Cost-effectiveness Analysis of Single-Session Walk-In Counselling

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

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Abstract

Background: Increased costs and demand for accessibility to mental health services accompanied by a decline in resources has forced mental health service providers and government to innovate and develop a variety of new programs and service delivery strategies. As a result, a substantial number of organizations in Ontario have adopted the walk-in/single session therapy model. Further, many more family services agencies are planning to open a walk-in counselling center. Although, there have been some studies on clinical effectiveness, only one previous study has examined the cost-effectiveness exclusively focusing on single-session therapy/walk-in counselling service and that study suffered from a small sample size and the lack of a control group. Therefore, a rigorous research that examines the economic effectiveness is of paramount need. With a large sample size and a control group, this study aims to close the existing gap in the economic evaluation of single-session therapy/walk-in counselling.

Objective: To determine the cost-effectiveness analysis of a single-session walk-in counselling model of service delivery compared to the traditional counselling model.

Methods: Cost effective analysis was undertaken with effectiveness measured by the General Health Questionnaire (GHQ-12) score. Cost was measured using data on direct medical costs: physician cost, hospital cost, emergency visit cost, counselling cost, and other social service cost, and indirect costs: the cost of lost work days and the cost of lost usual activities. To make the results comparable to other interventions, the GHQ-12 score was converted to QALYs using Serrano-Aguilar et al.'s (2009) algorithm. Incremental Cost-effectiveness Ratio (ICER) was calculated comparing walk-in counselling to being on the waitlist for traditional counselling. A probabilistic sensitivity analysis (PSA) was performed to account for uncertainties of parameters.

In-depth analysis was done using Mixed effect modeling (also called multilevel models) to analyze the data from both individual level and group/context level and also to study growth or change trajectories (of the outcome measure) over a period of time, in order to measure the effectiveness.

Perspective: The societal perspective was used for our analysis with a time period of 10 weeks.

Data sources: The data from a CIHR-funded project was used. The data were collected from two family service agencies in Ontario, Canada; Kitchener-Waterloo Counselling Services (KWCS) and Family Service Thames Valley (FSTV) at three different time points: baseline, 4 weeks and 10 weeks over a period of 6 months.

Results: During the ten weeks of the study, the total mean incremental costs were ($1,499.55-$1,865.10) =-$365.55, indicating that walk-in counselling was less costly than the traditional counselling. The overall incremental outcome between intervention group and control group in QALYs after 10 weeks was, on average, (0.0215-0.0176) =0.0039. Combining the incremental costs and outcome differences across intervention and control groups resulted in average point estimates of the ICER of -$93,730.77 per QALY gained.

Conclusions: The single-session walk-in counselling model of service delivery is cost saving, but the effect is not significant. It enables rapid improvement and faster service to those who need immediate help.

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Lists of Abbreviations

CADTH	Canadian Agency for Drugs and Technologies in Health
CBA	Cost Benefit Analysis
CEA	Cost Effectiveness Analysis
CEAC	Cost Effectiveness Acceptability Curve
CEP	Cost Effectiveness Plane
CMA	Cost Minimization Analysis
CUA	Cost Utility Analysis
ER	Emergency Room
FSTV	Family Service Thames Valley
GHQ-12	General Health Questionnaire
GP/FP	General or Family physician (GP/FP)
ICER	Incremental Cost Effectiveness Ratio
KWCS	Kitchener-Waterloo Counselling Service
MLM	Multilevel Modelling
OHIP	Ontario Health Insurance Plan
PSA	Probabilistic Sensitivity Analysis
QALY	Quality Adjusted Life Year
SST	Single Session Therapy
SSWIC	Single-Session Walk-in Counselling
WTP	Willingness to Pay

Chapter 1 Introduction

1.1 Background

Increased costs and demand for accessibility to mental health services accompanied by diminishing resources have forced mental health practitioners, and government to innovate and devise a variety of new programs and service delivery strategies (Bloom, 2001; Campbell, 1999; Miller, 2000). As a result, traditional approaches to service delivery have been altered in hospital, private practice and community settings. The notion that a long and laborious intervention is necessary to improve the client's condition has been challenged, and many studies confirm consistent evidence of the effectiveness of brief intervention (Bloom, 2011). Canadians seeking assistance for mental health problems face lengthy waiting lists for all most mental health services, which contribute to over-crowding in emergency rooms in addition to resources wasted when problems become worse, or people wait for service not appropriate to their needs. In response to systemic issues, an increasing number of family service and children's mental health agencies in Canada is employing walk-in counselling to improve accessibility. Single-Session Walk-in Counselling (SSWIC) was developed in 1990, as a result of community demands for greater accessibility to mental health services. SSWIC enables clients to meet with a mental health professional at their moment of choosing (Slive et al., 2011). Although single session walk-in counselling has been used in the US, UK and Australia for several decades, it is a fairly new concept in Canada. In spite of its growing popularity and global use, little evidence exists regarding economic effectiveness. Economic evaluation compares costs and consequences of at least two interventions, or one intervention compared to usual care (no intervention). The results of economic evaluation help decision makers to make a decision on whether a particular intervention should be executed or not.

1.2 K-W Counselling Service

K-W counselling service adopted single-session walk-in counselling in 2007 in response to a waiting list of 981 clients. The primary goal of the clinic is to provide the service to clients in their moment of need, utilizing “their readiness to change." The clinic aims to provide quick and accessible services and to eliminate costly no-shows, which comprise approximately 20% of all first sessions.

Chapter 2 Literature Review

2.1 Introduction

2.1.1 Overview of Mental illness in Canada

Mental disorders are highly prevalent and account for a large proportion of the disease burden within most countries (Mihalopoulos, Vos, Pirkis, & Carter, 2011). The severity of the mental illness may vary from mild to severe and contribute to disability and health care service use. Studies estimate that 1 in 5 Canadians is affected annually by anxiety disorders, schizophrenia, substance use disorders, attention deficit/hyperactive disorders (ADHD), mood disorders, conduct disorders, oppositional defiant disorders (ODD), dementia (Smetanin et al., 2011). Currently, there are 6.7 million Canadians living with mental illness, which account for approximately 20% of the total population (Mental Health Commission Canada, 2012). As the Canadian population ages, it is expected that by 2041, the prevalence of mental illness will rise to 8.9 million people, which is 20.5% of the total Canadian population (Smetanin et al., 2011).

2.1.2 Economic Burden

Mental illness not only impacts individuals, but also places a significant impact on families, communities and the health care system (Smetanin et al., 2011). Mental illness has substantial economic impacts in other areas, including lost productivity, caregivers/family costs and costs to various government sectors (such as welfare, housing, and the judiciary). The total cost of mental illness to the Canadian economy is estimated about $51 billion every year, about 2.8% of 2011 GDP (Lim, Jacobs, Schopflocher & Dewa, 2008). It is estimated that over the next 30 years the total costs will exceed $2.3 trillion in current dollars due to increase in the expected number of people living with mental illness, as a result, of the aging and growth of Canada population (Smetanin et al., 2011). In any given week, at least 500,000 Canadians are unable to work due to

mental illness; this includes approximately 355,000 disability cases due to mental disorders, plus approximately 175,000 full-time workers absent from work (Dewa, Chaun & Dermer, 2010). A study in 2008 found that people living with mental illness (diagnosed or undiagnosed) utilized more GP (General Physician) visits, specialist visit and hospital days, on average compared to those without a mental illness (Lim et al., 2008). The average health care (medical) cost per capita was $2,515 for those with diagnosed mental illness as compared to $643 without mental illness (Smetanin, et al., 2011). The Ontario Ministry of Health and Long-term (2009) estimates that the Ontario health care system spent over $2.5 billion on mental health and addiction services in 2007-08 when the costs of hospital care, community-based programs, physician services and medications were all included. This does not include amounts spent in other Ministries such as Education, Community and Social Services, and Community Safety and Correctional Services, or that spent by the private sector.

2.2.1 Single-Session Walk-in Counselling (SSWIC)

Single-Session walk-in Counselling was first used in 1990 in Calgary, Canada, as a result of community demands for greater accessibility to mental health services (Slive et al., 2008). No referral is required for walk-in counselling, anyone who needs help which includes individual, couples and families can attend the service. The service is provided on a first come, first-served basis. This model is based on the principle of solution-focused brief therapy; the therapist focuses on attempting to solve the current problem rather than talking about past causes (Slive et al., 2008). There is no single theoretical frame of SSWIC; however, many organizations offering a planned single session therapy (SST) have generated a number of guiding assumptions and beliefs. The following are some of the main assumptions (Young, Dick, Herring &Lee, 2008):

- Clients are ready to change.

- Effective help can be given in a short period.
- Therapists should focus on clients' goals and link clients' hope with expectation for improvement and client's own ideas about what will work.
- Clients have knowledge, abilities, skills and resources that can be discovered and developed in ways that can assist them to resolve current struggles.
- Risk of harm to self and/ to others is always addressed, and action is taken by the therapist, if indicated.

In SSWIC, there is no traditional intake and / or assessment process, and little is known about the client(s) prior to the session other than what is written on a brief, solution-focused form completed by the client in the waiting room (Slive et al., 2008). The service is provided right at the moment, and there is no follow-up meeting or telephone contact, unless the client returns to the walk-in service or requests ongoing counselling. Organizations offering SSWIC usually provide additional counselling to clients who request it or are perceived by the therapist to require immediate intervention because of life-threatening behaviour or other high-risk conditions. In situations where the client need additional mental health care services, the walk-in service can direct the client on how to access those additional services.

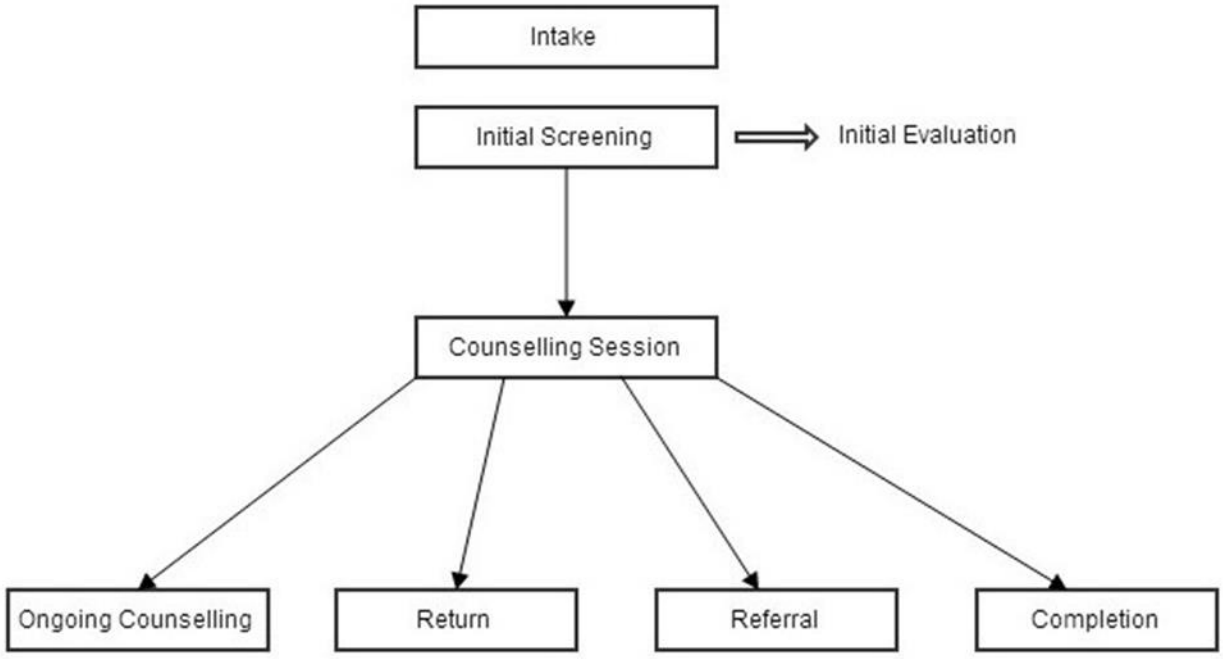

Figure 2.2.1 The Single Session Walk-In Counseling Process

The above figure (Figure2.2.1) illustrates how Single-Session walk-in counselling works. When client(s) come to an organization offering SSWIC, they are directed to the front desk, where short intake and initial screening takes place. The intake worker screens for risk to self-harm or to others, addiction and partner violence. After a wait of about 20 minutes, the client(s) sees a counsellor for a session lasting up to 90 minutes. In this session, the therapists employ a strength based-approach, where the therapist address immediate concerns and help clients and families (to identify the positive basis of the client(s) resources and strengths) to develop knowledge that will assist them better to manage and cope with their problems (Stalker, Horton & Cait, 2012). Clients are often assisted to develop a written "plan" for resolving the presenting concerns. At the end of the session, it is assumed that SSWIC is enough to address the problems and completion of the session. However, client(s) may return to walking counselling clinic (or

request ongoing counselling) if needed. Moreover, those who have more serious conditions, needing longer-term treatment, are referred to traditional counselling after the first session. Depending on needs of the client(s), therapist may provide referrals to other mental health services.

2.3 Economic Evaluation in Mental Health Care Research

Economic evaluation is a method for considering the benefits and costs of alternate uses of health care resources to aid decision makers in allocating and prioritizing health care resources (Drummond, Manca, & Schulpher, 2005). Economic analysis of mental health care interventions applies objective methods to clinical and economic outcome data to compare and evaluate alternative interventions and services (Fals-Stewart, Yates, & Klosterman, 2005). The results of well-conducted economic evaluations can assist decision-makers at the mental health policy level to determine which interventions are beneficial uses of scarce government resources (Chisholm, 1998).

2.3.1 Introduction to Types of Economic Evaluation

Several types of economic evaluation exist: cost-minimization analysis (CMA), cost-benefit analysis (CBA), cost- effectiveness analysis (CEA), and cost-utility analysis (CUA). Cost-minimization analysis is an economic evaluation in which consequences of competing interventions are the same, in which only cost is taken into consideration. In cost-benefit analysis, all the costs and benefits of the program are expressed in monetary terms. Cost-utility analysis is an economic evaluation in which an intervention which produces different outcomes, in terms of both quantity and quality of life, is evaluated in quality-adjusted life years (QALYs). It can be regarded as one particular case of cost-effectiveness analysis.

2.3.2 Cost-Effectiveness Analysis (CEA)

Cost-effectiveness analysis (CEA) is an analytic tool in which the costs and the effects of an intervention designed to prevent, diagnose or treat disease are calculated and compared with the alternative strategy to achieve the same goals (Drummond et al., 2005). The results of the CEA are presented as a ratio of costs to effects, where the effects are health outcomes such as cases of the disease prevented, years of life gained, and quality-adjusted life years gained. Cost-effectiveness analysis calculates the incremental effectiveness (-and incremental costs-) – i.e. the difference in effectiveness (and costs) between the intervention of interest, and the next least effective/most costly alternative.

2.3.3 Components of Cost-Effectiveness Analysis

2.3.3.1 Perspective

The perspective of economic evaluation provides the framework for the analysis. Depending on the perspective taken, the results of analyses could vary greatly. The societal perspective is considered by most health economists as the "gold standard" for cost analyses because it is the only perspective that does not count as a benefit what may be a loss for some other involved party (Gold, Seigel, Russell, & Weinstein, 1996). This perspective considers costs and benefits of all stakeholders affected by the intervention regardless of to whom they accrue. Use of the societal perspective will allow for the broadest possible consideration of all applicable costs and their benefits. The societal perspective represents the public interest rather than that of the healthcare sector (Martin, 2001). Adopting a societal perspective favours policies aimed at maximizing the welfare gains to society or minimizing the losses (Byford et al., 1998)

2.3.3.2 Costing

Costs in economic evaluations are always reported in monetary terms, and depending upon the perspective taken for the analysis costs could vary considerably (Drummond et al., 2005). In economic analyses, costs can be categorized into direct medical cost, direct non-medical cost, and indirect cost (loss of productivity).

2.3.3.3 Direct Medical Cost

Direct medical costs represent costs of health care resources consumed in the provision of intervention or in dealing with the side effects or other current and future consequences linked to the intervention (Gold et al., 1996). These costs include physician costs, hospital costs, diagnostic costs, pharmaceuticals and all other costs related to the provision of services of the health care facilities.

2.3.3.4 Direct Non-Medical Cost

Direct non-medical costs include the costs of non-medical goods, services and other resources consumed in the provision of intervention or in dealing with the side effects or other current and future consequences linked to it (Gold et al., 1996). Travel costs, communication costs, child care costs, caregiver's costs and any other non-medical related costs are direct non-medical costs.

2.3.3.5 Indirect Cost

The time horizon is the length of time over which benefits and costs are accrued in an economic analysis (Canadian Agency for Drugs and Technologies in Health – CADTH -, 2006). The time horizon should be long enough to capture the relevant costs and benefits of the

intervention (CADTH, 2006). If long-term cost and effectiveness data are not available, the time horizon should be extended to the point where there are meaningful differences between interventions; A sensitivity analysis between time horizon and results should be performed (CADTH, 2006).

