Institute of Actuaries of Australia

The Future, according to ~~(the Oracle)~~ actuaries…

Prepared by

Futurism Committee of the Institute of Actuaries of Australia

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1 Executive Summary

The Futurism Committee conducted a survey of actuaries, where we asked:

"What will the world be like in 20 years?"

in the areas of:
- The Economy
- The Environment
- Health and Mortality
- Demographics / Society

We used the Delphi Technique, whereby we sent the same survey twice, so we were able to assess not just current actuarial opinions, but also how subject those opinions are to change.

In summary, actuaries foresee that in 2025,
- the biggest threat to mankind will be environmental degradation, the same as it is now
- energy use per capita will have increased by 10% to 35% in Australia
- greenhouse gas emissions in Australia will be much the same but global temperatures will have risen
- Australia's population will have expanded 25%, mostly through immigration, while the world's population will have increased by 30%
- Australians will be having fewer babies, and living longer, leading to a significantly older population, and a huge increase in health spending
- with little change in hours worked per week, the 20% to 40% rise in GDP per capita will be due to productivity gains
- the gap between rich and poor will widen in Australia, and the inequity of wealth globally will be the second biggest risk to mankind
- more Australians will live in the cities and there will be a lot more domestic air travel
- there will be more actuaries per capita but research and development will still account for about 1.5% of the economy
- the level of law enforcement will increase resulting in a much higher prison population, and more stringent corporate governance
- and Australia will have become a republic.

In general actuaries were happy to be influenced by expert opinions about the world in 2025, particularly if those opinions aligned with the actuarial consensus.

2 Introduction to the Delphi Technique

The Delphi Technique has been used to assist in forecasting and decision making in a wide range of fields.

It was initially developed by Olaf Helmer, Theodore Gordon and Norman Dalkey for the RAND Corporation in 1953 for a project for the US Air force. The purpose of the project was the application of expert opinion on deciding what (from a Soviet perspective) would be the optimal industrial target in the United States, and the number of atomic bombs they would need to reduce weapons output by a prescribed amount. The Delphi Technique was developed to get a reliable consensus of opinion from a group of experts, using a series of questionnaires combined with opinion feedback.

Since the seventies the Delphi technique has enjoyed a wide application, most notably in Japan.

It has been used by American actuaries and is included in the Society of Actuaries' Futurism course.

2.1 Rationale for and Characteristics of the Delphi Technique

The Delphi technique was designed to capture the positive aspects of interacting groups, namely;
- Amalgamation of knowledge from a variety of sources,
- Creative synthesis from the interaction of different experts,
- Enunciation of the rationale from different points of view,
- The opportunity to change views without loss of face

while trying to avoid some negative aspects, such as:
- Social and or political conflicts of different members of a group
- Domination of the outcome by people with certain personality types
- Acquiescing to the perceived orthodox view or the status of a perceived dominant expert

The technique offers the added advantage of being able to achieve direct input from people who can be geographically dispersed.

The distinguishing feature of the Delphi Technique is that all participants are kept anonymous; this has several advantages compared to conventional forums or committees. Another feature of the Delphi is that the survey is typically repeated upwards of three or four times. This can allow participants to change their views based on responses from the previous round. The anonymous nature of this

study means that views can be changed without loss of face. Controlled feedback is provided by the moderator between iterations to aid experts to reevaluate their position. Areas of agreement and disagreement are highlighted, with a view to providing feedback on the reasons, so that the extent of disagreement can be minimized.

Typically, at the end of the study some form of statistical aggregation of the group response from the final iteration is collated for the purpose of decision making.

It is often found that after the third round the prognoses hardly change.

2.2 Where it works well

The Delphi works best in the following situations:
- Where the problem does not lend itself to precise analytical techniques, but where human judgment and input from experts can be valuable.
- More individuals are needed than can efficiently and cost-effectively interact face-to-face.
- Where it is important to have anonymity between experts, in order to reduce bias.
- Where the choice of experts is sufficiently heterogeneous to avoid a consensus forming too early without considering all important criteria in a situation.

The Delphi is not meant to be used in circumstances where models and prior statistics can be used to predict a particular outcome or suggest a course of action (as is perhaps typical for traditional actuarial work).

A paper by *Rowe and Wright* amalgamated results from various studies that set out to evaluate the effectiveness of different aspects of the Delphi technique. It concluded the following about the successful use of Delphi:
- Most of the Delphi studies examined were able to reduce the variances in responses between experts (comparing the final round to the first round). This is of course one of the desires of using the technique – to see if people will respond to the merits of different points of view and reach some form of consensus to enable decision making.
- The technique is effective at making better predictions (if used for that purpose) than a simple average of opinions of the first round respondents. This suggests that the technique is useful at amalgamating expert views for decision making.

- When compared against other structured group procedures, such as the Nominal Group Technique[1], the Delphi could not be proved to be statistically better.
- Studies that were most successful at having "successful" predictions were those that included providing "reasoned" feedback, rather than just simple statistical measures, such as average or median etc.
- Better predictions were generally made if there were subject experts amongst the panelists. "Experts" tended to hold on to their initial views, whereas non-experts tended to sway towards the median response in subsequent rounds.

2.3 Possible uses of the Delphi

The form and structure of the survey can vary depending on the topic and the purpose, for example quantitative or qualitative responses maybe sought.

A quick survey of the internet has revealed some of the following uses for the Delphi technique:

- Predictions of long-range trends in a particular field e.g. science and technology
- Identify issues related to the problem
- Build models and set parameters
- Develop action plans to attain a particular future scenario
- Make decisions while implementing a plan
- Evaluate results of implementation

It can be applied to most issues faced by actuaries in both traditional and emerging fields. The Society of Actuaries (SoA) has already used this technique in a study to evaluate the future changes in mortality rates. Other possible uses include:
- Assessing terrorism risks, including likely loss scenarios
- Coming up with health policy scenarios
- Developing long term scenarios for different retirement savings initiatives.
- Assessing and understanding operational risks in insurance companies

The SoA considers futurism studies to be an area of high importance to actuarial work and the Delphi technique is perhaps one of the most widely used techniques in this field. Similarly the profession in Australia can benefit from being at least aware of this technique and its applications.

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[1] Similar to Delphi, but with face-to-face meetings, and with discussion between rounds.

3 Implementation Issues

3.1 Planning

The use of a pilot study was useful as it allowed us to test the technology, vet the survey questions, and win over the Biennial Convention Organising Committee as to the relevance / worthiness of the paper.

However it took a part-time committee at least a month to turn around results and improve the format after each round of the pilot study so there was a delay to the staging of the actual study.

We aimed to conduct the surveys close enough to the Convention that people would be interested in responding, and yet long enough before to allow time to write the paper based on the results, which was a difficult logistical process.

3.2 Technology

From the outset, a web-based survey was the most obvious choice. It was cost effective and could be easily distributed to the IAAust's member database. Further the IAAust had been using online surveys, for example the Pulse survey.

As is often the case, speed and ease of use were the key software issues. The background information for round 2 included many graphs which could have taken a long time to download. Our solution was to set up html links to PDF files for each question so that respondents could choose which information to browse through.

We also tried to allow respondents to answer in free form rather than forcing them to tick a box.

The set up of the survey on the web was dependent on a single resource from the IAAust (we are grateful for the assistance provided by Julian Bucknell). There was a risk that if the technology resource was not available, then the survey may have been adversely impacted. While this scenario did not eventuate, this is a key risk to manage when conducting surveys.

3.3 Data Quality of Responses

One issue faced was a number of disinterested responses ("donkey votes"). While in some cases these were identified and removed, not all will have been

detected. With the large number of responses available for analysis, this should not have a material impact on the results.

The use of profanity by some respondents in the free form answer options caused problems as email servers blocked attempts to send the results to futurism committee members. Profanities had to be removed before the results could be transmitted for analysis.

3.4 Privacy

An interesting problem of the study was how to track the respondents over the two rounds.   While this is not a requirement for a Delphi study, we were interested in how the respondents behaved when presented with the first round results as well as an expert opinion.   We could have used the IAAust's login name to record the identity of each respondent but we thought this might violate some respondents' privacy, and discourage honest answers. Consequently we included a set of questions asking for respondents' characteristics. All of these identifier questions caused problems. Round 2 of the study was sent out 4 weeks after Round 1, and yet in that time we found that some respondents:

- chose not to enter their characteristics,
- changed country or state,
- changed level of actuarial qualification,
- changed their mother's maiden name (or at least the spelling of it),
- changed age (one aged by two years in a month, someone else's age dropped by a year),
- even changed gender!

4 Results

4.1 Demographic Questions

Questions 1+2 – Population
World population was one of only 6 questions where the popular vote changed, with the consensus of 2025 population increasing from the 7 billions to the expert's choice of the 8 billions. Our expert, Richard Cumpston, correctly pointed out that world population annual growth rate had slowed from "about 1.9% the 25 years to 1975 … to about 1.7% pa in the next 25 years". However he didn't point out that the recent trend has been for annual growth of 1.4% per annum and falling. The UN projections showed China's population plateauing by 2025 with the fastest continental growth rate projected for Africa (which also seems to be most at risk from war, famine, epidemics). The population of people aged under

20 is projected by the UN's medium fertility variant to peak in 2025, whilst the growth rate of those over 60 will be nearly 3% per annum.

The first round responses to Australia's population in 2025 showed the greatest dispersion of any question, with 39% choosing a population in the 24 millions, but over 20% in each of the 22 millions and 23 millions and a long tail of responses coming in from 25 up to 40 million. A key driver of Australia's population will be the net migration rate for the next 20 years, which is a highly political question. Perhaps fittingly in a democracy, it was this question which showed the greatest movement in responses towards the popular vote from round 1 to round 2. The consensus remained at 24 to 25 million, but attracted 62% of responses in the second round compared with 39% in the first.

Question 3 – Urbanisation
The Delphi study produced great convergence of opinion on Australia's urbanisation rate in 2025. By the end of Round 2, 83% of respondents believed that 90 to 95% of Australians would be living in urban areas by 2025, higher than any populous Western country except Belgium. "Urbanization" needs defining as pointed out by our expert, Richard Cumpston, as well as by some respondents.

Question 4 – Age Dependency Ratio
This is an example of a question where the round 2 results were impacted by the expert opinion far more so than by the opinion of other actuaries. In the first round 54% of actuaries believed that the age dependency ratio would increase to somewhere between 0.25 and 0.3, however in the second round the percentage in this range was 29%. The mode in the second round was 0.30 – 0.35 with 62% of responses.

One possible reason is our expert (Leonie Tickle)'s suggestion that during the next 20 years the bulk of the baby boomer population will move into the over 65 age bands. This may not have received a high enough weighting by round 1 respondents, and subsequently they had reviewed their estimates.

The age dependency ratio has important implication on the economic state of a nation. A study by the Council on the Ageing (2001) cites the following as some of the impacts on the economy from an ageing population.
- Reduction in national savings and investments.
- Reduction in taxation.
- Slowing in population growth.

Question 5 – Fertility Rate
This is again a question where Leonie Tickle's expert opinion has influenced the second round responses. After the first round the mode was a fertility rate in the range 1.4 – 1.6 (with 44% of responses), this is below 1.6 – 1.8 which straddles the current fertility rate 1.77. In the second 1.4 – 1.6 received 39% of responses, however the range 1.6- 1.8 was the new mode in round 2 with 51% of responses.

In the first round most respondents were expecting a slight drop in fertility. This is not unreasonable; there are already developed countries such as Japan, Italy, Germany and Sweden where the fertility rate is in this low range. There are currently several factors that could conceivably work to reduce fertility such as cost of raising children, increasing work pressure, move away from traditional family structures.

The expert opinion is that fertility continues at current levels. Leonie pointed out the influence of government policy in influencing the fertility rate. For example the recently introduced baby bonus may increase the birth rate in Australia.

4.2 Economic Questions

Question 6 – Real GDP per Capita
The common answer for this question for both rounds was a real GDP per capita of 12,001 to 14,000 per quarter. This reflects a projected growth of 1.0% pa to 1.7% pa from the quoted December 2004 real GDP per capita figure of 9,907. There was convergence to this range, from 44% in round 1 to 66%,.

The growth in real GDP will depend on both the availability of labour and productivity levels as suggested by Chris Caton.

Question 7 – Average Hours Worked
Respondents have predicted no change in the number of hours worked by full time workers. There is a clear majority around the current level of 40 to 45 hours, with 69% of responses in the first round and a near-unanimous 86% in the second.

The trend has been for working hours to increase over the past 20 years, however there is a slight decline in the last couple of years. It appears that there are several factors which suggest that working hours will not continue to rise significantly.

There is now a shift from the standard weekly hours to more flexible working arrangements. One significant driver of this experience could be the increase in the percentage of full time workers working more than 50 hours per week from 20% to 30% of all full time workers. There is a growing awareness of the impact of long hours on family life and of work leisure balance. In addition in other OECD countries, the Australian trend of increasing hours worked has not been observed (Australian Bureau of Statistics, 2003).

Question 8 – Income Distribution
In round one, the response was bi-modal, 46% of respondents chose 4.0 – 5.0 as the ratio of the income share of the 80th percentile to the 20th percentile in

Australia, however a similar proportion (44%) selected 5.0 – 6.5. In the second round there was some shift to the round 1 mode and the expert's pick, however a significant proportion (40%) still stayed with the higher band. In general it indicates that actuaries believe that the rich – poor gap will increase quite significantly.

Question 9 – Prison Population
Actuaries believe that the prison population will continue to increase. This could potentially have been influenced by the rate of growth in past periods (over 260% since 1982), and the prison population in other countries. General perceptions of society in general could also play a part. For example it is interesting to note that a sizeable number of respondents in Question 19 and 20, mentioned a loss of values and society breakdown as risks to mankind among general answers. Chris Caton's suggestions that the ageing of the population could lead to reduction in the prison population has some intuitive appeal, since over 65 people generally do not appear to carry out serious crimes.

Chris Caton confessed to not being a true incarceration expert and accordingly his opinion held less sway on second round responses than did actuarial consensus. In round 1 the modal response was 111 – 140 prisoners per 100,000 population in 2025, with 40% of responses, which increased to 50% in the second round.

4.3 Health and Mortality Questions

Question 10+11 – Life Expectancy
Overall, people are quite bullish about mortality improvements continuing for the next 20 years. Respondents were quite evenly divided in round one between choosing a life expectancy band for males of 80-82 and 83-85. Once the expert (Leonie Tickle) announced her views however, many people swayed towards her choice of 80-82, even if her explanation suggested that she was quite bullish on the likely improvements in mortality and that, perhaps, even 83-85 was not unreasonable as many had initially picked. A similar result happened for life expectancy forecasts for females, with many people changing their answers to match the expert's choice of 85-87.

The other information provided in round 2 showed historical improvements in mortality, which suggested that in recent times mortality had been increasing at very fast rates since the 1980s. Many people still switched to the lower estimate provided by the expert. This suggests that despite most actuaries being brought up on life tables, we are still not confident about future trends and would rather rely on the views of experts.

Question 12 – Health Expenditure

Respondents expect the costs of health care to increase to levels similar to where the USA currently is (around 14% of GDP) from our current 9%. Our expert (Brent Walker) argues that there will be some restrictions on the growth through efficiencies – but most people were more pessimistic than Brent in the first round, and did not then change their opinion in the second.

Question 13 – Genetic Testing
Many people were convinced that genetic testing is not likely to be used for either life or health insurance in 2025. If community rating does continue in health insurance, there is quite clearly no room for risk segmentation for most variables, let alone some of the more controversial ones. For life insurance, Brent Walker suggests that genes act in multi-factorial fashion, and as such it would be very complicated and time consuming for life insurance rates to start allowing for their effects.

4.4 Environmental Questions

Question 14 – Energy Use
In the first round respondents predicted a low rate of growth in energy use per capita of around 10% over the next 20 years. Electricity use and supply have become areas of concern in recent months with predictions of unreliable supply unless action is taken to build more power stations. Perhaps the respondents were being optimistic that demand pressures would be reduced.

However, the expert opinion and the additional data pointed to the strong link between GDP growth and energy use. The major drivers of growth in energy use are in the commercial, transport and industry sectors, the major influences on GDP growth. This information led to a strong movement of predictions up to a higher range of 300-350 GJ per capita, although less than 5% moved as high as the expert, Barney Foran, who projected more than 350 GJ.

Question 15 – Global Temperatures
In this question there was a movement towards the mode (15.5 – 15.75 degrees Centigrade global average surface temperature in 2025), mostly from the group who made a low prediction in the first round (15.0 – 15.25 C). The expert predicted a temperature above the ranges provided but fewer than 10% of Round 2 respondents agreed with the expert.

With the benefit of hindsight, clearer responses could have been made if more information had been provided on the current level of global temperatures. The graph was difficult to interpret.

Question 16 – Greenhouse gas emissions
The response to this question was similar to question 14. There was a strong movement towards the mode (500-550 Mt CO_2) but few respondents were willing

to move as far as the expert (>550 Mt CO_2). The band choices in the question should have been closer together.

The Australian government is confident that we will meet the Kyoto target of no more than 108% times 1990 emissions on average over the 2008-2012 period. Emissions in 1990 were 502 Mt CO_2 so the target is 542 Mt CO_2. We are already at the level of 550 million tonnes (2002 greenhouse gas inventory). With no concerted action being taken it is hard to see that the government's predictions will be correct.

Question 17 – Waste Disposal to Landfill
In this question there was a wide disparity between the mode of answers in the first round (800-1,000 kg per capita) and the expert opinion (more than 1,400 kg per capita). These answers compared with current waste disposal levels of around 1,000 kg per capita. It appears that respondents were influenced by the expert with a significant movement towards higher ranges. However few were willing to move as far as the expert.

Perhaps the first round results, which predicted a reduction in waste disposal, reflected a perception that recycling and waste reduction campaigns are being successful. The additional data from the NSW State of the Environment report described the target of a 60% reduction below 1990 levels. This target was originally intended to be met by 2000 but only an 18% reduction has been achieved. The target has now been extended to 2010.

The waste disposal industry is developing new technologies to convert waste to compost and energy. New policies, such as extended producer responsibility, are being developed to increase recycling and reduce packaging waste. Our expert may prove to be unduly pessimistic.

4.5 Miscellaneous Questions

Question 18 – Australian Government
There was little change between the two rounds with the majority believing that Australia will be a Republic in 20 years time. However respondents are evenly split between a popularly elected president and one elected by parliament.

Question 19+20 – Threats to Mankind
The questions 19 and 20 were asking about the biggest threat to mankind today and in twenty years time, respectively. In both rounds respondents picked environmental degradation, inequity in global wealth and disease as the risks facing mankind. There were hardly any differences in the responses between each round, indicating that the participants did not foresee a change in the risks faced by mankind now and in 20 years time. More interesting was the wide range of "Other" answers given, ranging from social issues and political

statements to outwardly "politically incorrect" responses. This seems to be a question to which many people like to take a firm stand.

The rough spread of answers between the rounds stayed constant, yet the item of Environmental Degradation received most scores in both rounds – and even more scores in the second. The expert, Adam Spencer, chose rogue states, however this did not seem to have drawn respondents.

Question 21 – Corporate Governance
Regarding corporate governance, there is a strong belief that there will be a move to more prescriptive corporate governance. This view is perhaps not surprising given the increasing regulatory requirements, especially following the recent spate of corporate collapses.

Question 22 – Expenditure on Research
There was a clear tendency to stick with B – that is 1.5%-1.75% of GDP in both rounds. This was not influenced by Adam Spencer's comment which could have shifted some responses to A, but rather, more people tended to move away from the mode, with responses spread more in round 2. Still, people do not expect any changes research spending as a percentage of GDP in the future. We found that the question was lacking, in the sense that it did not specify whether research spending is defined to be public spending or to include research in the private sector.

Question 23 – Aircraft Passengers Embarking in Australia
This question was not clearly worded as it did not indicate whether to consider domestic or international travel or both. With this question we hoped to get an idea of how aircraft travel will compare to projected scenarios of urbanisation and environment. The answers remained stable over both rounds.

Question 24 – Number of Actuaries
Most people stayed with their initial response of 2,000-3,000 FIAAs by 2025. At the time we distributed survey, we did not have an expert opinion at hand. Andrew Gale, President of the IAAust later indicated that a number of 3,500 actuaries would be realistic – based on the increased number of actuarial students,. It is surprising that hardly anyone followed Andrew's reasoning and it is unfortunate that we could not include his answer in the survey.

5 Key Findings

It is dangerous to draw too many conclusions from a study like this, but it is still possible to get a feel for how the actuarial profession interprets crucial issues and is influenced in its opinion   We focus on two lines of investigation: how the opinions were influenced in any way by peers or experts, and how a most likely scenario might be characterised.

5.1 The Influence of Peers and Experts

Second round respondents changed their view on 42% of the questions in total. There was a tendency for opinions to converge, with the modal response accounting for 50% of the votes on average in Round 1, but 64% on average in Round 2. The consensus view changed on only 6 of the 24 questions and in each case it moved more in line with the expert's opinion. There were, however, 4 questions where the popular vote failed to change despite a dissenting expert.

We attempted to compare the magnetic pull of the expert with the pull of the popular vote. In the 4 graphs which follow, we display a dot for each of the 126 respondents who answered both rounds of the survey. If a respondent changed their second round vote in such a way as to end up one multiple-choice category closer to the expert then we gave them a score of +1 relative to the expert for that question. The average of their score relative to the expert is measured along the Y-axis. Similarly, we score each respondent for each question as to how far they moved in the second round relative to the first round mode, and measured this along the X-axis. We then categorised respondents into one of 5 groups according to their second round responses:

Stubborn respondents averaged a net movement of less than 0.2 of a category per question.
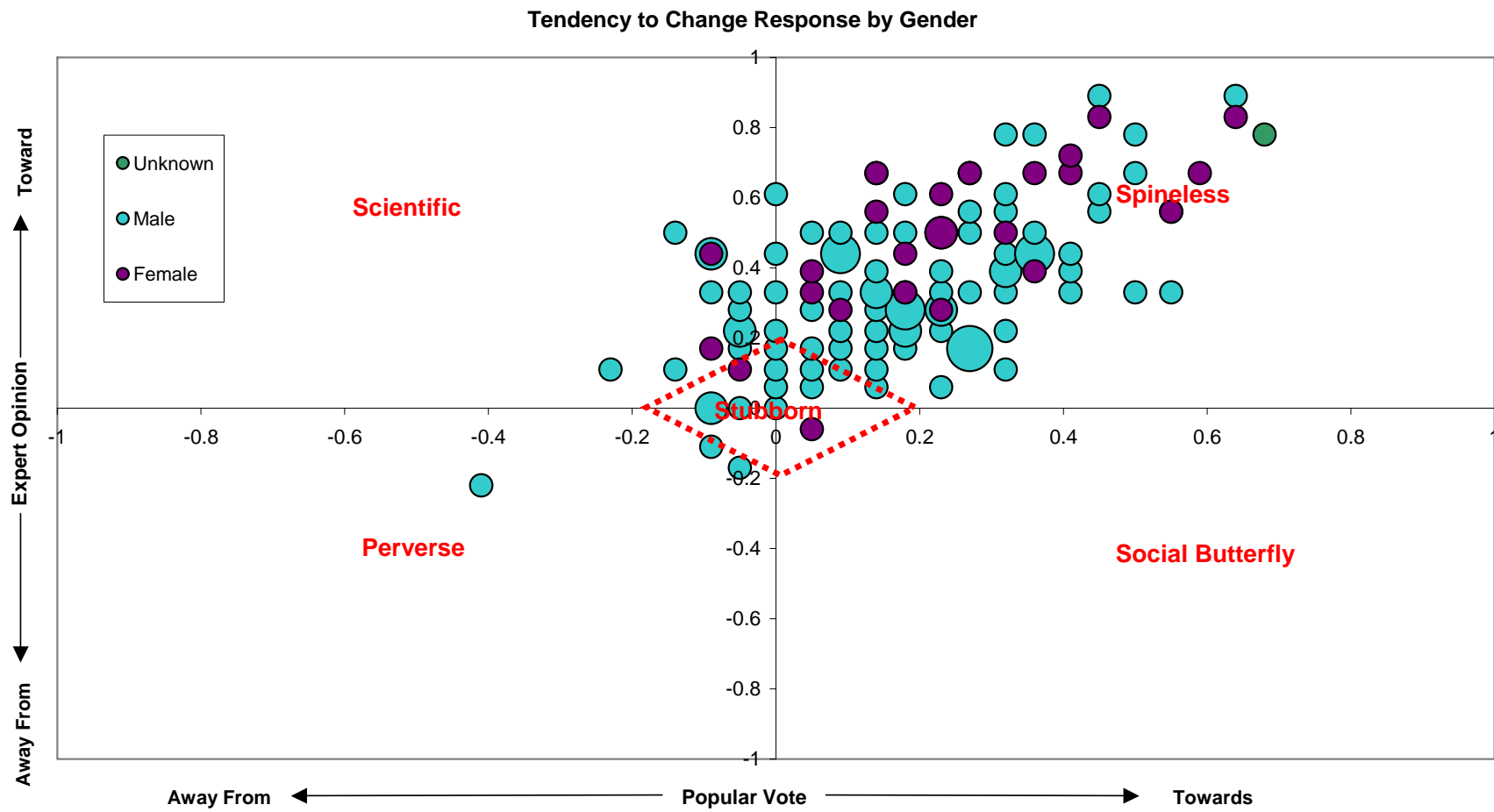
Spineless respondents moved significantly (more than 0.2 of a category in total) towards both the expert response and the first round mode.
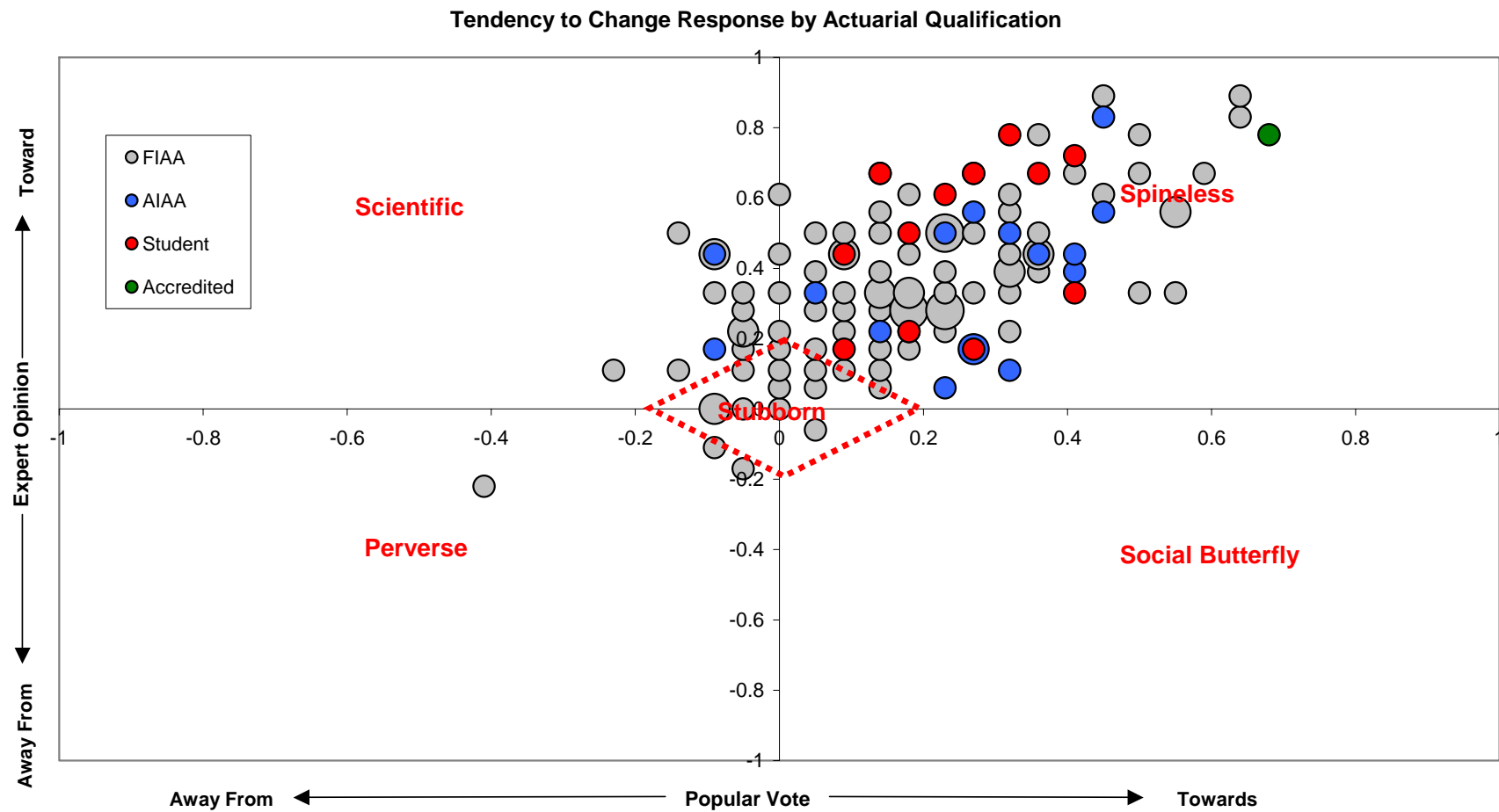
Scientific respondents changed their responses in the same direction as the experts whilst resisting all temptation to move towards the popular vote on average.
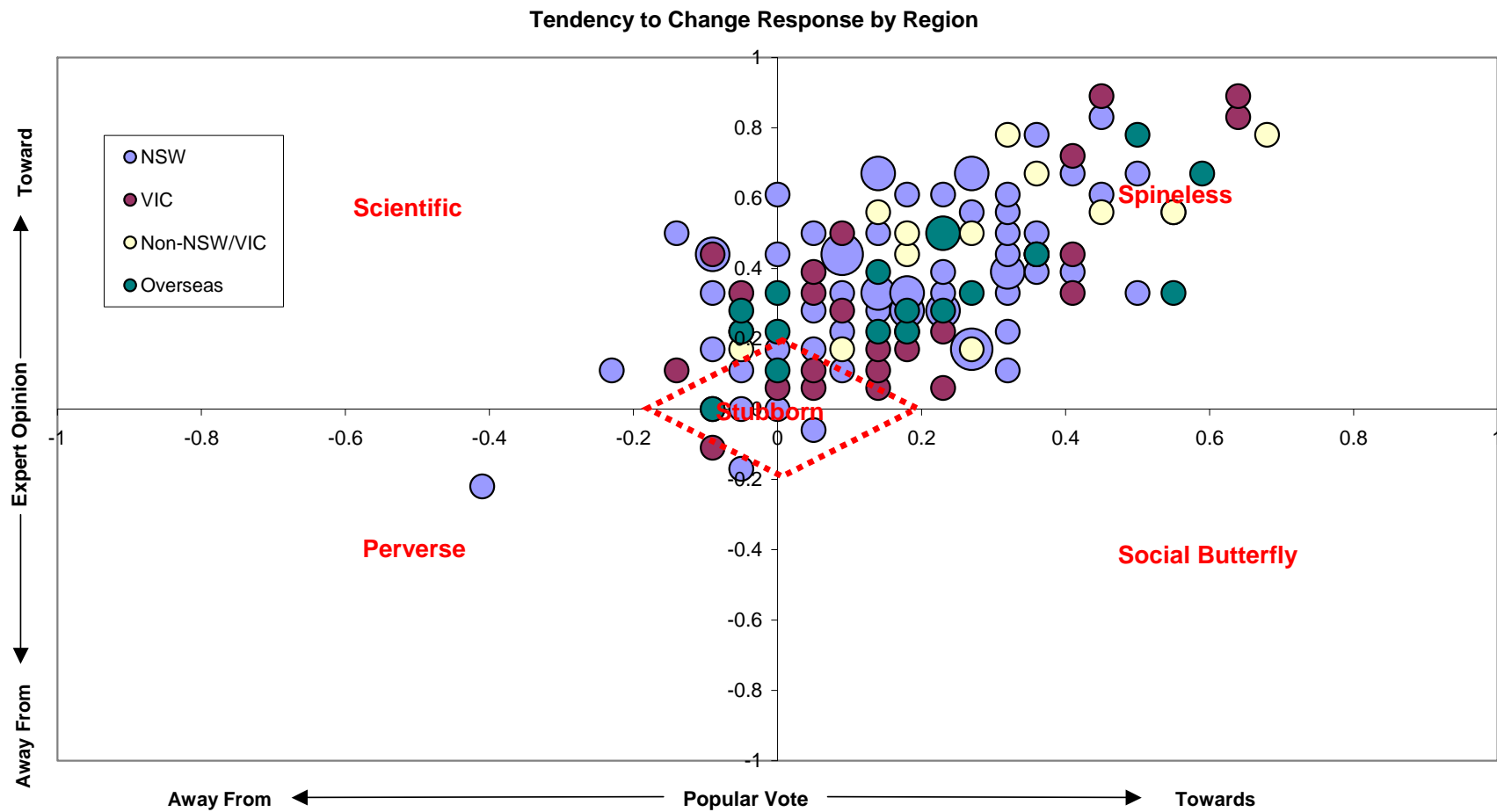
Social Butterflies changed their respondents to align with the majority, impervious to the sway of the experts.

