Introduction to Pharmac and Pharmacoeconomics
PHARMAC’s role and mission

“…to secure for eligible people in need of pharmaceuticals, the **best health outcomes** that are reasonably achievable from **pharmaceutical treatment** and **from within the amount of funding provided**.”

- New Zealand Public Health and Disability Act 2000
Our operating environment

PHARMACEUTICAL INDUSTRY GETS HIGH ON FAT PROFITS

KALYDECO – TOO HIGH A PRICE TO PAY?

THE RACE TO CURE RISING DRUG COSTS

THE DRUG THAT IS BANKRUPTING AMERICA
Health budget
$16 billion each year

Hospital medical devices: $650 million

Hospital medicines: $200 million

Community medicines budget: $870 million
Spoiler alert

Statutory Objective:
Does the proposal or decision help PHARMAC to secure for eligible people in need of pharmaceuticals the best health outcomes that are reasonably achievable from pharmaceutical treatment and from within the amount of funding provided?
# Ranking of Proposals

<table>
<thead>
<tr>
<th>Priority</th>
<th>Proposal</th>
<th>Indication</th>
<th>PTAC priority</th>
<th>CUA rank</th>
<th>QALYs per $1m, likely (possible)</th>
<th>Proposal expenditure (first year)</th>
<th>Cumulative expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fantasticol</td>
<td>Lupus</td>
<td>High</td>
<td>1</td>
<td>40-80 (20-100)</td>
<td>$80,000</td>
<td>$0.1m</td>
</tr>
<tr>
<td>2</td>
<td>Colomab</td>
<td>Colorectal cancer</td>
<td>Medium</td>
<td>2</td>
<td>25-50 (15-50)</td>
<td>$5,000,000</td>
<td>$5.1m</td>
</tr>
<tr>
<td>3</td>
<td>Rheumatol</td>
<td>Rheumatic fever</td>
<td>High</td>
<td>6</td>
<td>5-10 (3-10)</td>
<td>$1,000,000</td>
<td>$6.1m</td>
</tr>
<tr>
<td>4</td>
<td>Findaliptin</td>
<td>Diabetes</td>
<td>High</td>
<td>5</td>
<td>5-12 (2-20)</td>
<td>$530,000</td>
<td>$6.6m</td>
</tr>
<tr>
<td>5</td>
<td>Vinedronate</td>
<td>Arthritis</td>
<td>High</td>
<td>4</td>
<td>7-10 (6-12)</td>
<td>$1,200,000</td>
<td>$7.8m</td>
</tr>
<tr>
<td>6</td>
<td>Metogrel</td>
<td>ACS</td>
<td>Low</td>
<td>3</td>
<td>7-13 (4-16)</td>
<td>$620,000</td>
<td>$8.4m</td>
</tr>
<tr>
<td>7</td>
<td>Tagaliptin</td>
<td>Diabetes</td>
<td>High</td>
<td>7</td>
<td>4-8 (0-10)</td>
<td>$500,000</td>
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</tbody>
</table>
Pharmacoeconomics within PHARMAC’s Decision making process
• “To secure for eligible people in need of pharmaceuticals, the best health outcomes that can reasonably be achieved, and from within the amount of funding provided.”
  
  • New Zealand Public Health and Disability Act 2000

• “To secure for eligible people in need of pharmaceuticals, the best health outcomes that can reasonably be achieved, and from within the amount of funding provided.”

  • Econ 101
The decision making process
Getting clinical advice into our decision-making
Types of economic analysis

- Cost Benefit Analysis - CBA
- Cost Effectiveness Analysis - CEA
- Cost Consequence analysis - CCA
- Cost Minimization Analysis - CMA
- Cost Utility Analysis - CUA
- Budget Impact assessment - BIA
Inputs into a CUA

\[
\begin{align*}
\text{Cost of the proposal} & \quad \text{less} \quad \text{Cost of the status quo} = \text{Net Cost} \\
\text{Health gains of the proposal} & \quad \text{less} \quad \text{Health gains of the status quo} = \text{Net Health gains}
\end{align*}
\]

\[\text{Cost per QALY}\]
Four key bits for both intervention and comparator

- Health states
- Transition probabilities
- Health Gains
- Costs
A simple model
A complex model
Moving between states: Transition probabilities

Progression free survival and overall survival in metastatic cancer

- OS (Proposal) 1%
- OS (Status Quo) 3%
- PFS (Proposal) 4%
- PFS (Status Quo) 8%
Status Quo

