

Exploring the impact of psychosocial factors on health outcomes in the economic choice between short-term self-gratification and self-investment in education

David Campbell

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For additional information please contact

Ninti One Limited
Communications Manager
PO Box 154, Kent Town
SA 5071
Australia

Telephone +61 8 8959 6000 Fax +61 8 8959 6048

www.nintione.com.au

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Abstract

Rational: Chronic disease is a major agent in the gap in expected life span of Aboriginal and Torres Strait Islander people, which some see as the result of self-inflicted lifestyle choices. This need not be the case, however.

Method: An economic optimisation model is used. This is based on choosing between a) self-investing in education, which involves short-term costs and long-term health and economic advantage; and b) short-term self-gratification, which involves short-term self-gratification and long-term health and economic disadvantages. It is shown that self-gratification can be economically rational; especially in stressful circumstances with an uncertain future outcome. Such circumstances are relevant to Aboriginal and Torres Strait Islander people in remote Australia.

Results: Increasing stress levels result in increasing risk of chronic disease and hormonal responses. On the basis of a number of studies including those carried out on the British public service (Whitehall Studies), less than 25% of this change is attributable to poor lifestyle choices, while more than 50% is explained by other factors, including the loss of personal control due to external factors. In addition, hormonal responses can erode individual willpower including long-term volitional-control including long-term capacity to engage in education. Policies to mitigate the impact of the psychosocial determinants of health on stress levels can change the behavioural incentives necessary to select education in preference to short-term gratification.

Future directions: A possible longitudinal research methodology using a social framework based on the Theory of Planned Behaviour, where the data results are analysed using structural equation modelling is proposed.

1. Introduction

The following concerns the behavioural choices people make, the factors that can influence these choices, and how these choices can influence their life outcomes. The behavioural choices that people make are the result of a variety of factors that will differ according to their life experiences and the culture and constraints of the community in which they live. Such factors will influence all parts of their behaviour, extending from interpersonal relationships, to their engagement in and type of work, their educational outcomes and their health. While the interrelationships that are involved here are complex, the following is focused on the choices and circumstance of Aboriginal and Torres Strait Islander people in remote–very remote Australia in regard to improving their health and participation in education.

Closing the gap in the expected years of life for Aboriginal and Torres Strait Islander people in comparison with other Australians is an important national policy issue (HREOC/SCIHE 2008, Rudd 2008, Rudd & Roxon 2008). Over the period 2005–2007 the life expectancy for Aboriginal and Torres Strait Islander males was 67.2 years (a gap of 11.5 years) and for Aboriginal and Torres Strait Islander females 72.9 years (a gap of 9.7 years).¹ Analytically, the gap in expected life span is an indicator of the level of disadvantage suffered by Aboriginal and Torres Strait Islander people. While there have been improvements in the expected life span of Aboriginal and Torres Strait Islanders over the past twenty years (Condon et al. 2004, Thomas et al. 2006, Wilson et al. 2007, Zhao & Dempsey 2006), there have also been improvements in the expected life span of other Australians – and the gap between expected life spans remains.

The gap in the expected years of life of Aboriginal and Torres Strait Islander people in remote Australia is mostly the result of chronic disease,² including cardiovascular, diabetes, cancer and chronic respiratory disease. While the distal factors affecting the poor health outcomes for Aboriginal and Torres Strait Islander people involve the psychosocial determinants of health, the proximal risk factors associated with chronic disease include poor lifestyle choices such as smoking, physical inactivity, unhealthy diet and alcohol, drug and solvent abuse (AIHW 2008, WHO 2008). Poor behavioural choices have been assessed by some as the result of Aboriginal and Torres Strait Islander people taking a myopic or short-term view; the inference is that the resulting poor health is of the patients' own making and that they should 'reform themselves' (Fang & Loury 2005). Such social commentary contains racial and class overtones (Fang & Loury 2005) and ignores the distal factors over which people have little or no control.

A positive correlation has been observed of improved health outcomes with education (Ben-Porath 1967; Farrell & Fuchs 1982; Ganz 2001; Grossman 1972, 2000; Kutty 2009; WHO 2009). This should be kept in mind when considering that the schooling attendance rate of Aboriginal and Torres Strait Islander 16-year-olds in remote Australia in 2006 was 51% versus 83% for other Australian 16-year-olds (ABS 2006).

Policies directed at altering the impediments and incentives faced by Aboriginal and Torres Strait Islander Australians can play an important role in altering behaviour and improving health outcomes. This requires recognising the factors affecting behavioural choice. The purpose of this paper is to show such choices can be consistent with economic rationality. Recognition of rationality is used in guiding the removal of behavioural impediments and providing incentives for improved outcomes. While the emphasis is in regard to education, the factors considered are relevant to a range of areas, including workforce participation.

¹ These figures show a longer life expectancy than earlier estimates provided by the Australian Bureau of Statistics. This is not the result of a relative improvement in health outcomes for Aboriginal and Torres Strait Islanders Australians. Rather, it is the result of changes in the methodology used to estimate the expected life span of Aboriginal and Torres Strait Islanders Australians (HREOC/SCIHE 2008, ABS 2008, AIHW 2011).

² The terms 'non-communicable' and 'non-contagious disease' are also used.

Accordingly, an economic framework is used to integrate this material and to review and develop a response. The use of an economic approach is not a matter of personal naivety³ but is because economics has a role to play in three major policy areas: a) assessing the causal impact of the determinants of health and health inequalities; b) prioritising across a set of competing policies and objectives; and c) determining the probable role of government (Epstein et al. 2009).

Biddle (2007) showed that the income benefits for Aboriginal and Torres Strait Islander people in completing year 12 can exceed those obtainable for the rest of the community. Yet low attendance rates by young Aboriginal and Torres Strait Islander people remain. The following goes some way to explaining this discrepancy.

2. Economic behavioural choice

2.1 Self-investment

A fundamental assumption in this paper is that while inconsistencies exist, overall behaviour is optimal. That is, optimisation behaviour is fundamental to genetic selection, as initially explained by Williams (1992) and to long-term social behaviour (Alexander 1974). Such selection and behaviour is fundamental to the long-term competition among and between species for scarce resources.

That is, behavioural choices are discrete and consistent, and trade-offs between choices are continuous and consistent with optimising behaviour.⁴ These assumptions are readily defensible when applied across populations (e.g. see Winston 1989; and others in the same edition of the *Journal of Economic Behaviour and Organisation*). These assumptions allow the question of rational choice to be explored across two alternatives: a) the long-term choice of ‘self-investment in human capital through education’⁵; and b) alternative short-term lifestyle choice having negative health outcomes, or ‘short-term self-gratification’.

In general terms, four economic characteristics important to investment in capital are the initial cost of the capital investment, the expected annual rate of return on the capital investment, the length of life of the capital investment, and the individual time preference, that is, the time discount rate. The present value of capital investment is increased by minimising up-front costs and extending the time span of the flow of benefits. Hence, Ben-Porath’s observation that ‘[t]he main reason why investment is undertaken mostly by the young is that they have a longer period over which they can receive returns on their investment’ (1967 p. 352). In the case where the investment is in the form of education, there is the added issue that the opportunity cost of foregone wages at a younger age is less than it would be at an older age.⁶

Building on Becker’s (1965, 1966) work, Grossman (2000) viewed education as an investment of market inputs and time in capital stock that produces an output of ‘healthy time’, that is, a longer and healthier expected life. Education improves income-earning potential and the capacity of individuals in their life choices and in their efficient use of scarce resources (Grossman 1972, p. 225).

³ See Heckman (2011) for further discussion on the role of economics in providing an analytical framework (p. 3).

⁴ The assumption of continuity is required for technical reasons as it allows a smooth differential function.

⁵ While education and health are complementary inputs to human capital, the following developments are solely in term of education. Education, as an input to human capital can extend the extensive margin in the form of a longer lifetime and the intensive margin by providing a fuller and more productive lifetime.

⁶ While this is generally observable, Biddle (2007) observed Aboriginal and Torres Strait Islander Australians are more likely than other Australians to re-enter the educational system at a later stage of life. The exogenous variables resulting in this are worth examining.

Just as with expenditure on medication, time enters and affects choice as a cost in achieving an expected healthier life, such as through social interactions and exercise, and increased earnings. It has been shown that those expecting a longer life span are more likely to self-invest in education (Ben-Porath 1967, Holm 1996, van den Berg 2005). An individual's assessment of expected life span is influenced by the observed life span of their relations and community members (Ganz 2001). Such information can affect expected life span and expected return to an individual's investment in human capital (Chaloupka 1991, Holm 1996). Expected life span is affected by a range of factors in addition to genetic disposition (Grossman 2000), including prenatal and postnatal condition (Power & Hertzman 1997). Expected change in the life span of children has also been observed to influence the investment mothers may make in pre- and postnatal children. For example, the United Nations Expanded Programme on Immunization in Sub-Saharan Africa, Malawi, Tanzania, Zambia and Zimbabwe resulted in improved survival rates in the first years of life. Expectant mothers were observed to invest more in improving their own condition and the health of their pre- and postnatal child (Dow et al. 1999).

2.2 A conundrum: addressing the trade-off between the short run and the long run

The choices for our hypothetical decision maker involve trade-offs between short-term and long-term consequences. Carson et al. (2007) observed the health of Aboriginal people as a function of exogenous and endogenous factors. These two sets of factors are represented in this paper by $\mathbf{X}_{j,k}$. The use of 'j' indicates events and conditions that are exogenous to the individual, and which occur independently of individual choice. The use of 'k' represents self-initiated, or endogenous, behavioural choice, where these are affected by a range of exogenous variables. The formatting of $\mathbf{X}$ as bold is economic representation when dealing with a vector or matrix of variables.

Changes in the initial expected long-term genetic disposition of Aboriginal and Torres Strait Islander health (H), as a function of exogenous events and endogenous behavioural choice, is given by:

$$\Delta H = f(\mathbf{X}_{j,k}) \quad 1.$$

Exogenous conditions and endogenous choice are assumed to have either positive health outcomes, when j, or k = 1, or negative health outcomes when j, or k = 2. Initially, it is assumed that exogenous conditions are neutral with j held constant. In this case, expected changed life span is solely a function of endogenous behavioural choice.