2.3.3.6 Discounting and Inflation

Discounting of costs and health outcomes to present values (when they occur in the future) is performed in economic evaluation to reflect society's rate of time preference (CADTH, 2006). The Canadian Guidelines for the economic evaluation of health technologies recommend that both the outcomes and the costs of intervention that occur in the future should be discounted at a 5% rate. The estimated costs and benefits may need to be adjusted to account for the time of occurrence because costs and benefits of the program do not always occur at the same time (Fals-Stewart et al., 2005). For example, the cost data collected this year may not be directly compared to data collected last year. Standard inflation indices, such as the Canadian Consumer Price index can be used to adjust costs.

2.4 Measurements of CEA

Cost-effectiveness analysis (CEA) is used in the Mental Health arena to help to determine the appropriateness of replacing existing treatment with a new treatment. It provides information to decision makers about economic values and benefits, and assists with the difficult decision of health care resource allocation. From a decision perspective, the most preferable alternative would be the one that shows the lowest cost for a given improvement in outcomes. The results of cost effectiveness analysis are measured in Incremental Cost-Effectiveness Ratios (ICER).

2.4.1 Incremental Cost-effectiveness Ratio (ICER)

Cost-effectiveness analysis is used when effectiveness of two or more alternatives is measured in the same units. The ratio called incremental cost-effectiveness ratio (ICER) is used, where the difference in cost between treatment and control is divided by the difference in effect between the treatment and the control group (Drummond et al., 2005).

$$ICER = \frac{Cost_{intervention} - Cost_{standard}}{Effectiveness_{intervention} - Effectiveness_{standard}} = \frac{\Delta Cost}{\Delta Effectiveness}$$

The differences in cost and the differences in effect, of associated ICER are plotted in the cost-effectiveness plane (see Fig 2.4.1). The horizontal axis by convention measures differences in effectiveness and the vertical axis measures differences in costs. Suppose we are comparing a new treatment with the old treatment, ignoring the possibility that they do not differ in costs and effects, there are four possibilities. Four quadrants define differences in costs and differences in effects. The difference in cost and a difference in effect in quadrant I am more effective but also cost more. This region is often called a trade-off region because higher effects are achieved at greater expense. In quadrant IV, the new treatment dominates the old treatment (greater effect and lower cost with a new treatment group). In quadrant III the new treatment is less costly, but less effective; a smaller effect is achieved through the use of fewer resources. Finally, in quadrant II the old treatment dominates (less effect and higher cost with a new treatment group).

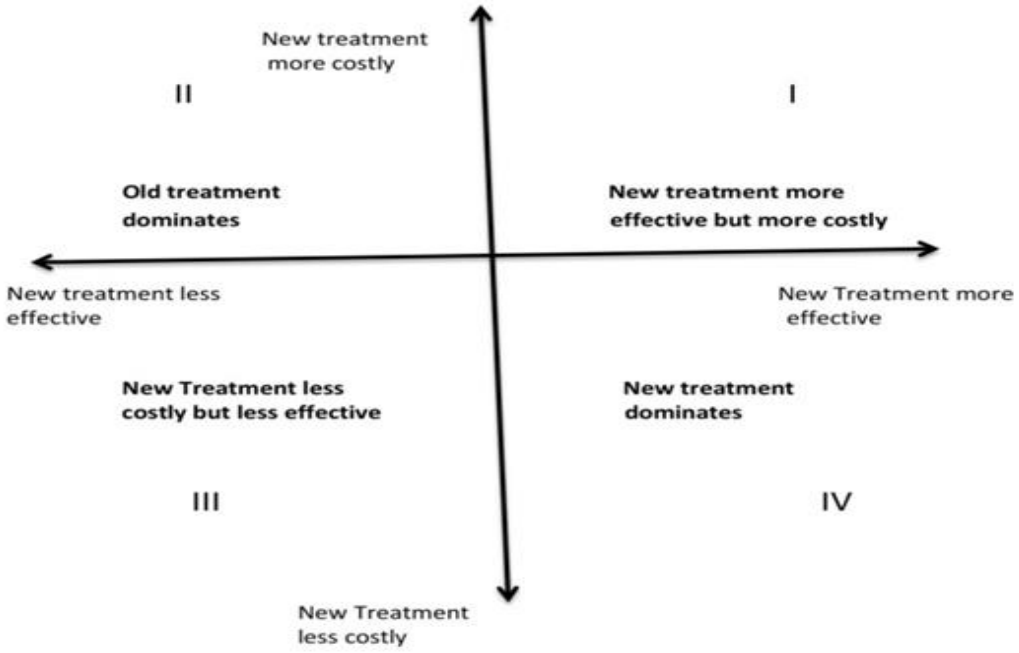

Figure 2.4.1 Cost Effectiveness Plan

If the difference in cost and the difference in effect are located in quadrant I, where the treatment is more costly and more effective, than the question of adopting a new treatment to replace an old treatment depends on the relationship between ICER and the willingness-to-pay (WTP; ƛ) for a unit increase in effect. WTP represents how much the society is willing to pay for additional units of effectiveness or to avoid additional unit of (certain) adverse events. The maximum willingness to pay (societal) is CDN $50,000/QALY (Ubel et al., 2003). If the ICER is less than the maximum willingness to pay (lambda; ƛ) for a unit increase in effect, then treatment is said to be cost-effective. Similarly, if the difference in cost and the difference in effect are located in quadrant III, where the treatment is less costly and less effective, but ICER

is less than the maximum willingness to pay (ƛ) for a unit increase in effect, the new treatment is considered as cost-effective for resource savings.

2.4.2 Sensitivity Analysis

Sensitivity analysis has become a standard method for presenting uncertainty in the cost-effectiveness analysis (CEA) (Baio & Dawid, 2011). Deterministic and probabilistic sensitivity (PSA) analyses are two frequently used methods. PSA, which is recommended by many health care decisions making bodies, involves assigning a distribution to all variables and conducting a Monte Carlo simulation (Sulvian, Milton, & Weinsterin, 2010). PSA provides a single, understandable, global analysis of uncertainty in decision-making. It is a method that allows all the uncertainty of all parameters to be considered simultaneously.

2.5 Effectiveness of Single Session Walk-In Counselling

2.5.1 Clinical Effectiveness of Single Session Walk-In Counselling

Prior research on the clinical effectiveness of single-session counselling is limited. Furthermore, of the clinical evaluations that do exist in the mental health care literature, many are poor in quality, have a short follow-up period, have small or unspecified sample sizes, and lack standardized measures and a control group (Hymmen, Stalker & Cait, 2013; Bloom 2001; Perkins, 2006). Bloom (2001) has reviewed the literature and has outlined the many benefits of a single session therapy. Based on the existing studies, he came to the conclusion that the single session psychotherapy is effective for interpersonal conflicts, and is the most appropriate when urgent intervention is needed (Bloom, 2001). More recently, Hymmen and his colleagues' review of a single session therapy concluded that the majority of clients who received a single session intervention found it sufficient, helpful and satisfactory (Hymmen, Stalker & Cait, 2013).

The majority of studies examining the effectiveness of a single session counselling involved children and adolescents. Barwick and colleagues conducted a study among children aged 3 to 18 years old and their caregivers who accessed the West End Walk-In counselling center and a comparison group who received service via the standard intake process. They found that those in the walk-in group had steeper rates of decline on psychological problems over three months compared to clients in standard (usual) care. Gawryiak, Nicholas and Hopko (2009) conducted a randomized controlled trial comparing individualized receiving Behavioral Activation Treatment for Depression (N=14) and no-treatment control (N=16) for university students with moderate depression symptoms. The outcome measures were depression, environmental reward, social support and somatic anxiety. Two weeks later, they came to the conclusion that the intervention group showed a significant reduction in depressive symptoms and increasing social support compared to the control group. Perkins (2006) found 61% of parents seen for the single session at children's mental health service reported they and their children had not required further therapy. In other studies, single session therapy has been found helpful in managing waitlist (Coren, 2001); treating family/marital stress, adolescent crises (Slaff, 1995), and getting referrals to other (community) social services (Horton, Stalker, Cait & Josling, 2012).

2.5.2 Economic Analysis

Little or no evidence exists regarding the economic evaluation of walk-in counselling/single-session therapy. A pilot study by Horton, Stalker, Cait, & Josling (2012) found that there are economic benefits of single-session counselling due to earlier return to work, and the diversion of clients from using hospitals and family doctors, towards using community services. The few studies that exist in the psychotherapy literatures suggest psychotherapy with multiple sessions is cost effective and can reduce the use of medical services for some patients

(Petrou, Copper, & Murry, 2006). A systematic review of the literature published between1984 in 2007 concluded that most studies illustrate cost-effectiveness of psychotherapy in treating depression by decreasing disability, reducing hospitalization and other medical costs (Lazar et al., 2010). In patients with emotional disorders, problem solving therapy was found cost-effective due to decreased absenteeism compared to patients given usual care by a general practitioner (Mynors, 1996). A systematic review of 12 studies conducted by Schulberg, Raue, & Rollamn (2002) on depressed patients seen in the primary care setting concluded that the depression-specific psychotherapy is more effective than usual primary care, although the cost was high. Many other studies have found that psychotherapy is cost-effective when used with other medications. Vos et al., (2005) concluded in the year 2000 that providing antidepressant drug treatment and cognitive behavioural therapy (CBT) together would reduce the disease burden of depression by approximately 50% over the next five years in Australia. A limited number of studies did find psychotherapy is not cost-effective in some settings (Bosman, Schaik, & Heyman, 2007; Petoru, Copper, Murray, & Davidson, 2006). A review of counselling in primary care concluded that it was effective in the short-term, but no significant difference persists in the long term, and no reduction of costs over a period of time (Bower and Rowland, 2006).

Chapter 3 Research Objectives

The prevention of mental disorders is an important health priority, given the large disease and economic burden associated with the mental health disorders. The Ontario government announced in 2008 that its top health care priorities were to reduce wait times in emergency departments and improve accessibility of service. Mental illness is by far the strongest determinant of frequent emergency department (ED) use, and family services agencies like traditional mental health services across the province are facing long wait- lists and costly no-shows. In such a situation, walk-in counselling can play an important role by reducing pressure on Ontario's health care system. The economic burden of mental illness in the Canadian health care system is high and will rise due to an increase in the expected number of people living with mental illness, as a result of the aging population and the growth of the Canadian population. Moreover, the need for effective treatment of these individuals through primary care will be more even pronounced. Single- Session Walk-in Counselling (SSWIC) has the potential to reduce the cost of mental illness.

In the last ten years, a substantial number of family services and children's mental health organizations in Ontario have adopted the single session walk-in therapy model, and many more such agencies are planning to open a walk-in counselling center. Although, there have been some studies on the clinical effectiveness of single-session therapy, to the author's best knowledge, there is only one research on economic evaluation of single-session walk-in counselling service by Horton et al., 2012. That study (Horton et al., 2012) suffered from a small sample size and the lack of a control group. With a large sample size and a control group, this study has the advantage of deriving valid conclusions. The main objective of this study was to estimate the

cost-effectiveness of SSWIC compared to being on the waitlist for traditional counselling (or having received counselling after a wait). The research question is:

"Is the Single-Session Walk-in Counselling (SSWIC) model more cost-effective than the traditional model of service delivery?"

Hypothesis:

A. The SSWIC model reduces the use of emergency rooms for mental health services and family physician (FP) visits compared to the traditional model where clients are normally put on a wait list before receiving counselling.
B. SSWIC encourages clients to use a greater number of other community services that provide mental health services than the traditional model of delivering counselling services.
C. The SSWIC model reduces the number of hospitalizations for mental health services compared to the traditional model.
D. Clients using the SSWIC model return to work earlier than clients of the traditional model for delivering counselling.
E. Clients using the SSWIC model return to usual activities earlier than clients using the traditional model.
F. The SSWIC model is more cost-effective than the traditional model for delivering counselling services.

Chapter 4 Methods

4.1 Introduction

This dissertation was based on a comparative analysis between two models of delivering community-based mental health services in Ontario, Canada: namely, SSWIC and waiting for or receiving traditional counselling, i.e the model where clients are normally put on a wait list before receiving counselling. A cost-effectiveness analysis was conducted comparing both groups. Cost-effectiveness was assessed using average costs for walk-in session, use of emergency and FP's/GP's visits, average wages for lost work, ability to undertake usual activities and change in the use of community services for both interventions. Further, changes in self-reported GHQ-12 scores were used to calculate the clinical benefits. In order to determine the differences in costs and benefit of the two models, incremental analysis was performed. A probabilistic sensitivity analysis was adopted to estimate the impact of various parameters on the overall findings. Mixed effects modeling (also called hierarchical linear models) was used to analyze data from both individual level and group/context level. Further, the same modeling was also applied to study growth or change trajectories (of outcome measures) over a period of time, in order to measure the effectiveness.

4.2 Justification of for Cost-Effectiveness Analysis using Societal Perspective

As we described earlier, there are different types of economic evaluations. Although, they use a common approach to calculate the cost, there are some differences on how to assess the outcome. The CBA and CMA are expressed in monetary terms. In order to assign a monetary value to benefits (health outcome), judgments are often made on the productive value of the individual to the economy. Because of the challenge of valuing benefits in monetary terms, CBA method is not considered as the best choice in the mental health care evaluation (Mental Health

Economics European Network-MEHH II-, 2006). Also, in mental health it is very difficult to assign a dollar value to the outcome of the measures because of lack of the appropriate method and nature of the disease.Thus, the most attractive and intuitive type of economic evaluation in mental health is the cost-effectiveness analysis (MEHH II, 2006). Cost effectiveness analysis measures the benefits in a single natural dimension (such as change in symptoms, disease prevented, years of life gained, or improvement in well-being), which is easy to understand. For psychiatric services, the societal viewpoint is preferred from the evaluator's point of view because there is reason to believe that there may be high patient, family and other sector costs (Singh, Hawthrone, & Vos, 2001).

4.3 Data

The data from a CIHR-funded project was used for this study. Data were collected from two family service agencies: Kitchener-Waterloo Counselling Service (KWCS) and Family Service Thames Valley (FSTV). The data were collected by employing a mixed method, sequential explanatory design (Ivankova, Creswell, & Stick, 2006) where the collection of quantitative data and analysis constituted the first phase, followed by a second phase of qualitative data collection and analysis. Clients attending the weekly Walk-In Counselling Clinic (SSWIC) at KWCS were recruited as the intervention group. Family Service Thames Valley (FSTV), which offers a traditional counselling service, - where clients requesting counselling are normally placed on a waiting list of up to 12 weeks, was used as a comparison site (control group). The walk-in counselling clinic at KWCS admits clients from noon to 6 pm once a week. The last client leaves at approximately 8:00 pm. Any individual, couple or family can attend without an appointment. Clients are asked to pay a fee on a sliding scale related to income, ranging from $0 to $187.50 ($125.00 per hour).

The FSTV in London offers traditional counselling from 8 am to 5pm each business day. Normally 8 to15 people call each business day requesting counselling, but the agency maintains a quota of 3-5 callers per day. These callers are given a day and time when the intake worker will call them back (usually within a few days). The intake worker determines the service offered, usually placing the caller on a wait-list. People calling after the daily quota has been reached are asked to call back the next business day. The cost of counselling is from $0 to $115.00 per one-hour session depending on the client's ability to pay. To the author's knowledge, no other community-based counselling agency in London offered walk-in counselling during the time of data collection.

4.4 Measures

The data were collected at three different time points: Baseline, 4 Weeks and 10 Weeks over a period of 8 months. Baseline was the point at which clients attended walk-in (KWCS) or telephoned (FSTV) and asked for counselling and were put on the wait list. Self-report paper questionnaires were given to clients at baseline for KWCS, with consenting clients responding to follow- up questionnaires by telephone. At FSTV, all three rounds of data collection were undertaken by telephone. At baseline for both sites, three different kinds of data were collected 1) socio-demographic data (See Appendix-A); 2) a standardized questionnaire assessing psychological distress (GHQ-12) (See Appendix-B), and 3) a set of questions designed to elicit information relevant to the cost-effectiveness of the intervention, namely the participants' ability to undertake normal activities and work, as well as use of health and community services over the past month (See Appendix-C). Psychological distress questions and the activity/use of service questions (i.e. Appendix B and Appendix C) were repeated for the follow- ups. For this analysis, three different data sets were used 1) socio-demographic data, 2) clinical effectiveness

data, and 3) economic data. Dr. Carol A. Stalker and Dr. Cheryl-Anne Cait at Wilfred Laurier University, Faculty of Social Work will address quantitative and qualitative analysis (clinical) of this project (Stalker et al., ongoing; Cait et al., ongoing). More in-depth discussion of how the data were collected is described in Booton et al., ongoing and more discussion of the multilevel modeling of clinical effectiveness in Reimer et al., ongoing.

