

Poverty is behaviour: An evaluation of Life History theory in Cape Town

A thesis submitted in fulfilment of the requirements for the degree of

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of

University of Cape Town

by

Robin John Small

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Declaration

I, the undersigned, hereby declare that this research thesis is, except where otherwise specified, my own work. It is submitted for the degree of Master of Sociology at the University of Cape Town. It has not been submitted before for any other degree or examination at any other University.

Robin John Smaill

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Abstract

This study used data from 2090 young adults and their households collected in a longitudinal survey in Cape Town from 2002 to 2009. The study examined factors influencing the educational achievement of the participants including environment, schools, parents and individual's own behaviour. Multivariate regression was used to analyse the data. Results showed that the education system had the largest influence followed by adolescent behaviour and then parental behaviour. The environment had no significant effect. Both gender and wealth declined in importance when the behavioural variables were added to the model supporting the hypothesis that behaviour is associated with educational achievement and hence poverty. The findings of this research suggest that the Education Department appears to have non-educational objectives and family processes influences educational achievement. These circumstances need to be transformed if educational achievement and thereby poverty or inequality is to be addressed. Future surveys examining young adults should include more details of the environment, early childhood experiences, family processes and the parent/child relationship.

Chapter 1 - Theories about poverty

Poverty is complex, persistent and the root cause of many social problems. Its persistence confirms the complexity and the probability that there is no single cause of poverty. History books indicate that poverty has been a part of human civilisations for a long time. This thesis asserts that poverty is behaviour and that the lack of wealth that defines poverty is a symptom of behaviour associated with poverty.

Education is generally considered the key to unlock poverty and as a lack of skills hinders economic growth that is a reasonable assumption. This places a responsibility on the education system that is possibly unrealistic because it ignores other contributing factors. Many factors affect poverty such as the economic system, the degree of democracy, labour legislation and the family.

The family is a biological entity, which produces the next generation, but there is a great deal of variety between families. The level of parental investment in children is a convenient way of quantifying this variable and it can directly influence the cognitive ability of children. This then affects education. Thus, the study of parenting in its many forms is relevant to poverty. The reproductive behaviour of people is also important to educational achievement because it is part of the family. Life History (LH) theory offers a framework on which to hang the behaviour of people and bring order to this complexity. Poverty occurs in a context of circumstances and behaviours. This chapter attempts to summarise various factors considered to affect poverty and particularly those affecting educational achievement.

People make decisions on how to behave, instinctively or consciously, and that behaviour affects other people to different degrees dependent on their position. At the highest level, the legislative body of a country decides how to distribute resources and what acts to pass. The efficiency and the behaviour of people within the various organs of state affect people. However, what is common to every person is the behaviour of parents within the home and that affects children and consequently the next generation.

Poverty is easy to measure with a poverty line of less than \$USA 1-93 per day in 2011 purchasing power parity (Kakwani & Son, 2016) or relatively measured and termed inequality

(Makiwane & Berry, 2013) . A common definition of poverty is a lack of basic human needs such as food, shelter, sanitation, water, health, education and access to services. While this definition is simple and measurable, it is problematic because these symptoms of poverty are then conceptualised as the cause of poverty. The assumption is then that supplying these lacks will be an effective treatment for the problem. The poor then become passive recipients of aid programs. A lack of wealth is a symptom of poverty in a similar way that a fever is a symptom of an infection. Doctors will treat symptomatically if they do not know the cause of the disease but it is generally more effective to treat the disease. Does the same apply to poverty? An alternative is to conceptualise poverty as behaviour. Poor people behave in such a way that they lack the ability to earn enough or that people in power behave in a way that is detrimental to the poor and this keeps them poor.

If poverty is a product of behaviour, it offers possibilities for solutions. Current remedies for poverty in South Africa focus on changing circumstances and providing education. This recipe appears to be unsuccessful. Unemployment in South Africa in 2013 was officially at 25% but this figure only includes people actively looking for work. When the people who are not actively searching for work are included, the unemployment figure is 37%. The level for youths is 53% (Lloyd & Leibbrandt, 2014). Research indicates that unemployment statistics should include both groups (Posel, Casale, & Vermaak, 2014). Another measure of poverty is to look at the status of children. In 2011, 58% of the children in South Africa were living in income poverty (Hall, 2013). This is calculated by dividing the total household income, including social grants, by the number of occupants and then compare with a defined poverty line. Research using the Cape Area Panel Study (CAPS), the data set used in this paper, confirms the persistence of poverty in South Africa (Magruder, 2010) and the high unemployment of youth (Lam, Leibbrandt, & Mlatsheni, 2007). These types of figures confirm the poverty observable by any visitor driving from the airport to central Cape Town.

Life History (LH) theory provides an explanation for human behaviour. The substance of the theory is that the behaviour of parents with infants and young children provides cues for the child about the safety and predictability of their environment. Thus, parental attachment provides an unconscious evaluation of the environment for children and results in reproductive and other behaviours that are adaptive to that perceived environment (Del

Giudice M. , 2009). When attachment security is minimal, it results in behaviours typically associated with poverty. The chain of poverty starts with parental behaviour, then poor educational achievement, which results in low earning abilities and consequently poverty. Generational poverty is the norm because poor parents live in environments that are dangerous and unpredictable and this is usually detrimental to the relationship with their children.

Logic suggests that education in its various forms and levels offers the only solution to poverty. Education improves skills or earning capacity so it is a sustainable way to lift populations above the poverty line. This logic has been applied in South Africa with resources poured into education but the results obtained mean the logic or application must be questioned. Authors have described the South African education system, as being in crisis and (Spaull, 2011 & 2013) is an example of many. Two explanations for the failure of this logic are possible. Firstly, the education departments are not performing their tasks adequately and a recent publicised court case about the delivery of textbooks suggests that they are not. The second explanation or contributing factor is the behaviour of parents. Success in industrialised societies requires both cognitive and other skills like motivation, attention, physical and mental health, perseverance and self-confidence. Evidence has shown that differences in these traits are detectable in children at a young age. The ability gap between advantaged and disadvantaged children exists before they even start school (Heckman, 2008). This implies parents can limit children and teachers will struggle with these children. The family has been under attack for a long time in South Africa. The migrant labour system separates men from their families and this practice continues today. Apartheid systematically destroyed the family with various policies so that it is not surprising that many families are dysfunctional. A symptom of this dysfunctionality is the performance of children at school and the possible cause are parenting skills.

Education primarily focuses on children with the aim to lift communities rather than the individual. Adults can and do lift their skill level, which is important for productivity and earning ability, it is however a subsidiary activity in comparison to the education of children. The next generation benefits from investment in children and a failure to invest adequately in the past will hinder current economic growth (Rasool & Botha, 2011). These

authors report that the consequence of skills shortage is poor economic growth and unemployment.

Unemployment is a large part of poverty and many things, besides a skill shortage, influence the amount of employment. A growing economy will increase employment. A century ago many people thought that communism or socialism could eliminate poverty but Russia proved otherwise. Capitalism, as exemplified by America, is also not poverty free. There are reams of research on minority groups in America described as poor or working class people, and their children do not move up the social scale (Lareau, 2011). This inequality gap has become a political issue and the American dream of a good education, hard work and becoming prosperous is not a reality for many of its citizens (Putnam, 2015). This evidence suggests that neither socialist nor capitalist economic systems provide a solution to poverty. Economic policy and regulations that promote stable long-term growth promote employment and are therefore beneficial in reducing poverty. The behaviour of regulators who determine interest rates and other controls are important.

Labour legislation can reduce employment. Minimum wages in the agricultural sector reduced employment (Bhorat, Kanbur, & Stanwix, 2012). Minimum wages interfere with the functioning of the labour market and legislators ignored this fact. Their behaviour contributes to poverty. In Germany, labour law deregulation contributed to increasing employment (Klinger & Rothe, 2012). There is an inherent conflict in labour legislation. One component of labour legislation is to protect the employee from unfair practices by the employer. This is necessary and good because it brings stability to people's lives. However, this only protects the employed and ignores the unemployed. Job protection legislation can potentially discourage employment and is therefore possibly not good for the unemployed and poverty. This conflict between flexibility and job security encapsulated in labour legislation is debated in Europe (Burrioni & Keune, 2011). Another conflict in labour legislation is the balance of power between the unions and employers. Excessive union power results in excessive wage increases, which forces employers to mechanise in order to stay competitive, which reduces employment. Currently, the mining industry in South Africa is shedding labour and mechanising to stay profitable when product prices are low and wage demands are high. Open debate should occur to find the optimal balance. The excessive unemployment in South Africa suggests that the balance is in favour of the

employee rather than the employer. A lack of open debate and a willingness to adjust is a behaviour that is detrimental to poverty alleviation. The German government established a commission after unemployment reached 11.4% while the South African unemployment rate is 25.5% (Statistics South Africa, November 2015) or 37% by a more inclusive measure and there is no commission. This behaviour contributes to poverty. Constructive and negotiated labour legislation can benefit employment and productivity (Deakin & Sarkar, 2008). Is democracy a solution to poverty?

When I was standing, with my small children, in the 1994 polling station queue the atmosphere was euphoria. South Africa had become a democracy, and it was just a matter of time and problems would dissolve. The different races chatted when previously we were aliens. All our children had a future. Twenty years later social problems weigh heavily on South African society and reports indicate deteriorating poverty. Violent protest marches are common and indicate frustration and hopelessness. Do these protestors' children have a bright future because of democracy? One of my children who stood in that queue is emigrating to give her children a future. Democracy in South Africa has not provided the solution to poverty. It may do so in the future but how long should a man or woman wait? South Africa has had no change of government since 1994, which indicates, by one standard, that it is not truly democratic. Possibly democracy enables poverty alleviation or increases its probability. Certainly, democracy has made a positive impact for many in terms of comfort and convenience.

Twenty years ago, amenities like electricity, water, and sanitation were not a reality for many black families in South Africa. Following 1994, the government embarked on a program to provide amenities with remarkable success in some areas. Today many shacks have electricity. The lack of water or electricity is no longer a reliable indicator of poverty. Many low cost houses have been provided free of charge to poor families but funding limits supply. These amenities must make life more comfortable for the recipients but there is no indication that they reduce poverty. If a family has electricity at home, how does that improve a person's income earning potential? If a family is given a house, how does that improve their income earning ability? The provision of amenities has not produced a solution to poverty in South Africa.

Education is the magic word when it comes to poverty in South Africa. Give children an education and they will dig themselves out of poverty. There are many problems with South African education but there are schools and teachers and all children have the opportunity of attending. However, the reality is that around half of children do not complete high school (Modisaotsile, 2012). Many research papers indicate that South African education is in crisis (Modisaotsile, 2012; Rasool & Botha, 2011; Spaul N. , 2011& 2013). Where is the problem? The provision of education in South Africa has not produced a solution to poverty.

Many people have dreamed of eliminating poverty but history proves their solutions ineffective. Changing behaviour might also be a dream and ineffective. However, alternatives need investigation. Success in education is about having a good working memory (a mind that learns quickly and easily), the motivation to learn (the child recognising that success in life requires a good education) and the opportunity to learn provided by a good teacher. Many other aspects like equipped laboratories, computers, books and sports equipment also contribute to education. With these components, there is a tremendous variance in Cape Town. A good working memory is influenced by parental behaviour, motivation is circumstantial combined with parental behaviour, and for government schools the quality of teaching depends on the behaviour of the Education Department. This thesis hypothesises that behaviour is associated with educational achievement. Thus, behaviour can result in poor educational achievement, which means a low earning potential and consequently poverty.

Education of children is ultimately the responsibility of parents even if there is delegation to the extended family, a common occurrence in South Africa. Parents produce them, parents care for them, parents love them and the development of their minds should be an extension of this process. However, governments around the world have mostly taken over this responsibility to ensure that all children are given the opportunities that education should provide. This is particularly so for children whose parents are not educated or poorly educated. Theoretically, they would be unable to educate their children adequately. This is particularly true for developing countries like South Africa. Sending children to school also has other benefits.

Specialisation is an economic reality. Few people can do everything required for life in a modern world so people specialise on particular skills and employ other people for the tasks in which they do not have skills. Thus, children go to school while the parent works at being a plumber, an accountant or whatever. Trained teachers teach and this specialisation should be for the benefit of all. However, this process can be taken too far with education. When parents' divorce themselves from the education of their children academic performance drops. A meta-analysis clearly shows that educational achievement improves with parental involvement (Jeynes, 2012). This applies to pre-school, primary schools and secondary schools. At least three things should happen. Parents and children should read together, parents should check homework, and teachers and parents need to communicate. The education of children needs to be a partnership between the teachers and parents. There are two types of parental involvement. Parents who get involved voluntarily and school programs designed to get parents more involved. Teachers receive little training in this aspect of the profession (Larocque, Kleiman, & Darling, 2011) and effort in this area would improve educational outcomes. South African research showed that schools with more parental involvement produced better results (Frempong, Reddy, & Kanjee, 2011). This behaviour affects educational achievement.

Sending children to school also has risks. Parents are reliant on the collective knowledge and wisdom of the school staff and/or the Education Department. South Africa has a split school system (Spaull N. , 2013) and in the privileged sector, parents have options. They can choose a school that they think is suitable for their child, they elect the Governing Body and they provide expertise and finance to improve the performance of the school. However, the majority of parents have little choice about school and in majority of schools, the Department of Education has a substantial influence. Low parental capabilities (Modisaotsile, 2012) means that the Governing Bodies, an elected parent organisation, do not have the skills to oversee the running of school so the responsibility rests with the Department. Thus, school performance is dependent on the efficiency and organisational ability of the Department. The behaviour of the Department of Education is important. Another factor with education is the difference between children.

Each child is unique in its abilities, attitudes and motivation when they start school. Of particular importance is their cognitive ability or working memory. This is their ability to

learn and reason and is a good predictor of education achievement (Alloway & Passolunghi, 2011). No amount of teaching is going to change the working memory so it is relevant when talking about educational performance. Specialised training can improve working memory in respect to reading but not with maths (Titz & Karbach, 2014). However, the training is still experimental and is unlikely to be available in South African government schools in the near future. Parental behaviour in early life influences working memory (discussed below). Without positive parental investment, working memory is low and the inevitable result is poor educational achievement and consequently poverty. The individual with low working memory will struggle. The behaviour of parents is important in educational achievement. Thus, the research question is: How does behaviour affect educational achievement? As discussed above, behaviour in many areas can affect poverty but this research is limited to factors directly affecting educational achievement. Life History theory (LHT) offers an explanation as to why parenting behaviour might be different but the Education Department also needs consideration.

Life History theory

If all parents love their children, why would parental behaviour differ between parents? LHT provides an answer. This is a biological theory that evolved in the 1960's to explain the different reproductive behaviour between species. The same principles apply to humans and the theory developed with an interdisciplinary effort that included biology, psychology, sociology and neurology. LHT offers an explanation for behaviour that singular disciplines can perhaps only describe. Brumbach, Figueredo, & Ellis (2009) provide a full description of the development of LH theory.

Evolutionary successful organisms need to devote effort towards mate acquisition, mating, parental effort, and somatic care. Depending on the environment, different allocations of resources may be more or less optimal. Species living in harsh unpredictable environments tend to have short intergenerational periods, produce many offspring, but have low levels of parental investment and have shorter lives. In contrast, species living in stable predictable environments tend to have long intergenerational periods, produce few offspring, but have high levels of parental investment and live long lives. These two contrasting behaviours have been termed a 'fast' life history because they reproduce early and frequently and a 'slow' life history because of delayed reproduction and there are fewer

offspring but parental investment is high. The difference between a 'fast' and 'slow' life history is essentially a trade-off between the quantity and the quality of offspring. An example of this is rabbits. Rabbits live in a risky environment.

A prototypical rabbit could live in semi-arid regions where variable rainfall dictates food availability. Predators will eat many of its offspring, even in good years, through what, from the rabbit's perspective, are by-products of random situational events. Due to the unpredictability nature of many of the rabbits' selective pressures, it is difficult for the species to evolve adaptations beyond ever-faster running speeds and keen senses to ensure an individual level of survival. Since the fundamental unit of analysis is the number of successful genetic replications, another type of adaptation, related to its reproduction, can solve some of these adaptive problems. Its response to this environment is to breed early, produce lots of offspring, and because of limited resources (time, calories, etc.) provide little parental investment. This response is characteristic of what biologists have called a fast life history.

In contrast, a species that exemplifies a slow life history strategy is the African elephant. Although the African elephant and the rabbit may occupy the same geographical space at any given point in time, its ability to expand its home range in response to predictable environmental fluctuations (e.g. dry and wet seasons) allows the elephant to solve adaptive problems, thereby increasing its individual survival. The elephant also has to worry about predators, but its behavioural and physical characteristics minimise this risk. Even though this species lives in a harsh environment, it is a relatively stable environment. This stability is conducive to a slow life history strategy and elephants breed late, produce few offspring, and there is lots of parental investment. Most offspring will live for 70 years and this response is termed a slow life history (van der Linden, Figueredo, de Leeuw, Scholte, & Engels, 2012).

As a species, humans have a long life history but humans respond differently to different environments and behaviour classified into fast and slow life history strategies (Del Giudice & Belsky, 2011). For humans a fast life history is characterised by early puberty, early first sex, promiscuous sexuality, poor education, poor pair bonding, and little parental investment (Figueredo, Vasquez, Brumbach, & Schneider, 2004; Figueredo, et al., 2005b;

Figueredo, Hammond, & McKiernan, 2006). This behaviour is associated with poverty and viewed as undesirable by modern societies. However, from a biological perspective, it is neither right nor wrong but an appropriate response to the environment in which the person lives (Del Giudice & Belsky, 2011).

Life history strategy is not genetically predetermined (Del Giudice & Belsky, 2011). Having such strong predispositions would leave individual organisms at a strategic disadvantage if the environment were to fluctuate. Humans do live in very different environments from the frozen Arctic to tropical rainforests and different behaviours are required. In response, evolution develops contingent adaptations that respond to environmental input or developmental cues that calibrate a particular individual's life history strategy to a particular environment through epigenetic (not genetic) developmental processes. Evolution is simplistically a design process that matches an organism to their environment. Two individuals might have the same gene, but environmental factors might alter the expression of that gene, so that each individual behaves in a way appropriate to its environment.

Evolutionary psychologists have expanded this line of thinking and have proposed that behavioural plasticity is an evolved response to stimuli received by the individual from its environment (Del Giudice & Belsky, 2011; Figueredo, Hammond, & McKiernan, 2006). The ability of the brain to process information and to react accordingly is an evolutionary adaptation that enables survival when the social or physical environment requires specific behaviour. For example when the weather deteriorates, I reach for a jersey - a learnt behaviour. Without the jersey, shivering and restricted blood flow to the extremities is automatic or instinctive to ensure a core body temperature. These are immediate and observable responses to environmental signals.

Social behaviour is more complex. The brain is continually receiving a host of information or stimuli. Over evolutionary time, the information will have varying validity and reliability as to how it represents the environment. Evolutionarily, these important parameters determine the amount of preparedness and plasticity of an adaption (Del Giudice & Belsky, 2011). The individual responds to stimuli and this behaviour becomes part of the environment. Human behaviour is the sum of many decisions that will result in many

behavioural types that can be confusing. LH strategy is a way of categorising human behaviour onto a continuum that has clear adaptive functions.

LH is a convergence of much social and behavioural research that improves predictability and provides a biological foundation to social investigation. Table 1 lists the contrasting characteristics of LH strategy (Griskevicius, et al., 2013). A short LH is characterised by daily survival and associated with short relationships in an uncertain environment. Conversely, a long LH is characterised by planning and preparing for the future, long relationships, and is an adaption for stable environments. These characteristics are the extremes of a continuum of adult behaviour.

Table 1 Examples of correlated fast and slow LH strategies (adapted from Griskevicius, et al., 2013)

Fast Strategy		Slow strategy
	Physiology	
Faster	Rate of development	Slower
Earlier	Onset of puberty	Later
Faster	Biological aging	Slower
	Mating	
Earlier	Sexual debut	Later
More	Sexual partners	Fewer
Casual	Relationships	Pair-bonding
	Parenting	
Earlier	Age of reproduction	Later
Higher	No. of offspring	Lower
Lower	Investment in offspring	Higher
	Reward orientation	
Short	Time horizon	Long
High	Impulsivity	Low
Take	Risk for reward	Avoid
	Economic	
Basic	Education	Higher
Basic	Relationships	dynamic

No	Team player	Yes
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LH predicts that parents living in a risky environment, generally the poor, should invest differently into their children from those parents that live in stable environments, generally but not necessarily the wealthier parents (Figueredo, Vasquez, Brumbach, & Schneider, 2004; Figueredo, et al., 2005b; Figueredo, Hammond, & McKiernan, 2006).

The alignment of behaviour with environment is important for success. Different types of parental investment are investigated in terms of parenting style (Baumrind, 1972). The correlation between education and relationships implies that improving one will improve the other (Figueredo, Vasquez, Brumbach, & Schneider, 2004; Figueredo, et al., 2005b; Figueredo, Hammond, & McKiernan, 2006) and this provides an opportunity for both parents and educators to advance educational outcomes by developing relationship skills.

LH theory has its origins in evolutionary biology but offers a theoretical perspective for human reproductive behaviour. This means a hypothesis can be tested and hence give social policy direction. Multiple behaviours and factors indicate the LH strategy of an individual. Some are more robust than others and possibly education is the most important outcome given the positive correlations between educational outcomes and future earnings (Anderson, Case, & Lam, 2008).

Parental investment

One important aspect of LH theory is parental investment, a term borrowed from biology to describe the amount of effort a “parent” invests in its offspring. For example, an oak tree produces millions of acorns but invests no effort into their survival. The strategy of the oak tree is to produce many offspring so that the chances are that one or two might grow to reproduce. Alternatively, an elephant produces few offspring but the herd expends a lot of effort and time to ensure the survival of any offspring, so that they in turn reproduce.

Humans, as a species and compared with other species, invest heavily in their offspring. This parental investment can be split into various areas: time or more specifically quality time with the child, money spent, physical care, and the emotional closeness

between the parent and child. Parental investment can be measured, assessed, or observed at points in the life of a child and these can have negative or positive influences on the child. In addition, the variation in parental investment means that it can be argued that this is the area where natural selection might occur, and is therefore a productive area of research.

