Women with Co-occurring Disorders and Histories of Abuse: Moderators of Treatment Effect on Services Use and Costs

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A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Health Policy and Management.

Chapel Hill
2009

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ACKNOWLEDGEMENTS

I would first like to thank the members of my dissertation committee for their guidance, support, and advice. That they thought my effort merited their participation is truly an honor, and I will continue to work toward their outstanding level of professional excellence. Foremost, I owe profound thanks to Marisa Domino for her continued support and mentorship throughout this most challenging effort of my academic career. Her guidance was both invaluable and instrumental in my achieving this long-sought goal.

Many thanks and much love to my dear friends and classmates – Talya Salz, Rene Sterling, and Virginia Wang – with whom I took this incredibly intense journey. Hysterical fits of laughter gave comic relief when we neared the breaking point from exhaustion and stress. Late-night instant-message sessions on our computers made quantitative methods problems sets manageable and even entertaining at times. Having shared this experience from the beginning is only one reason they will always be dear to my heart.

Loving thanks also to my parents for their unconditional love and generous support. I could not have accomplished this without their help. I really did it, guys! My darling Scof ushered me through my dissertation with the cutest love possible and an unlimited supply of tail wags and adoring looks.

Lastly, I would like to thank my dearest Casey for his endless love, laughter, support, and patience while working on my dissertation. He kept my spirits up, my confidence boosted, and my heart full throughout. Endearing admonitions when I would try to help make dinner such as, “What are you doing? The kitchen is no place for someone trying to finish her dissertation!” made my heart melt with love and appreciation. Thank you from the bottom of my heart!

ABSTRACT

Allison R. Gilbert, M.P.H.: Women with Co-occurring Disorders and Histories of Abuse: Moderators of Treatment Effect on Services Use and Costs

(Under the direction of Marisa E. Domino, Ph.D.)

Objective: Women with co-occurring mental health and substance abuse disorders and histories of abuse are heterogeneous in symptom severity and use of support services, which may affect their treatment response. This dissertation estimated differential effects of an integrated counseling intervention (IC) across sub-groups of women in this population on their outcome services use and costs.

Data Sources/Study Setting: Data from a national study conducted from 1998–2003. 2,729 eligible women were recruited into IC or usual care study groups at nine study sites.

Study Design: Interviews were conducted with participants at baseline, three, six, nine and 12 months regarding their service use.

Data Collection/Extraction Methods: Cluster analyses identified sub-groups of participants according to symptom profiles at baseline and separately according to service use profiles at baseline. Regression analyses estimated the effect of IC, by sub-group, on participants' outcome use of outpatient counseling, residential substance abuse treatment, medical and overall costs. Latent class analyses were also conducted as a comparative approach to modeling sub-group effects of IC.

Principal Findings: Among women with moderate-to-severe PTSD at baseline, the IC group had fewer counseling visits and a lower probability of having any medical costs at follow-up than the usual care group. Among women who used counseling intensively at baseline, the IC group had fewer days of residential treatment at 12 months than the usual care group. Among women with high drug addiction and PTSD at baseline and women with high alcohol severity, those in IC had lower medical costs than women in usual care. Latent class models produced generally consistent effects for residential treatment and medical costs.

Conclusions: IC was relatively inefficient for women whose predominant symptom at baseline was moderate-to-severe PTSD. Efforts should be made to improve treatment and outcomes for these women. IC worked well for women who at baseline used counseling intensively, had high drug addiction and PTSD, or had high alcohol severity. Practitioners can identify these women among their patients and direct them toward IC if they are not already engaged. Optimizing the effect of IC for women in this population can improve patient outcomes and conserve public resources.

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LIST OF ABBREVIATIONS

ASI-A	Addiction Severity Index – Alcohol
ASI-D	Addiction Severity Index – Drugs
BIC	Bayesian Information Criterion
CSR	[C]onsumers of mental health services, [S]urvivors of trauma, and women in [R]ecovery
ED	Emergency department
GSI	Global Severity Index
IC	Integrated counseling
LCA	Latent class analysis
MEPS	Medical Expenditure Panel Survey
OLS	Ordinary least squares
PTSD	Post-traumatic stress disorder
SD	Standard deviation
SE	Standard error
VAT	Violence/abuse/trauma-specific treatment
WCDVS	Women, Co-Occurring Disorders, and Violence Study

CHAPTER 1

INTRODUCTION

Co-occurring mental health and substance abuse disorders are devastatingly common among adults in the United States. (SAMHSA, 2002). Among women with these disorders, it is particularly common to also have a history of abuse, which often results in post-traumatic stress (PTSD) (Goodman et al., 1997; Mueser et al., 1998; SAMHSA, 2002). Usual care is often ineffective in treating co-occurring disorders, as services are commonly fragmented, uncoordinated, and not comprehensive (SAMHSA, 2002). Furthermore, current service delivery systems often do not adequately address special needs of women with co-occurring disorders who also have histories of abuse (Commonwealth Fund, 1996; Harris and Fallot, 2001; Mueser et al., 2003).

Integrated counseling (IC) is an innovative intervention for treating women with this complex constellation of problems, in which services are comprehensive, integrated, trauma-informed and include input from women who are consumers of mental health services, survivors of trauma, and recovering from addiction (Huntington et al., 2005). Evidence suggests that, on average, IC improves clinical outcomes better than usual care without significantly higher costs (Morrissey et al., 2005a; Morrissey et al., 2005b; Domino et al., 2005a; Domino et al., 2005b).

Variations in symptom severity and in the way women utilize services, however, may influence the way IC effects their outcome service use and costs. This dissertation sought to identify heterogeneous effects of IC across unique sub-groups of women who suffer from

this debilitating triad of problems, to better understand for whom IC works best and how. Specifically, the aims of this dissertation were to (1) generate two sets of sub-groups – once each by symptom severity and services use and costs – that reflect diversity among women in this population, and (2) estimate differential effects of the IC intervention on outcome services use and costs across sub-groups.

CHAPTER 2

BACKGROUND

Epidemiology of co-occurring disorders and abuse

Seven to 10 million people in the United States suffer from at least one mental health disorder along with a substance abuse disorder (Kessler, 1994; Kessler et al., 1994; Kessler et al., 1996; Reiger et al., 1990). Women make up a particularly high-risk subset of people suffering from co-occurring disorders. They exhibit unique characteristics and certain life stressors – such as dependent children, homelessness, poor job skills, and weak social networks – that are often not shared by men and that require special attention in treatment outreach and planning (Zweben, 1996). Women with co-occurring disorders are also much more likely than men to have histories of and be vulnerable to traumatic life events, such as physical or sexual abuse (Kessler et al., 1995; Gearon et al., 2003; Goodman et al., 1997, Lipschitz et al., 1996, Perkonigg et al., 2000; Hanson et al., 2002; Watkins et al., 2001).

Reports of lifetime interpersonal violence – often physical and/or sexual abuse – are particularly common among women with substance abuse disorders and women with mental health disorders, often doubling the reported prevalence among more generally representative populations of women (Najavits et al., 1997). Reports of physical and sexual abuse range from 40 percent to nearly 100 percent in surveys of women with serious mental illness and surveys of women in treatment for substance abuse (Alexander, 1996; Fullilove et al., 1993). Women suffering from co-occurring disorders are even more likely to have histories of abuse victimization and patterns of revictimization than women experiencing a

single disorder, and are at particularly high risk for ongoing or future abuse as well (Alexander, 1996; Gearon et al., 2003; Goodman et al., 2001, Mueser et al., 1998).

Women who have histories of abuse victimization and co-occurring disorders have unique circumstances that dictate how appropriate treatment services are for their special needs and their willingness to use those services (SAMHSA, 2002). For example, women may not respond well to confrontational approaches that are common in substance abuse treatment, and may avoid treatment altogether because they are fearful of losing custody of dependent children as a consequence (SAMHSA, 2002).

Treatment services utilization: empirical evidence of patterns and predictors

Existing evidence regarding service use patterns and predictors for people suffering from co-occurring disorders is helpful in understanding how women with co-occurring disorders and histories of abuse use services. There is strong evidence that usual care is often fragmented, uncoordinated, and not comprehensive, which is associated with gaps in services and suboptimal improvements in outcomes (SAMHSA 2002). Parallel versus integrated treatment for co-occurring disorders is also associated with an increased risk of dropping out of treatment, non-adherence to interventions, and confusion among service recipients due to potentially conflicting messages about treatment and recovery being put forth, respectively, by the separate mental health and substance abuse services systems (Drake et al., 2004).

Evidence suggests that people with co-occurring disorders very commonly do not receive the specialty services that they need (Harris et al., 2005; Watkins et al., 2001). An analysis of national household data from the Healthcare for Communities estimated that 72 percent of individuals suffering from co-occurring disorders did not receive any specialty mental health or substance abuse services in the last year, and only eight percent received both types of care, either parallel or integrated (Watkins et al., 2001).

People with co-occurring disorders do not use mental health services and substance abuse services uniformly either. On average, individuals with these disorders are more likely to use mental health services as compared to substance abuse services (Harris et al., 2005). Predictors of receiving any mental health care include being female, having insurance (public or private), having bipolar or psychotic disorder (versus depression or anxiety), having been in prison or on probation in the last 12 months, and the strongest predictor, perceiving the need for mental health treatment (Watkins et al., 2001).

Less than one-third of people who have co-occurring disorders and who use mental health services receive any kind of substance abuse treatment (Harris et al., 2005). However, while people in this population are generally less likely to use specialty services for their substance abuse disorders than for their mental health disorders, there are certain characteristics that are associated with an increased likelihood of using substance abuse treatment. An analysis of 2001 and 2002 data from the National Surveys on Drug Use and Health by Harris and colleagues suggested that the presence of severe mental health symptoms increases the likelihood that individuals with co-occurring disorders will receive substance abuse care along with mental health care services (2005). Wu and colleagues (2003) found similar results in their analyses of 1997 data from the National Household Survey on Drug Abuse (the former name of the National Surveys on Drug Use and Health). Use of substance abuse treatment services increased from approximately three percent among individuals with only substance abuse disorders to 11 percent among those with co-occurring mental health problems. That proportion rose to 18 percent using substance abuse treatment services among people reporting two or more mental health syndromes that co-occurred with their substance abuse problems.

Other predictors of using substance abuse services among people with co-occurring disorders have been identified. One study found that having been in prison or on probation in the last 12 months and having a perceived need for substance abuse treatment increases

the likelihood of using substance abuse services (Watkins et al., 2001). Wu and colleagues also identified several predictors of substance abuse service use in their analyses, including being male, American Indian or Alaska native ethnicity, having past-year drug use problems, and having past-year mental health services use (2003). The investigators also determined that college graduates and people who are employed full-time are less likely to use substance abuse services (Wu et al., 2003).

While evidence is strong that people with co-occurring disorders underutilize appropriate treatment services for their disorders, there is also evidence that they are high utilizers of other types of services, particularly medical services. It is quite common for people to present to primary care practitioners with medically unexplained symptoms (Kroenke and Mangelsdorff, 1984). There is evidence that clinical anxiety and depression is very common among people seeking help from primary care practitioners for unexplained medical symptoms (Smith et al., 2005). Furthermore, patients with mental distress that seek help in primary care settings are also more likely to report many types of physical symptoms than people presenting without mental distress (de Waal et al., 2005). These patterns of primary care utilization are a strong indication that primary care is, to some extent, used as a substitute for appropriate, targeted services.

Existing evidence demonstrates that people with co-occurring disorders also use high levels of crisis medical care, specifically inpatient hospital stays and emergency department (ED) visits. Community-based studies commonly use hospital and ED visits among this population as proxies for lack of engagement in treatment, and more generally, negative outcomes (Drake et al., 2004). Dickey and Azeni (1996) compared service use among Medicaid beneficiaries in Michigan for three sub-populations – patients with co-occurring disorders who received substance abuse treatment, patients with co-occurring substance abuse disorders who did not receive substance abuse treatment, and patients with mental illness only. Patients with a co-morbid substance abuse diagnosis were four

times more likely than patients with mental illness only to receive acute inpatient treatment at a hospital. Furthermore, after discharge from the hospital those same patients were less likely to be accepted into residential substance abuse treatment programs (Dickey and Azeni, 1996). Costs associated with treatment for patients with co-occurring disorders were significantly higher than for patients with mental illness only, particularly for inpatient hospitalizations, but also for general medical service costs as well (Dickey and Azeni, 1996).

More recent evidence also demonstrates elevated use of medical services among people with co-occurring disorders. Clark and colleagues (2007) analyzed Medicaid claims from five states and compared use of inpatient hospital, ED, and community- based treatment services for beneficiaries with co-occurring disorders to beneficiaries with only mental illness or a substance abuse disorder. Their results suggested that people with co-occurring disorders had significantly higher odds of inpatient hospital stays and ED visits than people with a single disorder (Clark et al., 2007). Furthermore, people with co-occurring disorders were estimated to be significantly less likely to use community-based treatment services than people with mental illness only (Clark et al., 2007).

Women with co-occurring disorders and histories of abuse also tend to be high-intensity service users (Kessler et al., 1997; Becker et al., 2005). A group of 2,729 women with co-occurring disorders and histories of abuse from around the U.S. reported high rates of hospital stays (20.5 percent), emergency room visits (35.9 percent), medical clinics (60 percent), and nights in jail (20.7 percent) during the three months prior to initiating integrated treatment (Becker et al., 2005).

Treatment services utilization: estimates of heterogeneous effects

A limited amount of work has been done in an attempt to estimate differences in services utilization according to symptom severity among people with co-occurring disorders. McGovern and colleagues (2007) used Medicaid claims from six states to

categorize people with co-occurring disorders into an existing, four-group symmetrical construct of symptom severity, evaluate the reliability of those categorizations, and estimate differences in service use across them. They found that categorizations were relatively stable across states for the most severe and the least severe symptom categories, and also that people with severe psychiatric problems were significantly more likely to have used inpatient hospital or ED services than people with less severe mental illness (McGovern et al., 2007).

McGovern and colleagues' study provides important information about how use of hospital services among people with co-occurring disorders varies generally by symptom severity (2007). However, limitations of the study indicate important areas for further investigation. The analyses did not control for patient characteristics that are likely to confound the relationship between symptom severity and use of hospital services, such as demographic characteristics, perceived need for care, and physical illness co-morbidities. More importantly, a symmetric four-category framework for symptom severity is likely too simplified and not reflective of how symptoms for these complex disorders may actually manifest, a point the investigators themselves make in describing the need for further research (McGovern et al., 2007).

Integrated treatment: a new approach

Where treatment for individuals with co-occurring disorders has traditionally been fragmented – each disorder being treated in isolation by its respective treatment agency and paradigm – integrated counseling coordinates multiple-level health care needs by addressing mental health and substance abuse issues concurrently. For women who also have histories of abuse victimization, integrated treatment must go one step further by incorporating trauma-informed counseling into service delivery to address possible PTSD and accommodate unique sensitivities of abuse victims. It is not uncommon for women to

avoid seeking out or fully engaging in treatment because of shame or emotional distress from having been abused (Goodman et al., 1997).

A growing body of evidence suggests that an integrated approach to treatment may be associated with better outcomes among women with co-occurring mental health and substance abuse disorders who also have histories of abuse victimization and consequent PTSD as compared to traditional, uncoordinated services (SAMHSA, 2002; Najavits et al., 1998; NASMHPD & NASADAD, 1998). Women in this population who receive care from providers who are trained in working with trauma survivors and who take incremental steps in treating their co-occurring disorders and trauma symptoms may respond more positively and, in turn, have more marked improvements in their outcomes (Harris, 1994).

WCDVS Six- and 12-month follow-up: clinical outcomes

This new approach to treatment – integrated, coordinated, and trauma-informed counseling and other services – was studied in the Women, Co-occurring Disorder and Violence Study (WCDVS) from 1998 – 2003. An in-depth description of the study and its participants is detailed in Chapter 4. Recent evaluations of WCDVS (Cocozza et al., 2005; Morrissey et al., 2005a; Morrissey et al., 2005b), demonstrated promising results for six- and 12-month clinical outcomes associated with IC. Aggregated results based on prospective meta-analysis of program-level effects at six-month follow-up indicated that intervention sites showed more improvement in mental health and substance abuse outcomes than comparison sites.

Hierarchical linear models of program- and individual-level effects on outcomes were also estimated at six- and 12-month follow-ups (Morrissey et al., 2005a; Morrissey et al., 2005b). At six months, participants at intervention sites showed greater improvement in mental health, substance abuse, and post-traumatic stress symptoms as compared to participants at comparison sites, even when controlling for the effect of most individual-level

characteristics. Four individual-level characteristics – high baseline alcohol- and drug-use severities, having been stalked or threatened, and having experienced physical abuse as an adult – were associated with improved outcomes in selected domains. At twelve months, average improvements in mental health and PTSD outcomes among women at intervention sites seen at 6 months continued to increase, and the substance abuse outcomes leveled off, maintaining 6-month improvements (Morrissey et al., 2005b).

WCDVS Six- and 12-month follow-up: service use and costs outcomes

Two analyses estimated health services use and total associated costs among WCDVS participants at both six- and 12-month follow-ups (Domino et al., 2005a; Domino et al., 2005b). The analyses included health services that were delivered at study sites as well as at points of access external to the study. Examples of services included are hospital days, ED visits, detoxification, and peer support groups, homeless or domestic violence shelter stays, and jail. The Medical Expenditure Panel Survey (MEPS), Medicaid reimbursement rates, and existing literature were used as sources for costs of included services.

