# The Perceptions of climate change and peak oil among Flinders University students and their receptiveness to individualist lifestyle changes and mitigation strategies

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*Abstract*

*Climate change and peak oil are the most important and intractable problems facing industrial societies in the coming decades. They represent the reaching of limits at sink and source of fossil fuel consumption. University students currently enrolled in undergraduate degrees will be a key demographic in making future decisions about mitigation and amelioration strategies, as well as potential leaders-by-example of carbon-neutral lifestyle change within the wider community. There has been no systematic research conducted into the attitudes of university students in Adelaide toward climate change and peak oil and their receptiveness to conservation-based lifestyle changes. Several undergraduate students at Flinders University completed an electronic survey to identify their perceptions of climate change and peak oil. The sample group was narrowed to students within the Faculty of Social Sciences as a pilot study for an expanded research project encompassing a sample group of all undergraduate students at Flinders University. Of particular focus to this study are student perceptions of the role of technology-based efficiency measures versus conservation based on lifestyle change. Student respondents felt unable to access high efficiency technologies because of prohibitive cost. With this in mind the survey asked participants about their receptivity to certain conservation-based lifestyle changes in the realms of transportation, consumption, and home living. Another key focus was student perceptions of the role of government versus the role of the individual in assuming leadership in executing mitigation strategies. Whilst respondents strongly agreed that individual action was important and could make a difference, a majority also believed that governments should exhibit leadership in this area. The results of this project may have application for state and local governments in Adelaide, as well as for the higher education sector itself, in structuring climate and energy mitigation strategies and promotion of individual lifestyle changes to this particular demographic.*

# Introduction

Climate change and peak oil are two of the most important and intractable problems facing industrial societies in the coming decades. They represent the reaching of limits at sink and source in our society's consumption of fossil fuels.

There has been no systematic research conducted into the attitudes of university students in Adelaide toward climate change and peak oil and their amenability to the lifestyle changes necessary to address these interconnected issues. University students currently enrolled in undergraduate degrees will be a key demographic in making future decisions about mitigation and amelioration strategies, as well as potential leaders-by-example of carbon-neutral and energy-efficient lifestyle changes within the wider community.

Undergraduate students in the Faculty of Social Sciences at Flinders University have participated in an electronic survey to identify their perceptions of climate change and peak oil as important and inter-related problems, and to gauge their receptiveness to certain conservation-based mitigation measures. The survey

consisted of eighteen written response and eleven multiple choice questions.[1] The sample group was narrowed to students within the Faculty of Social Sciences as a pilot study for an expanded research project encompassing all undergraduate students at Flinders University. Survey were distributed to the sample group by email to be completed electronically

The causes and impacts of climate change were better understood by survey respondents, while peak oil was less well known, as was the inter-relationship of both problems as the source and sink dimensions of fossil fuel use.

Of particular focus in this study are student perceptions of the role of technology-based efficiency measures versus conservation based on lifestyle change. An important hypothesis of this study, which was confirmed in the survey data, was that university students felt unable to access high efficiency technologies because of prohibitive cost. With this in mind the survey asked participants about their receptivity to certain individualist non-technology based lifestyle changes in the realms of transportation, consumption, and home living.

Another key focus was student perceptions of the role of government versus the role of the individual in assuming leadership in developing mitigation and amelioration strategies. Whilst students strongly agreed that individual action was important and could make a difference, a majority also believed that governments should take the lead in addressing climate change and peak oil.

The results of this project may have application for state and local government here in Adelaide, as well as for the higher education sector itself, in structuring climate and energy mitigation strategies and promotion of individual lifestyle changes to this particular demographic.

## *Students understanding of global warming and peak oil*

Studies have identified several current and future climate change impacts for South Australia that include higher average temperatures resulting in decreased rainfall, greater frequency and severity of drought, higher incidence and severity of bushfires, increasing prevalence of extreme weather events, and rising sea levels (SA Dept of Premier & Cabinet 2007: 1; Suppiah *et al.* 2006: 29, 37).

The survey asked student respondents to identify some of the causes and predicted impacts of climate change. Respondents clearly understood that the primary cause of climate change was anthropogenic greenhouse gases pooling in the atmosphere, though two respondents confused climate change with the problem of ozone depletion. Their understanding of current and predicted future impacts centred on the drought and the decreasing availability of water.

