Home Data Supporting the Dialogue of Care

Dr Nick Hine
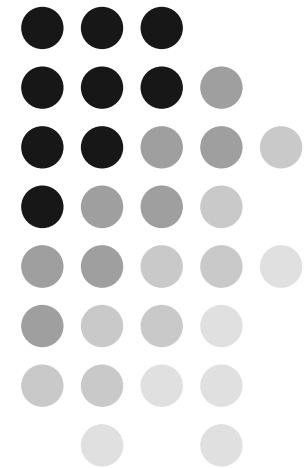
Role and importance of Telecare
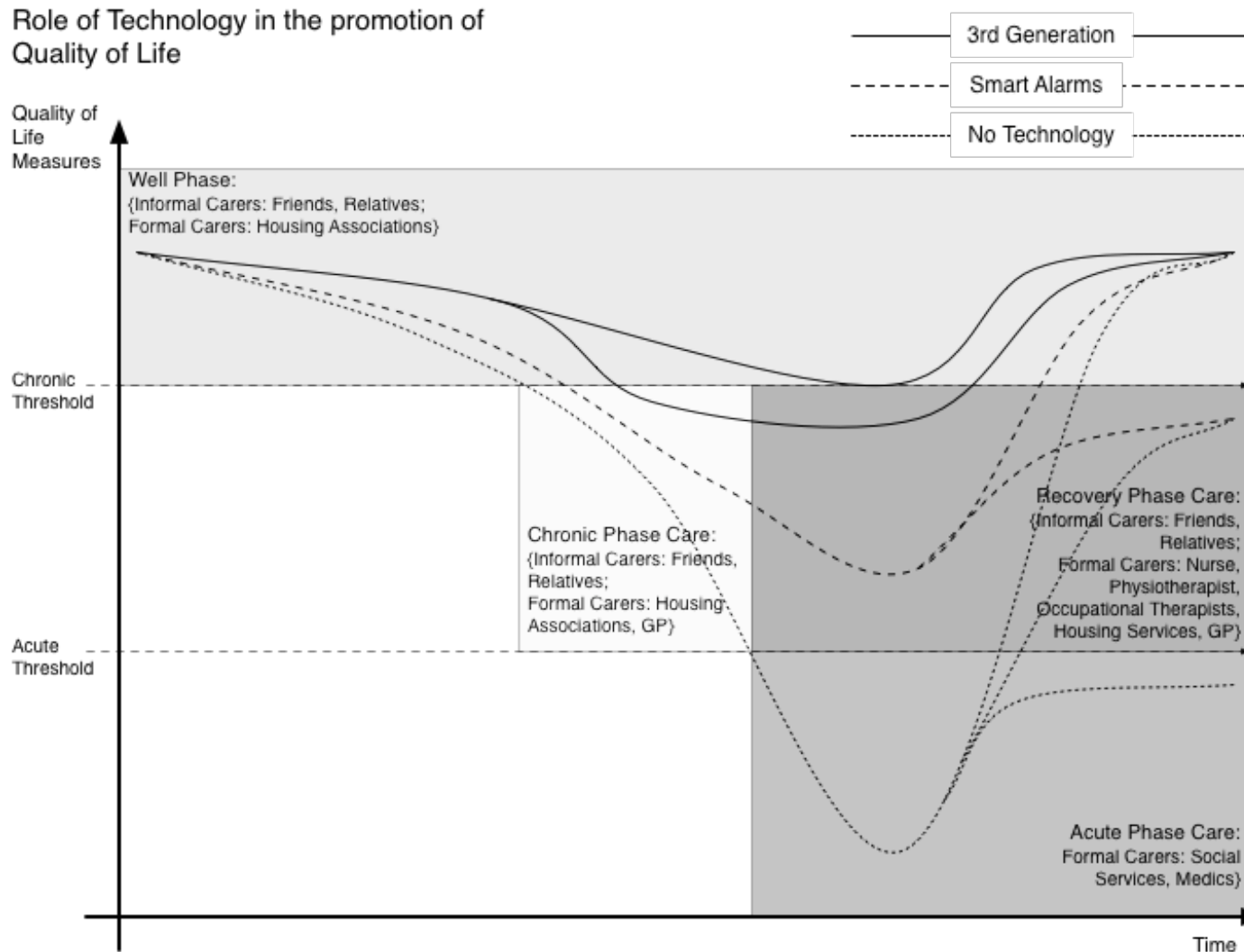
Role of Technology in the promotion of Quality of Life

