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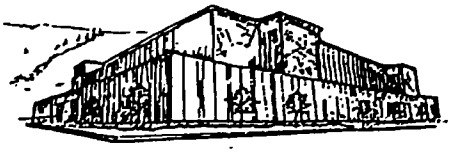
Brandon Fuller
The University of Montana



HOUSEHOLD SUBJECTIVE WELL-BEING IN SOUTH AFRICA

by

Brandon Fuller

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789 East Eisenhower Parkway
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Household Subjective Well-Being in South Africa

Committee Chair: Jeff Bookwalter

In addition to income, economists increasingly look for indicators to more accurately gauge human well-being. This study examines basic economic determinants of household subjective well-being (SWB) in South Africa. Household SWB is the head of household's assessment of whether household life is satisfactory or not satisfactory. Household SWB contributes to our understanding of human well-being by directly measuring how people perceive the well-being of their own household. Using basic household economic characteristics, a logit model of household SWB is proposed. The policy usefulness of household SWB is examined by testing the reliability of current South African survey techniques and determining which factors most shape perceived household welfare.

Results suggest heads of household give fairly reliable assessments of household welfare. However, potential measurement improvements exist and more empirical evidence is needed. Basic economic factors are good predictors of household SWB in South Africa. Public policy in areas such as child food security, housing and transportation could significantly improve people's satisfaction with life. The influence of household factors on household SWB reports changes when different population groups are considered. The model predicts household SWB well for black households but poorly for whites, who, for the most part, do not experience deprivation in basic living conditions. Child food security appears to affect female headed households more acutely than male headed households. Objective, household economic factors shape South African's welfare perceptions. Understanding how these factors interact with household SWB is valuable to development policy making.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Acknowledgements

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Chapter I. Introduction

Income is the traditional proxy of well-being in economics. Income growth raises well-being by expanding people's ability to satisfy needs and desires. Yet income and well-being are not one in the same; the context of income gains matters. Household income gains could be undermined by crime, illness, higher income tax brackets, or lack of economic or political freedom to consume in accordance with personal needs and desires. The connection between national income growth and well-being is not well delineated.

Environmental economists debate the importance of accounting for environmentally intensive growth. Income gained by destruction of scarce, non-renewable natural resources exaggerates welfare gains. Large income inequalities also exaggerate welfare gains. National income measures the production of private goods, ignoring instances where public goods are lost in private pursuits (Zaim, 2001, p. 94). Income figures alone provide an incomplete picture of human well-being. Although increasing national income can alleviate poverty, vague growth policies often fail to alleviate severe deprivations.

Supplemental measures of well-being improve development analysis. Examining other social and economic indicators sharpens our understanding of human well-being and provides clearer directives for public policy. By considering economic and social indicators in addition to income we can begin to understand the conditions under which larger incomes translate to better lives.

This project examines subjective well-being (SWB), a person's reported satisfaction with life, as a development indicator and policy tool. Amartya Sen (2000)

describes human welfare as a composite of capabilities. The development process seeks to enhance capabilities and improve human welfare. Capabilities can be thought of as basic economic factors shaping people's ability to lead richer lives. Sen's capability framework includes: achieving good health, adequate nourishment, adequate shelter, adequate mobility (transportation), avoiding unnecessary and non-useful pain (crime victimization, morbidity), being well-informed (education, political freedom), and community/family participation, among others (Crocker, 1995). Guided by Sen's capability framework, this project proposes a bottom-up SWB model whereby basic economic factors predict SWB. Socio-economic variables represent capabilities in the model. Testing the model determines whether external, bottom-up socio-economic factors influence SWB and by what magnitude.

SWB measurements traditionally occur at the individual level. The survey used here measures SWB at the household level. Household heads answered the question: "Taking everything into account, how satisfied is this household with the way it lives these days?" Household SWB raises interesting questions. The project considers two: (1) Does the head of household speak for all members when assessing household well-being? (2) Do determinants of household well-being vary depending on respondent's class or gender?

Subjective well-being (SWB) is a person's self-assessment of welfare and represents a person's inner feeling of well-being or life satisfaction. Most studies measure SWB by asking a person to rank life satisfaction using a numerical scale. The scale used here contains five choices: very dissatisfied, dissatisfied, neither satisfied nor

dissatisfied, satisfied and very satisfied. The survey asks the household head to assess life satisfaction for the entire household.

Subjective well-being supplements development indicators, sharpening descriptions of human welfare. Per capita income and social indicators such as life expectancy provide important but incomplete information about well-being. SWB gives a direct rank of perceived well-being. Measuring SWB and development indicators together supplies important information about what determines people's sense of welfare. If socio-economic factors influence SWB, policy decisions benefit from SWB analysis.

Per capita GDP identifies a nation's general development level fairly well. Paul Krugman asks skeptics to examine a table showing countries' GDP per capita:

> My question for people who say that real GDP is a simplistic measure of development is: which rankings would you like to reverse?...I have not found anyone who, when pressed on this, wants to change the rankings more than marginally: no matter how much they may claim that a one-dimensional measure like GDP is too crude to capture a complex reality, in practice they cannot find any countries whose level of development is seriously misrepresented by that measure. (Krugman, 1996, p. 719)

High per capita GDP characterizes countries we consider most developed; low per capita GDP corresponds with the least developed. Yet simply knowing poverty exists provides limited guidance for development policy.

Per capita income does not explain well-being. Low per capita GDP informs a country of its deplorable development position without suggesting what to do about it. As Sen observes, correlations between income deprivation and capability deprivation should not lull us into believing income levels tell us enough about capabilities (Sen, 2000, p. 20). Converting opulence into well-being depends on external conditions, public goods and other circumstances affecting a person's life. Similar income levels disguise

welfare differentials between sick and healthy persons or between urban and rural households. Describing human welfare demands consideration of these additional indicators. As an example, consider per capita GDP ranks of less developed countries (LDC). Depending on the development indicator considered, radical changes occur within the LDC subset of ranks. Exchanging ranks between Germany and Somalia seems absurd. We'd be hard pressed to find a set of development indicators suggesting Somalis are better off than Germans. What about China and South Africa?

In 1984, South African per capita income exceeded Chinese incomes by a factor of seven. Yet Chinese could expect, on average, to live 15 years longer than South Africans (Sen, 1988, p. 12-13). Focusing on income or life expectancy alone changes the development picture. Considering life expectancy, per capita GDP ranks don't accurately reflect relative development status. Switching development ranks between China and South Africa is a marginal change, but pursuing the vague development strategy of GDP growth has greatly different well-being implications. Income converts into well-being at different rates for different groups.

In 1984, using only per capita income as a welfare indicator, South Africans enjoyed seven times the well-being of the Chinese. GDP masks the severe deprivation among the black South African majority. A sharper development picture emerges after taking stock of additional indicators such as life expectancy, income inequality, and government oppression under communism or apartheid. Income ranks correlate with development levels, but fail to inform development strategy. Consideration of other social and economic indicators emphasizes the diverse challenges facing underdeveloped countries and improves the prospects for public action to enhance well-being.

Living standard surveys supplement income figures with information on basic economic factors. Numerous developing countries, working with development agencies such as the World Bank, undertake extensive living standard surveys to inform development strategies. Surveys include measures of income/expenditure, wealth, housing, sanitation, health, nourishment, transportation, crime, education, employment, water, energy and other conditions influencing household capabilities associated with well-being. In addition to shaping development policies, governments use the survey data to track policy progress. (For a description of the World Bank living standards survey efforts see: www.worldbank.org/lsms.)

Researchers often compose indices from survey data, augmenting income-based evaluations of well-being (Klasen, 1997; Klasen, 2000; Zaim, 2001). One such index, the United Nations Human Development Index (HDI), describes development by including income, schooling and life expectancy measures. These indices compile indicators generating a broader-based measure of poverty than income alone. Klasen (1997, 2000) uses South African household data to compose deprivation indices. Indices include objective measures such as wealth, housing and employment, in addition to perceived safety and life satisfaction. Survey design input from South Africans ensured unique local development concerns were not missed by generic surveys and measures. In addition to an index of development achievement, Zaim (2001) proposes an improvement index to rank development success over time.

While income is a means of achieving well-being, a broader deprivation index attempts to represent actual well-being achievements. Klasen finds the deprivation index measure identifies impoverished South Africans missed by income or expenditure

measures. Many South Africans above the expenditure poverty line still face significant deprivation according to Klasen's index. The deprivation index also shows that worst-off South Africans are even worse off than expenditure poverty measures suggest. Klasen's index components describe relevant household capabilities and show a sharper development picture. The index, however, is somewhat arbitrary: all indicators receive equal weight in computing the index. Can one assume housing improvements convert to well-being at the same rate as more education? The index approach faces two problems that Sen labels value-heterogeneity and value-endogeneity (Sen, 1996, p. 20).

Value-heterogeneity arises because index components affect well-being differently in different societies or groups. For example, the value of literacy varies with labor market structures, standards of community participation and the difficulty of becoming literate. While literacy expands capabilities everywhere, literacy may exhibit greater returns to well-being in higher-skill labor markets than lower-skilled. Benefits from sanitation improvements vary with incidence of water borne disease, population density and industrial pollution levels. The hardship associated with disabilities diminishes in societies with appropriate disabled access and health services. Using an index, such as the HDI, to assess development across countries ignores unique national features influencing the relative worth of capabilities. The components of an achievement index convert into well-being at different rates for different countries, making it difficult to interpret development improvements.

Values attached to various development indicators also change as the development process occurs, the trend Sen calls value-endogeneity (Sen, 1996, p. 20). Richard Inglehart's 'post-materialist' threshold illustrates value-endogeneity (Kahneman,

1999, xi). As people fulfill basic material needs, such as adequate nourishment, they become relatively more concerned with fulfillment of less material intensive realms, such as participation in community life. Although people value both capabilities regardless of development level, relative valuation changes as human capabilities expand. This value-endogeneity suggests a "satisfaction treadmill" (Kahneman, 1999, p. 13-15). As development progresses, higher standards and expectations suppress sustained increases in perceived well-being reports. SWB reports may remain steady over time, even though people respond to positive or negative impacts in the short-run (Kahneman, 1999; Frank, 1997).

Evidence of adaptation to improved circumstances and stagnant SWB reports do not suggest people's lives never improve. Higher standards and aspirations indicate development success even if average SWB remains the same. For example, life dissatisfaction climbed among African-Americans between 1946 and 1966 although the period marked significant political and social improvement. Blacks fought for and achieved improved quality of life. Their standards and aspirations began catching up with white America's definition of the good life. Black Americans came to expect more from life, causing healthy discontent. Dissatisfaction increased precisely because freedoms and capabilities expanded (Veenhoven, 2000, p. 4).

Value-endogeneity does not undermine SWB measure's usefulness as a policy tool. Explaining SWB variation over time requires the consideration of social indicators. The satisfaction treadmill appears to set in only after nations break some living standards threshold (Fuentes & Rojas, 2001, p. 293). In countries where people lack basic shelter and nutrition, living standards improvements produce permanent SWB improvements.

Empirical work suggests average SWB levels are lower in severely impoverished countries compared to rich countries (Frank, 1997). Raising SWB in developing countries appears feasible. Although SWB levels may plateau over time, the factors influencing perceived well-being change. Understanding how determinants of SWB change during development provides valuable policy input.

SWB analysis identifies factors that impact people's perceived welfare. Understanding the relationship between social indicators and SWB helps shape development strategy. Strong links between indicator deprivations and low SWB reports suggest policy priorities. Awareness of the social indicators that influence perceived well-being advances effective public action.

While income figures and development indices contain important information about human development, such measures also face significant short-comings. Income poverty measures miss crucial aspects of human welfare and opulence tells us little about how people succeed in living. Development indices arbitrarily weight composite indicators. For example, in Klasen (1997) the deprivation index assumes a household improvement from a standing water source to water piped inside the dwelling is equal to an increase in the average education of adult household members from less than two years to 12 or more years. Indices describe achievements for important indicators such as education, life expectancy, or household water source but do not tell us how important each composite indicator is to human welfare. SWB analysis improves development assessment. SWB analysis determines the relative value people attach to indicators. The relationship between SWB and social indicators tells us more than composite indices or

per capita income. Understanding indicator impacts on people's perceived welfare helps set policy priorities and shape development strategies.

This study focuses on SWB measures from a 1998 South African household survey. Post-apartheid South Africa faces significant development challenges. Klasen (1997, 2000) demonstrates the inadequacy of income poverty measures in identifying deprivation among South Africans. Many South Africans above the income or expenditure poverty line suffer from acute deprivations. Excluded from access to public goods, non-whites face numerous challenges in using additional income for poverty alleviation.

Apartheid left an enormous gap between the living conditions of whites and other population groups. South Africa ranks in the mid-income range in terms of per capita GDP but the rank disguises massive inequality. South Africa is both a first and third world country, the rich are mostly white and the poor are mostly black. Decades of racist government leave much for public action to address. Uprooted families, neglected education, malnourished children, inadequate health services, and gross misallocation of spending are important considerations in effective public policy. On the positive side, the country has more natural wealth, roads, railways, ports and connections to the developed world than the rest of Africa. In this sense development goals are more attainable (Economist, 2001). Policymakers must identify crucial development needs in order to prioritize spending.

The South African government commissioned annual October Household Surveys to quantify basic economic characteristics of households in order to gauge development needs and track policy progress. The surveys include household level SWB measures.

The household head is asked to assess the life satisfaction of the household. Analyzing the relationship between household level SWB and the basic economic characteristics of the household can help identify important development needs. Policies that improve household characteristics that are highly correlated with household SWB will likely raise perceived well-being and enable human development and economic prosperity. This study explores the usefulness of household SWB in discerning which deprivations most hinder household life.

Household level SWB seems useful since anti-poverty measures often occur at the household level. Household SWB indicates the collective satisfaction of household members with household life. Measurement of household SWB presents some challenges. Some surveys ask household heads to assess collective well-being of the household. Because household heads manage family affairs, they presumably have some idea of how well the household functions, yet individual assessment of a collective group is greatly influenced by perspective. Evaluation of firm performance may differ depending on who evaluates: a CEO's assessment may differ from a worker's or shareholder's or middle manager's. Given all choices for an individual's judgment of household SWB, the head appears reliable because he or she most familiar with household functioning. If household heads speak accurately for other household members, household SWB is valid. If not, reliance on household heads raises several concerns.

Asking household heads to assess the well-being of an entire household raises two important questions: (1) Are household SWB reports mostly determined by the individual welfare of the household head? (2) Do household heads perceive welfare of

other household members accurately? Consider a probable South African household. Among other chores, the mother and the children expend great energy and time fetching water. The father exercises the most power in household decisions but his chores do not include water fetching. If the father ignores water fetching burdens he may overstate household SWB. The household SWB reports won't reflect potential gains from improved water sources if the head of household underestimates the hardships incurred by water-fetching members.

Household heads may distort household well-being by weighting their own experiences independent of effects on other household members. Consider an unemployed household head. Unemployment disrupts household well-being by reducing income and raising uncertainties about the future. The assessment of household SWB should reflect how unemployment burdens impact the household. The head's personal dissatisfaction with or apathy towards unemployment may exaggerate or understate the judgment. The household may be living fairly well, despite the household head's personal hardships. Conversely, the household may be unwell, despite the household head's personal satisfaction.

This project tests whether household SWB, as reported by the head, actually reflects the head's individual SWB more than household SWB. If household heads fail to speak for the entire household a different method of obtaining household SWB measures is needed. Two models of household SWB are presented. One uses both head of household variables and household level characteristics, the other uses only household level variables. The study finds modeling household SWB with some head of household variables does not predict SWB ranks more accurately than modeling with strictly

household variables. Perhaps the model that includes head of household characteristics predicts in a manner similar to the model that includes household level characteristics because so much of the head's sense of welfare depends on factors occurring at the household level. Such 'household public goods' include housing, sanitation, energy and other goods that, once provided, accrue to all members.

After testing for differences between a head of household level and household level models of SWB, the sample was broken down by class, gender and race to test whether determinants of SWB vary by population group. For simplicity only the household level model was tested for different population groups. Notable differences arise between sub-samples. The determinants of SWB varied by the head of household's gender. For female head of households, household SWB appears more sensitive to child food security. The findings support research showing strong links between child welfare and female influence over household consumption decisions (Bookwalter & Warner, 2001).

The standards of a satisfactory life differ between poor and rich households. Examining household SWB at different expenditure quartiles sorts the impacts of differing conditions between classes. Household opulence quartiles were established using monthly per capita expenditure. Certain variables, such as child food security, significantly influence well-being perceptions across class, though marginal effect magnitudes vary. Model goodness of fit declines for the highest expenditure quartile. Transportation capabilities appear to influence well-being perceptions more as opulence increases.

Breaking the sample by race yields interesting results. Significant correlations between household SWB and basic economic factors exist for black households but the model shows a poor fit and few significant correlations for white household SWB. The basic living conditions and capabilities represented in the model are mostly fulfilled among white households. For example, most white households live in homes with indoor plumbing. Bottom-up, situational factors cannot explain variation in white household SWB reports. The difference in model fit between blacks and whites reflects the legacy of apartheid. In 1998, four years after establishing democracy, many black households lacked basic capabilities that nearly all white households commanded.

The significant results are an encouraging sign of the potential for SWB to inform policy in developing countries. By measuring the relationship between basic socio-economic factors and reported well-being researchers can obtain a deeper understanding of poverty. While income and social indicators are important for describing people's lives, modeling SWB gives us an idea of how objective indicators affect people's personal sense of welfare. Personal satisfaction with life is not the sole component of a good life but it is an important part. To the extent that public action can improve important SWB determinants, people's life satisfaction, goals and standards will improve, leading to richer lives and less deprivation.

Chapter II. Literature Review

There has been a great deal of work on both the validity and determinants of SWB. Most studies concerned with SWB determinants deal with measures at the individual level. Subjective assessments of household well-being are not rigorously explored in the literature. Much, though not all, literature suggests individual SWB responses are valid and reliable. Whether validity extends to the measure of household SWB as assessed by the head is a primary concern of this project.

Diener, Suh, Lucas and Smith (1999) review the past three decades of SWB research. Psychology literature deals extensively with the relationship between personality and SWB. Personality and objective life circumstances combine and interact to determine SWB reports. Personality impacts suggest SWB reports are fairly reliable. "Individuals do not fabricate an unreliable judgement of happiness at the time of assessment...SWB ratings reflect a stable and consistent phenomenon that is theoretically and empirically related to personality constructs" (Diener, 1999b, p. 214). While, personality traits are a stable component of life satisfaction reports across time and situations, current mood potentially distorts and destabilizes SWB reports. Most research, however, finds that the stable component of life satisfaction overshadows the influence of current mood. Someone who is generally satisfied with life is unlikely to report otherwise because of an uncharacteristic bad mood.

Although personality traits explain some variation in SWB, the psychology literature generally rejects the fixed response, genetically determined theory of SWB. The relation between personality and SWB is strong and consistent, but personality is by no means the sole influence. Even if people inherit sunny or gloomy dispositions, their

external situation shapes perceived well-being. Before considering other determinants, the validity and reliability of SWB reports should be explored further.

While SWB is an informative self-assessment, it deserves scrutiny. SWB is not the lone component of a successful life. Looking solely at SWB is as flawed as considering only income in gauging human welfare. SWB is not a direct function of objective conditions and net hedonic value of life experiences. The policy usefulness of SWB hinges on understanding its limits and uncertainties. Deiner et al. address concerns about the validity of SWB: "[SWB reports] possess adequate psychometric properties, exhibiting good internal consistency, moderate stability, and appropriate sensitivity to changing life circumstances. Furthermore, global reports show a moderate level of convergence with daily mood reports, [and] informant reports..." (Deiner et al., 1999a, p. 277-78) 'Informant reports' include evaluations of a person's well-being by others, such as spouse and co-workers.