Perverse respondents moved against the flow of both the experts and the actuarial community.

Tendency to Change Response by Age of Respondent

Tendency to Change Response by Gender

Tendency to Change Response by Actuarial Qualification

Tendency to Change Response by Region
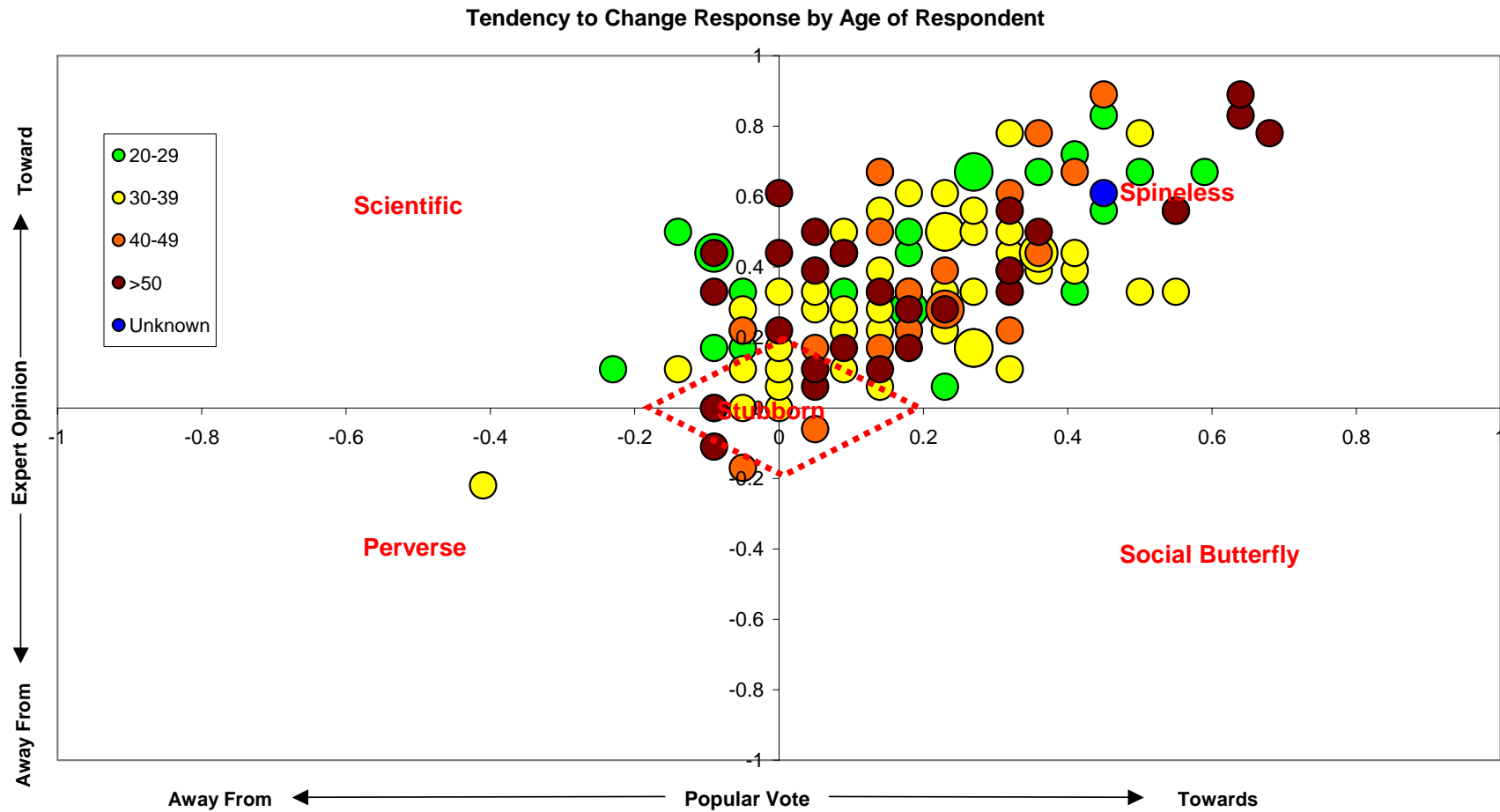
It can be seen from these graphs that actuaries were generally not too proud to be influenced by expert opinions, particularly if those opinions aligned with the actuarial consensus. 73% of us are spineless when it comes to opining about the state of the world in 2025.

One in 8 were stubborn respondents whose opinions were almost independent of the opinions expressed by others. These stubborn actuaries could be characterised as fully qualified older males.

Another one in 8 were scientific respondents, who shunned popular opinion but were quite influenced by what the experts had to say. The fast-to-qualify young males were over-represented in the group of scientists.

There were a couple of eccentrics who perversely changed their mind to a more extreme position relative to both the experts and the actuarial community.

We found no pattern in the behaviour of second round respondents according to their region of origin.

Some questions were more likely than others to entice respondents to change their views. In particular, the environmental expert, Barney Foran, proved to be very persuasive.

5.2 A Hypothetical Scenario: What will the World be like in 20 years time?

A hypothetical future scenario based on the answers given in the study may read as follows:

The demographic characteristics in the future will have a large impact on Australia particularly on our economy and environment. The demographic characteristics to some extent will depend on health parameters.

In 20 years the average life expectancy lifts, and with the low fertility rate the population is expected to age significantly, confirming the widely publicized actuarial concerns about how to sustainably fund retirees. The overall population of Australia will increase by 4 million people. Urbanisation will increase slightly, placing more pressure on the survival of our country towns. Australia will remain one of the world's mostly highly urbanised countries.

Real GDP is projected to increase between around 1.0% and 1.7%, say 1.3% on average. This is slower than the 1.8% experienced in the 30 years to 2004. As Chris Caton points out a significant proportion of the labour force will exit as the population ages. Hence to maintain growth in the GDP, particularly, on per

capita basis, there should be some increase in productivity growth. One indication of the ability to increase productivity is the spending on research. The study indicates that this will not increase, indicating that productivity growth could slow and the real GDP growth maybe at the lower end of the range.

Health spending will be a larger portion GDP, and the health services industry is likely to expand, driven primarily by the ageing of the population. On the other hand, the aging of the population, and high level of urbanisation could have an adverse effect on the agricultural sector. In general the ageing of the population will generally lead to a more mature full time workforce, this may have the effect of lowering the average working hours.

Interestingly there is a large increase in the gap between rich and poor. On a global level this is considered as a major risk to mankind. It is not immediately clear what will drive this. Demographic changes could have a small impact, for example as the population ages, the ownership of financial assets, rather than the ability to engage in productive labour drives the creation of wealth. In other words ageing could contribute to a widening in the rich poor gap. Other structural effects such as globalization will however have the largest impact.

With increases expected to health care, and a widening in the gap between rich and poor, access to health care services and who will fund the provision of services will become a major issue.

The Delphi study projects health spending to increase from around 9% to around 14% of GDP. Coupled with the growth in GDP per capita, this points to a 3.8% annual increase in the cost of health per capita.

On the environment front, there are some warning signs emerging. Australians will consume more energy, release more greenhouse gases, landfill will increase and global temperatures will increase. The survey finds that at present and in the future environmental degradation is a major risk to mankind.

Growth in per capita energy consumption is consistent with the growth in GDP, however other factors such as the cost and availability of fuels will have an impact. Given the growth in population, this points to an increase in the total energy consumption in Australia. Green house gas emissions do not increase significantly which might point towards an increasing penetration of cleaner sources of energy.

There will be an increase in the number of passengers on aircraft, which is due in part to an increase in GDP and population. It may mean that greenhouse gas restrictions won't adversely affect plane travel. Maybe businesses will become more nation-wide or decentralised despite the increasing urbanization. Or maybe it just highlights the importance of physical travel in an increasingly electronically integrated world.

5.3 General Conclusions from the Study

It is hard to draw comprehensive conclusions about the future from the results of the survey because we were limited to 24 questions. However, the results point to the situation that the achievement of sustainability, however defined, will be difficult. In other words, changes in our current way of living will be required in the future because of:
* population pressures
* aging population
* environmental degradation; eg climate change
* resource constraints, eg energy availability

6 Areas for Further Research

6.1 Questions that didn't make the cut

We attempted to cover a wide range of topics in the Delphi Study. However we omitted some very important questions about what the world will be like in 20 years:

1. What will be the price of water? The authors believed accessibility to clean water to be an increasingly important priority in both Australia and the world. There are an increasing number of mechanisms for passing on to the consumer the cost of distributing and purifying water. However there is as yet no water price index which might, say for Australia, combine the cost of water licenses in different river systems, and the price of domestic water in major cities.

2. What will be the unemployment rate? We considered this an important question, but the volatility and cyclicality meant that estimating unemployment rate in 2025 did not make much sense.

3. What will be the prevalence of different family structures? The authors could not find a way to ask this question in a multiple choice format.

4. Will the world environment be in (a) better shape (b) worse shape (c) a similar shape? This was considered important but too ambiguous.

5. What will be the Gini coefficient? We felt this better described the rich-poor gap, than question 8 which asks for the ratio of the income share of the 80th to the 20th percentile. However we felt the Gini coefficient concept would not be familiar to many in the target audience, and the effort to understand it might put them off completing the survey.

6. What will be the number of people killed in wars, rebellions or state-regimes?

We found it difficult to get accurate historic data, and the answer is likely to be volatile from one year to the next.

7. What will be the representation of women in positions of power? We couldn't find sufficient data, although we know it probably exists.

8. What percentage of married/de-facto females with a dependent child less than five years old will be in the workforce (either full-time or part-time)?

9. In 20 years time the following forms of cloning will be legal in Australia: (a) None, (b) Recombinant only, (c) Therapeutic with strict controls and Recombinant, (d) Therapeutic and Recombinant (e) All forms

6.2 Effectiveness of the modified Delphi Study

This Delphi study is different from a conventional Delphi study in that a large number of non experts were used on a broad topic. Conventional Delphi Studies involve a small number of experts, usually 20 to 30, dealing with a narrow topic range. In this study we tried to compensate for the lack of expert participants by providing expert opinions for the second round.

Some drawbacks of using this modified method were:
- Participants may have been apathetic to the questions, whereas in a conventional Delphi study the participants are often highly motivated to resolve a particular problem
- As authors of the Study, we did not always select appropriately credentialed experts (for example Chris Caton on prison population) which retracted from the credibility of the consensus opinion

Some advantages of the modified method were:
- that it encouraged non-experts to learn more about topics of interest to them
- that it shed some light on the relative sway of expert opinion versus popular opinion.

6.4 Consequences for the Actuarial Profession

The actuarial profession prides ourself on our ability to understand risk and advise on how best to plan for future uncertainty. This study has highlighted a range of areas about which there is great uncertainty over the next 20 years. The challenge for actuaries is to involve ourselves in better understanding the consequences of where we are heading, and what to do about it now.

Acknowledgements

References

Australia. Australian Bureau of Statistics. 2. Australian Social Trends Work - Paid work: Longer working hours. 2003. 17 April 2005. <http://www.abs.gov.au/Ausstats/abs%40.nsf/94713ad445ff1425ca25682000192af2/f46f5073e7cd46e4ca256d39001bc354!OpenDocument>

Australia. Council on the Ageing. The Economics of the Ageing Population: The Role of Mature Age Employment. 20 March 2001. 18 April 2005. < http://www.cota.org.au/economic.htm>

http://www.betterproductdesign.net/tools/user/delphi.htm

http://www.innovation-enterprise.com/5.2/5.2.279.html   Technology Foresight: Philosophy & Principles, Volume 5.2 (December 2003) Professor Greg Tegart Executive Advisor, APEC Center for Technology Foresight, Bangkok, Thailand

"Valuing ecosystem goods and services: a new approach using a surrogate market and the combination of a multiple criteria analysis and a Delphi panel to assign weights to the attributes", Ian A. Curtis, 25 September 2004, Ecological Economics

"The Delphi technique as a forecasting tool: issues and analysis", Gene Rowe, George Wright, International Journal of Forecasting, 1999

Appendix - Delphi Study questions and answers

There were 24 questions in the Delphi Study. This Appendix shows for each question:
- Multiple choice answers
- Round 1 data (Basic background information)
- Additional Round 2 data (Expanded background information and where available an expert's opinion)
- Summary of responses from rounds 1 and 2 including selected comments
- Transition matrix showing how respondents changed their opinion from one round to the next
- A summary of how many round 2 respondents moved towards or away from the round 1 mode or the expert opinion.

Note that the Round 1 survey showed only the question, the multiple choice answers, and some basic background information. In Round 2, the survey also showed additional background information, an expert's opinion, and a histogram showing the responses from Round 1.

Demographic Questions

1. In 20 years time the population of the world will be....

a) <6,000M b) 6,000 – 7,000M c) 7,000 – 8,000M d) 8,000 – 9,000M e) 9,000M – 10,000M f) 10,000M+

Round 1 Data

Round 2 Data

Data Source: United Nations Population Division

Data Source: United Nations Population Division

Data Source: United Nations Population Division
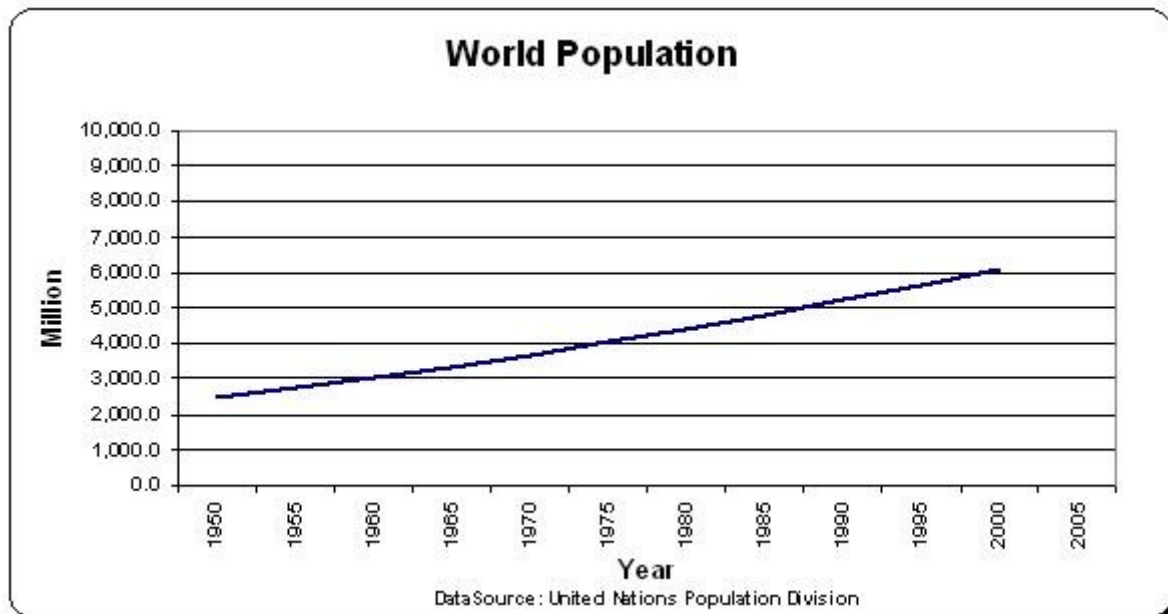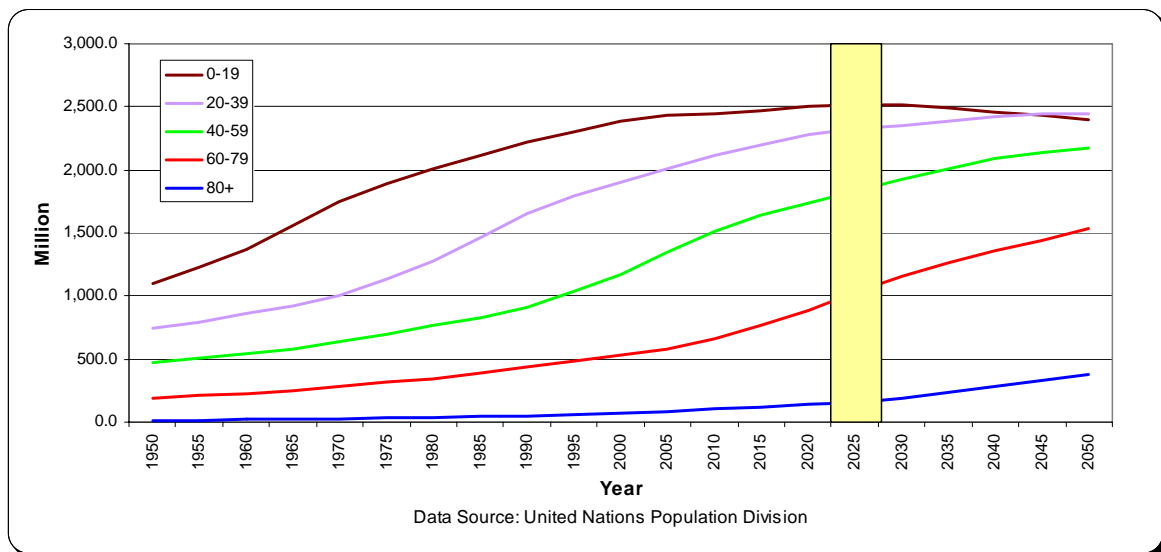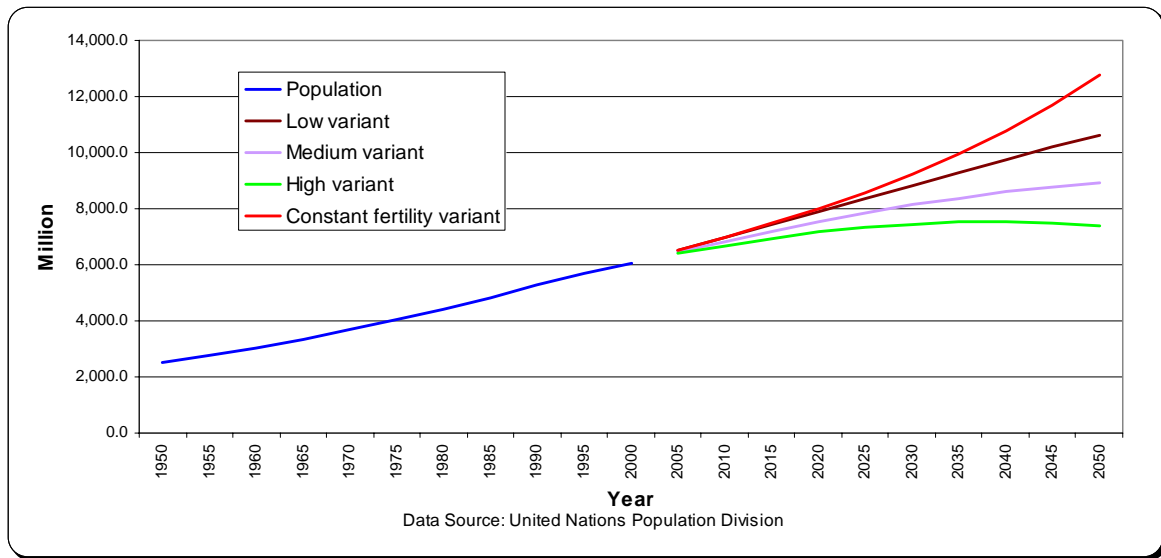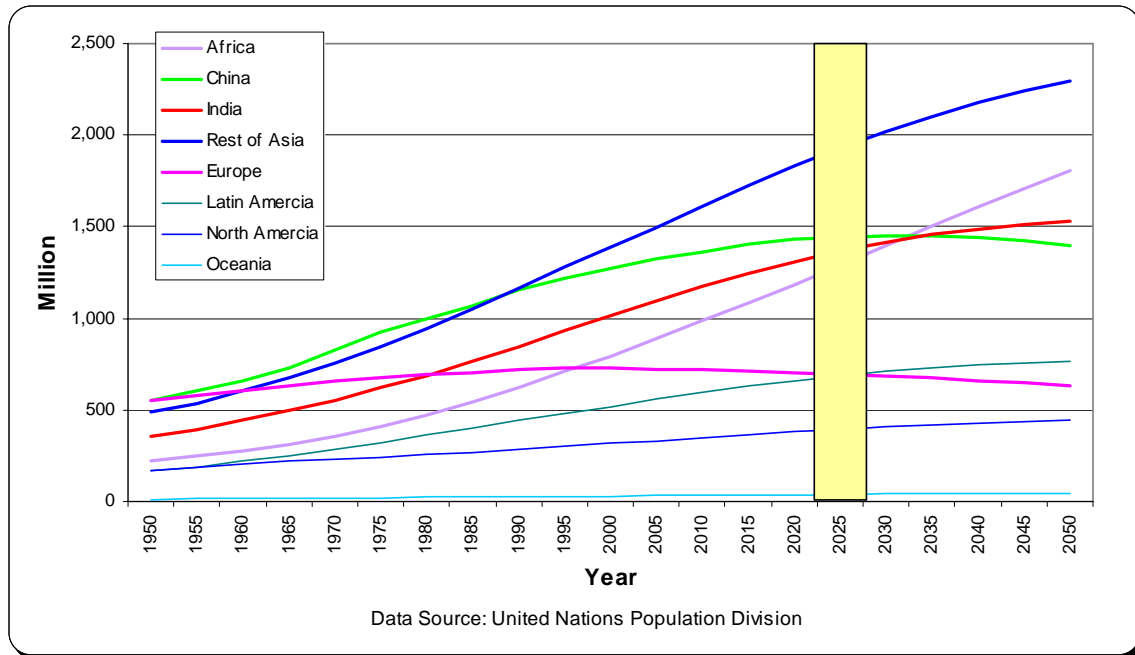
Expert Opinion (Richard Cumpston):

Answer is D (8,000 to 9,000m).

World population was about 1.9% the 25 years to 1975, and slowed to about 1.7% pa in the next 25 years. A population of 8000-9000m in 2025 would be growth at between 1.1% and 1.6%, which seems likely. Demographic transitions in most of the world, and HIV, war and famine in much of Africa, seem likely to further reduce growth.