Domino and colleagues' analysis of service use and costs at the six-month follow-up (2005a) was conducted from two policy-relevant payer perspectives – a governmental perspective, which encompassed a broad scope of medical and social services, and a Medicaid perspective, which included only medical services that would be covered by Medicaid. The results indicated that, from either perspective, there was no statistically significant difference in total average costs between the group of participants receiving IC and the group receiving usual care.

The analysis of services costs at 12 months employed a societal perspective, which added an additional layer of direct and opportunity costs to the individual (e.g., transportation costs, time that could be spent earning wages) to the aggregation of total

costs. Consistent with the findings at 6-months follow-up, the results at 12 months indicated that there were no statistically significant differences in total average costs between the IC and usual care study groups. Combined with the improvement in clinical outcomes described above, these results suggested that treatment services for women who suffer from co-occurring disorders and who have been victims of abuse could be provided in a more cost-effective way with IC. This is particularly important when considering that these services are often funded by constrained public resources.

Two additional analyses by Domino and colleagues measured the changes in service use associated with the WCDVS intervention at six- and 12-month follow-ups (Domino et al., 2006; Chung et al., 2009). Both analyses utilized two-part, difference-in-difference regression models to estimate, first, the probability of having used a service at all, and second, the aggregate level of service use at six-months, given the service was ever accessed. Results from the analysis of six-month follow-up data suggest that, on average, participants in the intervention arm used more outpatient group counseling than participants in the usual care study arm. Conversely, no statistically significant differences in levels of service use were found between intervention and usual care study arms for psychotropic medication, peer support, individual counseling, or services external to the study such as jail time, homeless or domestic shelter stays, among participants who had accessed these services at some point before the 6-month follow up (Domino et al., 2006).

Preliminary results from the 12-month services use analysis suggested that participants in the intervention arm were more likely than those in the usual care arm to have used psychotropic medication, though no statistically significant difference in level of use was evident (Chung et al., 2009). Residential treatment was the one study service in which participants in the intervention arm had, on average, a statistically significant higher level of use than usual care participants.

WCDVS 12-month follow-up: sub-group effects for clinical outcomes

While evidence for the average effects of IC was encouraging, it was not clear if IC was associated different outcomes for different sub-groups of women. While no evidence exists in the literature regarding sub-group effects of IC on service use and costs, limited work has been done examining the effects of IC on clinical outcomes among sub-groups of women. The only existing sub-group analysis of WCDVS outcomes in the literature is a study conducted by Cusack and colleagues (2008). The investigators evaluated the WCDVS data to determine whether the trauma-informed integrated counseling intervention affected clinical outcomes differentially across sub-groups of women according to baseline PTSD and substance abuse severity.

The investigators used k-means cluster analysis to generate clusters of women according to their symptom severity, and then predicted frequency of lifetime traumatic events, age at onset of mental health problems and poor physical health, and response to the WCDVS intervention. Women in clusters with severe co-morbidity and severe PTSD, respectively, had the greatest number of traumatic events throughout their lifetimes. Onset of mental health disorders was earliest among women whose predominant symptom was severe PTSD and among women who suffered from severe PTSD and severe drug and alcohol problems. Poor physical health ratings were worst for those clusters of women as well. Furthermore, Cusack and colleagues (2008) estimated that women with the most severe PTSD and substance abuse symptoms, and who were in IC versus usual care, had the greatest improvements in their post-traumatic stress symptoms.

Contribution of the present study

Existing evidence suggests that, on average, IC is associated with better improvements in clinical outcomes than usual care with no significant difference in total costs. Large, unmeasured variations in symptom severity profiles and in service use profiles

at baseline were not captured in analyses of the average effect of IC and may have masked the true effects of the integrated counseling intervention on heterogenous sub-populations. New evidence has demonstrated that there are indeed significant sub-group effects of IC on clinical outcomes (Cusack et al., 2008). This dissertation aimed to fill a gap in the literature by adding important evidence about heterogenous effects of IC on services use and costs, an area of study that has recently been recommended by experts in treatment for co-occurring disorders (Sacks et al., 2008). Uncovering heterogeneous effects of IC on service utilization among women with co-occurring disorders and histories of abuse will help clarify further for whom in this population the intervention is most effective and how.

This study also builds on existing efforts to identify sub-populations of people with co-occurring disorders that are representative of how ranges of symptom severity commonly manifest in an attempt to understand variations in how they use services. Specifically, this study improves on the existing quadrant framework for categorizing symptom severity by accounting for multi-dimensional combinations of symptoms that likely manifest in non-symmetrical ways. The groupings presented here will therefore have greater clinical significance in that they are more representative of how symptoms actually manifest in women in this population. From there, more accurate assessments of treatment effectiveness can be made for people in the different sub-populations.

Furthermore, this study examined sub-group effects according to two distinct domains of participant characteristics as they enter treatment – symptom severity and service use patterns. Each domain provides important information about women with different characteristics and makes it possible to estimate for whom the intervention is most effective. Identifying women by their symptoms using clinical screening and assessment tools is part of routine practice for providers of mental health and/or substance abuse services and likely a practical approach. Identifying women by their reported service use behavior, on the other hand, can be especially useful for general practitioners and other

providers who may not have direct access to women's symptom profiles or the resources to conduct in-depth symptom evaluations themselves. These practitioners can instead identify for whom IC is most appropriate by asking a few targeted questions about service utilization. By understanding if and how this intervention works differently for certain groups of women in this population, that knowledge can then be used by providers to improve how they target IC to their patients and by policy makers to improve the design and delivery of care for women who do not respond as well to IC.

CHAPTER 3

CONCEPTUAL FRAMEWORK

Stratification to examine heterogeneous effects

The rationale for this study was to understand how variations in baseline symptoms or baseline service use and costs modify the effect of IC on later service use and costs. The methodological rationale for this proposed conceptualization – versus previous studies that looked at average effects – was based in the epidemiologic concept of effect-measure modification. Heterogeneity of effect, or effect-measure modification, refers to the differences in the magnitude of exposure effect (in this case, IC versus usual care) across levels of another variable (in this case, baseline symptom severity and baseline service use and costs) (Rothman and Greenland, 1998). Stratification is a common method used to test for heterogeneity of effect and was used in this study to isolate sub-group effects of IC.

Classifying symptom severity: an existing framework

In 1998, the National Association of State Mental Health Program Directors and the National Association of State Alcohol and Drug Abuse Directors presented a framework for assessing severity of co-occurring mental health and substance abuse disorders. The model was based on symptom multiplicity and severity instead of specific diagnoses and divided symptom severity into four quadrants.

For three important reasons, the quadrant model developed in 1998 is not optimal for use in categorizing women in the WCVDS according to baseline symptoms. Firstly, the framework does not account for post-traumatic stress symptoms that may be associated

with women's experiences of interpersonal violence such as physical or sexual abuse, and thereby does not account for multiple dimensions of symptoms. Secondly, the four-category framework does not make a distinction between major types of addiction, thereby lumping alcohol and drug addiction together and losing information that can be important for evaluating treatment effectiveness. Thirdly, the framework proposed four categories with arbitrary cut points to reflect the following combinations of severity of mental health and substance abuse symptoms, respectively – low/low, low/high, high/low, and high/high. This construct assumes that symptoms manifest in people in ways that reflect discrete, symmetrical categorizations. The quadrant model has been criticized by experts for over-simplifying the potential combinations and interactions of symptoms among people with co-occurring disorders (McGovern et al., 2007; Keyser et al., 2008). So, it is even more likely to be unrepresentative of how the triad of PTSD and co-occurring disorders plays out empirically.

Cluster analysis: an alternative method of classification

Cluster analysis is an alternative approach to categorizing data according to multiple dimensions. A statistical algorithm constructs a parsimonious set of sub-groups, or clusters, that are data-driven and that reflect natural groupings of observations. This is particularly useful for creating meaningful categories of women with co-occurring disorders and abuse victimization, among whom there are likely many combinations of complex symptoms and varying degrees of severity. If symptoms among women in this study population had, in fact, played out as conceived in the 1998 framework, those patterns would emerge in cluster analysis and would provide supporting evidence for the quadrant model. If, on the other hand, symptoms actually manifested in a less symmetrical way, those unique patterns would emerge in cluster analysis, as well.

Theoretical bases for predictors of treatment services utilization

People suffering from co-occurring disorders comprise a seriously underserved population faced with multiple and complex barriers to effective care (SAMHSA, 2002). Barriers to appropriate care range from shortcomings in the coordination of care in separate substance abuse and mental health systems, to poor access to services, to disabling symptoms and poor social supports that may inhibit seeking out care. These factors can confound the effect of a treatment intervention on patient outcomes. Two different models of health care services utilization are helpful in framing the context and predictors of service use for treatment of co-occurring disorders.

The Behavioral Model of Health Services Use identifies three primary dimensions that determine an individual's use of health services: predisposition to use services, enabling or disabling factors, and need for care (Andersen, 1995). Predisposing factors by definition precede episodes of illness for which services may be sought, and may include demographic characteristics such as age, race, gender, and education. Enabling factors are resources that facilitate receiving health care services, such as health insurance, income, and availability in the user's community. The third dimension encompasses both need for care as perceived by the individual and need as evaluated by providers.

Another model lends insight into the pathway to care for mental health services and uncovers the underlying selection process. Goldberg and Huxley (1980) illustrated the progressive steps toward accessing psychiatric care and the barriers to advancing for each level. The model identifies predictors of psychiatric care at three basic states: (1) who seeks care; (2) among those who seek care, whose mental health disorders are detected; and (3) among those whose disorders are detected, who are channeled to psychiatric care and who, instead, are channeled to primary care services. Initially seeking care is associated in this model with symptom severity, psycho-social stress, attitudes of relatives, availability of medical services, and ability to pay. Disorder detection is predicted by provider

characteristics, such as interview techniques and training, as well by patient traits such as presenting symptoms and socioeconomic characteristics. Referral to psychiatric care (versus primary care) for treatment is influenced by patient symptom severity, attitudes of patient and family, and availability and quality of psychiatric services.

Clustering variables: categorizing participants according to two variable constructs

Participant sub-groups were constructed in two different ways – once according to baseline symptom severity, and again according to baseline service use and costs – with the expectation that each construct would group participants differently and have a unique association with the intervention that would drive unique responses to IC. Integrated counseling was designed and intended to treat women's disorders and trauma symptoms, so it may be that differences in the effect of the intervention depended on baseline symptom severity. One the other hand, services utilization theory suggests that factors other than symptoms (e.g., predisposing characteristics, enabling resources) drive people to seek, access, and engage services use differently. Services utilization behaviors before IC, therefore, may have been what most strongly influenced the engagement in IC and its consequent effect on outcome services use and costs.

The two clustering constructs are also very different in how they can be used in practice settings to identify unique sub-groups of women within this population to indicate for whom IC is likely to be relatively effective or ineffective. The advantage of identifying women by symptom sub-group is that some providers (e.g., psychiatrists, psychologists) are assessing diagnoses as part of their regular course of treatment and can easily distinguish in which sub-groups their patients belong. The disadvantage of identification by symptom sub-group is that it may not be practically feasible for practitioners that lack the diagnostic skills and resources necessary to conduct symptom assessment.

The relative ease of sub-group identification is an advantage of the service use and cost sub-grouping. All practitioners, regardless of formal training, can quite easily identify women according to the service use and cost patterns by asking relatively simple questions about their level of use of different types of services, such as outpatient counseling, residential treatment, and medical services. Answers to these questions will indicate to which service use and cost sub-group a given person likely belongs, and with that information the provider can then anticipate who effective IC is likely to be.

Theory and empirical evidence informed the identification and organization of sub-group modifying effects on the intervention as well as the selection of covariates to control for confounding effects so that the direct effect of IC could be measured (**Figure 1**).

Based on theory and existing evidence regarding service use patterns and treatment responses among people with co-occurring disorders, and particularly, women with co-occurring disorders and histories of abuse, I generated and tested three study hypotheses:

(h1) Differences in the effect of IC on service use and costs will be found among women in different sub-groups.

The Behavioral Model of Health Services Use (Andersen, 1995) and the Pathways to Care in the Community model for mental health services use (Goldberg and Huxley, 1980) both suggest that utilization of services varies based on many characteristics, including symptom severity, perceived need for care, availability, and socio-economic status. Existing empirical evidence supports the theory that different populations of people with co-occurring disorders use certain services differently depending on the severity of their psychiatric and substance abuse symptoms (McGovern et al., 2007; Cusack et al., 2008; Keyser et al., 2008). Based on the service utilization theories, I expect to find empirical differences in the effect of IC on service use and costs according to baseline symptom severity and according to baseline service use patterns among women with co-occurring disorders and histories of abuse.

(h2) Intervention effects on service use and costs will be stronger in clusters of women who use high levels of services at baseline than in clusters of women who have high symptom severity scores at baseline.

Based on empirical evidence that people with co-occurring disorders tend to over-utilize medical services, the IC intervention is expected to have a stronger effect of reducing potentially inappropriate use or over-use of services and associated costs (e.g., inpatient hospital stays, ED visits) among women who were high-intensity service users at baseline as compared to women who where characterized by high-severity symptoms at baseline. The effect of IC across clusters in the two constructs will be compared qualitatively by examining distributions and R-squared statistics that indicate the percent of variability in the outcome that is explained by the model.

(h3) Intervention effects on service use and costs will be stronger in clusters representing high outpatient counseling use at baseline as compared to clusters representing low outpatient counseling use at baseline.

It is expected that women who tended to be higher utilizers of counseling services at baseline will have had the strongest intervention effects on their outcome service use and costs. Counseling was a fundamental element of the intervention, and so these women would likely have tended to use the intervention services more intensively than women who used counseling less intensively or less often before starting treatment. High-intensity use of a primary intervention service is expected to be associated with the strongest intervention effects on outcome service use and costs.

CHAPTER 4

STUDY DESIGN AND DATA

WCDVS study design

From 1998 through 2003, Women, Co-Occurring Disorders, and Violence Study (WCDVS) implemented a quasi-experimental treatment protocol to serve the complex needs of women with co-occurring disorders and histories of abuse victimization (McHugo et al., 2005; Cocozza et al., 2005; Morrissey et al., 2005a, Morrissey et al., 2005b). Nine intervention sites were selected to implement integrated intervention programs. The sites were quite varied in the focus and modality of their service delivery – some provided primarily mental health services, other substance abuse services; some sites provided outpatient treatment, others residential treatment or a mix of both (McHugo et al., 2005). Participating sites were also given the freedom to choose which treatment model they would follow in developing and implementing the intervention services, so long as the models were group-based and trauma specific (McHugo et al., 2005).

Four core requirements were imposed on the nine sites regarding the content of the integrated-services intervention they provided study participants. First, each site was required to provide *comprehensive* intervention services and had to incorporate eight specific service elements, including outreach and engagement, parenting skills training, resource coordination and advocacy, and crisis intervention. Second, each site was required to implement a set of services that were *integrated*, both clinically and organizationally. In other words, sites needed to be coordinated with other agencies and individual providers participating in their patients' care. Third, services provided by each site

were required to be *trauma-informed*, meaning that potential circumstances and symptoms specific to having been a victim of abuse had be acknowledged and addressed in the intervention services. Fourth, each site was required to incorporate *CSR involvement* into their intervention services. Specifically, [C]onsumers of mental health services, [S]urvivors of trauma, and women in [R]ecovery (CSR) were to be included in the development, implementation, and evaluation of sites' intervention services (McHugo et al., 2005).

Each of the nine study sites contributed an intervention site and a comparison site that provided usual care. In most cases, comparison sites were similar in terms of service sector, but not necessarily geographic proximity (McHugo et al., 2005). Intervention and comparison sites were both varied in terms of the types and scope of services provided, however, the comparison sites did not specifically implement the intervention services. Women were enrolled in a quasi-experimental or non-random manner into the intervention site and from a comparison agency(s) that provided usual care in the same or an adjacent community. Target enrollment for each participating site was 150 – 200 participants. Mental health, substance abuse, and PTSD outcomes, as well as service use and costs were measured for study participants at baseline, six- and 12-months during in-person follow-up interviews. Telephone interviews were also conducted at three- and nine-months to measure service use.

The quasi-experimental study design may have limited study validity to an extent. Non-randomized site matching introduced the potential for site-specific characteristics confounding the effect of the intervention. Further, non-random participant recruiting could have produced study groups that were unbalanced, also allowing the introduction of systematic differences in participants across groups that could confound the effect of the intervention on outcomes. In the case of WCDVS, the quasi-experimental study design was arguably preferable over a randomized design for several reasons. First, within-agency randomization would have likely led to contamination of the intervention effect to the usual-

care participants because of system-level training (e.g., staff training on IC) that occurred in a preliminary phase of the study. Furthermore, evidence suggests that clinicians consider trauma-informed treatment to be superior to usual care, so it would likely have been difficult, if not infeasible, to justify randomizing patients to usual care groups (McHugo et al., 2005). Lastly, a group of women participating in the design of the integrated counseling intervention who were in recovery from these disorders asserted that participant randomization to study conditions would not be reflective of real-world circumstances.

