BRIEF INTERVENTIONS TO ADDRESS SUBSTANCE USE IN EMERGENCY DEPARTMENTS IN THE WESTERN CAPE: A COST-EFFECTIVENESS ANALYSIS

A mini-dissertation submitted to the University of Cape Town in partial fulfilment of the requirements for the Master of Public Health (Health Economics) degree.

Student Name: Rebecca Akua Kyerewaa Dwommoh

Student Number: DWMREB001

Faculty of Health Sciences, University of Cape Town

Supervisor: Associate Professor, Susan Cleary

Health Economics Unit, Faculty of Health Sciences, School of Public health and Family Medicine, University of Cape Town.

February 2014

PART 0: PREAMBLE

DECLARATION

I, Rebecca Akua Kyerewaa Dwommoh, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

I empower the university to reproduce for the purpose of research either the whole or any portion of the contents in any manner whatsoever.

Signature: Signed by candidate

Date: 6th February, 2014

Dedication

I dedicate this work to my family and friends for their support, prayers and encouragement; and to God for giving me the opportunity, needed strength and knowledge.

Thesis Abstract

This project assessed the cost effectiveness of two brief interventions offered in emergency departments in the Western Cape Province of South Africa. It was part of the STRIVE (Substance use and Trauma Intervention) study whose aim was to decrease substance use and its associated harms among South Africans attending emergency services in the Western Cape Province. The two brief interventions were Motivational Interviewing (MI) and a combined intervention of MI and Problem Solving Therapy (PST). These were delivered by peer counsellors who were trained specifically to do this exercise. To assess the financial feasibility of the intervention, the current study was conducted. Outcomes and costs were estimated from the main STRIVE study. The outcomes of interest were reduction in patient's ASSIST (Alcohol, Smoking and Substance Involvement Screening Test) score, depressive symptoms and verbal arguments. The main costs analysed were the overhead costs of emergency department visits, the direct costs of the interventions and the costs of screening. A decision tree model was used to assess the cost-effectiveness of the interventions. The cost of using the peer counsellors instead of trained clinical psychologists (task-shifting) was also analysed.

The results of the study showed that both interventions were more costly and more effective than the status-quo of no intervention. The combined intervention of MI and PST was more costly (R 1093.36 per patient) than the MI only intervention (R779.89 per patient). It was also more effective in reducing a patient's ASSIST score and depressive symptoms, leading to an incremental cost-effectiveness ratio (ICER) of R340.66 per mean reduction in patient's ASSIST score and R133.46 per mean reduction in depression score. The MI only intervention was eliminated through extended dominance with respect to these outcome measures.

The MI only intervention on the other hand was more effective in reducing verbal arguments and had an ICER of R3500.48 per patient. For this outcome measure, the combined intervention of MI with PST was eliminated through absolute dominance because it was more costly and less effective. The cost of training and employing peer counsellors to screen and offer the interventions was found to be R112 390 per peer counsellor over the study period of nine months.

Two conclusions can be drawn from the study. Firstly, it can be inferred from the study that screening and delivery of brief interventions in the emergency departments has the potential to be cost-effective. Secondly, it is feasible to train peer counsellor's to screen and administer brief interventions in emergency departments at relatively lower cost.

Acknowledgements

My profound gratitude goes to my supervisor, Associate Professor Susan Cleary for her enormous support, patience and guidance throughout the work. I also want to specially thank her for giving me the opportunity to do the work. Without her this work would not have been possible.

My heartfelt thanks goes to the Psychiatry Department of the University of Cape Town and to the members of the STRIVE study for providing the effectiveness data and for assisting with the collection of the costing data. Special thanks goes to Dr Katherine Sorsdahl (PhD), the principal investigator of the STRIVE study for her supportive role and expert contribution where needed.

I extend my appreciation to the Department of Health of the Western Cape Province for funding the STRIVE study which my study is a component of. Special thanks go to Drs Tracey Naledi, Manshil Misra and Rafieka Saban for their assistance with the acquisition of the operational costs of the health facilities used for the costing component of the study.

I also want to thank the staff and patients of the emergency departments of Khayelitsha Site B community health centre (CHC), Khayelitsha district hospital and Elsies River community clinic that made this study possible.

Finally I am thankful to Mr Chukwuechefu Ukattah and Miss Britany Ferrell who helped to review and edit my work and also to all my friends, especially Pastor Robert Akande and Miss Esther Adebayo for their prayers and encouragement during the course of the work.

TABLE OF CONTENTS

PART 0: PREAMBLE

PART A: PROTOCOL

PART B: LITERATURE REVIEW

PART E: APPENDICES

LIST OF TABLES

PART B: LITERATURE REVIEW

PART C: JOURNAL MANUSCRIPT

PART D: POLICT BRIEF

LIST OF FIGURES

PART B: LITERATURE REVIEW

PART C: JOURNAL MANUSCRIPT

PART D: POLICY BRIEF

PART A: PROTOCOL

Background

Substance use refers to the use of psychoactive drugs or substances which act in the brain to alter the user's 'consciousness, mood or thinking process' (World Health Organization, 2004: p.1). Examples of such substances include alcohol, mandrax, sedative-hypnotics (example benzodiazepines), opioids (example heroin), petrol, glue, cocaine, amphetamines, caffeine, nicotine, cannabis, ecstasy, etc. (Baumann, 2007). The use of these substances has different effects on the user depending on what substance is used, the intended aim of the user and the pattern of use (Baumann, 2007). The excessive or wrongful use of substances other than what they are intended for is described as substance misuse. Hazardous/risky substance use refers to misusing substances in a way that elevates the user's personal risk of the negative effects of the substance. Harmful substance use is when a user misuses substances in a way that causes actual harm to the user's mental or physical health (Baumann, 2007). The continual use and/or misuse of psychoactive substances is known to have long term harmful effects like 'dependence syndrome – a cluster of behavioural, cognitive, and physiological phenomena that develop after repeated substance-use and that typically include a strong desire to take the drug, difficulties in controlling its use, persisting in its use despite harmful consequences, a higher priority given to drug-use than to other activities and obligations, increased tolerance, and sometimes a physical withdrawal state' (World Health Organisation [WHO], n.d.: p.1).

Global/Public Health problems of substance use

Substance use disorders account for a number of public and global health problems. Alcohol and illicit drugs are reported to be the cause of death of over 350,000 and 40,000 people respectively per year globally (World Health Organization, 2010). 5.4% of the world's annual burden of disease can be associated with alcohol and illicit drug use, leading to problems such as cardiovascular diseases, HIV, Hepatitis C, cancers and injuries (World Health

Organization, 2010). The prevalence of HIV among injecting-drug users is reported to be about 20%, hepatitis C is about 46.7% whilst that for hepatitis B is about 14.6% globally (UNODC, 2012). Cannabis and amphetamine-type stimulants (ATS) are reported to be the 'most-widely' used substances globally (UNODC, 2012: p.1).

Substance use problem in South Africa

The lifetime prevalence of substance use disorder in South Africa is estimated to be about 13.3% with an estimated life time risk of about 17.5%, and this is among the highest in the world (Herman et al, 2009). The Western Cape Province is reported to have the highest lifetime prevalence rate of substance use disorder among all the nine provinces in the country with a rate of 20.6, which is higher than the national rate of 13.3 (Herman et al, 2009). The contribution of alcohol-related harm to total deaths and DALYs (Disability Adjusted Life Years) in the country in the year 2000 was 7.1% (37000 deaths) and 7.0% (1.1 million DALYs) respectively (Schneider et al, 2007). 63.1% of the alcohol related DALYs were as a result of injuries; 39% and 14.3% of these injuries were as a result of interpersonal violence and road traffic accidents respectively (Schneider et al, 2007).

Alcohol is the most commonly used substance in South Africa with a lifetime prevalence of 11.4% (Herman et al, 2009). Other substances used in the country include dagga (cannabis), tobacco, glue, cocaine, medication (prescribed drugs), heroin, crystal methamphetamine (tik) mandrax, methcathinone 'cat' and 'sugar' or 'sugars' which is a combination of heroin and cocaine or other stimulants along with various other substances (Baumann, 2007: p.291). Tik is mostly used in the Western Cape Province although used in smaller quantities in the Northern Cape Province (Baumann, 2007; Pasche & Myers, 2012).

Substance use disorder, interpersonal violence, depression and injury

The high prevalence of interpersonal violence and injuries in South Africa has been reported to be associated with the high rates of substance use in the country (Norman et al, 2007; Schneider et al, 2007). Based on this, it has been suggested that a great proportion of injuries and mortality in South Africa could be averted if alcohol misuse is eliminated or at least controlled (Parry et al, 1996). Substance use has been reported to cause changes in the biological functioning of the user and this increases aggressive behaviour (Atkinson et al, 2009). Alcohol users for instance are reported to be more likely to engage in activities and situations that increase their vulnerability to accidental injuries (Cherpitel, 1999). An association between depression and substance use disorder has been reported in different studies. A review of studies on the subject has reported that there is a likely causal relationship between depression and alcohol use disorder (Swendsen & Merikangas, 2000). A relationship has also been reported between heavy cannabis use and depression in another review (Degenhardt et al, 2003).

Substance use and the Emergency department

Injured patients are mostly treated in emergency departments and these injuries are usually as a result of substance use of some kind (Hungerford, 2005a; Hungerford, 2005b). In South Africa, it is reported that patients seeking treatment in emergency departments are mostly those with injuries resulting from interpersonal violence (Brysiewicz, 2001). There is also a high likelihood for injured patients seeking treatment in emergency departments to test positive for alcohol use (Parry et al, 2002).

Screening and Interventions for substance use

Interventions available for substance users include brief interventions and treatment services (Kumar & Malhotra, 2000). Patients are screened first to determine their level of risk or extent of substance use before they are offered interventions. In addition to helping to know which type of intervention to offer to users, screening also helps patients to become aware of the extent of their substance use and also to make decisions about their substance use by means of the feedback they receive after screening (Henry-Edwards et al, 2003). It should be noted that screening tools are used to assess levels of risk and are not used as a psychiatric diagnosis.

There are a number of effective screening tools available. These are mainly biological markers and self-report screening tools.

Biological markers

Biological markers are 'biochemical substances in the body that can indicate the presence or progress of a condition or any genetic predisposition toward it' (Peterson, 2004: p.30). Semen, urine, saliva, blood, ear wax and hair are biological samples commonly tested for the presence of psychoactive substances in the body. The choice of biological sample usually depends on the type of psychoactive substance being tested for, the setting and the time-frame. Whilst some samples are more reliable in detecting substances presently active in the body (blood and saliva), others like urine and hair help to detect substances used over a longer period of time (Wolff, 2003). The process of testing usually involves taking the body sample to the laboratory to be screened for the presence of psychoactive substances using immunoassay or chromatography techniques. Examples of biological markers commonly

used for alcohol screening include mean corpuscular volume (MCV), gamma-glutamyl transferase (GGT) and carbohydrate-deficient transferrin (CDT) (Peterson, 2004).

Self-Report

Self-Report tests or tools for screening for substance use include the AUDIT (Alcohol Use Disorders Identification Test), ASSIST (Alcohol, Smoking and Substance Involvement Screening Test), CAGE (Cut down, Annoyed, Guilty, Eye opener), CRAFFT, DAST (Drug Abuse Severity Test), GAIN (Global Appraisal of Individual Needs), S-MAST (Short Michigan Alcohol Screening Test), TWEAK (Tolerance, Worried, Eye opener, Amnesia, Cut down), RAPS – or RAPS 4 – (Rapid Alcohol Problems Screen), T-ACE (Tolerance, Annoyed, Cut down, Eye opener) and POSIT (Problem Oriented Screening Instrument for Teenagers) (American Public Health Association and Education Development Center, Inc., 2008). Most of these tools are used for screening for alcohol use. AUDIT, DAST and ASSIST are reported to be the most commonly used (Office of alcoholism and substance abuse services, 2012). ASSIST was used for screening in the STRIVE study.

Although biological markers are reported to be relatively less biased compared to self-reporting of substance use (Schwan et al, 2004), there are some limitations to this option which makes it less attractive to use. The way samples are collected and supervised is important and to some extent, these pose some limitations to the use of biological markers. Contamination and dilution of samples must be completely avoided as these can affect the results of the tests (Wolff, 2003). Biological markers are also often expensive (Darke, 1998) and may not be best for resource limited countries. Research also suggests that none of the methods currently being used is perfect (Peterson, 2004) and thus not any more reliable than measures of self-report. A review of literature has also shown that self-reporting for

substance use is accurate and effective enough to help identify the pattern and extent of substance use and related problems (Darke, 1998).

Brief Interventions

Brief interventions are 'a group of cost-effective and time efficient strategies' aimed at minimising substance use and/or associated harm (Kumar & Malhotra, 2000: p.172). They involve offering advice or counselling about the substances and their harmful effects to users. Motivational interviewing (MI) is a brief intervention mostly offered to substance users, especially those at moderate risk of substance use problems and sometimes as an initial intervention for those with dependence problems to enable them to adhere to treatment services (Henry-Edwards et al, 2003; Kumar & Malhotra, 2000). It is a counselling technique that focuses on the patient's initiative for change instead of directives from the counsellor (Miller, 1996). The aim of brief intervention is to help substance users comprehend the risks associated with their substance use, motivate them to minimise or quit the use of such substances and also to seek specialist care for their problem where necessary. They are also aimed at helping to minimise resistance among patients and also aid in making behaviour change decisions (Henry-Edwards et al, 2003). Brief interventions can be as short as a five minutes advice to a user about the harmful effects of the substances or as long as a one hour counselling session with the user. During these interventions self-help hand-outs and other materials meant to help users are also provided. In some cases the intervention goes beyond just advice and information provision to more rigorous therapy sessions. These however do not go beyond six sessions (Babor & Kadden, 2005; Henry-Edwards et al, 2003).

Brief interventions have been proven to be effective in reducing substance use in different settings in the world (Sorsdahl et al, 2012). Furthermore, it has been proven that providing these interventions in health care facilities, especially in emergency departments, can help to

decrease substance use among patients. This can further minimise repeated injuries, re-admissions into emergency departments and also improve the health of patients (Gentilello et al, 1999; Hungerford, 2005a; Hungerford, 2005b).

Treatment for substance use

Besides offering brief interventions, there are treatments for those with dependence problems. Treatments for these patients involve offering 'specialised medical, psychiatric and psychosocial services' (Temmingh & Myers, 2012: p.290). These treatments are aimed at helping users to abstain from the use of psychoactive substances or at least minimise their use. They are also aimed at reversing the negative consequence of substance use on their health and social life (Baumann, 2007). Treatments involve detoxification and are usually offered in both out-patient and in-patient departments. Patients usually need rehabilitation and/or medications to help 'prevent relapse' (Baumann, 2007: p.305). Support groups like AA (Alcoholic Anonymous), NA (Narcotics Anonymous) and CAD (Christelike Afhanklikheidsdiens) are also necessary to help patients after rehabilitation. Unlike brief interventions, this kind of intervention requires the use of specialists and usually extends for months and in some cases, years (Baumann, 2007; Kumar & Malhotra, 2000).

Limited mental health services/workers and task-shifting

Despite the high prevalence of substance use disorders and its associated negative effects, the availability of treatment services in South Africa is limited. This has been influenced by many socio-political factors, especially during the period of apartheid (Temmingh & Myers, 2012). Even though the situation seems to have improved in post-apartheid South Africa, the problem still exists, especially for the most vulnerable, the majority of whom live in disadvantaged communities. Available treatment facilities are expensive, especially for those

without medical aid and state funded ones are also insufficient (Myers et al, 2010; Temmingh & Myers, 2012)

Given this problem and the high prevalence of substance use problems in South Africa, brief interventions for at risk users before they become dependent and require treatment services can be a good intervention option. In addition to being less costly and relatively effective in reducing problematic and hazardous substance use, brief interventions can also be used as health promotion and substance use prevention tools in health care settings. Although brief interventions cannot be used to treat people with dependence problems, they can be used to motivate such patients to accept specialist care (Henry-Edwards et al, 2003).

There is still the issue of shortage of mental health workers and professionals even with the administration of brief interventions. In light of this problem and the increasing demand for mental health workers and professionals, task-shifting to lesser trained personnel has been recommended as a means of bridging the gap (Petersen et al, 2012).Task-shifting has been described as a potential tactic that can be employed to help address the challenge of shortage of health care workforce (Fulton et al, 2011). Unlike treatment services, specialists are not needed for the administration of brief intervention. They can be administered by health care professionals with limited training (Kumar & Malhotra, 2000). In the South African setting, a pilot study has reported that the use of peer counsellors for screening and brief interventions for substance use in emergency departments in Cape Town is feasible with marginal added costs (Myers et al., 2012). The study also showed that the use of these peer counsellors does not interrupt the usual flow of health care services in these emergency departments. In addition, their presence will also help to prevent the extra work load that screening and brief intervention will otherwise add to the existing workload in these emergency departments

(Myers et al., 2012). Task-shifting is especially important in resource limited countries where the demand for mental health workers is not adequately matched with their supply.

Studies on the effectiveness as well as the cost-effectiveness of screening and brief interventions in the emergency departments are essential to inform decision making. It is also important that studies investigate the type of brief intervention that would be most suitable and effective to implement in such settings given the work environment and how busy it can be. An example of such a study is the STRIVE study (described below) which this cost-effectiveness analysis study forms a part of.

The STRIVE study

The aim of the STRIVE study was to decrease substance use and its associated harms among South Africans attending emergency services by testing two brief, evidence-based interventions: motivational interviewing (MI) and a combination of motivational interviewing and Problem Solving Therapy (PST). These interventions were delivered by peer counsellors to risky substance users among adults attending emergency departments in the Western Cape Province of South Africa. The purpose of the study was to help address the gaps in current service delivery. Three study sites, Khayelitsha district hospital, Khayelitsha site B community health clinic and the Elsies River community health clinic, were used. Lay counsellors (not originally part of the routine health staff in the facilities) were recruited and trained to screen and offer the interventions to the patients in the facilities. To ensure that these counsellors were delivering the interventions appropriately, a clinical psychologist was employed to undertake fidelity checks with the counsellors every two weeks, and to ensure counsellors were coping with the stressful work environment of the emergency departments.

Consent for screening was taken from adult patients attending the emergency departments in the study health facilities. Those not in the position to give consent such as patients with severe head trauma or confusion were excluded from the study. Consenting patients were screened for substance use using the ASSIST screening tool. The advantage of the ASSIST over other screening tools, is that it screens for harmful use of all psychoactive substances from alcohol and tobacco use to the use of a wide range of other illicit drugs considered in this study – alcohol, cannabis, cocaine, amphetamine type stimulants (mostly tik), inhalants, sedatives or sleeping pills, hallucinogens and opioids. It also helps to detect patients who use or depend on one or more of the substances and it can also be used across different age groups unlike other screening tools. The ASSIST screening tool has been proven to be effective in different countries and across different languages (Henry-Edwards et al, 2003).

Depending on patients' scores on the ASSIST, patients were classified as being at low risk, moderate risk or high risk of substance use. Patients who scored between 0-10 for alcohol use and 0-3 for each of the other substances were classified as being at low risk. Those who scored between 11-26 for alcohol use and 4-26 for each of other substances were classified as being at moderate risk and those who scored above 27 for each of the substances were classified as being at high risk (Humeniuk et al, 2010).

Patients classified as being at moderate risk of substance use were invited to join the study and those classified as being at low risk were excluded from the study. Those classified as being at high risk were invited to participate in the study, but were also referred for specialist care. Participants who agreed to be part of the study were randomly allocated to either a psycho-educational control group or an intervention group (either an MI only group or a combination of MI and PST group). A baseline questionnaire on self-reported alcohol and

other drug use, health and other risk behaviours and problem-solving styles was then completed by the patients.

All patients randomised into the intervention group received the MI which lasted about 30 minutes on the average for each patient. Those in the MI only intervention group received just this. Patients in the combination of MI and PST intervention group received in addition to the initial MI, four sessions of PST. The first PST session lasted between 45 to 60 minutes per patient and the rest of the other three sessions lasted between 35 to 50 minutes per patient. Those in the control group, like all others in the study, received a self-help brochure describing the effects of alcohol and other drug use, thus the name, psycho-educational control group.

PST helps patients to develop attitudes and skills towards problem-solving (D'Zurilla & Nezu, 2010). Patients are usually offered alternative ways of solving their problem and based on these they are expected to make a choice of the most effective alternative they can apply to their problem (D'Zurilla & Goldfried, 1971). Through this intervention, patients are able to gain self-control over their problem and are also able to maintain their change in behaviour. PST has been shown to help patients to prevent relapse (D'Zurilla & Nezu, 2010).

At the three month follow-up, participants in both the control and the intervention groups were re-administered with base-line questionnaires. Effectiveness of the interventions with respect to the outcomes of interest was assessed by comparing before and after base line questionnaires. The outcomes of interest were functional and dysfunctional, reduction in problematic substance use, individual's depression level, substance use related injury, and substance use related violence. For ethical reasons, control participants who remained at high risk for substance use problems were referred to specialised service providers.

Purpose of the cost-effectiveness analysis

The purpose of this study is to compare the costs and effectiveness of the two brief interventions tested in the STRIVE study described above in relation to a do-nothing status-quo.

Justification of the study

The justification for carrying out this research is to help policy makers to decide which brief intervention for substance disorder will be more cost-effective to implement in emergency departments.

Why cost-effectiveness analysis?

Resources are usually scarce and getting funds to support the implementation of brief interventions in emergency departments has been reported to be relatively difficult compared to accessing funds for similar activities in primary care facilities (Hungerford, 2005a). Policy makers and funders therefore need adequate information including information on costs to guide their decisions to fund the implementation of such activities in emergency departments. To be able to provide such information to guide decision making, a cost-effectiveness analysis of the alternative brief interventions as provided in the emergency departments is needed. It helps to compare the costs as well as the effectiveness of each of the interventions against each other.

Cost-effectiveness analysis is one of the different methods of economic evaluation which include cost analysis, cost utility analysis (CUA) and cost-benefit analysis (CBA), even though cost-analysis is not considered a full economic evaluation method (Drummond et al, 2005). All these methods measure and value costs in monetary terms but differ in the way

outcomes are evaluated (Luce & Simpson, 1995). For instance, Cost-analysis does not evaluate outcomes of interventions. It only evaluates costs. CBA measures and values both costs and outcomes in monetary terms. CUA, which is considered a broader form of CEA, values outcomes in terms of utilities attached to the outcomes derived from the interventions (e.g. QALYs, DALYs) (Drummond et al, 2005). CEA measures and compares costs and effectiveness of alternative interventions that have the same outcome measure. The costs and the rate at which the different alternatives achieve the outcome of interest may however differ. It values outcomes in their natural units (e.g. life years saved, number of sick days averted). This makes it more feasible for this study than the other methods of economic evaluation because outcomes are measured and valued in terms of reduction in patient's ASSIST score, depression and verbal arguments.

Like all the other methods of economic evaluation, CEA can be conducted from three main perspectives – provider perspective (which considers costs only incurred by the provider of the intervention as a result of the intervention), patient perspective (considers cost incurred by the patient and relatives as a result of the intervention) and societal perspective (considers both costs to patients and the provider). Societal perspective is the broadest perspective. In cost-effectiveness analysis, decisions are made between alternative interventions by estimating the incremental cost-effectiveness ratios (ICERs) of the interventions. ICERs are estimated as the ratio of the difference in costs and effectiveness of the competing interventions as illustrated in equations (1) and (2) below. There are not always competing interventions. Sometimes new interventions are compared to a status quo which may be a no intervention situation.

$ICER_{YX}=\Delta C/\Delta E$……………………………………. (1)

$\Delta C=C_Y - C_X$; $\Delta E= E_Y - E_X$…………………………… (2)

Where C_Y is the cost of intervention Y (the new intervention) and E_Y is its effectiveness; C_X and E_X are the costs and effectiveness of intervention X (the old intervention or status-quo).

The results of CEA are expressed as cost/outcome (e.g. cost/life year saved or cost/reduction in substance use). A sensitivity analysis is usually conducted to address the issue of uncertainty which can affect the findings of the analysis (Briggs, 1995). Such uncertainties may arise from the way data was sampled, choice of analytic methods, data extrapolation and generalizability of study findings. Sensitivity analysis helps to generalise the results of the analysis (Briggs, 1995).

Aim and objectives of the study

Research has suggested that brief interventions can be administered within public health facilities in South Africa with little demand for additional resources and minimal burden on health workers, and that they are effective in helping to reduce substance-use (Temmingh & Myers, 2012). However, no comprehensive assessment of the costs and effects has been undertaken. Given this need, the main aim of this study is to assess the cost-effectiveness of providing brief interventions for adult substance users attending emergency departments in a South African setting.

The objectives of the study are as follows:

1. To calculate the provider cost of emergency department visit.
2. To assess the provider cost of screening patients for alcohol and drug use in emergency department.
3. To assess the societal costs of providing either a short ASSIST-linked Brief Intervention (MI) or a combination of MI and PST to substance users in emergency departments.

4. To assess the cost-effectiveness of the interventions in comparison to a no intervention status quo.
5. To do a cost analysis of task shifting

Methods

Study Design

Outcomes and costs are estimated from the STRIVE study. Both the ingredients and step down methods are used to calculate the economic cost of interventions. Cost-effectiveness is assessed from a societal perspective. A decision analytic model is used to assess the cost-effectiveness of the interventions. Three scenarios are compared; the cost and effectiveness of the MI only is compared to that of the status quo of no intervention and the cost and effectiveness of the MI with PST intervention is compared to that of the status quo of no intervention and then to that of the MI only.

Study population

The study population includes patients screened for substance-use at the emergency departments of Khayelitsha Site B community health centre, Khayelitsha district hospital and Elsies River community clinic. All patients consented to and who were included in the STRIVE study discussed above are included in this study.

Sample size

Based on the STRIVE study, a sample size of 335 is used for this study. Out of this 335, a sample size of 110, 113, and 112 are considered for the control, MI and PST groups respectively.

Estimation of costs

The main costs analysed are the overhead cost of emergency department visit, direct cost of screening and the interventions from a provider's perspective and costs to patients for taking part in the PST intervention.

Direct cost of screening and intervention from the provider's perspective

These include recurrent costs and capital costs. Recurrent costs are costs incurred on items that last for not more than a one year period. For this study they include the cost of salaries of counsellors, costs of materials used in the intervention (cost of substance use risk cards, PST booklets, substance use fact sheets, pens and clip boards), overheads, cost of fidelity checks for the counsellors (costs of clinical psychologists, tapes used, and checking of the tapes). Unit costs of all these are calculated from routine data (salaries, overheads etc.) for recurrent items sourced from the health facilities through the department of health and the appropriate service providers.

Capital costs are costs incurred on things that last for more than a one year period and they include the cost of space and furniture used within the facility and costs of training the counsellors. Costs of furniture and space are based on estimated replacement values of these items with appropriate annualisation based on useful working life assumptions.

Telephone costs, vouchers, supervisors used during the study, follow-up and baseline assessments (excluding screening) are considered as research costs and are therefore not included in the cost estimation.

Cost to patients

This is mainly based on costs incurred by patients as a result of their participation in the interventions. These costs include opportunity cost of patient's time, cost of transportation to and from the health facilities for the intervention, opportunity cost of care takers (if any), and other non-health care services utilised as a result of their participation in the intervention. Opportunity cost of time and care takers are based on time lost from work or any other income generating activity. Direct cost of care takers are estimated where these are paid to provide their services. These costs are derived from questionnaires administered to participants during the STRIVE study. Because the patients in the status quo and the MI interventions were already attending the emergency department on account of their substance use, it is assumed that no additional patient costs are incurred as a result of being screened or having the MI. Those randomised into the PST group however incurred this additional cost for their four extra PST sessions because they attended the facility specifically for the sessions.

Estimation of health and non-health related outcomes/effects

Outcome measures for the study are reduction in substance use (represented by reduction in patient's ASSIST score), depression, and verbal argument over the study period. In the STRIVE study, patient's ASSIST score is assessed with the ASSIST screening tool, depression with the Centre for Epidemiological Studies Depression Scale (CES-D) and the other outcomes measures with questionnaires designed for the study. The outcome measures are calculated for each of the intervention groups as well as the control group. The mean point difference for each of these outcomes is derived from the STRIVE study based on the base-line and follow-up questionnaires administered to participants during the study.

Cost-effectiveness analysis

A decision tree is used to assess the cost-effectiveness of the interventions. A decision tree is a flow chat that illustrates the structure of a problem. It integrates the costs and outcomes of the different ways or strategies of dealing with the problem. Decision trees are useful when modelling interventions that lead to outcomes in the short-term (example, short term screening programs, interventions for acute health care problems, etc.). They are also suitable for economic evaluations that involve intermediate outcomes (Karnon & Brown, 1998). They are generally useful for modelling problems that involve simple scenarios that are relatively less complicated. In this study, the model compares the costs and effectiveness of the interventions to that of the status-quo to estimate the incremental costs and effectiveness of the interventions. Cost-effectiveness is estimated as the ratio of the incremental costs to the incremental effectiveness of the interventions.

Costing of Task-shifting

The cost of using peer counsellors instead of clinical psychologists for screening and brief interventions is also analysed. This is mainly the costs of peer counsellors' training and fidelity checks. These are derived from the STRIVE study.

Sensitivity Analysis

A simple sensitivity analysis is conducted to test the robustness of the study's findings by varying some parameters of the study to test if there will be any major changes in the results of the cost-effectiveness analysis. The sensitivity analysis cover the main components of the costing analysis and other important parameters identified in the course of the work.

Pilot study

Even though there is no pilot study for this study in particular, a phase one study was undertaken by the STRIVE project to assess the relevance and necessity of the programme in emergency departments, the feasibility of implementing the intervention, and the potential problems and solutions that were likely to occur in the facilities.

Time schedule

Data checking and cleaning as well as data analysis and write-up is scheduled between April and December 2013. The provider and patients costs were collected earlier as part of the STRIVE study.

Data management and analysis

Checking and cleaning of data collected from the STRIVE study, the Department of Health and other appropriate service providers is done to identify and fix any missing data and anomalies. Microsoft Excel is employed for the analysis of the costing data and some aspects of the sensitivity analysis and a decision tree model is used for the cost-effectiveness analysis and a greater part of the sensitivity analysis.

Ethical and legal considerations

There are no ethical or legal issues as a result of conducting this study. The cost-effectiveness analysis is part of Project STRIVE which already has ethics approval from the Health Sciences Research Ethics Committee of the University of Cape Town. A copy of the ethics approval is attached to this document.

Reporting of results

A copy of the results of this study will be submitted to the manager of Project STRIVE. The work is also likely to be published in a peer reviewed journal. There will also be a policy brief.

References

American Public Health Association and Education Development Center, Inc. 2008. *Alcohol screening and brief intervention: A guide for public health practitioners.* Washington DC: National Highway Traffic Safety Administration, U.S. Department of Transportation. [Online]. Available from: http://www.apha.org/NR/rdonlyres/ B03B4514-CCBA-47B9-82B0-5FEB4D2DC983/0/SBImanualfinal4_16.pdf [Assessed 5th December 2012]

Atkinson, A., Anderson, Z., Hughes, K., Bellis, M., Sumnall, H. & Syed, Q. 2009 Interpersonal violence and illicit drugs. Centre for public health, *Liverpool: Centre for Public Health, Liverpool John Moores University.*

Babor, T.F. & Kadden, R.M. 2005. Screening and interventions for alcohol and drug problems in medical settings: what works? *The journal of trauma and acute care surgery*. 59(3):S80-S87.