4.5 Response Rate

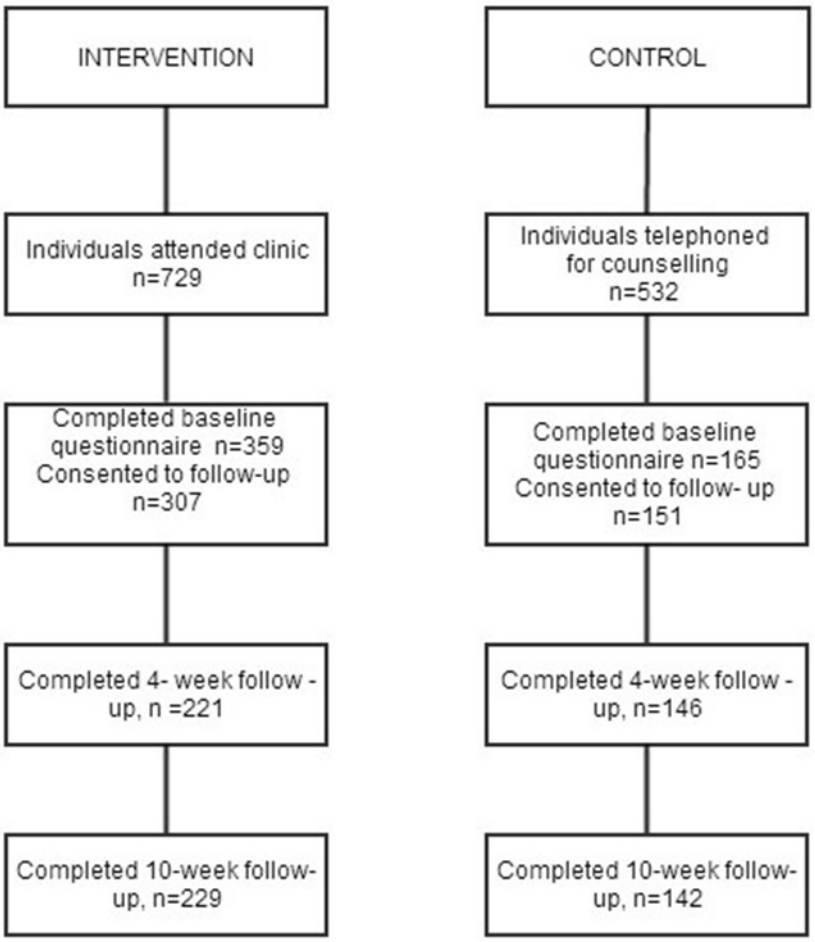

Figure 4.5 Flowchart of Participants

4.5.1 Walk-in Clients (KWCS)

At baseline, out of a possible 729 individuals who attended the clinic 359 clients completed baseline questionnaires, and 307 of the 358 (85.5%) consented to follow-up (this constituted 42.1% of all those attending the clinic. One of the participants had only answered 30% of questionnaire, so we decided to exclude this person's data). Of those consenting to follow-up,

72% (n=221) responded to 4- week questionnaires and 74.59% (n=229) completed the 10 Week questionnaires.

4.5.2 Control Clients (FSTV)

An estimated 534 eligible individuals telephoned requesting counselling at FSTV. Of 165 clients who completed baseline questionnaires, 90.96 % (n=151) agreed to follow- up. This constituted 28.38 % (151/532) of all those who telephoned to request counseling. Among those who agreed to follow-up, 96.68% (n=146) completed 4 week questionnaires and 94.03 % (n=142) completed 10 week questionnaires.

4.6 Demographics

The two cities, Kitchener-Waterloo and London, are located 60 miles apart, are similar in size and have populations of 316,628 and 366,151 respectively (Statistics Canada, 2011). Several socio-demographic questions were asked at the baseline. All participants at both sites were aged 16 years and above. The study excluded those younger than 16 from the study due to the more elaborate process required for informed consent, and the need to use a different scale to measure psychological distress.

4.6.1 Baseline

Table 4.6.1 Demographic Distribution for Intervention and Control Groups at Baseline

Characteristic	Intervention (n=359)	Control (n=165)
Age, mean(s.d.)	32.81(13.54)	38.35(13.55)
Sample range	16-85 years	16-74 years
Sex, % (n)		
Male	40.52(139)	26.06(43)
Female	58.02(199)	73.94(122)
Transgender	1.46(5)	0
First Language, % (n)		
English	90.48(304)	90.24(148)
French	0.89(3)	0.61(1)
Other	8.63(29)	9.15(15)
Relationship status, %(n)		
Married	32.13(107)	31.10(51)
Single	45.95(153)	31.71(52)
Separated or Divorced	12.61(42)	22.56(37)
Widowed	0	3.05(5)
Other	9.31(31)	11.59(19)
Household Income (Yearly), %(n)		
$00-$19,999	59.1(185)	64.9(105)
$20,000-$39,999	18.2(57)	22.2(36)
$40,000-$59,999	11.8(37)	8.6(14)
$60,000 +	10.9(34)	4.3(7)
Employment, % (n.)		
Full-time	23.28(78)	23.03(38)
Part-time	17.01(57)	12.12(20)
Self-employed	3.88(13)	4.85(8)
In school	13.13(44)	1.82(3)
Unemployed	17.31(58)	15.15(25)
OW/ODSP	19.70(66)	38.79(64)
Homemaker	1.79(6)	3.64(6)
Retired	2.09(7)	0
Medical Leave	1.79(6)	0.61(1)

Note: Although 359 individuals completed Baseline questionnaire at KWCS, several did not provide complete demographic data.

The average age of clients at KWCS was 32.81 years (n=340) with a range from 16 to 85 years, while that at FSTV was 38.35 years (n=165) with a range from 16 to 74 years. Among the participants at KWCS, 58.0 % were female, whereas at FSTV 73.9% were female. The percentage of the participants who were employed (includes full-time, part-time and self-employed) was higher in the intervention group (44.17%: -n=338) relative to the control group (40 %: n=165). Those with a household income of less than $19,999 were most frequent, accounting for 59.1% of the clients at KWCS. Further, among the clients at KWCS, 18.2% reported income between $20,000-$39,999, 11.38% reported income between $40, 00-$59,999 and 10.92% reported income of $60,000 or more. This trend was prevalent among clients at FSTV also as 64.93 % of the clients reported yearly household income of less than $19,999, 22.2 % reported income between $20,000-$39,999, 8.63% reported income between $40,000-$59,999 and 4.3 % reported income of $60,000 or more.

4.6.2 4 weeks

Table 4.6.2 exhibits similar demographic characteristics of clients at 4 weeks, as at baseline in both groups. There is no significant drop out of clients with particular demographic characteristics**.**

Table 4.6.2 Demographic Distribution for the Intervention and Control Group at 4weeks

Characteristic	Intervention (n=359)	Control (n=165)
Age, mean(s.d.)	33.36(14.01)	38.45(13.45)
Sample range	16-85 years	16-74 years
Sex, % (n)		
Male	43.95(85)	25.52(37)
Female	59.07(127)	74.48(108)
Transgender	1.40(3)	0
First Language, % (n)		
English	88.57(186)	89.66(130)
French	0.95(2)	0.69(1)
Other	10.48(22)	9.66(14)
Relationship status, %(n)		
Married	33.49(70)	30.56(44)
Single	47.37(99)	32.64(47)
Separated or Divorced	11.96(25)	25.00(36)
Widowed	0	2.78(4)
Other	7.18(23.81)	9.03(13)
Household Income (Yearly), %(n)		
$00-$19,999	59.5(119)	65.73(94)
$20,000-$39,999	20.0(40)	20.98(30)
$40,000-$59,999	12(24)	9.79(14)
$60,000 +	8.5(17)	3.5(5)
Employment, % (n.)		
Full-time	18.40(39)	22.07(32)
Part-time	19.34(41)	12.41(18)
Self-employed	4.72(10)	4.83(7)
In school	14.62(31)	2.07(3)
Unemployed	15.09(32)	15.17(22)
OW/ODSP	21.23(45)	38.62(56)
Homemaker	1.89(4)	4.14(6)
Retired	2.36(5)	0
Medical Leave	2.36(5)	0.69(1)

4.6.3 10 weeks

Table 4.6.3 Demographic Distribution for the Intervention and the Control Group at 10 weeks

Characteristic	Intervention (n=359)	Control (n=165)
Age, mean(s.d.)	33.09(13.43)	39.44(13.05)
Sample range	16-85 years	16-74 years
Sex, % (n)		
Male	38.05(86)	25.35(36)
Female	61.06(138)	74.65(106)
Transgender	0.88(2)	0
First Language, % (n)		
English	89.19(198)	89.44(127)
French	0.90(2)	0.70(1)
Other	9.91(22)	9.86(14)
Relationship status, %(n)		
Married	36.36(80)	28.37(40)
Single	46.82(103)	34.04(48)
Separated or Divorced	9.09(20)	24.82(35)
Widowed	0	2.84(4)
Other	7.73(17)	9.93(14)
Household Income (Yearly), %(n)		
$00-$19,999	57.82(122)	64.75(90)
$20,000-$39,999	20.85(44)	21.58(30)
$40,000-$59,999	11.37(24)	10.07(14)
$60,000 +	9.95(21)	3.6(5)
Employment, % (n.)		
Full-time	21.62(48)	23.94(34)
Part-time	17.12(38)	12.68(18)
Self-employed	4.95(11)	5.63(8)
In school	14.41(32)	1.41(2)
Unemployed	15.32(34)	15.49(22)
OW/ODSP	20.27(45)	37.32(53)
Homemaker	2.25(5)	2.82(4)
Retired	1.80(4)	0
Medical Leave	2.25(5)	0.70(1)

Table 4.6.3 illustrates that the demographic characteristics of clients at 10 weeks are quite similar to those at baseline and at 4 weeks for both control and intervention group. There is no significant change in demographics of clients from baseline to 4 weeks.

4.7 Economic Evaluation

4.7.1 Calculation of Economic Effectiveness

Economic effectiveness was calculated by a set of questionnaires designed to elicit relevant information (Appendix-C). To test the hypotheses, further mixed effect modeling (also called hierarchical model, multilevel model) was used. Price (unit cost) data were then incorporated.

Costs were measured using data on physician's visits, use of emergency room service, work loss, ability to undertake normal activities, use of other community and social services, and costs of counselling. The mean total costs for each of the groups were calculated at the end of 10 weeks (from baseline to 10 weeks follow-up). All costs were calculated in Canadian dollars (CAD) in 2013 prices. All costs in this study are assumed to occur in the same year, and were not discounted.

Costing information was collected from government reports, peer-reviewed articles, and the two family service agencies participating in the study - KWCS and FSTV. Details of costing for each resource is described below and summarized in Table 4.7.8.

The average direct medical costs were obtained by adding physician costs, hospital costs (for mental health), and emergency visits costs (for mental health), counselling costs and social service costs. The direct non-medical costs were excluded from this analysis because there is no data available in the survey. The non-medical costs were calculated by adding the cost of loss of employment and cost of loss of usual activities.

4.7.2 Physician Costs (GP/FP)

The cost of a physician visits ($77.20 per visit) and was obtained from the Ministry of Health and Long-Term (MOLTCH, 2013) for general consultation. Total cost for each client was valued by multiplying the numbers of visit by the unit cost ($77.20).

4.7.3 Hospital Admission Costs

Cost of hospital admission for one day was estimated to be $1013.00. Hospital costs were calculated by averaging costs per day (per diem rates) for inpatient services charged by hospitals in Ontario in 2013. The data on per diem rates by hospitals was obtained from the Ministry of Health and Long-Term Care, 2013. The cost of hospital admission per patient for mental health services was estimated by multiplying average costs per day by the number of days in the hospital (i.e. The cost of one day in hospital for mental health =1×$1013. 00=$1013.00)

4.7.4 Emergency Visit (ER) Costs

The cost of an emergency visit was estimated to be $433.18. The estimate of $433.18 is based on the average cost of an emergency visit $260 (average cost of ER excluding physician cost) for 2007-2008 (Canadian Institute of Health Information, 2010) plus physician costs for general consultation $77.20 (MOHLTC, 2013) and one-follow- up. This amount was converted to 2013 dollars with the Bank of Canada Inflation Calculator.

4.7.5 Counselling Costs

Counselling costs for both agencies were obtained from the administrative records of the service agencies. The cost of one session of walk-in counselling per client was estimated to be $187.50 ($125.00 per hour) (financial records, KWCS). The cost of traditional counselling was estimated to be $115.00 per client per one hour-session (financial records, FSTV).

4.7.6 Social Services Costs

The data we are using for this study was obtained from participants' responses to a list of other social and mental health services available in the local community. This list was developed to measure the use of other community services and contains names of the community–based social services and mental health agencies in the geographical region. Clients were asked to indicate whether they had received or contacted these services for support in the previous month. Numbers of visits or contacts were recorded at each time point, i.e. baseline, 4 weeks and 10 weeks. For this study, only costs of services from other agencies providing mental health services were included. It is very difficult to cost the use of mental health service agencies because of the heterogeneous nature of these agencies. Dr. Horton and colleagues have estimated the cost of using one community service at $30 for the pilot study (estimated from Horton et al. 2013). For this study, we will keep same cost. The total cost per client was obtained by multiplying the number of visits by $30.

4.7.7 Cost of Lost Work Days (Absenteeism)

Costs of lost work days were calculated by using human capital methods, which considers clients' hours that, are lost, and calculates productivity costs as the product of those lost hours with an hourly wage (Van, 2010). Costs of lost work days were estimated by multiplying numbers of work day clients missed by Ontario average wage for one day. Wages for one day of work were obtained by multiplying the average hourly wage in 2013 (Statistic Canada, 2013) by eight (i.e. $24.54x8=$196.32).

4.7.8 Cost of Lost Usual Activities

Costs of lost usual activities were calculated by using Ontario minimum wage ($10.25). The hour lost for usual activities is valued as an" hour lost" of work. Total cost for an individual was calculated by multiplying number of days lost for usual activities by $10.25 ($10.25x8=$82).

Table 4.7.8 Costing

Category	Unit Cost 2013 CAD	Source
Direct Medical Costs		
Physician Costs (GP)	$77.20	OHIP Schedule of Benefits, General assessment,2013
Hospital Admission	$1013.00	Interprovincial per diem rate for inpatient services,2013 SCHEDULE A
Emergency Visits	$433.18	Canadian Institute for Health Information,2010 (average cost of emergency plus one consultation and one follow up with a physician ($77.20)
Counselling Cost	$187.50	Financial Records, KWCS
Counselling Cost	$115.00	Financial Records, FSTV
Social Service Cost	$30.00	Horton et al., 2012
Direct Non-Medical Costs		Data not available
Indirect Costs		
Cost of Lost Workdays	$24.54x8=$196.32	Statistic Canada,2013
Cost of Lost Usual Activities	$10.25x8=$82	Ontario Ministry of Labour

4.8 Calculation of Clinical Effectiveness

The clinical effectiveness was calculated by using data on the General Health Questionnaire (GHQ-12) (ranges 0-36) (Goldberg et al., 1997). This scale is a self-reported screening instrument used to detect psychiatric disorders in a community setting and a non-psychiatric

setting (Goldberg et al., 1997). The GHQ-12 is a well-known instrument and has been translated into many languages. It is a shorter version of the original 60-item GHQ and has similar properties to the longer versions (other versions containing 30, 28 and 20 items have also been developed). It has been strongly associated with various psychological disorders such as depression and anxiety (Goldberg, 1972). The GHQ-12 contains twelve questions relating to psychiatric morbidity, each employing a four-point scale (1=less than usual, 2=no more than usual, 3=rather more than usual, or 4= much more than usual) (Appendix-B). Higher scores mean greater psychological distress. The primary measure of (clinical) effectiveness of this study is GHQ-12, and to make the results comparable to other economic analyses GHQ-12 score was converted to QALYs.

The quality adjusted life-year (QALYs) is a commonly used measure of health improvement and is used to guide healthcare resource allocation decisions (Sassi, 2006). A year of perfect health is assigned a value of 1 and death is considered to be equivalent to 0; however, conditions when health status is considered worse than death have negative scores (Sassi, 2006). The estimate of QALYs gained in an experimental setting is the difference between the mean of the change in the intervention and the control groups.

A common way of determining the QALY is by using the EuroQol (EQ-5D) (AU-Brooks, 1996). The EQ-5D is a brief, multi attributes, preference-based health status measure (Sassi, 2006). To calculate the QALY from EQ-5D, first we need to get utility scores from EQ-5D, and then multiply the utility of specific health state by the length of time an individual remains in that healthy state. For example, the number of QALYs lived by an individual in one year is

$$\text{QALYs lived in one year} = 1*Q \text{ with } Q \leq 1;$$

Where Q is the health-related quality (utility) of life weight attached to the relevant year of life. Since the survey data we are using does not have EQ-5D, Serrano-Aguilar et al. (2009)'s algorithm was used to convert the GHQ-12 score into EQ-5D, which was then converted into QALYs. Further details about the calculation of QALYs will be discussed in the next session.

4.8.1 General Health Questionnaire (GHQ-12)

The primary (clinical effect) outcome of this economic analysis was GHQ-12. There are two most common methods of calculating GHQ-12 scores; GHQ-12 scoring and Likert- scoring. Here the Likert-scales (1-4) was chosen because it produces a less skewed score distribution compared to the GHQ scoring. In four-point Likert- scale score method, responses are assigned scores between 1 to 4, yielding total scores between 12 to 48. In both cases, GHQ-12 is measured as a single sum score, with higher scores indicating higher symptoms or difficulties. Mean scores were calculated for the GHQ-12 at baseline, and two follow- up points (4 weeks and 10 weeks). The proc means statement was used to obtain means of GHQ-12 scores between treatment and control groups (see Appendix D :).