Physical Parental Investment

From conception to birth, the mother provides the environment for the foetus. Her behaviour can seriously affect the baby for the rest of its life. Abortion is the extreme example of negative investment but other behaviours can have as serious or lifelong consequences. High levels of alcohol intake can cause foetal alcohol spectrum disorders that include growth restriction, decreased cognitive functioning, attention deficits, emotional and behavioural problems, among others (Desmond, et al., 2012). Moderate consumption of alcohol, an average of one glass per day, can reduce risks but above this level increases the risk of low birth weights, being small for gestational age, and preterm birth (Patra, et al., 2011). Smoking has no safe lower limit and the risks generally increase with increasing rates (Smedberg, Lupattelli, Mardby, & Nordeng, 2014). The risks associated with smoking are spontaneous pregnancy loss, preterm delivery, low birth weight, small for gestational age, and stillbirths. The use of illegal drugs during pregnancy increases the risks of adverse outcomes above smoking alone (Black, Bhattacharya, Fairley, Campbell, & Shetty, 2013). Excessive use of alcohol, smoking, and illegal drugs can all end the life of the foetus and increase the risks of adverse effects on the child. These behaviours are examples of a negative parental investment.

The nutritional requirements of women during pregnancy and lactation are particularly high because of the nutritional requirements of the growing foetus and then for the production of milk. Foetal development is a critical period of life and a shortage of nutrients may compromise physiological process, which will have long-term consequences for health. Low birth weights are linked to coronary heart disease, type 2 diabetes, impaired glucose tolerance, and hypertension (Bonacase, Slow, & Mann, 2011). One of the effects of poor maternal nutrition is reduced birth weights and this is associated with poorer cognitive performance (Pyhala, et al., 2011; Yang, Platt, & Kramer, 2010). Lower cognitive ability has implications for academic performance and eventually employment of the child in adulthood.

When there are socioeconomic constraints the diet is likely to be of poor quality and meeting the nutritional needs becomes difficult. These women largely depend on plant foods that have a lower concentration of nutrients, compared to animal products, and tend to have a shortage of micronutrients. A foetus deprived of nutrients is likely to result in adverse pregnancy outcomes such as poor survival, risk of chronic diseases, and impaired mental development (Lee, Talegawkar, & Merialdi, 2012). Even pregnant women in first world countries need supplements of micronutrients to meet the recommended dietary standards. These dietary requirements mean that it is important that pregnant women go to clinics to receive their supplements and to ensure that their weight gain is within acceptable limits. Experience in Pakistan demonstrated the advantage of nutritional education to pregnant women. Education improved pregnancy outcomes (Akerodolu, Osisanya, Okafor, & Seriki-Mosadolorn, 2014).

When pregnant women take care of their nutrition, they are making a parental investment. Poor nutrition has serious implications for the life of the baby, for the family, and for society. It is in the interests of the state to look after the health and nutrition of pregnant women. There are indications that this is not happening effectively in South Africa. Infant mortality is 35 per 1 000 live births for South Africa compared with four per 1000 for Australia (World Bank, 2011). The high predisposition to hypertension and Type 2 diabetes in some population groups in South Africa might be related to foetal development (Bonacase, Slow, & Mann, 2011). The poor performance of education in South Africa (Spaull N. , 2013) could be attributed to poor foetal development and reduced cognitive ability of many students. This is speculative but possible, and it highlights the importance of a mother's nutrition during pregnancy.

Breastfeeding is a parental investment, a commitment of time and energy that a mother devotes to her baby. A commitment that involves certain costs: employment makes breastfeeding difficult, there is less somatic time, and older children receive less attention. The factors deemed to negatively influence breastfeeding include maternal malnutrition, a lack of educational support, a perception that milk supply is inadequate, unsupportive hospital practices that delay the initiation of breast-feeding and maternal employment (Imdad, Yakoob, & Bhutta, 2011). Therefore, breastfeeding and the age of weaning offer a substantive measure of a mother's commitment to parental investment. If a mother needs

to work and/or there is no support from the father it is more difficult for her, but those circumstances are likely to continue while the child grows.

There are documented benefits of breastfeeding to both the mother and the baby and consequently the World Health Organisation recommends six months of exclusive breastfeeding and continuing for two years and beyond. The benefits to the baby are better growth and fewer diseases like diarrhoea and respiratory infections; and for the mother it is a quicker recovery from the birth process and in later life, less chance of breast and ovarian cancer, and a lower risk of hip fractures (Imdad, Yakoob, & Bhutta, 2011). Breastfeeding also possibly improves IQ (Brion, et al., 2011) and this has implications for educational outcomes and job prospects in the future of the child.

Despite the benefits, the world rate of exclusive breastfeeding is low and a lack of education, especially prenatal education and mother support is implicated (Imdad, Yakoob, & Bhutta, 2011). The benefits to the baby are particularly important in developing countries where home hygiene standards are lower and good nutrition without breastfeeding more difficult to achieve.

Emotional Parental Investment

Giving a baby adequate levels of attention most of the time is a parental investment and means the parent cannot be doing other things. It would be logical to expect a continuum from extreme neglect to adequate attention and this would result in different brain development and therefore different skills levels in children.

Babies naturally express themselves by their body movements, facial expressions, and by making noises. Adult caregivers normally reciprocate and the “communication” becomes a two-way interaction that stimulates the baby’s brain to develop. However, in extreme instances, for example in care institutions with poorly trained staff, the caregivers may provide for all of the physical needs but fail to “communicate” with the baby. Unfortunately, this lack of “communication” is also likely to happen in private homes for a variety of reasons such as severe economic hardship, social isolation, chronic disease, mental illness, or substance abuse. It might also happen out of ignorance or social customs. Many children in Africa spend the first part of their lives strapped to their mothers’ backs so that there is less opportunity for the two-way reciprocal conversations that is so essential

for brain development. This type of neglect, although often unintentional, is found in all levels of society and racial, ethnic, and religious groups (National Scientific Council on the Developing Child, 2004).

In orphanages, there is a risk that children, even with good physical care, do not receive adequate “communication” from an adult. With limited staff training children exhibited poor attachment behaviours such as indiscriminate friendliness, lack of eye contact, aggression and impulsivity (Groark, Muhamedrahimov, Palmov, Nikiforova, & McCall, 2005). Children in orphanages are more likely to become psychiatrically impaired and economically unproductive adults (Frank, Klass, Earls, & Eisenberg, 1996) Because of budget constraints and staff changes, it is difficult for a child to develop a relationship with any adult that would allow for normal brain development. The AIDS epidemic in South Africa has resulted in many orphaned children. Most of these children live with kin but some live in orphanages. An educational survey detected that children from orphanages generally attended under-performing poor schools and that they performed substantially worse than their classmates who were themselves poor performers compared with the national sample (Spaull N. , 2011). This survey confirmed that low levels of parental investment with children changes brain development and results in lower cognitive abilities. This then results in poor academic achievement. Work with similar children initiated the attachment theory research.

This type of neglect, particularly early in life when the brain is developing, can have serious consequences for the child, and these are even more harmful than verbal or physical abuse (National Scientific Council on the Developing Child, 2012). The young child’s brain requires an interactive exchange with adults that care for them to develop the architecture, structure, and function of the brain. Children that have suffered neglect as youngsters show less electrical activity in the brain; there are poorer connections between different areas of the brain and the prefrontal cortex is smaller. This means that neglected children have less developed brains and will be less able to process information. This increases the risks of attention, emotional, cognitive, and behavioural disorders later in life.

Health is another indicator of early childhood. The persistent absence of a responsive adult results in the activation of a baby’s stress response and this is termed toxic

stress. In the presence of a caring adult, the stress reflex is likely to be normal and healthy. Frequent and prolonged activation of the stress response results in a smaller brain, a lower stress threshold and stress related physical and mental illness (National Scientific Council on the Developing Child, 2005). Hence, measures of physical and mental health indicate the level of parental investment these individual received as babies.

The evidence of the effects of early life stress on brain development is such that behaviour, health and cognitive ability can give an indication of parental investment. In the Adverse Childhood Experience (ACE) study, participants recorded their childhood experiences (Anda, et al., 2006). As the ACE score increased, a measure of childhood stress up to the age of 18, so did the incidence of certain behaviours. These included the use of tobacco, alcoholism, illicit drug use, early sexual intercourse, more than 30 sexual partners and memory impairment. For mental health, the following also increased with the ACE score: panic reactions, depression, anxiety, hallucinations, sleep disturbance, severe obesity and somatic symptoms. Problematic behaviours also increased with the ACE score, high levels of perceived stress, difficulty in controlling anger and intimate partner violence. The effect of childhood stress on health is well documented (Middlebrooks & Audage, 2008; Campbell, et al., 2014; & Shonkoff & Garner, 2012) so that health is a good indicator of parental investment. All these authors conclude that toxic stress in childhood can have a profound influence on life.

Attachment Theory

Attachment theory, pioneered by Ainsworth and Bowlby, was the foundation for the neurological and behavioural work described above. It explained the behaviour of a young child based on the responsiveness of its mother or caregiver (Ainsworth & Bowlby, 1991). For example, if two women with toddlers are sitting in a waiting room their behaviour might be different. One toddler wriggles off its mother's knee and starts to explore the room; touching objects, looking at people while making hand signals, and offering "words" to people in the room. The other toddler clings to its mother and protests so loudly when placed on the floor that the mother picks the child up again. Attachment theory offers an explanation as to why these children behave differently. When a mother routinely responds to their baby's signals, it gives the baby a secure base, enabling it to move away from the mother to explore and learn, knowing its mother will respond to a call for help.

It is an evolution-based theory that describes how organisms adjust to ensure survival. Infants need protection while they are defenceless but they also need to acquire knowledge of the social and physical environment. Secure attachment behaviour is formed by close bodily contact and proximity rather than the provision of food (Ainsworth & Bowlby, 1991). This means adults other than the mother might form attachment bonds with a child. The observation of young children with their caregiver allows evaluation of the relationship and hence gives an indication of the level of parental investment. Attachment theory explains why baby behaviour correlates with the mother's behaviour. LH theory builds on both sides of attachment theory by offering an explanation as to why a mother might behave as she does and how the baby might behave as an adult. Both theories explain behaviour on different scales and have different origins.

Qualitative study of the family

A sociologist (Lareau, 2011) conducted one such study of families giving clear and detailed descriptions of behaviour and circumstances. Her study is a confirmation of LH theory with descriptions of parental investment producing the expected results. Lareau visited families repeatedly, and even had overnight stays, to get a true picture of family life in the USA for different social and racial groups. She confirms that life is hard for the poor (not employed) and working class families. However, it is also stressful for the middle class families because of a perceived need to foster the development of their children so that they achieve high educational outcomes. This work confirmed the stability of the class; there was no movement up and only one person moved down a class during her research.

Although this was a qualitative study, its value lies in the descriptions it supplied. Firstly, there are social classes in a country founded on very high egalitarian ideals. Secondly, there are different parenting styles or parental investments used in the different social classes. With the poor and working classes there was less parental involvement with children and emotional closeness was not valued. In the middle class families, there was high parental involvement and emotional closeness. No theoretical explanation is offered for the persistence of inequality. The implication is that living circumstances is the cause of poor educational outcomes. The difference in parental care offers a clue to a possible fundamental cause.

Lareau (2011) looked at nine-year-old children from poor, working and middle class families, including different races at both ends of the economic spectrum. The methodology included many home visits, an overnight stay, trips to schools, trips to doctors, and separate interviews with the professionals involved in the lives of these children. As far as is practically possible she obtained a detailed picture of the lives of twelve diverse American families.

The value of the project is the broad view of society that it offers. Because the same eyes and ears were observing both the poor and middle classes, comparisons are possible. In South Africa, the poor will be even poorer but the contrast remains valid. Lareau (2011) reported on hunger when there was no food in the fridge for the next meal. There was one poor single mother, which is a common family structure in South Africa. There were officious and unfriendly officials handing out grants to which people were legally entitled. The inadequacy of the public transport system is described. There was always a distance to travel, on public transport, to health facilities and shops with competitive prices; poor people are usually forced to go to locally situated high priced shops. Complicated school systems and procedures were described which required parents to have inside knowledge, so as to help their children. All the poor and working class children failed to gain a higher education. All these negatives in the lives of the poor are found in a South African context. Although not explicitly stated, the impression gained from Lareau (2011) is that if these structural problems could be fixed, the inequality described might be eliminated.

The valuable lesson gained from this well-conducted research was that parental investment in children was vastly different for the middle and poor classes. Neither set of parents followed what professionals might consider ideal parenting, but a clear difference in the parenting styles is described. All the children had their physical needs met. They were loved, fed, had somewhere to sleep and were sent to school clean. Nevertheless, with the poorer classes of children, there was little interaction with their parents and were largely instructed as opposed to having two-way conversations with parents. Children were seen as separate entities from the adults and spent their free time playing with relations and other neighbourhood children, within boundaries, but otherwise free of adult interference. The impression given was that these children were happy. In contrast, the middle class children had very organised lives. They were highly organised by parents and were constantly

interacting with adults including their parents. The family was a single entity and family life revolved around children's activities. This difference in parenting indicates that parental investment warrants further investigation. To summarise, Lareau (2011), showed that poverty is a complex human condition in which there are many contextual factors but also behavioural variables, particularly in parental investment.

The interaction or "communication" between a caregiver and a baby is important because in its absence toxic stress takes over and causes the damage described above. There are five behaviours, from my observations, which promote the release of relationship hormones. These make humans feel good about themselves and the other. Firstly, there is eye contact that seems to convey honesty and genuine concern. Secondly, there is interactive talking, the sharing of ideas and feelings. This excludes instructions, domination or criticism. Thirdly, there is active listening. This excludes interruption, judgement and even recommendations. People need to tell their stories. Fourthly, there are messages of affirmation that tell how great the other is and how appreciated they are. Finally, there is physical touch appropriate to age and the relationship.

In Lareau (2011) there are distinct differences in the parenting behaviour of the middle class and the poorer classes. With the poor, eye contact was discouraged, interactive exchange of ideas was absent, and messages of affirmation appeared to be absent. For all classes there was no mention of the amount of physical touch. If the poor parents interacted with their children, as reported, for all their lives, then we might expect a lower cognitive ability and lower social skills. This offers a plausible explanation of poorer academic performance of poorer classes and low remuneration as adults.

The poor live in environments described as harsh and unpredictable. Their behaviour fits and is adaptive to that environment. Parenting style is part of that behaviour and it programmes children to live in the same environment. The middle class parents use a different parenting style that programmes their children to the middle class environment. Thus, the parenting style ensures the stability of the classes, but behaviour might be changed. The poor face many challenges described by Lareau and what LH theory adds to her work is an explanation of that behaviour and possibly an explanation of why the

children struggle at school. The poor adopt a fast life strategy and the middleclass a slow life strategy.

Parenting style

Parenting style is another area of research that focuses on the parent-child relationship or parental investment, mainly in the teenage years. Educationalists consider *authoritative* parenting style as optimal (Spera, 2005) because it produces better outcomes than other styles. *Authoritative* parents firmly enforce standards and rules using non-punitive methods of discipline (Glasgow, Dornbusch, Troyer, Steinberg, & Ritter, 1997). Expectations are that children behave in a mature way with social responsibility. Parents attempt to be warm and supportive while encouraging their children to talk and listen. The child's point of view is validated and they are taught to understand behaviour and consequences. With the alternative method, a sergeant-major style, children are told what to think and how to behave. There is little bi-directional communication and it inhibits self-reliance, responsibility and maturity. *Authoritative* parenting fits the description of an interactive bi-directional relationship, described previously, that stimulates brain development in babies. It seems probable that this approach to development works best for children of all ages.

Parental investment conclusions

It has been argued that "young children experience their world as an environment of relationships, and these relationships affect virtually all aspects of their development" (National Scientific Council on the Developing Child, 2004). Parental investment requires time and effort by the parent from day one of life and with that will follow the rewards. The child will be keen to learn and will achieve, will have sound relationships, will obtain a good job, and eventually become a parent too. When parental investment is inadequate, the result will be a series of problems and a lack of achievement academically and later with employment opportunities. This means that parental investment could be a contributing factor to poverty, and in particular, to generational poverty.

Parenthood is a complex task for which there is no training but it is possibly one of the most important tasks of life. Around 1970 there was a shift from interventions for children to parent training courses so that parents become agents of change for their children (Kaminski, Valle, Filene, & Boyle, 2008). There has been a proliferation of these

course and they vary in content and delivery. Correctly performed, parenting produces children who are able to compete in a modern, industrialised economy because of their education and in turn raise their own children. Insufficiently executed, and children are likely to have poor education and consequently find employment difficult and suffer from poor health as adults. These people will also have children but they are likely to follow in their parents' footpaths and generational poverty occurs. Parents would benefit from training or just spending more quality time with their children. An awareness of parenting and the importance of it could be a first step in improving parenting. Improved parenting will not solve poverty but it seems to be a critical part of the solution.

Educational outcomes

Expenditure on education has the potential to have an impact on poverty because its purpose is to increase knowledge and skills. Quality education is generally considered the foundation for economic development and social transformation (Bayat, Louw, & Rena, 2014) and this was reiterated by President Zuma in his State of the Nation address in June 2014 when he said "to invest in education and skills development as that is the key to economic growth and development" (President Zuma, 2014). Yet the squatter camps in Cape Town indicate a lack of growth and development. The failure of the investment in education to make any practical difference to the economy and poverty is because of the dismal performance of 75% of the education system (Spaull N. , 2013). The dysfunctional education system is one of the factors contributing to a skilled labour shortage in South Africa (Rasool & Botha, 2011) which affects the economy and poverty.

In South Africa of all the pupils who enter Grade 1, only half make it to Grade 12 and the majority of these do not qualify for university entrance (Modisaotsile, 2012). When the educational results of the poorest 25% of pupils, or rural children, from South Africa are compared to the results from other African countries, it is towards the bottom of the list (Spaull N. , 2011) despite South Africa having a large advantage in wealth. Reasons given for this poor performance were the failure of parents to participate in their children's education; the failure of the Governing Body governance of schools because of a lack of parent capabilities; the poor training of teachers; and a lack of resources in schools (Modisaotsile, 2012). The last two factors are clearly administrative problems and the first two are possibly associated with socioeconomics.

Socioeconomic conditions are important for schools, but schools can nonetheless make a difference to pupils from impoverished circumstances (Frempong, Reddy, & Kanjee, 2011). Successful schools are those where the parents are actively engaged in the learning process (Frempong, Reddy, & Kanjee, 2011), and this can compensate for socioeconomic disadvantages to some extent (Frempong, Reddy, & Kanjee, 2011). However, even though there is improvement in pupils from disadvantaged circumstances when they go to successful schools they remain disadvantaged and the difference is most prominent in high achieving schools (Frempong, Reddy, & Kanjee, 2011). The common factor in both these reports (Modisaotsile, 2012; Frempong, Reddy, & Kanjee, 2011) is parent participation or the parental investment made in education.

Parental involvement in education is the missing link to school success (Larocque, Kleiman, & Darling, 2011). A meta-analysis associated higher academic achievement with all types of parental involvement and for all ages (Jeynes, 2012). Children from low socioeconomic circumstances are frequently disadvantaged by minimal levels of parental investment, parents with mental health issues and/or addiction, low birth weights or a lack of adequate nutrition (Willingham, 2012). Any of these factors, and especially two combined, can result in impaired cognitive ability. This will result in these children entering the school system without the capacity to perform well academically and although these children can be helped, it is almost impossible for teachers with large numbers in their classes to devote enough time to individual children.

In the CAPS data set Wave 1 class size ranged from 1 to 108 pupils and the mean was 40. The average racial breakdown of this figure is 46, 39, and 31 pupils per class for blacks, coloureds, and whites respectively. To put a perspective on how this figure has changed over time, even if not directly comparable, figures for the country in 1984 were 41, 25 and 19 (Wilson & Ramphele, 1989) for the same race groups. Often the harsh parenting styles of low-income earning parents make academic achievement difficult for children (Willingham, 2012). The association between poverty and education has resulted in theories.

A theory to explain the persistence of inequality was proposed by Bourdieu in a series of articles reviewed by Di Maggio (1979). Bourdieu argued that social structures, particularly education, are designed to maintain the privileged social position of the middle

classes. The social system prevents the lower classes moving up into the higher classes. This seems an appropriate argument for South African schools. The high dropout rate where only half the pupils reach grade 12 suggests that some schools are more of a day care facility for children rather than an educational institution. If this is a designed result then political leaders need to be changed. Alternatively, if it is the result of poor management, then the managers need to be changed.

In mitigation of the education system, it is unlikely that education is the only factor involved in poverty. Many indicators of educational success are detectable in children before they start school (Heckman, 2008) which implicates the family rather than the education system. It is also true that educational outcomes are related to parental wealth or income. Parents that have money are able to live in areas that have better schools or to afford private education; and they are able to afford the extras that are perceived to make a difference to child outcomes. Conversely, it is also true that the majority of parents want the best for their children and that includes education. In his writing, Bourdieu proposed that middle class parents actively confine the poorer classes to being poor through educational structures.

Goldthorpe (1996) stated that there were class differentials in educational achievement and proposed mechanisms in partial support of Bourdieu. The first was a lack of aspiration for higher education amongst the lower classes, or a wish to remain within a social group. Secondly, social class affects the choices and decisions made regarding the future at points of change in an educational system. For example, when children reach the end of school, working class parents have incomes that are flat as opposed to middle class families whose incomes are increasing. Thirdly, middle class families view higher education as normal and required, whereas for working class families it is an unknown and possibly a frightening world. Lastly, the risk of failure is a more serious consideration for a working class family if their child enters university. Vocational training is much safer with a lower risk of failure, and it simultaneously provides the family with an income to help with finances. This theorising, backed by empirical results that showed that equal ability working class children are less likely to opt for higher education than middle class children do (Goldthorpe, 1996).

These arguments ignore any differences there might be in academic ability of children of the different classes. If middle class children have more academic ability than working class children, for whatever reason, then the above arguments will exacerbate the differences between the classes. In his paper Goldthorpe (1996) moved away from blaming the middle class and offers plausible mechanisms for the lower academic achievement of working class children.