3rd Generation

Smart Alarms

No Technology

Quality of Life Measures

Well Phase:
{Informal Carers: Friends, Relatives;
Formal Carers: Housing Associations}

Chronic Threshold

Acute Threshold

Chronic Phase Care:
{Informal Carers: Friends,
Relatives;
Formal Carers: Housing,
Associations, GP}

Recovery Phase Care:
{Informal Carers: Friends,
Relatives;
Formal Carers: Nurse,
Physiotherapist,
Occupational Therapists,
Housing Services, GP}

Acute Phase Care:
Formal Carers: Social
Services, Medics}

Time

To understand the various steps involved in using lifestyle data to support a care dialogue between carers and older people living independently

- Find the questions that carers ask in order to fulfill their role

- Sensor to answer those questions

- Collect data into a database

- Organise/Segment the data

- Analyse the data
  - Look for change

To understand the various steps involved in using lifestyle data to support a care dialogue between carers and older people living independently

- Find the questions that carers ask in order to fulfill their role

Service User	Bert		
Care Need	COPD with associated hypertensions and repeated lung infections. Is a smoker. Has cut down but is not convinced that he can stop.		
Stakeholder	GP & Community Nurses	Jim	Alice
Interest	Health: Control of COPD	Is friend OK, is he enjoying his walks each day?	Is Dad stopping smoking so he can get Oxygen at home?
Question	Is there a change in COPD symptom?	Is Bert getting out for a walk and where is he going?	Is Bert smoking
Measure	SPO2 levels, Breathing, Pulse, Blood Pressure.	Leaving and returning times, walking activity levels.	Being in parts of the house where Bert smokes and having smoking like activity levels.
Sensor	SPO2 sensor, Peak Flow meter, Pulse/Blood Pressure instrument	GPS location	Chair Occupancy, dwelling PIRs, SPO2 sensor, Pulse/Blood Pressure instrument
Data	SPO2 Levels, Peak Flow, Pulse, Blood Pressure	End point GPS data, data and time	Location and Busyness Levels, SPO2 Levels, Pulse
Data Representation	Trend graphs at various levels of granularity	SMS giving time when Bert reached destination	Web site showing occurrences of smoking-like activity, reinforced with SPO2 and pulse levels.

Stakeholders' Interests are varied and complex

Bert (yellow) cares about his well-being
Jim (pink) cares that his friend gets to do what he wants to do
Alice (orange) worries about her Dad living alone
Professionals (blue) have a caring job to do
Policy Makers (green) care about Bert as a member of society

