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Identifying young adults at risk of Medicaid enrollment lapses after inpatient mental health treatment

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Abstract

Objective—This study sought to describe Medicaid disenrollment rates and risk factors among young adults, known as emerging adults, after discharge from inpatient psychiatric treatment.

Methods—Participants were a statewide population of Medicaid-enrolled 18–26 year olds discharged from inpatient psychiatric treatment ($n=1176$). Medicaid disenrollment within 365 days post discharge, and predictors of disenrollment from the 180-day pre-discharge period were identified from administrative records. Classification and Regression Tree analysis and probit regression were both used for multivariable modeling.

Results—Thirty-two percent ($n=379$) disenrolled within a year of inpatient discharge. Both analytical approaches converged on four main risk factors: Medicaid enrollment categories for persons with a non-disabled low-income parent or child in low-income household, age 18 or 20 at discharge, a pre-discharge gap in Medicaid enrollment, and no antecedent primary care utilization. By contrast, the 48% of the population ($n=567$) continuously enrolled prior to discharge and in enrollment categories of disabled adults or foster care had only a 13% disenrollment rate.

Conclusions—A substantial minority of Medicaid-enrolled emerging adults in inpatient psychiatric care are disenrolled from Medicaid within a year after discharge. While about half of the population had low risk of disenrollment, the remaining half was at substantial risk. Risk factors largely reflect legal status changes that occur in these “transition-age youth”. Identifying those at high risk for disenrollment during inpatient treatment and ensuring continuous health care coverage should improve access to needed post-discharge supports. Regular primary care visits may also help reduce unintended Medicaid disenrollment in this population.

Introduction

Individuals maturing from adolescence to adulthood, referred to as young or emerging adults (1) or transition-age youth (e.g.2), undergo rapid legal and social status changes. Health care coverage is essential for chronically ill emerging adults (3,1), especially those with serious mental health conditions, who often need a broad array of mental health, substance abuse and medical treatment, and rehabilitation services [see 4]. However, in 2008, 8.7 million 19–29 year olds (19%) were uninsured and another 4.6 million (10%) were on Medicaid (5). Medicaid enrollment yields increased access to services and better self-assessed somatic and mental health (6). Moreover, in contrast to many private insurers, Medicaid often covers the rehabilitative and supportive services that emerging adults with mental illness need, such as educational, and employment supports (7). Yet, many low-income, emerging adults with serious mental health conditions are at risk for Medicaid disruptions.

Medicaid is offered principally to individuals made vulnerable by having low income, or disability (5,8, 9). Children predominate Medicaid populations as a consequence of preferential eligibility in federal law (9). However, among Medicaid-covered individuals approaching legal adulthood, coverage is frequently withdrawn or reduced following a re-determination process at age 18 (9,10). Among Medicaid-enrolled 16-year-old mental health services users, disenrollment increases sharply at ages 18 and 19, with about half of females and two-thirds of males experiencing at least 6 months of disenrollment by age 19 (11). Some states also have age-based enrollment category changes at age 21 (e.g. foster care coverage (12). Moreover, gaps in insurance coverage (public or private) significantly diminish access to needed health care (13, 14).

The present study examines predictors of Medicaid disenrollment for emerging adults (ages 18 to 26) during the first year following discharge from inpatient mental health care. Information on disenrollment risk factors could be used to design enrollment supports for vulnerable emerging adults. The post-discharge year is a period of elevated suicide risk (15, 16), with the risk elevated further by discontinuity in outpatient care (17). Continuity in Medicaid may be an important prerequisite for timely post-discharge follow-up care, which research suggests reduces readmission risk (18). We hypothesized the likelihood of disenrollment would be greater at ages associated with Medicaid eligibility changes (11); among males (11, 19); among individuals not enrolled through a Medicaid disability category (11, 19); among individuals with less serious mental health morbidity (11); and among those without recent connection to primary care or outpatient mental health services. Primary care and outpatient mental health clinic correlates were expected because such safety net providers, e.g., federally qualified health centers, are adept at and often required by law to help clients enroll in Medicaid when they are eligible (20, 21). Lastly, it was hypothesized that “near poor” individuals (22) (i.e., Medicaid enrollment designated for individuals with household incomes above the poverty line) would be at increased disenrollment risk due to even small income increases rendering them ineligible (23).