Questions about the stability of the classes in Britain and the USA are asked by Devine (2004). Devine describes a group of people whose parents were working class, of which she was one, that moved up into the middle class. Parental support and government educational grants made this possible at a time when both the British and USA economies were growing rapidly. There were no descriptions or comparisons of parental style but financial sacrifice and parental encouragement were important components of educational success in Devine's report. These people achieved academically and defied generational poverty. The reverse was also true in that parental wealth was no guarantee of successful child outcomes. These are both exceptions to the class war theory proposed by Bourdieu.

The link between economic growth and movement up the social classes poses theoretical questions. Is there a limit to the size of the middle class and is it only in periods of economic growth that there is a capacity to grow this sector? This argument is supported by the present economic climate of low growth, when it is reported that many graduates have problems finding work. This implies that good economic growth is a prerequisite to reducing inequality. There are always differential rates of gain/loss with economic cycles. Employment of the less skilled is mostly in industries like construction and manufacturing that are cyclic so when employment reduces the less skilled suffer (Hoynes, Miller, & Schaller, 2012).

Slow LH people plan for the long term and therefore place a high priority on education because it is an investment for the future. A good education generally means a good earning potential. Nevertheless, although education generally translates into wealth, wealth in itself is not always associated with a slow LH as the behaviour of some wealthy people demonstrates. Educational achievement is a universal indicator of LH strategy

because it is an indicator of earning potential. LH theory is a biological theory and aspects of human biology do have an impact on educational achievement.

Human biology and its relevance to education

Puberty

Genetics determine the parameters for puberty (Lee & Styne, 2013) but there is measurable variation caused by nutrition and social factors (Belsky, Steinberg, & Draper, 1991). In the CAPS survey, the average age of puberty, as answered in the questionnaire, for girls was 13.4 years while for boys it was 13.9 years. Improved nutrition advances puberty (Lee & Styne, 2013), and if it is assumed that parental wealth means better nutrition, then this effect can be seen. In the CAPS, girls with wealthier parents experienced puberty a year earlier than the poorer. With boys, there was a six-month difference.

LH theory predicts earlier puberty for fast LH strategy individuals and the causal mechanism for this is stress. Hormones regulate puberty and stress changes the levels and balance of the various hormones involved in this process. This stress includes family conflict, divorce, the absence of a father, the presence of a stepfather or other mature male, and maternal mood disorders. The absence of a father has a consistent but small effect on the timing of menarche and the presence of another man in the house increases the effect. There is little information of the effect of mother absence because it infrequently happens (Allison & Hyde, 2013). Because the age of puberty reduces with good nutrition and stress, puberty alone is not a reliable indicator of the LH strategy path of an individual. Behaviour and mental health differentiates the cause of early puberty.

Early puberty can have a detrimental effect on girls resulting in depression, eating disorders, substance abuse, or delinquency. Many causal mechanisms for these consequences are proposed. These are physical development being uncoordinated with cognitive and social skills and early physical development isolates girls from their peers so that they must cope with their body changes alone. In addition, these girls come under pressure from boys in their social group because of their advanced physical development, and society places value on being sexy resulting in excessive pressure. Adolescent brain development takes ten years and it seems that early puberty means that the brain lags physical development (Allison & Hyde, 2013). If family stress triggers early puberty it means

that parental support is less likely to occur during this period of adjustment. Mothers that had children before the age of 20 had earlier menarche than women matched on socioeconomic status (Nettle, Coall, & Dickins, 2010).

Compared to girls there is less research on puberty in boys. Early puberty in boys means earlier sexual debut and more sexual risk taking (James, Ellis, Schlomer, & Garber, 2012). It also increases anti-social behaviour such as violent crime and property damage (Patton & Viner, 2007). Male reproduction is not as limited by time, compared with females, so there may be less variation in male behaviour, or simply less interest from researchers. Although adolescent boys may be sexually mature, it is the older physically mature boys that will attract girls.

The psychopathologies and the faster life cycle both confirm LH theory because early menarche gives the female more time to produce offspring, which is advantageous in a risky environment, but is also associated with poverty.

Age of first sex

A fast LH predicts early reproduction and that means early first sex. Adolescents that had early sexual encounters have more sexual partners, have sexual intercourse more frequently, and are less likely to use contraception. This sexual promiscuity and risky behaviour are consistent with fast LH strategy. Conversely, factors associated with delayed first sex were those with good relationships, high education expectations, a mother's satisfaction with her relationship, and parental monitoring. For girls only, a mother's disapproval of sex and her education level delayed first sexual experiences. The lesser influence of mothers on boys is attributed to the lower risks for boys and parental signals that are not as clear. Dating and kissing were a predictor of sexual activity and fathers had less influence on both genders than mothers (McNeely, et al., 2002).

Children tend to repeat the behaviour of their mother. If she had sex early or had children early this behaviour was likely repeated by her children. The use of control substances doubles the probability of early sexual activity: namely smoking for girls and the use of alcohol for boys. In America, Black males were eight times more likely to have early sex compared with White males (Mott, Fondell, Hu, Kowaleski-Jones, & Menaghan, 1996), probably a class characteristic and the associated fast life strategy.

In rural South Africa, the results were similar for the use of control substances and education. The death of a parent or knowing somebody with HIV resulted in earlier first sex. Attendance at school delayed first sex and if the mother was part of the same household. However, there was later first sex in this rural area compared with peri-urban areas, attributed to community factors (McGrath, Nyirenda, Hosegood, & Newell, 2009).

If sex education happens before first sex there is more abstinence, first sex is delayed, and there is a greater use of contraception (Mueller, Gavin, & Kulkarni, 2008). These results fit into the behaviour patterns described by LH theory. Good relationships and education are associated with delayed first sex that is a characteristic of slow LH strategy. The comparison between rural and peri-urban South Africa also fit the model. Rural communities are comparatively more stable, resulting in better relationships and therefore delayed first sex is expected.

Early reproduction is a problem for society so delaying first sex is advantageous. The risky behaviour associated with early first sex also impacts on the AIDS epidemic. People can be encouraged to abstain, delay first sex, or consistently use condoms. LH theory suggests that improved parental investment, especially early in life, is an alternative method of changing sexual behaviour.

Age at first sex appears to be a good indication of LH strategy. However, if the education around AIDS in South Africa has altered behaviour and if people are practicing safe sex, then it may lessen the value of age at first sex as an indicator.

Sexual behaviour

Monogamy is associated with slow LH strategy and conversely sexual promiscuity is associated with a fast LH strategy. Sexually transmitted diseases and unwanted pregnancies increase with the number of sexual partners. Many young adults do not use condoms and condoms do not offer protection from all sexually transmitted diseases (Centre for Disease Control and Prevention, N.D.). Having multiple sexual partners was associated with early pubertal development, associations with deviant peers, less parental monitoring, and lower academic grades. Frequent intercourse with multiple sexual partners was associated with anti-social behaviour and substance use. While the sexual behaviour at age 16 was divergent, by the age of 22 the divergent groups had become more similar. The more

sexually active group at age 16 appeared to be asserting their independence from adults and experimenting. Again earlier first sex meant more sexual partners and greater risk-taking behaviour (Lansford, et al., 2010).

Public debates indicate the concern in South Africa about the high level of violence against women and children. A study in Cape Town showed that intimate partner violence was associated with multiple partners. Associated with this behaviour was inconsistent condom use, sexually transmitted diseases, alcohol use, and transactional sex (Townsend, et al., 2011). It is probable that this behaviour pattern has its roots in adolescence and possibly early childhood.

Generational Interval

The age at which a woman first gives birth is the generational interval. This indicator encompasses all the other sexual factors discussed above. Teenage pregnancy is a concern around the world because these women lack the emotional, social and financial resources to invest in their child. In other words, parental investment is low and the children of such mothers are at a disadvantage as discussed previously. These fit into the fast LH strategy category. A long generational interval is associated with a slow LH strategy.

Number of children

Being poor used to mean many children which is the theoretical prediction of LH theory (Figueredo, Vasquez, Brumbach, & Schneider, 2004; Figueredo, et al., 2005b; Figueredo, Hammond, & McKiernan, 2006). However, throughout most of the world, the education of women and the availability of family planning have changed this pattern of behaviour. South Africa is similar.

Family Structure

The family provides for the needs of a child. This includes protection, shelter, food, emotional support, skills, and social knowledge. Thus, the family supports the growing and developing child so that in their turn they can form a family and rear children. Family structure is variable and an example of how humans adapt to ecological conditions. Family structure is often associated with socioeconomic status and this can cause confusion when interpreting results. Life History proposes that the parent/child relationship (biological or other) is the important criterion - rather than the family structure.

In the western tradition, the nuclear family is considered the ideal structure for raising children. A large body of literature supports this opinion, for example (Pinsof, 2002). There is public concern about the decline of the family and statistics about marriage, divorce, cohabitation and babies born out of wedlock are quoted. These trends are concerning because they are perceived to have negative consequences for the next generation. This western concept of the nuclear family includes the woman rearing the children while the man provides the family with resources - the experience of most children born in the 1950's for example. The economic reality is generally that when there are two parents the socioeconomic status of the family is higher than with a single parent. There are two incomes versus one income when many of the costs are similar.

It is necessary to question this stereotype, which I will do using evidence from a worldwide survey of different societies, evolutionary evidence, and survey data from Cape Town in 2002. A survey of 90 different societies worldwide found that in half of the society's women and men each contributed equally to the family diet. In addition, where there was one main contributor to the family diet, the split between male and female was equal (Hewlett, 2000). When only hunter-gathers are considered, the results are similar (Marlowe, 2005). These results raise questions about the traditional roles in the western family culture. Possibly the nuclear family was optimal during the agricultural and industrial age but changing ecological conditions might make other family structures optimal.

The support of kin in rearing children appears to be a human universal, but the kin that provide support vary. With foragers, the father is more important but with farming, the siblings contribute. The review of (Sear & Mace, 2008) states that it is improbable that there has been one paramount family structure throughout family history and that the family adapts to optimise survival. Therefore, the concept of the nuclear family being best has to be discarded because the optimal family structure depends on ecological conditions.

The survival of children is a critical part of evolutionary theory and hence the importance of family structure. When survival is associated with kin it indicates the importance of that kin in child rearing. Very few children survive the death of their mother early in life but survival rates increase with age. Weaning is another critical time for a child because the mother usually has a new baby that demands her attention, and although the

child must now deal with the pathogens found in food, after weaning the effects of a mother's death on the child declines and disappears. Human females produce offspring every three years in natural fertility populations (Sear & Mace, 2008), which means they have more than one dependent child to rear at a time and would therefore require help with rearing.

The traditional answer is that the father of the children would provide the assistance required because of the pair bond between him and the mother and the parental bond. However, evidence from hunter-gathers suggests that the women are not as dependent on males for calories as this romantic model advocates. In addition, research shows that fathers have considerably less impact on child mortality than mothers do. In half of the fifteen populations studied, the father had no effect on child survival (Sear & Mace, 2008). However, these studies only considered children to the age of five and it is probable that a father has more significance in a child's life as they get older. Child survival is a blunt measure but it is the only data available in many cases. It seems that a father's nutritional provision is less important for young children than traditionally assumed.

Grandmothers, both maternal and paternal, improved the survival of children in 64% and 60% of the populations. This means that grandmothers are more important than fathers in the survival of the young child. This suggests that menopause and the post-reproductive life of women is an adaptation to increase the survival of children. In most populations, the grandfathers had no effect on child mortality (Sear & Mace, 2008).

The mother-only family has become an important family structure for several reasons. If there is a shortage of men, or suitable men, it means that women must either forgo reproduction or form their own families. In cities, there are often more females for a variety of reasons: the males stay at home to work the land, violent deaths and incarcerations occur. A lack of jobs also means many men do not have the finances to set up an independent family unit. They are therefore unattractive partners. Poverty is also associated with single parenthood and non-marital births have always been associated with difficult economic periods (Barber, 2005).

Family structure can change the level of investment provided by the male. Family structure is defined by the relationship of the male to the children in the home. Overall

males invest more into their biological children. The differences in contribution to children by males were not as great as expected from an evolutionary perspective. When the couple are married, as opposed to not being married, the differences are less. When there are stepchildren and biological children of the couple in the house there are no differences in investment. The differences are largest when the couple are not married and particularly if when the male is supporting non-resident children. There is also more investment when the relationship starts when the children are young and has lasted a longer time (Hofferth & Anderson, 2004). These results, derived from men living in the USA are similar for Xhosa men living in Cape Town (Anderson, Kaplan, Lam, & Lancaster, 1999). Male parental investment is influenced by relationships as well as genetics.

Family structure is a variable that changes with culture and economic conditions. It seems that a woman needs help with rearing children but there is no universal answer to who supplies that assistance. Family structure can therefore cause confusion and the amount of parental, biological or other investment that occurs will be more definitive.

Risk behaviour

Risk behaviour is another indicator of a fast or slow LH strategy. Fast LH individuals do not think of the future, their focus is on daily survival. To achieve their objectives they take risks. Risk attitude correlates with personality. Research on the behaviour of young drivers showed that personality has an indirect effect on risk taking behaviour. Sensation seeking and aggression were associated with risk taking and altruism and anxiety correlate with less risk taking behaviour (Ulleberg & Rundmo, 2003).

Risk behaviour is of critical importance in the fight against the AIDS epidemic. With the discovery of lower infection risk with male circumcision and the introduction of antiretrovirals, there is concern that these advances will inhibit safe behaviour (Cassell, Halperin, & Stanton, 2006). The risky behaviour associated with HIV is a lack of condom use and having concurrent sexual partners. For adolescents living in poverty, hopelessness predicted risk behaviour. Recommendations for these adolescents require training to provide skills and therefore hope (Bolland, 2003). All these findings confirm LH theory and the importance of an attitude to risk-taking behaviour. The use of control substances is a risky behaviour, as is driving under the influence of alcohol or any reckless driving. Crime

and belonging to gangs is a risky behaviour. Risk taking is a strong indicator of a fast LH strategy.

Social skills

Brain development has an impact on social skills (National Scientific Council on the Developing Child, 2012). Social skills have a direct effect on the family in the form of divorce or cooperation between parents in raising their children. They also affect employment and community life. Community projects, for the benefit of the community, generally require agreement and cooperation between the members of the community. In poor communities, mutual suspicion and distrust are often obstacles that need addressing before any constructive progress can be made. Frequently in the work place, it is the best team that is most successful. This requires that the team members have good social skills so that they can trust and support the other members of the team. Labour employer relationships in South Africa can be volatile. The legal framework that governs this relationship can be criticised but the social skills on both sides of the table are an important factor in this relationship. Social skills permeate the whole of society and its wellbeing. From this perspective, the developing brain needs more attention and debate by society. Social skills are a good indicator of LH strategy.

Employment

Sociologists frequently investigate occupations but to categorise jobs requires interpretation and the boundaries are frequently fuzzy. Employment also relies on opportunities and personal preference. For example, the same individual might choose between teaching and being a doctor. Both professions are vital for society, the commitment and workload is similar, but remuneration levels are different. It would be expected that both doctors and teachers would have high levels of parental investment; indicating a slow LH strategy. The different levels of wealth might erroneously separate the occupations when their behaviour is similar. Thus, employment is not always a good indicator of LH strategy. Sociologists have contributed to the understanding of poverty in work known as Life Course (LC) but it lacks theory or a biological input.

Life Course

LC sociology evolved over a number of years in order to unravel the different facets of human social existence. It emerged in the mid 1980's and into the 1990's (Mayer, 2009) after a long period of development.

LC is predominantly a methodology that uses quantitative longitudinal data sets (Shanahan, 2000; Mayer, 2009) to study many aspects of life including the family, work and social life. Large cohorts are used and investigations are complex (Mayer, 2009). These investigations are frequently interdisciplinary with biosocial processes, context-genotype interactions, anthropology, demography included, and with the need for more interaction with other sciences (Shanahan, 2000; Mayer, 2009; Lu & Halfon, 2003). The life cycle introduced experiences of youth and adulthood to form a collected LC (Shanahan, 2000; Mayer, 2009).

Life markers define the stages in a LC. The historical markers used to define the path to adulthood were leaving school, full time work, leaving the parental home, getting married and lastly becoming a parent. However, changes in society has altered this traditional sequence of markers for many. These changes are attributed to alterations in the job market, improved mortality, expanded education and social security. These contextual and institutional factors now mean that the order of markers is more random or flexible, like schoolchildren becoming parents and people leave employment to further education. People tend to fit into two groups by standardising their path to adulthood or individualising there route to adulthood. Young adults are better able to cope with these life markers serially rather than concurrently. Family and location primarily determined the old order of markers but these constraints are no longer dominant. Cohabitation, which became common in the 1980's, added more complexity to the passage to adulthood (Shanahan, 2000).

By tracking the changes of life markers through time, it became clear that people adapt their lives to economic circumstances and major events. Times of economic hardship delay first birth. The Depression and World War II are examples. Conversely, with economic booms the age of first birth decreases. However, wars tend to effect people differently. They are advantageous for some groups and disadvantageous for others depending on their

age and socioeconomic status. There is some criticism of markers because they are reversible, like marriage and employment and often they are not discrete or clearly bounded (Shanahan, 2000).

The application of LC methodology to the family indicated new levels of instability in families. Stress appeared to play a critical part in determining outcomes. When there was little stress, stable role models and high levels of parental investment resulted in desirable outcomes. Alternatively, when stress levels were higher and role models weak, frequent moves, weak emotional bonds, and low parental investment resulted in poor outcomes. Divorce frequently had adverse effects, many children lacked the ability to self-regulate and poverty was associated with negative family outcomes (Shanahan, 2000). In general, negative family circumstances led to troubled development outcomes.

With the focus on the family came the realisation that early childhood was a critical time. Negative family experiences in early childhood, particularly divorce and a lack of resources, had the most effect (Shanahan, 2000; Mayer, 2009). However, long-term effects were not consistent (Mayer, 2009). Persistent anti-social behaviour is also associated with childhood factors and this was predominantly a male behaviour with ten times more males than females. Adolescent delinquency, an age related behaviour, was not related to childhood factors and there were 1.5 males to every female (Moffitt & Caspi, 2001). This is an indication that males are more sensitive to negative family circumstances.

Early childhood is also important in understanding mental health. Early childhood has an effect on social class, indirectly through cognitive skills, and also on adult health (Palloni, Milesi, White, & Turner, 2009; Osypuk, 2013). Racial segregation also affects health outcomes but also of the availability of health services. Childhood health is a poor predictor of adult health but predicted inequality (Mayer, 2009). Racial segregation is associated with obesity in black women (Osypuk, 2013). With inequality, most of the race effects are attributed to socioeconomic status and parental education (Shanahan, 2000). The largest differences in LC correlate with inequality associated with racial segregation, socioeconomic effects and gender (Shanahan, 2000; Osypuk, 2013).

However, LC work is criticised with recurring themes. Firstly is the lack of biological input. Humans are biological organisms and hence biological mechanisms and processes are

an integral part of human life. Hormones influence the timing of many life markers (Mayer, 2009; Lu & Halfon, 2003). Secondly, LC concentrates mainly on the individual, when there is a need to account for neighbourhoods, community, and cultural affects. These are often risk factors for the individual and may cause chronic stress (Lu & Halfon, 2003). Finally, LC lacks any coherent theory (Shanahan, 2000; Mayer, 2009). Without theory, there is no hypothesis to test and this means that research tends to be descriptive. As a result, conclusions tend to result in more questions and suggestions for future research. This can be constructive when building a knowledge base but it is indecisive for policy.

Cultural Difference Model

Socialisation is a process through which values and norms pass from one generation to the next. If young adults are going to take advantage of opportunities offered by modernisation they often have to rebel against socialisation. Often there are few opportunities locally so that enforces the status quo (Elam, 2002). In agriculture, the worst advice a farmer can take comes from his grandfather. With socialisation, the opposite is true and grandparents carry a lot of influence. Culture is to be valued but much of the frustration expressed by the younger generation is a desire for improvement. However, they lack the cognitive ability and opportunities of employment. The culture of poverty in South Africa needs serious consideration but a strong desire for improvement exists.

Divisions within society

There are divisions within society, both natural and artificial, that affect behaviour that are of interest and need to be controlled. The most obvious is gender. Although there are many similarities, there are important differences. The other natural one is time. Education and emotional maturity generally improve with age and health can deteriorate with age. In addition, circumstances and opportunities can change with time and these need consideration. Race was a big division historically in South Africa and still is twenty years after democratisation. Wealth is also a big division with extremes very evident. Lack of wealth frequently defines poverty and it is necessary to look beyond this variable for insights into poverty.

Conclusion

LH theory offers sociology a coherent theory that explains some human behaviour. People allocate their resources differently and this can have a profound effect of society.

This is particularly so with parental investment. Low parental investment means compromised cognitive ability and therefore poor educational outcomes. This in turn means low labour productivity and poor competitiveness in the world economy. Early reproduction means a higher proportion of young people in the population and that places a strain on educational facilities. Low parental investment perpetuates poverty and that is associated with crime and violence against women and children. These are all symptoms of the ills that permeate South African society and LH theory offers a plausible explanation. Solutions to these problems then become a possibility. Behaviour has consequences and if different outcomes are required, behaviour needs to change. This thesis hypothesises that types of behaviour affect educational outcomes.

Chapter 2 - Analysis of Life History Theory

Life history theory is a developing conceptual tool used to analyse and explain human behaviour. Although it started as a biological theory, it has moved into the human social sphere. Humans as a species technically have a slow life strategy (nine month gestation, likely to die of old age etc.) however, human behaviour is diverse and can be categorised into a continuum between a fast and slow LH strategy. Many authors have described and contributed to LH theory and its application to humans (Brumbach, Figueredo, & Ellis, 2009; Del Giudice M. , 2009; Del Giudice & Belsky, 2011; Ellis, Figueredo, Brumbach, & Schlomer, 2009; Figueredo, Vasquez, Brumbach, & Schneider, 2004; Figueredo, et al., 2005a & 2005b; Figueredo, Hammond & McKiernan, 2006). The underlying principle of LH theory when applied to humans is that people adapt their behaviour to the social and physical environments in which they live in order to enhance their survival. In other words, differentiated parental behaviour prepares children either to survive in harsh conditions, like those found in South African townships, or to find employment in a modern industrial economy. The first requires survival skills and the second requires income-generating skills.