92%

Proposal

96%

5%
Increasing QALYs through improving QOL/survival

- **Health-related quality of life (score 0 to 1.0)**
  - *intervention*
  - *comparator*

- **Improved health-related quality of life**
- **Increased life expectancy**
Health Related Quality of Life (HR-QoL) - EQ5D

- **Mobility**
  1. No problems walking around
  2. Some problems walking around
  3. Confined to bed
- **Self-Care**
  1. No problems with self care (washing and dressing)
  2. Some problems with washing and dressing
  3. Unable to wash or dress
- **Usual activities**
  1. No problems with performing usual activities
  2. Some problems with performing usual activities
  3. Unable to perform usual activities
- **Pain/Discomfort**
  1. No pain or discomfort
  2. Moderate pain or discomfort
  3. Extreme pain or discomfort
- **Anxiety/Depression**
  1. Not anxious or depressed
  2. Moderately anxious or depressed
  3. Extremely anxious or depressed
Valuing health states

Would you rather?

- Lose an arm?
- Or
- Lose a leg?
Pharmaceutical costs

• Price of pharmaceutical
  • Include any rebate
  • Include future generic prices
  • Include price movements

• Dose of pharmaceutical
  • Dose should be based on dose used in clinical practice providing there is evidence of efficacy at the proposed dose
  • Include any dose adjustments

• Associated pharmaceutical costs
  • Include dispensing fees and pharmacy mark-up
  • Include administration cost
Health Sector Costs

Hospital costs estimated using Diagnostic Related Group (DRG) prices

Outpatient costs
- Outpatient clinic appointments
- Laboratory and diagnostic tests
- Nursing services
- Hospital-based outpatient programs
Patient Costs

• Include direct patient healthcare costs that are at least partially subsidised by government
  • General Practitioner visits
  • Pharmaceutical co-payments
  • Home or continuing care
• Indirect patient costs not included
Inputs into a CUA

Cost of the proposal \( \text{less} \) Cost of the status quo = Net Cost

Health gains of the proposal \( \text{less} \) Health gains of the status quo = Net Health gains

\[ \frac{\text{Cost per QALY}}{} \]

Now we have this
### CUA rank

<table>
<thead>
<tr>
<th>Drug</th>
<th>CUA Rank</th>
<th>QALYs per Million invested</th>
<th>Budget impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug A</td>
<td>1</td>
<td>20</td>
<td>$2m</td>
</tr>
<tr>
<td>Drug B</td>
<td>2</td>
<td>10</td>
<td>$4m</td>
</tr>
<tr>
<td>Drug C</td>
<td>3</td>
<td>8</td>
<td>$7m</td>
</tr>
<tr>
<td>Drug D</td>
<td>4</td>
<td>4</td>
<td>$15m</td>
</tr>
<tr>
<td>Drug E</td>
<td>5</td>
<td>2</td>
<td>$65m</td>
</tr>
</tbody>
</table>

$50,000 per QALY = 20 QALYs per million
Are we at best yet?
Factors for consideration

Statutory Objective:
Does the proposal or decision help PHARMAC to secure for eligible people in need of pharmaceuticals the best health outcomes that are reasonably achievable from pharmaceutical treatment and from within the amount of funding provided?
QALY versus DALY

<table>
<thead>
<tr>
<th>Disability weighting</th>
<th>Utility</th>
<th>Health state</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.0</td>
<td>Perfect</td>
</tr>
<tr>
<td>0.33</td>
<td>0.67</td>
<td>Deafness</td>
</tr>
<tr>
<td>1.0</td>
<td>0.0</td>
<td>Death</td>
</tr>
</tbody>
</table>

Life years

DALYs

QALYs
Health Need Proportional loss

![Graph showing Health Need Proportional loss against Age with QoL on the y-axis and Age on the x-axis. The graph indicates a decreasing trend in QoL with age.]
### Ranking of proposals

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Are we at best yet?
The practical and strategic still matter. You still use judgement.

