

## Public Service Reductions Associated with Placement of Homeless Persons with Severe Mental Illness in Supportive Housing

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### *Abstract*

This article assesses the impact of public investment in supportive housing for homeless persons with severe mental disabilities. Data on 4,679 people placed in such housing in New York City between 1989 and 1997 were merged with data on the utilization of public shelters, public and private hospitals, and correctional facilities. A series of matched controls who were homeless but not placed in housing were similarly tracked.

Regression results reveal that persons placed in supportive housing experience marked reductions in shelter use, hospitalizations, length of stay per hospitalization, and time incarcerated. Before placement, homeless people with severe mental illness used about \$40,449 per person per year in services (1999 dollars). Placement was associated with a reduction in services use of \$16,282 per housing unit per year. Annual unit costs are estimated at \$17,277, for a net cost of \$995 per unit per year over the first two years.

**Keywords:** Homelessness; Housing

### **Introduction**

Placing homeless persons with severe mental illness (SMI) into subsidized permanent housing with social service support promises to substantially reduce the demand for shelter among those placed. This housing provides a more humane alternative to living on the streets and in shelters, and providers report retention rates in such housing to be upwards of 70 percent in the first year after placement. However, little empirical evidence has been gathered to quantify the degree to which supportive housing supplants shelter use among the formerly homeless with SMI. Furthermore, it can similarly be assumed that homeless persons with SMI, once placed in supportive housing, reduce their use of acute psychiatric and medical services, and are arrested and incarcerated less often. However, such assumptions are somewhat more tenuous, and a similar dearth of empirical evidence exists both on the demand for these services among homeless persons with SMI and on the impact of supportive housing on this level of demand.

The study reported here examines service use by formerly homeless persons with SMI before and after being placed into New York/New

York (NY/NY) housing, a large housing program in New York City (NYC). Administrative data from public health, psychiatric, criminal justice, and shelter service providers are used to assess the aggregate level of service demand, pre- and postintervention, for the study group and for a matched set of controls. The extent to which reductions in services are present and attributable to NY/NY housing placement is assessed, and the degree to which service reductions offset supportive housing costs is measured.

## Background

In 1990, New York State (NYS) and NYC agreed to jointly fund and develop 3,600 community-based permanent housing units for homeless persons with SMI under what became known as the New York/New York Agreement to House the Homeless Mentally Ill (Hevesi 1999; Kennedy 1995, 1997).<sup>1</sup> This initiative was in response to problems with homelessness and community mental health services that were perceived to have reached crisis proportions in NYC. The NY/NY agreement was designed to target those who were among the most chronic and difficult to serve among the homeless population and to ease demands on public shelter and psychiatric treatment services.

The agreement provided housing and psychosocial services in a variety of configurations collectively known as NY/NY housing. There are two general models: The first, supportive housing, includes scattered-site housing with community-based service support and single-room occupancy (SRO) housing (independent housing linked to either community-based or site-based service support). The second, community residence facilities, includes community residences, long-term treatment facilities, and adult homes (Center for Urban Community Services 1995; Lipton et al. 2000). In general, supportive housing emphasizes “normality” in housing in terms of separating services from housing arrangements and giving tenants a choice in their housing arrangements and mental health service regimens. By contrast, community residences take a more clinical approach that integrates housing and services delivery by having services available on site and participation mandated by the residence agreement. Supportive housing maintains that such housing is appropriate for persons with mental illness regardless of the severity of impairment, while the community residence model places people in increasingly less restrictive living arrangements as they progress

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<sup>1</sup> This initiative is also now referred to as NY/NY I, since a second initiative to provide additional units under a similar state/city-financed structure (NY/NY II) was passed in 1999.

through their treatment regimens (Bebout and Harris 1992; Carling 1993).

To be eligible for this housing, tenants must have a diagnosis of SMI and have been recently homeless in shelters or on the streets. After going through an application and assessment with the NYC Human Resources Administration (HRA) to determine NY/NY housing eligibility, the prospective tenant then applies through one of the nonprofit agencies that administer the actual units funded under the agreement. Thus, NY/NY eligibility, housing availability, agency eligibility guidelines, and tenant preference all factor into the placements provided under the agreement.

## Literature review

Studies that focus on supportive housing interventions for homeless persons with mental illness consistently find high rates of retention in these programs. Lipton, Nutt, and Sabatini (1988) followed 49 homeless persons with mental illness, half of whom were provided program housing. After one year, they found that 69 percent of the experimental group were living in permanent housing, as opposed to 30 percent of the control group. Drake et al. (1997) similarly report improved housing outcomes for a group of dually diagnosed<sup>2</sup> homeless persons who were provided residential treatment, compared with a control group given standard treatment. Caton et al. (1993) and Murray et al. (1997) report high rates of housing retention for participants in transitional and/or continuum-model programs, although none of the studies included comparable control groups.

In the most comprehensive review of supportive housing studies to date, Ridgway and Rapp (1998) report that supportive housing for homeless persons with mental illness reduced homelessness and improved housing stability among program participants. Research from a McKinney Demonstration Program (Center for Mental Health Services 1994), in which the National Institute of Mental Health sponsored five supportive housing projects in four cities, found increased rates of stable housing among the experimental groups—formerly homeless persons with mental illness who received supportive housing and case management services—compared with similar groups of controls who were provided with standard treatment services (Shern et al. 1997).

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<sup>2</sup> In this article, “dually diagnosed” refers to comorbid diagnoses of serious mental illness and substance abuse disorder.

In the San Diego McKinney project, Hurlburt, Wood, and Hough (1996) report on 362 persons who were homeless and severely mentally ill and who were randomly assigned to four groups that varied Section 8 rental subsidies and case management services. They found that Section 8 manipulation had a dramatic impact on subsequent housing stability, but that enhanced case management manipulation had no significant impact. Only 30 percent of the study participants who did not receive a rent subsidy achieved stable independent living, compared with 57 percent of those who did.

Both Goldfinger et al. (1999) and Dickey et al. (1996) report on an initiative that provided two types of housing in Boston for homeless persons with mental illness: independent apartments with community-based services and so-called evolving consumer households, where the tenants lived communally and with gradually diminishing levels of staff assistance. Three-quarters of the total subjects were stably housed at the end of the 18-month follow-up period. The subjects in the group homes had fewer days homeless than the supported housing group, but otherwise no significant differences in housing outcomes or services use were found (Dickey et al. 1996; Goldfinger et al. 1999).

Three studies have looked at the housing provided by the NY/NY agreement. Lipton et al. (2000) found that after one, two, and five years, 75 percent, 64 percent, and 50 percent of the almost 3,000 persons placed had remained in the program across all types of NY/NY housing configurations. Tsemberis (1999) and Tsemberis and Eichenberg (2000) have also found high rates of housing retention by NY/NY recipients, but in addition, found that tenants of one supported scattered-site housing program affiliated with NY/NY had a substantially higher retention rate after five years (88 percent) than other NY/NY supportive housing programs (55 percent).

High tenant-retention rates among housing interventions regardless of the particular configuration of services and housing have been a common finding in the housing programs examined so far. However, these similar outcomes belie the disparate costs involved in the two approaches. Community residence models, with their incorporation of site-based staff and services that work exclusively with the tenants, have substantially higher associated service costs than supportive housing models; these decouple residency and services to a greater extent, and their tenants make greater use of existing community services.

Persons with SMI could also be expected to reduce their use of hospital services following a housing placement, because persons who are receiving services would be in a better position to engage in regular outpatient regimens that could prevent the need for hospitalization.

Furthermore, if they are hospitalized, access to housing and support could reduce the length of stay in a hospital. In a study of public hospital records in NYC, Salit et al. (1998) found homelessness to be associated with substantial excess stays and costs per hospital stay. Lewis and Lurigio (1994), in a study of state hospital patients living in Chicago, found that when poor persons with mental illness seek psychiatric hospitalization, they often do so more as a short-term housing arrangement than for psychiatric reasons. In a review of the literature, Rosenheck (2000) found that enhancing services, either housing or case management, can generate reductions in the use of inpatient mental health services, especially among heavy hospital users. These reductions, however, may be at least partially offset by increased use of outpatient services (Averyt and Kamis-Gould 2000) and support services such as case management, which are needed to effect such inpatient reductions (Rosenheck 2000).

This leads to the question of whether providing a service such as supportive housing is cost-effective in reducing homelessness among persons with mental illness. Rosenheck (2000) found that for all but the heaviest service users, enhanced interventions cost more than the savings they generate. However, studies of reductions in service utilization and associated cost savings have typically focused on one type of service and on a single service system and have not integrated multiple providers and multiple systems. Integrating costs accrued by homeless persons across multiple providers in such systems as shelters, mental health services, medical care, and criminal justice would allow for a more comprehensive assessment of the cost of homelessness from which to estimate savings. By tracking people across multiple systems, the estimated public expenses associated with homelessness would likely increase, as would the estimated reductions in service use following the receipt of targeted housing. Thus, greater cost-effectiveness may be demonstrated.

## **Data and methods**

### *Data sources*

The data used in this study come from administrative databases maintained by eight different agencies. These databases are collected in computerized management information systems and track service utilization over time. As such, they represent comprehensive banks of data on users, both their characteristics and their patterns of use. Because these databases contain client identifiers, they can be linked across systems to identify how services received through one system may affect services in others. Administrative databases are the only

practical means of obtaining information on a large number of homeless persons over an extended period of time and with accurate data on service consumption across multiple systems (Culhane and Metraux 1997).

Databases used for this analysis come from the following sources:

1. NYC HRA, with records for 4,679 persons either placed in housing developed under the NY/NY agreement or deemed eligible for NY/NY housing and placed in community-based housing. The database includes demographic and identifying information, as well as the date and type of housing for placements through 1997. No information on the duration of discrete NY/NY placements is available.
2. NYC Department of Homeless Services (DHS), with records for all shelter users and shelter use since 1986 for its single-adult shelter network.
3. NYS Office of Mental Health (OMH), with a database of lifetime records of inpatient stays in the state psychiatric hospital system for anyone who was an inpatient in a state hospital from 1990 through 1996.
4. NYS Department of Health, Office of Medicaid Management (hereafter referred to as Medicaid), with records of Medicaid-reimbursed inpatient and outpatient health care claims for persons with records of shelter use and/or NY/NY housing placements for the years 1993 through 1997.
5. NYC Health and Hospitals Corporation (HHC), with records of inpatient stays in municipal hospitals between 1989 and 1996 for all persons with a DHS shelter record.
6. U.S. Department of Veterans Affairs (VA), with records of inpatient stays in the VA hospital system between 1992 and 1999 for all persons with records of DHS shelter utilization or NY/NY placement.
7. NYS Department of Correctional Services (NYSDOCS), with a database on state prison utilization for persons with a NY/NY housing placement, and a set of control observations selected from the DHS shelter system. Data used in this study were from 1988 through April 15, 1997.
8. NYC Department of Corrections (NYCDOC), with a database on NYC jail utilization for persons with a NY/NY housing placement,

and a set of control observations selected from the DHS shelter system. Data used in this study were from 1988 to 1999.

These databases were merged by matching five common identifiers: first and last names, sex, date of birth, and Social Security number. Segments of the first four identifiers were combined to create a unique identifier that was used to match cases across databases. Also, Social Security numbers (when available) were used to provide additional matches when the other identifiers were missing or contained erroneous data.<sup>3</sup>

### *Matched control groups*

By comparing each individual's history of service use in the two-year periods immediately before and after his or her NY/NY placement, it is possible to estimate the changes in service use for persons with NY/NY placements across these seven service systems. In addition, each person placed in NY/NY housing was matched to an individual control observation with similar characteristics to assess service use in the absence of a supportive housing placement. Because of the difficulty in consistently pairing case (NY/NY) and control observations with similar pre-intervention service use patterns across the seven service systems, different control groups were used to analyze different service systems. Appendix A contains a more detailed overview of the sampling frames for the respective control groups.

To construct the matched-pair control group for each analysis, the following criteria were used to select observations for the control groups based on similarities with specific control observations:

1. Demographics. Gender, race (black/nonblack), and age. Ages of those in the control pool are within five years of the case.
2. Indicators of mental illness and substance abuse. For the DHS control group, these indicators are based on data from DHS records and reflect the assessments of DHS social service staff and self-disclosure by shelter users at the intake interview (no standardized criteria for determining mental illness or substance abuse problems are used). For the OMH, HHC, Medicaid, and VA control groups, these indicators are based on *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition*, diagnoses that accompany hospitalizations.

<sup>3</sup> Further details on this process are available from the authors.

3. Similar service use for the two-year period up to the NY/NY placement date, based on the number of stays and days spent in service facilities (shelter, hospital, or prison) during the two-year intervention period, and the length of time between the last service use and NY/NY placement.