SWB correlates well with other observations of the same phenomenon, such as informant reports or brainwave data. Veenhoven (1996) discusses tests that measure correspondence in responses to different indicators of perceived well-being. Several questions directly measuring SWB are asked, each question phrased differently. Response correlation suggests SWB reports are consistent and reliable personal reflections of well-being.

Veenhoven (1996) also reviews several questions surrounding the validity of SWB reports. Rather than making a personal assessment, people may report what others tell them about their welfare. For example, an inwardly dissatisfied person may report satisfaction because her friends frequently tell her she seems happy. Veenhoven suggests

large, random samples mitigate this unsystematic error. People are generally conscious about personal feelings of life satisfaction. Eight of ten Americans think about SWB on a weekly basis, responses to SWB questions are typically prompt, non-responses are low, and 'don't knows' are infrequent (Veenhoven, 1996a, p. 4).

Defensive attitudes and wishful thinking may distort SWB reports. Ego-defense occurs if people are actually dissatisfied with life but report satisfaction. The same result occurs when people's responses reflect the social desirability of being satisfied with life. For example, an individual may feel dissatisfied with life yet report satisfaction to appear upbeat to the interviewer. If such ego-defense widely occurs SWB reports exaggerate the actual extent of life satisfaction in a given population. Tests of ego-defense and social desirability responses compare responses to single direct questions of SWB to ratings based on depth interviews and projective tests. Results aren't significantly different from a single question asked by an anonymous interviewer (Veenhoven, 1996a, p. 4).

Not all psychology literature suggests SWB reflects the stable inner state of well-being. Schwarz and Strack (1999) outline the case against using SWB as a policy tool. The authors argue SWB reports are spot judgments, based on information chronically or temporarily accessible at the time of questioning, which lead to context effects. Other authors argue pronounced context effects can be mitigated by appropriate survey design. For example, surveyors avoid undesirable context problems by asking SWB before asking questions with regards to specific quality of life. (Frey & Stutzer, 2002)

Schwarz and Strack (1999) also raise concerns about contrast effects: an individual recalls a happy event, making the rest of life look bland by comparison and decreasing SWB. Because of contrast effects the same event may increase or decrease

SWB depending on how an individual interprets the event with respect to the rest of their life. The authors consider the impact of relative comparisons a drawback as well. Mood influence and self-presentation (ego-defense, social desirability) also concern the authors. The psychology literature empirically tests some of the authors' objections, such as ego-defense or social desirability (Veenhoven,1996a; Veenhoven, 1996b). Deiner et al. (1999a) suggest the stable component of life satisfaction overshadows current mood. People appear capable of making reliable global welfare assessments, putting recent episodes of mishap or fortune in proper perspective.

Researchers typically use retrospective questionnaires to measure SWB. Explorations of alternative measurements are underway in psychology literature and may prove useful for future development analysis. One alternative to the single question method targets multiple, immediate reports from people in their typical environments (a beeper informs subjects of report times). Averaging the well-being reports from various instants yields an overall SWB measure (Kahneman, 1999; Stone, Shiffman & Devries, 1999).

SWB reports are not perfect measures of well-being and the limits and vulnerabilities of SWB should be kept in mind. The discussion thus far addresses three criteria that help judge the value of SWB as a policy tool. (1) Reliability: are SWB responses distorted due to mood or contrast effects? (2) Validity: do SWB reports reflect true inner feelings rather than defensive or socially desirable responses? (3) Consistency: do SWB reports correspond with other observations typically connected with life satisfaction? (Frey & Stutzer, 2002). While SWB does not fulfill the criteria perfectly, the literature dealing with the criteria offer an encouraging assessment of SWB. A good

representative sample and sufficiently large datasets are important when using SWB in development policy analysis. Appropriate econometric techniques may then be used to deal with unsystematic validity errors in SWB reports. Research design may also mitigate several reliability concerns. All social science measures are imperfect, ignoring SWB neglects important information about well-being not reflected in objective social indicators or per-capita GDP (Frey & Stutzer, 2002).

The relationship between SWB and personality clarifies the potential of SWB as a development analysis tool. The personality relation suggests "[t]emporally unstable factors do not completely control affective and cognitive evaluations of one's life" (Deiner, 1999, p. 226). Personality findings suggest SWB reports are fairly reliable.

While the genetic component of personality limits the extent to which policy can improve SWB reports, changes in external circumstances can improve or diminish personal disposition. Beyond basic capability achievements, adaptation and personality appear to stabilize long-term SWB. According to surveys in rich countries, people imagine life-changing events would dramatically alter well-being. A windfall in income supposedly boosts happiness. A crippling accident is presumed worse than death. Evidence shows lottery winners experience no more life satisfaction than non-winners. Quadriplegics experience only slightly less life satisfaction than people without physical disabilities (Deiner, 1999b).

Stable long-term SWB does not make SWB analysis useless. First, improvements in living conditions improve peoples dispositions. Public policy influences childhood development situations important to personality development. Second, while moderately stable in the long-run, SWB also demonstrates appropriate sensitivity to changing life

circumstances. SWB fluctuates in the short-run, before adaptation and adjustment of standards and expectations takes place. Development policy may visibly impact SWB in the short-term. Most importantly, development policy changes the composition of standards and aspirations associated with perceived well-being. SWB may stabilize but changing determinants of SWB allow meaningful assessment of the development process.

Populations attach differing values to certain social indicators. For example, quality of housing influences well-being differently in different countries or different income groups. Testing the hypothesis that socio-economic factors explain variance in SWB reports is one way of estimating the values attached to indicators. Finding significant indicators allows policymakers to identify indicators that influence perceived well-being (Bookwalter & Dalenberg, forthcoming).

Governments typically play a large role in people's transportation opportunities. Roads, rail-ways, air traffic control, ground traffic control, buses and taxi license quotas all determine the ease of moving about. If analysis suggests a lack of transportation opportunities negatively impacts SWB reports, the government may raise well-being by improving transportation capabilities. If transportation explains variance in SWB then increasing the capabilities of all to move about safely and efficiently might actually diminish the explanatory power of transport with respect to variance in SWB. The value-endogeneity problem suggests the development process (government policies, changing technology, burgeoning markets) alters the importance of transportation capabilities as well-being indicators. Perhaps, in the short-term, average SWB rises. If policy succeeds and most people realize adequate transportation capabilities, standards and aspirations

rise and SWB reports adjust. In this case a development improvement transpires, long-term SWB averages remain relatively stable but the set of social indicators affecting SWB improves.

The literature suggests SWB measures have potential error but are largely reliable and valid. The fact that personality influences SWB, does not imply SWB is an inborn trait. While life circumstances do not lead directly to elation or despair they do influence SWB. SWB appears to have trait-like and state-like properties (Deiner, 1999a, p. 280). Social indicators affect perceived well-being and alter life disposition. The next section considers the literature on situational factors influencing SWB.

What socio-economic indicators should be considered for modeling SWB? Geography and demography partly determine what socio-economic data should be collected. For example, data on HIV status may be appropriate for research on sub-Saharan Africa and unessential for other regions. The literature examines the relation between SWB and socio-economic indicators extensively.

Although personality traits show correlation with SWB reports, situational factors also influence SWB. Furthermore, a person's living standard likely influences personality development. Even if personality traits remain stable, situational factors become more or less influential to SWB as life circumstances deteriorate or improve. Researchers find socio-economic and demographic factors have significant effects on SWB responses (Argyle, 1999). While personality differences explain some of the variation in SWB responses, considering unexplored economic factors might improve our understanding of what motivates life satisfaction. Adding some basic economic factors may improve the predictive power of bottom-up SWB models. Socio-economic factors

are all the more interesting because policy can improve socio-economic conditions and potentially raise average SWB.

In addition to personality, Diener et al. (1999a) and Frey and Stutzer (2002) survey literature examining relationships between individual SWB and each of the following: health, income, age, sex, employment, job morale, education, political institutions and social capital such as marriage and political engagement. Examining the literature on the determinants of individual level SWB will help in constructing a household level SWB.

Deiner et al. (1999a) survey research on the relation between perceptions of health and SWB as well as objective health (as rated by a physician) measures and SWB. Perceptions of health show stronger correlation with SWB. Adaptation may explain low correlations between objective health and SWB. Chronically ill or disabled persons adjust goals and expectations, mitigating negative impacts on SWB. Examining the relation between medical care access and SWB may be informative from a policy perspective. The model specified here incorporates medical scheme coverage to represent the capability to be healthy and avoid or treat illness.

Robert Putnam defines social capital as "...features of social life – networks, norms and trust – that enable participants to act together more effectively to pursue shared objectives" (Putnam, 1995, p. 664-65). Literature examining the relation of social capital and SWB is incomplete but several study areas exist, including marriage and political engagement.

The literature suggests a general positive relation between marriage and SWB. Causal direction goes both ways. Satisfied people tend to get married, the selection

effect, and marriage makes people happier, the salutary effect (Deiner, et al., 1999a, p. 290). Some research suggests the salutary effect dominates. Argyle (1999) argues that marriage gives people more social, emotional and material support than any other relationship. He also points to research suggesting married people report higher life satisfaction than those divorced or separated. Broken families diminish school performance among South African children and appear to correspond with rising violence and crime (Economist, 2001). This analysis of South Africa found married heads are more likely to report satisfactory household life than divorced or separated heads; however, heads who never married are also more likely to report satisfaction than divorced or separated respondents.

Frey and Stutzer (2002) argue two institutions critically affect SWB in constitutional democracies: (1) Political decentralization or federalism and (2) the possibility of political participation by citizens or direct democracy. Their research in Switzerland suggests cantons with more extensive political participation rights and autonomy increase people's SWB, holding other demographic and economic factors constant. Evidence from the Swiss studies suggests people value both outcomes and procedures of the political process. Participation rights are found to be more important than actual participation in the political process, because rights contribute to a feeling of control. Other social institutions potentially related to SWB, but largely unexplored in the literature, include monetary policies such as independence of the central bank, the importance of corporatism in policy making, and the prevalence of collective bargaining.

Moller and Saris (2001) find political expectations strongly influenced SWB assessments of black South Africans during the transition from apartheid to democracy.

Blacks demonstrated surprising optimism despite abysmal living conditions. The prospect of political empowerment after years of disenfranchisement improved their inner sense of well-being. The relation between meaningful political participation and SWB appears strong.

Current literature rejects the hypothesis coupling old age and declining life satisfaction. The Abe Simpson depiction of old folks – crotchety and dissatisfied with everything – is not realistic. Deiner et al. (1999a) suggest the lack of significant decline in SWB over life span demonstrates the ability of people to adapt to new conditions. Frey and Stutzer (2002) found the young and the old are generally more satisfied than the middle-aged. Age does not appear to explain variation in South African household SWB.

Studies do not suggest significant gender differences in SWB, a paradox considering depression is more prevalent in women than men. Deiner et al. (1999a, p. 292) document research suggesting women experience both positive and negative emotions more strongly and frequently than men, resulting in roughly equal life satisfaction reports among men and women. Gender affects are insignificant for South African household SWB reports. However, model estimation by gender classification raises interesting differences in the determinants of perceived well-being.

Researchers found surprising correlations between income and SWB. Four categories of research results emerged. (1) Within a country, wealthier people are consistently found to be happier than poorer people, but the effects are small. (2) Individuals experiencing income gain or loss likely adapt to the new level of income. SWB disturbance is temporary. Also, income gains may result in more stress, moderating positive effects of higher wealth. (3) Trends in national average SWB during

periods of aggregate economic growth present an interesting paradox. Researchers found economic recession increases depression rates, yet SWB remains stable during periods of rapid real GDP growth. Deiner et al. suggest "...growth may be accompanied by a concomitant rise in expectations regarding standards of living across all income groups" (Deiner et al., 1999a, p. 288). (4) Research shows a positive and strong relation between national wealth and average SWB. Other benefits received by individuals in wealthy nations inflate the income-SWB correlations between nations. For example, rich countries tend to be more democratic and egalitarian.

Work satisfaction and life satisfaction correlate positively, but the causal direction is uncertain. Some research suggests a top-down process whereby life satisfaction predicts job satisfaction. Simply being employed appears to be more important to life satisfaction than work satisfaction. Unemployed workers in nearly all countries report less life satisfaction than those at work (Argyle, 1999). Oswald (1997) finds higher rates of distress, low life satisfaction and suicide among the unemployed when compared to the employed.

Loss of income from unemployment does not entirely account for effects on SWB. Argyle (1999) argues that hidden benefits of work play a role. Such benefits include structuring time, providing social life, improving self-image and enjoyment of work tasks. Individual joblessness appears more distressing during high levels of employment. Oswald summarizes the policy implications from income and employment effects on SWB: "Unemployment seems to be the primary economic source of unhappiness. If so, economic growth should not be a government's primary concern"

(Oswald, 1997, p. 1828). This study finds a significant negative correlation between unemployment and household SWB in South Africa.

The literature shows a small but significant correlation between SWB and education. The correlation is higher among individuals with lower income and in poor countries. Much of the SWB-education relation results from the correlation of education with income and occupational status. Controlling for effects of income and occupational status sometimes renders the SWB-education relation insignificant for rich country populations. Education may improve ability to adapt to changing circumstances, but higher education also raises aspirations. Unless higher achievement meets higher aspirations, life satisfaction may suffer (Deiner et al., 1999a, p. 293). This study finds small but positive and significant education affects on household SWB.

The determinants of SWB discussed thus far are explored with the focus upon individual SWB. The determinants do not appear to be any less important for modeling household SWB as reported by the household head. Head of household personality affects may be mitigated since the act of assessing household well-being requires thinking for all household members. Household income or expenditures, members' education, marital status of the household head, employment among working age household members, and members' access to medical care affect the performance of the household. Using a 1993 South African household survey, Bookwalter and Dalenberg (forthcoming) develop a model of household SWB incorporating additional indicators based on Klasen's deprivation index (see Introduction). Additional indicators include transportation, sanitation, energy source, household wealth and housing. Research on individual SWB leaves most of these indicators unexplored.

Bookwalter and Dalenberg (forthcoming) propose a bottom-up model of household SWB. The bottom-up approach uses basic economic and social indicators to predict SWB. The top-down approach attempts to explain SWB by examining structures within the person (such as personality) that influence how life events and circumstances are perceived. Rather than including household SWB in an index, as Klasen did, the study tests the affects of objective household characteristics on the head of household's assessment of household SWB. The study identifies important indicators and measures the size of indicator effects on household SWB. The results tell policymakers which factors most influence perceived well-being, knowledge that may not be conveyed clearly in the typical political process (Veenhoven, lecture, p. 6). The Bookwalter and Dalenberg model correctly predicted household SWB in approximately 40 percent of the cases considered. The model left much to be explained, but also provided insight for development policy.

Housing indicators showed strong, consistent impacts on household SWB. Separating households by expenditure quartile suggested improvements in public transportation would yield welfare improvements in all but the highest quartile. The study found transportation and basic housing to be most important for the poorest South Africans. Sanitation, water, energy, education and health proved relatively more important for the rich.

According to Bookwalter and Dalenberg (forthcoming), social and community infrastructure, health and safety indicators might also improve household SWB analysis. In addition to most indicators used by Bookwalter and Dalenberg, this study introduces several new indicators. Data comes from the 1998 South African October Household

Survey. The household SWB model proposed here incorporates a refuse disposal variable as a proxy for community infrastructure, medical care coverage and child food security variables for health and crime victimization for safety. The additional variables appear important to household well-being as perceived by the household head. Crime victimization affects household well-being among all expenditure quartiles, but particularly the most opulent quartile. Child food security shows strong, consistent affects across expenditure, race, and gender classifications.

Although significant for both men and women, child food security affects female perceptions of household well-being more than male perceptions. Results support evidence from other studies that suggest higher sensitivity to child welfare among females. Several papers find significant, positive relationships between child welfare expenditures (food, clothing, education) and the extent of control women exercise over household assets (Bookwalter & Warner, 2002; Quisumbing, 2000; Quisumbing, 1999). The affects of child food security indicate important policy priorities and pose interesting questions for research on intra-household distribution.

Several important findings and gaps in the literature guide this study. The literature suggests SWB measures are plausible tools for development analysis. Personal sense of welfare is an important part of the good life and SWB responses appear valid and reliable, especially when a large sample is considered. In addition to top-down factors such as personality, the literature suggests bottom-up situational factors play an important role in explaining differences in SWB reports. The influence of bottom-up factors appears most important among populations facing deprivations in basic capabilities. Bottom-up models of SWB likely fit better for developing countries.

The range of living conditions that plausibly affect SWB will change with the time period and population group considered. Generic surveys conducted in unique locales will always miss important aspects of well-being that a localized survey design would capture. Research should incorporate localized surveys to specify SWB determinants. This study uses a South African survey designed by South Africans. The literature does not go far enough in exploring potential bottom-up determinants of SWB in developing countries. The important question for development economics is whether or not SWB analysis can contribute meaningful information to development policy decisions. The study examines potential SWB determinants that receive limited or no coverage in the literature. The literature addresses individual level SWB measures but devotes little attention to household level SWB, perhaps because the household level measure is less common. However, because governments such as South Africa measure it, the meaning and validity of household level SWB measures need to be established to determine their usefulness in policy decisions.

This project contributes to the existing literature on perceived well-being in two ways: (1) by considering whether head of household assessments of household welfare approximate true household welfare, and (2) by incorporating several new indicators in the model. The following section describes data collection, defines variables, explains variable derivation and introduces the household SWB model.

Chapter III. Data and Model Specification

The study dataset comes from the 1998 South African October Household Survey (OHS). The cross-sectional OHS occurs annually for a probability sample of South African households. For 1998, Statistics South Africa (Stats SA) surveyed 20,000 households, weighted to estimates of population size based on the population census of 1996. Stats SA drew the sample from 2000 enumeration areas, selecting 10 households in each area. Stats SA began conducting OHSs in 1994. Reference population estimates for sampling changed from 1991 for '94-95 to 1996 for '96-98 so data from the two periods are not directly comparable. Appendix 2a lists several publications involving 1998 OHS data. Annual OHS data and other South Africa data are available to researchers through the South African Data Archive (www.nrf.ac.za/sada) and Stats SA (www.statssa.gov.za).

The sampled population excludes prisoners in prison, patients in hospitals, and people residing in boarding houses and hotels. After Stats SA compiled the survey data the dataset contained 18,981 households. This study excludes all one-person households in order to test differences between head of household and household level models. Further exclusions for missing or illogical observations reduced the working dataset to 13,434 households. The composition of households by province does not change by much after excluding 5,547 households. The ethnic composition of the sample resembles 1996 census figures (Table 2a and Table 2b.). The dataset remains large and representative.

