

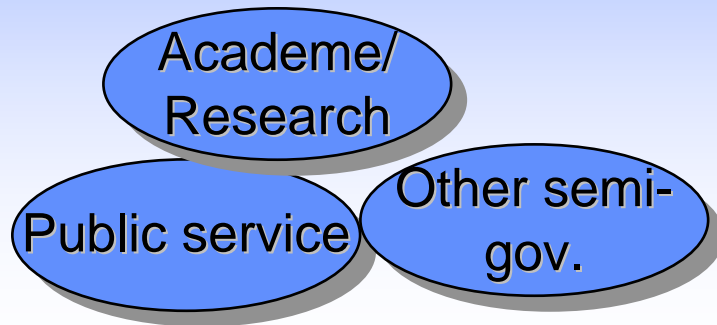
Statistics for life

*What are the statistical ideas or skills
that matter most, and why?*

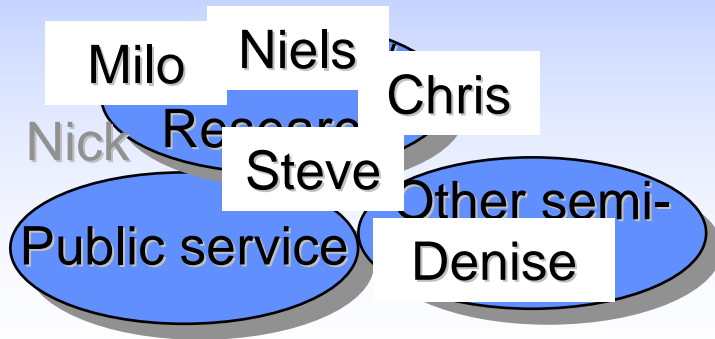
N.I. Fisher

University of Sydney & ValueMetrics Australia

Look around the room ...



Look around the room ...



This is about as
unrepresentative of the real
world as you can get ...

... academics, public
servants, researchers ...

... highly educated, highly
numerate, ...

Look around the room ...

Most people aren't like us ...

Academe/
Research

Public service

Other semi-
gov.

**Ordinary people
in real jobs**

Look around the room

Academe/
Research

Public service

Other se
gov.

Most people aren't like us ... **they are out there in the real world**, working

- for themselves, or
- **in a small family business or company** , or
- **for a larger company** ...

**Ordinary people
in real jobs**

Look around the room

Academe/
Research

Public service

Other se
gov.

Most people aren't like us ... they are out there in the real world, working

- for themselves, or
- **in a small family business or company** , or

Just in Australia, with a population of about **20 million**, there are about **800,000** small or medium enterprises ...

... quite apart from the tiny 1-5 person businesses with small turnover.

e

in real jobs

Look around the room

... and each of these companies has a **Board of Directors**, as do

- larger companies
- not-for-profit enterprises
- charitable trusts

Just in Australia, with a population of about 20 million, there are about **800,000** small or medium **companies** ...

... quite apart from the tiny 1-5 person businesses with small turnover.

in local jobs

e

What's all this leading to?

What's all this leading to?

Academe/

Re

Public se

In a population of 20 million, with

- **800,000 Small or Medium companies**
- **tiny incorporated enterprises**
- **larger companies**
- **not-for-profit enterprises**
- **charitable trusts**

there are a lot of Boards of Directors ...

... ergo, *a lot of people are Directors.*

in real jobs

e

What's all this leading to?

Academe/
Re

Public se

**Is anyone
here a
Director?**

in real jobs

What qualifications do you need to be a Director in Australia?

(apart from being of sound mind, and not recently a bankrupt, or various things to do with being some sort of criminal ...)

What qualifications do you need to be a Director in Australia?

- **You have to be at least 18 years old**

What qualifications do you need to be a Director in Australia?

- **You have to be at least 18 years old**
- **A penchant for eating and drinking at someone else's expense**

What qualifications do you need to be a Director in Australia?

- You have to be at least 18 years old
- A penchant for eating and drinking at someone else's expense
- *no other qualifications needed*

If these are the qualifications, what are a Director's responsibilities?

- ...
- **Monitoring performance**
- **Risk assessment**
- ...