Peak oil refers to the approaching peak of global oil production, first posited by M. King Hubbert in the 1950s. Hubbert proposed that the rate of discovery in individual oil fields followed a bell curve, at the halfway point of which rates of discovery would begin to decline. As a consequence of this, at some point in the future the rate of production from a given field would also follow a bell curve congruent with the discovery curve. The peak of the production curve represented the point at which all the cheap and easily accessible oil form the field had been produced, with the remaining half consisting of oil of decreasing quality that would be increasingly expensive to extract. Hubbert used his theory to predict that oil production from all fields in the United States would peak in 1970, which proved correct to within a year. He later extrapolated the peak principle to include all known global oil resources, coming to the prediction that the global oil peak would occur around 2000 (Hubbert 1956: 23). While the concept of peak oil is not a matter of debate in the academic literature, predictions for the timing of the global peak range from 2005 to 2030 (Deffeyes 2005; Heinberg 2005: 111; Ahlbrandt *et al.* 2000).

As demand for oil increases beyond the available supply as the peak is passed, the price of oil is likely to

[1] Please contact the author if you would like to view the complete survey results and list of questions.

trend upwards. The impact of the peak on oil-dependent modern industrial societies has been predicted to be severe, possibly resulting in disruption of agriculture and transportation, slowing down the wider economy (Robinson and Mayo 2006: 2; Roberts 2004: 13; Heinberg 2005: 185-98).

Peak oil as a concept has only recently entered the public consciousness and the timing of its occurrence is still a matter of some debate. This is reflected in the survey results, where 39 percent of respondents properly understood the concept, a third of respondents did not understand the peak oil concept or had not heard of it, while 28 percent believed it was due to oil "running out" or to oil company collusion.

Of the predicted impacts of peak oil on their own lives, 21 percent of respondents listed a lower standard of living, 17 percent stated it would reduce their volume of car travel, 10 percent said it would impact on the number of technologies available to them, while 14 percent had no idea. The remaining 38 percent listed higher oil prices, longer commutes, inflation, less plastic products, and limited social activities as likely impacts.

Peak oil and climate change are inter-related, representing limits at both source and sink on the continued use of fossil fuels (Meadows *et al*. 2004: 91) and as such should not be dealt with in isolation from one another. To illustrate, one option for peak oil mitigation would be to increase the use of coal, which remains relatively abundant. But to increase burning coal would release more greenhouse gases into the atmosphere, worsening the climate change problem. One option available for industrial societies is to develop clean coal and carbon sequestration technologies to enable the switch to using more coal. Waiting for these technologies to come online, however, is disempowering for individuals and a luxury of time that is not available. The concerned citizen can take action themselves by adopting lifestyle changes encompassing efficiency and conservation which will reduce their dependency on fossil fuels, especially oil, and lessen their greenhouse gas emissions footprint.

The concept of reaching limits to oil consumption and greenhouse gas pollution—source and sink—was identified by 32 percent of respondents as the inter-relationship between climate change and peak oil, while 22 percent were more vague, identifying "the end of the oil age" as the connection. Five percent of respondents confused climate change with ozone depletion, nine percent thought there was no inter-relationship between climate change and peak oil, while the remaining 32 percent were unaware of any connection.

## *Who should take the lead: governments of individuals?*

Public understanding and concern over climate change has reached a crescendo in the past eighteen months, having reached a tipping point where rising concern has pushed the issue into mainstream consciousness. Concern over peak oil is growing but has yet to reach the level of public awareness as an issue that climate change has attained. The issue of leadership in addressing these problems is a complex one. There is a perception that people are looking for leadership from governments—federal and state—but personally are adopting a wait-and-see approach to doing anything themselves (Climate Institute Australia, 2007: 3-8; Suppiah et al. 2006: 48).

The survey data reflects the complexity of this question. When asked whether individuals could make a difference in responding to these problems, 71 percent of respondents answered in the affirmative, while 29 percent disagreed. When asked who should take the lead in addressing climate change and peak oil, 46 percent of respondents thought that governments should take the lead, 21 percent believed individuals should act first, 13 percent called for leadership from the business community, while the remaining 20 percent looked for leadership from various actors in the international community.