Table 2a. Province Households as Percentage of Sample -Before and After Exclusions

Province	Before Exclusions	After Exclusions
Western Cape	11.7	10.9
Eastern Cape	13.3	14
Northern Cape	5.7	5.7
Free State	9.1	8.2
KwaZulu-Natal	14.4	15.8
North West	10.3	9.8
Gauteng	14.2	13.3
Mpumalanga	9.6	9.6
Northern Province	11.7	12.7

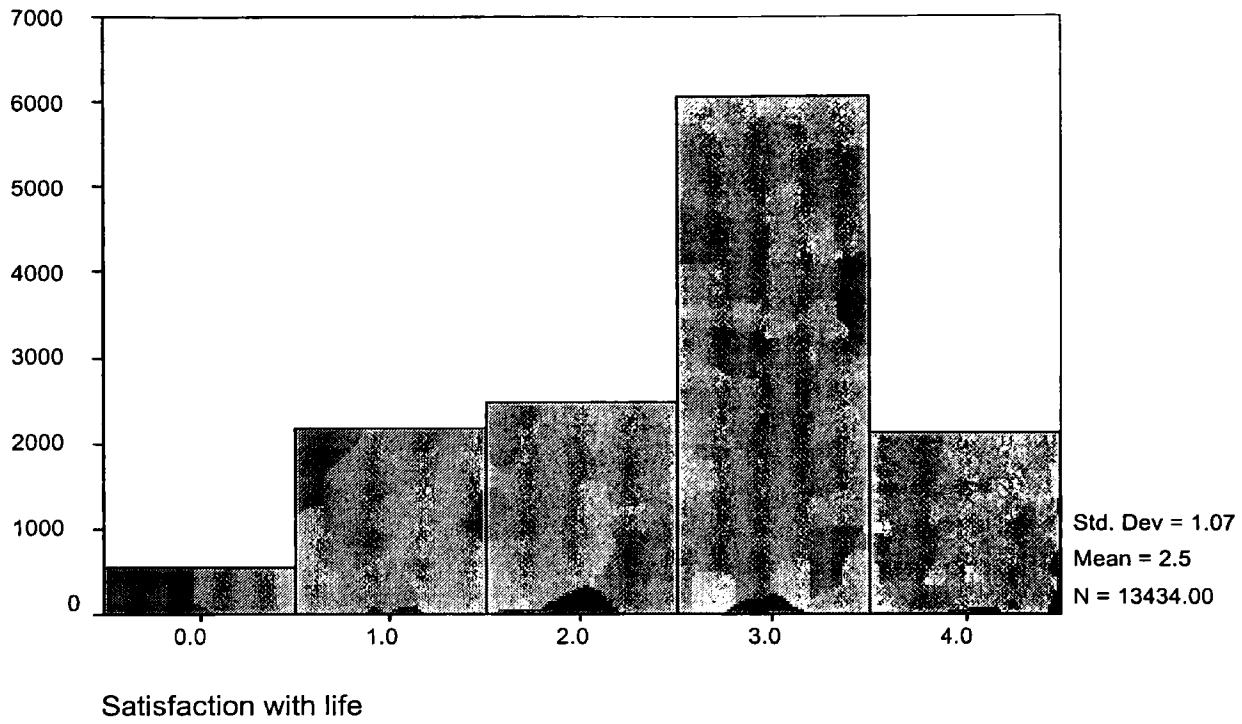
Table 2b. Ethnic Composition of Adjusted Sample Compared with 1996 Census Figures

Ethnicity	1996 Census	Stats SA Sample
African/Black	76.7	75
Coloured	8.9	10.7
Indian/Asian	2.6	2.5
White	10.9	11.6
Other	0.9	0.1

i. Use and Derivation of Variables

Figure 1 shows the distribution of household SWB reports for the entire sample. The distribution skews towards 'satisfied' (3) responses. The project rescales the dependent variable. Household SWB becomes 1 if the household head reported household living as satisfactory or very satisfactory and 0 for neither satisfactory nor dissatisfactory, dissatisfactory, or very dissatisfactory reports. By rescaling from a 5 point to 2 point scale, household SWB reports become either satisfied or not satisfied. The majority of household head assessments of household welfare, about 60 percent, fall in the satisfied category.

Figure 1. Household SWB Histogram



The OHS tracks development indicators. This study uses or derives variables from several survey categories: perceived well-being of the household, unemployment, dwelling, dwelling utilities and services, access to health services, household size, education levels, crime, child food security, age, gender and marital status. Table 2c offers a complete listing of variable definitions and descriptive statistics for the entire sample.

Table 2c Definitions and Descriptive Statistics

DEPENDENT VARIABLE

Variable	Definition	Mean	Std Dv
SAT	1 if household life is satisfactory	0.61	0.487

INDEPENDENT VARIABLES

Variable	Definition	Mean	Std Dv
MEDAID	1 if household head has medical aid scheme	0.17	0.378
DSBLTY	1 if household head has long-term disability	0.06	0.243
CRIME	1 if household head was victimized by crime in the past 12 months	0.03	0.178
NOTACT	1 if household head is not economically active	0.43	0.496
UNEMP	1 if household head is unemployed	0.07	0.258
EDYRS	Household heads education in years	7.65	5.372
HMEDAID	% household with medical aid scheme	0.16	0.351
HDSBLTY	% household with long-term disability	0.04	0.118
HCRIME	% household victimized by crime in past 12 months	0.02	0.105
PCTNOACT	% household not economically active	0.56	0.349
PCTUNEMP	% household unemployed	0.10	0.215
AVGED	Average education of household in years	8.81	3.879
GENDER	1 if household head is male	0.61	0.488
HHHAGE	Age of household head	48.36	15.31
URBRURAL	1 if household resides in urban area	0.55	0.498
TOTEXP	Total monthly expenditure of household	1255.21	2155.23
NPERSON	Number of persons in household	4.91	2.495
	CHILD FOOD SECURITY Dummies		
NOFEED	1 if unable to feed children during past year	0.29	0.453
FEED	1 if always able to feed children during past year	0.62	0.486
NAFEED*	1 if no children in household	0.09	0.291
	HOUSING Dummies		
HOUSE	1 if household lives in a house	0.67	0.470
TRDHUT	1 if household lives in a traditional hut	0.14	0.342
FLTAPTEX	1 if household lives in a flat, apartment or multiple multiple housing unit (duplex, triplex, etc)	0.05	0.226
OUTBACK	1 if household resides in formal unit (house, flat, room) in backyard	0.04	0.189
SQTSHCK*	1 if household lives in shack or squatter settlement	0.08	0.272
ROOM	1 if household occupies a room or flatlet	0.01	0.116
HOSTEL	1 if household lives in hostel	0.01	0.090
	SANITATION Dummies		
FLUSH	1 if household primarily uses a flush toilet	0.48	0.500
CHEMTLT	1 if household primarily uses a chemical toilet	0.00	0.056
PITVENT	1 if household primarily uses a ventilated pit latrine	0.12	0.330
PITOTHR	1 if household primarily uses another type of pit latrine	0.22	0.416
BUCKET	1 if household primarily uses a bucket	0.04	0.204
NOTOILT*	1 if household has no toilet	0.13	0.332
	WATER SOURCE Dummies		
PIPEDOUT	1 if main water source is piped water outside the dwelling	0.25	0.431
PIPEDIN	1 if main water source is piped water inside the dwelling	0.38	0.485
PUBTAP	1 if main water source is public tap	0.20	0.398
TRUCKIN	1 if main water source is from water tanker/carrier	0.01	0.118
BORHOLE	1 if main water source is from borehole	0.04	0.204
RAIN	1 if main water source is onsite rain-water tank	0.00	0.056
FLOW	1 if main water source is flowing water or stream	0.05	0.226
STAG*	1 if main water source is a dam/pool/stagnant water	0.02	0.124
WELL	1 if main water source is a well	0.01	0.103
SPRING	1 if main water source is a spring	0.04	0.189

Table 2c Definitions and Descriptive Statistics (cont'd)

Variable	Definition	Mean	Std Dv
	COOKING ENERGY Dummies		
ELCTRC	1 if main source of cooking energy is electricity from grid	0.51	0.500
GAS	1 if main source of cooking energy is gas	0.03	0.162
PAR	1 if main source of cooking energy is paraffin	0.18	0.382
WOOD*	1 if main source of cooking energy is wood	0.24	0.425
COAL	1 if main source of cooking energy is coal	0.04	0.204
DUNG	1 if main source of cooking energy is animal dung	0.00	0.068
	REFUSE DISPOSAL Dummies		
LOCAUTH	1 if rubbish disposed of by local authority	0.52	0.500
COMRMV	1 if rubbish disposed of by community members	0.01	0.113
COMDMP	1 if rubbish disposed of in communal dump	0.01	0.107
OWNDMP	1 if rubbish disposed of in own refuse dump	0.36	0.479
NORMVL*	1 if no rubbish disposal	0.10	0.304
	TRANSPORT Dummies		
PRIVATE*	1 if personal motorized vehicle is primary transport	0.24	0.428
PUBLIC	1 if public transportation (bus, train) is primary transport	0.17	0.377
NONMTR	1 if non-motorized (walk, bike, donkey) is primary transport	0.36	0.480
TAXI	1 if taxi (metered, minibus) is primary transport	0.23	0.419
	MARRIAGE Dummies		
NEVER	1 if household head never been married	0.41	0.492
CIVIL	1 if household head in civil marriage	0.19	0.390
TRAD	1 if household head in traditional marriage	0.08	0.272
LIVWITH	1 if household head lives with partner	0.16	0.365
WIDOW	1 if household head a widower/widow	0.05	0.213
DIVSEP*	1 if household head divorced/separated	0.11	0.317

*** BASE CASE**

If household heads do not accurately represent the well-being of the remainder of the household, the policy usefulness of household SWB is undermined. This study first tests the hypothesis that head of household characteristics predict the household head's assessment of household well-being better than household characteristics. The hypothesis assumes the head of household form household welfare assessments with respect to their personal life conditions. Such responses represent head of household SWB rather than household SWB. The introduction discusses potential biases in detail. Since most household characteristics also describe the head of household's living conditions, many indicators remain are applicable at both levels. The variables that change are medical coverage, disability, crime victimization, unemployment, labor force participation and education.

For the head of household, dummy variables (1=yes, 0=no) describe medical coverage, disability, crime victimization, unemployment and labor force participation. For example, an observation of 1 for UNEMP indicates an unemployed household head. Completed years of schooling describe the head's education level. In South Africa, completion of grade 12 takes 13 years of schooling and equates to completion of secondary schooling. Grade 13 is higher education preparation. Persons completing grade 12 and completing an advanced diploma receive 16 years of schooling. Grade 13 with an advanced diploma or degree represents 17 years of schooling. More years of education are possible but the variable intends to capture education level, so 17 years is the maximum value.

At the household level medical coverage, disability, crime victimization, unemployment, and labor force participation are observed in percentage terms. For example, if 1 of 4 household members is disabled the household level disability observation is 0.25. Average schooling years for working age (15 years and over) household members represent household education level. All other indicators, such as housing and child food security, are the same for both models. These variables are 'household goods,' characterizing both the household and household head. For example, if the household derives energy from a grid the household head also benefits from the electricity source.

In addition to education level, the transport indicator is derived from the initial dataset. The study considered primary work transport and transport the household would use to go to a hospital. For example, if household members go to work by bus and would get to a hospital by ambulance, the household transport observation is 1 for PUBLIC. In

cases where transport observations conflicted, the first best work transport describes household transport. For example, if members travel to work by taxi but would walk to the hospital, the transport observation is 1 for TAXI. If work transport among household members varies the majority transportation mode describes household transport. In the case of a missing transport observation the existing observation describes household transport.

The literature suggests household income may be an important determinant of SWB. Monthly expenditure is used in lieu of income. Although still imperfect, advantages of expenditure typically include reduced measurement error and a better proxy of household wealth. Incomes may fluctuate from period to period, while household expenditure remains relatively smooth (Bookwalter and Dalenberg, forthcoming). The survey asked households to estimate expenditures on all goods for the past month. Roughly 5 percent of households surveyed reported unusual expenditures during the month in question and such purchases probably inflate the monthly expenditure measure for those households. The study eliminated the 325 households reporting food expenditures greater than all expenditures for the month prior to the survey.

Indicators used in the study correspond to Amartya Sen's capability criteria for development analysis. Crocker (1992) provides an excellent analysis of basic human functional capabilities that Sen finds important. Public policy could potentially improve most indicators. Medical aid coverage and mental/physical disability status influence household members' ability to have good health, live to the end of complete lives, and avoid unnecessary pain. In addition to income and opulence considerations,

unemployment status relates to household members' ability to participate in the community and have self-respect. The child food security indicator influences household members' ability to be well nourished and have good health. In addition to potential returns to human capital, Sen argues that education affects household members' ability to be reasonably well-informed, participate in the community, and form goals and values.

Housing, sanitation, water source, energy source, refuse disposal, and transport indicators represent the adequacy of household shelter. Transportation mode largely determines household members' mobility. In addition to community infrastructure implications, sanitation, refuse disposal, water and energy sources directly influence household members' health and longevity capabilities.

ii. Logit Model of Household SWB

The survey data provides a measure of household well-being ranging from very dissatisfied to very satisfied on a 5 point scale (0-4). Bookwalter and Dalenberg (forthcoming) suggest using an ordered probit model to account for the ordinal nature of the dependent variable. An ordered probit accounts for the extra information implicit in the rank of household SWB. Ordinary least squares is not an efficient application because the coding of household SWB reflects ranking. The difference between neither satisfied nor dissatisfied (2) and satisfied (3) cannot be treated as equivalent to the difference between satisfied (3) and very satisfied (4). Likewise, satisfied rank of 3 cannot be interpreted as 3 times the magnitude of a dissatisfied rank of 1 (Kennedy, 1998).

Initial ordered probit models yielded many predictions of dissatisfied (1) and satisfied (3) responses but virtually no predictions of very dissatisfied, neither, or very

satisfied. The model was unable differentiate between households in the very dissatisfied to dissatisfied range or households in the satisfied to very satisfied range. Thus, this study defines a binary measure of household SWB as satisfied (1) or not satisfied (0). 'Very satisfied' or 'satisfied' responses are defined as satisfied (1). Responses of 'neither satisfied nor dissatisfied,' 'dissatisfied,' and 'very dissatisfied' are defined as not satisfied (0). Explaining the difference between satisfied and not satisfied responses still provides important information about potential welfare improvements. The change reduces the complexity of the model. The policy question is simplified as well: What social indicator improvements increase the probability that households are satisfied with the way they live?

Forcing responses to either satisfied or not satisfied categories makes the dependent variable dichotomous. For a qualitative, dichotomous dependent variable, the logit model is appropriate. Kennedy (1998) provides a general and technical discussion of the logit model.

The logit model estimates the probability of a satisfied response given the set of independent variables. Consider the linear combination of independent variables as a well-being index. The logit converts the index into a household SWB measure of either satisfied or dissatisfied for each household observation. The household level index is estimated as:

$$
\begin{aligned}
I_i = {} & b_1 + b_2\,\text{HMEDAID}_i + b_3\,\text{HDSBLTY}_i + b_4\,\text{CRIME} + b_5\,\text{PCTUNEMP}_i + \\
& b_6\,\text{PCTNOACT}_i + b_7\,\text{AVGED}_i + b_8\,\text{TOTEXP}_i + b_9\,\text{NPERSON} + \\
& \delta_j\,\text{FOOD SECURITY dummies}_i + \alpha_j\,\text{TRANSPORT dummies}_i + \\
& \pi_j\,\text{WATER SOURCE dummies}_i + \mu_j\,\text{SANITATION dummies}_i + \\
& \varepsilon_j\,\text{REFUSE DISPOSAL dummies}_i + \theta_j\,\text{ENERGY SOURCE dummies}_i + \\
& \lambda_j\,\text{HOUSING dummies}_i + \psi_j\,\text{DEMOGRAPHIC dummies}_i + e_i
\end{aligned}
$$

Where e_i is a random error term for the i^{th} household and demographic dummies are whether the household resides in a rural or urban area (URBRURAL), the head of households age (HHHAGE), the head of households gender (GENDER), and the head of households marital status. Recall that household measures of medical coverage, disability, crime, unemployment, labor force participation and education variables change to head of household measures when considering the head of household index. For example, in the head of household model, MEDAID, the dummy identifying head of households with medical coverage, would replace HMEDAID, the percentage of household members with medical coverage. The logit model calculates the probability of being satisfied as: $P_i = (e^I / 1 + e^I)$.

iii. Expected Signs for Variable Coefficients

A complete list of variables is shown in Table 2c, an (*) indicates base case dummy variables in Table 2b. For housing, sanitation, water source, energy source, refuse disposal and marital status the presumed 'worst-case' dummy variable is the base case. For example, NOTOILT, the dummy indicating a household with no toilet facility of any sort, is the base case for sanitation indicators. These dummies should have positive effects with respect to the 'worst case' base case variable. According to the literature, civil marriage should have positive consequences for household SWB with respect to households characterized by divorce or separation. Bookwalter and Dalenberg (forthcoming) find housing and housing related services and utilities significantly impact household SWB. Their results from 1993 South Africa suggest moving households from shacks to other forms of housing would significantly improve household welfare.

The literature does not address the effects of food security on SWB. Food security influences many aspects of household living such as health and productivity. For child food security, households without children are the base case. Compared to households without children, coefficient signs should be negative for households unable to provide food for children and positive or null for food secure households. For transportation the base case is PRIVATE and expected signs for non-motorized, taxi and public transportation coefficients are negative. Bookwalter and Dalenberg (forthcoming) suggest public transportation improvements could improve welfare. Non-motorized and taxi transportation modes all seemed to be undesirable options according to the 1993 survey Bookwalter and Dalenberg examined. Since speculating on a 'worst case' proved difficult, private motorized transport was used as the base case because it is easily presumed as the best case.

The literature suggests perceived health is positively correlated with SWB but finds the relationship between health as measured by a physician and SWB to be relatively weak. This study proxies the capability to receive adequate medical attention with a health coverage indicator. High percentage of medical coverage among household members should increase the likelihood of satisfaction with household life. The literature suggests high education have positive and negative affects on SWB, negative because highly educated people have high standards and expectations. For South Africa, more education might provide significant advantages in the labor market, but education may also raise healthy dissatisfaction with the state of society. Thus, the sign of the coefficient for education is unpredictable.

Coefficients for unemployment, crime victimization, and disability among household members should be negative. The literature clearly demonstrates the negative effects of unemployment. The adaptation affect for long-term disability likely reduces the negative impacts on SWB. Thus, the impacts of disability are expected to be negative but small. The literature does not explore the affects of crime victimization in detail but a negative effect seems obvious. Basic economic theory suggests the coefficient for total monthly expenditure is positive.

Predicting the impact of the percentage of the household that is of working age but not economically active is less clear. The model incorporates labor force participation in order to see whether the discouraged worker effect dominates among persons outside the labor market. Discouraged workers leave the labor force because they cannot find employment even though they'd like to work. If discouragement accounts for non-participation then the expected sign for NOTACT is negative since many people outside the labor force would be searching for work if they felt they could find it. If people outside the labor market are predominately pursuing household production or informal work or going to school the expected sign is positive or null. The expected coefficient for total monthly expenditure is positive.

Taken together, these basic economic factors provide ample information for predicting household SWB in South Africa. Such information would predict less well in an opulent country where most people experience basic economic security. For most South Africans deprivation in basic living conditions likely represents a significant source of dissatisfaction with life.

Chapter IV. Estimation Results

This study finds significant correlations between basic economic factors and household SWB in South Africa. This chapter first discusses some general notes on programming and results interpretation. The next section considers the validity issue surrounding the household head's assessment of household SWB. The chapter then considers estimation results for the entire sample before focusing on sub-samples based on gender, expenditure quartile and ethnicity.

i. Notes on Programming and Interpretation

The study used SPSS to organize the data and LIMDEP to estimate the logit models. Appendix A includes a complete copy of the LIMDEP program. LIMDEP estimates include calculations of variable marginal effects that are important to interpreting estimation results. The marginal effect represents the change in the probability that the dependent variable equals one (satisfied) due to a unit change in the relevant explanatory variable.