If these are the criteria, what are a Director's responsibilities?

- **Monitoring performance**

Financial

Non-financial – Customers, Employees, ...

- **Risk assessment**

- Business strategy

- Operational

- Client

- Regulatory

- Health & Safety

- Technological

- Market

- Human Resources

- Legal

- Acquisitions/Mergers

- Environmental

- Competitor actions

- ...

If these are the requirements, what are a Director's responsibilities?

A lot of this is to do with ...

Financial

Non-financial ... **Managing Uncertainty** ...

- **Risk assessment**

- Business strategy
- Operational
- Client
- Regulatory
- Health & Safety
- Technological
- Market
- Human Resources
- Legal
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- Environmental
- Competitor actions
- ...

If these are the requirements, what are a Director's responsibilities?

A lot of this is to do with ...

... Managing Uncertainty ...

- **Risk assessment**

How do a Director's 'formal' qualifications

– (sane, not a criminal or bankrupt, **over 18**, ...)

– **Client help here?**

– Regulatory

– Health & Safety

– Technological

– Acquisitions/Mergers

– Environmental

– Competitor actions

– ...

If these are the criteria, what are a Director's responsibilities?

A lot of this is to do with ...

... **Managing Uncertainty** ...

- Risk assessment

How do a Director's 'formal' qualifications

(sane, not a criminal or bankrupt, **over 18**, ...)

help here?

**We'd better teach 'em something useful
before they get to 18.**

After all, they're running the businesses.

**Key
conclusion:**

Who else needs to Manage Uncertainty, in their daily lives?

1. Others in positions of (great) influence, e.g.

- Politicians
- Judges, legal counsel and juries
- Senior public servants
- University administrators
- Anyone in [management](#)

The Dilbert Principle

Incompetent people should always be promoted to management positions as rapidly as possible, because that's where they'll affect the company least.

... Scott Adams

Who else needs to Manage Uncertainty?

1. Others in positions of (great) influence, e.g.

- Politicians
- Judges, legal counsel and juries
- Senior public servants
- University administrators
- Anyone in management

2. All of us, as we cope with the vagaries of day-to-day life.

Who else needs to Manage Uncertainty?

1. Others in positions of (great) influence, e.g.

- **Politicians**

- Judge
- Sen
- Understand and present 'good' statistical graphs
... **wait to hear the story about**
The Politician and the Pie Chart

- University administrators
- Anyone in management

2. All of us, as we cope with the vagaries of day-to-day life.

Who else needs to Manage Uncertainty?

1. Others in positions of (great) influence, e.g.

- Politicians
- **Judges, legal counsel and juries**

- Se
- Un
- An
- Basic concepts of uncertainty – precision & accuracy (and the difference between them)
- Representative sampling
- Correlation *versus* Causation

2. All of day-t

- What is risk?
- ? Bayes theorem?
- Lots of stuff from the President's Invited Speakers

Who else needs to Manage Uncertainty?

1. Others in positions of (great) influence, e.g.

- Politicians
- Judges, legal counsel and juries

- **Senior public servants**

- Univer

- Any

2. All of the day-to-day life.

- Use of statistical graphics *versus* tables
- Quantifying uncertainty and expressing it in simple terms
- Lead *versus* lag indicators

Who else needs to Manage Uncertainty?

1. Others e.g.

- Politicians
- Judges
- Senators

- Use of statistical graphics *versus* tables
- Quantifying uncertainty ... understanding the meaning of variations in expenditure, sales performance, student grades, ...
- Lead *versus* lag indicators
- The difference between an **Output** and an **Outcome**

- **University administrators**
- **Anyone in management**

2. All of us, as we cope with the vagaries of day-to-day life.

Who else needs to Manage Uncertainty?

1. Other e.g.

- Po
- Ju
- S
- U
- A

- Understand basic statistical graphics and how they can be misused
- Appreciating that statistical numbers that we encounter aren't really as precise as they appear
- Being conscious of the possibilities of biases (e.g. deliberate selectivity), 'noise', ...
- Realising that reliable data **can** be obtained by surveying a relatively tiny fraction of population
- Realising that apparent differences between two averages may not be real
- ...

