Figh: (Irish verb)-meaning to weave. Focusing Ireland on Global Health

Terrance J. Dishongh, Ph.D.
Senior Principal Engineer
Health Research and Innovation
Digital Health Group

"Can you believe we got married, raised a family and retired, all without the help of a hand-held computer?"

- Today India is home to one out of every ten senior citizens of the world.

- During the 1998-2025 period, the world's elderly population (ages 65 and above) will more than double

The number of elderly is now increasing by 8 million per year; by 2030, this increase will reach 24 million per year.

Asia and Latin America and the Caribbean are the world's fastest aging regions, with the percent of elderly in both regions projected to double between 2000 and 2030

Digital Health Group
Louis Burns Executive VP and GM

Strategic Technology Group
Doug Busch, CTO Digital Health

Policy & Standards Group
Collin Evans, GM

Continua
HEALTH ALLIANCE

Personal Health Platforms
Mariah Scott GM

Be fit for a healthier lifestyle

Train smarter to perform better

Health Information Technology
Pat Perry, GM VP Intel

Health Research and Innovation
Eric Dishman, GM

CAST
Center for Aging Services Technologies
A program of *aahsa*

TRIL
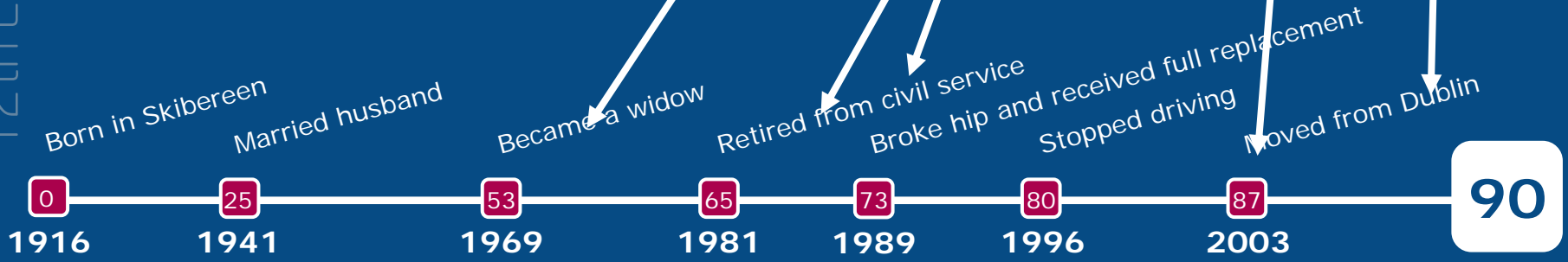Technology Research for Independent Living

alzheimer's association
ETAC

HRI Mission:
Understand, invent, & test new health and wellness usage models by studying people/practices across the continuum of care

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Interpreting
TV is set up in her room but not turned on or plugged-in. Not a technology user, no matter how simple.

Biographical Statistics

Born in Skibereen
Married husband
Became a widow
Retired from civil service
Broke hip and received full replacement
Stopped driving
Moved from Dublin

0	25	53	65	73	80	87	90
1916	1941	1969	1981	1989	1996	2003	

Portfolio of examples...

2002-4 Proactive Health / Social Health	2005 Parkinson's Early Detection	2006 Context Aware Meds Prompting
OHSU, UNLV	UCSF, Stanford	OHSU, Microsoft Res'rch
Congressional demos, Senate testimony,	Business Week's Design Excellence Award	White House Conf on Aging

Importance of history

- Family structure leads to a matriarch
  - Family history to the Fianna sometimes.
  - Family controller/communicator
- Community Centered
- Loyalty to a fault to the local GPs
- 4.0M mostly stagnant genetically with genealogical and medical histories.
- HSE crisis looming but relative
- Welcoming healthcare people
- 2nd richest country in the world

History

- Famines of the 1800s reduce population on the island to 2.3M from an all time high of 8.6M in the start of the famine.

- Deportation added with migration gives us 86M in the world with Irish ancestry.

- Current population is 4.3M with 4.0M being of Irish Decent. 230K new immigrants in the last 10 years.

- Today per-capita GDP in Ireland is 58KUSD, compared to UK of 46KUSD and the US of 43KUSD.

- Population boom from 1979-83 leading to the first generation not to have massive flight.

Niall Noigíallach

- In January 2006, scientists suggested that Niall may have been the most fecund male in Irish history, and second only to Genghis Khan worldwide.

- R1b1c7-M222 is believed to have been the Y-chromosome haplogroup of the kings of the Uí Néill clan of ancient Ireland.

- But why is the R1b1c7 group so interesting to health care. Within people with the R1b1 group and the R1a group there is evidence that they carry two genes called C282Y and H6D. These two genes are the major markers the individual probability to acquire hemochromatosis.

- European extraction, with about 1 in 10 people carrying the defective gene. The prevalence of hemochromatosis varies in different populations.

- In Northern Europeans it is of the order of one in 400 persons.

- A study of 3,011 unrelated white Australians found that 14% were carriers and 0.5% had the genetic condition.