This case-control matching process has two parts. First, matching on elements of the first two groups of criteria (demographics and diagnosis indicators) limits the numbers of potential matches between each case observation and the pool of controls. Then, for each match, using the case observation's NY/NY placement date (which varies for each observation) as a surrogate intervention date for each potential control observation means that the control observation with the most similar pattern of preintervention service use (i.e., days and episodes for the two-year preintervention period) is selected to pair up with each case. For each case-control pair, the case observation's NY/NY placement date represents the intervention point that separates pre- and post-intervention periods for the case and control observations.

### *Analysis methods*

Each analysis follows a parallel set of procedures. First, descriptive statistics that facilitate comparisons of raw pre- and postintervention service use among the aggregate group with NY/NY housing placements are provided. Second, descriptive statistics on pre- and postintervention service use are provided for the case and control groups, with paired comparison *t* tests used to assess whether the differences between and within groups across intervention periods are statistically significant. Following these two analyses, the effect of a NY/NY housing placement on the reduction in postintervention service use, measured in days, is estimated with multivariate least squares regression models, using a generalized estimating equations (GEE) methodology. With its use of maximum likelihood estimation and an iterative generalized least squares algorithm, GEE can accommodate nonindependent observations such as matched pairs. Such a data structure normally violates the assumptions associated with ordinary least squares (OLS) regression, but this approach corrects the attenuated standard error values that would otherwise result from using OLS regression (Allison 1999).<sup>4</sup> In each regression model, the dependent variable is the difference, for each observation, in the number of days accrued in each of the service systems across the pre- to postintervention periods. The covariate of

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<sup>4</sup> Regression analyses were computed using GENMOD with the REPEATED option in SAS statistical software, version 8.1.



primary interest estimates the effect of getting a NY/NY placement, with all other factors held constant. Along with this NY/NY covariate, the control variables in the models are as follows:

1. The variables used to match the control groups
2. When applicable, a set of dichotomous variables to control for the year of NY/NY placement
3. A set of measures for preperiod service use, including service episodes, service days consumed, and (when available) cost of services<sup>5</sup>
4. Measures of preperiod DHS shelter use

## Results

### *System-specific effects*

*Use of DHS shelter services.* Almost three-quarters of those placed in NY/NY housing have some record of having stayed in a DHS shelter at some point between 1987 and 1999.<sup>6</sup> These 3,365 persons with DHS and NY/NY records were matched with control observations from the NYC DHS single-adult shelter system, and the resulting dataset, with 3,338 matched pairs, provides the basis for a case-control comparison of shelter usage for two-year periods before and after the NY/NY intervention point. A total of 27 case observations (0.8 percent) could not be matched with a control observation.

The descriptive results (table 1) show a dramatic 85.6 percent pre/post placement decline in the mean number of shelter days used by persons with NY/NY placements, from 137.0 days per placement to 19.8 days

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<sup>5</sup> Measures of preperiod use of services control for two phenomena: first, the prerequisite that higher degrees of preintervention services must have higher differences in levels of pre/post use of services and second, the effects of prior use of services on the likelihood of engaging in subsequent use of services. These anticipated effects run counter to each other, since the former would associate higher preperiod use of services with greater reductions in postintervention use, and the latter would associate preperiod use of services with lower or negative differences in pre/post use of services. While this could lead to difficulty in interpreting the services use coefficients, it should control for these effects when considering the effects of NY/NY placement.

<sup>6</sup> Of the 4,679 persons with NY/NY housing placements, 3,365 (71.9 percent) also had DHS shelter records, even though all of them, by NY/NY eligibility criteria, must have been homeless before housing placement. Of those without shelter records, some may have used shelters not covered by the DHS database (approximately 20 percent of all NYC shelter beds), some may have used shelters outside NYC, and some may have stayed exclusively in nonshelter (street) arrangements during their periods of homelessness.

per placement. In the case-control comparison, the unadjusted case group decline (85.6 percent) is consistent with that of the entire NY/NY group and far outpaces the 6.4 percent unadjusted decline experienced by the controls. The pre/post declines for both groups are statistically significant (at  $p < 0.01$ ) using paired-comparison  $t$  tests. In the preintervention period, the mean per placement number of shelter days used among the cases is heavier ( $p < 0.0001$ ) among the case group, but this relationship inverts in the postintervention period ( $p < 0.0001$ ) as the controls become, on average, the heavier shelter users.

In the regression model shown on table 2, the NY/NY placement is still associated with a 115.3-day reduction in shelter days used from the pre- to the postintervention period (95 percent confidence interval [CI], 107.7 to 123.0 days) after controlling for other factors, especially heavy shelter use.<sup>7</sup> Taking this 115.3-day reduction and averaging it out over all 4,679 persons with NY/NY placements yields an estimated reduction per NY/NY placement of 82.9 shelter days (95 percent CI, 77.4 to 88.5 days) over the two-year period.<sup>8</sup> This represents an adjusted reduction of 60.5 percent, compared with the average preintervention shelter usage by the NY/NY placements (137.0 from table 1).

*Use of OMH inpatient state psychiatric hospital services.* Of the 2,396 persons receiving a NY/NY placement from 1992 to 1994, 897 (37.4 percent) had some record of an inpatient OMH state hospital stay. Of this subgroup, 630 observations also had a record of DHS shelter use and were matched with DHS controls. These 630 case observations provided the basis for the OMH case-control analysis, with 570 (90.5 percent) of these observations matched with control observations selected from DHS shelter users.

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<sup>7</sup> Heavy shelter use is interpreted as a combination of two covariates in the model, “shelter days accrued” and “any shelter use.” These coefficients have opposite signs, meaning that the value of preintervention shelter days is associated with decreased reductions in the number of postintervention shelter days with few preintervention shelter days accrued, and increased reductions with many preintervention shelter days accrued (see footnote 4). Thus, if an observation had five preintervention shelter days, the combined coefficient of the coefficients shelter days accrued and any shelter use ( $0.75 \times 5 - 34.48$ ) would be a postperiod increase of 30.73 shelter days used (all else held equal), while a preintervention stay of 100 days ( $0.75 \times 100 - 34.48$ ) would lead to a combined coefficient associated with a decrease of 40.52 shelter days used. Equilibrium here would be at 46 days.

<sup>8</sup> This average is computed by dividing estimated aggregate reduction in shelter days attributed to NY/NY ( $115.3 \times 3,365$ ) by the total number of NY/NY placements (4,679).

**Table 1. Shelter Days Consumed by Persons in NY/NY Housing and Controls in the Two-Year Periods before and after the NY/NY Intervention**

|                                     | NY/NY<br>(Total 1989–97) | NY/NY<br>(Matched Pairs) | Controls<br>(Matched Pairs) |
|-------------------------------------|--------------------------|--------------------------|-----------------------------|
| N                                   | 4,679                    | 3,338                    | 3,338                       |
| Total service users                 | 3,365                    | 3,338                    | 3,338                       |
| Pre-NY/NY intervention (two years)  |                          |                          |                             |
| Total persons with shelter records  | 2,786 (59.5%)            | 2,750 (82.4%)            | 2,265 (67.9%)               |
| Total days sheltered                | 641,171                  | 636,319                  | 544,700                     |
| Mean days (all persons)             | 137.0                    | 190.6                    | 130.9                       |
| Mean days (shelter users)           | 230.2                    | 231.4                    | 240.5                       |
| Post-NY/NY intervention (two years) |                          |                          |                             |
| Total persons with shelter records  | 782 (16.7%)              | 776 (23.2%)              | 1,754 (51.4%)               |
| Total days sheltered                | 92,421                   | 91,751                   | 408,883                     |
| Mean days (all persons)             | 19.8                     | 27.5                     | 122.5                       |
| Mean days (shelter users)           | 118.2                    | 118.2                    | 233.0                       |

Note: Between the NY/NY and control groups, paired-comparison *t* tests assessing difference yield, for preintervention differences in shelter days,  $t = 27.3$  (3,337 *df* and  $p < 0.0001$ ), and for postintervention differences,  $t = -26.2$  (3,337 *df* and  $p < 0.0001$ ).

Using paired-comparison *t* tests, pre/post differences yield, within the NY/NY group,  $t = 46.04$  (3,337 *df* and  $p < 0.0001$ ), and within the control group,  $t = 2.6$  (3,337 *df* and  $p < 0.01$ ).

**Table 2. Regression Model Estimating Effects on Changes in Shelter Days Used in the Two-Year Periods before and after the NY/NY Intervention (N = 3,338 Matched Pairs)**

| Covariate  | Parameter<br>Estimate<br>(Days Saved) | Lower<br>(95%) CI  | Upper<br>(95%) CI |
|--|---------------------------------------|--------------------|-------------------|
| Intercept  | -44.13***                             | -61.35             | -26.92            |
| Received NY/NY placement                                   | 115.33***                             | 107.66             | 123.01            |
| Shelter days accrued in two-year<br>preintervention period | 0.75***                               | 0.72               | 0.78              |
| Any shelter use in two-year preinter-<br>vention period    | -34.48***                             | -41.77             | -27.19            |
| NY/NY placement in 1996–97                                 | -24.83***                             | -36.32             | -13.34            |
| NY/NY placement in 1994–95                                 | -9.54                                 | -19.97             | 0.89              |
| NY/NY placement in 1992–93                                 | 3.70                                  | -6.35              | 13.76             |
| NY/NY placement before 1992                                |                                       | Reference Category |                   |
| Age at NY/NY placement                                     | -0.12                                 | -0.42              | 0.19              |
| Male   | -13.35***                             | -20.26             | -6.44             |
| Black race   | 1.97                                  | -4.72              | 8.67              |
| DHS mental illness indicator                               | -8.14*                                | -15.06             | -1.21             |
| DHS drug use indicator                                     | 0.02                                  | -7.04              | 7.09              |

\* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ .

Descriptive results of state hospital use, shown in table 3, show large reductions in pre/post state hospital use, measured in days, among the total NY/NY group (59.9 percent reduction), as well as among the more restricted case group (57.0 percent reduction). Looking at the case-control comparison, the preintervention state hospital use, measured in days, is (by design) very similar (i.e., with statistically nonsignificant differences). By contrast, the difference in postintervention state hospital use is both substantial and statistically significant ( $p < 0.0001$ ). Comparing within groups, the NY/NY group shows significant pre/post reductions in state hospital use ( $p < 0.0001$ ), while the reductions in state hospital days used are nonsignificant for the control group. Further, for the NY/NY group, far fewer persons experienced postintervention hospital episodes than in the control group, and the mean number of hospital days per hospitalized person also declined after the intervention. While persons hospitalized also declined in the latter time period for the control group, the average number of days hospitalized increased substantially for the control group.

*Table 3. OMH State Hospital Days Consumed by Persons in NY/NY Housing and Controls in the Two-Year Periods before and after the NY/NY Intervention*

|                                     | NY/NY<br>(Total 1992–94) | NY/NY<br>(Matched Pairs) | Controls<br>(Matched Pairs) |
|-------------------------------------|--------------------------|--------------------------|-----------------------------|
| N                                   | 2,396                    | 570                      | 570                         |
| Total service users                 | 897                      | 570                      | 570                         |
| Pre NY/NY intervention (two years)  |                          |                          |                             |
| Total persons hospitalized          | 634 (26.4%)              | 406                      | 406                         |
| Total days hospitalized             | 137,215                  | 78,250                   | 78,940                      |
| Mean days (all persons)             | 57.3                     | 137.3                    | 138.5                       |
| Mean days (hospital users)          | 216.4                    | 192.7                    | 194.4                       |
| Post NY/NY intervention (two years) |                          |                          |                             |
| Total persons hospitalized          | 353                      | 240                      | 335                         |
| Total days hospitalized             | 55,070                   | 33,623                   | 74,869                      |
| Mean days (all persons)             | 23.0                     | 59.0                     | 131.4                       |
| Mean days (hospital users)          | 156.0                    | 140.1                    | 223.5                       |

*Note:* Between the NY/NY and control groups, paired-comparison  $t$  tests assessing difference yield, among preintervention state hospital days,  $t = -1.8$  (569  $df$  and  $p = 0.07$ ), and for postintervention differences,  $t = -7.7$  (569  $df$  and  $p < 0.0001$ ).

Using paired-comparison  $t$  tests, pre/post differences yield, within the NY/NY group,  $t = 9.3$  (569  $df$  and  $p < 0.0001$ ), and within the control group,  $t = -1.8$  (569  $df$  and  $p = 0.37$ ).

A multivariate regression model (table 4) shows that, holding other factors constant, a NY/NY placement is associated with a statistically significant estimated reduction of 75.3 days (95 percent CI, 55.7 to 95.0 days). Averaging this adjusted reduction for the case group across all the 2,396 NY/NY placements from 1992 to 1994 yields an estimated reduction of 28.2 days per NY/NY placement (95 percent CI, 20.8 to 35.6 days).<sup>9</sup> Compared with the 57.3 days of mean preintervention state hospital use by the NY/NY group (table 3), this reflects a 49.2 percent adjusted reduction.