4.8.2 Quality of Life Adjustment (QALYs)

Translating GHQ-12 scores into QALYs is the most difficult methodological issue in mental health, as there is no well-established and world-wide accepted method available. For the purpose of this dissertation, we have used Serrano-Aguilar et al. (2009)'s algorithm to convert the GHQ-12 scores to health state values. This algorithm offers health state values derived from GHQ-12 scores by a mapping methodology. The relationship between mental health and health state-related quality of life (HRQL) was examined from the 2004 Canary Islands Health Survey. A total of 5,633 people over 16 years old were randomly selected for this study. Aguilar et al. present mean EQ-5D index scores by GHQ-12. The authors have used multivariate linear

regression analysis to examine the association between GHQ-12 and utility scores adjusting for socio-demographic variables and comorbidities.

Corresponding values from the data were imputed in multi-linear regression model provided by Serrano-Aguilar et al. 2009 to calculate the utility then converted into QALYs. The table for Serrano-Aguilar et al. (2009)'s algorithm can be found in (see Appendix E). The following is the process used:

EQ5D (Utility score) = Intercept-(value corresponding to GHQ-value corresponding to age-value corresponding to gender-value corresponding to education-value corresponding to morbidity)

For example: Suppose individual 0001 is a male, age 47 has a GHQ-12 score of 4 and university degrees. Then his EQ5D (utility) score is:

0.9940-0.1393-0.0433-0 (for female we would add 0.0175) -value corresponding to education*-0.023(scores are from Appendix E)

For the next step: QALYs for the previous month were obtained by multiplying utility scores by time

For example, for,

QALYs for Baseline-4week

Time = 28 days=28/365 years=0. 076 years

Utility=0.736

QALYs=0.055QALYs

Manca and colleagues (Manca, Hawkins, & Sculpher, 2003) described three frequently used methods to calculate QALYs: 1)'Area under the Curve' (AUC), 2) Change from baseline (CIB) and 3) analysis of covariance approach (regression model). In the AUC method, QALYs are estimated by the average EQ-5D value over the period of the experiment. The estimate of QALYs gained in the experiment is the difference between the average values in the intervention group and the control group. The CIB method uses the difference between baseline and follow-up utility. This method allows for differences at baseline when comparing two groups. The regression estimate uses the AUC values, adjusted for initial differences between treatment groups by regression on baseline values.

4.9 Perspective (viewpoint and time period):

For the purpose of this study, a societal perspective was chosen because it takes into account all the costs and benefits associated with an intervention. This broad perspective allows us to incorporate the costs of loss employment and usual activities.

The estimated time-horizon for this study is about 10-weeks and is sufficient to capture short-term costs and benefits of our intervention and control groups; data on the long run outcomes were not collected. There is no discounting of costs or effects due to the short analytic horizon (10 weeks).

4.10 Calculating ICER

ICER was calculated by dividing total differences in cost by total differences in effects. The differences in costs were calculated by subtracting total costs in the treatment group (KWCS) from the control group (FSTV) and the effect difference was calculated by subtracting total effects in the treatment group (KWCS) from the control group (FSTV).

Total costs of treatment group (Cost treatment) = Baseline +4Week+10Week

Total costs of control group (Cost control) = Baseline +4Week+10Week

Total effects of treatment group (Effect treatment) =Baseline +4Week+10Week

Total effects of Control group (Effect control) = Baseline+4Week +10Week

ΔCost= Cost treatment - Cost control

ΔEffect= Effect treatment - Effect control

ICER= ΔCost/ΔEffectiveness

4.11 Sensitivity Analysis

A sensitivity analysis is a systematic, quantitative method for determining uncertainty and robustness of the results. There are two ways conducting a sensitivity analysis. One-way and multilevel, and probabilistic sensitivity analysis (PSA); One-way and multilevel analyses do not allow for full consideration of all uncertainty. PSA is a method that allows for the uncertainty of all parameters to be considered simultaneously. Each variable is assigned a distribution. The ICER (or model output) can be calculated up to 10000s of times, each time drawing upon values from the distribution.

The statistical software Tree age Pro 2013 was used to create the cost-effectiveness acceptability curve and probabilistic sensitivity analysis (PSA). The decision model was created (see Appendix G) using all of the parameters, and the model was run according to the guidelines in the Tree age Pro manual for 2013. For PSA, each variable was assigned a distribution. The decision as to what types of the distribution to assign to which parameters were obtained from the Tree Age Manual (Tree Age Pro Manual, 2013) and recommendations. Also, the nature of

data was taken into consideration. For the cost variables gamma (γ) and for the utility beta (β) distributions were assigned. The gamma distribution is appropriate for variables bounded by zero, where a sizeable proportion of the sample has the value of zero. The alpha and beta values in the model for beta distributed variables were incorporated using the mean (μ) and the standard deviation (σX) from the survey data. Further, the alpha and lambda (λ) values in the model for the gamma distribution were incorporated using the mean and the standard deviation from the survey data. The parameter distribution table can be found in Appendix F. The PSA was conducted using Monte Carlo simulation using 10,000 samples.

Chapter 5 Statistical Methodology

5.1 Changes in Lost Days of Work and Usual Activities

To test the hypothesis, "Patients who have received a SSWIC return to work/usual activities earlier than patients in traditional counselling" in more detail, mixed effects modeling (also referred to as the multilevel or hierarchical model) was chosen. From the data, we have looked at the number of missed work days (including self-employment) and the number of days prevented from usual activities for each time point, i.e. baseline, 4 weeks, and 10 weeks for both treatments (KWCS) and control (FSTV) groups using a mixed effect model**.**

5.2 Mixed Effects Modeling

Longitudinal studies have an important role in mental health research. Traditionally, researchers tended to use only pre-intervention and post-intervention data to make the statistical conclusion regarding the effectiveness of an intervention. They use the model result at one level to draw statistical inferences at another level. The link found at the individual level is not a reliable predictor of the group level relationship or vice versa. This is called "ecological fallacy" (Robinson, 1950). However, with the advancement in statistical knowledge more robust methods have developed. Multilevel modeling or mixed effect modeling can help solve the problems. With mixed effect modeling, researchers are able to understand where the effects on the outcome measure are occurring (within and between group variance), and how the effects of individual level variables on outcome measures are moderated by the group level variables (Wang, Xie, & Fisher, 2012). Also, it allows the study of growth or change trajectories of outcome measures over time using longitudinal data. The mixed effects model offers important advantages compared to older models, such a better handling of missing values and unequal time intervals between and within- participant responses (Hedeker & Gibbons, 1997; Nich & Carroll, 1997).

The intra -class correlation co-efficient (ICC) measures both within-group homogeneity and between-group heterogeneity (Shrout & Fleiss, 1979). ICC is the ratio of the between group variance of the total variance (Shrout & Fleiss, 1979).

$$ICC = \frac{\sigma_b^{\,2}}{\sigma_b^{\,2} + \sigma_w^{\,2}}$$

Where $\sigma_b^{\,2}$ and $\sigma_w^{\,2}$ are the within -group variance (variance at the individual level), and the between-group variance; $(\sigma_b^{\,2} + \sigma_w^{\,2})$ is the total variance of the outcome measure.

5.3 Model fit, Hypothesis Testing and Model Comparisons

5.3.1 Model fit

Model fit is assessed using the likelihood ratio (-2LL) tests comparing the likelihood function values between the full model and a reduced model with fewer parameters (Wang, Xie, & Fisher, 2012). A smaller -2LL indicates that the model fits the data better (Akaike, 1974). In addition, there are three other frequently used measures to assess the model fit: Akaike's information criterion (AIC) (Akaike, 1974), finite sample corrected version of AIC (AICC) (Hurvich & Tasi, 1989), and Bayesian information Criterion (BIC) (Schwarz, 1978).

AIC= - 2LL+2d
AICC= - 2LL+2d.n/ (n-d-1)
BIC= - 2LL+d. Ln (n)

Where -2LL is -2 times log maximum likelihood function, d is the number of parameters to estimates in the model, and n is the number of valid observations for maximum likelihood estimation. SAS, PROC MIXED produces the _2LL, AIC and BIC statistics. To compare the model, researchers use AIC or BIC. As a rule of thumb, the more attractive model should have smaller AIC and BIC (Kwok et al., 2008).

5.3.2 Hypothesis Testing

Several hypothesis tests are needed for mixed level modeling, which includes hypothesis testing for random effects, and fixed effects. Fixed effects refer to the fixed components, and random effects refer to the random components of the variance in the model (Wang, Xie, & Fisher, 2012).

5.3.3 Empty Model/Unconditional model means

The empty model is fundamental in multilevel model development. It provides the total, within and between group variance in the group outcome. In addition, the empty model provides important information about the mean of outcome measures, and it is the first model (baseline model) with which other more complex models can be compared. The next step in model development is adding level 1 and level 2 explanatory variables. The following is an example of an empty level model:

Level-1 Model: $Y_{ij} = \beta_{oj} + \varepsilon_{ij}$ (1.1)

Level-2 Model: $\beta_{oj} = \gamma_{00} + \mu_{0j}$ (1.2)

Composite Model: $Y_{ij} = \gamma_{00} + \mu_{0j} + \varepsilon_{ij}$ (1.3)

In the equation (1.1) β_{oj} and ε_{ij} represent the mean outcome of group j and the random individual variation around this mean respectively, and Y_{ij} is the outcome measure. In equation (1.2) γ_{00} denotes the overall intercept representing the grand mean of Y_{ij} and μ_{0j} captures the variation between group means. The equation (1.3) is a composite model, in which the outcome measured by Y_{ij} is a linear combination of two parts: 1) a fixed part (i.e. γ_{00}), the grand mean across all the individuals in the sample; and 2) a random part, μ_{0j} which represents the group

specific variation from the grand mean, while ε_{ij} represents within-group individual variation around group-specific means.

5.3.4 Two-level Multilevel Models

The empty model specified in equation. 1.1 is a fundamental two-level model, which captures preliminary information about within-group and between-group variation in the outcome measure. Once ICC has been tested (statistical significance), explanatory variables can be added to the model

Level 1 Model: $Y_{ij} = \beta_{oj} + \beta_1 z_{1ij} + \varepsilon_{ij}$

Level 2 Model: $\beta_{oj} = \gamma_{00} + \gamma_{01} q_{1j} + \mu_{0j}$

Level 3 Model: $\beta_{1j} = \gamma_{10} + \mu_{1j}$

Composite Model= $Y_{ij} = \gamma_{00} + \gamma_{01} q_{j1} + \gamma_{10} z_{1ij} + (\mu_{0j} + \mu_{1j} z_{1ij} + \varepsilon_{ij})$ 2.1

Equation 2.1 is a typical single equation version of the multilevel model-two level (also called the mixed effect model) with only one group-level explanatory variable where z is the explanatory variable and q_{1j} is the group-level variable. The level-2 residual μ_{0j} represents how much the jth group outcome mean deviates from the overall mean γ_{00} and μ_{1j} represents how much the effect of variable z_{1ij} on Y_{ij} in the jth group deviates from the average effect γ_{10} of variable z_{1ij}. The two-level model can be extended to three or higher levels of models depending upon the available data.

There are mainly four steps for building a multilevel model: 1) Running the unconditional/empty model, 2) Adding explanatory variables 3) Testing for random effects, and

4) Testing for interactions. Running the empty model is a starting point for multilevel model development. The empty model allows one to test whether there is variation, within-group and between-group. If the empty model shows the existence of significant within-group and between-group variations the next step of model development is adding explanatory variables into the empty model. In this step, all relevant explanatory variables are added to the model; and the entire level-1 slope coefficients are treated as fixed. The next step is testing for random effects; whether the effects of level-1 explanatory variables on the dependent/outcome measure vary across the groups. The last step in model development is checking for cross-level interactions, i.e. whether there is the effect of interaction between level-1 explanatory variables with group-level variables.

5.4 Application of Mixed Effect Modeling

The main objective of the study was to (a) assess whether there is a difference in mean numbers of work lost days and ability to undertake normal activities between the intervention group (KWCS) and the control group (FSTV) at different time points (baseline, 4 weeks, and 10 weeks) and (b) determine if other explanatory variables of interest (age, sex, GHQ-12) are associated with the outcomes of interest (work days lost and loss of usual activities).

Explanatory variables used in this analysis are age, gender, GHQ-12 (GHQ-12 Likert), time point, and group (control or intervention group). Age and gender were entered into the model as control variables. The age variable was centered on the average age of 35 while gender is represented as a dummy variable (Female=1; 0=Male or transgender). The group variable was coded as a secondary dummy variable (1=KWCS and FSTV=0) to account for the effect of the walk-in model relative to the traditional model. Interaction terms were created using all explanatory variables to check whether there is significant interaction between variables or not.

A series of different models were created and tested by using AIC (the smaller the AIC, the better the model) to determine the best model. Explanatory variables that were statistically significant at 95 % confidence interval were kept in the model, whereas those statistically insignificant were taken out of the model. The details about modeling will be described in the results section.

Before creating a model, it is also necessary to check the assumption of the normality and the common variance to decide which modeling method is the best for a particular outcome of the measure /dependent variable. The assumption of normality was tested for the number of days lost for employment, and the number of days lost for usual activities only, because the other two dependent variables we are interested in are already in binary format (Yes, or No). The results showed both outcomes of measures/dependent variables, i.e. the number of days lost for employment and the number of days lost for usual activities are not normally distributed. So we decided to create a binary outcome for both outcome measures. A dummy variable was created: one or more days away from job/usual activities = 1, no day away = 0. Then, multilevel logistic regression was performed for all four outcomes/dependent variables.

It is also necessary to check the average growth line for the outcome variable over time. If the changes in the outcome variable occur in non-linear fashion with time, polynomial growth models are considered as the best (Wang, Xie, & Fisher, 2012). The order of the polynomial function such as linear, quadratic, or higher order depends on patterns of change in the outcome over time. A plot of the variables suggested that the time path was not linear, and a quadratic form was fitted (with only three points, this is the highest order polynomial which can be used).

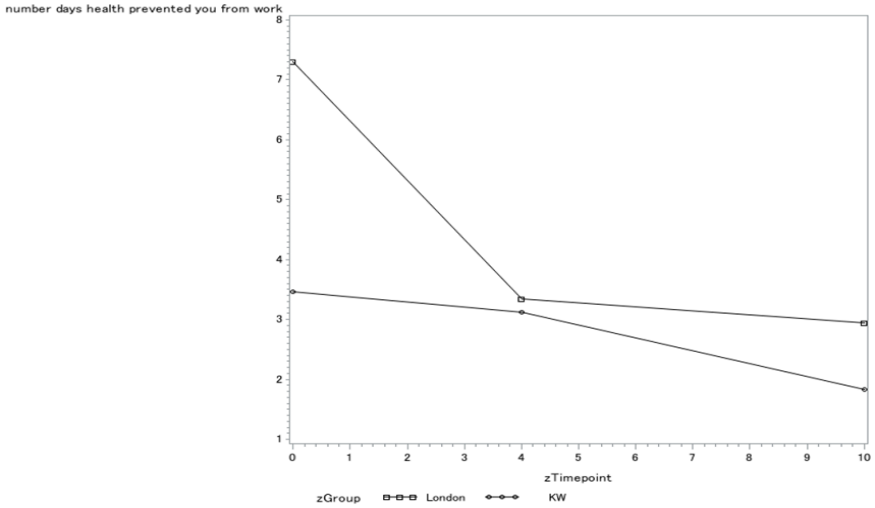

Figure 5.4a:Average Growth Line for Loss of Work Days

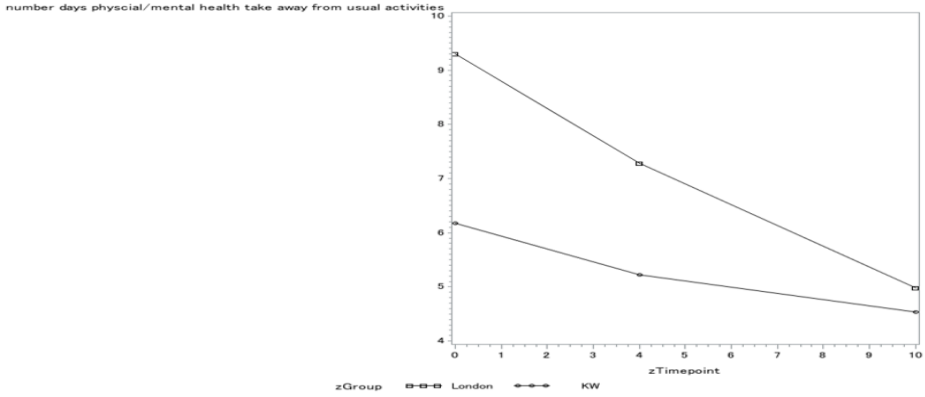

Figure 5.4b Average Growth Line for Loss of Usual Activities

5.5 Mixed Effect Model for Discrete (binary) Outcome Measures

Multilevel logistic regression models or multilevel logit models are widely used for binary outcomes (Wang, Xie, & Fisher, 2012). The outcome of measures for "did your health prevent you from undertaking your work for pay or self-employment", and "did your physical or mental

health take you away from your usual activities"? (Yes or No) are binary, so multilevel logistic regression model is the best fit for our analysis. Since the number of days lost for employment and the number of days lost for usual activities were not normally distributed, only a binary model can be used. Since this model is identical to the previous model, no results are presented. PROC GLIMMIX was used to run a multilevel logistic regression model in SAS 9.3. A typical multilevel logistic regression model looks like:

Level 1 Model: $Log\left(\frac{P_{ij}}{1-P_{ij}}\right) = \beta_{oj} + \beta_1 z_{1ij}$

Level 2 Model: $\beta_{oj} = \gamma_{00} + \gamma_{01} q_{1j} + \mu_{0j}$

Level 3 Model: $\beta_{1j} = \gamma_{10} + \gamma_{11} q_{1j} + \mu_{1j}$

Composite Model: $\log\left(\frac{P_{ij}}{1-P_{ij}}\right) = \gamma_{00} + \gamma_{01} q_{1j} + \gamma_{10} q_{1ij} + \gamma_{11} z_{1ij} q_{1j} + (\mu_{0j} + \mu_{1j} z_{1ij})$

Where ($\gamma_{00} + \gamma_{01} q_{1j} + \gamma_{10} q_{1ij} + \gamma_{11} z_{1ij} q_{1j}$) is the fixed component, $(\mu_{0j} + \mu_{1j} z_{1ij})$ is the random component of the model, and P_{ij} is the probability of an event (Wang et.al, 2012).