Bert going to the bookies
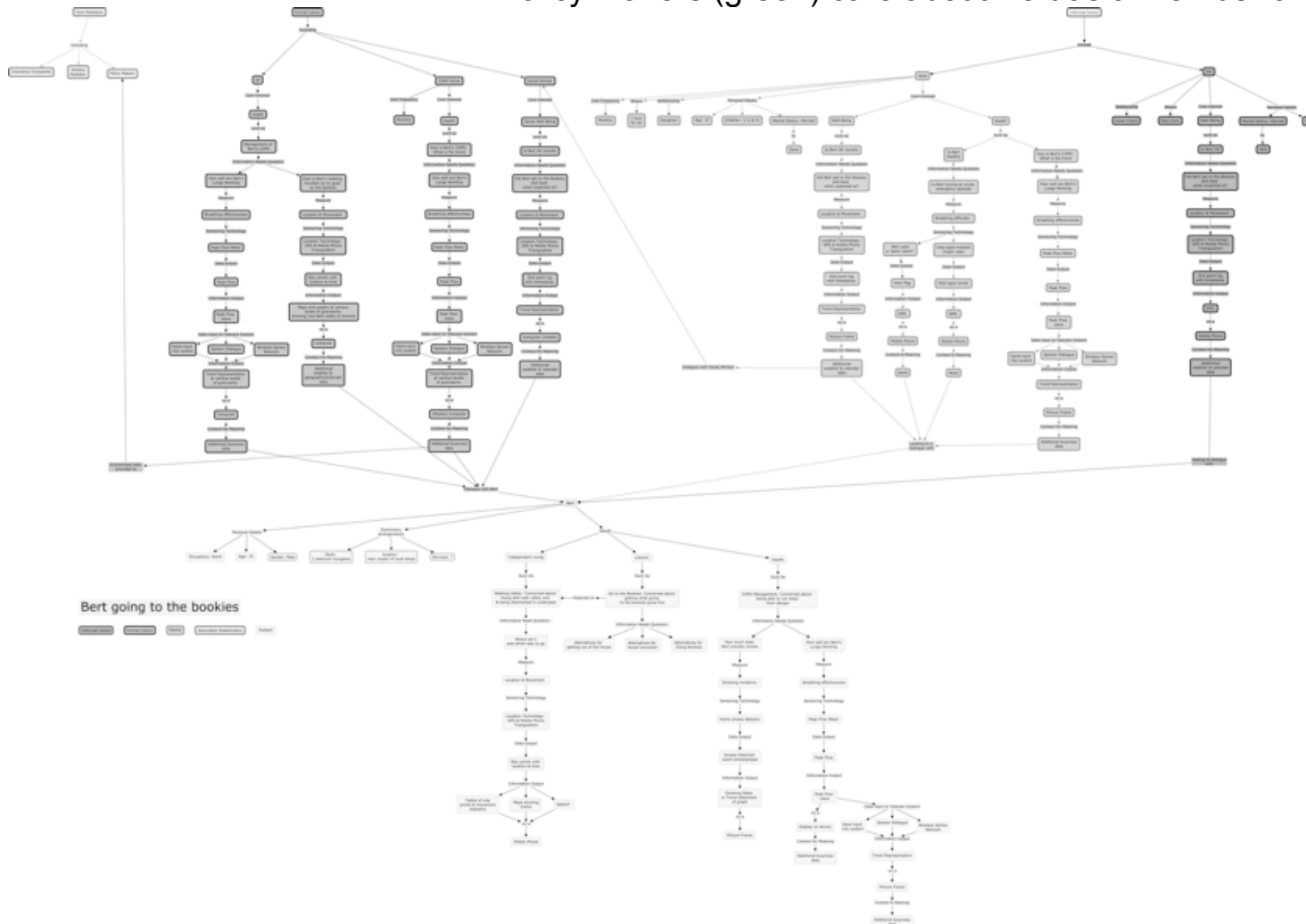
Sensor according to the questions that need to be answered

● The Dog Bowl Phenomenon!

Sensor according to the questions that need to be answered
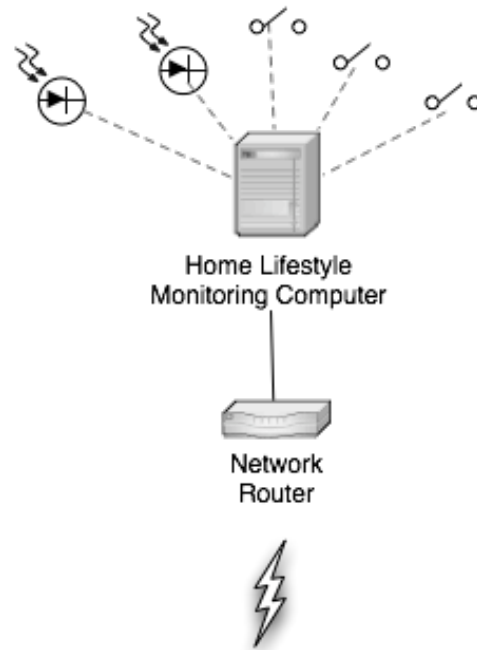

Low Risk Client

Single sensor detecting person specific activity.

Activity logged by service centre.