**Table 4. Regression Model Estimating Effects on Changes in State Hospital Days Used in the Two-Year Periods before and after the NY/NY Intervention (N = 570 Matched Pairs)**

| Covariate   | Parameter Estimate<br>(Days Saved) | Lower<br>(95%) CI  | Upper<br>(95%) CI |
|---|------------------------------------|--------------------|-------------------|
| Intercept   | -101.40**                          | -165.69            | -37.12            |
| Received NY/NY placement  | 75.33***                           | 55.66              | 95.00             |
| Days between last preintervention OMH exit and NY/NY placement (gap) <sup>a</sup> | 0.16***                            | 0.11               | 0.21              |
| No preintervention period OMH inpatient record                                    | -70.49***                          | -99.90             | -41.09            |
| Hospital days in preintervention period   | 0.75***                            | 0.66               | 0.83              |
| Hospital stays in preintervention period  | 1.76                               | -15.19             | 18.70             |
| Shelter days in preintervention period  | -0.03                              | -0.09              | 0.03              |
| NY/NY placement in 1992   |                                    | Reference Category |                   |
| NY/NY placement in 1993   | 2.51                               | -17.51             | 22.53             |
| NY/NY placement in 1994   | 12.08                              | -9.98              | 34.15             |
| Age at NY/NY placement  | 0.42                               | -0.60              | 1.45              |
| Male  | -8.20                              | -26.98             | 10.59             |
| Black race  | 3.90                               | -15.15             | 22.94             |
| 295 diagnosis (schizophrenia)   | -46.44***                          | -63.61             | -29.26            |
| 296 diagnosis (affective disorders)   | -35.17***                          | -55.93             | -14.41            |
| Drug/Alcohol dependency diagnosis   | -7.39                              | -25.84             | 11.07             |

<sup>a</sup>For those with no preintervention OMH inpatient record, the gap is set at 731 days.

\* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ .

<sup>9</sup> This is estimated by multiplying 75.3 by the 897 persons with both NY/NY placements and OMH records and then dividing by the 2,396 NY/NY placements in 1992–94. This assumes that the pre/post reduction in state hospital use is the same for NY/NY placements with and without shelter records. Comparisons of these two subgroups (Metraux, Culhane, and Hadley 2000) indicate that use of OMH inpatient services is in fact somewhat higher among nonshelter users in the preintervention period and that this group has higher pre/post intervention period reductions compared with counterparts with DHS shelter records. Thus, this 75.3-day reduction extrapolation for nonshelter users is likely to be a conservative estimate.

*Use of NYC public hospitals (HHC).* HHC granted access to inpatient hospital records from 1989 to 1996 for all persons with a history of DHS shelter use. These parameters limit the analysis to the 1,984 persons who had a NY/NY placement between 1991 and 1994 and who also had a DHS shelter record. Of these, 855 (43.1 percent) had at least one record of inpatient hospitalization through HHC that was not reimbursed through Medicaid,<sup>10</sup> and these observations were matched with controls selected from persons who had both a DHS shelter record and at least one HHC hospitalization record. The resulting case-control group, consisting of 791 matched pairs (92.5 percent of those with HHC records), are used for further analysis on NY/NY housing placements and their impact on hospitalizations.<sup>11</sup>

HHC hospital utilization, summarized in table 5, shows another substantial unadjusted pre/post placement decline for the NY/NY group. Among all NY/NY placements (first column), total users decline 68.6 percent from the pre- to the postintervention period, while hospital days consumed declines even more sharply at 79.9 percent. Looking at the case-control groups (second and third columns), for the cases there is a similar pre/post decline in persons hospitalized, 68.9 percent, and again a larger decline in days consumed, 78.0 percent. Comparatively for the controls, both the pre/post declines in persons hospitalized and days consumed, 49.5 percent and 53.4 percent, respectively, are substantial but considerably lower than the declines for case observations. While the cases have a significantly higher preintervention number of hospital days used ( $p < 0.01$ ), their number of postintervention hospital days used is significantly lower than that of the control group ( $p < 0.0001$ ).

Regression model results (table 6) show that, after controlling for differences in the included covariates, NY/NY placement is associated with a greater pre/post differential of 8.1 days (95 percent CI, 4.6 to 11.6 days). Averaging this 8.1-day reduction over the 1,984 observations results in

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<sup>10</sup> Hospitalizations that are included in both the HHC and Medicaid datasets (i.e., a Medicaid-reimbursed inpatient stay occurring in an HHC hospital) are omitted from the HHC analysis and included in the subsequent Medicaid analysis.

<sup>11</sup> A separate analysis of hospital stays finds that over three-quarters of the hospitalizations fall into nine Diagnosis Related Groups (DRGs), all of which correspond to treatment for either mental health or substance abuse issues. The Psychosis DRG (430) alone accounts for over half of all hospitalizations by persons receiving NY/NY placements, during both the pre- and postintervention periods (Metraux, Culhane, and Hadley 2000). DRG is a categorization system for hospital stays that are medically related with respect to diagnosis and treatment and that are statistically similar in length of stay.

a reduction of 3.5 days per placement (95 percent CI, 2.0 to 5.0 days).<sup>12</sup> Compared with the 16.5 days of mean preintervention HHC use by the NY/NY group (table 5), this reflects a 21.2 percent adjusted reduction.

*Table 5. HHC Hospital Days (non-Medicaid) Consumed by Persons in NY/NY Housing and Controls in the Two-Year Periods before and after the NY/NY Intervention*

|  | NY/NY<br>(Total 1991–94) | NY/NY<br>(Matched Pairs) | Controls<br>(Matched Pairs) |
|--|--------------------------|--------------------------|-----------------------------|
| N (NY/NY placements with shelter record)     | 1,984                    | 791                      | 791                         |
| Inpatient (non-Medicaid) HHC record: 1989–96 | 855                      | 791                      | 791                         |
| Pre-NY/NY intervention (two years)           |                          |                          |                             |
| Total persons hospitalized                   | 549 (27.7%)              | 515 (65.1%)              | 515 (65.1%)                 |
| Total days hospitalized                      | 32,823                   | 27,014                   | 26,456                      |
| Mean days (all persons)                      | 16.5                     | 34.2                     | 33.4                        |
| Mean days (hospital users)                   | 59.8                     | 52.5                     | 51.4                        |
| Post-NY/NY intervention (two years)          |                          |                          |                             |
| Total persons hospitalized                   | 175 (8.8%)               | 160 (20.2%)              | 260 (32.9%)                 |
| Total days hospitalized                      | 6,610                    | 5,937                    | 12,330                      |
| Mean days (all persons)                      | 3.3                      | 7.5                      | 15.6                        |
| Mean days (hospital users)                   | 37.8                     | 37.1                     | 47.4                        |

*Note:* Between the NY/NY and control groups, paired-comparison *t* tests assessing difference yield, for preintervention HHC hospital days,  $t = -2.6$  (790 *df* and  $p < 0.01$ ), and for postintervention differences,  $t = 5.0$  (790 *df* and  $p < 0.0001$ ).

Using paired-comparison *t* tests, pre/post differences yield, within the NY/NY group,  $t = 15.2$  (790 *df* and  $p < 0.0001$ ), and within the control group,  $t = 9.6$  (790 *df* and  $p < 0.0001$ ).

<sup>12</sup> This is estimated by multiplying 8.1 by the 855 persons with NY/NY placements, DHS records, and HHC records (from which the control group was selected) and then dividing by the 1,984 persons with NY/NY placements and DHS records. For this analysis, it is assumed that NY/NY placements without DHS shelter records have HHC hospital use patterns that are the same as those of the persons with DHS records used in this case-control analysis.

**Table 6. Regression Model Estimating Effects on Changes in HHC Hospital Days (non-Medicaid) Used in the Two-Year Periods before and after the NY/NY Intervention (N = 791 Matched Pairs)**

| Covariate   | Parameter Estimate<br>(Days Saved) | Lower<br>(95%) CI  | Upper<br>(95%) CI |
|---|------------------------------------|--------------------|-------------------|
| Intercept   | -12.67*                            | -23.57             | -1.77             |
| Received NY/NY placement  | 8.05***                            | 4.55               | 11.55             |
| Days between last preintervention HHC exit and NY/NY placement (gap) <sup>a</sup> | 0.03***                            | 0.01               | 0.04              |
| No preintervention period HHC inpatient record                                    | -15.31***                          | -20.39             | -10.23            |
| Hospital days in preintervention period   | 0.94***                            | 0.87               | 1.01              |
| Hospital stays in preintervention period  | -1.34                              | -3.59              | 0.90              |
| Shelter days in preintervention period  | 0.00                               | -0.01              | 0.01              |
| NY/NY placement in 1991   |                                    | Reference Category |                   |
| NY/NY placement in 1992   | 7.48*                              | 1.78               | 13.17             |
| NY/NY placement in 1993   | 3.17                               | -1.87              | 8.21              |
| NY/NY placement in 1994   | 5.73*                              | 0.58               | 10.87             |
| Age at NY/NY placement  | -0.11                              | -0.28              | 0.07              |
| Male  | 2.47                               | -1.06              | 6.00              |
| Black race  | 2.02                               | -1.25              | 5.29              |
| 295 diagnosis (schizophrenia)   | -7.28***                           | -10.44             | -4.11             |
| 296 diagnosis (affective disorders)   | -8.27***                           | -12.57             | -3.96             |
| Drug/Alcohol dependency diagnosis   | -6.19***                           | -9.39              | -2.99             |

<sup>a</sup>For those with no preintervention HHC inpatient record, the gap is set at 731 days.

\* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ .

*Use of Medicaid-reimbursed inpatient and outpatient services.* This analysis looks at claims records, both inpatient and outpatient, for medical and psychiatric health services that were eligible for reimbursement under the NYS Medicaid program.<sup>13</sup> Medicaid data were available for 1993 through 1997. To provide full two-year pre- and postintervention periods of claims records, only the cohort placed in NY/NY housing in 1995 and a set of matched controls were included in this analysis.

<sup>13</sup> The Medicaid inpatient claims data include hospital stays that are duplicated in the HHC database but are not used for the HHC analysis. Over three-quarters of the health care services provided in both outpatient and inpatient settings involved a primary diagnosis of either mental illness or substance abuse. The inpatient claims, which allow up to seven diagnoses, showed at least one diagnosis involving mental illness or substance abuse 92 percent of the time. More details can be found in Metraux, Culhane, and Hadley (2001a).



*Inpatient services*

As has been the pattern, unadjusted inpatient service use reimbursed by Medicaid (table 7) drops substantially in the post-NY/NY placement period. Of the 733 persons who were in the 1995 NY/NY cohort, 502 (68.5 percent) had a Medicaid claims record from 1993 to 1997. The percentage of this cohort using inpatient services dropped 22.4 percent between the pre- and postperiods, while the number of inpatient days consumed dropped a more drastic 39.9 percent. The cost of services, also included in the Medicaid data, drops proportionately as well.

**Table 7. Inpatient Hospital Days Reimbursed by Medicaid for Persons in NY/NY Housing and Controls in the Two-Year Periods before and after the NY/NY Intervention**

|                                     | NY/NY<br>(Total 1995) | NY/NY<br>(Matched Pairs) | Controls<br>(Matched Pairs) |
|-------------------------------------|-----------------------|--------------------------|-----------------------------|
| N                                   | 733                   | 457                      | 457                         |
| Medicaid service users              | 502                   | 457                      | 457                         |
| Pre-NY/NY intervention (two years)  |                       |                          |                             |
| Total persons hospitalized          | 406 (55.4%)           | 372 (81.4%)              | 372 (81.4%)                 |
| Total days hospitalized             | 25,892                | 21,157                   | 19,210                      |
| Mean days (all persons)             | 35.3                  | 46.3                     | 42.0                        |
| Mean days (hospital users)          | 63.8                  | 56.9                     | 51.6                        |
| Total amount billed to Medicaid     | \$12,538,656          | \$10,525,629             | \$10,025,685                |
| Mean amount billed (all persons)    | \$17,106              | \$23,032                 | \$21,938                    |
| Mean amount billed (hospital users) | \$30,883              | \$28,295                 | \$26,951                    |
| Post-NY/NY intervention (two years) |                       |                          |                             |
| Total persons hospitalized          | 316 (43.1%)           | 280 (61.3%)              | 313 (68.5%)                 |
| Total days hospitalized             | 15,558                | 13,542                   | 19,137                      |
| Mean days (all persons)             | 21.2                  | 29.6                     | 41.9                        |
| Mean days (hospital users)          | 49.2                  | 36.4                     | 51.4                        |
| Total amount billed to Medicaid     | \$8,070,885           | \$7,109,844              | \$10,738,287                |
| Mean amount billed (all persons)    | \$11,011              | \$15,558                 | \$23,497                    |
| Mean amount billed (hospital users) | \$25,541              | \$19,112                 | \$28,866                    |

*Note:* For the number of inpatient days (non-HHC) reimbursed by Medicaid: Between the NY/NY and control groups, paired-comparison *t* tests assessing difference yield, for the preintervention period,  $t = -4.8$  (456 *df* and  $p < 0.0001$ ), and for postintervention differences,  $t = 3.7$  (456 *df* and  $p < 0.001$ ).