Methods

Sample and variables

Maryland administrative data from the Medicaid program and from the public mental health system were used to construct an individual-level database for all 1,177 Medicaid-enrolled persons who were 18–26 years of age upon discharge from an inpatient mental health stay between October 2005 and September 2006. For individuals with multiple admissions, only the first admission was used to include them in the sample. A single individual who was flagged as a Qualified Medicare Beneficiary (i.e., limited Medicare *and* Medicaid coverage)

was dropped, leaving 1176. This study received Institutional Review Board approvals from [AUTHORS' UNIVERSITIES AND THE STATE OF MARYLAND IRB].

The dependent variable for this investigation was the occurrence of any (>0) days the person was not enrolled in Medicaid within 365 days after discharge from the targeted inpatient event. A one year follow-up period was chosen because this interval represents heightened risk for suicide and hospital readmission (15, 16, 18, 24).

Independent variables (See Table 1) included demographics (age, race/ethnicity, gender, and urban/suburban vs. rural residence), Medicaid eligibility category (25) and higher income. Several additional independent variables were obtained from *antecedent* records, (*antecedent* defined as <180 days prior to inpatient discharge): mental health morbidity (i.e. mental health diagnosis, co-occurring substance use diagnosis, number of inpatient days), primary care and outpatient mental health care utilization, other medical service utilization, pregnancy, and antecedent Medicaid disenrollment.

Statistical analysis

Three statistical approaches were used to characterize the relationship between post-discharge disenrollment and the independent variables. First, bivariate statistics (X^2 or t-tests) were used to compare all variables by disenrollment group (disenrolled vs. non-disenrolled). Second, classification and regression tree (CART) analysis, using IBM SPSS version 21 (Armonk, New York), was conducted to display population subgroups and their relative risks of disenrollment. CART analysis creates statistically distinct subgroups based on sequential, hierarchical splits in the population that yield the strongest between-subgroup differences regarding a selected outcome (26–28). The tree growing method was CRT, which maximizes within-group homogeneity, and splits in the data were found based on squared probabilities of membership into each outcome category (using the Gini calculation) with a minimum change improvement of .0001. Only splits that produced final groups of at least 50 individuals were considered. The CART analysis provides a graphic that is useful for contrasting the relative risk of disenrollment between subgroups, but does not yield point estimates that simultaneously adjust for all variables in the model.

The third approach was a probit regression analysis for the probability of disenrollment. Probit regression is similar to logistic regression but is based on the normal probability distribution and yields estimates that can be interpreted as changes in probability (rather than logistic regression odds ratios). (29). In addition to all the independent variables described earlier, this regression included an indicator for ages 18 or 20 at discharge, because eligibility under “child” coverage categories in this state often ends by ages 19 and 21, respectively (30). For sensitivity analyses, probit regressions were re-estimated using a disenrollment gap definition of 30 days. Additionally, probits were estimated without the limited coverage group (composed largely of pregnant or post-partum women, which thus was correlated with the pregnancy status variable). Resulting statistics were considered significant if p-values were .05.

Results

Characteristics of the overall sample and disenrollment groups are presented in Table 2. This sample experienced a 32% disenrollment rate.

Unadjusted comparisons

Bivariate unadjusted comparisons reveal significant differences between those continuously enrolled and those disenrolled (Table 2). Those disenrolled were more likely to be ages 18

or 20, have a higher income, to be enrolled in the F&C/CHIP category, to have an antecedent disenrollment, and fewer inpatient psychiatric days. Those continuously enrolled were more likely to have a diagnosis of schizophrenia, recent pregnancy, enrollment as disabled or through foster care, and antecedent outpatient mental health or primary care visits.

Regression tree results

Figure 1 summarizes the CART analysis results. The first (furthest left on the tree), and thus the most differentiating split is by enrollment category, indicating that the greatest difference in disenrollment rate was between those in the F&C/CHIP group (57% disenrolled) and those in the other enrollment categories (20% disenrolled). The absence of subsequent splits between disabled, foster care or limited coverage groups suggests they are equivalent regarding disenrollment risk. The CART revealed a low risk group (13% disenrollment); those in non-F&C/CHIP enrollment categories without an antecedent disenrollment. This low-disenrollment group was large ($n=567$; 48% of the sample), but contained only 18% of those disenrolled. By contrast, of the remaining sample ($n=609$), 51% were disenrolled (derived from figure). The highest disenrollment rate (83%) was observed within the F&C/CHIP group among individuals between ages 20.1 and 22.7 years and with no antecedent primary care utilization. This group comprised only 7% of the sample. All other subgroups identified by the CART experienced disenrollment at variously elevated rates (range=40–71% disenrollment).

