FROM BAYESIAN MODELLING TO SADDAM'S KURDISH GENOCIDE

Inaugural Professorial Lecture

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University of Glamorgan

17th January, 2012

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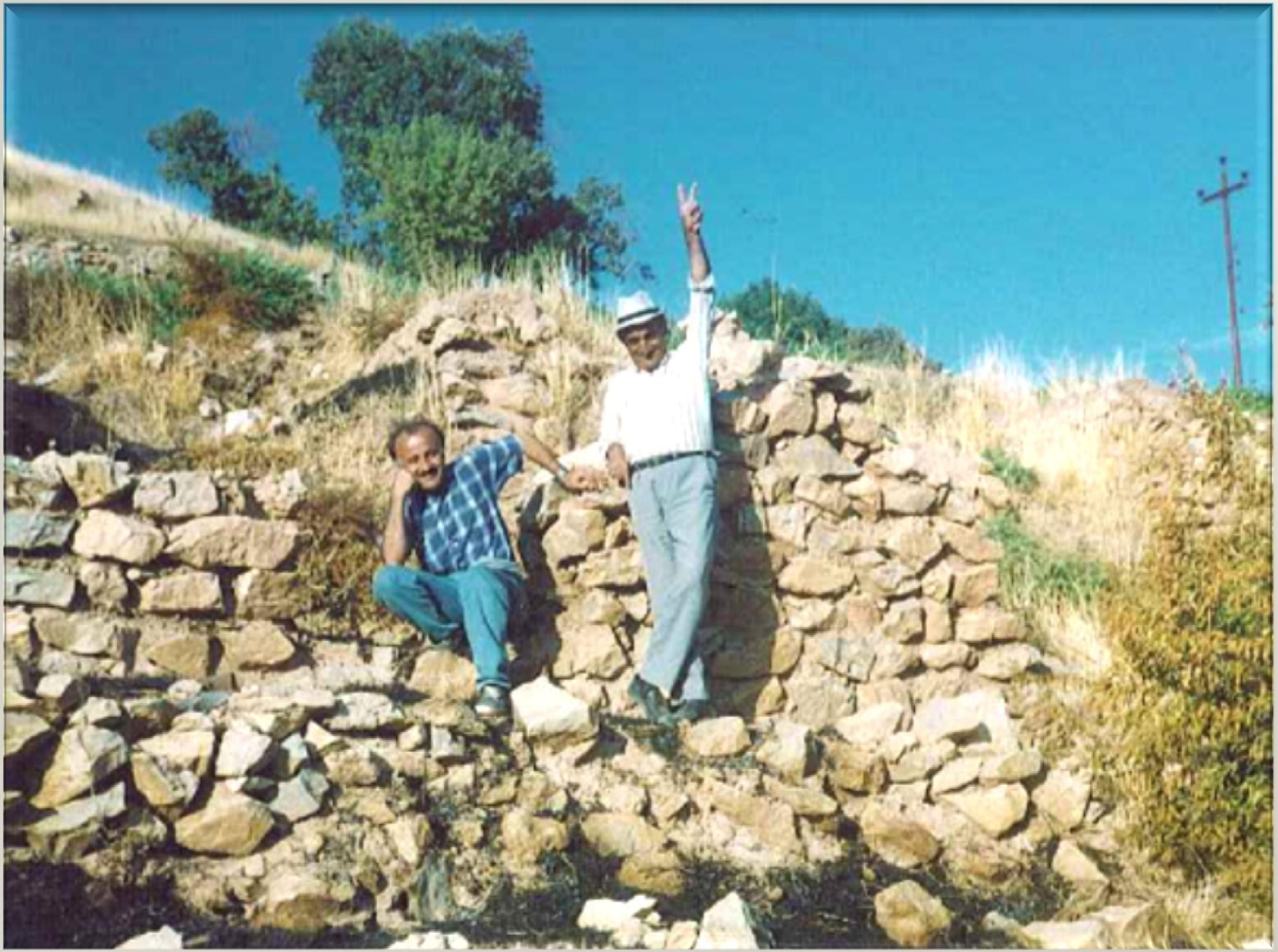
US Dept of State Geographer



Life in a Refugee Camp in Iran

Life in a Refugee Camp in Iran

My Carrier

- Living to be productive;
- Statistics as a platform;
- Bayesian modelling as a tool;

What is meant by a Model

A miniature version of a state of nature that is:

- Satisfactory in performance relative to the stated objective,
- Logically sound,
- Representative,
- Questionable and subject to on-line interrogation,
- Able to accommodate external or expert information and
- Able to convey information.

Elements of Bayesian Statistics

- Tomas Bayes (1702-1761): English Mathematician, studied theology and logic at the University of Edinburgh
- His theorem known as “Bayes Theorem” was read to the Royal Society after his death in 1763 and later published in the Philosophical Transactions of the Royal Society of London a year later.

Bayes Theorem

Given two events $A_1 and\ A_2$ within a sample space of events;

$$P(A_1)P(A_2 \backslash A_1) \equiv P(A_2)P(A_1 \backslash A_2)$$

Or

$$P(A_2 \backslash A_1) = \frac{P(A_2)P(A_1 \backslash A_2)}{P(A_1)}$$

Provided that;