While respondents largely believed that their individual efforts would make a difference, they still felt that government action was integral and would be decisive in leading a meaningful and timely response. However, when asked whether they believed the government would do what was necessary to respond to climate change and peak oil in a timely and appropriate manner, 73 percent of respondents replied in the

negative, seven percent thought that they would respond appropriately, while 20 percent were unsure. Despite wanting governments to lead the response, students were pessimistic about the prospects of this happening.

Government legislation has been enacted at state and federal levels to address climate change adaptation and greenhouse gas reduction, though there has been little response to peak oil. The response so far has fallen well short of the far-sighted measures necessary to address emission reduction and energy security concerns. The politically easy measures have been taken, but the politically difficult choices have been put off. Governments will remain inactive on the difficult choices while it remains politically less costly to do so (Monbiot 2006: 214). To move governments from their inertia into action, individuals must demonstrate through their actions that there is a constituency supportive of change. However, no pressure is exerted on governments to change policy while people continue to lead energy and emissions-intensive lifestyles. The political impetus for changing government policy can be generated through people making changes in their own lives. If many people act to reduce their energy and emissions footprint, governments will be under greater pressure to act (Pearse 2007).

## *Efficiency through technology versus conservation*

Having established that the actions of individuals are both practically and politically important in the response to climate change and peak oil, the next issue to address is what specific measures are available to individuals to play their part.

Of particular focus to this study are student perceptions of the potential roles of technology-based efficiency measures and conservation based on lifestyle change. Energy efficiency requires little or no alteration of lifestyle. Instead, technology is used to make existing practices more efficient, reducing both energy use and output of pollution (IPCC, 2007: 18).

This raises two issues: First, in some areas such as transportation, increases in efficiency often lead to greater consumption; as the cost of the given activity or service comes down, more of it can be bought for the same monetary sum, leading to a net overall increase in its consumption and thus an increase in energy use and pollutant emission (Monbiot 2006: 61). Clearly this is not the desired outcome.

When asked whether technology could be the primary solution to addressing climate change and peak oil, 44 percent of respondents disagreed, 33 percent agreed, while 17 percent thought that efficient technologies are one of a number of strategies on the table. Five percent did not know or were unable to decide.

Second, the costs of energy efficient technologies—such as solar water heaters, photovoltaic systems and hybrid powered cars—are prohibitively expensive for many people (SA Dept of Premier & Cabinet, 2007: 43; CSIRO, 2006: 35). People in this position must therefore look to reduce their energy and emission footprint through conservation, which requires changes to lifestyle and consumption habits. There is a view however that conservation measures are not likely to have wide public appeal (Monbiot 2006: xii).

An important hypothesis of this study, which was confirmed in the survey responses, was that university students were one of the social demographics who felt unable to access high efficiency technologies because of prohibitive cost. When asked what obstacles may impact on their decision to reduce their energy and emissions footprint through increased efficiency and lifestyle changes, 33 percent of respondents listed prohibitive cost as an obstacle, 17 percent worried about the social stigma of acting out of step with the mainstream, 11 percent had a limited knowledge of the lifestyle and efficiency alternatives available to them, while the remaining 39 percent listed a combination of factors such as comfort, apathy, denial and the absence of green role models. The last set of obstacles could be grouped; it could be inferred that these respondents enjoy their current lifestyles more than they are worried about climate change and peak oil.

These results establish that respondents believe in the merits of individual action, but due to limited

financial resources are restricted to undertaking lifestyle-based conservation measures to reduce their energy and emissions footprint.

## *Specific lifestyle changes: Transportation*

Transportation in Australian cities, including Adelaide, is particularly geared around the car. Car dependency has grown in conjunction with the availability of cheap and abundant oil. Adelaide has a concentration of 475 cars for every 1,000 people, which is one of the highest car/person concentrations in the world. This car fleet is the source of 20 percent of the city's carbon dioxide emissions and approximately two thirds of transport-related energy use (CSIRO, 2006: 25; Girardet 2003: 44).

Car dependency in Adelaide becomes increasingly pronounced as one radiates outward from the city centre. Those living in the outer suburbs generally have to commute further to get to and from work, are poorly serviced by public transport relative to those living closer to the city centre, and have limited financial capacity to absorb increasing costs of car travel. It is these outer suburban residents whose transportation habits will be most affected by peak oil and climate change, yet they are also the demographic with the least capacity to change voluntarily (Dodson and Sipe 2006: 11-14). Many of the survey respondents live in Adelaide's outer southern suburbs and are representative of this vulnerable demographic (see Figure 1).

