Data, technology and the future of health

Dr Minh Huynh, Department of Statistics, Data Science & Epidemiology

Dr. Mark Merolli, Academic Director of Digital Health and Informatics
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Source: PayScale Analytics
Statistician jobs are growing faster than the job market as a whole
Job growth and demand

- Named the top job in America for 2016 by Glassdoor.
- Sexiest job of the 21st century by Harvard Business Review.

- Of data scientists, 79.7% report there is a shortage in their field.
- Projected growth from 2014 to 2024: 11%, faster than growth for all occupations: 7%.
The information age (also known as the digital age) has radically changed the way all sectors operate.

- Data and analytics is being used to inform decisions and drive policy-making.
Infusing technology

Technology is being infused into the systems and processes that makes our world work:

- Smart devices
- Smart cars
- Smart cities
An ocean of data

• The trillions of active devices online each day means that we are always connected

• The vast amount of data produced every second of every day cannot be quantified

• Data comes in varieties, from the flow of markets through to the pulses of societies
Why Statistics?

- How does understanding about data help us to:
  - Reduce waste?
  - Improve the quality, productivity and efficiency of our processes?

- Data is all around us, and understanding how to access and interpret that data is crucial
Today, more and more businesses, government bodies and major organisations rely on data to inform their decisions. More importantly, they require the people with the skills and knowhow to analyse and interpret these data.
69% of employers say they will prefer candidates with analytical skills over candidates without.

23% of educators state that graduates will have the necessary analytical and data science skills.

Source: Gallup & BHEF, Data Science & Analytics HE Survey
Bachelor of Health Science Key Facts

Bachelor of Health Science
Applied Statistics Major

- Duration: 3 years full-time
- Hawthorn Campus
- 2019 Guaranteed Entry ATAR: 60
- Professional Degree: 80

Bachelor of Health Science
Digital Health and Informatics Major

- Duration: 3 years full-time
- Hawthorn Campus
- 2019 Guaranteed Entry ATAR: 60
- Professional Degree: 80
Applied Statistics

- Understanding and making sense of data
- Effective presentation to different audiences
- Market research, data analytics, health sector, finance
- Combines with all other majors in health
How Technology and Analytics is changing Health

- Continuous Glucose Monitoring
- Wearable devices
Name that disease:

- Blurred vision
- Increased thirst
- Slow healing
- Fatigue
- Frequent hunger
- Weight loss
- Frequent urine
- Itchy skin
Earliest known record of Diabetes

Diabetes: A History
Diabetes: A History

The first descriptions of sugar in the urine and its occurrence in obese individuals
Diabetes: A History

Let’s call it *Diabetes*

Apollonius of Memphis
Diabetes: A History

- **Up to the 11th Century:**
  Diagnosing diabetes was often made by “water tasters”
Diabetes: A History
For thousands of years, no one knows how to live with diabetes, let alone treat or cure it. Children with diabetes often die within days of onset and older people deal with devasting complications.
• Researchers develop the first chemical tests to indicate and measure the presence of sugar in the urine
1897

- The average life expectancy for a 10-year-old child with diabetes is about 1 year.

- Diagnosis at age 30 carries a life expectancy of about 4 years.

- A newly diagnosed 50-year-old might live 8 more years.
Diabetes: A History

Insulin is discovered
Diabetes: A History

Diagnosis at: | 1897 | 1945 |
---|---|---|
10 years of age | 11 | 55 |
30 years of age | 34 | 66 |
50 years of age | 58 |   |
Diabetes: Today

Office for National Statistics:

- Life expectancy is reduced, on average, by:
  - more than 20 years in people with type 1 diabetes
  - up to 10 years in people with type 2 diabetes

Diabetes in the UK 2021: Key statistics on diabetes

Diabetes UK
Diabetes: Today

Office for National Statistics:

- Life expectancy is reduced, on average, by:
  - more than 20 years in people with Type 1 diabetes
  - up to 10 years in people with Type 2 diabetes.

Diabetes in the UK 2010: Key statistics on diabetes

- Diagnosis
- Prevalence
- Deprivation
- Genes
- Ethnicity
- Gestational Diabetes
- Obesity

Complications in pregnancy
- Diabetes in pregnancy can lead to complications for both the mother and the baby.
- The risks include:
  - Increased risk of miscarriage
  - Higher risk of preterm birth
  - Higher risk of stillbirth
  - Increased risk of congenital anomalies in the baby

Life expectancy and mortality
- Diabetes is the 3rd most common cause of death in the world.

- 1175 people die a week
- 255 people die a day
- 11 people die an hour
- 1.8 people die a second

- One in two people admitted to hospital has diabetes. In some age groups, it is as many as one in five. This could be one in three years or can be as many as one in five. This could be one in three years or can be as many as one in five.

- Complications of diabetes make up around one in five of all NHS blood and vessel admissions.