LIMDEP uses the common convention of estimating marginal effects at the mean values of the explanatory variables. For example, a marginal effect of –0.09 for NPERSON would suggest an additional household member beyond the sample mean reduces the probability of a satisfied response by 9 percentage points with all other explanatory variables held constant at their mean. LIMDEP calculates the marginal effect as:

[prob(y=1)][1-prob(y=1)]B

(Kennedy, 1998). Computing marginal effects for binary independent variables requires appending LIMDEP operations because LIMDEP computes marginal effects for dummy

variables as though they were continuous. At the means for all other explanatory variables, the formula for a dummy marginal effect subtracts the probability that the dependent variable equals 0 from the probability that the dependent variable equals 1, when the given dummy equals 1. The program contains do-loops that identify dummy variables and accurately calculate their marginal effects on the probability of satisfied responses.

Further complications arise in interpreting the marginal effects of household percentage of crime victimization, medical aid coverage, disability, unemployment, and working age members not in the labor force. LIMDEP assumes a one unit change in these variables when computing marginal effects. An example illustrates the problem: if the average percentage of household members covered by medical aid schemes is 50% (0.5), a one unit change in HMEDAID (to 1.5) implies 150% medical coverage among household members. Aside from dwarfing a marginal change, the outcome is impossible. In lieu of 100% 'marginal' changes, the study uses a one standard deviation unit change for percent household member variables. The standard deviation is a plausible marginal change and seems more realistic than an arbitrary percentage change.

In the case of household unemployment, the one standard deviation unit change is roughly 25 percentage points. Using the standard deviation, interpretation of marginal effects becomes more reasonable: given the average set of household characteristics, a 25 percentage point increase in household unemployment leads to an X percentage point decrease in the probability of a satisfied response, all else constant. Unfortunately, marginal effects for household characteristics expressed as the percentage of members with the characteristic are not directly comparable to marginal effects for the dummy

variables from the head of household model. The household head is either unemployed or not unemployed. The status change for a dummy is not comparable with the one standard deviation change for the percentage household variable.

Since marginal effects of some household level and head of household level variables cannot be compared, the study looks at goodness of fit measures. Kennedy (1998) suggests a goodness of fit criteria for the logit. R-square tends to be both low and unreliable since the dependent variable is either 0 or 1. LIMDEP provides a table showing the number of y=1 values correctly and incorrectly predicted, and the number of y=0 values correctly and incorrectly predicted. Kennedy advises against compiling a percentage of correct predictions figure from the predictions table. A naïve predictor may perform well under this criteria. For example, the prediction that South African household heads will always report satisfactory household life would be correct roughly 60% of the time for the 1998 sample. Kennedy recommends using the fraction of zeros (not satisfied) correctly predicted plus the fraction of ones (satisfied) correctly predicted. The sum should exceed one for a useful prediction method. This study incorporates Kennedy's suggestion, identifiable as 'goodness of fit' in results tables.

The adaptation and expectations effect of changing life circumstances warrant a cautionary note on interpreting marginal effects. The literature review suggests people adapt to improving or deteriorating life circumstances. As peoples' lives improve standards and expectations effecting sense of well-being change. A sudden inflow of income may raise sense of welfare for a period, but the person or family may soon adapt to the new situation, and raise the standards of what constitutes satisfactory living. While higher standards and adaptation to a better life suggest improvements, SWB reports may

tend back toward some mean. Higher expectations may actually lower SWB reports. The bundle of determinants influencing personal sense of welfare may improve dramatically but SWB reports may stay the same or fall. Thus, the qualification, 'all else constant,' is important to remember when considering marginal changes. Assuming standards and expectations remain constant, one can posit policies that would raise SWB.

ii. Comparing Head of Household and Household Models of Household SWB

Since head of households assessed household SWB, an interesting question arises: Do household head characteristics predict household SWB reports better than household characteristics? Table 4a presents selected estimation results for the head of household level and household level models, a complete table of results is found in Appendix B. Bold listings indicate significant coefficients at the 95% confidence level. Logit analysis of each model yields identical goodness of fit measures (1.36). If head of household characteristics predict household SWB reports better than household characteristics we'd expect a higher goodness of fit measure for the head level model. Though this is not the case one cannot conclude the household model predicts better.

The marginal effects in Table 4a do not help determine model accuracy. The marginal effects of disability, medical aid coverage, crime victimization and unemployment appear larger at the head of household level. Yet the effects of these variables cannot be directly compared because unit changes are scaled differently. The head of household level marginal effect of being unemployed is a change in the employment status of an individual. At the household level, the marginal effect stems from a one standard deviation change in the percentage of household members that are

Table 4a. Model Estimation - Full Sample

Variable	HH Coeff	Head Coeff	HH Asym t	Head Asym t	HH Marg Effects	Head Marg Effect
HDSBLTY	-0.273	NA	-1.620	NA	-0.008	NA
DSBLTY	NA	**-0.177**	NA	-2.188	NA	-0.041
HCRIME	**-1.020**	NA	-5.585	NA	-0.025	NA
CRIME	NA	**-0.613**	NA	-5.622	NA	-0.143
PCTUNEMP	**-0.737**	NA	-6.874	NA	-0.037	NA
UNEMP	NA	**-0.449**	NA	-5.679	NA	-0.105
AVGED	**0.013**	NA	1.914	NA	0.003	NA
EDYRS	NA	**0.013**	NA	2.563	NA	0.003
HHHAGE	**0.004**	**0.004**	2.604	2.184	0.001	0.001
NPERSON	**-0.046**	**-0.046**	-5.261	-5.342	-0.011	-0.011
NOFEED	**-1.215**	**-1.199**	-15.104	-14.942	-0.290	-0.281
FEED	**0.308**	**0.326**	4.150	4.414	0.072	0.076
PUBLIC	**-0.348**	**-0.371**	-4.761	-5.096	-0.083	-0.087
NONMTR	**-0.277**	**-0.312**	-4.027	-4.562	-0.065	-0.073
TAXI	**-0.305**	**-0.352**	-4.123	-4.827	-0.073	-0.083
PIPEDIN	**0.394**	**0.404**	3.244	3.325	0.091	0.095
PIPEDOUT	**0.412**	**0.413**	3.921	3.924	0.094	0.097
PUBTAP	**0.263**	**0.257**	2.660	2.600	0.060	0.060
FLOW	**0.387**	**0.373**	3.344	3.226	0.086	0.087
WELL	**0.848**	**0.841**	4.150	4.117	0.171	0.197
LOCAUTH	0.184	0.177	1.875	1.797	0.043	0.041
COMRMV	**0.484**	**0.483**	2.465	2.474	0.105	0.113
COMDMP	-0.310	-0.330	-1.630	-1.729	-0.075	-0.077
OWNDMP	**0.246**	**0.244**	3.620	3.582	0.057	0.057
ELCTRC	**0.177**	**0.165**	2.360	2.213	0.041	0.039
GAS	**0.284**	**0.273**	2.130	2.043	0.064	0.064
COAL	**-0.262**	**-0.262**	-2.504	-2.508	-0.063	-0.061
HOUSE	**0.389**	**0.396**	4.760	4.852	0.092	0.093
FLTAPTEX	**0.298**	**0.304**	2.492	2.539	0.067	0.071
OUTBACK	**0.251**	**0.255**	2.072	2.108	0.057	0.060
ROOM	**0.533**	**0.538**	2.912	2.952	0.115	0.126
CIVIL	**0.209**	**0.216**	2.642	2.726	0.048	0.051
NEVER	**0.168**	**0.186**	2.260	2.503	0.039	0.044
GENDER	**-0.120**	**-0.113**	-2.289	-2.136	-0.028	-0.027
URBRURAL	-0.142	**-0.164**	-1.707	-1.977	-0.033	-0.038
Significant variables in **bold**						
N			13434			
Goodness of fit - household level			1.36			
Goodness of fit - head level			1.36			

unemployed. Coefficient significance and marginal effect signs coincide for the all variables that change between models, except for disability. The disability coefficient is significant at the head of household level, not the household level.

Comparing goodness of fit measures leads to uncertain conclusions about whether household heads speak primarily for themselves when assessing the well-being of the entire household. In an attempt to test the hypothesis that household heads report personal rather than household welfare in response to household well-being questions this study pursued a likelihood ratio test. The unrestricted model consisted of all household level and head of household level variables. The restricted model excluded the six variables unique to the household head (MEDAID, DSBLTY, CRIME, UNEMP, NOTACT, EDYRS). The likelihood ratio test checks whether the coefficients of the restricted head of household variables are equal to zero using the log likelihood functions from the restricted and unrestricted model. If all restricted coefficients equal zero the head of household variables have no effect on household SWB.

At the one percent level we cannot reject the hypothesis that all coefficients of household head variables are equal to zero. At the five percent level we reject the same hypothesis. The different test results at different confidence intervals again raise uncertainty about the ability of household heads to make representative assessments of the household's collective well-being.

So what do the results suggest? One interpretation is that it does not matter if the individual welfare of heads of household primarily determines the assessment of the entire household's well-being. The assessment will reflect household well-being because many aspects of the household head's living standards are the same for the entire

household. The models share common indicators. If the head resides in a house, so do other household members. Even variables explicitly describing the head implicitly describe the household. For example, an unemployed head represents an underemployed household because head of household unemployment factors into the percentage of household unemployment. Characteristics influencing the head of household's welfare also influence the welfare of the entire household.

Household goods may make head of household assessments of household SWB fairly representative. Once provided, certain household goods accrue to all members. Even if the head's household SWB reports reflect their personal characteristics more than those of the household, the reports partly reflect household welfare if all members share important living circumstances or capabilities. The results do not suggest a clear answer to whether or not heads of household accurately assess well-being for all household members. The results do suggest that head of household characteristics predict household SWB reports no better or worse than household characteristics, perhaps because so many characteristics are shared.

Intra-household inequalities change the welfare implications of household goods. If household decision makers ignore or neglect certain household member needs and preferences, intra-household well-being may vary dramatically. Survey improvements can resolve some problems with relying on household heads for household SWB assessments. The remainder of the study interprets results on the assumption that heads of household can approximate household welfare. The results of the household model receive attention throughout the rest of the paper.

Although the study is limited to a head of household assessment of household well-being, other measurement methods could improve the policy usefulness of perceived household well-being. The conclusion discusses potential improvements to household SWB measures, and alternative means of testing whether household decision makers speak accurately for all household members.

iii. Full Sample Estimation Results – Household Level Model

The paper includes 'Start and End' tables to demonstrate variable marginal effects on the probability of a satisfied report. Starting probabilities represent the likelihood of a satisfied response given the average set of household characteristics. Ending probabilities represent the change in the probability of a satisfied response given a one unit change in the given variable. The program determined end probabilities for each household by changing the specified variable by one unit, holding all other characteristics constant, and recalculating the probability of a satisfied response. For example, given the average sample characteristics the probability of a satisfied response is 62.6%. A one standard deviation change in household crime victimization, a 0.178 increase in HCRIME, reduces the likelihood of a satisfied response to 60.1%, holding all else constant.

The household level model contains several statistically significant determinants of household SWB. Table 4b presents the changes in the probability of a satisfied response for marginal changes in statistically significant variables. Household crime victimization during the past year (HCRIME) and household unemployment (PCTUNEMP) reduce household SWB. For example, 62.6% of households fall in the

Table 4b. Changes in Probability of 'Satisfied' Response for Significant Variables – Full Sample

Variable	Starting Probability of a Satisfied Household	Ending Probability of a Satisfied Household
HCRIME	62.6%	60.1%
PCTUNEMP	62.6%	58.9%
NOFEED	62.6%	33.6%
FEED	62.6%	69.9%
PUBLIC	62.6%	54.3%
NONMTR	62.6%	56.1%
TAXI	62.6%	55.4%
PIPEDIN	62.6%	71.7%
PIPEDOUT	62.6%	72.0%
PUBTAP	62.6%	68.6%
WELL	62.6%	79.7%
LOCAUTH	62.6%	66.9%
COMRMV	62.6%	73.1%
OWNDMP	62.6%	68.3%
ELCTRC	62.6%	66.8%
GAS	62.6%	69.0%
COAL	62.6%	56.3%
HOUSE	62.6%	71.9%
FLTAPTEX	62.6%	69.3%
ROOM	62.6%	74.1%
CIVIL	62.6%	67.4%
NEVER	62.6%	66.5%

satisfied category. A standard deviation increase in unemployment (.258) reduces the percent of satisfied households to 58.9%.

Housing and related utilities and services significantly influence household SWB reports. Bookwalter and Dalenberg (forthcoming) found similar evidence for housing effects on household SWB in 1993 South Africa. Though the samples are not directly comparable, 1998 OHS data suggest some movement out of squatter shack settlements towards other dwelling types since 1993. Yet potential welfare improvements remain strong for the roughly 8% of households living in shacks. Improving housing conditions

relative to the shack base case increases the probability of satisfied responses by 6 to 12 percentage points. Refuse removal services by local authorities (LOCAUTH) or community groups (COMRMV) increase the likelihood of satisfied responses relative to no removal by 4-10 percentage points. Adequate garbage services reduce pollution problems and disease while enhancing community aesthetics. Garbage removal also signifies a level of public infrastructure required to coordinate the service such as roads, capital equipment and landfills.

Improving water sources relative to drawing water from a stagnant source also significantly raises the likelihood of satisfied responses. Increased access to piped water in (PIPEDIN) or outside (PIPEDOUT) the dwelling, public taps (PUBTAP) and wells (WELL) likely improves household health by ensuring cleaner drinking and cooking water and reducing exposure to water borne disease. Improved water sources also cut time and effort costs of water fetching, freeing resources for leisure, market labor and household production. Similar benefits result from improving energy sources.

Relative to the base case household using wood, using electricity or gas raises the likelihood of reporting household life satisfaction. Coal use actually reduces the probability of a satisfied SWB response relative to wood use. Both coal and wood pose health problems for households with inadequate ventilation. Access to gas or electricity reduces local environmental burdens of excessive wood collection. Like water fetching, wood gathering burdens drain household resources, lowering household productivity, market income potential and leisure.

Relative to owning and driving a private motorized vehicle as a primary transportation source, using public transportation, non-motorized transport or taxi service

has a negative marginal effect on household well-being. Bookwalter and Dalenberg (2002) find similar welfare effects for transportation. They suggest safety and congestion largely account for the negative impacts. Taxi service is particularly dangerous due to high accident rates and stand-offs between rival gangs trying to control the market. Non-motorized and public transport increases exposure to crime as well. Bookwalter and Dalenberg also speculate that poor South Africans must travel further to work centers, making commutes longer and more stressful. Policy implications include improved urban housing and safer, more efficient public transport.

Relative to households experiencing divorce or separation, households with married heads or never married heads report higher well-being. Not surprisingly broken homes tend to reduce household welfare. Domestic violence, reduced earning power and household production, and emotional hardship seem plausible explanations. Policy implications are unclear since never marrying avoids household stress from divorce or separation. Future research might focus on the impact of divorce or separation among a sample of households raising children.

Child food security has the largest marginal effect on household SWB. An inability to feed one's children at any point during the past year (NOFEED) dramatically lowers the probability of a satisfied response, relative to households without children to provide for. The probability declines by nearly 30 percentage points. Unfortunately, the survey does not capture the duration of food shortage. The time period or periods when households are unable to feed the children undoubtedly varies. The survey suggests even relatively 'rich' South African households face child food shortages, although the problem is likely more acute for relatively poor households. Regardless of time period,

households that face uncertainty in providing food for their children experience tremendous disutility.

The ability to consistently feed children (FEED) raises the likelihood of a satisfied response. Clearly, food security enhances well-being for households rearing children. Parents undoubtedly derive direct utility from raising well-nourished children. Well-fed children also provide more assistance for household production, ensure more secure elderly lives for their parents, and signal household level food security. Failure to meet basic food requirements implies households face severe deprivation in other essential living conditions.

iv. Expenditure Quartile Analysis

The study next raises the question of whether the determinants of well-being change among expenditure quartiles. Bookwalter and Dalenberg (2002) find important differences between household SWB determinants based on expenditures. Different living conditions and perceptions of welfare between rich and poor may mask important effects. From 1993 data, the authors find transportation and housing are most important for household SWB of the poor, while sanitation, water, energy, education and health are relatively more important for the rich.

This study uses per capita household expenditure to break the sample into quartiles. Goodness of fit exceeds one for the household level model in each quartile. For quartile one, the poorest, goodness of fit equals 1.38, for quartile two goodness of fit equals 1.37, for quartile three goodness of fit equals 1.36 and for the richest expenditure quartile goodness of fit equals 1.18. The weaker goodness of fit for the upper expenditure quartile may reflect the lack of indicator variation among richer households.

Because most rich households use electricity from a grid, have flush toilets and piped water, and live in homes, the model does not predict household SWB as well. Table 4c includes quartile means for selected variables.

Table 4c. Selected changes in Probability of 'Satisfied' Response – Quartiles

Variable	q1 start	q1 end	Q2 start	q2 end	q3 start	q3 end	q4 start	q4 end
HMEDAID	0.490	0.490	0.575	**0.603**	0.649	0.666	0.770	0.770
HCRIME	0.490	**0.462**	0.575	**0.555**	0.649	0.640	0.770	**0.738**
PCTUNEMP	0.490	**0.441**	0.575	**0.543**	0.649	**0.603**	0.770	**0.748**
NPERSON	0.490	0.482	0.575	**0.555**	0.649	0.648	0.770	**0.758**
NOFEED	0.490	**0.201**	0.575	**0.248**	0.649	**0.411**	0.770	**0.536**
FEED	0.490	0.595	0.575	0.625	0.649	**0.778**	0.770	0.799
PUBLIC	0.490	0.432	0.575	0.543	0.649	**0.572**	0.770	**0.663**
NONMTR	0.490	0.445	0.575	0.533	0.649	0.603	0.770	**0.713**
TAXI	0.490	0.427	0.575	0.525	0.649	0.612	0.770	**0.698**
PIPEDIN	0.490	0.570	0.575	**0.672**	0.649	0.698	0.770	0.816
PIPEDOUT	0.490	**0.582**	0.575	**0.702**	0.649	0.715	0.770	0.775
PUBTAP	0.490	**0.567**	0.575	0.632	0.649	0.690	0.770	0.739
FLOW	0.490	**0.615**	0.575	**0.689**	0.649	0.670	0.770	0.626
WELL	0.490	**0.720**	0.575	0.737	0.649	0.788	NA	NA
PITOTHR	0.490	0.524	0.575	0.538	0.649	**0.554**	0.770	0.683
LOCAUTH	0.490	**0.593**	0.575	0.640	0.649	0.652	0.770	0.714
COMRMV	0.490	0.637	0.575	**0.817**	0.649	0.638	0.770	0.756
COMDMP	0.490	0.465	0.575	0.540	0.649	0.485	0.770	0.552
OWNDMP	0.490	0.555	0.575	**0.651**	0.649	0.694	0.770	0.728
ELCTRC	0.490	**0.571**	0.575	0.537	0.649	0.707	0.770	**0.905**
GAS	0.490	0.558	0.575	0.575	0.649	0.710	0.770	**0.905**
COAL	0.490	**0.381**	0.575	0.529	0.649	0.579	0.770	0.811
HOUSE	0.490	0.516	0.575	**0.700**	0.649	**0.779**	0.770	0.822
TRDHUT	0.490	0.482	0.575	0.633	0.649	**0.738**	0.770	0.744
FLTAPTEX	0.490	0.616	0.575	**0.699**	0.649	**0.751**	0.770	0.772
OUTBACK	0.490	0.530	0.575	**0.681**	0.649	0.662	0.770	0.808
ROOM	0.490	0.580	0.575	0.711	0.649	**0.881**	0.770	0.622
CIVIL	0.490	0.508	0.575	**0.666**	0.649	0.681	0.770	0.836
URBRURAL	0.490	0.458	0.575	0.579	0.649	0.638	0.770	**0.670**

End probabilities in **bold** if variable coefficient significant

The starting probabilities of a satisfied household SWB report rise as expenditure per capita quartiles rise. The model includes a monthly expenditure variable,

TOTMEXP, that appears to have little influence on household SWB. The welfare effects of monthly expenditure may be nullified by the living condition variables included in the model. Housing and related indicators represent goods the household succeeds in obtaining with income. The increased likelihood of life satisfaction as expenditure quartile rises suggests wealth plays a role, but the model suggests the way households use wealth is more important.