$$P(A_1) > 0.$$

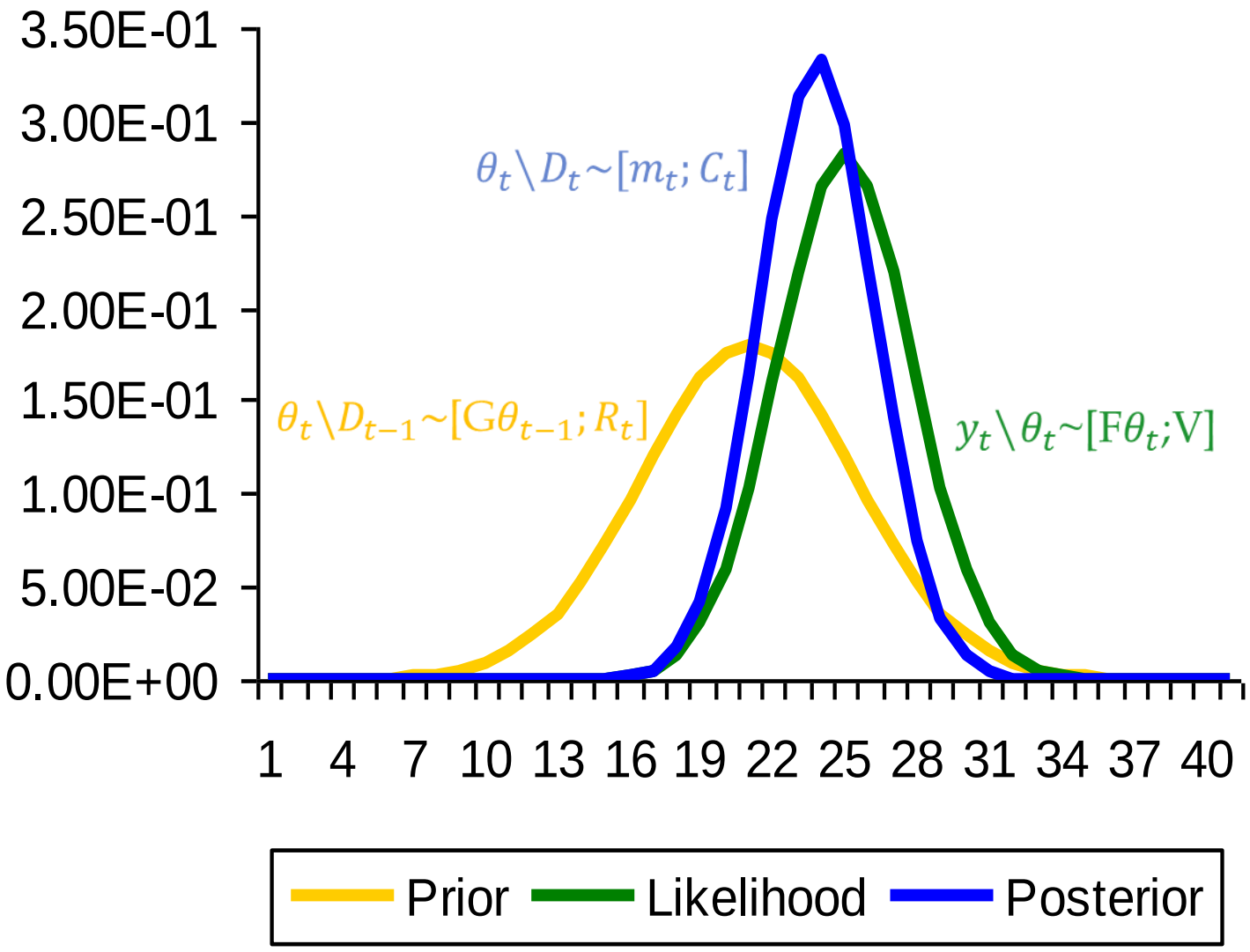
Different Forms of Bayes Theorem

- Prior *Likelihood=Predicted*Posterior

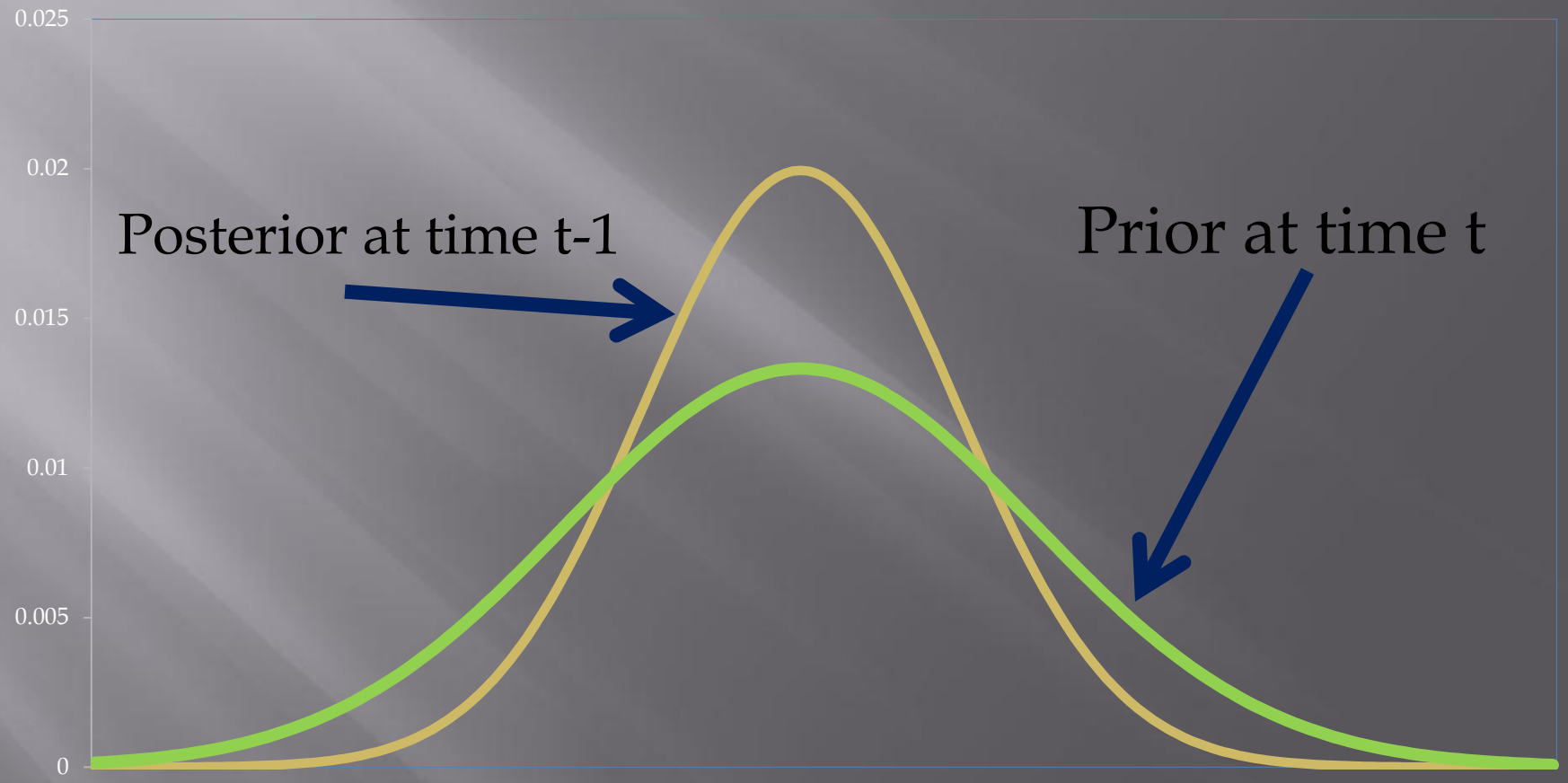
$$f(\theta)f(y \backslash \theta) = f(y)f(\theta \backslash y)$$

- Prior: Sate of Knowledge before observing
- Likelihood: Sate of observed information
- Predicted: Prediction State
- Posterior: Current state after updating

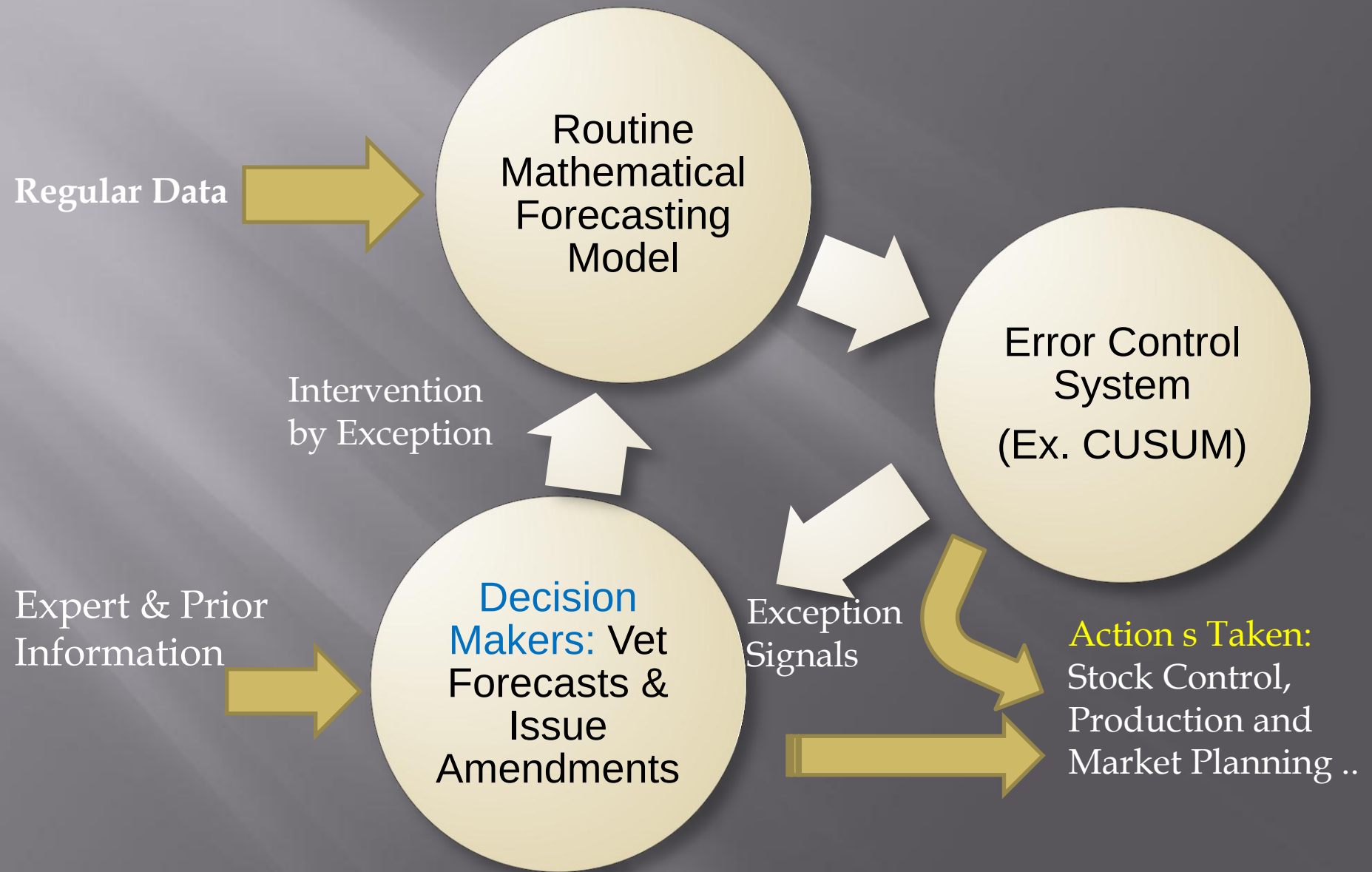
The Bayesian Learning System



Posterior to Prior Knowledge Transition



Management by Exception



Implications

- No stationarity prerequisites;
- Man and machine continuous interaction:
  - A scientific blend of subjectivity and objectivity;
- Unforeseen events accommodated;
- Full probabilistic information provided for utility maximisation and decision making;
- Applicability across all of social, economical and environmental fields.

Implications for Decision Making

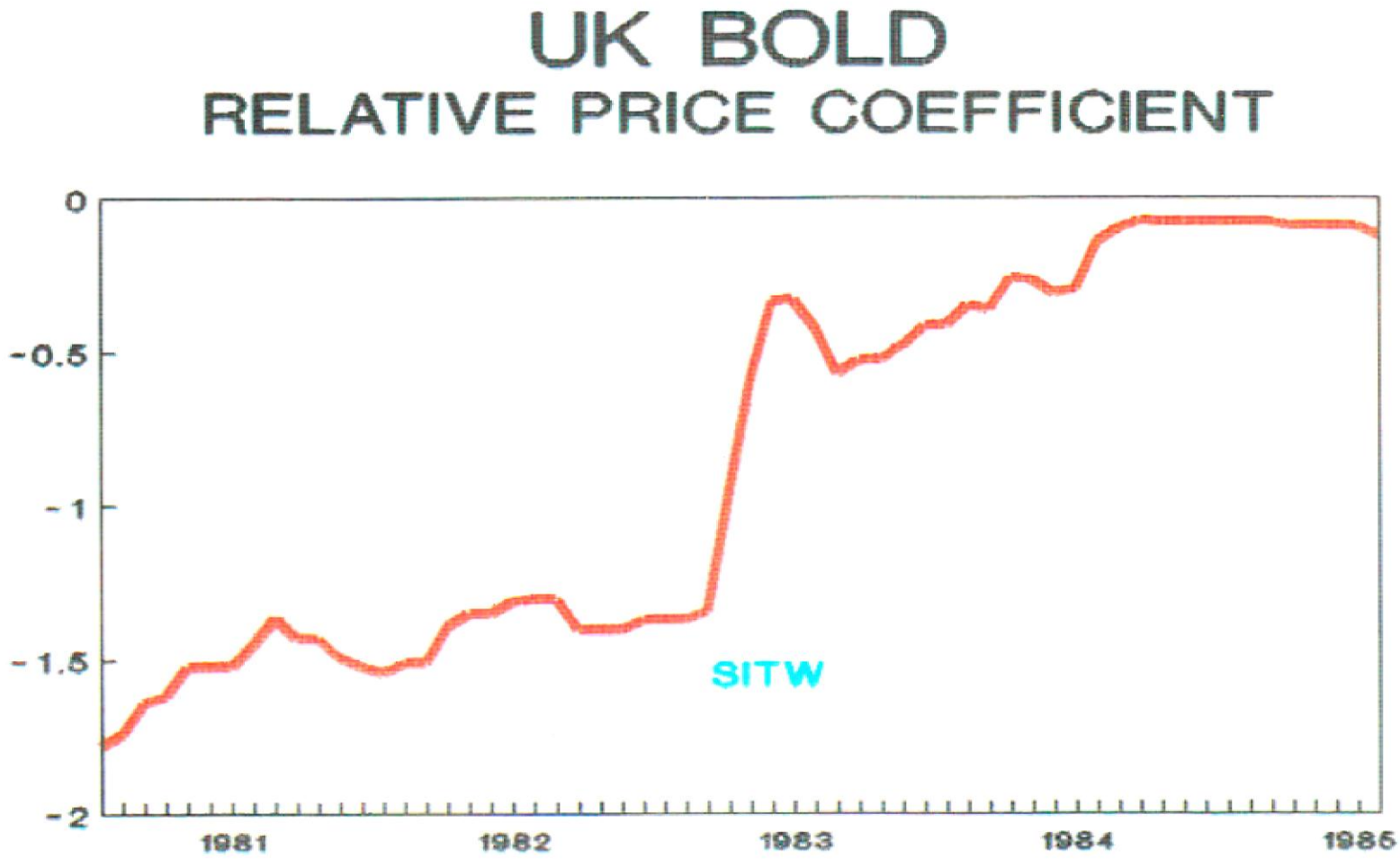
- Capturing dynamics in:
  - User behavior;
  - Environmental changes;
  - Unforeseen Events.
- Blending expert information and prior beliefs;
- Probabilistic expression of reliability of results;
- Reliability of data and information based on their age.