2. All of us, as we cope with the vagaries of day-to-day life.

Who else needs to Manage Uncertainty?

Others in positions of (great) influence, e.g.

Summary so far

Statistics (“The Science of Managing Uncertainty”) is needed

- as a (largely untaught, yet essential) skill by many of the leaders in our community
- as a life skill ... by all of us

All of us, as we cope with the vagaries of day-to-day life.

Purposes

Statistics for life:

What are the statistical ideas or skills that matter most, **and why?**

Purposes

Statistics for life:

What are the statistical ideas or skills that matter most, and why?

So what do people need to understand?

Examples

- 1. Even if you measure the same thing a few times, the measurements tend to wobble around.**
- 2. Even though quantities seem to differ, they might be effectively indistinguishable**

***Essential:* a basic level of knowledge that helps people to be aware of the uncertainties likely to be associated with quantitative data or information being presented to them.**

***Desirable:* some simple ways to check on these things themselves.**

So what do people need to understand?

Examples

3. Graphs can be misleading

4. You can learn a lot from simple graphs

***Essential:* ability to understand basics of a good statistical graph.**

***Desirable:* how to construct some simple graphs – ordinal versus factor, trend chart, scatter plot,**

....

So what do people need to understand?

Examples

5. Just because one variable seems to increase when another one does, it doesn't mean that the first one is 'causing' the second one to increase.

***Essential:* how spurious correlations can arise**

***Desirable:* how one might go about checking for something more.**

So what do people need to understand?

Examples

6. Are these numbers representative of the overall population?

Essential: samples versus populations; strata

Desirable: enough knowledge to ask sensible questions when confronted by such situations

So what do people need to understand?

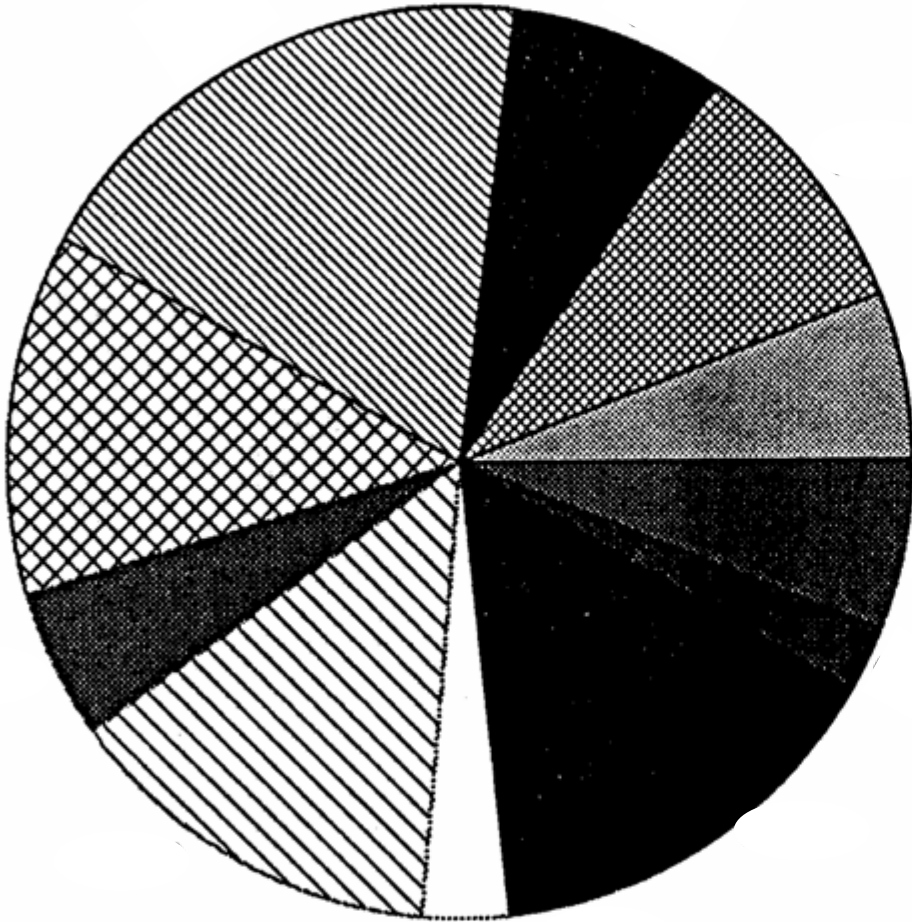
Examples

7. ***(A implies B) doesn't mean (B implies A)***
8. **'Independence'**
9. **'Risk'**
10. **At a rudimentary level, the existence and power of the **Science of Statistics**, and how it can be beneficial in all aspects of life.**