WCDVS study population characteristics

The study sample at baseline included 2,729 eligible women. Overall, these women had a very complex and challenging set of mental and physical health problems, trauma histories, and present life circumstances (Becker et al., 2005). At baseline, participants were, on average, high-intensity users of addiction treatment, and over half were living in residential substance abuse treatment facilities (Becker et al., 2005). Nearly half of the women had at least one psychiatric hospital stay in the past, and among that proportion, the average number of admissions was 4.5. Trauma experiences among participants were commonly severe, the majority reporting having been victims of physical abuse, sexual abuse, emotional abuse, neglect, and often, some combination those abuses. Complicating their disorder and trauma symptoms, many women in this population reported having poor physical health status. Nearly half reported having a serious health problem, and only 22 percent considered their current health to be excellent or good (Larson et al., 2005).

Along with a constellation of health problems and being victims of abuse, many WCDVS participants faced other life circumstances that put them at a general disadvantage and likely made treatment and recovery more challenging. The majority was under-educated and under-employed – nearly half did not finish high school, and only 12 percent reported working either full- or part-time (Becker, 2005). Twenty percent of participants

reported being in jail or a correctional facility during the three months prior to enrolling in WCDVS. Many of the women were unstable parents, as well. Of the 87 percent who had children, 40 percent had lost custody of all their children. Women's reports about how they viewed themselves as parents often reflected a lack of confidence, as well.

There were 2,006 women who completed interviews at both baseline and six-month follow up. At 12-months' follow-up, 2,026 women completed interviews. The odds of dropping out before the 6- or the 12-month follow-ups were not statistically different for the intervention and comparison groups. Older age and higher education levels were associated with statistically lower odds ($p<.05$) of dropping out before six months or 12 months, while black women and participants with higher drug severity scores at baseline were more likely to drop out before both six months and 12 months. Higher post-traumatic stress scores at baseline were associated with slightly greater odds ($p<.05$) of dropping out before completing a 12-month interview.

Assessing receipt of intervention services

An important consideration about the study conditions is the extent to which participants received the services intended for the study arm to which they were assigned. It is possible that there was some crossover among participants, in which women in the intervention arm did not receive integrated counseling or women in the usual care arm received intervention services. The potential for study-arm crossover is particularly relevant in WCDVS as participation did not preclude women from engaging in treatment beyond the study conditions, and participants were interviewed about all services used during follow-up intervals, not just services encompassed in the study.

The interview data were examined carefully in an attempt to uncover the extent to which participants received study services as intended. Interview questions covered a broad range of services use, from those specific to the intervention such as counseling,

case management, and peer support services received, to other services that may have been used during a given interval, such as hospital stays, nights spent at a shelter, or nights in jail. The IC condition was to have a foundation of individual and/or group counseling and include services with the four key dimensions described above – comprehensiveness, integration, a trauma-informed approach, and CSR involvement. The comparison condition was not a prescribed set of usual-care services, but instead reflected a range of typical services use by women meeting the study criteria.

Another feature of WCDVS that further complicates the measurement of IC versus usual care services was how the study condition was defined. While women in each study arm were recruited from study sites and comparison sites, the follow-up interviews did not explicitly ask them to limit their responses regarding services use to the study sites. Therefore, reporting could to some extent reflect services used in the larger community as well. Nothing in the interview schedule could definitively indicate the presence of each of the four required components in intervention services; however, several questions did refer to important aspects of comprehensiveness and integration in services that participants received.

Group counseling, either in residential or outpatient treatment settings, was to be the core service activity for delivering the intervention. Almost 90 percent (89.71%) of intervention group women reported participating in group counseling sometime during the 1-year follow up period. Nearly 80 percent (78.23%) of these women reported receiving violence/abuse/trauma-specific treatment (VAT) during group counseling. Inasmuch as the receipt of counseling that has a VAT component can be used to measure receipt of intervention services, this would suggest that 70 percent of intervention participants actually received these services. Eighty percent of comparison group participants reported group counseling sometime over the 1-year follow up period, of whom more than half (54.54%) reported VAT was included. If participant reports of receiving counseling with a VAT

component are used as a measure of intervention receipt, almost 44 percent of all comparison participants actually received intervention services. Based on that indicator alone, the data would suggest that there was substantial study-arm cross-over amongst study participants.

Another measure of intervention services participation is self-reported receipt of trauma-informed care for other service types beyond group counseling, such as individual counseling, case management, and peer support services. These variables, as indicators of intervention receipt, captured more participants in each study arm than VAT in group counseling. Among women who reported group counseling participation, but with no VAT, 86.14 percent of the intervention group reported receiving VAT in at least one of the three additional intervention services. Nearly 73 percent of comparison-group women also reported VAT in individual counseling, case management, and/or peer support services. Combining having used group counseling or other intervention services with a VAT component, 94.45 percent of intervention group women reported receiving some VAT during the one year of follow up, as compared to 83.35 percent of comparison group women.

A final indicator that intervention services were to some extent integrated and delivered with a VAT component was identified in items rating participants' perceptions about the care they had received. Three items in particular addressed the extent to which service providers helped the patient understand the connection between abuse, mental health and substance abuse problems; if providers explained abuse-related symptoms in understandable way; and if providers were helping the patient recover from the traumas in her life. Almost all participants in both intervention and comparison groups (97.83 percent and 96.67 percent, respectively) agreed or strongly agreed with at least one of these three statements about their providers' approach.

Questions about where participants received the intervention services were included in the interview and could potentially indicate treatment receipt, however response rates for

participants' reporting of facility or program names were poor. Only 50 percent of women receiving outpatient group counseling and approximately 40 percent of women receiving residential group counseling provided facility or program names at which that counseling took place. Therefore we are unable to use attendance at intervention clinics as a reliable measure of treatment receipt.

The data from participant interviews summarized above suggest that over 90 percent of women in the intervention arm received at least one required dimension of the intervention that featured VAT. That many women in the comparison group also reported receiving intervention-type services – over 50 percent reported some service with VAT – may indicate that self-reports of services use in this study serve as an imperfect measure for intervention receipt. This is consistent with findings from an analysis by Chung and colleagues (2007) about the reliability of self-reports of treatment content among women participating in WCDVS. The investigators determined that reliability ranged from moderate to substantial levels of agreement in participants' self-reports about any versus no use of services. However, reliability of reported service content was low – particularly for trauma content in counseling services – with agreement ranging from none to moderate (Chung et al., 2007).

It may be that low specificity (many false-positives) of interview questions and the relatively uncontrolled nature of self-reporting, itself, yielded more reports of intervention-like services than were actually received. Also, counseling, case management, or peer support services outside the intervention arm (i.e., usual care) may well have addressed trauma, but that would not necessarily be indicative of "integrated counseling" as defined for the WCDVS intervention. Conversely, provider sensitivity to the unique needs of study participants did not necessarily translate into direct observables – a trauma-informed approach could have been unrecognized by a participant and therefore not reflected in her reporting of services received.

The degree of formality with which trauma was addressed during treatment distinguished treatment as it was delivered in the intervention condition as compared to usual care, but may not have been detected. Considering how pervasive trauma is among women with co-occurring disorders (Kessler et al., 1995; Gearon et al., 2003; Goodman et al., 1997, Lipschitz et al., 1996, Perkonigg et al., 2000; Hanson et al., 2002; Watkins et al., 2001), casual mentions of trauma may have been very common in usual care treatment services. Even brief mentions of trauma may have inclined study participants in the usual care group to report having received care with a VAT component. Their having actually received services with a VAT component, as intended for the intervention, was unlikely given the evidence that usual care services generally do not adequately address trauma for women in this population (Goodman et al., 1997). In intervention services, on the other hand, VAT issues were addressed formally as a part of treatment. This important distinction between causal mention and formal address of trauma could not be teased out in service use questions in the study interview, and so may account, in part, for high levels of receiving VAT services among women in the comparison group.

Because nearly all women in the intervention group reported receiving some intervention-type services, this analysis was conducted based on the assumption that intervention-arm participants received integrated counseling and comparison-arm participants received usual care from their recruiting comparison site or elsewhere in the community. A process evaluation of WCDVS provides supporting evidence for this assumption about comparison sites (Huntington and Moses, 2005). Comparison sites that were selected for site visits were judged to have had generally low levels of integration (Huntington and Moses, 2005). Site investigators determined that specific strategies to insure involvement and integration of CSRs (consumers/survivors/women in recovery) in the intervention services were nearly absent in comparison sites (Huntington and Moses, 2005). Finally, intervention sites were generally successful in incorporating the eight core services

identified for comprehensiveness by developing trauma-specific services. Meanwhile, trauma-specific services were absent from most comparison sites (Huntington and Moses, 2005). While these evaluations of the study condition suggest that the intervention services were generally exclusive to the intervention sites, the impossibility of accurate measurement of intervention receipt is a limitation of these data.

CHAPTER 5

METHODS

Clustering methodology

This dissertation sought to divide the WCDVS sample into more homogenous sub-groups of women according to their baseline symptom severity and separately according to their baseline service use, and to conduct analyses separately for each unique sub-group. The organization of study participants into distinct sub-groups was carried out using two clustering methods, combining hierarchical and k-means clustering analyses. While cluster analysis is a useful and unique tool for generating data-driven sub-groups, an inherent estimation limitation is that it requires the analyst to ultimately, and largely qualitatively, decide what is the correct number of clusters. Unlike regression analyses, there is no test statistic to use in cluster analysis that clearly supports or refute the results. Another limitation of cluster analysis is the lack of consensus about whether to standardize variables at all, and if so, by what method. To assess the robustness of the cluster analysis results, we also used clusters created by latent class analysis. We then ran a series of regression models for each outcome of interest, generating IC effect estimates for each cluster. In this section, the process of creating clusters and the analyses within clusters are described.

Cluster analysis is an approach to categorizing data according to multiple dimensions that constructs a parsimonious set of clusters that are driven by the data and thereby represent existing patterns within them. Cluster analysis has been used in recent health psychology and health services research for grouping people according to sets of characteristics (Lee et al., 2008; Jin-An et al., 2008; Clatworthy et al., 2005; Henry, 2005;

Halpern et al., 2004; Jason and Taylor, 2002; Sugar et al., 2004; Sugar and James, 2003; Lenert et al., 2000; Sugar et al., 1998). By this method, categories (clusters) are no longer necessarily equally-weighted and instead are determined by relative positions of cluster centers, points that are derived using a statistical algorithm. Data points are then assigned to clusters for which center values of each dimension of interest are closest to their own values. While many approaches to cluster analysis are possible, these analyses were based on a two-step process recommended in contemporary texts (Khattree R and Naik D, 1999) and current scientific literature (Clatworthy J, et al., 2005; Mandara J, 2003; Henry DB, et al., 2005, Milligan GW, 1980, Milligan GW, 1985, Milligan and Cooper, 1988), in which the number of clusters and their starting centroids are first obtained using a hierarchical method, and second, the clustering solution is then improved by optimizing assignment of observations to clusters using k-means clustering. .

Standardization of variables

Input variables for both clustering constructs were first rescaled before being used for cluster analysis. Because the clustering variables, particularly the service variables, were based on different raw scales, the variation in their ranges was large. For example, the number of days spent in residential substance abuse treatment among participants in the three months before baseline ranged from zero to 114 days. On the other hand, costs of psychotropic medications in the three months prior to baseline ranged from $0 to $2,325. Unequal scaling yields unequal variable weights, giving more relative influence to variables with large ranges during cluster assignment. For these analyses, each variable was divided by its range, which placed the four variables on a single scale while leaving relative variability before and after transformation unchanged.

Each variable was then multiplied by 100 so that all input variables for symptom and service cluster analyses had potential ranges of 0 to 100. This was recommended as the

optimal rescaling approach by Milligan and Cooper (1988) after conducting a simulation study to compare different approaches to standardization. Their study demonstrated that standardization by division by the range consistently performed best in recovering the underlying structure of the cluster as compared to other approaches. Several other rescaling approaches were explored, including generating various quantiles of baseline values. The approach recommended by Milligan and Cooper was ultimately selected based on their supporting evidence (1988) and because the clusters formed using this rescaling approach produced the strongest difference in IC effects across clusters on outcome service use and costs.

Hierarchical clustering procedure

The first step of the cluster analyses was to apply Ward's method, a hierarchical agglomerative analysis, to identify the most appropriate number of clusters. The agglomerative process begins by assigning each observation to its own cluster, and clusters are then successively combined to form larger sub-groups. The Ward's algorithm begins by assigning each observation as its own cluster and then continues to link individual clusters together to form larger clusters based on a dictated distance metric. The recommended and predominating metric, squared Euclidean distance, was used here (Milligan, 1985). This measure was calculated by summing the squared differences between observations for each input variable, generating the shortest (or as-the-crow-flies) distance between two points.

Dendrograms, or tree diagrams, were generated from the results of the Ward's analyses, by which the most appropriate cluster solutions were selected. A dendrogram represents the distance between clusters as they are combined, as well as the number of observations assigned to each cluster. The greater the vertical distance is between a given

cluster and the remaining clusters, the more unique it is. Visual inspection of the dendrograms was used to assess the number of unique clusters that exist in the data.

The dendrogram generated from Ward's hierarchical analysis of the three symptom severity variables suggested, upon visual inspection, that the data grouped naturally into six or seven clusters. Cohen's kappa statistics for K-means clustering, as performed on two random sub-samples of the analytic sample, once for each possible cluster solution, suggested that the seven-cluster solution was more reliable than a six-cluster solution (eight-cluster solution: 0.66, $p < .0001$; seven-cluster solution: $k = 0.70$, $p < .0001$; six-cluster solution: $k = 0.64$, $p < .0001$).

The Ward's cluster analysis grouped participants' service use and cost profiles into four or five apparent clusters. K-means cluster analysis results for the two randomly-split sub-samples were tested for agreement. The Cohen's kappa statistics for the four- and five-cluster solutions ($k = 0.44$, $p<.0001$ and $k = 0.90$, $p<.0001$, respectively) indicated that the five-cluster solution produced more stable results.

K-means clustering procedure

The second step for the cluster analysis was to use the mean values, or centroids, from the Ward's cluster solution as starting seeds for k-means cluster analysis. K-means analysis is an iterative partitioning approach, which unlike hierarchical methods, allows cases to be reclassified into other clusters throughout the assignment process to optimize cluster fit. The k-means clustering algorithm iteratively assigns observations to clusters to minimize the within-cluster distances and maximize the distance between cluster centroids.

The final step taken in the cluster analysis was to validate the selected cluster solution, also according to an approach commonly recommended in current literature (Mandara, 2003; Henry, 2005, Clatworthy, 2005). Because there is no single, definitive approach for selecting the optimal number of clusters, validating the results adds important

support to the goodness of fit for the selected cluster solution. The stability of cluster solutions was assessed by (a) randomly dividing the study sample in two, (b) performing cluster analysis on sub-sample 1, (c) performing cluster analysis on sub-sample 2, and (d) performing cluster analysis on sub-sample 2 again, the second time using the final centroids generated from the analysis of sub-sample 1 as starting points. The stability of results between the two analyses of sub-sample 2 was assessed using Cohen's kappa statistic, a common measure of rater agreement, and standards of reliability proposed by Shrout (1998).

After cluster solutions were finalized for each baseline construct, clusters were assessed for similarity according to their mean values for input variables. As a sensitivity analysis, clusters with similar profiles were combined to test the stability of IC effects for distinct sub-groups of women in the study population. Baseline symptom clusters C2-Sx and C3-Sx had similar mean values for alcohol and addiction severity. Both clusters had high PTSD symptom scores relative to the other symptom clusters, though the mean PTSD score in C3-Sx was nearly 70 percent higher than in C2-Sx. To assess the stability of the results of the final seven-cluster solution, these two clusters were combined to use for a sensitivity analysis of the sub-group effects of IC.

For all outcomes, the regression analyses in which symptom clusters C2-Sx and C3-Sx were combined produced null results for the effect of IC. As there were significant effects of IC for C2-Sx on counseling use and external medical costs using the final 7-cluster solution, the null results for the combined cluster indicate that collapsing those observations into one sub-group diluted the unique effects that are evident specifically for women whose predominant symptom is moderate-to-severe PTSD. Therefore, the final 7-cluster solution for baseline symptom sub-groups was retained for use in generating IC effect estimates.

The end result was that each woman was assigned to a cluster, and dummy variables for those cluster assignments were used as control variables in the regression models and interacted with the IC indicator variable to form the key explanatory variable.

Measures

Participants' use of services was assessed at baseline, and at three- , six-, nine-, and 12-month follow ups. An intention-to-treat analytic approach was implemented, thereby including all women in the final study sample and results, regardless of whether they followed through with treatment, as long as they completed baseline and 12-month interviews. Services such as hospital stays, jail stays, nights in shelters, residential treatment stays were reported as number of days.

Dependent variables

Service use outcomes were operationalized as four separate dependent variables, comprising use of outpatient group and individual counseling services, residential treatment use, costs of medical services used that were external to the WCDVS intervention, and total costs of all services reported (**Table 1**). These outcomes were selected because they reflect a broad scope of services — two basic types of treatment for substance abuse and mental health disorders, as well as use and cost of services that may, in part, be used as substitutes for appropriate care.