Because LH theory is an evolving concept, there is no standard set of questions or set procedures to follow. In addition, surveys and data sets are not designed for LH theory and investigators have to select questions relevant to LH theory from those available. From the LH literature there appears to be a growing consensus of the type of information required for LH analysis. To collect the type of questions frequently used in LH analysis various papers have been summarised to illustrate the questions and their relevance. From these papers, a list of questions was compiled. Such a list will always have limitations and never be complete but it provides a framework for the analysis of the CAPS data set and possibly others. There are always questions not asked in any survey and the CAPS is no different. However, variables in LH theory frequently correlate so these gaps do not prevent a meaningful analysis of the data.

Life History (LH) theory is about measuring biological aspects of life including growth, reproduction, parental investment and aging. Reproduction includes age at sexual maturity, the age at first sex, the number of sexual partners and age of first reproduction. Parental investment is the size and number of offspring and the investment per offspring. These LH traits vary within populations because of resource allocation decisions. Life needs resources

and resources are limited so organisms need to allocate resources to the competing requirements of growth, maintenance and reproduction. Allocation decisions are conceptualised as being involuntary. Each decision affects the next in an endless sequence of decisions. Some choices have consequences that limit future choices and others offer multiple choices in the future. For example, pregnancy at a young age limits future options and effort at school opens up future options. This chain of allocation decisions result in very different behaviour across a population (Brumbach, Figueredo, & Ellis, 2009).

This flow of allocation decisions forms a LH strategy that has been categorised into a continuum between a slow and fast strategy. Slow life strategy is characterised by later reproduction, few offspring, a high level of parental investment and a long life. Fast life strategy by early reproduction, many offspring, low parental investment and a short life. These differences are obvious in the reproductive behaviour of different species of mammals. As a species, humans follow a slow strategy because of the long gestation period and the long dependency of offspring on parents. However, the behaviour of humans can also be categorised into the slow fast continuum as described (Brumbach, Figueredo, & Ellis, 2009).

Original LH theory is about biological traits but psychosocial traits correlate with the biological traits to facilitate behaviour. For example, a slow life individual will have fewer offspring, invest heavily in each of them and live longer but will also be committed to long term relationships, think and invest long term to provide for his children and have better health. The behaviour and the psychology of the individual are matched so that a man, for example, that has children from three women is likely to have a low level of parental investment. The non-biological traits are a critical part of LH theory. Analytical investigations have shown that the psychosocial, health and traditional LH traits are highly correlated. Clusters of traits from any of these types can indicate a LH strategy (Brumbach, Figueredo, & Ellis, 2009).

The traits of LH theory can be categorised into biological, behavioural and cultural. Biological traits would be the life span, age of sexual maturity and health. Behavioural traits would be the amount of parental investment and planning. These two categories could be applied to most organisms but the cultural category is mainly specific to humans. These

cultural traits could include home ownership, a savings account and contraceptive use. Traits associated with a slow LH strategy can vary with different cultures (Brumbach, Figueredo, & Ellis, 2009). For example, a slow life strategist black man living in Cape Town might value a kraal in his ancestral village above home ownership in Cape Town. Cultural differences are expected in the analysis of data collected in Cape Town because of the different races included in the survey.

Development of Life History Strategies

Organisms adapt different LH strategies because of the gene-environmental interaction. Separating the influence of these two factors requires detailed specialist investigation so for practical purposes it is generally the environment influence that is considered. With LH theory investigations there are two environmental influences considered, environmental harshness and the predictability of the environment. Harshness is the amount of environmental stress on an organism and is measured by the levels of morbidity and mortality. Extreme climates, predator pressure, competition for mates, scarcity of food and pathogens cause this stress. Unpredictability in the environment is caused by events that occur randomly. Examples might be the death of a parent in an accident, a plague that nullifies any parental investment strategy or the loss of stable employment. Random type events cannot be avoided by a strategy and will cause stress for the individual (Brumbach, Figueredo, & Ellis, 2009).

Humans' LH strategy evolves during their development phase. In respect to harshness, cues about morbidity and mortality to the adolescent and young adult stages are particularly important. High rates of disease or violent deaths in this age group signal the importance of reproducing early to have offspring before death occurs. This happens when there are adequate resources to sustain growth and reproduction. High levels of inequality predict high levels of violence and this correlates with women reproducing at a young age. This is not to be a lack of contraceptive knowledge. A fast life strategy is associated with earlier sexual debut, multiple sexual partners and teenage pregnancy (Brumbach, Figueredo, & Ellis, 2009).

With an unpredictable environment, the response is also a fast life strategy. The biological logic is to reproduce early and produce many offspring in the hope that some will

have phenotypes suitable for the future environment and be able to survive. In practical terms, children can experience environmental unpredictability in two ways. Directly experiencing random events or being effected by the behaviour of others who are experiencing random events (Brumbach, Figueredo, & Ellis, 2009).

Harsh and unpredictable environment both result in a fast life history strategy. This includes early reproduction, many offspring and low levels of parental investment. However, if resources are extremely limited a slow life strategy might be necessary to have any offspring survive. Another variation from the expected response to the environment is male behaviour. This can change in response to sex ratios, the local mating system and the intensity of competition from other males. Children respond to cues from their parents however, there is variation in this response dependent upon their genetics (Del Giudice & Belsky, 2011).

Measurement of Life History Strategy

Age at maturity is one of the critical factors for all life forms, including humans. Maturity for some societies focuses on the age of twenty-one. Emotional maturity is around twenty-five years but in biological terms it is determined by reproduction and the birth of offspring. Life before maturity is about preparation and later fulfilment. Delaying maturity allows more preparation for the fulfilment phase. This could include greater size (weight and or height), better education, more skills, a better social network, more financial security, more emotional stability; and all this gives the individual the capability to invest more into their offspring. Delayed maturity also means a longer life expectancy and lower fecundity (Stearns, 1992). All of these items can affect the quality of life but they also have a potential impact on children. Early maturity in humans appears to have mostly negative social consequences but the big advantage is that it reduces the probability of death before reproduction because of a shortened juvenile period. Additionally, it reduces the generational interval and increases the reproductive potential of females. Early reproduction may appear to be an illogical choice, considering the many negative consequences, but it is a fact of human life and biology informs us that it is a response to ecological conditions. A perceived risky or unpredictable life, consciously or subconsciously, means that early reproduction is the logical choice. However, early reproduction means the parent is less able to invest in the child and results in poorer child outcomes. Females can

reproduce after puberty but the early years of fertility are associated with increased infant mortality (Stearns, 1992). Early maturity is a trade-off between the quality and quantity of children when a modern industrialised society would prefer quality. When resources are scarce, delaying reproduction is of no advantage because it is not possible to accumulate resources (Del Giudice & Belsky, 2011). Early reproduction also has other social consequences.

Britain is a country with a strong social support system but it has enough variation in socioeconomic status to produce different behaviours. The 'Millennium Cohort Study' of 8660 families found that, in the poorest neighbourhoods, women give birth at a younger age to lower birth weight children, they breast feed for a shorter period, fathers are absent more frequently, and grandmothers are less involved, compared with more affluent areas. Fathers also show less investment in their children in poorer areas. Mortality and morbidity rates are higher in harsher environments and a faster LH is expected. Although this behaviour is adaptive to the conditions in which people live, it comes with a cost. The children from the poor neighbourhoods had lower verbal skills at the age of five and this was partially due to less parental investment. Part of the problem is that young parents are less able to invest in their children. Birth weights increase with age of the mothers, as does the ability to breast-feed successfully. Older men also seem more willing to invest in children (Nettle D. , Dying young and living fast: variations in life history across English neighborhoods, 2010).

Two other studies using the 2001 and 2011 English census data confirmed the reliability of a LH theory approach. Using the 2001 census, ecological conditions correlate with criminal violence and teenage conceptions. The 2011 census produced similar results (Copping & Campbell, 2014) but using the 2001 ecological indicators improved the predictions of the 2011 census results. These results are remarkable because Britain is a first world economy with a welfare system that means that the poor are not poor by South African standards. Every dwelling has running water and sanitation, which is not the case in South Africa. Ecological conditions in Cape Town are considerably worse and greater variation with more detrimental implications for children in Cape Town is expected.

An Australian trial conducted at a metropolitan hospital demonstrated the effects of early adverse family life on the reproductive life of women. Comparisons were made between fifty women under the age of 20 and equal numbers over the age of 20 at first delivery. Interviews established details of their early family life with questions about violence between parents, parental divorce or separation, absence of a father figure and details of relationships within the family. Early life stress predicted the age of menarche, age at first birth, adult attachment and expected life span (Chisholm, Quinlivan, Peterson, & Coall, 2005). Motivation for this trial was concerns about teenage pregnancy and results confirmed LH theory.

In another Australian trial conducted in Perth on a population that was relatively well fed and relatively safe, early child stress also affected reproductive results. Women that had early menarche and a stressful childhood had lower birth weight babies (Coall & Chisholm, 2010). Early menarche without a stressful childhood did not lower birth weights. A questionnaire evaluated psychosocial stress and the births were singles, first child and between 37-42 weeks of gestation. Stress is not the only cause of early puberty (discussed later) so these results confirm LH theory. Reduced parental investment by a mother is associated with her childhood in an environment where nutrition is not an important factor. This is not a conscious decision by the mother, like many aspects of parental investment, but a physiological change associated with psychosocial stress in childhood. These lower birth weights have implications for the cognitive ability of the children (Pyhala, et al., 2011). This trial raises questions about parental investment and the balance between rational decisions and physiological processes. The lower parental investment measured in the above reports all have negative consequences.

The effects of lower birth weight, minimal breast-feeding, separation from the mother, less parental involvement, and frequent moves are all associated with earlier first pregnancy in daughters (Nettle, Coall, & Dickins, 2010). This is consistent with life history theory and puts the daughters in a similar situation to their mothers. This is generational poverty explained by life history theory. Teenage pregnancy is often a consequence, but generally considered in isolation from its contextual background.

Teenage pregnancy is generally associated with families from low socioeconomic neighbourhoods. The association with low socioeconomic status is not necessarily correct, as investigations have shown. In an analysis of a British child development study, women who had children as teenagers were matched with women of the same socioeconomic status who were not teenage mothers. There were distinct childhood differences between the groups of women of the same socioeconomic status. The teenage mothers were lighter at birth and shorter at age seven than the control group but they had mostly caught up by the age of sixteen. The teenage mothers experienced menarche four months earlier, had more adult breast development at age sixteen, and their growth terminated earlier than the controls. These growth pattern differences were small, but psychological differences were much more significant. Emotional and behavioural disturbances are different at age seven and more so at age eleven. By age eleven, depression and hostility are double those found in the control group (Nettle, Dickins, Coall, & de Mornay Davies, 2013). Coupled with this behaviour were the ideals of marriage and motherhood. From a LH perspective, teenage mothers had lower parental investment early in life. This behaviour is indicated by their lower birth weight, slower growth to age seven, and lack of social skills or the presentation of more psychological problems. They live in harsher ecological conditions and their expected behaviour is early reproduction. Interventions like contraceptive education to prevent this behaviour were futile.

The assumption often made about teenage pregnancy is that a lack of contraceptive knowledge is the primary cause. The one factor in which there was no difference between the teenage mothers and the controls was contraceptive education. Both groups had similar levels of education in this area and both groups reported satisfaction with the information supplied. Young women need contraceptive information but it appears futile to expect this to reduce teenage pregnancy. The recommended remedy for teenage pregnancy in Britain was to improve nutrition for expectant mothers, provide better nutrition for young children, and the creation of less stressful early home environments.

In the western world, the age of menarche has been decreasing for the last 150 years and there is no reason to suspect this trend will not continue. Reasons given for this trend are improved nutrition and disease control rather than the effect of chemicals, frequently reported in the media. Some early human records indicate puberty at age seven

and first birth at age ten but life expectancy was 27 years (Hochberg & Belsky, 2013). Early puberty was in a response to the harsh ecology of the environment. This indicates two factors that reduce the age of puberty: stable environments with good nutrition but also harsh unpredictable environments. However, there will be very different psychological measures associated with the different causes of early puberty. Life history theory predicts that nutritional early puberty will be associated with emotional stability and good social skills. Alternatively, the early puberty associated with harsh ecology combines with behavioural problems and poor social skills. This will be also associated with early reproduction when nutritional results in early puberty it will be associated with delayed reproduction. The age of puberty is not a reliable indicator of ecological conditions, but combined with other data it can be a useful indicator. Girls who experienced chronic illness as children reproduced early than their peers (Waynforth, 2012). This was not associated with lower educational achievement or other life history factors. The analysis confirmed that early reproduction in girls often occurred in father absent homes (Waynforth, 2012). Although most research on reproduction is concentrated on females, males have received some attention.

Male reproduction

Male parental investment is also important. Evidence shows that there is variation in plasma testosterone levels and testes volume among men. As these increased, the amount of caregiving decreased. Caregiving was measured by observing brain activity in the ventral tegmental area, an area that predicts caregiving, when men were shown a picture of their own child (Mascaro, Hackett, & Rilling, 2013). Thus, biology confirms LH theory. LH predicts that fast life strategy men are more aggressive and have the testosterone and testis size associated with that lifestyle. That is associated with a reproductive effort more orientated to mating than the rearing of children. In a dangerous environment, it makes biological sense to produce more children because the chances of survival are low. A slow life strategy male is not competing with other males for sexual partners so he has no requirement of the secondary sexual features, such as muscle and bone, associated high testosterone levels, nor a need for a large testicular volume to produce lots of semen if he is monogamous. Conversely, a fast life strategy male needs more muscle and bone to compete against other males and requires lots of semen to service his females. In primate species, where the

females mate with many males, the males have larger testes to produce more semen and remain fertile with frequent copulation. In one group of men, semen quality and quantity started to decrease after 3.5 emissions per week (Wilcoxe, Weinberg, & Baird, 1995) which may be inadequate for a fast life strategy individual. The cause of large testes and why there is less nurturing brain activity in fast life history strategy men is unknown (Mascaro, Hackett, & Rilling, 2013), but that it seems probable that it might be due to early life stress.

Testosterone levels are also inversely related to marriage quality and directly related to divorce and polygamy (Mascaro, Hackett, & Rilling, 2013). This reduces parental investment and confirms predictions by LH theory. A fast life strategy and the higher levels of testosterone are associated with health risks.

Obesity is a disease for which LH theory offers a possible explanation. Fast foods containing high levels of energy are tasty because of their high fat content and they are cheap and convenient. However, the consensus is that they are unhealthy (Laran & Salerno, 2012) if they constitute a high proportion of an individual's diet and that they do cause obesity, especially if associated with a sedentary life style. People may be choosing high-energy diets in response to cues they receive from news articles. News bulletins are frequently depressing with items about the poor state of the economy, high unemployment, personal tragedy stories, strikes, corruption, and many other negative items. LH theory proposes that people respond to environmental cues, and high-energy foods are an insurance against pending bad times. A study has shown that the choice of food is influenced by information associated with environmental harshness (Laran & Salerno, 2012) and is not always a desire for self-indulgence. The interesting fact is that people respond to their immediate environment. South Africa has a serious obesity problem, particularly high among black women, that is of concern to government and health professionals (Kruger, Puoane, Senekal, & van der Merwe, 2005) because it frequently results in type 2 diabetes.

A study in Cape Town indicated that childhood deprivation followed by access to resources in adulthood explained obesity in women. Different aspirations for body size explained the sex difference (Case & Menendez, 2009). Low parental investment results in childhood deprivation so LH theory predicts obesity for women. Fast LH strategy women living in harsh circumstances eat more to enhance their reproductive ability where as slow LH women in similar situations eat less to suppress reproduction **Invalid source specified..**

The response to harsh conditions was more pronounced in women with a low weight index where a weight change is most likely to alter reproductive functioning. In conjunction with this fast LH strategy men in harsher ecological conditions prefer heavier women and slow LH strategy men prefer lighter women (Hill, Delpriore, Rodeheffer, & Butterfield, 2014). This adds valuable knowledge to the complex processes that control eating, especially for women for whom it can have serious health implications.

Depression is another health issue that fits the life history model. In a Finnish study of boys of the ages of eight and eighteen, depression was associated with stressful life events in childhood. The use of illicit drugs and somatic health was associated with depression at age eighteen and teachers' reports of emotional problems at age eight predicted depression at age eighteen (Ronning, et al., 2011). Stressful life events are expected with parents who follow a fast life strategy path and health problems, including mental health, are to be expected with their children. LH theory was not used in the analysis but it is probable that it would be a good predictor of depression in boys aged eighteen. An associated problem is addiction.

Pre-puberty stress and particularly stress experienced in the early years of life are associated with development of alcohol problems in adolescence and addiction in early adulthood (Enoch, 2011). This stress can cause permanent changes in the neuro-hormonal system, the brain, and the dopamine reward system, and are all implicated in the development of addiction. However, a proportion of the children who experience early life stress do not develop addiction because of differences in the gene-environment interaction and family or peer relationships. The heritability of alcoholism is around 50% and drug dependency between 60 and 70% (Enoch, 2011). However, for a child living in a household with an addicted parent the probabilities are that it will be stressful. Early life stress limits parental investment and LH theory predicts addiction. Addiction in its various forms causes human misery for the individual and their families. It must also be associated with lower productivity and certainly with increased health costs. For this reason, any contribution from LH theory towards the prevention of addiction could make a large social impact. Addiction is frequently associated with criminal behaviour to fund the addiction.

Criminal behaviour and especially violent crime is associated with poverty. A study of inmates in the USA found that people categorised by more violence, had previously had behaviour that is more delinquent, were younger when first arrested, were likely to return to prison, and had more psychological and social problems. These inmates scored lower on a personality measure (van der Linden, Dunkel, Beaver, & Louwen, 2014). This personality score is similar to LH theory and parental investment. The worst inmates had the lowest parental investment. Criminal behaviour is risky and understanding adolescent risk behaviour from an evolutionary perspective would assist in designing interventions for youths in low socioeconomic neighbourhoods (Ellis, et al., 2012). A randomised trial aimed at reducing criminal behaviour used boys with behavioural problems. One of the interventions tested was parental supervision and it did reduce adult criminal activity but it was not particularly successful (Vitaro, Barker, Brendgen, & Tremblay, 2012). The evidence presented previously indicates that increasing parental investment, in high-risk families, from birth is more likely to have a substantial effect. Criminal activity probably stems from extreme family conflict but family conflict in general is the subject of much research. Using LH theory would bring more cohesion and progress to this topic (Schlomer, Del Giudice, & Ellis, 2011)

From the above papers, potential LH theory questions were obtained. There will be overlaps and many ways of phrasing question so only core ideas are given.

Measurements potentially used in Life History

Environment

1. Environmental harshness measured by mortality risk. Experience of or knowledge of violence and disease are relevant questions.
2. Environmental unpredictability is measured by inconsistent home circumstance. How often have you not been taken care of? How many moves have you made?

Life History Strategy

3. Age of puberty is influenced by nutrition, exercise and health but also early childhood stress. It is therefore not a reliable indicator of LH strategy unless coupled with behavioural measures.
4. Mating effort is indicated by the age of first sex and number of sexual partners.

5. Age of reproduction is an absolute measure of mating effort. Age of parent at first reproduction is an indication of the social, financial resources available to invest in children.
6. Relationship stability is indicated by marital status, years spent with both mother and father, and parents' current relationships.
7. Prenatal parental investment starts with mineral supplements used before and during pregnancy. A mother's use of alcohol, tobacco and other drugs during pregnancy. Adequate nutrition and health care.
8. Postnatal parental investment starts with breastfeeding followed by normal nutrition. Inadequate nutrition can be assessed up to age 7 but by age 11 any differences are gone. The interactive and emotional relationship between the child and a parent. The parenting style including the amount of monitoring, expectations of responsibility and the use of consequences. Financial support and quality time with child.
9. Male interest in offspring can be measured. Testis size, plasma testosterone and brain activity in the ventral tegmental area are all measures of male interest in his children and marital relationships. Aggressiveness and secondary sexual features, such as muscle and bone are related to plasma testosterone.
10. Wealth is a measure of the ability to invest in children. It might include house construction, asset classes and income.

Symptoms of Life History Strategy

11. Physical health is an indicator of somatic effort. Measures can include how frequently health disrupts normal life, subjective assessments of health and lists of health problems. Non-communicable diseases such as diabetes and blood pressure regulation can be indicators. Chronic illness in childhood can be associated with a fast life strategy.
12. Mental Health can be measured by substance use, levels of depression with both positive and negative questions, delinquent behaviour and hostility. For females, romantic notions of marriage and motherhood early in life. Obesity can be associated with a short life strategy.

13. Sexual behaviour and attitudes are indicators of mating effort. The type of partner is an indicator of relationship skills.
14. Risk behaviour can be indicated by the frequency of condom use.
15. Status seeking by males indicates a fast life strategy
16. Cooperation and altruism indicate a slow life strategy
17. Education and skills.
18. Social skills and the size of a social network.
19. Marital violence, separation and divorce.

Symptoms of Parental investment in children

20. Birth weight is an indicator of prenatal parental investment.
21. Infant mortality rates indicate a population's parental investment.
22. Cognitive ability, literacy and numeracy skills can all be measured before a child starts school.
23. Behaviour of the child
24. Age/size
25. Relationship with parents

School type

26. School type or efficiency can have a major influence on educational achievement and consequently this social environment needs to be included in an analysis.
27. Children from slow life strategy parents tend to go to efficient schools while children from fast life parents tend to go inefficient schools.

Conceptual Diagrams

Following are two conceptual diagrams. The first illustrates general LH theory and second the divergent paths of a fast and slow LH strategy. These different strategies result in poverty or prosperity. Added to both is the part that schools can play in determining educational achievement and needs to be included when investigating poverty.