Chapter 6 Results

6.1 Use of Mental Health Services

6.1.1 Use of the Emergency Room and Family Physician/Medical Clinic Visits

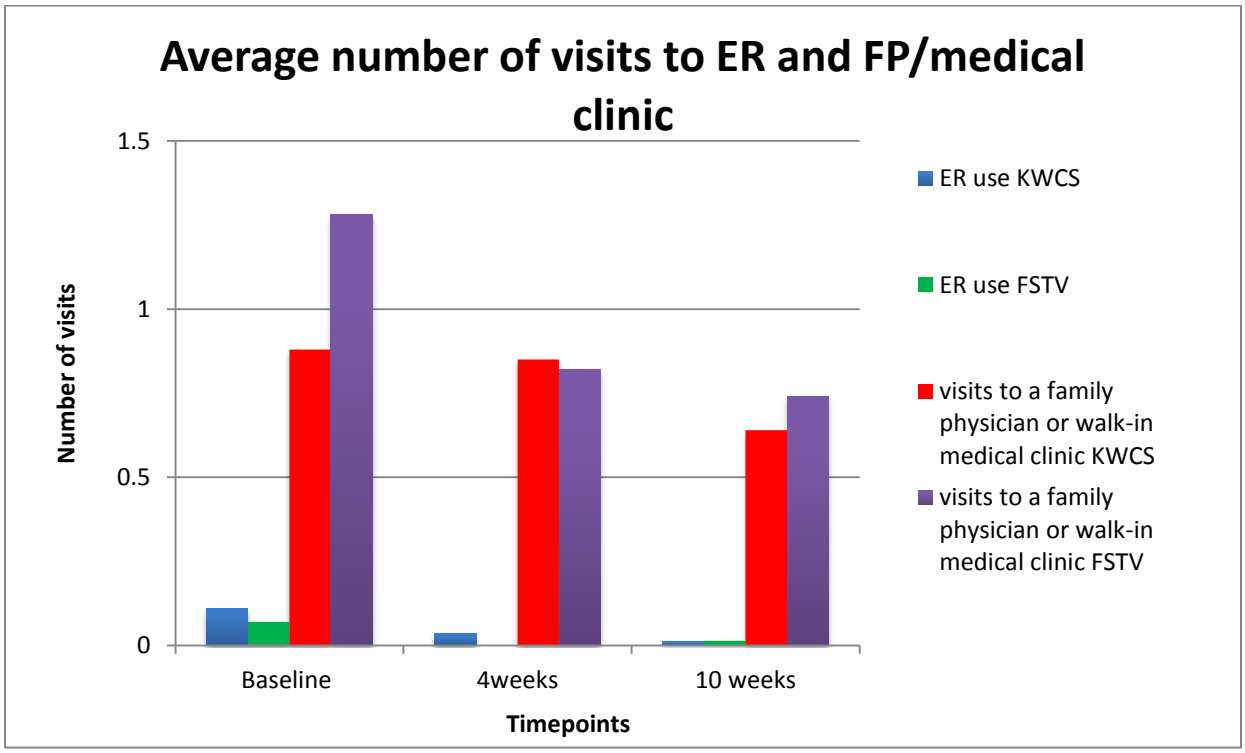

Figure 6.1.1: The bar graph of the average number of visits to ER and Family Physician or walk-in /urgent care medical clinic

The figure 6.1.1 is the graphical representation of the average number of visits to Emergency Rooms (ER) only for mental health services and family physician or walk-in/urgent care medical clinic. The actual data can be found in (see Appendix D). The average number of visits to ER for mental health services was estimated to be 0.11 in the intervention group, and 0.07 in the control group. For the 4 weeks follow-up and the 10 weeks follow-up the average number of visits to ER for mental health reasons was estimated to be 0.036 and 0.013 respectively for the intervention group and 0 and 0.014 for the control group. This indicates that the participants in both groups

are less likely to visit the ER after baseline. However, the two groups were very similar in terms of use of ER for mental health services. Hence, SSWIC did not reduce the uses of ER as compared to waiting for or receiving the traditional counselling.

Similarly, the average number of visits to FP or walk-in /urgent care medical clinic was estimated to be 0.88, 0.85 and 0.64 for the intervention group, and 1.28, 0.82 and 0.74 for the control group at baseline, 4 weeks and 10 weeks respectively. At baseline, the participants in the control group visited FP or walk-in /urgent care medical clinic more compared to the intervention group. From the baseline to 4 week follow- up, the average number of visits has reduced significantly in the control group compared to the intervention group. However, from 4 weeks up to 10 weeks up follow-up, the average numbers of visits have reduced significantly in the intervention group. The results suggest that the walk-in counselling did not reduce the number of visits to FP or walk-in /urgent care medical clinic compared to the traditional counselling.

The results of the statistical test will be presented in the costing section (testing whether the difference is statistically significant or not at 95% confidence interval).

6.1.2 Use of Hospital for Mental Health Services

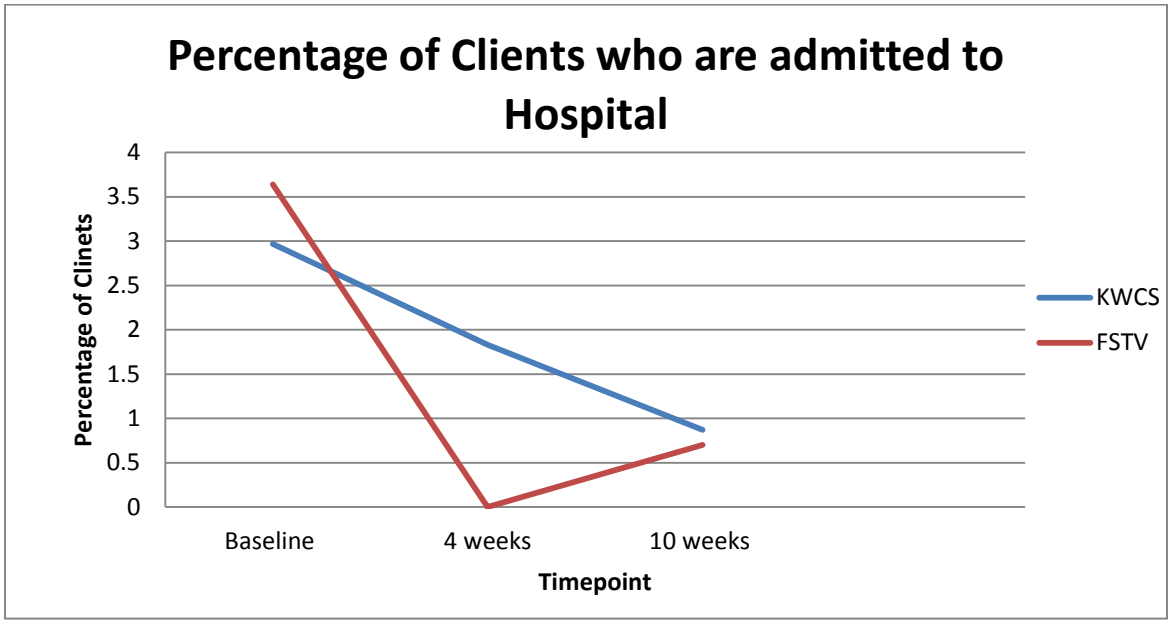

Figure 6.1.2: Percentage of Clients who are admitted to Hospital

The above figure 6.1.2 is the graphical representation of table (Appendix-D). As seen in the fig. 6.1.2, at baseline, both groups were similar in the percentage of clients who were admitted to the hospital for one or more days in the previous month for mental health services. About 3% of clients were admitted to the hospital for one or more days at baseline for the intervention group and similarly, about 4% of clients were admitted to the hospital for mental health service at baseline for the control group. Further, about 2% of and 0.87 % of clients at 4 weeks and 10 weeks respectively were admitted to the hospital for the intervention group. At 4 weeks, no one in the control group was admitted to the hospital and .07% of clients were admitted to the hospital at 10 weeks. This shows that SSWIC did not reduce the use of Hospital admission for mental health services as compared to waiting for or receiving traditional counselling. The results of the statistical test, to test whether the differences are statistically significant at 95% confidence interval, will be presented in the costing section.

6.1.3 Use of Other Community Mental Health Services

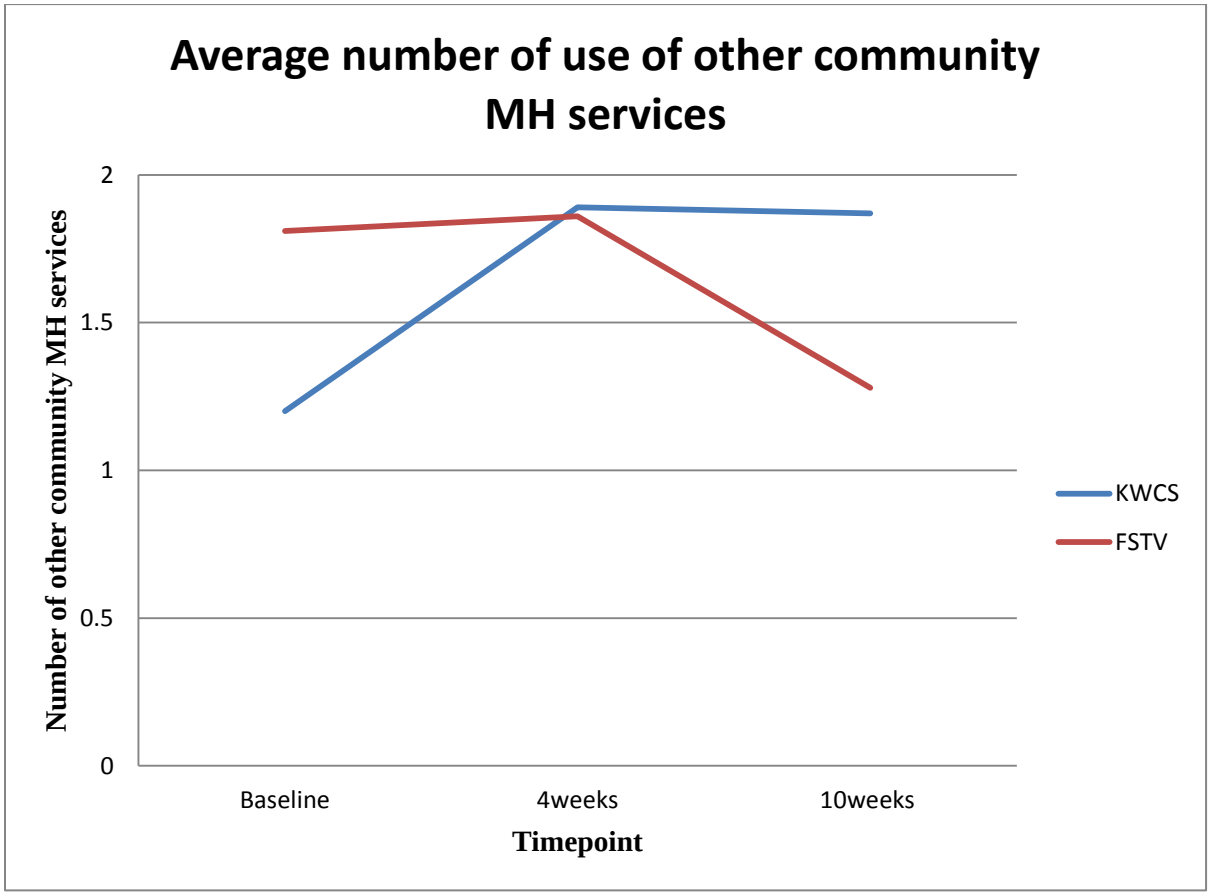

Figure 6.1.3: Average number of uses of other community mental health services (only mental health)

At baseline, the average number of uses of other community mental health services was estimated to be 1.2 for the intervention group and 1.81 for the control group. At the four week follow up, the average number of uses of other community mental health services was estimated to be 1.89 and 1.87 for the intervention and control groups respectively and at 10 weeks 1.86 for the intervention and 1.28 for the control group. Participants seen at walk-in counselling used more communities at 4week point compared to baseline whereas, in comparison groups there was not significant differences from baseline to 4-week point. This illustrates that information

provided by the counsellors at walk-in clinic might help participants in getting service from other agencies.

6.2 Cost Effectiveness Analysis (CEA)

6.2.1 Estimating Differences in Average Costs

Table 6.2.1. Difference in the Average Costs Over 10 Weeks of Study

Category	Intervention(KWCS) Mean (S.D)	Control (FSTV) Mean(S.D.)	Difference in Mean(KWCS-FSTV)	Pr > |Z|
Direct Medical Costs				
Physician Cost(GP)	$62.46(101.4)	$74.63(106.3)	-$12.17	0.0395*
Hospital Admission	$195.69(2038.6)	$103.09(1248.7)	$92.60	0.546*
Emergency Visits(ER)	$26.83(193.7)	$13.44(75.21)	$13.38	0.744*
Social Service Cost	$47.78(122.4)	$49.97(129.4)	$-2.19	0.315*
Counseling Cost	$167.75(358.01)	$80.73(80.73)		
Indirect Costs				
Cost of Lost Work Days	$442.8(732.8)	$597.8(812.7)	-$155.00	0.0001*
Cost of Lost Usual Activities	$557.0(436.1)	$945.4(713.9)	-$388.42	0.0004*
Total Cost	**$1,499.55**	**$1,865.10**	**-$365.55**	

Note: * Wilcoxon- Mann-Whitney test was used to compare the cost differences at 95% confidence interval because of non-normality characteristics of variables.

The total mean (average) cost in the intervention group was estimated to be $1499. 55 and in the control group the mean was estimated to be $1,865.10 between baseline and 10 weeks. The average incremental cost was estimated to be -$365.55 and was calculated as the difference in the average costs of the intervention group minus the costs of control group. The average physician and hospital admission costs were estimated to be $62.46 and $195.69 for the intervention group, and $74.63 and $103.09 for the control group. Likewise, the average

emergency visits and social service cost were estimated to be $26.83 and $47.78 for the intervention group; and $13.44 and $49.97 for the control group. Furthermore, the mean counselling costs for the intervention group was estimated to be $167.75 and $80.73 for the intervention and control groups respectively. The average cost of lost work days was estimated to be $442.8 for the intervention groups and $597.8 for the control groups. Also, the average cost of lost usual activities was estimated to be $557.01 for the intervention group and $ 945.43 for the control group.

As seen in the Table 6.2.1 for each category of costs, the average differences were calculated by subtracting the cost of the control group from the intervention group. The biggest differences in the average costs were in cost of lost work days and the cost of lost usual activities. Only the hospital admission cost and emergency visit cost was higher for the intervention group compared to the control group, all other costs were higher in the control group than the intervention group. To check whether these differences in costs are statistically significant or not at the 95 % confidence level the Wilcoxon-Mann-Whitney test was employed.

The Wilcoxon-Mann-Whitney test is a non-parametric equivalent to the t-test for two independent samples. "The Mann-Whitney-Wilcoxon test ranks all of the observations from both groups and then sums the ranks of one of the groups that compare with the expected rank, sum (Institute for Digital Research and Education, UCLA)." This test is used when the assumption of normality is not met i.e. the dependent variable is not normally distributed.

For each category of cost, the assumption of normality was tested and found to be non-normally distributed. The Wilcoxon-Mann-Whitney test was used for each category of cost to check whether the difference is statistically significant at 95% confidence interval. **Proc npar** way was used in the SAS 9.3. Statistically insignificant differences were observed in the average

hospital cost (p=0.54), social service cost (p=0.74) and emergency visit cost (p=0.31). However, the differences in cost of lost work days (p=0.0001), the differences in the cost of lost usual activities (p=0.0004) and the differences in the cost of Family Physician or walk-in /urgent care medical clinic were statistically significant (p=0.0395).