Activity compared to expected profile

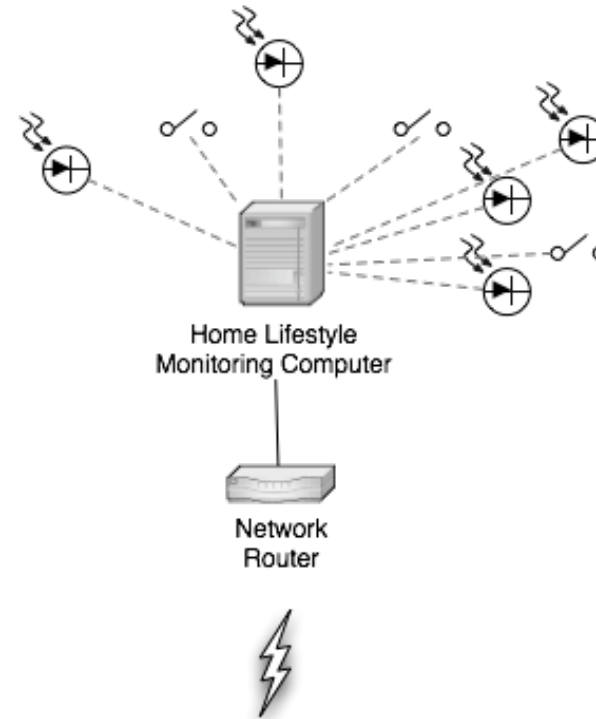Deviation from expected activity triggers an alert to preferred carer.

At Risk Client

Generic sensor array detects activity in the home.

Activity logged by lifestyle monitoring computer.

Lifestyle model built up over time

Deviation from expected activity is classified as an alarm or an alert and is passed to preferred carer.

Client with Specified Risk

Generic sensor array supplemented with additional sensors specific to the identified risk.

Activity logged by lifestyle monitoring computer.

Lifestyle model built up over time

Deviation from expected activity is classified as an alarm or an alert and is passed to preferred carer.

Monday 27th July 2009

N. Hine, University of Dundee

To understand the need to segment data so that it can be explored in context

People behave in people time, not necessarily in formal time

Zone	Hour
Sleeping	00:00 – 7:00 a.m.
Early morning	7:00 – 9 a.m.
Late morning	9:00 – 12:00 p.m.
Lunch	12:00 -4:30 p.m.
Afternoon	4:30 – 7:00 p.m.
Evening	7:00 – 10:30 p.m.
Late evening	10:30 – 12:00 midnight

People operate in places, not necessarily in rooms

So, segment data

To understand the principles underlying Online Analytical Processing (OLAP) as a data modelling technique and its use in exploring telecare data

Sensors generate potentially enormous volumes of data

So do supermarket store cards

So do transactional business systems

How can we possibly explore this huge volume of data in any meaningful way?