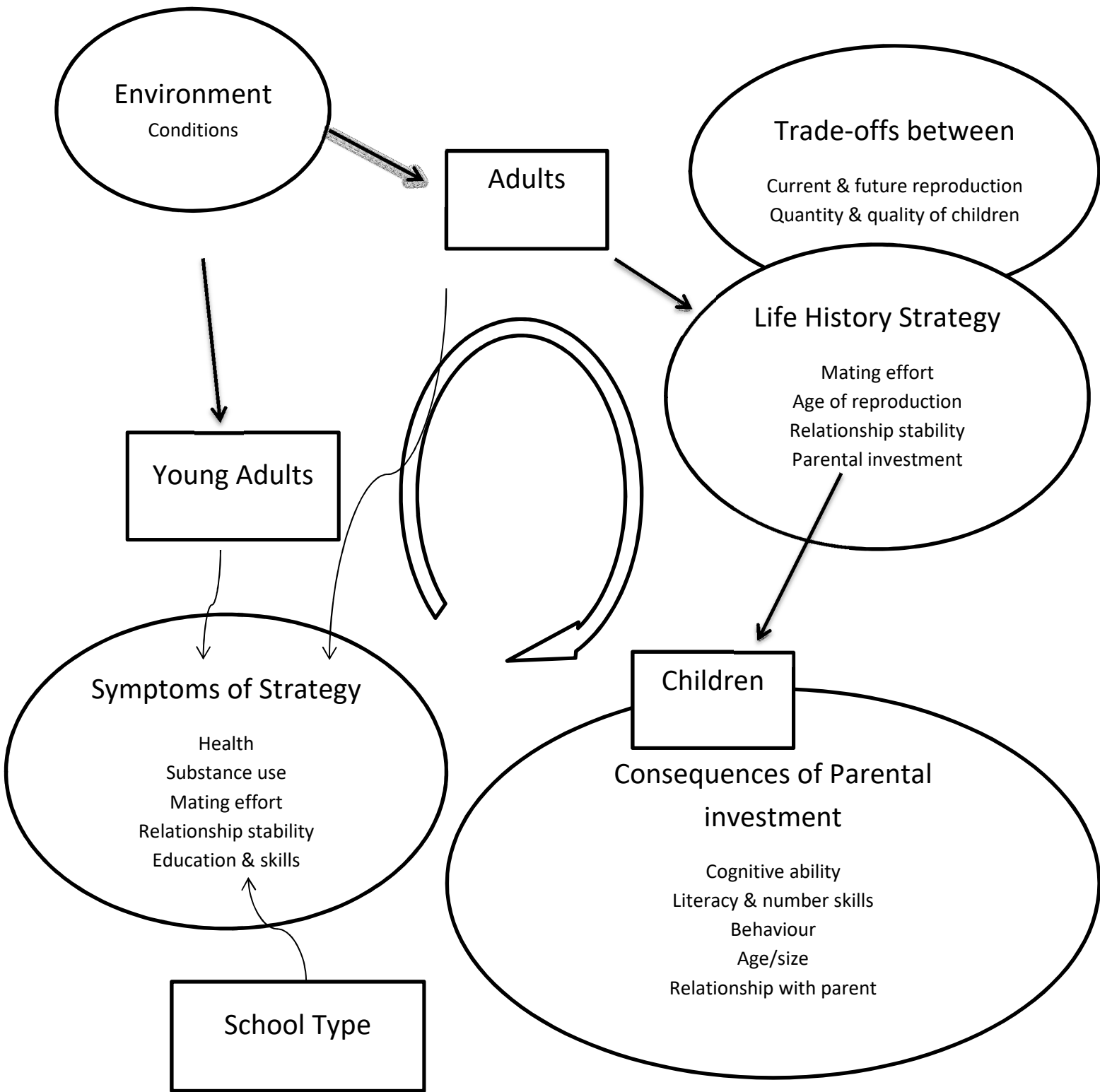


Figure 1 Life History conceptual diagram

Slow life strategy

Fast Life Strategy

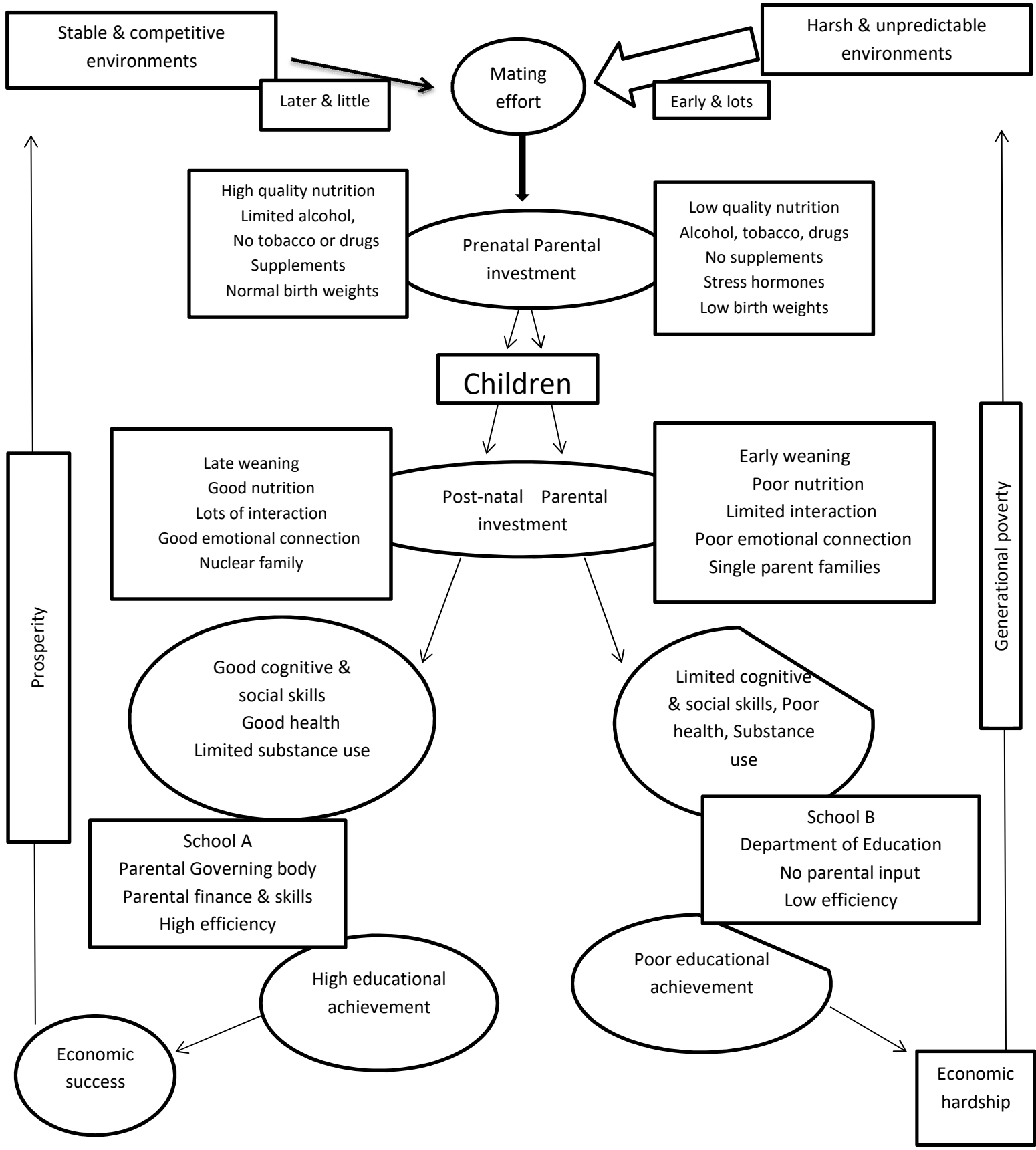


Figure 2 Conceptual diagram of contrasting life history strategies

Research Question

Life History is a conceptual theory to explain the link between environments and the changes they cause in human behaviour to optimise survival. The research question is hence: Can behaviour contribute to poor educational achievement and consequently poverty?

Method

The Cape Area Panel Study (CAPS) was a longitudinal study conducted in the Cape Town metro from 2002 until 2009. There were five waves starting with young adults ages 14 to 22 in Wave 1. The CAPS Waves 1-2-3 were collected between 2002 and 2005 by the University of Cape Town and the University of Michigan, with funding provided by the US National Institute for Child Health and Human Development and the Andrew W. Mellon Foundation. Wave 4 was collected in 2006 by the University of Cape Town, University of Michigan and Princeton University. Major funding for Wave 4 was provided by the National Institute on Aging through a grant to Princeton University, in addition to funding provided by NICHD through the University of Michigan. Wave 5 was collected in 2009 by the Centre for Social Science Research (CSSR) at the University of Cape Town. Major funding for Wave 5 was provided by the Health Economics & HIV/AIDS Research Division (HEARD) at the University of KwaZulu-Natal, with additional funding from the Andrew W. Mellon Foundation (through the CSSR at UCT), the European Union (through the Microcon research partnership on the microfoundations of violent conflict, via the CSSR) and the NICHD (through the University of Michigan) (Lam, et al., 2012).

The CAPS data set has attracted interest from researchers and a Google Scholar search produced 25 papers. Of these, 15 focused on sexual behaviour relating to the HIV/AIDS epidemic and are referenced in the discussion on HIV/AIDS. The balance of the research covers a variety of social problems and some are referenced where relevant.

Statistical analysis

The primary analysis was a multiple regression using the least squares method and with educational achievement as the outcome. Education rather than employment was used because it was simpler and more reliably measured. In addition, household survey data strongly predicts adult economic outcomes from education (Anderson, Case, & Lam, 2008). Most of the participants would have completed their high school education by age 21,

which was the minimum age in Wave 5. With employment, many participants would have been unemployed and a proportion would not have entered the job market.

Education, despite the problems in South Africa, also appears to be the most direct policy to tackle the problems of inequality and unemployment. The media place a lot of attention on education because of its potential to change lives and the administrative bungles that are a common occurrence. Research on South African education clearly indicates that it is far from healthy or achieving its objectives of supplying enough skilled people for the economy (Frempong, Reddy, & Kanjee, 2011; Lam, Ardington, & Leibbrandt, 2011; Modisaotsile, 2012; Rasool & Botha, 2011; Soudien, 2007; Spaul, 2011&2013; van der Berg, 2008). For these reasons, a focus on education is appropriate. A focus on employment raises all sorts of issues beyond the scope of this research.

Presented are two models. In Model A, all variables are included for theoretical reasons with significant interactions. Model B contains only significant variables and interactions.

LH theory suggests that people change their reproductive behaviour to adapt to the environment, so two environmental factors were included. Children spend a lot of time at school and three school variables were included. Young adults, rather than schools, were the focus of the survey so there are limited school questions. Parents are important and there are six factors relating to parents. Another six variables relate to the participants directly or alternatively parent variables because of the influence that parents can have on their children.

The age of puberty was not included because it is not a clear indicator of LH strategy. The aim of the study was to focus on the parents of the participants and the participants. If grandparents or the children of the participant were included, this would have added complexity and detracted from the study.

Most questions used in the analysis were from Wave 1 to establish a background for the young adults. The questions used to establish consequence came from all five waves. These questions were about health, substance use, sex partners, age of first sex and educational achievement (see table 4). Health and substance answers were averaged across

waves, the minimum age was used for sexual debut and for educational achievement and number of sex partners, and the maximum was used when multiple answers were supplied.

Sample analysed

Table 2 Comparison of demographics in survey and analysed in the models

Demographic	Category	Survey	Analysed
Gender	Females	53%	63%
	Males	47%	37%
Age Wave 1	14	10%	12%
	15	11%	14%
	16	12%	13%
	17	13%	14%
	18	12%	13%
	19	12%	11%
	20	11%	9%
	21	10%	8%
	22	9%	6%
Race	Black	45%	41%
	Coloured	42%	48%
	White	13%	11%
Wealth	very poor	11%	11%
	poor	23%	22%
	just getting by	43%	46%
	comfortable	21%	20%
	very comfortable	3%	2%
Totals	Wave 1 household	5256	
	Wave 1 youth	4754	
	Wave 5 youth	2915	
	Analysed	1978	

There is little difference in the demographic ratios of Wave 1 of the survey and the sample analysed. There is a drop off with older male participants that is to be expected. Participants with missing data were excluded from the analysis.

Constructs and Variable measurements

Demographic Variables

Year of birth and race are all directly from the survey.

Composite variables

Composite variables reduce the complexity of the data and decrease errors. They also convert categorical answers into continuous variables that allow regression analysis. The variables are combined by converting the data to Z scores ($(x - \text{mean}) / \text{standard deviation}$) and the Z scores are then summed. The factor loadings are the correlations between the composite variable and the individual variables. Correlations above 0.6 are acceptable.

Wealth

The definition of household wealth for this study is the earning capacity of the family. A composite variable derived from questions in the household survey in Wave 1 included income, house construction, household assets and a subjective assessment of family wealth. Household income came from an actual income given or a category of income earned. An indicative value of the residence was derived from the permanence of the materials used in the construction of the walls and the roof plus the number of main rooms in the house. The number of assets categories in the household, obtained by a binomial question, was the figure in the variable. These four variables combined to form a composite variable for wealth and were scored such that higher scores indicate more wealth. The factor loading for Wealth are house 0.82, assets 0.86, income 0.80, and subjective assessment 0.77.

Morbidity and mortality

Knowledge of morbidity and mortality obtained from questions about awareness of people with AIDS/HIV and people that had died of the same disease in the Wave 1 youth questionnaire. A third question involved deaths in the family asked in the household survey in Wave 1. These variables were combined to form a composite variable for a knowledge of morbidity and mortality. The composite variable was scored such that higher scores indicate more awareness of disease and deaths. The factor loading for morbidity and mortality are: know someone with AIDS 0.69, know someone died of HIV 0.72, and death in the family 0.55

Neighbourhood environment

Neighbourhood environment is defined as the perception of the local area. Questions asked about appearance, friendliness and helpfulness. The composite variable was scored such that higher scores indicate a more amenable neighbourhood. The factor

loading for neighbourhood environment are area looks nice 0.69, people friendly 0.83, and people helpful 0.81.

Substance Use

Substance use was defined as the use of controlled substances alcohol, tobacco and other drugs. Questions were binary recording use but not frequency or amount. The composite variable was scored such that higher scores indicate more use of these substances. The factor loading for substance use was alcohol 0.74, tobacco 0.80, and other drugs 0.72.

Number of sexual partners

Number of sexual partners is defined by the sexual activity of the participant. Questions asked about the number of sexual partners in the last 12 months and the number of sexual partners in their life. The frequency of condom use was the third question. These questions were asked in most waves of the survey. The composite variable was scored such that higher scores indicate more sexual partners. The factor loading for number of sexual partners was sex partners one year 0.81, sex partners for life 0.80, and condom use 0.73.

Parental support

Funding for children is defined by the incidence of payment by any caregiver. Possible caregivers are biological mother, biological father, stepparent or other guardian. The questions were binomial (yes/no) and asked about money for school costs, non-school clothing, gifts and pocket money. The composite variable was scored such that higher scores indicate more financial commitment by all caregivers. The factor loading for parental support was school expenses 0.80, non-school clothes 0.85, gifts 0.77, and pocket money 0.78.

Parental time

The parental investment of time with children is defined by the frequency of time that caregivers spent with children. Possible caregivers were biological mother, biological father, stepparent or other guardian. The questions gave a range of frequency from none to daily and asked about sleeping under the same roof, time alone together, talking about personal matters and eating meals together. The composite variable was scored such that higher scores indicate more parental time with the participant. The factor loading for

parental time was nights same roof 0.87, alone together 0.84, conversations about personal matters 0.72, and meals together 0.88.

Health

Three questions asked in most waves defined and recorded health. There were two subjective questions about the participant's health and a third question about how frequently health disrupted normal activities and answers up to the age 22 were included. This composite variable was scored such that higher scores indicate improved health. The factor loading for Health was health 0.73, health problems 0.73, and disrupts normal life 0.69.

School attitude

The participant's attitude to school defined school attitude. Questions asked about how frequently homework was not done, how often participants were late for school and how often they were truant. The composite variable was scored such that higher scores indicates improved attitude to school. The factor loading for school was homework done 0.73, school late 0.71, and truant 0.72

Home stability

Home stability is defined by the years the participant spent with their mother and their father and by the marital state of the parents. A question in the Wave 1 household survey asked about each year of the participant's life and if they were resident with their parents. The first 15 years were used in the analysis. A binomial question asked if their parents were married. The composite variable was scored such that a higher score indicates a more stable home. The factor loading for home stability was years with mother 0.71, years with father 0.87 and parents married 0.78.

Direct Measurements

Reproductive group

The reproductive groups are defined by gender, the occurrence of pregnancy and the age of that occurrence. Group 1 was females that reported no pregnancy, group 2 reported being pregnant in their twenties and group 3 reported teenage pregnancy or being pregnant before the age 20. Group 4 are males. The youngest female participants were age 21 in Wave 5 and consequently there was limited time for these women to become pregnant in their twenties. As young females mature, there is an increasing probability of

pregnancy. Thus, group 2 is small and bias probable. With only participants born up until 1984 the model improved indicating bias. However, the sample size halved, the effect of year of birth was reduced considerably because it is the younger participant that are effected mostly (see Graph 3) and many of the variables were no longer significant. The focus is on possible gender differences and between slow life strategist females (never pregnant) and fast life strategist female whom reported teenage pregnancy.

Mothers age at first birth

Mother's age at first birth is defined as her age when her first child was born. The Wave 1 household survey supplied the age of mother and her children. The age of the oldest child was subtracted from the age of the mother. There is a possibility of error because biological children older than 22 in Wave 1 were not recorded.

Age of sexual debut

Age of sexual debut is defined as the age at which the participant stated or the age when they stated that, they had had sexual intercourse (full penetration). Questions either asked directly about the age of first sex or if they had had sexual intercourse. The score is the age of sexual debut with a greater score meaning an older age at sexual debut.

Parental education

Parental education is defined as the highest educational achievement of the parents. This information is supplied from a question about parental education. A higher score means improved or further education for the highest achieving parent.

Classroom size

Classroom size is defined as the number of pupils in the participant's classroom. A question asked about average numbers in their class or in their last year of school. An increasing score represents more pupils in the classroom.

Age-grade

Age grade is defined as the appropriate grade for the age of the pupil. For the purposes of this study the grade of the pupil was subtracted from the age of the pupil. In Wave 1 participants supplied their age in each grade and the grade at age 14 is used in the analysis. An increasing score indicates more repeated grades.

Homework

Homework is defined as the time spent on homework during the week and weekends. Questions asked how many hours were spent on homework. An increasing score represents more time on homework.

Educational outcomes

Educational outcomes are defined as the educational achievement of the participant in high school. Questions about grade achievement and matric results (grade 12 exam) were asked in each wave and the highest level was used in the analysis. The grade achieved was added to the matric aggregate mark. Around half the participants did not write the matric exam so matric marks alone were not adequate. An increasing score represents greater educational achievement.

Table 3 summary of the variables used in the analysis

Variable	Description
House construction	Permanency of wall and roof materials and number of main rooms
Assets	The number of asset classes in the household. Maximum 14 in Wave 1
Income	Household income in Wave 1
Subjective wealth	A subjective assessment of wealth
Wealth	A composite variable derived from the above four variables
Residence with "parent"	Frequency of residency with parent of substitute parent
Spent time with "parent"	Frequency of time spent with parent of substitute parent
Conversations with "parent"	Frequency of conversations with parent of substitute parent
Meals with "parent"	Frequency of meals with parent of substitute parent
Parent time	A composite variable derived from the above four variables
Money on school	A binomial question about money for school cost by "parents"
Money on clothing	A binomial question about clothing from "parents"
money on gifts	A binomial question about gifts from "parents"
pocket money	A binomial question about pocket money from "parents"
Parent support	A composite variable derived from the above four variables
Homework not done	Frequency of homework not done
School late	Frequency of being late to school
Truant	Frequency of being truant
Attitude to school	A composite variable derived from the above three variables
How is your health	A subjective assessment of health
Health problems	A binomial question about health
Health disrupted normal life	The frequency of health affecting normal life
Health	A composite variable derived from the above three variables
Alcohol use	Frequency of alcohol use
Tobacco use	Frequency of tobacco use

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Other drug use	Frequency of the use of illicit drugs
Substance use	A composite variable derived from the above three variables
sex partners 12 months	The number of sex partners during the year
sex partners life	The number of sexual partners during the life of the participant
condoms use	The frequency of condom use
Sexpartners	A composite variable derived from the above three variables
homework hours per week	Hours of homework during the week and weekend
Class size	The size of class in Wave 1 or the participants last year of school
Mother number of children	The number of children to which the mother gave birth
age of first sex	Age at which the participant reported having sex for the first time
Reproductive Group	1 female non-pregnant, 2 pregnant >age 19, 3 pregnant <age20, 4 males
Year of birth	In Wave 1 from age 14 to 22
Race	Categorical, 1 = black, 2 = coloured, 3 = white
Age-grade	Grade at age 14. Age minus grade.
Years with mother	From the first 15 years of life, years resident with mother.
Years with father	From the first 15 years of life, years resident with father.
Parents married	Binomial variable
Home stability	A composite variable derived from the above three variables
Age of mother at first birth	The age of the mother at the birth of her first child
Educational achievement	The school grade completed plus Grade 12 exam aggregate.
Parental education	The school grade completed or a higher educational achievement.