Results
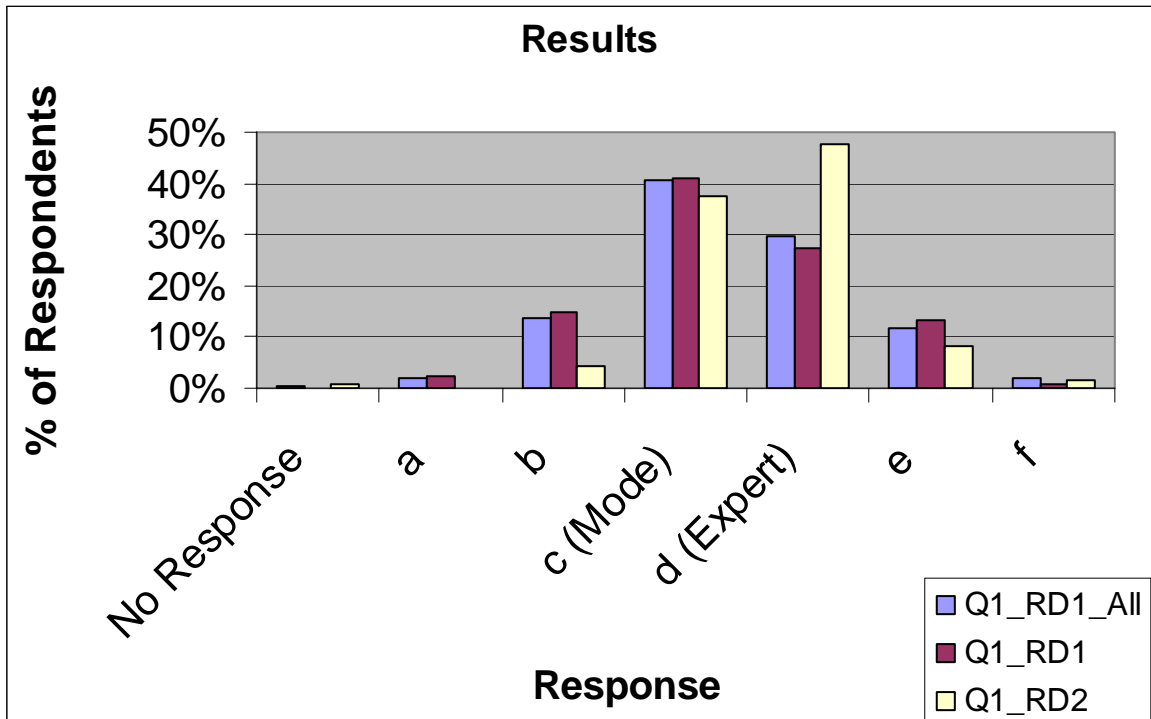
Selected Comments Round 1

Range from 10 billion to 20 billion.

Selected Comments Round 2

In the second round the upper bound is 15 billion.

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	0	1	1	1	0	0	3
	b	0	0	1	11	5	0	1	18
	c	1	0	2	26	23	2	0	54
	d	0	0	0	8	24	2	0	34
	e	0	0	1	1	7	6	1	16
	f	0	0	0	0	0	1	0	1
	Total	1	0	5	47	60	11	2	126

Movement Vs Expert

Away	No Change	Toward
14	61	50

Movement Vs Mode

Away	No Change	Toward
31	62	32

2. In 20 years time the population of Australia will be...

<21M b) 21 – 22M c) 22 – 23M d) 23 – 24M e) 24 – 25M f) 25M+

Round 1 Data

Round 2 Data

Data Source: United Nations Population Division

Australian Population - Net Migration
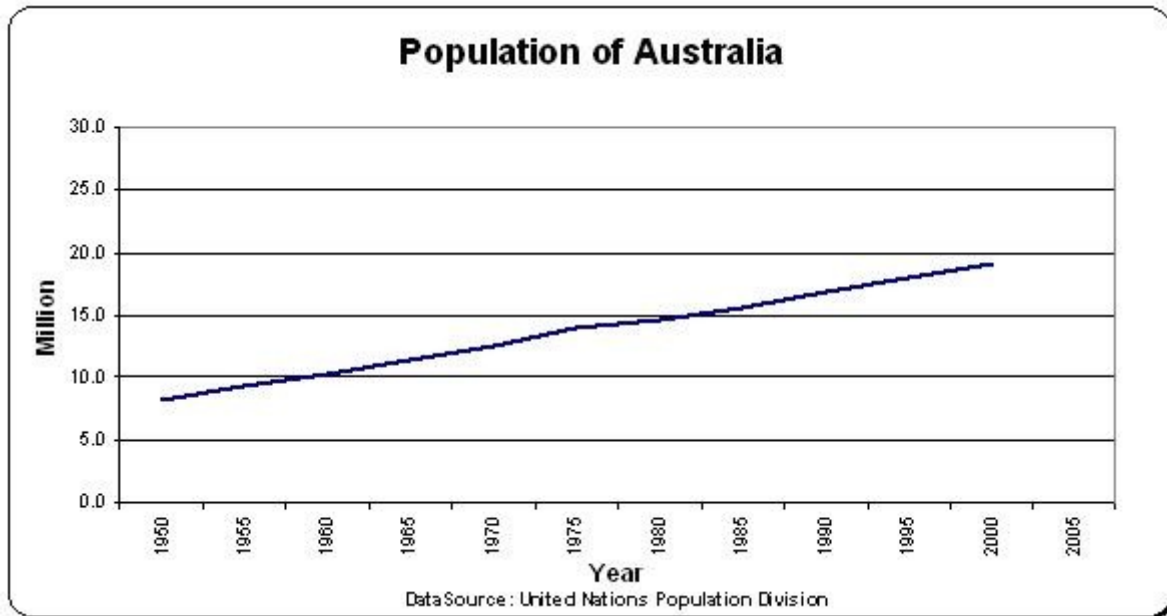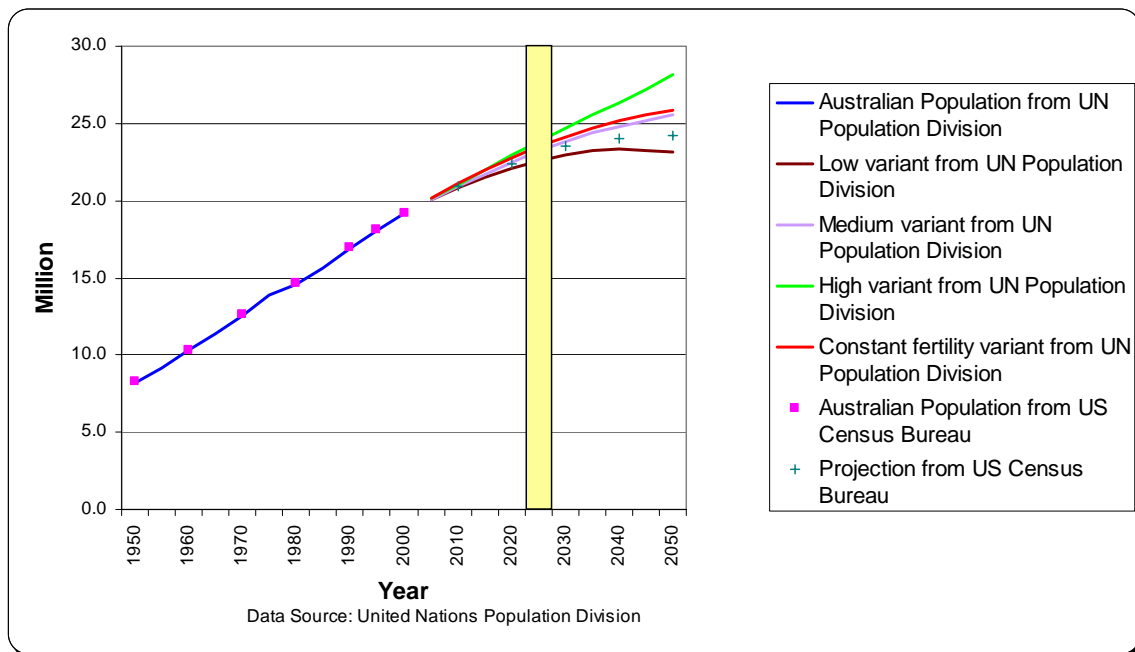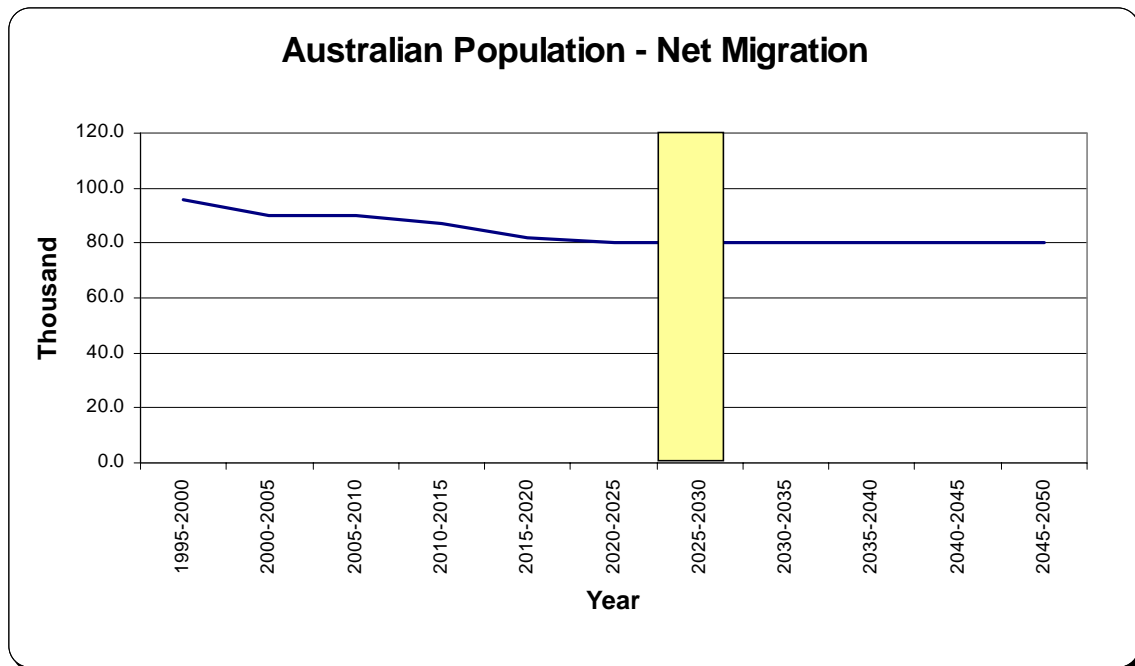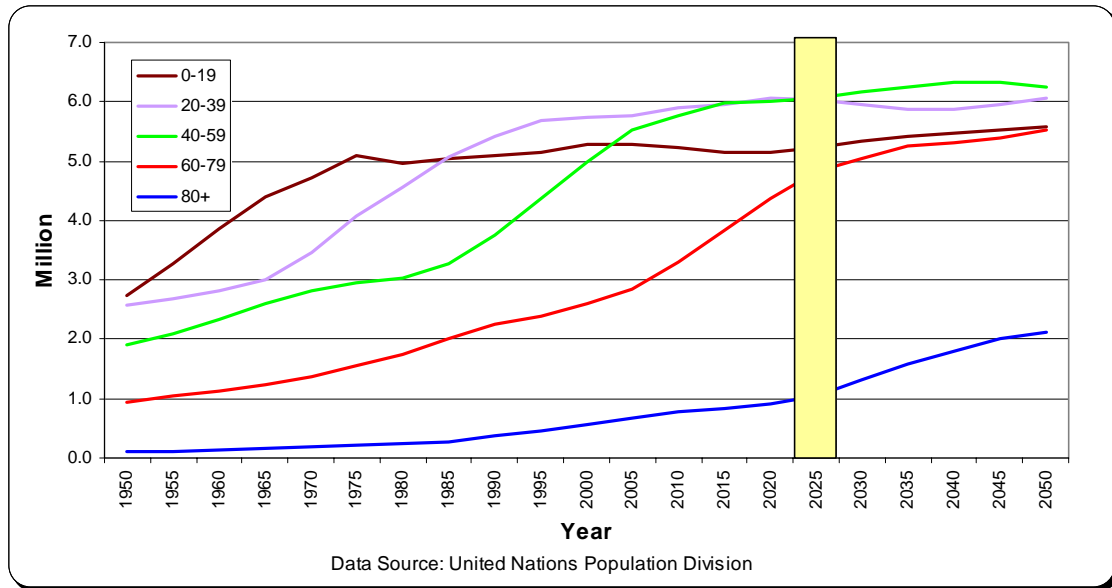
Expert Opinion (Richard Cumpston):

Answer is E (24 to 25m).

Series A, B and C projections published by the ABS on 3/9/03 give 25.5, 24.0 and 22.7m persons In Australia by 2025. ABS is usually about right, so 24-25m seems a good call.

Results

Selected Comments Round 1

One comments points out the possibility that the definition of urban could widen.

Selected Comments Round 2

None

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	2	1	1	0	0	0	4
	b	0	2	3	17	0	0	0	22
	c	0	0	1	72	5	0	0	78
	d	1	0	1	13	6	0	0	21
	e	0	0	0	1	0	0	0	1
	f	0	0	0	0	0	0	0	0
	Total	1	4	6	104	11	0	0	126

Movement Vs Expert

Away	No Change	Toward
8	84	33

Movement Vs Mode

Away	No Change	Toward
8	84	33

3. In 20 years time the percentage of Australians in non-urban areas will be...

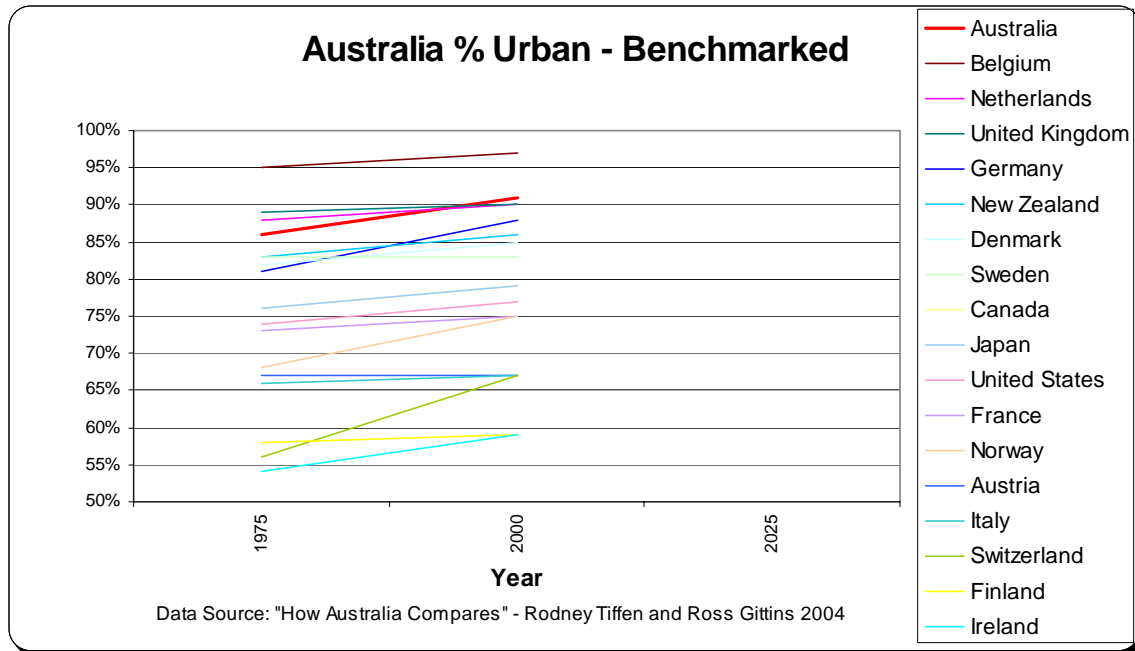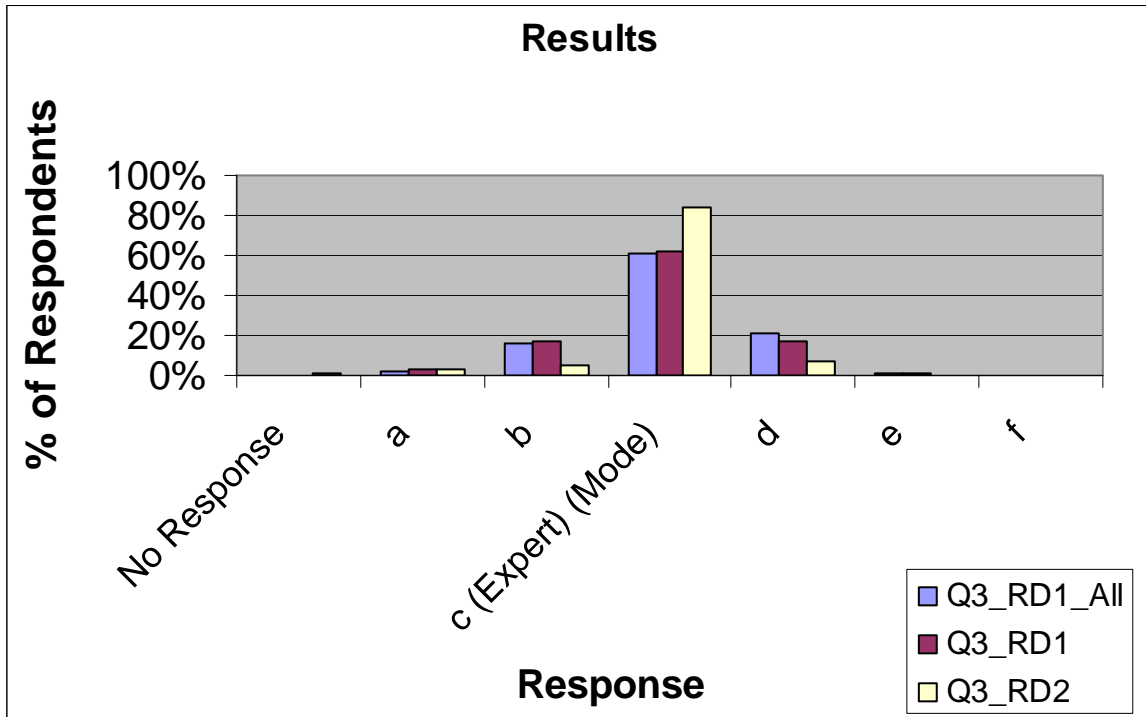a) < 85% b) 85 – 90% c) 90 -95% d) 95 – 98% e) > 98%

Round 1 Data

Australia's Urbanisation

DataSource: United Nations Population Division

Round 2 Data

Australia % Urban - Projected

Data Source: United Nations Population Division

Australia % Urban - Benchmarked

Data Source: "How Australia Compares" - Rodney Tiffen and Ross Gittins 2004

Legend: Australia, Belgium, Netherlands, United Kingdom, Germany, New Zealand, Denmark, Sweden, Canada, Japan, United States, France, Norway, Austria, Italy, Switzerland, Finland, Ireland

Expert Opinion (Richard Cumpston):

Answer is C (90 to 95%).

90-95% seems a really good call (even though I don't know what their definition of urbanization is).

Results

Selected Comments Round 1

One comments points out the possibility that the definition of urban could widen.

Selected Comments Round 2

None

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	2	1	1	0	0	0	4
	b	0	2	3	17	0	0	0	22
	c	0	0	1	72	5	0	0	78
	d	1	0	1	13	6	0	0	21
	e	0	0	0	1	0	0	0	1
	f	0	0	0	0	0	0	0	0
	Total	1	4	6	104	11	0	0	126

Movement Vs Expert

Away	No Change	Toward
8	84	33

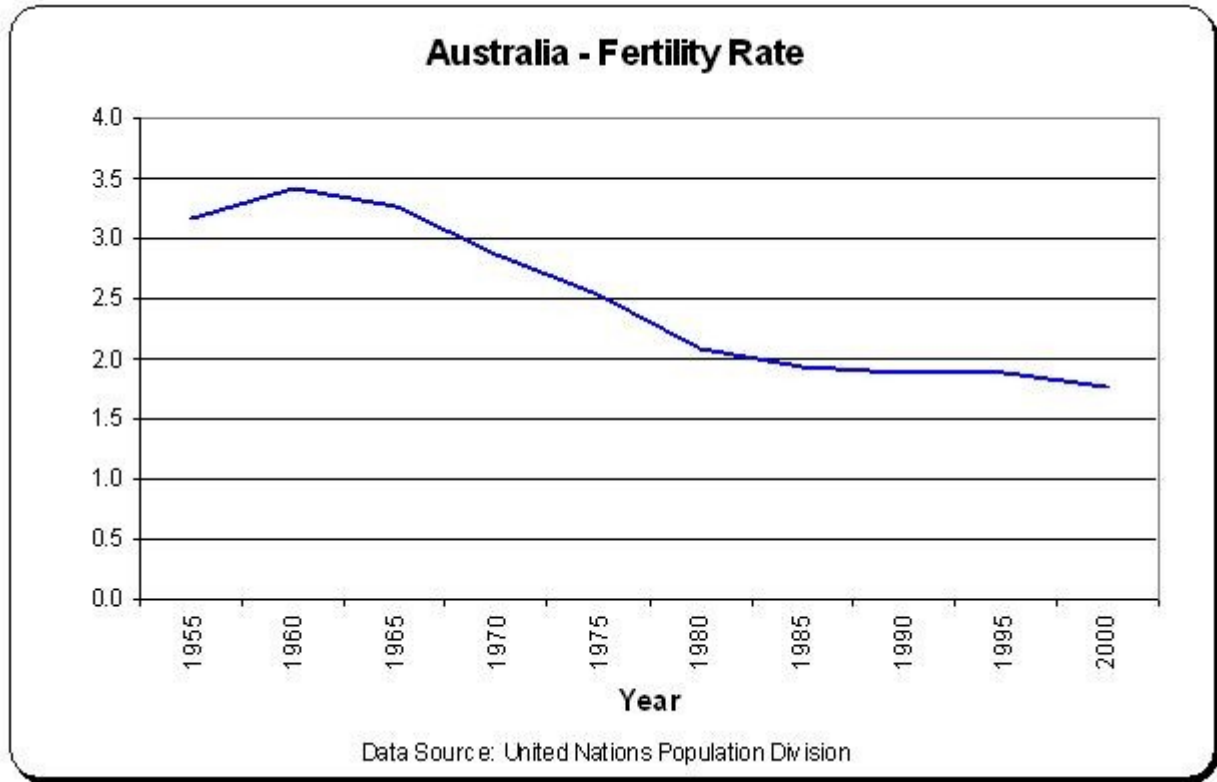**Movement Vs Mode**

Away	No Change	Toward
8	84	33

4. The age dependency ratio (ratio of those >65 years to those aged 15-64) in 2002 was 0.19 having increased from 0.13 in 1971. In 20 years time, the ratio will be:

a) < 0.2
b) 0.2 – 0.25
c) 0.25 – 0.30
d) 0.30 – 0.35
e) > 0.35

Round 1 Data

None

Round 2 Data

Expert Opinion (Leonie Tickle):

Answer is D (0.30 0.35).

Continuing mortality declines and the movement of the large baby boom cohort into the 65 and over age group will both contribute to a very substantial increase in the population aged 65 and over in the next 20 years. In contrast, the population aged 15 to 64 is expected to change little over the period. The overall effect will be a very marked increase in the age dependency ratio to around 0.35 in 2025.
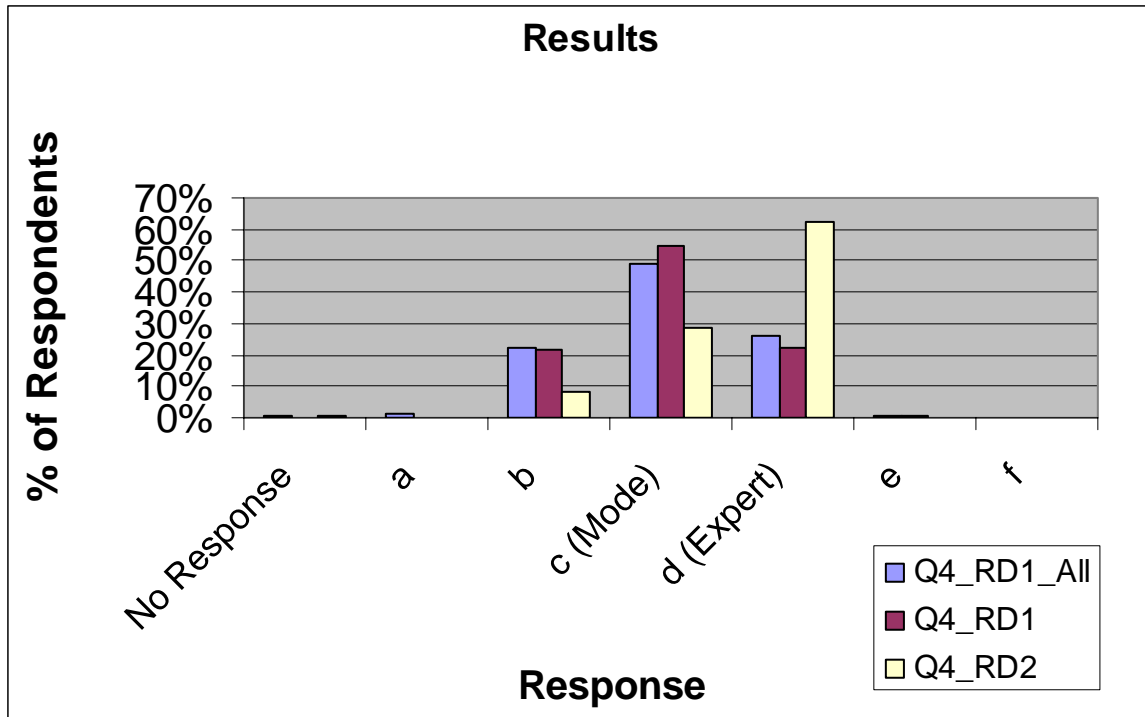
Selected Comments Round 1

Other answers suggest range above 0.4.