In particular, outpatient counseling was a fundamental component of IC and considered to be a key service associated with improving outcomes among women in this population. Therefore, assessing the extent to which the IC intervention affected counseling use across sub-groups of women in the study was an important indicator of the dose of the intervention that was received. Residential substance abuse treatment was also an important outcome to measure because it is one of the most clinically- and resource-

intensive treatment services for co-occurring disorders. While it is a critically important mode of treatment for people with severe addiction disorders (Greenfield et al., 2004; Shou et al., 2006), it is possible that its use might be reduced in an appropriate way if IC services are used successfully.

External medical costs – defined here as costs associated with inpatient hospital stays, ED visits, and outpatient medical services – were selected as a study outcome based on the existing evidence that people with co-occurring disorders, including women who also have histories of abuse, tend to be high utilizers of medical services, including primary care and, particularly, crisis services such as inpatient hospital stays and ED visits. By modeling the effects of IC on external medical costs, we were able to estimate the extent to which different sub-populations of women in the study may have used IC as an appropriate substitute for medical services as treatment for their co-occurring disorders.

The effect of IC on total overall costs was also selected as an important outcome, as it provided information about whether and to what extent total overall costs changed among sub-groups of study participants after initiating IC versus receiving usual care. Overall costs were measured by aggregating study participants' use and costs of all services addressed in the study interviews. These costs were associated with the following twelve services: inpatient hospital stays, ED visits, detoxification services, residential substance abuse treatment, homeless shelter stays, nights in jail, outpatient counseling (group), outpatient counseling (individual), case management, outpatient medical services, psychotropic prescription medication use, and peer support services.

Health services costs were aggregated according to a societal perspective, as recommended in guidelines for cost-effectiveness analysis (Gold et al., 1996), accounting for both direct and indirect costs to study participants and their families as well as the costs associated with their care. Services costs were specified directly following Domino and colleagues (2005a, 2005b), in which services were assigned a unit cost for each type. Cost

sources for outpatient medical visits, hospital days, and ED visits included MEPS, Medicaid reimbursement rates, and the existing scientific literature where government data were not available (AHRQ, 2005; Weinstein et al., 1997; Welsh and Quirke, 1997; Coalition for Homelessness, 2001; Domino et al., 2004; Nevada Provider Rates Task Force, 2002; Humphreys and Moos, 1996; US Bureau of Labor Statistics, 2001; US Bureau of Transportation Statistics, 2001; US General Services Administration, 2005; Gold et al., 1996; Ettner et al., 1997; Simon et al., 2001).

Indirect costs to the patients associated with their use of external medical services (i.e., transportation costs, lost wages due to time receiving treatment) were specified after estimates used by Domino and colleagues (2005b). Transportation costs were calculated assuming a 40-minute round trip at $.35 per mile (U.S. Department of Transportation, 2001; U.S. General Services Administration, 2001). Hourly wages were based on averages statistics from the U.S. Labor Department for women and were reduced by a factor of nearly 30 percent to reflect lower earnings of people with mental illness (Bureau of the Census, 2001; Ettner et al., 1997).

Independent variables

The primary independent variable of interest was treatment group assignment, modeled as a dummy indicator variable. The differential effect of IC in contrast to the comparison arm was measured across each cluster domain using two respective vectors of cluster dummy variables, a treatment group dummy variable, and two vectors of interaction variables: (1) baseline symptom severity cluster dummy variables, each one interacted with the treatment variable and (2), baseline service use/cost clusters, interacted with the treatment variable. The coefficients on the interaction variables represent the extent to which cluster position modifies the effect of integrated counseling as compared to usual care on follow-up service use and costs.

Clustering variables: Baseline symptom severity

Several well-validated, widely used survey instruments were used in WCVDS to measure women's disorder-related symptoms and were used as the basis for the baseline symptom severity clustering in analyses by Cusack and colleagues (2008) as well as in these analyses. Mental health symptoms were measured using the Global Severity Index (GSI) from the Brief Symptom Inventory, a well-validated and widely used survey instrument for assessing mental health status, functioning, and symptoms (Derogatis, 1993). The GSI comprises a 53-item scale, where each response ranges from 0 – 4 for increasing symptom severity in the past seven days. A score of 1.35 was the mean item-level GSI score among the WCDVS study population at baseline (McHugo et al., 2005).

Post-traumatic stress symptoms in WCVDS participants were measured using the Posttraumatic Stress Diagnostic Scale, which assesses 17 key symptoms, ranging in score from 0 – 3 as severity increases, associated with the experience of PTSD. Established cut-points exist to categorize symptom severity, so that Mild = 1-10, Moderate = 11-20, Moderate-to-Severe = 21-35, and Severe = 36-51 (Foa, 1995; Foa et al., 1997).

Substance abuse behavior was measured using the Addiction Severity Index (ASI), another well-validated instrument for assessing non-diagnostic degree of addiction based on self-reported use and perceived problem seriousness in the past 30 days (McLellan, 1992). The ASI includes two composite scores –ranging from 0 – 1 as severity increases – one each for alcohol (ASI-A) and drugs (ASI-D).

The GSI variable was highly correlated with the PTSD variable ($r = 0.7687$, $p < 0.0001$) and therefore was excluded from the cluster. Participants' post-traumatic stress scores were instead used to represent general mental health symptoms in the grouping of observations. Sixty-six observations had missing values for PTSD scores. GSI scores were regressed on PTSD scores using participants with non-missing observations for both

variables (R^2 of 0.58, r = .0.76), and the predicted values were calculated and imputed for the 68 missing values. Addiction severity scores for alcohol and drugs were missing for two and eight participants, respectively. For each addiction score, the mean value for participants for each variable was imputed for missing values. As a sensitivity analysis to determine the effect of imputing predicted values for mental health scores in place of missing PTSD scores, regression models were re-run dropping all participants for whom PTSD scores were missing at baseline.

The sensitivity analysis to determine the effect of missing baseline PTSD values on effect estimates generated similar results across all outcomes. Upon dropping the 66 observations missing baseline PTSD values, both effect estimates and their strength of statistical significance were slightly attenuated. Only in the case of follow-up outpatient counseling did the conclusion change, as the effect of IC for women in the moderate-to-severe PTSD group as compared to the low symptom group dropped below the Type 1 error threshold of 5 percent, the standard by which all study analyses were assessed for statistical significance (β = -0.39, p = .045 with imputed values for missing baseline PTSD; β = -.38, p = .054 after dropping missing PTSD observations). The remaining three outcomes maintained statistical significance for the same sub-groups with slightly lower effect sizes and p-values. This effect is likely due to the reduction in power from dropping 66 observations from the models. Due to the largely consistent results across these two analytic approaches, the sample with imputed values for PTSD was used for final analytic models.

Clustering variables: Baseline service use

A second set of clusters was constructed to categorize WCDVS participants according to baseline service use patterns. Four main service use and cost dimensions were included in cluster analysis: (1) psychotropic medication costs, (2) outpatient individual

and group counseling, (3) residential treatment use, and (4) external medical costs. These four dimensions reflect a broad scope of services –psychiatric, psychotherapeutic, substance abuse rehabilitation, and medical care – that were used and reported by study participants.

Control variables

Drawing upon both Andersen's model of health services utilization and Goldberg and Huxley's model of the pathway to psychiatric care, as well as current literature regarding services use by people with co-occurring disorders (Andersen, 1995; Goldberg & Huxley, 1980; Harris & Edlund, 2005; Watkins et al., 2001; Wu et al., 2003), a set of variables was identified as potential confounders of the relationship between IC and outcome service use and costs and were thus controlled for in the analyses. Age, race, and education were controlled for as predisposing factors. Having a serious physical illness or disability was also included as a predisposing factor for services use in these analyses, as participants were reporting medical service use as well as mental health or substance abuse treatment services they used during the study period. Answering affirmatively to any of the following was considered a disabling factor for use of treatment services: current physical or emotional abuse (within past six months), participant feeling unsafe with someone she knows well, or participant feeling afraid of someone with whom she lives or who lives nearby. Having health insurance (public or private) and court-ordered participation in treatment were included as enabling factors. Finally, a perceived unmet need for care by participants was included as a control variable. The unmet need variable was operationalized so that women who responded that services they felt they needed but hadn't received in the past three months – ranging from mental health, substance abuse, or trauma services, to case management services or medical services – were considered in these analyses as having perceived unmet need for care.

The following observations were dropped from all study analyses due to missing data: one due to missing information about race, three due to missing information about education level, three due to missing information about whether treatment was court-ordered, and nineteen due to missing information about perceived need for care, yielding a sample of 2,001 individuals.

Regression analyses

Modeling selection bias and attrition

Given that treatment assignment was not randomized, logistic regression analysis was used to test for selection bias among the study population, in which case certain participant characteristics would make them more or less likely to be in a given treatment group. In addition, to test for attrition bias, logistic regression analyses were conducted to determine whether treatment group assignment or other participant characteristics predicted drop out by six months and drop out by 12 months. In the final analytic sample, black women were statistically significantly more likely to be in the intervention group than White women (OR = 1.653, $p<.001$). Women who were court-ordered to received treatment for at least one of their disorders were also more likely to be in the intervention group than women who were not court-ordered to receive treatment (OR = 1.49, $p<.001$). There was not a statistically significant difference in loss to follow-up by 12 months for women in the intervention group versus the comparison group (OR = 1.20, $p=.077$). There were, however, increased odd of dropping out by 12 months associated with other participant characteristics. Being relatively young, less educated, or African-American was associated with increased odds of dropping out, as was relatively severe PTSD and drug addiction scores. Because these characteristics were associated with increased drop-out, these study results may not be as representative of women with these characteristics as compared to the rest of the women without in the sample. This limitation withstanding, this analytic

sample was used for all analyses because there was not a significant difference in drop-out across study arms, reflecting a good balance in the sample for the primary effect of interest.

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Regression models

Regression models were estimated to assess the effects of baseline symptom severity and baseline service use/cost patterns, respectively, on each of the four outcome domains – outpatient counseling use, residential treatment use, external medical costs, and total costs. A vector of interaction terms for each cluster with the intervention variable was used to estimate the intervention effect across clusters, along with a group of relevant control variables.

The effects of IC across clusters on 12 month outpatient counseling visits and residential treatment days were estimated using zero-inflated negative binomial models because of the count nature of these variables. A two-part model was estimated for external medical costs due to a large proportion of zeros (5.4 percent). A logit model was estimated to predict the probability of having any medical costs, and an Ordinary Least Squares (OLS) regression was modeled to estimate the level of costs for participants who had any. An OLS model was used to estimate the effect of IC versus usual care across clusters on total overall costs.

A series of specification tests were run for all models. For counseling visits and days in residential treatment – the two count-variable outcomes – the variable distributions were assessed according to the dispersion alpha parameter for over-dispersion and the Voung test for zero-inflation to determine whether Poisson, negative binomial or zero-inflated negative binomial models were appropriate. The Wald test was conducted to test hypotheses regarding the value of explanatory-variable constructs. The Ramsey RESET test (Ramsey, 1969) was used to test for non-linear parameter combinations to optimize

functional form in the models with count and continuous variables as outcomes. For both external medical costs and overall costs at 12 months, the Wooldridge test was used to determine whether or not the dependent variables should be log transformed, the Ramsey RESET test was used to check functional form for each model, and the White test was selected to test for heteroskedasticity, or unequal variances, in their respective error terms.

Goodness-of-fit tests (counseling: χ^2 = 278010.6, p<0.00001; residential treatment: χ^2=140561.7, p<0.00001) and large variances indicated that Poisson models were not appropriate for modeling the two count-type outcomes variables, number of counseling visits and days in residential treatment. The Voung test of zero-inflated versus standard negative binomial model confirmed that, due to a large proportion of zeros for counseling visits and residential treatment days (13.29 percent and 48.58 percent, respectively), the zero-inflated negative binomial model was most appropriate for both variables (counseling: z = 10.25, p<0.00001; residential treatment: z = 13.36, p<0.00001).

For outpatient counseling and residential treatment, the results of the Wald test indicated that the coefficients for all study site dummy variables were not equal to zero (counseling: χ^2 = 6.87, p<.05; residential treatment: χ^2 = 326.73, p<.001), indicating that the site variables contributed unique information and should therefore be modeled as separate variables. The same conclusions were made for Wald test results for study site construct for the cost outcomes. For the residential treatment model, results of the Wald test indicated that the hypothesis that all race variables were equal to zero could not be rejected. Based on those results and to save degrees of freedom in the model, the race indicators were excluded. Regression results for residential treatment were similar when the race variables were retained and when they were excluded, so the decision to exclude race variables here did not change the effect estimates. The Ramsey RESET test results suggested that neither model would be improved by adding non-linear parameter combinations.

For the two cost outcomes – external medical costs and total overall costs – results from the Wooldridge test for dependent variable log transformation (Wooldridge, 2003) indicated that log transformations were not necessary in either case upon comparing the pseudo-R-squared statistic for the logged models and the R-squared for the unlogged models, respectively. Ramsey RESET results for both outcome variables did not indicate that inclusion of non-linear parameterizations of independent variables would improve functional form. Results from the White test rejected the null hypothesis that error variances were homoskedastic in the error terms for both external medical costs and total overall costs ($p<.001$ for both), and error terms were corrected for heteroskedasticity.

Differential effects of IC versus usual care were calculated for clusters with significant treatment effects for a representative woman of mean age, 36.67 years old, who had not completed high school, reported having a serious physical illness or disability, was currently at risk for abuse, had some type of medical insurance, no perceived unmet need for care, and was recruited at a study site that provided mental health and substance abuse services in a residential treatment setting.

Latent class analyses

A second approach to estimating sub-group effects of IC on follow-up service use and costs was explored as an accompaniment to cluster analysis. Latent class analysis (LCA) is a statistical method that, like cluster analysis, classifies similar observations into sub-groups (McCutcheon, 1987). Where cluster analysis groups observations according to their measures for a set of observed input variables, latent class analysis estimates two or more treatment effects where the characteristic that splits the sample is latent. Potential advantages of latent class analysis include probabilistic modeling of class membership, a diagnostic statistic for determining the number of clusters, accommodation of non-normal or mixed distributions for input variables, and no need for variable standardization.

Model parameters are generated using maximum likelihood estimation – first, the proportion of cases that fall into *n* latent classes was estimated, and second, the probability of each observed characteristic was estimated for cases within each latent class. I conceived of a two-class latent class structure that reflects a group of women with an unobserved unmet need for IC and a group of women with no unmet need for IC. This expected latent structure was informed by theory and empirical evidence. The Andersen model of health care utilization and Goldberg and Huxley's model of pathways to mental health care in the community identify a set of complex conditions and characteristics that influence the likelihood of someone seeking out, accessing, and receiving care. Those factors range from health system characteristics that enable the access of needed care to socio-economic characteristics that influence a person's efforts and attitudes regarding using services. Complex combinations of these influences on service utilization result in an individual's need for care being met or not.

Existing empirical evidence has demonstrated that people with co-occurring disorders often have a significant unmet need for care (SAMHSA, 2002; Watkins et al., 2001; Harris et al., 2005; Wu et al., 2003). Therefore, the presence or absence of unmet need among WCDVS participants, an arguably unobserved collection and interaction of conditions and characteristics that influence how they use services, is conceived as the two-class underlying construct for the latent class analysis. This construct is similar to those used in existing studies of health services utilization among sub-groups of health services users (Deb and Trivedi, 2002; Deb and Holmes, 2000; Deb and Trivedi, 1997).

The effect of IC was then estimated three ways for each latent class of unobserved need for care among study participants – once generating classes according to baseline symptoms, a second time according to baseline service use patterns, and third time according to both baseline symptoms and service use.

The three separate baseline constructs each provided unique information in generating the classes of participants according to unmet need for care and so were all explored for LCA models. Modeling the underlying structure of unmet need for IC by baseline symptom severity revealed the extent to which symptom severity predicted unmet need for IC and, in turn, how women's unmet need associated with their symptoms moderated the way IC affected their follow-up service use and costs. Applying the service use/cost construct to the assignment of participants to two latent classes based on unmet need for care, on the other hand, demonstrated both the probability of the presence or absence of unmet need in this study population according to their service use patterns, and how IC effects the way they use services at follow-up depending on whether they have unmet need for care. Using both symptom and service use characteristics at baseline to model the presence or absence of unmet need allowed for both a broader association with unmet need and any interaction between symptoms and service use that may have influenced the likelihood of having unmet need for care.

For each baseline construct, I used the same subset of input variables from cluster analysis to model the probabilistic assignment of participants to the two latent classes – 'unmet need' and 'no unmet need'. For the symptom-based latent classes, probabilities of participants being in one of the two latent classes were generated using the alcohol, drug, PTSD, and treatment group assignment variables. For the service-based model, probabilities of latent class membership were estimated according to baseline counseling, psychotropic medication costs, residential treatment days, external medical costs, and the treatment group variable. A third construct was modeled, combining the symptom and service use variables and treatment group variable to generate probabilities of class membership.

The effect of IC on each outcome was then modeled by class and included the covariates described earlier to control confounding bias. For the counseling and residential

treatment outcomes, a negative binomial density was specified to account for the large proportion of zeros in the dependent variables. For external medical costs and total overall costs, the models were estimated assuming that the distributions of the error terms from these outcome variables were normal, as a specification test for log transformation of the dependent variable (Wooldridge, 2003) indicated that the fit of the non-transformed variables were better than the log transformed versions.