SOME REAL LIFE EXAMPLES

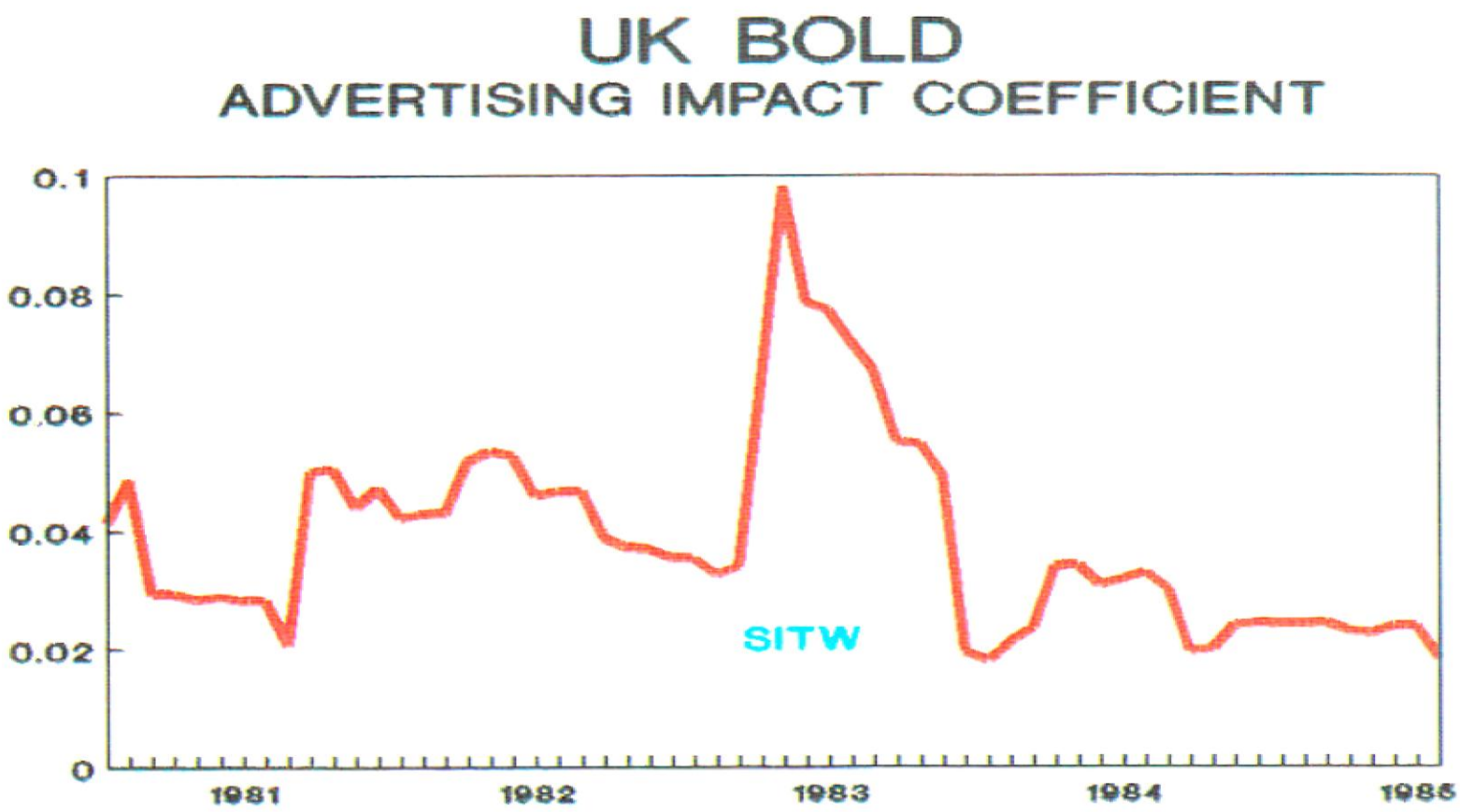
Real life Examples

- Impact of Innovation: UK Bold;
- Electricity Consumption and Temperature;
- Pressure Bandages Blood Decomposition Control;
- Pain monitoring
- Clustering and Crime Detection
- Construction and Cost Estimation
- Data zooming
- Saddam’s Genocide of Kurdistani’s

Impact of Innovation



Impact of Innovation



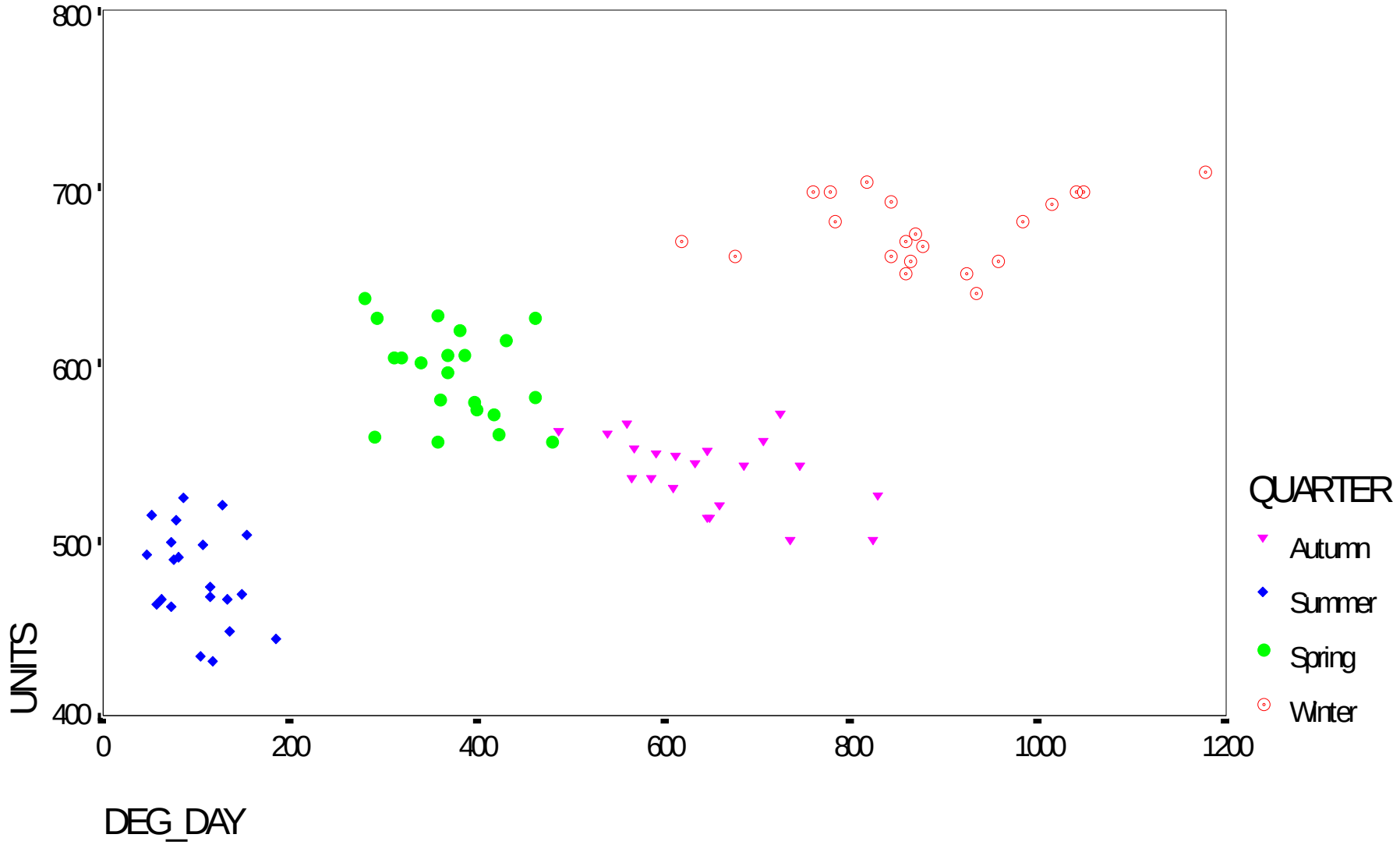
South Wales Domestic Electricity Consumption

- Modelling the impact of temperature on DEC;