The CART successfully classified 74% of the sample into the two categories (i.e. disenrolled or not), but successful classification of disenrollment occurred for only 38% of disenrolled cases.

Probit regression results

The overall regression model is significant (see Table 2, right columns), with *pseudo-R*² calculations indicating it accounted for 20% of the variance in the enrollment outcome (31). Of the ten variables that were significantly different between disenrollment groups in the bivariate analyses, seven were significant in the probit analyses, while group differences in age (years), diagnosis, and outpatient mental health utilization did not reach significance. No new significant effects emerged from the probit. Similar to the CART analysis, F&C/CHIP enrollment status was a strong and significant predictor of disenrollment, increasing the probability of disenrollment by 38% (95% CI: 30 to 45%). Also similar to the CART analysis, antecedent primary care decreased the probability of follow-up disenrollment by 11% (CI: 18 to 4.7%).

Probit sensitivity analyses

Sensitivity analyses (data not shown) largely agreed with results presented in Table 2. Removing the limited coverage group ($N=90$) produced the following changes to disenrollment risk: higher income yielded increased effects (25%, CI: 12% to 38%), pregnancy effects were attenuated slightly to non-significance (from –15.0% to –9.0%, CI: –21% to 1.0%), and antecedent emergency room use became a significant correlate (8.1%, CI: 1% to 15%). Using longer (≥ 30 day) disenrollment replicated in magnitude and significance 6 of the 7 significant effects listed in Table 2 (inpatient days became non-significant). Limited coverage, Hispanic race, and male gender were also significant correlates of longer disenrollment, suggesting that each is more associated with longer than shorter gaps. Longer disenrollment occurred in 28% of the population.

Discussion

This study quantified, using two distinct statistical methods which considered all independent variables hierarchically (CART) or simultaneously (probit), individual-level correlates of future Medicaid disenrollment among emerging adults discharged from a psychiatric inpatient stay. Thirty-two percent of emerging adults experienced disruptions in Medicaid coverage in the first year after discharge from a psychiatric inpatient event. This finding alone supports concerns about the adequacy of health care coverage during this interval of heightened risk for suicide and hospital readmission (15, 16, 18, 24).

Although the disenrollment rate observed in this sample is comparable to disenrollment rates observed in general populations of child and adult Medicaid enrollees (32), a relatively lower disenrollment rate was expected due to the multiple clinical vulnerabilities of these emerging adults. Consequently, contrary to expectations, these emerging adults were not “protected” them from disruptions in health care coverage. Moreover, emerging adults are less likely than any other age group to have private insurance (33), suggesting that in the critical time following inpatient mental health treatment many of these emerging adults may have had poorer access to outpatient mental health treatment compared to other child or adult Medicaid enrollees.

Generally, our findings confirm five of the hypothesized risk factors. Support from both the CART and probit modeling confirmed that being non-disabled (i.e., being enrolled via F&C/CHIP), being an eligibility change age (i.e., 18 or 20 years old), and without recent connection to primary care, were each correlated with disenrollment. Probit analysis also provided support for greater enrollment continuity among those with greater morbidity (i.e. more inpatient days) and relatively greater incomes. Less support was found for the effect of antecedent outpatient mental health services, or gender.

Our findings indicate that the single strongest Medicaid disenrollment risk factor is being enrolled under F&C/CHIP eligibility, with a majority (57%) of these emerging adults subsequently disenrolled. Those in the F&C/CHIP category typically qualify for Medicaid because they are a low-income child or child in a low-income family; conditions which change in the transition to adulthood. Both analyses also converged on the importance of prior disenrollment as a risk factor for subsequent disenrollment. This finding suggests that being admitted for inpatient mental health treatment does not necessarily reduce future risk of disenrollment among those emerging adults whose enrollment in Medicaid had previously been inconsistent. Having either of these two characteristics (F&C/CHIP or antecedent disenrollment) indicated a 51% rate of disenrollment, and applied to approximately half of the population.

Prior primary care utilization emerged as a protective factor from disenrollment. Primary care providers may play an active role in observing risk for coverage loss and facilitate applications for continuation. Others have observed directly or commented about the importance of primary care, including holistic care, to help persons with serious mental illness address the other health issues they typically face (e.g. (19, 34–37).

