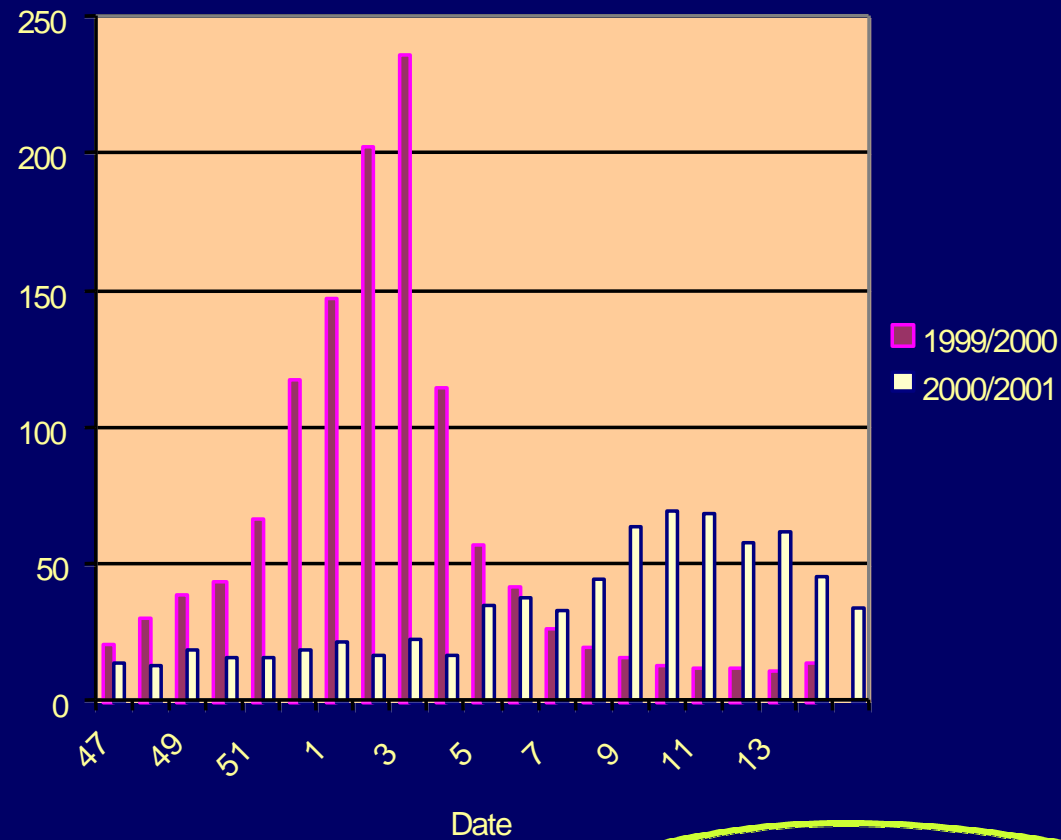
- For every degree drop in temperature:
  - Increase in Cardiac deaths (3 days)
  - Increase in stroke deaths (5 days)
  - Increase in Respiratory deaths (12 days)
- Air quality and cardiac/respiratory disease
- Mobile westerlies and cardiac admissions
- Long periods of wet weather and falls