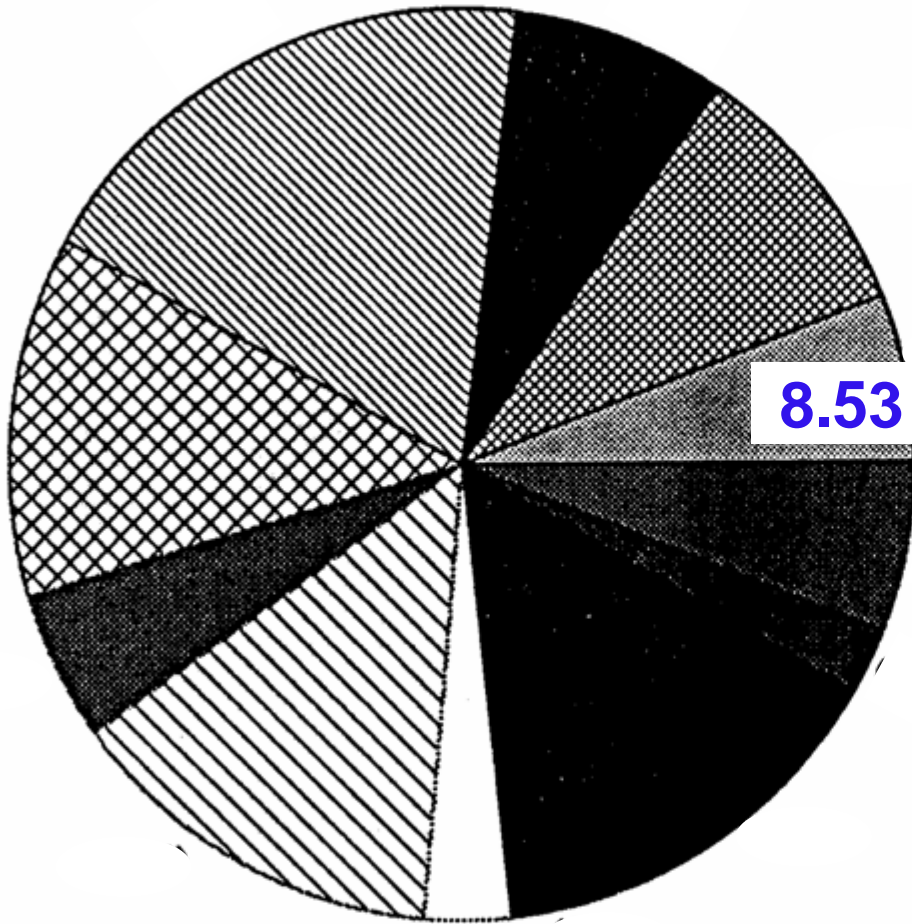
Back to

...the Politician and the Pie Chart ...