6.2.2 Average GHQ-12 Score at three Time points

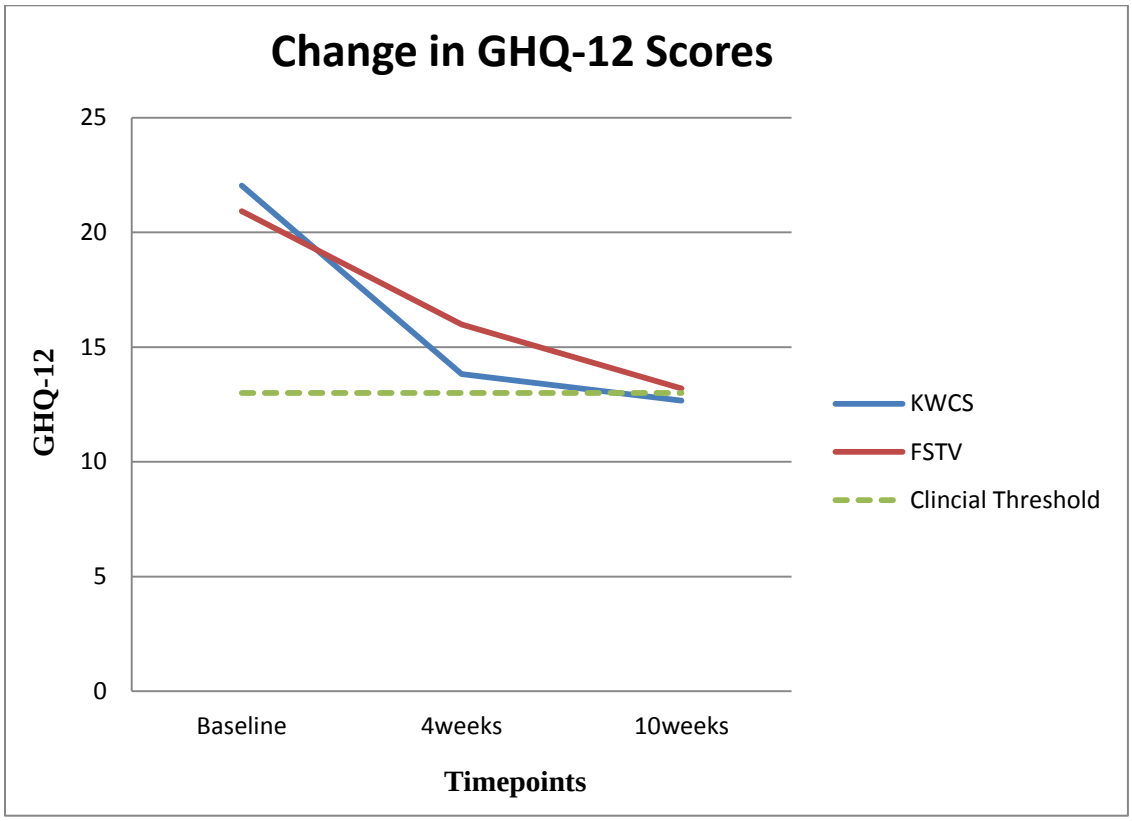

Figure 6.2.2: Average GHQ-12 Score at three Time points

Figure 6.2.2 shows the changes in GHQ-12 scores at three different time points in both groups. At baseline, the two groups were similar in GHQ-12 scores. The average GHQ-12 score was estimated to be 22.04 for the intervention group and 20.93 for the comparison group. At 4 weeks follow-up for the intervention group, the average GHQ-12 score reduced significantly - about 8.22. In the control group also, the average GHQ-12 score reduced by about 5.00 scores.

However, at 10 weeks for both groups, the average scores have decreased and are on the same level. This showed that participants who attended walk-in counselling clinic improved faster than those requesting counselling from the traditional counselling. As seen in the figure, the improvements mostly happened in the first few weeks following the initial contact with the agency. After 10 weeks follow-up (at end of the study), the average GHQ-12 scores for both groups are similar. A score of 13 or above is considered a "case". It also showed that participants who attend walk-in counselling, on average, transition from a clinical severity (i.e. a GHQ-12 score of 13 or more) level to a normal level more rapidly than participants who requested counselling from the traditional model...

6.2.3 Change in Quality Adjusted Life-Year (QALYs)

The following table (see table 6.2.3 shows the average utility scores (EQOL) at baseline, 4 weeks follow-up and 10 weeks follow-up for both intervention and control groups obtained from the Serrano-Aguilar transformation. The mean EQ-5D utility score was estimated to be 0.736 and 0.745 at the baseline for intervention and control group respectively. Similarly, the mean utility score at 4 weeks follow-up and 10 weeks follow-up was estimated to be 0.839 and 0.813 for the intervention group and 0.855 and 0.845 for the control group. The average utility score (EQOL) (averaged over all three time points) was reported to be 0.799 for the intervention and 0.796 for the control group. The independent group t-test was used to compare the means between the intervention and the control group. The difference in the average utility score at baseline between the intervention and the control group was estimated to be (0.736-0.745=-0.003) and was not statistically significant (P=0.691). The difference in the average utility scores between the intervention and the control group was (0.839-0.814=0.026) at 4 weeks-follow up, which was statistically significantly different (P=0.031). Furthermore, the difference in the

average utility between the intervention and the control group at10 week follow-up was (0.855-0.845=0.010), which was not significantly different (P=0.377). Hence, the difference (between the intervention and the control group) in the change in utility scores from baseline to 10-week follow-up was 0.002, which was not significantly different (P=0.389). The participants in the walk-in counselling reported higher utility scores than the participants in the traditional counselling at4 week follow-up, but the differences at 10 weeks follow-up were not statistically significant. The results are presented in Table 6.2.3

Table 6.2.3: Utilities scores (EQOL)

Timepoints	Intervention(KWCS) Mean	Control (FSTV) Mean	Difference in Mean (KWCS-FSTV)	Pr > |Z|
Baseline	0.736	0.745	-0.009	p>0.691
4weeks	0.839	0.813	0.026	p<0.031
10weeks	0.855	0.845	0.01	p>0.377
Baseline to 10 weeks	**0.799**	**0.796**	**0.002**	**p>0.738**

For this study, change from baseline method was used to calculate the QALYs. As seen in Table 6.2.3, there appears to be some difference in the average utility scores in the intervention and the control group. The formula for calculation is as follows:

The average improvement for the intervention group at the end of 10 weeks follow up **(QALYs intervention) =** QALYs (U1 KWCS - U0 KWCS) * (28/365 years) + (U2 KWCS - U0 KWCS) * (42/365 years)

The average improvement for the intervention group at the end of 10 weeks follow up **(QALYs control)** = (U1 FSTV - UO FSTV) * (28/365 years) + (U2 FSTV - U0 FSTV) * (42/365 years)

QALYs gain= (QALYs intervention) - (QALYs control group)

Where U0, U1 and U2 represent utility at baseline, 4 weeks and 10 weeks respectively. The average number of QALYs improvement was estimated to be 0.0215 for the intervention group and 0.0176 for the control group. The average incremental effect (QALYs gain for the intervention group compared to the control group) was estimated to be 0.0039.

6.2.4 Base Case Analysis

The ICER was calculated using the incremental costs and the incremental effects. ICER was calculated according to the guidelines for health, economic evaluations (CADTH, 2006). As seen in the Table 6.2.1 the intervention was more effective and less costly than the control. An ICER was calculated, resulting in an ICER of –$93,730.77 per QALY gain (Δcost/Δeffect=-365.55/0.0039=-$93,730.77). As we noted earlier, the ICERs with a negative value are in the south-east (SE) or north-west (NW) quadrant. In the NW quadrant, the new treatment is more effective and involves higher costs compared to the old treatment. In SE quadrant the new treatment is more effective and involves less costs compared to the old treatment. The ICER calculated in the base case analysis falls in the SE quadrant. Hence, the new treatment dominates the old treatment, and therefore is the subject of further discussion. The main question we need to answer here is how confident we can be that our base case ICER is an accurate reflection of the analysis? To ensure that the results of the base case analysis are valid; a sensitivity analysis is needed.

6.2.5 Cost-Effectiveness Acceptability Curve

Cost-effectiveness acceptability curves (CEACs) are derived from the joint density of incremental costs and incremental effects from the intervention group and the control group. The following figure represents the CEAC of the base case analysis. This graph shows what percentage of iterations favour the new treatment versus the old treatment strategies at varying values of willingness to pay.

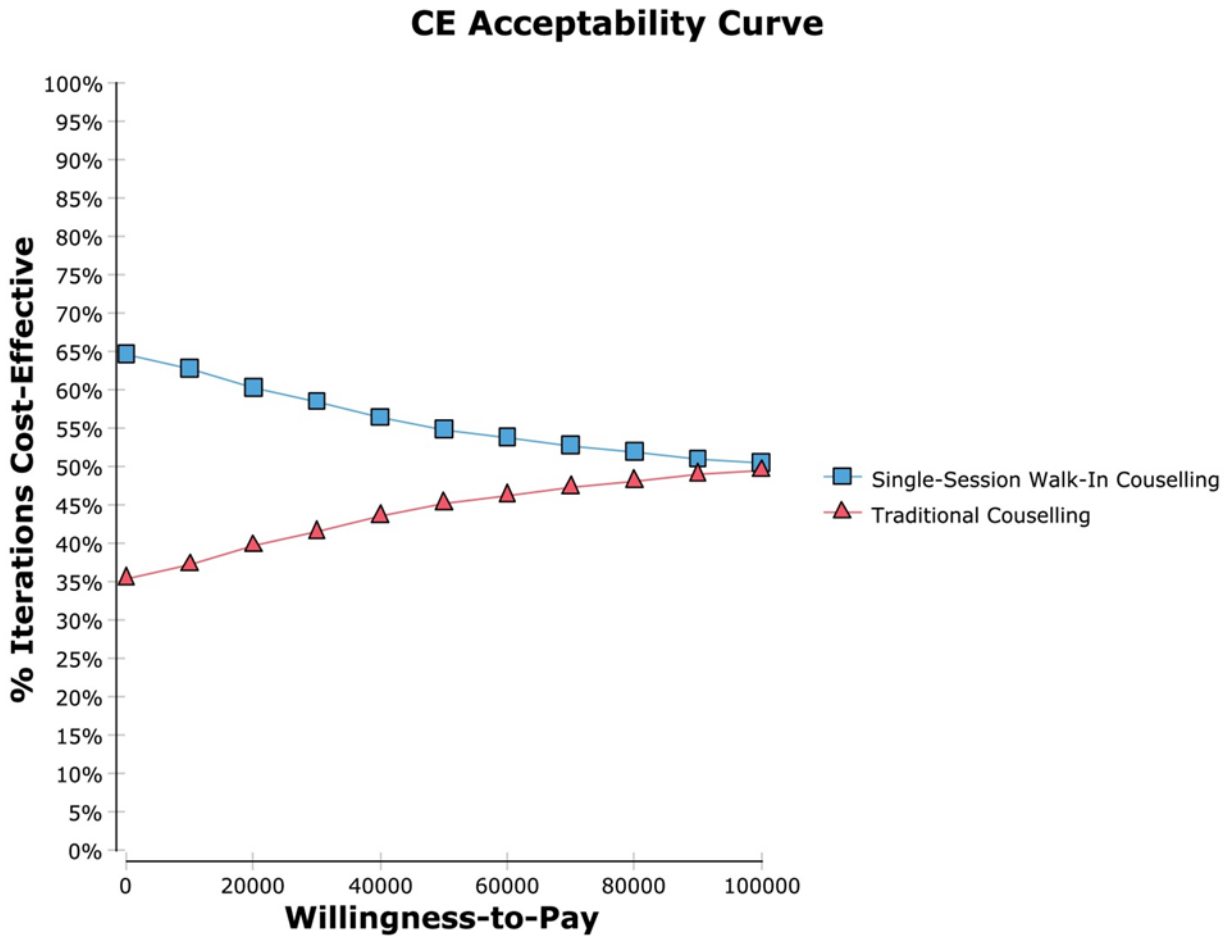

Figure 6.2.5a Cost-Effectiveness Acceptability Curve

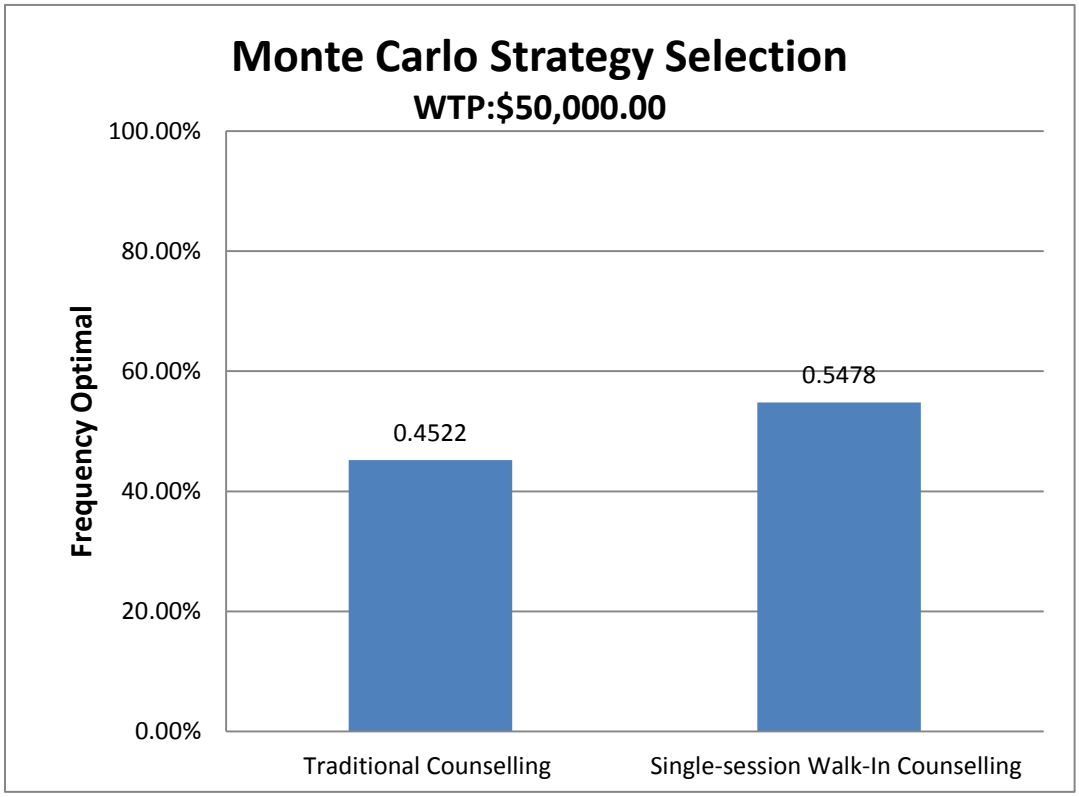

Figure 6.5.2b Strategy Selection Frequency Graph

The strategy selection frequency graph shows the percentage of simulation and re-calculation of ICER 1000 times. At willingness to pay $50000, 54.79 % favours using new strategies and 45.22% favours using old strategies. This confirmed that using new strategy is what we need to choose over the old strategy.