The finding of lowered risk in the disabled and foster care groups and those with more inpatient psychiatric days confirms that, even within our clinically at-risk group, those most vulnerable were less likely to be disenrolled. The surprisingly low disenrollment in foster care youth despite their “aging out” status, which was also reported by Pullmann and colleagues (11), may be accounted for by Medicaid extensions through age 20 for those that are disabled, pregnant, parents or medically needy (38), with perhaps additional efforts by case workers to prevent disenrollment in this particularly vulnerable subpopulation.

Antecedent pregnancy also reduced disenrollment risk, consistent with previous findings in this age group (11), and with adults in general (20). Moreover, probit coefficients for antecedent pregnancy were only slightly attenuated by removing the limited coverage group from the analysis. Pregnancy is a qualifying condition for limited coverage, and the current limited coverage group contained 58 of the 135 pregnant women in our sample. Accordingly, it seems that any pregnancy, even if it was *not* the nominal Medicaid qualifying event, results in more stable Medicaid enrollment. This finding suggests that new mothers or expectant women are easier to maintain in Medicaid than others despite pregnancy-related eligibility often “expiring” 60 days post-partum (25). Continued Medicaid enrollment may be supported through their own motivation to keep their infant and themselves covered, or qualifying as a low-income family when infant care can make income earning challenging.

The association of higher family income with greater disenrollment suggests “temporary” eligibility that results from slight fluctuations in income or age producing disenrollment (23).

Overall, the current findings are similar to those found by Pullmann and colleagues (11) who examined Medicaid disenrollment patterns across 7.5 years for a Mississippi Medicaid-cohort of 16 year-olds with mental health service utilization. They also found reduced disenrollment among individuals enrolled through disability or foster care, or pregnant, and substantial disenrollment at ages associated with enrollment eligibility changes, and among those enrolled through child or parental low-income. Generally, the direction of the effect of other shared variables (i.e. male gender, and schizophrenia diagnosis) was similar, but was weaker in the current study. Overall, the similarity of findings is striking given the shorter duration of disenrollment and follow-up in the current study, and the opposite state rankings of per capita income in the two samples (MD 5th, MS 50th; U.S. Census 2007; www.census.gov/statab/ranks/rank29.html).

These findings suggest that Medicaid disenrollment following an inpatient stay might be prevented by identifying and offering enrollment supports to those emerging adults who are at greatest risk of disenrollment. Such supports would involve assisting young adults with Medicaid re-enrollment processes or with obtaining alternative coverage, and would presumably be offered by the state Medicaid office or the public mental health authority. Given the brevity of inpatient mental health treatment, and many competing priorities prior to discharge, assessing disenrollment risk should happen as quickly as possible, with linkage to supports that can help negotiate and advocate for health care coverage.

Beginning in 2014, implementation of Medicaid expansions and insurance exchange plans under the 2010 Affordable Care Act might be expected to reduce the risk of Medicaid disenrollment in emerging adults. In addition, many states are putting in place administrative processes intended to simplify insurance plan enrollment, using for example a single unified application for both Medicaid and Exchange plans; outreach to underserved populations; exchanges plans designed specifically for youth under age 21; making childless adults with incomes up to 133% of poverty eligible for Medicaid, at state option, with a much higher federal match than for other populations; and those uninsured for more than six months may be eligible for federally-subsidized state high-risk insurance plans that provide subsidized coverage for those with pre-existing conditions (39, 40).

However, there are also reasons to be skeptical of the potential effectiveness of such reforms, at least for emerging adults with substantial mental health morbidity. Each step of preventing disenrollment or obtaining alternative health care coverage requires individuals to engage in the application process, which may be a substantial barrier for this group.

Indeed, studies of the Massachusetts health care reform have found increased enrollment for young adults in Medicaid and through health care exchanges, (41, 42) but worse enrollment among adults with behavioral health problems (43).

Limitations

This study's sample was comprised of emerging adults in a single state's Medicaid program. These results may not generalize accurately to populations in other states, to other age groups, or to populations with different service utilization histories. In addition, the Medicaid enrollment data used for this study did not provide any information about receipt of private or other insurance coverage among those who disenrolled from Medicaid. However, prior evidence suggests that the likelihood of maintaining continuous health insurance coverage may have been quite low for these emerging adults, who were from low income backgrounds and had serious mental health problems(33). Statistical models explained only a portion of the variability in Medicaid disenrollment, with most of the variability left unexplained. Factors such as disenrollment due to imprisonment (emerging adulthood is the peak age for imprisonment in males), and failure to re-apply, which were not captured by this database, may also have been important.