Baumann, S.E. 2007. *Primary Healthcare Psychiatry: A Practical Guide.* Juta Academic

Briggs, A.H. 1995. *Handling the Uncertainty in the Results of Economic Evaluation*. Office of Health Economics.

Brysiewicz, P. 2001. Trauma in South Africa. *International journal of trauma nursing*. 7(4):129-132.

Cherpitel, C.J. 1999. Substance use, injury, and risk-taking dispositions in the general population. *Alcoholism: Clinical and experimental research*. 23(1):121-126.

D'Zurilla, T.J. & Nezu, A.M. 2010. *Problem-solving therapy. Handbook of cognitive-behavioral therapies*. 3:197-225.

D'Zurilla, T.J. & Goldfried, M.R. 1971. Problem solving and behavior modification. *Journal of abnormal psychology*. 78(1):107.

Darke, S. 1998. Self-report among injecting drug users: a review. *Drug and alcohol dependence*. 51(3):253-263.

Degenhardt, L., Hall, W. & Lynskey, M. 2003. Exploring the association between cannabis use and depression. *Addiction*. 98(11):1493-1504.

Drummond, M.F., Sculpher, M.J. & Torrance, G.W. 2005. *Methods for the economic evaluation of health care programs*. Oxford university press.

Fulton, B.D., Scheffler, R.M., Sparkes, S.P., Auh, E.Y., Vujicic, M. & Soucat, A. 2011. Health workforce skill mix and task shifting in low income countries: a review of recent evidence. *Hum resour health*. 9(1):1.

Gentilello, L.M., Rivara, F.P., Donovan, D.M., Jurkovich, G.J., Daranciang, E., Dunn, C.W., Villaveces, A., Copass, M. et al. 1999. Alcohol interventions in a trauma center as a means of reducing the risk of injury recurrence. *Annals of surgery*. 230(4):473.

Henry-Edwards, S., Humeniuk, R., Ali, R., Monteiro, M. & Poznyak, V. 2003. Brief intervention for substance use: A manual for use in primary care. *Draft version*. 1.

Herman, A.A., Stein, D.J., Seedat, S., Heeringa, S.G., Moomal, H. & Williams, D.R. 2009. The South African Stress and Health (SASH) study: 12-month and lifetime prevalence of common mental disorders. *SAMJ: South African medical journal*. 99(5):339-344.

Humeniuk, R., Henry-Edwards, S., Ali, R., Poznyak, V. & Monteiro, M.G. 2010. The Alcohol, Smoking and Substance involvement Screening Test (ASSIST): manual for use in primary care/prepared by R. HumeniukU̓ [et al].

Hungerford, D.W. 2005a. Interventions in trauma centers for substance use disorders: new insights on an old malady. *The journal of trauma and acute care surgery*. 59(3):S10-S17.

Hungerford, D.W. 2005b. Recommendations for trauma centers to improve screening, brief intervention, and referral to treatment for substance use disorders. *The journal of trauma and acute care surgery*. 59(3):S37-S42.

Karnon, J. & Brown, J. 1998. Selecting a decision model for economic evaluation: a case study and review. *Health care management science*. 1(2):133-140.

Kumar, S. & Malhotra, A. 2000. Brief interventions in substance abuse. *Indian journal of psychiatry*. 42(2):172.

Luce, B.R. & Simpson, K. 1995. Methods of cost-effectiveness analysis: areas of consensus and debate. *Clinical therapeutics*. 17(1):109-125.

Miller, W.R. 1996. Motivational interviewing: Research, practice, and puzzles. *Addictive behaviors*. 21(6):835-842.

Myers, B., Louw, J. & Pasche, S. 2010. Inequitable access to substance abuse treatment services in Cape Town, South Africa. *Subst abuse treat prev policy*. 5:28.

Myers, B., Stein, D.J., Mtukushe, B. & Sorsdahl, K. 2012. Feasibility and Acceptability of Screening and Brief Interventions to Address Alcohol and Other Drug Use among

Patients Presenting for Emergency Services in Cape Town, South Africa. *Advances in preventive medicine*. 2012.

Norman, R., Matzopoulos, R., Groenewald, P. & Bradshaw, D. 2007. The high burden of injuries in South Africa. *Bulletin of the world health organization*. 85(9):695-702.

Office of alcoholism and substance abuse services. n.d. OASAS: Addiction services for prevention, treatment, recovery. New York State. [Online]. Available from: www.oasas.ny.gov/AdMed/FYI/sbirt.cfm. [Assessed 5th December 2012]

Parry, C., Tibbs, J., Van der Spuy, J. & Cummins, G. 1996. Alcohol attributable fractions for trauma in South Africa. *Curationis*. 19(1):2.

Parry, C.D., Bhana, A., Myers, B., Plüddemann, A., Flisher, A.J., Peden, M.M. & Morojele, N.K. 2002. Alcohol use in South Africa: Findings from the South African community epidemiology network on drug use (SACENDU) project. *Journal of studies on alcohol and drugs*. 63(4):430.

Pasche, S. & Myers, B. 2012. Substance misuse trends in South Africa. *Human psychopharmacology: Clinical and experimental.* 27(3):338-341.

Petersen, I., Lund, C., Bhana, A. & Flisher, A.J. 2012. A task shifting approach to primary mental health care for adults in South Africa: human resource requirements and costs for rural settings. *Health policy and planning.* 27(1):42-51.

Peterson, K. 2004. Biomarkers for alcohol use and abuse-A summary. *Alcohol research and health*. 28(1):30.

Schneider, M., Norman, R., Parry, C., Bradshaw, D., Pluddemann, A. & Collaboration, South African Comparitive Risk Assessment 2007. Estimating the burden of disease attributable to alcohol use in South Africa in 2000. *South African medical journal*. 97(8):664-672.

Schwan, R., Albuisson, E., Malet, L., Loiseaux, M., Reynaud, M., Schellenberg, F., Brousse, G. & Llorca, P. 2004. The use of biological laboratory markers in the diagnosis of alcohol misuse: an evidence-based approach. *Drug and alcohol dependence*. 74(3):273-279.

Sorsdahl, K., Stein, D.J., Weich, L., Fourie, D. & Myers, B. 2012. The effectiveness of a hospital-based intervention for patients with substance-use problems in the Western Cape. *South African medical journal*. 102(7).

Swendsen, J.D. & Merikangas, K.R. 2000. The comorbidity of depression and substance use disorders. *Clinical psychology review*. 20(2):173-189

Temmingh, H. & Myers, B. 2012. Clinical treatment of substance use disorders in South Africa. *Substance use and abuse in South Africa*. :329-366.

UNODC. 2012. *World Drug Report 2012*. United Nations Publication, Sales No.E12XI.1. [Online]. Available from: www.unodc.org/documents/data-and-analysis/WDR2012/WDR_2012_web_small.pdf [Assessed 2nd December 2013]

Wolff, K. 2003. Biological markers of drug use. *Psychiatry-abingdon-medicine publishing company ltd-*. 2(12):16-17.

World Health Organisation. 2010. ATLAS on substance use (2010): resources for the prevention and treatment of substance use disorders. Geneva: World health organization. 137.

World Health Organisation. 2004. *Neuroscience of psychoactive substance use and dependence*. World Health Organization.

World Health Organisation. n.d. *WHO: Health Topics, Substance Abuse*. [Online]. Available from: www.who.int/topics/substance_abuse/en/ [Assessed 5th August 2012]

PART B: LITERATURE REVIEW

Introduction

Screening and brief interventions for substance use disorders are targeted at minimizing substance use and related problems. The objectives of this literature review are to: (1) provide a theoretical overview of the brief interventions used in this study (MI and PST) and the methods of economic evaluation; (2) provide empirical evidence of the effectiveness of the brief interventions; (3) review published literature on economic evaluation of the interventions to inform the methodology of the current study and also identify gaps in current literature; and (4) to provide an overview of task-shifting as it applies to screening and brief interventions.

Only studies on brief interventions for at-risk substance users were considered in this review. Studies on treatments for alcohol and other drug dependence were excluded since that is not the focus of the current study. Studies for this review were searched mostly from Google scholar, PubMed, EBSCO HOST databases and a manual search of references of other studies on the subject.

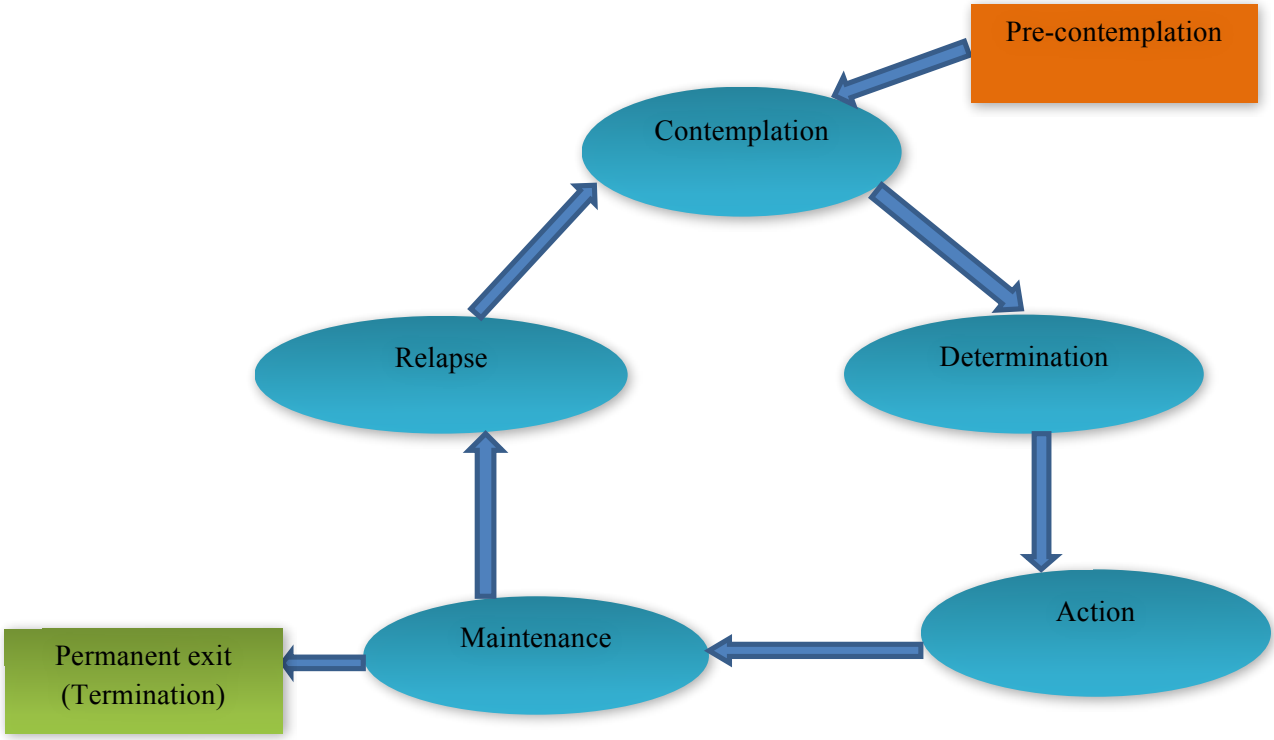
The rest of the chapter is in four parts. The first part is focused on the brief interventions, the second part is on economic evaluation, the third on task-shifting – basically what it is and its application in screening and brief intervention for substance use –lastly the chapter is summarised and concluded in the fourth part.

Theoretical overview of motivational interviewing (MI)

Motivational interviewing is 'a directive, client-centred counselling style for eliciting behaviour change by helping clients to explore and resolve ambivalence' (Miller, 1996: p.835). It is a style of counselling rather than particular procedures that motivate clients to change. During motivational interviewing, clients are allowed to come up with steps that can help them to change rather than the counsellor trying to find reasons for the clients' problems and dictating to the clients what they can do to help them to change (Miller, 1996).

According to brief interventions based on a motivational interviewing framework, there are six stages of change that can be experienced by a patient during brief interventions. These are Pre-contemplation stage – a stage where a patient does not consider the need to change their substance use behaviour because they think the positive effects of using the substances supersedes the negative effects; Contemplation stage – the stage where the patient compares the pros and cons of changing their substance use behaviour against not changing. Patients usually have a mixed feeling about the advantages and disadvantages of substance use at this stage; Determination or preparation stage – the stage where the patient resolves his mixed feeling and makes a decision either to change or not to change; Action stage – the stage where the patient takes action towards behavioural change after a decision towards change has been made. Here the patient chooses which change approach to go with and actually does it; Maintenance stage – the stage where the patient takes steps to maintain the behavioural change made in order to avoid relapse; and Termination or Relapse stage – this is the stage where the patient either makes a full behavioural change and sustains it thereby terminating the intervention or relapses in which situation he has to start the process again (Baumann, 2007; Kumar & Malhotra, 2000). The process of change is illustrated in figure 1.

Figure 1: Illustration of the processes of change during motivational interviewing



Sources: (Baumann, 2007; Kumar & Malhotra, 2000)

The following are the guiding principles of motivational interviewing. During motivational interviewing, the counsellor or therapist is expected to express empathy, avoid arguments and help the patient to weigh the disadvantages of substance use above the advantages. They are also expected to 'roll with resistance' (Baumann, 2007: p.301; Kumar & Malhotra, 2000: p.174) that is, go along with the patient's resistance to behaviour change or shift the patient's focus on resistance or present a new way of viewing the issue under discussion. This component is more helpful to patients who refuse to accept any positive idea that can help them to make the needed change in their substance use behaviour to get a 'balanced' or 'opposite' idea (Kumar & Malhotra, 2000: p.174). Finally, counsellors are expected to

support patients' self-efficacy by increasing their optimism that they can successfully effect change in their substance use behaviour (Baumann, 2007; Kumar & Malhotra, 2000)

Empirical evidence of the effectiveness of brief MI for substance use

This section provides evidence of the effectiveness of MI as a brief intervention for substance use and some of the common issues arising from these effectiveness studies. Studies included here are those conducted in emergency departments with a few useful ones from other settings. The outcome measures used to assess the effectiveness of brief interventions for the current study are reduction in substance use and related problems – depression and verbal arguments. Therefore, only studies with similar outcome measures were considered whilst those that considered other intermediate effects were excluded.

In all, 13 studies were reviewed for this section. Nine of the studies recruited participants from emergency departments, one from outpatient clinics, two from the communities and one from both emergency departments and out-patient clinics. The subjects of most of the studies were adolescents and young adults. This is probably because of the early onset of substance use in most situations (Baumann, 2007). Whilst six of the studies concentrated on only alcohol, the rest of the studies either looked at other substances or a combination of alcohol and other substances. The summary of all the studies included in this review are presented in table 1.

Ten studies showed some form of positive results in favour of the effectiveness of brief motivational interviewing (Bernstein et al, 2009; Bernstein et al, 2005; Colby et al, 2005; Gentilello et al, 1999; Magill et al, 2009; McCambridge & Strang, 2004; Monti et al, 1999; Monti et al, 2007; Stein et al, 2009; Vasilaki et al, 2006). Compared to no intervention, brief MI has been reported to be more effective in reducing alcohol use in emergency departments

(Gentilello et al, 1999) as well as cocaine and heroin use (Bernstein et al, 2005). A meta-analytic review showed that brief MI was more efficacious in reducing alcohol use compared to no treatment and other brief interventions like skill-based counselling, directive-confrontational counselling and cognitive behavioural therapy (Vasilaki et al, 2006). Combined with personalised feedback, it has been reported that brief MI was effective in reducing alcohol consumption among high-risk youth in emergency care at 6 months and 12 months follow-up (Monti et al, 2007). In addition to providing brief MI, some of these studies offered booster sessions mostly with the aim of improving the long term effectiveness of the intervention (Bernstein et al, 2009). In most of the studies, the control groups also reported some reduction in substance use at least in the short-term.

Despite the above mentioned positive results, three of the studies included in the review reported that brief MI was not as effective as reported in the other studies (Daeppen et al., 2007; Marsden et al, 2006; Segatto et al, 2011). These studies reported no statistical difference in outcome measures between intervention and control groups. Whilst Marsden et al (2006) explained that screening, baseline assessment and interaction with researchers may account for their results, Daeppen et al (2007) argued that such activities may not be accountable for the similar effects in their study. In effect, there was no clear reason to explain why the intervention was not more effective.

The review of the empirical evidence revealed a number of issues related to the effectiveness of brief MI. Firstly, the effectiveness of brief MI recorded in some studies was short term and was not sustainable in the longer term. Vasilaki et al (2006) for instance reported that brief MI was more effective in the first 3 months of follow up compared to effectiveness at 6 months. Marsden et al (2006) reported that even though brief MI was not more effective

compared to providing information only at 6 months, their pilot study showed more effectiveness at 3 months.

Secondly, different studies used different tools for screening and the assessment of outcome measures. Some studies used a combination of biological makers and self-report screening tools whilst others used either of the two. Monti et al (2007) used BAC (Blood Alcohol Concentration) and AUDIT screening tool whereas McCambridge & Strang (2004) used self-report. Other studies used other assessment tools or questionnaires. Stein et al (2009) for instance used the Addiction Severity Index questionnaire to assess cocaine use among their study subjects. Substance use has different effects on users and brief interventions normally target different outcome measures and not just level of substance use. Studies therefore use different tools and questionnaires to assess their different outcome measures and this helps to evaluate the different outcome measures of interest. The study that is the topic of this thesis measured the level of risk of substance use with the ASSIST screening tool, depression with the Centre for Epidemiological Studies Depression Scale (CES-D) and the other outcomes measures with questionnaires designed for the study. The use of different screening tools and assessments of the different outcome measures (which is very common in substance use studies) makes it difficult to compare study findings.

Thirdly, brief MI offered to patients differed in duration and this may have some influence on the extent to which the intervention impacted on patient outcomes. No particular reasons were available for this practice in the available literature reviewed. In light of this, Vasilaki et al (2006) suggested the need for more studies into the issue. Their meta-analytic review showed that whilst MI was more efficacious than other interventions that lasted longer, it was also more efficacious than those offered within a shorter time frame like standard care and short advice. Besides the difference in duration, the interventions also had different

components even though they all included the main components of brief interventions – Feedback, Responsibility, Advice, Menu, Empathy and Self efficacy (FRAMES) (Humeniuk et al, 2010).

All these notwithstanding, there is enough evidence to support the effectiveness of brief MI as an intervention for substance use.

Table 1: Summary of studies on the effectiveness of brief MI for substance use

study	Type(s) of substance	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
1. (Bernstein et al, 2009) Randomised controlled trial (RCT) – pilot study	Marijuana	To examine the effectiveness of screening and brief intervention (SBI) in minimising marijuana use.	Youth and young adults in a paediatric emergency department with different clinical problems.	The Youth and Young Adult Health and Safety Needs Survey was used for screening.	Brief MI compared to a standard assessed (AC) group and a non-accessed control (NAC) group. Intervention group received written advice, a 20-minute structured conversation based on motivational interviewing technique, resources, a 10-day booster telephone 3- and 12-month appointment; The standard assessed control (AC) group received resources, written advice, and 3- and 12-month follow-up appointments; NACs received a resource brochure, written advice about marijuana use risks, and a 12-month follow-up appointment.	3 and 12 months follow-up.	SBI was effective in encouraging abstinence and reduction in marijuana use.

Table 1 continued

study	Type(s) of substance	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
2. (Bernstein et al, 2005) RCT	Cocaine and Heroin	To motivate out-of treatment cocaine and heroin users to abstain or minimise their substance use.	Patients 18+ years at out-patient clinics.	RIA (radio-immune assay of hair) test and Drug Abuse Severity Test screening tool (DAST).	One session of brief MI compared to no treatment.	3 and 6 months follow-up.	Brief MI has the potential of helping patients to achieve abstinence from cocaine and heroin use at 6 months follow-up.
3. (Colby et al, 2005) RCT	Cigarette smoking	To assess the efficacy of brief MI to minimise smoking.	Adolescent patients between the ages of 14–19 years in hospital outpatient clinic or emergency department.	Biomarker (saliva samples) and other tools including TWEAK, the timeline follow back, the Fagerstrom Tolerance questionnaire, etc.	One session of 35 minutes MI compared to 5 minutes standardized brief advice. Intervention group also received 20-15 minutes booster session one week after baseline assessment.	1, 3, and 6 months follow-up.	Brief MI was effective in reducing smoking at 3 and 6 months.

RCT= randomised controlled trial; MI=motivational interviewing

Table 1 continued

study	Type(s) of substance	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
4. (Daeppen et al, 2007)	Alcohol	To evaluate the efficacy of brief alcohol intervention (BAI) in reducing alcohol use. To test if the effects of observation and assessments were accountable for the similar reduction in alcohol use among intervention and control groups.	Injured patients treated in emergency department of an urban university hospital.	A 2-minute life-style questionnaire.	10 – 15 minutes of standardised brief alcohol intervention based on motivational interviewing compared to control groups of screening and 30 minutes assessment and screening only.	12 months follow- up.	Reduction in alcohol use was similar in all groups. 10–15-minute BAI did not decrease alcohol consumption and the utilisation of other health resources among hazardous drinkers. Baseline assessment did not account for the similar reduction in alcohol use between the groups.

Table 1 continued

study	Type(s) of substance	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
5. (Gentilello et al, 1999) RCT	Alcohol	To assess the effectiveness of routine screening and brief intervention (MI) in trauma units to reduce alcohol use and repeated trauma visits.	Injured patients, aged, over 18 years old admitted to Trauma unit.	Blood alcohol concentration (BAC); gamma glutamyl transpeptidase level, and Michigan Alcoholism Screening Test (SMAST).	30 minutes single motivational MI session compared to no intervention aside screening.	6, 12 months and 3 years follow-up.	Single 30 minutes MI session was effective in minimising alcohol use, alcohol related trauma injuries (47%), hospitalisation from injuries after 3 years (48%) and reduction in problem with the police. The intervention was most effective among moderate users who formed about 83% of the overall study population.

Table 1 continued.

study	Type(s) of substance	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
6. (Magill et al, 2009) RCT	Marijuana	To assess the extent of marijuana use and related problems among young alcohol consumers and their response to brief MI.	Young adults between 18 to 24 years in emergency departments.	Blood Alcohol Concentration (BAC), Alcohol Use Disorders Identification Test (AUDIT), drug use frequency questionnaire.	30-45 minutes brief MI for alcohol use compared to feed back only (FO).	6 and 12 months follow-up.	Brief intervention for alcohol users was effective in reducing marijuana use in both groups at 6 months but reduction in marijuana use in the MI group continued even at 12 months follow-up contrary to the FO group. Days of combined alcohol and marijuana use was also reduced in the MI group.

Table 1 continued.

study	Type(s) of substance	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
7. (Marsden et al, 2006) RCT	Alcohol, cocaine and ecstasy.	To probe into the effectiveness of brief MI in encouraging positive attitude towards abstinence from the use of cocaine and ecstasy and the minimisation of the amount and regular use of alcohol and stimulants.	Young adults and adolescent substance users between 16 and 22 years, recruited in the communities (specifically, Greater London and south-east England).	The Alcohol Use Disorders Identification Test (AUDIT); a 45 minutes questionnaire; a validated Maudsley Addiction Profile (MAP); five-item Severity of Dependence Scale (SDS).	45-60 minutes brief MI compared to health risk information only.	6 months follow-up.	Brief MI was not more effective than information only.

Table 1 continued

study	Type(s) of substance	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
8.(McCambridge & Strang, 2004) Cluster randomized trial	Alcohol, tobacco, cannabis and other illicit drugs.	To investigate the efficacy of MI in reducing substance use among young people or their view on risks and harm associated with drug use.	Young substance users between 16-20 years old in advance education colleges.	Self-report	Single one-hour face-to-face MI compared to education as usual	3 months follow up	MI was more effective in reducing substance use compared to education only even though the reduction in related risk and harm was not as much as reduction in substance use.

Table 1 continued.

study	Type(s) of substance	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
9. (Monti et al, 2007) RCT	Alcohol	To test the efficacy of brief MI delivered in emergency departments to minimise alcohol use and its consequences among young adults.	18 – 24 year-old patients with drinking problems in emergency departments.	Blood Alcohol concentration (BAC) and AUDIT	One session of 30-40 minutes MI that included personalised feedback compared to feedback only (FO). Booster sessions were conducted 1 and 3 months post-baseline by telephone but it was more detailed for those in the MI group.	6 and 12 months follow-up.	MI was more effective in reducing alcohol consumption compared to FO (effectiveness was maintained at 12 months follow-up). There was no significant difference between the interventions with respect to reduction in alcohol related problems.

AUDIT=Alcohol Use Disorder Identification Test

Table 1 continued

study	Type(s) of substance	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
10. (Monti et al, 1999) RCT	Alcohol	To assess the efficacy of brief MI to reduce alcohol use and its related problems.	Adolescents, 18-19 years old attending emergency departments after an alcohol-related incident.	Blood Alcohol concentration (BAC) and self-report of alcohol consumption before the incident.	35 -40 minutes of MI compared to standard care (normal treatment for youth involved in alcohol related injuries in emergency care which included self-help hand outs on drink-driving and a list of local treatment organisations).	3 and 6 months follow-up.	Compared to standard care, brief MI was more effective in reducing alcohol related problems. Both groups reported of reduction in alcohol use especially in the first 3 months of follow-up.

Table 1 continued.

study	Type(s) of substance	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
11.(Segatto et al, 2011) RCT	Alcohol	To assess the effectiveness of brief MI and educational brochure in minimising alcohol misuse and associated problems.	Adolescents and young adults between the ages of 16-25 years treated for alcohol related problems in emergency departments within 6 hours of alcohol use.	Self-report with a four multiple-choice questionnaire on alcohol use 6 hours before emergency department visit.	45 minutes of single MI session delivered by a senior psychologist plus reading and discussion of educational brochure compared to 5 minutes reading and discussion of 3 paged risks of alcohol use and guides to minimise alcohol use or prevent alcohol related problems.	3 months follow-up.	There was no statistical difference between the groups with respect to alcohol use and related problems. Brief interventions are effective among emergency departments patients no matter how brief the intervention.
12. (Stein et al, 2009) Randomized Trial	cocaine	To assess the effectiveness of multiple brief MI sessions in reducing cocaine use among the study population.	Out-of treatment cocaine users over the 18 years of age.	Addiction Severity Index (ADI) and the AUDIT.	4 sessions of MI lasting between 20 to 40 minutes per session compared to assessment only.	6 months follow-up.	MI was more effective in reducing cocaine use compared to assessment only.

Table 1 continued.

study	Type of substance(s)	Objective(s) of the study	Study participants and setting	Screening tool(s)	Description of interventions	Study period	Summary of Findings/ conclusions
13. (Vasilaki et al, 2006) A meta-analytic review.	alcohol	To assess the efficacy of brief MI against no intervention and other interventions.	Participants from different settings including emergency/trauma departments.	Different tools were used to evaluate level of alcohol use, e.g. Brief Drinker Profile was mentioned.	Compared brief MI to no intervention and other brief interventions for alcohol (standard care/brief advice/treatment as usual, skill based counselling educational intervention, cognitive behavioural treatment, directive-confrontational counselling).	3, 6, 12, and 25 months follow-up.	Brief MI was more efficacious compared to no intervention in the short-term (3 months follow-up). It is also more efficacious when compared to the other interventions. Brief MI was more effective in the first 3 months of follow up compared effectiveness at 6 months.

Theoretical overview of Problem Solving Therapy (PST)

PST is a cognitive clinical behavioural treatment that equips patients with problem-solving as well as coping strategies and skills aimed at improving 'psychological and behavioural functioning' in order to minimise and/or avert mental disorders and manage life's stressful issues more effectively (D'Zurilla & Nezu, 2010: p.179). Problem-solving is a process of ascertaining answers to particular problems (D'Zurilla & Nezu, 2010). It is a 'behavioural process' that offers the patient different ways of handling a problem and also promotes the likelihood of choosing the most effective alternative (D'Zurilla & Goldfried, 1971: p.107). Problem solving skills alone are however not enough. Depending on the nature and/or level of their problem, coping skills developed through PST enables patients to minimise their psychological distress and improve on their situations by helping them to accept their situation, eliminate any opposition to change, achieve their goals of change, develop tolerance and turn their problems around. An effective combination of these two skills helps to get the most out of PST. PST is based on models of social problem-solving and relational/problem solving models of stress and well-being (D'Zurilla & Nezu, 2010).

Relational/Problem Solving Models of Stress and Well-Being

The relational/problem-solving model of stress and well-being provides both a theoretical basis for PST and a useful outline for assessment before PST is offered. It is a broad and resourceful coping strategy. Prior assessments help to apply PST in a way that helps to improve the elements of problem solving that enhances positive outcomes and minimise or prevent those elements that lead to negative outcomes (Bell & D'Zurilla, 2009; D'Zurilla & Nezu, 2010).

Social Problem-Solving Model

Social problem-solving is a 'learning process, a general coping strategy and a self-control method' (D'Zurilla & Nezu, 2010: p.198). It is more related to real life problems and stress and how the patient is able to comprehend, evaluate and cope with such situations. The problem solving model was developed by D'Zurilla & Goldfried in 1971 and then modified by D'Zurilla & Nezu in 1982 and 1990. It theorised that there were two methods of problem solving – problem orientation and problem solving skills (Bell & D'Zurilla, 2009; D'Zurilla & Nezu, 2010).

Problem-solving orientation

Problem-solving orientation is explained to be a set of consistent responsive reasoning patterns that show how individuals recognise and evaluate the problems they face in life and their ability to solve those problems. It thus plays a 'motivational function' in the process of problem solving (Bell & D'Zurilla, 2009: p.349; D'Zurilla & Nezu, 2010: p.200). There are two problem solving orientations, positive and negative problem solving orientations. People with high positive problem solving orientation have a positive attitude towards their problems whilst the opposite is true for those with high negative problem solving orientation.

Problem solving skills

Problem solving skills are actual actions (both mental and behavioural) relating to an individual's efforts to comprehend everyday problems and come up with coping strategies to effectively handle the problem (Bell & D'Zurilla, 2009; D'Zurilla & Nezu, 2010). D'Zurilla and Goldfried (1971) presented four problem-solving skills which include creation and recognition of problems, creation of different solutions, making of decisions, and confirmation and application of solutions. D'Zurilla and Nezu (2010) later explained that the

latter skill is not about the actual implementation skill of the person but rather how he/she observe and appraise his/her solution after and whilst executing it.

Scales for measuring patient's social problem solving

D'Zurilla and Nezu developed the social problem solving inventory (SPSI) which is made up of the problem orientation scale (POS) and the problem solving skills scale (PSSS). These scales were based on the original 1971 model and measure cognitive, emotional and behavioural problem solving characteristics of the individual. It was a 70 item self-report scale developed to provide a theoretical basis for the measurement of social problem solving for research and clinical assessments that is precise and valid. SPSI was later revised into a five-element model made up of problem orientation elements – positive problem orientation (PPO), negative problem orientation (NPO) – and elements of problem-solving techniques – rational problem solving (RPS), impulsivity/carelessness style (ICS) and avoidance style (AS). These are the five dimensions of social problem solving model. The positive problem orientation and the rational problem solving are the positive dimensions and enhance positive problem-solving results whilst the remaining three elements are the dysfunctional dimensions that work in the opposite way (D'Zurilla & Nezu, 2010; D'Zurilla et al, 2002). As part of the main STRIVE study, patients' social problem solving were assessed based on these dimensions (results are not presented as part of the current cost-effectiveness analysis).

