Which drugs, medical procedures and equipment should be funded?[1]

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All health systems must grapple with how best to allocate their limited budgets across the many thousands of health 'technologies' – drugs, medical procedures, equipment, etc. – that are available. This resource-allocation problem is intensifying thanks to advances in medicine, more old people and pressure on government finances in general. And so decisions about which drugs, procedures, equipment, etc. to fund and make available (and which ones not to!) are necessary.

YOU CAN'T ALWAYS GET WHAT YOU WANT

Deciding which technologies to fund – formally known as 'health technology prioritisation' – almost always involves confronting tradeoffs between multiple, conflicting objectives. For example, is it better to fund a drug that will deliver a small health improvement to many people or a medical procedure that will save just a few people's lives? In the last few years prioritisation frameworks based on Multi-Criteria Decision Analysis (MCDA) have become increasingly popular.

In general terms, MCDA is concerned with decision-making situations in which alternatives are ranked based on considering a variety of objectives or criteria simultaneously. For example, if you were looking for a car to buy, you might evaluate the ones you're considering according to criteria such as fuel economy, reliability, age, coolness, safety, etc. and compare their overall 'performance' and ranking on these (multiple) criteria relative to the cars' prices.

Using MCDA to prioritise health technologies is conceptually similar. Not surprisingly, though, the fundamental questions in this case are: What are the appropriate criteria for prioritising health technologies? And, what are the weights for the criteria, reflecting their relative importance to decision-makers and citizens in general?

In this article, we report on our research into developing and pilot-testing a methodology for involving New Zealanders in answering the two questions above. Given that everyone consumes health care and that most people pay taxes to fund the health system, it is appropriate – and a strength of our methodology – that so-called 'every-day' people are asked about their preferred criteria and weights for prioritising technologies.

Understanding people's preferences is important to New Zealand's Pharmaceutical Management Agency (PHARMAC), for example. PHARMAC recently undertook a public consultation exercise, with the aim of, in the words of Chief Executive Steffan Crausaz, ensuring that "the criteria we use to help us make those decisions … mean our funding decisions continue to reflect the things New Zealanders … value." (PHARMAC, 2013, p. 2).

FOCUS ON WHAT MATTERS

To find out what people care about when thinking about health technologies that should be funded, we recruited six focus groups comprising health care consumers, providers and academics: Group (1) 5 general practice staff, (2) 5 nurses, (3) 4 staff from a non-medical health care organisation, (4) 6 public health professionals and academics, (5) 13 staff from a health care provider for Māori, and (6) 7 retirees.

Before attending their group meeting, each person was asked to complete an online 'ranking survey', implemented using 1000Minds software (1000minds.com), that involved ranking short descriptions (or 'vignettes') of the 14 health technologies ((1) Dialysis for end-stage renal disease, (2) Methadone for opioid addiction, (3) Hand sanitiser use in primary schools, (4) Hip replacements, (5) Statins for patients at high risk of cardiovascular disease, (6) Abatacept

1 This article is based on Trudy's research for her PhD degree (supervised by her co-author here and Paul Thorsnes and Rob Lawson). A discussion paper is also available; see Sullivan & Hansen (2014).
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for last-line treatment of rheumatoid arthritis, (7) Antiretroviral drug for HIV, (8) Vaccine for preventing cervical cancer (Gardasil), (9) Growth hormone treatment for Prader-Willi Syndrome, (10) Imatinib mesylate for chronic myeloid leukaemia, (11) IVF treatment, (12) Positron Emission Tomography (PET Scan), (13) Oral drugs for erectile dysfunction (e.g. Viagra, Cialis), and (14) Service for postnatal depression) with respect to their value to society and hence their relative desirability for being available in the health system. Table 1 presents a subset of these vignettes.[4] Participants were instructed: "When ranking this treatment, do not consider its cost – just consider its benefits/value to society."