Using paired-comparison *t* tests, pre/post differences yield  $t = 6.0$  (456 *df* and  $p < 0.0001$ ) within the NY/NY group and  $t = 0.05$  (456 *df* and  $p = 0.96$ ) within the control group.

For the billing of inpatient days (non-HHC) reimbursed by Medicaid:

Between the NY/NY and control groups, paired-comparison *t* tests assessing difference yield, for the preintervention period,  $t = -1.3$  (456 *df* and  $p = 0.20$ ), and for the postintervention period,  $t = 4.5$  (456 *df* and  $p < 0.0001$ ).

Using paired-comparison *t* tests, pre/post differences yield, within the NY/NY group,  $t = 5.1$  (456 *df* and  $p < 0.0001$ ), and within the control group,  $t = -0.84$  (456 *df* and  $p < 0.40$ ).

Also in table 7, the case group's pre/post drop in service use is in contrast to virtually no change in the number of days used and costs accrued by the controls over this time. Compared with the controls, the cases have a significantly higher number of days consumed in the pre-intervention period ( $p < 0.0001$ ), but nonsignificant cost differences and a significantly lower number of postintervention days consumed and costs accrued in the postintervention period ( $p < 0.001$ ).

Separate regression models are presented in table 8 for pre/post changes in days and costs. Controlling for all other factors in the model, a NY/NY placement is still significantly associated with pre/post reductions of 12.6 days (95 percent CI, 6.2 to 18.9 days) and \$7,983 (95 percent CI, \$4,608 to \$11,358). Averaged over the total number of NY/NY placements in 1995, this leads to an estimated reduction of 8.6 days (95 percent CI, 4.2 to 13.0 days) and \$5,467 (95 percent CI, \$3,156 to \$7,779).<sup>14</sup> These adjusted reductions reflect 24.4 percent and 31.9 percent declines from the mean preintervention levels of inpatient days used and costs accrued, respectively, by the overall group of NY/NY placements studied here.

### *Outpatient services*

In contrast to the reductions in inpatient services that have been documented so far, table 9 shows that the number of outpatient visits and the costs *increase*, by 95.2 percent and 114.1 percent, respectively, for the 1995 NY/NY cohort. Looking at the case-control group, the same group as was used for the inpatient analysis, the significant and substantial increase among the cases is matched by a modest, nonsignificant pre/post increase in the number of outpatient visits by the control group. These pre/post changes in visits and costs, when adjusted through a multivariate model, yield an increase of 68.9 visits (95 percent CI, 47.1 to 90.6) and \$5,612 (95 percent CI, \$3,871 to \$7,352) associated with NY/NY placement. Averaging this over all 733 NY/NY placements in 1995 results in increases of 47.2 visits (95 percent CI, 32.3 to 62.1 visits) and \$3,843 (95 percent CI, \$2,651 to \$5,035). These adjusted amounts reflect proportional increases of 75.9 percent and 81.5 percent over the mean number preintervention outpatient visits consumed and costs accrued, respectively.

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<sup>14</sup> This is estimated by multiplying the reductions in days and costs associated with NY/NY in the case group, 12.6 and \$7,983, respectively, by the 502 persons with NY/NY placements and Medicaid inpatient records (from which the control group was selected) and then dividing by the 733 persons with NY/NY placements in 1995.

**Table 8. Regression Model Estimating Effects on Changes in Medicaid-Reimbursed Inpatient Hospital Days Used and Related Costs in the Two-Year Periods before and after the NY/NY Intervention (N = 457 Matched Pairs)**

| Covariate                                       | Parameter Estimate | Reduction in Stays (Days) |              | Parameter Estimate | Cost Reduction (\$) |              |
|---|--------------------|---------------------------|--------------|--------------------|---------------------|--------------|
|   |                    | 95% CI Lower              | 95% CI Upper |                    | 95% CI Lower        | 95% CI Upper |
| Intercept                                       | 5.67 –             | 14.99                     | 26.32        | –807               | –11,986             | 10,373       |
| Received NY/NY placement                        | 12.56 ***          | 6.19                      | 18.93        | 7,983 ***          | 4,608               | 11,358       |
| Gap—Hospital to NY/NY intervention <sup>a</sup> | 0.01               | –0.01                     | 0.04         | 11.6 *             | 0.2                 | 22.9         |
| No preintervention Medicaid record              | –27.33 ***         | –39.95                    | –14.71       | –15,063 ***        | –21,916             | –8,210       |
| Medicaid days (preintervention)                 | 0.84 ***           | 0.69                      | 1.00         | –10.4              | –95.0               | 74.2         |
| Medicaid stays (preintervention)                | –1.95              | –5.74                     | 1.85         | –999.6             | –3,213.5            | 1,214.3      |
| Amount billed to Medicaid (preintervention)     | 0.00               | 0.00                      | 0.00         | 0.8 ***            | 0.7                 | 1.0          |
| Shelter days (preintervention)                  | 0.01               | –0.01                     | 0.02         | 3.0                | –6.3                | 12.2         |
| Age   | –0.01              | –0.43                     | 0.41         | 27.6               | –188.9              | 244.1        |
| Male  | –4.50              | –11.44                    | 2.44         | –1,543             | –5,400              | 2,314        |
| Black race                                      | –8.28 *            | –15.30                    | –1.26        | –4,853 *           | –8,680              | –1,026       |
| 295 diagnosis (schizophrenia)                   | –21.60 ***         | –29.24                    | –13.96       | –7,947 ***         | –12,177             | –3,717       |
| 296 diagnosis (affective disorder)              | –21.07 ***         | –29.24                    | –12.91       | –11,524 ***        | –16,152             | –6,895       |
| Chemical dependency diagnosis                   | –13.74 ***         | –20.15                    | –7.33        | –9,979 ***         | –13,402             | –6,556       |

<sup>a</sup>In records where there is no preintervention period Medicaid inpatient stay, a value of 731 days is inserted.

\* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ .

*Use of VA hospitals.* This analysis examines inpatient VA hospital data from 1992 through 1999 across pre- and postintervention periods for the 2,496 persons with NY/NY placements in the years 1994–97 and, when applicable, the controls matched to individual observations.<sup>15</sup>

<sup>15</sup> Judging from the information available, approximately 20 percent of the persons receiving NY/NY placement claim veteran status. These proportions are somewhat higher for men (27 percent) and very small for women (2 percent). This suggests that approximately one fifth of the persons with NY/NY placements are eligible for VA services and that a smaller number will likely actually use these services. The DRGs for hospitalizations for persons with NY/NY placements show that over 75 percent of the stays involved treatment for mental illness or substance abuse or both (Metraux et al. 2000).

**Table 9. Outpatient Visits Reimbursed by Medicaid for Persons in NY/NY Housing and Controls in the Two-Year Periods before and after the NY/NY Intervention**

|                                      | NY/NY<br>(Total 1995) | NY/NY<br>(Matched Pairs) | Controls<br>(Matched Pairs) |
|--------------------------------------|-----------------------|--------------------------|-----------------------------|
| N                                    | 733                   | 457                      | 457                         |
| Medicaid service users               | 502                   | 457                      | 457                         |
| Pre-NY/NY intervention (two years)   |                       |                          |                             |
| Total persons with outpatient visits | 461 (62.9%)           | 419 (91.7%)              | 410 (89.7%)                 |
| Total outpatient visits              | 45,615                | 42,623                   | 37,323                      |
| Mean visits (all persons)            | 62.2                  | 93.3                     | 81.7                        |
| Mean visits (hospital users)         | 98.9                  | 101.7                    | 91.0                        |
| Total amount billed to Medicaid      | \$3,448,239           | \$3,246,487              | \$2,796,755                 |
| Mean amount billed (all persons)     | \$4,704               | \$7,104                  | \$6,120                     |
| Mean amount billed (hospital users)  | \$7,480               | \$7,748                  | \$6,821                     |
| Post-NY/NY Intervention (two years)  |                       |                          |                             |
| Total persons with outpatient visits | 483 (65.9%)           | 440 (96.3%)              | 374 (81.8%)                 |
| Total outpatient visits              | 89,042                | 80,913                   | 40,109                      |
| Mean visits (all persons)            | 121.5                 | 177.1                    | 87.8                        |
| Mean visits (hospital users)         | 184.4                 | 183.9                    | 107.2                       |
| Total amount billed to Medicaid      | \$7,382,207           | \$6,587,614              | \$3,218,494                 |
| Mean amount billed (all persons)     | \$10,071              | \$14,415                 | \$7,043                     |
| Mean amount billed (hospital users)  | \$16,013              | \$14,972                 | \$8,606                     |

*Note:* For the number of outpatient visits (non-HHC) reimbursed by Medicaid:

Between the NY/NY and control groups, paired-comparison *t* tests assessing difference yield, for preintervention differences,  $t = 1.5$  (456 *df* and  $p = 0.15$ ), and for postintervention differences,  $t = 7.7$  (456 *df* and  $p < 0.0001$ ).

Using paired-comparison *t* tests, pre/post differences yield, within the NY/NY group,  $t = -8.2$  (456 *df* and  $p < 0.0001$ ), and within the control group,  $t = -0.9$  (456 *df* and  $p = 0.35$ ).

For the billing of outpatient visits (non-HHC) reimbursed by Medicaid:

Between the NY/NY and control groups, paired-comparison *t* tests assessing difference yield, for preintervention differences,  $t = 1.4$  (456 *df* and  $p = 0.15$ ), and for postintervention differences,  $t = 7.6$  (456 *df* and  $p < 0.0001$ ).

Using paired-comparison *t* tests, pre/post differences yield, within the NY/NY group,  $t = -9.2$  (456 *df* and  $p < 0.0001$ ), and within the control group,  $t = -1.7$  (456 *df* and  $p = 0.10$ ).

**Table 10. Regression Model Estimating Effects on Changes in Visits and Costs related to Medicaid Outpatient Use in the Two-Year Periods before and after the NY/NY Placement (N = 457 Matched Pairs)**

| Covariate                                    | Parameter Estimate | Reduction in Visits |              | Parameter Estimate | Cost Reduction (\$) |              |
|--|--------------------|---------------------|--------------|--------------------|---------------------|--------------|
|  |                    | 95% CI Lower        | 95% CI Upper |                    | 95% CI Lower        | 95% CI Upper |
| Intercept                                    | -0.97              | -66.20              | 64.25        | -4,130             | -9,394              | 1,134        |
| Received NY/NY placement                     | -68.88 ***         | -90.62              | -47.14       | -5,612 ***         | -7,352              | -3,871       |
| Gap—Visit to NY/NY intervention <sup>a</sup> | 0.11 **            | 0.04                | 0.18         | 10.02 ***          | 5.00                | 15.04        |
| No preintervention Medicaid record           | -64.36 **          | -110.25             | -18.47       | -5,427 **          | -8,808              | -2,047       |
| Medicaid visits (preintervention)            | 0.53 ***           | 0.26                | 0.81         | -3.69              | -26.99              | 19.61        |
| Amount billed to Medicaid (preintervention)  | 0.00               | 0.00                | 0.00         | 0.58 ***           | 0.30                | 0.87         |
| Shelter days (preintervention)               | -0.05              | -0.14               | 0.05         | -2.90              | -9.33               | 3.53         |
| Age  | -1.24              | -2.67               | 0.19         | -10.99             | -118.89             | 96.92        |
| Male   | 32.64 *            | 6.86                | 58.42        | 2,637 *            | 525                 | 4,749        |
| Black race                                   | 0.79               | -22.25              | 23.82        | 545                | -1,296              | 2,385        |
| 295 diagnosis (schizophrenia)                | -25.96             | -52.75              | 0.82         | -2,820 **          | -4,867              | -774         |
| 296 diagnosis (affective disorders)          | -38.09 **          | -66.53              | -9.64        | -2,641 *           | -4,725              | -557         |
| Chemical dependency diagnosis                | 6.83               | -22.38              | 36.04        | 1,009              | -1,306              | 3,324        |

<sup>a</sup>In records where there is no preintervention period Medicaid inpatient stay, a value of 730 days is inserted.

\* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ .

Among the NY/NY placements, 323 (12.9 percent) had some record of VA inpatient hospitalization between 1992 and 1999. Of these, 255 (10.2 percent) had records of hospitalization, and these observations, whether or not they had shelter records, were matched with persons who had DHS shelter records (but not necessarily in the two-year preintervention period). Of the 323 observations with VA records, 294 (91 percent) were matched with control observations. Table 11 shows that both NY/NY and control groups had (by design) virtually identical numbers of days of preintervention VA inpatient hospital use and that this use declined significantly for both cases and controls in the post-intervention period. However, the decline was substantially greater among the cases than among the controls, leading to statistically significant postintervention case-control differences ( $p < 0.001$ ).

**Table 11. VA Inpatient Days Consumed by Persons in NY/NY Housing and Controls in the Two-Year Periods before and after the NY/NY Intervention**

|   | NY/NY-DHS<br>(Total 1994–97) | NY/NY<br>(Matched Pairs) | Controls<br>(Matched Pairs) |
|---|------------------------------|--------------------------|-----------------------------|
| N   | 2,496                        | 294                      | 294                         |
| Total service users                                     | 323                          | 294                      | 294                         |
| Persons with preintervention<br>VA hospitalization      | 255 (10.2%)                  | 229 (77.9%)              | 229 (77.9%)                 |
| Total preintervention hospital<br>days                  | 19,578                       | 15,332                   | 15,130                      |
| Mean preintervention hospital<br>days (all persons)     | 7.8                          | 52.1                     | 51.5                        |
| Mean preintervention hospital<br>days (hospital users)  | 76.8                         | 67.0                     | 66.1                        |
| Persons with postintervention<br>VA hospitalization     | 169 (6.8%)                   | 153 (52.0%)              | 180 (61.2%)                 |
| Total postintervention hospital<br>days                 | 8,053                        | 7,651                    | 12,289                      |
| Mean postintervention hospital<br>days (total)          | 3.2                          | 26.0                     | 41.8                        |
| Mean postintervention hospital<br>days (hospital users) | 47.7                         | 50.0                     | 68.3                        |

*Note:* Between the NY/NY and control groups, paired-comparison *t* tests assessing difference yield, for preintervention state hospital days,  $t = -0.8$  (293 *df* and  $p = 0.41$ ), and for postintervention differences,  $t = 3.7$  (293 *df* and  $p < 0.001$ ).

Using paired-comparison *t* tests, pre/post differences yield, within the NY/NY group,  $t = 6.9$  (293 *df* and  $p < 0.0001$ ), and within the control group,  $t = 2.3$  (293 *df* and  $p < 0.05$ ).

The regression model results on table 12 show a significant 14.4-day reduction in VA hospital use (95 percent CI, 5.6 to 23.1 days), all other factors held equal. When averaged over all 2,496 NY/NY placements made during the years 1994–97, this effect becomes considerably more diluted, resulting in an estimate of 1.9 days saved (95 percent CI, 0.7 to 3.0 days) per NY/NY placement. This represents an adjusted 24.4 percent decrease in mean preintervention VA hospital days used attributable to the effect of a NY/NY placement.<sup>16</sup>

*Incarceration in NYSDOCS prisons.* The last type of institution included in this study consists of incarceration facilities: state prisons and city jails. For state prisons, data include incarcerations up to April 15, 1997, so all NY/NY placements made before April 15, 1995, are included in this analysis. Because of the availability of records, the

<sup>16</sup> This was estimated by multiplying 14.4 by the 323 persons with NY/NY placements and Medicaid inpatient (non HHC) records (from which the control group was selected) and then dividing by the 2,496 persons with NY/NY placements and Medicaid inpatient records.

**Table 12. Regression Model Estimating Effects on Changes in VA Hospital Days Used in the Two-Year Periods before and after the NY/NY Intervention (N = 294 Matched Pairs)**

| Covariate                           | Parameter Estimate<br>(Days Saved) | Lower<br>(95%) CI  | Upper<br>(95%) CI |
|-------------------------------------|------------------------------------|--------------------|-------------------|
| Intercept                           | 34.63*                             | 0.54               | 68.72             |
| Received NY/NY placement            | 14.37**                            | 5.60               | 23.14             |
| Gap—VA to intervention <sup>a</sup> | 0.03                               | 0.00               | 0.06              |
| Pre-NY/NY shelter record            | -18.31                             | -37.40             | 0.78              |
| VA days (preintervention)           | 0.77***                            | 0.62               | 0.91              |
| VA stays (preintervention)          | 0.02                               | -4.89              | 4.93              |
| Pre-NY/NY shelter days              | 0.01                               | -0.01              | 0.04              |
| Placement in 1994                   |                                    | Reference Category |                   |
| Placement in 1995                   | -1.45                              | -12.47             | 9.57              |
| Placement in 1996                   | 9.73                               | -0.67              | 20.12             |
| Placement in 1997                   | 9.26                               | -3.15              | 21.68             |
| Age                                 | -0.62*                             | -1.11              | -0.13             |
| Male                                | -19.15*                            | -34.97             | -3.34             |
| Black race                          | -4.14                              | -12.60             | 4.31              |
| 295 diagnosis (schizophrenia)       | -15.40**                           | -25.96             | -4.84             |
| 296 diagnosis (affective disorders) | -26.78***                          | -37.45             | -16.12            |
| Chemical dependency diagnosis       | -10.93*                            | -19.43             | -2.44             |

<sup>a</sup>For those with no preintervention VA inpatient record, the gap is set at 731 days.

\* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ .

case-control group used in the DHS shelter analysis is again used here to assess differences in pre- and postintervention days spent incarcerated. Thus, the case group includes only those persons with DHS shelter records, and 44 pairs were omitted from the analysis because the control observation was incarcerated at the intervention point and thus would have biased the pre/post analyses.<sup>17</sup>

Table 13 shows that low proportions of observations in either group have records of incarceration. Despite this, the NY/NY placements show substantial reductions in the use of state prisons. In the case-control comparison, the state prison utilization rate for the two groups is very similar (and statistically nonsignificant) in the preintervention period, suggesting that, for the purposes of this analysis, the groups are comparable. In the postintervention period, the NY/NY group shows a substantial, statistically significant reduction in the number of days incarcerated ( $p < 0.0001$ ), while the control group fails to show any statistically significant change in the number of persons incarcerated or in the total number of days the group was incarcerated.

<sup>17</sup> In these 44 pairs, the case observation did not necessarily have an incarceration record.

**Table 13. NYSDOCS Prison Days Used by Persons in NY/NY Housing and Controls in the Two-Year Periods before and after the NY/NY Intervention**

|  | NY/NY-DHS<br>(Total up to 4/1/95) | NY/NY<br>(Matched Pairs) | Controls<br>(Matched Pairs) |
|--|-----------------------------------|--------------------------|-----------------------------|
| N  | 3,196                             | 2,285                    | 2,285                       |
| Total service users                              | 109                               | 94                       | 136                         |
| Pre-NY/NY intervention period                    |                                   |                          |                             |
| Persons incarcerated                             | 87 (2.7%)                         | 75 (3.3%)                | 74 (3.2%)                   |
| Time incarcerated (days)                         | 29,569                            | 25,490                   | 25,241                      |
| Time incarcerated (days per total persons)       | 9.3                               | 11.2                     | 11.0                        |
| Time incarcerated (days per person incarcerated) | 339.9                             | 339.9                    | 341.1                       |
| Post-NY/NY intervention period                   |                                   |                          |                             |
| Persons incarcerated                             | 36 (1.1%)                         | 32 (1.4%)                | 78 (3.4%)                   |
| Time incarcerated (days)                         | 7,818                             | 6,938                    | 26,236                      |
| Time incarcerated (days per total persons)       | 2.4                               | 3.0                      | 11.5                        |
| Time incarcerated (days per person incarcerated) | 217.1                             | 216.8                    | 336.4                       |

*Note:* Between the NY/NY and control groups, paired-comparison *t* tests assessing difference yield, for preintervention state incarceration days,  $t = -0.05$  (2,294 *df* and  $p = 0.96$ ), and for postintervention differences,  $t = 5.2$  (2,294 *df* and  $p < 0.0001$ ).

Using paired-comparison *t* tests, pre/post differences yield, within the NY/NY group,  $t = 5.2$  (2,294 *df* and  $p < 0.0001$ ), and within the control group,  $t = -0.2$  (2,294 *df* and  $p = 0.83$ ).

After multiple regression was used to control for various factors in table 14, it was determined that having a NY/NY placement is associated with a reduction of 7.9 days (95 percent CI, 4.8 to 11.0 days). This estimate differs from those in the previous models in that placements in the case and control groups were included regardless of whether they had a state prison record. Since case-control data are unavailable for the incarceration of persons without a DHS shelter record, this adjusted reduction is used, without further adjustment, as the per placement reduction in prison use attributable to NY/NY. Taking this reduction estimate as a proportion of average preintervention prison use, 7.9 days represents an 84.8 percent reduction in the mean preintervention days spent incarcerated by the NY/NY group.



**Table 14. Regression Model Estimating Effects on Changes in NYSDOCS Incarceration Days in the Two-Year Periods before and after the NY/NY Intervention (N = 2,285)**

| Covariate                           | Parameter Estimate<br>(Days Saved) | Lower<br>(95%) CI  | Upper<br>(95%) CI |
|-------------------------------------|------------------------------------|--------------------|-------------------|
| Intercept                           | -24.56***                          | -33.75             | -15.36            |
| Received NY/NY placement            | 7.89***                            | 4.81               | 10.97             |
| Any incarceration (preintervention) | -48.98**                           | -84.54             | -13.41            |
| Days incarcerated (preintervention) | 1.04***                            | 0.95               | 1.12              |
| DHS days (preintervention)          | 0.01**                             | 0.00               | 0.01              |
| Age at NY/NY intervention           | 0.35***                            | 0.21               | 0.50              |
| Male                                | -3.68**                            | -6.46              | -0.89             |
| Black                               | 1.88                               | -1.39              | 5.15              |
| Mental illness indicator            | 2.43                               | -0.80              | 5.66              |
| Drug/Alcohol dependency indicator   | 0.47                               | -2.81              | 3.75              |
| NY/NY placement in 1990             |                                    | Reference Category |                   |
| NY/NY placement in 1991             | -3.35                              | -9.96              | 3.25              |
| NY/NY placement in 1992             | -0.80                              | -6.24              | 4.64              |
| NY/NY placement in 1993             | -0.71                              | -5.83              | 4.41              |
| NY/NY placement in/after 1994       | -0.31                              | -5.01              | 4.40              |

\* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ .

*Incarceration in NYCDOC jails.* Analysis of incarceration data from NYCDOC augments the NYSDOCS analysis, which does not cover any incarceration episodes in county or municipal corrections facilities. This analysis of NYCDOC incarceration records for Riker's Island and other local jail facilities follows the same case-control group that was examined in the NYSDOCS and DHS analyses.<sup>18</sup>

As shown in table 15, the number of persons incarcerated, as well as the time spent in jail, declined significantly for the NY/NY group between the pre- and postintervention periods. Persons spending time in jail represented 12.0 percent of the total NY/NY group in the preintervention period, but only 8.2 percent of this group in the postintervention period. The total number of days incarcerated fell 39.8 percent after the housing placements. The average number of persons and days

<sup>18</sup> The data set used here is larger than the one in the NYSDOCS analysis because information was available through 1999 (see appendix A). There are no duplicate incarceration records between this and the NYSDOCS analyses, although some of the records examined here immediately precede state prison records used in the other analysis. Of the 1,590 offenses related to the study group over this time, by far the most frequently occurring types involved possession or sale of drugs (27.2 percent), offenses related to assault (12.8 percent), theft (11.6 percent), and larceny (8.9 percent). Some 39 percent of these offenses were charged as felonies (Metraux, Culhane, and Hadley 2001b).

**Table 15. NYCDOC Jail Days Used by Persons in NY/NY Housing and Controls in the Two-Year Periods before and after NY/NY Intervention**

|                                       | NY/NY–DHS<br>(1989–97) | NY/NY<br>(Matched Pairs) | Controls<br>(Matched Pairs) |
|---------------------------------------|------------------------|--------------------------|-----------------------------|
| N                                     | 4,679                  | 3,284                    | 3,284                       |
| Total service users                   | 766                    | 607                      | 716                         |
| Pre-NY/NY intervention period         |                        |                          |                             |
| Persons jailed                        | 563 (12.0%)            | 441 (13.4%)              | 480 (14.7%)                 |
| Time in jail (days)                   | 46,574                 | 36,165                   | 41,481                      |
| Time in jail (days per total persons) | 10.0                   | 11.0                     | 12.6                        |
| Time in jail (days per person jailed) | 82.7                   | 82.0                     | 86.4                        |
| Post-NY/NY intervention period        |                        |                          |                             |
| Persons jailed                        | 383 (8.2%)             | 308 (9.4%)               | 457 (13.9%)                 |
| Time in jail (days)                   | 28,027                 | 21,711                   | 37,828                      |
| Time in jail (days per total persons) | 6.0                    | 6.6                      | 11.5                        |
| Time in jail (days per person jailed) | 73.2                   | 70.4                     | 82.8                        |

*Note:* Between the NY/NY and control groups, paired-comparison *t* tests assessing difference yield, for preintervention city jail incarceration days,  $t = 1.4$  (3,283 *df* and  $p < 0.17$ ), and for postintervention differences,  $t = 4.8$  (3,283 *df* and  $p < 0.0001$ ).