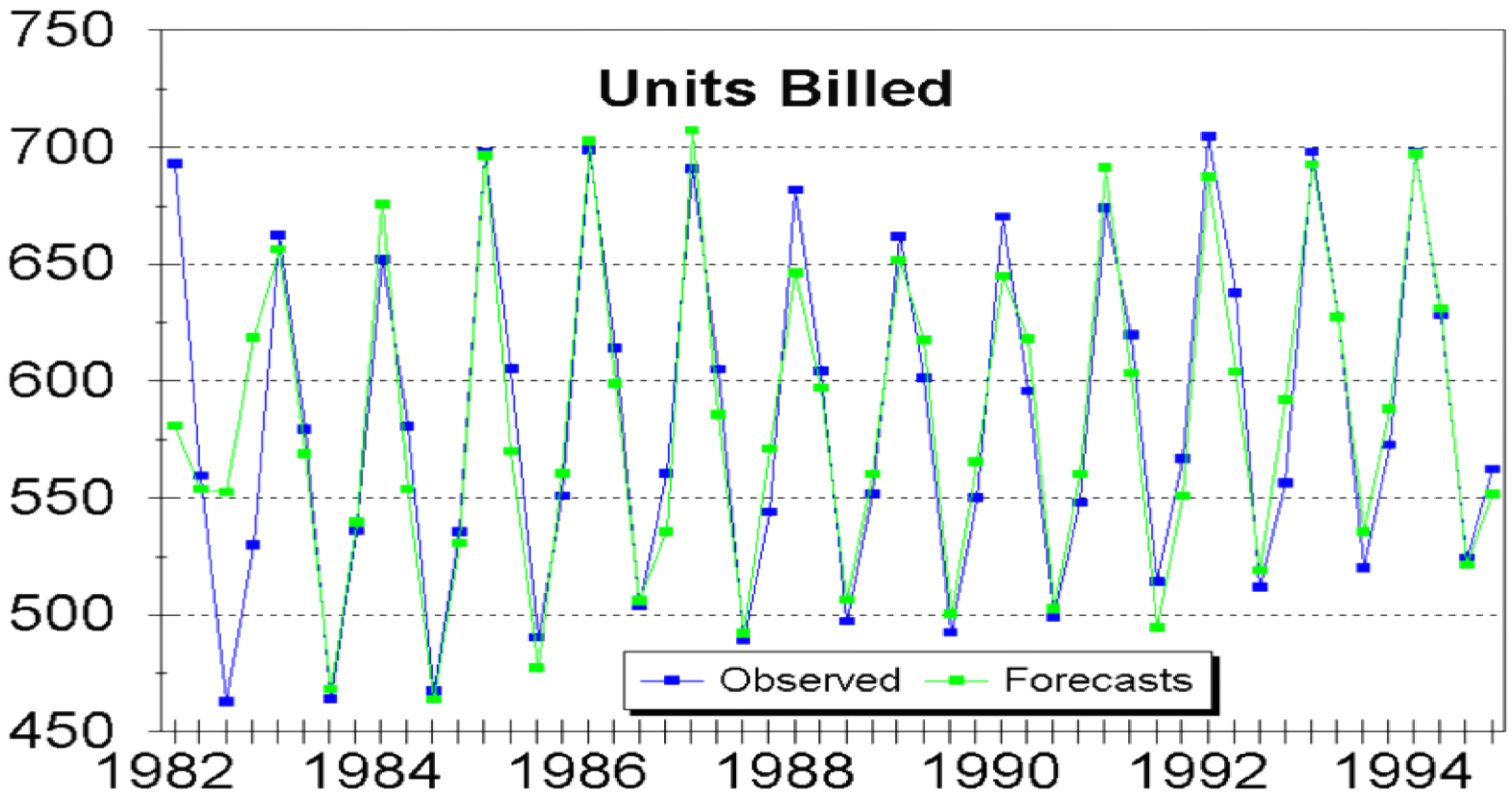
Project outcomes:

- Industrial consultancy;
- Industrial financial support for a successful PhD student;
- Publications and conference presentations in Europe and Australia;
- The candidate employed by the university as Senior Lecturer.

Quarterly Degree Days by Units of Electricity Consumed



Electricity Consumption and the Weather



Pressure Bandages & Leg Ulcer Treatment

European Funded

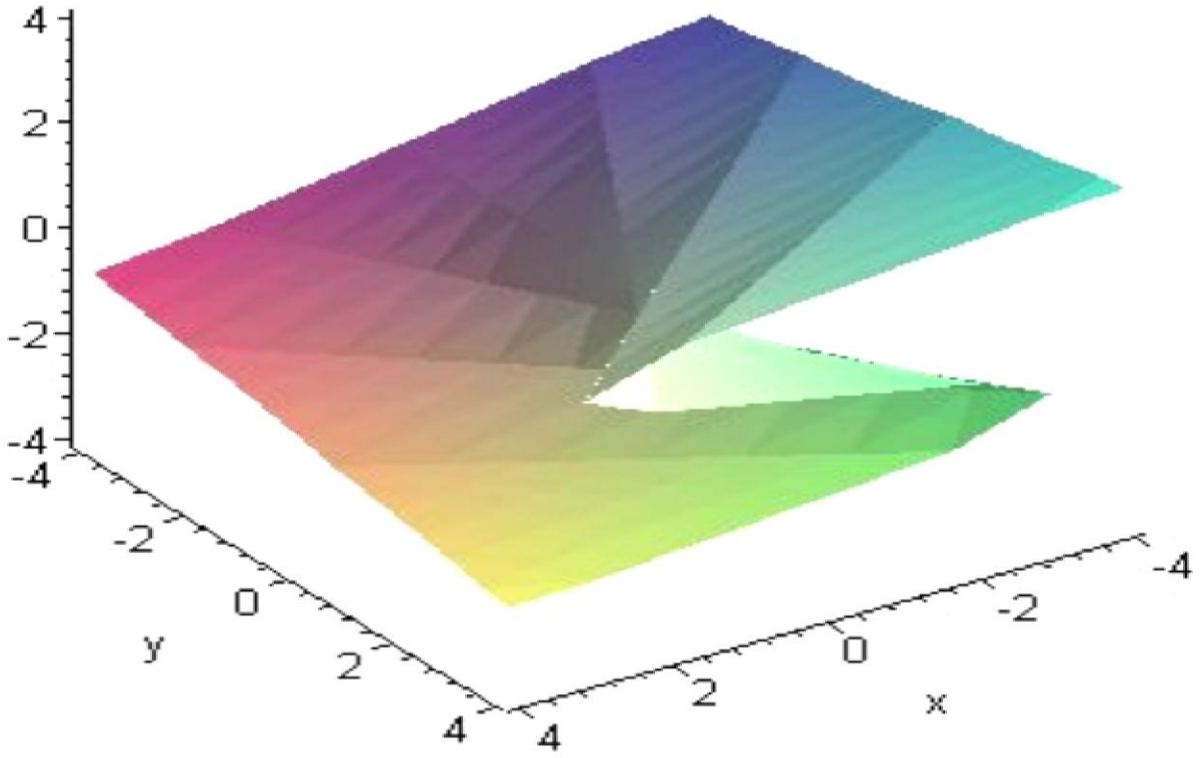
- Pressure Bandages for blood flow control to aid the healing process;
- Excess pressure can produce the risk of ischemia;

Detailed data on the level of pressure and blood decomposition were observed;

A cusp catastrophe was discovered from the observed data. This was unexpected by the clinicians.

Considerable implications for the monitoring and controlling on patient recovery.