Endogenous choice is classified according to whether there is a negative or positive effect on Aboriginal and Torres Strait Islander health and expected life span:

$$\begin{aligned} \partial H / \partial \mathbf{X}_{.,1} > 0 \text{ and } \partial H / \partial \mathbf{X}_{.,2} < 0; \\ \mathbf{X}_{.,1} \geq 0; \mathbf{X}_{.,2} \geq 0; \end{aligned} \quad 2.$$

Rational economic behaviour is when people make choices on the basis of individual preference so as to maximise their utility (U) on the basis of choosing between education, $\mathbf{X}_{.,1}$, or short-term gratification, $\mathbf{X}_{.,2}$ according to their budgetary constraint (B), where $\mathbf{C}_k$ is a vector of costs:

$$\begin{aligned} \text{Max. } U &= U(\mathbf{X}_{.,1}, \mathbf{X}_{.,2}). \\ \text{Subject to: } &f(\mathbf{C}_k \mathbf{X}_{.,k}) \leq B; \end{aligned} \quad 3.$$

with $\mathbf{X}_{.,1}$ and $\mathbf{X}_{.,2}$ being interdependent. That is, there is a trade-off between the two choices.

While utility-maximising behaviour is assumed, this does not mean that what is being maximised for an Aboriginal or Torres Strait Islander is necessarily the same as for other social groups (see Walter & Mooney 2007). The Aboriginal and Torres Strait Islander budget, or 'B' in equation 3, in remote Australia includes money earned from employment and the sale of arts and crafts; transfer payments; income or services derived from capital, including access to traditional country involving commodities and cultural assets; government services; and time (Campbell 2000, 2001). Investment in health involves time and market-purchased medical and non-medical inputs. Important to the choices Aboriginal and Torres Strait Islander decision makers take are the budgetary opportunity costs of market and non-market sourced inputs, including time, cultural assets and traditional foods and medicines. The use of time involves foregone opportunities such as income, whether in paid employment or the arts and craft industry; and participation in community and family activities, including meal preparation, home maintenance, community cultural responsibilities and recreation.

The choice variables $X_{.1}$ and $X_{.2}$ enter an individual's preference function according to their impact on utility. A utility-maximising decision maker will allocate their budget so that the marginal benefit of choosing $X_{.1}$ or $X_{.2}$, equals the marginal opportunity cost of the foregone alternative choice:

$$\partial U / \partial X_{.1} = \partial U / \partial X_{.2}. \quad 4.$$

Individual demand for education is derived from an expected improvement in income, status, health outcomes and a range of other market and non-market derived benefits. Non-market benefits of education and increased knowledge can lead to better behavioural choices, such as reduced smoking (Grossman 2000, Holm 1996) and improved efficiency in the use of market- and non-market-sourced resources (Grossman 1972 pp. 223–224).

In choosing between $X_{.1}$ or $X_{.2}$ there are immediate and longer-term opportunity costs. For $X_{.1}$ behavioural choices, involving self-investment in human capital through education, the benefits of improved income and health occur in the future, with a resulting delay of the impact on utility, while the costs are immediate. With behavioural short-term gratification, $X_{.2}$, the initial costs and benefits enter directly into the utility function. In this instance the negative health impact on the utility function occurs in the future. In sum, the positive impacts of $X_{.1}$ are delayed, with the costs up front; while the negative health impacts of $X_{.2}$ are delayed with the benefits up-front. Depending on how the future is assessed, it is possible for a rational consumer to make choices that have negative long-term health effects. That is, it is possible for economically rational utility-maximising Aboriginal and Torres Strait Islander people to make decisions that lead to a negative feedback loop and an increase in the expected life gap. That is:

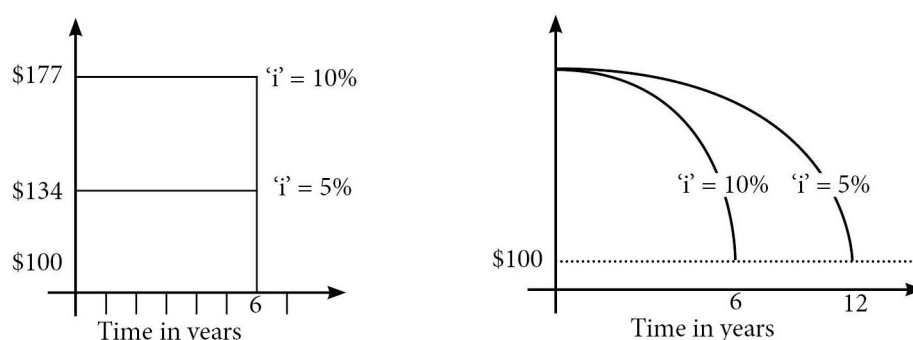
$$\partial U / \partial X_{.2} > 0, \text{ even when } \partial H / \partial X_{.2} < 0. \quad 5.$$

2.3 Assessing the future: Time discounting, risk/uncertainty, volitional control and stress

The history of time discounting in the economic literature, starting with the earlier work of Knight (1921) and Savage (1954), is based on a discounted expected utility approach. According to this approach, certain utility and uncertain utility are interchangeable, or are risk neutral. In this case we can measure the present value of a future flow of annual net benefits (that is taking into account the initial fixed costs, including opportunity costs of spending time attending class, and later annual marginal costs and benefits) according to:

$$\text{Net present value of education} = \sum ((\text{Net annual benefits}) / (1.i))^t. \quad 6.$$

The value 't' (t = 1, 2, ..., T) refers to the number of years over which returns on the investment in education will occur, that is, the expected life span. The expression '1.i' (or 1 + i) refers to the additional future return required in compensation for the opportunity cost of foregoing current consumption. The character 'i' is the interest or time preference rate, where different rates of interest will affect the rate of growth, or, alternatively, the rate at which the present value of future benefits are discounted. For example, Figure 1a shows that \$100 is worth far more in six years if the rate of return is 10% (\$177) than if the rate of return were 5% (\$134). Alternatively, and important to this discussion, Figure 1b shows that the present value of future benefits is worth far more in the future for lower interest or discount rates. That is, at a 10% discount rate, the present value of \$177 is \$100 in six years. However, at a 5% interest rate, it takes up to 12 years before the present value of \$177 is discounted to \$100.



Not to scale

Figure 1a,b: The effect of different interest rates on the value of future benefits

Figure 1a: Effect on growth Figure 1b: Effect on future value

There is increasing evidence that the assumption of interchangeability between time periods does not hold. This is particularly so when the comparison involves the choice between certainty and uncertainty, because a disproportionate preference is given to certainty (Andreoni & Sprenger 2010, Kahneman & Tversky 1979, Laury et al. 2010, Loewenstein et al. 2003, O'Donoghue & Rabin 1999). In this regard, it is important to differentiate between what individual decision makers will decide for themselves and their families, and the decisions a social epidemiologist might make in regard to a community. Decisions made by a social epidemiologist are likely to involve large populations for which the probable outcomes and probable pay-offs are likely to be known. Accordingly, such decisions involve handling risk rather than uncertainty. That is, social epidemiologists are operating in a world in which the 'experiment' is repeatable⁸, and the expected results can be estimated using compounded probabilities. The individual decision maker, however, is dealing with uncertainty; because of possible financial or physical constraints limiting capacity to handle relatively serious outcomes, individuals would be prevented from repeating the 'experiment'.⁹

⁷ This relationship is shown in more detail in Figure 2, section 2.4.

⁸ This is a somewhat simplistic view as it ignores the fact that decisions are made by individuals or definable groups, for whom getting a decision wrong can affect their future professional standing (see Mueller 2003). Accordingly, the loss of individual reputation in the case of the social epidemiologist, or the loss of political influence, in the case of a government minister or government, can limit their opportunity for repeat experiments.

⁹ It is important to recognise that repeatable events need not be similar events. All that is required is that events are small enough such that the failure of any single event will not disrupt an individual's ongoing budgetary (including time) and physical capacity.

Because Aboriginal and Torres Strait Islander people are likely to be dealing with higher levels of uncertainty and lower levels of purchasing power,¹⁰ they have less capacity to repeat the experiment. That is, depending on the degree of future uncertainty, and relative budgetary demand, the weight given to the future will decrease; they will place a higher discount rate on future benefits and will become less interested in investing in the future, as implied in Figure 1b.

2.3.1 Assertion of self-control

An important capacity necessary to self-invest in human capital through education is individual capacity to self-regulate, self-constrain, or apply volitional control and willpower. Muraven and Baumeister (2000) described self-control as an extension of control over the self by the self, when the purpose of self-control is assumed to maximise the long-term best interests of the individual. They describe capacity to apply self-control as being used and consumed any time the self initiates, alters, or stifles a response; they also say that those who have undergone stress have less capacity to delay self-gratification, and the erosion of willpower due to stress is accumulative.

Ozdenoren et al. (2010) put this in an economic context by commenting that individuals have limited capacity to apply self-constraint in highly stressful circumstances and when they have incomplete volitional control. In particular, they note, there is evidence to suggest ‘that the exercise of self-control draws on a limited and fungible cognitive resource – a resource that is often called *willpower*’ (p. 1).

Cox (1985) discussed how stress may be associated with behavioural outcomes of two types: 1) direct responses, sometimes termed ‘self-medication’ (Dallman et al. 2005), such as smoking and excess alcohol; and 2) secondary responses due to hormonal variation, such as cortisol, with lower capacity for relatively lower income groups to be persistent in carrying through tasks and to self-regulate behaviours, including being less patient (Evans & English 2002).

In summary, it is likely that Aboriginal and Torres Strait Islander people living in stressful circumstances will place increasingly higher discount rates on the future. Indeed, we may liken the approach to what economists refer to as a minimax strategy, where the decision maker assumes the worst future outcome will occur and makes the best possible choice under this assumption. As discussed in Section 3, stress plays an important and complex role with consequent biological, health and behavioural responses, including the choice to self-invest, or not, in education.