IF A NIGHTMARE HAPPENS WHEN YOU ARE ASLEEP

DOES A LOGISTICAL NIGHTMARE MEAN YOU ARE LIVING THE DREAM?
Monitor Outcomes
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Australia</strong></td>
<td>90</td>
<td>100</td>
<td>94</td>
<td>82</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>99</td>
<td>96</td>
<td>81</td>
<td>52</td>
<td>84</td>
<td>95</td>
<td>74</td>
<td>70</td>
<td>86</td>
<td>78</td>
<td>93</td>
<td>98</td>
<td>90</td>
<td>93</td>
<td>89</td>
<td>84</td>
<td>83</td>
<td>83</td>
</tr>
<tr>
<td><strong>New Zealand</strong></td>
<td>86</td>
<td>96</td>
<td>90</td>
<td>87</td>
<td>99</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>99</td>
<td>89</td>
<td>79</td>
<td>60</td>
<td>82</td>
<td>87</td>
<td>73</td>
<td>66</td>
<td>62</td>
<td>70</td>
<td>84</td>
<td>93</td>
<td>86</td>
<td>96</td>
<td>89</td>
<td>81</td>
<td>80</td>
<td>83</td>
</tr>
</tbody>
</table>
NZ Pharmaceutical spending, 1978-2013
Overall spending on health is in line with the OECD averages.
Expenditure Internationally
Source - University of Auckland

- OECD Average
- Australia: ~$1.3 Billion USD P.A.
- New Zealand
## Generics share

<table>
<thead>
<tr>
<th>Source</th>
<th>Share of Prescriptions</th>
<th>Value of sales</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand (2013)</td>
<td>77%</td>
<td>34%</td>
<td>OECD Health at a glance</td>
</tr>
</tbody>
</table>
Case Study – Fluconazole 200 mg (per pack)

- 1993: $628
- 2005: $41.50
- 2009: $1.9 million
PHARMAC’s management model

New Medicines

Savings

Competition e.g. Generics

re-investment in the sector
Those in greatest needs get most of the funds
Online Pharmaceutical Schedule - March 2019

Hepatitis C Treatment 🎧 ▲

Ledipasvir with sofosbuvir 🛠️ NDF FDA HML

[Xpharm]
- No patient co-payment payable
- Special Authority 📂 SA1605

Tab 90 mg with sofosbuvir 400 mg

✓ Harvoni 2504111

$24363.46 per 28
Cost of cancer medicines, compared to overall spending

IN THE YEAR TO JUNE 2017

849.6 MILLION SPENT ON ALL MEDICINES

17% / $203.8 MILLION SPEND ON CANCER MEDICINES

MORE THAN A 1/4 OF THE SPENDING WAS ON TWO MEDICINES

TRASTUZUMAB (HERCEPTIN)

PEMBROLIZUMAB (KEYTRUDA)
We make comparisons

35
ONLY IN AUSTRALIA

89
MEDICINES FUNDED IN BOTH AUSTRALIA & NZ

13
ONLY IN NZ
Overall survival gains relative to NZ funded comparator
PHARMAC’s role and mission

“…to secure for eligible people in need of pharmaceuticals, the best health outcomes that are reasonably achievable from pharmaceutical treatment and from within the amount of funding provided.”

• New Zealand Public Health and Disability Act 2000
Are we at best yet?
Getting a sense of scale

- Identify sources of death and disability
- Determine what is amenable to change
343 additional deaths

Age Standardised Cancer Deaths per 100k people

Australia: 121
New Zealand: 128

Source: https://vizhub.healthdata.org/gbd-compare/
Unequal Impact: Māori and non-Māori cancer statistics, Te Rōpū Rangahau Hauora A Eru Pōmare

Table 24: Cancer indicators, by gender, Māori and non-Māori, 2010–12 [1]

| Indicator                                                      | Māori            | Non-Māori        |
|                                                               | Males | Females | Total | Males | Females | Total |
| Total cancer registrations, 25+ years, rate per 100,000, 2010–12 | 455.5 (438.1–473.5) | 552.5 (534.4–571.1) | 506.3 (493.6–519.1) | 419.2 (414.6–423.9) | 394.7 (390.1–399.3) | 405.8 (402.6–409.1) |
| Total cancer mortality, 25+ years, rate per 100,000, 2010–12    | 218.4 (206.5–230.7) | 214.5 (203.6–225.9) | 215.6 | 133.0 (130.6–135.3) | 110.0 (108.0–112.1) | 120.3 (118.6–121.9) |

Relative risk  = 1.79
New Zealand has 128 Cancer deaths per 100k Maori Relative risk of death is 1.79

<table>
<thead>
<tr>
<th></th>
<th>% of Population</th>
<th>Death rate per 100k</th>
<th>Share of total deaths</th>
<th>Total deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maori</td>
<td>15%</td>
<td>204</td>
<td>31</td>
<td>31+ 97 = 128</td>
</tr>
<tr>
<td>Non-Maori</td>
<td>85%</td>
<td>114</td>
<td>97</td>
<td></td>
</tr>
</tbody>
</table>