# .....and bugs

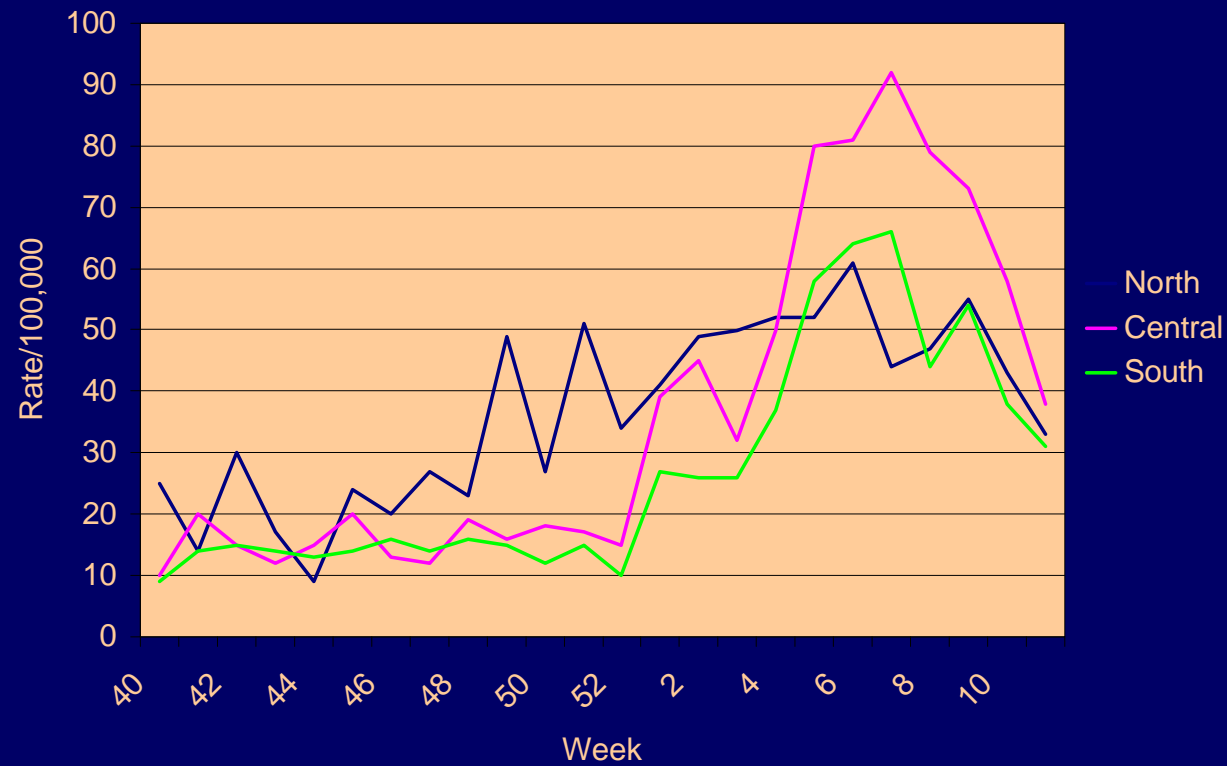
- 1999/2000
  - Influenza H2N3 and a nasty RSV
- 2000/2001
  - Little bit of Influenza H1N1 then predominantly Influenza B.
- 2001/2002
  - Nothing so far (...the calm before...)