Selected Comments Round 2

None

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	0	1	0	0	0	0	1
	b	0	0	6	8	12	0	0	26
	c	1	0	4	20	43	0	0	68
	d	0	0	0	8	22	0	0	30
	e	0	0	0	0	1	0	0	1
	f	0	0	0	0	0	0	0	0
	Total	1	0	11	36	78	0	0	126

Movement Vs Expert

Away	No Change	Toward
12	48	65

Movement Vs Mode

Away	No Change	Toward
47	60	18

5. In 20 years time the fertility rate (births per woman) in Australia will be...

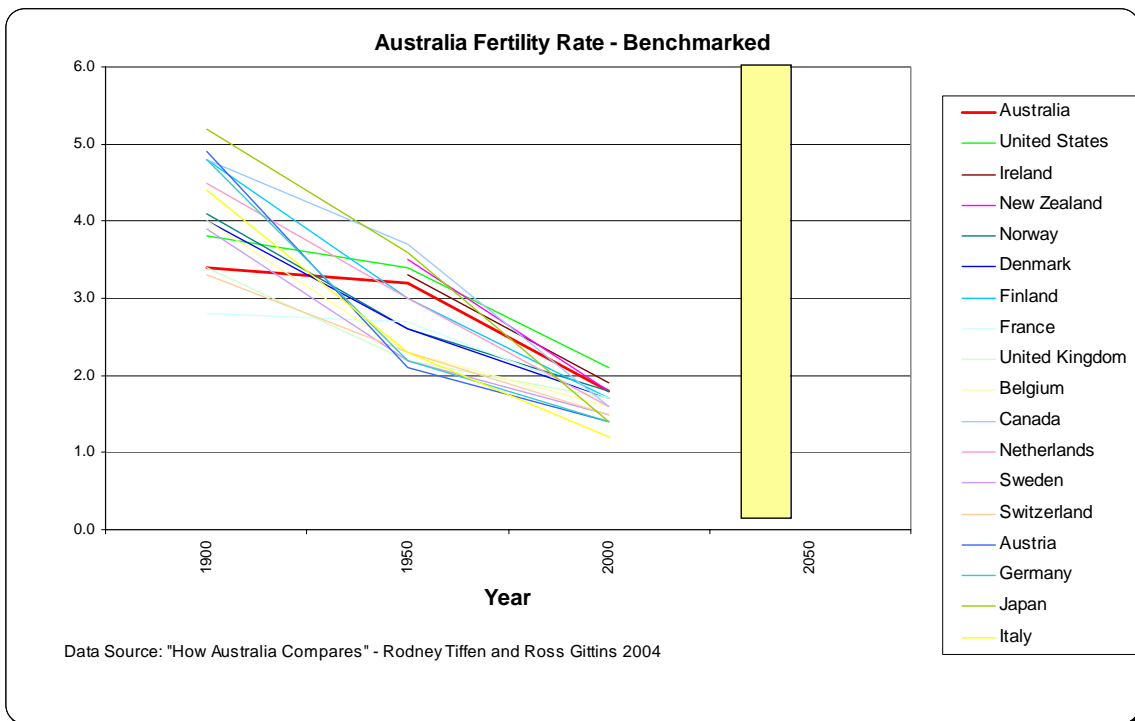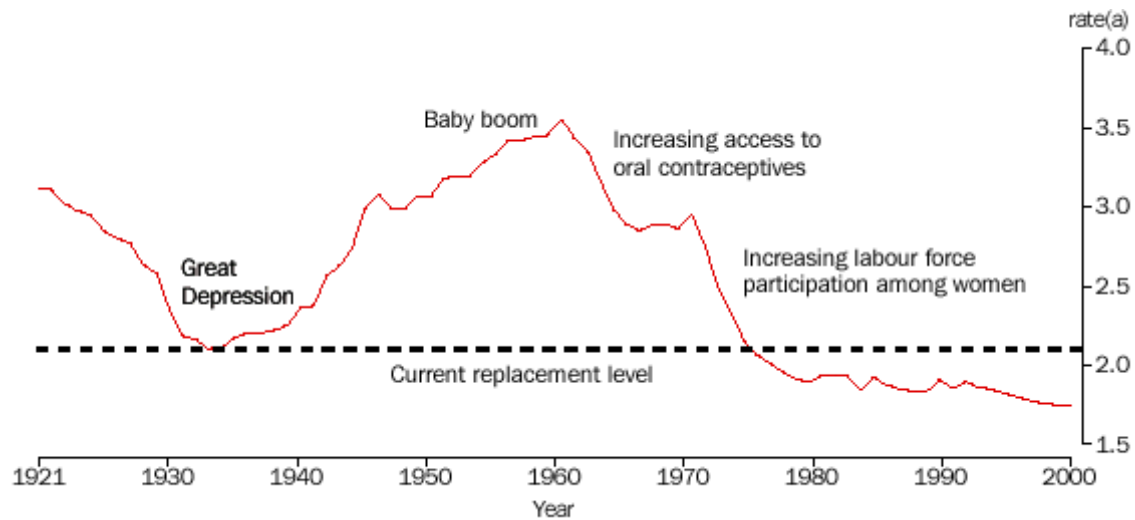a) < 1.2 b) 1.2 – 1.4 c) 1.4 – 1.6 d) 1.6 – 1.8 e) 1.8 +

Round 1 Data

Australia - Fertility Rate

Data Source: United Nations Population Division

Round 2 Data

Australia Fertility Rate - Projected

Data Source: United Nations Population Division

Australia Fertility Rate - Benchmarked

Data Source: "How Australia Compares" - Rodney Tiffen and Ross Gittins 2004
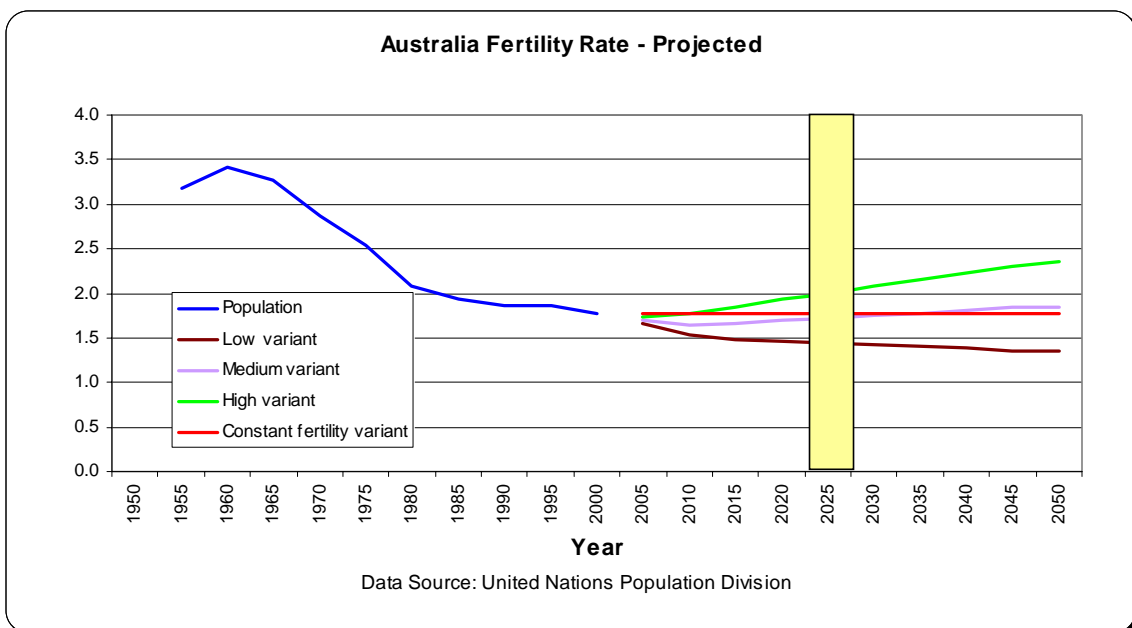
Expert Opinion (Leonie Tickle):

Answer is D (1.6 – 1.8).

The fertility rate is dependent on government policy and other factors that are difficult to predict. It is predicted that the rate will remain at roughly the current level, assuming that the government will take steps to try to avoid fertility declines experienced in other countries.

Results
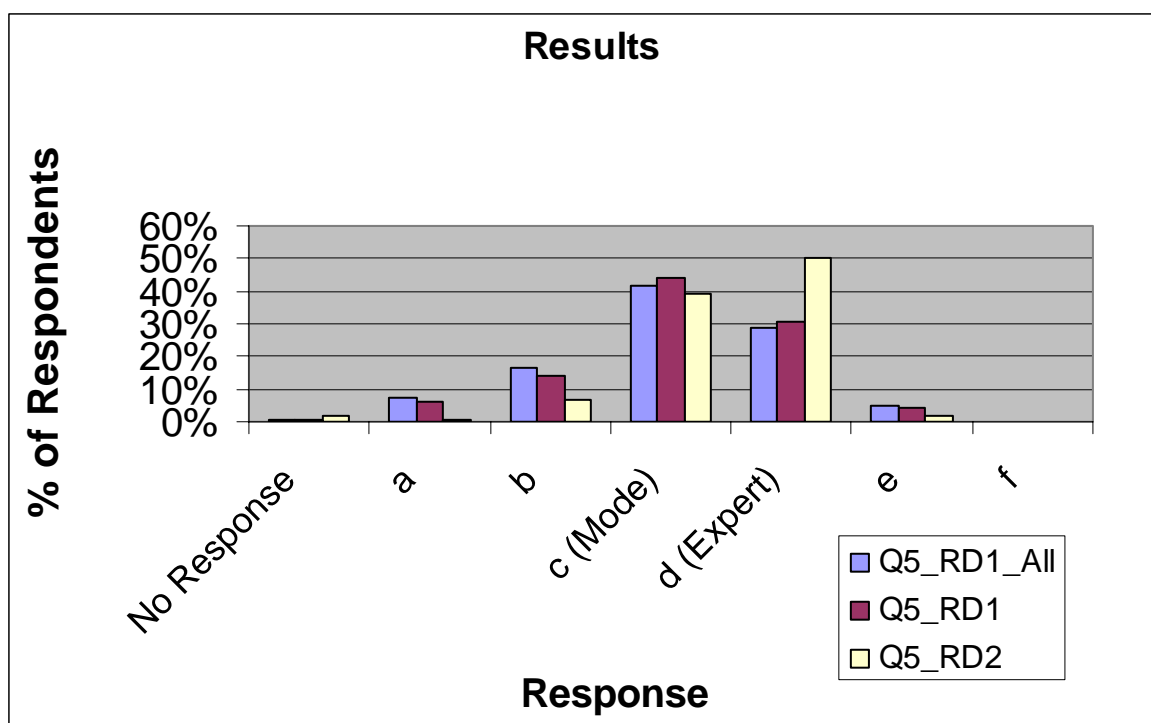
Selected Comments Round 1

Over 1.8 and up to 2.5.

Selected Comments Round 2

Over 1.8 to 2.0.

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	1	0	0	0	1
	a	0	0	2	3	2	0	0	7
	b	1	1	0	12	3	0	0	17
	c	1	0	6	26	22	1	0	56
	d	0	0	0	6	33	0	0	39
	e	0	0	0	1	4	1	0	6
	f	0	0	0	0	0	0	0	0
	Total	2	1	8	49	64	2	0	126

Movement Vs Expert

Away	No Change	Toward
13	62	48

Movement Vs Mode

Away	No Change	Toward
30	63	30

Economic Questions

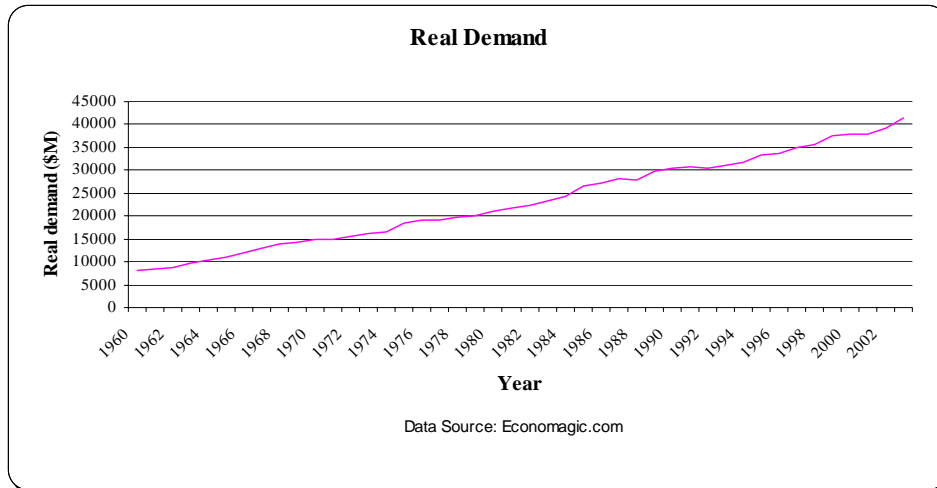**6. In 20 years time the Real Gross Domestic Product per capita in Australia will be...**

a) <10,000 b) 10,001 – 12,000 c) 12,001 – 14,000 d) 14,001 – 16,000 e) >16,000

Round 1 Data

Real GDP per capita

Data Source: Economagic.com

Round 2 Data

Real Exports

Data Source: Economagic.com

Real Demand

Data Source: Economagic.com
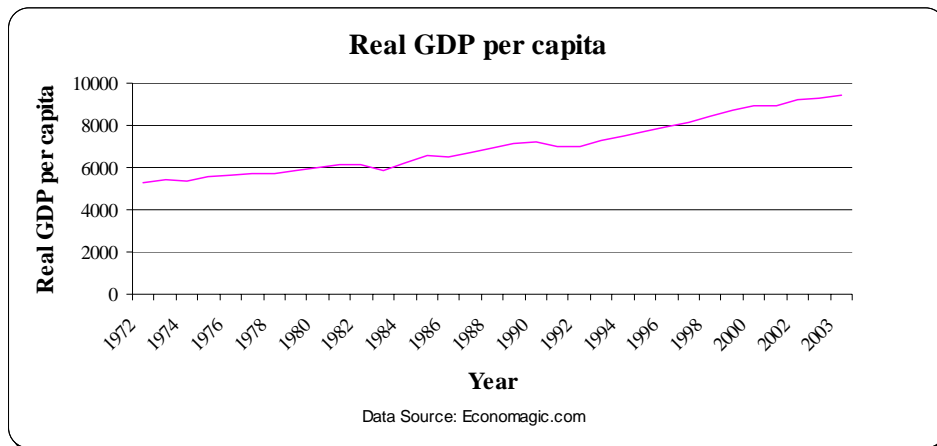
Expert Opinion (Chris Caton):

Answer is C (12,001 – 14,000).

In the December quarter of 2004,real GDP per capita came to $9907....somewhat unusually down from $9918 two quarters earlier. In the medium term it is mainly productivity growth that drives GDP per capita. The proportion of the population that goes out to work is the other significant variable. The latter could fall by up to 5% over the next 20 years, mainly reflecting the aging of the population. Productivity is very hard to predict,...I assumed 1.75% per year. Assuming little or no change in hours worked per week, output per person employed will grow by about 41% over 20 years, and hence output per capita by about 34%...this puts it close to the middle of answer c. Note that this will be wrong because in 20 years time real GDP will no longer be calculated using 2002-03 as the base year!

Results
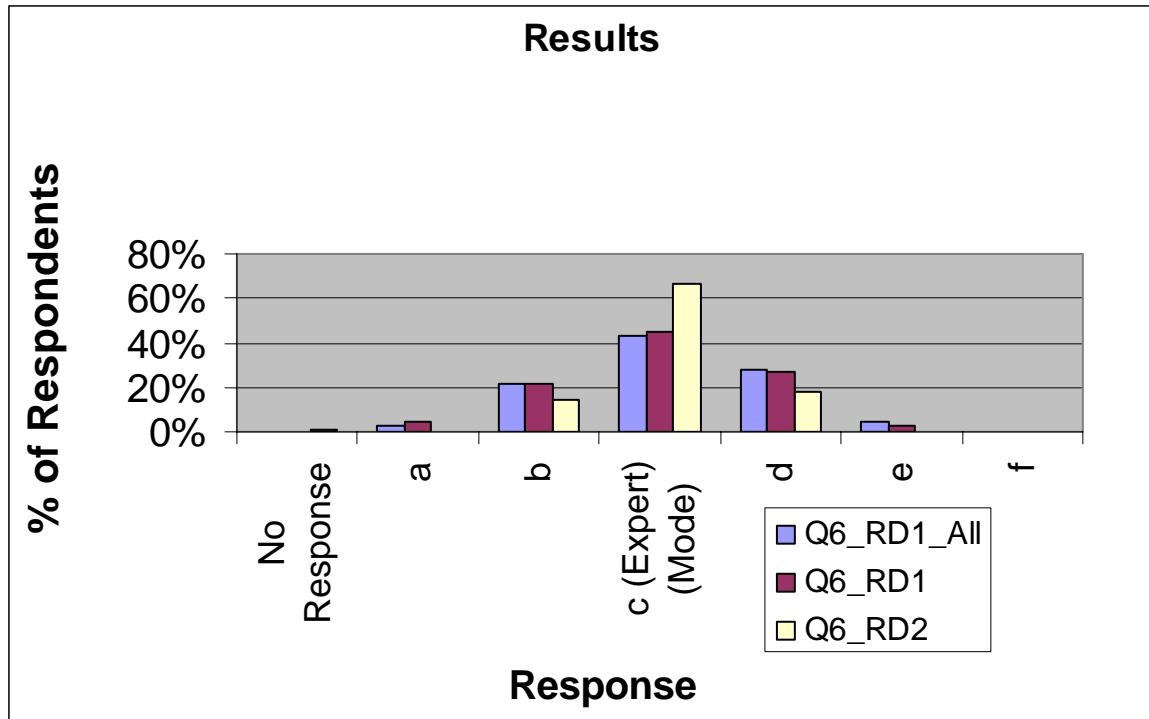
Selected Comments Round 1

Largest value is $27K

Selected Comments Round 2

None

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	1	3	1	1	0	0	6
	b	0	0	7	17	3	0	0	27
	c	1	0	5	43	8	0	0	57
	d	0	0	2	21	10	0	0	33
	e	0	0	0	1	2	0	0	3
	f	0	0	0	0	0	0	0	0
	Total	1	1	17	83	24	0	0	126

Movement Vs Expert
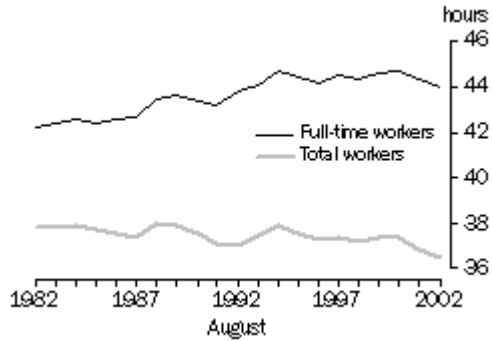
Away	No Change	Toward
13	66	46

Movement Vs Mode

Away	No Change	Toward
13	66	46

7. In 20 years time the average hours worked per week for full time workers in Australia will be...

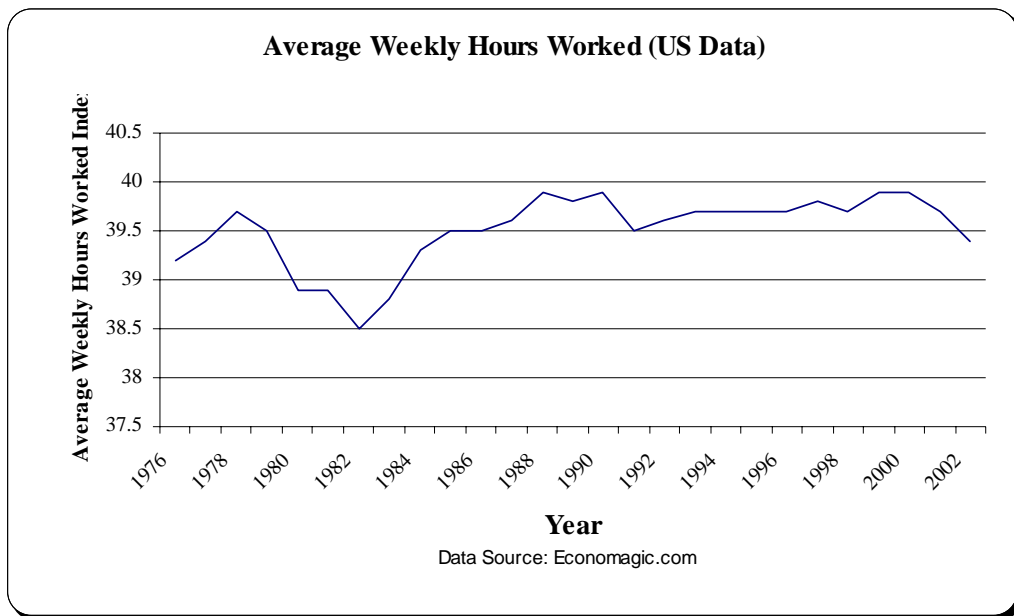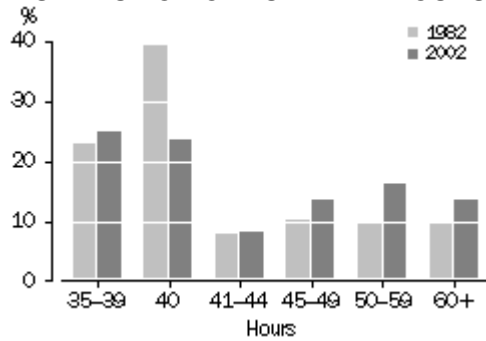a) < 35 b) 35 - 40 c) 40 - 45 d) 45 - 50 e) 50+

Round 1 Data

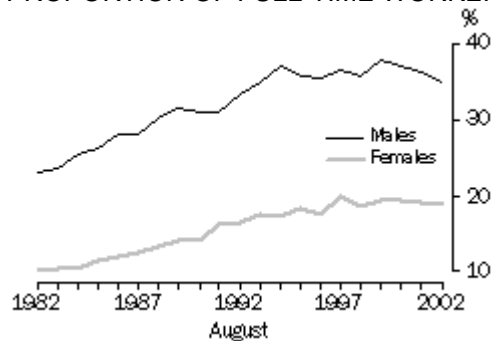Source: ABS Labour Force Survey.

Round 2 Data

DISTRIBUTION OF FULL-TIME HOURS WORKED PER WEEK

Source: ABS Labour Force Survey.

PROPORTION OF FULL-TIME WORKERS WORKING 50 HOURS OR MORE PER WEEK

Source: ABS Labour Force Survey.

HOURS WORKED, AUGUST 1988 TO AUGUST 1998

Source: Unpublished data, Labour Force Surveys, August 1988 to August 1998.

Expert Opinion (Chris Caton):

Answer is C (40 - 45).

While there has been an upward trend in full-time hours worked in the past 20 years, this is far less obvious in the last few years. Shifts in industrial composition(towards services and away from goods production) would seem likely to hold hours down. In the scheme of things,40-45 hours is a wide range(the range over the past 20 years has been 42 to 45),so c is the most logical answer.
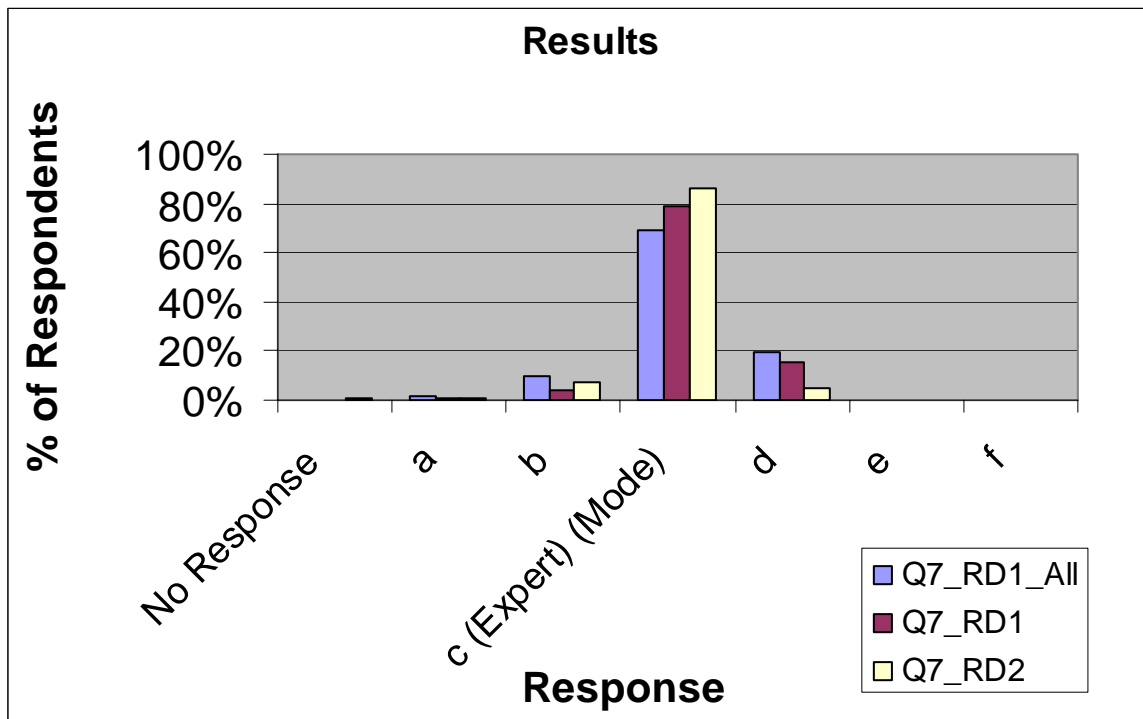
Results

Selected Comments Round 1

None

Selected Comments Round 2

None

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	1	0	0	0	0	0	1
	b	0	0	3	2	1	0	0	6
	c	1	0	6	88	3	0	0	98
	d	0	0	0	18	3	0	0	21
	e	0	0	0	0	0	0	0	0
	f	0	0	0	0	0	0	0	0
	Total	1	1	9	108	7	0	0	126

Movement Vs Expert

Away	No Change	Toward
9	96	20

Movement Vs Mode

Away	No Change	Toward
9	96	20

8. In 1968 – 69 the ratio of the income share of the 80th percentile to the 20th percentile in Australia was 2.65 by 1997-98 the ratio had risen to 4.03. In 20 years time the ratio will be...

a) < 2.5 b) 2.5 – 4.0 c) 4.0 – 5.0 d) 5.0 – 6.5 e) 6.5+
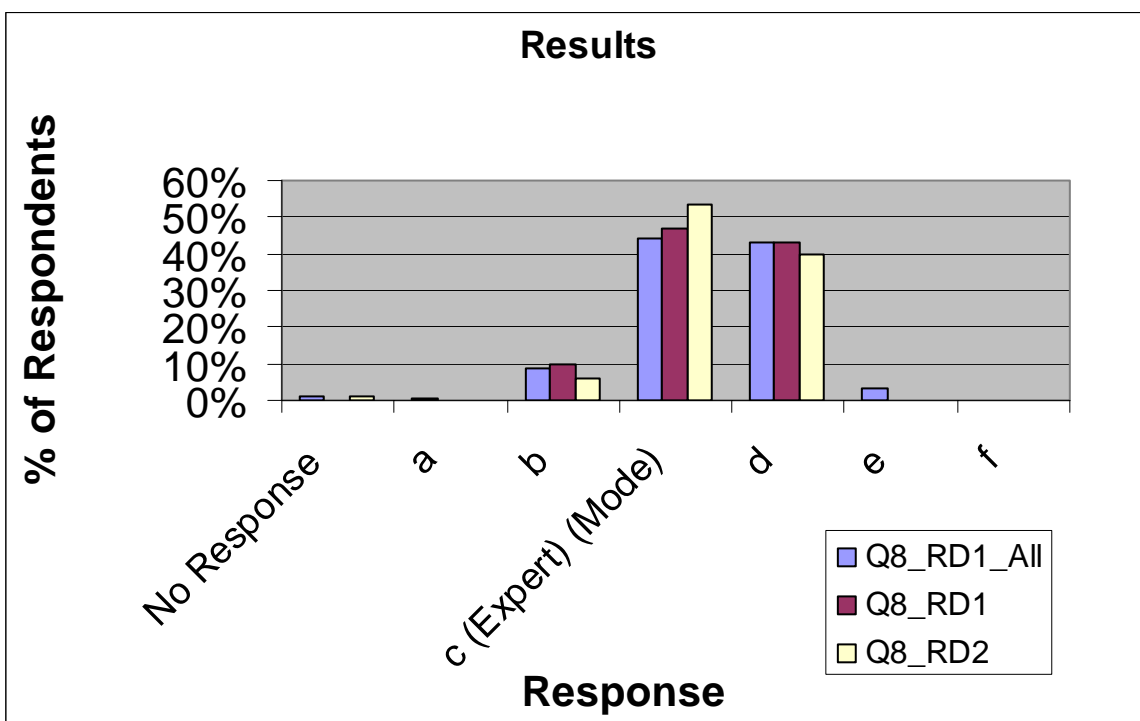
Round 1 Data

None

Round 2 Data

	1968-69		1997-98		Change, 1968-69 to 1997-98	
Income deciles	Income Share %	Upper Bound $('68-69)	Income Share %	Upper Bound $('97-98)	Income Share Percentage Points	Upper Bound $('97-98)
First	2.2	13,040	1.8	15,030	-1.8	1,990
Second	4.6	20,000	3.3	19,100	-1.3	-900
Third	6.2	24,200	4.4	26,220	-1.8	2,020
Fourth	6.9	28,260	6	34,180	-0.9	5,920
Fifth	8.5	32,460	7.6	43,020	-0.9	10,560
Sixth	9.3	36,820	9.3	51,790	0	14,970
Seventh	10.6	42,030	11.2	62,200	0.6	20,170
Eighth	12.2	49,130	13.3	74,000	1.1	24,870
Ninth	15	62,030	15.3	94,200	0.3	32,170
Tenth	24.7	. .	26.8	. .	2.1	. .
P10/P50(b)	. .	0.402	. .	0.349	-0.053	. .
P90/P50(b)	. .	1.911	. .	2.19	0.279	. .
P90/P10(b)	. .	4.756	. .	6.266	1.51	. .
Gini coefficient	0.33		0.39		18.20%	
Robin Hood index	22.5		26.6		18.20%	

Source: Australia Bureau of Statistics

Expert Opinion (Chris Caton):

Answer is C (4.0 – 5.0).