2.4 Graphical representation

The question of whether to invest in education or to participate in short-term gratification, according to expected length of life, is represented in Figure 2. The horizontal axis represents expected increasing years of life; the left hand vertical axis represents net present value of benefits (or utils in economics speak). As shown, early in life the present cost of education, $X_{1,1}$, receives a disproportionate greater cost weighting than short-term gratification, $X_{2,2}$. Indeed, the net present value of the benefits of education in the first few years of life is shown as being negative. That is, the present value of investing in human capital is initially negative when undergoing schooling, while the benefits of choosing short-term gratification is positive over all years. The present value of short-term gratification, $X_{2,2}$, is dominant up until T' , when it is

¹⁰ The term ‘purchasing power’ is used here to accommodate not only a lower level of financial capacity but higher costs and, in remote regions, less access to goods and services.

intersected from below by education, $X_{.,1}$. Beyond the point of intersection, the expected present value of investing in education dominates short-term gratification, $X_{.,2}$.¹¹

The selection of $X_{.,1}$ over $X_{.,2}$ is dependent on expected life span, the intersection of the $X_{.,1}$ function with the vertical axis and the relative slopes of the $X_{.,1}$ and $X_{.,2}$ functions. Aboriginal and Torres Strait Islander people have higher and earlier levels of morbidity, as well as earlier mortality, than the rest of the population. This further shortens the expected period of time over which the benefits of self-investment in education are realised. Health improvements and reductions in the gap mean that expected life is more likely to exceed T' years (Figure 2).

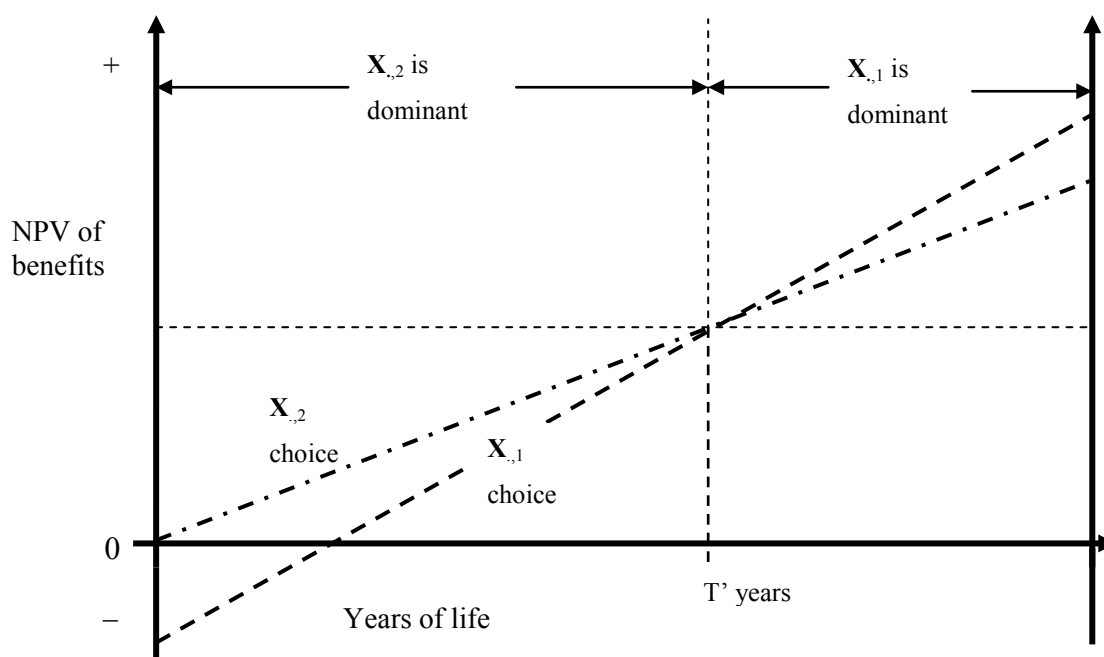


Figure 2: Representation of the response to expected years of life on behavioural choice

Note: NPV is net present value; see equation 6.

In addition to increased expected life span, improvements in the length of time for preference of $X_{.,1}$ over $X_{.,2}$ can be achieved by raising the interception of the $X_{.,1}$ function with the vertical axis by decreasing the cost of education,¹² and altering the relative slope of the $X_{.,1}$ and $X_{.,2}$ functions – which is a function of the comparative rate of costs and benefits into the future according to the individual's discount rate. This is achievable by reducing the unit cost of education, removing uncertainty about the expected benefits of education, such as improved probability of culturally acceptable work, and decreasing the net present value of short-term gratification.

These relationships can be altered by technical change, changes in individual behavioural incentives and changes in individual and community expectations. Decreases in the discount rate will increase the expected value of future benefits, such as can occur with decreased stress levels. As shown in Figure 1b above, such changes, by increasing the present value of future benefits (that is, future benefits are worth more and aggregate at a faster rate), will increase the slope of the $X_{.,1}$ choice curve and bring the

¹¹ The slopes of the respective functions are likely to differ depending on the individual's age, although the relative relationships at normal schooling age are expected to remain as shown.

¹² As earlier intimated in the discussion regarding equation 3, Aboriginal and Torres Strait Islander costs and benefits involve more than financial costs and benefits.

intersection where $X_{1,1}$ is dominant over $X_{2,2}$ at a younger age. As a result, the self-investment in education choice, $X_{1,1}$, would dominate the short-term gratification choice, $X_{2,2}$, at a younger age than that shown. The reverse would occur for a higher discount rate and $X_{1,1}$ choice would dominate $X_{2,2}$ choice at an older age (see Figure 3).¹³

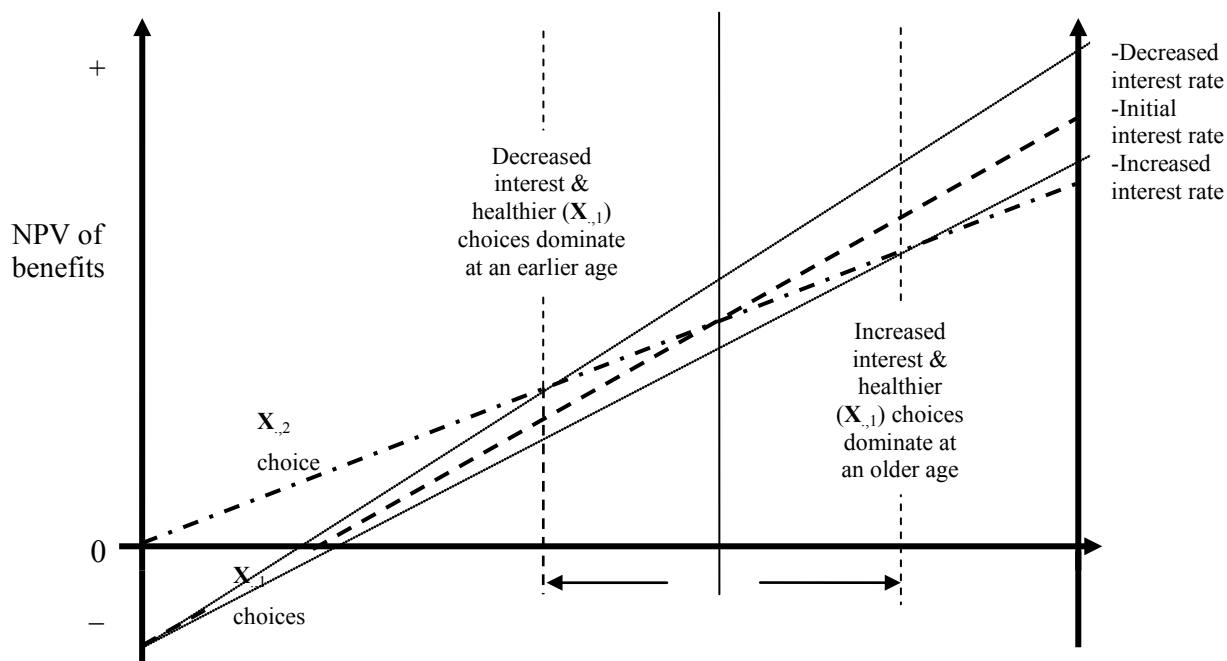


Figure 3: Response to changes in the expected interest or time discount rate

Section 3 deals with these exogenous factors. While financial budgetary constraints are not included in the following, financial constraints at the individual and at the policy level are important when choosing between the respective causative agencies and the degree of policy response. Many of the non-financial budgetary considerations referred to earlier are considered within the following.

3. Exogenous variables affecting stress and poor educational outcomes

3.1 Extending the utility maximisation model

Up to this point behavioural choice for a utility maximiser has been examined on the basis of variation in endogenous variables. This assumption is now relaxed, and the possible influences of a range of possible exogenous factors affecting the selection of alternative behavioural choices are considered. That is, we return to the view that behavioural choice is in response to exogenous *and* endogenous variables according to $X_{j,k}$. This section builds on and extends the utility maximising choice model developed in Section 2.

There are two parts to this section. The first part, 'Influence of the psychosocial determinants of health', reviews the effect of the psychosocial determinants of health on expected life span and volitional controls as it effects time discounting. As earlier noted, the high level of stress suffered by Aboriginal and Torres

¹³ Any change in time preference will have a compounding effect consistent with the initial change. That is, any decrease in interest and the selection of increased investment in education over short-term gratification will result in an increase in expected working life and increased returns to education. The converse will occur with an increase in the discount rate.

Strait Islander people in remote Australia (Carson et al. 2007) leads to a higher discount rate (see Johnson & Schoeni 2007). The psychosocial determinants are important in regard to their effect on choice as a result of their impact on expected length of life, their effect on stress and the resulting loss of ability to assert vocational control and the discounting of future benefits.

The second part, 'Factors affecting school attendance and classroom attention', considers the effect of cultural contradictions and early life preparation on school attendance and performance. These include the need for culture engagement, peer group and community influences, consideration of classroom presentation and impediments to achieving preferred outcomes.