Several variables significantly affect household well-being regardless of wealth. In all but the third expenditure quartile crime noticeably affects well-being. The first and fourth expenditure quartiles experience the largest marginal effects from crime victimization. Unemployment reduces household well-being for all quartiles. Child food security greatly influences household SWB role for all quartiles. The impacts demonstrate that even the relatively 'rich' quartiles experience deprivations unimaginable to relatively wealthy households in industrialized countries.

Water sources are relatively important for households in the poorest quartiles. Clean, accessible water can improve household welfare by reducing exposure to disease and freeing up labor for other household production. The 2001 Economist survey of South Africa found that government extended clean water access to nine million households since the end of apartheid. Continuing water source improvement among the poorest households can enhance welfare. Water is an excellent example of a basic necessity that, pending successful development policy, could accrue to all households and eventually lose explanatory power for differences in SWB.

The richest and poorest quartiles are sensitive to energy sources. Coal reliance appears problematic among the poorest households. Coal is a relatively dirty energy

source and may contribute to illness in dwellings without adequate ventilation. Getting on the grid improves well-being for relatively rich and poor households. Since the end of apartheid one-and-one-half million households have received access to electricity, a policy that can continue to improve welfare.

Housing variables influence well-being for the middle two quartiles. Relative to driving personal transport, other transportation sources negatively impact household SWB for the richest quartiles. The results suggest that once basic necessities are achieved, household characteristics that are secondary to day-to-day survival (such as dwelling type and transportation) begin to influence perceived welfare more intensely.

v. Estimation Results By Ethnicity and Gender

The study presents estimation results for sub-samples of black and white households. Apartheid policies deprived blacks of basic freedoms and capabilities while promoting the interests of white South Africans. The segregation produced stark differences in living standards along ethnicity lines. Examining the determinants of household SWB by ethnicity provides insight on progress towards restitution and equality in post-apartheid South Africa. While post-apartheid changes brought dramatic legal and political improvement for blacks, living standards still depict the legacy of apartheid policies.

The model predicts household SWB reports for blacks fairly well but predicts white SWB reports poorly. The goodness of fit measure is 1.36 for black households and 1.02 for white households. The model consists primarily of basic living standard indicators. Most, though not all, white households fit the 'best case' scenario for model indicators. The model lacks explanatory power for whites because so little indicator

variation occurs. Most whites live in houses, have access to piped water and electricity and never worry about feeding their children. This is not to say that all white households are devoid of deprivation, but generally whites score well for the basic indicators in the model. Since apartheid forced severe deprivation on blacks and the push for economic equity takes time, indicator performance varies considerably among black households. The model consists primarily of basic economic factors that fit and predict SWB fairly well for black households facing a variety of basic deprivations.

Tables 4d and 4e present significant estimation results for black and white

Table 4d. Model Estimation for Black Households

Variable	Coeff	Asym t	Marginal Effect	Start	End
NOFEED	-1.203	-12.050	-0.291	0.568	0.277
HCRIME	-0.982	-3.863	-0.021	0.568	0.547
WELL	0.861	4.197	0.189	0.568	0.758
PCTUNEMP	-0.698	-5.911	-0.040	0.568	0.528
ROOM	0.616	3.232	0.141	0.568	0.709
FLTAPTEX	0.485	2.798	0.113	0.568	0.682
HOUSE	0.405	4.773	0.100	0.568	0.668
PIPEDOUT	0.396	3.683	0.096	0.568	0.664
FLOW	0.392	3.351	0.093	0.568	0.661
PIPEDIN	0.378	2.969	0.091	0.568	0.659
FEED	0.346	3.614	0.085	0.568	0.653
PUBTAP	0.276	2.756	0.067	0.568	0.635
CIVIL	0.274	3.287	0.066	0.568	0.635
OUTBACK	0.266	2.108	0.064	0.568	0.632
COAL	-0.254	-2.396	-0.063	0.568	0.505
OWNDMP	0.253	3.642	0.062	0.568	0.630
NEVER	0.213	2.629	0.052	0.568	0.620
TRDHUT	0.199	1.980	0.048	0.568	0.616
PUBLIC	-0.193	-2.099	-0.048	0.568	0.520
NONMTR	-0.167	-1.910	-0.041	0.568	0.527
ELCTRC	0.165	2.110	0.040	0.568	0.608
N		10075			
Goodness of fit		1.36			

Table 4e. Model Estimation for White Households

Variable	Coeff	Asym t	Marginal Effect	Start	End
HCRIME	-0.113	-3.524	-0.031	0.805	0.773
NOFEED	0.000	-2.203	-0.124	0.805	0.681
FEED	-0.667	2.332	0.066	0.805	0.870
NPERSON	0.008	-1.923	-0.018	0.805	0.787
N		1562			
Goodness of fit		1.02			

households. Not surprisingly, marginal effects on black household SWB are similar to those of the full sample, of which black households were a majority. Basic economic factors do well in explaining black household SWB. For whites, basic economic factors predict household SWB poorly and only four variable coefficients are significant. Crime and food security impact white household SWB. The fact that child food security is an issue for some white households, suggests deprivation is not solely dependent on ethnicity.

The study estimates the model for male and female head of household sub-samples to see if indicator marginal effects on SWB reports vary by gender (Table 4f). A large disparity exists between the effect of child food security on male and female well-being assessments. Female heads appear more sensitive to child food security than males. Other notable differences in marginal effects occur for the transportation dummies. Female household heads are less likely to report satisfaction when commuting by public transport, non-motorized means, or taxi. Safety concerns may account for some of the difference if females are more susceptible to violent crime and theft.

Table 4f. Selected Changes in Probability of 'Satisfied' Response - Male Head and Female Head Sub-Samples

Variable	male start	male end	female start	female end
HCRIME	65.6%	**62.8%**	57.8%	**55.8%**
PCTUNEMP	65.6%	**62.1%**	57.8%	**53.9%**
NOFEED	65.6%	**39.2%**	57.8%	**23.7%**
FEED	65.6%	**73.5%**	57.8%	62.3%
PUBLIC	65.6%	**60.3%**	57.8%	**42.0%**
NONMTR	65.6%	**61.2%**	57.8%	**45.1%**
TAXI	65.6%	**59.8%**	57.8%	**45.4%**
PIPEDIN	65.6%	**75.0%**	57.8%	65.7%
PIPEDOUT	65.6%	**75.1%**	57.8%	**66.5%**
PUBTAP	65.6%	71.3%	57.8%	**64.0%**
FLOW	65.6%	71.5%	57.8%	**68.9%**
WELL	65.6%	**81.6%**	57.8%	**76.5%**
LOCAUTH	65.6%	**72.2%**	57.8%	59.4%
COMRMV	65.6%	72.6%	57.8%	**74.2%**
OWNDMP	65.6%	**71.3%**	57.8%	**63.5%**
ELCTRC	65.6%	**71.5%**	57.8%	59.1%
GAS	65.6%	**73.9%**	57.8%	61.7%
COAL	65.6%	60.4%	57.8%	**50.3%**
HOUSE	65.6%	**74.8%**	57.8%	**66.8%**
FLTAPTEX	65.6%	**72.8%**	57.8%	62.3%
ROOM	65.6%	70.5%	57.8%	**76.9%**

Ending probabilities for variables with significant coefficients in **bold**

vi. Impacts of Child Food Security: Male and Female Headed Households

No model variable impacts household SWB stronger or more consistently than child food security. Inability to feed one's children during the past year greatly reduces the likelihood of satisfactory SWB reports. Table 4g presents the mean and marginal effects of the dummy representing inability to feed ones children (NOFEED) for the full sample, quartiles, male and female sub-samples and intra-quartile male and female sub samples. In all cases the impact of NOFEED is large, negative and significant. Some interesting disparities arise when analyzing quartile and gender sub-samples.

Table 4g. Marginal Effect of Child Food Insecurity on Probability of 'Satisfied' Response - Full Sample, Gender, Expenditure Quartiles and Intra-Quartile Gender

TARGET GROUP	NOFEED
FULL SAMPLE	
Full sample mean	0.289
Full sample marginal effect (me)	-28.4%
GENDER	
male mean	0.238
male me	-25.2%
female mean	0.369
female me	-34.8%
EXPENDITURE QUARTILE	
q1 mean	0.468
q1 me	-29.8%
q2 mean	0.353
q2 me	-33.3%
q3 mean	0.232
q3 me	-22.8%
q4 mean	0.102
q4 me	-19.5%
INTRA-QUARTILE GENDER	
mq1 mean	0.435
mq1 me	-26.0%
fq1 mean	0.499
fq1 me	-56.4%
mq3 mean	0.208
mq3 me	-18.9%
fq3 mean	0.275
fq3 me	-32.0%

The strongest impacts for NOFEED occur in the 2nd expenditure quartile and diminish as households become wealthier. While the number of NOFEED observations declines as per capita expenditure rises, the fact that any household in the 'richest' quartiles suffer from food shortages shows that relatively opulent South Africans face deprivation. The weaker effects in higher expenditure quartiles may be due to differences in the severity of food insecurity. NOFEED does not measure the frequency of

household food shortage. For relatively opulent households, food shortage may be isolated, infrequent and less acute in terms of calories missed. Food shortages are likely more acute and frequent among the poorest households. If so, poorest quartile NOFEED observations represent greater deprivation than observations in richer quartiles.

The predominance of child food security effects on well-being across expenditure quartile implies substantial policy potential for improving welfare. Addressing child food security means increasing food entitlements for South Africans and ensuring transfers result in well-nourished children. Economic growth, food distribution and transfers do not automatically ensure food security, particularly when households face other deprivations. The structure of household decision-making, particularly the power of adult female members, affects the way marginal resources are used to address household deprivations and meet individual member preferences. The impact of extra resources on child food security appears to depend on who is included in household consumption decisions. When female household members or primary childcare givers command some household consumption, child food security may rise.

Model estimates by gender reveal a disparity between the impact of child food security on male and female-headed households. The reduction in probability of satisfied household SWB reports from child food insecurity is nearly ten percentage points greater for female (-34.8%) than male headed-households (-25.2%). The differing marginal effects suggest female heads are more sensitive to child food security. Bookwalter and Warner (2001) show different intra-household allocation preferences between male and female South Africans. Women show stronger preferences for food expenditures and men prefer more discretionary goods. The differing marginal effects for NOFEED

support these findings. Results may also reflect that many men are migrant workers and may not see the deprivation up close or as often.

Households that include women in resource allocation decisions are more likely to address child welfare as a primary concern. The study considers intra-quartile gender differences as well. The struggle for child food security intensifies among poorest households because different household member preferences compete for few resources. In the poorest expenditure quartile, NOFEED shows much stronger effects on female heads (-56.4%) than male heads (26%). The difference between marginal effects decreases between male and female heads in the 3rd expenditure quartile, though a fairly large disparity persists. Female decision makers appear to attach strong preferences towards child welfare even when other deprivations pose serious problems.
While male decision makers are by no means insensitive to child food security, the weight of consideration is far less than female counterparts. Extra resources appear more likely to facilitate child deprivations in households where females hold sway on household consumption decisions. Extremely poor households with female decision makers appear more likely to allocate marginal resources to child welfare despite facing severe deprivations elsewhere. Policy aimed at child welfare will have bolder effects when female household members partly control transfers. Enhancing female participation in household decision-making improves child welfare, especially among the poorest households.

Chapter V. Conclusion

i. Measuring Household SWB

The study initially asked the question, Do heads of household report household SWB based on their characteristics or those of the household? The study attempts to answer this question by estimating two models: one with head of household characteristics and one with household characteristics. The models share many variables that describe both the household and the household head and both models predict SWB with similar frequency. While this study sheds some light on the question, it remains unresolved.

Surveyors attempting to measure household well-being by asking household heads should be encouraged by several findings. (1) The head of household model does not fit head of household SWB reports better than the household model. If head of household characteristics predicted SWB better than household characteristics one might conclude that heads distort household SWB. (2) Many household indicators, such as water source, significantly influence SWB reports, suggesting household characteristics play an important role in assessments. Household goods, such as dwelling type, affect the individual welfare of the household head as well as the collective welfare of the household. Even if heads of household assess household SWB based on their personal living conditions, the affects of household goods ensure that some information about household welfare is captured in the SWB assessment. (3) Child food security greatly influences household SWB reports, suggesting non-personal characteristics play a strong role in the level of life satisfaction reported for the household. The strong effect of child food security suggests the basic needs of household members are of concern to the

household head. The degree of concern is unclear because food shortages for children may indicate food shortages for adult household members and the head of household.

While this study does not show head of household indicators predict household SWB better than household indicators, the potential for heads of household to miss some important aspects of household welfare still exists. Heads of household may not participate intensively in the day-to-day life of most household members. Perhaps migrant or wage labor demands keep them out of household production. If the head of household does not experience hardships associated with household deprivations such as poor water supply or sanitation, head of household assessments distort household well-being.

Changing survey methods might improve the policy effectiveness of SWB measures. Surveyors might only ask individual SWB questions. Individual SWB is likely influenced by household level characteristics such as dwelling type, sanitation and other indicators common to everyone in a household. The significance of basic household economic traits in modeling household SWB in South Africa suggests such traits would be important in models of individual SWB, particularly in developing countries. If so, individual SWB analysis provides useful policy information at the household level by identifying which household factors most influence people's individual SWB reports.

To examine how well households collectively function, some indication of collective household performance is desirable. Individual adult household member SWB could be averaged for a composite household measure. With individual household member SWB researchers can compare differences in SWB reports among household

members. The differing effects of household level variables on individual SWB may help explain intra-household differences in SWB and address intra-household inequality. For example, given Bookwalter and Warner's (2001) finding that females prefer household consumption of necessities, while males exhibit a relative preference for discretionary goods, we might expect members of female headed households to report higher average SWB, all other factors being equal. If women prove more sensitive to the food security of household members than men (perhaps because men work away from the home and do not experience day-to-day hunger and malnutrition among household members) government could increase the share of transfer payments going to household food consumption by establishing transfer accounts in the name of the female household head.

Again, this study concludes that head of household characteristics do not predict head of household reported household SWB better than household characteristics. However, collecting SWB assessments from household members and averaging for household SWB would provide richer research potential and avoid the validity concerns of asking one person to speak for several. Further surveying and research are needed.

ii. Policy Implications

The study focuses on the household level SWB model since the head of household level model did not improve predictions and individual SWB was unavailable. Using the head of household model would also throw away household level information on characteristics such as unemployment and crime. The household level model embodies all information from the head of household model. For example, if the

household head is unemployed, their unemployment status is factored into the household unemployment composite.

Researchers agree that basic economic factors play a role in determining SWB; however, the size of the role is disputed. The household level model, composed primarily of basic economic factors such as unemployment and housing, correctly classifies 52% of not satisfied households and 84% of satisfied households, well exceeding goodness of fit criteria. For South Africa and other developing countries, basic economic factors strongly influence perceived household welfare, thus SWB measures can help prioritize public policies. In a country where many families go without basic economic necessities, a bottom-up model of SWB provides useful information for development strategies.

Despite falling in the mid-income range nationally, 57% of South Africans lived below the income poverty line in 1996, a line that, according to Klasen (1997), underestimates true poverty. Income inequality, uprooted families, neglected education, malnourished children, and gross misallocation of public spending during the apartheid era leave massive deprivations for public action to improve (Economist, 2001).

Several areas stand out from the household SWB analysis. Unemployment of working age household members shows significant, negative impacts on household SWB. Underemployment in rural areas may be worsened by slow and ineffective land reform measures (Economist, 2001). To the extent that government can connect underemployed land and underemployed labor by facilitating land transfers from whites to blacks, some unemployment would remain. To the extent that unemployment is cyclical, the impacts

of child food security suggest increased unemployment entitlements could raise household well-being by sustaining adequate consumption during rough times.

Household crime victimization has consistent, negative effects on household SWB. Crime statistics indicate rape, murder, assault and theft were all on the rise in post-apartheid South Africa. Poor South Africans bear the brunt of victimization, adding fear to deprivation of basic needs they already confront (Economist, 2001). The study shows the largest marginal effects for crime in the richest and poorest quartiles. In addition to violent crime, poorly-trained, ill-equipped, brutal, and corrupt police forces diminish well-being for the poorest. Property theft may contribute more to decreasing well-being among the relatively rich. In 1996, the estimated cost of crime to businesses and individuals was substantial, about 40 billion rand (Economist, 2001). Honest, effective law enforcement could greatly reduce crime and fear of crime for the poorest and richest South Africans.

Unfortunately, violent crime towards women is likely exacerbated by attitudes towards women. As of 2001, between 17% and 25% of women were in abusive relationships. One woman is killed by her partner every six days (Economist, 2001). Government can reduce violent crime towards women by expanding female education opportunities and leadership roles and making it easier for women to report spousal abuse without fear of reprisal. Another factor contributing to crime but missing from the model is AIDs. Crime increases as children orphaned by AIDs turn to the streets. Often infected themselves, orphans have little to lose and few alternatives to crime. Programs keeping orphaned children off the street could reduce crime and raise welfare.

It is also important to provide families with housing. A significant portion of South African households still live in informal shack dwellings in squatter settlements. Housing improvements can increase household SWB. Moving households out of squatter-shack settlements increases well-being and likely brings improved household utilities, higher security from crime, and better access to public services. Among the middle expenditure quartiles, living in dwellings other than shacks has a significant, positive impact on perceived welfare. Household SWB for relatively rich families appears insensitive to dwelling type, perhaps because so many households in the top expenditure quartile live in homes. Subsidized housing programs and government lending assistance could move people into higher quality dwellings and increase well-being.

Household utilities also affect perceived well-being. Dwelling improvements may bring utility improvements but the two may not move in lock step. Substantial improvements in access to electricity and clean water began after the end of apartheid. Continued water, energy source and refuse disposal improvements are worthwhile policy goals. Specifically, policy should provide clean water access, such as water piped in or out of the dwelling or taken from a public tap, for households currently drawing on stagnant, dirty and disease vulnerable sources. Increasing electricity access would improve well-being, particularly for poor households currently relying on coal for heat and cooking. The poorest expenditure quartiles could benefit from refuse disposal improvements. Organized removal to some type of landfill or dump outside of the community would have positive health, sanitation and environmental impacts.

Household transportation affects perceived well-being. Among the relatively rich expenditure quartiles, any form of transport other than a personal motorized vehicle reduces the likelihood of satisfaction. Public transportation is dangerous, crowded and inefficient. Reducing the vulnerability of non-motorized, public transport and taxi commuters to theft and violence is essential. Bookwalter and Dalenberg (forthcoming) point to rival gang violence over the taxi market as a source of danger for commuters. General theft and violent crime threatens people traveling by slow and vulnerable means of transportation other than in the protection of a personal vehicle. The government can reduce hardship associated with transportation by providing safe, effective public transportation.