It is an unfortunate development that the income distribution in Australia widened in the 30 years to 97/98. Globalisation probably played a role,and the process may not be over yet...It is not clear exactly what income distribution the figures provided refer to...I assume family income,but is it before or after tax? In the future,the aging of the population may exacerbate inequality,and there seems no strong political resolve to offset the upward creep by means of the tax/transfer mechanism,so I have to forecast a further increase.

Results

% of Respondents (y-axis)

Response (x-axis): No Response, a, b, c (Expert) (Mode), d, e, f

Legend:
- Q8_RD1_All
- Q8_RD1
- Q8_RD2

Selected Comments Round 1

Range from 6.5 to 8, there is one answer of greater than 8.

Selected Comments Round 2

None

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	**0**
	a	0	0	0	0	0	0	0	**0**
	b	0	0	5	5	2	0	0	**12**
	c	1	0	1	43	13	0	0	**58**
	d	0	0	1	19	35	0	0	**55**
	e	0	0	0	0	1	0	0	**1**
	f	0	0	0	0	0	0	0	**0**
	Total	1	0	7	67	51	0	0	**126**

Movement Vs Expert

Away	No Change	Toward
14	86	25

Movement Vs Mode

Away	No Change	Toward
14	86	25

9. What will be the number of prisoners per 100,000 population in Australia in 20 years time?

a) 0-80
b)81–110
c) 111- 140
d)141 – 170
e) >171

Round 1 Data

In Australia, the number of prisoners per 100,000 population in Australia was 46 in 1982, 85 in 1990 and 110 in 2000.

Round 2 Data

	Prisoners per 100 000 population		
	1982	1990	2000
Japan	46	38	45
Finland	99	65	50
Denmark	62	64	60
Norway	46	57	60
Sweden	55	58	65
France	59	80	80
Ireland	-	56	80
Austria	-	82	85
Belgium	64	65	85
Netherlands	32	44	85
Switzerland	-	77	90
Germany	80	78	95
Italy	62	52	95
Canada	107	109	105
Australia	46	85	110
United Kingdom	91	92	123
New Zealand	84	120	145
United States	301	457	700
Mean	82	85	120

Data Source: "How Australia Compares" - Rodney Tiffen and Ross Gittins 2004

Expert Opinion (Chris Caton):

Answer is B (81 – 110).

Not sure how the number of prisoners gets to be an economic question(unless they are white-collar criminals or we're looking to privatise the jails). Some trends you have to think should not be simply extrapolated.......the demographic shifts should act to reduce the ratio,ceteris paribus. So I've gone for a slight decline.

Results
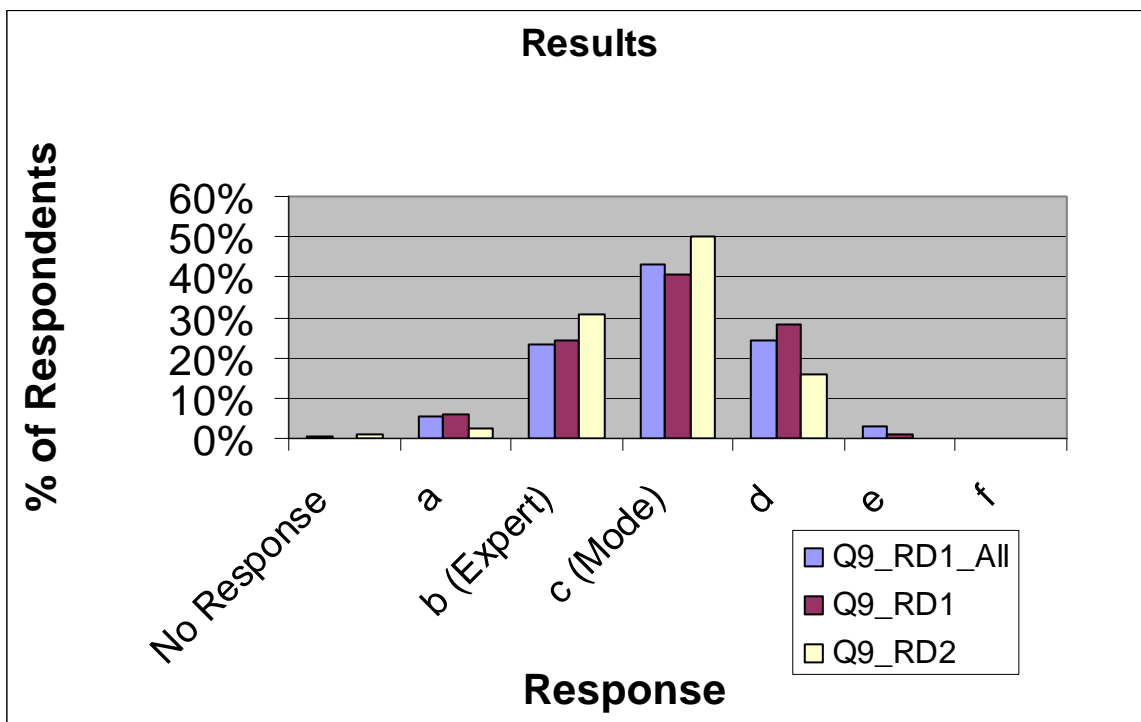
Selected Comments Round 1

Answers generally to 300.

Selected Comments Round 2

None

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	**0**
	a	0	3	4	0	0	0	0	**7**
	b	1	0	21	9	1	0	0	**32**
	c	0	0	7	35	8	0	0	**50**
	d	0	0	8	18	10	0	0	**36**
	e	0	0	0	1	0	0	0	**1**
	f	0	0	0	0	0	0	0	**0**
	Total	1	3	40	63	19	0	0	**126**

Movement Vs Expert

Away	No Change	Toward
18	69	38

Movement Vs Mode

Away	No Change	Toward
15	78	32

Health and Mortality Questions

10. In 20 years time the life expectancy at birth for males in Australia will be...

< 77 b) 77 – 79 c) 80 – 82 d) 83 – 85 e) 86+

Round 1 Data

	Life Expectancy at Birth	
Australian Life Table	Males	Females
1960-62	67.9	74.2
1965-67	67.6	74.2
1970-72	67.8	74.5
1981-83	71.5	78.0
1985-86	72.6	79.0
1986-88	73.0	79.3
1992	74.5	80.4
1994-96	75.2	81.1
1996-98	75.9	81.5
1999-01	77.0	82.4
2000-02	77.4	82.6

Round 2 Data

The graph below shows trends in life expectancy. It is clear that large improvements were made from the 19080s to the 90s, following moderate increases before hand.

Figure 1: Trends in life expectancy at age 65 years, Australia 1905-1994
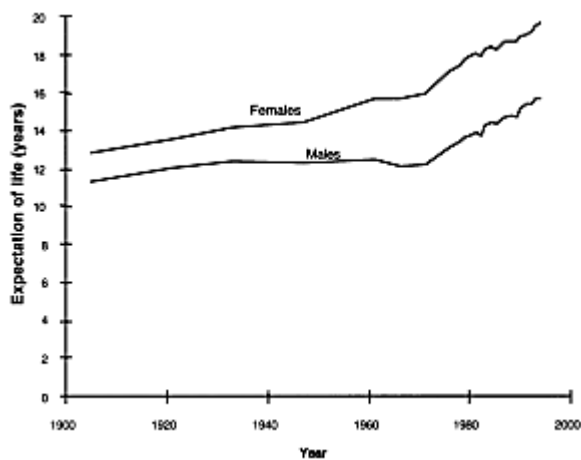
Data from Australian Bureau of Statistics [34] and Cumpston [35]

The article below is from the ABS on trends in mortality

MORTALITY CONTIUES TO DECLINE

The Australian death rate changed little in 2002, compared to the last two years. The standardised death rate in 2002 (6.7) was up by 1.5% since 2001 (6.6), down 1.5% (6.8) since 2000 and down 35% (10.3) since 1982. There were 133,700 deaths registered in Australia in 2002, approximately 5,200 (4.0%) more than the number registered in 2001 (128,500).

Over the past 20 years there has been a sustained decline in the death rates for all states and territories. The highest age-standardised death rate in 2002 was in the Northern Territory and the lowest was in the Australian Capital Territory.

LIFE EXPECTANCY CONTINUES TO INCREASE

Life expectancy at birth continued to increase, reflecting the general decrease in death rates. A boy born in 2000–2002 could expect to live 77.4 years, while a girl could expect to live 82.6 years. Since 1982, life expectancy at birth has increased by six years for males and four years for females.

Internationally, Australia's male life expectancy at birth ranks below Japan, Sweden and Hong Kong (each 78 years), similar to that for Switzerland and Canada (each 77 years), and above that for France, Greece, New Zealand and Spain (each 76 years), the United Kingdom and the United States of America (75 and 74 years respectively).

Australia's life expectancy at birth for females was similar to that for France, Spain and Switzerland (each 83 years). It was behind Japan and Hong Kong (each 85 years), and above Canada and Sweden (each 82 years), Greece and New Zealand (each 81 years), the United Kingdom and the United States of America (each 80 years).

Male life expectancy at birth was highest in the Australian Capital Territory (79.2 years), while female life expectancy was highest in the Australian Capital Territory (83.3 years), closely followed by Western Australia (82.9 years). The lowest life expectancy was in the Northern Territory where a boy born in 2000–2002 could expect to live an average of 71.3 years, and a girl, 76.7 years.

In 2000–2002, the life expectancy at birth for males and females varied across the regions of Australia by up to 11 years. Male life expectancy at birth was highest in Canberra (79.2 years) followed by Outer Adelaide, Melbourne, Moreton (Queensland) and Perth (each 78.4 years), while female life expectancy was highest at 83.4 years in Perth, followed by Moreton (Queensland) and Canberra (each 83.3 years).

Male life expectancy was lowest in the Balance of the Northern Territory (68.1 years) followed by the Kimberley (71.8 years), and North-West Queensland (72.3 years). Female life expectancy was lowest in the Balance of the Northern Territory (73.6 years), North-West Queensland (77.6 years) and the Kimberley (78.0 years).

Expert Opinion (Leonie Tickle):

Answer is C (80 -82) if rounded down.

Results
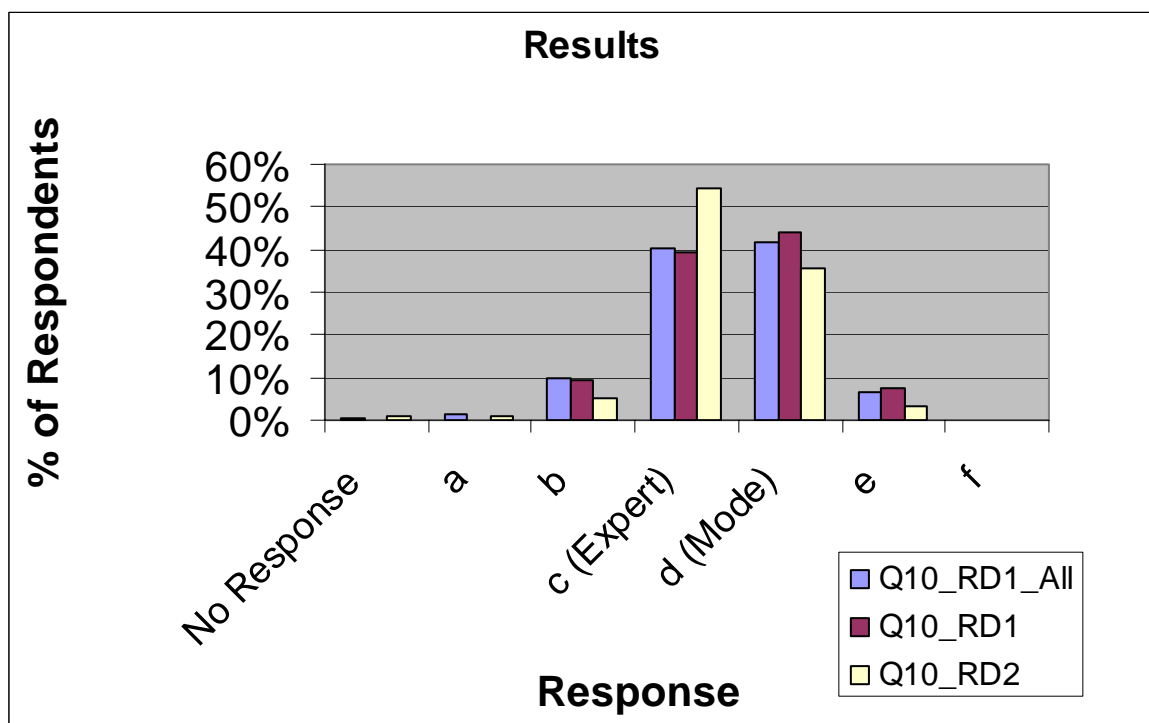
Selected Comments Round 1

Goes up to 100.

Selected Comments Round 2

Greater than 85 and 95.

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	1	0	0	0	0	0	1
	b	0	0	4	6	1	0	0	11
	c	1	0	1	37	9	0	0	48
	d	0	1	1	23	31	1	0	57
	e	0	0	0	2	4	3	0	9
	f	0	0	0	0	0	0	0	0
	Total	1	2	6	68	45	4	0	126

Movement Vs Expert

Away	No Change	Toward
12	78	35

Movement Vs Mode

Away	No Change	Toward
27	78	20

11. In 20 years time the life expectancy at birth for females in Australia will be...

a) < 82 b) 82 – 84 c) 85 – 87 d) 88 – 90 e) 91 +
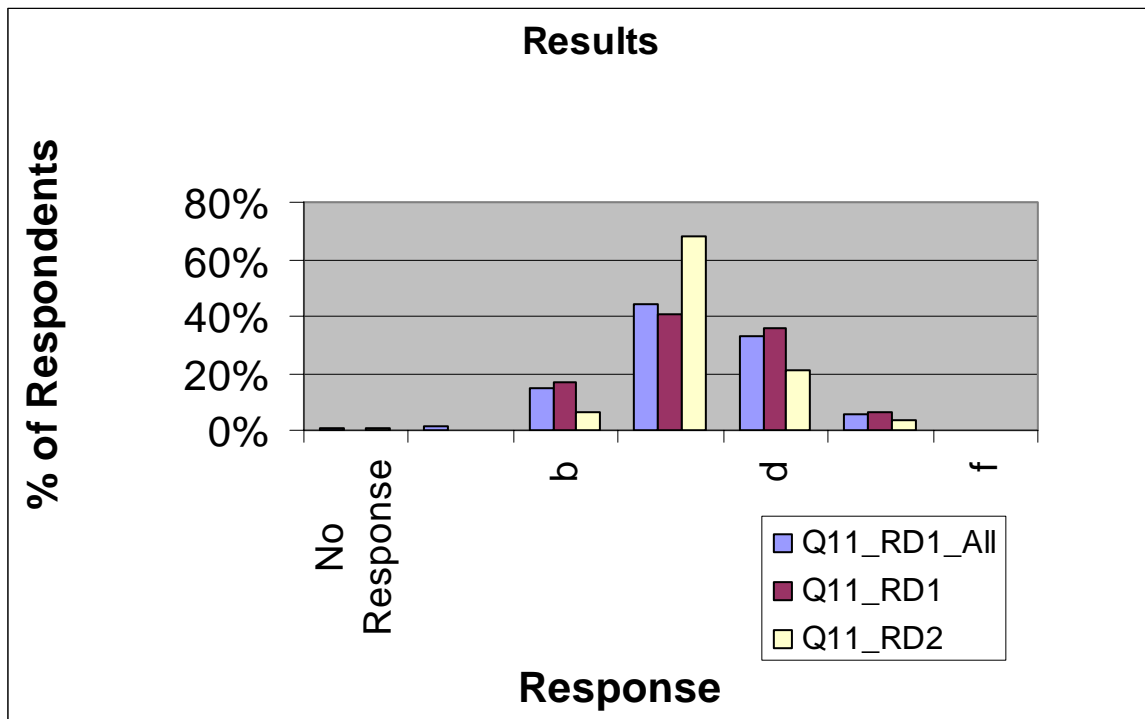
Round 1 Data

See Q10

Round 2 Data

Expert Opinion (Leonie Tickle):

Answer is C (85 -87) if rounded down.

Justification for 10 and 11: Experience has shown that in Australia and other developed countries, official forecasts of life expectancy are almost always assumed to increase at a slower rate than turns out to be the case. This conservatism arises from a common belief that most of the possible reduction in mortality has already been achieved and that a limit will soon be reached. Assuming instead that mortality declines over the last three decades are a good guide to what might be expected in future; life expectancy should reach around 82.5 for males and 87.5 for females by 2025.

Results

Y-axis: % of Respondents (0% to 80%)
X-axis: Response (No Response, b, d, f)
Legend: Q11_RD1_All, Q11_RD1, Q11_RD2

Selected Comments Round 1

Goes up to 110.

Selected Comments Round 2

Greater than 90 and 95.

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	1	0	0	0	0	0	1
	b	0	0	5	15	0	0	0	20
	c	0	0	2	43	5	1	0	51
	d	1	0	2	23	19	1	0	46
	e	0	0	0	2	4	2	0	8
	f	0	0	0	0	0	0	0	0
	Total	1	1	9	83	28	4	0	126

Movement Vs Expert

Away	No Change	Toward
9	72	44

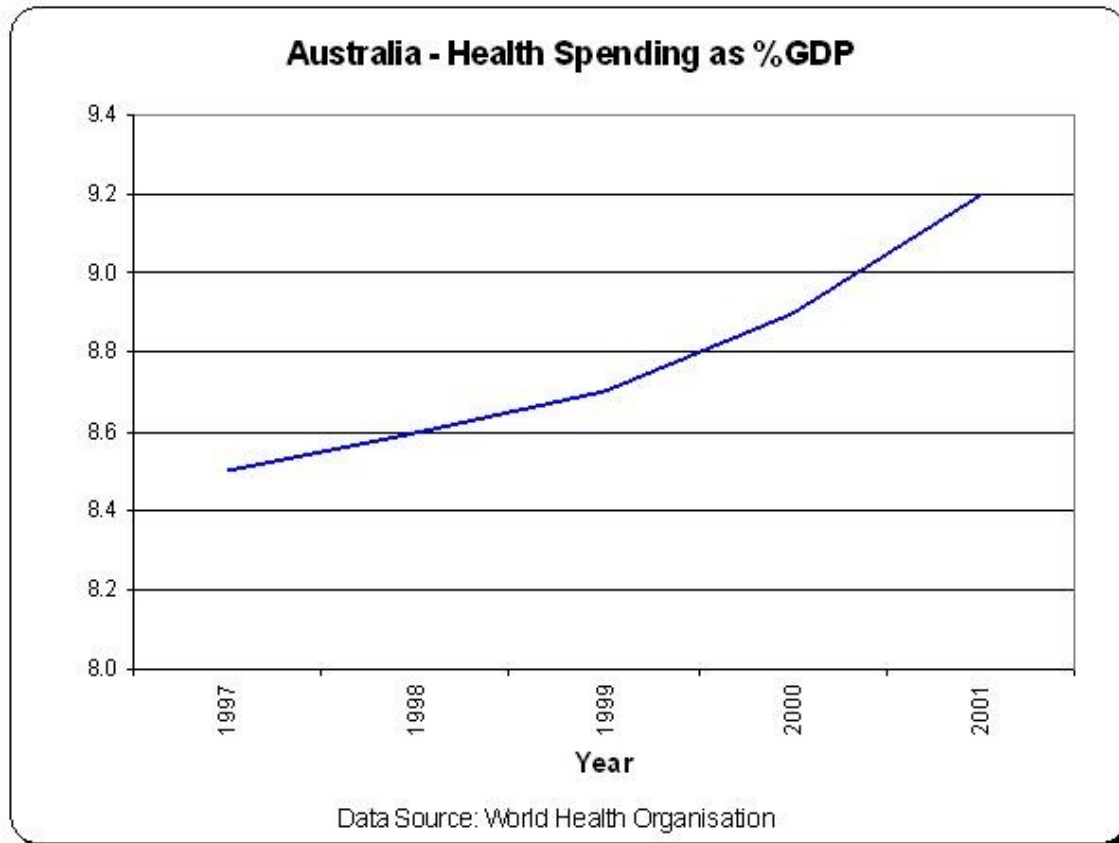**Movement Vs Mode**

Away	No Change	Toward
9	72	44

12. Currently Australia spends 9.2% of GDP on health. In 2025, the percentage of spending on health will be:

(a)   < 9.2%
(b)   9.2 – 10.5%
(c)   10.5 – 12%
(d)   12 - 15%
(e)   >15%

Round 1 Data

Australia - Health Spending as %GDP

Data Source: World Health Organisation

Round 2 Data

Currently, Australia spends 9.2% of its GDP on health . This has been increasing steadily, as can be seen in the figures below of trends in health expenditure. If we fit a linear trend to this graph, it will grow to 13.2% of GDP in 2025, an increase of 43% on current levels.

The graph below shows how the expenditure for Australia compares against some others. We spend more than Great Britain, but much less than the United States. This graph shows that countries such as the US can afford to spend larger proportions of their income on health, and that large increases in Australian spending might be able to be accommodated.

Total expenditure on health as % of GDP
2001

Copyright World Health Organization 2004
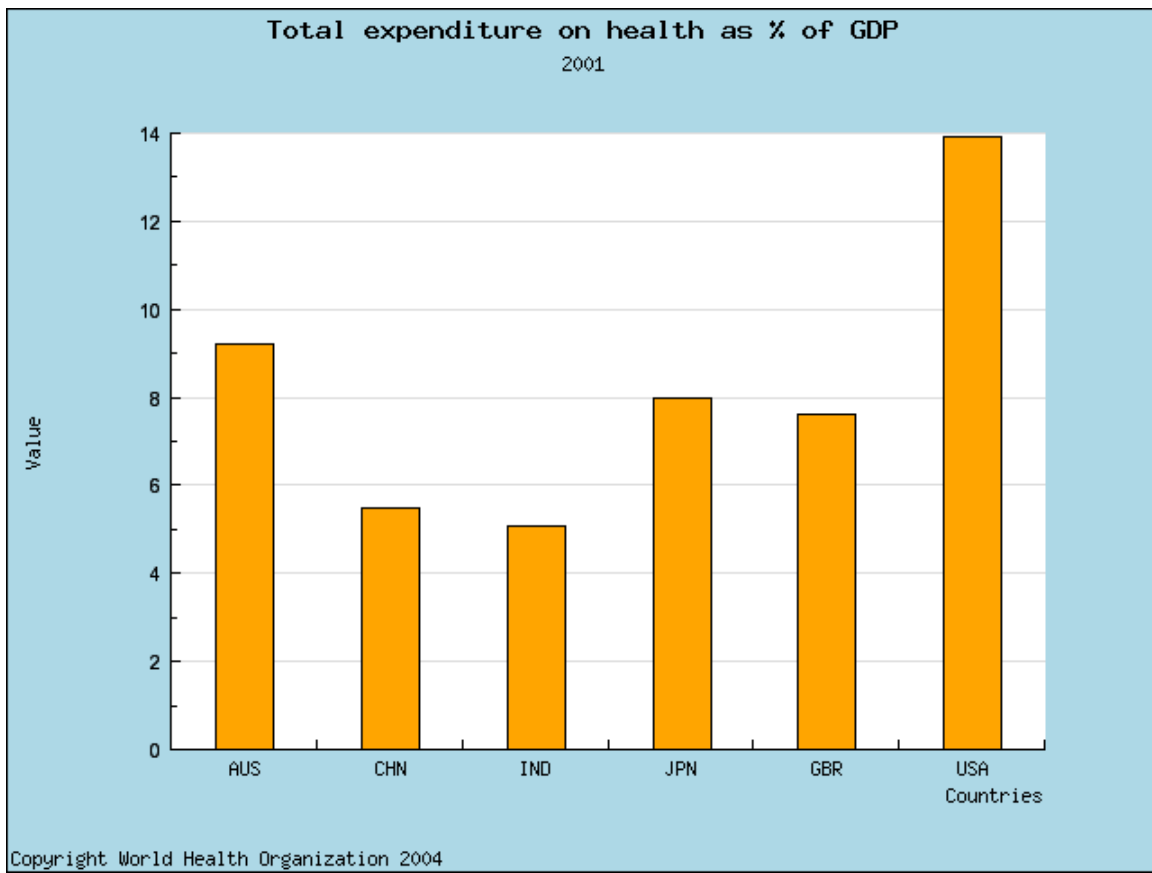
Some argue that health costs may increase exponentially in Australia, due to the aging population in this country. See figure below for an age distribution of the Australia population.

Australia's population by age band
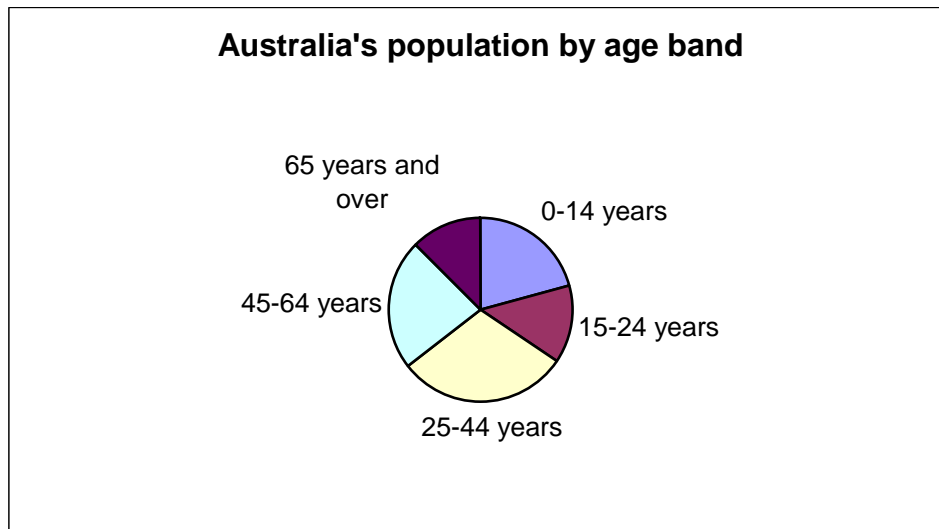
Expert Opinion (Brent Walker)

Answer is C (10.5 – 12%)

Of course the answers are a little subjective. The problem with health costs is they keep growing even when the economy doesn't so in part it will be determined by the state of the economy in the interim and generally the next 20 years should see pretty solid growth in Australia. However I also think that health costs are already too high in Australia and there will be serious moves to curb this growth in the next few years. One of the measures will be to equip every Australian with a personal health record. This will happen within five years and have a big effect on longer term growth in costs.

Results
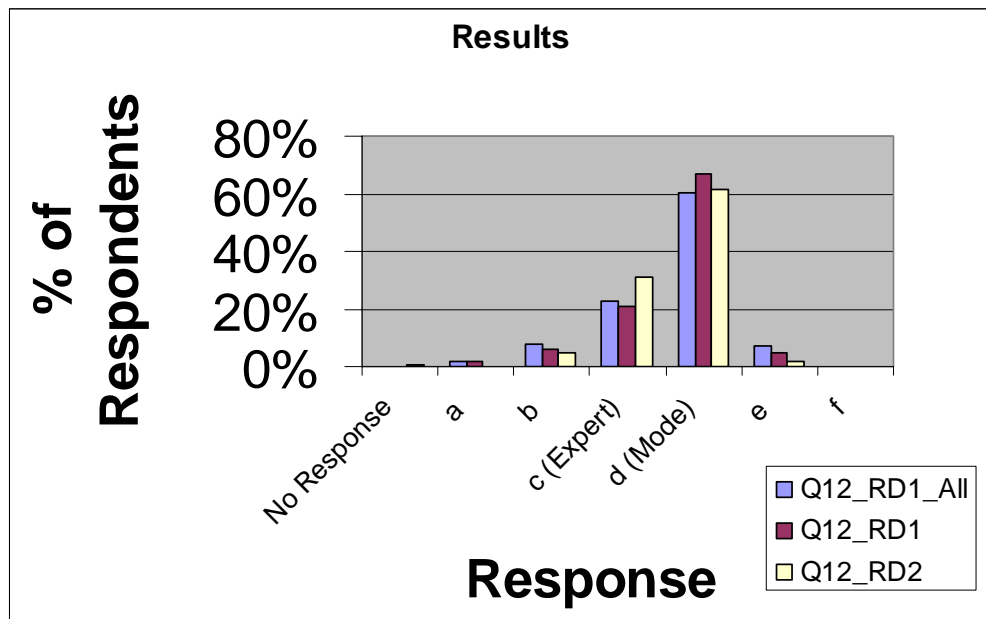
Selected Comments Round 1

Up to 20%.