Three-class models were also estimated to explore the possibility that an underlying unmet need for IC services might more accurately be modeled as having three levels – low, medium and high levels of unmet need for targeted services. One benefit of latent class analysis is the availability of a diagnostic test statistic to assess goodness of fit in the attempt to identify the correct number of latent classes. The Bayesian Information Criterion (BIC) assesses goodness of fit by identifying the model with the most appropriate number of latent classes. The BIC weighs the predictive power of the number of parameters in the model against the increase in consequent variance that is introduced along with the parameters. The value of the BIC statistic increases along with unexplained variance in the dependent variable and the number of predictor variables included in the model. When comparing goodness of fit across two models a lower BIC value indicates better fit.

Ultimately, only two-class models would converge for each of the four outcomes. It was possible to estimate models with more than two classes, but only when all covariates were excluded. Models without covariates yielded biased results, as important confounders of the effect of IC were not accounted for. Furthermore, no comparison of results could have been made between LCA models without covariates and cluster analysis regression models with covariates. Therefore, I was unable to compare the two-class model to models with three or more latent classes of unmet need for IC (e.g., low, medium, high unmet need) to assess which model structure provided the best fit for the data.

Statistical programming

All statistical programming for these study analyses were conducted using Stata® 10 (StataCorp LP, College Station TX) and SAS® 9.1 (SAS Institute, Inc., Cary NC).

CHAPTER 6

RESULTS

Of the 2,026 women who completed 12-month interviews, 2,001 were included in the final analytic sample. **Table 2** includes demographic and other relevant information for the analytic sample and according to study group. Baseline values for the symptom severity and service use clustering domains are presented in **Tables 3** and **4**.

Cluster analysis results

Cluster analysis: symptom severity profiles

The WCDVS participants were characterized according to seven distinct symptom severity profiles (**Table 5**). Each cluster was described based on relative symptoms with other clusters and assigned a label for the sake of brevity. Approximately 17 percent of participants had relatively low symptoms on substance abuse and mental health dimensions at baseline (C1-Sx). About 21 percent experienced moderate-severe PTSD, but low alcohol and drug addiction symptoms (C2-Sx). Nearly 18 percent of participating women had moderate-severe PTSD and relatively high drug addiction symptoms (C3-Sx), while 11 percent of women reported moderate-to-severe PTSD and severe drug addiction symptoms (C4-Sx). About 8.5 percent of women had high severity symptoms across all three dimensions, particularly alcohol and drugs (C5-Sx), and another 10 percent of women had relatively high alcohol severity accompanied by moderate drug and PTSD (C6-Sx). A final group of women (C7-Sx) were characterized by extremely high alcohol severity, high drug severity, and moderate-to-severe PTSD. Across all symptom severity clusters, drug

addiction severity scores were relatively low as compared to alcohol addiction and PTSD scores and displayed less variation.

Cluster analysis: service use profiles

Five distinct service use/cost patterns emerged among participants at baseline (**Table 6**). Thirty-nine percent of participants had low usage for group or individual outpatient counseling and days in residential treatment, as well as low costs associated with psychotropic medication use and external medical services in the three months prior to baseline (C1-Serv). Sixteen percent of participants were low users of counseling services, but fairly high users of residential treatment (C2-Serv). Approximately 12 percent reported using high levels of counseling and low use of residential treatment, with average costs for psychotropic medication and external medical services (C3-Serv). Another 13 percent of women in the study were characterized as being very high users of residential treatment, with above average costs for medication and external medical services (C4-Serv). Finally, almost 20 percent of participants had high costs for psychotropic medication and external medical services, along with average use of counseling and low use of residential treatment (C5-Serv).

The distribution of study participants in the final analytic sample across baseline symptom and service clusters demonstrates that the two clustering constructs did, indeed, comprise unique groups of women (**Table 7**). Relatively large proportions of women who were in the service cluster characterized by low-intensity service use (C1-Serv) were also in the low-severity symptom cluster (C1-Sx) (22.14 percent), the sub-group of women marked by moderate-to-severe PTSD (C2-Sx) (22.65 percent), and the sub-group of women with moderate drug addiction and severe PTSD (17.37 percent). Overall, however, the participants were well distributed across symptom and service clusters, resulting in unique sub-groups of study participants across the two clustering constructs.

Regression analysis results

There were significant effects of IC as compared to usual care on service outcomes for several symptom and service clusters (**Tables 8** and **9**).

Outpatient counseling

By the 12 month follow-up, there were no statistically significant differences in outpatient counseling visits among women in the IC group as compared to women in usual care group. Further, when considering only the main effect of cluster membership, there were no significant differences in counseling use across women in the different symptom and service sub-groups.

Among women with low alcohol and drug addiction symptoms and moderate-to-severe PTSD at baseline (C2-Sx), however, those in the IC group had statistically significantly fewer outpatient individual or group counseling visits than women in this cluster who received usual care (**Table 10**). A representative woman in sub-group C2-Sx who was in the IC treatment group would have a predicted 27.38 fewer counseling visits during the year than her counterpart in the usual care group. The predicted number of counseling visits over 12 months for a representative woman who characterized by moderate-to-severe PTSD at baseline was 77.83. A woman in the same sub-group with equivalent characteristics but who was instead in the usual care group would have a predicted 105.21 counseling visits by 12 months.

Certain model covariates had significant effects on counseling use, as well. Women who were court-ordered to engage in treatment had significantly more counseling visits than women who were not. On the other hand, being Black or other race, and either not finishing high school or having at least some college were associated with lower use of counseling at follow-up than being White or having a high school education.

Residential treatment use

There were no statistically significant differences in the number of residential treatment days used by 12 months between symptom clusters or between service clusters when not accounting for the effect of treatment group assignment. For both the symptom and service cluster constructs, on the other hand, women in the IC treatment group across clusters had significantly more residential treatment days by 12 months than women in the usual care group (**Table 11**).

There were significant differences in residential treatment use across study groups among women who had low-severity symptoms at baseline (C1-Sx). Women in this sub-group who were in the IC group had significantly more residential treatment days at follow-up as compared to their counterparts who were in the usual care group. A representative woman in C1-Sx who was in IC had a predicted 125.37 days of residential treatment at follow-up as compared to 92.56 days if she were in the usual care group.

Unique effects of IC were also detected for three service use/cost sub-groups. Among women characterized as low-intensity service users at baseline, a representative woman C1-Serv who was in IC had a predicted 105.87 days of residential treatment at follow-up as compared to 82.53 days if she were in the usual care group. Among women in the sub-group characterized by a high level of counseling use at baseline (C3-Serv), those in the intervention group used fewer days of residential treatment at follow-up as compared to women in the usual care group. For a representative woman in the C3-Serv sub-group, being in the IC group was associated with having a predicted 9.2 fewer days in residential treatment than the counterfactual condition of this woman being in the usual care group. The predicted number of days spent in residential treatment for a representative woman in this cluster (C3-Serv) who was in the IC group was 83.45 as compared to 92.65 days for a woman with the same characteristics in the usual care group.

A similar significant effect of IC on follow-up residential treatment use was also found among women in the sub-group of high-intensity residential treatment users at baseline (C4-

Serv). A representative woman in sub-group C4-Serv who was also in the IC treatment group had a predicted 8.16 fewer days in residential treatment than her counterpart in the usual care group. The average woman in this sub-group of high-intensity residential treatment users at baseline who was in the IC group had a predicted 108.01 days in residential treatment at 12 months as compared to 116.17 days if in the usual care group. Having some college education was associated with having spent fewer days in residential treatment at 12 months than having only completed high school.

External medical costs

There were several unique effects for IC and symptom sub-groups on 12-month external medical costs (**Table 12**). There was no significant difference across symptom clusters in the probability of having any medical costs when holding treatment group assignment constant. Conversely, when holding sub-group effects constant, the odds of having any medical costs was over three times higher (OR = 3.32, $p<.05$) for women in the IC study group in all clusters as compared to women in the usual care group. Women in the moderate-to-severe PTSD sub-group who were in IC had significantly lower odds (OR = .214, SE = 0.909) of having any medical costs compared to women in this sub-group who were in the usual care group.

The level of external medical costs was also predicted by symptom-cluster membership (**Table 12**), indicating substantial differences in costs predicted by baseline symptoms. Integrated counseling appeared to lower medical costs for two symptom sub-groups. Women with high drug addiction and PTSD at baseline (C4-Sx) and women with severe alcohol addiction at baseline (C6-Sx) who were in the IC group both had relatively low medical costs as compared to women in the same respective sub-groups who were instead in the usual care group. Among women who had any medical costs at 12 months,

those in these two high-severity clusters (C4-Sx and C6-Sx) who were in the IC treatment group had significantly lower medical costs than their counterparts in the usual care group.

Accounting for both the probability of having any external medical costs and the level of costs, a representative woman in the low-severity symptom group (C1-Sx) had $1,554 more in external medical costs at follow-up than if in the IC group as compared to the usual care group. A representative woman characterized by moderate-to-severe PTSD and severe drug addiction at baseline (C4-Sx) had $5,863 less in external medical costs if in the IC group as compared to the usual care group. A representative woman who was characterized by severe alcohol addiction at baseline had $5,938 less in external medical costs if in the IC group versus the usual care group.

In the symptom-cluster model, Black women were less likely to have any external medical costs at follow-up than White women. Also, among women with any external medical costs, women with high drug addiction and PTSD severity at baseline (C4-Sx), as well as women with high alcohol addiction severity at baseline (C6-Sx) had significantly lower costs for external medical care than women in the low-symptom group. Having a serious illness or disability and having insurance were both associated with having higher medical costs than not having an illness/disability or not having insurance.

There were no statistically significant differences in the effect of IC across service clusters on external medical costs (**Table 13**). There were, however, overall differences in the level of medical costs across clusters. Among women who had any medical costs, women who were characterized as high-intensity residential treatment users at baseline (C4-Serv), regardless of treatment group assignment, had significantly lower medical costs at 12 months than women in the low-intensity services use baseline sub-group (β = -2,310.56, SE = 1,156.288), possibly indicating that residential treatment substituted for external medical care to a certain extent. Women who were in the baseline sub-group marked by high psychotropic medication costs and high external medical costs (C5-Serv),

on the other hand, had significantly higher external medical costs at 12 months than women who were low-intensity service users at baseline.

Two covariates also had effects on the probability and level of external medical costs. Women who reported having a serious illness or physical disability had almost four times the odds of having any external medical costs in the service-cluster model as compared to women without illness or disability, as well as a relatively high level of costs among those women who had any. Women who reported being court-ordered to undergo treatment had about half the odds of having any medical costs as compared to women who were not court-ordered to treatment.

Total overall costs

Several symptom and service clusters had significant effects on overall total costs at 12 months, but only when controlling for the effect of treatment group assignment. Women in sub-groups characterized by high-severity substance abuse and/or high PTSD – including the high drug and PTSD cluster (C4-Sx), the high alcohol addiction cluster (C6-Sx), and the high drug and alcohol addiction cluster (C7-Sx) – had significantly higher overall costs than women in the low symptom group (**Table 14**). Similarly, women in the four service clusters characterized by various elevated levels of service use and/or costs at baseline (C2-Serv, C3-Serv, C4-Serv, and C5-Serv) all had significantly higher overall costs compared to women in the low-intensity service use group when not accounting for the effect of treatment group assignment.

Only one symptom sub-group demonstrated a significant IC effect on total overall costs when also accounting for treatment group assignment. Women in the high alcohol-addiction-severity baseline cluster (C6-Sx) who were in the IC study group had lower overall costs at 12 months than women in this sub-group who were in the usual care group (β=-12,882.55, SE = 6,060.984) (**Table 14**). A representative woman with severe alcohol

addiction at baseline who was in the IC group had predicted overall costs of $49,861. The same woman in the usual care group had predicted overall costs of $56,645. Similar to external medical costs, having a serious illness or disability was associated with higher overall costs than not having an illness/disability in both the symptom cluster and service cluster models. In addition, both models also indicated that women who reported being currently at risk for abuse or having been court-ordered to engage in treatment had significantly higher overall costs than women who were not at risk for abuse and women who were not court-ordered to treatment.

Latent class analysis results

The two-class models for latent effects of IC on outcome service use and costs generated similar results across all three approaches to modeling the probability of latent class membership – one classifying the presence or absence of unmet need for care based on treatment group assignment and baseline symptom severity, a second based on treatment group assignment and baseline service use patterns, and a third based on treatment group assignment, symptoms and service use. Given similar magnitude and statistical significance of effects across the three modeling approaches, only results from models using treatment group assignment, baseline symptoms, and baseline service use are presented in accompanying tables. There were significant effects of IC versus usual care on two service outcomes (**Table 15**).

The two-class models for latent effects of IC on outpatient counseling indicated that there were no significantly different effects among participants with an unobserved unmet need for IC treatment as compared to women with no unmet need for IC (**Table 16**). There were significant effects on outcome counseling use for other participant characteristics. Among women with no unmet need for IC, Black women had used significantly less outpatient counseling than women who were White. Also among women

with no unmet need for IC, women who were court-ordered to undergo treatment used significantly more outpatient counseling than women who were not under court-order.

There were significant differences in the extent to which IC affected use of residential substance abuse treatment at follow-up depending on the presence or absence of unmet need for targeted IC services. When the presence or absence of unmet need was modeled according to treatment group and symptom severity, among women in the class with unmet need for IC, those in the IC study group used significantly more days of residential treatment by 12 months than women in the usual care group IC ($\beta = 0.196$, $p<.001$). Women with unmet need who were in the IC group had a predicted average of 106.50 (SD = 100.24) days in residential treatment at 12 months as compared to 86.95 (SD = 77.25) days among women with unmet need who were in the usual care group.

When the latent classes generated according to unmet need for IC were determined by treatment group and baseline service use patterns, the model for residential substance abuse treatment also indicated distinct effects of IC for women with an unmet need for targeted intervention services. The sub-group of women with unmet need who were in the IC group spent a statistically significantly greater number of days in residential treatment than women with unmet need who were in the comparison group ($\beta = 0.189$, $p<.001$). The predicted number of days spent in residential treatment over 12 months' follow up was 119.82 days (SD = 91.63) among those women in the IC group versus 93.12 days (SD = 71.91) among women in the comparison group.

Models that used both baseline symptoms and service use to estimate the probability of having an unmet need for care produced similar results for the effect of IC on residential treatment use at follow-up. Women in the IC group who had unmet need for care spent more days in residential treatment than women in the comparison group who had unmet need for care ($\beta = 0.190$, $p<.001$), and the predicted number of days of treatment was 119.33 (SD = 90.72) and 94.85 (SD = 71.30), respectively (**Table 17**).

For external medical costs, there were no statistically significant differences in IC effect between women in the unmet need sub-group and women in the sub-group without any unmet need for IC when the latent classes were estimated according to treatment group assignment and baseline symptom severity. There were, however, significant differences in IC effects on external medical costs when the latent classes were generated according to treatment group assignment and service use patterns at baseline. Among women with no unmet need for IC services, women in the IC group had higher expenditures for medical care at 12 months than women in the usual care group ($\beta = 302.56$, $p<.05$). Furthermore, having a physical illness or disability and having some type of medical insurance had positive effects on follow-up external medical expenditures for women with no unmet need, but did not have significant effects for the class of women who had unmet need for IC.

Similar effects of IC on external medical costs were estimated for classes based on treatment assignment, symptoms and service use. Among women who did not have an unmet need for IC, those in the IC group had higher expenditures at follow-up than women in the usual care group ($\beta = 282.80$, $p<.05$) (**Table 18**). Among women with no unmet need for IC, relatively higher levels of psychotropic medication costs and residential treatment use were associated with modest increases in external medical costs at 12 months' follow-up. Also among women with no unmet need for IC, having a serious illness or disability and having medical insurance were both associated with higher medical costs than women without illness or insurance.

The two-class models for latent effects of IC on total overall costs indicated that there were no significantly different effects among participants with an unobserved unmet need for IC treatment as compared to women with no unmet need, across each of the three classifying approaches (**Table 19**). There was, however, a significant positive association between drug addiction severity scores and overall costs at 12 months among women who had no unmet need for IC. Among women who had an unmet need for IC, women in the

Other race category and women who had less than a high school education had lower overall costs than White women and women who had completed high school.

CHAPTER 6

DISCUSSION

Existing evidence suggests that, on average, IC is more effective for improving clinical functioning than usual care without a significant increase in costs (Cocozza et al., 2005; Morrissey et al., 2005a; Morrissey et al., 2005b; Domino et al., 2005a; Domino et al., 2005b). However, estimates of the average effect of IC mask important variations in symptom severity and service use and cost patterns among people who engage in IC that can influence the intervention's effectiveness. The present analyses added important evidence by uncovering heterogeneous effects of integrated counseling among different types of women who participated in WCDVS. The clustering methods used here generated two sets of parsimonious, data-driven sub-groups – one by baseline symptom severity and another by baseline service utilization patterns. Each approach to categorization provided important unique information about how IC works differently for different sub-populations. Sub-groups were also generated using latent class analysis as a comparative approach and as a means for assessing the effects of limitations of cluster analysis limitations on these analyses.

While the study results indicate that the majority of women in the analytic sample had similar outcomes for service use and costs, there is evidence that there were, indeed, significant differences in the effect of IC on outcome service use and costs for certain sub-groups of women in the study population. This evidence about heterogeneous effects of IC provides important information for clinical practice, program design and delivery, and policy. By understanding how IC works in different sub-populations, this intervention can be

optimally targeted to women for whom it works best, and continued/new efforts can be made to help women for whom IC is not as effective.