Chapter 3 - Results

Descriptive statistics

Table 4 Descriptive statistics of questions used in the analysis

Question	Wave	Min	1st Qu	Median	Mean	3rd Qu	Max
House construction	1	1	3	4	3.8	4	9
Assets Wave 1	1	0	4	7	7.2	11	14
Income Wave 1	1	0	1300	2800	5202	6000	75000
Wealth subjective assessment	1	1	2	3	2.8	3	5
Residence with "parent"	1	0	8	11	10.7	14	24
Spent time with "parent"	1	0	6	8	8.8	12	26
Conversations with "parent"	1	0	3	7	6.9	10	23
Meals with "parent"	1	0	8	12	10.8	14	25
Money on school	1	0	0	1	1.0	2	3
Money on clothing	1	0	1	1	1.3	2	4
money on gifts	1	0	0	1	1.1	2	4
pocket money	1	0	1	1	1.2	2	4
Homework done	1	0	4	4	4.2	5	7
School on time	1	0	4	5	4.4	5	5
Not truant	1	0	4	5	4.6	5	5
How is your health?	All	0	3	4	4.0	5	5
No health problems	All	1	4	4	3.8	4	4
No health disrupted life	All	1	5	5	4.7	5	5
Alcohol use	All	0	0	1	.55	1	1
Tobacco use	All	0	0	0	.48	1	1
Other drug use	All	0	0	0	.12	0	1
sex partners 12 months	All	0	1	1	1.6	2	20
sex partners life	All	0	1	3	3.6	4	50
condoms use	All	0	1	1	1.7	3	4
homework hours per week	1	0	2	3	3.4	4	40
Class size	1	1	32	40	39.8	46	108
Mother number of children	1	1	2	3	3.3	4	16
age of first sex	All	0	14	16	13.7	18	29
age Wave 1	1	14	16	18	17.9	20	22
Age-grade	1	4	6	7	6.9	8	13
Years with mother	1	0	13	15	12.8	15	15
Years with father	1	0	0	12	8.9	15	15
Parents married	1	0	1	1	0.75	1	1
Age of mother at first birth	1	12	20	23	24.1	27	48
Educational achievement	All	0	9	11	12.2	15	20
Parental education	1	0	7	9	8.7	12	16

Table 5 Descriptive statistics of categorical and composite variables used in the analysis

Question	Min	1st Qu	Median	Mean	3rd Qu	Max
Race (1, 2, 3)	Black 803, Coloured 960, White 215					
Reproductive group (1, 2, 3, 4)	Non-preg: 650, Preg >19: 353, Preg <20: 239, male: 736					
Wealth	-1.6	-0.6	-0.1	0	0.5	3.5
Parent time	-2.8	-0.7	.2	0	0.7	2.9
Parental support	-1.6	-0.6	-0.0	0	0.9	2.2
School attitude	-4.2	-0.2	0.3	0	0.4	1.5
Health	-4.5	-0.2	0.2	0	0.7	0.7
Substance use	-0.8	-0.8	-0.2	0	0.4	3.2
Sex partners	-1.1	-0.4	-0.1	0	0.4	4.3
Home stability	-2.5	-0.3	0.5	0	0.6	0.6
Neighbourhood environment	-1.7	-0.5	0.1	0	0.9	0.9
Knowledge of AIDS	-0.5	-0.5	-0.5	0	0.4	2.2

Some of the descriptive statistics require emphasis. The distribution of income is skewed by some extreme income levels whereas the other measures of wealth have a normal distribution. Because wealth is a composite variable, the skewed nature of income is emolliated. The use of alcohol and tobacco is around the 50% level but the use of other drugs in much lower at 12%. The number of life sex partners is low but there are some extremes. The age of the mothers at first birth ranges from age 12 to 48 and the other figures indicate a youngish age at first birth. The participants who had not had sex skew the distribution of age of sexual debut. The median of age 16 is the better indicator of average age of sexual debut. For age-grade the first quintile is 6 indicating Grade 8 at age 14 which represents normal progression. The median is 7 indicating grade 7 at age 14. Years with parents differed. For the mother the mean was 12.8 years out of 15. For the father it was 8.9 years. In the sample, 75% of the parents were married.

Educational achievement

With educational achievement, both the mean and the median are low and Figure 3 illustrates the high proportion of students who drop out of school before finishing high school.

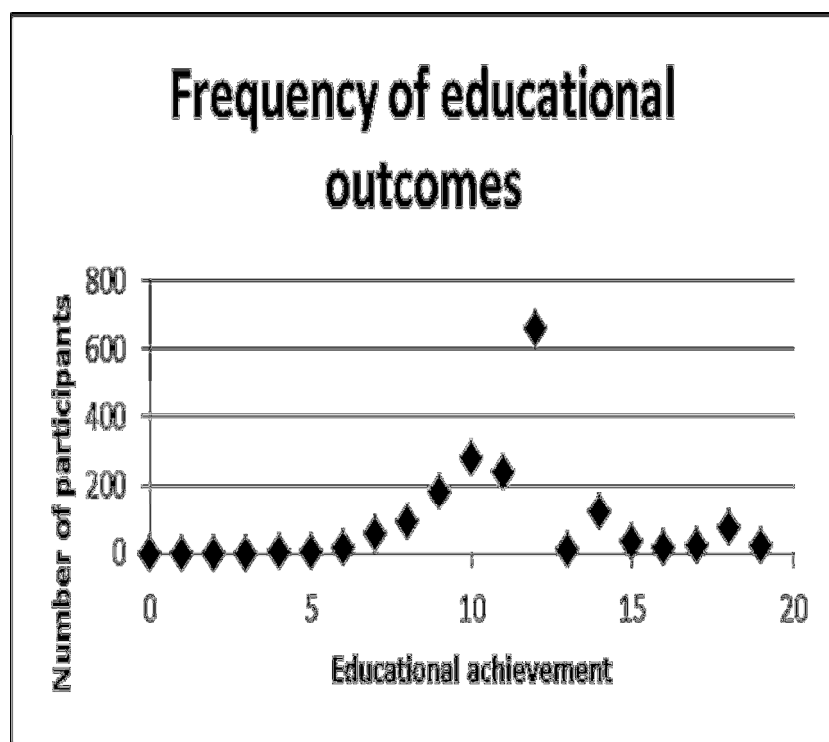


Figure 3 Frequency of educational achievement

Forty eight percent of the analysed sample did not complete high school, which is normal in South Africa. Educational achievement up to 12 is a school grade and then above represents diplomas, degrees with 19 representing a postgraduate degree.

Looking at the descriptive statistics gives the impression that the education has improved from one generation to the next. This is the case when parents achieved Grade 11 or less, their children have done better. Above this level, children on average did not reach their parents standard of education.

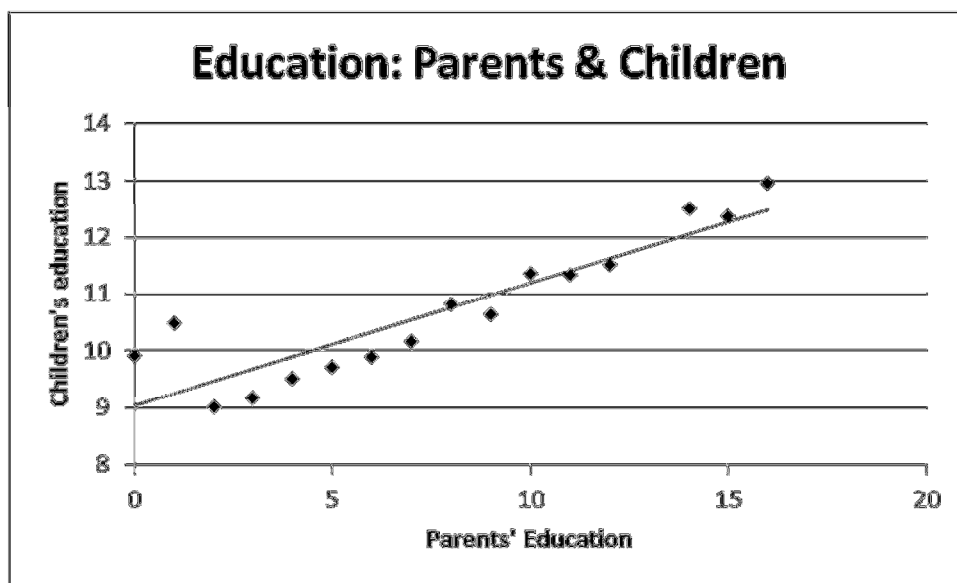


Figure 4 Education of parents and children

For parents that had less than grade 11 their children improved on their parent's education. However, after grade 11 the parents had a better education than their children did. This assumes that there has been no change in standards over a generation. A possible explanation is a lower quality of education in the lower grades resulting in an inability to progress through the higher grades. The scales are the same as Figure 3. There were over 400 parents with no education and for the next three grades; the sample size was less than 100 per grade. The balances of the grades were more than 100 parents.

The mean educational achievement of participants declined over the period of the survey.

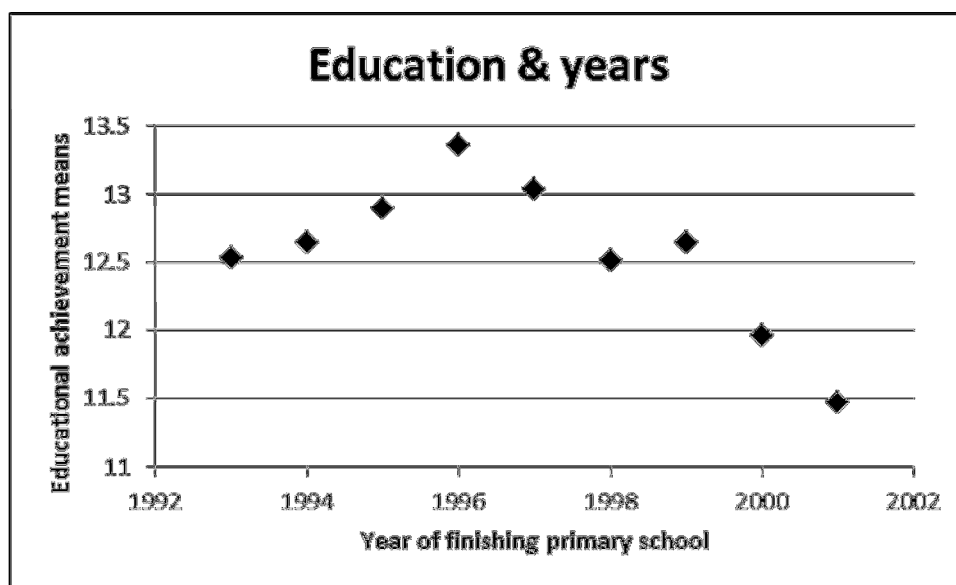


Figure 5 Educational achievement and estimated year of completing primary school

Figure 5 is the mean educational achievement for all the participants per year of birth and assuming that participants graduated primary school at age 13. Educational achievement increased until the class of 1996 and then declines. This suggests a link with the change of government in 1994. Such a consistent decline suggests a change of policy or deteriorating efficiency in the Education Department. To get all children into class, class size may have increased or less qualified teachers employed. Both measures would have influenced classroom efficiency.

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Table 6 Correlation matrix for Model A

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	mothers age	1																			
2	class size	-0.08	1																		
3	homework	0.01	-0.02	1																	
4	chd of mother	-0.17	0.13	-0.04	1																
5	Sexual debut	-0.02	0.07	-0.1	0.07	1															
6	Year of birth	-0.02	0.1	-0.03	-0.05	-0.28	1														
7	Race	0.14	-0.39	0.02	-0.29	-0.18	0.08	1													
8	Education	0.09	-0.22	0.17	-0.14	-0.04	-0.1	0.27	1												
9	Parental education	0.06	-0.21	0.09	-0.27	-0.14	0.1	0.36	0.35	1											
10	Reproductive Grp	0.04	0.03	-0.07	0.01	-0.02	0.07	-0.01	-0.16	0	1										
11	Age grade	-0.02	0.22	-0.05	0.18	0.06	-0.15	-0.39	-0.48	-0.3	0.16	1									
12	Home stability	0.09	-0.13	0.06	0.19	-0.08	0.02	0.32	0.17	0.21	0.03	-0.17	1								
13	Parental time	0.01	-0.09	0.09	0	-0.1	0.09	0.23	0.17	0.25	0.02	-0.15	0.39	1							
14	Attitude to school	-0.03	-0.03	0.09	-0.01	-0.03	0.12	-0.09	0.14	0.04	-0.08	-0.03	-0.06	0.04	1						
15	parental support	0.01	-0.04	0.1	-0.03	-0.17	0.36	0.17	0.2	0.29	0.03	-0.14	0.25	0.54	0.15	1					
16	Wealth	0.16	-0.36	0.08	-0.23	-0.2	0.02	0.71	0.43	0.49	-0.02	-0.41	0.33	0.33	-0.05	0.31	1				
17	Sexpartners	-0.1	0.13	-0.07	0.12	0.39	-0.26	-0.36	-0.14	-0.18	0.2	0.18	-0.13	-0.13	-0.12	-0.17	-0.29	1			
18	Health	-0.07	0.06	0	0.04	0	0.06	-0.08	0.08	0.02	0.06	-0.08	0.02	0.07	0.03	0.04	0	0.06	1		
19	Substance use	0.03	-0.05	-0.11	-0.06	0.11	-0.11	0.26	-0.18	0.03	0.27	0.02	0.1	-0.03	-0.28	-0.11	0.1	0.28	-0.02	1	
20	Neighbourhood	0.06	-0.01	0.05	-0.02	-0.07	-0.02	0.04	0.1	0.12	0.03	-0.01	0.02	0.07	0.05	0.1	0.15	-0.04	0.01	-0.05	1
21	AIDS	0.03	0.07	0.01	0.05	0.04	-0.07	-0.2	-0.02	-0.04	-0.03	0.04	-0.06	-0.07	0.01	-0.06	-0.11	0.13	-0.02	-0.03	0.01

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Table 7 Model A: Multivariate regressions predicting educational achievement

Variable	Coefficient	
(Intercept)	-0.26	***
Categorical: Race - Coloureds	0.30	***
Categorical: Race - Whites	-0.01	
Categorical: Reproductive group - Females pregnant > age 19	0.32	***
Categorical: Reproductive group - Females pregnant < age 20	0.46	***
Categorical: Reproductive group - Males	0.06	
Wealth	0.20	***
Neighbourhood environment	-0.01	
Knowledge of AIDS & death in family	-0.01	
Year of birth	-0.27	***
Class size	-0.03	
Age-grade	-0.41	***
Parental education	0.07	***
parental financial support	0.03	
Parental time	-0.06	**
Mothers number of children	-0.03	
Mothers age first birth	0.01	
Home stability	0.11	***
Homework hours	0.12	***
Attitude to school	0.06	***
Health	0.12	***
Substance use	-0.16	***
Sexual debut	0.02	
Sexual partners	0.01	
Race Coloureds: Mothers age first birth	0.00	
Race Whites: Mothers age first birth	0.19	**
Class size: Substance use	0.05	**
Reproductive grp Females preg >19: Home stability	-0.05	
Reproductive grp Females preg <20: Home stability	-0.13	*
Reproductive grp Males: Home stability	-0.08	.
Reproductive grp Females preg >19: Health	-0.11	*
Reproductive grp Females preg <20: Health	-0.01	
Reproductive grp Males: Health	-0.07	.
Reproductive grp Females preg >19: Sexual debut	0.18	
Reproductive grp Females preg <20: Sexual debut	0.51	**
Reproductive grp Males: Sexual debut	0.02	
Reproductive grp Females preg >19: Parental support	0.17	**
Reproductive grp Females preg <20: Parental support	0.06	
Reproductive grp Males: Parental support	0.04	
Reproductive grp Females preg >19: Homework	-0.11	*
Reproductive grp Females preg <20: Homework	-0.14	*
Reproductive grp Males: Homework	-0.06	

Multiple R-squared: 0.4748, Adjusted R-squared: 0.4637

Note that there are two categorical variables in these models, race and reproductive group. The base for the first is the African race and the second non-pregnant females. The category coefficients represent the differences between other categories and the base category. In the model, there is no significant difference between the non-pregnant females and males. With race, there is no significant difference between the Whites and Africans but the Coloureds are significantly different from African. There is no comparison between Coloureds and Whites.

This model accounts for 47% of the variation in the dependant variable and the difference between the multiple and adjusted R-squared indicates that these results are applicable beyond the sample.

In Model A (Table 7), non-significant variables were included for theoretical reasons. These included two environmental variables neighbourhood environment and knowledge of death and disease. All other variables were significant or had significant interactions. In Model B (Table 8), non-significant variables are excluded. Using this model the same multivariate regression was run repeatable, excluding one variable at a time, to estimate the contribution that each variable made to the analysis. The proportional contribution of each variable or interaction is shown in Table 9.

The unexpected result of the analysis is the influence that education policy and practice has in the lives of young people. Grade retention (age-grade variable) is an ineffective way of solving learning difficulties and is probably a direct contributor to the high dropout rate from South African schools (Shepard & Smith, 1990). The other surprise is the decline in educational achievement indicated by the year of birth, possibly a cost of the transformation of the Education Department. These two variables plus class size and homework hours is associated with 27% of the variation in educational achievement in the survey.

Although the contribution of the individual behavioural variables is small they can be cumulative and together they are associated with 15% of the variation in the model.

Model B

Table 8 Model B Multivariate regressions predicting educational achievement

Variable	Coefficient	
(Intercept)	-0.25	***
Categorical: Race - Coloureds	0.28	***
Categorical: Race - Whites	-0.03	
Categorical: Reproductive group - Females pregnant > age 19	0.32	***
Categorical: Reproductive group - Females pregnant < age 20	0.45	***
Categorical: Reproductive group - Males	0.06	
Wealth	0.20	***
Year of birth	-0.27	***
Class size	-0.03	
Age-grade	-0.41	***
Parental education	0.07	***
parental financial support	0.03	
Parental time	-0.06	**
Mathers age first birth	0.01	
Home stability	0.11	***
Homework hours	0.12	***
Attitude to school	0.06	***
Health	0.12	***
Substance use	-0.16	***
Sexual debut	0.02	
Race Coloureds: Mothers age first birth	0.00	
Race Whites: Mothers age first birth	0.18	**
Class size: Substance use	0.05	**
Reproductive grp Females preg >19: Home stability	-0.05	
Reproductive grp Females preg <20: Home stability	-0.13	*
Reproductive grp Males: Home stability	-0.08	.
Reproductive grp Females preg >19: Health	-0.10	*
Reproductive grp Females preg <20: Health	-0.01	
Reproductive grp Males: Health	-0.07	.
Reproductive grp Females preg >19: Sexual debut	0.17	
Reproductive grp Females preg <20: Sexual debut	0.49	**
Reproductive grp Males: Sexual debut	0.02	
Reproductive grp Females preg >19: Parental support	0.18	***
Reproductive grp Females preg <20: Parental support	0.06	
Reproductive grp Males: Parental support	0.04	
Reproductive grp Females preg >19: Homework	-0.11	*
Reproductive grp Females preg <20: Homework	-0.14	*
Reproductive grp Males: Homework	-0.06	

Multiple R-squared: 0.4739, Adjusted R-squared: 0.4639

Table 9 Ranking of variables: contribution towards variation explained by Model B

Variable	Proportion in model	Proportion In survey
Age-grade	39%	19%
Year of birth	14%	6.7%
Reproductive group	8.6%	4.1%
Race	7.2%	3.4%
Substance use	6.5%	3.1%
Wealth	4.8%	2.3%
Parental financial support	2.7%	1.3%
Homework hours	2.3%	1.1%
Health	1.9%	0.9%
Parental education	1.2%	0.6%
Home stability	1.2%	0.6%
Sexual debut	1.2%	0.6%
Repro grp: parental sup	1.1%	0.5%
School attitude	1.1%	0.5%
Mothers age first birth	1.0%	0.5%
Class size	0.8%	0.4%
Race: Mothers age	0.8%	0.4%
Repro grp: sexual debut	0.8%	0.4%
Repro grp: homework	0.7%	0.3%
Class size: substance use	0.7%	0.3%
Parental time	0.7%	0.3%
Repro grp: health	0.6%	0.3%
Repro grp: home stability	0.6%	0.3%
	100%	47%

The largest is the reproductive group but there is no significant difference between the females reporting no pregnancy and the males (Table 8). The variation originates from the females who reported pregnancy.

Race accounts for some variation, Coloured people are significantly different from the Blacks but there is no significant difference between the Blacks and Whites. Wealth accounts for 2.3% of the variation in educational achievement but this is small when compared with the behaviour of the Education Department and parents. This validates the argument that educational achievement and hence poverty is a consequence of behaviour and not wealth.

Interactions illustrated graphically

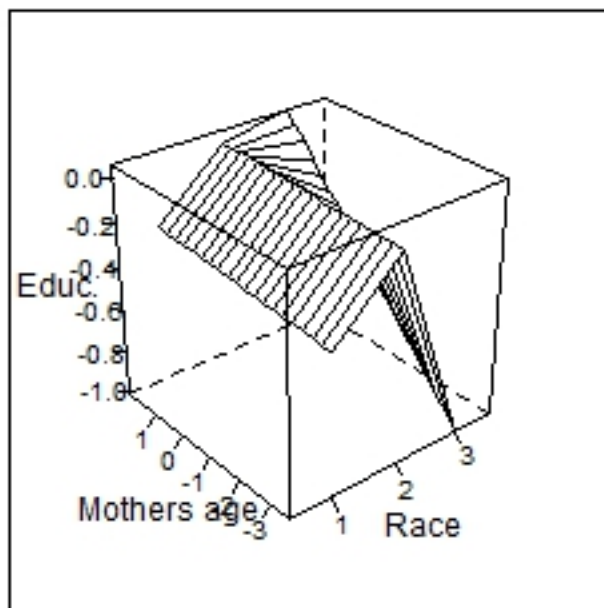


Figure 6 Education, Race and Mothers age at first birth

Educational outcomes are expected to improve as mothers become older because they have more resources (higher birth weight children, improved breast-feeding) and are emotionally more mature. This is the case for the Whites (3) but not for the Coloureds (2) or Africans (1). A possible explanation is that a scarcity of resources means that women of these groups did not acquire more resources, as they get older during the period when the participants were born in the 1980's.

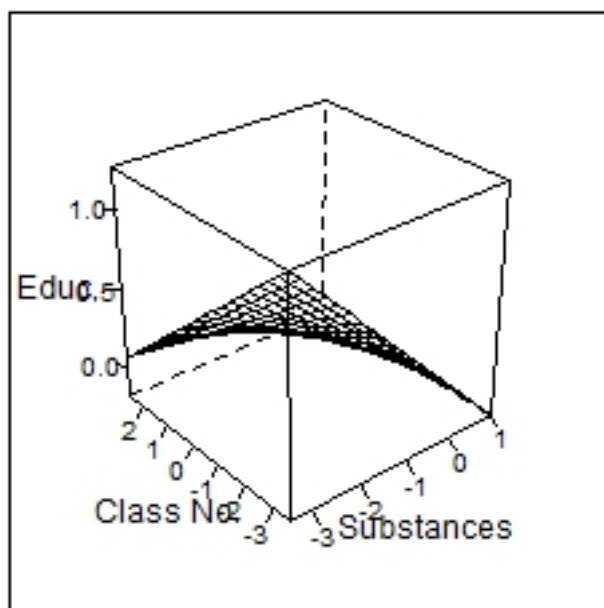


Figure 7 Education, substances & class size

As might be expected education declines with an increasing substance use (right of graph). Also, as expected, education declines with increasing class size (front left of graph). With high substance use, class size is of no consequence (back right of graph).