Selected Comments Round 2

Greater than 15%.

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	0	2	0	1	0	0	3
	b	0	0	4	1	2	0	0	7
	c	0	0	1	12	12	0	0	25
	d	1	0	0	25	59	0	0	85
	e	0	0	0	1	3	2	0	6
	f	0	0	0	0	0	0	0	0
	Total	1	0	7	39	77	2	0	126

Movement Vs Expert

Away	No Change	Toward
13	79	33

Movement Vs Mode

Away	No Change	Toward
26	78	21

13. In 20 years time genetic test results will be used by insurers to determine (a) health insurance premiums (b) life insurance premiums (c) both (d) neither

Round 1 Data

None

Round 2 Data

Expert Opinion (Brent Walker)

Answer is Neither.

In regard to genetic testing. It won't be allowed in health insurance unless we scrap the community rating principle. The use by life insurance of genetic testing is a different matter. There will obviously be some loading parameters that will be contingent on specific genetic tests but I don't think it will be widespread across the diseases that commonly kill us. The genome program is showing us that most diseases have multifactorial causes. Genes are only part of the disease story and often a large number of genes play a part but also environmental conditions provide very significant factors. So even if the role of dozens of genes and several different environmental factors could be attributed to the cause of most of the diseases that we will die from in the future, the testing of these, getting the order right and the proving that the right environmental conditions occurred in the right sequence will be beyond the industry. Even then the modeling is unlikely to be strongly predictive enough to base premium rates!
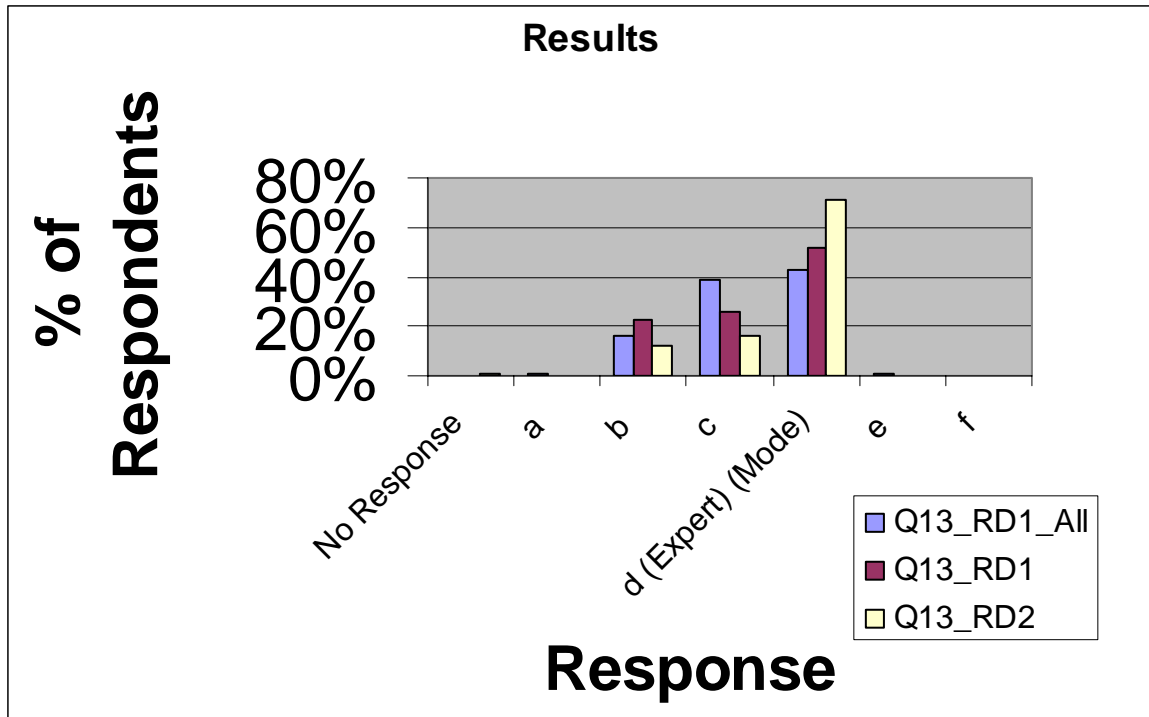
Results

Selected Comments Round 1

None

Selected Comments Round 2

None

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	0	0	0	0	0	0	0
	b	0	0	10	4	15	0	0	29
	c	1	0	4	14	13	0	0	32
	d	0	0	3	2	60	0	0	65
	e	0	0	0	0	0	0	0	0
	f	0	0	0	0	0	0	0	0
	Total	1	0	17	20	88	0	0	126

Movement Vs Expert

Away	No Change	Toward
9	84	32

Movement Vs Mode

Away	No Change	Toward
9	84	32

Environment Questions

14. In 2000 Australia's energy use per capita was 256.5 GJ. In 20 years time energy consumption per capita in Australia will be...

a) <256.5 GJ b) 256.5 – 275 GJ c) 275 – 300 GJ d) 300 – 350 GJ e) >350 GJ

None

Australia's consumption of conventional energy (i.e. fossil fuel, wood, bagasse, hydro-electricity) has grown steadily, with growing population and economic activity. Indeed, final energy consumption has doubled since the early 1970s.
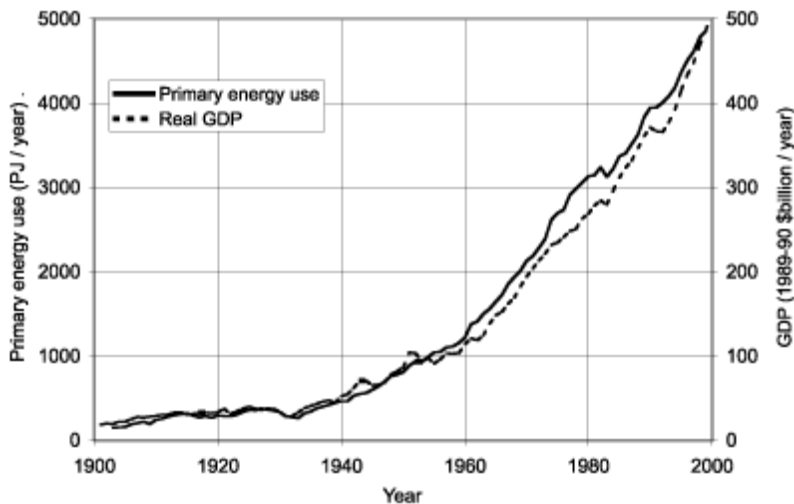

Figure 25: Primary energy use and GDP, 1900-2000. [HS Indicator 1.1], [HS Indicator 0.2]
Sources: ABARE (1997); Snooks (1994); Vamplew (1987); Poldy and Foran (1999).

Another perspective on energy use can be gained by considering energy use per capita; when compared with other countries, Australia rates among the highest in the world (Figure 30).
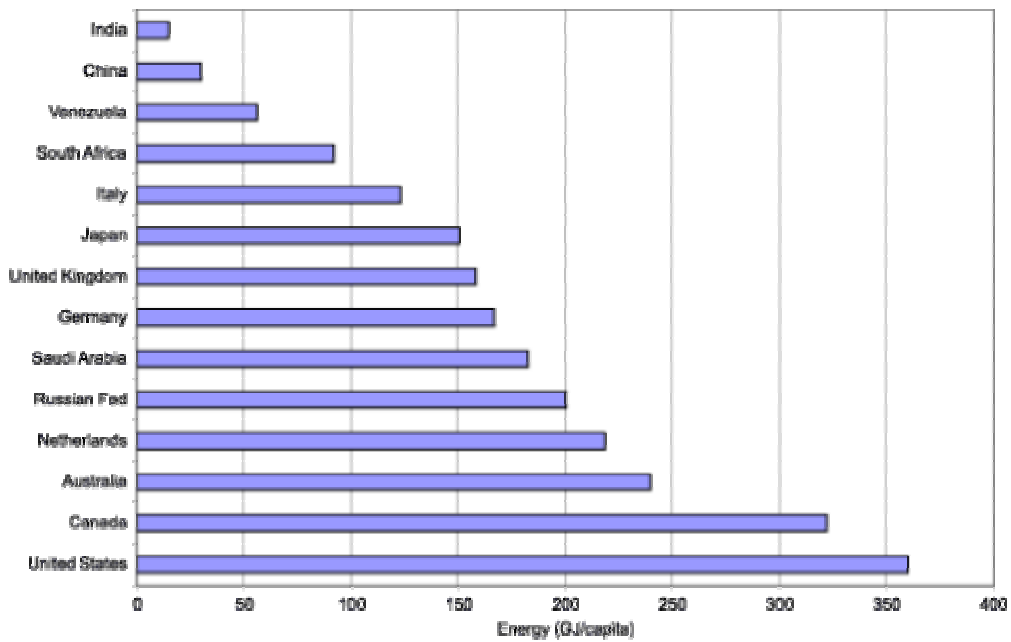

Figure 30: Energy use per capita in Australia and selected countries, 1995.
Source: WRI (1998).

Australia's high energy use per capita is not due merely to high levels of energy use by individuals. As can be seen in Figure 31, non-transport end-use energy consumption by households comprises less than 15% of Australia's overall end-use energy. Private transport comprises a similar proportion of total energy use. Energy use in other sectors is therefore a major issue, as discussed below. Of course, much of the energy used in these other sectors produces goods and services for use by private individuals, so the indirect energy use by households through the consumption of goods and services is also a significant issue.
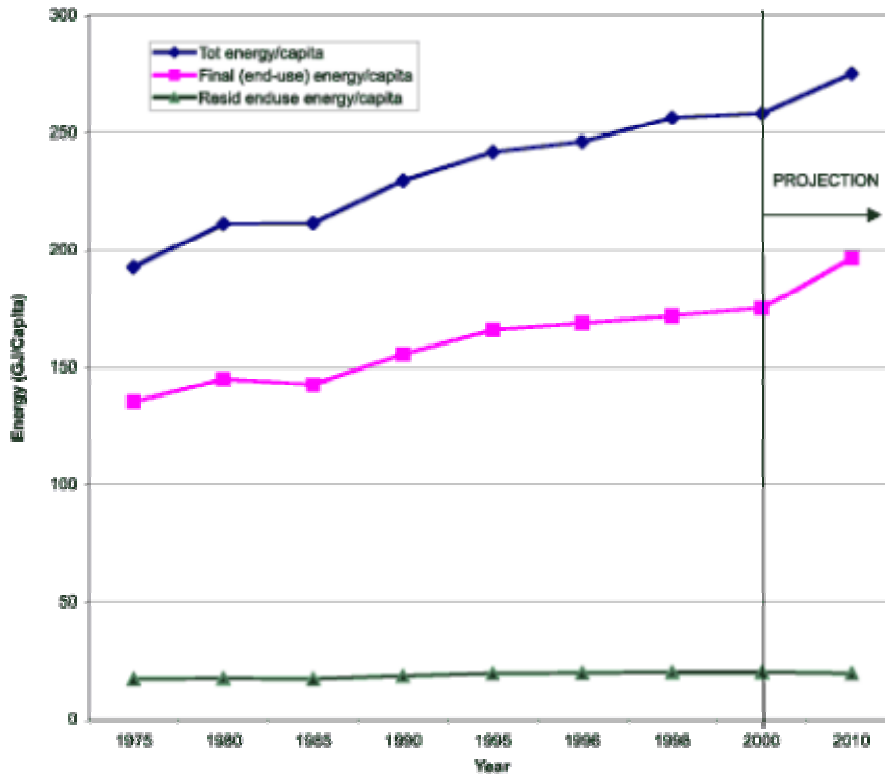

Figure 31: Trends in total energy use per capita, end-use energy consumption per capita, and residential sector end-use energy consumption. [HS Indicator 1.4]
Sources: BRE (1987); Bush et al. (1989, 1993, 1999); Jones et al. (1991); ABS (1994).

Figure 31 also shows that, while household energy use per capita is relatively stable, having risen only 15% over the past 25 years, growth in the rest of the economy's energy use per capita is quite strong.

Overall trends in final or end-use energy consumption by major sectors are shown in Figure 32. Final energy consumption is dominated by industry and transport, where growth is projected to increase. The dramatic growth in commercial sector energy use is evident. This sector's rapid growth is partly due to its increasing share in economic activity, but also reflects poor performance in the take-up of energy-efficient technologies and systems. The trend in residential sector energy growth reflects the combined effects of population growth and the modest growth in energy use per capita shown in Figure 31. However, it should be noted that most energy used in the commercial sector, and almost half of residential sector energy, is electricity. Each unit of electricity consumed involves consumption of around three units of total energy, mostly from coal, for the generation of that electricity.
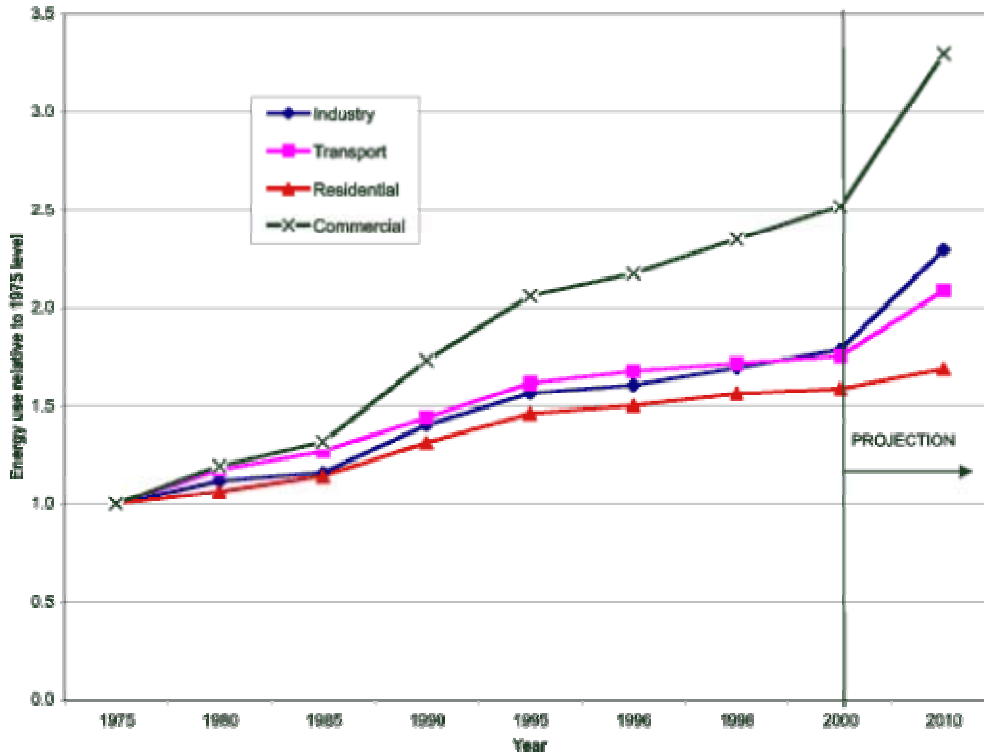

Figure 32: Trends in end-use energy consumption for major sectors relative to 1975 consumption, Australia.[A][HS Indicator 1.2, 1.3, 1.4 and 1.5]
[A]A value of 2 on the vertical scale indicates energy use is double the 1975 level.

Expert Opinion (Barney Foran):

Answer is E (> 350 GJ).

Energy use grows in line with economic growth. In fact it is the cause of economic growth from our physical economy perspective. If we grow at 2% per annum in the long term , we have a doubling time of say 35 years, we will be doing at least 350 GJ by 2025

Results
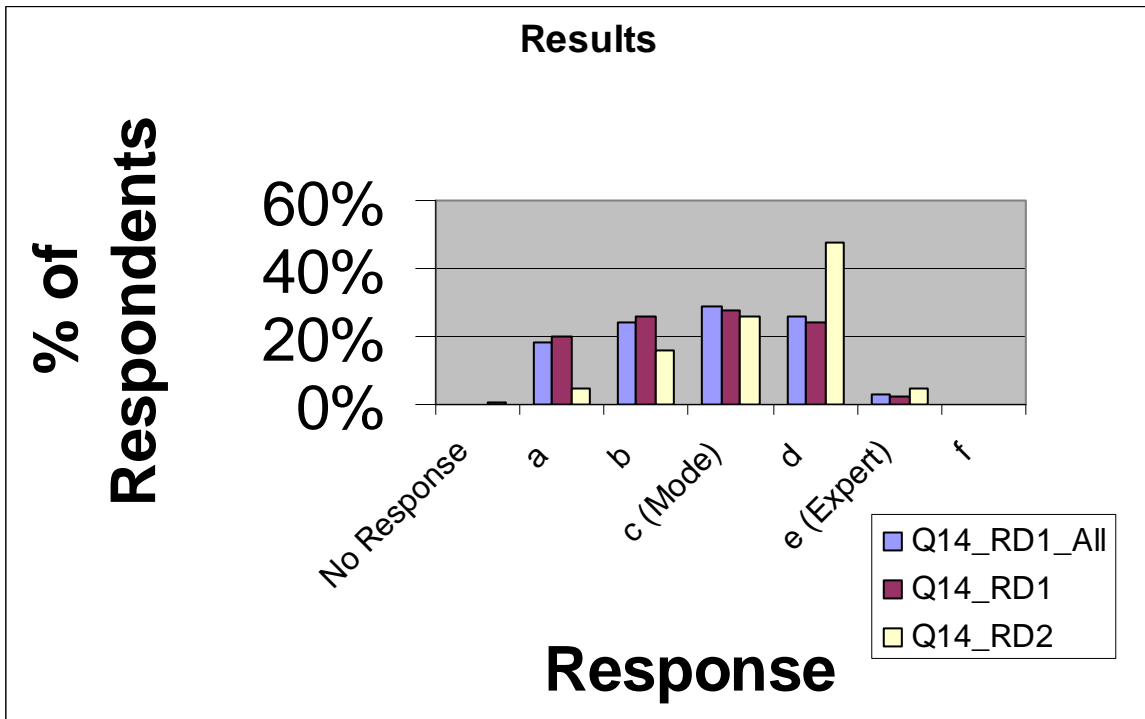
Selected Comments Round 1

Generally to 680, though one response at 1000.

Selected Comments Round 2

Greater than 350 and 380.

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	**0**
	a	0	4	9	4	7	2	0	**26**
	b	0	3	9	8	11	1	0	**32**
	c	1	0	2	14	18	0	0	**35**
	d	0	1	0	5	21	3	0	**30**
	e	0	0	0	1	2	0	0	**3**
	f	0	0	0	0	0	0	0	**0**
	Total	1	8	20	32	59	6	0	**126**

Movement Vs Expert
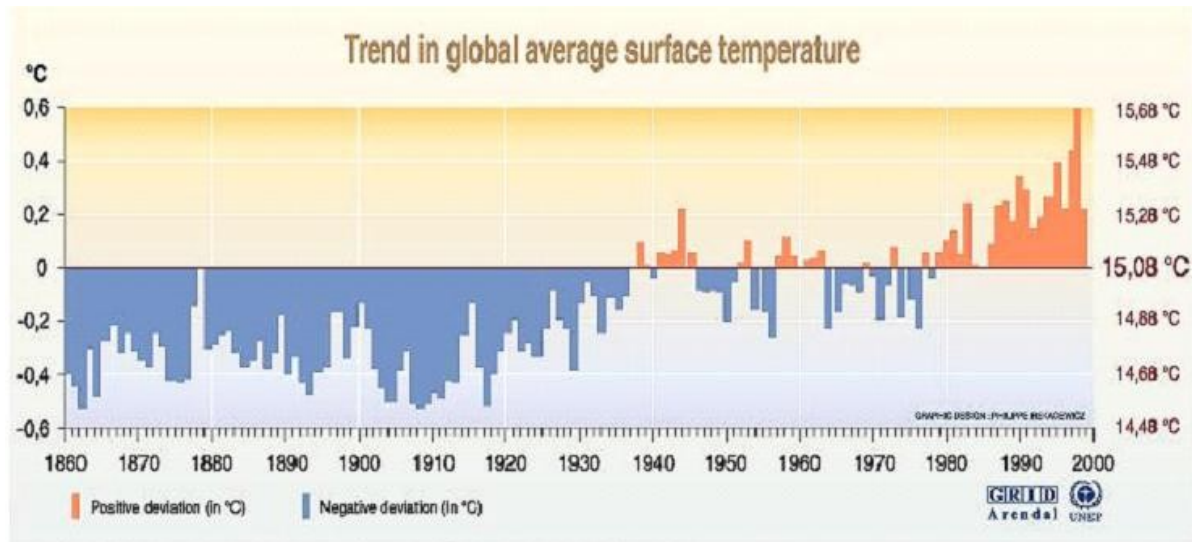
Away	No Change	Toward
14	48	63

Movement Vs Mode

Away	No Change	Toward
28	61	36

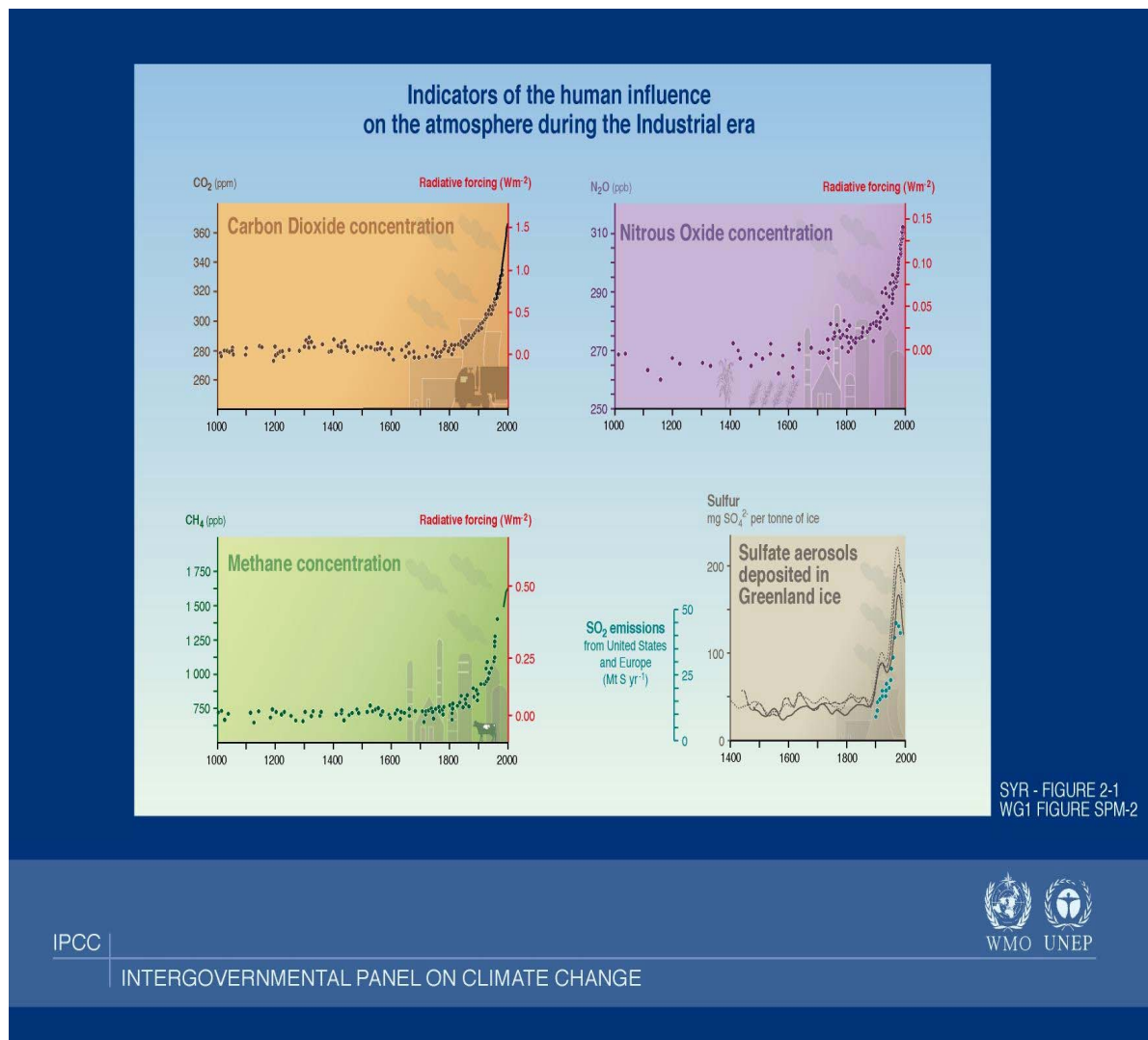**15. In 20 years time the average global temperature will be...**

< 15 C b) 15 – 15.25 C c) 15.25 – 15.5 d) 15.5 – 15.75 e) >15.75

Source: School of environmental sciences, climatic research unit, university of East Anglia, Norwich, United Kingdom, 1998.

Round 2 Data

Source: www.ipcc.ch

Expert Opinion (Barney Foran):

Answer is E (> 15.75).

Given the global rate of economic growth and the way we are hooked on CO2 for growth I'm going for the upper bound of global temperature. I am fairly aware however that we are dealing with a very complex system and we may get wide scale failures of the climate system and for Australia it may be more locked into droughty conditions in many regions combined with higher incidence of heat waves within the context of a temperature which "on the average" does not change too much. We may just get more extreme events.

Results
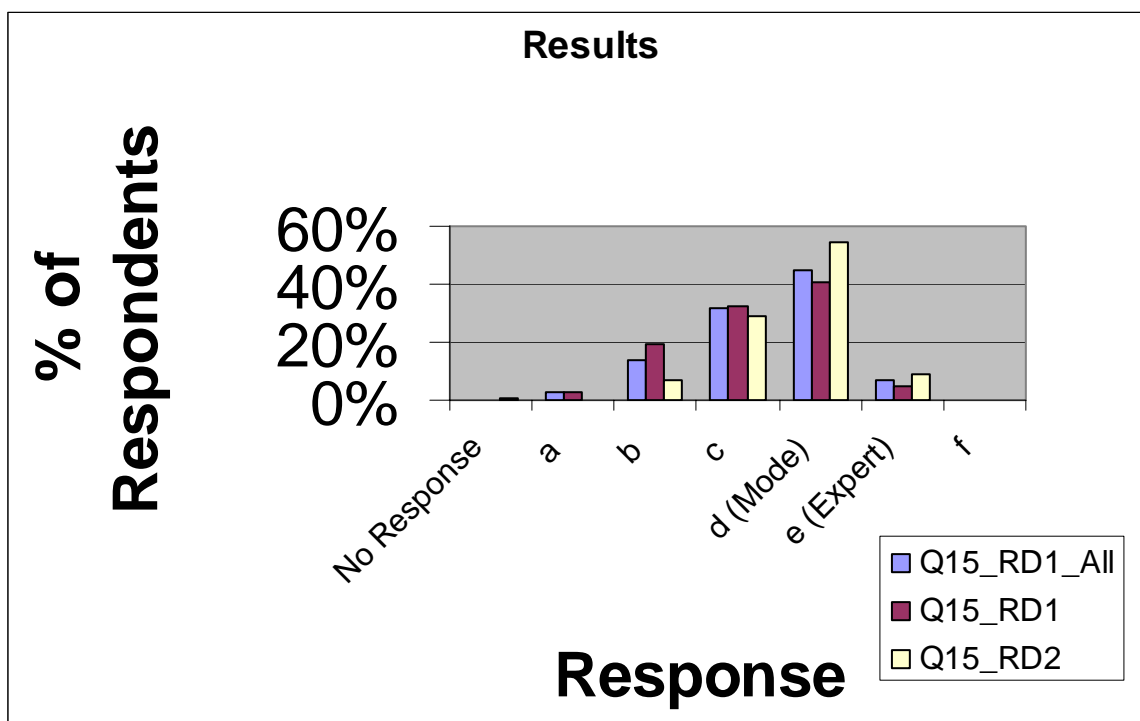
Selected Comments Round 1

Answers around 16C to 17C.