The social problem solving inventory-revised (SPSI-revised) was developed to measure the five elements of social problem solving. It is a self-report instrument and is used to assess a person's problem solving skills in order to help develop those skills where they are lacking. There is the long version (SPSI-R: L) which is a 52-item instrument and the short version (SPSI-R: S) which is a 25-item instrument and can be used in a time constrained environment or situation. The difference between the two versions is that in addition to the five main

elements, the long version also measures the four subscales of rational problem solving which are 'problem definition and formulation'; 'generation of alternative solutions'; 'decision making'; and 'solution implementation and verification' (D'Zurilla & Nezu, 2010: p.201; D'Zurilla et al, 2002). The SPSI-R is reported to be useful in a wide range of settings (including clinical, educational and research settings) and useful to all calibres of people interested in the mental and emotional welfare of people. It is not difficult to administer and score therefore non-mental health workers as well as other health workers can use it with ease. In scoring the SPSI-R, higher scores in the positive dimensions (PPO and RPS) is associated with positive problem-solving results whilst higher scores in the dysfunctional dimensions is associated with flawed problem solving results (D'Zurilla et al, 2002).

Empirical evidence of PST as a brief intervention for substance use

The underlying theory of PST is supported by empirical evidence (D'Zurilla & Nezu, 2010). The efficacy and appropriateness of PST in different adolescent and adult populations has been reported in a number of studies ranging from clinical randomised control trials to psychology outcome studies (Bell & D'Zurilla, 2009; Cuijpers et al, 2007; D'Zurilla & Nezu, 2010). It has been reported to be effective in the treatment of mental disorders such as major depression, anxiety, emotional distress, suicidal thoughts and personality disorders (Society of Clinical Psychology, n.d.). There is enough evidence of its effectiveness for some mental as well as some physical disorders (Bell & D'Zurilla, 2009; Cuijpers et al, 2007; Malouff, Thorsteinsson & Schutte, 2007).

Unlike studies on other mental disorders, no published studies on the effectiveness of PST as an intervention for substance use and related problems were found during the literature search for this work. The only evidence of effectiveness available (unpublished) was the results of the STRIVE study. It was found that a combination of PST and MI as brief interventions for

substance use disorder was effective in reducing depression and patient's ASSIST score (which reflected reduction in substance use) among at risk substance users in emergency departments (Sorsdahl et al, unpublished data). Despite the lack of numerous effectiveness studies in the area of PST and substance misuse as compared to MI, the result of the STRIVE study is promising.

Theoretical overview of methods of economic evaluation

In economic theory, an interaction between demand and supply in a perfectly competitive market leads to the efficient allocation of resources. This is however limited in the health care market because the conditions of a perfectly competitive market do not hold. There is uncertainty about the occurrence and duration of diseases, problem of asymmetry of information between providers and consumers of health care, irrational behaviour of individuals when sick and monopoly in the health market (Walker et al, 2011). This notwithstanding, equitable and efficient allocation of health care resources is important given the scarcity of health care resources as against the increasing demand for health and health care. Decisions about treatment options and interventions to implement must be made to ensure that resources are efficiently distributed. Methods of economic evaluation of alternative interventions or programs aid in such decisions (Cowell et al, 2010; Drummond et al, 2005; Walker et al, 2011). Economic evaluations 'identify, measure, value and compare' costs and effects of competing alternatives (Drummond et al, 2005: p.9). It deals with the issue of choice between alternatives by considering and comparing their costs and effectiveness. Based on this, economic evaluation has been defined as 'the comparative analysis of alternative courses of action in terms of both costs and consequences' (Drummond et al, 2005: p.9).

Economic evaluation of mental health services like other health services is important. Such analysis helps to address issues of resource allocation between mental health services and services for other physical illness and sectors of the economy by gathering the necessary cost information (Weisbrod, 1993). The determination of the societal costs of mental health disorders including substance use disorders is however difficult. These usually take account of a wide range of costs that may not be monetary and are usually covered in other sectors outside the health sector and mental health services like the legal and law enforcement services (Weisbrod, 1993).

There are four main methods of economic evaluation – cost analysis, cost-effectiveness analysis (CEA), cost utility analysis (CUA) and cost-benefit analysis (CBA), even though cost-analysis is not considered a full economic evaluation method (Drummond et al, 2005). All of these methods are similar in their cost measurement and valuation but differ in their outcome valuation. The main advantages, limitations and differences between these methods are summarised in table 2 below.

Methods of economic evaluation are associated with micro-economic theories/viewpoints of welfarism and non-welfarism. These influence the method used and the policy suggestions to be made from such analysis (Walker et al, 2011). For instance, CBA is said to be based on the Kaldor-Hicks welfare theory of potential Pareto improvement whereby gainers of a policy compensate the losers of the policy in order for societal welfare to increase. CEA is mostly based on non-welfare theories which favour the maximisation of targeted health outcomes and does not place much emphasis on the maximisation of people's utilities which is the focus of welfare theories (Walker et al, 2011). The type of analysis chosen also depends on the problem being analysed, difficulty with measurement and/or valuation of outcome and the analyst's view on the role of economic evaluation (Drummond et al, 2005). Despite these, it

cannot be ignored that the intended purpose of the analysis and the data available to the researcher can also play key role in the selection of the method to use.

Table 2: Summary of differences and limitations of the main methods of economic evaluation

Type of evaluation	Outcome measures	Measurement/valuation of outcomes	Decision making	Advantage/ limitations	limitations
Cost-analysis	Does not include outcomes in the analysis.	Not applicable.	Based on the cost per intervention. Lower costs are preferred.	Easier to conduct compared to the others.	Not a full economic evaluation.
CEA	Single outcome measure for both interventions being compared.	Natural units. Example, life years gained, reduction in substance use, etc.	Based on *ICERs per LYs gained/saved/lost. Lower ICERS are preferred to higher ones in most cases.	Easier to compute outcomes in natural units.	Difficult to compare cost-effectiveness of interventions across different programs or sectors of the economy.
CUA	Outcome measures may not be similar to alternatives being compared and it may also be more than one outcome measure.	Healthy years, usually measured in Quality Adjusted Life Years (QALYs) with reference to people's health related quality of life.	Based on cost per QALY gained or cost per healthy years. Lower values are preferred.	Computes outcomes in a single comparable unit (QALYs).	Not always easy to convert outcome measures into QALYs.

CBA	Outcome measures may not be similar to alternatives being compared and it may also be more than one outcome measure.	Monetary terms based on people's willingness to pay.	Based on [#]net present values presented as cost-benefit ratios or benefit-cost ratios. High positive net values are preferred.	Allows for comparison of outcomes across different programs and sectors of the economy. Enhances sectorial decision making.	Not always easy to compute outcomes in monetary terms.

Sources: (Cowell et al, 2010; Drummond et al, 2005; Luce & Simpson, 1995; Walker et al, 2011)

***** Incremental cost-effectiveness ratios (ICERs) are measured as a ratio of additional costs to additional effectiveness of alternative interventions.

[#] Net present values are calculated as the difference in the costs and benefits of the interventions being compared.

Empirical evidence of economic evaluation studies on screening and brief interventions for substance use.

A number of economic evaluation studies have been conducted on treatment services for substance abuse and addiction (Barnett & Swindle, 1997; Cartwright, 1998; French, 2000; French et al, 2002; French et al, 2000; Mojtabai & Graff Zivin, 2003; Schumacher et al, 2002). Most of these focused on alcohol use with very few on brief interventions for hazardous substance use (Kunz et al, 2004). For the purpose of this review, only brief interventions for substance use, specifically those that incorporated MI or PST were included. Studies that focused on other forms of brief interventions apart from those mentioned above as well as those that focused on treatment services for patients with dependence problems were excluded. In addition to the cost-effectiveness studies, other economic evaluation studies on brief interventions for substance use were also included. No published studies on economic evaluation for PST as a brief intervention for substance use were found. None were therefore included in this section of the review.

Cost-effectiveness Studies

In all, six published cost-effectiveness studies were reviewed. Three of these involved emergency departments. All the studies with the exception of one, focused on interventions for alcohol use. A summary of cost-effectiveness studies reviewed are presented in Table 3. The empirical evidence showed that screening and brief interventions for substance use can be cost-effective. At 6 months follow-up, Barrett et al (2006) reported that 45 minutes brief intervention for alcohol use in emergency departments was cost-effective compared to just screening and providing patients with hand-outs with information on alcohol consumption. As part of a pilot study, Kunz et al (2004) also reported that screening and brief interventions in emergency departments has the potential of being cost-effective compared to providing

only information after screening. Brief MI for teenagers presenting at emergency departments with alcohol related problems was reported to be cost-effective compared to standard care of 5 minutes of brief advice on risky alcohol behaviours (Neighbors et al, 2010). Among low-income pregnant women who quit smoking, brief MI was reported to be more cost-effective in the prevention of relapse compared to usual care (Ruger et al, 2008). Combinations of MI with other brief interventions have been reported to be more cost-effective. A study among college freshmen reported that MI combined with feedback was more cost-effective compared to MI only, feedback only and no intervention at all (just assessment of alcohol consumption and risk level). MI or feedback only was more costly and less effective (Cowell et al, 2012).

Contrary to the positive results of the cost-effectiveness of brief MI reported above, the intervention has been reported to be more costly but not more effective in getting low-income pregnant women to stop smoking compared to usual care (Ruger et al, 2008).

Table 3: Summary of cost-effectiveness studies

Study	Objective(s)	Study participants and setting	Description of Interventions	Outcome measure(s)	Perspective taken	Range of costs	Summary of results/conclusion	Comment(s)
1. (Barrett et al, 2006)	To conduct a cost-effectiveness analysis of screening and brief intervention following a referral to an Alcohol Health Worker (AHW).	Hazardous alcohol consumers in accident-emergency departments.	A 45-minutes single session of brief intervention compared to information only.	Weekly units of alcohol consumed.	Societal perspective .	Cost of intervention (employer costs and overheads), productivity losses, cost of resources of the criminal justice system, other services used like community health and social services.	The intervention was more effective and slightly less costly compared to information only leading to an ICER of £22 per reduction in the units of alcohol consumed in a week. The intervention cost or cost to the health sector was the highest cost component followed by the cost to the social services and then cost of productivity losses.	No discounting was done because costs and effects were within a year.

Table 3 continued

Study	Objective(s)	Study participants and setting	Description of Interventions	Outcome measure(s)	Perspective taken	Range of costs	Summary of results/conclusion	Comment(s)
2. (Cowell et al, 2012)	To calculate the cost and cost-effectiveness of brief MI and feedback (MIFB).	Heavy drinking university freshmen.	Brief MI and feedback information (MIFB) compared to assessment only (AO), 30-45 minutes single session of brief MI and feedback information (FB).	Average number of drinks consumed in a drinking period and the number of days of periodic heavy alcohol consumption.	Provider's perspective (the university).	Cost of staff time utilized in the delivery of the interventions.	MIFB dominated all the interventions and resulted in an ICER of $47.04 per reduction in the average number of drinks consumed in a drinking period and $64.34 per reduction in the number of days of periodic heavy alcohol consumption. At a willingness to pay value of $47 and $64 per reduction in the average number of drinks and the number of days of periodic heavy alcohol consumption respectively, AO could be the most cost-effective intervention. Beyond those values, MIFB would be preferred.	Included only short term costs of the intervention. Fixed costs like costs of computers and training for staff were excluded from the analysis.

Table 3 continued

Study	Objective(s)	Study participants and setting	Description of Interventions	Outcome measure(s)	Perspective taken	Range of costs	Summary of results/conclusion	Comment(s)
3. (Kunz et al, 2004)	To evaluate the cost and cost-effectiveness of screening and brief alcohol interventions.	Underprivileged population in an emergency department of an inner city hospital.	Brief counselling and information pack compared to information pack only.	AUDIT score, average number of drinks per week and incidence of heavy drinking.	Provider's perspective.	Costs of screening and intervention made up of staff wages, costs of equipment used, incentives paid to patients for participating in the study, overhead costs.	Brief intervention for substance use can be cost-effective.	Did not include costs to patients.

AUDIT= Alcohol Use Disorders Identification Test

Table 3 continued

Study	Objective(s)	Study participants and setting	Description of Interventions	Outcome measure(s)	Perspective taken	Range of costs	Summary of results/conclusion	Comment(s)
4. (Neighbors et al, 2010)	To assess the cost-effectiveness of brief MI.	At-risk teenage alcohol users in emergency departments.	A 30-45-minutes single session of MI compared to standard care.	Frequency of drunk-driving, injuries associated with alcohol consumption, road traffic violations and problems associated with the use of alcohol.	Provider's perspective.	Cost of intervention – staff time used in the delivery of the intervention, costs of MI brochures, designed computer program for feedback preparation, staff training and overheads.	MI was more cost-effective compared to standard care for all the outcome measures. ICER per reduction in drinking and driving, alcohol related injuries, traffic violations and alcohol related problems were $362.04 to $375.96, $591.33 to $614.07, $387.34 to $402.23 and $953.76 to $990.43 respectively.	There was no discounting. Costs to patients were excluded.

Table 3 continued

Study	Objective(s)	Study participants and setting	Description of Interventions	Outcome measure(s)	Perspective taken	Range of costs	Summary of results/conclusion	Comment(s)
5. (Ruger et al, 2008)	To assess the cost-effectiveness of brief MI to encourage smoking cessation and prevent relapse.	Two groups of low-income pregnant women – present smokers and new quitters from different obstetrical centres.	About 1 hour brief MI delivered during 3 home visits to the women plus self-help brochure on smoking cessation compared to care as usual (prenatal care and approximately 5 minutes intervention on the risks of smoking for pregnant women and new mothers plus self-help resources).	Infants Health outcomes at birth and after birth, successful prevention of relapse among quitters, smoking cessation among current smokers and the Life years and QALYs saved as a result.	Societal perspective	1. Cost of intervention – cost of staff time for the delivery of the interventions, cost incurred in the analysis of nicotine in the environment, staff training cost, travel time and cost of self-help resources. 2. Cost saving from averted neonatal and maternal medical costs.	MI was more costly and not more effective compared to UC with respect to smoking cessation and was therefore dominated. For relapse prevention, MI was more costly and more effective than UC leading to $851/Lys and $628/QALYs saved.	Not all costs were included in the analysis. Productivity losses to patients were excluded. Effects of the interventions were discounted.

Table 3 continued

Study	Objective(s)	Study participants and setting	Description of Interventions	Outcome measure(s)	Perspective taken	Range of costs	Summary of results/conclusion	Comment(s)
6. (Tariq et al, 2009)	To assess the cost-effectiveness of SBI for too much alcohol consumption.	Primary care facilities.	Screening and 10 to15 minutes brief counselling compared to current practice of no screening and intervention.	Reduction in alcohol consumption, QALYs gained.	Provider's perspective.	Cost of health care which included cost of the brief intervention, screening, diseases associated with alcohol and those not associated with alcohol.	SBI was cost-effective leading to £5,400/QALY gained. At different willingness to pay values per QALY, the intervention was still cost-effective compared to current practice.	Study did not include cost to participants. Discounted both cost and effects but at different rates.

There are a number of methodological issues arising from these studies. Unlike traditional cost-effectiveness studies where there are common outcome measures like life years (LYs) gained, life years lost, life years saved, etc., there is a lack of agreement on a single common outcome measure for cost-effectiveness studies on substance use (Barbosa et al, 2010; Cowell et al, 2010). This was evident in the studies reviewed above. With the exception of two studies that used QALYs and LYs gained (Ruger et al, 2008; Tariq et al, 2009), all the other studies used different outcome measures. These were however centred on substance use and/or related problems. The outcome measures of the studies reviewed are presented in table 3. Like the studies reviewed, the study reported in this thesis does not use QALYs and LYs but measures outcomes in natural units. The outcome measures used were different from those used in published studies. In addition to measures on substance use based on patients' ASSIST scores which has not been reported in any of the published studies reviewed it also includes measures on verbal argument and depression as secondary outcomes.

The perspective taken in an economic evaluation is important. It delineates the point of view of the analyst, and also influences the range of costs and outcomes to be evaluated in the study. It drives the design of the analysis (Luce & Simpson, 1995). The perspectives and range of costs of the studies reviewed are also presented in table 3. Four of the studies reviewed used providers perspective in their analysis (Cowell et al, 2012; Kunz et al, 2004; Neighbors et al, 2010; Tariq et al, 2009). These studies were focused on providers' decision making. However, the use of provider's perspective does not provide the full cost of these interventions. It excludes the costs to patients, their families and costs from other sectors of the economy that are affected by substance use like the justice system, law enforcement, labour market and educational sector. Besides, the effects of substance use go beyond health outcomes. The social consequences are

usually even higher than the health consequences leading to higher social costs. Excluding such costs hinders the accurate analysis of the true costs and in some cases the effects of these interventions. Even though the current study aims to inform provider's decision making, it employs societal perspective which allows for the consideration of other social costs including costs to patients for taking part in the intervention.

Sensitivity analysis is an important aspect of economic evaluation. It tests the strength of study findings by varying the study parameters (Briggs, 1995). The four main methods of sensitivity analysis identified by Briggs (1995) are simple sensitivity analysis, extreme scenario analysis, threshold analysis and probabilistic sensitivity analysis. All the studies reviewed conducted sensitivity analysis. Whereas some of them conducted either simple sensitivity analysis (Ruger et al, 2008) or probabilistic sensitivity analysis (Kunz al, 2004; Tariq et al, 2009), others conducted a combination of the two (Barrett et al, 2006; Cowell et al, 2012; Neighbors et al, 2010). Barrett et al (2006), Cowell et al (2012) and Tariq et al (2009) employed cost-effectiveness acceptability curves to evaluate uncertainty around their incremental cost-effectiveness ratios (ICERs). The present study conducted a simple sensitivity analysis. With the exception of Cowell et al, (2012) and Ruger et al, (2008), the results of the sensitivity analysis of the other studies supported the initial findings reported by the authors. The one-way sensitivity analysis by Ruger et al, (2008) showed that even though MI was more costly and less effective in encouraging smoking cessation among their participants in the initial analysis, 8% cessation rate among smokers could make the intervention cost-effective.

Discounting is another important aspect of the evaluation of programs (Olsen, 1993) and is thus encouraged in economic evaluation of health care programs or interventions. It gives a view of

future costs and effects in present terms (Drummond et al, 2005). Whereas discounting costs in economic evaluation is not a disputed issue, there are a number of arguments for and against the discounting of health effects. Whilst some authors argue in favour of the discounting of health effects equally as costs, others argue against equal discounting or no discounting at all (Drummond et al, 2005). Drummond et al (2005) mentioned that in all these, the researcher should take into consideration the context of the economic evaluation. Given that brief interventions for substance use are effective in reducing negative consequences of substance use and future health care costs (Gentilello et al, 2005), some of the studies reviewed discounted either their costs or effects or both. Tariq et al (2009) discounted both costs and effects at 4% and 1.5% respectively. Ruger et al (2008) also discounted effects of the interventions. However, not all studies discounted their costs or effects. Whilst some totally ignored it without any reason, others explained that discounting was not necessary because costs and benefits did not exceed one year (Barrett et al, 2006). Cowell et al (2012) excluded long term costs and effects and so did not need to discount these. In addition to not discounting, some studies failed to annuitise their costs even though they included capital costs. In most situations these were treated like recurrent costs. Even though the current study does not discount overall intervention costs and effects of the intervention given that these were all incurred over a short time frame of less than a year, capital costs were discounted and annuitised to extract the monthly costs of those resources.

Most of the studies assessed cost-effectiveness by calculating the ratio of the incremental costs and effects of the interventions to the comparators (Barrett et al, 2006; Cowell et al, 2012; Kunz et al, 2004; Ruger et al, 2008; Tariq et al, 2009). Neighbors et al (2010) used decision analytic models to compute ICERs. The current study used decision analytic model (decision tree) to assess cost-effectiveness of the interventions.

Other Economic Evaluation Studies

Only one published cost-benefit study of brief interventions for substance use in emergency departments was found and reviewed. Gentilello et al (2005) provided brief alcohol intervention to injured patients in emergency departments and hospitals and reported that the intervention was cost-effective. The intervention led to reduction in emergency department visits and hospitalisation at a lower cost, leading to a net cost saving of $89 for each patient screened or $330 for each patient to whom an intervention was offered. Each $1 spent on screening and brief intervention led to $3.81 savings in health care cost. Unlike the present study, this study focused on alcohol only. It included only the direct medical costs for alcohol related injuries. It did not include other medical costs, costs to patients for attending the emergency departments or hospital or participating in the interventions and other social costs (Gentilello et al, 2005).

In another cost-benefit study, brief physician advice to problem drinkers was reported to be cost-effective leading to a benefit: cost ratio of $56,263:$10,000 (Fleming et al, 2000). An intervention cost of $205 per patient led to a benefit of $1,151 in monetary terms. Comparing cost of intervention to its effectiveness, the authors reported that the intervention led to an economic benefit of $ 195,448 in savings from reduction in hospital and emergency department visits and $ 228,071 in averted cost of crime and automobile accident reductions (Fleming et al, 2000).

Among older alcohol users between the ages of 65 and 75 years old, brief physician advice was reported not to be very cost-effective (Mundt et al, 2005). There was no statistical difference in the monetary value of change in the use of health care services and alcohol-related social effects between the intervention and control groups. However, compared to other treatment services

provided in out-patient departments, the authors reported that the intervention was more effective in minimizing alcohol consumption among hazardous drinkers at a lower cost of $236. Although cost-benefit allows for easier comparison of costs and benefits of interventions in monetary terms and across different sectors of the economy, the main limitation to the use of the method is the difficulty in converting outcomes into monetary terms. Such conversions were beyond the scope of the present study.

In a cost-utility analysis, Neighbors et al (2010) provided evidence that brief MI for alcohol was more cost-effective compared to standard care. The combined cost per QALY gained for both men and women was $8,795 per QALY and this was reported to be preferred to other medical technologies (Neighbors et al, 2010). The authors compared lives saved by the intervention and its incremental costs. Unlike most of the studies reviewed, the cost-utility study used a single outcome measure (QALYs). In emergency departments where a lot of the patients are injured or are in some form of extreme pain, using a health related quality of life scale to measure people's health state can be biased by their current health state. In the current study, about 72.2% of the study participants were injured (Sorsdahl et al, unpublished work).

Task-shifting

Task-shifting is when people with lesser qualifications are given some amount of training to undertake a task that could otherwise have been done by those with higher qualification. It is also when tasks are redistributed such that lower qualified workers do the jobs that should have been done by more qualified professionals (Fulton et al, 2011). Based on a review of literature on task-shifting or task substitution, Dovlo (2004) identified four main forms of task-shifting or substitution in Africa: (1) using existing but different group of health workers in place of another

group – example, nurses doing the work of physicians; (2) replacing or substituting existing roles with new or different ones – example, medical assistants taking the role of physicians; (3) assigning specific roles to less trained group of workers from the same profession – example, assigning specialist work to general practitioners; (4) assigning non-technical tasks to others to minimise work load. Using peer counsellors for screening and brief interventions for substance use in emergency departments fits more in the fourth category. Given the nature of economic and health problems in most developing countries, task shifting in the health sector provides a favourable way of acquiring health care at reasonable cost despite its challenges. It provides the opportunity to fill in the gap in heath service delivery (Dovlo, 2004). According to Fulton et al (2011), it increases production efficiency in the health sector by leading to the provision of more health care services at a given cost and quality or the same quantity and quality of health care at a lower cost. Such efficiency leads to improvement in health service delivery. It also reduces cost of training and wage payment to highly skilled workers. Task shifting also minimises the time needed to increase the workforce since it takes lesser time to train people to undertake shifted tasks (Fulton et al, 2011).

Given the gaps in the mental health services in South Africa, Petersen et al (2012) reported that at minimal cost, task shifting in the mental health sector can bridge the mental health service delivery gap in South Africa. They calculated the cost of a hypothetical human resource mix required to provide mental health services in rural settings in the country. In the area of screening and brief interventions for substance use, many of the studies reviewed above have used non-traditional mental health workers like physicians, physician assistants, health educators/promoters, peer health educators, etc. who were given special training to screen patients, offer brief interventions and in some cases make referrals for specialist care. The use of

these non-mental health professionals was feasible and resulted in effective intervention delivery and outcomes. In the South African setting, a pilot study has shown that the use of peer counsellors to provide screening and brief interventions for substance use in emergency departments has been reported to be feasible with limited cost (Myers et al, 2012).

A cost-analysis by Zarkin et al (2003) reported that the cost of screening and brief interventions for alcohol is fair and even cheaper when delivered by lower level health workers. Most of the economic evaluation studies on the topic concentrated more on the cost analysis of the total intervention without providing an explicit cost analysis or cost description on task-shifting even though they used non-mental health workers (Babor et al, 2006; Kunz et al, 2004; Neighbors et al, 2010). The current study provides an explicit analysis on the costs of using peer counsellors for screening and brief intervention in emergency departments. Unlike the study by Zarkin et al (2003), the current study involved peer counsellors rather than traditional mental health workers.

Summary and conclusion

The review of literature revealed that screening and brief interventions that employ motivational interviewing for substance use in emergency departments are feasible and effective. In-spite of the available evidence of the effectiveness of the intervention, only a few of the published literature included other psychoactive substance besides alcohol. The review also reveals that different studies used different screening tools and targeted different outcome measures even though they were mostly related to substance use and related problems. Brief motivational interventions were offered at different durations ranging from 5 minutes to 45 minutes per session. Only short-term effectiveness mostly between 3 to 12 months follow-up was reported in the reviewed studies. This was due to the high loss to follow-up in these studies. This is not

surprising given the fact that the participants are substance users and have a high potential not to be committed to the program.

Like the effectiveness studies, very few published cost-effectiveness analyses on the subject were identified. Despite this, those available provided enough information to inform the methodology of the current study. For instance it could be deduced from the literature review that there is no one way of measuring outcomes included in the economic evaluation. Incremental cost-effectiveness ratios can be reported according to the outcome measure used for the effectiveness analysis.

The main gaps identified in the current literature on cost-effectiveness analysis of screening and brief interventions were that only few studies have been conducted in emergency departments, on other psychoactive substances other than alcohol, on PST as a brief intervention for substance use and none of the studies were conducted in the South African setting. Other gaps identified were the fact that none of the studies used the ASSIST for screening and neither included outcome measures on verbal arguments and depression. Although the use of non-traditional mental health workers for screening and brief interventions for substance use was common in most of the studies reviewed, none of these studies provided an explicit cost analysis or description of task-shifting.

In conclusion, even though screening and brief interventions for substance use are reported to be feasible and cost-effective in reducing substance use and related problems, there are still some gaps in literature that the current study aims to address, paramount of which is the fact that there is no published literature on the subject from the South African setting.

References

Babor, T.F., Higgins-Biddle, J.C., Dauser, D., Burleson, J.A., Zarkin, G.A. & Bray, J. 2006. Brief interventions for at-risk drinking: patient outcomes and cost-effectiveness in managed care organizations. *Alcohol and alcoholism.* 41(6):624-631.

Barbosa, C., Godfrey, C. & Parrott, S. 2010. Methodological assessment of economic evaluations of alcohol treatment: what is missing? *Alcohol and alcoholism.* 45(1):53-63.

Barnett, P.G. & Swindle, R.W. 1997. Cost-effectiveness of inpatient substance abuse treatment. *Health services research.* 32(5):615.

Barrett, B., Byford, S., Crawford, M.J., Patton, R., Drummond, C., Henry, J.A. & Touquet, R. 2006. Cost-effectiveness of screening and referral to an alcohol health worker in alcohol misusing patients attending an accident and emergency department: a decision-making approach. *Drug alcohol depend.* 81(1):47-54.

Baumann, S.E. 2007. *Primary Healthcare Psychiatry: A Practical Guide for Southern Africa.* jutaonline. co. za.

Bell, A.C. & D'Zurilla, T.J. 2009. Problem-solving therapy for depression: A meta-analysis. *Clinical psychology review.* 29(4):348-353.

Bernstein, E., Edwards, E., Dorfman, D., Heeren, T., Bliss, C. & Bernstein, J. 2009. Screening and brief intervention to reduce marijuana use among youth and young adults in a pediatric emergency department. *Academic emergency medicine.* 16(11):1174-1185.

Bernstein, J., Bernstein, E., Tassiopoulos, K., Heeren, T., Levenson, S. & Hingson, R. 2005. Brief motivational intervention at a clinic visit reduces cocaine and heroin use. *Drug and alcohol dependence.* 77(1):49-59.

Briggs, A.H. 1995. *Handling the Uncertainty in the Results of Economic Evaluation.* Office of Health Economics.

Cartwright, W.S. 1998. Cost-benefit and cost-effectiveness analysis of drug abuse treatment services. *Evaluation review.* 22(5):609-636.

Colby, S.M., Monti, P.M., O'Leary Tevyaw, T., Barnett, N.P., Spirito, A., Rohsenow, D.J., Riggs, S. & Lewander, W. 2005. Brief motivational intervention for adolescent smokers in medical settings. *Addictive behaviors.* 30(5):865-874.

Cowell, A.J., Bray, J.W., Mills, M.J. & Hinde, J.M. 2010. Conducting economic evaluations of screening and brief intervention for hazardous drinking: Methods and evidence to date for informing policy. *Drug and alcohol review.* 29(6):623-630.

Cowell, A.J., Brown, J.M., Mills, M.J., Bender, R.H. & Wedehase, B.J. 2012. Cost-effectiveness analysis of motivational interviewing with feedback to reduce drinking among a sample of college students. *Journal of studies on alcohol and drugs.* 73(2):226-237.

Cuijpers, P., van Straten, A. & Warmerdam, L. 2007. Problem solving therapies for depression: a meta-analysis. *European psychiatry.* 22(1):9-15.

Cunningham, R.M., Bernstein, S.L., Walton, M., Broderick, K., Vaca, F.E., Woolard, R., Bernstein, E., Blow, F. et al. 2009. Alcohol, tobacco, and other drugs: future directions for

screening and intervention in the emergency department. *Academic emergency medicine.* 16(11):1078-1088.

D'Zurilla, T.J. & Nezu, A.M. 2010. Problem-solving therapy. *Handbook of cognitive-behavioral therapies.* 3:197-225.

D'Zurilla T.J., Nezu A.M., Mayeu-Olivares A., 2002., *Social problem solving Inventory-revised (SPSI-R) brochure*. [Online]. Available from: http://downloads.mhs.com/spsi/SPSI-R_Brochure.pdf [Assessed on 21st June 2013]

D'Zurilla, T.J. & Goldfried, M.R. 1971. Problem solving and behavior modification. *Journal of abnormal psychology.* 78(1):107.

Daeppen, J., Gaume, J., Bady, P., Yersin, B., Calmes, J., Givel, J. & Gmel, G. 2007. Brief alcohol intervention and alcohol assessment do not influence alcohol use in injured patients treated in the emergency department: a randomized controlled clinical trial. *Addiction.* 102(8):1224-1233.