Pressure Bandages and Blood Composition

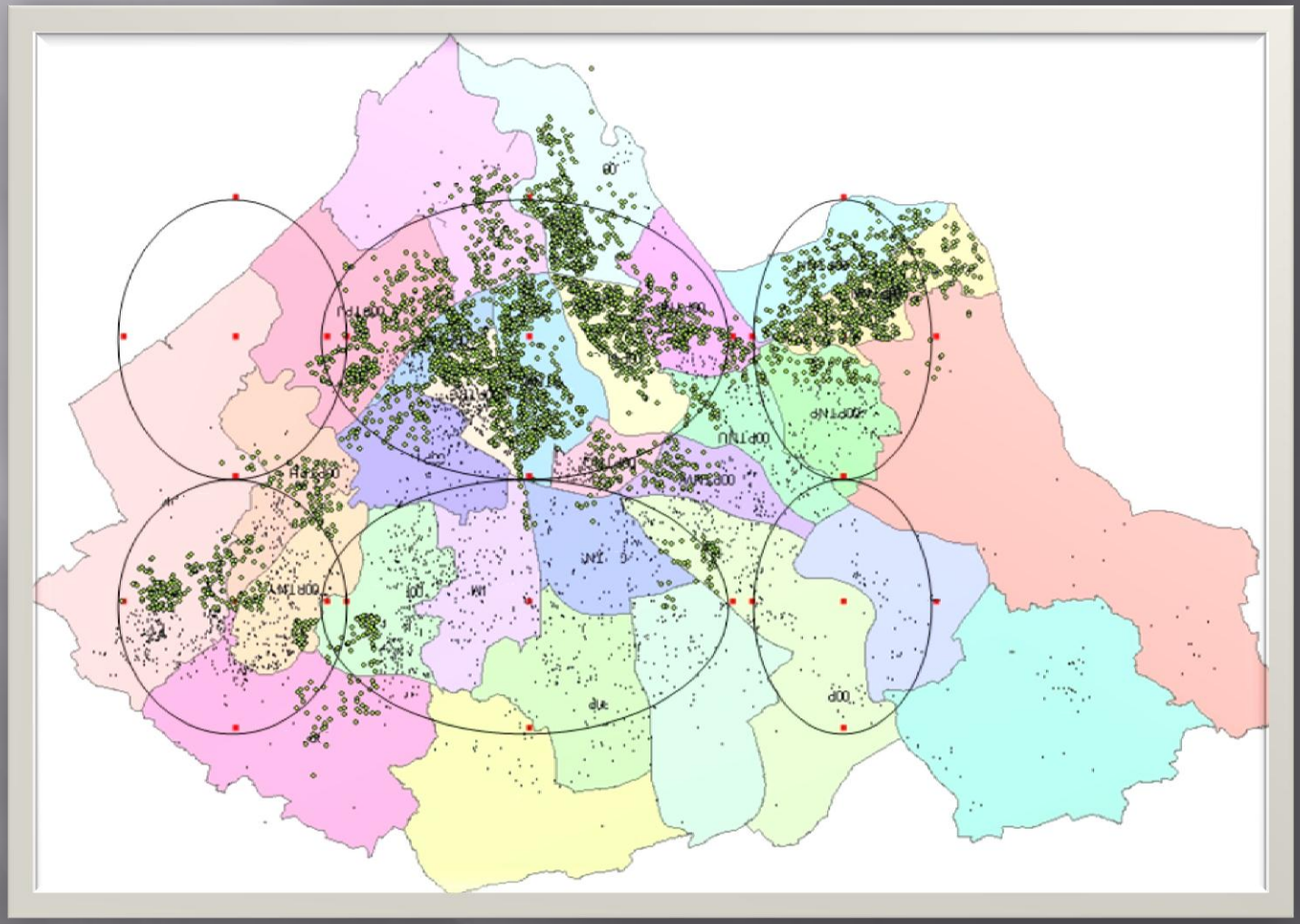


Leg Ulcer & Pain Dynamic Profiles

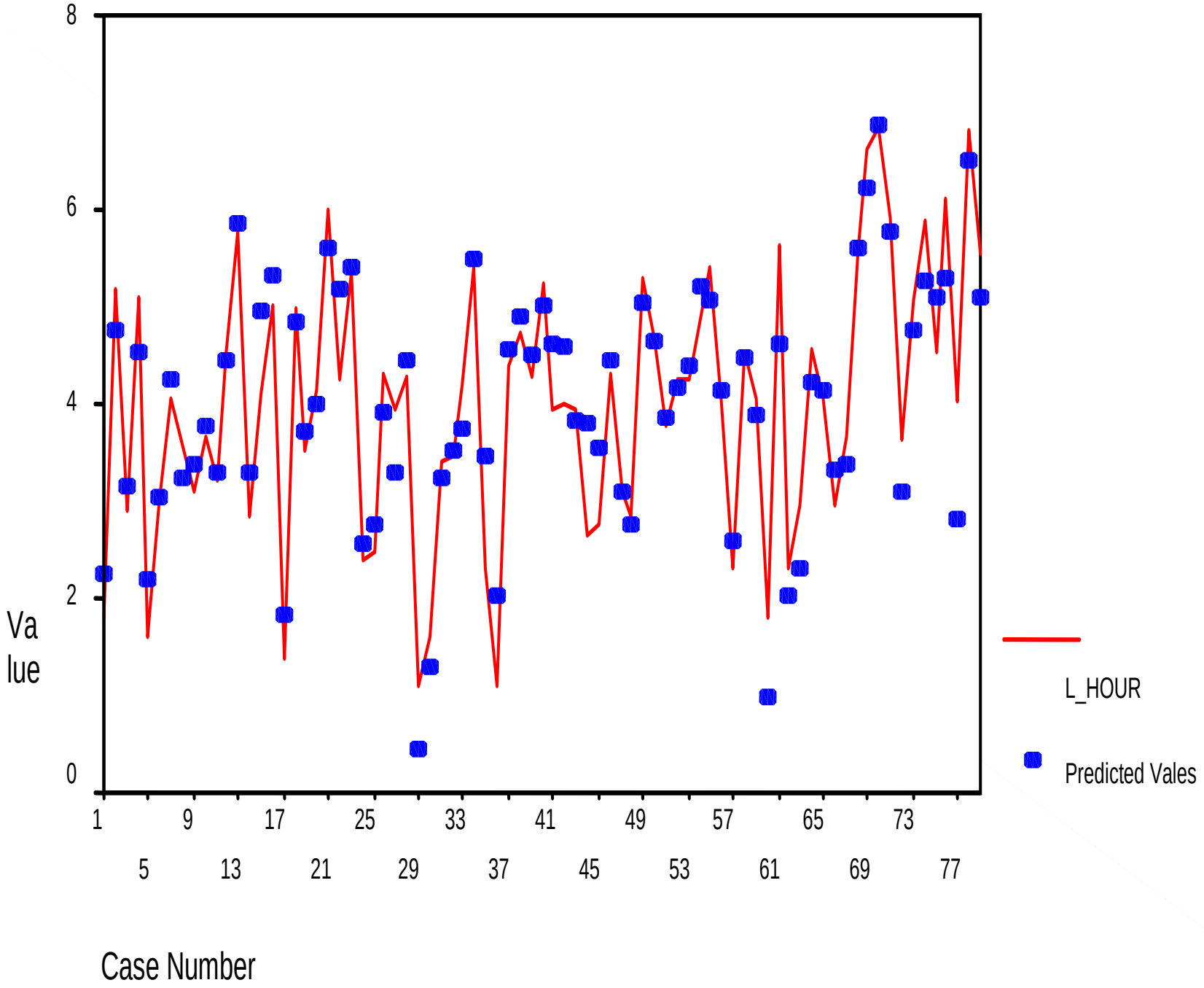
- Smith & Nephew Foundation funding for the modeling stage;
- Welsh Government funding for preparing a prototype with prospects for mass production and marketing.

THAS
THAS

Clustering and Crime Detection



Construction and Cost Estimation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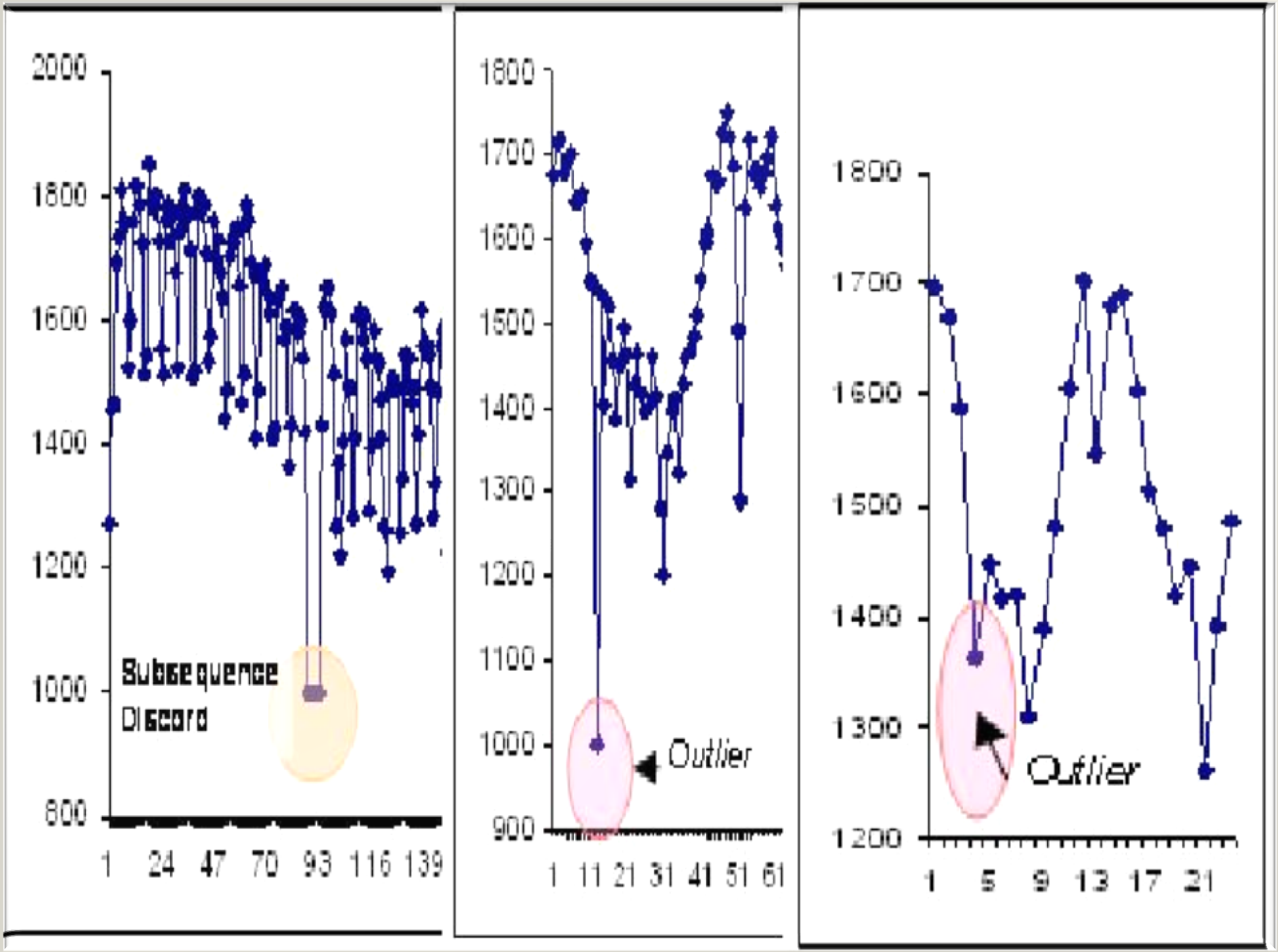
Data Mining and Modeling