3.2 Influence of the psychosocial determinants

3.2.1 Stress

Stress is a component in the pathway from the psychosocial determinants of health to chronic disease. The Macquarie Dictionary (Deldridge et al. 1997) defines stress as: 'a disturbing physiological or psychological influence which produces a state of severe tension'. Stress has also been described as being bi-polar (Karasek et al. 1981) and being likened to an 'inverted U' in nature (e.g. Cavanagh & Allen 2008), where some stress (strain or challenge) is necessary for optimal performance, with higher or lower stress levels being non-optimal.

In discussing the impact of the psychosocial determinants of health, Krieger (2001) describes how psychosocial factors can influence the multiple sectors of human wellbeing and stress, in affecting 'both behavioural and endogenous biological responses to human interactions'. In this, psychological stress is identified as a result of 'despairing circumstances, insurmountable tasks, or lack of social support'. These stressors, she goes on to suggest: '(a) alter host susceptibility or become directly pathogenic by affecting neuroendocrine function, and/or (b) induce health damaging behaviours (especially in relation to use of psychoactive substances, diet, and sexual behaviours)'. She further explains the role of social cohesion as either a positive or a negative factor supportive of stressful circumstance and appropriate or inappropriate behaviour (p. 696) (see Figure 4).

Figure 4 shows the complex pathway, described by Krieger (2001), from social disadvantage to stress to biomedical health risks and chronic disease, via a dual pathway involving psychological responses and behavioural responses to stress. This structure is consistent with the Whitehall I and Whitehall II studies (Marmot et al. 1997). The Whitehall studies were designed to explain the decrease in expected life span among British public servants with decreasing public service status. In the Whitehall I study, less than 25% of the difference in health outcomes with decreasing social status was explained by increasing poor behavioural choice such as smoking, excess alcohol consumption, poor diet and lack of exercise. In the Whitehall II study more than 50% of the difference in health outcomes was explained by decreasing individual opportunity to exert control in the workplace – thus emphasising the role of the 'psychological response' pathway.

While the Whitehall studies are based on observations in the workplace, these results demonstrate the likely response of people to a particular circumstance. That these circumstances also occur outside of the workplace with similar results has been observed elsewhere (Adler et al. 1994, Karasek 1979, Karasek et al. 1981, Schnall et al. 1994).

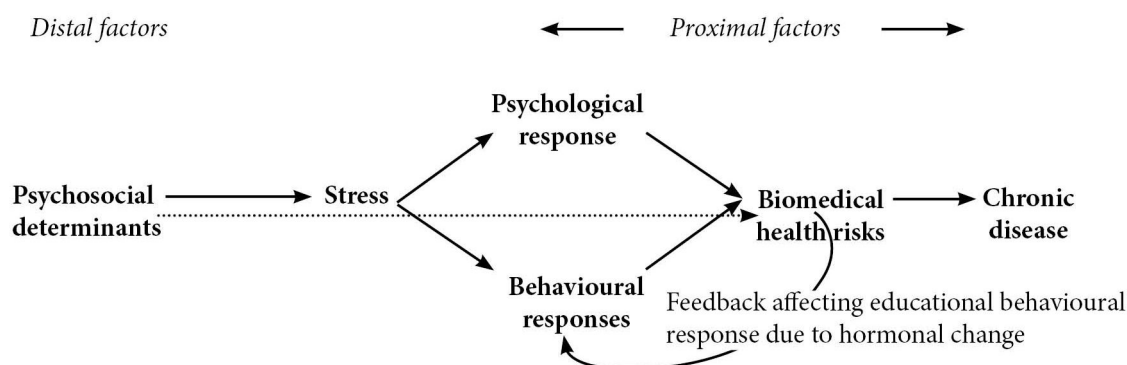


Figure 4: The pathway from the psychosocial determinants of health to chronic disease

Note: the broken line represents the effect of pre- and postnatal factors, such as poor kidney development, on future (mid-life) health. There are feedback responses of biomedical health in addition to the educational response due to hormonal change. These are not included as they do not directly relate to the current discussion.

The follow-up Whitehall II studies showed poor workplace decision authority, high job demand, effort-reward imbalance and associated work-based stress increased with lower work status. Stensfeld et al. (1999) observed increased risk of psychiatric disorders on this basis. Brunner et al. (2007) observed the existence of an inverse dose-response relationship between job strain and increased general and central obesity (see Nieuwenhuijsen et al. 2010).

These results indicate that the psychosocial response to stress is more important in its impact on biomedical health risks than are the impacts of the behavioural response. Yet on the basis of a non-structured review of the literature, much of the focus in the mitigation of chronic disease appears to be focused on the proximal behavioural variables of smoking; physical inactivity; unhealthy diet; and alcohol, drug and solvent abuse. Some successes have been achieved in this approach, such as the substantial reduction in smoking in the Australian population (from 34% in 1980 to 20% in 2011) (Australians for Global Action on NCDs 2011) and a minor reduction in smoking within the Aboriginal and Torres Strait Islander community (AIHW 2008).

A possible advantage of addressing distal psychosocial factors is the possibility of cost efficiencies through scoping economies, which can involve multiple benefits (Campbell 2011, Campbell et al. 2008). Research carried out in joint participation with an Aboriginal community of nearly 1300 people in tropical Northern Territory showed decreased incidence of diabetes, renal disease and hypertension and decreased stress levels with increasing participation in caring for country (Burgess et al. 2009, Garnett et al. 2009).¹⁴

These results were estimated to have brought about annual savings in primary health care of \$279,000 (Campbell et al. 2011). These savings are in addition to a range of environmental benefits such as the biosequestration of greenhouse gases, biodiversity and the mitigation of smoke and dust storms, which are a vector of disease (Campbell et al. 2008) Such savings were also shown to apply to Aboriginal communities in central Australia (Campbell 2011).

¹⁴ Burgess et al. (2009) defined 'caring for country' as Indigenous participation in interrelated activities with the objective of promoting ecological and human health. Such behaviour has important cultural associations.

3.2.2 Early life factors

The capacity of children to engage in and benefit from school attendance is influenced by maternal nutritional status preceding and at the time of conception, by the pre- and postnatal environment, and by the early childhood environment (De Boo & Harding 2006). These influences can include pre- and postnatal responses to poor diet, diabetes and whether the mother suffers from a cardiovascular disease condition during pregnancy (Barker 1998, Cass et al. 2004, Thearle et al. 2008, Yajnik 2002). Even non-obese Aboriginal and Torres Strait Islander people of normal birth weight can suffer higher incidence of chronic disease later in life resulting from malnutrition of the mother during early pregnancy. This condition has been referred to as the ‘thrifty phenotype’ (Barker 1998). The association appears to be due to the foetus preparing itself for a low nutrition environment, but will find itself mismatched if this condition does not exist at birth (see de De Boo & Harding 2006 and Bajaj & Banerji 2007 for the Asian-Indian experience). This condition might explain rapid weight gain in early infancy as a risk factor later in life (Dabelea & Pettitt 2001, Willig et al. 2011). Adult biomedical risks have also been associated with the condition of children of 2–17 years of age (Freedman et al. 2005).

Low birth weight is associated with plasma cholesterol and fibrinogen, which are predictors of coronary heart disease (De Boo & Harding 2008, p. 5). Citing three sources, De Boo and Harding (2006) noted that ‘correction for known risk factors such as diet, smoking and exercise did not have a major effect on the relationships between birth size and subsequent disease risk’ (p. 4). Low birth weight due to poor intrauterine nutrition has been associated with poor kidney nephron development among Aboriginal and Torres Strait Islanders and higher incidence of chronic kidney disease (al Salmi et al 2008).

While preschool nutrition, nurturing and stimulation will positively affect future educational outcomes, high birth weight (Chomtho et al. 2008) and rapid weight gain in early infancy have been identified as risk factors later in life (Dabelea & Pettitt 2001, Willig et al. 2011).

Early life factors are linked through the parents’ socioeconomic and psychosocial environment. These factors affect the child’s cognitive abilities, longer-term or secondary behavioural choices and immediate and longer-term health. These direct risk influences are represented by the broken line in Figure 4, while the secondary feedback is represented by the line from biomedical health risks to behavioural responses.

The environmental factors impinging on a child’s socio-emotional development include diet, crowding, noise, and substandard housing conditions (Evans & English 2002). Children from low-income families, who are more disposed to these conditions, have higher systolic and diastolic blood pressure, and higher cortisol, epinephrine and norepinephrine readings – indicators of stress levels – than their middle class cousins. Such differences indicate decreased capacity for lower socioeconomic groups to carry through tasks due to poor self-regulation and less patience; they can also affect attention to immediate health factors such as diet and exercise and to longer-term factors such as education. In addition there are the possible direct effects of poor health on school attendance and classroom concentration.¹⁵ Dunbar and Scrimgeour (2007), for instance, discuss the negative effect of poor hearing on the uptake of classroom lessons by Aboriginal children; while Burrow et al. (2009) commented on the negative impact on educational attainment due to the high incidence ear infection (*Otitis media*), especially among Aboriginal children in remote Australia.

¹⁵ There appears to be a strong association between educational and health outcomes and parental guidance early in life. And while education can influence future health outcomes, childhood health might affect educational outcomes (Conti & Heckman 2010). Although, as Conti and Heckman observe, an alternative behavioural choices (a third factor) might be affecting both outcomes in conjunction (2010 p. 586).

Flinn and England (1995), in a longitudinal study carried out in the Commonwealth of Dominica, examined the connection between childhood stress and parental/caretaker support by monitoring changes in cortisol levels, using saliva swabs. They found that poor relationships (including family conflict and residential change) between the child and their parent or caretaker along with peer group pressure, work pressures, high disease and low nutrition levels led to increased cortisol levels. These results were associated with immune suppression, inhibited growth, psychological problems and energy depletion. Part of this story is the pathway between trauma and high levels of delinquency (Maschi et al. 2008).

In addition to a range of disadvantages such as household crowding, greater psychosocial influences, and secondary loss of volitional control due to biomedical response to stress, self-investment by Aboriginal and Torres Strait Islanders in human capital through education is likely to be more expensive relative to total income.

3.2.3 All-of-life factors

Using nationally representative data from the United States, Johnson and Schoeni (2007) found evidence of the relationships between early life factors and cognition, human capital accumulation including education, adult health status and timing of mortality. They found that low birth weights, parental status and access to health care on the basis of family health insurance are important predictors.