6.2.6 Probabilistic Sensitivity Analysis

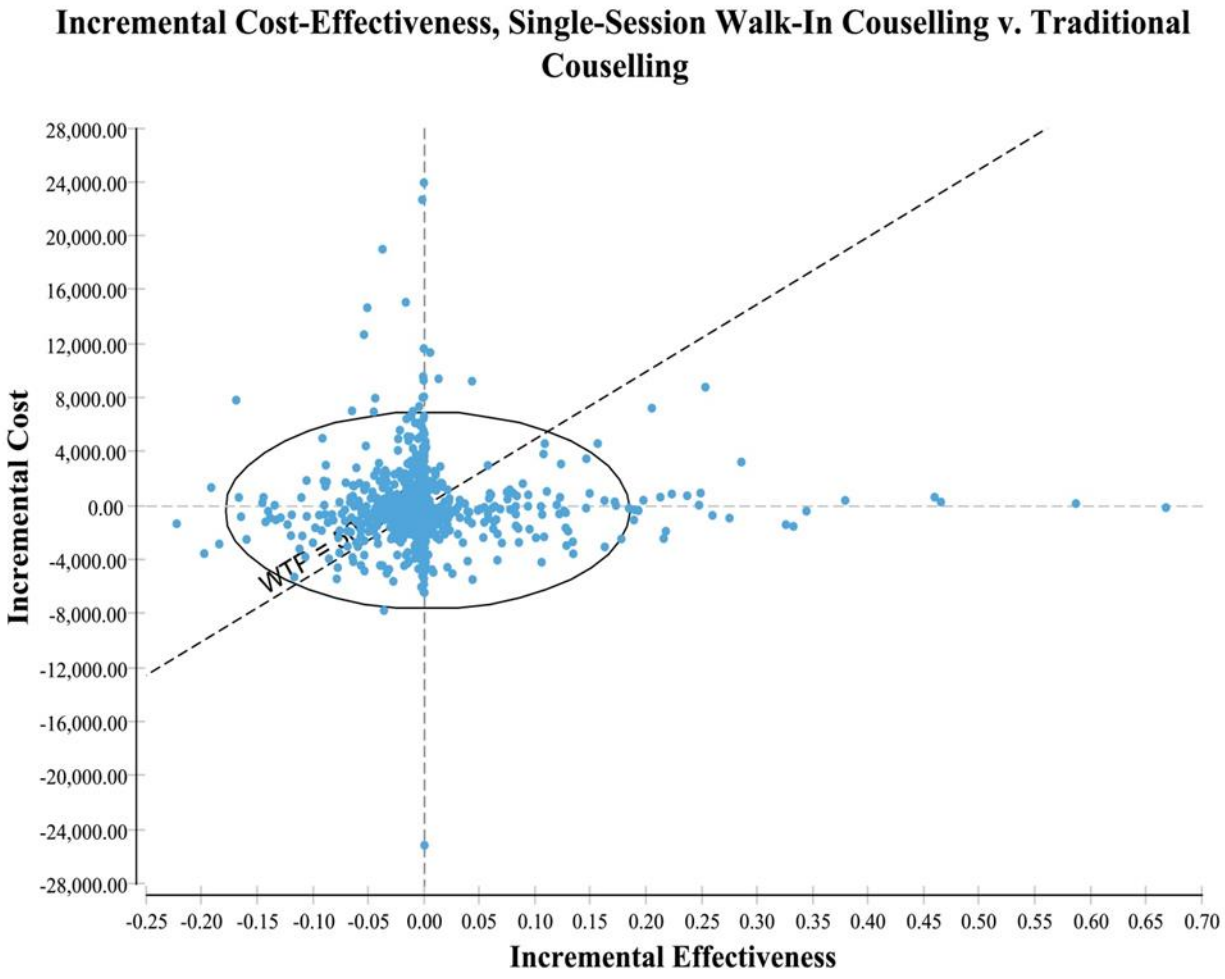

Figure 6.2.6 Probabilistic Sensitivity Analysis

Each point is in this graph represents the pair of values which shows the incremental effectiveness and incremental cost effectiveness of that simulation. The dotted line is the societal WTP of $50,000. Any points that lie along this line mean that they have an ICER of $ 50,000. The region below the line shows all the points that are cost-effective. The proportion of points less than WTP is 54.78 percent. That indicates that in this region, we have 54.78% of points; and that shows the confidence we can have on choosing new treatment. The ellipse shows the 95%

confidence interval (CI); the 95% is overlapping all the four quadrants. The results of PSA showed that we can only have 54.78% confidence (results of base case analysis) in choosing walk-in counselling compared to the traditional counselling or waiting. Hence, walk-in counselling is not unequivocally the best alternative to waiting for or traditional counselling.

6.3 Multilevel Modeling

6.3.1 Model A: Fully Unconditional Model

$$Log\left(\frac{P_{ij}}{1-P_{ij}}\right)=\beta_{0j}$$

$$\beta_{0j}=\gamma_{00}+\mu_{0j}$$

$$Log\left(\frac{P_{ij}}{1-P_{ij}}\right)=\gamma_{00}+\mu_{0j} \qquad (3.1)$$

Equation 3.1 is an empty model. No predictors or explanatory variables are specified in this model. The main purpose of running this model is to assess within-group homogeneity or between-group heterogeneity. The model was estimated using LAPLACE, the default estimated method in PROC GLIMMIX.

6.3.2 Model B: Random Intercept Growth Model

$$Log\left(\frac{P_{ij}}{1-P_{ij}}\right)=\beta_{ij}+\beta_{1j}zTimepoint_{ij}$$

$$\beta_{0j}=\gamma_{00}+\mu_{0j}$$

$$\beta_{1j}=\gamma_{10}$$

$$Log\left(\frac{P_{ij}}{1-P_{ij}}\right)=\gamma_{00}+\gamma_{10}ztime_{ij}+\mu_{0j} \qquad (3.2)$$

Equation 3.2 is a simple version of random intercept growth models. This model is used for testing within-subject and between subject variations.

6.3.3 Model C: Adding explanatory Variables in the Model

$$Log\left(\frac{P_{ij}}{1-P_{ij}}\right)=\beta_{0j}+\beta_{1j}zTimepoint_{ij}$$

$$\beta_{0j}=\gamma_{00}+\gamma_{01}zGroup_{j}+\gamma_{02}Age\_35_{j}+\gamma_{03}Sex_{j}+\gamma_{04}Timesqr_{j}+\gamma_{05}\text{zGHQ12\_Likert}_{\text{j}}+\mu_{0j}$$

$$Log\left(\frac{P_{ij}}{1-P_{ij}}\right)=\gamma_{00}+\gamma_{01}zGroup_{j}+\gamma_{10}zTimepoint_{ij}+\gamma_{02}Age\_35_{j}+\gamma_{03}Sex_{j}+\beta_{4}Timesqr_{j}+\gamma_{05}\text{zGHQ12\_Likert}_{\text{j}}+\mu_{0j}$$

(3.3)

Equation 3.3 is a multilevel model created to test the effect of all explanatory variables (only fixed effect).

6.3.4 Model D: Controlling for Individual Background Variables in Models with Randomness

$$Log\left(\frac{P_{ij}}{1-P_{ij}}\right)=\beta_{0j}+\beta_{1j}zTimepoint_{ij}$$

$$\beta_{0j}=\gamma_{00}+\gamma_{01}zGroup_{j}+\gamma_{02}Age\_35_{j}+\gamma_{03}Sex_{j}+\gamma_{04}Timesqr_{j}+\gamma_{05}\text{zGHQ12\_Likert}_{\text{j}}+\mu_{0j}$$

$$\beta_{0j}=\gamma_{10}+\gamma_{11}zGroup_{j}+u_{1j}$$

$$Log\left(\frac{P_{ij}}{1-P_{ij}}\right)=\gamma_{00}+\gamma_{01}zGroup_j+\gamma_{10}zTimepoint_{ij}+\gamma_{02}Age\_35_j+\gamma_{03}Sex_j+\beta_4Timesqr_j+$$
$$\gamma_{05}\text{zGHQ12\_Likert}_j+\gamma_{11}zGroup_j*zTimepoint_{ij}+(\mu_{0j}+u_{1J}zTimepoint_{ij})$$

(3.4)

Equation 3.4 is a full model with all fixed effects and random effect. In this model we assume that the individual background variables (Age, Sex) may influence the outcome, but their effects do not change over time. And it also contains the random effect of ztimepoint. The equation 3.4 only contains the interaction between zgroup and time point, but in our selection process all of interaction effects were considered.

6.3.5 Identifying the Best Model

A between-group and within-group variation for outcome measures were tested using ICC and were found significantly different with a 95% confidence interval. The results showed that there was differences in the variation in outcome measures (number of clients who missed work and usual activities) between the intervention group and the control group, and within in each group. The random components were tested and found statistically insufficient. So we did not keep in the model. A series of models were created to find the best model for this study. Through the series of model comparisons it was determined that equation 3.5 is the best fit model of this analysis.

$$Log\left(\frac{P_{ij}}{1-P_{ij}}\right)=\gamma_{00}+\gamma_{01}zGroup_j+\gamma_{10}zTimepoint_{ij}+\gamma_{11}zGroup_j*zTimepoint_j$$
$$+\beta_5\text{zGHQ12\_Likert}_j+\gamma_{11}zGroup*\beta_4Timesqr_{ij}+\mu_{0j}$$

(3.5)

This model contains, *zGroup* and zGHQ12_Likert as explanatory variables; and interaction between *zGroup* and *zTimepo*int , and *zGroup* and $Timesqr_{ij}$.

6.5 Model Outcomes

6.5.1 Outcome Measures /Dependent Variable: did your physical or mental health take you away from your usual activities? ($Usual_{ij}$)

Table 6.5.1 Hierarchical Longitudinal Model of $Usual_{ij}$

Parameter	Estimated Coefficient	SE	Pr>|t|
Fixed Effects			
Intercept	-4.55	0.51	<.0001
Time (growth rate)	-0.01	0.03	0.686
zGHQ12_Likert	0.17	0.01	<.0001
Group	-1.07	0.28	0.005
Group*Time	0.30	0.10	0.003
Group*Time Squared	-0.02	0.009	0.017
Variance/Covariance Component			
Between			
Intercept ($\boldsymbol{\tau_{00}}$)	2.31		0.53
Fit Statistics			
-2Log Likelihood	1399.06		
AIC	1413.06		

The estimates for the final model for ($Usual_{ij}$) can be seen in Table 6.5.1. The intercept -4.55 (when all of the variables are zero) is the conditional log-odds for those who missed the usual activities for the reference group. Each additional fixed effect provides an estimate how the (reference group) would change, on average, for each unit increase in that particular variable. As seen in Table 6.5.1 , there is a significant main effect of group (-1.07) suggesting that, on

average, participants in the walk-in counselling have missed less usual activities compared to the participants in the traditional counselling at baseline. The estimate of 0.17 zGHQ12_Likert indicates that, if a participant were to increase the GHQ-12 score by one points, the difference in log-odds for usual activities missed is expected to increase by 0.17 units, given the other variables in the model are held constant. The instantaneous growth rate of -0.01 indicates that the rate of change in the Log odds of missed usual activities, on average, decreased in the intervention group compared to the traditional group. However, this difference is not statistically significant (p=0. 686). The positive interaction between Group and Time suggest that the rate of change in the Log odds of participants who missed usual activities increased in the intervention group as compared to the control group. However, over time, the rate of change in the Log odds of the participants who missed work decreased in the intervention compared to the control group. This model predicts that the participants in walk-in counselling group, on average, have missed more usual activities over a short period time compared to the traditional counselling. Nevertheless, the differences become less pronounced in the long run.

6.5.2 Outcome Measure/Dependent Variable: Did your health prevent you from undertaking your work for pay or self-employment? ($Work_{ij}$)

Table 6.5.2 Hierarchical Longitudinal Model of $Work_{ij}$

Parameter	Estimated Coefficient	SE	Pr>|t|
Fixed Effects			
Intercept	-4.10	0.71	<0.0001
Time (growth rate)	-0.07	0.04	0.1262
zGHQ12_Likert	0.12	0.02	<.0001
Group	-1.44	0.42	0.0007
Group*Time	0.33	0.14	0.0166
Group*Time Squared	-0.02	0.01	0.035

Variance/Covariance Component		
Between		
Intercept ($\boldsymbol{\tau_{00}}$)	3.55	1.12
Fit Statistics		
-2Log Likelihood	856.81	
AIC	870.81	

The same modeling equation 3.5 was used with a different the outcome variable. The estimates of the final model for work loss can be seen in the table 10.The intercept of -4.10 is the log-odds for work missed for the reference group (when all of the variables are zero).The main effect of group (-1.44) shows that at baseline, on average, the log odds of participants missing work was lower for the intervention group compared to the control group. The main effects of zGHQ12_Likert (0.12) suggest that, on average, participants in the walk-in counselling were more distressed at baseline (higher GHQ-12 score).The instantaneous growth rate of -0.07 indicates that right after the baseline, log odds of participants missed work in the intervention group decreased. However, this difference is not statistically significant (P=0. 126). The positive interaction between group and time (0.33) shows the increase in the log-odds of the participants who missed work in the intervention group compared to the control group. However, the negative interaction between group and time squared suggests that, the log-odds of the participants missing work decreased over the long run in the intervention group compared to the traditional counselling. Similar to the previous model, this model also predicts that clients who attend the walk-in counselling model missed more work days than those requesting counselling from the traditional counselling model in a short period; however the difference becomes less pronounced over the long run.

As we noted earlier, the assumption of normality for outcomes of measures/dependent variables, i.e. the number of days prevented from usual activities (usual activities) and the number of missed work days (including self-employment) (workdays) was not met. So, both variables were converted into binary outcome. Because of this, these variables become identical to other two variables, i.e. did your health prevent you from undertaking your work for pay or self-employment? ($Work_{ij}$) and did your physical or mental health take you away from your usual activities? ($Usual_{ij}$).

6.6 Summary of Results

There is not strong evidence that the single-session walk-in counselling model is cost-effective compared to waiting for or the traditional counselling. The results suggest that given that small difference in effectiveness, the walk-in counselling is cost-effective only 54% of the time. So the economic benefits are not unequivocal.

Chapter 7 Discussion

The economic evaluation of single-session walk-in counselling (SSWIC) is conducted to estimate the economic benefits of an SSWIC model of service delivery compared to waiting for or receiving traditional counselling. With two different methods, we were able to compare the cost-effectiveness and effectiveness of SSWIC i.e. Cost-Effectiveness Analysis and Multilevel Modeling.

The finding from cost-effectiveness analysis suggests that, although, SSWIC saves society money by $365.55 on average, the results are not statistically significant. The results demonstrated that over a short period, we can only have 54.78% confidence in choosing walk-in counselling compared to waiting for or receiving traditional counselling in saving society money.

Findings from multilevel modeling indicated that clients who attend the SSWIC missed fewer days in the work (including self-employment) and the usual activities compared to those waiting for the traditional walk-in counselling in the short term. However, it becomes less prominent over the time. This illustrates that there are no definitive economic benefits of walk-in counselling in terms of earlier return to work or usual activities after 10 weeks. These findings are not consistent with findings from the literature which state that there are economic benefits to counselling or psychotherapy due to earlier return to work (Maat et al., 2007).

The results of the Wilcoxon-Mann-Whitney test confirms our hypothesis-A that the SSWIC model reduces the use of emergency rooms for mental health services and the family physician (FP) visits compared to the traditional model where clients are normally put on a waiting list before receiving counselling. In addition, the results also suggest that the SSWIC did

not reduce the number of participants who admitted to the hospital compared to the traditional counselling. Further, the SSWIC did not increase the use of other mental health services at 10 weeks. However, clients in walk-in model reported contact with significantly more mental health services in the four weeks following the baseline assessment as compared to the comparison group. Therefore, in addition to the counselling, the walk-in model may encourage clients to visit other mental health community centers to get services they would not otherwise be aware of and indicate a step forward in someone getting more help.

Although there are not economic benefits in the short term, walk-in counselling does provide service more quickly than the traditional model to people. Findings from this study suggest that the clients who attended the walk-in counselling model improve earlier and faster in terms of severity of psychological distress compared to those requesting counselling from the traditional model. At 4 weeks follow- up, only 31% of the participants requesting counselling from the traditional model reported they had seen a counsellor at that agency at least once and at 10 weeks follow-up, only 44% had seen a counsellor at least once. Whereas all walk-in counselling clients had seen a counsellor at least once during the 10 weeks period of the study. This evidence further supports the clinical effectiveness and accessibility of the walk-in counselling service.

7.1 Policy Implications and Future Recommendations

The rising costs and demand for accessibility of mental health services are perceived as a top priority of the Ontario government. The Ontario government announced in 2008 that its top health care priorities were to reduce wait times in emergency departments and improve accessibility of service. Mental illness is a strong determinant of frequent emergency department use. The walk-in counselling model has the potential to reduce the pressure on the health care

system in Ontario. This study has provided detailed economic information and evaluated the benefits of single session walk-in counselling.

Evidence found from this study demonstrated that walk-in counselling is very effective for those who need immediate help which may prevent both escalation of issues and deterioration of health. Furthermore, this study also revealed that over the long-run walk-in counselling saves the society money due to earlier return to work or usual activities, and treatment being less expensive compared to the traditional model of delivering counselling services. As other types of counselling services, like the traditional model of counselling, across the province are facing long wait lists and costly no-shows, the walk in counselling model provides services to people when they request it. No waiting lists or telephone calls are required and this eliminates no-shows.

The results of this study provide information to health care organizations and family service agencies as they are considering or planning to adopt the walk-in /single session therapy model. Likewise, this study also provide further economic information to policy makers at the provincial level, who are considering allocation of resources in an important area of mental health care in a manner that is both clinically effective and cost-effective. However, if decision makers require evidence that the walk-in counselling is cost-effective within in the boundary of statistical significance, then long-term studies involving multiple walk-in counselling services are needed.

We recommend that future research should use preference-based outcome measure such as QALYs to measure effectiveness. Mental illness and addiction are important causes of absenteeism and presenteeism in the workplace. Studies have shown that a significant proportion of the burden of mental disorders arises from presenteeism rather than absenteeism (Lim et al.,

2008; Dewa et al., 2007). In this study, we were unable to measure the economic burden due to presenteeism because of lack of data on the survey. So future research needs to include the cost of lost of productivity due to presenteeism in indirect costs. Additionally, the economic evaluation should cover all the costs associated with the intervention if it is possible. Most economic evaluations in mental health have used narrow measures of costs. Costs which studies frequently miss include non-medical costs such as social care, education, criminal justice and housing incurred by individuals with mental health problems and their families.

7.2 Strength and Limitation

To the author's best knowledge, there is only one research on economic evaluation of single-session walk-in counselling service by Horton et al., 2012. However, that study (Horton et al., 2012) suffered from a small sample size and the lack of a control group. With a large sample and a control group, the present study had the advantage of deriving valid conclusions. This study advances research on the economic benefits of single session walk-in counselling by using two methods of cost-effectiveness analysis and multilevel modeling. A strength is that, it has used probabilistic sensitivity analysis (simulation of ICER 10,000 times) to account for the uncertainties of the parameters and to check the robustness of the results.