Introduced the principle of zooming in and out of data to aid the blending of classical and modern methods of data analysis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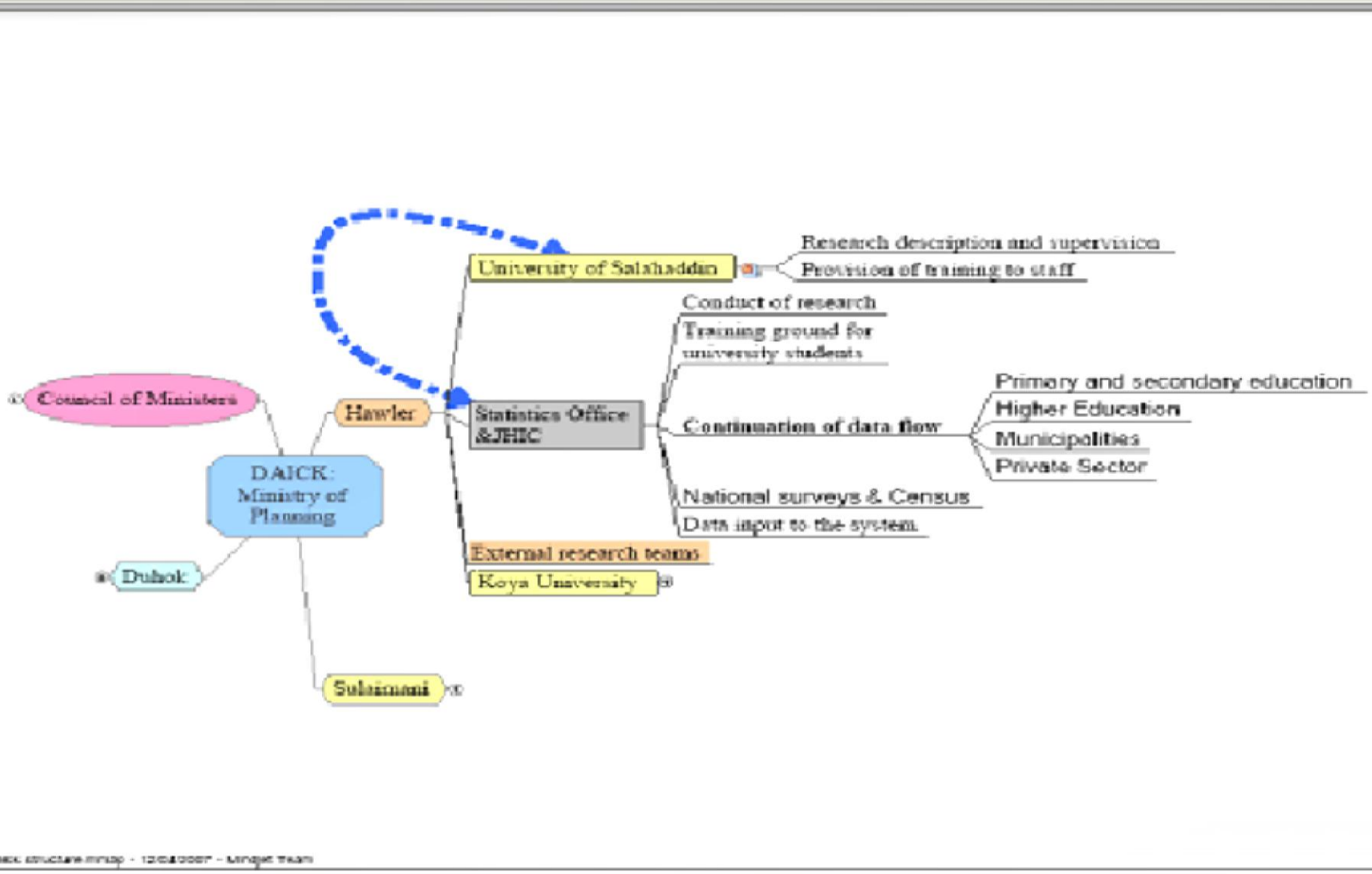
Contributions to My Native Home: Kurdistan

- An Establishing member of Kurdistan Medical and Scientific Federation based in London;
- Data and Information Centre for Kurdistan;
- The Human Cost of Tyranny in Kurdistan Region: A Bayesian Dynamic Estimation Model;
- Over 20 publications in the local media covering the economical, social and political aspects of interest to Kurdistan.

The structure of data communication



THE KRG
THE KURDISH SOCIETY
LOCAL ACADEMIC INSTITUTIONS
INTERNATIONAL ACADEMIC INSTITUTIONS

Kurdistan Regional Statistical Office - Windows Internet Explorer

http://www.krso.net/

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Kurdistan Information Center
Statistical Office
Ministry of Planning - KRG

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r Iraq is explained in a workshop in Amman

Poverty line for Iraq is explained in a workshop in Amman

In order to reduce the poverty line rate in Iraq, a workshop was organized by the World Bank in cooperation with the Baghdad Central Organization for Statistics, and the Kurdistan Regional Statistics Office. more..

Statistics by Subjects

Population

Administration Units in Kurdistan Region, KRG Population - 2007, Hewler Gov. Population - 2007, Suleimaniya Gov. Population - 2007, Duhok Gov. Population - 2007, Head of Household in Hewler Gov. by Age groups - 2007, Household size in Hawler Gov - 2007, Head of Household in Sulaimaniya Gov. by Age groups - 2007, Household size in Duhok Gov - 2007, Household size in Sulaimaniyah Gov - 2007.

Education

Number of Studeents Acording to stage, gender in all Universities and Foundation of Kurdistan Region 2008 - 2009, Number of Lecturers According to certification, degree, and gender in all Universities and Foundation of Kurdistan Region 2008 - 2009, Pre-school educational program, Attendance Percentage for the year 2006, Boys and girls equality, The enrollment age of the elementary (primary) school, Attendance Percentage for the

Latest News

WFP assesses its future plans

To design its strategy plan for the next five years, the Word Food Program (WFP) held a workshop in Amman. more..

The result of IHSES survey is launched

The result of Iraqi Household Socio Economy Survey (IHSES) was launched in a proper ceremony in Amman on January 25th 2009. more..

Iraqinfo database is launched in an official ceremony

In order to make public the information resulting from all surveys, that has been done and available to professionals; the Iraqinfo database was launched in a ceremony in 21/12/2008. more..

Iraqinfo database launches

Iraq info database is going to be launch in a ceremony by Ministry of planning- Regional Statistics Office in cooperation and coordination with UNDP Organization

Information Center

Weekly Figure

Announcements

- Tenders are extended for another month
- Announcement by The Ministry of Planning, KRG

Highlights

- Statisctical Yearbook
- Strategic Planning
- Statisctical Yearbook
- Strategic Planning

Quick Figures

- Population
  - Iraq 29,789,563
  - World 6,873,692,147
- CPI 2.0%
- Unemployment 4.7%

Internet | Protected Mode: On | 100%

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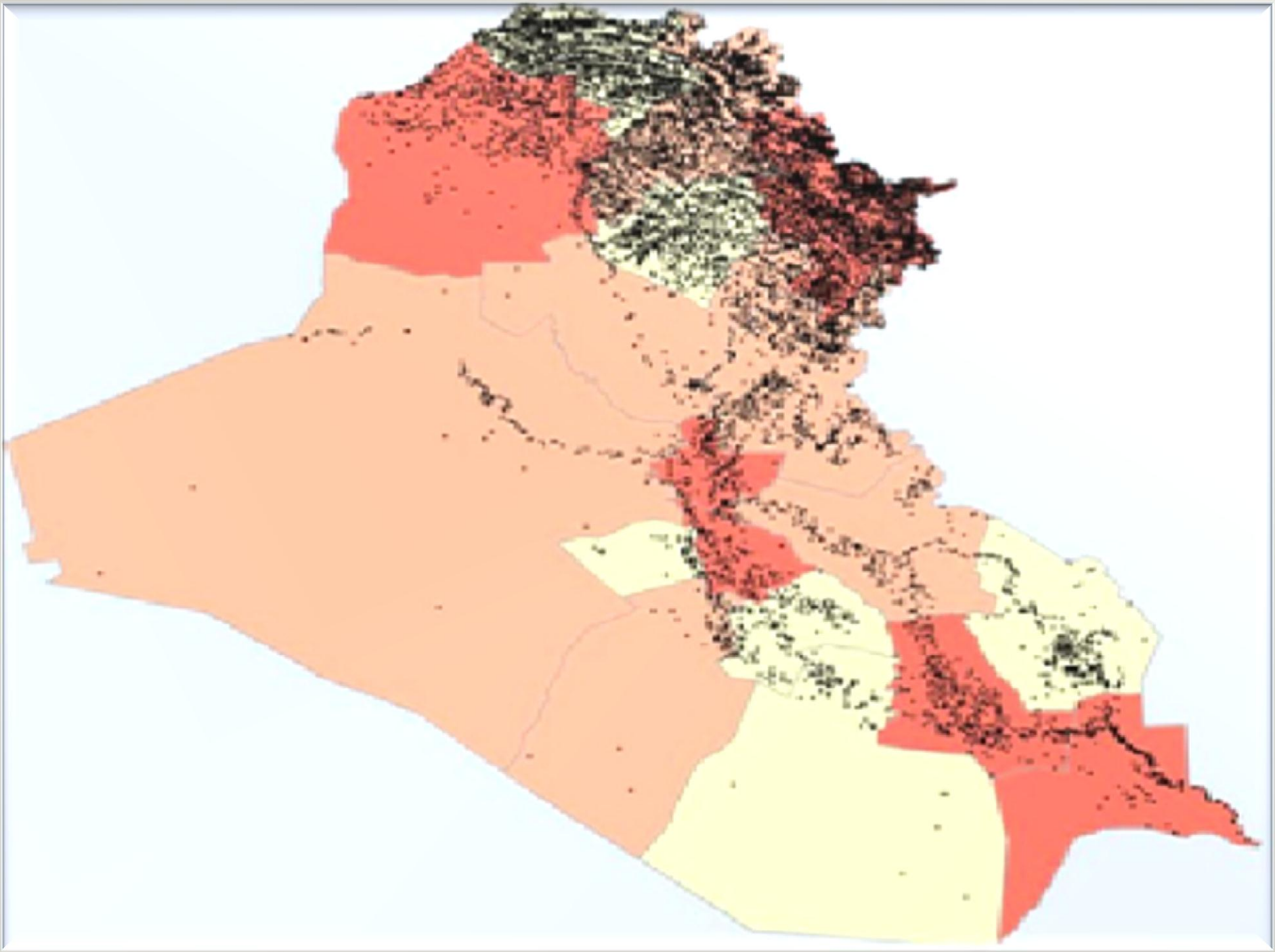

