TRENDS IN COMPLETING TREATMENT FOR SUBSTANCE USE DISORDERS IN MINNESOTA 2006-2011

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Minnesota Department of Human Services
April 2013

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Completing treatment for substance use disorders is generally regarded as an indicator of successful treatment. Unfortunately, rates of completion declined annually from 2006 to 2011. About one-third of this change is due to the changing composition of the population receiving treatment or the setting in which treatment is received. In particular, the decline in the proportion of patients who are employed full-time and the related increase in the proportion who are unemployed or out of the paid labor force, as well as the decline in inpatient and concomitant increase in outpatient treatment, explain part of the decline. An analysis of differential change reveals that the decline in completion was especially pronounced among the young, users of cocaine, those who are unemployed or not in the paid labor force, and those in long-term residential and outpatient settings. It is especially troubling that those who are unemployed or not in the paid labor force and those in outpatient treatment are increasing components of the population receiving treatment. These results suggest that placing more clients in inpatient treatment could halt or at least slow the troubling trend.

Substance use disorders are widespread and exact a huge toll in human suffering. McAlpine et al. estimate that about 9% of adult Minnesotans suffer from substance abuse or dependence. Furthermore, these disorders place a large financial burden on the state. The National Center on Addiction and Substance Abuse estimates that Minnesota spent almost $3 billion on substance abuse and its consequences in 2005. Treatment has been shown to be an effective antidote for chemical dependency and has been estimated to return $7 in benefits for every $1 spent. Treatment is most effective if patients complete the course of treatment prescribed for them. In fact, Harrison and Asche state that completion is the most consistent predictor of post-treatment abstinence. Therefore, trends in the likelihood of completing treatment are of interest.

All providers of treatment for chemical dependency who receive any federal funding must submit data for every client that they serve to the Drug and Alcohol Abuse Normative Evaluation System (DAANES), which is maintained by the Minnesota Department of Human Services. Providers submit the required data at treatment admission and discharge. At discharge, providers state whether patients completed the course of treatment.

Figure 1 displays the percentage who completed treatment from 2000 to 2011. The percentage completing treatment rose from 64% in 2000 to 66% in 2004, declined to 64% in 2005, and climbed again to 65% in 2006. After 2006, the percentage completing treatment declined consistently to a low of 58% in 2011, which is the lowest level seen in the 12-year span. The decline in the percentage completing treatment from 2006 to 2011 is the focus of this report.

![Figure 1. Percent Who Complete Treatment by Year of Admission.](image)

**Changes in factors that affect the completion rate**

Our attempt to understand this change involves two avenues of investigation. The first asks whether the composition of the population of patients changed in such a way that an identifiable category of people who are less likely to complete treatment became a bigger part of the population of patients who receive treatment. This could happen if certain sociodemographic groups who are less likely to complete, such as women, African Americans, adolescents, or users of illegal drugs, comprised a bigger part of the population at the end of the period than at the beginning. Another possibility that does not “explain” the change but helps to understand it asks if rates of completion declined more for some groups than for others.

Sociodemographic variables that I consider are gender, cultural group, age, employment status, and primary substance of abuse.
• Cultural group results from two separate questions on race and ethnicity. Those who are of Hispanic ethnicity are coded Hispanic regardless of the racial category chosen. Additional cultural groups are white, African American, American Indian, Asian (including Pacific Islanders), and other (including those who choose some other racial designation or who do not answer the question).
• Employment status is categorized as full-time worker, part-time worker, unemployed, and out of the paid labor force.
• Primary substance of abuse is coded alcohol, marijuana, methamphetamine, cocaine, crack, heroin, other opiates, and other (including unknown).
• I also consider the setting in which treatment was received: short-term residential (30 days or less), long-term residential (more than 30 days), and outpatient. Unfortunately, setting was collected with different categories in 2006 and subsequent years. Table 1 shows how categories were combined to yield a workable variable. Those who received treatment in methadone clinics or who were identified as receiving methadone were excluded from the analysis. Despite these attempts to create a variable that would be comparable across years, changes that involve setting between 2006 and 2007 should be viewed skeptically.

| Table 1. Creation of Setting from Codings in 2006 and 2007 through 2011. |
|------------------|------------------|------------------|
| Setting          | 2006             | 2007-2011        |
| Inpatient        | Primary inpatient| Hospital inpatient|
|                  | Combined inpatient| Sort-term residential|
| Long-term residential | Extended care | Long-term residential |
|                  | Halfway house    |                  |
| Outpatient       | Primary outpatient| Non-residential |
|                  | Combined outpatient|                    |

The distribution of patients by cultural group and gender did not change much during this period. Adolescents became a bit less prevalent (10% in 2006 and 9% in 2011), while those 45 to 64 became more prevalent (20% in 2006 and 23% in 2011), but this cannot explain the decline in rates of completion because adolescents typically have lower rates of completion.