- It is presumed, through genetic studies, that the "first" hemochromatosis patient, possibly of Celtic ethnicity, lived 60-70 generations ago.
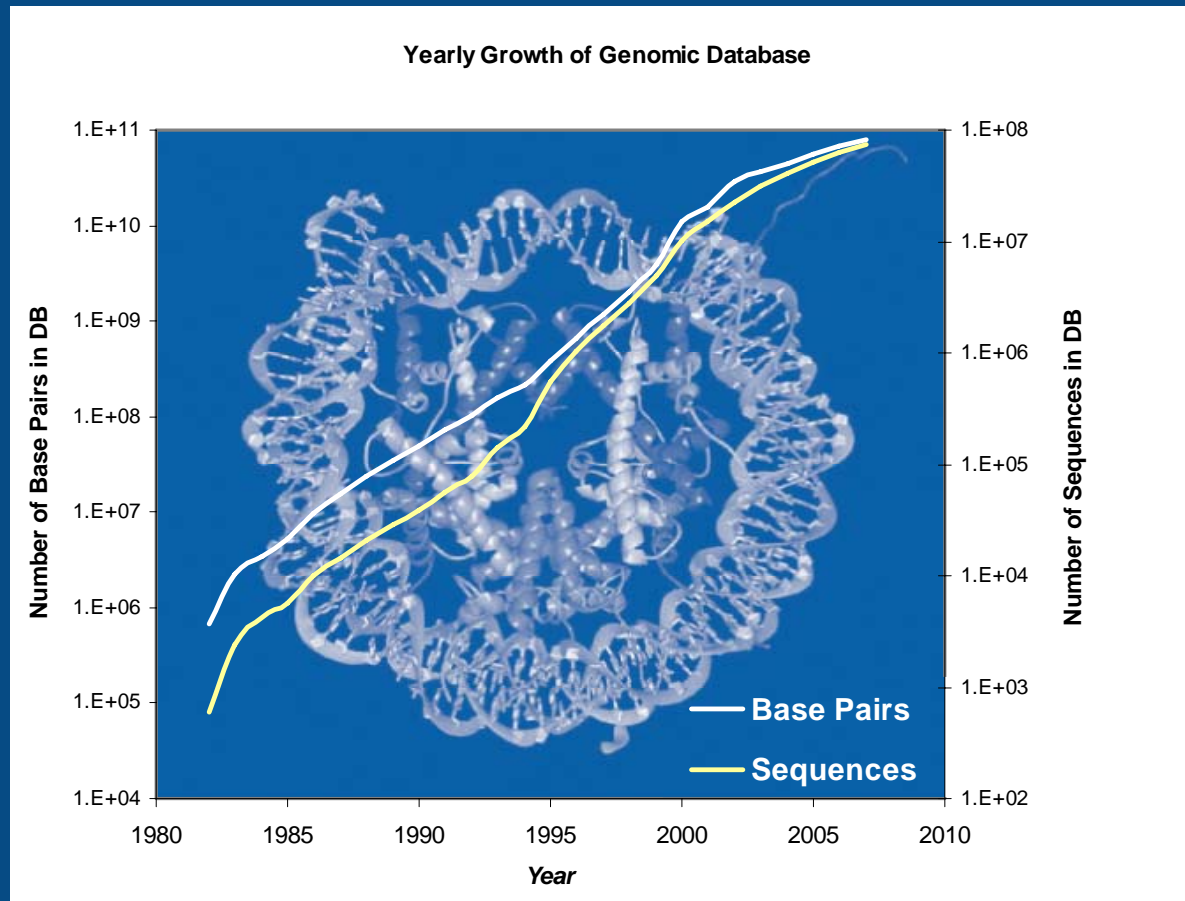
A Case Study: Jim

- Hep A 1971 and again Hep A April 2000!
  - Usually you cannot have Hep A twice so
  - diagnosed as Chronic Alcoholic "how many a day sir?"
  - 1 yr on, liver function not coming back to normal
- Niamh's Uncle, a family doctor, dying in the US from Hemochromatosis – diagnosed Jim in June 2001 – at a distance
- 'The Celtic Curse' - discovered in Australia
  - Iron Overload
- Route cause of many chronic diseases
  - arthritis
  - liver disease, including an enlarged liver, cirrhosis, cancer, and liver failure
  - damage to the pancreas, possibly causing diabetes
  - heart abnormalities, such as irregular heart rhythms or congestive heart failure
  - thyroid deficiency
  - damage to the adrenal gland

Other Possible Celtic Rooted Diseases

- *Dyslexia – higher among students with Irish descent.*

- *Chronic Kidney Disease increase in Ireland 20% Y to Y*

- *Times of London Reports 100% increase in Cirrhosis in younger population than 30 years ago.*