The main limitation of this study is the inability to collect the data over the long run. As we discussed earlier, the results of growth models predict that clients who attend the walk-in counselling model missed more work days and usual activities than those requesting counselling from the traditional counselling model in a short period (4 weeks). However, over the longer run (10 weeks) this becomes less pronounced. Because of the lack of data over the longer run (past 10 weeks), we were unable to draw a valid conclusion. Another limitation of this study is that it was unable to measure the effectiveness of the programs in terms of preference-based outcome

measure such as QALYs. The survey data used for this dissertation did not have QALYs as the outcome measure. Therefore, QALYs was obtained by converting the GHQ-12 score using Serrano-by Aguilar et al.'s (2009) algorithm. Moreover, Aguilar et al.'s (2009) algorithm is based on the population of the Spain. Hence, it may not accurately reflect the Canadian population. Given the cross sectional nature of the study, Serrano Aguilar et al. were not able to draw definite conclusion about causal relationships among GHQ-12 and EQ-5D. Other limitations include our inability to measure the direct non-medical costs such as travel costs, communication costs, child care costs, caregiver's costs and any other non-medical related costs. Also, the different mode of data collection between two sites at baseline (self-report and telephone) is another limitation.

7.3 Conclusion

This study has concluded that single session walk-in counselling is cost-effective, but the effect is not significant. The results did not show definitively that the walk-in counselling model saves society money in the short term as compared to the traditional model for delivering counselling. However, the walk-in counselling is associated with faster recovery and quicker access to services and consequently benefits the society in these ways.

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Appendix A: Demographic Questionnaire

A. Now, please tell us a little about yourself. This information will help us know more about the circumstances of people who use walk-in counselling services.

A1.	My **age** is:	_____ **years**	
A2.	My **gender** is: (please circle one)	a. M b. F	c. Trans (please specify) _____
A3.	**Household Income** Per Year: (please circle one)	a. $00 -- $ 9,999 b. $10,000 – $19,999 c. $20,000 – $39,999	d. $40,000 – $59,999 e. $60,000 +
A4.	Current **Relationship Status**: (please circle one)	a. Married or Common-law b. Single c. Separated or Divorced	d. Widowed e. Other (please specify) _____
A5.	**Number of family members** living at home (including myself)	_____ people living at home	
A6.	First **language**: (please circle one)	a. English b. French	c. Other (please specify) _____
A7.	Were you **born in Canada**?	**NO**	**YES**
A8a.	If No, in what **country** were you born?	_____ **country where born**	
A8b.	How many **years** have you lived in Canada?	_____ **years in Canada**	
A9.	**Employment**: (please circle one)	a. Full-time b. Part-time c. Self-employed d. In school e. Unemployed	f. Ontario Works (OW)/Ontario Disability Support Program (ODSP) g. Homemaker h. Retired i. Other (please specify) _____

Appendix B: Standardized Questionnaire Assessing Psychological Distress (GHQ-12)

E1. What organization or person(s) would you have approached for assistance if the walk-in counselling clinic did not exist? **Please circle all that apply**.

A. Family Physician
B. Emergency Room
C. Friend/Relative
D. Religious Leader
E. Other Counselling Agency
F. Don't Know
G. Other (please specify): _____
H. None of These

B. We would like to know if you have had any medical complaints, and how your health has been in general, ***over the past few weeks***. Please answer the questions on the two pages simply by **circling the answer** that you think most nearly applies to you. Remember that we want to know about present and recent complaints, not those that you had in the past.

Have you recently:					
B1.	*been able to concentrate on whatever you're doing?*	Better than usual 4	Same as usual 3	Less than usual 2	Much less than usual 1
B3.	*felt that you are playing a useful part in things?*	More so than usual 4	Same as usual 3	Less useful than usual 2	Much less useful 1
B4.	*felt capable of making decisions about things?*	More so than usual 4	Same as usual 3	Less so than usual 2	Much less capable 1
B12.	*been feeling reasonably happy, all things considered?*	More so than usual 4	About same as usual 3	Less so than usual 2	Much less than usual 1
B7.	*been able to enjoy your normal day-to-day activities?*	More so than usual 4	Same as usual 3	Less so than usual 2	Much less than usual 1
B8.	*been able to face up to your problems?*	More so than usual 4	Same as usual 3	Less able than usual 2	Much less than able 1
B2.	*lost much sleep over worry?*	Not at all 4	No more than usual 3	More than usual 2	Much more than usual 1
B5.	*felt constantly under strain?*	Not at all 4	No more than usual 3	More than usual 2	Much more than usual 1
B6.	*felt you couldn't overcome your difficulties?*	Not at all 4	No more than usual 3	More than usual 2	Much more than usual 1
B9.	*been feeling unhappy and depressed?*	Not at all 4	No more than usual 3	More than usual 2	Much more than usual 1
B10.	*been losing confidence in yourself?*	Not at all 4	No more than usual 3	More than usual 2	Much more than usual 1
B11.	*been thinking of yourself as a worthless person?*	Not at all 4	No more than usual 3	More than usual 2	Much more than usual 1

Appendix C: Economic Evaluation Questionnaire

D1. We would like to know if attending the walk-in clinic or attending ongoing counselling is related to the health and social services you require. Please answer the following questions about your contact *in the last month* with health and social service organizations. Please **CIRCLE YES or NO** and **if yes, provide some details**.

D1a.	In the last month, did you see a **family physician** or go to a **walk-in/urgent care medical clinic**?	**YES**		**NO**
D1b.	If yes, how many visits did you make to **both services combined**?	_____ **visits**		
D2a.	In the last month, did your physical or mental health take you **away from your usual activities**?	**YES**		**NO**
D2b.	If yes, for how many days?	_____ **days**		
D3a.	In the last month, did your health **prevent** you from undertaking your **work for pay** or **self employment**?	**YES**	**NO**	**NOT Applicable** I do not work for pay/I am not self-employed
D3b.	If yes, how many days of **work** or **self-employment** did you **miss**?	_____ **days**		
D4a.	In the last month, did you receive services from an **Emergency Room**?	**YES**		**NO**
D4b.	If yes, please indicate how many visits for **Mental Health services**.	_____ **visits**		
D4c.	If yes, please indicate how many visits for **Physical Health services**.	_____ **visits**		
D5a.	In the last month, were you admitted to a **Hospital**?	**YES**		**NO**
D5b.	If yes, please indicate how many days you were in hospital for **Mental Health services**.	_____ **days**		
D5c.	If yes, please indicate how many days you were in hospital for **Physical Health services**.	_____ **days**		

D6. In the **last month** did you receive services from any of the following organizations? If you used the service, please tell us how many contacts or sessions you had.

	ORGANIZATION	If NO visits this last month, Write 'X' Here	If 1 or MORE visits this last month, Write Number of Visits
D6a.	**What about organizations that deal with children and adolescents?**		
1	Lutherwood / Kidslink Children's Mental Health Services	0	# Visits _____
2	Family and Children's Services	0	# Visits _____
3	KidsAblility	0	# Visits _____
D6b.	**What about Counselling Agencies?**		
1	Mosaic Family Counselling	0	# Visits _____
2	Cambridge Family Counselling Centre	0	# Visits _____
3	EAP funded counselling	0	# Visits _____
4	Shalom Counselling Services Waterloo	0	# Visits _____
5	Community Justice Initiatives	0	# Visits _____

	ORGANIZATION	If NO visits this last month, Write 'X' Here	If 1 or MORE visits this last month, Write Number of Visits
6	Walk-in Counselling at KW Counselling Services	o	# Visits _____
7	General Services at KW Counselling Services	o	# Visits _____
D6c.	**What about professionals in private practice, a guidance counsellor in a school or a religious advisor?**		
1	Psychologist in private practice	o	# Visits _____
2	Social worker in private practice	o	# Visits _____
3	Minister/rabbi/priest/imam/other	o	# Visits _____
4	Guidance counsellor in a school	o	# Visits _____
D6d.	**What about organizations that deal with abuse issues?**		
1	KW Sexual Assault Support Centre	o	# Visits _____
2	Women's Crisis Services – Anselma House/Haven House	o	# Visits _____
D6e.	**What about agencies that provide counselling regarding addiction problems?**		
1	St. Mary's Addiction Counselling	o	# Visits _____
2	House of Friendship	o	# Visits _____
D6f.	**What about organizations or professionals that deal with mental health issues?**		
1	Canadian Mental Health Association (CMHA)	o	# Visits _____
2	Mobile Crisis	o	# Visits _____
3	Hazelglen Outreach	o	# Visits _____
4	Trellis Mental Health Services	o	# Visits _____
5	Waterloo Region Homes for Mental Health	o	# Visits _____
6	A psychiatrist	o	# Visits _____
D6g.	**What about organizations that help newcomers settle in our Region?**		
1	Multicultural Center	o	# Visits _____
2	Focus for Ethnic Women	o	# Visits _____
D6h.	**What about services related to income, employment or disability?**		
1	The Working Centre	o	# Visits _____
2	OW/ODSP worker from Regional Social Services	o	# Visits _____
D6i.	**What about services related to Housing?**		
1	House of Friendship	o	# Visits _____
D6j.	**What about assistance with legal issues?**		
1	John Howard Society	o	# Visits _____
2	Community Justice Initiatives	o	# Visits _____
D6k.	**What about services for Aboriginal people?**		
1	Healing of the Seven Generations	o	# Visits _____
D6l.	**Others?**		
1		o	# Visits _____
2		o	# Visits _____
3		o	# Visits _____

D6. I am going to ask you whether you have received counselling or other kinds of assistance from any other organizations in our area. Please tell me whether <u>in the last month</u> you received any of the kinds of assistance that I mention. If you did, I will ask you to tell me how many contacts or sessions you had.

	ORGANIZATION	**How Many Times Visited in the Last Month?** ***(please check box below)***				
		0	**1**	**2**	**3**	**More**
D6a.	**Did you receive assistance from organizations that deal with children and adolescents like...?**					
1	Vanier Children's Services					
2	CPRI (Child and Parent Research Institute)					
3	Child and Adolescent Centre					
4	Children's Aid Society					
5	WAYS (Western Area Youth Services)					
6	Craigwood					
D6b.	**Did you receive assistance from other Counselling Agencies like...?**					
1	DAYA Counselling Centre					
2	EAP funded counselling					
3	Family Services Thames Valley					
D6c.	**Did you receive assistance from professionals in private practice, a guidance counsellor in a school or a religious advisor like...?**					
1	Psychologist in private practice					
2	Social worker in private practice					
3	Minister/rabbi/priest/imam/other					
4	Guidance counsellor in a school					
D6d.	**Did you receive assistance from organizations that deal with abuse issues like...?**					
1	Sexual Assault Centre					
2	Women's Community House					
3	London Abused Women's Centre					
4	Changing Ways					
5	Rotholme Family Shelter					
D6e.	**Did you receive assistance from agencies that provide counselling regarding addiction problems like...?**					
1	Salvation Army Centre of Hope					
2	Addiction Services of Thames Valley					
D6f.	**Did you receive assistance from organizations or professionals that deal with mental health issues like...?**					
1	Canadian Mental Health Association (CMHA)					
2	WOTCH Community Services					
3	My Sister's place					

	ORGANIZATION	**How Many Times Visited in the Last Month?** ***(please check box below)***				
		0	**1**	**2**	**3**	**More**
4	Mental Health Crisis Service					
5	Distress Centre					
6	A psychiatrist					
D6g.	**Any other organizations that I haven't mentioned?**					
1						
2						
3						

D7.	**If this agency had a walk-in counselling clinic where you could receive one counselling session the day of your visit, would you use it?**	**YES**	**NO**	**DON'T KNOW**

Appendix D: Results of the Average Changes at Baseline, 4weeks and 10 weeks

Category		KWCS	FSTV
GHQ-12	Baseline	22.04	20.93
	4weeks	13.82	15.98
	10weeks	12.67	13.2
Use of ER	Baseline	0.11	0.07
	4weeks	0.036	0
	10weeks	0.013	0.014
Hospital Use	Baseline	0.2	0.23
	4weeks	0.237	0
	10weeks	0.13	0.049
Use of FP/GP	Baseline	0.88	1.28
	4weeks	0.85	0.82
	10weeks	0.64	0.74
Use of other Community	Baseline	1.2	1.81
	4weeks	1.89	1.86
	10weeks	1.87	1.28

Appendix E: Table for Serrano-Aguilar et al. (2009)'s algorithm

	GHQ-12										
	0	1	2	3	4	5	6	7	8	9-12	TOTAL
Age											
16-25	0.95	0.94	0.91	0.89	0.81	0.69	0.68	0.50	0.77	0.58	0.92
26-35	0.95	0.89	0.87	0.80	0.81	0.77	0.82	0.67	0.59	0.60	0.90
36-45	0.93	0.85	0.80	0.75	0.73	0.68	0.62	0.59	0.62	0.56	0.86
46-55	0.89	0.85	0.80	0.68	0.73	0.53	0.50	0.73	0.66	0.50	0.82
55-65	0.83	0.75	0.77	0.59	0.68	0.58	0.56	0.47	0.59	0.48	0.75
66+	0.77	0.70	0.69	0.63	0.53	0.59	0.52	0.42	0.45	0.37	0.70
Sex											
Male	0.91	0.86	0.82	0.77	0.71	0.75	0.62	0.60	0.61	0.53	0.86
Female	0.86	0.80	0.81	0.70	0.69	0.62	0.57	0.51	0.57	0.47	0.79
Education											
No formal	0.72	0.63	0.64	0.66	0.55	0.30	0.46	0.32	0.48	0.38	0.62
Primary level	0.83	0.76	0.78	0.62	0.65	0.55	0.57	0.55	0.55	0.46	0.76
Secondary level	0.92	0.87	0.82	0.80	0.77	0.74	0.63	0.49	0.60	0.52	0.86
Higher level	0.94	0.88	0.91	0.78	0.76	0.69	0.64	0.65	0.77	0.68	0.90
N° of morbidity conditions											
0	0.97	0.91	0.90	0.87	0.84	0.82	0.76	0.75	0.55	0.64	0.94
1	0.92	0.86	0.85	0.78	0.66	0.62	0.66	0.63	0.68	0.60	0.88
2	0.89	0.86	0.76	0.74	0.73	0.69	0.66	0.62	0.60	0.55	0.84
3	0.84	0.80	0.82	0.81	0.74	0.75	0.63	0.65	0.64	0.44	0.81
4	0.78	0.75	0.74	0.75	0.74	0.72	0.60	0.48	0.44	0.60	0.74
5	0.80	0.75	0.82	0.68	0.68	0.53	0.58	0.45	0.62	0.40	0.72
6	0.76	0.72	0.68	0.59	0.75	0.58	0.49	0.32	0.80	0.41	0.67
7	0.68	0.65	0.67	0.53	0.63	0.56	0.55	0.64	0.73	0.58	0.63
8+	061	0.65	0.71	0.49	0.54	0.52	0.52	0.40	0.49	0.39	0.56
TOTAL	0.88	0.83	0.81	0.72	0.69	0.64	0.59	0.53	0.58	0.49	0.82

Appendix F: Parameter distributions used in the PSA

Model parameter description	Point estimate	Probability distribution	Distribution parameters	Source
Intervention				
Physician cost	$62.46	Gama	α=0.379, λ =0.006 (estimated from mean and s.d.)	Survey Data
Hospital cost	$195.69	Gama	α=0.006 , λ =6.611 (estimated from mean and s.d.)	Survey Data
Emergency visi	$26.83	Gama	α=0.009, λ =4.708 (estimated from mean and s.d.)	Survey Data
Counseling cost	$167.75	Gama	α=0.219, λ =0.001 (estimated from mean and s.d.)	Survey Data
Social service cost	$47.78	Gama	α=0.152, λ =0.003 (estimated from mean and s.d.)	Survey Data
Cost of loss work days	$557.02	Gama	α= 0.144, λ =2.59 (estimated from mean and s.d.)	Survey Data
Cost of loss usual activities	$442.02	Gama	α=0.364, λ =8.247 (estimated from mean and s.d.)	Survey Data
QALYs	0.0215	Beta	α=0.077 , β=3.51 (estimated from mean and s.d.)	Survey Data
Treatment				
Physician cost	$74.63	Gama	α=0.493 , λ =0.007 (estimated from mean and s.d.)	Survey Data
ospital cost	$103.09	Gama	α= 0.006, λ =6.611 (estimated from mean and s.d.)	Survey Data
Emergency cost	$13.44	Gama	α=0.031, λ =0.002 (estimated from mean and s.d.)	Survey Data
Counseling cost	$80.73	Gama	α=0.218, λ =0.002 (estimated from mean and s.d.)	Survey Data
Social service cost	$49.97	Gama	α=0.149, λ =0.003 (estimated from mean and s.d.)	Survey Data
Cost of loss work days	$945.43	Gama	α=0.647 , λ =6.853 (estimated from mean and s.d.)	Survey Data
Cost of loss usual activities	$597.81	Gama	α= 0.568, λ =9.501 (estimated from mean and s.d.)	Survey Data
QALYs	0.0176	Beta	α=0.299 , β=16.69 (estimated from mean and s.d.)	Survey ata

Appendix G: Decision Analysis Model