For most South Africans the ability or inability to feed their children significantly affects perceived well-being. In many cases the lack of food for children means a lack of food for adults as well. Adequate nutrition is essential for a healthy, productive society. School lunch programs should continue to ensure children receive at least one adequate meal per day, school breakfast would ensure two. The school lunch program is already active. Providing breakfast before school would free up additional household resources to feed adults or meet other needs. One drawback to a school meal plan is that it only benefits enrolled children. At the same time free school meals provide an incentive for enrollment and attendance and ensure that public resources convert directly into child nourishment. Transfer payments during hard times could also sustain food security.

This study supports evidence that, in South Africa, females are more sensitive to the basic needs of all household members than men. Though inability to feed children for any period of time substantially lowers household SWB assessments of male household

heads, the effect is even larger for female-headed households. Many South African men migrate to find employment and/or share little responsibility for childcare because of work demands outside the household and traditional roles. Transfers intended for food and children may better achieve their intended purpose if mothers or female household members control outlays from the payment. Whether government addresses child food security through school programs, transfer payments to households, a combination of the two or some other means, effective policies could significantly raise household well-being. Given the importance of child food security, future surveys should include a measure of food shortage duration and an indication of how households dealt with the shortage. Some households undoubtedly face more acute shortages than others and understanding how shortages are dealt with could speed public relief efforts.

iii. Future Survey Design and Research Topics

Though the 1998 survey provided important data for a model of South African household level SWB, several potentially important well-being determinants went unmeasured. The exclusion of a specific question about AIDs infection in the household is an important oversight. Implementing policies based on the presented model and results would be worthless without serious efforts to control the AIDs epidemic. As of 2001 South Africa had more HIV positive people than any other country in the world. The epidemic dramatically lowers average life expectancy and inflicts immense personal suffering. Many children orphaned by AIDs place additional strain on already deprived extended family or, abandoned entirely, turn to the street and crime. (Economist, Feb 2002) In South Africa it is impossible to imagine that AIDs does not strongly influence every household's way of life. At the time of the survey South African leadership

denied the problem and failed to take relatively straight forward preventative measures such as educating the public about how the disease is transmitted. Only recently has the government sought to reverse its grave irresponsibility. Any serious development strategy in South Africa begins with fighting AIDs. Future surveys aimed at welfare assessment and policy design must provide detailed information about AIDs victims.

Several other factors could improve the model of South African household SWB. An indication of credit access and land ownership would indicate the extent to which market opportunities influence SWB. Information on retirees could indicate whether pension schemes affect household and individual SWB. Specific information on the types of crime household members experience would allow for in-depth examination of the relationship between crime and SWB and more useful policy suggestions.

An improved health access measure might reveal a significant relationship between medical aid access and SWB. This study used the extent of medical scheme coverage in the household. A better indicator of health care access might be obtained by asking: during the past 12 months is there any point where the household could not afford or obtain medical treatment? More specifically households where serious illness occurred during the past year could tell surveyors whether or not modern medical treatment was available.

Moller and Saris (2001) found political expectations strongly affected perceived well-being of blacks and whites during the transition to democracy in South Africa. Frey and Stutzer (2002) find political institutions and degree of political participation have substantial affects on SWB reports among Europeans. For South Africans, inept and corrupt local government or police are not uncommon. Furthermore some of the initial

euphoria surrounding the transition to democracy gave way to political and social realities. Indicators of local politics and law enforcement might explain some variation in SWB reports as well.

Appendix A – LIMDEP Program

```
reset$
title;SWB Analysis$
read;file=Q:\swb8xl.csv;nobs=13434;nvar=77;names=10$
?dstat; rhs=UQNR,HMEDAID,HDSBLTY,HCRIME,RACE,SWB,PAST,TOTEXP,PROV,
       URBRURAL,ELCTRC,GAS,PAR,WOOD,COAL,DUNG,PCTNOACT,
       PCTUNEMP,AVGED,HHHAGE,HHHMRG,RMPPRSN,PIPEDIN,PUBTAP,
       TRUCKIN,BORHOLE,RAIN,FLOW,STAG,WELL,FLUSH,CHEMTLT,
       PITVENT,PITOTHR,BUCKET,NOTOILT,LOCAUTH,COMRMV,COMDMP,
       OWNDMP,NORMVL,BETTER,SAME,WORSE,NEVER,CIVIL,TRAD,
       LIVWITH,WIDOW,DIVSEP,GENDER,MEDAID,DSBLTY,CRIME,NOTACT,
       UNEMP,EDYRS,PRIVATE,PUBLIC,NONMTR,TAXI,SATP,SATN,HOUSE,
       TRDHUT,FLTAPTEX,OUTBACK,SQTSHCK,ROOM,HOSTEL,PIPEDOUT,
       SPRING,NPERSON,OWNRSHP,NOFEED,FEED,NAFEED$

sample; all$
?histogram; rhs=xpc; int=20$
create;xpc = totexp/nperson$
create;if(swb<=2)sat=0;(else)sat=1$
dstat; rhs=sat$
dstat; rhs=xpc; quantiles$
create; ltotexp= log(totexp)$

namelist;xhouse=one,HMEDAID,HDSBLTY,HCRIME,PCTUNEMP,PCTNOACT,
       AVGED,HHHAGE,NPERSON,TOTEXP,NOFEED,FEED,PUBLIC,NONMTR,TAXI,
       PIPEDIN,PIPEDOUT,PUBTAP,TRUCKIN,BORHOLE,RAIN,FLOW,WELL,FLUSH,
       CHEMTLT,PITVENT,PITOTHR,BUCKET,LOCAUTH,COMRMV,COMDMP,OWNDMP,
       ELCTRC,GAS,PAR,DUNG,COAL,HOUSE,TRDHUT,FLTAPTEX,OUTBACK,ROOM,
       HOSTEL,CIVIL,TRAD,LIVWITH,WIDOW,NEVER,GENDER,URBRURAL$

namelist;xhead=one,MEDAID,DSBLTY,CRIME,UNEMP,NOTACT,
       EDYRS,HHHAGE,NPERSON,TOTEXP,NOFEED,FEED,PUBLIC,NONMTR,TAXI,
       PIPEDIN,PIPEDOUT,PUBTAP,TRUCKIN,BORHOLE,RAIN,FLOW,WELL,FLUSH,
       CHEMTLT,PITVENT,PITOTHR,BUCKET,LOCAUTH,COMRMV,COMDMP,OWNDMP,
       ELCTRC,GAS,PAR,DUNG,COAL,HOUSE,TRDHUT,FLTAPTEX,OUTBACK,ROOM,
       HOSTEL,CIVIL,TRAD,LIVWITH,WIDOW,NEVER,GENDER,URBRURAL$

namelist;xcombo=one,HMEDAID,HDSBLTY,HCRIME,PCTUNEMP,PCTNOACT,
       AVGED,MEDAID,DSBLTY,CRIME,UNEMP,NOTACT,
       EDYRS,HHHAGE,NPERSON,TOTEXP,NOFEED,FEED,PUBLIC,NONMTR,TAXI,
       PIPEDIN,PIPEDOUT,PUBTAP,TRUCKIN,BORHOLE,RAIN,FLOW,WELL,FLUSH,
       CHEMTLT,PITVENT,PITOTHR,BUCKET,LOCAUTH,COMRMV,COMDMP,OWNDMP,
       ELCTRC,GAS,PAR,DUNG,COAL,HOUSE,TRDHUT,FLTAPTEX,OUTBACK,ROOM,
       HOSTEL,CIVIL,TRAD,LIVWITH,WIDOW,NEVER,GENDER,URBRURAL$

?Logit - entire sample combined model, unrestricted$
logit;lhs=sat;rhs=xcombo$

?Logit   entire sample household level$
logit;lhs=sat;rhs=xhouse;marginal effects$

?marginal effects   dum corrections house level$

?Do loop$
matrix;dm=[10_0,40_1]$
matrix;dum=dm'$
calc;list;dchk=row(dum)$
```

```
matrix;mx=mean(xhouse);mb=mx'b$
matrix;mdmhouse=init(kreg,1,0)$
calc;i=1$
proc=me$
label;1$
matrix;mbb=b'mx$
calc;dumchk=dum(i,1)$

go to;3;dumchk=0$
matrix;mbb0=mbb-b(i,1)*mx(i,1);mbb1=mbb0+b(i,1)$
calc;impact=(1/(1+exp(-1*mbb1))) (1/(1+exp(-1*mbb0)))$

go to;2$
label;3$
matrix;bi=b(i,1)$
calc;impact=(exp(mbb)/((1+exp(mbb))^2))*bi$

label;2$
matrix;mdmhouse(i,1)=impact$
calc;i=i+1$
go to;1;i<=kreg$

endproc$
execute$

?Start and End$
matrix;shouse=init(50,1,mbb)$
matrix;ehouse=shouse+mdmhouse$



?Logit   entire sample head level$
logit;lhs=sat;rhs=xhead;marginal effects$

?marginal effects   dum corrections head level$

?Do loop$
matrix;dm=[10_0,40_1]$
matrix;dum=dm'$
calc;list;dchk=row(dum)$
matrix;mx=mean(xhead);mb=mx'b$
matrix;mdmhead=init(kreg,1,0)$
calc;i=1$
proc=me$
label;1$
matrix;mbb=b'mx$
calc;dumchk=dum(i,1)$

go to;3;dumchk=0$
matrix;mbb0=mbb-b(i,1)*mx(i,1);mbb1=mbb0+b(i,1)$
calc;impact=(1/(1+exp(-1*mbb1)))-(1/(1+exp(-1*mbb0)))$

go to;2$
label;3$
matrix;bi=b(i,1)$
calc;impact=(exp(mbb)/((1+exp(mbb))^2))*bi$

label;2$
matrix;mdmhead(i,1)=impact$
```

```
calc;i=i+1$
go to;1;i<=kreg$

endproc$
execute$

?Start and End$
matrix;shead=init(50,1,mbb)$
matrix;ehead=shead+mdmhead$


create;if(xpc<=72.2222)q1=1;(else) q1=0$
create;if(xpc>72.2222 & xpc<=140)q2=1;(else) q2=0$
create;if(xpc>140 & xpc<=333.3333)q3=1;(else) q3=0$
create;if(xpc>333.3333)q4=1;(else) q4=0$

dstat; rhs=q1,q2,q3,q4$

create;if(gender=1)male=1;(else) male=0$
create;if(gender=0)female=1;(else) female=0$

dstat; rhs=male,female$


?Logit   exp quartile 1 household level
reject;new;q1#1$
dstat;rhs=*$
logit;lhs=sat;rhs=xhouse;marginal effects$


?Logit   exp quartile 1 head level$
logit;lhs=sat;rhs=xhead;marginal effects$


?Logit   exp quartile 2 household level
reject;new;q2#1$
dstat;rhs=*$
logit;lhs=sat;rhs=xhouse;marginal effects$


?Logit   exp quartile 2 head level$
logit;lhs=sat;rhs=xhead;marginal effects$

?Logit   exp quartile 3 household level
reject;new;q3#1$
dstat;rhs=xhouse$
logit;lhs=sat;rhs=xhouse;marginal effects$


?Logit   exp quartile 3 head level$
logit;lhs=sat;rhs=xhead;marginal effects$


?Logit   exp quartile 4 household level
reject;new;q4#1$
dstat;rhs=*$
logit;lhs=sat;rhs=xhouse;marginal effects$
```

```
?Logit    exp quartile 4 head level$
logit;lhs=sat;rhs=xhead;marginal effects$

?namelist; xhousg=one,HMEDAID,HDSBLTY,HCRIME,PCTUNEMP,PCTNOACT,
       AVGED,HHHAGE,NPERSON,TOTEXP,RMPPRSN,NOFEED,FEED,PUBLIC,NONMTR,TAXI,
       PIPEDIN,PIPEDOUT,PUBTAP,TRUCKIN,BORHOLE,RAIN,FLOW,WELL,FLUSH,
       CHEMTLT,PITVENT,PITOTHR,BUCKET,LOCAUTH,COMRMV,COMDMP,OWNDMP,
       ELCTRC,GAS,PAR,DUNG,COAL,HOUSE,TRDHUT,FLTAPTEX,OUTBACK,ROOM,HOSTEL,
       CIVIL,TRAD,LIVWITH,WIDOW,NEVER,URBRURAL$

?namelist; xheadg=one,one,MEDAID,DSBLTY,CRIME,UNEMP,NOTACT,
       EDYRS,HHHAGE,NPERSON,TOTEXP,RMPPRSN,NOFEED,FEED,PUBLIC,NONMTR,
       TAXI,PIPEDIN,PIPEDOUT,PUBTAP,TRUCKIN,BORHOLE,RAIN,FLOW,WELL,FLUSH,
       CHEMTLT,PITVENT,PITOTHR,BUCKET,LOCAUTH,COMRMV,COMDMP,OWNDMP,
       ELCTRC,GAS,PAR,DUNG,COAL,HOUSE,TRDHUT,FLTAPTEX,OUTBACK,ROOM,HOSTEL,
       CIVIL,TRAD,LIVWITH,WIDOW,NEVER,URBRURAL$


?Logit    male head household level$
reject;new;male#1$
dstat;rhs=*$
?histogram; rhs=nofeed$
logit;lhs=sat;rhs=xhousg;marginal effects$


?Logit    male head head level$
logit;lhs=sat;rhs=xheadg;marginal effects$


?Logit    female head household level$
reject;new;female#1$
dstat;rhs=*$
?histogram; rhs=nofeed$
logit;lhs=sat;rhs=xhousg;marginal effects$

?Logit    female head head level$
logit;lhs=sat;rhs=xheadg;marginal effects$


?Logit    male head household level exp quartile 1$
reject;new;male#1$
reject;q1#1$
histogram; rhs=nofeed$
dstat;rhs=*$
logit;lhs=sat;rhs=xhousg;marginal effects$


?Logit    male head head level exp quartile 1$
logit;lhs=sat;rhs=xheadg;marginal effects$


?Logit    female head household level exp quartile 1$
reject;new;female#1$
reject;q1#1$
histogram; rhs=nofeed$
dstat;rhs=*$
logit;lhs=sat;rhs=xhousg;marginal effects$

?Logit    female head head level exp quartile 1$
```

```
logit;lhs=sat;rhs=xheadg;marginal effects$

?Logit   male head household level exp quartile 2$
reject;new;male#1$
reject;q2#1$
dstat;rhs=*$
logit;lhs=sat;rhs=xhousg;marginal effects$


?Logit   male head head level exp quartile 2$
logit;lhs=sat;rhs=xheadg;marginal effects$


?Logit - female head household level exp quartile 2$
reject;new;female#1$
reject;q2#1$
dstat;rhs=*$
logit;lhs=sat;rhs=xhousg;marginal effects$

?Logit   female head head level exp quartile 2$
logit;lhs=sat;rhs=xheadg;marginal effects$

?Logit   male head household level exp quartile 3$
reject;new;male#1$
reject;q3#1$
dstat;rhs=*$
logit;lhs=sat;rhs=xhousg;marginal effects$

?Logit   male head head level exp quartile 3$
logit;lhs=sat;rhs=xheadg;marginal effects$

?Logit - female head household level exp quartile 3(no dungs, wood base case)$
reject;new;female#1$
reject;q3#1$
dstat;rhs=*$
logit;lhs=sat;rhs=one,HMEDAID,HDSBLTY,HCRIME,PCTUNEMP,PCTNOACT,
       AVGED,TOTEXP,RMPPRSN,NOFEED,FEED,PRIVATE,PUBLIC,NONMTR,
       PIPEDIN,PIPEDOUT,PUBTAP,TRUCKIN,BORHOLE,RAIN,FLOW,FLUSH,
       PITVENT,PITOTHR,BUCKET,LOCAUTH,COMRMV,COMDMP,OWNDMP,
       ELCTRC,GAS,PAR,COAL,HOUSE,TRDHUT,FLTAPTEX,OUTBACK,ROOM,
       CIVIL,TRAD,LIVWITH,WIDOW,DIVSEP,HHHAGE,NPERSON,URBRURAL;
       marginal effects$

?Logit - female head head level exp quartile 3(no dungs, wood base case)$
logit;lhs=sat;rhs=one,MEDAID,DSBLTY,CRIME,UNEMP,NOTACT,
       EDYRS,TOTEXP,RMPPRSN,NOFEED,FEED,PRIVATE,PUBLIC,NONMTR,
       PIPEDIN,PIPEDOUT,PUBTAP,TRUCKIN,BORHOLE,RAIN,FLOW,FLUSH,
       CHEMTLT,PITVENT,PITOTHR,BUCKET,LOCAUTH,COMRMV,COMDMP,OWNDMP,
       ELCTRC,GAS,PAR,COAL,HOUSE,TRDHUT,FLTAPTEX,OUTBACK,ROOM,HOSTEL,
       CIVIL,TRAD,LIVWITH,WIDOW,DIVSEP,HHHAGE,NPERSON,URBRURAL;
       marginal effects$

?KwaZulu-Natal Province
reject; new;prov#5$
?histogram; rhs=swb$
?histogram; rhs=sat$
dstat; rhs=*$
?Logit   KZN household level$
logit;lhs=sat;rhs=xhouse;marginal effects$
```

```
?Logit   KZN head level$
logit;lhs=sat;rhs=xhead;marginal effects$

sample;all$

reject; new;sat#0$
histogram; rhs=swb$
create;if(swb=0) VD=1;(else)VD=0$
dstat; rhs=VD$
?Dis/very dis   head model
logit;lhs=VD;rhs=xhead;marginal effects$
```