- *Coeliacs are more have prevalent in Ireland.*

- *IUGR impact 50K children born in Ireland each year, 150% higher than US.*

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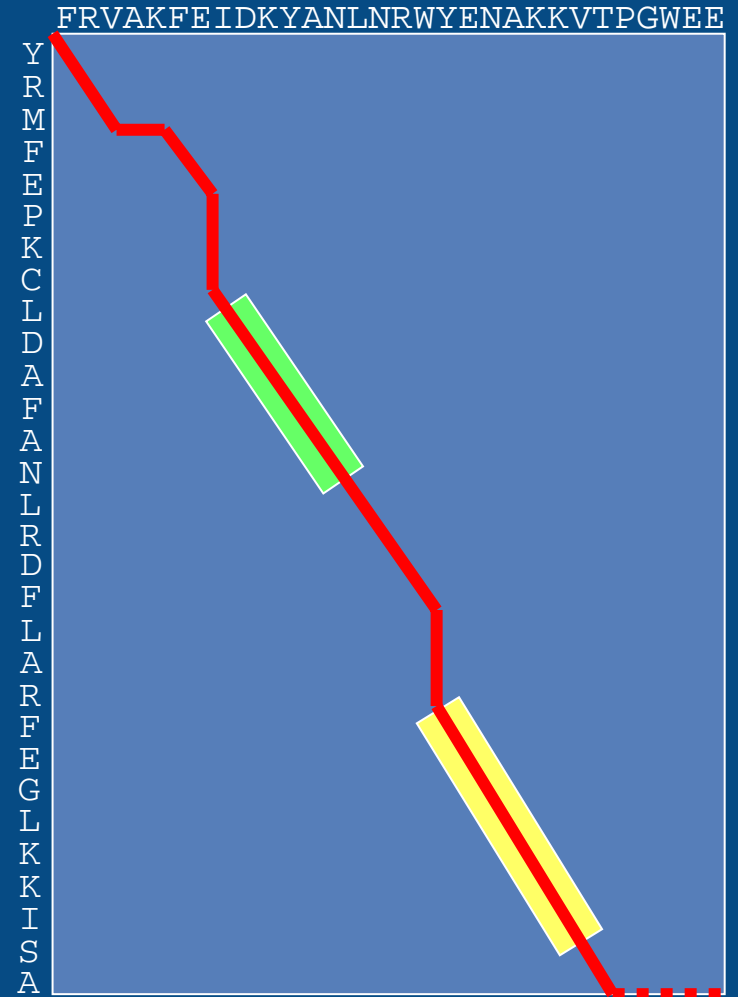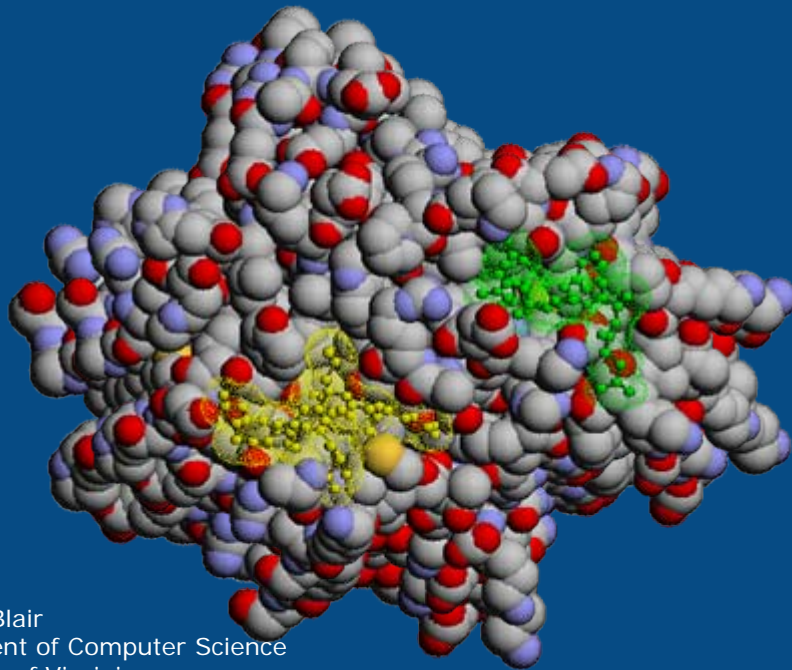# Bioinformatics Moore's Law

Yearly Growth of Genomic Database

Although Moore's Law shows transistor density doubles every year the number of base pairs grows by 10 fold every year in the genomics database