# Influenza over past two winters



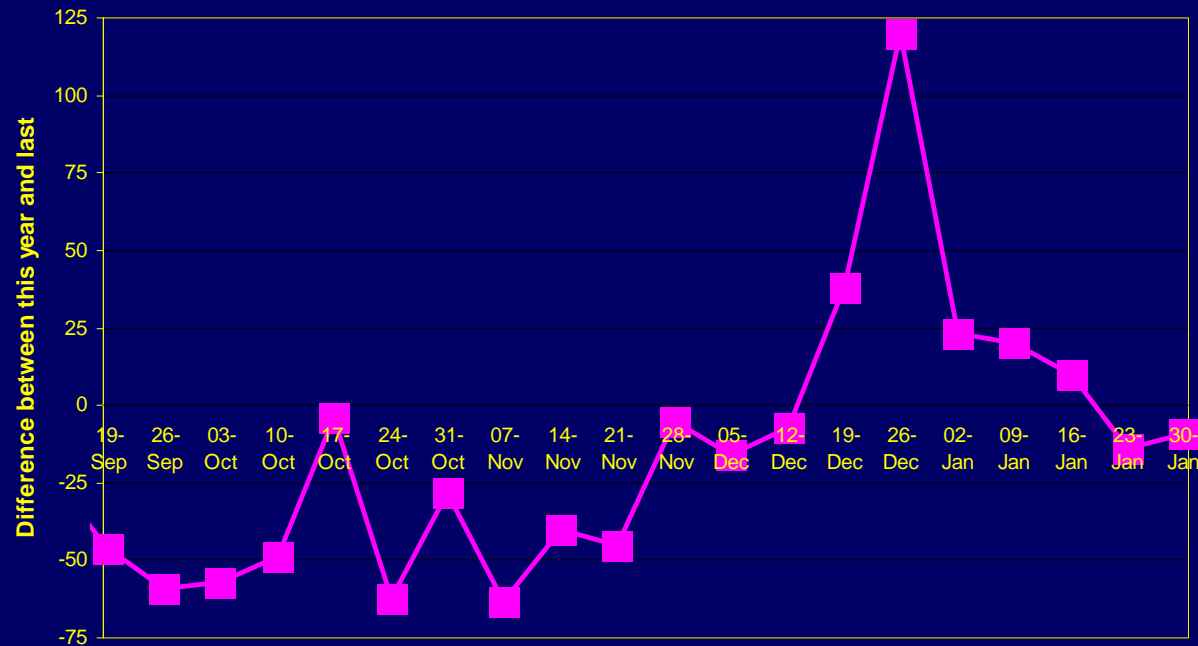
# Influenza by Region

Influenza by Region 2000/01

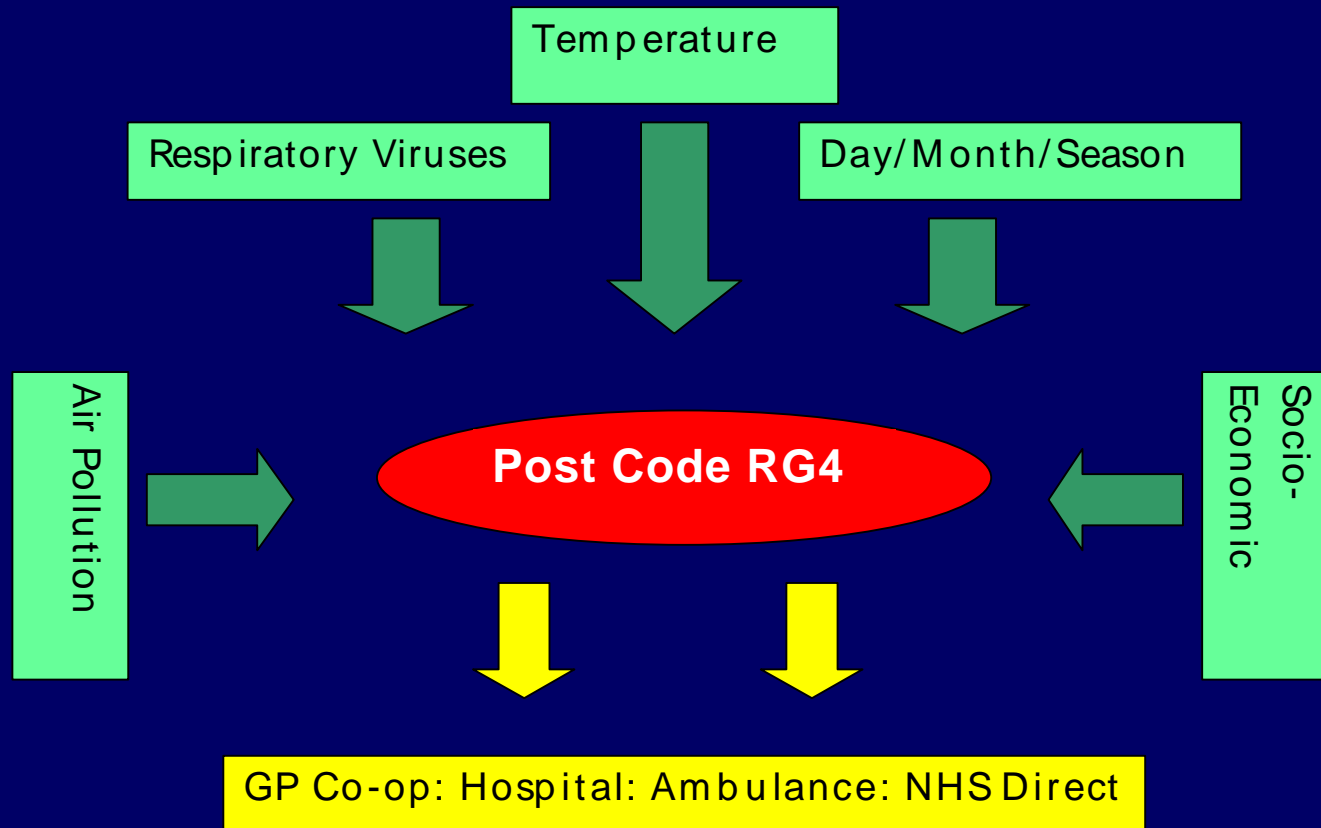


# Forecast being Used

## Overnight activity in the surgical group of specialties



# Input and Output of Forecast



# The Vulnerable

- Those with Ischaemic Heart Disease
- Chronic Obstructive Airways Disease
- Asthma
- Other chronic Illness's reducing immunity
- The Elderly

# Ozone

- Increased number of children's admissions for wheeze over a threshold of 200 ppb
- Asthmatics susceptible over a level 200 ppb
- This is worse when exercising
- Each year in UK Ozone levels bring forward 12500 deaths and causes 9900 hospital admissions

# Ozone

- Low <50 ppb
- Moderate 100-200 ppb
- High 200-400 ppb
  - Asthmatics affected
- Very High 400+ ppb
  - Asthmatics & non asthmatics Affected.
- Levels over 90 ppb should be eliminated by 2010



# Sulphur Dioxide

- Non-asthmatics not affected by SO<sub>2</sub>
- Asthmatics significantly affected
- Each year in the UK SO<sub>2</sub> may bring forward 3500 deaths and cause 3500 admissions.

# Sulphur Dioxide

- Low <100 ppb
- Moderate 100-200 ppb
- High 200-400 ppb
  - levels of 400 ppb can lead to significant airway narrowing in asthmatics