Dovlo, D. 2004. Using mid-level cadres as substitutes for internationally mobile health professionals in Africa. A desk review. *Human resources for health.* 2(1):7.

Drummond, M.F., Sculpher, M.J. & Torrance, G.W. 2005. *Methods for the economic evaluation of health care programs.* Oxford university press.

Fleming, M.F., Mundt, M.P., French, M.T., Manwell, L.B., Stauffacher, E.A. & Barry, K.L. 2000. Benefit-cost analysis of brief physician advice with problem drinkers in primary care settings. *Medical care.* 38(1):7-18.

French, M.T. 2000. Economic evaluation of alcohol treatment services. *Evaluation and program planning.* 23(1):27-39.

French, M.T., Roebuck, M.C., Dennis, M.L., Diamond, G., Godley, S.H., Tims, F., Webb, C. & Herrell, J.M. 2002. The economic cost of outpatient marijuana treatment for adolescents: findings from a multi-site field experiment. *Addiction.* 97(s1):84-97.

French, M.T., Salome, H.J., Krupski, A., Mckay, J.R., Donovan, D.M., McLellan, A.T. & Durell, J. 2000. Benefit-cost analysis of residential and outpatient addiction treatment in the State of Washington. *Evaluation review.* 24(6):609-634.

Fulton, B.D., Scheffler, R.M., Sparkes, S.P., Auh, E.Y., Vujicic, M. & Soucat, A. 2011. Health workforce skill mix and task shifting in low income countries: a review of recent evidence. *Hum resour health.* 9(1):1.

Gentilello, L.M., Ebel, B.E., Wickizer, T.M., Salkever, D.S. & Rivara, F.P. 2005. Alcohol interventions for trauma patients treated in emergency departments and hospitals: a cost benefit analysis. *Annals of surgery.* 241(4):541.

Gentilello, L.M., Rivara, F.P., Donovan, D.M., Jurkovich, G.J., Daranciang, E., Dunn, C.W., Villaveces, A., Copass, M. & Ries, R.R.,1999. Alcohol interventions in a trauma center as a means of reducing the risk of injury recurrence. *Annals of surgery.* 230(4):473.

Humeniuk, R., Henry-Edwards, S., Ali, R., Poznyak, V. & Monteiro, M.G. 2010. The Alcohol, Smoking and Substance involvement Screening Test (ASSIST): manual for use in primary care/prepared by R. HumeniukU̓ [et al].

Kumar, S. & Malhotra, A. 2000. Brief interventions in substance abuse. *Indian journal of psychiatry.* 42(2):172.

Kunz, F.M., French, M.T. & Bazargan-Hejazi, S. 2004. Cost-effectiveness analysis of a brief intervention delivered to problem drinkers presenting at an inner-city hospital emergency department. *Journal of studies on alcohol.* 65(3):363-370.

Luce, B.R. & Simpson, K. 1995. Methods of cost-effectiveness analysis: areas of consensus and debate. *Clinical therapeutics.* 17(1):109-125.

Magill, M., Barnett, N.P., Apodaca, T.R., Rohsenow, D.J. & Monti, P.M. 2009. The role of marijuana use in brief motivational intervention with young adult drinkers treated in an emergency department. *Journal of studies on alcohol and drugs.* 70(3):409.

Malouff, J.M., Thorsteinsson, E.B. & Schutte, N.S. 2007. The efficacy of problem solving therapy in reducing mental and physical health problems: A meta-analysis. *Clinical psychology review.* 27(1):46-57.

Marsden, J., Stillwell, G., Barlow, H., Boys, A., Taylor, C., Hunt, N. & Farrell, M. 2006. An evaluation of a brief motivational intervention among young ecstasy and cocaine users: no effect on substance and alcohol use outcomes. *Addiction.* 101(7):1014-1026.

McCambridge, J. & Strang, J. 2004. The efficacy of single-session motivational interviewing in reducing drug consumption and perceptions of drug-related risk and harm among young people: results from a multi-site cluster randomized trial. *Addiction.* 99(1):39-52.

Miller, W.R. 1996. Motivational interviewing: Research, practice, and puzzles. *Addictive behaviors.* 21(6):835-842.

Mojtabai, R. & Graff Zivin, J. 2003. Effectiveness and cost-effectiveness of four treatment modalities for substance disorders: a propensity score analysis. *Health services research.* 38:233-259.

Monti, P.M., Barnett, N.P., Colby, S.M., Gwaltney, C.J., Spirito, A., Rohsenow, D.J. & Woolard, R. 2007. Motivational interviewing versus feedback only in emergency care for young adult problem drinking. *Addiction.* 102(8):1234-1243.

Monti, P.M., Colby, S.M., Barnett, N.P., Spirito, A., Rohsenow, D.J., Myers, M., Woolard, R. & Lewander, W. 1999. Brief intervention for harm reduction with alcohol-positive older adolescents in a hospital emergency department. *Journal of consulting and clinical psychology.* 67(6):989.

Mundt, M.P., French, M.T., Roebuck, M.C., Manwell, L.B. & Barry, K.L. 2005. Brief physician advice for problem drinking among older adults: an economic analysis of costs and benefits. *Journal of studies on alcohol.* 66(3):389-394.

Myers, B., Stein, D.J., Mtukushe, B. & Sorsdahl, K. 2012. Feasibility and Acceptability of Screening and Brief Interventions to Address Alcohol and Other Drug Use among Patients Presenting for Emergency Services in Cape Town, South Africa. *Advances in preventive medicine.* 2012.

Neighbors, C.J., Barnett, N.P., Rohsenow, D.J., Colby, S.M. & Monti, P.M. 2010. Cost-Effectiveness of a Motivational lntervention for Alcohol-Involved Youth in a Hospital Emergency Department. *Journal of studies on alcohol and drugs.* 71(3):384.

Olsen, J.A. 1993. On what basis should health be discounted? *Journal of health economics.* 12(1):39-53.

Petersen, I., Lund, C., Bhana, A. & Flisher, A.J. 2012. A task shifting approach to primary mental health care for adults in South Africa: human resource requirements and costs for rural settings. *Health policy and planning.* 27(1):42-51.

Ruger, J.P., Weinstein, M.C., Hammond, S.K., Kearney, M.H. & Emmons, K.M. 2008. Cost-effectiveness of motivational interviewing for smoking cessation and relapse prevention among low-income pregnant women: a randomized controlled trial. *Value in health.* 11(2):191-198.

Schumacher, J.E., Mennemeyer, S.T., Milby, J.B., Wallace, D. & Nolan, K. 2002. Costs and effectiveness of substance abuse treatments for homeless persons. *Journal of mental health policy and economics.* 5(1):33-42.

Segatto, M.L., Andreoni, S., Diehl, A. & Pinsky, I. 2011. Brief motivational interview and educational brochure in emergency room settings for adolescents and young adults with alcohol-related problems: a randomized single-blind clinical trial. *Revista brasileira de psiquiatria.* 33(3):225-233.

Society of Clinical Psychology, division 12 of the American Psychological Association. n.d. *What is Problem-solving therapy?* [Online]. Available from http://www.div12.org/sites/default/files/WhatIsProblemSolvingTherapy.pdf [Assessed 20th June 2013].

Stein, M.D., Herman, D.S. & Anderson, B.J. 2009. A motivational intervention trial to reduce cocaine use. *Journal of substance abuse treatment.* 36(1):118-125.

Tariq, L., van den Berg, M., Hoogenveen, R.T. & van Baal, P.H. 2009. Cost-effectiveness of an opportunistic screening programme and brief intervention for excessive alcohol use in primary care. *PloS one.* 4(5):e5696.

Vasilaki, E.I., Hosier, S.G. & Cox, W.M. 2006. The efficacy of motivational interviewing as a brief intervention for excessive drinking: a meta-analytic review. *Alcohol and alcoholism.* 41(3):328-335.

Walker, S., Sculpher, M. & Drummond, M. 2011. The methods of cost-effectiveness analysis to inform decisions about the use of health care interventions and programs. In *The Oxford Handbook of health economics.* Glied, S. & Smith, P.C. (eds.). Oxford University Press. pp.733-758.

Weisbrod, B. 1993. Economics of mental illness: costs, benefits and incentives. *Health economics of depression: Perspectives in psychiatry.* 4:15-34.

Zarkin, G.A., Bray, J.W., Davis, K.L., Babor, T.F. & Higgins-Biddle, J.C. 2003. The costs of screening and brief intervention for risky alcohol use. *Journal of studies on alcohol and drugs*. 64(6):849.

PART C: JOURNAL MANUSCRIPT

Proposed Journal: Cost Effectiveness and Resource Allocation[1]

[1] Instructions for authors in appendix G. Tables and figures have been inserted in the main text of the manuscript instead of the end of the article to improve readability. Authors' contribution and information are also excluded. For the purpose of this thesis, the student is the first and sole author of the work.

BRIEF INTERVENTIONS TO ADDRESS SUBSTANCE USE IN EMERGENCY DEPARTMENTS IN THE WESTERN CAPE: A COST-EFFECTIVENESS ANALYSIS

Abstract

Background: This study is part of Project STRIVE (Substance use and Trauma Intervention) study which investigated the effectiveness of two brief interventions in reducing harmful substance use in patients presenting to emergency departments at three health facilities in the Western Cape Province of South Africa. The two interventions, offered by peer counsellors, were motivational interviewing (MI) or MI together with problem solving therapy (PST). The objective of the study is to assess the cost and cost-effectiveness of the two interventions from the provider and societal perspectives and to compare these to a no intervention status quo.

Method: 335 patients were randomised into a control (n=110) or intervention (n=225) arm after being screened with the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST). Patients in the intervention group either received 1 session of MI (n=113) or MI in addition to 4 sessions of PST (n=112). Costs included in the analysis were the direct health care costs associated with running the interventions and screening for substance use as well as the costs of emergency department visits. Patient costs included any out of pocket payments incurred accessing the interventions. Outcome measures were patient's ASSIST scores on substance use, depression and frequency of verbal arguments.

Results: Both interventions were more effective than the control. The total cost per patient was R 83.48 for screening, R 779.89 for the MI only intervention and R 1093.36 for the MI with PST intervention. For patient's ASSIST score and depression, the MI with PST intervention had a lower ICER than the MI (R340.66 and R133.46 per mean point reduction in ASSIST score and depressive symptoms respectively). For verbal arguments, the MI only intervention had a lower ICER of R3500.48 per mean reduction in the frequency of the outcome measure. The results of

the sensitivity analyses were not very different from the results of the initial analysis. It also showed that increasing the number of patients who screened positive and thus received the intervention could increase the effectiveness of the intervention.

Conclusion: A combination of PST and MI delivered by peer counsellors can be cost-effective strategy for the minimisation of substance use and depression in emergency departments.

Keywords: Substance use; emergency departments; brief interventions; motivational interviewing; problem solving therapy; task-shifting; cost-effectiveness analysis

Background

Substance use is a public health problem accounting for a number of diseases and deaths globally [1]. It is associated with interpersonal violence, vehicular accidents and injuries [2-4]. Most of the victims of these incidences are treated in emergency departments [5-9]. South Africa has a long history of substance use disorder, particularly alcohol misuse [10] and is one of the countries with the highest prevalence and risk rate of substance use disorder in the world[11, 12]. Given the high rate of substance misuse in the country, the services available in the country to help substance users are relatively inadequate and are mostly treatment services aimed at helping those with dependence problems [13, 14]. Brief interventions for substance use are targeted at risky users who do not have dependence problems and may not be using treatment services. The aim is to help them quit or at least minimise their substance use [15]. In some situations, these interventions help those with dependence problems to enter treatment services and/or adhere to treatment [16].

Brief interventions for substance use in emergency departments have been reported to be effective in reducing substance use, injuries and readmissions into emergency departments [17-20]. Most of these interventions employ motivational interviewing techniques [21].

Despite the proven effectiveness of these interventions and the fact that emergency departments are reported to be ideal for the provision of brief interventions for substance use, this is usually not the case [6, 7]. Emergency departments are usually swamped with severely injured or sick patients and health workers in these departments are almost always overwhelmed with work, with little or no time to screen and offer brief interventions for patients with substance use problems. To help deal with the problem of shortage of medical staff as well as the problem of

work-overload in these settings, task-shifting in medical settings has been recommended [22]. Task shifting has been described as the use of other workers to perform a task other than those traditionally trained or responsible for doing it [22]. It could take the form of task delegation or redistribution. Usually, those given the new task have lower qualification than those originally trained to do the work and are specifically trained to take on the task [22]. In this study task-shifting denotes the use of peer counsellors for screening and the delivery of the brief interventions instead of clinical psychologists. The use of non-traditional mental health workers or general health workers for screening and the delivery of brief interventions in emergency departments has been reported to be feasible and in most cases encouraging of effective patient outcomes [23, 24].

Economic evaluation of brief interventions is important to aid decision making about their implementation by comparing the costs and effectiveness of the interventions. Not many economic evaluation studies have been conducted on the subject especially cost-effectiveness analysis. The few available published cost-effectiveness studies involving emergency departments mostly focused on patients with alcohol problems without much focus on other substance users. There is no agreed outcome measure for use in cost-effectiveness analysis of brief interventions for substance use [25]. The use of different types of costs and outcome measures in these analyses is common practice and this makes comparison of results of studies on the subject difficult [26].

Kunz, French and Bazargan-Hejazi provided brief counselling sessions and health information to problem drinkers presenting in emergency departments as part of a pilot study [27]. Their costs were mainly treatment and screening costs and their outcome measures were participant's scores

on the AUDIT (Alcohol Use Disorders Identification Tests), average number of drinks consumed per week and cases of heavy drinking over 3 months of follow up. The average cost of the intervention per patient was reported as $632 and the screening cost ($497) formed about 79% of this cost. The intervention was found to be cost-effective in that setting, leading to incremental cost effectiveness ratios (ICERs) of $258 per reduction in patient's AUDIT scores, $219 per reduction in average number of drinks consumed per week and $61 per reduction in probability of heavy drinking during 3 month follow up [27].

A cost-effectiveness analysis of brief MI compared to standard care of 5 minutes of brief advice offered to teenagers with alcohol related problems in emergency departments also reported that MI was relatively more cost-effective [28] . Costs included in the study were intervention costs, costs of the hand-outs used, staff training, costs of a computer program that prepared the feedback used during the intervention and overheads. Outcome measures were reduction in drinking and driving, road traffic violations and injuries associated with alcohol consumption. Decision analytic model was used to assess the cost-effectiveness of the interventions [28].

45 minutes brief intervention following a referral to Alcohol Health Workers (AHWs) has been reported to be more cost-effective compared to just receiving health information [29]. Patients' alcohol consumption was measured at baseline and at 6 and 12 months follow-up to assess effectiveness of the intervention. Cost of all services used (hospital, community and social services), cost of productivity losses and intervention costs, mainly costs of the AHWs were assessed from a societal perspective. The findings of the study showed that costs and outcomes were slightly higher for the intervention group even though there was no statistically significant difference between control and intervention groups at 12 months follow up [29].

Unlike most of these studies, the current study included users of other illicit substances like cocaine, cannabis, amphetamine type stimulants (mostly tik), inhalants, sedatives or sleeping pills, hallucinogens and opioids. The study was part of Project STRIVE which offered two brief interventions, a combination of problem-solving therapy (PST) with motivational interviewing (MI) or just motivational interviewing to patients attending emergency departments in the Western Cape province of South Africa. The interventions were offered by peer counsellors [Sorsdahl et al, unpublished observation]. The inclusion of PST was to help patients develop and practice the skills needed to deal with problems of life. This cost-effectiveness analysis component aimed at assessing the costs and cost-effectiveness of these interventions. It also estimated the cost of emergency department visits and the cost of task-shifting, i.e. the cost of using the peer counsellors instead of clinical psychologist for screening and the administration of the interventions.

Methods

Study Design

Cost-effectiveness was assessed from both provider and societal perspectives. Outcomes and costs were extracted from the STRIVE study. Both the ingredients and step down methods were used to calculate the economic cost of interventions. Cost-effectiveness analysis was estimated by computing the incremental cost-effectiveness ratios (ICERs) of the interventions. A decision analytic model (decision tree, built in TreeAge Pro 2013, R1.0) was used for the assessment of cost-effectiveness of the interventions. Cost of task-shifting was also analysed. A simple sensitivity analyses was conducted to examine the robustness of the study findings.

Study population and setting

The analysis included participants of the STRIVE study. The study population of the STRIVE study included emergency department patients with substance use problems in the Western Cape province of South Africa. The study sample was patients attending the emergency departments of Khayelitsha Site B community health centre, Khayelitsha district hospital and Elsies River community clinic. The Western Cape province has the highest lifetime prevalence of substance use disorders in South Africa with a prevalence of 20.6 compared to the national level of 13.3 [11]. As at 2011, the unemployment rate was 21.4% in the province [30]; 23.96% in Elsies River [31] and 38.02% in Khayelitsha [32]. Both Khayelitsha and Elsies River have high rates of crime and violence.

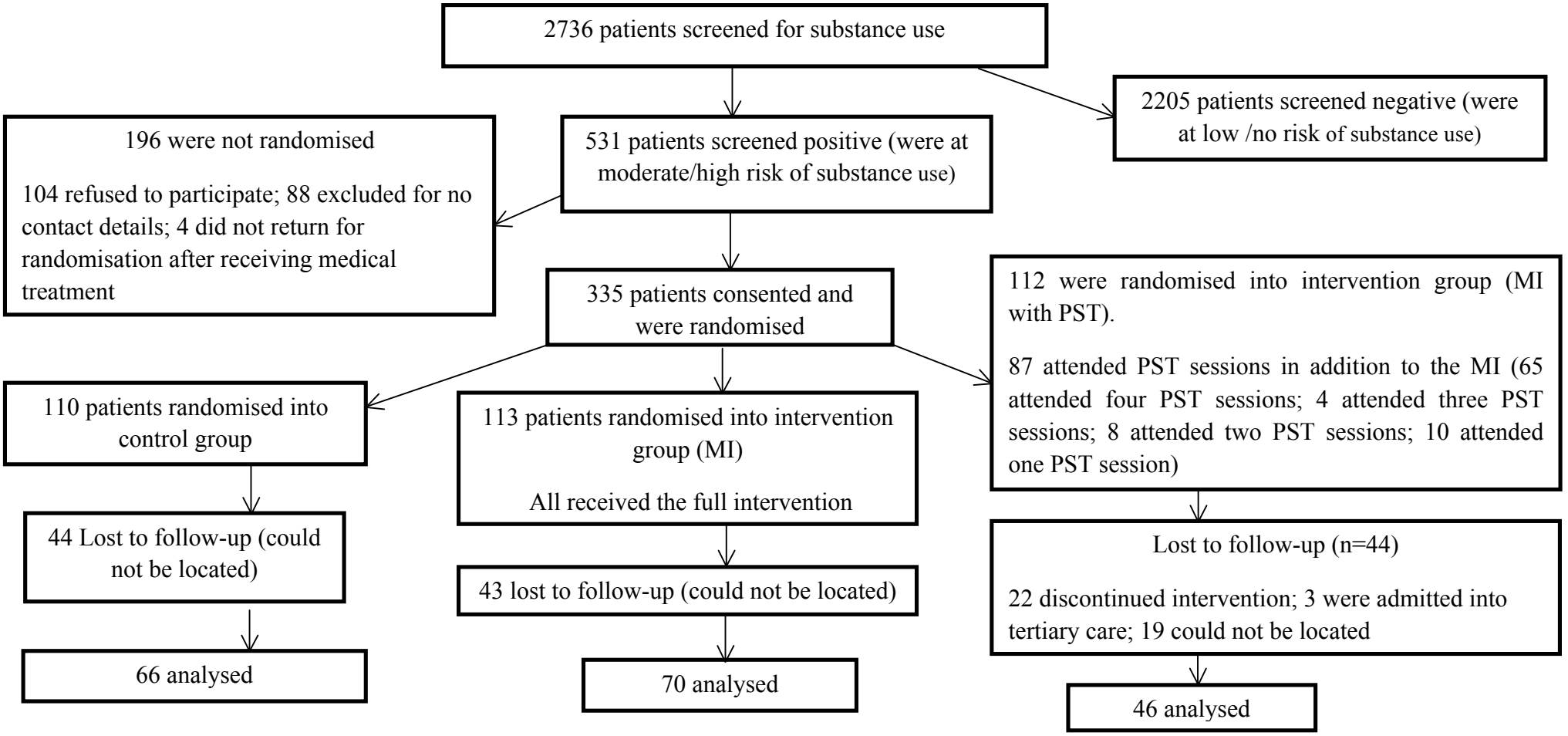
Screening and recruitment

Details of screening and assessments are explained in detail elsewhere (Sorsdahl et al, unpublished observation). Briefly, 2736 consented patients were screened with the ASSIST for substance use by peer counsellors whilst they waited to be attended to by doctors. The ASSIST has been proven to be effective in identifying substance users across different substances and different settings [33]. Based on their ASSIST score patients were classified as low, moderate or high risk for health and other problems due to their pattern of substance use. 531 patients screened positive for moderate to high risk of substance use out of the total of 2736 patients screened. 110 patients were assigned to the control group, 113 patients were assigned to the MI only intervention group and 112 to the MI with PST intervention group. Patients at high risk were also referred for specialised treatment whilst those at low risk were excluded from the study

[Sorsdahl et al, unpublished observation]. The follow-up rate for the entire study sample was 54% (n=182). A patient flow chat is presented in figure 1.

In addition to patient's level of substance use measured by their ASSIST score, their depressive symptoms were also assessed at baseline with the Centre for Epidemiological Studies Depression Scale (CES-D). This measured common symptoms of depression based on 20 self-rated items. Patients also completed a questionnaire to assess their substance related injuries, violence and interaction with the police in the three months preceding the study. The ASSIST and the other assessments were re-administered during a three months follow-up to determine the effectiveness of the interventions [Sorsdahl et al, unpublished observation].

Figure 1: Patient's flow chat



Source: adapted from the STRIVE study

Peer counsellors

The peer counsellors used for the study were recruited from the study areas. They either had tertiary level education (bachelors) or equivalent knowledge and were trained specifically to screen and offer the interventions for the purpose of the study [Sorsdahl et al, unpublished observation]. In all, they had 45 hours of training from a certified trainer; 25 hours on MI training, 12 hours on PST training and 8 hours on screening, including training on substance use and risks and research ethics. In addition to being trained, the peer counsellors also had biweekly fidelity checks (supervision and debriefing sessions) throughout the study period with a clinical psychologist to ensure the fidelity of the interventions.

Description of interventions

MI intervention

Patients randomised into the MI group received only one session of MI after screening and baseline assessment. This intervention has been proven to be effective in reducing substance use and related problems [33]. The intervention lasted about 30 minutes per patient. Patients received substance use risk cards which provided feedback on their level of risk after screening. It also provided information on the problems/risks associated with the use of each of the substances they use as well as local telephone contacts of SANCA (a substance use centre), the South African Depression and Anxiety group and other emergency helplines like the suicide helpline. They were also handed a fact sheet on alcohol and illicit drugs. The fact sheet provided basic information on alcohol consumption and why people should or should not use illicit drugs. It also had the local telephone contacts on the substance use risk card. During the intervention, the peer

counsellors talked about substance use, provided feedback on patient's level of risk based on their ASSIST scores on substance use and advised patients on their substance use pattern and the need to change in order to minimise their health and other risks especially risk of injury. Through a motivational interviewing approach, they also boosted patient's motivation and willingness to change [Sorsdahl et al, unpublished observation].

MI with PST intervention

Patients assigned to this intervention group received the same MI intervention discussed above in addition to four sessions of PST, provided one week apart from each other [Sorsdahl et al, unpublished observation]. PST was designed to provide patients with problem solving and coping skills to help them deal with psychological disorders and cope effectively with the stress of life. It equips patients with different ways of dealing with a problem and the skill to select the most efficient solution [34, 35].

The first PST session lasted about 60 minutes and the three other sessions lasted about an average of 40 minutes each. During these sessions the peer counsellor worked together with the patient to ascertain problems in the patient's life, during which time the counsellor taught the patient how to deal with those problems using structured PST strategies. A PST booklet was used for these sessions and it also contained homework for each session aimed at providing patients the chance to practice their problem solving skills in real world situations [Sorsdahl et al, unpublished observation].

Control

Patients in this group were given the alcohol and illicit drugs fact sheet without any form of intervention during the study. For ethical reasons, they were administered the MI intervention at the three months follow-up [Sorsdahl et al, unpublished observation].

Costs

Costs were analysed from a provider and societal perspective. They comprised of both recurrent and capital costs, grouped into the cost of screening, intervention, cost of emergency department visit and general costs of the intervention. Provider costs were sourced from the project manager of the STRIVE study and the expenditure records of the health facilities through the Department of Health of the Western Cape Province. Prices were based on 2012/2013 market prices where appropriate. Costs to patients were extracted from the questionnaires administered to patients at the three months follow up. All costs were calculated and presented in South African rand. Costs were reported as average cost per patient. This was calculated as total costs divided by the number of patients who screened positive for risky substance use (in the case of screening) and the number of patients in an intervention group (in the case of the interventions).

Estimation of capital costs

These were made up of the cost of counsellor's training, room space and furniture used within the facilities.

Cost of room and furniture

Screening and the interventions were administered in a private room in the emergency departments. Cost of room space was estimated based on the price index for new buildings in South Africa [36]. Cost of furniture was estimated based on their market prices. It was assumed that the useful life for furniture and the rooms used were 5 and 20 years respectively. Capital costs were then annuitised using a 3% discount rate [37]. 3% was chosen in order to facilitate comparability with other cost-effectiveness analyses. 75% of the annual costs were used in the analysis based on the length of the study (which took place over three-quarters of a year). Total costs were proportionally allocated to screening, MI and the MI with PST interventions based on the number of sessions undertaken in each of these activities.

Cost of peer counsellors' training

Total cost of counsellors training was estimated as the cost of the training materials, room space, and the salary of the trainer. Retraining for peer counsellors was assumed to be within the next three years. Calculation for annuitisation was the same as described above for furniture and room space. Total costs were proportionally allocated to screening and the intervention groups based on the number of hours used in training for those activities. Cost per peer counsellor was calculated as the total cost divided by the number of peer counsellors.

Estimation of Recurrent costs

These costs included the cost of peer counsellor's time, costs of materials used for screening and the interventions (cost of the substance use risk cards, PST booklets, alcohol and illicit drugs fact sheets, stationaries), screeners, overheads (cost of emergency department visits), and cost of

fidelity checks (cost of tapes for fidelity checks, cost of clinical psychologists for fidelity checks and the cost of checking the tapes after each session of fidelity checks).

Cost of counsellor's time

Total salary paid to a peer counsellor was divided by the total number of minutes used for screening and the interventions to generate the cost per minute. The total cost of each activity was calculated as the product of the cost per minute and the total number of minutes for the activity. It was assumed that this also covered the cost of time the peer counsellor was not seeing any patient. Cost per patient was estimated as the total costs divided by the number of patients receiving the interventions. Cost of time for baseline and follow-up assessments were considered as research costs and were therefore ignored.

Overheads

These included the general operating costs required to run the emergency departments, and were allocated per emergency department visit using routine facility visit statistics. They were mostly administrative costs, costs of medical and non-medical staff, utilities, and other operational costs of the health facilities. Total costs of overheads were estimated for all three facilities over the study period. Average cost per patient was estimated as the total costs divided by the total number of patient who visited the emergency departments during the study period.

Cost of materials

Costs of materials used for screening and the interventions included the cost of the substance use risk cards, PST booklets, alcohol and illicit drugs fact sheets, screeners and other stationary.

Costs per patient for the risk cards (used for the MI), PST booklets, substance-use facts sheets and screeners were based on the unit costs provided by the project manager for the STRIVE study. For the other stationaries used, costs were based on their market prices.

Cost of fidelity checks

Cost of fidelity checks included the cost of tape recorders used for the recording the fidelity check sessions, salary of clinical psychologists for checking the tapes and for undertaking the exercise with the peer counsellors. Total costs were calculated as the sum of all those costs over the study period. Costs were allocated proportionally to screening and the intervention groups in a similar way as cost of peer counsellor's training was allocated.

Cost of screening

This was made up of cost of screeners, stationary, cost of peer counsellor's time and the share of capital costs and cost of fidelity checks allocated to screening.

Cost of MI only intervention

The direct costs of the MI only intervention included cost of the substance use risk cards, alcohol and illicit drugs fact sheets, other stationary used, peer counsellor's time for the delivery of the MI intervention and the cost of fidelity checks and capital costs apportioned to the MI intervention.

Cost of the MI with PST intervention

This included both provider's costs and costs to patients. Provider's costs of the intervention were the cost of the PST booklets (which also included the substance use risk cards), peer counsellor's time for the delivery of the interventions, substance use information sheet, other stationary used, capital costs and cost of fidelity checks apportioned to the MI with PST intervention.

Costs to patients

Cost to patients for participating in the intervention was basically the transportation costs incurred by participants for travelling to the facilities to attend their PST sessions. Productivity losses in terms of salary loss, cost of care takers and other non-health care costs to patients as a result of their participation in the intervention were excluded from the analysis because the patients indicated that they did not incur these costs or losses. Patients reported their cost of transportation for a PST session during the follow-up session. Not all patients incurred this cost because many walked; those who incurred these costs reported costs ranging between R 14 to R 25. To include this cost in the costing analysis, the mean cost of transportation was calculated as the sum of the costs reported by each participant divided by the total number of participants who answered this question (thereby including those who had incurred zero cost in this calculation). This was multiplied by the number of PST sessions attended to get the total cost of transportation incurred for attending the PST sessions. Average cost of transportation per patient for attending PST sessions was estimated as the total cost divided by the number of participants who were in the MI with PST intervention group. There were no costs to patients for participation in the MI and control groups because they received their intervention whilst seeking health care in the

emergency departments. In contrast to those in the MI with PST intervention group, they did not have to attend the facilities specifically for any intervention.

Analysis

Effectiveness Analysis

Reduction in patient's ASSIST score (which measure their substance use), depressive symptoms and verbal arguments were used as the measures of effectiveness of the interventions. Effectiveness, measured as the mean point difference between assessments at baseline and at 3 months follow-up was estimated with paired-samples t-test. Difference between the groups was analysed with univariate ANCOVAs. Pre-treatment scores were used as the covariate [Sorsdahl et al, unpublished observation].

Cost-effectiveness analysis

A decision tree model was created to assess the cost-effectiveness of the interventions. A decision tree is a flow chart that illustrates the structure of a problem. It integrates the costs and outcomes of the different ways or strategies of dealing with the problem. Decision trees are useful when modelling interventions that lead to outcomes in the short-term (example, short term screening programs, interventions for acute health care problems, etc.). They are also suitable for economic evaluations that consist of intermediate outcomes [38]. They are generally useful for modelling problems that have simple scenarios that are relatively less complicated.

For this study, the model, as depicted in figure 3, was built to compare the costs and effectiveness of the interventions with the status quo of no intervention. The costs and

effectiveness of the interventions estimated from the STRIVE study were used to populate the model. In the model, patients were allocated to the intervention groups (MI only, MI with PST and status-quo of no intervention) and followed through a series of events to establish the costs and outcomes of the interventions. The model assigned costs and outcomes to the different events. Patients were tracked through the model depending on whether they screened positive or negative to substance use. Patients who screened positive were further followed based on whether they gave consent for the intervention, refused it or were excluded for not having contact details for follow-up. Patients in the MI with PST intervention group were again followed based on whether they dropped out of the intervention or not and the number of PST sessions they attended. The proportions (table 1) and assumptions (table 2) used in the decision tree model were based on the outcome of the STRIVE study.