Appendix B – Complete Estimation Results

i. Household level model

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	SAT
Weighting variable	ONE
Number of observations	13434
Iterations completed	5
Log likelihood function	-7752.865
Restricted log likelihood	-8972.107
Chi-squared	2438.485
Degrees of freedom	49
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Characteristics in numerator of Prob[Y = 1]				
Constant	.7511525634E-01	.19670759	.382	.7026	
HMEDAID	.1385986904	.74992966E-01	1.848	.0646	.16294328
HDSBLTY	-.2730958590	.16857960	-1.620	.1052	.38241775E-01
HCRIME	-1.019974412	.18262172	-5.585	.0000	.18951913E-01
PCTUNEMP	-.7368574015	.10719562	-6.874	.0000	.10466503
PCTNOACT	-.8373560918E-01	.76733167E-01	-1.091	.2752	.55841894
AVGED	.1345483611E-01	.70302968E-02	1.914	.0556	8.8134852
HHHAGE	.4195636206E-02	.16111941E-02	2.604	.0092	48.364523
NPERSON	-.4584261602E-01	.87144686E-02	-5.261	.0000	4.9100789
TOTEXP	-.1196017168E-05	.11368023E-04	-.105	.9162	1255.2057
NOFEED	-1.214803294	.80431637E-01	-15.104	.0000	.28919160
FEED	.3075016046	.74088628E-01	4.150	.0000	.61753759
PUBLIC	-.3475044240	.72996437E-01	-4.761	.0000	.17128182
NONMTR	-.2772164555	.68833986E-01	-4.027	.0001	.35960994
TAXI	-.3045019965	.73861488E-01	-4.123	.0000	.22748251
PIPEDIN	.3942197814	.12152464	3.244	.0012	.37732619
PIPEDOUT	.4124129020	.10519031	3.921	.0001	.24735745
PUBTAP	.2627728636	.98776174E-01	2.660	.0078	.19696293
TRUCKIN	.3964645924E-01	.18059157	.220	.8262	.14068781E-01
BORHOLE	.1934885165	.12570596	1.539	.1238	.43471788E-01
RAIN	.4046161423	.35303705	1.146	.2518	.32008337E-02
FLOW	.3867555541	.11566787	3.344	.0008	.54116421E-01
WELL	.8475584006	.20425026	4.150	.0000	.10644633E-01
FLUSH	.2330931473E-02	.11091383	.021	.9832	.48042281
CHEMTLT	.1648656763	.34137167	.483	.6291	.32008337E-02
PITVENT	.1028198046	.82777928E-01	1.242	.2142	.12460920
PITOTHR	-.9094075652E-01	.72527160E-01	-1.254	.2099	.22212297
BUCKET	.2467110617	.13005791	1.897	.0578	.43397350E-01
LOCAUTH	.1843711550	.98326731E-01	1.875	.0608	.51600417
COMRMV	.4835954517	.19615721	2.465	.0137	.12877773E-01
COMDMP	-.3100653185	.19020168	-1.630	.1031	.11612327E-01
OWNDMP	.2463067827	.68045476E-01	3.620	.0003	.35670686
ELCTRC	.1766562676	.74842149E-01	2.360	.0183	.51064463
GAS	.2841283216	.13340360	2.130	.0332	.26872116E-01
PAR	-.9563255001E-01	.70687394E-01	-1.353	.1761	.17760905
DUNG	-.1049714084	.28024019	-.375	.7080	.46151556E-02
COAL	-.2617832547	.10454906	-2.504	.0123	.43397350E-01
HOUSE	.3891803819	.81766174E-01	4.760	.0000	.67128182
TRDHUT	.1762182619	.97570398E-01	1.806	.0709	.13540271
FLTAPTEX	.2981073871	.11962173	2.492	.0127	.54116421E-01
OUTBACK	.2507888781	.12105464	2.072	.0383	.37144559E-01
ROOM	.5325556294	.18285665	2.912	.0036	.13622153E-01

HOSTEL	.2667269521	.22465947	1.187	.2351	.81137413E-02
CIVIL	.2093916169	.79247474E-01	2.642	.0082	.18743487
TRAD	-.7660668168E-01	.92113764E-01	-.832	.4056	.80616347E-01
LIVWITH	-.2088711027E-01	.84649631E-01	-.247	.8051	.15780855
WIDOW	-.6952292225E-01	.10774956	-.645	.5188	.47640316E-01
NEVER	.1678693334	.74281555E-01	2.260	.0238	.41283311
GENDER	-.1200812240	.52456695E-01	-2.289	.0221	.60890278
URBRURAL	-.1419431401	.83176498E-01	-1.707	.0879	.54816138

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	2708	2505	5213
1	1310	6911	8221
Total	4018	9416	13434

ii. Head of household model

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	SAT
Weighting variable	ONE
Number of observations	13434
Iterations completed	5
Log likelihood function	-7761.511
Restricted log likelihood	-8972.107
Chi-squared	2421.192
Degrees of freedom	49
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Characteristics in numerator of Prob[Y = 1]					
Constant	.3876269483E-01	.19280065	.201	.8407	
MEDAID	.7073623113E-01	.67178993E-01	1.053	.2924	.17291946
DSBLTY	-.1771743379	.80962494E-01	-2.188	.0286	.62825666E-01
CRIME	-.6126683282	.10897880	-5.622	.0000	.32603841E-01
UNEMP	-.4489747449	.79054422E-01	-5.679	.0000	.71981539E-01
NOTACT	.1597422707E-01	.52215499E-01	.306	.7597	.43389906
EDYRS	.1332275147E-01	.51982986E-02	2.563	.0104	7.6525979
HHHAGE	.3793137535E-02	.17368690E-02	2.184	.0290	48.364523
NPERSON	-.4628095725E-01	.86635988E-02	-5.342	.0000	4.9100789
TOTEXP	.2860029472E-05	.11435096E-04	.250	.8025	1255.2057
NOFEED	-1.199226390	.80259859E-01	-14.942	.0000	.28919160
FEED	.3262656539	.73920474E-01	4.414	.0000	.61753759
PUBLIC	-.3712091110	.72838361E-01	-5.096	.0000	.17128182
NONMTR	-.3119294863	.68373372E-01	-4.562	.0000	.35960994
TAXI	-.3523956827	.73012633E-01	-4.827	.0000	.22748251
PIPEDIN	.4036332453	.12140003	3.325	.0009	.37732619
PIPEDOUT	.4131946432	.10531191	3.924	.0001	.24735745
PUBTAP	.2570193224	.98844193E-01	2.600	.0093	.19696293
TRUCKIN	.4184594144E-01	.18062465	.232	.8168	.14068781E-01
BORHOLE	.1745390252	.12574876	1.388	.1651	.43471788E-01
RAIN	.4299358115	.35273073	1.219	.2229	.32008337E-02
FLOW	.3732439301	.11569882	3.226	.0013	.54116421E-01
WELL	.8410171846	.20427631	4.117	.0000	.10644633E-01

FLUSH	.9907990091E-03	.11057835	.009	.9929	.48042281
CHEMTLT	.1676133370	.33969856	.493	.6217	.32008337E-02
PITVENT	.1069819060	.82585139E-01	1.295	.1952	.12460920
PITOTHR	-.9347705334E-01	.72302713E-01	-1.293	.1961	.22212297
BUCKET	.2587460612	.12993246	1.991	.0464	.43397350E-01
LOCAUTH	.1766390186	.98276595E-01	1.797	.0723	.51600417
COMRMV	.4829509827	.19521165	2.474	.0134	.12877773E-01
COMDMP	-.3295529181	.19055663	-1.729	.0837	.11612327E-01
OWNDMP	.2438694628	.68072596E-01	3.582	.0003	.35670686
ELCTRC	.1650406639	.74585740E-01	2.213	.0269	.51064463
GAS	.2726372279	.13343976	2.043	.0410	.26872116E-01
PAR	-.1142538633	.70662940E-01	-1.617	.1059	.17760905
DUNG	-.1303736776	.27963326	-.466	.6411	.46151556E-02
COAL	-.2624852276	.10466139	-2.508	.0121	.43397350E-01
HOUSE	.3964525607	.81705842E-01	4.852	.0000	.67128182
TRDHUT	.1717167467	.97507367E-01	1.761	.0782	.13540271
FLTAPTEX	.3036136074	.11959352	2.539	.0111	.54116421E-01
OUTBACK	.2550814290	.12099252	2.108	.0350	.37144559E-01
ROOM	.5384669174	.18239062	2.952	.0032	.13622153E-01
HOSTEL	.2438539396	.22327461	1.092	.2748	.81137413E-02
CIVIL	.2163465963	.79355879E-01	2.726	.0064	.18743487
TRAD	-.6821076572E-01	.91895797E-01	-.742	.4579	.80616347E-01
LIVWITH	-.2135229291E-01	.84658513E-01	-.252	.8009	.15780855
WIDOW	-.5361078474E-01	.10804659	-.496	.6198	.47640316E-01
NEVER	.1859307198	.74277501E-01	2.503	.0123	.41283311
GENDER	-.1134192154	.53091729E-01	-2.136	.0327	.60890278
URBRURAL	-.1641561158	.83048524E-01	-1.977	.0481	.54816138

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	2683	2530	5213
1	1293	6928	8221
Total	3976	9458	13434

iii. Expenditure quartile 1

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	SAT
Weighting variable	ONE
Number of observations	3354
Iterations completed	5
Log likelihood function	-2010.330
Restricted log likelihood	-2324.553
Chi-squared	628.4452
Degrees of freedom	49
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Characteristics in numerator of Prob[Y = 1]					
Constant	-.2262425932	.41837715	-.541	.5887	
HMEDAID	-.2045328603E-01	.39894156	-.051	.9591	.13073942E-01
HDSBLTY	.5423578511	.44981769	1.206	.2279	.33026237E-01

HCRIME	-1.737320231	.66715156	-2.604	.0092	.86076327E-02
PCTUNEMP	-.8114071917	.21707540	-3.738	.0002	.13106440
PCTNOACT	-.7851258485E-01	.17251609	-.455	.6490	.67680382
AVGED	.1518659010E-01	.14178497E-01	1.071	.2841	6.7276237
HHHAGE	.5706013541E-02	.32241292E-02	1.770	.0768	49.944842
NPERSON	-.3303045160E-01	.19093493E-01	-1.730	.0836	6.6466905
TOTEXP	.2992392921E-03	.33946653E-03	.881	.3780	300.09213
NOFEED	-1.193137644	.24834086	-4.804	.0000	.46809779
FEED	.4182318485	.24704707	1.693	.0905	.50805009
PUBLIC	-.2333943176	.21460577	-1.088	.2768	.14907573
NONMTR	-.1808644204	.19894679	-.909	.3633	.52295766
TAXI	-.2539455720	.20836393	-1.219	.2229	.28503280
PIPEDIN	.3205701520	.21894626	1.464	.1432	.10137150
PIPEDOUT	.3689616828	.16594004	2.223	.0262	.27519380
PUBTAP	.3068905882	.14922027	2.057	.0397	.29039952
TRUCKIN	-.9470592517E-01	.28718761	-.330	.7416	.22659511E-01
BORHOLE	.2123583465	.19215510	1.105	.2691	.70065593E-01
RAIN	.6205622593	.56235202	1.104	.2698	.47704234E-02
FLOW	.5057663641	.16802218	3.010	.0026	.10614192
WELL	.9763561698	.27886896	3.501	.0005	.23553965E-01
FLUSH	-.4809676435E-01	.20464214	-.235	.8142	.18395945
CHEMTLT	-.2242835434	.73636923	-.305	.7607	.23852117E-02
PITVENT	.9878915953E-01	.12972962	.762	.4464	.17710197
PITOTHR	.1343748241	.11082050	1.213	.2253	.32677400
BUCKET	.1144478338	.23435262	.488	.6253	.54561717E-01
LOCAUTH	.4140026714	.19649231	2.107	.0351	.24478235
COMRMV	.5994652318	.44368370	1.351	.1767	.83482409E-02
COMDMP	-.1019657867	.38559432	-.264	.7914	.11031604E-01
OWNDMP	.2589442056	.11030825	2.347	.0189	.57125820
ELCTRC	.3248655313	.13242534	2.453	.0142	.21228384
GAS	.2699994765	.29732620	.908	.3638	.18485391E-01
PAR	.3215246564E-02	.11840698	.027	.9783	.21943948
DUNG	.3669606617E-01	.36439977	.101	.9198	.11329756E-01
COAL	-.4436785754	.17672994	-2.510	.0121	.62313655E-01
HOUSE	.1015044357	.16786336	.605	.5454	.57394156
TRDHUT	-.3314148711E-01	.18384693	-.180	.8569	.27370304
FLTAPTEX	.5095718027	.38407706	1.327	.1846	.12820513E-01
OUTBACK	.1570054675	.23890036	.657	.5111	.42933810E-01
ROOM	.3595376272	.34236777	1.050	.2936	.16398330E-01
HOSTEL	1.200424207	.71180020	1.686	.0917	.32796661E-02
CIVIL	.6952906731E-01	.14555700	.478	.6329	.28890877
TRAD	-.1184343538	.18163147	-.652	.5144	.87358378E-01
LIVWITH	-.1199541941	.15569766	-.770	.4410	.21228384
WIDOW	-.5104830136E-01	.21007969	-.243	.8080	.48598688E-01
NEVER	.5723961555E-01	.14981412	.382	.7024	.24329159
GENDER	-.1432060558	.98323310E-01	-1.456	.1453	.48747764
URBRURAL	-.1312870640	.17516267	-.750	.4535	.28592725

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	1155	543	1698
1	487	1169	1656
Total	1642	1712	3354

iv. Expenditure quartile 2

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	SAT
Weighting variable	ONE
Number of observations	3458
Iterations completed	5
Log likelihood function	-2064.286
Restricted log likelihood	-2364.863
Chi-squared	601.1547
Degrees of freedom	49
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Characteristics in numerator of Prob[Y = 1]				
Constant	.1446838226	.38086838	.380	.7040	
HMEDAID	.6227695606	.24428654	2.549	.0108	.42125506E-01
HDSBLTY	-.3632558388	.33733742	-1.077	.2816	.42293233E-01
HCRIME	-.9964797416	.46158635	-2.159	.0309	.12417582E-01
PCTUNEMP	-.5739866287	.21066027	-2.725	.0064	.12475419
PCTNOACT	-.3034811338E-01	.15956834	-.190	.8492	.61908907
AVGED	.2122224374E-01	.13785142E-01	1.540	.1237	7.5126489
HHHAGE	-.9650093743E-03	.30955395E-02	-.312	.7552	49.911510
NPERSON	-.8104861247E-01	.38870438E-01	-2.085	.0371	5.1720648
TOTEXP	.1840454568E-03	.36375186E-03	.506	.6129	527.52689
NOFEED	-1.361632020	.19712383	-6.907	.0000	.35280509
FEED	.2012320846	.19289948	1.043	.2969	.60497397
PUBLIC	-.1319269725	.16592351	-.795	.4266	.19809138
NONMTR	-.1708812950	.15714640	-1.087	.2769	.43146327
TAXI	-.2047622682	.16606409	-1.233	.2176	.29236553
PIPEDIN	.4051749781	.21303393	1.902	.0572	.19838057
PIPEDOUT	.5284803357	.18201037	2.904	.0037	.32648930
PUBTAP	.2357040904	.17212112	1.369	.1709	.25477154
TRUCKIN	.2970124995	.30198525	.984	.3253	.20532099E-01
BORHOLE	.3819413805	.22854788	1.671	.0947	.49450549E-01
RAIN	-.7169193481E-01	.62602024	-.115	.9088	.34702140E-02
FLOW	.4875933588	.20578849	2.369	.0178	.67958357E-01
WELL	.7225791438	.37302653	1.937	.0527	.12145749E-01
FLUSH	-.2512896119	.19689328	-1.276	.2019	.32735685
CHEMTLT	.3806501628E-01	.49498741	.077	.9387	.60728745E-02
PITVENT	.4304154169E-01	.14470943	.297	.7661	.16801619
PITOTHR	-.1513637094	.12858762	-1.177	.2391	.28744939
BUCKET	.5927326417E-01	.22965824	.258	.7963	.57547715E-01
LOCAUTH	.2663893089	.17849186	1.492	.1356	.39097744
COMRMV	1.188168467	.42163856	2.818	.0048	.10410642E-01
COMDMP	-.1420682902	.31592183	-.450	.6529	.16772701E-01
OWNDMP	.3115376150	.12113004	2.572	.0101	.45864662
ELCTRC	-.1575423668	.12796770	-1.231	.2183	.36784268
GAS	-.1584317069E-02	.24282087	-.007	.9948	.30075188E-01
PAR	-.2157508748	.12199989	-1.768	.0770	.24233661
DUNG	-.1884351353	.49755928	-.379	.7049	.57836900E-02
COAL	-.1871431269	.18084172	-1.035	.3007	.58704453E-01
HOUSE	.5070096941	.14073423	3.603	.0003	.64025448
TRDHUT	.2412195335	.16990228	1.420	.1557	.16223250
FLTAPTEX	.5354058199	.28146565	1.902	.0571	.24869867E-01
OUTBACK	.4519926335	.22134455	2.042	.0411	.41353383E-01
ROOM	.5955675755	.32248385	1.847	.0648	.17061885E-01
HOSTEL	.3599003825	.41360648	.870	.3842	.89647195E-02

CIVIL	.3784141378	.14865453	2.546	.0109	.22585309
TRAD	-.1565069732	.17419662	-.898	.3689	.90514748E-01
LIVWITH	.2347672259	.15835611	1.483	.1382	.20532099
WIDOW	.1180915201	.20640150	.572	.5672	.48004627E-01
NEVER	.3425170965	.14407436	2.377	.0174	.30624639
GENDER	-.1237013577	.96643924E-01	-1.280	.2006	.52891845
URBRURAL	.1536141728E-01	.15424898	.100	.9207	.43204164

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	855	639	1494
1	404	1560	1964
Total	1259	2199	3458

v. Expenditure quartile 3

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	SAT
Weighting variable	ONE
Number of observations	3209
Iterations completed	5
Log likelihood function	-1857.864
Restricted log likelihood	-2107.375
Chi-squared	499.0233
Degrees of freedom	48
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Characteristics in numerator of Prob[Y = 1]					
Constant	.2761312537E-01	.42343848	.065	.9480	
HMEDAID	.2367768747	.15120993	1.566	.1174	.12596447
HDSBLTY	-.3616184801	.29253733	-1.236	.2164	.45406669E-01
HCRIME	-.3933323087	.37339380	-1.053	.2922	.17852914E-01
PCTUNEMP	-.9630404410	.21884739	-4.401	.0000	.10373325
PCTNOACT	-.1382169628	.15587544	-.887	.3752	.52336865
AVGED	.3013957723E-02	.14394603E-01	.209	.8342	8.7665160
HHHAGE	.5271456780E-02	.33902702E-02	1.555	.1200	47.299159
NPERSON	-.5896787440E-02	.40186899E-01	-.147	.8833	4.2602057
TOTEXP	-.1536022753E-03	.17477833E-03	-.879	.3795	894.05609
NOFEED	-1.000709347	.15648711	-6.395	.0000	.23247117
FEED	.5537357821	.14296106	3.873	.0001	.66936740
PUBLIC	-.3329252076	.13684905	-2.433	.0150	.23247117
NONMTR	-.1998316763	.13224047	-1.511	.1308	.35244624
TAXI	-.1597365111	.14316346	-1.116	.2645	.23558741
PIPEDIN	.2144378232	.27245118	.787	.4312	.38018074
PIPEDOUT	.2928475883	.25070228	1.168	.2428	.29230290
PUBTAP	.1818128389	.24331683	.747	.4549	.19975070
TRUCKIN	-.3518130152	.43635779	-.806	.4201	.10906825E-01
BORHOLE	-.1159736762	.29237364	-.397	.6916	.40822686E-01
RAIN	.7530872185	.75550893	.997	.3189	.37394827E-02
FLOW	.9260207814E-01	.30134766	.307	.7586	.32408850E-01
WELL	.6988583757	.55638162	1.256	.2091	.62324712E-02

FLUSH	-.3481341892E-01	.23416544	-.149	.8818	.52290433
CHEMTLT	.7995006198	.76901102	1.040	.2985	.34278591E-02
PITVENT	.4381612597E-01	.19461489	.225	.8219	.12371455
PITOTHR	-.4076766434	.17418450	-2.340	.0193	.21938299
BUCKET	.2045751996	.26722022	.766	.4439	.49548146E-01
LOCAUTH	.1137167025E-01	.19028992	.060	.9523	.56684325
COMRMV	-.5034621710E-01	.31401974	-.160	.8726	.22748520E-01
COMDMP	-.6759750224	.36881327	-1.833	.0668	.13399813E-01
OWNDMP	.2013568493	.14864855	1.355	.1756	.30040511
ELCTRC	.2544496356	.16296604	1.561	.1184	.56216890
GAS	.2786849689	.24321906	1.146	.2519	.41134310E-01
PAR	-.8784996735E-01	.15476447	-.568	.5703	.20286694
COAL	-.2989028057	.22490660	-1.329	.1838	.42692428E-01
HOUSE	.5584505452	.14910802	3.745	.0002	.67528825
TRDHUT	.4135281106	.20242300	2.043	.0411	.82891867E-01
FLTAPTEX	.4817995190	.22301038	2.160	.0307	.60143347E-01
OUTBACK	.5739877839E-01	.22426475	.256	.7980	.41757557E-01
ROOM	1.365942431	.38754613	3.525	.0004	.12776566E-01
HOSTEL	.3047765199	.36365446	.838	.4020	.13711437E-01
CIVIL	.1403004235	.16206445	.866	.3867	.16204425
TRAD	-.1085552922	.17498501	-.620	.5350	.97849797E-01
LIVWITH	-.2318032764	.17403921	-1.332	.1829	.14615145
WIDOW	-.2920205476	.21569033	-1.354	.1758	.49236522E-01
NEVER	.9232786670E-02	.14447696	.064	.9490	.41851044
GENDER	-.1851312098E-01	.10636243	-.174	.8618	.62916797
URBRURAL	-.4783662726E-01	.15734573	-.304	.7611	.60922406