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Sequence Alignment
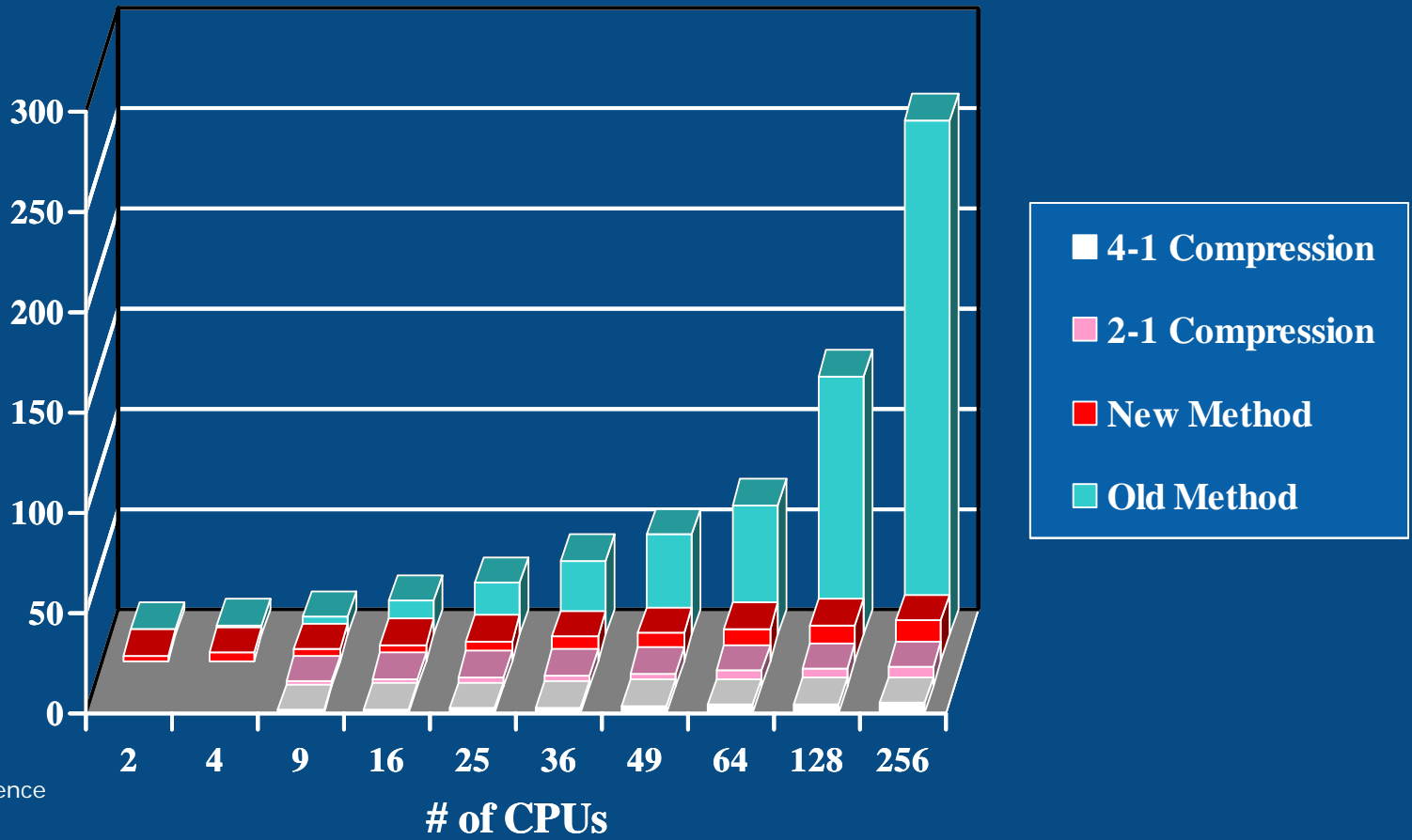
Douglas Blair
Department of Computer Science
University of Virginia

Transmitted Data

Douglas Blair
Department of Computer Science
University of Virginia

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Transformation Challenge...

02 **The Challenge of Change**

Across the globe, it is becoming increasingly obvious that conventional approaches to health and social care delivery are unsustainable.

Transformation
Programme 2007-2010

Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

Clár Athraithe 2007-2010

Programme 10:

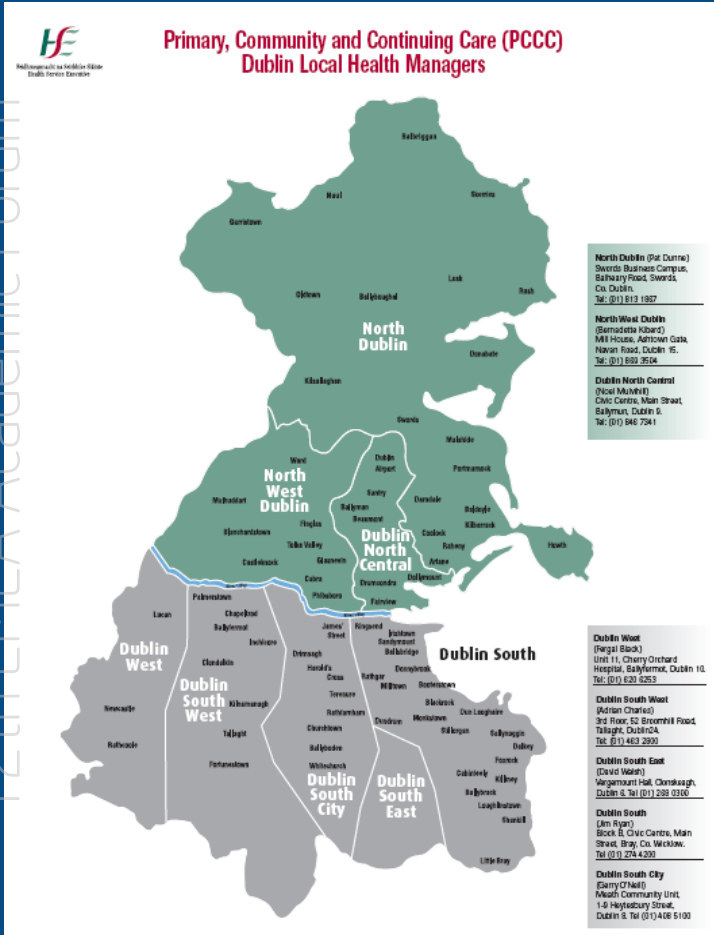**Information and Communications Technology (ICT).**