The model estimated the incremental cost effectiveness ratios (ICERs) of the interventions. ICER is the ratio of additional costs to additional effect – comparing each more costly intervention to the one directly preceding it [37]. Cost of emergency department visits was the only cost incurred in the status-quo situation. Cost of intervention was therefore considered to be zero (0) because in the status-quo situation, no form of intervention was offered to patients with substance use problem.

Table 1: The proportions that drove patient's pathways in the model

Event	Proportions used
Screened negative	0.81
Screened positive	0.19
Gave consent to receive interventions	0.63
Refused the interventions	0.20
Excluded from interventions for some reason	0.17
Attended all four PST sessions	0.58
Did not attend all PST sessions	0.39
Referred for tertiary care	0.03
Proportions who did not attend all PST sessions	
Did not attend any PST session	0.50
Attended one PST session	0.23
Attended two PST sessions	0.18
Attended three PST sessions	0.09

Table 2: Model assumptions

Assumptions
Patients who screened negative for substance misuse were assigned a zero (0) outcome which can be interpreted to mean that no improvement in outcome was achieved. The outcome measures used in the study were the mean point difference between baseline and follow-up. Those who screened negative did not record follow-up values. Patients who tested positive for substance misuse but refused the intervention, as well as those excluded from the study after being screened, were assigned the outcomes recorded for those in the control group. Patients who dropped out of the MI with PST intervention group were assigned the same outcome measures as those who received the MI only intervention because that was all the intervention they received. Patients who did not attend all PST sessions in the MI with PST group were allocated the same outcomes as those who attended all the sessions. This was because the study did not record separate outcomes for them. It was therefore assumed that the intervention had the same impact on them.

Cost of task-shifting

In addition to the cost-effectiveness analysis, the cost of using peer counsellors instead of clinical psychologists was also analysed. This included the total cost of peer counsellor's training, salaries and fidelity checks. Both total costs and costs per peer counsellor were analysed. Total

cost was estimated as the sum of all the costs over the study period. Because the cost recorded was the total for all the five peer counsellors used in the study, average cost per peer counsellor was estimated by dividing the total cost by the total number of peer counsellors used in the study. Cost of peer counsellor's training included in this section of the analysis was the full cost and not based on the annuitised cost as was estimated under capital cost. The reason was to incorporate the full cost of training.

Sensitivity Analysis

Simple sensitivity analysis was conducted to test the robustness of the study findings [39]. The proportion of patients that screened positive was about 19% of the total screened and this was increased to see what the situation would be like in a case of higher prevalence. In the study, not all the patients in the MI with PST intervention group completed the intervention. In the sensitivity analysis, the percentage that completed the intervention was increased. The main cost drivers of the interventions were also varied to see their impact on the study results.

Results

Baseline characteristics

65% (n=218) of the study participants included in the STRIVE study were men. Their ages ranged between 18 to 75 years with the average age being 28 years. 72.2% of the people attended the emergency department for treatment of their injuries. 76.5% (n=185) of these injuries were as a result of violent assaults and 59.2% (n=197) of the injured patients were under the influence of psychoactive substances when they attended the emergency departments. Alcohol was the most

common substance used (n=286, 85%), followed by cannabis (n=24, 7%) and methamphetamine (n=20, 6%) [Sorsdahl et al, unpublished observation].

Effectiveness

The effectiveness data from the STRIVE study showed that both interventions were more efficacious in all three outcome measures than the control group of no intervention even though all three groups recorded some reduction (i.e. improvement) in their outcome measures at 3 months follow-up. The mean effectiveness of the different groups is presented in table 3. A significant number of participants who received the MI with PST intervention recorded better outcomes compared to those who received the MI only intervention with respect to substance use and depressive symptoms. Their mean ASSIST score reduced from 19.20 (SD=6.59) at baseline to 7.4 (SD=5.9) at three months follow-up and their mean depressive symptoms measured by the CES-D reduced from 26.0 (SD=6.85) at baseline to 12.91 (SD=5.93) at 3 months follow-up. The mean ASSIST score for those in the MI only group reduced from 20.33 (SD=6.71) at baseline to 12.31 (SD=7.87) at three months follow-up whilst their mean depressive symptoms measured by the CES-D reduced from 23.28 (SD=7.84) at baseline to 16.92 (SD=7.85) at 3 months follow-up. Difference between groups was significant at a p-value<0.001. The MI only intervention was more efficacious in reducing the frequency of verbal arguments [mean reduction from 0.53 (SD=0.94) at baseline to 0.23 (SD=0.46) at 3 months follow-up] compared to the MI with PST intervention [mean reduction from 0.83 (SD=1.34) at baseline to 0.65 (SD=1.2) at 3 months follow-up]. This was significant at a p-value of 0.004 [Sorsdahl et al, unpublished observation].

Table 3: Mean effectiveness of interventions (expressed as difference in these measures between baseline and three-month follow up)

Intervention	Mean effectiveness		
	ASSIST score	Depression	Verbal argument
Status-quo	7.01	1.5	0.01
MI	8.01	6.23	0.3
MI with PST	11.8	13.08	0.17

Costs

The cost per patient refers to the full cost of each intervention if delivered in its entirety (e.g. without any loss to follow up). The cost of screening was R 83.48, the direct cost of the MI only intervention was R 317.73 and the direct cost of the MI with PST intervention was R 689.79 (provider cost=R 631.20; patient cost=R 58.59). The average cost of an emergency department visit per patient for all three facilities used was R 378.68 (table 4). The main cost drivers of the direct cost of the interventions and screening per patient were costs of fidelity checks (22.42% of screening cost; 86.48% of MI only cost; 61.12% of MI with PST intervention cost) and cost of counsellor's time per patient (69.90% of screening cost; 10.69% of MI only intervention cost; 25.5% of MI with PST intervention cost).

The total cost per patient in each intervention group if delivered in full was estimated as the direct cost of the intervention, cost of screening and the average cost of emergency department visit. All put together, the average cost per patient was R 779.89 for the MI only intervention and R 1093.36 for MI with PST intervention (table 4). Cost of emergency department visit accounted

for the highest percentage (48.56%) of the overall cost of MI only intervention whilst the direct cost of the MI with PST intervention accounted for the highest percentage (59.88%) of the MI with PST intervention. Cost of screening contributed the lowest percentage to all the interventions (figure 2).

Table 4: Cost per patient

Cost variables	Average Cost per patient	
Provider Costs	MI only intervention	MI with PST intervention
Cost of screening	R 83.48	R 83.48
Cost of the intervention	R 317.73	R 631.20
Cost of emergency department visits	R 378.68	R 378.68
Sub total	*R 779.89*	*R 1093.36*
Patient Costs		
Cost of transportation	N/A	R 58.59
Total	R 682.10	R 1151.95

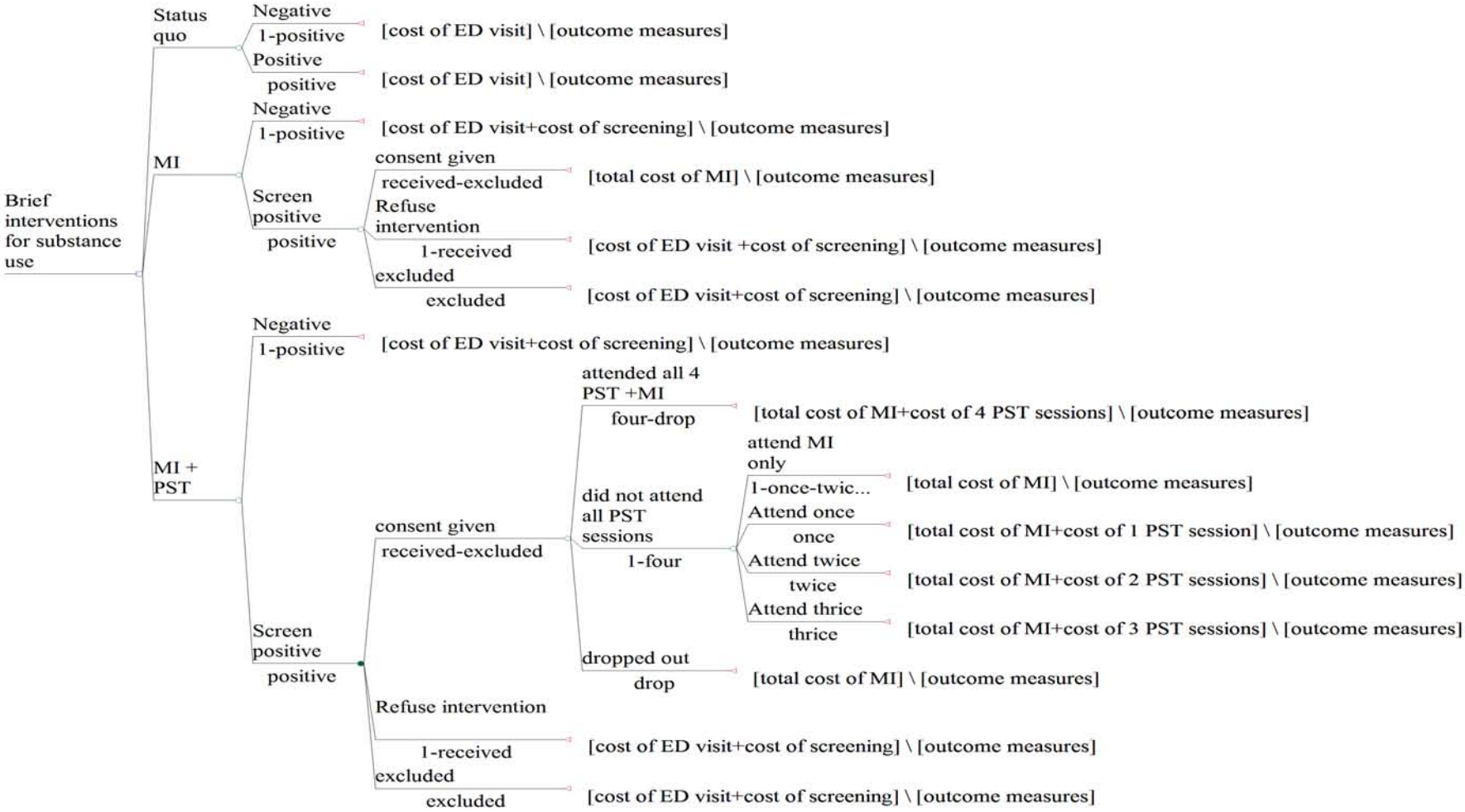
Note: N/A means the estimation is not applicable in that particular situation

Figure 2: Distribution of cost per patient for each intervention

Cost-effectiveness analysis

Cost-effectiveness was assessed within the decision tree model depicted in Figure 3. In assessing cost-effectiveness, the analysis took into account patients that were lost to follow-up, excluded or refused the intervention. Because of this, both the costs and the effectiveness calculated are lower than the cost per patient and the effectiveness reported above. But, as before, both interventions were more costly and more effective than the status quo of no intervention. The MI with PST intervention was more costly than the MI only intervention. It was also more effective with respect to reduction in patient's ASSIST score and depressive symptoms, leading to ICERs of R 340.66 and R 133.46 for mean reduction in patient's ASSIST score and depressive symptoms respectively. For these outcome measures, the MI intervention was eliminated through extended dominance. This implied that a combination of no intervention and MI with PST intervention would be more cost-effective than administering only the MI intervention to patients. The MI only intervention was more effective with respect to reduction in verbal argument, leading to an ICER of R 3500.48 per patient. The MI with PST intervention was more costly and less effective with respect to verbal argument and was eliminated through absolute dominance (table 5).

Figure 3: Output of the decision tree model.



* outcome measures= effectiveness values for patient's ASSIST score, depression and verbal arguments; ED=emergency department

Table 5: Result of cost-effectiveness analysis

Interventions	Cost	Incremental cost per patient (ΔC)	Effectiveness			Incremental effectiveness (ΔE)			Incremental cost effectiveness ratios (ICERs) [ΔC/ΔE]		
			*AS	*DP	*VA	*AS	*DP	*VA	*AS	*DP	*VA
Status quo (no intervention)	R 378.68	N/A	1.33	0.29	0	N/A	N/A	N/A	N/A	N/A	N/A
MI only	R 500.19	R 121.51	1.45	0.86	0.04	0.12	0.57	0.03	#Dominated	#Dominated	3500.48
MI with PST	R 539.23	R 160.55	1.8	1.49	0.02	0.47	1.2	-0.01	340.66	133.46	†Dominated

Note: *AS= ASSIST score; DP= depression; VA= verbal arguments; ΔC = change in cost compared to status quo; ΔE= change in effectiveness compared to status quo; MI= motivational interviewing; PST=problem solving therapy; R = South African rands; N/A means the estimation was not applicable in that particular situation; #Dominated through extended dominance (the MI with PST intervention had a lower ICER than the MI only intervention with respect to the outcome measures in question); †Dominated through absolute dominance (the MI with PST intervention was more costly and less effective compared to the MI only intervention and so was dominated by the MI only intervention).

Cost of task-shifting

Total cost of task-shifting was R 561 950 for all five peer counsellors used in the study and R 112 390 for each peer counsellor. Cost of fidelity checks contributed to 49.73% of the total costs whilst the cost of peer counsellor's salary contributed to 48.05% of the cost. Cost of training accounted for only a 2.22% of the total cost (table 6).

Table 6: Cost description of task-shifting

Cost items	Costs per month		Total costs over study period (9 months)		Contribution of cost item to total cost (%)
	Cost per peer counsellor	Cost for all five peer counsellors	Cost per peer counsellor	Cost for all five peer counsellors	
Cost of peer counsellor's training	N/A	N/A	R 2 500	R 12 500	2.22%
Cost of fidelity checks	R 6 210	R 31 050	R 55 890	R 279 450	49.73%
Salary paid to peer counsellors	R 6 000	R 30 000	R 54 000	R 270 000	48.05%
Total	R 12 487.78	R 62 438.89	R 112 390	R 561 950	100%

Note: N/A means the estimation was not applicable in that particular situation

Sensitivity analysis

In the initial analysis which was based on study findings, 19% of patients screened positive for moderate and high risk of substance use. In the sensitivity analysis this was varied from 1% to 50%. This resulted in an increase in the costs and effectiveness of the interventions. While the ICER for the MI intervention (for the ASSIST score and depressive symptoms) continued to be higher than that for MI with PST (and hence would be eliminated through extended dominance) the MI intervention did improve its cost-effectiveness as the proportion of patients that screened positive increased. For verbal argument on the other hand, the MI with PST intervention was still dominated by the MI only intervention (table 7).

Increasing the proportion of patients who completed the MI with PST intervention from 58% to 100% led to an increase in the costs and effectiveness of the intervention with respect to patient's ASSIST score and depressive symptoms (table 9). The intervention still had lower ICER than the MI only intervention. The effectiveness of the intervention in reducing verbal argument on the other hand decreased as more patients participated in the full intervention. The intervention was still dominated by the other interventions as was reported in the initial analysis.

Cost of fidelity checks was identified as one of the main cost drivers of the direct cost of the interventions. 5%, 10% and 50% reduction in the cost led to some reduction in the costs of screening and the interventions (table 8). Cost of peer counsellor's time was identified as another cost driver. An analysis of the working capacity of the peer counsellors showed that they had enough excess capacity to see more patients. A simple analysis showed that given the number of minutes used for screening and the interventions, the peer counsellors could screen 8780 patients and offer each of the interventions to 852 people (if 1716 screened positive based on the 19%

used in the study). This could lead to reduction in the cost of counsellor's time per patient. At the moment, the counsellor's utilised only 16% of their time seeing patients.

Table 7: Sensitivity analysis: Varying the proportion of patients who screened positive

% screening positive	Intervention	Costs	Incremental costs	Effectiveness			Incremental effectiveness			ICERs		
				*AS	*DP	*VA	*AS	*DP	*VA	*AS	*DP	*VA
1%	Status quo	R 378.68		0.07	0.02	0.000						
	MI only	R 464.16	R 85.48	0.08	0.05	0.002	0.01	0.03	0.002	#dominated	#dominated	46788.01
	MI with PST	R 466.22	R 2.05	0.09	0.08	0.001	0.02	0.03	-0.001	3529.02	1382.55	†dominated
17%	Status quo	R 378.68		1.22	0.26	0.002						
	MI only	R 496.86	R 118.18	1.32	0.78	0.033	0.11	0.52	0.032	#dominated	#dominated	3731.72
	MI with PST	R 532.47	R 35.61	1.65	1.36	0.022	0.32	0.58	-0.011	357.69	140.13	†dominated
34%	Status quo	R 378.68		2.36	0.51	0.003						
	MI only	R 529.55	R 150.87	2.57	1.52	0.065	0.21	1.01	0.062	#dominated	#dominated	2452.82
	MI with PST	R 598.72	R 69.17	3.20	2.64	0.044	0.62	1.12	-0.021	263.49	103.23	†dominated
50%	Status quo	R 378.68		3.51	0.75	0.005						
	MI only	R 562.24	R 183.56	3.82	2.26	0.096	0.32	1.51	0.091	#dominated	#dominated	2009.47
	MI with PST	R 664.97	R 102.72	4.75	3.92	0.065	0.93	1.66	-0.032	230.83	90.43	†dominated

*AS= ASSIST score; DP= depression; VA= verbal arguments; †dominated through absolute dominance (explained above); #dominated through extended dominance (explained above)

Table 8: Sensitivity analysis: Percentage reduction in cost of fidelity checks

	Cost of fidelity checks (R)	Cost of Screening (R)	MI intervention Direct cost of intervention (R)	MI with PST intervention Direct cost of intervention (R)
Initial analysis	55890	83.48	317.73	689.79
% reduction in cost				
5%	53095.5	82.54	303.99	668.71
10%	50301	81.61	290.26	647.63
50%	27945	74.12	180.34	478.99

R= South African rands

Table 9: Sensitivity analysis: Increasing the proportion of patients who completed the MI with PST intervention

% completed intervention	Interventions	Costs	Incremental costs	Effectiveness			Incremental effectiveness			ICERs		
				*AS	*DP	*VA	*AS	*DP	*VA	*AS	*DP	*VA
58%(As used in initial analysis)	Status quo	R 378.68		1.33	0.29	0.002						
	MI only	R 500.19	R 121.51	1.45	0.86	0.037	0.12	0.57	0.035	1015.14	212.37	3500
	MI with PST	R 538.12	R 37.93	1.80	1.49	0.025	0.34	0.62	-0.012	110.01	61.31	†don
72%	Status quo	R 378.68		1.33	0.29	0.002						
	MI only	R 500.19	R 121.51	1.45	0.86	0.037	0.12	0.57	0.035	1015.14	212.37	3500
	MI with PST	R 543.28	R 43.09	1.83	1.53	0.024	0.38	0.68	-0.013	114.43	63.78	†don
86%	Status quo	R 378.68		1.33	0.29	0.002						
	MI only	R 500.19	R 121.51	1.45	0.86	0.037	0.12	0.57	0.035	1015.14	212.37	3500
	MI with PST	R 548.44	R 48.24	1.86	1.59	0.023	0.41	0.73	-0.014	118.16	65.86	†don
100%	Status quo	R 378.68		1.33	0.29	0.002						
	MI only	R 500.19	R 121.51	1.45	0.86	0.037	0.12	0.57	0.035	1015.14	212.37	3500
	MI with PST	R 553.59	R 53.40	1.89	1.65	0.022	0.44	0.79	-0.015	121.35	67.64	†don

*AS= ASSIST score; DP= depression; VA= verbal arguments; †Dominated through absolute dominance (explained above); R= South African rand.

Discussion

The study examined the cost-effectiveness of two brief interventions delivered in emergency departments by peer counsellors, with a no intervention comparator. The cost-effectiveness results suggested that a combination of no intervention with the MI with PST intervention would be more cost-effective than the MI only intervention with an ICER of R 340.66 for a mean point reduction in a patient's ASSIST score and an ICER of R 133.46 for a mean point reduction in depressive symptoms. For verbal argument MI only intervention could be the preferred intervention compared to the MI with PST intervention given that it was more effective and less costly.

The intervention related costs (screening and the direct costs of the interventions) contributed about half of the total costs of the interventions (35% for the MI only intervention and 56% for the MI with PST intervention). Cost of emergency department visit (overhead costs – administrative and operational costs of the facilities) accounted for the rest of the costs. For the MI with PST intervention, the costs to patients contributed less than 10% of the cost of the intervention. About 90% of the cost was therefore borne by the provider.

The study also highlighted the fact that, at relatively minimal costs, it was possible to employ and train people without any prior medical or mental health skills to screen and effectively deliver the brief interventions in emergency departments. Expert knowledge shows that the cost of employing a trained clinical psychologist for these activities could cost about 5 times more than the salary of a peer-counsellor.

The results of this study support findings from other studies that brief interventions for substance use in emergency departments can be cost-effective [27, 28]. The inclusion of a combined MI with PST intervention in the analysis differentiates the current study from the

other published studies. Even though the analysis of brief MI is common, the same cannot be said about PST, let alone a combination of the two. This study has therefore shown that administering a combined intervention of MI with PST can be a better option than just the MI only intervention, especially if the aim is to reduce patient's substance use and depressive symptoms.

Another difference in this study was the presentation of a cost description of task-shifting. Even though a number of studies have used non-medical and/or non- traditional mental health workers for screening and the delivery of brief interventions for substance use [26, 27], the cost of this is usually incorporated in the cost-effectiveness analysis. A separate cost description of task-shifting gives a clear estimate of how much it costs to train and employ these non-traditional medical and/or mental health workers. It can also provide a better guide to decision makers in their cost comparison and decision making about what kind of personnel to use for these interventions.

Despite the promising results of the cost-effectiveness analysis, the ICERs presented cannot form the only basis upon which implementation decisions can be made. In effect, as suggested by Birch and Gafni [40], a consideration of the budgetary limitations, the total cost of both interventions, the number of people at risk of harmful substance use, those in need of the interventions, the general health needs of the population as against available health budget among other things must be considered in the decision making to ensure efficient and equitable allocation of resources.

The results of the cost-effectiveness analysis showed that in order to reduce patient's ASSIST score and depressive symptoms, it would be more cost-effective to target the MI with PST intervention to settings where there would be a relatively high likelihood of finding patients with alcohol and substance misuse. However, targeting the intervention in this manner could

lead to some ethical issues. For example, would it be ethical to provide the intervention in certain high risk settings while providing only psycho-educational material elsewhere; under what conditions would such decisions be made and on what bases?

One of the limitations to the study was its inability to estimate the cost of productivity losses, thus inhibiting the calculation of the full cost to patients. Productivity losses were not included because none were reported by patients. Most of the participants were unemployed. It was difficult to estimate actual or potential productivity losses to them because there was not enough information. 31 of the participants in the MI with PST intervention group who showed up for the 3 months follow-up were unemployed. Of those who were employed, only four took time off work to attend their sessions and only one out of these reported losing some salary even though no amount was stated.

The study also suffered from high rate of loss to follow-up, especially in the MI with PST intervention group. This may have masked the estimated full costs and effectiveness of the interventions, thereby introducing a potential bias in the cost-effectiveness analysis. This shortcoming was however addressed in the sensitivity analysis that indicated that cost-effectiveness would be enhanced if initial loss to follow up were reduced. A shortcoming that could not be addressed, however, was the assumption of equal effectiveness for all who received one, two, three or four PST sessions. In reality, effectiveness might be higher if patients received all four sessions.

The peer counsellors posted to the facilities could not work fully due to lack of office space in some of the facilities and lack of cordial relationship between them and the staff in the facilities. This may have been one of the main reasons for their high excess capacity. If the conditions were more favourable they could have been able to see more patients than they did.

It would have been beneficial to do a full economic evaluation of task-shifting by comparing the costs and effectiveness of using peer counsellors and clinically trained psychologists or other medical/mental health workers. However, this could not be accomplished in this study because the relevant information on the latter group of workers was unavailable and beyond the scope of the current analysis. The study also could not include the long term economic costs of the interventions especially its impact on long term utilisation of emergency department services which would hopefully be reduced through lowered substance misuse in communities. This could have thrown more light on the long term benefits of the interventions from the provider's perspective. Reduced substance use could also be valuable for the wellbeing of communities for instance in terms of reduced violence and crimes. Future studies could look at these issues. Such a study will provide more information on the full economic costs and benefits.

Conclusion

This study has illustrated that the use of peer counsellors for screening and the administration of a combined brief intervention of MI and PST to substance users in emergency departments can be cost-effective in reducing substance use and depressive symptoms. In a country like South Africa where substance use is high and resources to deal with the problem are limited both in terms of finance and well qualified human resources, introduction of interventions like this can be useful in minimising substance use and related problems at a relatively minimal cost. Despite the encouraging results presented in this study, a future study that would include the long term utilisation of the emergency departments, and also compare the costs and effects of using peer counsellors and clinical psychologist and/or other medical or mental health workers could add to decision-making.

Competing interests

The author(s) declare that they have no competing interests.

Acknowledgement

Associate Professor Susan Cleary and the members of the STRIVE study, especially Dr. Katherine Sorsdahl (PhD) are acknowledged for their assistance and guidance during the work. The department of Health of the Western Cape Province is also acknowledged for funding the STRIVE study which this study is part of.

References

1. World Health Organization. **ATLAS on substance use (2010): Resources for the prevention and treatment of substance use disorders**. *Geneva: World Health Organization*. 2010,**137**.

2. Atkinson A, Anderson Z, Hughes K, Bellis M, Sumnall H, Syed Q: **Interpersonal violence and illicit drugs.** *Liverpool: Centre for Public Health, Liverpool John Moores University*. 2009.

3. Callaghan RC, Gatley JM, Veldhuizen S, Lev-Ran S, Mann R, Asbridge M: **Alcohol-or drug-use disorders and motor vehicle accident mortality: A retrospective cohort study.** *Accident Analysis & Prevention*. 2013.

4. Cherpitel CJ: **Substance use, injury, and risk-taking dispositions in the general population.** *Alcoholism: Clinical and Experimental Research.* 1999,**23**(1):121-6.

5. Brysiewicz P: **Trauma in south africa**. *Int J Trauma Nurs*. 2001,**7**(4):129-32.

6. Hungerford DW (a): **Recommendations for trauma centers to improve screening, brief intervention, and referral to treatment for substance use disorders**. *The Journal of Trauma and Acute Care Surgery*. 2005,**59**(3):S37-42.

7. Hungerford DW (b): **Interventions in trauma centers for substance use disorders: New insights on an old malady**. *The Journal of Trauma and Acute Care Surgery*. 2005,**59**(3):S10-7.

8. Parry CD, Bhana A, Myers B, Plüddemann A, Flisher AJ, Peden MM, Morojele, N.K: **Alcohol use in south africa: Findings from the South African Community Epidemiology**

Network on Drug Use (SACENDU) project. *Journal of Studies on Alcohol and Drugs.* 2002,**63**(4):430.

9. Soderstrom CA: **Session 2: Substance-abuse interventions-setting the stage for discussion.** *The Journal of Trauma and Acute Care Surgery.* 2005,**59**(3):S77-9.

10. Pasche S, Myers B: **Substance misuse trends in South Africa**. *Hum Psychopharmacol Clin Exp*. 2012,**27**(3):338-41.

11. Herman AA, Stein DJ, Seedat S, Heeringa SG, Moomal H, Williams DR: **The South African stress and health (SASH) study: 12-month and lifetime prevalence of common mental disorders**. *SAMJ: South African Medical Journal.* 2009,**99**(5):339-44.

12. Kessler, R.C., Angermeyer, M., Anthony, J.C., De Graaf, R., Demyttenaere, K., Gasquet, I., De Girolamo, G., Gluzman, S., Gureje, O., Haro, J.M: **Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health Organization's world mental health survey initiative**. *World Psychiatry*. 2007,**6**(3):168.

13. Temmingh H, Myers B: **Clinical treatment of substance use disorders in South Africa.** *Substance use and abuse in South Africa*. 2012,329-66.

14. Myers B, Louw J, Pasche S: **Inequitable access to substance abuse treatment services in Cape Town, South Africa**. *Subst Abuse Treat Prev Policy.* 2010,**5**:28.

15. Kumar S, Malhotra A: **Brief interventions in substance abuse**. *Indian journal of psychiatry*. 2000,**42**(2):172.

16. Henry-Edwards S, Humeniuk R, Ali R, Monteiro M, Poznyak V: **Brief intervention for substance use**: **A manual for use in primary care.** *Draft version*. 2003,**1**.

17. Bernstein E, Edwards E, Dorfman D, Heeren T, Bliss C, Bernstein J: **Screening and brief intervention to reduce marijuana use among youth and young adults in a pediatric emergency department**. *Acad Emerg Med*. 2009,**16**(11):1174-85.

18. Gentilello LM, Rivara FP, Donovan DM, Jurkovich GJ, Daranciang E, Dunn CW, Villaveces, A, Copass, M, Ries, R.R: **Alcohol interventions in a trauma center as a means of reducing the risk of injury recurrence**. *Ann Surg*. 1999,**230**(4):473.

19. McCambridge J, Strang J: **The efficacy of single-session motivational interviewing in reducing drug consumption and perceptions of drug-related risk and harm among young people: Results from a multi-site cluster randomized trial**. *Addiction*. 2004,**99**(1):39-52.

20. Monti PM, Colby SM, Barnett NP, Spirito A, Rohsenow DJ, Myers M, Woolard, R, Lewander, W: **Brief intervention for harm reduction with alcohol-positive older adolescents in a hospital emergency department.** *J Consult Clin Psychol*. 1999,**67**(6):989.

21. Babor TF, Kadden RM: **Screening and interventions for alcohol and drug problems in medical settings: What works?** *The Journal of Trauma and Acute Care Surgery*. 2005,**59**(3):S80-7.

22. Dovlo D: **Using mid-level cadres as substitutes for internationally mobile health professionals in africa. A desk review**. *Human Resources for Health*. 2004,**2**(1):7.

23. Bernstein J, Bernstein E, Tassiopoulos K, Heeren T, Levenson S, Hingson R: **Brief motivational intervention at a clinic visit reduces cocaine and heroin use**. *Drug Alcohol Depend*. 2005,**77**(1):49-59.

24. Myers B, Stein DJ, Mtukushe B, Sorsdahl K: **Feasibility and acceptability of screening and brief interventions to address alcohol and other drug use among patients presenting for emergency services in cape town, South Africa**. *Advances in preventive medicine.* 2012.

25. Cowell AJ, Bray JW, Mills MJ, Hinde JM: **Conducting economic evaluations of screening and brief intervention for hazardous drinking: Methods and evidence to date for informing policy**. *Drug Alcohol Rev*. 2010,**29**(6):623-30.

26. Cowell AJ, Brown JM, Mills MJ, Bender RH, Wedehase BJ: **Cost-effectiveness analysis of motivational interviewing with feedback to reduce drinking among a sample of college students**. *Journal of studies on alcohol and drugs*. 2012,**73**(2):226-37.

27. Kunz FM, French MT, Bazargan-Hejazi S: **Cost-effectiveness analysis of a brief intervention delivered to problem drinkers presenting at an inner-city hospital emergency department**. *J Stud Alcohol*. 2004,**65**(3):363-70.