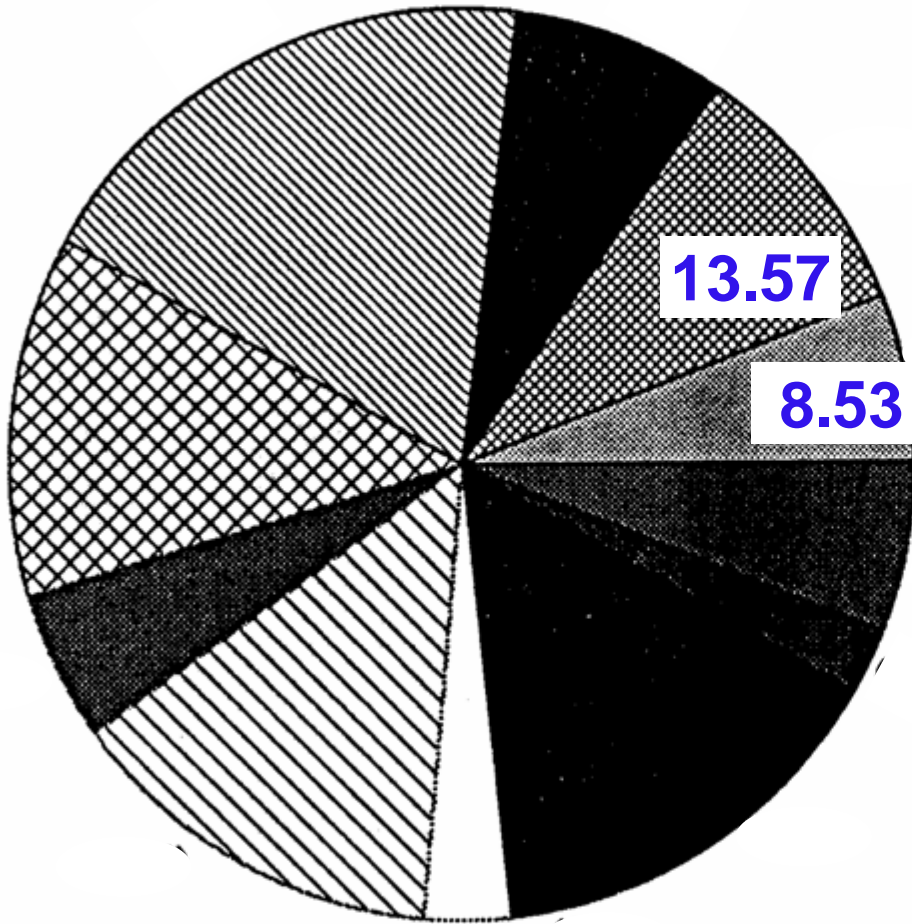
- Once upon a time there was an important politician called Dr Hewson.
- He was Leader of Her Majesty's Loyal Opposition Party in the Parliament of the Commonwealth of Australia.
- One day, Dr Hewson brought a new graph into Parliament and showed it to the Minister. It was a **pie chart**.
- Of course, the Minister wanted a pie chart too. So he asked his Department to make him a pie chart.