Using paired-comparison *t* tests, pre/post differences yield, within the NY/NY group,  $t = 4.8$  (3,283 *df* and  $p < 0.0001$ ), and within the control group,  $t = 1.1$  (3,283 *df* and  $p < 0.29$ ).

incarcerated fell such that not only did fewer persons get jailed after their housing placements, but, for those incarcerated, the average time spent behind bars also fell.<sup>19</sup> These pre/post dynamics are not replicated in the control group. While the NY/NY and control groups are comparable in their use of jails in the preintervention period, the magnitude of the reduction per placement realized by the NY/NY group (4.4 days) is statistically significant ( $p < 0.0001$ ), as opposed to the smaller and nonstatistically significant pre/post reduction for the control group (1.1 days).

When multiple regression is used to control for other factors in table 16 and everything else is held constant, NY/NY placement is associated with a 3.8-day reduction per placement (95 percent CI, 1.8 to 5.8 days). As in the NYSDOCS analysis, the estimated regression model includes all of the DHS case-control observations, regardless of whether they have a record of jail use, and 3.8 days represents the number of days

<sup>19</sup> A total of 54 matched pairs were omitted because the control observation was incarcerated during the intervention date.

**Table 16. Regression Model Estimating Effects on Changes in NYC Jail Days in the Two-Year Periods before and after the NY/NY Intervention (N = 3,284 Matched Pairs)**

| Covariate                         | Parameter Estimate<br>(Days Saved) | Lower<br>(95% CI)  | Upper<br>(95% CI) |
|-----------------------------------|------------------------------------|--------------------|-------------------|
| Intercept                         | -18.21***                          | -24.17             | -12.26            |
| Received NY/NY placement          | 3.81***                            | 1.79               | 5.84              |
| Any jail (preintervention)        | -22.32***                          | -28.61             | -16.03            |
| Days jailed (preintervention)     | 0.93***                            | 0.88               | 0.98              |
| Any shelter use (preintervention) | 1.80                               | -1.11              | 4.71              |
| DHS days (preintervention)        | 0.01***                            | 0.00               | 0.01              |
| Age at NY/NY intervention         | 0.25***                            | 0.17               | 0.33              |
| Male                              | -4.41***                           | -6.48              | -2.35             |
| Black                             | -0.03                              | -2.09              | 2.04              |
| Mental illness indicator          | -1.64                              | -3.73              | 0.45              |
| Drug/Alcohol dependency indicator | -0.33                              | -2.61              | 1.94              |
| NY/NY placement in 1990           |                                    | Reference Category |                   |
| NY/NY placement in 1991           | 3.05                               | -1.46              | 7.56              |
| NY/NY placement in 1992           | 4.61*                              | 0.28               | 8.94              |
| NY/NY placement in 1993           | 2.93                               | -1.60              | 7.46              |
| NY/NY placement in 1994           | 0.39                               | -4.12              | 4.91              |
| NY/NY placement in 1995           | -0.12                              | -4.84              | 4.59              |
| NY/NY placement in 1996 or 1997   | 2.49                               | -1.89              | 6.87              |

\* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$ .

per placement (without further adjustment) attributed to a NY/NY placement. This represents a 38.0 percent decrease in the mean preintervention period number of incarceration days used by the case group.

### *Cumulative system effects*

The results of the system-specific analyses have thus far been presented separately by agency over the two-year postplacement period. For purposes of facilitating an interpretation of the cumulative effects of the intervention within and across systems, summary results are provided in tables 17 and 18.

Table 17 estimates the costs of service utilization by intervention group members in the two years before their housing placement by multiplying service days used by the average per diem service cost (in 1999 dollars). These costs are then annualized by dividing by two. The results show that, per placement per year, the total mean cost of service utilization for the two-year pre-NY/NY placement period was \$40,451. The bulk of those expenditures occurred in health services (86 percent,

*Table 17. Summary of Mean Two-Year Pre-NY/NY Intervention Period Service Use across Seven Service Providers*

| Service Provider                     | Mean Days Used           |           | Cost<br>(Two Years)* | Annualized<br>Cost* |
|--------------------------------------|--------------------------|-----------|----------------------|---------------------|
|                                      | (Two Years<br>Pre-NY/NY) | Per Diem* |                      |                     |
| DHS                                  | 137.0                    | \$68      | \$9,316              | \$4,658             |
| OMH                                  | 57.3                     | \$437     | \$25,040             | \$12,520            |
| HHC                                  | 16.5                     | \$755     | \$12,458             | \$6,229             |
| Medicaid (inpatient)                 | 35.3                     | \$657     | \$23,192             | \$11,596            |
| Medicaid (outpatient stays)          | 62.2                     | \$84      | \$5,225              | \$2,613             |
| VA                                   | 7.8                      | \$467     | \$3,643              | \$1,822             |
| Department of Corrections<br>(state) | 9.3                      | \$79      | \$735                | \$368               |
| Department of Corrections<br>(city)  | 10.0                     | \$129     | \$1,290              | \$645               |
| Total                                |                          |           | \$80,899             | \$40,451            |

\*In 1999 dollars. Totals reflect rounding.

or \$34,778) and in emergency shelter services (11 percent, or \$4,658). Criminal justice services (incarceration costs only) accounted for only 3 percent, or \$1,012 per year.

Table 18 summarizes estimates of the cost reductions in service use, based on pre/post placement comparisons and as adjusted by the case-control regression analyses. Cost savings are again imputed based on estimated per diem costs by service system in 1999 dollars. Results indicate that placement in NY/NY housing is associated with a \$12,146 net reduction in health, corrections, and shelter service use annually per person over each of the first two years of the intervention. Half of those cost reductions are associated with reduced use of state psychiatric inpatient services, and another quarter (23 percent) are associated with reduced use of emergency shelter services. Half of the remaining quarter in net savings is associated with reduced use of NYC public hospitals (10.9 percent of the total) and VA hospitals (3.7 percent of the total). Reductions in costs associated with Medicaid inpatient services outweigh, by \$843 (6.9 percent of the total cost reductions), the increases in Medicaid outpatient services. Taken together, about 95 percent of the cost reductions are associated with reductions in health and shelter services. The criminal justice system costs account for the remaining 4.5 percent of the total cost reductions associated with a supportive housing placement.

**Table 18. Summary of Estimated Cost Reductions Associated with Reductions in Service Use Attributable to NY/NY Housing, by Type**

| Service Provider                     | Days Saved<br>(Two Years<br>Pre/Post) | Cost<br>Reductions<br>95% CI | Per<br>Diem* | Cost<br>Reductions*<br>(Two Years) | Annualized<br>Cost<br>Reductions* |
|--------------------------------------|---------------------------------------|------------------------------|--------------|------------------------------------|-----------------------------------|
| DHS                                  | 82.9                                  | 77.4–88.5                    | \$68         | \$5,637                            | \$2,819                           |
| OMH                                  | 28.2                                  | 20.8–35.6                    | \$437        | \$12,323                           | \$6,162                           |
| HHC                                  | 3.5                                   | 2.0–5.0                      | \$755        | \$2,643                            | \$1,322                           |
| Medicaid (inpatient)                 | 8.6                                   | 4.2–13.0                     | \$657        | \$5,650                            | \$2,825                           |
| Medicaid (outpatient<br>visits)      | –47.2                                 | –62.1 to –32.3               | \$84         | –\$3,965                           | –\$1,983                          |
| VA                                   | 1.9                                   | 0.7–3.0                      | \$467        | \$887                              | \$444                             |
| Department of<br>Corrections (state) | 7.9                                   | 4.8–11.0                     | \$79         | \$624                              | \$312                             |
| Department of<br>Corrections (city)  | 3.8                                   | 1.8–5.8                      | \$129        | \$490                              | \$245                             |
| Total                                |                                       |                              |              | \$24,289                           | \$12,146                          |

\*In 1999 dollars. Totals reflect rounding.

## Do reductions in service use offset the costs of supportive housing?

One of the primary purposes of the previous analyses was to determine whether reductions in service use attributable to a housing placement offset the costs of the intervention. To compare the costs of the intervention with the reduced service system costs, both sets of costs must be computed in comparable terms. In the previous cross-system analysis, the reductions in service use were calculated in terms of annualized average cost reductions *per placement* in the two-year period after housing placement. Alternatively, housing cost figures, given the annual budgeting process by which they are calculated by city and state officials (the methodology for deriving the housing costs is provided in appendix B), are measured in annual costs *per housing unit*. Each measure has its usefulness, the former for service system planners who need to take account of client turnover and project costs for a pool of placements and the former for housing planners, who need to project costs based on fully occupied units of housing, irrespective of turnover.<sup>20</sup>

<sup>20</sup> Because these measures are not directly comparable, they must be converted, taking into account client turnover, to produce annualized cost and cost-reduction estimates. Because tenant-level data on length of housing tenure for each placement were not available for this analysis, aggregated data on longevity of placement in NY/NY housing, presented in Lipton (1996), are used. These data indicate that NY/NY tenants stay in housing, on average, for 17.9 months of the two-year postintervention period. The annualized length of tenure is therefore 8.95 months, or 0.746 a year. The inverse of

*Per placement per year.* Table 19 shows the conversion of annual costs per housing unit into annualized costs per placement, both overall and as broken down by the two housing models featured in NY/NY.<sup>21</sup> The *annualized cost per placement*, averaged over the two-year postplacement period and derived by multiplying the annual costs per housing unit by the average annual length of tenure (0.746 years), is \$13,570. This can then be compared with the adjusted service cost reductions reported in the last column of table 18, which show an annualized reduction of \$12,146 per placement. The result is a net annual cost of \$1,425 associated with a NY/NY placement. It is noteworthy that the supportive housing units, which comprise two-thirds of the units developed, have an annualized cost per placement of \$12,889 and therefore operated at a lower average annualized net cost of \$744 per placement.

*Table 19. Estimated Annual Costs per Unit and Annualized Costs per Placement of NY/NY Housing, by Housing Type*

| Housing Type               | Number of Units | Annualized per Unit Cost* | Annualized per Placement* |
|----------------------------|-----------------|---------------------------|---------------------------|
| Community residence (mean) | 1,384           | \$19,662                  | \$14,668                  |
| Supportive housing (mean)  | 2,231           | \$17,277                  | \$12,889                  |
| Weighted mean              | 3,615           | \$18,190                  | \$13,570                  |

\*In 1999 dollars.

*Per housing unit per year.* Alternatively (and inversely), one can convert the annualized service utilization reductions, reported in terms of placements (table 18) into annualized reductions per housing unit (table 20). These reductions are then expressed in terms of average annualized service cost reductions per housing unit by multiplying the annualized per placement service reductions by the annualized number of tenants per housing unit (1.34 per year). This procedure yields turnover-adjusted cost reductions per housing unit per year of \$16,281, imputing an assumption of *year-round* housing occupancy. This figure can be compared with the estimated cost per housing unit per year,

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this number, 1.34, produces the annualized average number of tenants per housing unit. These numbers are used to compute both annualized per placement costs from the annual housing unit costs in appendix B and annualized per housing unit service cost reductions from the per placement service use reductions in table 18. These two computations reflect inverse procedures and are equally valid approaches for comparing the service cost savings and housing costs associated with the intervention (all figures are in 1999 dollars).

<sup>21</sup> See appendix B for the specific housing programs and also table B.8.

as shown in table 19 (and as computed in appendix B), which also assumes year-round occupancy. Comparing the average annual cost of a housing unit (\$18,190) with the comparable measure for the service utilization reductions yields a net cost of \$1,908 per unit per year. Again, the supportive housing units, which comprise two-thirds of the units developed, operate at a lower net cost of \$995 per housing unit per year. The net cost attributable to year-round occupancy of NY/NY housing can be calculated by multiplying the annualized per unit net cost by 3,615 (the total number of housing units developed), yielding a net annual cost of \$6,897,420 per year.