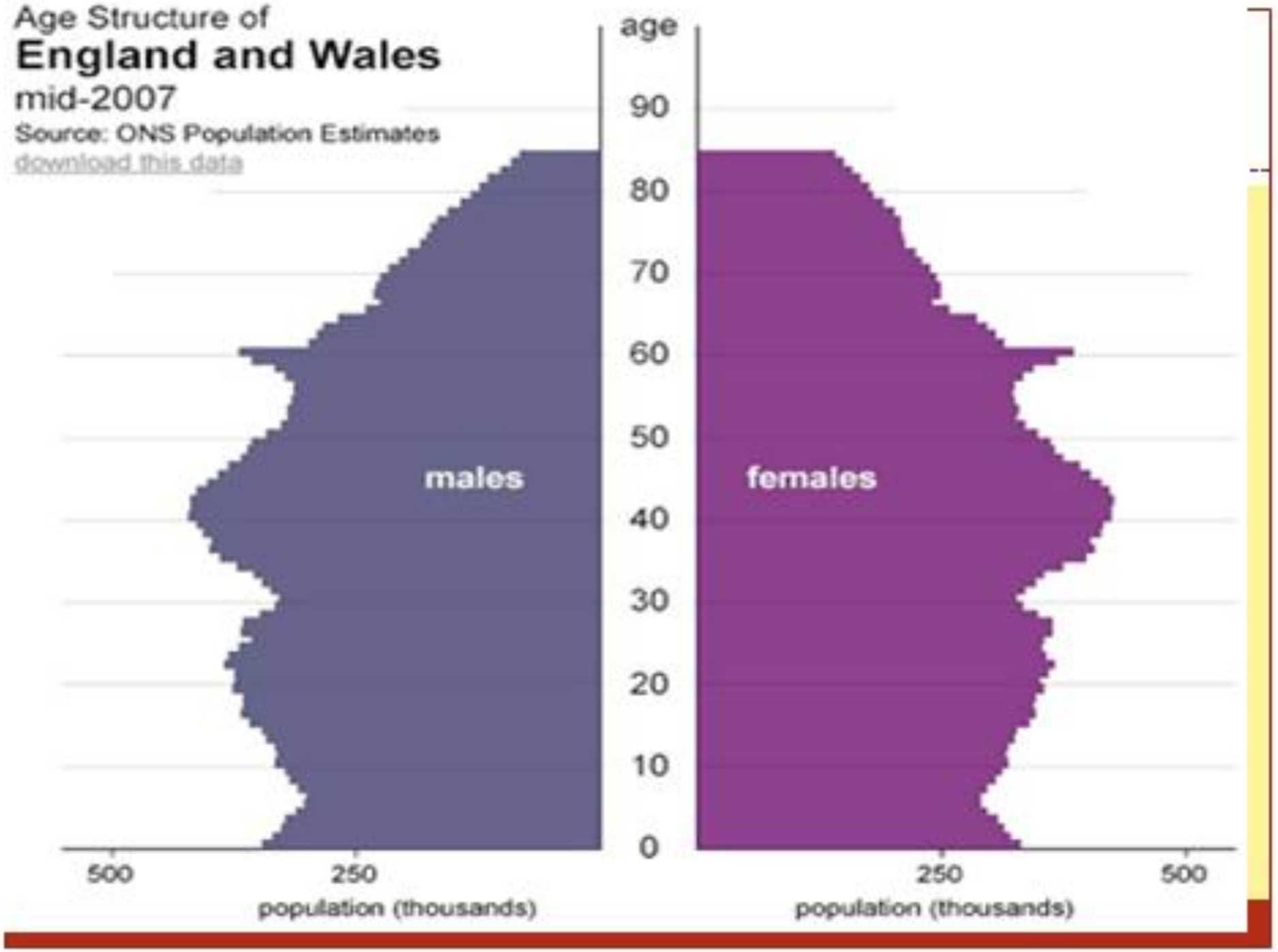
Age Structure of
England and Wales
mid-2007
Source: ONS Population Estimates
download this data
age
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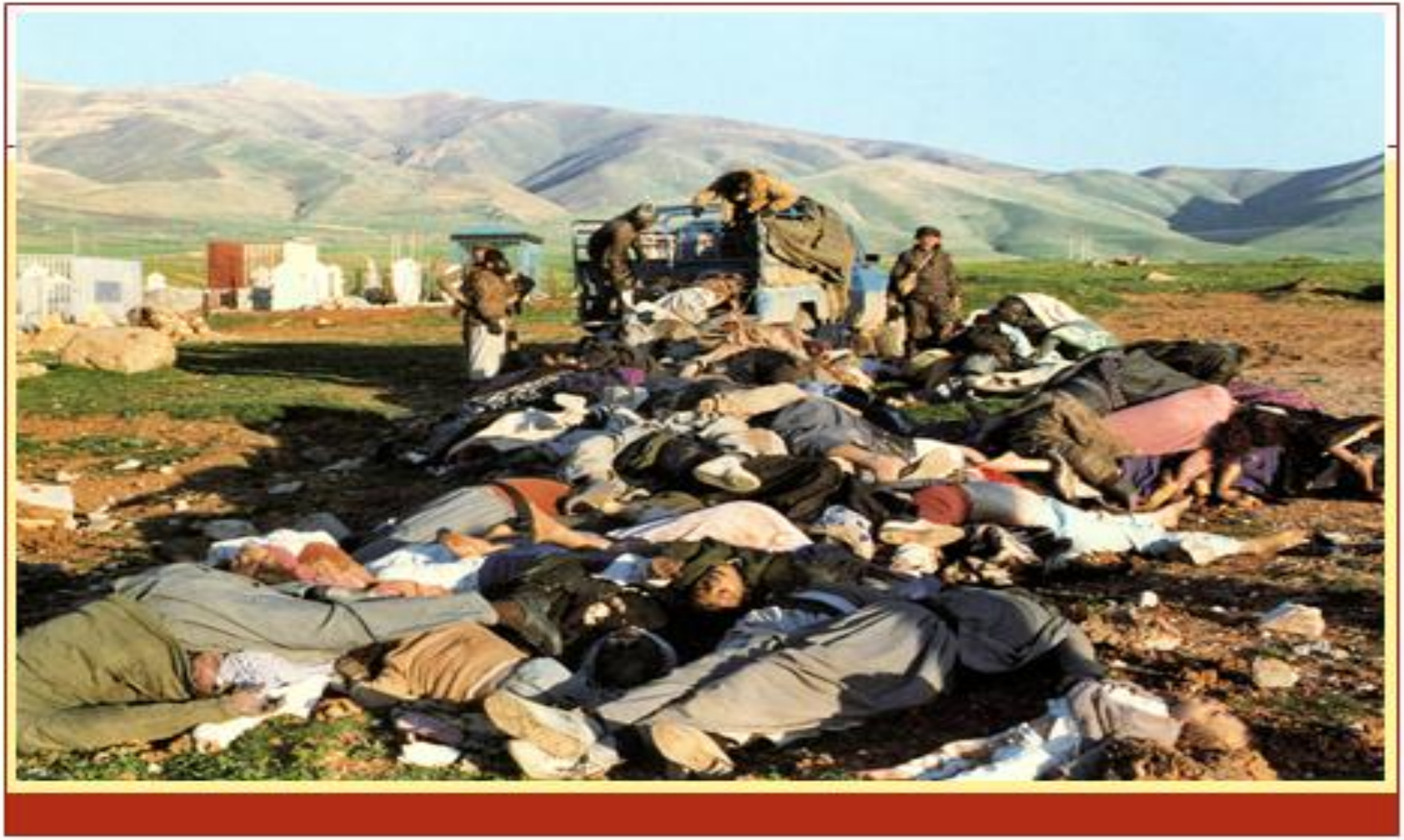
population (thousands)
population (thousands)