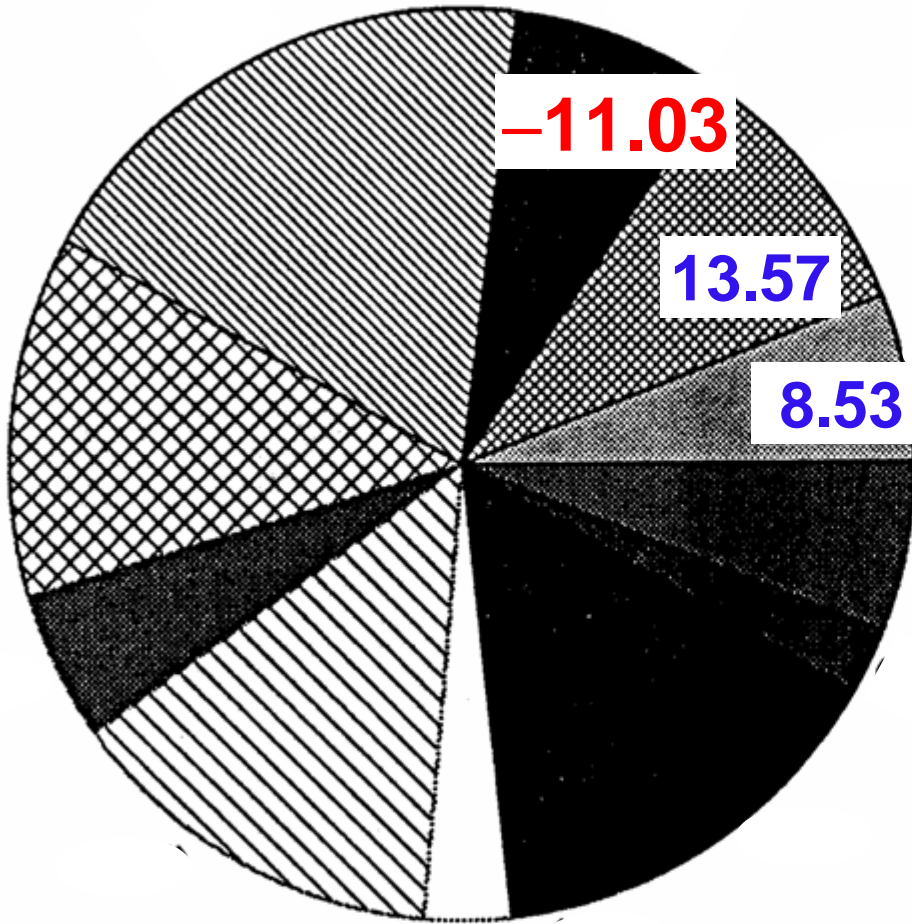
Don Dawkins's Pie Chart



Don Dawkins's Pie Chart

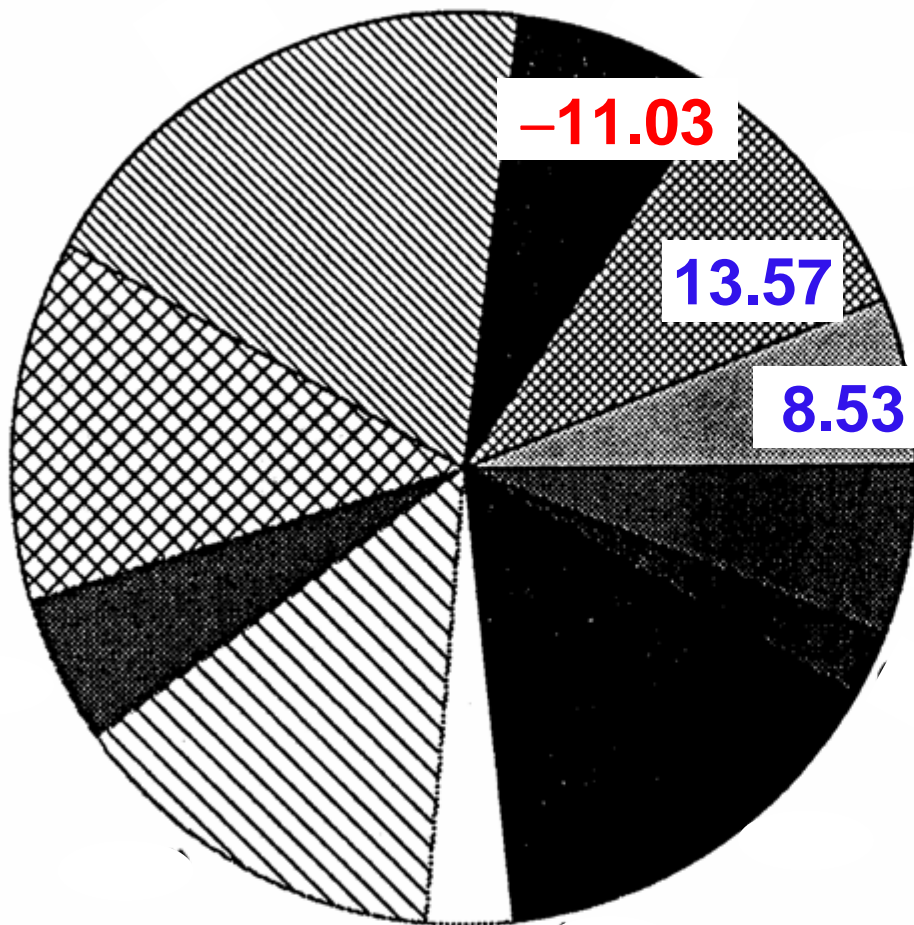














Don Dawkins's Pie Chart




Don Dawkins's Pie Chart

Employment Growth by Industry February 1978 - February 1983



-  Agriculture
-  Community Services
-  Construction
-  Electricity, Gas etc
-  Finance, Property...
-  Manufacturing
-  Mining
-  Pub Admin & Defence
-  Recreation etc
-  Transport & Storage
-  Wholesale & Retail
-  Communication

 Negative Growth

Employment Growth by Industry February 1978 - February 1983