Central to this programme is the development of a unified national ICT infrastructure and support services and the development of clinical and administrative systems. This will involve establishing national ICT governance structures, integration with shared services, ICT staff development and engagement with health professionals to drive ICT based transformation.
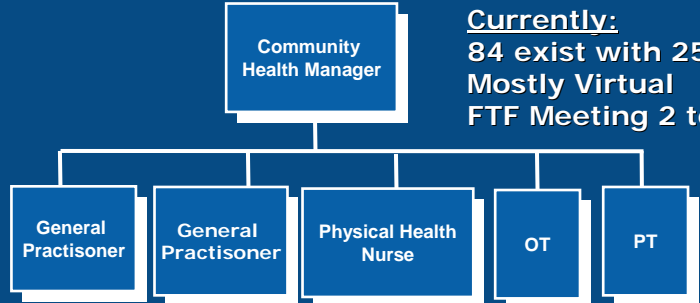
Examples of significant projects

1. National ICT infrastructure
2. Clinical and administrative systems strategy
3. Structures and funding mechanism
4. ICT organisation and governance
5. Integration with corporate shared services
6. National ICT staff development
7. Establish National ICT Subject Matter Experts (SMEs) "best practice".

HSE Integrated Community Care

HSE Head

Community Health Manager Regional Lead

Community Health Manager Regional Lead

Primary, Community and Continuing Care (PCCC) Dublin Local Health Managers

North Dublin (Pat Dunne)
Swords Business Campus,
Balheary Road, Swords,
Co. Dublin.
Tel: (01) 813 1807

North West Dublin
(Bernadette Kibard)
Mill House, Ashtown Gate,
Navan Road, Dublin 15.
Tel: (01) 860 3504

Dublin North Central
(Noel Mulvihill)
Civic Centre, Main Street,
Ballymun, Dublin 9.
Tel: (01) 846 7341

Dublin West
(Fergal Black)
Unit 11, Cherry Orchard
Hospital, Ballyfermot, Dublin 10.
Tel: (01) 620 6253

Dublin South West
(Adrian Charles)
3rd Floor, 62 Broomhill Road,
Tallaght, Dublin24.
Tel: (01) 463 2900

Dublin South East
(David Walsh)
Vergemount Hall, Clonskeagh,
Dublin 6. Tel: (01) 268 0300

Dublin South
(Jim Ryan)
Block B, Civic Centre, Main
Street, Bray, Co. Wicklow.
Tel (01) 274 4200

Dublin South City
(Garry O'Neil)
Meath Community Unit,
1-9 Heytesbury Street,
Dublin 9. Tel (01) 408 5100

32 Major team in roughly one per county
- **500 Teams in Ireland by 2010**

Community Health Manager

Currently:
84 exist with 250 total EOY
Mostly Virtual
FTF Meeting 2 to 3 times a week

General Practisoner	General Practisoner	Physical Health Nurse	OT	PT

Staff
Nurses
Labs

Mental Health
Disability
Pharama
Speech
Chiro

Commercial cost of co-locating 2-6M Euros

Mobile Clinical Assistant

- Durable exterior casing that can be wiped clean with disinfectant

- Radio frequency identification (RFID) technology for rapid user and patient identification

- Bar code scanning to help reduce medication-dispensing errors.

- A digital camera to enhance patient documentation and progress notes

- Bluetooth technology to record patient vital signs

- Wireless connectivity to access electronic medical records systems

- Generous screen display minimizes scrolling

Cost on virtualization

Medical Team Virtual Gathering

$20K USD/yr

- 8-10 C5 Devices
- 8-10 Desktops
- 1 Server/Router
- Maintenance
- ISP

Video Conference
Data Sharing
E-Medical Records
Journal Management
No Travel Time

Low Community Cost

Medical Team Co-Location

$144K USD/yr

- Building
- Maintenance
- Phones
- Travel
- Meeting overhead

Co-Location
Paper Transfer

High Community Cost

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Geographic Distribution of Older Persons IRL