Table 1. Sample vignettes for health technologies used in the ranking survey

1. Dialysis for end-stage renal disease

- End-stage renal disease is when the kidneys no longer function well enough to keep a person alive and renal replacement therapy (RRT) is required.
- RRT includes kidney transplantation, haemodialysis and peritoneal dialysis.
- Dialysis removes waste and extra fluids from the blood using a special filter (haemodialysis) or a catheter in the abdomen (peritoneal dialysis).
- Dialysis is time-consuming and is done in hospital or at home.
- The major causes of renal failure are diabetes, kidney disease, high blood pressure and genetics.
- The average age of a dialysis patient is 56 yrs, with many patients over 65. Almost 50% of patients are Māori.
- The number of people receiving dialysis could double in the next 5 yrs.
- Approx. 50% of people starting dialysis are still alive after 5 yrs.
- No. of people to start dialysis: 440, for the rest of their lives.

2. Methadone for opioid addiction

- Methadone is used to treat people who have an opioid addiction (e.g. heroin or morphine), by helping them to reduce their use of opioids.
- Methadone reduces the death rate from overdoses and the spread of infectious diseases (hepatitis B, C or HIV from injecting drugs) and improves the health of addicts.
- Opioid addiction is also associated with high cannabis and tobacco use, low health status and low rates of employment.
- Methadone treatment reduces the substantial social and economic costs resulting from drug abuse.
- Alternatives to methadone such as abstinence-based treatments are largely ineffective.
- Relapsing is common with methadone treatment. 98% of addicts stop injecting drugs after an average of 5 years' stabilisation.
- No. of people to receive methadone: 4000 (until they stop their opioid use).

3. Hand sanitiser use in primary schools

- Hand washing helps reduce infectious disease transmission. An alcohol-based no-rinse hand sanitiser is an alternative to using soap, water and drying facilities.
- It helps to reduce the spread of respiratory and gastrointestinal infections by killing various types of bacteria and inactivating different kinds of viruses.
- On average, approx. 11% of children are absent from school each week due to illness.
- In addition to children being ill, spread of the illness harms other pupils, staff and caregivers. Also parents/caregivers may require time off work due to illness or caring for a sick child.
- Alcohol-based hand sanitisers in schools could reduce the rate of absenteeism due to illness by 20%-50%.
- No. of children to use hand sanitisers: 400,000 (for one 4-month period during winter).

4. Hip replacements

- A hip replacement is a surgical procedure in which the damaged hip joint is replaced by a prosthetic implant.
- Hip damage is caused by osteoarthritis, rheumatoid arthritis and hip fractures.
- The most common cause of deterioration of the hip joint is osteoarthritis. As the cartilage lining becomes damaged and wears away, the bones within the joint rub together causing pain and making it difficult to get around.
- It can affect men and women, and is more common over the age of 50.
- A hip replacement relieves pain and restores function to the joint. Patients become mobile again and can lead a normal lifestyle.
- A hip replacement typically lasts 15-20 yrs.
- No. of people to receive a hip replacement: 7000.

5. Statins for patients at high risk of cardiovascular disease

- Cardiovascular disease (heart, stroke and blood vessel disease) is the leading cause of death and hospitalisation in NZ.
- Risk factors are smoking, physical inactivity, an unhealthy diet, high cholesterol, high blood pressure and diabetes.
- Death rates are higher for men than women and are much higher for Māori and Pacific Island people.
- Statins are drugs that reduce the production of cholesterol by the liver, helping to prevent blood vessels becoming blocked with fatty deposits.
- Approx. 20% of people over the age of 35 could benefit from using statins, depending on the threshold for absolute risk.
- Statins reduce the risk of a heart attack or coronary death by about a third.
- No. of people to receive statins: 220,000, for the rest of their lives (potentially preventing 66,000 heart attacks or coronary deaths).