The alternatives to travel by car include high-density public transport—encompassing bus, rail and tram—and non-motorised individual conveyance such as cycling and walking. The non-car transportation alternatives available to people depend heavily on the availability of reliable public transport, cycle-ways and walking tracks in a given location. It is widely acknowledged that public transport infrastructure in Australian cities has to be improved, particularly in the vulnerable outer suburban areas (SA Dept of Premier & Cabinet, 2007: 39; Dodson and Sipe 2006: 44; Bristow *et al.* 2004: 23).

Respondents were asked a number of questions about their transportation habits. To commute to university, 39 percent of respondents always caught the bus, 17 percent walked, 17 percent car pooled with others, while only six percent cycled and a further six percent caught the train. When asked if they would consider these alternatives in the future, 61 percent said they would consider cycling to university, 44 percent would consider walking, 44 percent would contemplate car pooling, 72 percent would consider bus travel, and 28 percent would consider catching the train. The train option seems problematic however as there is no train line close to the university. The results indicate that there is a willingness among the respondents to change their commuting patterns to university.

The air travel industry is completely dependent on oil as there is no known substituted fuel to replace oil in aircraft propulsion. Because of this the industry is vulnerable to rising oil prices and is a major contributor to greenhouse gas emissions (Flannery 2005: 282; Monbiot 2006: 173).

Respondents were then asked if they had caught a bus, train, or car pooled when traveling interstate. Fifty six percent of students had caught an interstate bus, 56 percent had caught a train and 72 percent had car pooled on an interstate trip. In future, 78 percent of respondents would consider interstate bus travel, 78 percent the train, and 73 percent may car pool. The high number of respondents—over fifty percent in each instance—who had already undertaken interstate trips on bus, train and by car pooling suggests that the larger number of students who would consider such travel in the future is a plausible figure. It may also be reflective of their financial circumstances; air travel may be prohibitively expensive for many this demographic.

## *Specific lifestyle changes: Shopping and food consumption*

A major contribution to a person's energy and emissions footprint is a product of shopping and food consumption. The average Australian discards approximately fifteen times their body weight in garbage

every year, much of which is packaging material (Lowe 2005: 217). Yet this component of waste at the consumer end of the product stream is a fraction of the total waste output within a given product cycle. Meadows, Randers and Meadows (2004: 103) estimate that for every ton of waste at the consumer end of the product stream, five tons of waste has been produced in the manufacturing process and a further 20 tons at the site of initial resource extraction, such as a mine or farm. Each step of this process has its own energy and emissions footprint, of which the consumer is only dimly aware, if at all.

Modern agriculture is heavily dependent on fossil fuels and thus carries an embedded cost in greenhouse gas emissions. On the farm, oil powers the machinery that ploughs the fields and harvests the crops. The electricity for irrigation pumps comes from diesel generators or power stations fueled by coal or natural gas. The mining, manufacture and transport of the phosphates in fertilisers are energy and emissions-intensive also. Once crops are harvested, they are transported, processed, packaged and marketed before they reach the home kitchen, where refrigeration and food preparation constitute a further energy and emissions-rich link in the production chain (Bednarz 2007; Brown 2006: 24-27; Singer and Mason 2006: 130). As the climate changes, South Australia's agricultural crop yields will be affected by higher average temperatures, changing rainfall patterns, water scarcity, and more frequent extreme weather events (Brown 2006: 64; Lowe 2005: 60, 74).

As well as being a significant source of greenhouse gas pollution, industrial and agricultural systems are vulnerable to rises in the price of oil, which are predicted by peak oil theorists. The challenge before the consumer is thus to conserve energy and minimise greenhouse gas emissions throughout the product cycle by using less and reducing waste according to the often quote phrase "reduce-reuse-recycle" (Brown 2006: 110) and to source food and consumables from the local area (Singer and Mason 2006: 130-5).[2] For example, communal gardens or the humble home garden in the backyard or on a rooftop contribute to local food self-sufficiency and reduce the distance food must travel from source to dinner plate (Holmgren 2007; Mazereeuw 2005: 11). Another strategy is to reduce the amount of meat consumed, as the energy and emissions footprint of meat production is substantially higher than that of food crops (Lowe 2005: 219-20). This will minimise the energy and emissions impact of the products consumed and will increase urban food security by shielding the consumer to a degree from inflationary price rises passed on due to the rising cost of oil (Holmgren 2007; Brown 2006: 28-9).