- Very High > 400 ppb
  - Asthmatics may need preventative measures.

# NO<sub>2</sub>

- This is a common pollutant and has little effect on health until levels are very high.
- Levels are likely to rise only slowly due to traffic volumes but this is tempered by catalytic converters.

# NO<sub>2</sub>

- Low <150 ppb
- Moderate 150-300 ppb
- High 300-400 ppb
  - Those with pre-existing heart or lung problems are now most at risk.
- Very High >400 ppb
  - Increased risk of admissions

# Particulates (PM<sub>10</sub>, PM<sub>2.5</sub>)

- People with pre-existing respiratory and or cardiac disorders are most at risk.
- In UK particulates bring forward 8100 deaths and 10500 hospital admissions.

# A 10 $\mu\text{g}$ reduction of PM<sub>10</sub>

- Average Exposure of PM<sub>10</sub> is about 20  $\mu\text{g}/\text{m}^3$
- The results of a 10  $\mu\text{g}/\text{m}^3$  reduction are:
  - The population UK today would gain up to 1.4 million life years, i.e., 6 months per person.
  - A reduction of 31968 deaths in the UK over 5 years.

# PM<sub>2.5</sub>

- 15  $\mu\text{g}/\text{m}^3$  of PM<sub>2.5</sub> could be responsible for the loss of 16 months of life in a lifetime.
- Smoking results in a loss of 7 years