6. Abatacept for last-line treatment of rheumatoid arthritis

- Rheumatoid arthritis (RA) is a chronic and progressive disabling disease that causes pain and joint inflammation and can cause joint damage.
- Onset of RA mainly occurs between 40-70 yrs, affecting 3 times as many women as men.
- Abatacept helps stop the immune system attacking healthy tissues in the body.
- Abatacept is not a cure for RA but when combined with other drugs can significantly improve the quality of life of a person by reducing pain, joint inflammation and damage to bones and cartilage.
- Abatacept is used when treatment with other drugs has been unsuccessful.
- A serious side effect is that it can reduce a person's ability to fight infection.
- No. of people to receive abatacept: 30, for the rest of their lives.

4 To see the full paper which includes all the vignettes, go to otago.ac.nz/Healthsystems/ otago066743.pdf.

FIRST TO LAST

In each of the six focus group meetings, the 14 vignettes were also ranked via discussion and majority consensus. Each group's ranking of the 14 vignettes, as well as mean and median ranks across all groups, are reported in Table 2. As can be seen, 'Statins for patients at high risk of cardiovascular disease' is the highest or second-highest priority for all groups. At the other extreme, 'oral drugs for erectile dysfunction' is ranked last or second-last by five groups and third-last by the remaining group.

HOW IMPORTANT ARE THE CRITERIA?

Based on the focus group discussions, the criteria and the levels within each criterion for ranking technologies presented in Table 2 were specified for use in a discrete choice experiment (DCE) to determine the weights[5] on the criteria, reflecting their relative importance.

The DCE was also implemented using 1000Minds software, which applies the PAPRIKA method (Hansen & Ombler, 2008), in which participants rank pairs of hypothetical patients, defined on the criteria two-at-a-time, with respect to their relative priority for treatment.[6] An example of a pairwise-ranking question appears in Figure 1.[7]

Table 2. Rankings of the 14 health technology vignettes by the six focus groups

	Focus group						Mean rank[a]	Median rank[b]
Health technology vignette	(1)	(2)	(3)	(4)	(5)	(6)		
Statins for patients at high risk of cardiovascular disease	1st	1st	1st	1st	2nd	2nd	1.3	1
Service for postnatal depression	6th	3rd	7th	2nd	1st	4th	3.8	3.5
Hip replacements	2nd	11th	2nd	4th	4th	3rd	4.3	3.5
Methadone for opioid addiction	4th	5th	6th	7th	5th	10th	6.2	5.5
Vaccine for preventing cervical cancer	3rd	13th	5th	5th	3rd	11th	6.7	5
IVF treatment	8th	4th	8th	6th	9th	8th	7.2	8
Positron emission tomography (PET Scan)	11th	12th	4th	10th	6th	1st	7.3	8
Dialysis for end-stage renal disease	7th	7th	10th	8th	7th	7th	7.7	7
Abatacept for last-line treatment of rheumatoid arthritis	9th	6th	12th	12th	8th	5th	8.7	8.5
Antiretroviral drugs for HIV	5th	10th	9th	9th	10th	9th	8.7	9
Imatinib mesylate for chronic myeloid leukaemia	10th	2nd	11th	13th	11th	6th	8.8	10.5
Hand sanitiser use in primary schools	12th	9th	3rd	3rd	12th	14th	8.8	10.5
Growth hormone for Prader-Willi Syndrome	13th	8th	13th	14th	13th	13th	12.3	13
Oral drugs for erectile dysfunction	14th	14th	14th	11th	14th	12th	13.2	14

a Mean ranks are calculated by summing the group ranks for each vignette and dividing by six, the number of groups.
b Median ranks are calculated in the usual way from the group ranks for each vignette.

5 Sometimes referred to as 'part-worth utilities'.
6 Another DCE applying this method featured in an article that appeared in Issue 31 of ***EcoNZ@Otago***; see Kergozou, Hansen & Knowles (2013).
7 Technical details are available from Hansen & Ombler (2008); and for a gentle introduction to the PAPRIKA method, see the Wikipedia article: http://en.wikipedia.org/wiki/PAPRIKA.