Survey respondents were asked four questions about buying local goods, recycling, and reducing waste. When asked whether they currently buy locally-made or produced non-food goods, 28 percent said they always did so while 67 percent did so on occasion. Sixty seven percent of respondents indicated that they would definitely consider doing so in the future, while the remaining 33 percent said they might do so.

When asked whether they currently buy second-hand goods, 11 percent of respondents did so often and 72 percent did so sometimes, while 17 percent never bought second hand goods. Sixty one percent of respondents would definitely consider doing so in the future, while 39 percent stated that they may do so. When asked whether they repair, re-use and recycle things that they already have, 44 percent of respondents said that they always try to do this, while 56 percent do so on occasion. In the future, 83 percent of respondents said they would always try to reduce, re-use and recycle, while 17 percent said they may do so.

Twenty eight percent of respondents said that they always try to buy goods with minimal or no packaging, 67 percent said they do this sometimes and six percent said they never do this. In the future, 78 percent of respondents said they would try to buy goods with minimal or no packaging and 22 percent said they might try.

These results indicate that a large portion of the survey group is already committed to reducing waste, re-

[2] Singer and Mason (2006: 135) add the following proviso for buying locally produced food: "To reduce the amount of fossil fuel that is involved in producing our food, we should buy local food, if it has been grown with similar energy efficiency to food from somewhere else—but not if the local grower had to burn fossil fuel to provide heat, and not if there is a lot of extra driving involved in picking the food up, or getting it delivered."

using and recycling things they already have, but much fewer are committed to buying locally-produced goods. There is however a substantial level of interest in moving toward these behaviours in the future.

Student respondents were also asked a series of questions about how they source their food and their receptivity to alternative food sources. When asked whether they bought food produced locally or within near-regions (i.e. within 100 kilometres from Adelaide), 41 percent said they always tried to do so, while 59 percent said they do so on occasion. Seventy eight percent of respondents would definitely consider doing so in the future and 22 percent said they might do so.

When asked whether they currently grow a portion of their food in a home garden (backyard or rooftop), 11 percent of respondents said they already did so, 61 percent of respondents said they have attempted home gardening in the past, while 28 percent had not done so at all. Sixty one percent of respondents expressed a definite willingness to do so in the future and 22 percent said they may do so, while 17 percent said they would not. Backyard food production is an activity that was essentially the norm in suburban Adelaide up to the 1970s. Many people will have grown up with parents or grand parents who cultivated food in their backyards and as such this lifestyle choice has a cultural precedent to which many respondents may be receptive.

Respondents were then asked if they currently participated in some form of communal gardening.[3] None did so on a regular basis, 39 percent of respondents did so on rare occasions, while 61 percent no experience with community gardening. In the future, 39 percent said they would definitely consider communal gardening, 39 percent said they may consider it, while 22 percent said they would never consider it.

A less popular question asked of the respondents was whether they would consider eating less meat in their diet. Only six percent of respondents said they were already doing this, 50 percent said they occasionally eat meat less often, while 44 percent had not altered the amount of meat in their diet. Fifty percent of respondents said they would definitely consider eating less meat in the future, 28 percent said they may eat less meat, while 22 percent said they would not consider this at all. Of all the possible lifestyle changes presented in the survey, eating less meat was the least popular.

## *Specific lifestyle changes: Home living*

South Australians produce approximately half of their greenhouse gas emissions in the production and use of energy for the home (SA Dept of Premier & Cabinet 2007: 22). It is in home environment where many gains in energy efficiency and emissions reduction can be made with various technological innovations, including compact fluorescent light bulbs, energy efficient white goods, and photovoltaic solar electricity systems. As has already been discussed, many of these technological innovations are priced beyond the reach of university students. Also, a number of students may be still living with their parents and as such do not have the autonomy to make big decisions about innovations that would affect the whole house.