Finally, multiplying the turnover-adjusted cost reductions by 3,615 for each category of service produces an estimate of the annual cost reductions (or increases) accruing to each service type attributable to a year-round housing placement, as shown in the last column of table 20. These figures provide useful information about the impact of the intervention on aggregate service use annually by service type and demonstrate that annual service use was reduced by \$58.9 million. This compares to the annual cost of the NY/NY intervention (including operating, service, and debt service costs) of approximately \$65.8 million.

*Table 20. Annualized Cost Reductions per Placement and per Housing Unit, and Total NY/NY Housing Units (N = 3,615), by Service Type*

| Service Provider                  | Annualized Cost Reductions per Placement* | Annualized Cost Reductions per Housing Unit* | Total Cost Reduction by NY/NY Units* |
|-----------------------------------|---|--|--------------------------------------|
| DHS                               | \$2,819                                   | \$3,779                                      | \$13,660,436                         |
| OMH                               | \$6,162                                   | \$8,260                                      | \$29,860,094                         |
| HHC                               | \$1,321                                   | \$1,771                                      | \$6,401,361                          |
| Medicaid (inpatient)              | \$2,825                                   | \$3,787                                      | \$13,689,511                         |
| Medicaid (outpatient stays)       | -\$1,982                                  | -\$2,657                                     | -\$9,604,464                         |
| VA                                | \$444                                     | \$595  | \$2,151,555                          |
| Department of Corrections (state) | \$312                                     | \$418  | \$1,511,903                          |
| Department of Corrections (city)  | \$245                                     | \$328  | \$1,187,232                          |
| Total                             | \$12,146                                  | \$16,281                                     | \$58,857,628                         |

\*In 1999 dollars. Totals reflect rounding.

## Discussion

The placement of homeless people with SMI in supportive housing is, as expected, associated with substantial reductions in homelessness. Not only do homeless people with severe mental disabilities who are placed in housing have marked reductions in shelter use, they also

experience marked reductions in their use of hospital and correctional facilities. Although other studies tracking the placement of homeless people in housing have found comparable housing retention rates, only a few, more limited analyses have assessed reductions in collateral services (Averyt and Kamis-Gould 2000; Proscio 2000). By contrast, this study provides a uniquely broad and more comprehensive test, employing a case-control study design and examining the impact of a comparatively large number of housing placements on seven major publicly financed service systems.

It is important to note that this study was able to quantify for the first time in the published literature the extent of service use by homeless people with SMI *before* a housing placement. Results show that such persons are extensive users of publicly funded services, particularly inpatient health services, and that they accumulate an average of \$40,449 per year in health, corrections, and shelter system costs. While the costs of services before housing placement are comparably high for the cases and controls, due to the matching criteria of this study, it is not clear whether these costs can be generalized to all homeless people with SMI, and they certainly cannot be generalized to homeless people irrespective of their mental health. Nevertheless, in light of this high cost for such a significant number of persons, the importance of the effect found here—that the supportive housing intervention significantly reduces these costs—is further reinforced.

Strictly on the basis of the direct cost reductions measured here and compared with the annual cost of the housing, the NY/NY initiative was a sound investment of public resources. The \$6.9 million net annual cost, or \$1,908 per housing unit per year, represents approximately 10 percent of the annual overall cost of providing this housing. However, supportive housing units, which were the more common type developed under this initiative and which better represent the trend in housing development for people with mental illness, operated at a more modest per unit cost of \$995 per year, or 5 percent of the overall housing unit cost. In other words, 95 percent of the costs of the supportive housing (operating, service, and debt service costs) are compensated for by reductions in collateral service attributable to the housing placement. This modest cost is particularly striking, given the magnitude of the initiative, which required an original capital investment of \$200 million and which costs \$65.8 million annually (including service, operating, and debt service costs).

It should be noted that the service reductions measured here represent a conservative assessment of the impact of the initiative on service use and costs. First, by limiting the analysis to the impact on service use in



the first two years postintervention, the study has included the stabilization period associated with entry into housing. As in other service interventions for people with SMI, service use often increases temporarily following placement, because tenants' unmet health and psychiatric needs are more likely to be identified and treated once they receive regular, periodic case management services (Pollio et al. 2000). If this were the case here, one would expect service use to decline and stabilize over time, producing net cost savings in successive years. However, this possibility must be balanced against the possibility that people may be engaged in services more intensively before a housing placement, in part to prepare them for it. This area deserves further study.

This study did not include all direct or indirect costs associated with service use by the homeless persons eventually placed in housing. Street outreach services, soup kitchens, and services provided by drop-in centers were not included. Health services funded by the federal Health Care for the Homeless program were not included. Other clinical and social services provided at shelters that are funded by grants from the Department of Housing and Urban Development's (HUD's) McKinney Act programs were also not included, and neither were the costs of uncompensated care provided by private hospitals. Not included as well are the social costs of homelessness, which are far more difficult to enumerate or to associate with individual persons. They include the costs of crime to crime victims, to the courts, and to the police, and the private and public costs of accommodating homelessness (or not) in public spaces.

Finally, many of the potential benefits of the housing initiative were not measured here. Residents of supported housing are more likely to secure voluntary or paid employment (HUD 1994) and to experience an improved quality of life. Investments in supported housing have also been shown to be associated with improved neighborhood quality and property values (Arthur Andersen LLP et al. 2000). Lastly, the social value of reduced homelessness and of providing greater social protection for those who are disabled, while not possible to translate into economic terms, constitutes an important if less tangible benefit to society. Were all such costs and benefits included, these unmeasured costs of homelessness and benefits of the housing intervention would have increased its already significant net benefit (and potential cost savings).

Although this study was limited to one locality and cannot be generalized to all urban areas, the results have important public policy implications. Research suggests that on any given day, as many as 112,000 single adults with SMI are homeless in the United States and that as

many as 280,000 single adults are chronically homeless.<sup>22</sup> If such persons, or even significant proportions of them, are extensive users of acute care health services, public shelters, and criminal justice systems, then the results of this study suggest that an aggressive investment in supportive housing is warranted. While such housing may not be appropriate or effective for every person who is homeless and mentally ill, enough would likely benefit that their placement in housing could significantly offset the costs of a targeted initiative, such as was demonstrated here. In effect, the results presented here indicate that policy makers could substantially reduce homelessness for a large, visible segment of the homeless population—often thought to be stubbornly beyond the reach of the social welfare safety net—at a very modest cost to the public.

However, while reductions in service use may nearly cover the costs of supportive housing intervention in the aggregate (assuming that the results given here can be generalized beyond NYC), it remains a major public policy challenge to shift funds from one set of purposes (health, jails, prisons) to another (housing or housing support services). Different levels of government pay for different activities, and some will have to do so regardless of whether homeless people are using them (jails and prisons, for example). Moreover, legislative committees with responsibility for housing cannot appropriate funds from health committees for housing or housing support purposes, regardless of the savings in health costs that might justify the expenditure. So, the challenge facing proponents of a national strategy to increase the supply of supportive housing will be to determine how costs can be paid in one area (for housing or housing support services), when the bulk of the savings from the intervention will accrue elsewhere (state mental health services, Medicaid, etc.). In New York, a complex package of federal, state, and city resources was required to pay for the operating, service, and debt service costs of the NY/NY initiative (see appendix B). Similarly, a national strategy will require the participation of various levels of government and multiple agencies within each level of government.

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<sup>22</sup> The Burt et al. (2001) analysis of a 1996 federal survey of homeless persons suggests that as many as 840,000 people were homeless at one point in time in the United States that year. One-third of those were people in families, leaving approximately 560,000 single adults. A meta-analysis of epidemiological research estimates that approximately 20 percent of homeless adults without children have SMI (Lehman and Cordray 1993), yielding an estimated 112,000 persons with SMI as homeless for that study period. Longitudinal research in two large U.S. cities (Philadelphia and New York) finds that people who are chronic shelter users, with or without a mental disability, represent approximately 50 percent of the daily shelter-using population (Kuhn and Culhane 1998) or an estimated 280,000 of the adults during the Burt et al. one-day study period. Given the differing sampling frames underlying their derivation, these figures must be understood as gross estimates only.

### *Operating costs*

A substantial hurdle that must be overcome in developing and sustaining permanent supportive housing is bridging the gap between the costs of operating the housing and the extremely low incomes of prospective tenants. Supportive housing providers typically address this gap through a direct housing subsidy to the tenant or housing unit and/or income supports to the tenants. The NY/NY initiative drew on both strategies to cover the operating costs, relying on a combination of federal Section 8 subsidies, supplemental security income payments by the state, and some direct state support, resulting in an average per unit subsidy of \$4,600 (see appendix B, derived from table B.3).

Historically, HUD has been the primary source of housing subsidies. An especially potent source of operating subsidies for supportive housing serving homeless persons, including those with SMI, has been the McKinney-Vento Homeless Assistance Act, which authorized operating subsidies in various forms under its three major programs: Section 8 Moderate SRO Rehabilitation, the Supportive Housing Program, and Shelter Plus Care. Federal primacy and initiative in the provision of operating subsidies are likely necessary if supportive housing for homeless persons with SMI is to be taken to scale. Even in relatively wealthy states, there is little evidence of an inclination to displace or even significantly add to the federal role in this regard (Twombly et al. 2001).

Although the federal investment in incremental housing subsidies slowed to a trickle in the mid-1990s (DeParle 1996), significant opportunities in this area may be on the horizon. In enacting HUD's fiscal year (FY) 2001 budget, Congress explicitly stated its goal that "HUD and local providers increase the supply of permanent supportive housing for chronically homeless, chronically ill people over time until the need is met (estimated 150,000 units)" (U.S. Senate 2000, 52–53). To that end, Congress maintained its recent requirement that 30 percent of McKinney-Vento funds (about \$300 million per year based on recent annual appropriations) be targeted to permanent housing for homeless persons with disabilities. If this funding level is maintained, then this investment alone could result in subsidizing 96,000 new units of supportive housing over the next 10 years.<sup>23</sup>

<sup>23</sup> This figure was derived from an estimated cost of \$6,100 per unit (based on HUD's FY 1999 estimates for the Shelter Plus Care program), assuming five-year terms and an annual inflation adjustment of 2 percent. Some 9,643 subsidies per year would result. Over a decade, this would translate into 96,433 incremental subsidies, assuming that any subsidies expiring during this period were renewed from another source.

The FY 2001 VA–HUD appropriations bill also authorized substantial changes in the statute that allow local housing authorities to convert tenant-based Section 8 vouchers into project-based subsidies linked to specific units in order to spur new development in tight housing markets or for special populations (Public Law 106–377, Sec. 232. 114 Stat. 1441A at 31). The changes streamlined a previously underused tool for housing development<sup>24</sup> and also increased the ceiling on such “project-basing” of vouchers to 20 percent of the total tenant-based portfolio (the previous limit was 15 percent). Nationally, this could translate into over 300,000 potential project-based operating subsidies.<sup>25</sup> Even in the absence of incremental vouchers, the new project-basing statutory authority can be of significant use in adding affordable units to serve special populations, like homeless persons with SMI, who often cannot access housing in a tight rental market even with a tenant-based subsidy (Sard 2001).<sup>26</sup>

Thus, opportunities already exist to finance operating subsidies for permanent supportive housing. Of course, other issues remain to be resolved, including local resistance to the siting of such housing, the capacity of states and localities to develop it, and the ongoing financial burden of renewing operating subsidies (though this final factor is an issue in all federally subsidized affordable housing).

### *Capital and debt service*

With respect to capital and debt service costs, the NY/NY initiative used a combination of city and state bonds, valued at nearly \$200 million, and, secondarily, federal tax credits, valued at approximately \$5 million,<sup>27</sup> to fund the capital costs for acquisition, development, and

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<sup>24</sup> The NYC Housing Authority has been a notable exception among local housing agencies in its willingness in recent years to stimulate the development of new housing by project-basing a portion of its tenant-based Section 8 portfolio. The new statutory provisions could encourage other housing authorities to follow its example.

<sup>25</sup> While Congress has appropriated between 50,000 and 100,000 incremental vouchers each year for the past half decade, the Bush budget proposes only 34,000 this year.

<sup>26</sup> Evidence suggests that homeless households, even without SMI, struggle to use housing subsidies in the private market. See “Judge Orders City” (2001) (noting that the city-funded rent subsidy program intended to house 460 homeless families had to date housed only 11 because private landlords were reluctant to accept them as tenants).

<sup>27</sup> Approximately \$25 million in federal tax credit expenditures were involved in the NY/NY initiative, but only 20 percent of these funds supported capital costs; 80 percent was used to fund operating reserves (see appendix B).

rehabilitation. The average debt service cost per unit per year for the NY/NY initiative is approximately \$4,900 (see table B.7).