Selected Comments Round 2

16C

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	0	1	0	1	1	0	3
	b	0	0	6	8	9	1	0	24
	c	0	0	2	19	19	1	0	41
	d	1	0	0	8	36	7	0	52
	e	0	0	0	0	3	3	0	6
	f	0	0	0	0	0	0	0	0
	Total	1	0	9	35	68	13	0	126

Movement Vs Expert
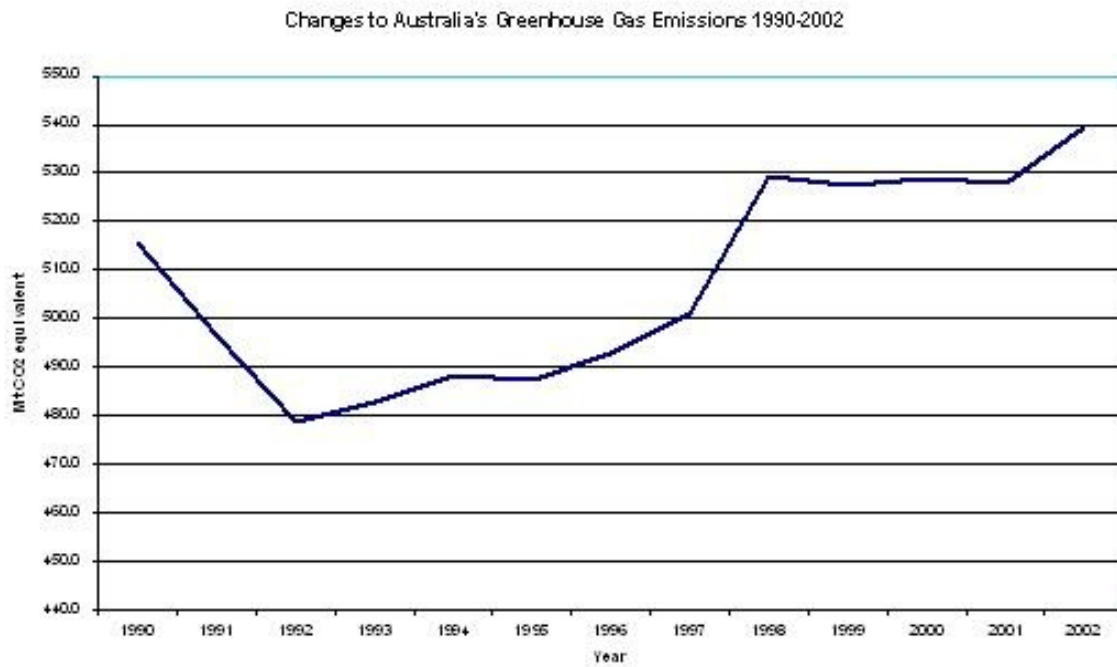
Away	No Change	Toward
13	64	48

Movement Vs Mode

Away	No Change	Toward
17	65	43

16. In 20 years time Greenhouse gas emissions per capita in Australia will be...

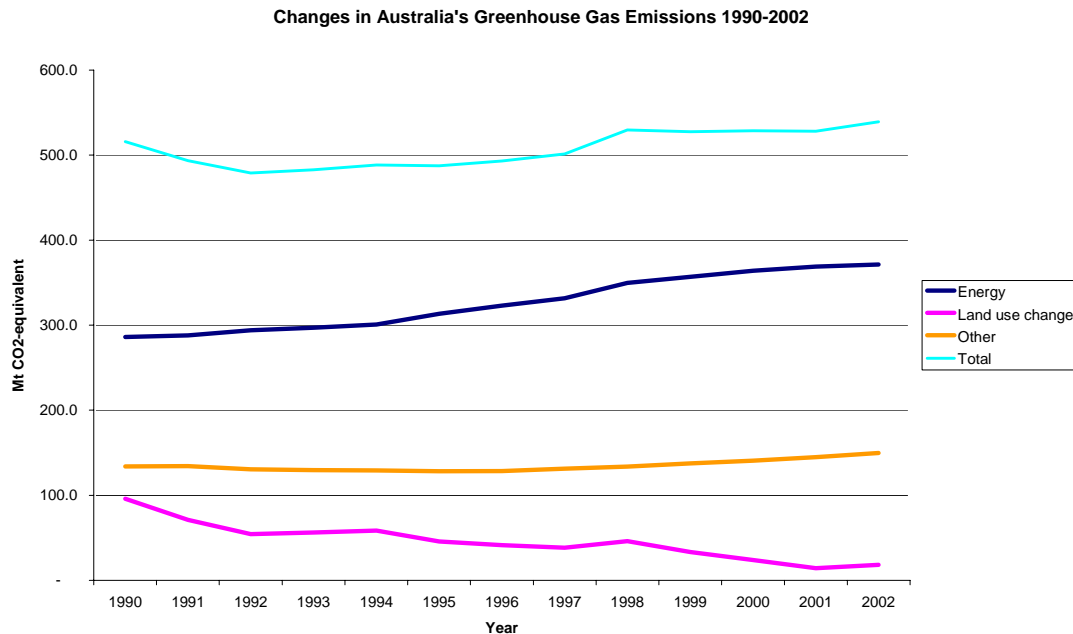a) < 400 million tonnes CO2 – equivalent b) 400 – 450 c) 450 – 500 d) 500 – 550 e) >550

Round 1 Data

Changes to Australia's Greenhouse Gas Emissions 1990-2002

Round 2 Data

The reduction in emissions in the early 1990's has occurred in the land use change sector as shown in the sector graph below.

**Changes in Australia's Greenhouse Gas Emissions 1990-2002**

Source: Australian Greenhouse Office

Expert Opinion (Barney Foran):

Answer is E (> 550).

Most of our growth in greenhouse gas will come from the use of fossil energy which is closely tied to growth in GDP. I'm assuming that our GDP growth will be in the region of 2-3% for the 20 years, say 2% to be conservative. That will give a doubling time of the size of our GDP of around 36 years. Our current CO_2 generation from energy use is about 385 million tonnes per year. Growth in GDP alone will take that to around 577 million tonnes in 20 years, ie above the 550 mt mark. There is a chance that some innovative technologies may come in such as geosequestration from large point sources such as power stations. However power stations are large long lived capital items, and any new items will not penetrate the total infrastructure stock much in that time. Let's be a bit innovative and believe that societal change and some technological change will take place. I'll go back from >55 to item (d) 500-550, but won't budge below that.

Results
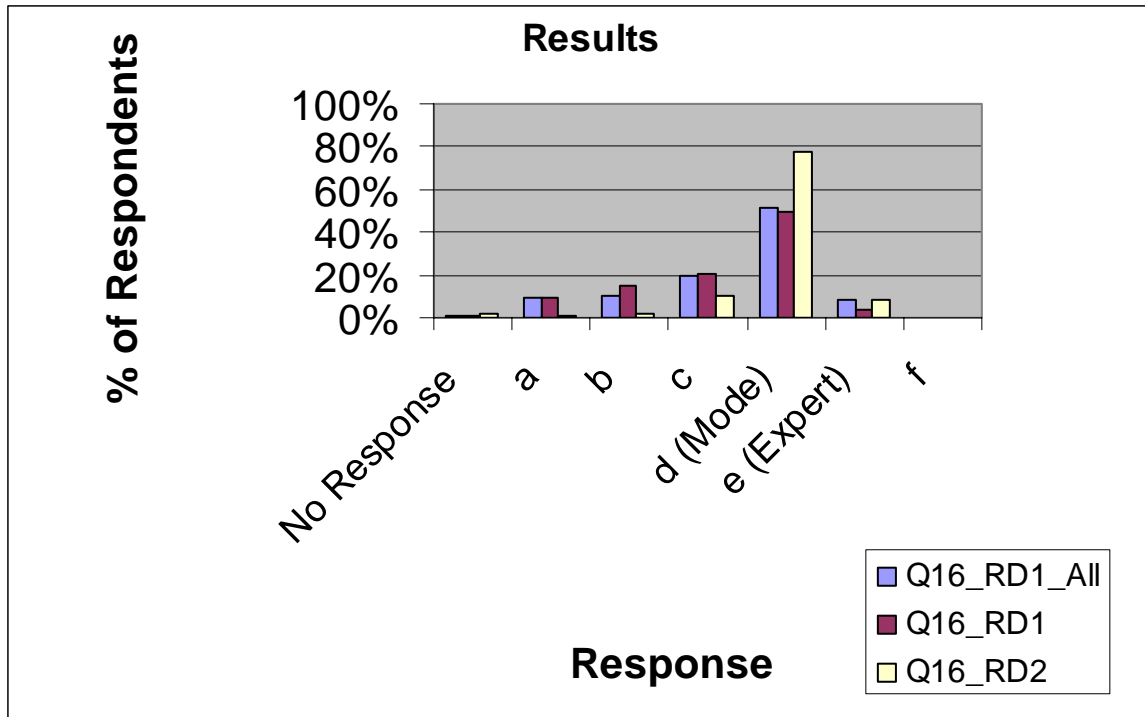
Selected Comments Round 1

Ranges to 850.

Selected Comments Round 2

Ranges to 700.

Transition Matrix

		Round 2 Response						
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	1	0	0	1
	a	0	1	0	3	7	0	0	11
	b	1	0	2	3	11	1	0	18
	c	0	0	0	5	22	0	0	27
	d	1	0	0	1	55	6	0	63
	e	0	0	1	0	1	4	0	6
	f	0	0	0	0	0	0	0	0
	Total	2	1	3	12	97	11	0	126

Movement Vs Expert

| Away	No Change	Toward
3	67	53

Movement Vs Mode

Away	No Change	Toward
8	67	48

17. In 2001 the average waste disposed to landfill per capita in Sydney was 1,027 kilograms. In 20 years time the average municipal waste disposed to landfill per capita in Sydney will be

        a)   <800kg
        b)   800 - 1000kg
        c)   1000 - 1200kg
        d)   1200 - 1400kg
   e)   >1400kg

Round 1 Data

Figure 2.13: Waste disposal rates for all sectors and waste disposed of per capita, SMA, 1990-2001
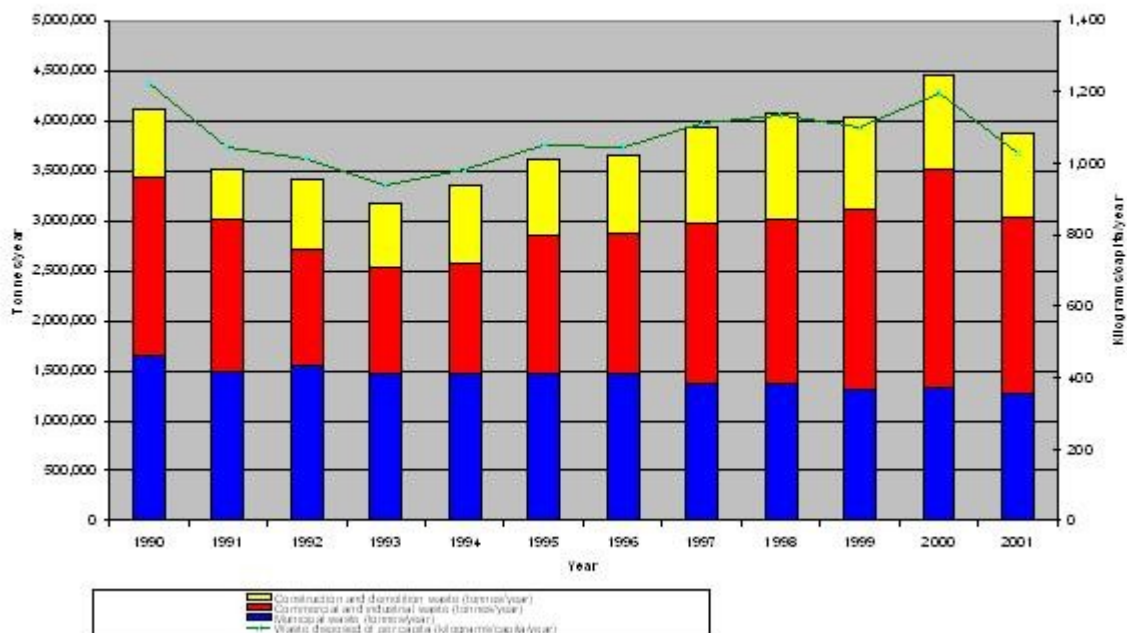
Round 2 Data

Since a national waste reduction target of 50% by the year 2000 was adopted by ANZECC in 1992, a number of state-level waste minimisation initiatives have steadily gained momentum. The guiding principle for all current waste management strategies is to begin with waste avoidance in the first place, followed by minimisation, recycling, and finally disposal as a last option.
Data of waste disposal and recycling rates for the Sydney Metropolitan area are demonstrated in the graphs above and below.

Figure 2.14: Domestic kerbside recycling, SMA, 1991-2001
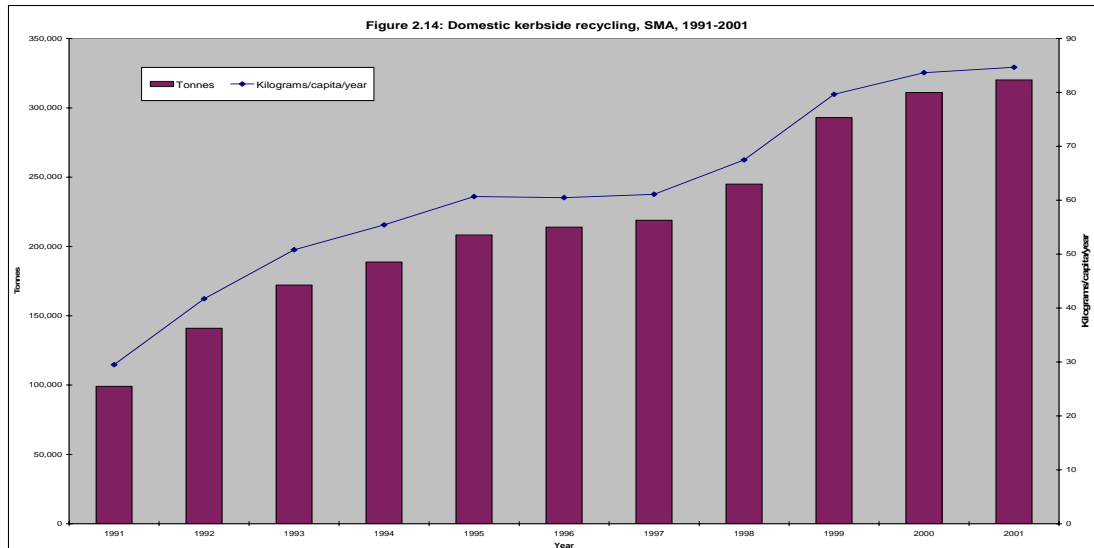
All states and territories have set ambitious waste minimisation goals in line with or exceeding national targets. In New South Wales, a 60% waste reduction by 2000 target from baseline 1990 levels was set. In the ACT, a zero waste target has been set for 2010. In all other states and territories, 50% waste reduction targets by 2000 have been set. The introduction of stringent waste reduction targets has become a primary driver for recent significant downward trends in waste disposal quantities (e.g. in the ACT; see figure below). Most of the gains in waste reduction have been attributed to increases in recycling rates. Yet in spite of increased recycling rates, absolute waste generation rates remain high. Therefore, most waste reduction targets would not be attainable by their stipulated deadlines. In Sydney, the level of waste reduction achieved by 2000 against the 1990 baseline level was close to 18%, well below the 60% target set by the New South Wales Government (Holden 2000). To meet waste reduction targets in WA, the required per capita disposal rate in metropolitan Perth is 0.8 tonnes/year by 2000. Between 1995 and 1997, the actual per capita waste disposal rate in Perth was 1.13 tonnes/year (DEP WA 1998).
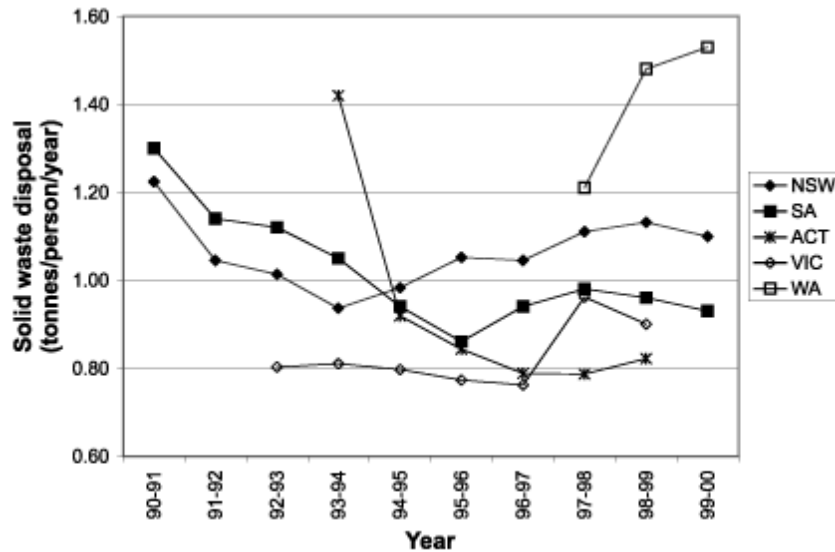
Solid waste disposal rates (tonnes/person/year). [HS Indicator 10.2]
Note: Significant changes in values from one year to another may indicate changes in data coverage, e.g. between 1996 and 1998 in Victoria.
Sources: Unpublished data from EcoRecycle Victoria, EPA NSW, EPA SA, ACT Government, and DEP WA.

Expert Opinion (Barney Foran):

Answer is E (> 1400kg).

In a similar argument to my one about GDP and CO2, I'll invoke a similar argument to take us into the 1200 to 1400 kg range. This may be one area where I am wrong. Waste is a more touchy feely thing but we are playing around with it now by attempted recycling. However the products from much recycling don't have much of a market and we are getting large stockpiles of unusable stuff. Prospects of considerable change revolve around using green waste for compost for local food production and the use of plastic/paper for energy production in a local context perhaps turning plastic back into fuel oil. Waste will still go up in line with GDP in this scenario, but "waste to landfill" will go down as we will recycle a large part of the stream into energy production.

Results
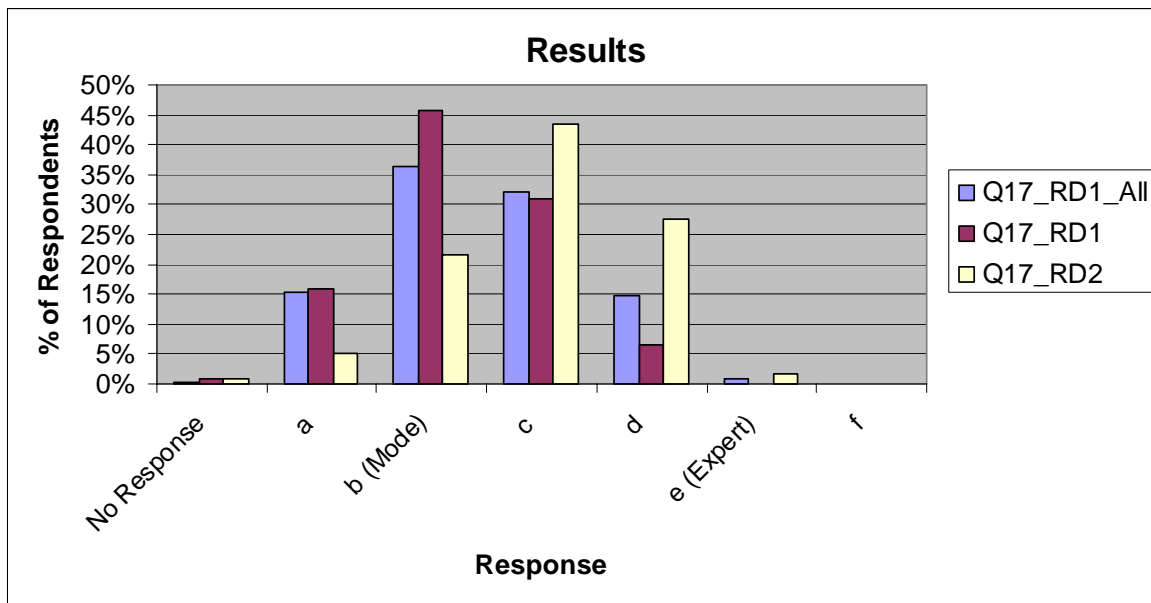
Selected Comments Round 1

Most answers to 1500Kg, though one answer at 5000Kg.

Selected Comments Round 2

Both suggestions were greater than 1400.

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	1	0	0	1
	a	0	4	9	5	2	0	0	20
	b	0	2	17	28	10	0	0	57
	c	1	0	1	20	15	2	0	39
	d	0	0	0	3	5	1	0	9
	e	0	0	0	0	0	0	0	0
	f	0	0	0	0	0	0	0	0
	Total	1	6	27	56	33	3	0	126

Movement Vs Expert

Away	No Change	Toward
6	46	72

Movement Vs Mode

Away	No Change	Toward
60	51	13

Miscellaneous Questions

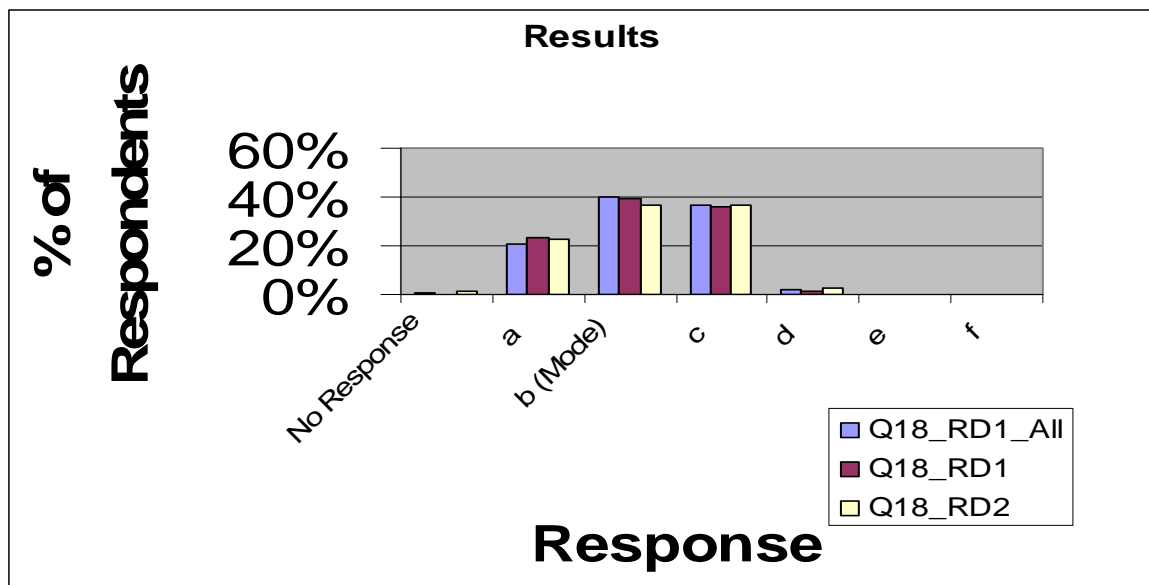**18. In 20 years time, Australia will be:**

(a) a Constitutional Monarchy with a governor general (b) a Republic with a popularly elected president (c) a Republic with a president elected by parliament (d) something else

Round 1 Data

None

Round 2 Data

None

Results

Selected Comments Round 1

5 other responses suggest republic but with a variant:
    no president
    president elected by Senate
    president appointed by a group of qualified Australians
    PM as head of state and head of govt
    a banana republic
One response suggested Australia would be part of a multi-national confederation (a la european union)
One response suggested Australia would be privately owned

Selected Comments Round 2

republic with no president
part of a multi-national confederation (a la european union)
51st state of USA
Dictatorship/military
Pre-fascist

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	1	0	0	0	0	1
	a	1	21	3	4	1	0	0	30
	b	1	2	37	8	1	0	0	49
	c	0	5	5	33	0	0	0	43
	d	0	0	2	0	1	0	0	3
	e	0	0	0	0	0	0	0	0
	f	0	0	0	0	0	0	0	0
	Total	2	28	48	45	3	0	0	126

Movement Vs Expert

    Not applicable

Movement Vs Mode

Away	No Change	Toward
12	101	10

19. What are the 3 biggest risks to mankind at the moment?
(a) terrorism (b) 'rogue' states (c) doctrine of regime change (d) inequity in wealth globally (e) environmental degradation (f) economic mismanagement (g) disease (h) natural disaster (i) extra-terrestrial (j) Other (please specify)
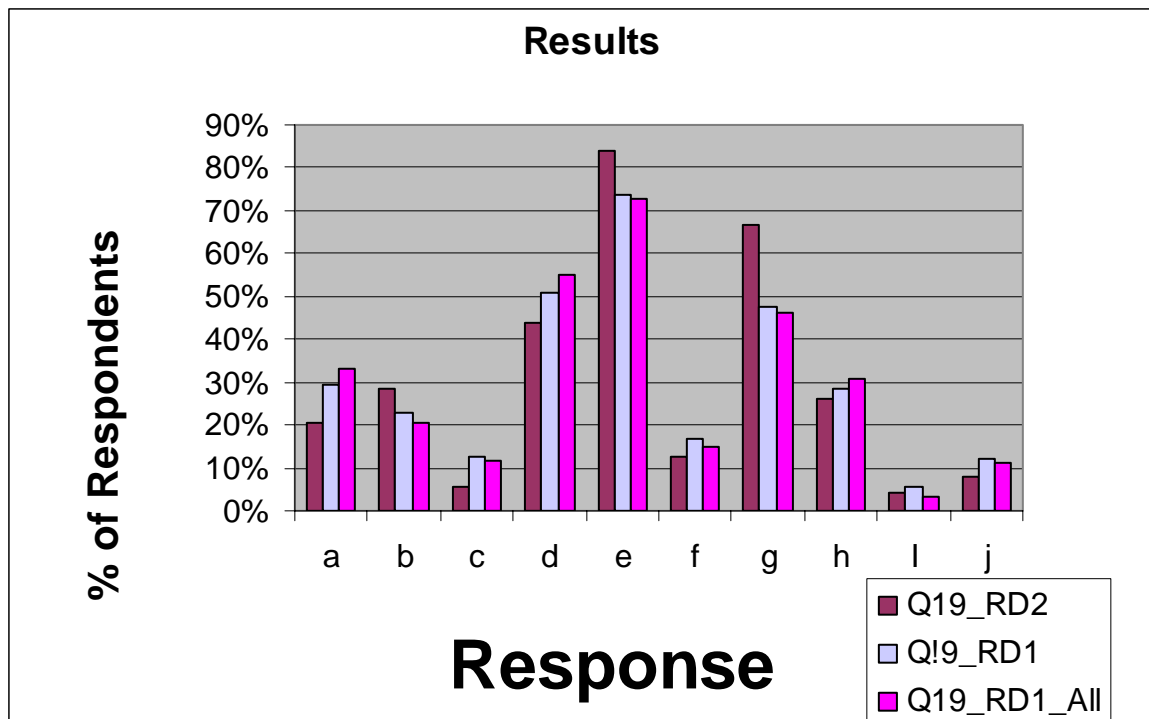
Round 1 Data

None

Round 2 Data

Expert Opinion (Adam Spencer):

Answer is E – environmental degradation – by a long way – specifically global warming. Second and third biggest risks are B – rogue states and G – disease.