A number of questions were asked about the receptivity of respondents to various home-based conservation measures and behavioural modifications. Student respondents were asked if they were currently using compact fluorescent light bulbs in their home. Forty percent of respondents had changed all available light fittings in their home, 40 percent had changed at least one, while 20 percent had yet to change any. Eighty three percent of respondents would definitely changing all light fittings to compact fluorescent bulbs in the future, while the remaining 17 percent indicated that they may do so.

Thirty percent of respondents currently always shower for four minutes or less, 50 percent do so on occasion, while 20 percent always shower for longer than four minutes. In future, 67 percent of respondents said they would definitely shower for less than four minutes, while 28 percent said they might do so. Seventy percent of respondents had installed a water efficient shower head.

[3] Flinders University has its own community garden staffed by volunteers of current and former students.

When asked whether they currently hand wash dishes instead of using a dishwasher, 90 percent already did so, while 10 percent did so on occasion. Ninety four percent of respondents would definitely consider doing so in the future and the remaining six percent may possibly consider doing so.

In a similar question, respondents were asked if they currently dry their clothes on a clothesline instead of using an electric dryer. Eighty percent of respondents always did so, while 20 percent did so on occasion. All respondents indicated that they would definitely consider doing so in the future.

These results show that students are supportive of simple and common-sense behavioural modifications that have little or no up front financial cost.

## *Key findings*

The results of this pilot study have raised many issues for further exploration in the future expanded research project. This expanded project will feature a much larger sample size, with the demographic being widened to include all undergraduate students at Flinders University. Similar projects can and should be undertaken at other tertiary institutions in Adelaide.

A cautionary note in reviewing the data on future intent: these results represent the aspirational goals of the respondents. There is no guarantee that the intent displayed in the data will translate into actual behavioural change. The data does indicate that there is a reservoir of potential for behavioural change, which could be tapped and encouraged by appropriate climate and peak oil mitigation policies from the university, future workplaces, and all levels of government.

The causes of climate change and its potential impacts on South Australia are well understood, though a couple of respondents confused ozone depletion as a dimension of climate change. Peak oil is less well understood, perhaps because the concept is newer to mainstream audiences and because predictions about the timing of the oil peak are still a matter of intense debate. The inter-relationship of peak oil and climate change as source and sink dimensions of anthropogenic use of fossil fuels was generally only vaguely recognised.

Respondents felt that individuals can make a difference in responding to climate change and peak oil, yet they were looking to governments in Australia—state and federal—for leadership in addressing these problems. They were extremely pessimistic about the capacity of governments to react in a timely and appropriate manner.

A slight majority of respondents believed that technology was not the primary solution to climate change and peak oil. Technological efficiency measures are priced beyond the financial reach of university students. Consequently, only behaviour-based conservation measures are available to them.

Bus travel, walking and car pooling are the most popular forms of commuting alternatives to attend university, while bus travel and cycling showed the most promise for future uptake. Commuting by train is restricted because the university is not serviced by any rail routes.

A majority of respondents have already travelled inter-state by bus, train or car pool. All of these alternatives showed promise for increased future uptake, though future preferences may change over time as the financial circumstances of respondents improve after graduation.

Recycling formed the major component of respondents' efforts to reduce waste from shopping. This may be due to the availability of curb-side recycling services in most areas. There does appear to be a recognition that the purchase locally-produced food and consumer goods will help to reduce the greenhouse and energy footprint of these products.

Despite an acknowledgement that obtaining food from local sources is desirable, this has not translated in this demographic into a drive to grow food for themselves, either in home or community gardens. There does however appear to be substantial scope for future uptake of home gardening.

Few respondents have substantially reduced the amount of meat in their diet, though there is evidence in the data that up to fifty percent of those surveyed would definitely consider doing so in the future. This is interesting, given that the culture of meat consumption in Australia is strong and pervasive.

The survey data indicates that the greatest conservation-based behavioural changes have already taken place through practical and low-cost conservation measures in the home. Many respondents have already installed water-efficient shower heads and compact fluorescent light bulbs in their homes, while most respondents were happy to hand wash their dishes and dry their clothes on clotheslines, forgoing the use of electric dish washers and clothes dryers. These conservation measures also showed the greatest intention of future uptake in the data.

The results of this project may have application for state and local government here in Adelaide, as well as for the higher education sector itself, in structuring climate and energy mitigation strategies and promotion of individual lifestyle changes to this particular demographic.

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