28. Neighbors CJ, Barnett NP, Rohsenow DJ, Colby SM, Monti PM: **Cost-effectiveness of a motivational lntervention for alcohol-involved youth in a hospital emergency department.** *Journal of studies on alcohol and drugs*. 2010,**71**(3):384.

29. Barrett B, Byford S, Crawford MJ, Patton R, Drummond C, Henry JA, Touquet, R: **Cost-effectiveness of screening and referral to an alcohol health worker in alcohol misusing patients attending an accident and emergency department: A decision-making approach**. *Drug Alcohol Depend*. 2006,**81**(1):47-54.

30. Lehohla, P: **Statistics South Africa, Census 2011 municipal report, Western Cape**. [http://www.statssa.gov.za/Census2011/Products/WC_Municipal_Report.pdf]. Assessed 18th January 2014

31. Strategic Development Information and GIS Department (SDI&GIS): **City of Cape Town - 2011 census suburb, Elsies River.** [http://www.capetown.gov.za/en/stats/2011CensusSuburbs/2011_Census_CT_Suburb_Elsies_River_Profile.pdf]. Assessed 18th January 2014

32. Strategic Development Information and GIS Department (SDI&GIS): **City of Cape Town -2011 census suburb, Khayelitsha.** [http://www.capetown.gov.za/en/stats/2011CensusSuburbs/2011_Census_CT_Suburb_Khayelitsha_Profile.pdf]. Assessed 18th January 2014

33. Humeniuk R, Henry-Edwards S, Ali R, Poznyak V, Monteiro MG: **The alcohol, smoking and substance involvement screening test (ASSIST): Manual for use in primary care.** 2010.

34. D'Zurilla TJ, Nezu AM: **Problem-solving therapy**. *Handbook of cognitive-behavioral therapies*. 2010,**3**:197-225.

35. D'Zurilla TJ, Goldfried MR. **Problem solving and behavior modification**. *J Abnorm Psychol*. 1971,**78**(1):107.

36. Bureau for economic research, University of Stellenbosch: **Trends.** 2012,**35**:88. [http://www.ber.ac.za/data/2007.aspx]. Assessed March 2013

37. Drummond MF, Sculpher MJ, Torrance GW: *Methods for the economic evaluation of health care programs*. Oxford university press; 2005.

38. Karnon J, Brown J: **Selecting a decision model for economic evaluation: A case study and review.** *Health Care Manag Sci*. 1998;**1**(2):133-40.

39. Briggs AH: **Handling the uncertainty in the results of economic evaluation**. Office of Health Economics; 1995.

40. Birch S, Gafni A: **Information created to evade reality (ICER)**. *Pharmacoeconomics.* 2006,**24**(11):1121-31.

PART D: POLICY BRIEF

OLICY BRIEF [FEBRUARY 2014]

Providing brief interventions to substance users in emergency departments in the Western Cape Province:

Which brief intervention is more cost-effective?

The policy brief is based on a study that assessed the cost-effectiveness of two brief interventions, motivational interviewing and a combination of motivational interviewing and problem solving therapy, delivered in emergency departments by peer counsellors. The study was submitted as an MPH mini dissertation to the Health Economics Unit of the Faculty of Health Sciences at the University of Cape Town by Rebecca Dwommoh, under the supervision of A/Prof. Susan Cleary. The study was part of a larger project STRIVE [Substance use and Trauma Intervention] which assessed the effectiveness of the interventions.

The project was sponsored by the Department of Health of the Western Cape Province through the Psychiatry Department of University of Cape Town

EXECUTIVE SUMMARY

Substance use disorder has been associated with a high rate of interpersonal violence, vehicular accidents and crime in the Western Cape Province and South Africa in general. Brief interventions, delivered in different settings including emergency departments, have been found to be effective in alleviating the problem of substance use disorder and related problems. Estimating the cost-effectiveness of these brief interventions highlights the financial implication of their implementation and also ensures efficient allocation of resources by comparing costs and effectiveness of the interventions. In the Western Cape, a combination of motivational interviewing and problem solving therapy provided in emergency departments has been found to be a more cost-effective intervention in reducing patients' substance use and depressive symptoms compared to just motivational interviewing. Motivational interviewing is also more cost-effective with respect to reduction in verbal arguments. The study also shows that it is feasible to use peer counsellors to screen and administer these interventions in the emergency departments at relatively lower cost.

INTRODUCTION

Substance use disorders account for a number of public health problems which include interpersonal violence, road traffic accidents, diseases, injuries and even deaths. In the year 2000, alcohol-related deaths were 37,000, accounting for 7.1% of total deaths in South Africa (Schneider et al, 2007). South Africa has one of the highest rates of substance use disorder in the world with a lifetime prevalence of about 13.3% and an estimated life time risk of 17.5%. The Western Cape Province has the highest lifetime prevalence rate (20.6% - higher than the national rate of 13.3) in the country (Herman et al, 2009; Kessler et al, 2007). These high rates of substance use disorder have also been associated with high rates of interpersonal violence and injuries in the country (Norman et al, 2007; Schneider et al, 2007). A large percentage of patients visiting emergency departments in the country as a result of injuries are more likely to test positive for alcohol use (Parry et al, 2002; Plüddemann et al, 2003). In addition to these, substance use also inflicts financial burden on the economy. For instance, it has been reported that there are about 235,777 problem drug users costing the country approximately R10 billion; and about 1.97 million 'problem drinkers' and 3.2 million 'risky drinkers' (Central Drug Authority, 2011:p.1), also costing the country about R78 billion in direct costs and socio-economic cost of about R130 billion each year (Central Drug Authority, 2011).

A number of interventions are available to help substance users and brief interventions have been found to be effective in reducing substance use and related problems, especially among moderate substance users who are not yet dependent on these substances. The effectiveness of these interventions has been tested in different countries and health care settings including emergency departments.

In the Western Cape Province of South Africa, Project STRIVE (Substance use and Trauma Intervention) assessed the effectiveness of two brief interventions, motivational interviewing and a combination of motivational interviewing with problem solving therapy in emergency departments. These interventions were administered by peer counsellors who were recruited from the communities and trained to offer these interventions. Patients classified as being at moderate and high risk after being screened with the ASSIST were randomised to receive either of the interventions. After three months follow-up they found that these interventions were more effective in reducing substance use represented by reduction in patient's ASSIST score, verbal argument and depression.

Description of interventions offered by Project STRIVE

- *Motivational interviewing (MI) group: patients in this group were offered 30 minutes motivational interview (patient-centred counselling style), received substance use risk-cards and fact sheets.*
- *Motivational interviewing (MI) with Problem solving therapy (PST) group: patients in this group were offered in addition to motivational interviewing, 4 extra PST sessions, received PST booklets that contained assignments for them to do at home and the substance use fact sheets. The PST was meant to help patients developing problem solving and coping skills*
- *Control group: these patients received only the substance use fact sheet. During the three months follow-up they were offered the MI for ethical reasons.*

To assess the financial implication of providing these interventions and to -promote the efficient allocation of resources, a cost-effectiveness analysis was conducted. This analysed the costs of the interventions and compared with their effectiveness as found by Project STRIVE.

RESEARCH OBJECTIVE

The study assessed cost-effectiveness of the two interventions compared to a status-quo of no intervention. To know the cost of using peer counsellors instead of clinical psychologists, the cost of task-shifting was also analysed.

Cost-effectiveness analysis: brief background information

- ***Cost-effectiveness analysis compares the costs and effectiveness of alternative interventions by generating incremental cost-effectiveness ratios (ICERs) of the interventions which forms the basis for decision making between the interventions.***

- ***ICER is the ratio of the incremental costs and effectiveness of the alternative interventions. This is estimated by calculating the additional costs and effectiveness of each of the interventions compared to the status-quo situation (in this situation a no intervention situation). This is expressed as the additional cost per each additional effect derived from the intervention.***

- ***The intervention with the lowest ICER value is usually preferred over the one with the higher ICER value. This is because a relatively lower additional cost needs to be incurred to gain the additional effectiveness from the intervention compared to the alternative intervention.***

- ***Costs are analysed from either a provider, patient or societal perspective***
  - ***Provider's perspective: these are costs incurred by the provider for the intervention***
  - ***Patient's perspective: these are costs incurred by the patient (and their family and friends) for receiving the intervention***
  - ***Societal perspective: this is the combination of the costs from both the provider and the patient's perspectives***

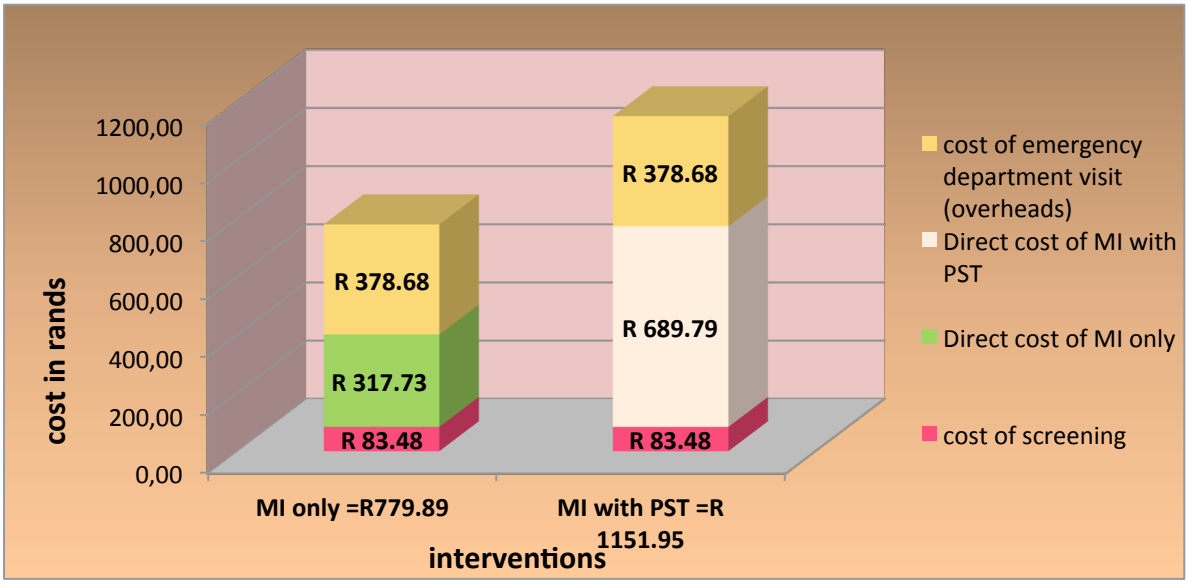
METHODS

The cost-effectiveness of introducing either of the interventions was calculated as the additional costs incurred for each additional reduction in patient's ASSIST score, depressive symptoms and verbal argument compared to status-quo of no intervention. Costs were estimated from both the provider and the societal perspectives. Costs included in the analysis were the costs of screening, the overheads costs of emergency department visits and the direct costs of the interventions. Costs were estimated from both the provider and the societal perspectives.

FINDINGS

- The overall average cost per patient for MI with PST intervention was more costly than the MI only intervention. The direct cost of the MI with PST intervention was more than twice that of the MI only intervention.

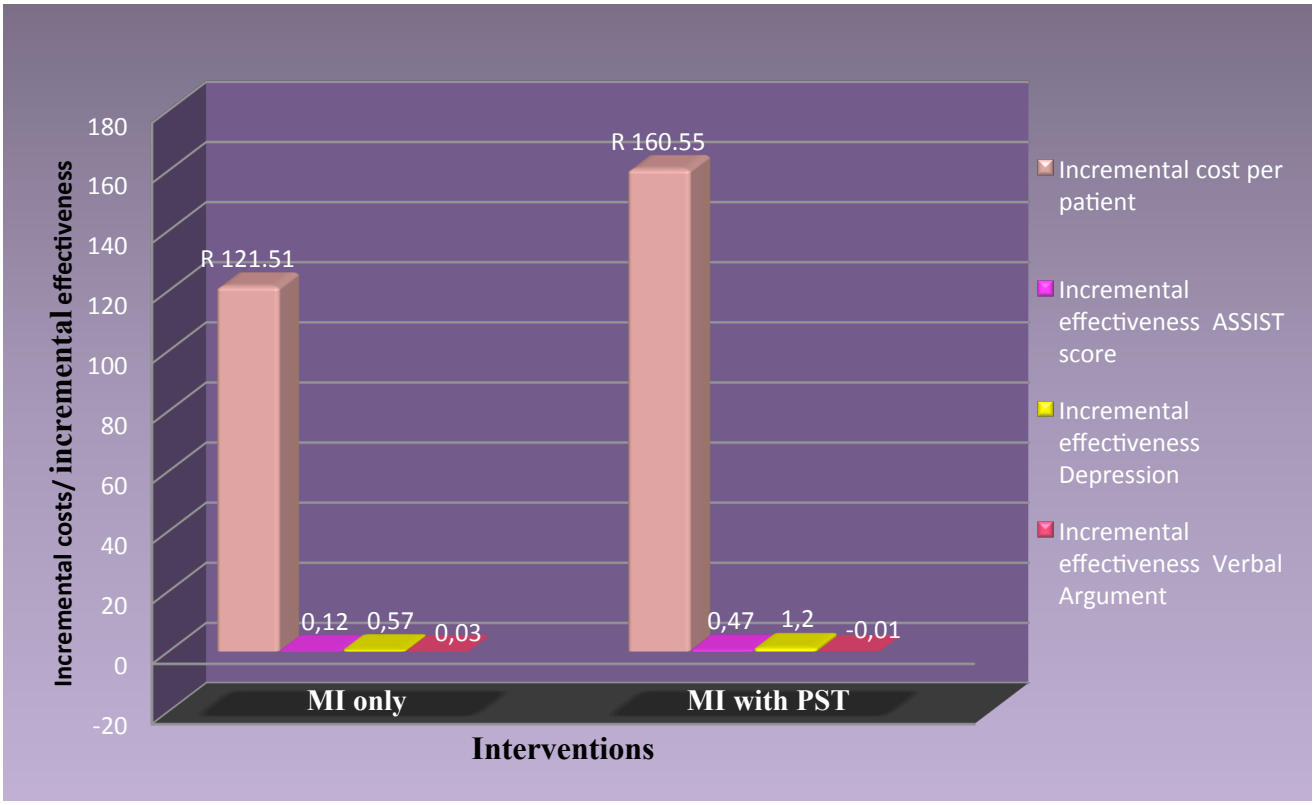
Figure 1: Cost of interventions



- MI with PST intervention was relatively more costly (with a higher incremental cost) but more effective in reducing patient's ASSIST score and depression than the MI only intervention. It had higher incremental costs and effectiveness but lower incremental cost-effectiveness ratios.

- The MI only intervention was relatively less costly and more effective compared to the MI with PST intervention with respect to reduction in verbal argument. It therefore had lower incremental cost-effectiveness ratios.

Figure 2: Comparison of the incremental costs and effectiveness of the interventions



- It was also found that at relatively lower cost, it was possible to train peer counsellors to screen and offer brief interventions to substance users in emergency departments

Table 1: Cost of using a peer counsellor for screening and brief interventions instead of a clinical psychologist (task-shifting)

Total cost of task-shifting			
Cost item	Cost per peer counsellor	Cost for all 5 counsellors	Contribution to total cost
Cost of peer counsellor's training	R 2 500	R 12 500	2.22%
Cost of fidelity checks	R 55 890	R 279 450	49.73%
Salary paid to peer counsellors	R 54 000	R 270 000	48.05%
Total	R 112 390	R 561 950	100%

Given the high prevalence of substance use and related problems in South Africa, especially in the Western Cape Province, providing interventions for at risk substance users could be the right thing to do. However, these interventions should be cost-effective to ensure the efficient use of scarce health care resources. The following policy recommendations have been made based on the results of the cost-effectiveness analysis.

POLICY RECOMMENDATIONS

- Screening and offering brief interventions for substance use in emergency departments can be cost-effective in minimizing substance use, depression and verbal arguments among substance users. For reduction in patient's ASSIST score and depression, offering the MI with PST intervention and in some situations not offering any intervention at all could be more cost-effective than offering just the MI intervention. For reduction in verbal argument on the other hand, offering the MI only intervention will be more cost-effective than the combined intervention of MI and PST. Policy makers should however take into consideration their budgetary limitation as well as ethical issues when deciding on which intervention to implement and how it should be done

- Using peer counsellors trained to screen and offer the interventions in emergency departments can be relatively cheaper and efficient, especially in the situation where there are not enough mental health workers to undertake the task.

- It will also be more cost-effective to provide the intervention in areas where the prevalence of substance use is higher than where it is relatively lower. This can help to minimise cost of peer counsellor's time per patient which formed a high percentage of the direct costs of the interventions. It will also help to attain more benefits from the interventions and thus make it more cost-effective.

REFERENCES

Central Drug Authority. CDA. Substance Abuse research & 2011 Summit Resolutions: briefing by Central Drug Authority & Department of Social Development. [Online]. Assessed from:http://www.pmg.org.za/report/20111108-department-central-drug-authority-cda-substance-abuse-strategy-summit [Assessed 10th December 2012]

Herman, A.A., Stein, D.J., Seedat, S., Heeringa, S.G., Moomal, H. & Williams, D.R. 2009. The South African Stress and Health (SASH) study: 12-month and lifetime prevalence of common mental disorders. *SAMJ: South African medical journal.* 99(5):339-344.

Kessler, R.C., Angermeyer, M., Anthony, J.C., De Graaf, R., Demyttenaere, K., Gasquet, I., De Girolamo, G., Gluzman, S., Gureje, O., Haro, J.M. 2007. Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health Organization's World Mental Health Survey Initiative. *World psychiatry.* 6(3):168.

Norman, R., Matzopoulos, R., Groenewald, P. & Bradshaw, D. 2007. The high burden of injuries in South Africa. *Bulletin of the world health organization.* 85(9):695-702.

Parry, C.D., Bhana, A., Myers, B., Plüddemann, A., Flisher, A.J., Peden, M.M. & Morojele, N.K. 2002. Alcohol use in South Africa: Findings from the South African community epidemiology network on drug use (SACENDU) project. *Journal of studies on alcohol and drugs.* 63(4):430.

Plüddemann, A., Hon, S., Bhana, A., Harker, D.N., Elizabeth, P., Potgieter, H., Gerber, G.W., Parry, M.C. et al. 2003. South African Community Epidemiology Network on Drug Use (SACENDU) Monitoring Alcohol and Drug Abuse Trends in South Africa. *Proceedings of SACENDU Report Back Meetings.*

Schneider, M., Norman, R., Parry, C., Bradshaw, D., Pluddemann, A. & Collaboration, South African Comparitive Risk Assessment 2007. Estimating the burden of disease attributable to alcohol use in South Africa in 2000. *South African medical journal.* 97(8):664-672.

PART E: APPENDICES

Appendix 1: Informed Consent form and Baseline questionnaire used for the STRIVE study

UNIVERSITY OF CAPE TOWN

Department of Psychiatry and Mental Health

J Block Groote
Schuur Hospital
Observatory , Cape Town
Tel: 021-4042137
Fax: 021-4488158

INFORMED CONSENT TO TAKE PART IN THE SUBSTANCE USE INTERVENTION

Introduction: We are asking you to take part in a research study. The aim is to test whether an intervention to reduce substance use among adults at trauma units in the Western Cape is effective. This study is being run by the University of Cape Town, the Department of Health, The Department of Social Development, and the Premier's Office. You qualify for this study because you are a patient of the trauma centre and you screened positive for substance use. We hope to find 450 adults to be in this study. If you decide to take part in the study, you will be asked questions about and may attend sessions related to decreasing your substance use and improving your health.

What We're Asking of You:

Today- We will ask you to answer a set of questions about your substance use, problem solving ability, mental health, and other behaviours. This will take about 20 minutes of your time. We will also ask you for contact information so that we can stay in touch with you during the study.

Some of you (selected by chance) will also spend 20 minutes with health counsellor discussing substance use.

Once a Week for 3 Weeks-Some patients will be selected by chance to attend 3 follow-up sessions. These sessions will discuss issues related to improving your problem solving skills. If you are selected, you will need to be here for about 1 hour each time. We will give you a voucher of R50 for each of your visits. We will ask you to attend 3 extra sessions in total.

Three and 6 months later - Three and 6 months later, all participants will get a call from our research assistant who will ask you more questions about your substance use, mental health and other behaviours.

Risks or Discomforts - There are some risks to taking part in this study. Answering some of our questions may make you uncomfortable. All project staff must sign confidentiality agreements stating that they will not reveal any information. However, we cannot rule out the possibility that someone might reveal information about you to people outside the study. Your decision to take part or not take part in this study or decision to drop out of the study will not affect your access to any services or benefits.

Benefits of Taking Part in The Study: If you take part in this study you may decrease your substance use and increase your quality of life. You will also help us understand the best way to help patients who use substances in the Western Cape reduce their use.

Being In The Study Is Voluntary And Confidential: Taking part in this study is completely up to you. All your information will be used for research purposes only. We will keep your information private. If you don't want to be in the study, that is okay. If you don't want to answer a certain question or don't want to be in a certain part of the study that is also okay. If you choose not to take part or if you drop out, it will not affect any benefits you may be getting. We will still give you referrals to any services you may need.

Privacy: Anyone who is working with any of the information you give us has to sign an agreement not to share what you tell us. Your answers will be given a special number instead of your name. No one else will know these are your answers. In research reports, your answers will always be grouped with other people's answers or disguised to protect you from being recognized. All confidential data will be stored in double-locked file cabinets. The screener and consent forms will be destroyed after one year of the completion of study activities.

Future Contact: In the future, we may contact you to see if you want to take part in more study activities or another study. If we do that, we will tell you about that study and ask you to complete a separate consent form if you agree to participate.

Who to Contact With Questions: If you have any questions about your rights as a participant, concerns or complaints, contact Dr. Katherine Sorsdahl, Katherine.sorsdahl@uct.ac.za or 082 055 4676.

Indicating Consent: Because we have given you a lot of information, please tell me in your own words what you understand us to be asking of you. In the box below, please put your initials if you agree to each of the following activities. You do not give up any rights by initialling any of the lines.

	Initials	**What We're Asking of You**
1		I agree to take part in the study, which has been fully described to me. I will answer questions today and to the best of my ability attend all the sessions.
		Agree to provide contact information so researcher can keep in touch and remind me of future sessions
2		I agree to come back for additional sessions, if chosen.
3		I understand that in about 3 and 6 months I will be receiving phone calls

Declaration by participant

By signing below, I ……..……. agree to take part in substance use intervention

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressured to take part. I also understand that I do not give up any rights by signing below.

- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.
- I have received an unsigned copy of this form to keep.

Signed at (*place*) .....….....…… on (*date*) ……...……..
Day/Month/Year

..... **.....**

Signature of participant Signature of witness

A. Demographic Information

Name _____ contact #: _____

Name and number of friend or relative who we call to get hold of you:
_____

1. How many children do you have? _____

2. Marital Status:
☐ Single (never been married)
☐ Married
☐ Divorced
☐ Widowed
☐ Other (please state: _____)

3. How much school did you finish? _____ (e.g. Standard 3/matric)

4. Which of the following best describes your work situation now?
☐ Employed full-time
☐ Employed part-time
☐ Self-employed
☐ Student
☐ Retired/pensioner
☐ Disabled
☐ Unemployed

5. Have you received treatment for substance use? ☐ Yes ☐ NO

6. In the past three months how many times have you been in trouble with the police? _____
6b. In the past three months how many times was this related to substance use? _____

7. Have you ever been arrested or convicted? ☐ Yes ☐ NO
7b. If yes describe: (was it substance use related)
_____

8. How many times in the past 3 months were you injured? _____
8b. How many times in the past 3 months were you injured as a result of your substance use? _____
8c. Thinking about the times you were injured, on how many occasions did you seek medical treatment? _____

9. How many times in the last 3 months have you got in a physical fight? _____
9b. How many times was alcohol or drugs involved in these physical fights? _____

10. How many times in the last 3 months have you got in a verbal argument/fight? _____
10b. How many times was alcohol or drugs involved in these verbal argument/fights? _____

Injury Specific Questions

11. Injury Severity: Triage Colour: ☐ Red ☐ Orange ☐ Yellow ☐ Green

12. Nature of Injury:
injury caused:

☐ Fracture
Poisoning
☐ Sprain
Firearm/Gun
☐ Cut or open wound
☐ Bruises, superficial would know
☐ Haematoma/swelling
Drowning
☐ Burning Cerebral conclusion
☐ Injury other organs
☐ Other _____

13. Mechanism of Injury: How was

☐ Traffic Accident ☐
☐ Assault ☐
☐ Fall ☐ Other
☐ Blunt Force/ Object ☐ Don't
☐ Fire/hot fluid ☐
☐ Strangulation

14. Where did you get injured?

☐ House ☐ School ☐ Commercial area
☐ Street/Road ☐ Shebeen ☐ Other _____

15. What were you doing when you got injured:

☐ Working
☐ Traveling
☐ Studying
☐ Sports/athletics
☐ Leisure Playing
☐ Drinking
☐ Socializing (family friends)

Traffic Injuries:

Were you a:
☐ Driver
☐ Pedestrian
☐ Passenger in private car
☐ Passenger in taxi
☐ Bicyclist
☐ Motorcyclist

Was there another car involved:

☐ Yes ☐ NO

Self-Inflicted:

Precipitating factors:

☐ Family conflicts
☐ Physical problem/disease or pregnancy ☐
Psychological/psychiatric condition
☐ Financial
☐ Death in family
☐ Sexual or physical assault
☐ Other _____
☐ Don't Know

Assaults:

Relationship of Victim to Assailant:

☐ Spouse/Partner ☐ X partner
☐ Parents
☐ Other relative
☐ Friends
☐ Stranger
☐ Police
☐ Other
☐ Don't know

What was the reason:

☐ Fight Quarrel
☐ Robbery
☐ Sexual Assault
☐ Drug-related
☐ Other crimes
☐ Gang-related
☐ Political
☐ Xenophobia

Who started the fight? ☐ You ☐ Other person/person (how many ____)
How did it start _____

C. Substance Use

C. SRQ

READ: **I am going to read a list of the ways you might have felt or behaved. I am then going to ask you how often you have felt this way during the past month.**

	NEVER	Some or little of the time (1 or 2 Days a week)	Occasionally (3 or 4 Days a week)	Most of the time (5,6, 7 Days a week)
1. I am worried by things that usually don't bother me.				
2. I do not feel like eating, my appetite is poor.				
3. I feel that I cannot stop being sad even with help from my family.				
4. I feel that I am just as good as other people.				
5. I have trouble keeping my mind on what I was doing.				
6. I feel depressed.				
7. I feel that everything I do is a bit of an effort.				
8. I feel hopeful about the future.				
9. I feel my life has been a failure.				
10. I feel fearful.				
11. My sleep is restless.				
12. I am happy.				

13. I talk less than usual.				
14. I feel lonely.				
15. People are unfriendly.				
16. I enjoy life.				
17. I cry.				
18. I feel sad.				
19. I feel that people don't like me.				
20. I cannot get going in the morning.				
21. Are you afraid of your spouse/partner?				

D. Problem Solving Skills

READ: I am going to read to you ways you might think, feel and act when faced with a problem in everyday living. A problem is something important in your life that bothers you a lot, but you don't right away know how to make it better or stop it from bothering you so much. The problem could be something about yourself (thoughts, feelings, behaviour, health, appearance or relationships with other people (family, friends) or your environment and the things that you own.

1. I feel afraid when I have an important problem to solve					
2. When making decisions, I do not think carefully about my many options	**0**	**1**	**2**	**3**	**4**
3. I get nervous and unsure of myself when I have to make an important decision	**0**	**1**	**2**	**3**	**4**
4. When my first efforts to solve a problem fail, I give up quickly because finding a solution is too difficult	**0**	**1**	**2**	**3**	**4**
5. Sometimes even difficult problems can have a way of moving my life forward in positive ways	**0**	**1**	**2**	**3**	**4**
6. If I avoid problems, they will generally go away on their own	**0**	**1**	**2**	**3**	**4**
7. When I can't solve a problem, I get very frustrated	**0**	**1**	**2**	**3**	**4**
8. If I am faced with a difficult problem, I probably will not be able to solve it on my own no matter how hard I try	**0**	**1**	**2**	**3**	**4**
9. Whenever I have a problem, I believe that it can be solved	**0**	**1**	**2**	**3**	**4**
10. I try to do anything I can in order to avoid problems in my life	**0**	**1**	**2**	**3**	**4**
11.Difficult problems make me very upset	**0**	**1**	**2**	**3**	**4**
12. When I have a decision to make, I take the time to try to predict the positive and negative consequences of each possible option before I act	**0**	**1**	**2**	**3**	**4**
13. When problems occur in my life, I like to deal with them as soon as possible	**0**	**1**	**2**	**3**	**4**
14. When I am trying to solve a problem I go with the first good idea that comes to mind,	**0**	**1**	**2**	**3**	**4**

15. When I am faced with a difficult problem, I believe that I will be able to solve it on my own if I try hard enough	**0**	**1**	**2**	**3**	**4**
16. When I have a problem to solve, one of the first things I do is get as many facts about the problem as possible	**0**	**1**	**2**	**3**	**4**
17.When a problem happens in my life, I put off trying to solve it for as long as possible	**0**	**1**	**2**	**3**	**4**
18. I spend more time avoiding my problems than solving them	**0**	**1**	**2**	**3**	**4**
19. Before I try to solve a problem, I set a specific goal so that I know exactly what I want to accomplish	**0**	**1**	**2**	**3**	**4**
20. When I have a decision to make, I do not take the time to consider the pros and cons of each option	**0**	**1**	**2**	**3**	**4**
21. After carrying out a solution to a problem, I try to evaluate as carefully as possible how much the situation has changed for the better	**0**	**1**	**2**	**3**	**4**
22. I put of solving problems until it is too late to do anything about them	**0**	**1**	**2**	**3**	**4**
23. When I am trying to solve a problem, I think of as many options as possible until I cannot come up with any more ideas	**0**	**1**	**2**	**3**	**4**
24. When making decisions, I go with my "gut feeling" without thinking too much about the consequences of each option	**0**	**1**	**2**	**3**	**4**
25. I am too impulsive when it comes to making decisions	**0**	**1**	**2**	**3**	**4**

READ: Now I am going to read a number of statements. Each one describes a way that you might (or might not) feel about your drinking. For each statement, you will need to answer from 1 to 5, to indicate how much you agree or disagree with it right now.