Other researchers have commented on the importance of positive social interactions in mitigating stress (Stensfeld et al. 1999, Brunner et al. 2007, Krieger 2001, Nieuwenhuijsen et al. 2010). Anderson (2007) emphasises the importance of such social interactions in their effect on health for Aboriginal and Torres Strait Islander people. Conversely, social dissociation due to any of the multiple sources of stigma, racism, disease condition, place of residence or educational level was observed by Link and Phelan (2006) to have substantial negative health impacts. Social associations can also have negative impacts in the form of group behaviour, as proposed by Krieger (2001, p. 696), and as discussed in section 3.3.3 with the example of ‘acting white’ syndrome.

3.2.4 Aboriginal and Torres Strait Islander experience

Aboriginal and Torres Strait Islander people are likely to suffer a range of experiences that differ from those suffered by the remainder of the community, if only in degree. For example, in 2008, 65% of Aboriginal and Torres Strait Islander children (4–14 years) reported at least one stressful event for the previous 12 months – twice the rate of that experienced by other Australians (AIHW 2008). These included death of a close family member or friend (22%), difficulty in keeping up with school work (22%: 24% boys and 16% for girls), and as a result of somebody else’s behaviour (19%). Those living in a non-remote location reported a more stressful experience than those living in a remote location (66% versus 60%). Those who reported stressful events also showed lower rates of excellent to very good health (73% versus 83%) (AIHW 2008). Carson et al. (2007) commented that ‘while dealing with [these] multiple life stressors Aboriginal people are expected to engage with stressful educational circumstances’.

Carson et al. (2007) noted that the most important issues raised by Aboriginal people in regard to their health has been the impact of ‘[a] history of exclusion from citizenship, census, voting, pensions, government, employment, land and society’ (p. XIII). Garvey also identified a history of denial of humanity, existence and identity for Aboriginal and Torres Strait Islanders. Many of these risk factors ‘lie outside the ambits of mental health services and require long-term, sustained efforts across multiple sectors of the community, identifying the need for collaborative intersectoral partnerships’ (2008 p. 6). Paradies, in research carried out in Australia regarding Aboriginal and Torres Strait Islanders (2005) and for minorities in the United States (2006), observed a negative impact of racism on health.

Limited research has been carried out on the relationship between self-control and health for minority Indigenous peoples, with the research of Daniel et al. (2005) and Daniel et al. (2004) being Canadian exceptions. More recently, Daniel et al. (2006) carried out similar research for an Elcho Island Aboriginal population off north-eastern Arnhem Land. All three studies showed decreasing health with decreasing control. Tsey et al. (2003) discuss the results of the Whitehall studies and the relationship of these studies to the lack of control experienced by Aboriginal people. These studies help to generalise the importance of control in explaining differences in health outcomes for minority Indigenous peoples, including Australian Aboriginal and Torres Strait Islander people.

Rowley et al. (2008) found that while the socioeconomic indicators were lower than those generally observed for Aboriginal Northern Territorians, the Utopia Aboriginal community had health outcomes that more closely approximated the Northern Territory non-Aboriginal community. The authors suggest this result is explained by the greater level of control members of the community have been able to assert over their lives. This community is characterised as living in small family groups and would have had greater access to carry out traditional caring for country practices. Burgess et al. (2009) observed that stress levels decreased with increasing participation in caring for country for an Arnhem Land Aboriginal community.

A link exists between lower relative income/social status and negative psychosocial determinants of health. Scrambler suggests that because people in this circumstance have less access to physical and social resources, they have less opportunity to assert personal control. It is suggested that interventions that target social relationships or 'social structures, forces and suchlike' can play an important part in mitigating the effect of lack of control (2011 p. 1975). Daniel et al. (2004) found in their study involving Native Americans that participation in behaviours with obvious negative health impacts, such as smoking, is likely to be an indicator of psychosocial distress. Such behaviours were seen as a coping mechanism. Daniel et al. (2006) observed the high levels of suicide among young Aboriginal males in north-eastern Arnhem Land as an indicator of the lack of emotional and psychological wellbeing and low levels of mastery and control (see also Ozdenoren et al. 2010). Hunter et al. (2001) discussed the interrelationship between higher levels of suicide and the loss of culture for Aboriginal Australians.

An important factor working against the assertion of control is the greater impact for Aboriginal people of government policies and institutions than exists for the non-Aboriginal community (Anderson 2007). The Australian Government's Northern Territory Emergency Response ('the Intervention') in 2007 is a contemporary example of this (AIDA & Centre for Health Equity Training, Research and Evaluation, University of NSW 2010). While positive impacts of the Northern Territory Intervention occurred, negative impacts, including the denial of Aboriginal and Torres Strait Islander people's goals, and further cumulative trauma as a result of intervention outside of Aboriginal and Torres Strait Islander control, also occurred. The Australian Indigenous Doctors' Association and the Centre for Health Equity Training, Research and Evaluation, UNSW recommended that 'the educational elements of the Northern Territory Emergency Response can be strengthened by collaboration between communities, schools and the education sector' (2010 p. 37). Aboriginal people were given little to no opportunity to negotiate on equal terms in regard to major changes to their living environment – thus increasing the level of uncertainty and further loss of volitional control.

3.3 Factors affecting school attendance and classroom attention

3.3.1 Culture

Culture has been defined as the 'integrated pattern of human behaviour that includes thoughts, communications, actions, customs, beliefs, values and institutions of a racial, ethnic, religious or social

group (Cross et al. 1989). Culture is an important aspect of self-identification. The relationship between culture and health can be approached in a number of different ways. For instance, it can be considered on the basis of the impact of a particular cultural position on health, such as described by Dressler (2004). Alternatively, culture can be a source of personal strength and capacity to exert control. Kleinman et al. (1978), for example, emphasise the importance of culture as a health determinant. These results are supported by Dressler et al. in Brazil, where they found ‘that living materially in a manner that more closely approximates the ideals of one’s culture is conducive to better physiological adjustment’ (1998 p. 438).¹⁶

The introduction of social interventions, such as schooling, can result in stressors between traditional cultural patterns and the cultural patterns of western schooling (Carson et al. 2007) and the shortfall by Aboriginal and Torres Strait Islanders in school attendance (Akerlof & Kranton 2002, Purdie et al 2000). Cultural differences can have important influences on how people engage in learning and the effectiveness of learning delivery. Nasir and Hand (2006) noted that educational frameworks based on social and cultural processes are central to learning. Taking the observations of Zubrick et al. observations as an example, ‘Aboriginal cultural knowledge systems are based on intimate relationships not focused on what things are as much as *who* they are and how they are related. Everything has spirit, feeling and law.’ Unlike western culture, ‘spiritual and physical worlds are continuous and interactive ... while time is fluid; past, present and future are all in one place/space/time, more circular than linear’ (2005 pp. xxi–xxii).

Dockery (2009, 2010) examined the statistical association between wellbeing and educational attainment for Aboriginal and Torres Strait Islanders. Overall, these studies show a positive relationship between cultural strength and improved wellbeing (see Campbell et al. 2008 and Davies et al. 2010), educational attainment and workforce participation.¹⁷ Also relevant to school attendance is that ‘[c]hronic stress and high average cortisol levels are associated with frequency of illness, a stress–health relation suggested by temporal associations’ (Flinn & England 1995 p. 860), with consequent effects on school attendance.

Positive self-identity has been found to be an important factor affecting the relationship of Aboriginal and Torres Strait Islander students with their engagement in the classroom, where this involves the student in constant reassessment of themselves according to their own cultural norms (Purdie et al. 2000). The New Zealand experience following the introduction of a Māori-based *Māori Educational Strategy 2008–2012* (Voxy News Engine 2011) provides an example of the benefits of integrating school experiences with the students’ cultural norms. Māori immersion curriculums have grown, where Māori students can attend Māori immersion schools and bilingual units and classes. Substantial steps are being undertaken in the supply of Māori-speaking teachers.

3.3.2 Pre-preparation for schooling

Heckman and Masterov (2007) highlighted the importance of developing cognitive skills at a very early age, as gaps in cognitive ability remain constant after age eight. Indeed, Heckman and Masterov make a strong argument in support of families who are ‘major producers of the skills and motivation *required* [emphasis added] for producing successful students and workers’ (2007 p. 448). They conclude that policies to supplement child-rearing resources for disadvantaged families will not only reduce inequality, but will result in economic pay-offs through improved health, educational attainment and decreased anti-social behaviour. The United States’ Head Start project, for example, resulted in substantial financial and

¹⁶ The results of this study are consistent with the observation that decreasing health outcomes with decreasing personal control occurs across cultures.

¹⁷ These observations are consistent with the New Zealand experience in taking a Māori cultural approach to education.

social cost savings with improvements in school participation, employment and graduation rates, and lower arrest and teenage pregnancy rates (2002 pp. 93–94). The recommendation of the Great Britain report of the Independent Review on Poverty and Life Chances (Field 2010) was that ‘increased funding should be targeted at those factors we know matter most in the early years: high quality and consistent support for parents during pregnancy, and in the early years, support for better parenting; support for a good home learning environment; and high quality childcare’ (Field 2010 p. 7), as a precursor to better educational outcomes.

Increasing emphasis is given in Australia to the role of the home environment in preparing children for school. Zubrick et al. (2005 p. vii) recommend the engagement of Aboriginal parents and caregivers as educators of their children in the first five years of life. The paper by Docket et al. (2010) emphasised the important role of school readiness for Australian Aboriginal and Torres Strait Islander children. Important to this, they suggest, is the understanding by guardians of what is required in preparing children for ‘school readiness’. They found it to be a multidimensional construct, recognising the interplay of children’s individual characteristics in the contexts in which they live, as they grow and develop. It incorporates three major components: a) children’s readiness for school; b) school’s readiness for children; and c) the capacity of families and communities to provide the necessary opportunities, conditions and supports to optimise children’s development and learning. These factors are in addition to the early life health impacts of school readiness.