Changes in employment status are more promising as an explanatory factor as the percentage employed full-time declined from 28% in 2006 to 19% in 2011, while the percentage unemployed increased from 43% to 47% and the percentage out of the labor force increased from 22% to 25%. Both the unemployed and those out of the labor force have lower rates of completion than do full-time workers.

Changes in primary substance were less consistent with trends in completion. The percentage of patients whose primary substance was alcohol increased from 52% to 54%, and users of alcohol tend to have higher rates of completion (68%). Methamphetamine, cocaine, and crack became less prevalent as primary substances, while marijuana, heroin, and other opiates became more prevalent. The rates of completion for users of methamphetamine and cocaine are about 61%, whereas the rates for crack (53%), marijuana (55%), heroin (51%), and other opiates (56%) are considerably lower. The increasing prevalence of alcohol runs counter to the trend of lowering
rates of completion, but the increasing prevalence of marijuana, heroin, and other opiates could explain part of the trend.

The setting in which treatment occurred changed in ways that are consistent with the changes in completion rates. Inpatient treatment became less common (30% in 2007 and 26% in 2011), while outpatient became more common (50% in 2007 and 53% in 2011). Completion rates are highest in inpatient (73%), followed by outpatient (60%) and long-term residential (58%), so this change could also explain part of the trend in completion rates.

**Factors influencing decline in completion rates**

Logistic regression provides a way to answer questions such as those raised above. The model is of the form,

\[
\hat{Y} = a + b_1 x_1 ,
\]

where \( \hat{Y} \) is a measure of the likelihood of completing treatment, \( a \) reflects a baseline level of completion, \( b_1 \) describes the effect of time on the likelihood of completing, and \( x_1 \) specifies the year of admission. In particular, \( \hat{Y} \) is the natural logarithm of the expected odds on completing treatment, but we can think of it as an indicator of the likelihood of completing treatment. More generally, we can think of the model as a way of quantifying how the likelihood of completing treatment changes over time. In particular, \( b_1 \) describes the average change in the likelihood of completing treatment. In our data, \( b_1 = -0.053 \), so the log of the odds on completing decline by 0.053 every year. This translates to a decrease of about one percentage point per year, which is what we see in Figure 1.

Logistic regression enables us to add other factors to the model and re-estimate \( b_1 \), net of these other factors. The model is of the form,

\[
\hat{Y} = a + b_1 x_1 + b_2 x_2 ,
\]

where \( \hat{Y} \), \( a \), \( b_1 \), and \( x_1 \) are defined as above, \( b_2 \) describes the effect of the other factor, and \( x_2 \) specifies the person’s value on the other factor. (For factors whose categories do not have an order, such as employment status, the model actually includes an \( x \) and \( b \) for each category included, so \( b_2 x_2 \) becomes \( \Sigma b_k x_k \), where \( k \) varies from 2 to \( m \), the number of categories.) The estimates of \( b_1 \) and \( b_2 \) are net effects: \( b_1 \) represents the effect of time, controlling for the other factor, and \( b_2 \) represents the effect of the other factor, controlling for time. In other words, we can estimate the change in the likelihood of completing treatment after allowing for compositional changes in the population being treated. The difference in the two estimates of \( b_1 \) provides an estimate of how much of the decline in rates of completion is due to the compositional changes.