Conclusions

This study provides evidence that gaps in Medicaid coverage among emerging adults in the year following inpatient psychiatric discharge are related to being enrolled via an impoverished child or non-disabled parent Medicaid eligibility category, recent prior Medicaid discontinuities, ages associated with eligibility changes, and recent absence of primary care visits. Additionally, having household income closer to the upper bound of Medicaid eligibility increases risk for future Medicaid disenrollment, and pregnancy is only transiently protective against disenrollment. Although implementation of the 2010 Affordable Care Act will offer various pathways for emerging adults to maintain their health insurance coverage, achieving this continuity may still be challenging for many of these emerging adults due to their relative inexperience coupled with their mental health symptoms. In the absence of evidence demonstrating that the 2010 Affordable Care Act eliminates coverage disruptions in this vulnerable population, the feasibility and effectiveness of formal supports to increase continuity of coverage for needed mental health services should be examined.

References

1. Arnett JJ. Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*. 2000; 55:469–480. [PubMed: 10842426]
2. Davis M, Vander Stoep A. The transition to adulthood for youth who have serious emotional disturbance: Developmental transition and young adult outcomes. *The Journal of Behavioral Health Services and Research*. 1997; 24:400–427.
3. Gore F, Bloem P, Patton G, et al. Global burden of disease in young people aged 10–24 years: a systematic analysis. *Lancet*. 2011;60512–60516.
4. Davis M, Green M, Hoffman C. The service system obstacle course for transition-age youth and young adults. 2009;25–46.
5. Collins SR, Nicholson JL. Rite of Passage: Young adults and the Affordable Care Act of 2010. *The Commonwealth Fund*. 2010
6. Finkelstein A, Taubman S, Wright B, et al. The Oregon health insurance experiment: Evidence from the first year. *The Quarterly Journal of Economics*. 2012; 127:1057–1106. [PubMed: 23293397]
7. Garfield RL, Lave JR, Donohue JM. Health reform and the scope of benefits for mental health and substance use disorder services. *Psychiatric Services*. 2010; 61:1081–1086. [PubMed: 21041345]