3.3.3 Effecting effort in the classroom

The social environment influences behaviour by: a) shaping norms; b) enforcing patterns of social control (which may be health promoting or health damaging); c) providing or not providing opportunities to engage in certain behaviours; and d) reducing or increasing stress, for which certain behaviours may be an effective coping mechanism. Consistent with these results is Anderson’s comment regarding the importance of social interrelationships for Aboriginal and Torres Strait Islander health (2007 p. 26) and the consistency with Krieger’s (2001) comment regarding the psychosocial determinants of health (see section 3.2.1).

Akerlof and Kranton (2002) observed that the results of increased public investment in education did not always result in improved educational outcomes. Their starting point, in exploring the reason for such differences, was to recognise that individual students gain utility when their own actions and the actions of others enhance their own self-image. These same students also think of themselves and of others according to different social categories, such as, in the United States, ‘jocks’, ‘nerds’ or ‘burnouts’. Important to self-esteem is the congruence between the students’ social category/self-image and the social/school environment, or, alternatively, social difference. Entry into these categories is influenced by the students’ ascriptive characteristics, including their social background and their capabilities, whether intellectual and/or physical. Students maximise their utility by implicitly (as opposed to consciously) choosing their social category *and then choosing the educational effort according to the norms of their chosen category*. As a result, student engagement in education (time and effort) is influenced by the degree of social difference in their school environment rather than expected future wage.

The effect of this social difference can be mitigated by schools offering students a choice of social goals, rather than a single social goal. This is a trade-off for school administrators, who now cannot promote a single social ideal and may need to accept lower expectations of academic performance. However, it minimises the possibility of intergroup conflict which may arise where the social make-up of students is heterogeneous and some students feel disenfranchised from the school environment (Akerlof & Kranton 2002).

A later paper by Akerloff and Kranton (2005) explored this further via the question of ‘remaining in your peer group’. These results indicated a strong social incentive for disadvantaged groups to maintain behaviour consistent with peer group norms. They observed that such behaviour maintained the entrapment of disadvantaged groups. Conversely, the benefits of maintaining peer group cohesion include providing support at times of need, including social support. The greater the disparity and separation between identifiable groups the greater is the peer pressure to conform, for which Afro-Americans use the term ‘not acting white’ (Field 2010). The same terminology has been applied by Aboriginal youth to similar circumstances (Purdie et al. 2000).

Berkman and Kawachi, in their review of the historical framework of social epidemiology, found the most successful interventions for minimising risk factors are those that incorporate social and organisational interaction and support (2000 p. 7). Such social interactions, as earlier commented on, can also involve negative health and social behaviours as well as positive outcomes. The culture around ‘not acting white’, for instance, can have a negative influence on educational participation with immediate and longer-term health outcomes.

3.3.4 Classroom impediments for Aboriginal children

Lack of control over life circumstances, including education, is proposed as important in explaining poor educational outcomes. Malin discusses the impact of lack of control over destiny and social exclusion for poor health with stress hormones being the plausible pathway (2002 p. 1). She also provides a starting point when it comes to classroom impediments: ‘With regard to the impact of racism on physical health, research suggests that the subjective experience of discrimination, by provoking particular responses such as anger, cynicism and anxiety, may generate stress which can lead to cardiovascular reactivity, high blood pressure and negative health consequences on both objective and self-reported measures of physical health’ (also, see Krieger 2001 p. 5).

In examining the two-way relationship between health and educational relationship, Malin (2002) noted the failure in health outcomes and school attendance due to lack of control within and outside of the classroom. Indeed, she suggests, the negative health impacts of attending school could more than negate any health benefits of school attendance. While the marginalisation or classroom exclusion of Aboriginal students can be difficult to observe, the impact of an accumulation of classroom actions can be tabulated over time. Comment in the *Western Australian Aboriginal Child Health Survey* provides a further example of the influence of accepting poor academic performance. This, they suggest, had a cumulative effect leading to limited access to lifelong learning, employment and economic opportunities (Zubrick et al. 2005 p. vi).

Malin (2002) refers to Hudspeth’s (1997) discussion of the positive educational results of how a teacher [‘Mrs Banks’] maintained a positive interaction with Aboriginal children in Alice Springs, including through recognition of the students’ traditional country and the establishment of contacts with student parents. She showed positive expectations of behaviour and class performance through the provision of a classroom environment that was stress free. Zubrick et al. (2005) noted a need for educators to work collaboratively with parents and caregivers and to encourage their participation in ensuring educational performance and the needs of students, and for parents and caregivers to understand educational standards.

Mooney (2005) reviewed a range of factors affecting the negative perspectives that Aboriginal and Torres Strait Islander children can have about attending classes and participating in education, including a long-term history of marginalisation in society in general and in the classroom in particular. The quality of teaching had, in many instances, been below that received by other Australian children, while teaching

failed to engage with the experience and culture of Aboriginal and Torres Strait Islander students. In addition, she suggested that because of the often harsh schooling experience of parents and older family members, carers may not be supportive of school attendance and were often unable to assert control over children to attend school. Aboriginal children, when observing the poor work opportunities of their elders, are likely to question the benefits of schooling.

The Australian Indigenous Doctors' Association and the Centre for Health Equity Training, Research and Evaluation, in commenting on the Northern Territory Intervention, note poor school attendance in remote Australia. They commented that while there are expected health benefits of education, the low school attendance is partly explained by poor student health. Even if there were full attendance, there would be a serious shortfall in facilities and staffing (2010 p. 34). Kronemann (2007) estimated that 7500 Northern Territorian Aboriginal and Torres Strait Islander children aged 3–17 years of age missed out on preschool and school in 2006. It was estimated that providing for these students would take an additional 660 teachers with an additional annual expenditure of \$99 million.

One option often called for by politicians and others (e.g. Henry 2007a, 2007b) has been to encourage school attendance by Aboriginal students by linking school attendance with social welfare transfer payments. However, research carried out in the California school system (Campbell & Wright 2005) showed that such an approach fails to take full consideration of all of the factors affecting school attendance. In addition to disenfranchisement within the school system, poor student and parental health can be an important factor affecting attendance. There are also a number of home stress factors including family conflicts, logistic problems for single parent families and financial difficulties associated with getting children to school. Campbell and Wright (2005) found the use of sanctions had, at best, little effect on school attendance, while supportive actions directed at the underlying issues were observed to have positive outcomes. Consistent with Campbell and Wright's Californian results, the Northern Territory Emergency Response Review Board (2008) found no evidence to support linking welfare payments with school attendance; instead, the review found the inability of parents to control children's behaviour, poor teacher quality, school culture and household overcrowding were important explanative variables for non-attendance. Yet contrary to such evidence, and the recognised approaches that do work, the Australian Government is trialling a program in the Northern Territory where parents can have their welfare payments suspended if their children are not going to school.

3.3.5 Performance assessment

A number of studies assessing the educational outcomes of Aboriginal and Torres Strait Islander students have recently been carried out, including *Achievement of Australia's Early Secondary Indigenous Students: Findings from TIMSS2003* (Thomson et al. 2006), *A Snapshot of Early Childhood Development in Australia* (Centre for Community Health and Telethon Institute for Child Health Research 2009), and *School attendance and retention of Indigenous Australian Students* (Purdie & Buckley 2010). These studies provide important input in evaluating educational performance and monitoring the success or otherwise of educational programs, but provide little in the way of explaining behaviour change.

3.3.6 Lifetime history

The impact of living in an environment of poor volitional or behavioural control is likely to impact at all life stages, as shown in Figure 5. Figure 5 also shows the range of factors likely to affect the choice to self-invest in education for each life stage. Addressing these factors depends on the level of control.

An additional aspect is the relationship between the life history stages and the choices available at each stage and as part of the whole. Achievement of educational and lifetime success is sequential; that is, the difficulties and successes achieved at each life stage will depend on the preceding life history (e.g. Contoyannis & Li 2011). This sequential process exists between stages and within stages. Any interruption in a student's progression through their life history – such as through sickness, poor quality teaching or any other exogenous factor affecting class attendance and classroom attention – will affect ongoing control and future educational capacity.

Also important to perceived control are expected future outcomes. Thus, the arrows in each quantum stage point in both directions, as the condition at time t_i is a function of the conditions at t_{i-1} , as well as expected t_{i+1} .

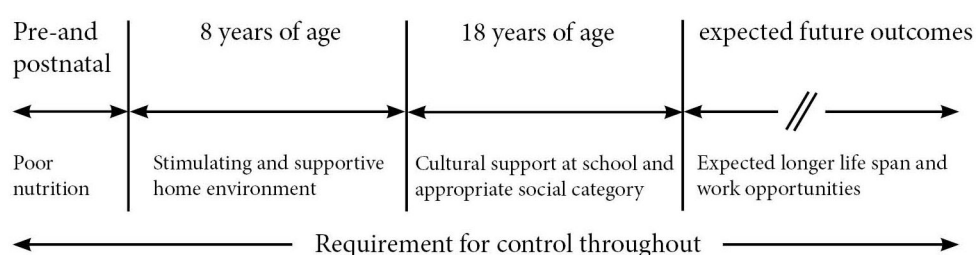


Figure 5: Different control factors given expected quantum changes in life history

Lack of control and poor experiences in the classroom (including stress levels) or at any other stage of an individual's life history may result in an absolute or a partial impediment against education and future outcomes, including work. Such impacts might be accumulative, as earlier discussed in regard to discounting. Performance assessments have shown that the educational performance of Aboriginal children in the first year of class is much the same as that for non-Aboriginal children, but steadily drops away over the following years (Thomson et al. 2006).

Control is a central theme that passes through each life stage. As noted, certainty and continuity are important factors affecting educational attainment. Fundamental to the establishment and maintenance of control is the social environment in which people live. As earlier discussed, health and hormonal changes due to stresses derived from the psychosocial determinants of health are important; therefore Figures 4 and 5 should be jointly considered.

3.4 Summary

Aboriginal and Torres Strait Islander people have a lower level of educational achievement than the rest of the population. In Section 2 'Economic behavioural choice', a human capital investment model was used to examine behavioural choice across two choice variables: self-investment in human capital through education, and the alternative behavioural choice variable of short-term self-gratification. Using a utility maximisation model, with exogenous variables held constant, it was shown that the selection of short-term self-gratification could be economically rational, in spite of improved future income and health benefits of education. Self-gratification, as discussed, is more likely to occur with expected shorter life span and high stress levels, as are borne by Aboriginal and Torres Strait Islander people.