Figure 1. Example of a pairwise-ranking question (a screenshot from 1000Minds software)

The DCE was completed by 322 adults randomly selected from the New Zealand electoral roll (a 10% response rate). Their mean weights are reported in Table 3, where the criteria are listed in decreasing order of relative importance. Thus, in summary, the first two criteria (*Patient's health before treatment and Benefit to patient (i.e. length and/or quality of life))* are relatively important, accounting for half of the overall weight between them (i.e. 0.28 + 0.22 = 0.50). Each of the remaining four criteria, which are approximately equally important, are relatively unimportant; though, together they account for half of the overall weight too (0.14 + 0.13 + 0.12 + 0.11 = 0.50).

YOU JUST MIGHT FIND YOU GET WHAT WE CAN AFFORD

Finally, it is worthwhile remembering that the ultimate objective of determining criteria and weights is to be able to use them for prioritising health technologies. In a similar fashion to Golan & Hansen (2012), we demonstrate how the criteria and weights can be applied in an imaginary prioritisation exercise that involves the 14 technologies in Table 1 being rated on the six criteria in Table 3 and then scored using the mean weights (also in the table).

The first author performed this rating task based on her understanding of the technologies and, ultimately, her judgment. Bear in mind that this exercise is intended for illustrative purposes only; were it to be done 'for real' a more exacting process based on experts' judgments and 'hard' evidence would be appropriate. In addition to the criteria, other variables of interest for prioritising technologies include: number of patients affected, cost per patient, total cost and quality of clinical evidence.

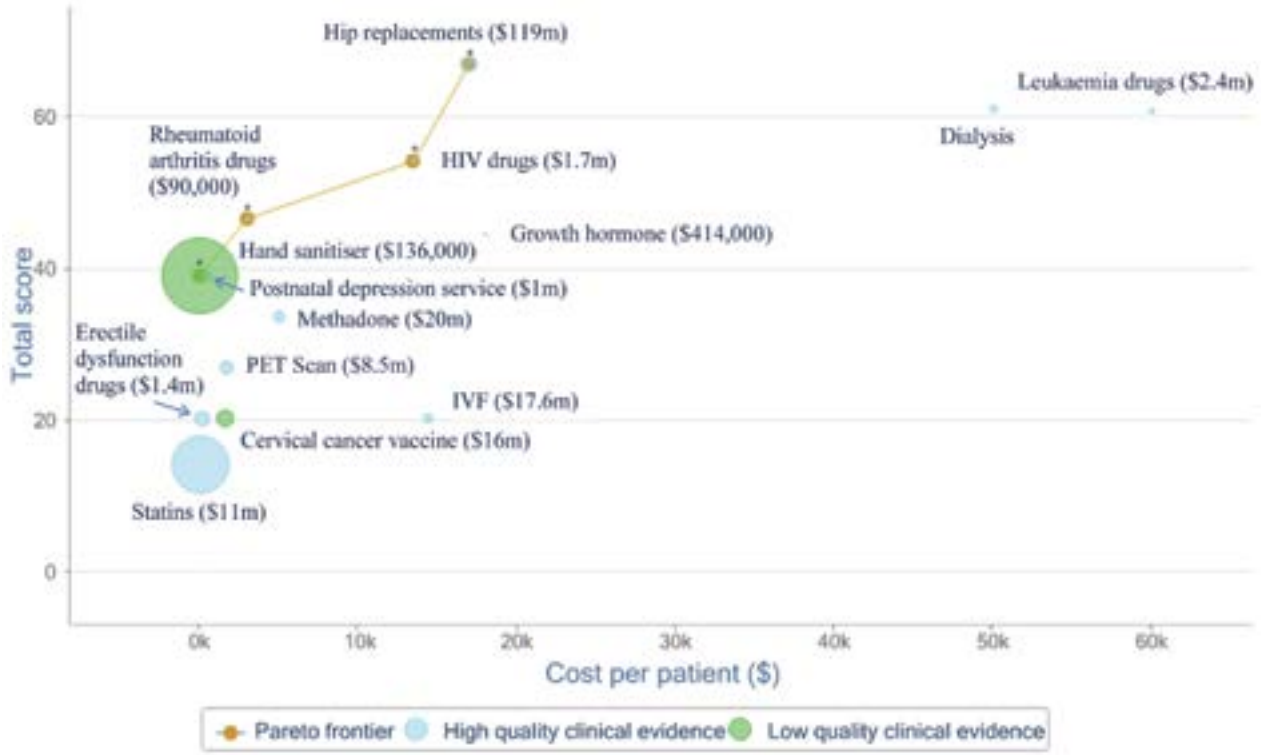
Everything is represented graphically in Figure 2. The chart's vertical axis displays each technology's total score (out of 100), reflecting its aggregate performance on the six criteria (at the individual patient level). The horizontal axis displays each technology's cost per patient. The size of the bubble representing each technology is in proportion to the total number of patients affected, and the total cost for the patient group is reported in parentheses. The colour of the bubbles indicates the quality of the clinical evidence: blue indicates 'high' quality and 'green' indicates 'low'.