8. Frank, RG.; Glied, SA. Better but not well: Mental health policy in the United States since 1950. Baltimore, MD: Johns Hopkins University Press; 2006.
9. Kaiser Commission on Medicaid and the Uninsured: Aging out of Medicaid: What is the risk of becoming uninsured? Publication. 2010 Mar. #8057.
10. Hemmeter J. Health-related unmet needs of Supplemental Security Income youth after the age-18 redetermination. *Health Services Research*. 2011; 46:1224–1242. [PubMed: 21306371]
11. Pullmann MD, Heflinger CA, Mayberry LS. Patterns of Medicaid disenrollment for youth with mental health problems. *Medical Care Research and Review*. 2010; 67:657–675. [PubMed: 20555015]
12. Courtney, ME.; Heuring, DH. On your own without a net: The transition to adulthood for vulnerable populations. Chicago: University of Chicago; 2005. The transition to adulthood for youth “aging out” of the foster care system; p. 27–67.
13. Pottick KJ, Bilder S, Vander Stoep A, et al. US patterns of mental health service utilization for transition-age youth and young adults. *The Journal of Behavioral Health Services and Research*. 2008; 35:373–389. [PubMed: 18026842]
14. Olson LM, Tang SS, Newacheck PW. Children in the United States with discontinuous health insurance coverage. *New England Journal of Medicine*. 2005; 353:382–391. [PubMed: 16049210]
15. Yim PH, Yip PS, Li RH, et al. Suicide after discharge from psychiatric inpatient care: A case-control study in Hong Kong. *Australian and New Zealand Journal of Psychiatry*. 2004; 38:65–72. [PubMed: 14731196]
16. Desai RA, Dausey DJ, Rosenheck RA. Mental health service delivery and suicide risk: the role of individual patient and facility factors. *American Journal of Psychiatry*. 2005; 162:311–318. [PubMed: 15677596]
17. Troister T, Links PS, Cutcliffe J. Review of predictors of suicide within 1 year of discharge from a psychiatric hospital. *Current Psychiatry Reports*. 2008; 10:60–65. [PubMed: 18269896]
18. Schoenbaum SC, Cookson D, Stelovich S. Post discharge follow-up of psychiatric inpatients and readmission in an HMO setting. 1995; 46:943–945.
19. Abrams MT, Myers CS, Feldman SM, et al. Cervical cancer screening and acute care visits among Medicaid enrollees with mental and substance use disorders. *Psychiatric Services*. 2012; 63:815–822. [PubMed: 22660581]
20. Hill I, Hogan S, Palmer L, et al. Medicaid Outreach and enrollment for pregnant women: What is the state of the art? The Urban Institute. 2009
21. Snyder A, Dolatshahi J, Hess C, et al. Potential roles for safety net providers in supporting continuity across Medicaid and Health Insurance exchanges. National Academy for State Health Policy. 2012
22. Hadley J, Reschovsky JD, Cunningham P, et al. Insurance premiums and insurance coverage of near-poor children. *Inquiry*. 2006; 43:362–377. [PubMed: 17354371]
23. Kaiser Commission on Medicaid and the Uninsured: Where are states today? Medicaid and CHIP eligibility levels for children and non-disabled adults. 2012 7993-02.
24. Klinkenberg WD, Calsyn RJ. Predictors of receipt of aftercare and recidivism among persons with severe mental illness: a review. *Psychiatric Services*. 1996
25. Maryland Department of Health and Mental Hygiene: Quick Reference Guide to Medical Care Program Coverage Groups and Health Choice Eligibility. 2006
26. Breiman, L.; Friedman, JH.; Olshen, RA., et al. Classification and Regression Trees. New York: Chapman & Hall/CRC; 1984.
27. Toschke AM, Beyerlein A, von Kries R. Children at high risk for overweight: a classification and regression trees analysis approach. *Obesity research*. 2005; 13:1270–1274. [PubMed: 16076998]
28. Steadman HJ, Silver E, Monahan J, et al. A classification tree approach to the development of actuarial violence risk assessment tools. *Law and Human Behavior*. 2000; 24:83–100. [PubMed: 10693320]
29. Maddala, GS. Limited-Dependent and Qualitative Variables in Econometrics. Cambridge University Press; 1983.

30. Davis M, Koroloff N. The great divide: How mental health policy fails young adults. *Community-based mental health services for children and adolescents*. 2005; 14:53–74.
31. Institute for Digital Research and Education UCLA: Stata Annotate Output Probit Regression. 2012
32. Sommers BD. Loss of Health Insurance Among Non-elderly Adults in Medicaid. *Journal of General Internal Medicine*. 2008; 24:1–7. [PubMed: 18810555]
33. Mills, RJ.; Bhandari, S. Health insurance coverage in the United States. Washington, D.C: U.S. Census Bureau; 2003. p. 1-21.
34. Cunningham P, Felland L, Stark L. Safety-net providers in some US communities have increasingly embraced coordinated care models. *Health Affairs*. 2012; 31:1698–1707. [PubMed: 22869647]
35. Takach M. About half of the states are implementing Patient-Centered Medical Homes for their Medicaid populations. *Health Affairs*. 2012; 31:2432–2440. [PubMed: 23129673]
36. Dierker L, Donny E. The role of psychiatric disorders in the relationship between cigarette smoking and DSM-IV nicotine dependence among young adults. *Nicotine & Tobacco Research*. 2008; 10:439–446. [PubMed: 18324562]
37. Needham BL, Epel ES, Adler NE, et al. Trajectories of change in obesity and symptoms of depression: The CARDIA study. *American Journal of Public Health*. 2010; 100:1040–1046. [PubMed: 20395582]
38. Raghavan R, Shi P, Aarons GA, et al. Health insurance discontinuities among adolescents leaving foster care. *Journal of Adolescent Health*. 2009; 44:41–47. [PubMed: 19101457]
39. Koyanagi, K.; Alfano, E. Promise for the future: How federal programs can improve the career outcomes for Youth and Young Adults with serious mental health conditions. Worcester, MA: University of Massachusetts Medical School and Washington, DC, Bazelon Center for Mental Health Law; 2013.
40. The Henry J. Kaiser Family Foundation: Establishing Health Insurance Exchanges: An Overview of State Efforts. 2013 8213-02.
41. Gettens J, Mitra M, Henry AD, et al. Have working-age people with disabilities shared in the gains of Massachusetts health reform? *Inquiry*. 2011; 48:183–196. [PubMed: 22235544]
42. Long SK, Yemane A, Stockley K. Disentangling the effects of health reform in Massachusetts: How important are the special provisions for Young Adults? *The American Economic Review*. 2010; 100:297–302.
43. Capoccia V, Croze C, Cohen M, et al. Sustaining enrollment in health insurance for vulnerable populations: Lessons from Massachusetts. *Psychiatric Services*. 2013; 64:360–365. [PubMed: 23319011]
44. National Committee for Quality Assurance: HEDIS 2008: Technical Specifications (10284-00-08). 2007
45. Goodman DC, Mick SS, Bott D, et al. Primary Care Service Areas: A New tool for the evaluation of primary care services. *Health Services Research*. 2003; 38:1. [PubMed: 12650378]