The exogenous variables that were held constant in Section 2 were then loosened in Section 3 'Exogenous variables affecting stress and poor educational outcomes'. The two parts to this section were 3.2 'Influence of the psychosocial determinants of health', and 3.3 'Factors affecting school attendance and classroom

attention'. The common influence in sections 3.2 and 3.3 is the psychosocial determinants of health, including lack of control. In the first part the effect of the psychosocial determinants on expected life span and on the capacity to focus on achieving longer-term outcomes was demonstrated by looking at the expected length of time, 't', over which returns on investment in education could be expected and the relative importance given to future events, or discounting of future events, 'i', as compared with choosing current events. Section 3.3 examined the cost and impediments to school attendance and classroom concentration according to a range of cultural inconstancies, lack of school cultural support and home environmental factors to prepare children for schooling.

4. Research framework

4.1 Handling complexity

The purpose in this section is to set out a research framework in which the preceding behavioural and educational information is integrated. This involves resolving questions regarding the conceptual structure, how this might be modelled, and the data requirements. The model must be theoretically robust and able to handle complex interrelationships. One way of integrating the resulting complexity is through the use of structural equation modelling. The theoretical basis on which the causative relationships might be integrated is via the Theory of Planned Behaviour (TPB) (Ajzen 1991). This approach to modelling behaviour under stress has been used to model farmer stress (Edward-Jones 2006, McGregor et al. 1995, Willock 1997, Willock et al. 1999).

4.2 Application of Ajzen's Theory of Planned Behaviour

The behavioural choices that people make do not occur in isolation but are the result of individual history: personal experiences and beliefs, the beliefs and influence of the people around them, and the options that are available to them as a consequence of the natural and anthropomorphic environment in which they live. Much of this, as discussed, is encapsulated within the psychosocial determinants of health. One approach to including the context in which decisions are made is the TPB (Ajzen 1991, 2002). As noted by Armitage and Conner (2001) the TPB provides an effective means of predicting intention and consequent behaviour.

This approach explicitly accounts for impediments through perceived behavioural control. As indicated in Figure 5 control is a variable affecting outcomes over the life span, and people being able to exercise control is a necessary assumption in the application of the TPB. Factors affecting control include differences in stress levels and capacity to handle stress, as discussed above. The TPB can be used to help explore why somebody makes a particular behaviour choice, or, conversely, to identify pathways to encourage or to discourage behaviours.

The core assumption of the TPB is that intention is the best predictor of behaviour. According to the TPB, behavioural intention is the result of an endogenous variable: personal subjective attitude to the behaviour (the degree to which an individual approves of or disapproves of the behaviour) and two exogenous variables: the subjective attitude to the behaviour by people of influence (e.g. cultural and peer group norms) and personal perception of capacity to control the behavioural outcome given the perceived conditions/environment. Perceived behavioural control affects intention in the sense of the expected full or partial success in carrying out the behaviour (Figure 6). For example, a student's intention might be to finish the year in the top quartile. At end of year, however, the student succeeds in placing high in the second highest quartile. This might be seen as a partial success.

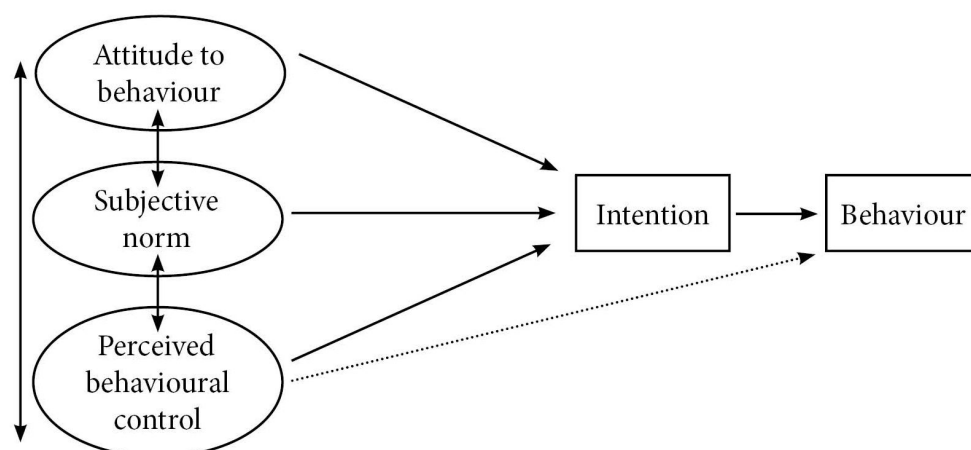


Figure 6: Ajzen's Theory of Planned Behaviour

Source: Ajzen 1991

Other factors such as the subjective norm, even if substantive, can place a limited impact on intention and consequent behaviour, due to an inverse relationship of intention with perceived behaviour control. Within the economic literature, perceived behaviour control would normally be captured in regard to budgetary considerations and in use of the term 'impediment'. The budgetary constraints were explicitly included in equation 3, Section 2. A range of possible non-financial budgetary and behavioural impediments affecting choice and classroom behaviour were discussed in Section 3.

Based on the material in Section 3, we know that perceived behavioural control has two aspects. These are that variation in individual perceived behavioural control is affected by the psychosocial determinants of health and that there is variation in perceived behavioural control as a result of exogenous impediments and stress levels. These aspects jointly affect behaviour. Saliva swabs might be used as a minimally invasive approach to obtaining stress level measurements (see Flinn & England 1995).

Ajzen's TPB has been shown to be a good predictor of how different contextual factors can affect behaviour, including health (Godin & Kok 1996) and education (Casper 2007). Such eliciting studies have assisted the application of policies aimed at reducing poor lifestyle choices such as fatty diet, smoking and excessive alcohol consumption, and in the promotion of positive lifestyle choices such as exercise (Armitage & Conner 2001) and continuing education (Casper 2007).

4.3 Structural equation modelling

The following relies on the work of Pearl (2009, 2011) at the University of California, Los Angeles, and Simon (1997) at Carnegie Mellon. Structural equation modelling involves the 'integration of substantive knowledge with statistical data so as to refine the former and interpret the latter' (Pearl 2009 p. 34). Such combining of qualitative and quantitative information and knowledge is a helpful step in explaining events and developing policy response to these events. That is, the use of structural equation modelling can be used to integrate qualitative knowledge and existing theory with quantitative data for the purpose of manipulating endogenous variables through the use of exogenous variables. Structural equation models can be used to facilitate economic modelling of complex systems. Because the questions being dealt with in

this study involve people and anthropomorphic systems, quantifying the coefficient values, by necessity, may need to rely on semi-experimental and non-experimental data (Pearl 2009, Angrist & Pischke 2009).

The use of graphs (path diagrams) in structural equation modelling provides a conventional means of expressing substantive assumptions and challenging these assumptions. For example, structural equation modelling allows us to follow the impact of an intervention for one of the relationships within a system without changing the other structural equations. Its use also facilitates economical presentations of joint probability functions and facilitates efficient inferences from observations (Pearl 2009 p. 13).

4.3.1 The nature of structural equation models

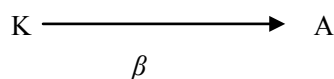
Qualitative, including theoretical, information can be used to construct the model; quantitative information provides a measure of the effect of one variable to another. The sort of question to be considered here is the probability of ‘A’ occurring given the condition ‘K’, or $P(A|K)$, where K is known with certainty. In which case:

$$A = \alpha + \beta K + U; \quad 7.$$

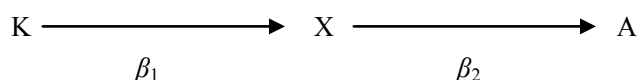
where A is the dependent¹⁸ variable the value of which is unknown, α the intercept or constant value of A, β the rate of change in A depending on the value of the associated variable or variable with which A is correlated, and U is the unexplained variables. Equation 7 tells us is that there is an association between A and K.

Three structural equation relationships are shown using three different path diagrams in Graphs 1, 2 and 3. Graph 1 shows the value of A as changing as a result of the manipulation of the variable K according to the coefficient β , where $0 \leq \beta \leq 1$. Here, we see the use of a graph as a mathematical language (Pearl 2009), where it provides improved clarity and understanding of the causative relationship. Graph 2 shows a Markovian relationship where the value undergoes transitions from one state to another across multiple states (from a finite or countable number of possible states; two possible states are shown) in a chainlike manner. Graph 3 shows what is referred to as a complex causative relationship, as further discussed below.

Graph 1: Representation of a single causative relationship

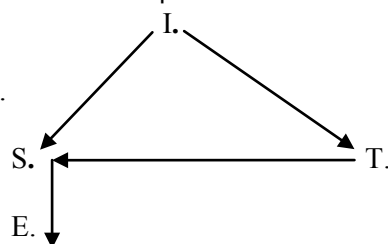


Graph 2: Representation of a Markovian causative relationship



¹⁸ Or should we say: A is the variable that we are trying to estimate, on the basis of the correlation of A with K? This view is given by Angrist and Pischke in their interesting volume *Mostly Harmless Econometrics*, when they observe: ‘Causal inference has always been the name of the game in applied econometrics ... Less thoughtful observers fall back on the truism that “correlation is not causality.” Like most people who work with data for a living, we believe that correlation can sometimes provide pretty good evidence of a causal relation, even when the variable of interest has not been manipulated by a researcher or experimenter’ (2009 p. 113).