▪Ireland: Within the State, 11.8% of the population is aged 65 or older.
▪Within each area this varies from 9.7% within the eastern area to 13.1% within the north-western area.
▪In general, the west and north-west have the highest percentage of older people as well as the highest proportion in the oldest age groups
•There is not much variation in the marital status of older persons across areas
▪Leitrim, with an average age of 38.5 years in 2002, has the oldest population in the state, Followed by Roscommon (38 years) both have 80% household type as detached.
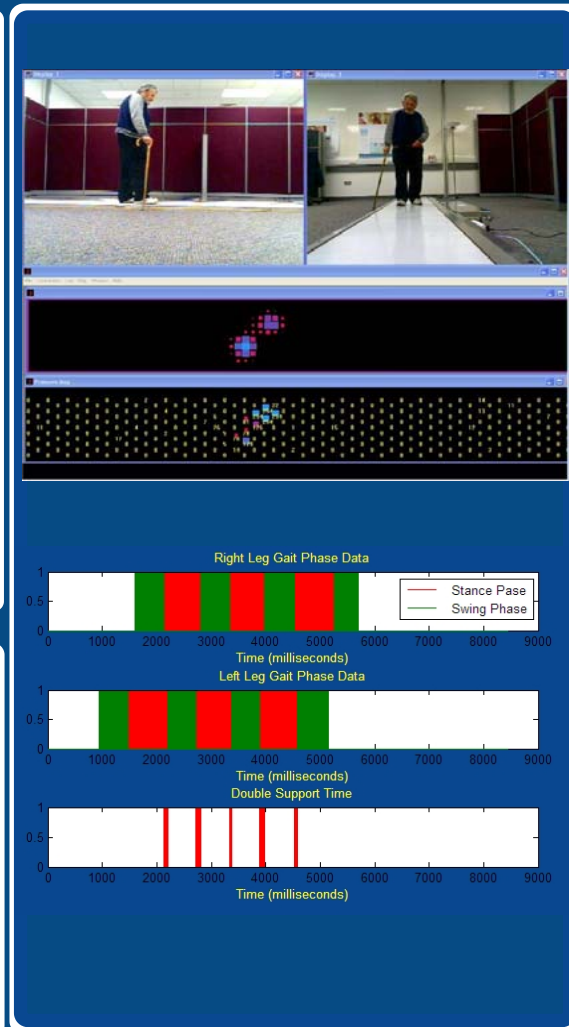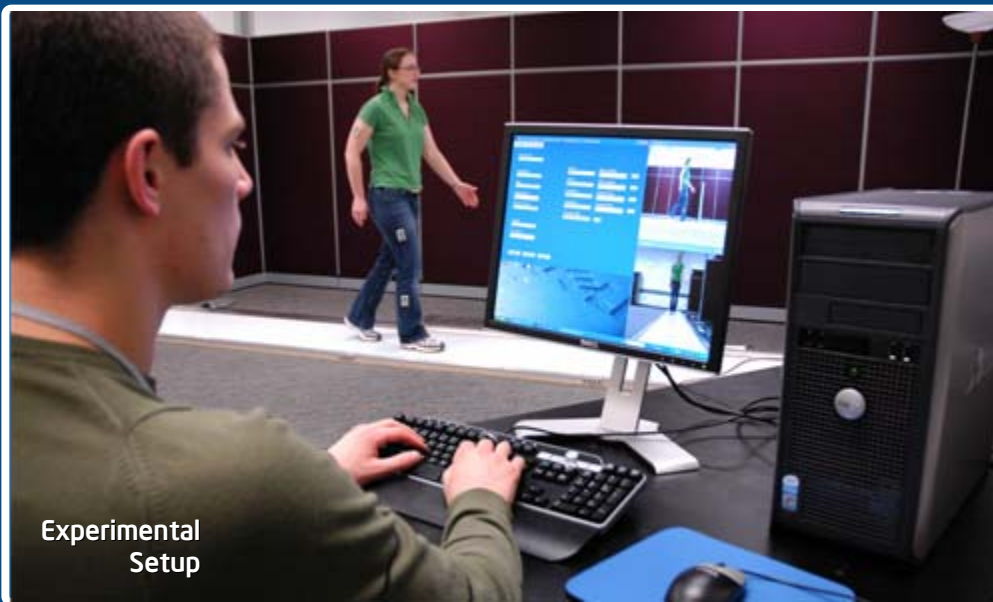

Elderly Population Age Groups by County

Legend: 80+, 80-84, 75-79, 70-75, 65-69

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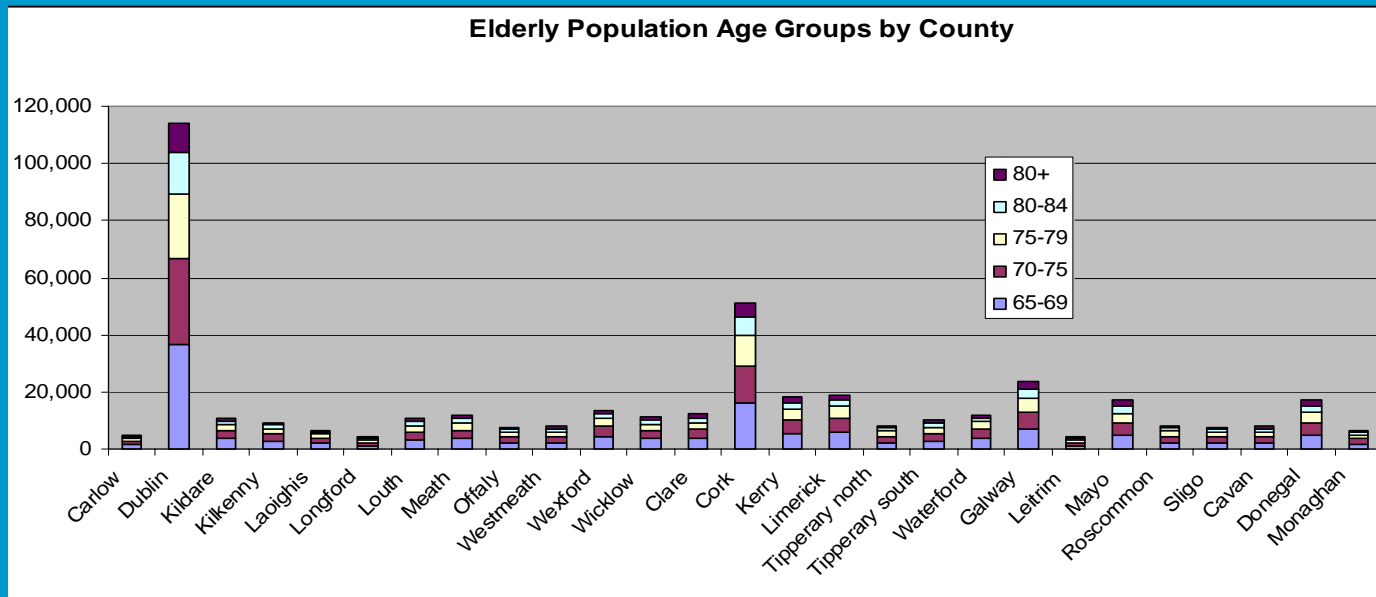
The Irish Longitudinal StuDy on Aging (TILDA)