Difference in death rate is 90

Source: Own calculations. Age Standardised.
Why scale is important

Difference between Maori and non-Maori on cancer deaths

Difference between Aus and NZ on Cancer deaths
"Approximately 90% of cancers that are cured are cured by surgery and radiation" - Richard Sullivan, Professor of Cancer and Global Health, Kings college London
<table>
<thead>
<tr>
<th>Disease</th>
<th>Women</th>
<th>Men</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic heart disease</td>
<td>16%</td>
<td>20%</td>
<td>37%</td>
</tr>
<tr>
<td>Alzheimer's disease and other dementias</td>
<td>12%</td>
<td>6%</td>
<td>18%</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>6%</td>
<td>6%</td>
<td>11%</td>
</tr>
<tr>
<td>Tracheal, bronchus, and lung cancer</td>
<td>5%</td>
<td>6%</td>
<td>11%</td>
</tr>
<tr>
<td>Colon and rectum cancer</td>
<td>5%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Ischemic stroke</td>
<td>5%</td>
<td>3%</td>
<td>8%</td>
</tr>
<tr>
<td>Intracerebral hemorrhage</td>
<td>3%</td>
<td>2%</td>
<td>6%</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>5%</td>
<td>0%</td>
<td>5%</td>
</tr>
<tr>
<td>Lower respiratory infections</td>
<td>2%</td>
<td>2%</td>
<td>4%</td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>0%</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Atrial fibrillation and flutter</td>
<td>2%</td>
<td>1%</td>
<td>4%</td>
</tr>
<tr>
<td>Falls</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Pancreatic cancer</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Diabetes mellitus type 2</td>
<td>1%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Self-harm</td>
<td>1%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Chronic kidney disease due to diabetes mellitus type 2</td>
<td>1%</td>
<td>1%</td>
<td>3%</td>
</tr>
</tbody>
</table>
Figure 1: Numerical differences in script counts for Māori compared with non-Māori, adjusted for age and historical disease burden, disaggregated by access (i.e. index patient) and persistence 2012/13

Shortfalls (-) or excess (+) in Rx uptake by Māori, adjusted for age and relative disease burden (DALY loss)
### Table 22a: Cardiovascular disease indicators, by gender, Māori [1]

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cardiovascular disease mortality, 35+ years, rate per 100,000, 2010–12</td>
<td>346.9 (328.6–365.9)</td>
<td>232.3 (219.2–246.1)</td>
<td>286.8 (275.7–298.3)</td>
</tr>
</tbody>
</table>

### Table 22b: Cardiovascular disease indicators, by gender, non-Māori [1]

<table>
<thead>
<tr>
<th>Indicator</th>
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<th>Total</th>
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<tr>
<td>Total cardiovascular disease mortality, 35+ years, rate per 100,000, 2010–12</td>
<td>168.2 (165.3–171.0)</td>
<td>99.2 (97.6–100.8)</td>
<td>132.4 (130.9–133.9)</td>
</tr>
</tbody>
</table>

Relative risk = 2.16

New Zealand also has 128 Cardiovascular deaths per 100k Maori. Relative risk of death is 2.16

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Difference in death rate is 126
Age Standardised death rate per 100k per annum

- Difference between Maori and non-Maori
  - Cancer
  - Cardiovascular
- Difference between Aus and NZ
  - Cancer
  - Cardiovascular
What is amenable to change?

Mortality trends for all vascular disease:
age 35-69 years, New Zealand (Aotearoa)

Male deaths from this cause at age 35-69 years in 2009:
- 1274 (30% of deaths at this age)
- 173 out of every 100 000 males at this age, a rate which was:
  - 36% less than in 2000 (rate: 271)
  - 77% less than in 1975 (rate: 755)
  - 76% less than in 1955 (rate: 711)

Female deaths from this cause at ages 35-69 years in 2009:
- 513 (17% of deaths at this age)
- 70 out of every 100 000 females at this age, a rate which was:
  - 41% less than in 2000 (rate: 119)
  - 79% less than in 1975 (rate: 335)
  - 84% less than in 1955 (rate: 441)
New Strategy Launched 3 July 2017

- **Bold Goal One**: Inequities
- **Bold Goal Two**: Savings
- **Bold Goal Three**: Systems

...by 2025...
Questions?