Selected Comments Round 1

The 41 "other" responses can be classified as
- political or war (19 responses):
  - USA (3),
  - George W Bush (3),
  - Israel,
  - politicians,
  - Green fundamentalism,
  - lack of respect for freedom of thought as in Right Wing countries like US and Australia,
  - nuclear war (6),
  - unspecified war (2),
  - armaments industry
- breakdown of social structures and values (15 responses):
  - loss of religion or ignoring/rejecting God (3),
  - family breakdown (2),
  - obesity / sedentary lifestyles (3),
  - depressive illnesses,
  - moral degradation,
  - rogue religions,
  - lack of education in poorer countries,
  - selfishness,
  - greed,
  - apathy
- mismanagement of resources (6 responses):
  - water resource management / access to clean drinking water (2),
  - lack of sustainable energy resources,
  - over-population,
  - collective / consumer stupidity (2)
- one protest vote saying the list was too biased and the question is not about the future

20. What will be the 3 biggest risks to mankind in 20 years time?

(a) terrorism (b) 'rogue' states (c) doctrine of regime change (d) inequity in wealth globally (e) environmental degradation (f) economic mismanagement (g) disease (h) natural disaster (i) extra-terrestrial (j) Other (please specify)
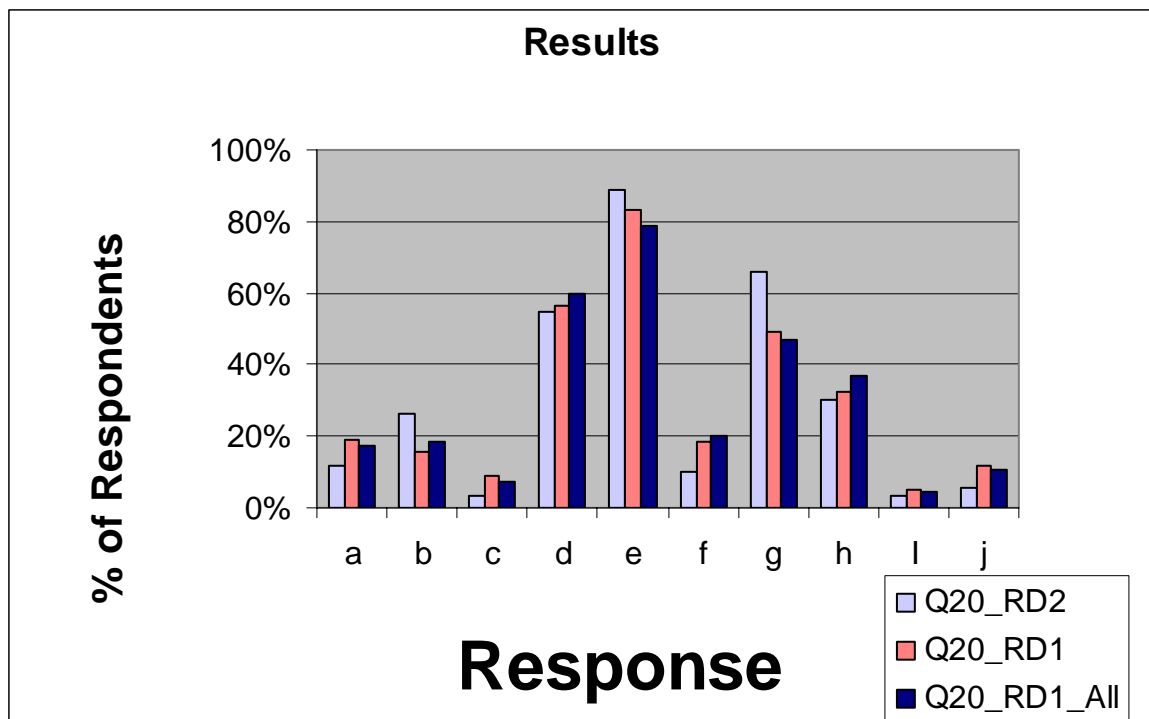
Round 1 Data

None

Round 2 Data

Expert Opinion (Adam Spencer):

Answer is E – environmental degradation and G – disease, which will both be in the Top 3 for the foreseeable future. Third biggest risk in 20 years I'd guess B – rogue states.

Selected Comments Round 1

The 42 "other" responses can be classified as
- political or war (14 responses):
  - economic and political domination by USA
  - Green fundamentalism,
  - nuclear war (4),
  - unspecified war (7 including 2 specifying combatants as USA and China),
  - armaments industry
- breakdown of social structures and values (14 responses):
  - loss of religion or ignoring/rejecting God (3),
  - family breakdown (2),
  - sedentary lifestyles,
  - depressive illnesses,
  - moral degradation,
  - enforced spread of Muslim religion,
  - rogue religions,
  - lack of education,
  - housing,
  - selfishness,
  - greed
- mismanagement of resources (13 responses):
  - global warming (3),
  - water resource management / access to clean drinking water (2),
  - lack of sustainable energy resources,
  - over-population (3, including one specifying that it would lead to war),
  - collective / consumer stupidity (2)
  - technological mismanagement
  - accidental destruction from military or energy technology.
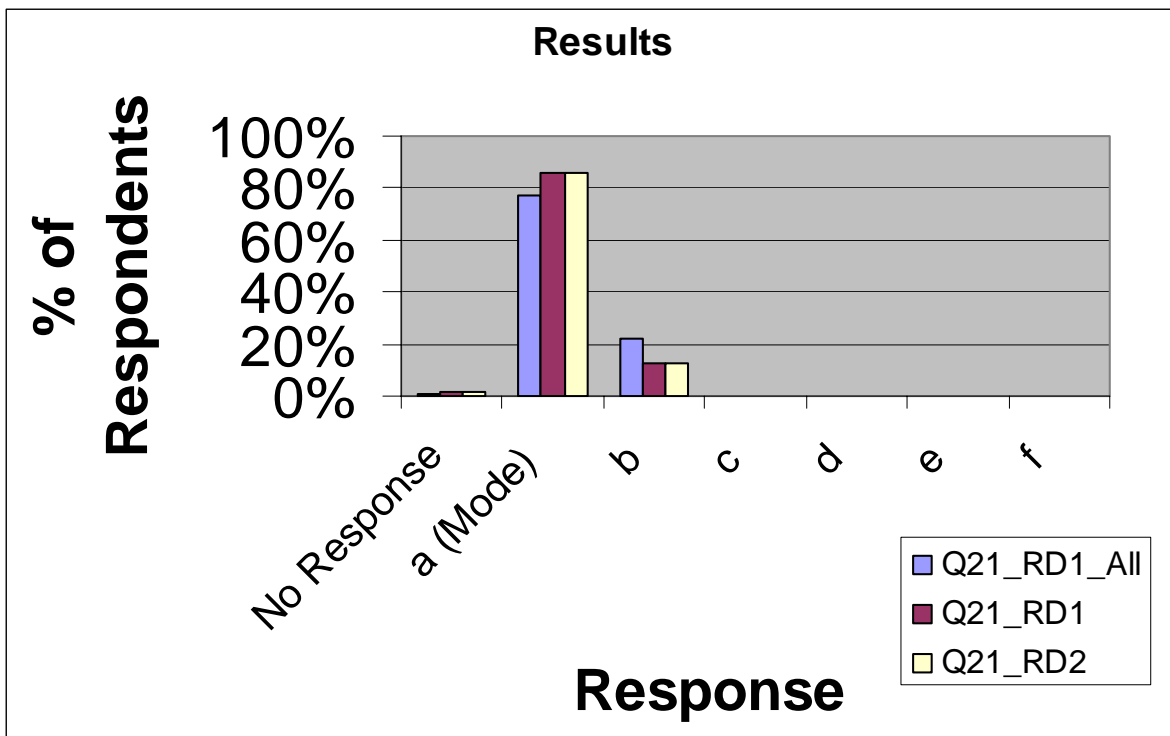- one protest vote saying the list was too narrow and biased

21. In 20 years time the business world will be (a) more prescriptive on corporate governance issues, and rely less on individuals' own "ethical standards" (b) less prescriptive on corporate governance issues, and rely more on individuals' own "ethical standards

Round 1 Data

None

Round 2 Data

None

Selected Comments Round 1

None

Selected Comments Round 2

None

Transition Matrix

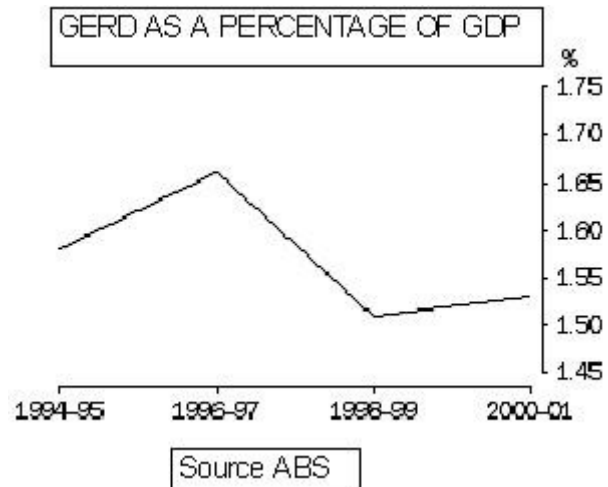|		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	1	0	0	0	0	0	1
	a	2	99	3	0	0	0	0	104
	b	0	9	12	0	0	0	0	21
	c	0	0	0	0	0	0	0	0
	d	0	0	0	0	0	0	0	0
	e	0	0	0	0	0	0	0	0
	f	0	0	0	0	0	0	0	0
	Total	2	109	15	0	0	0	0	126

Movement Vs Expert

Not applicable

Movement Vs Mode

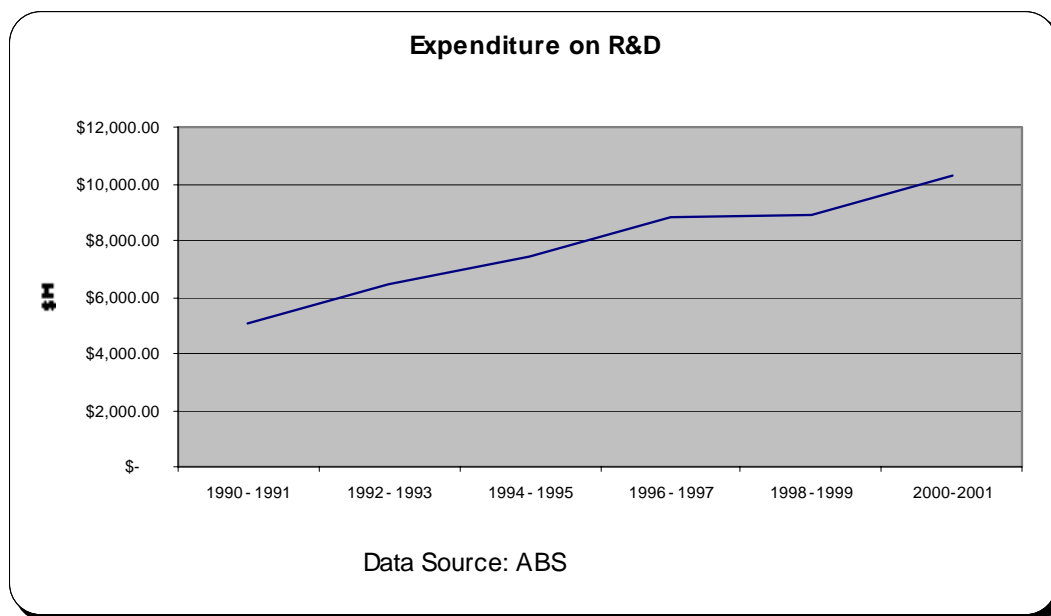| Away	No Change	Toward
3	111	9

22. In 20 years time Gross Expenditure on Research and Development as a % of GDP will be...

a) <1.5% b) 1.5% - 1.75% c) 1.75% - 2% d) 2% - 2.25% e) >2.25%

Round 1 Data

GERD AS A PERCENTAGE OF GDP

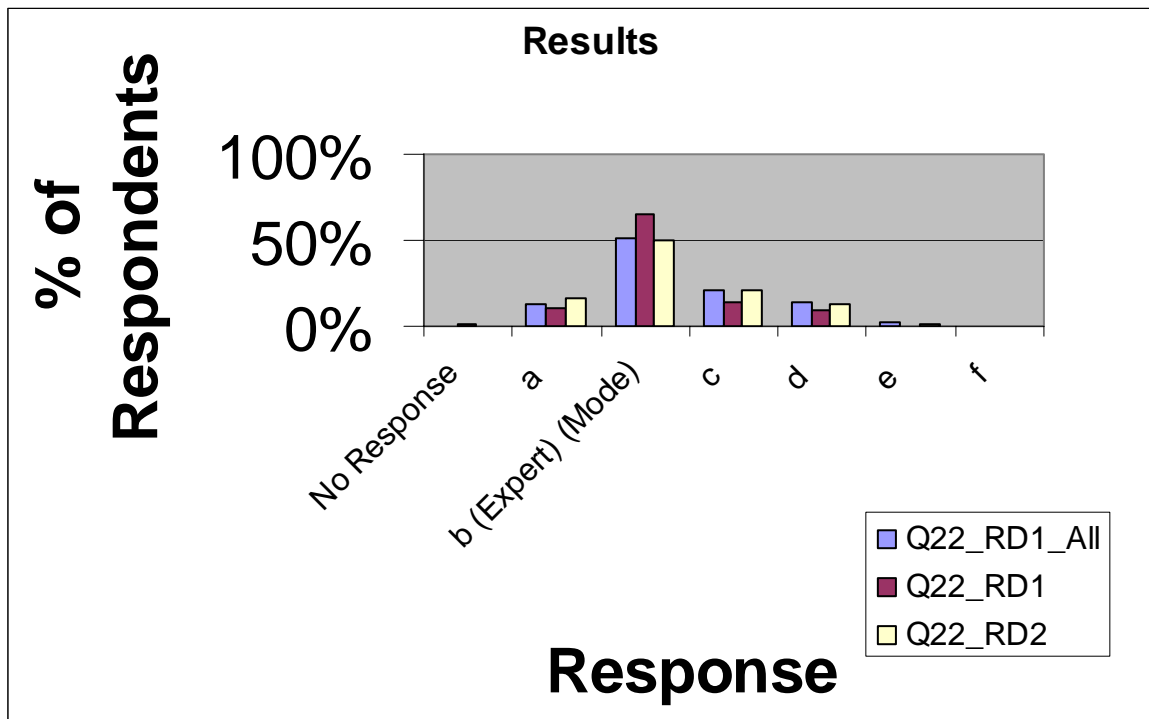Source ABS

Round 2 Data

Expenditure on R&D

Data Source: ABS

Expert Opinions:

Adam Spencer: Answer is B, maybe A – either way, depressingly and ignorantly low.

Richard Cumpston: Based on the track record, 1.5%-1.75% seems a good bet.

Results

Selected Comments Round 1

Answers up to 5%

Selected Comments Round 2

0

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	**0**
	a	0	10	8	0	1	0	0	**19**
	b	1	3	50	6	3	0	0	**63**
	c	0	0	18	9	1	0	0	**28**
	d	0	0	5	4	6	0	0	**15**
	e	0	0	0	1	0	0	0	**1**
	f	0	0	0	0	0	0	0	**0**
	Total	1	13	81	20	11	0	0	**126**

Movement Vs Expert

Away	No Change	Toward
14	75	36

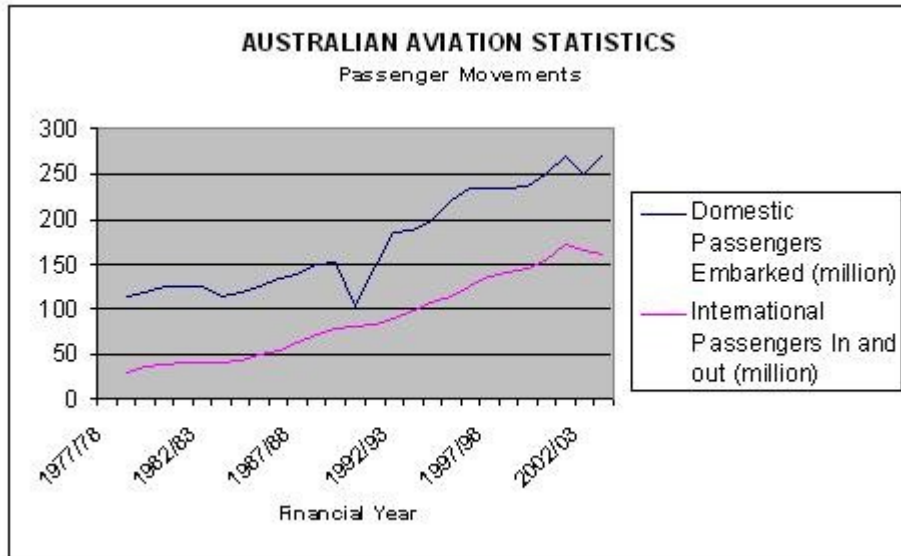**Movement Vs Mode**

Away	No Change	Toward
14	75	36

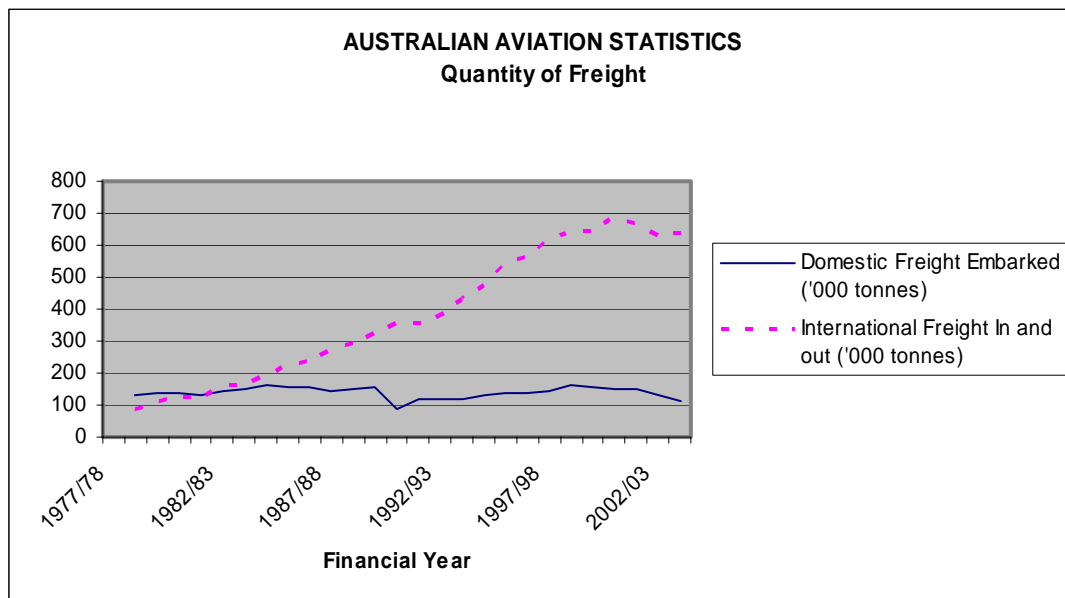**23. In 20 years time the number of domestic aircraft passengers embarking in Australia will be...**

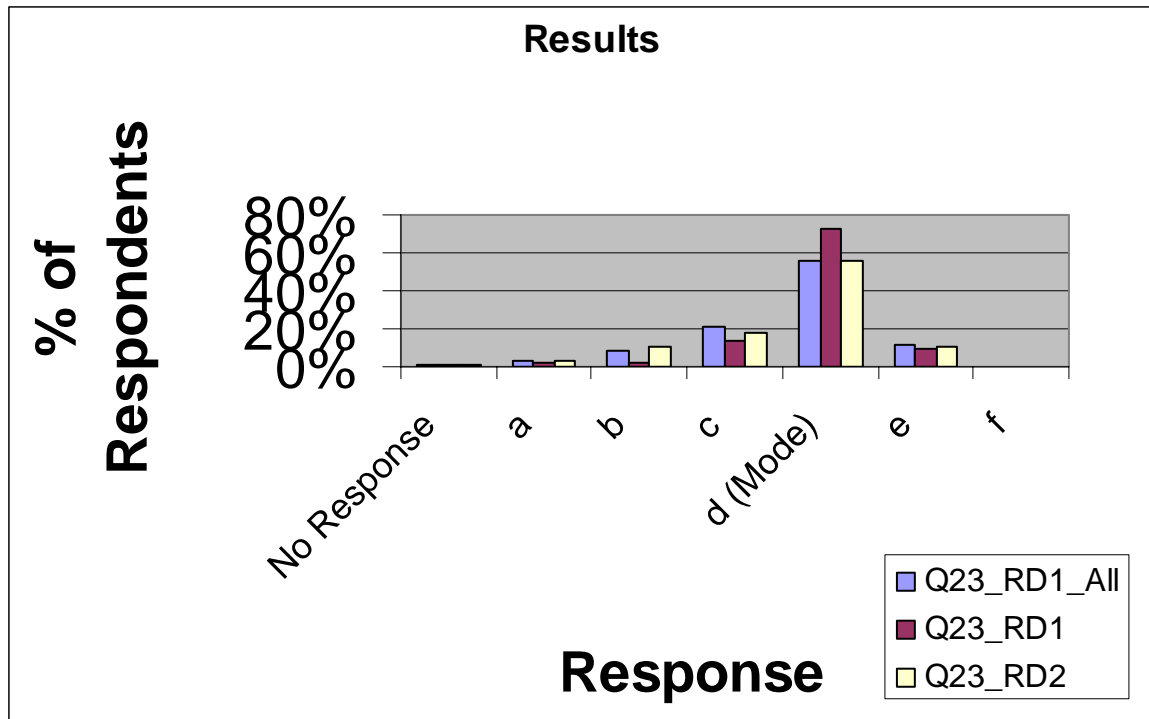a) < 250M b) 250M – 300M c) 300 – 350M d) 350 – 400M e) 400M+

Round 1 Data

Round 2 Data

Source: Bureau of Transport and Regional Economics

Results

% of Respondents (y-axis), **Response** (x-axis)

Categories: No Response, a, b, c, d (Mode), e, f

Legend: Q23_RD1_All, Q23_RD1, Q23_RD2

Selected Comments Round 1

Answers up to 800 million.

Selected Comments Round 2

More than 400 million and one response at 600 million.

Transition Matrix

		Round 2 Response						
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	1	0	0	1
	a	0	2	1	0	1	0	0	4
	b	0	0	1	6	5	1	0	13
	c	0	0	1	6	16	0	0	23
	d	1	0	0	4	63	2	0	70
	e	0	0	0	0	6	9	0	15
	f	0	0	0	0	0	0	0	0
	Total	1	2	3	16	92	12	0	126

Movement Vs Expert

Not applicable

Movement Vs Mode

Away	No Change	Toward
7	81	36

24. In 20 years time the number of FIAAs will be...

a) <1,300 b) 1,300 – 2,000 c) 2,000 – 3,000 d) 3,000 – 4,000 e) 4,000+

Round 1 Data

	Fellows (FIAAs)	Accredited	Associates	Students	Affiliate	Total
1987	501	15	192	375	11	1,094
1988	527	33	274	321	11	1,166
1989	555	40	307	317	10	1,229
1990	589	40	346	306	10	1,291
1991	647	40	340	332	10	1,369
1992	693	35	333	400	9	1,470
1993	759	30	331	436	9	1,565
1994	810	38	345	433	8	1,634
1995	865	40	363	422	7	1,697
1996	921	37	362	423	7	1,750
1997	991	34	370	426	7	1,828
1998	1,048	34	412	545	6	2,045
1999	1,093	29	482	629	6	2,239
2000	1,158	19	517	657	5	2,356
2001	1,212	15	533	770	5	2,535
2002	1,237	21	565	822	9	2,654
2003	1,277	19	600	854	21	2,771
2004	1,332	19	635	872	27	2,885

Source: Institute of Actuaries of Australia Annual Reports

Round 2 Data

None
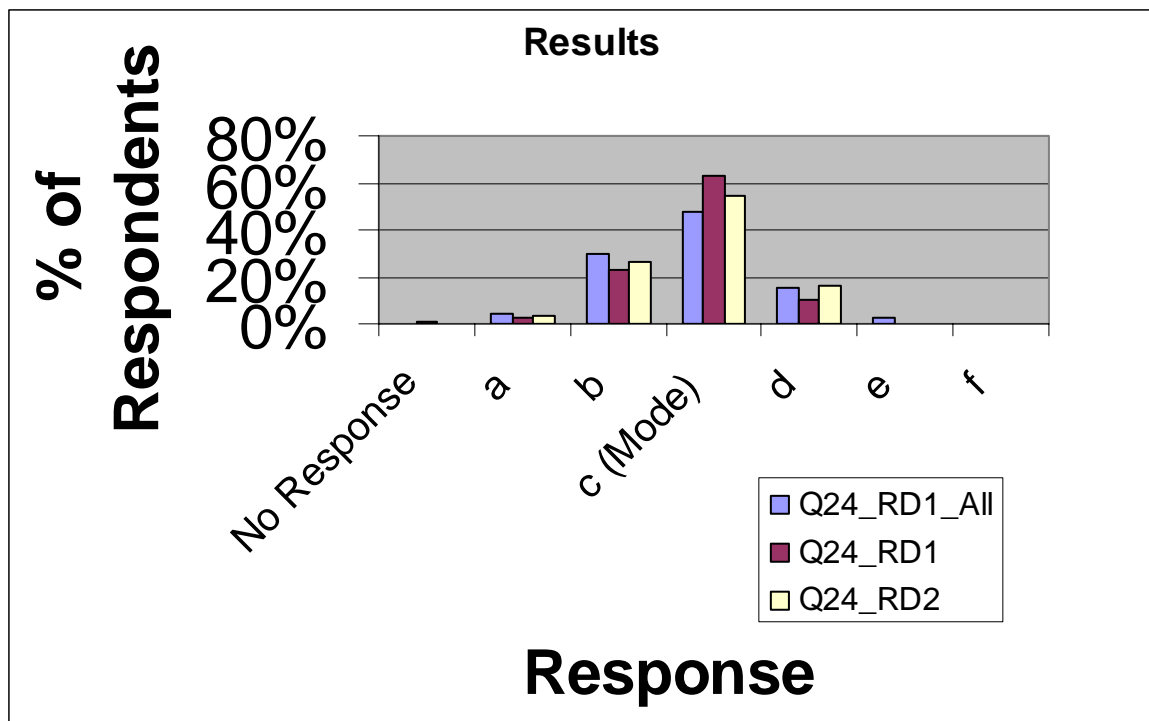
Selected Comments Round 1

Generally range between 4000 and 5000, though one answer suggests the possibility that the profession and the FIAA designation may not exist in 20 years

Selected Comments Round 2

Greater than 4000 members, again suggestion that profession and FIAA designation may not exist.

Transition Matrix

		Round 2 Response							
		No Response	a	b	c	d	e	f	Total
Round 1 Response	No Response	0	0	0	0	0	0	0	0
	a	0	2	2	0	0	0	0	4
	b	1	1	18	13	2	0	0	35
	c	0	0	11	54	3	0	0	68
	d	0	0	0	11	8	0	0	19
	e	0	0	0	0	0	0	0	0
	f	0	0	0	0	0	0	0	0
	Total	1	3	31	78	13	0	0	126

Movement Vs Expert

    Not applicable

Movement Vs Mode

Away	No Change	Toward
15	84	26