-over 10yrs
   10000 elders studied
- Gait
 - Cardio
 - Cognitive
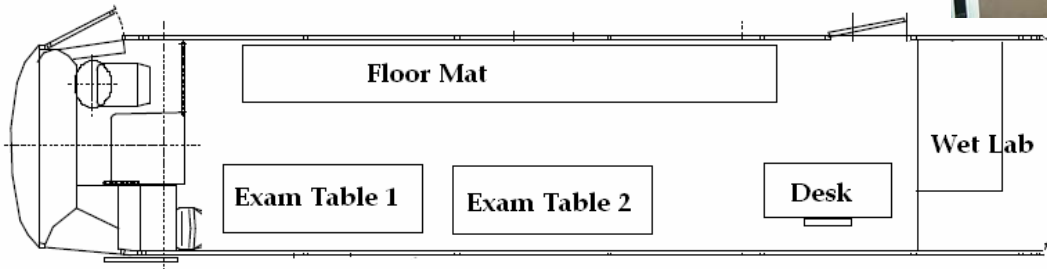
Gait and Fall Clinical System

Experimental Setup

Body Fixed Motion Sensors

Body fixed motion sensors units incorporating tri-axial kinematic sensors are attached at various locations on the body. Implementation of algorithms on sensor signals are used to determine temporal and spatial parameters of gait

Toe Off

Heel Strike

Right Leg Gait Phase Data

Stance Pase
Swing Phase

Time (milliseconds)

Left Leg Gait Phase Data

Time (milliseconds)

Double Support Time

Time (milliseconds)

Gait and Falls Analysis System

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Broadband Coverage Ireland

"In the absence of reliable data for broadband availability across all platforms, it is not possible to quantify the percentage of the population without access to any broadband service"

- In Rural Ireland DSL availability stands at 38%, while 40% of the population live in rural areas

- At the end of Q2 2005 there were 75,500 broadband subscribers up from 63,600 a year previously.

- Increase of 170% but only 1 in 20 of the population subscribing

- Eircom have only released 2% of LLU and approximately enabled 400 out of 1100 exchanges in Ireland, coverage map opposite

- *From Q2 2004 to Q2 2005*
DSL 154% increase
FWA 313% increase
Cable 177%

- In 2002 13.62% of private households obtaining broadband
Information provided by Benchmarking Ireland's Broadband Performance Nov 2005, Forfás

The TRIL Centre

Technology Research for Independent Living

- Co-funded by Intel and IDA with researchers from NUI Galway, Trinity College Dublin and University College Dublin
- Research aimed at developing innovative technologies that will help people "age successfully in place" from wherever they choose to live.

- Initially focused on three aspects of ageing:

  - Falls Prevention
  - Cognitive Function
  - Social Connection

- TRIL Centre research is grounded in Ethnography and built on components from the Technology Platform

- $30M over 3 years
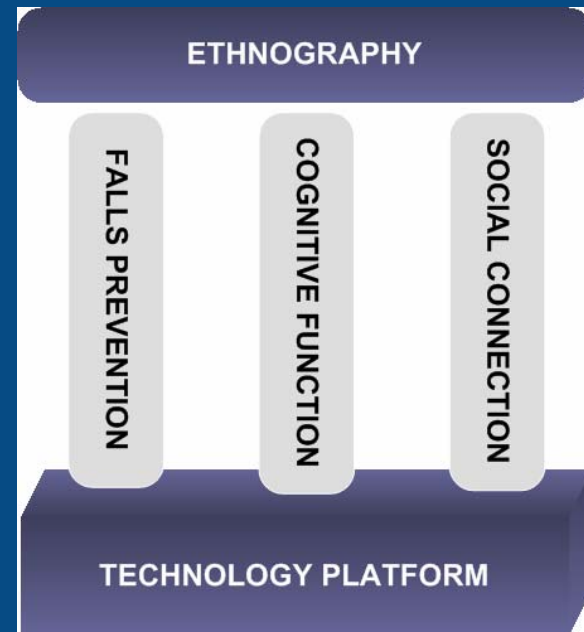
Technology and Academic Outreach