I estimated such a model for each of the factors described above and found that only employment status and treatment setting reduce the effect of time. The effect of time is reduced to -0.043 in the model with employment status. Therefore, we can say that employment status accounts for about \( 100 \times (0.053 - 0.043) / 0.053 = 19\% \) of the decline in the likelihood of completion. Similarly,
including setting reduces the effect of time to -.048, so setting accounts for about 9% of the
decline in the likelihood of completion. Including both factors in one model yields an estimate of
\( b_1 \) of -0.037, so accounting for compositional changes involving employment status and setting
reduces the decline in the likelihood of completing treatment by about 30%. In summary, about
one-third of the decline in rates of completion is due to compositional changes: the decline in
full-time employment and the decline in inpatient treatment.

The question of whether change is more pronounced in some segments of the population is also
addressed with logistic regression, but we now add an interaction term. The model is,

\[
\hat{Y} = a + b_1 x_1 + b_2 x_2 + b_3 x_1 x_2,
\]

where \( x_1 x_2 \) is the product of time and the other factor, and \( b_3 \) is the effect of this interaction. This
model allows the change to vary by the level of the other factor. For gender, for example, the
change is allowed to vary for men and women. The significance of \( b_3 \) indicates whether the
change should be allowed to vary by the other factor.

The interactive effects of year with gender and cultural group are not significant, but the
interactive effects of year with age, employment status, substance, and setting are significant.

The pattern of change by age is fairly straightforward: the younger age groups showed the
greatest decline in the likelihood of completing treatment. For example, 61% of those under 18
completed treatment in 2006, but only 51% did so in 2011. At the other extreme, 75% of those
over 64 completed treatment in 2006 and 77% did so in 2009. Figure 2 shows the percentage
who completed treatment by age and year. The youngest age group, which already had the
lowest completion rate in 2006, showed the steepest decline, while the oldest age group, which
had the highest completion rate in 2006, showed the least decline. In general, as age increases,
the likelihood of completing treatment increases and the decline from 2006 to 2011 decreases. In
other words, disparities in completion by age deepened considerably during this period.
The differential change by employment status appears in Figure 3. The percentages who complete treatment among those who work full- or part-time decline by 3.4 and 3.9 percentage points, respectively. In contrast, the percentages who complete among those who are unemployed or out of the paid labor force decline by 5.2 and 7.4 percentage points, respectively. So the groups who showed the lowest likelihood of completing treatment in 2006, those who were unemployed or out of the paid labor force, experienced the greatest decline in the likelihood of completing treatment.
Trends by primary substance are shown in Figure 4. The most obvious feature of the graph is that users of alcohol exhibit a higher rate of completion than do users of other substances in all years. At first glance, all of the lines seem to decline at roughly the same rate. However, statistical analysis reveals that the rate of completion declines more steeply for patients whose primary substance is cocaine.

![Figure 4. Percent Completing Treatment by Year and Primary Substance.](image)

Figure 5 presents the percentage of patients who completed treatment by setting and year of admission. Because the coding of setting changed between 2006 and 2007, and because the results for 2006 differ considerably from those for other years, it is probably best to focus on changes between 2007 and 2009. Completion rates for those in inpatient remained high during this period, while the rates for those in outpatient and long-term residential declined.

![Figure 5. Percent Completing by Year and Setting.](image)
Conclusions

In summary, rates of completion declined annually from 2006 to 2011. About one-third of this change is due to the changing composition of the population receiving treatment. In particular, the decline in the proportion of patients who are employed full-time and the related increase in the proportion who are unemployed or out of the paid labor force, as well as the decline in inpatient treatment and increase in outpatient treatment, explain part of the decline. An analysis of differential change reveals that the decline in completion was especially pronounced among the young, users of cocaine, those who are unemployed or not in the paid labor force, and those in long-term residential and outpatient settings. It is especially troubling that those who are unemployed or not in the paid labor force and those in outpatient treatment are an increasing component of the population receiving treatment.

These results suggest that treatment providers could profitably devote more energy to helping patients with employment issues. The results with regard to setting suggest at least two courses of action, the most obvious of which is to adopt an assessment strategy that diverts people from outpatient to inpatient treatment. A less costly alternative might be a blended regimen that combines an initial period of inpatient treatment followed by a less costly period of outpatient treatment, but it is unclear whether this strategy would be effective. It is also possible that greater efforts to retain patients in outpatient treatment might be able to reverse the trend of declining completion rates. What is clear, though, is that the current strategy is not working well: rates of completion declined for five straight years, and preliminary data for 2012 suggest that the decline continues.