Reproductive groups

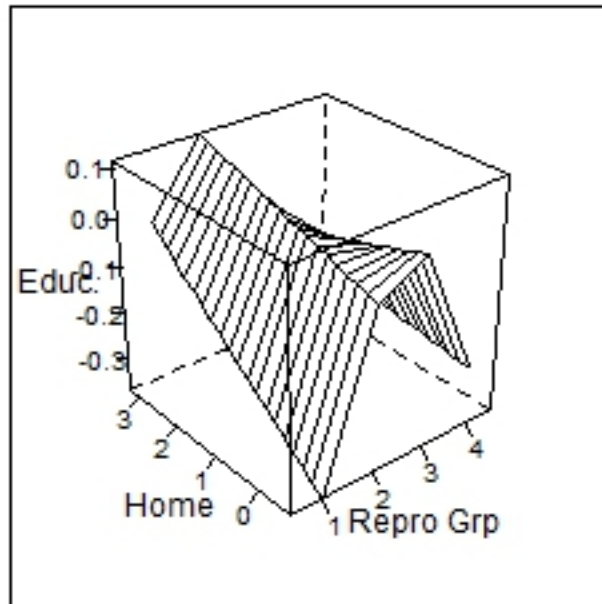


Figure 8 Education, Reproductive group and Home stability

There is no statistical difference between non-pregnant females (1) and female pregnant in their twenties (2) or males (4). For these groups the more stable the home the better their educational achievement. However, for the females that reported teen pregnancy (3) increasing home stability correlated with declining educational achievement. Their pregnancy indicates a poor parent/child relationship so greater stability means a more negative influence.

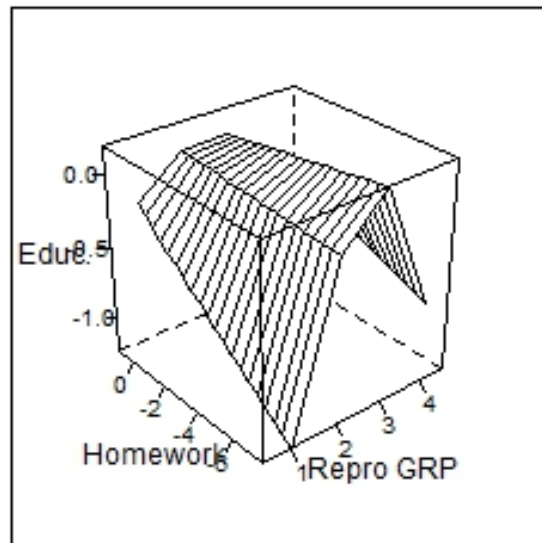


Figure 9 Education, Reproductive group and Homework

For both non-pregnant females (1) and males (4) more homework hours were correlated with improved educational achievement. However, for both groups of pregnant females (2&3) the effect of homework hours was significantly different from the non-pregnant females. Doing more homework did not produce better outcomes. LH theory suggests that the pregnant females were participating in life rather than preparing for life.

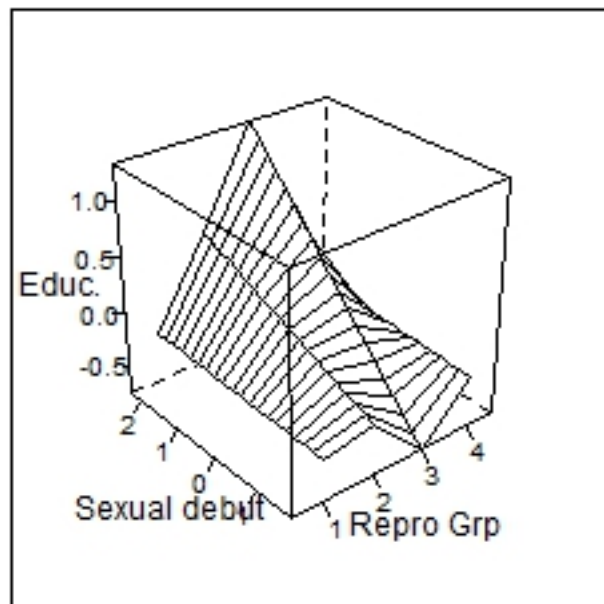


Figure 10 Education, Reproductive group and Sexual debut

All reproductive groups had an improvement in educational achievement associated with delayed sexual debut. However, teen pregnancy females (3) were significantly different

from the other groups with a greater benefit to delaying sexual debut. These females must have had unprotected intercourse to become pregnant so delaying first sex also means also delaying pregnancy and this is understandably beneficial to their education.

Chapter 4 - Discussion

The survey shows a very diverse range of educational achievement. Life was hard for the majority of young adults living in Cape Town during the first decade of the twenty-first century. The Department of Education appears poorly managed and resources were scarce. Additionally, the dynamics within the family resulted in behaviour of young adults that reduced educational achievement. It is possible that the management in the Department has improved but the current unemployment means that resources are still scarce and there is no reason to think that the dynamics within the family have changed.

Wealth

A common perception is that these sorts of circumstances are attributable to a variation in socioeconomic status (SES) with the poor being at the bottom of the pile. However, SES is usually a conglomeration of factors including wealth and education (Altschul, 2012 & Bradley & Corwyn, 2002). This generalisation hides some of the realities of human life and behaviour.

When the contribution of each variable was estimated by running Model B repeatedly without one variable, the wealth variable was ranked sixth in importance (Table 9) and accounted for 2.3% of the variation in educational achievement. This infers that wealth is of secondary importance. This is consistent with other research. For example, in an investigation into family processes, as variables were added to a model, the effects of income decrease and eventually became modest (Yeung, Linver, & Brooks-Gunn, 2002). In a similar educational study of Mexican Americans, the coefficient for family income was only 0.13 (Altschul, 2012). In an American longitudinal study of early childhood, it was material hardship rather than income that was related to parental stress and that affected cognitive and social skills in children (Gershoff, Aber, Raver, & Lennon, 2007). It appears that parents manage their resources differently. Families with the same income can have completely different levels of material hardship because their spending decisions differ.

Another study using the CAPS data set showed that SES influenced educational outcomes (Kola, 2011). When the components of SES are analysed separately in the Kola study there is variation in the results. For example, in the family level regression income was not a significant variable for Non-whites but was for Whites. A household computer was a significant variable for Non-whites but not for Whites. This contrasts with this thesis in

which income is a composite variable that measures wealth by including income, house construction and size, number of asset classes (which included computers) and a subjective assessment of wealth. There was no significant interaction between race and wealth.

The size of the building is not important but rather what happens within the building. This applies to the home as well as the Education department. The research data is therefore, in line with other research, and shows that a lack of wealth is a symptom of behaviour associated with poverty. Wealth potentially becomes a non-significant variable if additional behavioural variables are included in a model.

Race

Research necessarily looks at differences and the differences in physical appearance of races are obvious. It is sensible and easy to categorise people by race and research produces differences (Kola, 2011 & Lam, Ardington, & Leibbrandt, 2011). However, race can be a generalisation for behaviour and it is inevitable that there are differences. Educational achievement is a measure of brain development. Behaviour influences brain development (Johnson, Riis, & Noble, 2016) and because behaviour of an average Black person will be different from an average White person, for reasons of culture circumstances and history, it is inevitable that brain development and therefore educational achievement will be different. If behaviours are included, in an analysis, the generalisation of race is removed and racial differences decrease and may even become insignificant, as is the case in this analysis. The arguments against the generalisation of SES stated above apply equally to race.

Two studies that used the CAPS data set emphasise large racial differences in educational outcomes (Kola, 2011 & Lam, Ardington, & Leibbrandt, 2011). This is in stark contrast to this analysis where there was no significant difference in educational achievement between Blacks and Whites (Table 8). There was a significant difference between Blacks and Coloureds. Race explained 3.4% of the variation in sample (see Model B Table 9) which explained 47% of the variation in education. The LH variables including biological, behavioural and indicators of stress early in life could explain this difference. This is a constructive step for understanding education because behaviour is changeable when race is not. The biological approach of LH theory improved the R-squared of 0.36 from the family level regression (Kola, 2011) to an R-squared of 0.47 of Model B in this analysis.

Reproductive groups

The use of the categorical variable *reproductive groups* was included for theoretical considerations. The alternative was to use gender. There was no significant difference between the non-pregnant females and the males. This concurs with another CAPS analysis that found no gender difference for progression through the grades (Lam, Ardington, & Leibbrandt, 2011) and with educational research using Household survey data (Anderson, Case, & Lam, 2008). However, there was a highly significant difference between the non-pregnant and pregnant females (Table 8). There are questions about the reliability of analysis for the females that become pregnant in their twenties but not for the teen pregnant individuals. Society expresses concern about teen pregnancy and this analysis confirms that it curtails educational achievement.

Reproductive behaviour is an important source of variation in educational achievement with this variable contributing 4.1% to the variation in the sample. The age of the mothers of the participants at first birth explains another 0.5% of the variation. Efforts to define males by reproductive behaviour added nothing to the model. The cause may be paternity dishonesty or that becoming a parent has no impact on educational achievement for males.

There were five interactions between *reproductive groups* and other variables indicating the importance of reproductive behaviour. Interactions occurred with Home stability, Health, Sexual debut, Parental support and Homework hours. Home stability correlates positively with all groups except the teen pregnancy group where education correlates negatively. This was significantly different from the non-pregnant females at the 5% level. Homework hours correlate positively with education for the non-pregnant females and negatively for the other groups. Only the pregnant groups were significantly different. Delaying sexual debut correlates with improved education for all groups but especially so for the teen pregnancy group. This was significantly different at the 1% level. To become pregnant these women must have had unprotected sex, so delaying sex means delaying pregnancy. This gives an indication of the negative effect pregnancy has on education for teenagers. There were no significant interactions with race for this variable. Another CAPS study found racial differences with Black women having earlier sexual debut than both Coloured and White women (Marteleto, Lam, & Ranchhod, 2008). The teen pregnant

women had poorer grade progression before pregnancy occurred. This indicates that pregnancy was not necessarily the cause of lower educational achievement. The negative correlation with home stability for this group indicates a poor relationship with parents (negative parental investment) and this may be the cause of both the poorer education and the pregnancy.

Reproductive groups have provided useful insights on the transition of females into adulthood. They are more important than racial categories that receive much attention in research and society. Additionally, they highlight the importance of parental behaviour in determining the success of the next generation.

Environmental factors

Poverty, from a middleclass perspective, is generally associated with living in rather unpleasant crowded conditions. When the two environmental factors were included in Model A (Table 7), they were not significant and therefore excluded from Model B (Table 8). The first of these two factors was knowing somebody with AIDS or knowing somebody that had died of AIDS and additionally experienced a death in the family. This is a measure of morbidity and mortality and was expected to result in a faster LH strategy (Brumbach, Figueredo, & Ellis, 2009), which would include a lower educational achievement. This was not the case. An inverted measure of harshness also had no effect on educational achievement. It is possible that these two environmental factors were not a source of significant stress for the participants or that the stress caused was minor compared with other factors. It is also possible that environmental factors influence parental behaviour; and that children are influenced by parental behaviour rather than directly from the environment. Alternatively, the data used in the analysis may have been poor measures of the environment. Therefore, the evidence from this research data is not substantial enough to make conclusions about environmental effects.

Education system

School or the education system variables contribute the largest part of the variance explained by Model B (Table 9). The largest contribution comes from Age-grade and accounts for 19% of the variation in the survey. A review of the research on grade repeating states that, "although grade repeating is widely practiced, it does not help children to catch up. Retained children may appear to do much better in the short term, but they are at much

greater risk for future failure than their equally achieving, non-retained peers” (Shepard & Smith, 1990, pg84). This analysis clearly shows that a child repeating a grade is detrimental to a child. The high dropout rate in South African schools reported in the literature (Anderson, Case, & Lam, 2008) and confirmed by the CAPS data set is probably a direct result of grade repeating. Individuals that repeat twice almost certainly leave school early. There are alternatives to grade repeating, for example more involvement by parents, remedial help, before and after school programs, summer school, peer tutoring and facilitators and research states that these alternatives offer the child a better future (Shepard & Smith, 1990). South African research indicates grade progression is not always related to actual ability (Lam, Ardington, & Leibbrandt, 2011). An inappropriate policy poorly applied must contribute to the educational crisis.

The other education variable is the Year of birth of the student and accounts for 6.7% of the educational variation in the survey. The younger the student is the worse the educational achievement. This has serious and has long-term implications for all children at government schools. Participants who were age 22 at the beginning of the CAPS survey achieved better educational standards than those aged 14. Figure 5 shows the mean educational achievement for each age group and clearly illustrates a declining standard of education over time. The figure shows the year in which the participants turned 13 which is usually when children, with normal grade progression, finish primary school. This is an attempt to link political changes with educational outcomes. The policy of grade repeating could change in a short period but the decline of educational standards might take a generation to correct. Following the 1994 elections and change of governing party, all officials in the Education Department were offered “golden handshakes”. This happened at a time when I chaired a school Governing Body and the Governing Body collectively followed changes in the Department that might affect our school. Education Department staff that could find alternative employment, generally the more skilled, left the Department. This exit of skills from the Department appears to have resulted in a drop of efficiency and performance by the Department and consequently the declining educational achievement by children shown by the data. Skills take time to acquire and this frequently happens under the tutorship of a mentor similar to any apprentice scheme. The mentors left the Department and it flounders. The performance of the Department not only affects the

future of children but the lower skills level has implications for the economy. A lower skill level means less growth, fewer jobs and more poverty (Rasool & Botha, 2011).

An informed opinion as to why this decline happened and possible reasons for it are as follows. One possibility is the transformation in the Department to reflect the demographics of the country. This would be a political objective rather than an educational objective. Prior to 1994, the Department mainly employed white people. The changes were a natural reaction to the previous policy and the consequence of that change was unintended. The other possibility is that the change was intended to drop educational standards in order to maintain social structures that are to the advantage of the African National Congress (ANC) government in line with the theories of Bourdieu (DiMaggio, 1979). With respect to the economy, South African mines need unskilled labour to go underground and dig out minerals. The present education system produces unskilled people in abundance. On the political side, the ANC party needs grateful voters. The government provides day care facilities for children where clothing and meals are provided at no cost to parents. In addition, teachers are well paid, poorly supervised and cannot be fired. This is another group of grateful voters. Another explanation for declining educational standard was that the increase in enrolments required that under qualified teachers were employed with natural consequences. These are speculative arguments that need consideration because the consequence of an education system in crises (Modisaotsile, 2012) ripples through the country and economy with negative effects (Rasool & Botha, 2011).

Class size had a median and mean of 40 with a minimum of 32 and maximum of 108. These figures are high when most teachers (own communication) think that 30 is a maximum if they are going to teach effectively. There is no researched definitive number because it is dependent on the training and experience of the teacher and teaching methods can be adjusted to suit class size. Despite these high numbers, the analysis showed that class size was not a significant variable in Model B (Table 8). There is a good correlation between *class sizes* and *wealth* (Table 6). Poorer people had larger classes. It is recognised that smaller classes produce better results but only if the teacher changes the teaching method to take advantage of the smaller class size. It is also probable that improving teacher quality may be more effective in improving performance than reducing class size. Reducing class size means more teachers and if that means employing lesser qualified

teacher then there is no advantage to the pupil. Smaller classes also mean more buildings that also add cost to the education system (Ehrenberg, Brewer, Gamoran, & Douglas Willms, 2001). The effectiveness of teaching depends on many factors of which class size is only one. It is therefore not surprising that class size was not a significant factor when predicting educational outcomes. A significant interaction between class size and substance use is discussed later under the behaviour of young adults.

The analysis suggests that the policy of repeating grades has a negative effect on educational achievement and this is confirmed by research focused on this practice (Shepard & Smith, 1990). Teachers and schools need to be informed about the alternatives to grade repeating. The academic performance of schools dropped during the period of the survey (2002 to 2009) and this demands informed public debate. Questions about why it is happening need to be asked and practical solutions found. The findings in this research suggest that reducing classroom numbers is not the solution.

It is simplistic to think that solutions to the crisis in education could emanate only from the Education Department. Although the education of children is ultimately the responsibility of parents, the poor performance of the education system results in low skill levels and this affects the economy, society at large and particularly poverty levels. A possible solution is a contract between schools and parents. In this contract, schools would commit to obtainable educational standards and performance levels. A non-department body would require monitoring of progress and achievement because schools and the Department need to be accountable to society. The parental part of the contract would be a commitment to provide a culture of learning in their homes. This might include appropriate bed times, limits on electronic devices, reading to children, supervising homework, parenting styles that are more authoritative than authoritarian, an interactive relationship with teachers and talking to children about their progress at school and plans for the future (Porumu & Necsoi, 2013). Another CAPS study reported the need for more parental involvement in education by non-white parents, a lack related to parental education (Kola, 2011). A change of behaviour by schools, the Education Department and parents is required to improve education.

Parents

Parental reproductive behaviour is the core components of LH theory (Brumbach, Figueredo, & Ellis, 2009). Before the findings related to this variable can be discussed, the six variables used related to parenting need to be outlined. Table 4 has the age of the mother at which she first reproduced and this varied from age 12 to age 48 with a median of 23 and a mean of 24. Information for the father was available but was not included in the model because of missing data. Only 48% of the participants lived with their father compared to 78% with the mother. The number of children of the mother is included but the father excluded because female fertility is the more limiting. Family size started with one and went to a maximum of 16 children. The medium was 3 and mean 3.3. Parental financial support, parental time with children, parental education and the stability of the home were the other measures of parental investment. Parental financial support is a composite variable from any parent (mother, father, stepparent or other guardian) on four aspects of support (school costs, clothes, gifts and pocket money). The questions were binomial and not the amount of money. Parental time was again from any of the parents and a composite of nights under the same roof, meals together, time alone with the parent and conversations about personal matters. The stability of the home was a composite variable composed of number of year's residence with mother, with the father and the marital status of the biological parents.

Of these six parental investment variables, parental financial support explained the largest part of the variation in Model B (Table 8) but it is a non-significant variable. There are significant interactions with the female reproductive group who reported pregnancy in their twenties; however, this is a discounted group for statistical reasons. The Kola study (Kola, 2011) reported that SES was only important for Whites. Parental financial support and SES are different measures but it appears that money does is not an important deterrent in educational outcomes.

Next on the ranking is parental education and this is a highly significant variable. This variable was for the maximum education of both biological parents. In the Mexican American educational study the fathers education was not significant and the mothers education had a coefficient of 0.09 (Altschul, 2012). In Cape Town, children are possibly more reliant on their educated parents because of low school performance. The intention of

public schooling is to give all children an equal chance in life and especially those whose parents have no education. If parents have no education, children have a reduced probability of achieving. Parents with limited education are less able to support their children's education (Kola, 2011) and consequently adult literacy programmes could lift education and improve earning ability. It is also possible that educated parents have a better understand of their children, have better relationships with children and this results in a better education.

Stability of the home was significant at the 5% level, had a coefficient of 0.11 and is next on the contribution to variation ranking (Table 9). This variable is about the nuclear family and it is important but not as important as might be expected. Another CAPS study stated that family structure does not directly account for educational outcomes (Kola, 2011). Stability of the home is a composite variable compiled from years with the mother, years with the father and the marital status of parents. Many argue for the sanctity of marriage for the health of society and wellbeing of children (Martin, Astone, & Peters, 2014 & Pinsof, 2002). Cohabitation became common during the period when the participants were born (Teachmen, 2003), and may influence the results. However, the interaction between home stability and the reproductive groups indicate why this variable has a low ranking. With the female participants divided into three LH strategy groups, teenage pregnancy (fast strategist), the early twenties pregnancy (middle strategist) and non-pregnant (slow strategist) there were divergent effects of home stability as shown in Figure 8. The slow strategist showed a positive correlation with educational achievement and home stability. This confirms the common opinion that marriage is good for children. However, the fast strategist showed a negative correlation with educational achievement and home stability. It would appear that parental investment was negative for these children and so the more stable the home, the more negative parental investment children received. The more stable the marriage the more negative the influence on the child. Thus, it is only with a good parent-child relationship that a stable marriage improves educational outcomes. For the males, there was no significant difference from the non-pregnant females. LH strategy groups were not used for the males. Another CAPS analysis confirms that home instability results in poor outcomes for children (Goldberg, 2013). In the past family structure was determined for many by political policy and today economics are

important. Fathers migrate to find work or children reside with relatives so both parents can work (Goldberg, 2013). Family structure or home stability is advantageous for education, provided family relationships are sound, and harsh economics influence family structure and hence education.

Next on the ranking list is Mothers age at first birth, not significant but there is a significant interaction with Race. Expectations are that a more mature woman at the birth of her first child will have more resources available to invest into her children. This greater investment, inclusive of financial, social, physical and emotional, will result in better educational outcomes for her children. The birth of her first child marks the end of her preparation stage of life (Brumbach, Figueredo, & Ellis, 2009). Whites in Figure 6 illustrate this phenomenon. For the Coloured and African mothers there was no such response. Cultural differences may explain part of this difference as children might be raised by the extended family so that the maturity of the mother is less important. A more likely explanation is that resources were so scarce in the 1980's that African and Coloured women were unable to accumulate resources so there was no advantage for the children of women who delayed reproduction. During the 1980's, when the participants were born, apartheid disadvantaged African and Coloured groups. This is compatible with LH theory, described by Brumbach, Figueredo, & Ellis, 2009. This is a biological measure of inequality.

Society frowns on teen pregnancy and the 2014 household survey indicated that 5.6% of females age 15 to 19 reported being pregnant in the last 12 months (Statistics South Africa, 2014). The direct concern about this behaviour is the disruption or curtailment of education for the mother (Han, Teal, Sheeder, & Tocce, 2014). Early reproduction also increases the demand for health and educational services. Additionally, teenagers are poorly equipped emotionally, socially, physically and financially, to be mothers and that means their offspring will be disadvantaged. Maternal psychological maturity correlates with child development (Johnson N. , 2015) and older women are better mothers (Branson, Ardington, & Leibbrandt, 2011). This results in better educational outcomes and consequently increased prosperity. The White mothers in Figure 6 collaborates these findings and highlights the detrimental influence apartheid had on the family during the 1980's.