Today

- 7 IRCSET Students
- 1 Funded Post Doc
- 2 MOUs in Ireland / 1 US all with TRIL IP Agreements
  - NUIG Ger Lyons
  - Tyndall Sarasota2 Validation
  - Spaulding Medical
- Conference Committees
- GREP's Proposals
  - Bio-informatics
  - Behavioral Biomedical Engineering
  - Clinical Diagnostics

- But more educated students will be needed to analyze the wealth of data coming.
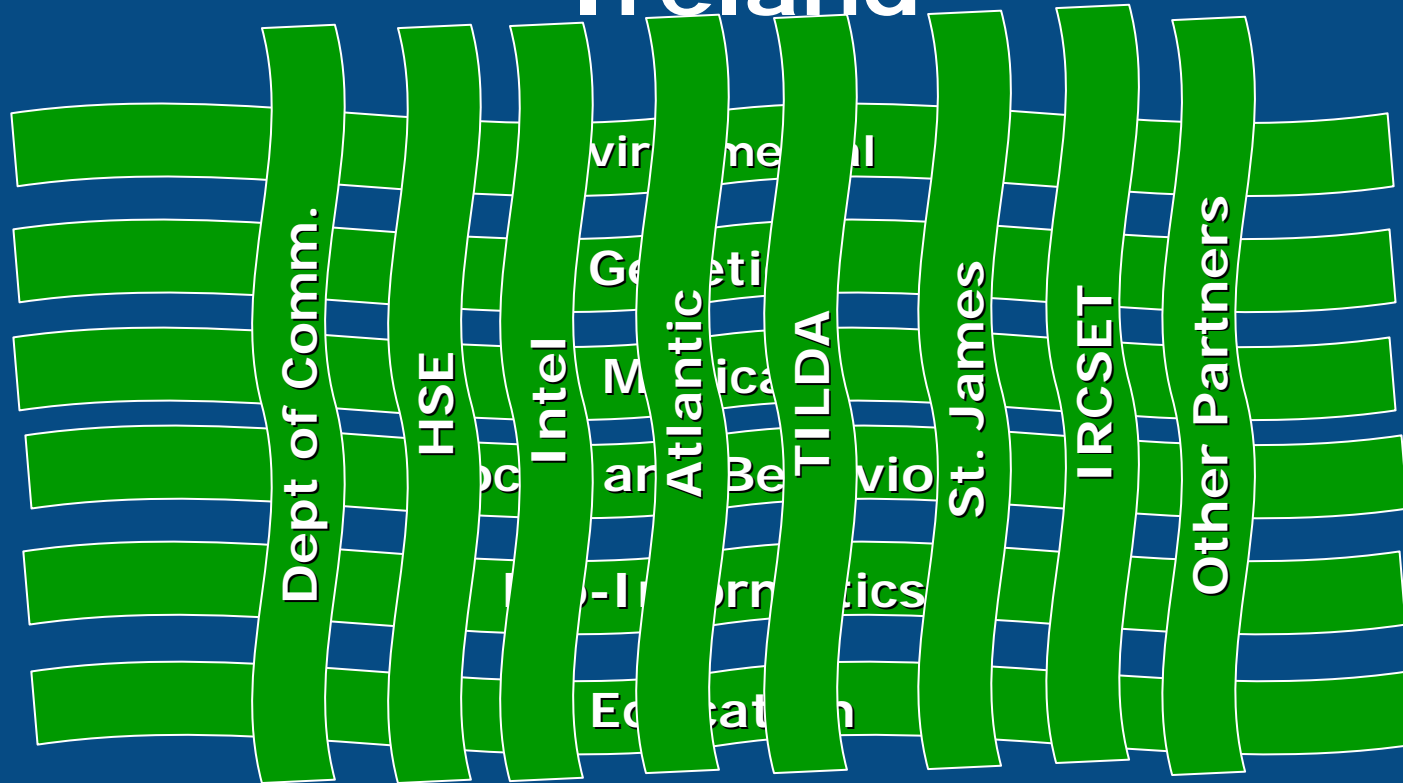
Basic Foundation of FIGH

- *A population with known history, genealogy, and medical history leads to a deterministic genomic database.*

- *Following the population for a long-term longitudinal phonemic database.*

- *Training and establishing engineers, bio-informatics experts, clinicians, and healthcare workers enables a population to understand and solve diseases.*

- *Creation of the infrastructure begins today;*
  - Back TILDA
  - Stress TRIL
  - Digital Nation needs to be accelerated
  - Set Agenda for IRCSET and GREPs
  - Establish HSE as DHeG Test-bed
  - Advertise and Evangelize

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Comparative Data

- With the established Celtic genome defined
- With a long term longitudinal survey done for medical evaluation of elders in that database
- With the medical data from the GP's
- Finally a full picture of the establishment of diseases states emerge.

Key Message: But currently comparative genomics output is measured in CPU days! The rest of the data increases the problem complexity.

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Fabric of Health Care Research in Ireland

What is needed.....

- Faster processing sure but...

- Greater leveraging of parallel computing

- Faster database and comparative search algorithms.

- Applications that will keep up with our pace of discovery 10X/yr.

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