Table 3. Criteria included in the DCE and their mean weights (n=322)

Criteria	Mean weights
Patient's health before treatment	
Relatively good (though treatment is still beneficial)	0
Fair (neither good nor bad)	0.07
Poor (but not immediately life threatening)	0.14
Will die soon without treatment	**0.28**[a]
Benefit to patient (i.e. length and/or quality of life)	
Small	0
Medium	0.12
Large	**0.22**
Age of patient	
65+ years	0
15-64 years	0.07
0-14 years	**0.14**
Illness or injury caused mainly by lifestyle choices	
Yes	0
No	**0.13**
Benefit to others (e.g. family or society)	
Small	0
Large	**0.12**
Treatment options for this patient	
This is the best treatment (there are less effective alternatives)	0
This is the **only** treatment available	**0.11**

a Values in bold represent the relative weights of the criteria overall (i.e. bolded values sum to one).

Figure 2. Main prioritisation variables of interest for the 14 illustrative technologies



WHICH TECHNOLOGIES SHOULD BE FUNDED?

Decision-makers should focus their attention first on the technologies in the top-left quadrant of the chart (with high benefits and low cost per patient), while also being mindful of the total number of patients for each technology, the total cost and the quality of clinical evidence. These technologies represent relatively good value for money per patient. In contrast, the technologies in the bottom-right quadrant (low benefits and high cost per patient) represent relatively poor value for money per patient.

The 'Pareto (efficiency) frontier' is the line in the chart connecting hand sanitiser, rheumatoid arthritis drugs, HIV drugs and hip replacements. All else being equal, there are no other technologies that have both a lower cost per patient and a higher total score (benefit) than these 'dominant' technologies. Also relevant is the number of patients, total cost (affordability) and quality of clinical evidence; for example, the effectiveness of hand sanitiser at reducing the spread of germs (compared to using soap and water) is controversial, and therefore decision-makers might be reluctant to invest in this technology, even at a low cost.

By comparing alternative combinations of technologies based on value for money and these other considerations, by a process of 'trial and error', decision-makers can arrive at an 'optimal' portfolio of technologies.

QUESTIONS TO CONSIDER

1. Ignoring cost, how would you rank the vignettes in Table 1 "with respect to their value to society and hence their relative desirability for being available in the health system"?
2. How would *you* answer the question posed in Figure 1?
3. Based on *your* own personal preferences, which of the six criteria included in the study (see Table 3) is the most important? Which is the least important?

FURTHER READING

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