Women who were characterized as having low symptom severity at baseline and who were in the IC group appeared to have used services inefficiently, as they had relatively high levels of residential treatment use and external medical costs as compared to their counterparts in the usual care group. Cusack and colleagues' sub-group analysis found no change in clinical symptoms among women with low symptom severity at baseline, though their cluster assignments were not exactly the same as those generated in these analyses. Nevertheless, the two separate study findings for the effect of IC among women with low symptom severity may indicate that, on average, women with this symptom profile were not using services efficiently upon receiving IC. Joint analyses of clinical and service outcomes among women with low baseline symptom severity would be useful to learn more about the efficiency of their service use.

Women in the moderate-to-severe PTSD group who were in IC also appeared to use services inefficiently at follow-up. They may have underutilized IC counseling services after initiating participation in the intervention considering that they used counseling less intensively than their counterparts in the usual care group and this counseling was the primary service of the intervention. Isolating this effect in this particular symptom sub-group suggests not that integrated counseling does not work for them, but that they are underutilizing the intervention services. This may indicate that more intensive and sustained outreach is needed for women whose predominant symptom is moderate-to-severe PTSD to encourage them to fully engage in IC services in the hopes of improving their clinical outcomes and other areas of functioning.

Less clear are the implications of women in the moderate-to-severe PTSD group who were in IC being less likely to have any external medical costs than women with moderate-to-severe PTSD who were in the usual care group. It is possible that a lower

likelihood among these women of having any external medical costs indicated that they were substituting the use of more appropriate services that were intended to treat their particular complex set of disorders (e.g., peer support, case management) for use of crisis or medical services (e.g., hospital stays, ER visits), thereby reducing the costs associated with their care.

More likely, arguably, is that women with moderate-to-severe PTSD were generally underutilizing services, given that they used relatively little counseling and that they were relatively likely to have no medical costs at all. This implies that IC outreach efforts may need to more effectively target women who suffer predominantly from moderate-to-severe PTSD and who are not yet engaged in IC. Among women with this disorder profile who have already initiated IC, on the other hand, these results suggest that more intensive case management could help ensure that they maintain consistent and sustained use of IC services, and thereby increase their chances of achieving improved outcomes. It is also important to note that outreach and case management may need to be intensified for Black women in this population, as well. They, like women whose predominant symptom was moderate-to-severe PTSD, used counseling services less intensively than White women and were less likely to have any external medical costs.

A promising result of these analyses was evidence of relatively lower medical costs among women with high-severity drug addiction and moderate-to-severe PTSD who were in the IC group as compared to the same women in the usual care group. Here, too, the relative reduction in medical costs may indicate that these women reduced their use of inappropriate or sub-optimal services for treating their disorders (e.g., hospital stays, ER visits). This interpretation of the effect of IC among this sub-group of women is supported by evidence from the sub-group analyses by Cusack and colleagues that found significant improvements in PTSD symptoms associated with the intervention among women with co-morbid substance abuse and PTSD as the predominating symptoms at baseline. However,

without direct connections between medical costs and clinical symptoms among this particular analytic sub-group of women, it is not possible to impose a value judgment on the change in medical costs. With that in mind, clinical improvements among these women could potentially accompany reductions in costs if they were encouraged to participate more intensively in outpatient counseling and other targeted IC services.

The trend of lower costs after IC was even more pronounced among women who were in the high alcohol severity group at baseline, as women in this sub-group in IC had relatively low medical and overall costs as compared to women in the same symptom sub-group who were in the usual care group. This may also reflect their having shifted away from use of potentially inappropriate, resource-intensive services, and instead having substituted them with targeted IC service, particularly in light of the findings by Cusack and colleagues. However here, too, it is not possible to draw absolute conclusions about the benefit of the reduction in costs without coincident improvements in clinical symptoms for this specific analytic sample. Significantly higher overall costs among women on this sub-group who reported that they were currently in an abusive situation than those who were not may be an important indication that IC is not fully effective in terms of cost reduction for women who are being abused while engaged in treatment. For this reason and in the interest of overall welfare, IC treatment for women currently in abusive situations should include special measures to address acute needs to assure victims' safety and achieve stability.

The integrated counseling intervention appeared to be particularly effective in its effect on use of residential substance abuse treatment for certain sub-groups of participants. Women who were low-intensity services users and in IC used more residential treatment at follow-up than their counterparts in the usual care group. This may indicate that these women in the IC group were using residential treatment more efficiently after engaging in the intervention if they, in fact, had been underutilizing the service previously.

Integrated counseling also reducing use of residential substance abuse treatment among the sub-group of women who reported using residential treatment intensively at baseline as compared to women with the same baseline service characteristic who were received usual care. While a definitive conclusion about the appropriateness of reductions in use of residential treatment among women who were heavy users of residential treatment is not evident, their decrease in use of residential treatment is likely a positive effect of IC. Residential treatment, while at times necessary, is highly resource intensive (Dickey and Azeni, 1996; Barnett and Swindle, 1997; Roebuck et al., 2003) and interrupts women's lives and roles in their communities. Use of targeted outpatient services to control substance abuse symptoms is arguably much better for the women and for cost savings than residential treatment.

Another promising result of these analyses is the effect of IC for the sub-group of women who were high-intensity users of counseling at baseline. These women used fewer days of residential treatment at follow-up as compared high-intensity counseling users who received usual care. Here, too, the implication is that women substituted targeted, less intensive services for residential treatment. The benefits of this effect extend beyond the reduced use of a resource-intensive service and clinical improvements for these women. Fewer days spent in residential treatment for these women translates to more days spent in the community and fewer interruptions in their fundamental roles as parents, participants in the workforce, and other positive, meaningful activities.

The results from the LCA models supported the results from cluster-approach models for two outcomes, residential treatment and external medical costs, but generated null results for counseling and overall costs. For the sake of parsimony and ease of interpretation, the LCA model results in which both baseline symptoms and service use were used to estimate the probability of having an unmet need for care are discussed here.

Similar conclusions can be drawn from the LCA and cluster models for the effect of IC on outcome residential treatment use. Among women in IC, those with an unobserved unmet need for care (i.e., women in the low-intensity service use cluster at baseline) used more residential treatment at follow-up than women with no unmet need for care (i.e., women in the high-intensity residential treatment use cluster at baseline). The LCA model and cluster models both demonstrated that similar types of women had relatively low external medical costs. The LCA model characterized these women as having an unobserved unmet need for care, while according to the cluster analysis models, these women were characterized as having high severity symptoms – either moderate-to-high PTSD severity, high drug and moderate-to-severe PTSD severity, or high alcohol severity.

The LCA model results for outpatient counseling and total overall costs differed from the cluster model results, as the LCA models for both of these outcomes did not demonstrate significant effects for either latent class. The differences in results between the cluster approach and the LCA approach likely reflect different sub-groups of women in the respective models' clusters and latent classes, for each of whom IC had unique effects on the outcomes. It is also possible that if LCA models with three or more classes could have been estimated, they would have been more comparable to the sub-groups generated using cluster analysis and may have produced IC effects that were consistent with the cluster models.

Strengths and limitations

There are many important strengths of the study design and analyses conducted for this dissertation. A primary strength of this dissertation is the identification of heterogeneous effects of the IC intervention within a larger population of women with co-occurring disorders and histories of abuse. The assumption of a homogeneous treatment response is often unreasonable without empirical evidence to support it (Manski, 2001). Therefore, differential

treatment response should be estimated in an effort to work toward maximizing the benefits of treatment for women in this larger population. Both average effects of IC within the population and sub-group effects of IC according to defining characteristics can help policymakers understand how IC works in the population at large, as well as for whom specifically it is most and least effective.

The intent-to-treat analytic approach used in this study generated results that reflect how IC actually worked in this population versus how IC could potentially work if all study design conditions were fulfilled. Therefore, the intent-to-treat approach provided a more realistic picture of how effective IC was in its real-world application. This approach gives care providers, outreach coordinators, and policymakers important information that can help them optimize the access, delivery, and effectiveness of services for women with co-occurring disorders and histories of abuse.

Another important strength is this study's contribution to improving the categorization of people with co-occurring disorders, particularly women in this study population, in an effort to identify sub-groups in as representative and meaningful a way as possible. I employed cluster analytic methods to derive distinct sub-groups and build on the existing quadrant model. The quadrant model divides people into four symmetrical categories, which is likely not representative of the way complex symptoms actually manifest. Cluster analysis also improves upon the quadrant model by accounting for possible PTSD, thereby generating clusters based on multiple dimensions and accommodating complex combinations and interactions of symptoms. The more accurately we can identify sub-groups of people with complex disorders, the more likely we are to understand how treatment works for them in hopes of improving their symptoms and the quality of their lives.

The clustering methodology used here also added to the strength of the study. Having used a combination of multi-step cluster methods improved the accuracy of identifying the number of distinct clusters and the assignment of data points to those

clusters as compared to using a single method. Having conducted several iterations of cluster analyses, specification tests and sensitivity analyses added important support for final clustering solutions that were used. In addition, evaluating sub-group effects of IC using LCA in addition to cluster analysis provided important support to the robustness of our evidence regarding how IC changed outcome service use and costs differentially for certain sub-groups of study participants.

There are several limitations to this study that are important to consider. First, a quasi-experimental study design can introduce biases, e.g., unbalanced treatment groups and differential attrition. In the case of WCDVS, it would have been near impossible to achieve the benefits of random assignment, as the intervention condition would almost certainly carry over into services provided to control group participants within the same agencies. Also, care providers expressed ethical concern about withholding trauma-informed elements of care from any participants (McHugo et al., 2005).

The quasi-experimental study design generated intervention and comparison groups that were not perfectly balanced, as White women, Black women, and women court-ordered to receive treatment were more likely to be in the integrated counseling group than the comparison group. Also, there was differential attrition at 12 months based on age, race, education level, and symptom severity; however, there was no differential attrition between the IC and comparison groups. The benefit of non-random recruitment is that the study groups it generated were more representative of women who, in the real world, may migrate to targeted IC services and others who remain in settings where they receive usual care.

Secondly, making the assumption that treatment assignment was the equivalent of treatment receipt may have biased results if participants in the control group were actually receiving IC-type services. However, this would attenuate the effect, biasing the estimate downwards. In this case, estimates would then be too conservative versus overstated.

There are strengths to be gleaned from the limitations of the quasi-experimental design. By understanding its inherent limits for making counterfactual inferences about treatment effect, as discussed above, one can avoid common pitfalls in the assumptions one makes about experimental study results. Common assumptions made about studies using random assignment include expectations that the study sample is representative of the larger population to which the investigator hopes to generalize his results; that there is perfect, or at least equal, compliance in all study arms; that the absence of circumstances in the social context in the experimental setting will extend to the natural setting if the program is implemented on a large scale; and that there is no variation in treatment across the study population (Manski 1996, Manski 2000). These conditions seldom exist in a real-world setting, and have been acknowledged here in interpreting the results. Furthermore, the sub-group analysis presented in this dissertation avoids and disproves the assumption that the average treatment effect is the same for all people within the study population, an arguably important contribution to the understanding of how IC works in this population of people.

Thirdly, an important limitation of cluster analysis is that there is no definitive way to ascertain the true number of clusters that exist in the data. Instead, this step in the clustering process depends on the judgment of the investigator. This shortcoming of the method was mitigated by use of specification tests, as well as several other analytic tools for assessing the sensitivity of the cluster results. This included conducting several iterations of the clustering process using different variable scaling approaches, re-generating effect estimates after combining similar clusters to detect any differences in the effect of IC on sub-groups of study participants, and using LCA as a comparative methodological approach to identifying sub-groups in this study population. Also, one of the assumptions of cluster analysis is that the input variables have normal or Gaussian distributions. Considering that the variables used for clustering in this study had non-normal distributions, the violation of that assumption could have biased effect estimates. The use of LCA as a comparative

approach to generating sub-groups of women in this population provides a means for assessing consistency of results, and thereby mitigates the potential concern of non-normal clustering variables to some extent.

Fourth, there were limitations in the modeling of LCA for this dissertation. Firstly, the finite mixture modeling function in Stata® v10 software does not support zero-inflated negative binomial distributions, and so a negative binomial distribution was estimated instead for counseling and residential treatment outcomes. The large proportion of zeros for each of these outcome variables was therefore not accounted for in the model. In addition, models with more than two latent classes would not converge, and so it was not possible to compare the goodness of fit of two-class models with multi-class models. It was beyond the scope and resources of this study to use specialized software for latent class analyses, however, additional work on latent class models using specialized software would be a useful contribution to future analyses of the heterogeneous effects of integrated counseling.

Finally, another limitation of the study analyses is the possibility that endogeneity bias was introduced in the study models by the explanatory variable indicating whether participants had any insurance versus none. This variable would be endogenous if it not only predicted a given outcome variable, but if the outcome variable also predicted whether or not a participant had insurance. That circular causality, if present, would bias effect estimates. The risk of endogeneity seems most likely in the case of residential substance abuse treatment, as use of the service may be contingent on having insurance due to the high cost.

Endogeneity bias due to the insurance variable is arguably not present in these analyses for two reasons. Model estimates of the effect of IC on outcomes were not significantly different when re-run without a control for insurance status. While this study sample comprised a variety of women for whom IC may have worked differently, it also was relatively homogeneous, in a broader sense, in its being a unique sub-set of people with co-

occurring disorders who had many shared circumstances affecting their access and use of medical insurance. This aspect of the data likely minimized any endogenous effect of insurance status. Also, the presence of a covariate for the presence of serious physical illness or disability is an exogenous variable that is likely accounting for some of the unique effect of insurance status.

Future research opportunities

Future analyses would continue to build our understanding of how and why some sub-groups of women participating in WCDVS responded better to IC than others. For example, it would be helpful to look more closely at social functioning and supports, predisposing and enabling factors associated with their use of services, and perceived need for care among women for whom IC was relatively ineffective to identify potential barriers to their using and benefiting from services that are intended for their unique needs. An example of two important social factors to consider that may have inhibited some women's engagement in IC treatment are homelessness and whether they were residing in domestic abuse shelters during the study period. Possible analyses to explore these associations include clustering women according to these baseline characteristics to estimate differential treatment effect.

In addition, further analyses should be conducted to understand more about changes in service use and costs after receiving IC among women in the high baseline drug/moderate-to-severe PTSD cluster and women in the high baseline alcohol cluster. This would provide more insight into their relatively large reductions in external medical costs and overall costs, and how it coincided with their use of IC services other than outpatient counseling. This could include modeling the effect of IC on follow-up use of inpatient counseling, peer support services, and case management among these sub-groups of women.

Another potential set of analyses would be to understand more about the sub-groups of women identified in this study who responded well to IC. Specifically, among women for whom IC was relatively effective, it would be interesting to analyze additional outcomes to determine if/how IC improved other aspects of their lives (e.g., labor force participation, improved housing situation, use of domestic violence shelters) in addition to their clinical symptoms and service use and costs.

Implications for practice, policy, and research

The findings presented here provide important information for both practitioners and policy-makers. Several types of practitioners – including medical, mental health, substance abuse treatment providers – can quite easily identify women who use high levels of counseling for co-occurring disorders, a sub-population for whom IC was particularly effective, and encourage them strongly to engage in IC treatment. Identifying women by asking them about their service use is much more practically feasible than assessing several complex dimensions of symptom severity, particularly for practitioners without the diagnostic skills and resources necessary to conduct symptom assessments. So, this new evidence presented here creates a particularly good opportunity for care providers to find the women for whom IC works well.

These results also suggest that professionals involved in the planning, delivery, and administration of integrated counseling may need to improve outreach and case management for women in this population who suffer predominantly from moderate-to-severe PTSD, and encourage them to use IC-specific counseling more intensively in an effort to improve their clinical functioning.

Finally, alternatives should be explored and evaluated for women in this population with low-level baseline symptoms, as they had higher levels of service use and costs at follow up then several other sub-groups and therefore may be using services inefficiently. It

is important to understand why these women continue to have relatively high levels of utilization of inpatient hospital stays, ED visits, and outpatient medical care even though they are engaged in targeted IC services. Additional resources should be dedicated to developing and evaluating interventions that are cost-effective for women with this symptom profile to optimize their use of effective, efficient services and reduce their use of medical care.

This study provides important information about how effective IC is for different sub-populations of women with co-occurring disorders and histories of abuse. The evidence presented here reveals for whom the intervention appears to be most effective, and for whom treatment effectiveness could still be improved. By responding to the unique needs of sub-groups of women in this population, we can reduce their inappropriate use of resource-intensive medical services and increase their use of targeted, integrated care in an effort to improve clinical functioning, enhance quality of life, and achieve a more efficient expenditure of constrained public resources.