Figure 1.

Classification and Regression Tree (CART) of Medicaid-enrolled emerging adults that received inpatient mental health treatment (n=1,176) illustrating subgroups and associated Medicaid disenrollment rates in the 365 days post discharge.

Table 1

Description of independent variables. Variables were generated by algorithmic review of Medicaid claim, enrollment, and recipient demographic files for periods noted.

Independent Variable	Description
Demographics	
Age	Age at discharge
Race	Race of record
Gender	Gender of record
Urban/Suburban vs. Rural	Based on zip code of residence at discharge
Higher Income	Flag [*] for enrollment categories at discharge which accommodate family incomes ranging from 116% to up to 185% of federal poverty level (e.g. children under age 19 or pregnant women), and two other codes revealing “spend down” categories which required families to first use their own savings prior to tapping government Medicaid funds for their medical needs (25). Higher income individuals thus are those at baseline who were in families that have incomes above 116% of poverty, or those who have some spare savings.
Major Medicaid Eligibility Categories at Discharge Event (25)	
Disabled	Categorically per state or federal standards, i.e., higher overall morbidity than other eligibility categories
Foster care	Custodial care provided by state
Families and Children or Children’s Health Insurance Program (F&C/CHIP)	Eligibility based on family income and participant’s minor status
Limited coverage groupings	Coverage provided is limited in duration and/or extent of Medicaid coverage {i.e., pregnancy or post-partum (71%), pharmacy assistance or primary care only (14%), or non-citizens (14%)}
Variables from antecedent (i.e. 180 days before discharge event) records	
Mental Health Diagnoses	Based on each participant’s 5 most frequent diagnoses in their Medicaid claims. ^{**} using the International Classification of Diseases (ICD)-9 diagnostic codes in the Medicaid record
Schizophrenia spectrum	ICD-9 code series: 295.1–295.4; 295.6–295.9
Bipolar	ICD-9 code series: 296.0x, 296.4x–296.9x, absent a schizophrenia spectrum diagnosis
Depressive disorders	ICD-9 code series: 296.2x–296.3x, 311.xx, absent a schizophrenia spectrum or bipolar disorder diagnosis
Other mental illness	ICD-9 code series: 290, 293–4, 297–302, 306–319, absent schizophrenia spectrum, bipolar, or depressive disorders diagnoses
Substance Use Disorder (non tobacco)	ICD-9 code series: 303.xx–305.xx; excluding 305.1 (tobacco use disorder)
Pregnancy	A flag [*] for Standardized {National Center for Quality Assurance/Healthcare Effectiveness Data and Information Set (NCQA/HEDIS)} ICD-9 and procedure code criteria (44)
Medicaid Disenrollment	A flag for disenrollment (>0 days) in antecedent records, i.e., one or more days without Medicaid coverage per enrollment span records.
Outpatient Mental Health Service Use	A flag indicating receipt of at least one standard outpatient mental health service where primary diagnosis is a mental health diagnosis (ICD-9: 290–302; 306–319), and standard outpatient mental health treatment venue (i.e. excluding emergency department, specialized day hospital or psychiatric rehabilitation clinic)
Primary Care Visit	A flag indicating at least one primary care visit occurred per definitions employed previously to isolate “well-visits” and other primary care encounters (44, 45)
Inpatient somatic care stay	A flag indicating any inpatient stay not connected to a primary mental health diagnosis (i.e., excluding ICD-9 codes in the series: 290–302, 306–319).
Emergency room visit	A flag indicating any emergency room visit per UB revenue codes (045x or 0981) adapted from NCQA/HEDIS definitions of ambulatory care visits (44)
Total number of mental health inpatient days	Includes index inpatient event, and all other inpatient days in the 180 interval before discharge where primary diagnosis was in the ICD-9 series: 290–303, 306–319

* Flag= a binary variable where 1= presence of the event, and 0 = its absence.