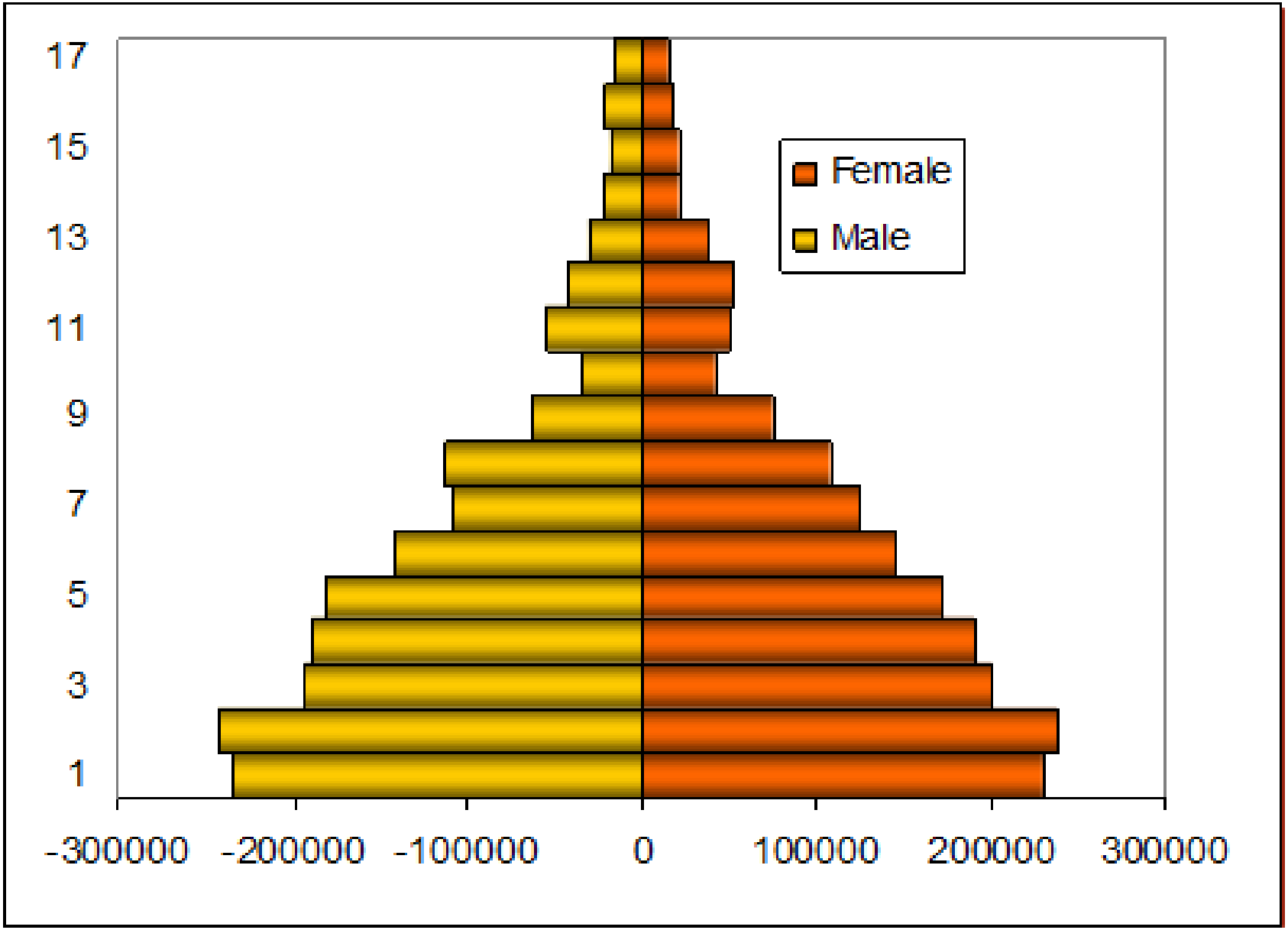
The Halabja Gas Massacre



The Barzani Tribe Genocide

One of the Concentration Camps

The Mass Exodus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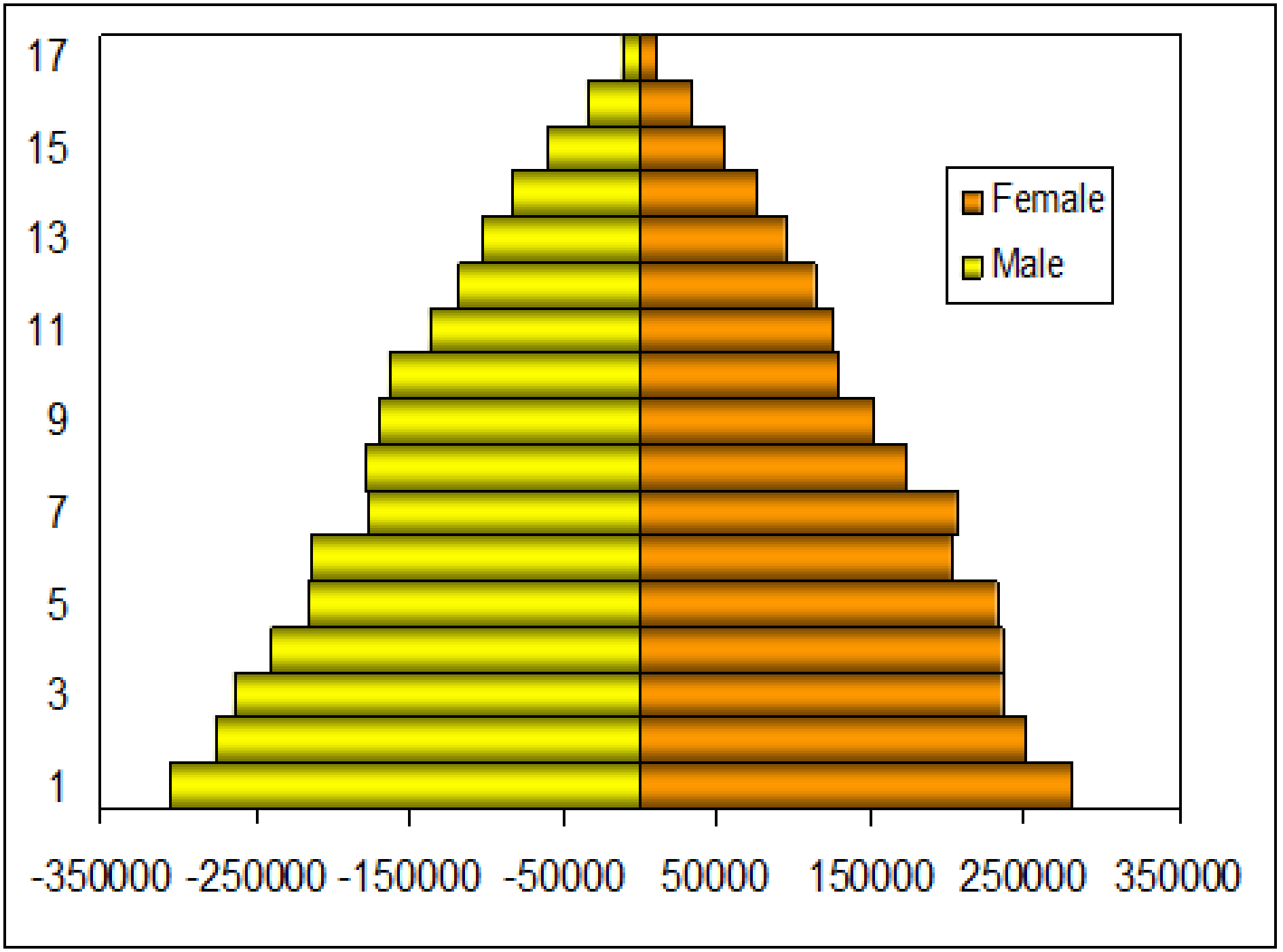
Human Cost Estimation

- No intermediate data
- The only reliable census data available from the years of 1947 and 1957
- Fertility rates and survival rates estimated from the past surveys;
- A dynamic model was built with these estimates completing the state transition matrix.

$$\theta_t = G_t \theta_{t-1} + w_t; \quad w_t \sim N[0; W]$$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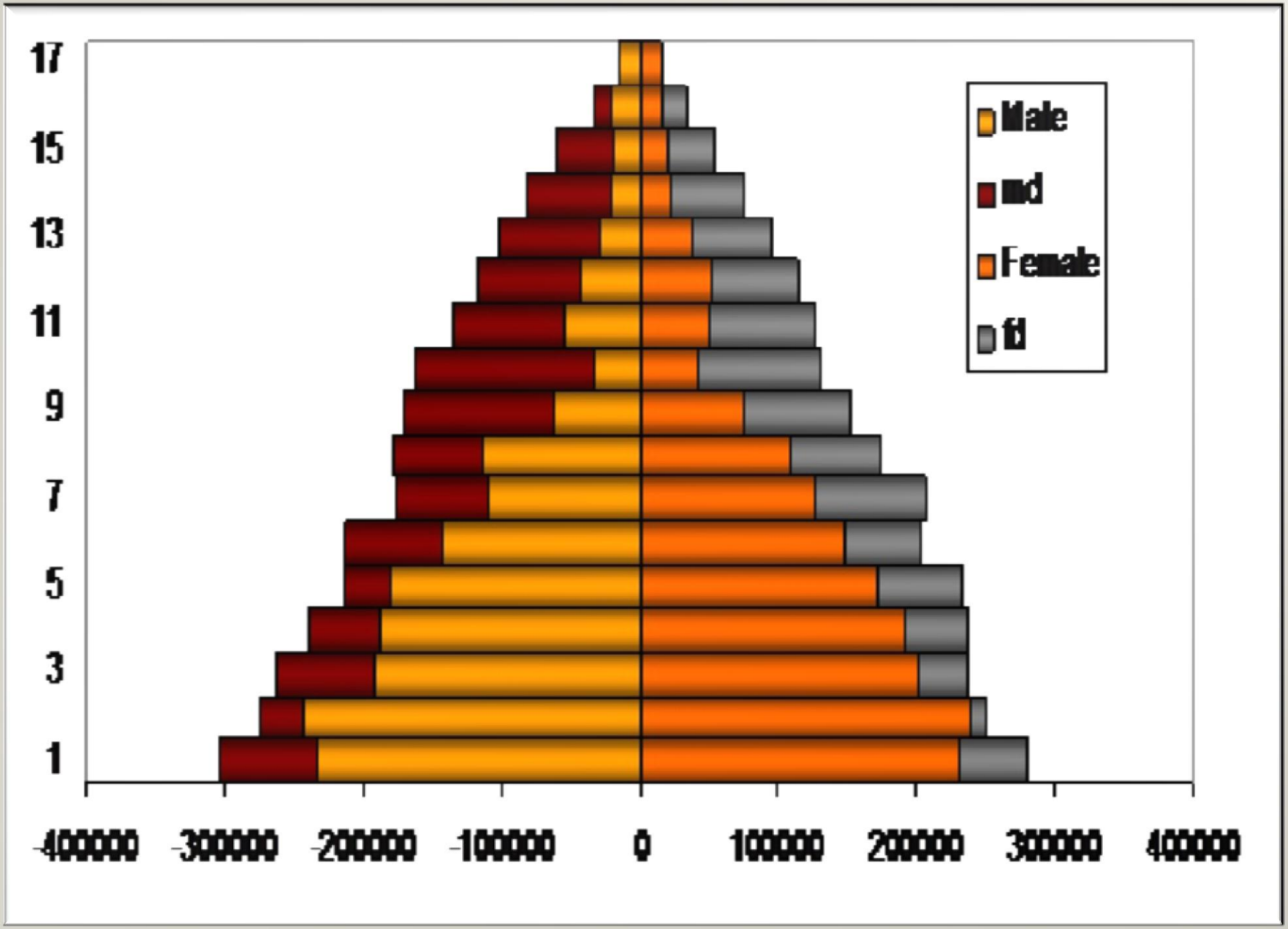
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Estimated Human Cost of Tyranny in Kurdistan

1,911,479

of which

1,043,549 ARE MALE

&

867,930 ARE FEMALE

Thank you for listening