	No! Strongly Disagree	**NO Disagree**	**? Undecided or Unsure**	**Yes Agree**	**YES Strongly Agree**
1. I really want to make changes in my drinking/drug use	1	2	3	4	5
2. Sometimes I wonder if I am an alcoholic and/or drug addict	1	2	3	4	5
3. If I don't change my drinking/drug use soon, my problems are going to get worse	1	2	3	4	5
4. I have already started making some changes in my drinking/drug use	1	2	3	4	5
5. I was drinking /doing drugs too much at one time, but	1	2	3	4	5

I've managed to change my drinking.	1	2	3	4	5
6. Sometimes I wonder if my drinking/drug use is	1	2	3	4	5
hurting other people.	1	2	3	4	5
7. I am a problem drinker/drug user.	1	2	3	4	5
8. I'm not just thinking about changing my drinking, I'm already doing something about it.	1	2	3	4	5
9. I have already changed my drinking, and I am looking for ways to keep from slipping back to my old pattern.	1	2	3	4	5
10. I have serious problems with drinking/drug use	1	2	3	4	5
11. Sometimes I wonder if I am in control of my drinking.	1	2	3	4	5
12. My drinking/drug use is causing a lot of harm	1	2	3	4	5
13. I am actively doing things now to cut down or stop drinking.	1	2	3	4	5
14. I want help to keep from going back to the drinking/drug problems that I had before.	1	2	3	4	5
15. I know that I have a drinking problem	1	2	3	4	5
16. There are times when I wonder if I drink/do drugs too much.	1	2	3	4	5
17. I am an alcoholic/drug addict	1	2	3	4	5
18. I am working hard to change my drinking	1	2	3	4	5
19. I have made some changes in my drinking/drug use, and I want some help to keep from going back to the way I used to drink	1	2	3	4	5

IF YES TO BEING ASSAULTED BY SPOUSE/PARTNER/X **OR** BEING AFRAID OF PARTNER… ASK THESE QUESTIONS:

500	Has a current or previous husband or boyfriend ever insulted you or made you feel bad about yourself? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4
501	Has a current or previous husband or boyfriend ever belittled or humiliated you in front of other people? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4

502	Has a current or previous husband or boyfriend ever done things to scare or intimidate you on purpose for example by the way he looked at you, by yelling and smashing things? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4
503	Has a current or previous husband or boyfriend ever threatened to hurt you? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4
504	Have any of these things happened in the past 12 months?	YES……1 NO……...0

PHYSICAL ABUSE

Men often fight with their girlfriends/wives and often these fights get physical. I am going to ask some questions about this because we want to learn more about what women experience in their lives. I want you to speak freely and remember that everything you say will be confidential.

512	Has a current or previous husband or boyfriend ever slapped you or threw something at you which could hurt you? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4
513	Has a current or previous husband or boyfriend ever pushed or shoved you? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4
514	Has a current or previous husband or boyfriend ever hit you with a fist or with something else which could hurt you? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4
515	Has a current or previous husband or boyfriend ever kicked, dragged, beat, choke or burnt you? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4
516	Has a current or previous husband or boyfriend ever threatened to use or actually use a gun, knife or other weapon against you? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4
517	Have any of these things happened in the past 12 months?	YES……1 NO……0

SEXUAL ABUSE

There are also other things which women experience that they sometimes do not talk about. I want you to speak freely and remember that everything you say will be confidential.

539	Has a current or previous husband or boyfriend ever physically forced you to have sex when you did not want to? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4	
540	Have you ever have sex with a current or previous husband or boyfriend when you did not want to because you were afraid of what he might do? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4	
541	Has a current or previous husband or boyfriend ever forced you to do something sexual that you found degrading or humiliating? Did this happen many times, a few times, once or did it not happen?	NEVER .....1 ONCE.....2 FEW .....3 MANY 4	
542	Have any of these things happened in the past 12 months?	YES……1 NO……0	

Appendix 2: Screening questionnaire used to screen patients for substance use in the STRIVE study

UNIVERSITY OF CAPE TOWN

Department of Psychiatry and Mental Health

J Block Groote

Schuur Hospital

Observatory , Cape Town

Tel: 021-4042137

Fax: 021-4488158

SCREENING QUESTIONNAIRE

1. Are you a male or female? ☐ Male ☐ Female 2. How old are you?_____

3. What is your race: ☐ Black ☐Coloured ☐ White ☐ Indian/Asian

4. Injury Severity on admission: Triage Colour: ☐ Red ☐ Orange ☐ Yellow ☐ Green

5. Intent of Injury:

☐ Unintentional (accidental, RTA)

☐ Intentional (assault, violence)

☐ Self-inflicted (suicide, attempted suicide)

☐ Other _____

I am going to ask you some questions about your experience of using these substances across your lifetime and in the past three months. These substances can be smoked, swallowed, snorted, inhaled, injected or taken in the form of pills (show drug card).Some of the substances listed may be prescribed by a doctor (like amphetamines, sedatives, pain medications). For this interview, we will not record medications that are used as prescribed by your doctor. However, if you have taken such medications for reasons other than prescription, or taken them more frequently or at higher doses than prescribed, please let me know. While we are also interested in knowing about your use of various illicit drugs, please be assured that information on such use will be treated as strictly confidential

Question 1: In your life, which of the following substances have you used:

	YES	NO
Tobacco		
Alcoholic Beverages (beer, wine etc)		
Cannabis (dagga, marijuana)		
Cocaine (rocks, coke, crack)		
Amphetamine Type Stimulants (Tik)		
Inhalants (nitrous glue, petrol)		
Sedatives or sleeping pills (Mandrax)		
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)		
Opiods (heroin, morphine, methadone, unga)		

Probe if all answers are negative:

"Not even when you were in school?"

If "No" to all items, skip substance use questions.

If "Yes" to any of these items, ask Question 2 for each substance ever used.

Question 2: In the past three months, how often have you used the substances you mentioned (FIRST DRUG, SECOND DRUG, ETC)

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	2	3	4	6
Alcoholic Beverages (beer, wine etc)	0	2	3	4	6
Cannabis (dagga, marijuana)	0	2	3	4	6
Cocaine (rocks, coke, crack)	0	2	3	4	6
Amphetamine Type Stimulants (Tik)	0	2	3	4	6
Inhalants (nitrous glue, petrol)	0	2	3	4	6
Sedatives or sleeping pills (Mandrax)	0	2	3	4	6
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	2	3	4	6
Opiods (heroin, morphine, methadone, unga)	0	2	3	4	6

Question 4: During the past three months, how often has your use of substances led to health, social, legal or financial problems? (Please circle)

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	4	5	6	7
Alcoholic Beverages (beer, wine etc)	0	4	5	6	7
Cannabis (dagga, marijuana)	0	4	5	6	7
Cocaine (rocks, coke, crack)	0	4	5	6	7
Amphetamine Type Stimulants (Tik)	0	4	5	6	7
Inhalants (nitrous glue, petrol)	0	4	5	6	7
Sedatives or sleeping pills (Mandrax)	0	4	5	6	7
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	4	5	6	7
Opiods (heroin, morphine, methadone, unga)	0	4	5	6	7

Question 5: During the past three months, how often have you failed to do what was normally expected of you because of your use of substance use? (Please circle)

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	5	6	7	8
Alcoholic Beverages (beer, wine etc)	0	5	6	7	8
Cannabis (dagga, marijuana)	0	5	6	7	8
Cocaine (rocks, coke, crack)	0	5	6	7	8
Amphetamine Type Stimulants (Tik)	0	5	6	7	8
Inhalants (nitrous glue, petrol)	0	5	6	7	8
Sedatives or sleeping pills (Mandrax)	0	5	6	7	8
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	5	6	7	8
Opiods (heroin, morphine, methadone, unga)	0	5	6	7	8

Ask Questions 6 & 7 for all substances ever used (i.e. those endorsed in Question 1)

Question 6: Has a friend or relative or anyone else ever expressed concern about your use of specific substances?

	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
Tobacco	0	6	3
Alcoholic Beverages (beer, wine etc)	0	6	3
Cannabis (dagga, marijuana)	0	6	3
Cocaine (rocks, coke, crack)	0	6	3
Amphetamine Type Stimulants (Tik)	0	6	3
Inhalants (nitrous glue, petrol)	0	6	3
Sedatives or sleeping pills (Mandrax)	0	6	3
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	6	3
Opiods (heroin, morphine, methadone, unga)	0	6	3

Question 7: Have you ever tried and failed to control, cut down or stop using specific drugs?

	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
Tobacco	0	6	3
Alcoholic Beverages (beer, wine etc)	0	6	3
Cannabis (dagga, marijuana)	0	6	3
Cocaine (rocks, coke, crack)	0	6	3
Amphetamine Type Stimulants (Tik)	0	6	3
Inhalants (nitrous glue, petrol)	0	6	3
Sedatives or sleeping pills (Mandrax)	0	6	3
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	6	3
Opiods (heroin, morphine, methadone, unga)	0	6	3

Question 8: Have you ever used any drug by injection?	**No, Never**	**Yes, in the past 3 months**	**Yes, but not in the past 3 months**
	0	2	1

Total Score Drug 1: _____ Total Score Drug 3: _____ Total Drug 5: _____

Total Score Drug 2: _____ Total Score drug 4: _____ Total Drug 6: _____

Willingness to Participate in Substance use Interventions:

Would you be willing to participate in studies with interview content similar to the one that you just had with me? ☐ Yes ☐ Maybe ☐ No

Would you willing be to participate in interventions for substance use that include:

10-20 minute session with a health counsellor face to face ☐ Yes ☐ Maybe ☐ No

Two sessions with a health counsellor (1 week a part) ☐ Yes ☐ Maybe ☐ No

Three sessions with a health counsellor (1 week apart) ☐ Yes ☐ Maybe ☐ No

Four sessions with a health counsellor (1 week apart) ☐ Yes ☐ Maybe ☐ No

NOTES FOR COUNSELLOR

Does the patient meet inclusion criteria for participation? ☐ Yes ☐ No

Does the patient want to participate in the research study? ☐ Yes ☐ No

If no, please describe in brief why not?

_____

_____

_____

If yes, what group is the patient randomized to:

☐ Control

☐ BI

☐ PST

Appendix 3: Follow-up questionnaire (MI and control groups) used for the STRIVE study

UNIVERSITY OF CAPE TOWN

Department of Psychiatry and Mental Health

J Block Groote
Schuur Hospital
Observatory , Cape Town
Tel: 021-4042137
Fax: 021-4488158

6. In the past three months how many times have you been in trouble with the police? _____
6b. In the past three months how many times was this related to substance use? _____

8. How many times in the past 3 months were you injured? _____
8b. How many times in the past 3 months were you injured as a result of your substance use? _____
8c. Thinking about the times you were injured, on how many occasions did you seek medical treatment? _____

9. How many times in the last 3 months have you got in a physical fight? _____
9b. How many times was alcohol or drugs involved in these physical fights? _____

10. How many times in the last 3 months have you got in a verbal argument/fight? _____
10b. How many times was alcohol or drugs involved in these verbal argument/fights? _____

READ: I am going to ask you some questions about your substance use in the past 3 months.

Question 2: In the past three months, how often have you used the substances you mentioned (FIRST DRUG, SECOND DRUG, ETC)

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	2	3	4	6
Alcoholic Beverages (beer, wine etc)	0	2	3	4	6
Cannabis (dagga, marijuana)	0	2	3	4	6
Cocaine (rocks, coke, crack)	0	2	3	4	6
Amphetamine Type Stimulants (Tik)	0	2	3	4	6
Inhalants (nitrous glue, petrol)	0	2	3	4	6
Sedatives or sleeping pills (Mandrax)	0	2	3	4	6
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	2	3	4	6
Opiods (heroin, morphine, methadone, unga)	0	2	3	4	6

If "Never" to all items in Question 2, skip to Question 6. If any substances in Question 2 were used in the previous three months, continue with Questions 3, 4 & 5 for <u>each substance</u> used.

Question 3: During the past three months, how often have you had a strong desire or urge to use?

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	3	4	5	6
Alcoholic Beverages (beer, wine etc)	0	3	4	5	6
Cannabis (dagga, marijuana)	0	3	4	5	6
Cocaine (rocks, coke, crack)	0	3	4	5	6
Amphetamine Type Stimulants (Tik)	0	3	4	5	6
Inhalants (nitrous glue, petrol)	0	3	4	5	6
Sedatives or sleeping pills (Mandrax)	0	3	4	5	6
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	3	4	5	6

Opiods (heroin, morphine, methadone, unga)	0	3	4	5	6

Question 4: During the <u>past three months</u>, how often has your use of substances led to health, social, legal or financial problems? (Please circle)

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	4	5	6	7
Alcoholic Beverages (beer, wine etc)	0	4	5	6	7
Cannabis (dagga, marijuana)	0	4	5	6	7
Cocaine (rocks, coke, crack)	0	4	5	6	7
Amphetamine Type Stimulants (Tik)	0	4	5	6	7
Inhalants (nitrous glue, petrol)	0	4	5	6	7
Sedatives or sleeping pills (Mandrax)	0	4	5	6	7
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	4	5	6	7
Opiods (heroin, morphine, methadone, unga)	0	4	5	6	7

Question 5: During the past three months, how often have you failed to do what was normally expected of you because of your use of substance use? (Please circle)

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	5	6	7	8
Alcoholic Beverages (beer, wine etc)	0	5	6	7	8
Cannabis (dagga, marijuana)	0	5	6	7	8
Cocaine (rocks, coke, crack)	0	5	6	7	8
Amphetamine Type Stimulants (Tik)	0	5	6	7	8
Inhalants (nitrous glue, petrol)	0	5	6	7	8
Sedatives or sleeping pills (Mandrax)	0	5	6	7	8
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	5	6	7	8
Opiods (heroin, morphine, methadone, unga)	0	5	6	7	8

Ask Questions 6 & 7 for all substances ever used (i.e. those endorsed in Question 1)

Question 6: Has a friend or relative or anyone else ever expressed concern about your use of specific substances?

	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
Tobacco	0	6	3
Alcoholic Beverages (beer, wine etc)	0	6	3
Cannabis (dagga, marijuana)	0	6	3
Cocaine (rocks, coke, crack)	0	6	3
Amphetamine Type Stimulants (Tik)	0	6	3
Inhalants (nitrous glue, petrol)	0	6	3
Sedatives or sleeping pills (Mandrax)	0	6	3
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	6	3
Opiods (heroin, morphine, methadone, unga)	0	6	3

Question 7: Have you ever tried and failed to control, cut down or stop using specific drugs?

	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
Tobacco	0	6	3
Alcoholic Beverages (beer, wine etc)	0	6	3
Cannabis (dagga, marijuana)	0	6	3
Cocaine (rocks, coke, crack)	0	6	3
Amphetamine Type Stimulants (Tik)	0	6	3
Inhalants (nitrous glue, petrol)	0	6	3
Sedatives or sleeping pills (Mandrax)	0	6	3
Hallucinogens (LSC, acid, mushrooms, PCP, special K etc)	0	6	3
Opiods (heroin, morphine, methadone, unga)	0	6	3

Question 8: Have you ever used any drug by injection?	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
	0	2	1

Total Score Drug 1: _____ Total Score Drug 3: _____ Total Drug 5: _____
Total Score Drug 2: _____ Total Score drug 4: _____ Total Drug 6: _____

C. SRQ

READ: **I am going to read a list of the ways you might have felt or behaved. I am then going to ask you how often you have felt this way during the past month.**

	Never	Some or little of the time (1 or 2 Days a week	Occasionally (3 or 4 Days a week)	Most of the time (5,6, 7 Days a week)
1. I am worried by things that usually don't bother me.				
2. I do not feel like eating, my appetite is poor.				
3. I feel that I can not stop being sad even with help from my family.				
4. I feel that I am just as good as other people.				
5. I have trouble keeping my mind on what I was doing.				
6. I feel depressed.				
7. I feel that everything I do is a bit of an effort.				
8. I feel hopeful about the future.				
9. I feel my life has been a failure.				
10. I feel fearful.				
11. My sleep is restless.				
12. I am happy.				
13. I talk less than usual.				
14. I feel lonely.				

15. People are unfriendly.				
16. I enjoy life.				
17. I cry.				
18. I feel sad.				
19. I feel that people don't like me.				
20. I cannot get going in the morning.				

D. Problem Solving Skills

READ: I am going to read to you ways you might think, feel and act when faced with a problem in everyday living. A problem is something important in your life that bothers you a lot, but you don't right away know how to make it better or stop it from bothering you so much. The problem could be something about yourself (thoughts, feelings, behaviour, health, appearance or relationships with other people (family, friends) or your environment and the things that you own.

1. I feel afraid when I have an important problem to solve					
2. When making decisions, I do not think carefully about my many options	**0**	**1**	**2**	**3**	**4**
3. I get nervous and unsure of myself when I have to make an important decision	**0**	**1**	**2**	**3**	**4**
4. When my first efforts to solve a problem fail, I give up quickly because finding a solution is too difficult	**0**	**1**	**2**	**3**	**4**
5. Sometimes even difficult problems can have a way of moving my life forward in positive ways	**0**	**1**	**2**	**3**	**4**
6. If I avoid problems, they will generally go away on their own	**0**	**1**	**2**	**3**	**4**
7. When I can't solve a problem, I get very frustrated	**0**	**1**	**2**	**3**	**4**
8. If I am faced with a difficult problem, I probably will not be able to solve it on my own no matter how hard I try	**0**	**1**	**2**	**3**	**4**
9. Whenever I have a problem, I believe that it can be solved	**0**	**1**	**2**	**3**	**4**
10. I try to do anything I can in order to avoid problems in my life	**0**	**1**	**2**	**3**	**4**
11.Difficult problems make me very upset	**0**	**1**	**2**	**3**	**4**
12. When I have a decision to make, I take the time to try to predict the positive and negative consequences of each possible option before I act	**0**	**1**	**2**	**3**	**4**
13. When problems occur in my life, I like to deal with them as soon as possible	**0**	**1**	**2**	**3**	**4**
14. When I am trying to solve a problem I go with the first good idea that comes to mind,	**0**	**1**	**2**	**3**	**4**

15. When I am faced with a difficult problem, I believe that I will be able to solve it on my own if I try hard enough	**0**	**1**	**2**	**3**	**4**
16. When I have a problem to solve, one of the first things I do is get as many facts about the problem as possible	**0**	**1**	**2**	**3**	**4**
17.When a problem happens in my life, I put off trying to solve it for as long as possible	**0**	**1**	**2**	**3**	**4**
18. I spend more time avoiding my problems than solving them	**0**	**1**	**2**	**3**	**4**
19. Before I try to solve a problem, I set a specific goal so that I know exactly what I want to accomplish	**0**	**1**	**2**	**3**	**4**
20. When I have a decision to make, I do not take the time to consider the pros and cons of each option	**0**	**1**	**2**	**3**	**4**
21. After carrying out a solution to a problem, I try to evaluate as carefully as possible how much the situation has changed for the better	**0**	**1**	**2**	**3**	**4**
22. I put of solving problems until it is too late to do anything about them	**0**	**1**	**2**	**3**	**4**
23. When I am trying to solve a problem, I think of as many options as possible until I cannot come up with any more ideas	**0**	**1**	**2**	**3**	**4**
24. When making decisions, I go with my "gut feeling" without thinking too much about the consequences of each option	**0**	**1**	**2**	**3**	**4**
25. I am too impulsive when it comes to making decisions	**0**	**1**	**2**	**3**	**4**

READ: Now I am going to read a number of statements. Each one describes a way that you might (or might not) feel about your drinking. For each statement, you will need to answer from 1 to 5, to indicate how much you agree or disagree with it right now.

	No! Strongly Disagree	**NO Disagree**	**? Undecided or Unsure**	**Yes Agree**	**YES Strongly Agree**
1. I really want to make changes in my drinking/drug use	1	2	3	4	5
2. Sometimes I wonder if I am an alcoholic and/or drug addict	1	2	3	4	5
3. If I don't change my drinking/drug use soon, my problems are going to get worse	1	2	3	4	5
4. I have already started making some changes in my drinking/drug use	1	2	3	4	5

5. I was drinking /doing drugs too much at one time, but	1	2	3	4	5
I've managed to change my drinking.	1	2	3	4	5
6. Sometimes I wonder if my drinking/drug use is hurting other people	1	2	3	4	5
7. I am a problem drinker/drug user.	1	2	3	4	5
8. I'm not just thinking about changing my drinking, I'm already doing something about it.	1	2	3	4	5
9. I have already changed my drinking, and I am looking for ways to keep from slipping back to my old pattern.	1	2	3	4	5
10. I have serious problems with drinking/drug use	1	2	3	4	5
11. Sometimes I wonder if I am in control of my drinking.	1	2	3	4	5
12. My drinking/drug use is causing a lot of harm	1	2	3	4	5
13. I am actively doing things now to cut down or stop drinking.	1	2	3	4	5
14. I want help to keep from going back to the drinking/drug problems that I had before.	1	2	3	4	5
15. I know that I have a drinking problem	1	2	3	4	5
16. There are times when I wonder if I drink/do drugs too much.	1	2	3	4	5
17. I am an alcoholic/drug addict	1	2	3	4	5
18. I am working hard to change my drinking	1	2	3	4	5
19. I have made some changes in my drinking/drug use, and I want some help to keep from going back to the way I used to drink	1	2	3	4	5

Appendix 4: Follow-up questionnaire (MI with PST intervention group)

PST Group

Participant #:

Participant Name:

Follow-up date:

You may remember that three months ago you met with a health counsellor at the clinic who gave you feedback and information on your (insert drug name), and discussed with you the good and bad things about your drug use. You also attended sessions with the health counsellor to improve your problem solving skills. As mentioned when you met with (name of SW) three months ago, we would like to ask you what you honestly thought of the information and advice given to you by the health counsellors.

1. How useful did you find the program in helping you to understand your level of risk?
   ☐ Not Useful ☐ Somewhat useful ☐ Very Useful ☐ Don't know

2. How useful did you find the program in helping you to understand the positive and negatives of using (name drug/s)
   ☐ Not Useful ☐ Somewhat useful ☐ Very Useful ☐ Don't know

3. How useful did you find the program in helping you to understand what you can do about your use of (name drug/s)
   ☐ Not Useful ☐ Somewhat useful ☐ Very Useful ☐ Don't know

4. How useful did you find the program in giving you tips and advice for helping you with your problems.
   ☐ Not Useful ☐ Somewhat useful ☐ Very Useful ☐ Don't know

5. How useful did you find the program in actually helping you to cut down or stop using (drug)
   ☐ Not Useful ☐ Somewhat useful ☐ Very Useful ☐ Don't know

6. How satisfied are you with the amount of help you received?
   ☐ Quite satisfied ☐ Kind of satisfied ☐ Mostly satisfied
   ☐ Very satisfied

7. Have the services you received helped you to deal with your problems better
   ☐ Yes they helped a great deal ☐ Yes they helped somewhat
   ☐ No, they really didn't help they really ☐ No, they seemed to make things worse

8. Would you have liked to have been offered more follow-up sessions with the counsellor?
   ☐ Yes ☐ Not sure ☐ No

9. Did the health counsellor refer you to a treatment centre for your substance use?
☐ Yes ☐ No

9b. If yes, did you go and get help from the treatment centre? ☐ Yes ☐ No

9c. If no, Why not? If yes, was it helpful?

_____
_____
_____
_____
_____

10a. In the past three months how many times have you been in trouble with the police? _____

10b. In the past three months how many times was this related to substance use? _____

11a. How many times in the past 3 months were you injured? _____
11b. How many times in the past 3 months were you injured as a result of your substance use? _____
11c. Thinking about the times you were injured, on how many occasions did you seek medical treatment?__

12a. How many times in the last 3 months have you got in a physical fight? _____
12b. How many times was alcohol or drugs involved in these physical fights? _____

13a. How many times in the last 3 months have you got in a verbal argument/fight? _____
13b. How many times was alcohol or drugs involved in these verbal argument/fights? _____

COSTING

1. How much did it cost to travel to the clinic for your PST session? _____
2. Did you have to take off work? If so, did you lose any payment? _____
3. Did you have to get someone to take care of your children when you went for your sessions? _____
4. Any other costs: _____

READ I am going to ask you some questions about your substance use in the past 3 months.

Question 2: In the past three months, how often have you used the substances you mentioned (FIRST DRUG, SECOND DRUG, ETC)

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	2	3	4	6
Alcoholic Beverages (beer, wine etc)	0	2	3	4	6
Cannabis (dagga, marijuana)	0	2	3	4	6
Cocaine (rocks, coke, crack)	0	2	3	4	6
Amphetamine Type Stimulants (Tik)	0	2	3	4	6
Inhalants (nitrous glue, petrol)	0	2	3	4	6
Sedatives or sleeping pills (mandrax/buttons)	0	2	3	4	6
Hallucinogens (LSC, acid, mushrooms, PCP, special K)	0	2	3	4	6
Opioids (heroin, morphine, methadone, unga)	0	2	3	4	6

If "Never" to all items in Question 2, skip to Question 6. If any substances in Question 2 were used in the previous three months, continue with Questions 3, 4 & 5 for <u>each substance</u> used.

Question 3: During the past three months, how often have you had a strong desire or urge to use?

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	3	4	5	6
Alcoholic Beverages (beer, wine etc)	0	3	4	5	6
Cannabis (dagga, marijuana)	0	3	4	5	6
Cocaine (rocks, coke, crack)	0	3	4	5	6
Amphetamine Type Stimulants (Tik)	0	3	4	5	6
Inhalants (nitrous glue, petrol)	0	3	4	5	6
Sedatives or sleeping pills (mandrax/buttons)	0	3	4	5	6
Hallucinogens (LSC, acid, mushrooms, PCP, special K)	0	3	4	5	6
Opioids (heroin, morphine, methadone, unga)	0	3	4	5	6

Question 4: During the past three months, how often has your use of substances led to health, social, legal or financial problems? (please circle)

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	4	5	6	7
Alcoholic Beverages (beer, wine etc)	0	4	5	6	7
Cannabis (dagga, marijuana)	0	4	5	6	7
Cocaine (rocks, coke, crack)	0	4	5	6	7
Amphetamine Type Stimulants (Tik)	0	4	5	6	7
Inhalants (nitrous glue, petrol)	0	4	5	6	7
Sedatives or sleeping pills (mandrax/buttons)	0	4	5	6	7
Hallucinogens (LSC, acid, mushrooms, PCP, special K)	0	4	5	6	7
Opioids (heroin, morphine, methadone, unga)	0	4	5	6	7

Question 5: During the past three months, how often have you failed to do what was normally expected of you because of your use of substance use? (please circle)

	Never	Once or Twice	Monthly	Weekly	Daily or Almost Daily
Tobacco	0	5	6	7	8
Alcoholic Beverages (beer, wine etc)	0	5	6	7	8
Cannabis (dagga, marijuana)	0	5	6	7	8
Cocaine (rocks, coke, crack)	0	5	6	7	8
Amphetamine Type Stimulants (Tik)	0	5	6	7	8
Inhalants (nitrous glue, petrol)	0	5	6	7	8
Sedatives or sleeping pills (mandrax/buttons)	0	5	6	7	8
Hallucinogens (LSC, acid, mushrooms, PCP, special K)	0	5	6	7	8
Opioids (heroin, morphine, methadone, unga)	0	5	6	7	8

Ask Questions 6 & 7 for all substances ever used (i.e. those endorsed in Question 1)

Question 6: Has a friend or relative or anyone else ever expressed concern about your use of specific substances?

	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
Tobacco	0	6	3
Alcoholic Beverages (beer, wine etc)	0	6	3
Cannabis (dagga, marijuana)	0	6	3
Cocaine (rocks, coke, crack)	0	6	3
Amphetamine Type Stimulants (Tik)	0	6	3
Inhalants (nitrous glue, petrol)	0	6	3
Sedatives or sleeping pills (mandrax/buttons)	0	6	3
Hallucinogens (LSC, acid, mushrooms, PCP, special K)	0	6	3
Opioids (heroin, morphine, methadone, unga)	0	6	3

Question 7: Have you ever tried and failed to control, cut down or stop using specific drugs?

	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
Tobacco	0	6	3
Alcoholic Beverages (beer, wine etc)	0	6	3
Cannabis (dagga, marijuana)	0	6	3
Cocaine (rocks, coke, crack)	0	6	3
Amphetamine Type Stimulants (Tik)	0	6	3
Inhalants (nitrous glue, petrol)	0	6	3
Sedatives or sleeping pills (mandrax/buttons)	0	6	3
Hallucinogens (LSC, acid, mushrooms, PCP, special K)	0	6	3
Opioids (heroin, morphine, methadone, unga)	0	6	3

Question 8: Have you ever used any drug by injection?	No, Never	Yes, in the past 3 months	Yes, but not in the past 3 months
	0	2	1

Total Score Drug 1: _____ Total Score Drug 3: _____ Total Drug 5: _____
Total Score Drug 2: _____ Total Score drug 4: _____ Total Drug 6: _____

C. SRQ

READ: **I am going to read a list of the ways you might have felt or behaved. I am then going to ask you how often you have felt this way during the past month.**

	NEVER	Some or little of the time (1 or 2 Days a week	Occasionally (3 or 4 Days a week)	Most of the time (5,6, 7 Days a week)
1. I am worried by things that usually don't bother me.				
2. I do not feel like eating, my appetite is poor.				
3. I feel that I cannot stop being sad even with help from my family.				
4. I feel that I am just as good as other people.				
5. I have trouble keeping my mind on what I was doing.				
6. I feel depressed.				
7. I feel that everything I do is a bit of an effort.				
8. I feel hopeful about the future.				
9. I feel my life has been a failure.				
10. I feel fearful.				
11. My sleep is restless.				
12. I am happy.				
13. I talk less than usual.				
14. I feel lonely.				
15. People are unfriendly.				
16. I enjoy life.				

17. I cry.				
18. I feel sad.				
19. I feel that people don't like me.				
20. I cannot get going in the morning.				

D. Problem Solving Skills

READ: I am going to read to you ways you might think, feel and act when faced with a problem in everyday living. A problem is something important in your life that bothers you a lot, but you don't right away know how to make it better or stop it from bothering you so much. The problem could be something about yourself (thoughts, feelings, behaviour, health, appearance or relationships with other people (family, friends) or your environment and the things that you own.