# PM<sub>2.5</sub>

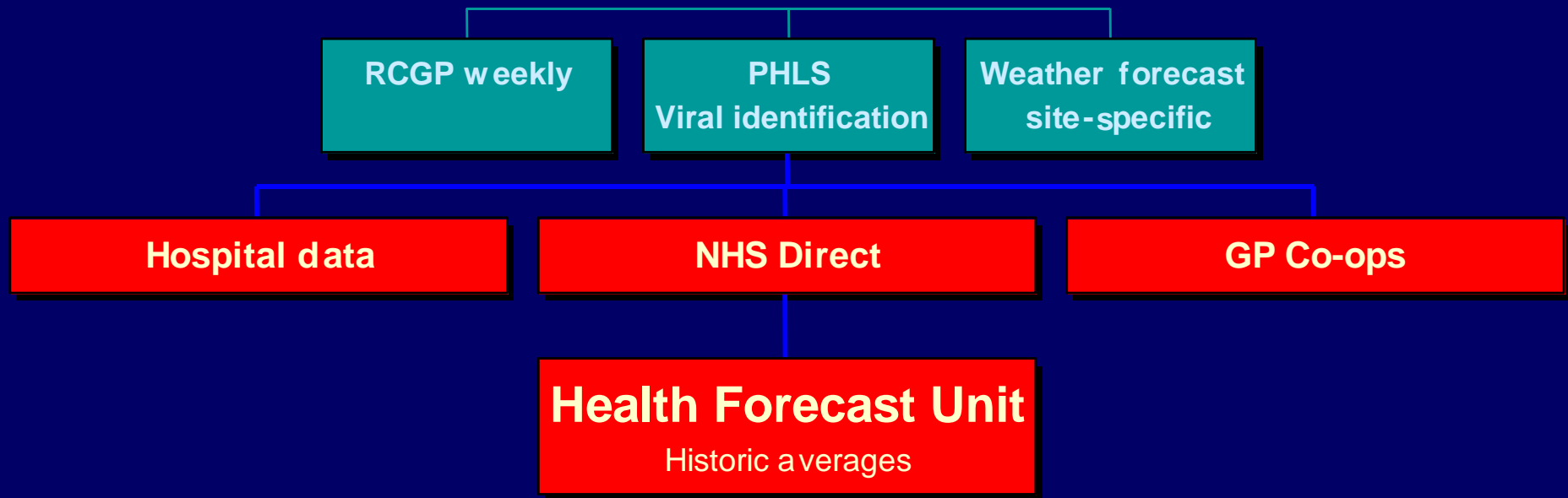
- Passive smoking leads to a similar increased risk of heart disease than those living in the most polluted areas.
- This represents a 24 µg/m<sup>3</sup> difference of PM<sub>2.5</sub>