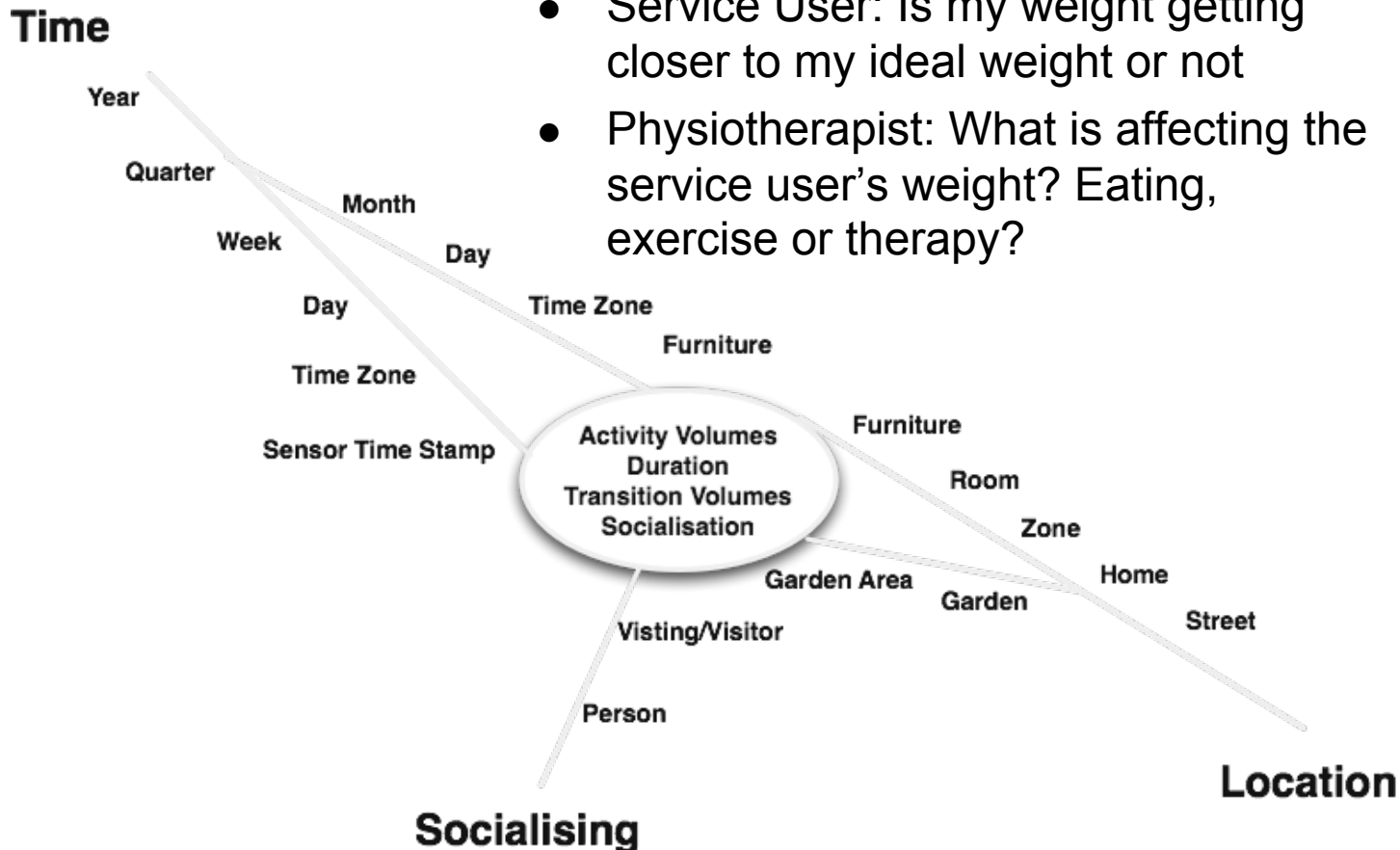Ask questions: Business people do it all the time.

They use a technique known as Online Analytical Processing (OLAP)

To understand the principles underlying Online Analytical Processing (OLAP) as a data modelling technique and its use in exploring telecare data

Different stakeholders care about a person in different ways

The information that they needs is different. Some is detailed, some is higher level

For Example:

- Service User: Is my weight getting closer to my ideal weight or not

- Physiotherapist: What is affecting the service user's weight? Eating, exercise or therapy?
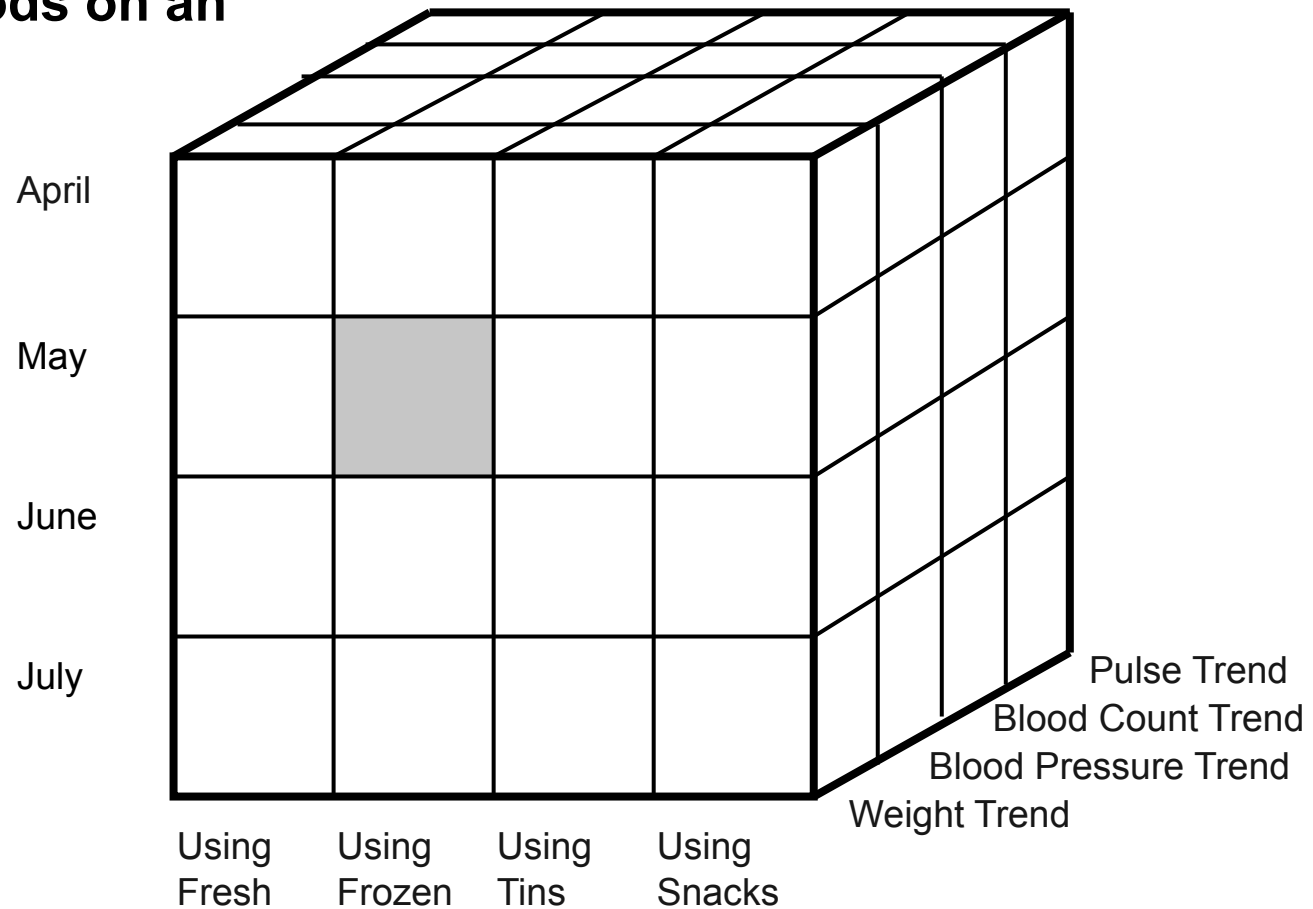
Time

Year

Quarter

Week

Month

Day

Day

Time Zone

Time Zone

Furniture

Sensor Time Stamp

Furniture

Activity Volumes
Duration
Transition Volumes
Socialisation

Room

Zone

Garden Area

Home

Garden

Visting/Visitor

Street

Person

Location

Socialising

Build an OLAP "Cube"

Pre-calculate all possible data values

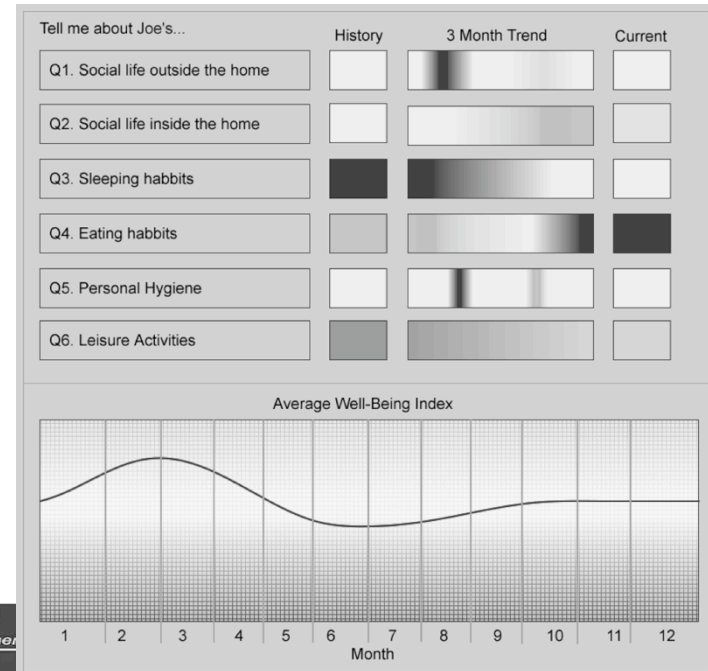|			Doctor	Community Nurse
2009	Q3	July	1	5
		Aug	1	3
		Sept	3	5
	Q3 Total		5	13
2009	Q4	Oct	2	5
		Nov	8	19
		Dec	5	12
	Q4 Total		15	36
2009 Total			50	85