Tables

Table 1. Dependent variables: Service use and costs

Variables	Measure(s)	Proposed Operationalization
(V1) Outpatient counseling use - *Individual and/or group counseling*	Number of visits	*Total number of counseling visits aggregated across 12 months of follow up*
(V2) Residential treatment use	Number of days	*Sum of days used across 12 months of follow up*
(V3) External medical costs - *Outpatient medical visits* - *Hospital days* - *ER visits*	Total cost per service	*Sum of number of days/visits x average cost per service, aggregated across 12 months of follow up*
(V4) Total costs	Total cost of all types of services reported	*Sum of number of days/visits x average cost per service, aggregated across 12 months of follow up*

Table 2. Baseline Sample Characteristics by Intervention/Comparison Group

	Overall study sample (N = 2,001)	Intervention Sites (N = 999)	Comparison Sites (1,002)
Age	36.7	36.6	36.7
Race			
White	56.8%	54.2%*	59.4%
African American	27.1%	31.9%**	22.3%
Hispanic	17.2%	16.6%	17.9%
Other	18.3%	17.4%	19.3%
Education – mean # years	11.6	11.5	11.7
Physical illness or disability	50.9%	50.0%	51.9%
Currently at risk for abuse	71.9%	73.4%	70.4%
Any health insurance	69.9%	69.7%	70.0%
Court-ordered treatment	33.8%	37.9%**	29.7%
Perceived unmet need for care	43.5%	41.9%	45.1%

Z-score probabilities for intervention versus comparison group calculated for each variable using logistic regression;
* significant at 5% level; ** significant at 1% level

Table 3. Baseline mean values (SD) for symptom severity clustering variables

	Rescaled values (0 – 100)			**Raw scale values**		
Variable	*Mean*	*SD*		*Mean*	*SD*	*Range*
Addiction Severity Index - Alcohol	20.18	03.19		0.20	0.30	0 – 1
Addiction Severity Index - Drugs	16.90	15.59		0.17	0.16	0 – 0.70
Post-traumatic Symptom Scale	46.17	22.89		23.94	11.77	0 - 51

n = 2,729

Table 4. Baseline mean values (SD) for service use/cost clustering variables

	Percent with any use/costs	**Rescaled values (0 – 100)**			**Raw scale values**	
Variable		*Mean*	*SD*		*Mean*	*SD*
Outpatient counseling visits	65.22%	8.62	12.73		20.18	29.78
Psychotropic medication costs	62.77%	15.57	16.33		361.90	379.65
Residential Tx days	52.42%	15.55	22.54		18.66	27.05
External medical costs	75.26%	1.99	5.56		3,173.75	8880.30

n = 2,729

Table 5. Symptom clusters: baseline mean values (SD) for input variables

Cluster →	**C1-Sx**	**C2-Sx**	**C3-Sx**	**C4-Sx**	**C5-Sx**	**C6-Sx**	**C7-Sx**
N	*368*	*431*	*355*	*222*	*164*	*201*	*260*
Addiction Severity Index - Alcohol	1.81	1.60	1.52	5.11	40.39	41.61	83.85
Addiction Severity Index - Drugs	10.79	8.03	13.37	38.09	15.84	12.28	26.78
Post-traumatic Symptom Scale	16.11	43.15	73.01	46.34	72.16	31.75	51.72

n = 2,001

Table 6. Service use/cost clusters: baseline mean values (SD) for input variables

Cluster →	**C1-Serv**	**C2-Serv**	**C3-Serv**	**C4-Serv**	**C5-Serv**
N	*777*	*314*	*246*	*250*	*414*
Counseling visits	4.68	2.50	33.80	6.00	9.56
Psychotropic medication costs	8.21	6.28	11.75	15.55	40.03
Residential Tx days	3.02	27.32	4.94	69.68	5.19
External medical costs	1.34	1.59	1.25	1.89	3.61

n = 2,001

Table 7. Distribution of participants (n) across symptom and service clusters

	C1-Serv	C2-Serv	C3-Serv	C4-Serv	C5-Serv	Total
C1-Sx	172	70	46	45	35	*368*
C2-Sx	176	42	69	49	95	*431*
C3-Sx	135	28	46	22	124	*355*
C4-Sx	65	62	15	37	43	*222*
C5-Sx	58	16	22	22	46	*164*
C6-Sx	88	36	30	23	24	*201*
C7-Sx	83	60	18	52	47	*260*
Total	*777*	*314*	*246*	*250*	*414*	*2,001*

n = 2,001; χ^2 = 192.166, p<.001

Table 8. Summary of significant effects (95% confidence intervals) for IC v. usual care: symptom cluster regression models[a]

	Outpatient counseling[b]	Residential treatment[b]	External medical costs[c]	Total overall costs[d]
Low symptom severity (C1-Sx)	—	0.363 (0.167, 0.559)	—	—
Predominant PTSD (moderate) (C2-Sx)	-0.381 (-0.697, -0.065)	—	—	—
Predominant PTSD (severe) (C3-Sx)	—	—	—	—
Comorbid Drug (severe) & PTSD (moderate) (C4-Sx)	—	—	-7,458.706 (-13,957.404, -960.016)	—
Comorbid PTSD (severe) & Alcohol (moderate) (C5-Sx)	—	—	—	—

Comorbid PTSD (moderate) & Alcohol (moderate) (C6-Sx)	—	—	-7,495.390 (-13,453.561, -1,537.219)	-12,882.548 (-24,762.077, -1,003.020)
Comorbid Alcohol (severe) & PTSD (moderate) (C7-Sx)	—	—	—	—

[a] n = 2,001; All models controlled for individual- and program-level covariates. Only coefficients and confidence intervals that were statistically significant at the 95 percent level are reported here. [b] Zero-inflated negative binomial models. [c] Two-part model, logit for probability of any costs, OLS for level of costs for those with any costs. [d] Ordinary least squares (OLS) model.

Table 9. Summary of significant effects (95% confidence intervals) for IC v. usual care: service cluster regression models [a]

	Outpatient counseling[b]	Residential treatment[b]	External medical costs[c]	Total overall costs[d]
Low service use (C1-Serv)	—	0.395 (0.219, 0.571)	—	—
Moderate residential treatment days (C2-Serv)	—	—	—	—
High counseling use (C3-Serv)	—	-0.384 (-0.733, -0.035)	—	—
High residential treatment days (C4-Serv)	—	-0.303 (-0.560, -0.046)	—	—
High psychotropic drug & external medical costs (C5-Serv)	—	—	—	—

[a] n = 2,001; All models controlled for individual- and program-level covariates. Only coefficients and confidence intervals that were statistically significant at the 95 percent level are reported here. [b] Zero-inflated negative binomial models. [c] Two-part model, logit for probability of any costs, OLS for level of costs for those with any costs. [d] Ordinary least squares (OLS) model.

Table 10. Effect of IC on 12-month counseling visits by cluster[a,b]

Symptom clusters	Coefficient (SE)	Service clusters	Coefficient (SE)
(*Reference group – Low alcohol, Average drug, Low PTSD (C1-Sx)*)	-- --	(*Reference group – Low service use (C1-Serv)*)	-- --
Moderate/Severe PTSD (C2-Sx)	0.173 (0.114)	Moderate residential treatment days (C2-Serv)	-0.052 (0.14)
Severe PTSD, Moderate Drug (C3-Sx)	0.123 (0.121)	High counseling use (C3-Serv)	0.519** (0.130)
Moderate/Severe PTSD, Severe Drug (C4-Sx)	0.190 (0.14)	High residential treatment days (C4-Serv)	0.071 (0.138)
Severe PTSD, Moderate/Severe Alcohol, & Drugs (C5-Sx)	-0.057 (0.152)	High psychotropic drug & external medical costs (C5-Serv)	0.144 (0.133)
High alcohol (C6-Sx)	0.047 (0.14)		
High alcohol/Drug (C7-Sx)	0.081 (0.133)		
IC treatment group	0.107 (0.122)	IC treatment group	0.025 (0.121)
Moderate/Severe PTSD (C2-Sx) x IC	-0.381* (0.161)	Moderate residential treatment days (C2-Serv) x IC	0.134 (0.233)

Severe PTSD, Mod Drug (C3-Sx) x IC	0.142 (0.168)	High counseling use (C3-Serv) x IC	-0.158 (0.175)
Moderate/Severe PTSD, Severe Drug (C4-Sx) x IC	-0.125 (0.200)	High residential treatment days (C4-Serv) x IC	-0.091 (0.184)
Severe PTSD, Moderate/Severe Alcohol, & Drugs (C5-Sx) x IC	0.390 (0.209)	High psychotropic drug & external medical costs (C5-Serv) x IC	0.163 (0.167)
High alcohol (C6-Sx) x IC	-0.043 (0.207)		
High alcohol/Drug (C7-Sx) x IC	-0.362 (0.226)		
Age	0.0000 (0.003)	Age	-0.002 (0.004)
Hispanic	-0.002 (0.085)	Hispanic	0.016 (0.11)
Black	-0.258** (0.074)	Black	-0.255** (0.082)
Race-Other	-0.202** (0.078)	Race-Other	-0.21* (0.092)
Less than high school	-0.238** (0.064)	Less than high school	-0.204* (0.083)
College	-0.245** (0.070)	College	-0.202* (0.087)

Illness/disability	-0.008 (0.055)	Illness/disability	-0.008 (0.062)
Current abuse	0.011 (0.060)	Current abuse	0.061 (0.066)
Any insurance	0.096 (0.063)	Any insurance	0.088 (0.082)
Court-ordered treatment	0.203** (0.058)	Court-ordered treatment	0.223** (0.072)
Perceived unmet need for care	-0.012 (0.053)	Perceived unmet need for care	-0.033 (0.062)
Constant	4.867** (0.179)	Constant	4.872 (0.226)**

n = 2,001; Robust standard errors in parentheses; * significant at 5%; ** significant at 1%;
[a] Zero-inflated negative binomial models. [b]All models controlled for site-level fixed effects.

Table 11. Effect of IC on 12-month residential treatment days by cluster[a]

Symptom clusters	Coefficient (SE)	Service clusters	Coefficient (SE)
(*Reference group – Low alcohol, Average drug, Low PTSD (C1-Sx)*)	-- --	(*Reference group – Low service use (C1-Serv)*)	-- --
Moderate/Severe PTSD (C2-Sx)	0.025 (0.106)	Moderate residential treatment days (C2-Serv)	0.138 (0.078)
Severe PTSD, Moderate Drug (C3-Sx)	-0.011 (0.124)	High counseling use (C3-Serv)	0.069 (0.126)
Moderate/Severe PTSD, Severe Drug (C4-Sx)	-0.016 (0.101)	High residential treatment days (C4-Serv)	0.107 (0.09)
Severe PTSD, Moderate/Severe Alcohol, & Drugs (C5-Sx)	0.103 (0.169)	High psychotropic drug & external medical costs (C5-Serv)	0.012 (0.107)
High alcohol (C6-Sx)	0.139 (0.101)		
High alcohol/Drug (C7-Sx)	0.084 (0.096)		
IC treatment group	0.363** (0.100)	IC treatment group	0.395** (0.090)
Moderate/Severe PTSD (C2-Sx) x IC	-0.042 (0.143)	Moderate residential treatment days (C2-Serv) x IC	-0.158 (0.113)

Severe PTSD, Mod Drug (C3-Sx) x IC	-0.109 (0.17)	High counseling use (C3-Serv) x IC	-0.384* (0.178)
Moderate/Severe PTSD, Severe Drug (C4-Sx) x IC	-0.082 (0.139)	High residential treatment days (C4-Serv) x IC	-0.303* (0.131)
Severe PTSD, Moderate/Severe Alcohol, & Drugs (C5-Sx) x IC	-0.275 (0.218)	High psychotropic drug & external medical costs (C5-Serv) x IC	0.082 (0.154)
High alcohol (C6-Sx) x IC	-0.130 (0.172)		
High alcohol/Drug (C7-Sx) x IC	-0.060 (0.137)		
Age	0.001 (0.003)	Age	0.001 (0.003)
Less than high school	-0.053 (0.055)	Less than high school	-0.057 (-0.055)
College	-0.116 (0.06)	College	-0.122* (0.059)
Illness/disability	0.011 (0.044)	Illness/disability	-0.019 (-0.048)
Current abuse	0.017 (0.049)	Current abuse	0.004 (-0.048)

Any insurance	0.049 (0.051)	Any insurance	0.048 (-0.051)
Court-ordered treatment	0.086 (0.045)	Court-ordered treatment	0.087 (-0.046)
Perceived unmet need for care	-0.011 (0.045)	Perceived unmet need for care	-0.005 (-0.044)
Constant	4.588** (0.134)	Constant	4.573** (0.130)

n = 2,001; Robust standard errors in parentheses; * significant at 5%; ** significant at 1%;
a Zero-inflated negative binomial models.

Table 12. Effect of IC on 12-month external medical costs by symptom clusters[a,b]

Logit	**OR (SE)**	**OLS**	**Coefficient (SE)**
(*Reference group – Low alcohol, Average drug, Low PTSD (C1-Sx))*	-- --	(*Reference group – Low alcohol, Average drug, Low PTSD (C1-Sx))*	-- --
Moderate/Severe PTSD (C2-Sx)	1.333 (0.574)	Moderate/Severe PTSD (C2-Sx)	2,381.344 (1359.964)
Severe PTSD, Moderate Drug (C3-Sx)	1.437 (0.68)	Severe PTSD, Moderate Drug (C3-Sx)	508.993 (1304.895)
Moderate/Severe PTSD, Severe Drug (C4-Sx)	1.341 (0.696)	Moderate/Severe PTSD, Severe Drug (C4-Sx)	6277.392* (2,945.182)

Severe PTSD, Moderate/Severe Alcohol, & Drugs (C5-Sx)	2.879 (2.272)	Severe PTSD, Moderate/Severe Alcohol, & Drugs (C5-Sx)	779.923 (1713.066)
High alcohol (C6-Sx)	1.37 (0.646)	High alcohol (C6-Sx)	5545.435* (2,471.531)
High alcohol/Drug (C7-Sx)	1.097 (0.489)	High alcohol/Drug (C7-Sx)	1,472.845 (1512.748)
IC treatment group	3.321* (1.703)	IC treatment group	1,470.237 (1265.037)
Moderate/Severe PTSD (C2-Sx) x IC	0.214* (0.142)	Moderate/Severe PTSD (C2-Sx) x IC	-610.902 (2338.684)
Severe PTSD, Mod Drug (C3-Sx) x IC	0.302 -0.223	Severe PTSD, Mod Drug (C3-Sx) x IC	2,660.516 (2621.770)
Moderate/Severe PTSD, Severe Drug (C4-Sx) x IC	0.584 (0.525)	Moderate/Severe PTSD, Severe Drug (C4-Sx) x IC	-7458.706* (3,315.660)
Severe PTSD, Moderate/Severe Alcohol, & Drugs (C5-Sx) x IC	0.135 (0.135)	Severe PTSD, Moderate/Severe Alcohol, & Drugs (C5-Sx) x IC	-2,448.352 (2252.480)
High alcohol (C6-Sx) x IC	0.350 (0.279)	High alcohol (C6-Sx) x IC	-7495.390* (3,039.883)
High alcohol/Drug (C7-Sx) x IC	0.920 (0.749)	High alcohol/Drug (C7-Sx) x IC	-2,757.799 (2339.356)

Age	0.990 (0.014)	Age	84.802 (57.869)
Hispanic	0.731 (0.241)	Hispanic	-52.687 (986.362)
Black	0.494** (0.130)	Black	-1,244.703 (896.390)
Race-Other	0.839 (0.271)	Race-Other	-725.818 (889.605)
Less than high school	1.425 (0.348)	Less than high school	233.585 (1110.627)
College	1.522 (0.430)	College	-153.501 (1077.815)
Illness/disability	3.925** (1.021)	Illness/disability	3,490.997** (806.783)
Current abuse	0.945 (0.227)	Current abuse	854.674 (1,000.061)
Any insurance	1.632* (0.376)	Any insurance	889.846 (917.833)
Court-ordered treatment	0.470** (0.101)	Court-ordered treatment	-1,052.475 (850.575)

Perceived unmet need for care	1.279 (0.278)	Perceived unmet need for care	-4.212 (837.606)
Constant	2.276** (0.673)	Constant	-777.049 (2872.960)
n = 2,001		n = 1,893	

[a] Bootstrapped standard errors in parentheses; * significant at 5%; ** significant at 1%

[b] Two-part model, logit for probability of any costs, OLS for level of costs for those with any costs.

Table 13. Effect of IC on 12-month external medical costs by service clusters[a]

Logit	**OR (SE)**	**OLS**	**Coefficient (SE)**
(*Reference group – Low service use (C1-Serv)*)	-- --	(*Reference group – Low service use (C1-Serv)*)	-- --
Moderate residential treatment days (C2-Serv)	1.17 (0.451)	Moderate residential treatment days (C2-Serv)	696.532 (1550.838)
High counseling use (C3-Serv)	1.88 (-0.873)	High counseling use (C3-Serv)	941.641 (1580.451)
High residential treatment days (C4-Serv)	1.52 (0.682)	High residential treatment days (C4-Serv)	-2310.563* (1,156.288)
High psychotropic drug & external medical costs (C5-Serv)	2.19 (1.038)	High psychotropic drug & external medical costs (C5-Serv)	4,566.327* (1,864.637)

IC treatment group	1.52 (0.476)	IC treatment group	-606.259 (1275.327)
Moderate residential treatment days (C2-Serv) x IC	1.27 (0.751)	Moderate residential treatment days (C2-Serv) x IC	-145.512 (2,001.218)
High counseling use (C3-Serv) x IC	0.35 (0.219)	High counseling use (C3-Serv) x IC	396.097 (2690.972)
High residential treatment days (C4-Serv) x IC	1.62 (1.249)	High residential treatment days (C4-Serv) x IC	3,020.33 (2252.384)
High psychotropic drug & external medical costs (C5-Serv) x IC	0.97 (0.763)	High psychotropic drug & external medical costs (C5-Serv) x IC	177.256 (2770.065)
Age	0.99 (0.014)	Age	50.809 (54.718)
Hispanic	0.77 (0.252)	Hispanic	-321.695 (951.801)
Black	0.514* (0.135)	Black	-840.638 (881.703)
Race-Other	0.86 (0.278)	Race-Other	-738.144 (904.348)
Less than high school	1.45 (0.354)	Less than high school	306.002 (-1075.342)

College	1.58 (0.445)	College	-167.466 (998.107)
Illness/disability	3.756** (0.969)	Illness/disability	3,226.877** (822.523)
Current abuse	0.96 (0.222)	Current abuse	854.986 (860.854)
Any insurance	1.52 (0.349)	Any insurance	471.424 (847.592)
Court-ordered treatment	0.499** (0.108)	Court-ordered treatment	-856.209 (850.836)
Perceived unmet need for care	1.26 (0.275)	Perceived unmet need for care	-300.158 (841.19)
Constant	2.298** (0.664)	Constant	2,359.48 (2,789.083)
n = 2,001		n = 1,893	

* significant at 5%; ** significant at 1%

[a] Two-part model, logit for probability of any costs, OLS for level of costs for those with any costs.