- In 2016, 26.4 million people in the UK were prescribed 5.2 million diabetes prescriptions, accounting for 7% of all prescription costs.
Diabetes: Today
8.5
Diabetes: Today

<table>
<thead>
<tr>
<th>Date</th>
<th>Blood Glucose Test Results</th>
<th>Comments</th>
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<tr>
<td><strong>Date</strong></td>
<td><strong>Breakfast</strong></td>
<td><strong>Lunch</strong></td>
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<tr>
<td>Sunday</td>
<td>Before After</td>
<td>Before After</td>
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<tr>
<td>Time</td>
<td>BG 155 103</td>
<td>112 142</td>
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<td>BG 143 170</td>
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How technology and analytics are changing Diabetes
How technology is changing Diabetes management
Applying the Statistics
## Pay scale

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Source: PayScale Analytics
How technology and analytics are changing Health

- Continuous Glucose Monitoring
- Wearable devices
Name that disease:

- Dizziness
- Light headiness
- Fainting
- Shortness of Breath
Complications of Tachycardia

- Stroke
- Heart Attack / Failure
- Ventricular fibrillation
Continuous Monitoring Devices
Pre-Fit Bit

Holter monitor

- Not automatic
- Wear for two to three days
- Specialist downloads the data afterwards and analyses:
Pre-Fit Bit

ECG

- Expensive (> $5000)
- Intrusive
- Must remain still
- Remove clothes
- Results need to be read and analysed by specialist
Continuous Monitoring Devices
Photoplethysmography
People being fooled by inaccurate fitness trackers

Experts at Aberystwyth University are warning fitness trackers are fooling people in to thinking they've burned more calories than they have.

Criticisms
Further research required

Number of Published Research Studies Using Fitbit Devices

Presented by fitabase
fitabase.com/research-library

*As of 12/11/2017
69% of employers say they will prefer candidates with analytical skills over candidates without.

23% of educators state that graduates will have the necessary analytical and data science skills.

Source: Gallup & BHEF, Data Science & Analytics HE Survey
The future of Health Science

Everyone has health and everyone’s health is important to them....

The future of healthcare will involve:

- Technology
- Personalised healthcare
- Prevention and community based
- Healthcare 4.0...(IoT, big data etc)
THE FUN SIDE OF STATISTICS
Digital Health and Informatics

Dr. Mark Merolli
Academic Director of Digital Health and Informatics
Physiotherapist
School of Health Sciences
Digital Health and Informatics
Health science is multi-faceted
It involves studying health, wellness, and disease at several levels: physiological, individual and population
It’s about understanding various human, disease, social, and cultural factors impacting human health
Considers disease, wellbeing, prevention, cure holistically
Health is personal, personalised, and participatory

It’s a rapidly growing area for jobs....
Who of you has...

- Looked for health information online?
- Downloaded a health app for your phone/tablet?
- Uses the My Health Record?
- Used or uses an activity/health tracker of some kind?
- Arranged health appointments via the Internet?
- Had an online health consultation via video?
- Used social networking to connect with others about health? (i.e. Facebook, YouTube, Twitter, Blogs, etc)
Do these look familiar?
Digital Health

The *convergence of digital technologies with health & healthcare* to enhance efficiency, effectiveness, quality and safety in the health domain

*Informatics = improving use of INFORMATION*
Health & Wellbeing

Technologies

People
Wearables and activity trackers

Internet/Social media

Mobile apps

Electronic Health Records

Advances: virtual reality, artificial intelligence, robots
Funding has reached a tipping point

Healthcare Costs as % of GDP are Rising

Citizen Expectations are Increasing

Re-Thinking of Service Models

Source: Aus Institute of Health and Welfare
Why study Digital Health and Informatics?

• Enormous growth of health technology industry

• Core focus areas:
  – New ways to leverage/interpret health data
  – Providing health services in innovative ways

• Career prospects

• Aligned to priorities of Australian Digital Health Strategy
Safe, seamless and secure: evolving health and care to meet the needs of modern Australia.

Australia’s National Digital Health Strategy
The future skills of health professionals

- A workforce that delivers smarter more affordable care
- Understanding of how best to delivery high quality and high value care
- Professionals with a well rounded vocabulary and skillset
- Adaptive to technological innovation
- Attuned to patient interests and satisfaction
- Ability to use technology to interpret data
“A major in digital health is about developing the skills to support the delivery of healthcare in the 21st century”

- Understanding a future “digital” health system
- Who needs what information, when, where and how can technology better enable this?
- People with clinical and health information system knowledge that know how to deliver projects in healthcare organisations, hospitals, etc
- Skills to help high level health managers and decision-makers make good decisions that benefit the organisation and its stakeholders (intelligent health-decision making)
Digital Health at Swinburne

- Digital health foundations (core)
- Problem solving with ICT
- Health data and information management
- Health informatics
- Statistical computing
- User-centred design
- Health analytics
- Digital health innovation: methods
- Digital health innovation: project
Careers in Digital Health

Anticipated growth of careers at the intersection of technology and health, requiring skills and knowledge in digital health

- Health information managers
- Administrator
- Health data analysts
- Project management
- Med tech sales/support officers
- Consultant
- Clinicians with technological acumen
- Researcher
- Health Promotion
- Policy makers
- Entrepreneur, start-ups
- Health product/service designers
Digital Health and Informatics, and.....

- Clinical Technologies
- Applied Statistics
- Health Promotion
- Biomedicine

Source: Wikimedia Commons
Digital Health and Analytics in Practice...
Questions?