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**Add more Dimensions:
To explore diet and the
physiological effects of
different foods on an
individual**

April

May

June

July

Using Fresh   Using Frozen   Using Tins   Using Snacks

Pulse Trend
Blood Count Trend
Blood Pressure Trend
Weight Trend

After Visulaisation, THEN we can try Data Mining

- Data mining reveals things we didn't know

- Data mining allows us to recognise whether current behaviour is normal or unusual

- Data mining might allow us to predict when change is about to happen

To understand the role of data mining in exploring telecare data

- Rules

- Clusters

- Probabalistic Models

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Alternative data visualisations are required for different stakeholders in order for them to comprehend features of interest in telecare data

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Time out for a walk: Service User

25

20

15

10

5

☐ Duration/ Mins

0

24 Apr 2008 4 May 2008 14 May 2008 24 May 2008 3 Jun 2008 13 Jun 2008 23 Jun 2008 3 Jul 2008

Time out for a walk: Carer

25

20

15

10

5

⬤ Duration/ Mins ━━ Change in Duration of Walk

0

24 Apr 2008 4 May 2008 14 May 2008 24 May 2008 3 Jun 2008 13 Jun 2008 23 Jun 2008 3 Jul 2008

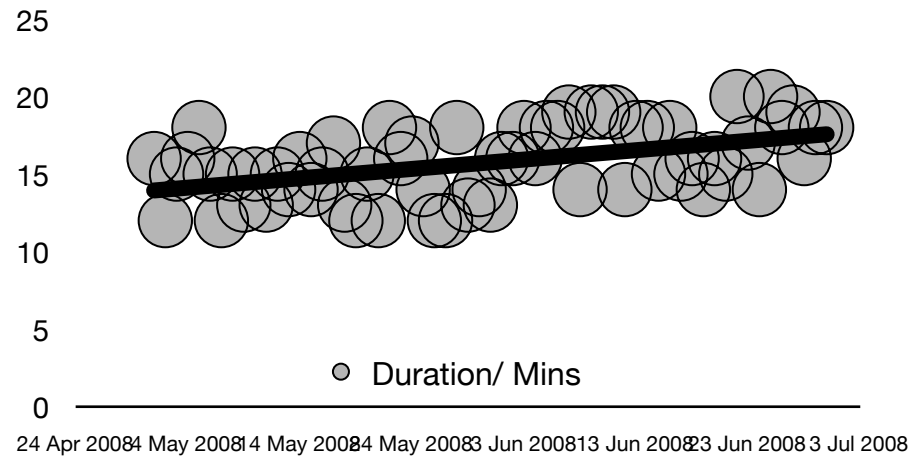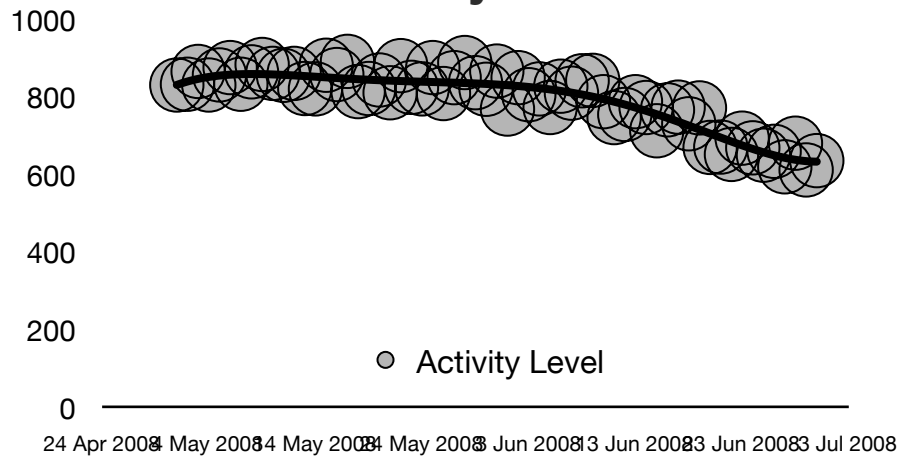N. Hine, University of Dundee
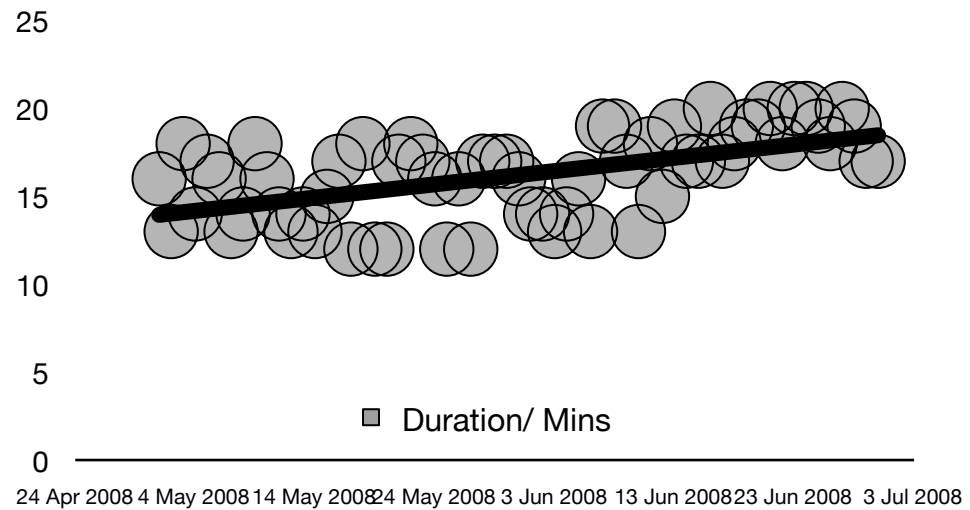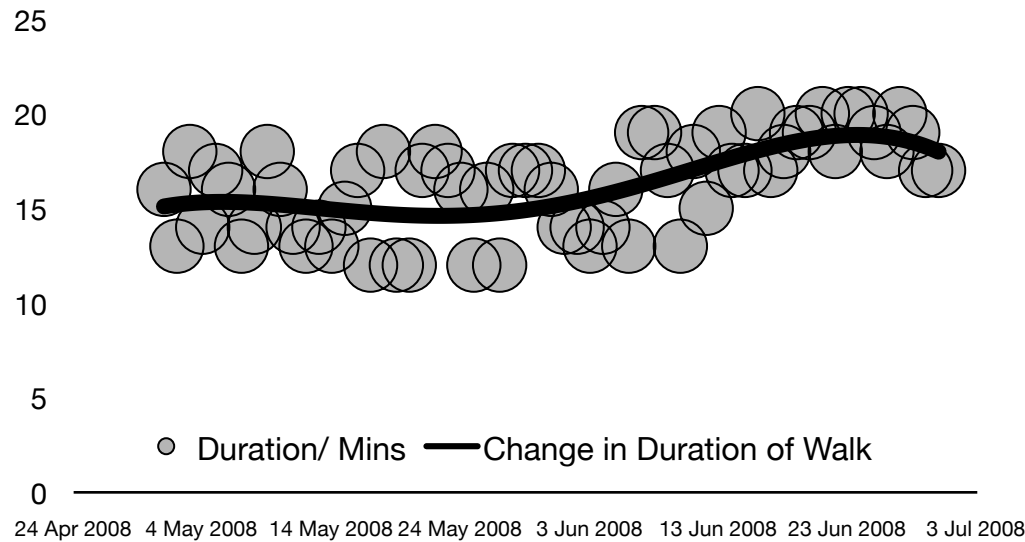
But!!

- Home data is messy and unpredictable!

- However regular a person wants their life to be, they get disturbed.

  - Sensors fail

  - Lives get interrupted

  - Lives get modulated

  - Jim Rowan's butterflies

What does the Data MEAN?

Time out for a walk

25
20
15
10
5
0

○ Duration/ Mins

24 Apr 2008 4 May 2008 14 May 2008 24 May 2008 3 Jun 2008 13 Jun 2008 23 Jun 2008 3 Jul 2008

Activity Level

1000
800
600
400
200
0

○ Activity Level

24 Apr 2008 4 May 2008 14 May 2008 24 May 2008 3 Jun 2008 13 Jun 2008 23 Jun 2008 3 Jul 2008

So ....

- This is Data … not Information

- It becomes information when interpreted/ contextualised by people

- This data contributes to a more informed "Dialogue of Care"