Table 14. Effect of IC on 12-month total overall costs by cluster[a]

Symptom clusters	Coefficient (SE)	Service clusters	Coefficient (SE)
(*Reference group – Low alcohol, Average drug, Low PTSD (C1-Sx)*)	--	(*Reference group – Low service use (C1-Serv)*)	--
Moderate/Severe PTSD (C2-Sx)	4,010.26 (2901.393)	Moderate residential treatment days (C2-Serv)	9,883.022** (2,982.724)
Severe PTSD, Moderate Drug (C3-Sx)	3,064.68 (3016.312)	High counseling use (C3-Serv)	9,703.038** (3,221.983)
Moderate/Severe PTSD, Severe Drug (C4-Sx)	11,326.813* (4,493.085)	High residential treatment days (C4-Serv)	11,450.631** (2,821.225)
Severe PTSD, Moderate/Severe Alcohol, & Drugs (C5-Sx)	2,382.73 (3726.817)	High psychotropic drug & external medical costs (C5-Serv)	9,704.808** (2,998.378)
High alcohol (C6-Sx)	10,851.316** (3,880.857)		
High alcohol/Drug (C7-Sx)	7,914.338* (3,279.484)		
IC treatment group	6,098.96 (3,242.723)	IC treatment group	123.684 (2,222.326)

Moderate/Severe PTSD (C2-Sx) x IC	-8,564.05 (4,372.599)	Moderate residential treatment days (C2-Serv) x IC	6,100.81 (4,479.285)
Severe PTSD, Mod Drug (C3-Sx) x IC	-910.59 (4,950.879)	High counseling use (C3-Serv) x IC	-6,153.56 (4,746.269)
Moderate/Severe PTSD, Severe Drug (C4-Sx) x IC	-11,699.51 (6,046.802)	High residential treatment days (C4-Serv) x IC	-1,099.70 (4,515.741)
Severe PTSD, Moderate/Severe Alcohol, & Drugs (C5-Sx) x IC	558.69 (5,558.82)	High psychotropic drug & external medical costs (C5-Serv) x IC	4,972.05 (4,341.103)
High alcohol (C6-Sx) x IC	-12,882.548* (6,060.984)		
High alcohol/Drug (C7-Sx) x IC	-3,497.16 (4,923.974)		
Age	201.53 (104.216)	Age	196.67 (101.699)
Hispanic	-176.20 (2,276.196)	Hispanic	-444.36 (2,271.499)
Black	-1,642.83 (1,946.282)	Black	-1,177.27 (1,911.389)
Race-Other	-3,060.35 (2,219.287)	Race-Other	-2,914.27 (2,208.296)
Less than high school	-4908.905* (1,940.334)	Less than high school	-5175.212** (1,899.176)

College	2,187.23 (2144.33)	College	1,703.03 (2,113.754)
Illness/disability	4,129.675** (1,486.560)	Illness/disability	3,445.167* (1,476.400)
Current abuse	4,583.615** (1,655.775)	Current abuse	4,989.368** (1,574.152)
Any insurance	569.302 (1,670.463)	Any insurance	-315.55 (1,643.228)
Court-ordered treatment	5,314.695** (1,652.961)	Court-ordered treatment	5,130.807** (1,656.702)
Perceived unmet need for care	-1,906.51 (1,504.181)	Perceived unmet need for care	-2,100.58 (1,512.51)
Constant	34,030.071** (4,964.667)	Constant	33,374.569** (4,860.346)

n = 2,001; Robust standard errors in parentheses; * significant at 5%; ** significant at 1%

[a] Ordinary Least Squares (OLS) models.

Table 15. Summary of significant effects (95% confidence intervals) for IC v. usual care: latent class models [a]

	Outpatient counseling	Residential treatment	External medical costs	Total overall costs
No unmet need for IC	—	—	282.804 (15.600, 550.011)	—
Unmet need for IC	—	0.191 (0.095, 0.287)	—	—

[a] n = 2,001; All models controlled for individual- and program-level covariates. Only coefficients and confidence intervals that were statistically significant at the 95 percent level are reported here.

Table 16. Effect of IC on 12-month outpatient counseling use by latent class

'No unmet need for care'	Coefficient (SE)	'Unmet need for care'	Coefficient (SE)
IC group	0.083 (0.049)	IC group	0.027 (0.11)
ASI-Alcohol score	-0.106 (0.088)	ASI-Alcohol score	0.014 (0.166)
ASI-Drug score	-0.009 (0.173)	ASI-Drug score	-0.497 (0.361)
PTSD score	0.005* (0.002)	PTSD score	0.010* (0.005)
Counseling visits - baseline	0.008** (0.001)	Counseling visits - baseline	0.006** (0.002)

Psychotropic med costs - baseline	0.000 (0.000)	Psychotropic med costs - baseline	0.000 (0.000)
Residential treatment days - baseline	0.002 (0.001)	Residential treatment days - baseline	0.004* (0.002)
External medical costs - baseline	0.000** (0.000)	External medical costs - baseline	0.000 (0.000)
Age	0.006* (0.003)	Age	0.006 (0.006)
Hispanic	-0.044 (0.076)	Hispanic	-0.130 (0.187)
Black	-0.240** (0.067)	Black	-0.144 (0.143)
Other race	-0.121 (0.077)	Other race	0.052 (0.165)
Less than high school	-0.057 (0.055)	Less than high school	-0.183 (0.123)
College	-0.068 (0.059)	College	-0.121 (0.131)
Illness/disability	-0.038 (0.047)	Illness/disability	-0.011 (0.105)

Current abuse	0.051 (0.053)	Current abuse	0.011 (0.113)
Any insurance	0.101 (0.059)	Any insurance	0.180 (0.123)
Court-ordered treatment	0.182** (0.050)	Court-ordered treatment	0.156 (0.111)
Unmet need for care	0.025 (0.048)	Unmet need for care	-0.132 (0.102)
Constant	3.792** (0.160)	Constant	3.267** (0.342)

n = 2,001; Robust standard errors in parentheses; * significant at 5%; ** significant at 1%

Table 17. Effect of IC on 12-month residential treatment use by latent class

'No unmet need for care'	Coefficient (SE)	'Unmet need for care'	Coefficient (SE)
IC group	0.251 (0.136)	IC group	0.191** (0.049)
ASI-Alcohol score	0.568** (0.194)	ASI-Alcohol score	0.021 (0.062)
ASI-Drug score	1.367** (0.476)	ASI-Drug score	-0.017 (0.133)

PTSD score	-0.01 (0.006)	PTSD score	-0.002 (0.002)
Counseling visits - baseline	0.000 (0.002)	Counseling visits - baseline	0.001 (0.001)
Psychotropic med costs - baseline	0.000 (0.000)	Psychotropic med costs - baseline	0.000 (0.000)
Residential treatment days - baseline	0.016** (0.002)	Residential treatment days - baseline	-0.001 (0.001)
External medical costs - baseline	0.000 (0.000)	External medical costs - baseline	0.000 (0.000)
Age	0.011 (0.008)	Age	0.003 (0.003)
Hispanic	-0.244 (0.209)	Hispanic	0.088 (0.071)
Black	0.334* (0.150)	Black	0.050 (0.061)
Other race	0.141 (0.194)	Other race	-0.029 (0.071)
Less than high school	0.340* (0.155)	Less than high school	-0.019 (0.053)

College	0.242	College	-0.060
	(0.167)		(0.059)
Illness/disability	-0.131	Illness/disability	0.075
	(0.132)		(0.044)
Current abuse	0.586**	Current abuse	0.062
	(0.160)		(0.050)
Any insurance	-0.272*	Any insurance	0.036
	(0.132)		(0.049)
Court-ordered treatment	0.343**	Court-ordered treatment	0.041
	(0.126)		(0.046)
Unmet need for care	-0.415**	Unmet need for care	0.001
	(0.125)		(0.043)
Constant	2.484**	Constant	4.771**
	(0.433)		(0.138)

n = 2,001; Robust standard errors in parentheses; * significant at 5%; ** significant at 1%

Table 18. Effect of IC on 12-month external medical costs by latent class

'No unmet need for care'	Coefficient (SE)	'Unmet need for care'	Coefficient (SE)
IC group	282.804* (136.330)	IC group	-950.523 (2,692.830)
ASI-Alcohol score	-287.105 (225.732)	ASI-Alcohol score	-2,094.65 (4655.798)
ASI-Drug score	-294.54 (466.908)	ASI-Drug score	-16,015.30 (9339.813)
PTSD score	9.128 (6.220)	PTSD score	55.079 (125.163)
Counseling visits - baseline	-0.816 (2.322)	Counseling visits - baseline	1.002 (40.127)
Psychotropic med costs - baseline	0.626** (0.210)	Psychotropic med costs - baseline	0.646 (3.666)
Residential Tx days - baseline	7.784** (2.499)	Residential Tx days - baseline	-31.525 (59.584)
External medical costs - baseline	0.016 (0.008)	External medical costs - baseline	0.853** (0.178)
Age	12.819 (8.141)	Age	187.436 (170.45)

Hispanic	146.925 (229.122)	Hispanic	-2,153.70 (4332.493)
Black	-141.182 (172.43)	Black	-4,062.25 (3862.32)
Other race	-44.84 (201.13)	Other race	-654.485 (4191.456)
Less than high school	-9.77 (161.224)	Less than high school	3,101.79 (3234.466)
College	-9.216 (175.387)	College	-3,086.41 (3395.06)
Illness/disability	528.831** (136.724)	Illness/disability	3,891.20 (2796.396)
Current abuse	-56.341 (160.101)	Current abuse	3,212.91 (2940.835)
Any insurance	460.568** (162.071)	Any insurance	-945.443 (3270.418)
Court-ordered treatment	-170.053 (140.39)	Court-ordered treatment	-2,262.78 (2984.891)
Unmet need for care	157.579 (126.024)	Unmet need for care	352.371 (2632.025)

Constant	536.747 (435.632)	Constant	12,342.74 (8,690.310)

n = 2,001; Robust standard errors in parentheses; * significant at 5%; ** significant at 1%

Table 19. Effect of IC on 12-month total overall costs by latent class

'No unmet need for care'	**Coefficient (SE)**	**'Unmet need for care'**	**Coefficient (SE)**
IC group	395.060 (946.155)	IC group	-143.171 (4,707.456)
ASI-Alcohol score	1,216.568 (1994.342)	ASI-Alcohol score	-7,775.690 (6,404.782)
ASI-Drug score	10,575.547** (3,731.625)	ASI-Drug score	-7,288.786 (14,107.796)
PTSD score	-37.148 (44.72)	PTSD score	152.310 (209.599)
Counseling visits - baseline	70.447** (16.210)	Counseling visits - baseline	56.154 (75.851)
Psychotropic med costs - baseline	5.878** (1.507)	Psychotropic med costs - baseline	5.182 (6.32)
Residential Tx days - baseline	191.702** (27.383)	Residential Tx days - baseline	-286.732** (76.740)

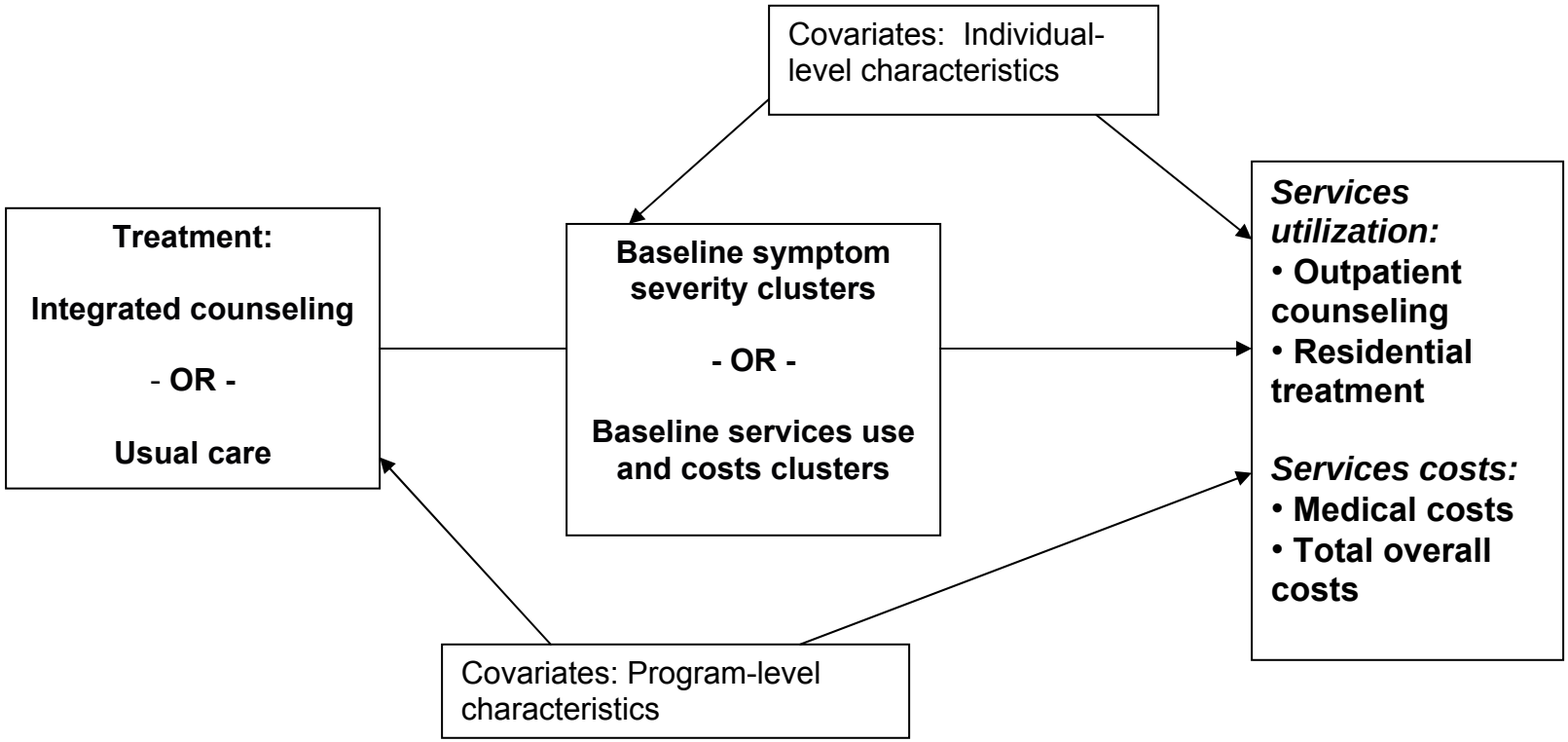
External medical costs - baseline	0.306** (0.115)	External medical costs - baseline	0.013 (0.175)
Age	53.018 (57.881)	Age	785.109** (267.696)
Hispanic	-1,555.361 (1,470.114)	Hispanic	4,955.734 (7,123.03)
Black	-1,635.195 (1,314.795)	Black	-7,059.675 (5,793.035)
Other race	500.400 (1,448.528)	Other race	-13,701.184* (6,423.355)
Less than high school	-1,669.076 (1,121.231)	Less than high school	-11,037.931* (5,274.150)
College	1,673.660 (1,233.63)	College	-3,285.835 (5,669.546)
Illness/disability	1,286.264 (960.446)	Illness/disability	5,832.890 (4,410.628)
Current abuse	2,445.708* (1,029.616)	Current abuse	7,174.152 (4,849.835)
Any insurance	1,055.427 (1,100.085)	Any insurance	-2,006.683 (4,829.773)
Court-ordered treatment	3,770.909** (1,037.032)	Court-ordered treatment	8,636.085 (4,519.147)

Unmet need for care	-271.533	Unmet need for care	-4,353.237
	(916.901)		(4,252.669)
Constant	23,850.482**	Constant	56,044.493**
	(3,123.576)		(13,323.088)

n = 2,001; Robust standard errors in parentheses; * significant at 5%; ** significant at 1%

Figures

Figure 1. Conceptual Model: Symptom severity as a moderator of treatment effects on services use and costs among women with co-occurring disorders and histories of abuse victimization



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