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	527	647	1174
1	283	1752	2035
Total	810	2399	3209

vi. Expenditure quartile 4

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	SAT
Weighting variable	ONE
Number of observations	3413
Iterations completed	5
Log likelihood function	-1738.823
Restricted log likelihood	-1912.353
Chi-squared	347.0605
Degrees of freedom	45
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
Characteristics in numerator of Prob[Y = 1]					
Constant	1.635896351	.77148234	2.120	.0340	
HMEDAID	.1419392235E-02	.10332079	.014	.9890	.46740111
HDSBLTY	-.5053790023	.32754536	-1.543	.1228	.32525637E-01

HCRIME	-1.230140591	.26026340	-4.727	.0000	.36771169E-01
PCTUNEMP	-.7424817663	.25599026	-2.900	.0037	.59244067E-01
PCTNOACT	-.1367378807	.15281330	-.895	.3709	.41356578
AVGED	-.3273710643E-02	.17090345E-01	-.192	.8481	12.225438
HHHAGE	.4533261697E-02	.37332072E-02	1.214	.2246	46.245825
NPERSON	-.6863743717E-01	.31165881E-01	-2.202	.0276	3.5490771
TOTEXP	-.3278301631E-05	.12868711E-04	-.255	.7989	3270.6446
NOFEED	-1.098743204	.16338975	-6.725	.0000	.10225608
FEED	.1638615239	.12177572	1.346	.1784	.68912980
PUBLIC	-.5444442098	.14140982	-3.850	.0001	.10840902
NONMTR	-.3017923362	.14209083	-2.124	.0337	.13302080
TAXI	-.3741710841	.15892078	-2.354	.0186	.97568122E-01
PIPEDIN	.2512837563	.59534745	.422	.6730	.82713156
PIPEDOUT	.3047930939E-01	.57746880	.053	.9579	.97568122E-01
PUBTAP	-.1673291440	.57266813	-.292	.7701	.43949604E-01
TRUCKIN	-.2019804490	1.0422972	-.194	.8463	.20509815E-02
BORHOLE	-.5809671802	.63156888	-.920	.3576	.13770876E-01
FLOW	-.6926603239	.64282808	-1.078	.2812	.93759156E-02
FLUSH	-.2338748376	.44609586	-.524	.6001	.88690302
PITVENT	-.5486636166E-01	.42853359	-.128	.8981	.29885731E-01
PITOTHR	-.4424165337	.38017631	-1.164	.2445	.55669499E-01
BUCKET	.2601880880	.53455238	.487	.6264	.12305889E-01
LOCAUTH	-.3359298945	.30833029	-1.090	.2759	.86141225
COMRMV	-.7445396547E-01	.53100113	-.140	.8885	.10547905E-01
COMDMP	-.9989814860	.60543218	-1.650	.0989	.52739525E-02
OWNDMP	-.2241249884	.29466333	-.761	.4469	.95517140E-01
ELCTRC	.6731569192	.34084371	1.975	.0483	.90008790
GAS	1.027331846	.44887204	2.289	.0221	.18458834E-01
PAR	-.1868962328	.35249561	-.530	.5960	.47172575E-01
COAL	.2513590082	.49295107	.510	.6101	.99619103E-02
HOUSE	.2820812029	.28451295	.991	.3215	.79460885
TRDHUT	-.1411174872	.38684062	-.365	.7153	.21681805E-01
FLTAPTEX	.1036724283E-01	.30800926	.034	.9731	.11866393
OUTBACK	.2262588129	.36269890	.624	.5327	.22853794E-01
ROOM	-.7107987180	.49684392	-1.431	.1525	.82039262E-02
HOSTEL	-.2576086925	.52436489	-.491	.6232	.67389393E-02
CIVIL	.4134518469	.22280920	1.856	.0635	.72663346E-01
TRAD	.1832472185	.23490794	.780	.4353	.47758570E-01
LIVWITH	-.2347735463E-01	.23039240	-.102	.9188	.67096396E-01
WIDOW	-.1164199800	.24460331	-.476	.6341	.44828597E-01
NEVER	.2363815279	.17396979	1.359	.1742	.68209786
GENDER	-.2082269575	.14032387	-1.484	.1378	.79021389
URBRURAL	-.6415790825	.21858064	-2.935	.0033	.86610021

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	182	665	847
1	104	2462	2566
Total	286	3127	3413

vii. Male headed households

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	SAT
Weighting variable	ONE
Number of observations	8180
Iterations completed	5
Log likelihood function	-4631.132
Restricted log likelihood	-5347.946
Chi-squared	1433.626
Degrees of freedom	48
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Characteristics in numerator of Prob[Y = 1]				
Constant	-.6355622560E-01	.26050672	-.244	.8073	
HMEDAID	.1608799960	.85722357E-01	1.877	.0606	.21779584
HDSBLTY	-.2138699599	.21102069	-1.014	.3108	.38078240E-01
HCRIME	-1.087335389	.21347808	-5.093	.0000	.22356968E-01
PCTUNEMP	-.7748900739	.14162124	-5.472	.0000	.97127139E-01
PCTNOACT	-.8426085068E-01	.99530454E-01	-.847	.3972	.49122372
AVGED	.7744675263E-02	.91580222E-02	.846	.3977	9.2120611
HHHAGE	.4612216523E-02	.22219440E-02	2.076	.0379	47.280196
NPERSON	-.5567837742E-01	.11910682E-01	-4.675	.0000	4.7694377
TOTEXP	-.3285558892E-05	.12740188E-04	-.258	.7965	1531.5534
NOFEED	-1.115503301	.95562182E-01	-11.673	.0000	.23814181
FEED	.3459161820	.84623793E-01	4.088	.0000	.63202934
PUBLIC	-.2310484449	.88117826E-01	-2.622	.0087	.17212714
NONMTR	-.1938225146	.82965057E-01	-2.336	.0195	.32396088
TAXI	-.2526137833	.92139169E-01	-2.742	.0061	.17127139
PIPEDIN	.4180141072	.17135545	2.439	.0147	.46393643
PIPEDOUT	.4393746399	.15384456	2.856	.0043	.23471883
PUBTAP	.2578241782	.14863649	1.735	.0828	.16308068
TRUCKIN	.8931699082E-02	.24959306	.036	.9715	.12836186E-01
BORHOLE	.1955660199	.18669521	1.048	.2949	.34107579E-01
RAIN	.3271025503	.45692060	.716	.4741	.33007335E-02
FLOW	.2716929271	.17279074	1.572	.1159	.41687042E-01
WELL	.8383693175	.29140449	2.877	.0040	.89242054E-02
FLUSH	.7232029306E-01	.14435994	.501	.6164	.56271394
CHEMTLT	.2416121879	.45765156	.528	.5975	.30562347E-02
PITVENT	.9822545204E-01	.11621863	.845	.3980	.10330073
PITOTHR	-.1241019593	.10189180	-1.218	.2232	.18740831
BUCKET	.2233114202	.16917456	1.320	.1868	.42176039E-01
LOCAUTH	.2881914507	.12770678	2.257	.0240	.58606357
COMRMV	.3268923966	.24372540	1.341	.1798	.14425428E-01
COMDMP	-.2723665336	.23506991	-1.159	.2466	.12713936E-01
OWNDMP	.2568424442	.93943424E-01	2.734	.0063	.29694377
ELCTRC	.2575776493	.10147888	2.538	.0111	.58911980
GAS	.3899576290	.18080259	2.157	.0310	.25061125E-01
PAR	-.9479818476E-01	.99247634E-01	-.955	.3395	.15611247
DUNG	-.8350804831E-01	.33577829	-.249	.8036	.52567237E-02
COAL	-.2265424019	.14659038	-1.545	.1222	.35574572E-01
HOUSE	.3962915194	.10718810	3.697	.0002	.69767726
TRDHUT	.1622479186	.13144746	1.234	.2171	.10256724
FLTAPTEX	.3326353253	.15158035	2.194	.0282	.60757946E-01
OUTBACK	.2982488028	.15771597	1.891	.0586	.35207824E-01
ROOM	.2266030188	.24305138	.932	.3512	.12347188E-01
HOSTEL	.1540224307E-01	.25289633	.061	.9514	.10880196E-01

CIVIL	.1788272174	.12087429	1.479	.1390	.21613692
TRAD	-.1388714239	.12730711	-1.091	.2753	.10745721
LIVWITH	.4160064751E-01	.19233792	.216	.8288	.26528117E-01
WIDOW	-.3788002732	.24854513	-1.524	.1275	.11980440E-01
NEVER	.9627008386E-01	.11602158	.830	.4067	.57738386
URBRURAL	-.3129476844	.10808253	-2.895	.0038	.61491443

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	1374	1576	2950
1	700	4530	5230
Total	2074	6106	8180

viii. Female headed households

Multinomial Logit Model	
Maximum Likelihood Estimates	
Dependent variable	SAT
Weighting variable	ONE
Number of observations	5254
Iterations completed	5
Log likelihood function	-3097.575
Restricted log likelihood	-3591.196
Chi-squared	987.2419
Degrees of freedom	48
Significance level	.0000000

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]	Mean of X
	Characteristics in numerator of Prob[Y = 1]				
Constant	.3292613302	.32926076	1.000	.3173	
HMEDAID	.6450713937E-01	.15771860	.409	.6825	.77542825E-01
HDSBLTY	-.4061877669	.28469157	-1.427	.1536	.38496384E-01
HCRIME	-.9440824790	.35367643	-2.669	.0076	.13650552E-01
PCTUNEMP	-.7002906274	.17068840	-4.103	.0000	.11640084
PCTNOACT	-.8045147114E-01	.12938805	-.622	.5341	.66303578
AVGED	.2308948231E-01	.11219994E-01	2.058	.0396	8.1929387
HHHAGE	.4290647809E-02	.24518425E-02	1.750	.0801	50.052722
NPERSON	-.3595768082E-01	.13003644E-01	-2.765	.0057	5.1290445
TOTEXP	.1423455201E-04	.23635732E-04	.602	.5470	824.95737
NOFEED	-1.428736269	.17870355	-7.995	.0000	.36867149
FEED	.1846701801	.17472422	1.057	.2905	.59497526
PUBLIC	-.6412452716	.14197685	-4.517	.0000	.16996574
NONMTR	-.5232980779	.13526007	-3.869	.0001	.41511230
TAXI	-.5067900494	.13943901	-3.634	.0003	.31499810
PIPEDIN	.3262470674	.18043412	1.808	.0706	.24248192
PIPEDOUT	.3600545636	.14791970	2.434	.0149	.26703464
PUBTAP	.2574004308	.13377246	1.924	.0543	.24971450
TRUCKIN	.7801428880E-01	.26781292	.291	.7708	.15987819E-01
BORHOLE	.1792444806	.17203387	1.042	.2975	.58051009E-01
RAIN	.6065922934	.55564159	1.092	.2750	.30452988E-02
FLOW	.4728314384	.15795167	2.994	.0028	.73467834E-01
WELL	.8622547118	.28826566	2.991	.0028	.13323182E-01
FLUSH	-.1465862670	.17935839	-.817	.4138	.35230301
CHEMTLT	.1972533099E-03	.52155441	.000	.9997	.34259612E-02

PITVENT	.1243875433	.11942602	1.042	.2976	.15778455
PITOTHR	.4970967823E-01	.10467047	-.475	.6348	.27617054
BUCKET	.2626263431	.20744096	1.266	.2055	.45298820E-01
LOCAUTH	.6495406845E-01	.15833633	.410	.6816	.40692805
COMRMV	.7410061960	.32987856	2.246	.0247	.10468215E-01
COMDMP	-.3120532918	.32616171	-.957	.3387	.98972212E-02
OWNDMP	.2314437721	.10029235	2.308	.0210	.44975257
ELCTRC	.5157394407E-01	.11242819	.459	.6464	.38846593
GAS	.1604345907	.20012508	.802	.4227	.29691663E-01
PAR	-.9938338716E-01	.10203302	-.974	.3300	.21107727
DUNG	-.2432364218	.51556895	-.472	.6371	.36162923E-02
COAL	-.3057105418	.15075960	-2.028	.0426	.55576703E-01
HOUSE	.3680370665	.12892439	2.855	.0043	.63018652
TRDHUT	.1815788488	.14909017	1.218	.2233	.18652455
FLTAPTEX	.1856421076	.20019263	.927	.3538	.43776171E-01
OUTBACK	.1754836076	.19109041	.918	.3584	.40159878E-01
ROOM	.8813538826	.28186244	3.127	.0018	.15607156E-01
HOSTEL	1.237171008	.55163700	2.243	.0249	.38066235E-02
CIVIL	.2020253468	.11538047	1.751	.0800	.14274838
TRAD	.2496216717E-02	.17287602	.014	.9885	.38827560E-01
LIVWITH	.3239484998E-02	.10259719	.032	.9748	.36220023
WIDOW	.1923260981E-01	.12301264	.156	.8758	.10315950
NEVER	.2034106894	.10956825	1.856	.0634	.15664256
URBRURAL	.1494936924	.13453775	1.111	.2665	.44423297

Frequencies of actual & predicted outcomes
Predicted outcome has maximum probability.

	Predicted		
Actual	0	1	Total
0	1312	951	2263
1	592	2399	2991
Total	1904	3350	5254

BIBLIOGRAPHY

Allardt, Erik (1981). Experiences from the Comparative Scandinavian Welfare Study. *European Journal of Political Research,* v9, pp. 101-111.

Argyle, Michael (1999).Causes and Correlates of Happiness. from Kahneman, Daniel, Ed Diener, and Norbert Schwartz, editors (1999) Well-Being: The Foundations of Hedonic Psychology. New York: Russell Sage Foundation, pp. 353-373.

Becker, Gary S. (1991) A Treatise on the Family. Cambridge, MA: Harvard University Press.

Bookwalter, Jeffrey T. and James Michael Warner (forthcoming). Power and Bargaining in Intra-Household Resource Allocation: An Empirical Analysis of Rural South Africa.

Bookwalter, Jeffrey T. and Douglas Dalenberg (forthcoming). Subjective Well-being and Household Factors in South Africa.

Crocker, David A. (1995). Functioning and Capability: Foundations of Sen's and Nussbaum's Development Ethics, Part 2. from Nussbaum, Martha and Jonathan Glover (eds). Women, Culture and Development. Oxford University Press, pp. 153-198.

Diener, Ed, Eunkook M. Suh, Richard E.Lucas, and Heidi L.Smith (1999a). Subjective Well-Being: Three Decades of Progress. *Psychological Bulletin* v125, n2, pp. 276-302.

Diener, Ed and Richard E Lucas (1999b). Personality and Subjective Well-Being. from Kahneman, Daniel, Ed Diener, and Norbert Schwartz, editors (1999) Well-Being:

The Foundations of Hedonic Psychology. New York: Russell Sage Foundation, pp. 213-229.

Erikson, R. and H. Uusatilo (1987). The Scandinavian Approach to Welfare Research. from Erikson, R., E. Hansen, S. Ringen, and H. Uusatilo (eds). The Scandinavian Model, Welfare States, and Welfare Research. New York: M.E. Sharpe.

Frank, Robert H. (1997). The Frame of Reference as a Public Good. *The Economic Journal,* November, v107, pp. 1832-1847.

Frey, Bruno S. and Alois Stutzer (2000). Happiness, Economy and Institutions. *The Economic Journal* v110, October, pp. 918-938.

Frey, Bruno S. and Alois Stutzer (2002). Happiness and Economics: How the Economy and Institutions Affect Human Well-Being. Princeton University Press.

Fuentes, Nicole and Mariano Rojas (2001). Economic Theory and Subjective Well-Being: Mexico. *Social Indicators Research* v53, pp. 289-314.

Kahneman, Daniel (1999). Objective Happiness. from Kahneman, Daniel, Ed Diener, and Norbert Schwartz, editors (1999) Well-Being: The Foundations of Hedonic Psychology. New York: Russell Sage Foundation, pp. 3- 25.

Klasen, Stephan (1997). Poverty, Inequality and Deprivation in South Africa: An Analysis of the 1993 SALDRU Survey. *Social Indicators Research* v41, pp. 51-94.

Klasen, Stephan (2000). Measuring Poverty and Deprivation in South Africa. *Review of Income and Wealth* v46, n1, pp. 33-58.

Krugman, Paul (1996). Cycles of Conventional Wisdom on Economic Development. *International Affairs* v72, pp. 717-732.

Moller, Valerie and Willem E. Saris (2001). The Relationship Between Subjective Well-Being and Domain Satisfactions in South Africa. *Social Indicators Research* v55, 2001, pp. 97-114.

Ng, Yew-Kwang (1997). A Case For Happiness, Cardinalism, and Interpersonal Comparability. *The Economic Journal,* November, v107, pp. 1848-1858.

Putnam, Robert D. (1995). Tuning In, Tuning Out: The Strange Disappearance of Social Capital in America. *PS: Political Science and Politics,* December, pp. 664-683.

Schwartz, Norbert and Fritz Strack (1999). Reports of Subjective Well-being: Judgemental Processes and Their Methodological Implications. from Kahneman, Daniel, Ed Diener, and Norbert Schwartz, editors (1999) Well-Being: The Foundations of Hedonic Psychology. New York: Russell Sage Foundation, pp. 61-84.

Sen, Amartya (1988). The Concept of Development. from Chenery, H. and T.N. Srinivasan (eds). Handbook of Development Economics Volume 1. Elsevier Science Publishers, pp. 9-26.

Sen, Amartya (2000). Development as Freedom. New York: Anchor Books.

The Economist (2001). Survey of South Africa. February 22nd.

Veenhoven, Ruut (1996a). Developments in Satisfaction Research. *Social Indicators Research,* v37, pp. 1-46.

Veenhoven, Ruut (1996b). The Study of Life Satisfaction. from Saris, W.E., R. Veenhoven, A.C. Scherpenzeel, and B. Bunting (eds). A Comparative Study of Satisfaction With Life in Europe. Eotvos University Press, pp. 11-48.

Veenhoven, Ruut (2000). Why Social Policy Needs Subjective Indicators. Paper presented at 3rd Conference of the International Society for Quality of Life Studies, Girona, Spain.

Warr, Peter (1999). Well-Being and the Workplace. from Kahneman, Daniel, Ed Diener, and Norbert Schwartz, editors (1999) Well-Being: The Foundations of Hedonic Psychology. New York: Russell Sage Foundation, pp. 392-412.

Zaim, Osman, Rolf Fare and Shawna Grosskopf (2001). An Economic Approach to Achievement and Improvement Indexes. *Social Indicators Research* v56, pp. 91-118.