	Not at all	Slightly	Moderately	Very true	Extremely
1. I feel afraid when I have an important problem to solve	**0**	**1**	**2**	**3**	**4**
2. When making decisions, I do not think carefully about my many options	**0**	**1**	**2**	**3**	**4**
3. I get nervous and unsure of myself when I have to make an important decision	**0**	**1**	**2**	**3**	**4**
4. When my first efforts to solve a problem fail, I give up quickly because finding a solution is too difficult	**0**	**1**	**2**	**3**	**4**
5. Sometimes even difficult problems can have a way of moving my life forward in positive ways	**0**	**1**	**2**	**3**	**4**
6. If I avoid problems, they will generally go away on their own	**0**	**1**	**2**	**3**	**4**
7. When I can't solve a problem, I get very frustrated	**0**	**1**	**2**	**3**	**4**
8. If I am faced with a difficult problem, I probably will not be able to solve it on my own no matter how hard I try	**0**	**1**	**2**	**3**	**4**
9. Whenever I have a problem, I believe that it can be solved	**0**	**1**	**2**	**3**	**4**
10. I try to do anything I can in order to avoid problems in my life	**0**	**1**	**2**	**3**	**4**
11.Difficult problems make me very upset	**0**	**1**	**2**	**3**	**4**
12. When I have a decision to make, I take the time to try to predict the positive and negative consequences of each possible option before I act	**0**	**1**	**2**	**3**	**4**
13. When problems occur in my life, I like to deal with them as soon as possible	**0**	**1**	**2**	**3**	**4**
14. When I am trying to solve a problem I go with the first good idea that comes to mind	**0**	**1**	**2**	**3**	**4**
15. When I am faced with a difficult problem, I believe that I will be able to solve it on my own if I try hard enough	**0**	**1**	**2**	**3**	**4**
16. When I have a problem to solve, one of the first things I do is get as many facts about the problem as possible	**0**	**1**	**2**	**3**	**4**
17.When a problem happens in my life, I put off trying to solve it for as long as possible	**0**	**1**	**2**	**3**	**4**
18. I spend more time avoiding my problems than solving them	**0**	**1**	**2**	**3**	**4**
19. Before I try to solve a problem, I set a specific goal so that I know exactly what I want to accomplish	**0**	**1**	**2**	**3**	**4**

20. When I have a decision to make, I do not take the time to consider the pros and cons of each option	**0**	**1**	**2**	**3**	**4**
21. After carrying out a solution to a problem, I try to evaluate as carefully as possible how much the situation has changed for the better	**0**	**1**	**2**	**3**	**4**
22. I put of solving problems until it is too late to do anything about them	**0**	**1**	**2**	**3**	**4**
23. When I am trying to solve a problem, I think of as many options as possible until I cannot come up with any more ideas	**0**	**1**	**2**	**3**	**4**
24. When making decisions, I go with my "gut feeling" without thinking too much about the consequences of each option	**0**	**1**	**2**	**3**	**4**
25. I am too impulsive when it comes to making decisions	**0**	**1**	**2**	**3**	**4**

Appendix 5: Project manager's expenditure extraction sheet

Information on participants and materials used

		Khylitsha site B CHC	KDH	Elsie's river	Total for all facilities
Number of study participants	No. screened				
	Control				
	MI				
	PST				
	Tot. for study				
Number of STRIVE (single sheet or fact sheets) leaflets used	Control				
	MI				
	PST				
Number of STRIVE substance use risk cards used	MI				
Number of STRIVE self-help manuals/booklets used	PST				
Number of screeners (questionnaires for screening) used					
Number of pens used					
Number of clip boards used					
Number of other stationaries used (if any)					

Counselors' information

	Counselor 1	Counselor 2	Counselor 3	Counselor 4	Counselor 5
Number of participants screened					
Number of MI participants					
Number of PST participants					
Number of controls					

Information on costs

Cost Item		Amount in rands
Cost of counselor's training	Cost of setting up and running the training (materials and other training equipment and cost of space if a room was rented for that)	
	*Estimated cost of overseeing and administering training program (cost of trainer and other personnel if present to help or supervise the training)	
	No. of days or hours of training(please separate time for MI and PST if possible)	
Cost of fidelity checks for counselors	Cost of materials for such checks (if any)	
	*Cost of personnel in charge of such checks	
	Number of hours for such checks	
Cost of clinical psychologist. per hour or month (for the project)		
Salary of each counselor per month		
Salary of each supervisor for the counselors per month		
†Cost of employing a clinical psych. to administer the interventions per month		
Cost of screeners		
Cost of risk cards		
Cost of substance use information leaflets		
Cost of PST booklets		

	Khylitsha site B CHC	**Khayelitsha Dist. Hosp.**	**Elsies River**	**Total for all facilities**
Telephone costs				

N.B

*If someone was hired to do the training (or checks in the case of fidelity chks), how much was paid for such a service. If the training was administered by regular worker in the department (e.g. yourself), what is his/her salary per day or hour. (If you can provide salary per month it will still be fine). This will help to work out the cost and opportunity cost of such trainings.

†This is for the purpose of the analysis on task shifting. We are interested in estimating how much it will cost to employ a clinical psychologist to do the work of the counselors (screening and offering the interventions).

Appendix 6: Ethics approval letters

UNIVERSITY OF CAPE TOWN

Health Sciences Faculty
Faculty of Health Sciences Research Ethics Committee
Room E52-24 Groote Schuur Hospital Old Main Building
Observatory 7925
Telephone [021] 406 6338 • Facsimile [021] 406 6411
e-mail: sumayah.ariefdien@uct.ac.za

22 September 2010

HREC REF: 396/2010

Dr K Sorsdahl
Psychiatry & Mental Health
J –Block

Dear Dr Sorsdahl

PROJECT TITLE: THE DEVELOPMENT OF A BRIEF INTERVENTION FOR SUBSTANCE USERS IN THE WESTERN CAPE

Thank you for submitting your study to the Health Science Faculty of Health Science Research Ethics Committee for review.

It is a pleasure to inform you that the Ethics Committee has **formally approved** the above-mentioned study.

Approval is granted for one year till the 30th September 2011.

Please submit a progress form, using the standardised Annual Report Form (FHS016), if the study continues beyond the approval period. Please submit a Standard Closure form (FHS010)if the study is completed within the approval period.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the REC. REF in all your correspondence.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, HSF HUMAN ETHICS

Federal Wide Assurance Number: FWA00001637.
aAriefdien

Institutional Review Board (IRB) number: IRB00001938

This serves to confirm that the University of Cape Town Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP) and Declaration of Helsinki guidelines.

The Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

sAriefdien

UNIVERSITY OF CAPE TOWN

Department of Psychiatry and Mental Health

J Block Groote
Schuur Hospital
Observatory , Cape Town
Tel: 021-4042137
Fax: 021-4488158

Ms. Katherine Sorsdahl
Department of Psychiatry & Mental Health
J-Block Groote Schuur Hospital
Observatory
Cape Town
South Africa

Prof. M. Blockman
Faculty of Health Sciences
Research Ethics Committee
E-52-23 Old Main Building, Groote Schuur Hospital
Observatory, 7925

Re: Annual Progress report HREC Ref: 323/2011

Dear Prof Blockman,

Please find enclosed an application for extension for HREC Ref: 323/2011. We have already initiated recruitment for our intervention in trauma units and would like ethical approval to be extended for another year while we finish recruitment (December 31st, 2012) and the 3 and 6 months follow of patient progress.

If you require any further information, please do not hesitate to contact me.

Yours sincerely,

Katherine Sorsdahl

UNIVERSITY OF CAPE TOWN

Health Sciences Faculty
Faculty of Health Sciences Research Ethics Committee
Room E52-24 Groote Schuur Hospital Old Main Building
Observatory 7925
Telephone [021] 406 6338 • **Facsimile** [021] 406 6411
e-mail: sumayah.ariefdien@uct.ac.za

22 August 2011

HREC REF: 323/2011

Ms K Sorsdahl
Psychiatry & Mental Health
J – Block
GSH

Dear Ms Sorsdahl

PROJECT TITLE: THE DEVELOPMENT OF A BRIEF INTERVENTION FOR SUBSTANCE USERS IN THE WESTERN CAPE

Thank you for addressing the issues raised by the committee.

It is a pleasure to inform you that the Ethics Committee has **formally approved** the above-mentioned study.

Approval is granted for one year till the 28 August 2012.

Please submit a progress form, using the standardised Annual Report Form (FHS016), if the study continues beyond the approval period. Please submit a Standard Closure form (FHS010)if the study is completed within the approval period.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please quote the REC. REF in all your correspondence.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, HSF HUMAN ETHICS

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

sAriefdien

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

FHS016: Annual Progress Report

HREC office use only (FWA00001637; IRB00001938)			
This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report		
☐ Not approved	See attached comments		
Expiry date	28 August 2013		
Signature of Chairperson of the HREC	pp TCBurgess	Date	13/08/2012

Principal Investigator to complete the following:

1. Protocol information

Date	7 August 2012
HREC REF Number	323/2011
Protocol title	The development of a Brief Intervention for Substance users in the Western Cape
Protocol number (if applicable)	Not applicable
Principal Investigator	Dr Katherine Sorsdahl
Department / Office Internal Mail Address	Department of Psychiatry and Mental Health J2 Groote Schuur Observatory, Cape Town, 7925

1.1 Does this protocol receive US Federal funding?	☐ Yes	√☐ No
1.2 Has sponsorship of this study changed? If yes, please attach a revised summary of the budget.	☐ Yes	√☐ No

2. List of documentation

RESEARCH ETHICS COMMITTEE
2012 -08- 13
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

3. Protocol status (tick ✓)

√☐	Open to enrolment

☐	Closed to enrolment (tick ✓)
☐	Research-related activities are ongoing
☐	Research-related activities are complete, long-term follow-up only
☐	Research-related activities are complete, data analysis only
☐	Study is closed → Please submit a Study Closure Form (FHS010)

4. Enrolment

Number of participants enrolled to date	220
Number of participants enrolled, since last HREC Progress report (continuing review)	
Additional number of participants still required	100

5. Refusals

Total number of refusals (participants invited to join the study, but refused to take part)	30

6. Cumulative summary of participants

Total number of participants who provided consent	1200 (for screening)
Number of participants determined to be ineligible (i.e. after screening)	800
Number of participants currently active on the study	120
Number of participants completed study (without events leading to withdrawal)	50
Number of participants withdrawn at participants' request (i.e. changed their mind)	
Number of participants withdrawn by PI due to toxicity or adverse events	
Number of participants withdrawn by PI for other reasons (e.g. pregnancy, poor compliance)	
Number of participants lost to follow-up	30
Number of participants no longer taking part for reasons not listed above. Please provide reasons below:	

7. Protocol violations and exceptions (tick ✓ all that apply)

√☐	No prior violations or exceptions have occurred since the original approval
☐	Prior violations or exceptions have been reported since the last review and have already been acknowledged or approved
☐	Unreported minor violations that have occurred since the last review, as well as significant deviations not yet reported, are attached for review

8. Amendments (tick ✓ all that apply)

☐	No prior amendments have been made since the original approval

☐	Prior amendments have been reported since the last review and have already been approved
☐	New protocol changes/ amendments are requested as part of this continuing review (See note below)

Note: If new protocol changes are being requested in this review, please complete an amendment form (FHS006). Specific changes in the amended protocol and consent/assent forms must be **bolded**, *italicised* or tracked and all changes must include a rationale.

9. Adverse events

9.1 Please provide below or attach a narrative summary of serious adverse events and/ or unanticipated problems since the last progress report. Please indicate changes made to the protocol and informed consent document(s) as a result (if not already reported to the HREC).

9.2 Have participants received appropriate treatment/ follow-up/ referral when indicated (e.g. in the case of abnormal or incidental clinical findings, distress or anxiety)?		
√☐ Yes	☐ No	☐ Not applicable
If yes, please describe: All participants who screen at risk for substance use dependence are referred to specialist services (in addition to receiving an intervention)		

10. Summary of Monitoring and Audit Activities (tick ✓)

10.1 Was this study monitored or audited by an external agency (e.g. MCC, FDA)? *		
☐ Yes	☐ No	☐ Not applicable

10.2 Did a Data and Safety Monitoring Board publish a report?		
☐ Yes	√☐ No	☐ Not applicable

10.3 If yes, please identify the agency and attach a summary of the findings.					
Agency Name		Report attached	☐ Yes	☐ No	☐ Not applicable
		DSMB report attached	☐ Yes	☐ No	☐ Not applicable

10.4 Has there been any agency, institutional or other inquiry into non-compliance in this study, or any finding of non-compliance concerning a member of the research team?	
☐ Yes	☐ No
If yes, please explain:	

11. Level of risk (tick ✓)

11.1 In light of your experience of this research, please indicate whether the level of risk to participants has:	
☐	Increased
☐	Decreased
√☐	Shown no change
If there has been a change, please explain:	

11.2 Please provide a narrative summary of recent relevant literature.

12. Statement of conflict of interest

Has there been any change in the conflict of interest status of this protocol since the original approval? (tick ✓)	
☐ Yes	√☐ No
If yes, please explain and if necessary attach a revised conflict of interest statement (Section #7 in the New Protocol Application Form):	

13. Signature

My signature certifies that I will maintain the anonymity and/ or confidentiality of information collected in this research. If at any time I want to share or re-use the information for purposes other than those disclosed in the original approval, I will seek further approval from the HREC.			
Signature of PI		Date	7/8/2012

Appendix 7: Journal instructions for authors

Cost Effectiveness and Resource Allocation

Instructions for authors

Research Articles

Preparing main manuscript text

General guidelines of the journal's style and language are given below.

Overview of manuscript sections for Research Articles

Manuscripts for Research Articles submitted to *Cost Effectiveness and Resource Allocation* should be divided into the following sections (in this order):

Title page

Abstract

Keywords

Background

Methods

Results and discussion

Conclusions

List of abbreviations used (if any)

Competing interests

Authors' contributions

Authors' information

Acknowledgements

Endnotes

References

Illustrations and figures (if any)

Tables and captions

Preparing additional files

The **Accession Numbers** of any nucleic acid sequences, protein sequences or atomic coordinates cited in the manuscript should be provided, in square brackets and include the

corresponding database name; for example, [EMBL:AB026295, EMBL:AC137000, DDBJ:AE000812, GenBank:U49845, PDB:1BFM, Swiss-Prot:Q96KQ7, PIR:S66116].

The databases for which we can provide direct links are: EMBL Nucleotide Sequence Database (EMBL), DNA Data Bank of Japan (DDBJ), GenBank at the NCBI (GenBank), Protein Data Bank (PDB), Protein Information Resource (PIR) and the Swiss-Prot Protein Database (Swiss-Prot).

You can download a template (Mac and Windows compatible; Microsoft Word 98/2000) for your article.

For reporting standards please see the information in the About section.

Title page

The title page should:

Provide the title of the article

List the full names, institutional addresses and email addresses for all authors

Indicate the corresponding author

Please note:

The title should include the study design, for example "A versus B in the treatment of C: a randomized controlled trial X is a risk factor for Y: a case control study"

Abbreviations within the title should be avoided

Abstract

The Abstract of the manuscript should not exceed 350 words and must be structured into separate sections: **Background,** the context and purpose of the study; **Methods**, how the study was performed and statistical tests used; **Results**, the main findings; **Conclusions**, brief summary and potential implications. Please minimize the use of abbreviations and do not cite references in the abstract. **Trial registration**, if your research reports the results of a controlled health care intervention, please list your trial registry, along with the unique identifying number (e.g. **Trial registration**: Current Controlled Trials ISRCTN73824458). Please note that there should be no space between the letters and numbers of your trial registration number. We recommend manuscripts that report randomized controlled trials follow the CONSORT extension for abstracts.

Keywords

Three to ten keywords representing the main content of the article

Background

The Background section should be written in a way that is accessible to researchers without specialist knowledge in that area and must clearly state - and, if helpful, illustrate - the background to the research and its aims. Reports of clinical research should, where appropriate, include a summary of a search of the literature to indicate why this study was necessary and what it aimed to contribute to the field. The section should end with a brief statement of what is being reported in the article.

Methods

The methods section should include the design of the study, the setting, the type of participants or materials involved, a clear description of all interventions and comparisons, and the type of analysis used, including a power calculation if appropriate. Generic drug names should generally be used. When proprietary brands are used in research, include the brand names in parentheses in the Methods section.

For studies involving human participants a statement detailing ethical approval and consent should be included in the methods section. For further details of the journal's editorial policies and ethical guidelines see 'About this journal'.

For further details of the journal's data-release policy, see the policy section in 'About this journal'.

Results and discussion

The Results and discussion may be combined into a single section or presented separately. Results of statistical analysis should include, where appropriate, relative and absolute risks or risk reductions, and confidence intervals. The Results and discussion sections may also be broken into subsections with short, informative headings.

Conclusions

This should state clearly the main conclusions of the research and give a clear explanation of their importance and relevance. Summary illustrations may be included.

List of abbreviations

If abbreviations are used in the text they should be defined in the text at first use, and a list of abbreviations can be provided, which should precede the competing interests and authors' contributions.

Competing interests

A competing interest exists when your interpretation of data or presentation of information may be influenced by your personal or financial relationship with other people or organizations. Authors must disclose any financial competing interests; they should also

reveal any non-financial competing interests that may cause them embarrassment were they to become public after the publication of the manuscript.

Authors are required to complete a declaration of competing interests. All competing interests that are declared will be listed at the end of published articles. Where an author gives no competing interests, the listing will read 'The author(s) declare that they have no competing interests'.

When completing your declaration, please consider the following questions:

Financial competing interests

In the past five years have you received reimbursements, fees, funding, or salary from an organization that may in any way gain or lose financially from the publication of this manuscript, either now or in the future? Is such an organization financing this manuscript (including the article-processing charge)? If so, please specify.

Do you hold any stocks or shares in an organization that may in any way gain or lose financially from the publication of this manuscript, either now or in the future? If so, please specify.

Do you hold or are you currently applying for any patents relating to the content of the manuscript? Have you received reimbursements, fees, funding, or salary from an organization that holds or has applied for patents relating to the content of the manuscript? If so, please specify.

Do you have any other financial competing interests? If so, please specify.

Non-financial competing interests

Are there any non-financial competing interests (political, personal, religious, ideological, academic, intellectual, commercial or any other) to declare in relation to this manuscript? If so, please specify.

If you are unsure as to whether you, or one your co-authors, has a competing interest please discuss it with the editorial office.

Authors' contributions

In order to give appropriate credit to each author of a paper, the individual contributions of authors to the manuscript should be specified in this section.

An 'author' is generally considered to be someone who has made substantive intellectual contributions to a published study. To qualify as an author one should 1) have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) have been involved in drafting the manuscript or revising it critically for important intellectual content; and 3) have given final approval of the version to be published. Each author should have participated sufficiently in the work to take public

responsibility for appropriate portions of the content. Acquisition of funding, collection of data, or general supervision of the research group, alone, does not justify authorship.

We suggest the following kind of format (please use initials to refer to each author's contribution): AB carried out the molecular genetic studies, participated in the sequence alignment and drafted the manuscript. JY carried out the immunoassays. MT participated in the sequence alignment. ES participated in the design of the study and performed the statistical analysis. FG conceived of the study, and participated in its design and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

All contributors who do not meet the criteria for authorship should be listed in an acknowledgements section. Examples of those who might be acknowledged include a person who provided purely technical help, writing assistance, or a department chair who provided only general support.

Authors' information

You may choose to use this section to include any relevant information about the author(s) that may aid the reader's interpretation of the article, and understand the standpoint of the author(s). This may include details about the authors' qualifications, current positions they hold at institutions or societies, or any other relevant background information. Please refer to authors using their initials. Note this section should not be used to describe any competing interests.

Acknowledgements

Please acknowledge anyone who contributed towards the article by making substantial contributions to conception, design, acquisition of data, or analysis and interpretation of data, or who was involved in drafting the manuscript or revising it critically for important intellectual content, but who does not meet the criteria for authorship. Please also include the source(s) of funding for each author, and for the manuscript preparation. Authors must describe the role of the funding body, if any, in design, in the collection, analysis, and interpretation of data; in the writing of the manuscript; and in the decision to submit the manuscript for publication. Please also acknowledge anyone who contributed materials essential for the study. If a language editor has made significant revision of the manuscript, we recommend that you acknowledge the editor by name, where possible.

The role of a scientific (medical) writer must be included in the acknowledgements section, including their source(s) of funding. We suggest wording such as 'We thank Jane Doe who provided medical writing services on behalf of XYZ Pharmaceuticals Ltd.'

Authors should obtain permission to acknowledge from all those mentioned in the Acknowledgements section.

Endnotes

Endnotes should be designated within the text using a superscript lowercase letter and all notes (along with their corresponding letter) should be included in the Endnotes section. Please format this section in a paragraph rather than a list.

References

All references, including URLs, must be numbered consecutively, in square brackets, in the order in which they are cited in the text, followed by any in tables or legends. Each reference must have an individual reference number. Please avoid excessive referencing. If automatic numbering systems are used, the reference numbers must be finalized and the bibliography must be fully formatted before submission.

Only articles, datasets, clinical trial registration records and abstracts that have been published or are in press, or are available through public e-print/preprint servers, may be cited; unpublished abstracts, unpublished data and personal communications should not be included in the reference list, but may be included in the text and referred to as "unpublished observations" or "personal communications" giving the names of the involved researchers. Obtaining permission to quote personal communications and unpublished data from the cited colleagues is the responsibility of the author. Footnotes are not allowed, but endnotes are permitted. Journal abbreviations follow Index Medicus/MEDLINE. Citations in the reference list should include all named authors, up to the first 30 before adding '*et al.*'..

Any *in press* articles cited within the references and necessary for the reviewers' assessment of the manuscript should be made available if requested by the editorial office.

Style files are available for use with popular bibliographic management software:

BibTeX

EndNote style file

Reference Manager

Zotero

Examples of the *Cost Effectiveness and Resource Allocation* reference style are shown below. Please ensure that the reference style is followed precisely; if the references are not in the correct style they may have to be retyped and carefully proofread.

All web links and URLs, including links to the authors' own websites, should be given a reference number and included in the reference list rather than within the text of the manuscript. They should be provided in full, including both the title of the site and the URL, in the following format: **The Mouse Tumor Biology Database** [http://tumor.informatics.jax.org/mtbwi/index.do]. If an author or group of authors can clearly be associated with a web link, such as for weblogs, then they should be included in the reference.

Examples of the *Cost Effectiveness and Resource Allocation* reference style

Article within a journal
Koonin EV, Altschul SF, Bork P: **BRCA1 protein products: functional motifs.** *Nat Genet* 1996, **13:**266-267.

Article within a journal supplement
Orengo CA, Bray JE, Hubbard T, LoConte L, Sillitoe I: **Analysis and assessment of ab initio three-dimensional prediction, secondary structure, and contacts prediction.** *Proteins* 1999, **43**(Suppl 3):149-170.

In press article
Kharitonov SA, Barnes PJ: **Clinical aspects of exhaled nitric oxide.** *Eur Respir J*, in press.

Published abstract
Zvaifler NJ, Burger JA, Marinova-Mutafchieva L, Taylor P, Maini RN: **Mesenchymal cells, stromal derived factor-1 and rheumatoid arthritis [abstract].** *Arthritis Rheum* 1999, **42:**s250.

Article within conference proceedings
Jones X: **Zeolites and synthetic mechanisms.** In *Proceedings of the First National Conference on Porous Sieves: 27-30 June 1996; Baltimore.* Edited by Smith Y. Stoneham: Butterworth-Heinemann; 1996:16-27.

Book chapter, or article within a book
Schnepf E: **From prey via endosymbiont to plastids: comparative studies in dinoflagellates.** In *Origins of Plastids. Volume 2.* 2nd edition. Edited by Lewin RA. New York: Chapman and Hall; 1993:53-76.

Whole issue of journal
Ponder B, Johnston S, Chodosh L (Eds): **Innovative oncology.** In *Breast Cancer Res* 1998, **10:**1-72.

Whole conference proceedings
Smith Y (Ed): *Proceedings of the First National Conference on Porous Sieves: 27-30 June 1996; Baltimore.* Stoneham: Butterworth-Heinemann; 1996.

Complete book
Margulis L: *Origin of Eukaryotic Cells.* New Haven: Yale University Press; 1970.

Monograph or book in a series
Hunninghake GW, Gadek JE: **The alveolar macrophage.** In *Cultured Human Cells and Tissues.* Edited by Harris TJR. New York: Academic Press; 1995:54-56. [Stoner G (Series Editor): *Methods and Perspectives in Cell Biology,* vol 1.]

Book with institutional author
Advisory Committee on Genetic Modification: *Annual Report.* London; 1999.

PhD thesis
Kohavi R: **Wrappers for performance enhancement and oblivious decision graphs.** *PhD thesis.* Stanford University, Computer Science Department; 1995.

Link / URL
The Mouse Tumor Biology Database [http://tumor.informatics.jax.org/mtbwi/index.do]

Link / URL with author(s)
Corpas M: **The Crowdfunding Genome Project: a personal genomics community with open source values** [http://blogs.biomedcentral.com/bmcblog/2012/07/16/the-crowdfunding-genome-project-a-personal-genomics-community-with-open-source-values/]

Dataset with persistent identifier
Zheng, L-Y; Guo, X-S; He, B; Sun, L-J; Peng, Y; Dong, S-S; Liu, T-F; Jiang, S; Ramachandran, S; Liu, C-M; Jing, H-C (2011): **Genome data from sweet and grain sorghum (Sorghum bicolor)**. *GigaScience*. http://dx.doi.org/10.5524/100012.

Clinical trial registration record with persistent identifier
Mendelow, AD (2006): **Surgical Trial in Lobar Intracerebral Haemorrhage**. Current Controlled Trials. http://dx.doi.org/10.1186/ISRCTN22153967

Preparing illustrations and figures

Illustrations should be provided as separate files, not embedded in the text file. Each figure should include a single illustration and should fit on a single page in portrait format. If a figure consists of separate parts, it is important that a single composite illustration file be submitted which contains all parts of the figure. There is no charge for the use of color figures.

Please read our figure preparation guidelines for detailed instructions on maximising the quality of your figures.

Formats

The following file formats can be accepted:

PDF (preferred format for diagrams)

DOCX/DOC (single page only)

PPTX/PPT (single slide only)

EPS

PNG (preferred format for photos or images)

TIFF

JPEG

BMP

Figure legends

The legends should be included in the main manuscript text file at the end of the document, rather than being a part of the figure file. For each figure, the following information should be provided: Figure number (in sequence, using Arabic numerals - i.e. Figure 1, 2, 3 etc); short title of figure (maximum 15 words); detailed legend, up to 300 words.

Please note that it is the responsibility of the author(s) to obtain permission from the copyright holder to reproduce figures or tables that have previously been published elsewhere.

Preparing tables

Each table should be numbered and cited in sequence using Arabic numerals (i.e. Table 1, 2, 3 etc.). Tables should also have a title (above the table) that summarizes the whole table; it should be no longer than 15 words. Detailed legends may then follow, but they should be concise. Tables should always be cited in text in consecutive numerical order.

Smaller tables considered to be integral to the manuscript can be pasted into the end of the document text file, in A4 portrait or landscape format. These will be typeset and displayed in the final published form of the article. Such tables should be formatted using the 'Table object' in a word processing program to ensure that columns of data are kept aligned when the file is sent electronically for review; this will not always be the case if columns are generated by simply using tabs to separate text. Columns and rows of data should be made visibly distinct by ensuring that the borders of each cell display as black lines. Commas should not be used to indicate numerical values. Color and shading may not be used; parts of the table can be highlighted using symbols or bold text, the meaning of which should be explained in a table legend. Tables should not be embedded as figures or spreadsheet files.

Larger datasets or tables too wide for a landscape page can be uploaded separately as additional files. Additional files will not be displayed in the final, laid-out PDF of the article, but a link will be provided to the files as supplied by the author.

Tabular data provided as additional files can be uploaded as an Excel spreadsheet (.xls) or comma separated values (.csv). As with all files, please use the standard file extensions.

Preparing additional files

Although *Cost Effectiveness and Resource Allocation* does not restrict the length and quantity of data included in an article, we encourage authors to provide datasets, tables, movies, or other information as additional files.

Please note: All Additional files **will be published** along with the article. Do not include files such as patient consent forms, certificates of language editing, or revised versions of the main

manuscript document with tracked changes. Such files should be sent by email to resource-allocation@biomedcentral.com, quoting the Manuscript ID number.

Results that would otherwise be indicated as "data not shown" can and should be included as additional files. Since many weblinks and URLs rapidly become broken, *Cost Effectiveness and Resource Allocation* requires that supporting data are included as additional files, or deposited in a recognized repository. Please do not link to data on a personal/departmental website. The maximum file size for additional files is 20 MB each, and files will be virus-scanned on submission.

Additional files can be in any format, and will be downloadable from the final published article as supplied by the author. We recommend CSV rather than PDF for tabular data.

Certain supported files formats are recognized and can be displayed to the user in the browser. These include most movie formats (for users with the Quicktime plugin), mini-websites prepared according to our guidelines, chemical structure files (MOL, PDB), geographic data files (KML).

If additional material is provided, please list the following information in a separate section of the manuscript text:

File name (e.g. Additional file 1)

File format including the correct file extension for example .pdf, .xls, .txt, .pptx (including name and a URL of an appropriate viewer if format is unusual)

Title of data

Description of data

Additional files should be named "Additional file 1" and so on and should be referenced explicitly by file name within the body of the article, e.g. 'An additional movie file shows this in more detail [see Additional file 1]'.

Additional file formats

Ideally, file formats for additional files should not be platform-specific, and should be viewable using free or widely available tools. The following are examples of suitable formats.

Additional documentation

PDF (Adode Acrobat)

Animations

SWF (Shockwave Flash)

Movies

MP4 (MPEG 4)

MOV (Quicktime)

Tabular data

XLS, XLSX (Excel Spreadsheet)

CSV (Comma separated values)

As with figure files, files should be given the standard file extensions.

Mini-websites

Small self-contained websites can be submitted as additional files, in such a way that they will be browsable from within the full text HTML version of the article. In order to do this, please follow these instructions:

Create a folder containing a starting file called index.html (or index.htm) in the root.

Put all files necessary for viewing the mini-website within the folder, or sub-folders.

Ensure that all links are relative (ie "images/picture.jpg" rather than "/images/picture.jpg" or "http://yourdomain.net/images/picture.jpg" or "C:\Documents and Settings\username\My Documents\mini-website\images\picture.jpg") and no link is longer than 255 characters.

Access the index.html file and browse around the mini-website, to ensure that the most commonly used browsers (Internet Explorer and Firefox) are able to view all parts of the mini-website without problems, it is ideal to check this on a different machine.

Compress the folder into a ZIP, check the file size is under 20 MB, ensure that index.html is in the root of the ZIP, and that the file has .zip extension, then submit as an additional file with your article.

Style and language

General

Currently, *Cost Effectiveness and Resource Allocation* can only accept manuscripts written in English. Spelling should be US English or British English, but not a mixture.

There is no explicit limit on the length of articles submitted, but authors are encouraged to be concise.

Cost Effectiveness and Resource Allocation will not edit submitted manuscripts for style or language; reviewers may advise rejection of a manuscript if it is compromised by grammatical errors. Authors are advised to write clearly and simply, and to have their article checked by colleagues before submission. In-house copyediting will be minimal. Non-native speakers of English may choose to make use of a copyediting service.

Help and advice on scientific writing

The abstract is one of the most important parts of a manuscript. For guidance, please visit our page on Writing titles and abstracts for scientific articles.

Tim Albert has produced for BioMed Central a list of tips for writing a scientific manuscript. American Scientist also provides a list of resources for science writing. For more detailed guidance on preparing a manuscript and writing in English, please visit the BioMed Central author academy.

Abbreviations

Abbreviations should be used as sparingly as possible. They should be defined when first used and a list of abbreviations can be provided following the main manuscript text.

Typography

Please use double line spacing.

Type the text unjustified, without hyphenating words at line breaks.

Use hard returns only to end headings and paragraphs, not to rearrange lines.

Capitalize only the first word, and proper nouns, in the title.

All pages should be numbered.

Use the *Cost Effectiveness and Resource Allocation* reference format.

Footnotes are not allowed, but endnotes are permitted.

Please do not format the text in multiple columns.

Greek and other special characters may be included. If you are unable to reproduce a particular special character, please type out the name of the symbol in full. **Please ensure that all special characters used are embedded in the text, otherwise they will be lost during conversion to PDF.**

Units

SI units should be used throughout (liter and molar are permitted, however).

Appendix 8: Plagiarism declaration

Name: Dwommoh, Rebecca Akua Kyerewaa

Student Number: DWMREB001

Course: Master of Public Health (Health Economics)

Declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.

2. I have used the **Harvard** referencing convention for citation and referencing for the protocol, literature review and policy brief and **The Cost-effectiveness and Resource Allocation reference style** for the journal manuscript. Each contribution to, and quotation in, this thesis from the work(s) of other people has been attributed, and has been cited and referenced.

3. This **thesis** is my own work.

4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

Signature Signed by candidate

Date: 6th February, 2014