The last parental variable was parental time. This coefficient is unexpectedly a negative 0.06 and significant at the 1% level. In other words, more parental time correlates with deteriorating educational achievement. Some aspects of parental time can be expected to be negative but to have an aggregate of parental time negative is surprising. In the Mexican American study parental help with homework in Grade 10 had negative effects but other aspects of parental involvement were positive (Altschul, 2012). Poor parents frequently have harsh parenting styles and this is especially so with parents suffering from mental illness or addiction of any kind (Willingham, 2012). Under these conditions, the more time a child spends with parents the worse off they are likely to be. However, parenting styles are not necessarily associated with wealth. If a parenting style labelled as authoritative is used, children are encouraged to talk and listen and parent time is likely to have a positive influence. If a parenting style labelled as authoritarian is used, children are told what to think and do and parental time is likely to have a negative influence (Spera, 2005, & Glasgow, Dornbusch, Troyer, Steinberg, & Ritter, 1997). Given that investigations show that parental involvement improves educational achievement and emotional stability (Wang & Sheikh-Khalil, 2014), the negative result in this analysis is an indication of a low level of parenting skills in the average Cape Town family.

The Mothers number of children was not a significant variable in Model A (Table 7) and was therefore not included in Model B (Table 8). Although there were exceptions, family size was small probably as a result of family planning clinics. The data from CAPS are that 67% of the families were three children or less, 78% were four or less and 89% were five or less. Hormonal contraception became available in the 1960's (Alvergne & Lummaa, 2009) and today most women have a choice about family size. The correlation matrix (Table 6) indicates that as wealth increases family size decreases and similarly for parental education. Theoretically, resources are diluted as family size increases or there is a trade-off between quantity and quality. This is not the case in this investigation and it is probably because people that have large families are different from people that have small families. Family size is now mainly a choice because of the availability of contraception. An investigation using British survey data showed that family size did not affect educational achievement and that parental education was a much stronger predictor of education (Chan, Henderson, & Stuchbury, 2015). These results concur with this analysis.

Young Adults

Five significant youth variables correlate with educational achievement. Sex partners were not a significant variable in Model A and were deleted from Model B (Table 8). The ranking in contribution to the variation in Model B was; Substance use, Homework hours, Health, Sexual debut and School attitude. All were significant at the 0.1% level except Sexual debut, which was not significant, but there is an interaction with reproductive groups. These five variables are all indicators of a developing LH strategy and are conceptually the result of cues received from parents earlier in life.

A body of literature links early life stress to deviant behaviour in adult life. This stress, labelled as toxic stress (Shonkoff & Garner, 2012) is associated with mental and somatic health problems and memory impairment and includes increases in substance use, more promiscuity, a younger age of first sex and higher levels of sexual dissatisfaction (Anda, et al., 2006). Other research links physical health with early life stress (Campbell, et al., 2014). It is therefore reasonable to assume that the behaviour of the young adults in the survey is an indication of the stress in the early part of their life or the parental investment they received. The Substance use negatively correlates with educational achievement (Table 8) and explains 3.1% of the variability in the sample. There is also a significant interaction with Class size (Figure 7). With minimal Substance use, Class size negatively correlates with education. With high Substance use, educational achievement is low and Class size has little effect. The substance use variable in the analysis is more of a frequency of use than the amount of substances used. It is likely that the memory impairment associated with childhood stress (Anda, et al., 2006) will have consequences for the child at school eg how easily they learn new concepts and how well they remember them. This offers a physiological explanation as to why these behavioural variables correlate significantly with educational achievement.

Homework hours are the next ranking variable with an estimated positive coefficient of 0.12 but there is also an interaction with the Reproductive groups (Figure 9). The non-pregnant females and the males show the positive correlation to homework hours. However, both groups of pregnant females show no response to homework hours. This coincides with LH theory suggesting that early reproduction is an adaption and that these women focused on reproduction rather than education.

A fast life strategy is associated with lower cognitive ability, poorer educational outcomes and poorer health (Brumbach, Figueredo, & Ellis, 2009). The link between health and cognitive ability is confirmed by work on childhood toxic stress (Middlebrooks & Audage, 2008). Health has an estimated positive correlation coefficient of 0.12 with educational achievement. Research suggests there is frequently a time lag of decades between childhood adversity and the effects on health (Shonkoff & Garner, 2012). The data used in the analysis included health questions only until age 22. Thus, it is surprising that the correlation found is so significant and it contributes to the variability explained. South Africa has a high incidence of the non-communicable diseases (Mayosi, et al., 2009) associated with early life stress and these include; obesity, diabetes, hypertension, coronary heart, stroke and cancer. It is necessary to provide health assistance to people with these diseases but an emphasis on prevention is likely to be more cost effective and productive.

Sexual debut is a non-significant variable but has an informative interaction with Reproductive groups (Figure 10). All four groups show a positive correlation with education to delaying first sex. However, for the teen pregnancy females, there is a much larger coefficient than the other groups and it is significantly different from the non-pregnant females at the 1% level. The teen pregnancy females must have had unprotected intercourse to become pregnant, so delaying sex means delaying pregnancy on average. Pregnancy disrupts education or terminates it so it is understandable that delaying sexual debut has educational advantages for these females. Early sexual debut is associated with adverse childhood experiences (Anda, et al., 2006) and is part of a fast LH strategy in LH theory (Table 1). Early reproduction is a biological advantage when living with a high risk of mortality and this offers an explanation why the teen pregnancy females have unprotected sex.

School attitude is the last young adult variable and it is significant at the 0.1% level. It may reflect the school or be attributable to a home where a culture of learning is absent. The questions that compiled the variable were homework being done, getting to school on time and no truancy. Schools with clear boundaries and rules communicate problems to parents. A culture of learning in the home means parents closely follow progress at school, supervise homework and communicate with teachers. A poor attitude to school probably means these attributes are missing and it is understandable that educational achievement

suffers. This raises questions about the wisdom of the policy of “no fees schools”. A grant to parents so they can pay fees is an alternative that improved education in Namibia (Haarmann, et al., 2009). The enthusiasm for education by parents will also contribute to a pupil’s attitude to school.

Life History Theory

LH theory is a comprehensive theory that explains that behaviour varies in response to ecological conditions (Brumbach, Figueredo, & Ellis, 2009). Biological organisms need to produce the next generation to ensure survival. This means for any particular environment reproductive behaviour tends to suit that environment to optimise the chance of continuing the genetic line. Unfortunately, this adaptive behaviour can have undesirable consequences and the above analysis is an attempt to link the reproductive behaviour of parents and the consequences in their children, principally through educational achievement. This is a classical theory as defined by the Oxford dictionary. “A theory is a supposition or system of ideas explaining something, especially one based on general principles independent of the particular things to be explained” (The South African Pocket Oxford Dictionary of current English, 1994). LH theory links three independent things: the environment, reproductive behaviour of parents and economic prospects of offspring. This comprehensive approach of LH theory is different to many theories offered on in the literature.

There is a lot of interest in the effects of socioeconomic status (SES) and children’s development (Altschul, 2012; Winkleby, Jatulis, Frank, & Fortmann, 1992; Conger, Conger, & Martin, 2010; Haas, 2008 & Higgs, 2002). SES is generally a composite variable compiled from income, education and occupation and high SES correlates to desirable outcomes in children. The complication with SES is that there is no consensus of what it is and how to measure. Poor health has been shown to be a consequence of low SES and many mechanisms are suggested. These mostly relate to low parental investment. A similar argument applies to the relationship between cognitive ability and SES. In a review paper, the authors concluded that it is difficult to determine the processes of how SES affects child outcomes and most proposals ignore the larger context (Bradley & Corwyn, 2002). LH theory is more precise and detailed and is inclusive of the context. Another investigation into SES and academic achievement discusses a parental stress model and a parental investment model (Altschul, 2012). This author proposed that discrete components of SES

have different effects on youth that is a move away from the generalisation of SES. LH theory considers both parental stress and parental investment together as parts of the same model as the factors that cause parental stress and reduce parental investment are likely to be the same.

A review of parental attitude or involvement with children's academic achievement lamented the lack of contextual background of much of the research. Parental education, income and number of children in the family and similar variables were absent. These sorts of variables are part of LH investigations. Some of the variables found to define parental involvement were parental attitude to school, home activities, parental expectations, parenting style, parental supervision, home rules and communication between parents and children (Portumbu & Necsoi, 2013). These variables also partly define parental investment that is an important part of LH theory. This review emphasise the importance of the broad approach that LH offers.

Comprehending the dynamics of life is a considerable challenge. LH theory provides a concise but simple framework that explains much human behaviour and in this analysis, a good proportion of the variation in educational achievement was explained by the use of relatively few questions. There are certainly alternative theories that tend to focus on parts of life or that are more descriptive rather than offering explanations. Life course work (reviewed in Chapter 1) was criticised in a review for lacking a comprehensive theory and ignoring the biological realities of life events (Mayer, 2009). This analysis has shown that LH theory has distinct advantages for sociological investigations in terms of its ability to interpret and understand a multitude of complex factors, including biology, that impact outcomes.

HIV/AIDS epidemic

The CAPS data set has resulted in 15 papers (possibly more) that reported on sexual behaviour with the aim of reducing the HIV/AIDS infection rate. These are (Anderson, Beutel, & Maughan-Brown, 2007; Beauclair, Kassanjec, Temmerman, Welte, & Delva, 2012; Burns & Snow, 2012; Dinkelman, Lam, & Leibbrandt, 2007; Dinkelman, Lam, & Leibbrandt, 2008; Gillespie, Kadiyala, & Greener, 2007; Kenyon, Dlamini, Boulle, White, & Badri, 2009; Kenyon, Boulle, Badri, & Asselman, 2010; Lam, Marteleto, & Ranchhod, 2013; Marteleto,

Lam, & Ranchhod, 2008; Maughan-Brown, 2012; Maughan-Brown, 2013; Nattrass, Maughan-Brown, Seekings, & Whiteside, 2012; Tenkorang, Rajulton, & Maticka-Tyndale, 2009 & Teukorang, Maticka-Tyndale, & Rajulton, 2011). While all of these papers contribute to an understanding of sexual behaviour there is no consensus of a recommendation on how to reduce the infection rate. Most recommendations are gender and race specific and advise caution in designing prevention programmes. An alternative recommendation based on LH theory and the above analysis is as follows. The AIDS virus is favoured when people have unprotected sex with concurrent partners. There are a group of females, regardless of race, with brains programmed by circumstances to have unprotected sex. These are fast life strategist adapted to dangerous environments so the biological imperative is to reproduce. Contraceptive or AIDS advice is futile because of this programming. It is almost impossible to change the programming and the optimal solution is to endeavour to influence the individual when the programming occurs early in life. The recommendations for combating AIDS are the same for alleviating poverty and inequality, to attempt to change the programming that occurs early in life as detailed below.

Alleviation of poverty

Alleviating poverty centres on persuading people to adopt a slow LH strategy and programming the next generation for a slow LH strategy. Education, frequently portrayed as the solution to poverty, has proved a futile effort for many people despite substantial resources allocated to education in South Africa. Parenting is the second pillar of alleviation and without both poverty will flourish. Parenting receives minimal resources if any. There is no quick fix for alleviating poverty. It will take generations but measurable indications occur quickly and economic benefits by year twenty. There are three aspects to improved parenting: preconception, pregnancy and early childhood.

Preconception

Young adults need to delay reproduction. Figure 6 illustrates the potential benefits. Older women are likely to breast feed and this benefits cognitive ability and hence education. Older women are more likely to produce babies that are at normal weights and this benefits cognitive ability (Pyhala, et al., 2011 & Yang, Platt, & Kramer, 2010). Older women are more emotionally mature and this improves child development that influences education (Johnson N. , 2015).

Young adults need to continue their education or skills development. This improves income-earning ability, parenting skills and an improved understanding of education helps children. The analysis showed that parental education is a highly significant variable in educational achievement.

Young adults need relationship skills. This has two benefits. Firstly, they are more likely to choose life partners more carefully, go through a bonding process slowly and therefore have stable marriages. Figure 8 illustrates the potential benefit of a stable marriage to children. Secondly, relationship skills are critical for parenting. Figure 8 also illustrates the negative results of poor parent/child relationships.

Pregnancy

It is during pregnancy that the brain starts developing and maternal behaviour can adversely influence this development with implications for cognitive and social abilities. Drugs (Black, Bhattacharya, Fairley, Campbell, & Shetty, 2013), smoking (Smedberg, Lupattelli, Mardby, & Nordeng, 2014) and bingeing on alcohol (anything more than a glass per day) (Patra, et al., 2011) all have serious consequences. Adequate nutrition is necessary and this is difficult for poorer women who mostly rely on the cheaper plant carbohydrates for nutrition. Mineral and vitamin supplements are necessary for all women.

Early childhood and later

Breastfeeding has positive implications for brain development and cognitive ability (Brion, et al., 2011). Following this is adequate nutrition for the growing child and this is necessary for normal brain development and the consequential benefits. The most critical part of parenting is the parent/child relationship (National Scientific Council on the Developing Child, 2004). It is this that differentiates the brain, or programmes the brain to a fast life strategy (a focus on reproduction) or a slow life strategy (a focus on the future and hence education). There appear to be five parental behaviours that favour a slow life strategy, eye contact, interactive talking, actively listening without interruption, messages of affirmation and appropriate touch. Every person, including babies, needs these interactions because they stimulate the release of relationship hormones, which make people feel good about themselves and the other. In the absence of these hormones, stress hormones are released and it is these that alter the development of the brain and cause the focus on reproduction (Middlebrooks & Audage, 2008). Babies want to communicate and can

communicate but with their limited skills parents need to be sensitive and also allocate time to this need. These relationship behaviours are required for all human relationships and should be a central part of all parenting. For adolescents an authoritative parenting style produces the best results (Spera, 2005 & Glasgow, Dornbusch, Troyer, Steinberg, & Ritter, 1997)

Education

Education is the second pillar of alleviating poverty. Education in South Africa is in a state of crisis and this has consequences for the individual and the economy (Bhorate & Kanbur, 2005). There appears to be a lack of accountability and an abdication of responsibility towards education. Education starts with a culture of learning in the home and this includes supervised homework, a positive attitude to school (see Table 8), appropriate bed times, limited time with electronic devices, communication with teachers, attending school meetings and discussing school progress with children. Schools actively need to educate parents about their responsibility to their own children. More parental involvement is required in education (Kola, 2011). If parents do not collaborate with schools, the children should stay at home.

From the opposite perspective, many schools and the Education Department are failing to provide society with people with reasonable skill levels (Bhorate & Kanbur, 2005). Parliament is the ultimate place for accountability but this does not appear to be a practical solution. Accountability needs to be at a more local level, possibly at the district council level, with a public body to monitor schools (and Department) annually. This body should be predominantly comprised of employers and tertiary educators because they are the people that suffer directly when schools perform badly. Instructions to The Department and enabling powers to act drastically with the bottom 10% of schools are required.

Another approach to lifting schools out of the day care category is a contract between parents and the school. Parents commit to behave as stated above and schools commit to lifting their standard of teaching. For the school it might include reducing grade retention, reducing class size, educating parents about their responsibilities, communicating more with parents and teacher training. This contract would encourage parent involvement that is beneficial for education and improved school performance (Jeynes, 2012).

School fees are a contentious issue. With high unemployment levels, it is understandable that many people battle to pay school fees. However, paying fees, even R10 per month brings commitment and involvement with the school. A Basic Income Grant (BIG) trial in Namibia showed a positive response in education partially because people could pay a symbolic school fee (Haarmann, et al., 2009).

Labour legislation

Rigid labour legislation and especially minimum wages discriminate against the unskilled. When their worth to an employer is less than the cost, they are unemployable. A large proportion of school leavers are unskilled and are therefore unemployable with current labour legislation. Labour legislation is out of phase with the proportion of unskilled people and these people need incorporation into the economy. The argument to justify current legislation is labour exploitation and there are merits for this argument. However, it is better for the economy and a person to earn R50 per day than sit at home and earn nothing. Demand for a person's skills and labour is the optimal safeguard against exploitation. Government stopped controlling commodity markets and even the currency markets many years ago, yet the labour market is highly controlled and consequently South Africa has an extremely high level of unemployment. This contributes to poverty but it is a secondary level problem with the primary cause of poverty being parenting and the education system.

Prosperity has its roots in the family and in family processes. Apartheid systematically destroyed the family and it needs fostering if inequality and poverty are a society priority. When family dynamics improve, it is probable that education will also improve because parents will demand quality and their children will have more enthusiasm and a greater aptitude for education. Democracy, the economic system, gifts or black empowerment legislation do not change behaviour within the family and consequently their impact on poverty is minimal.

Conceptualisation of prosperity

Communities and countries depend on the individuals to create wealth by selling their labour, a service or providing products. Crucial to performing this economic function is the brain. The brain starts development from conception and parental behaviour influences that development and the working memory, the ability to process information and learn

(Alloway & Passolunghi, 2011) that a child has when arriving at the school gate. The behaviour of teachers, Department and parents then further influence the development of the brain. Since economic prospects are correlated with educational achievement (Anderson, Case, & Lam, 2008), both stages in brain development are important. However, economic activity takes place within a framework of legislation, regulations and bureaucracy and these can potentially hinder or promote economic activity. For example, minimum wages discriminate against the poorly skilled (Bhorat, Kanbur, & Stanwix, 2012). Central to brain development and therefore prosperity, is behaviour. Improved parenting will give children a greater learning ability and parents will be more concerned for their children and therefore more demanding and more involved with schools. Schools and the Department need to be more directly accountable to the society they serve because this is vital in building a prosperous society. It takes time for children to enter the job market where improved skills will have an economic impact.

Chapter 5 – Conclusions

In South Africa race is a major focus in politics, institutions and research. The early CAPS work focused on race and, as is to be expected they found large racial differences in educational and other outcomes (Kola, 2011 & Lam, Ardington, & Leibbrandt, 2011). The analysis in this dissertation used LH theory, i.e. a biological theory. When I modelled educational outcomes using appropriate behavioural variables, I found no significant difference by race. This suggests that a concentration on race will not be a productive way of improving the country or institutions and might even be counter productive.

South Africa also has a focus on inequality, the haves and the have nots. This is seen in research that uses SES, including work by Kola (2011) using the CAPS data set. Large educational differences are correlated with SES. My research carefully defined and measured wealth and found that while it is a significant variable its contribution to the variability explained is relatively small. This means that the size of the house or the income of the household is not as important as previously thought or shown. This implies that giving people gifts of any kind will not be the most effective way of alleviating poverty.

The use of reproductive groups in this thesis, instead of a gender only, is unique in CAPS research. It clearly shows how the reproductive behaviour of women influences education. It is probable that pregnancy has a direct affect on education but more likely that the poor education and pregnancy has a common cause. The inverse correlation between home stability and education for the teen pregnancy group is an indication that the cause is the parent/child relationship (Figure 8). LH theory postulates that children are programmed early in life by the parent/child relationship to reproduce early (Del Giudice & Belsky, 2011); their world is a dangerous place and early reproduction enhances the survival of the genes. This type of parental behaviour influences memory, emotion regulation, cognitive functioning, language and literacy (Johnson, Riis, & Noble, 2016) and has undesirable consequences for educational achievement, prospects for the individual and skills available for economic activity. The reproductive behaviour of the child creates opportunities for the AIDS virus and LH theory provides a framework that could reduce infections. Other CAPS research into sexual behaviour recommends caution when designing interventions (Anderson, Beutel, & Maughan-Brown, 2007).

The deplorable state of education is of concern to many South African citizens, a status confirmed by research (Modisaotsile, 2012), including those using the CAPS data set (Lam, Ardington, & Leibbrandt, 2011). Parental involvement in schools is recommended (Kola, 2011) and (Frempong, Reddy, & Kanjee, 2011). There is concern expressed about the ability of parents to contribute to education and the need to train parents on their responsibilities. This thesis agrees with these sentiments but goes beyond these recommendations to say that there is a need for general parental training. The inverse correlation between parent time and education in Model B (Table 8) is a direct indication of parent ability. Poor health (Middlebrooks & Audage, 2008) and substance use (Anda, et al., 2006) are indirect measures of stress in early childhood and, hence parenting ability. Parents that are more involved and connected to their children would demand better education rather than being disinterested spectators in the education process.

This thesis focused on behaviour and found that it explained a high proportion of the variability in educational outcomes. This suggests that changing behaviour through a family intervention is the most effective method of alleviating poverty. In Finland, divorce, poverty, substance abuse and mental health problems among parents have raised concerns of the detrimental effect on children. A group-based mentalizing intervention for early parenthood was introduced in primary health care units, with the aim of promoting child development and family health (Kalland, Fagerlund, von Koshull, & Pajulo, 2016). Finland's unemployment was at 9% in 2016 (Statistics Finland) yet they considered it a serious enough problem to alleviate the effects on the family. South Africa has three times the unemployment rate and the family receives little or no attention.

LH theory, shown to be a valuable tool in social research, clearly demonstrated that poverty is a result of behaviour. The use of this theory produced possibilities for the alleviation of poverty rather than descriptions of problems and more questions.

There were no ethical issues in this research. The data supplied was anonymous and all ethical challenges were survey relevant. A possible ethical issue was that data collected at great expense was not fully utilised. The participants told their story and gave their time in the hope that it somehow might make a difference.

Limitations of Data

There are limitations with the data but they are mainly limited to variables that contributed less than 1% to the variation in educational outcomes. There was limited time for the younger females in the sample to become pregnant in their twenties. Some of the female parents may have older children not captured in the Household survey in Wave 1 and that would affect age of first birth and number of children of the mother. There was a definitive way of separating out the fast life strategy females. This was not the case with the males and could have improved the model.

However, the top eight factors in the model were robust across all variations in the model tried and age-grade (policy of grade retention) always remains the largest impediment to educational achievement and, therefore eventual employment.

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