** When a participant's 5 most frequent diagnoses fell into more than one category, the individual was assigned to the category associated with the greatest morbidity, in the following order: schizophrenia, bipolar, depressive disorders, and other mental illness.

Table 2

Sample characteristics of 1176 young adults that received inpatient psychiatric care and were Medicaid enrolled at discharge, stratified by post-discharge Medicaid enrollment status and bivariate and probit regression analysis results.

Variable	Total Sample (N=1176)		Bivariate Analyses				Probit Multiple Regression ^d		
	N	% or mean±SD	Continuously Enrolled (N=797)	Disenrolled (N=379)	χ ²	p	degrees of freedom	df/dx ^c	95% confidence interval
Male gender	478	49	408	51	.12	.73	1	.057	-.0079, .12
Age 18 or 20 years (%)	300	26	169	35	24	<.001	1	.13**	.046, .22
Age (years) M±SD	1176	22.1±2.3	797	21.9±2.3	t=2.1	.04	1,174	.015	-.00072, .030
Race (reference: White)									
White (%)	540	46	364	46					
Black (%)	574	47	378	45				.0090	-.055, .073
Hispanic (%)	31	2.6	16	3.9	5.8	.21	4	.15	-.047, .33
Other	18	1.5	<11 ^d	<11 ^d				.22	-.033, .47
Unknown (%)	40	3.4	29	2.9				-.0015	-.17, .16
Higher income (%)	145	12	77	18	16	<.001	1	.13*	.021, .24
Urban or Suburban Residence (%)	973	83	670	80	3.0	.081	1	-.015	-.092, .063
Diagnosis ^b (reference: Other Mental Illness)									
Schizophrenia (%)	307	26	236	30				-.0056	-.097, .086
Bipolar (%)	342	29	240	30	25	<.001	3	.016	-.065, .097
Depressive disorders (%)	238	20	150	19				.027	-.058, .11
Other Mental Illness (%)	289	25	171	21					
Substance Use Disorder (%)	116	9.9	83	10	.84	.36	1	-.036	-.13, .055
Recent pregnancy	135	11	107	13	9.2	.002	1	-.15**	-.23, -.058
Enrollment category ^b (reference: Disabled)									
Families & Children or CHIP (%)	382	32	165	21	162	<.001	3	.38***	.30, .45

	Total Sample			Bivariate Analyses								Probit Multiple Regression ^a		
	(N=1176)			Continuously Enrolled (N=797)		Disenrolled (N=379)		χ ²	p	degrees of freedom	df/dx ^c	95% confidence interval		
Variable	N	% or mean±SD		N	% or mean±SD	N	% or mean±SD	-	-	-	-	-		
Disabled (%)	646	55		514	64	132	35							
Foster Care (%)	58	4.9		53	6.7	5	1.3							
Limited coverage (%)	90	7.7		65	8.2	25	6.6							
Recent disenrollment (%)	354	30		176	22	178	47	76	<.001	1	.17***	.093, .24		
Outpatient mental health visit (%)	977	83		699	88	278	73	38	<.001	1	-.073	-.16, .011		
Primary care visit (%)	499	42		390	49	109	29	43	<.001	1	-.11**	-.18, -.047		
Inpatient somatic event (%)	176	15		126	16	50	13	1.4	.24	1	-.011	-.095, .073		
Emergency room visit (%)	486	41		340	43	146	39	1.8	.18	1	.043	-.022, .11		
Recent inpatient psychiatric use (days) M±SD	1176	7.9±11		797	8.7±13	379	6.1±6.9	t=3.7	<.001	1,174	.0037*	-.0071, -.00022		

^aLog-likelihood= -595, $\chi^2=293$, pseudo- $R^2=.20$, $n=1,176$, degrees of freedom=23

^bMutually exclusive categories = refers to a yes/no binary indicator

^cdf/dx = incremental change in y (disenrollment risk) for each incremental change in the listed variable

^dUpper bound given to protect individual patient confidentiality

* p<.05

** p<.01

*** p<.001