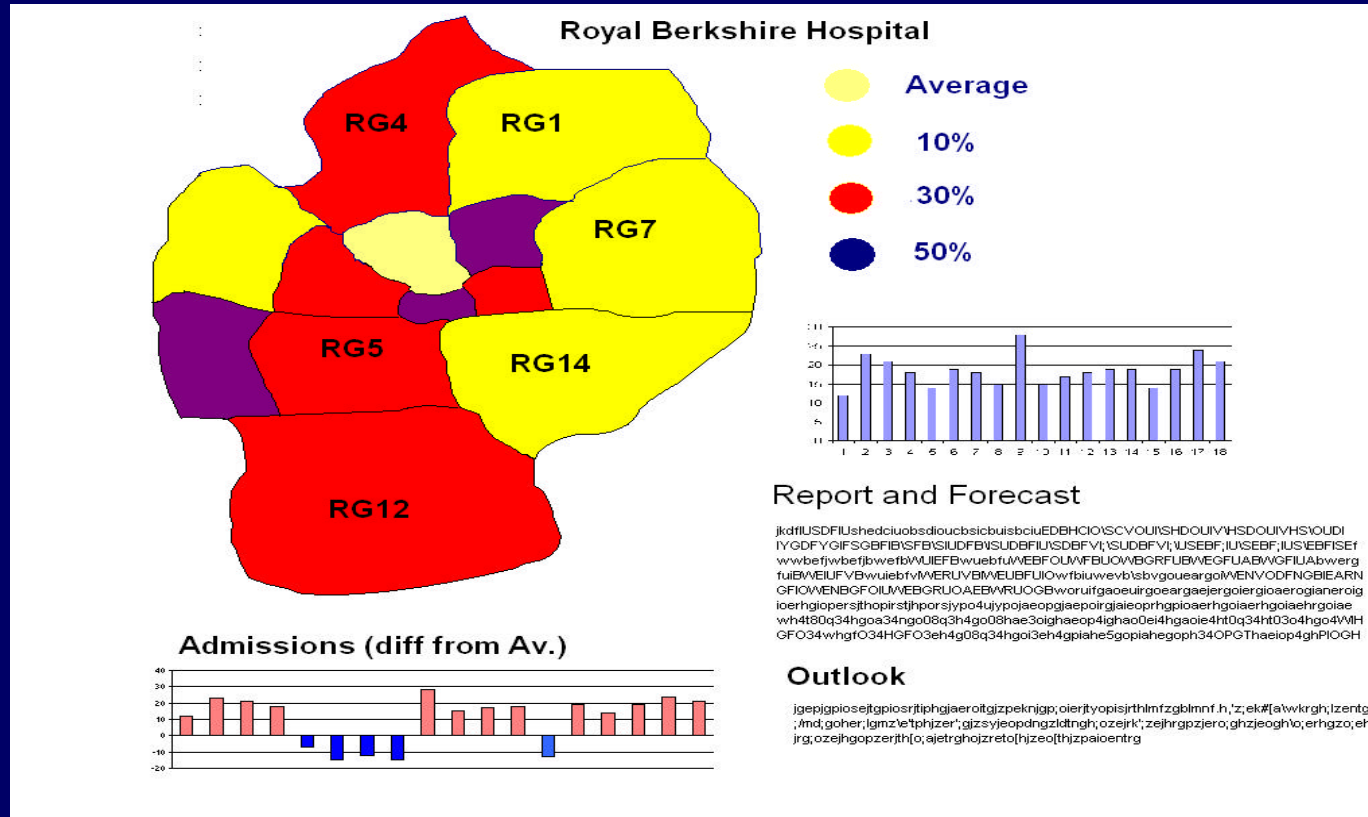
# Winter 2001/02

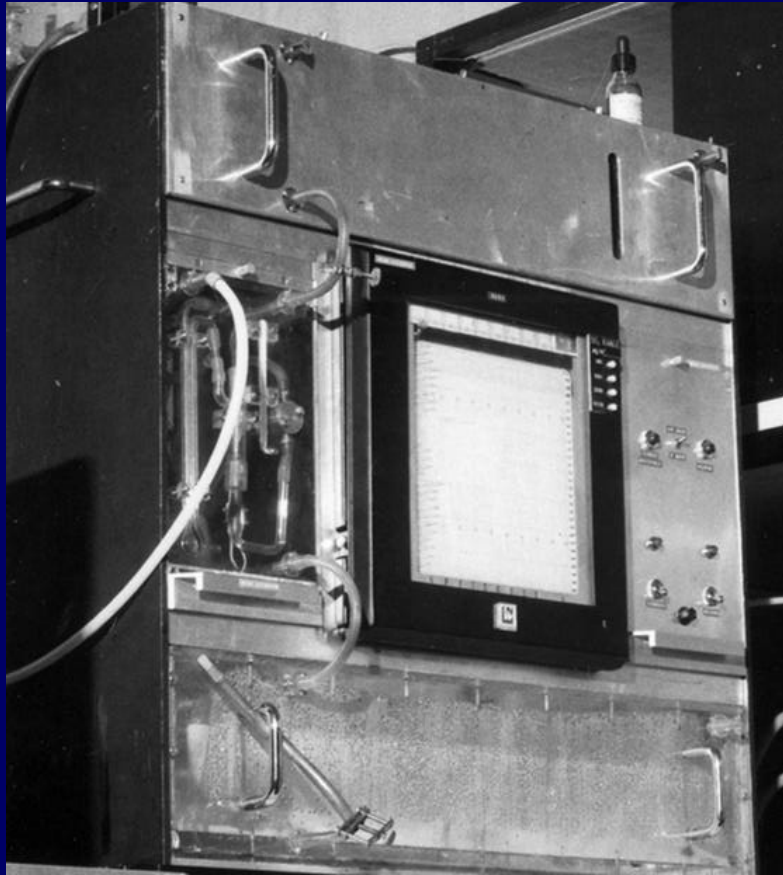
- GP Co-ops
  - 28 co-ops sending in data using A dastra Software
  - Every day automated
- Hospitals
  - 30 hospitals sending in admission data.
- NHS Direct
  - Respiratory illness by age and diagnosis daily

# NHS forecast service (input)



# Forecast for next year





# SO<sub>2</sub> Analyser Warren Springs (1973)