Graph 3: A complex causative relationship



The structural equation models represented in Graphs 1, 2 and 3, and structural equation models in general, differ from equation 7 in a number of important ways:

- An important defining characteristic of structural equation models is that while the data defining a linkage may be symmetric, the causal relationship is usually asymmetric (see Pearl (2009); Simon (1997 p. 13). For instance ‘ $\rightarrow$ ’, is not equivalent to ‘ $=$ ’, as ‘ $\rightarrow$ ’ defines an asymmetric relationship. While the use of $=$ normally implies a reflexive property, this is not what is intended in the use of structural equation modelling. That is, while the algebraic relationship 3 (in section 2.2) can be manipulated, such that the value of U might be identified, the value K cannot be estimated from A in Graph 1. That is, while the causative relationship goes from A to K , it does not go from K to A . In this instance the causal relationship extends from A , the exogenous causative variable, to K , the manipulated endogenous variable.
- There is no base data α . All that is shown is the change in the value of A according to a change in K , given by the statistical relationship β ($\beta + U$ might be used). According to Pearl (2009): ‘If we have the means of conducting a controlled randomized experiment, with y randomized, then if we set the control group to y_1 , and the experimental group to y_2 , the observed difference in $E(Z)$ ¹⁹ will be $E(Z_2) - E(Z_1) = c(y_2 - y_1)$ ²⁰ regardless of the values of y_1 and y_2 . (Z_1 and Z_2 are the measurements of z under the control and experimental groups, respectively.)’
- The causative relationship may be multiplicative or additive. For Graph 2, the change in A as a result of changes in K and X is multiplicative, such that when $0 \leq \beta_1, \beta_2 \leq 1$, the value A is monotonically decreasing according to $\beta_1 * \beta_2$.
- Structural equation analysis can be used to handle complex relationships, as shown in Graph 3. Relating to this proposed study, this example could be applied to the change in educational outcomes as a result of improved classroom conditions. The lack, or poor quality, of classrooms can be an impediment to school attendance and classroom participation. In Graph 3, changed classroom conditions ‘ I ’ affect the students’ ‘ S ’ performance and the teacher’s ‘ T ’ classroom performance in teaching students, with a consequent change in the students’ educational performance ‘ E ’. The change in student performance due to the change in the classroom, plus the change in the students’ performance due to the change in the teacher’s performance due to the changed class room condition is additive. Meanwhile, the Markovian relationship represented by the chain of events $I \rightarrow S \rightarrow E$ is multiplicative. However, in this instance it is possible that the relationship: $I \rightarrow S \rightarrow E$ is not monotonic.

¹⁹ Read ‘expected’ for E .

²⁰ Assuming the distribution of the random variable $Z_1 - y_1$ is the same as that for $Z_2 - y_2$.

4.3.2 Testing structural equation models

Following the introduction of structural equation models in 1921 by Wright (1921) and others (see Pearl 2011 p. 3), there has been a tendency to move away from modelling causality to the use of causality-free approaches. The apparent explanation for this is the confusion that occurs with the use of '=', as discussed, and the desire to use traditional statistical means of proof. Pearl (2009, 2011), for instance, gives the use of covariance structures and simultaneous equations as an example of the misapplication of structural equation models. An example involving the misapplication of covariance analysis to structural equation modelling is the work by Byrne (2006), as critiqued by Pearl (2009, 2011). Pearl has attributed this to notational short sightedness as a result of the failure by the equality sign to distinguish structural form from a regression equation (2009, p. 138; 2011, p. 3).

This leaves those brought up in a world of econometrics and biometrics with questions of experimentation proof. As noted, it is not enough to identify the statistical relationship – or predictor – of a condition without also identifying the causal relationship – the factor/s causing change – where reliance can be applied to qualitative knowledge as well as quantitative data.²¹ The conditions to test the causal relationships include:

- Manipulability, when the exogenous or experimental variables can be manipulated by the experimenter to cause change in the endogenous variable according to the causative relationship
- Time precedence, when the occurrence of the exogenous causative agent precedes the response of the endogenous variable
- Prepotency, which relies on whichever is the larger or more powerful as the explanative or causative variable resulting in a change in the smaller or less powerful variable. That is, the larger or more powerful is usually accepted as the causative variable and the weaker as the affected variable (Simon 1997 pp. 21–22) – unless, of course, there is reason to believe otherwise.
- Occam's Razor, or the Laws of Parsimony, in which the simplest explanation takes precedence over more complex explanations, unless there is a contrary explanation. A possible explanation for this position is that simple systems, biologic or otherwise, are likely to have a comparative competitive advantage over complex systems. Aside from this, the number of possible complex explanations takes us to 'infinity and beyond' and would be impossible to factor into calculations. (See Pearl 2009 Chapter 2 for further explanation of Occam's Razor.)
- Theoretical consistency.

Structural equation modelling can be used to integrate exogenous, $X_{j..}$, variables with the endogenous variables, $X_{j.k}$, according to the Theory of Planned Behaviour. Equation 8 is a structural equation model of the TPB (Figure 6). That is, probable behaviour choice, $X_{j.k}$, depends on endogenous behavioural choice (intention) as affected by exogenous variables, according to the TPB:

$$P(X_{j,k} | Y_1, Y_2, Y_3, Y_4). \quad 8.$$

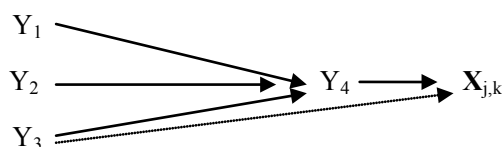
Graph 4 is the graphical notation of Figure 6, and shows a series of nodes, or variables ($Y_1, Y_2, Y_3, Y_4, X_{j,k}$) connected by a series of links '→'. These links denote a certain (probabilistic) relationship between nodes. That is, Graph 4 shows $P(X_{j,k})$ as the joint probabilistic behavioural outcome of the variables $Y_1,$

²¹ Endogenous variables have been used to explain behaviour while being dependent on a range of exogenous variables, which is likely to involve a complex causative relationship, as per Graph 3.

Y_2, Y_3 , where Y_4 , (intention) is independent of all other non Y_1, Y_2, Y_3 , predecessors. That is, $Y_4 \rightarrow X_{j,k}$, is the expected probability intention of choosing $X_{j,1}$, or self-investment in human capital through education.

The complexity inherent in the TPB can be developed through the use of sub-systems, such that Y_1, Y_2, Y_3 can be initially developed as independent sub-systems (although interrelated, as earlier shown in Figure 6). For example, Y_1 (attitude), is the result of a range of causative relationships (equations) such as history, education, thinking patterns, general disposition, and feedback between Y_1, Y_2 , and Y_3 .

Graph 4: Representation of the factors affecting intention, leading to behaviour



4.4 Development of a possible social survey framework

It will be noted that Graph 4 is a simplification of Figure 6, as the interrelationships between Y_1, Y_2 and Y_3 , shown in Figure 6 are not included. That is, personal attitude to behaviour (Y_1) is affected by the subjective norm (Y_2) and perceived behavioural control (Y_3). Such inter-relationships might be obtained using time series survey data. However, careful consideration would have to be taken of changed circumstances over the time period; reference can be made to the manual on the construction of questionnaires based on the TPB developed by Francis et al. (2004).

As represented in Figure 4 and Graph 4, all of the variables Y_1 through Y_3 can influence or override the development of an intention, Y_4 , to carry out a behaviour, $X_{j,k}$. This is particularly the case with perceived behavioural control, Y_3 , which can also affect behaviour. Thus, as discussed earlier, the importance of the assumption of perceived behavioural control in the application of the Theory of Planned Behaviour. Also, as discussed in Section 3, relative lack or loss of control is an important factor affecting health outcomes.

The data requirements will depend on identification of what the factors are that affect educational learning, where this involves both school attendance and the effort children will apply, as has been discussed throughout this paper. Accordingly, the population in this instance is Aboriginal primary school-aged children resident in remote Aboriginal communities. As is well understood, there are a number of issues requiring careful consideration in the identification and representative strength of such populations. People of influence have an important role, as does the interrelationship between the community and the school. Consideration needs to be given to the differential effect of how well integration of these aspects occurs. Who are the people of influence? How do they differ in the role they might play? What factors do they influence in affecting the behaviour of school attendance and attention?

4.4.1 Questionnaire development

Intention is assumed to depend on the influence of three sets of factors, as set out in the TPB. In applying the TPB, Francis et al. (2004 p. 6) note that the steps required in developing a questionnaire designed to elicit the psychological background to a behaviour are to identify the target, the action/s to be taken, the context in which the behaviour occurs and time phase. In this instance these are:

- Target: Primary school-aged Aboriginal and Torres Strait Islander children in remote Australia
- Action: To encourage primary school attendance and engagement with classes

- Context: Poor educational achievement by Aboriginal and Torres Strait Islander children in remote community schools
- Time: Over the years of age of primary school attendance.

5. Conclusion

The interrelationships between short-run and long-run behavioural choices that people make and how the external influences of the psychosocial determinants of health can influence these choices have been examined within an economic framework.

It is shown that the poor lifestyle choices of Aboriginal and Torres Strait Islander people are likely to be the result of poor lifetime experiences rather than myopia. A number of factors add to this, including poor prenatal and postnatal care, and high levels of stress due to a history of dispossession, racism and changing government policies. While improved medical intervention is important to improved outcomes, changes in life experiences, according to the psychosocial determinants, have an important role to play in closing the gap in expected life outcomes for Aboriginal and Torres Strait Islander people.

Understanding the role of the factors influencing the behavioural choices made by Aboriginal and Torres Strait Islander people is an important step to changing poor lifestyle choices and to closing the gap. The TPB has been used to understand and alter poor lifestyle choices in other settings and might be used as a means of elicitation of the factors affecting behavioural choice and in the development of strategies aimed at changing the lifestyle choices of Aboriginal and Torres Strait Islander people. As discussed at several stages throughout the paper there are two major aspects in regard to control: a lack of personal control, which is a major factor affecting stress levels and biomedical health risks; and the influence perceived behavioural control has on intention. Given the poor lifetime experiences of Aboriginal and Torres Strait Islander people, questions of volitional control are important. It is importance to identify the factors affecting volitional control as a precondition to be met, if we expect Aboriginal and Torres Strait Islander people to take greater responsibility, including self-investment in human capital through education.

In prioritising investment across competing policies, it is important to meet the usual long-run marginal requirements. Within an economic framework, any policy response under a budgetary constraint that includes market and non-market-based costs and benefits is best when the marginal net social benefits across all policy options are equal, or, alternatively, that marginal social benefits equal marginal social costs if budgetary constraints do not apply.

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