Several factors will affect whether sufficient capital investment/debt service can be obtained to develop supportive housing at the scale to meet the need among homeless person with SMI. Nationally, competition with other low-income housing programs for federal tax credits and competition with other state and local purposes for bond funds will pose a challenge to state and local leaders who must balance demands for housing for the homeless with other public interests. It remains to be seen whether the federal or state governments are willing to establish a priority for supportive housing for the homeless in this competitive process or will allocate new dollars, given the potential for offsetting cost savings. The availability of capital/debt service funding is also likely to vary significantly across different regions of the country.

To the extent that policy makers perceive existing affordable housing programs, including the Low-Income Housing Tax Credit and HOME programs, as insufficient to produce capital for housing that extremely low income households (below 30 percent of the area median income [AMI]) can afford, supportive housing providers would clearly benefit from a new production program targeted to that population.<sup>28</sup> In the 106th Congress, senators from both major parties introduced bills directed to this purpose,<sup>29</sup> and such a program was nearly enacted as part of the FY 2001 HUD appropriations bill. It remains to be seen whether the momentum will carry over into this congressional session or whether the new administration will identify such an initiative as a priority for HUD.

### *Supportive services*

The challenge of identifying funding for the *services* that must accompany this housing may well prove greater than finding the resources for the housing. In the case of the NY/NY initiative, the NYS OMH paid for nearly all of the services associated with this housing, at an average

<sup>28</sup> Data from the 1999 American Housing Survey indicate that there are more than 5 million fewer housing units affordable and available (i.e., not occupied by a household of higher income) to households earning below 30 percent of the AMI than there are such households. Put another way, there are 7.7 million households with incomes below 30 percent of the AMI and 4.9 million units affordable to such households, but 2.6 million of those units are already occupied by households with incomes above 30 percent of the AMI—so only 2.3 million of the affordable units are actually available. (Dolbeare, C., unpublished data. Available from the author.)

cost of approximately \$9,100 per unit per year.<sup>30</sup> Results from this study indicate that the expenditures by the state OMH also provided ample returns, given that the plurality of cost reductions attributable to the intervention were reductions in OMH inpatient hospital costs (\$8,260 per housing unit, see table 20). Other inpatient health services paid by Medicaid, public hospitals, and the VA experienced combined cost reductions as well (\$6,153 per housing unit per year, see table 20). However, only Medicaid paid for some of the housing support services (at a net savings of \$1,130 per housing unit per year).

From the perspective of developing a national strategy, the question for proponents will be how to motivate other states or health service payers (and potential savers) to make the same commitment as the NYS OMH and, secondarily, Medicaid did under this initiative. One possible mechanism is to make housing support services (or more of them) reimbursable by Medicaid. Unfortunately, some of these services, such as intensive case management or community treatment teams, are already reimbursable by Medicaid at the states' option, and many states do not avail themselves of it. Another option is to increase funds or create a set-aside for housing support service funds in the federal Mental Health Block Grant. However, states have successfully opposed federal mandates on block grant funds and may oppose such a mandate for this program. A third alternative would be to create a new program at the federal level that would provide matching funds from the Department of Health and Human Services (DHHS) for funds committed by HUD through its set-aside in the McKinney-Vento Act for permanent, supportive housing. In this case, services could be specifically targeted to housing for homeless people with mental disabilities.<sup>31</sup> Whatever the specific mechanism chosen, the provision of support services will be a necessary component to any national strategy to address the housing problems of homeless people with SMI.

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<sup>29</sup> S.2997, National Affordable Housing Trust Fund Act of 2000 (introduced by Senator John Kerry, D-MA), available at <<http://www.thomas.loc.gov>>; S 3033, The Housing Needs Act of 2000 (introduced by Senator Christopher Bond, R-MO), also available at <<http://www.thomas.loc.gov>>.

<sup>30</sup> For this calculation, tenant contributions, where applicable, were deducted from average state service contract amounts to produce a net service cost (see appendix B).

<sup>31</sup> "The 106th Congress Wrap-up" contains language of agreement reached in the appropriations process but dropped at the later stages.

## Conclusion

In sum, acquiring the resources for supportive housing will require local, state, and federal leadership in all three areas that comprise the essential elements of this intervention: operating subsidies, capital/debt service, and supportive services. The federal government, through new programs, matching funds, and set-asides within existing programs, can provide the incentives that engage states' interest. However, only executive leadership at the state level can compel various agencies to work together for the common, multijurisdictional purpose of developing permanent supportive housing for homeless persons with SMI. Our research has demonstrated the compensatory cost reductions of a supportive housing initiative, but only political will and leadership can act on such findings to guide the next initiative through the intergovernmental and interagency maze.

Of course, there are some caveats to this study—it is post hoc and quasi-experimental. Therefore, the extent to which cases and controls are truly comparable could not be addressed fully by random assignment. Comparability problems were reduced by matching cases and controls according to a variety of available demographic, service, and diagnostic criteria, and by statistically correcting for differences that may have remained. However, the extent to which unmeasured differences between the study groups may persist cannot be fully ascertained, nor can the possibility of a selection effect in the study sample be eliminated. Whether housing providers select for heavier service users or for less severe cases could not be determined, although every effort was made to produce results generalizable to the population of homeless persons with SMI from which the intervention group was drawn. Despite this limitation, it is also clear that there exists a relatively large pool of homeless persons with SMI for whom this housing is effective in achieving housing stability and providing offsetting reductions in the use of collateral services.

There are also caveats on the use of administrative data. Given the large volume of data entered into the databases of the service systems studied here and a level of quality control on data entry that is not as stringent as is usual for scientific studies, these administrative sources can be prone to missing data, keystroke errors, and erroneous information. Although missing data did not present a problem in these analyses, it is more difficult to ascertain the quality of the data along the other dimensions. Despite these potential problems, the only source that can inform a study of service use covering a large study group over an extended period of time, as is done here, is administrative data.

Future research should specify the effects of the various housing types on patterns of service use. Causes of attrition from supportive housing and the housing transitions of those who exit supportive housing also deserve careful attention. For although most people remain stably housed two years after placement, a third of the clients exit this housing and represent a substantial group that should be further studied. Future research could also benefit from replicating this study method, in that integrated administrative records provide a wealth of information on the utilization patterns and costs of a population that has otherwise proven costly and difficult to track and study. In particular, applying this method to studying patterns of homelessness and service use among the majority of homeless persons who do not have an SMI could likewise prove informative as to the potential efficacy of the various policies and intervention strategies that would target them. Further fruitful areas of study could examine the same group studied here but follow their service use over longer pre- and postintervention periods (as additional data become available) and/or through service systems not covered in this article.



## Appendix A

## Summary of Control Group Selection across Seven Public Services Systems

Table A.1. Selection Factors for Constructing the Matched-Pair Case-Control Groups Used in the Analyses

| Service Provider   | Time Frame   | Intervention Years Selected | Total NY/NY Placements | Matched Pairs | Restrictions   |
|--------------------|--------------|-----------------------------|------------------------|---------------|--|
| DHS                | 1987-99      | 1989-97                     | 4,679                  | 3,338         | NY/NY placements (cases) without a DHS shelter record are omitted (N = 1,341)  |
| OMH                | 1990-96      | 1992-94                     | 2,396                  | 570           | NY/NY placements (cases) omitted include those without a state hospital inpatient record (N = 1,499) with a state hospital record but without a DHS shelter record (N = 267) without an appropriate control match (N = 60) |
| Medicaid           | 1993-97      | 1995                        | 733                    | 457           | NY/NY placements (cases) omitted include those without a Medicaid claim record (N = 231) without an appropriate control match (N = 45)   |
| HHC (non-Medicaid) | 1989-96      | 1991-94                     | 2,396                  | 791           | NY/NY placements (cases) omitted include those without a DHS shelter record (N = 412) with a DHS record but without an HHC inpatient record (N = 1,920) without an appropriate control match (N = 64)                      |
| VA                 | 1992-99      | 1994-97                     | 2,496                  | 294           | NY/NY placements (cases) omitted include those without a VA hospital inpatient record (N = 2,173) without an appropriate control match (N = 29)  |
| NYSDOCS            | 1987-4/15/97 | 1989-4/15/95                | 3,196                  | 2,285         | NY/NY placements (cases) omitted include those without a DHS shelter record (N = 911) whose matched control observation was incarcerated on the placement date (N = 44)  |
| NYCDOC             | 1987-99      | 1989-97                     | 4,679                  | 3,284         | NY/NY placements (cases) omitted include those without a DHS shelter record (N = 1,341) whose matched control observation was incarcerated on the placement date (N = 54)  |

## *Appendix B*

### *Estimating direct federal, state, and city expenditures on the NY/NY supportive housing initiative*

#### **Introduction**

In 1990, NYS and NYC agreed to collaborate on what became known as the NY/NY supportive housing initiative. The agreement committed the state and the city to jointly fund construction, operating, and social service costs for 3,600 community-based housing units in NYC for persons who were severely mentally ill and homeless. While much of the funding for this program comes from the state and the city of New York, as well as from the federal government, an array of private non-profit organizations administer these housing units. This appendix provides estimates of the federal, state, and city outlays for the NY/NY initiative, in the aggregate, per year, per housing unit, and per housing placement. This compilation and disaggregation of costs is intended to provide a quantitative benchmark for evaluating returns from the program, as measured by the reductions in the use of collateral services that were detailed in the article.

#### **Data and methods**

Data on the distribution of housing units and both the total and the per unit operating, debt, and service costs were constructed from budget documents and in consultation with state and city administrators involved in financing and administering the programs.<sup>32</sup> Inflation adjustments and unit-cost calculations were also verified by personal communication with program administrators. All figures are reported in 1999 dollars. Unless otherwise noted, all cost estimates assume full, year-round occupancy of housing units. Actual costs will differ for specific sites and specific service contracts.

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<sup>32</sup> Final confirmation of data on construction costs and debt service costs was obtained by personal communication with Michael Newman of the NYS OMH (March 5, 2001). Figures for the tenant contributions deducted from OMH-developed sites were confirmed in consultation with Christopher Roblin of the NYS OMH (April 4, 2001, personal communication). The value of federal Section 8 subsidies and the service cost estimates for the city-developed sites were confirmed by personal communication with Peter Bittle of the NYC Department of Mental Health (April 4, 2001). Information on the financing of city Department of Housing Preservation and Development (HPD)-developed units was obtained by personal communication with Timothy O'Hanlon of the NYC HPD (March 5, 2001). Information on the city HRA-developed units was obtained from David Mittelman of the NYC DHS (March 25, 2001).

## Housing and service configurations

The housing developed under the NY/NY initiative encompasses a variety of housing and service configurations and consists of several distinct models that combine housing with rehabilitative or support services. The residential continuum includes, on the one end, supportive housing models that provide private, individual apartment-style living accommodations with varied levels of service support. In the supportive housing model, the intensity of services provided depends on need as expressed by the tenant and can change as the tenant's needs change. Tenants' housing tenure is based on a lease arrangement and is not contingent on a prescriptive service plan. On the other end of the continuum are community residence living arrangements that provide more intense, structured regimens of supportive services. Community residential programs are supervised, and housing is part of a structured treatment plan. Both supportive housing and community residence approaches are tied into bodies of research literature that provide theoretical rationales and evaluations for each approach. More relevant to the purposes of this inquiry is the fact that the two models are associated with different sources and amounts of funding.

Table B.1 shows the number of housing units, grouped by different housing and service configurations, that are funded under NY/NY. Under the community residences subheading, community residence/SROs provide extended-stay housing in SRO living units with on-site services for those whose self-maintenance and socialization skills are minimal. Community residences are single-site facilities with either private or shared bedrooms, meals provided, access to on-site rehabilitative services, and 24-hour staff coverage. Community residences often target special populations, such as people with co-occurring mental health and substance abuse problems, and they seek to eventually place residents in less service-intensive, more permanent housing arrangements.

The supportive housing grouping includes various state- and city-administered programs that range from scattered-site, individual apartments to clustered apartments or SRO units in a single development. In both cases, services are available on a periodic or as-needed basis. For capital (state) supportive housing, construction was initiated by NY/NY funding, while rental (state) supportive housing used existing units in the private rental market. For city-funded supportive housing, the Department of Housing Preservation and Development (HPD) administers NYC-HPD housing units, the HRA administers NYC-HRA units, the NYC-NYS units are administered by the city with state capital funding, and the three NYC rental units use existing, private apartments that receive state funding for services.

*Table B.1. NY/NY-Funded Housing: Number of Units under Different Housing/Service Configurations*

| Housing                   | Units |
|---------------------------|-------|
| Community residences      |       |
| Community residences/SROs | 713   |
| Community residences      | 671   |
| Supportive housing        |       |
| Capital (state)           | 285   |
| Rental (state)            | 520   |
| Capital (NYC-HPD)         | 1,087 |
| Capital (NYC-HRA)         | 258   |
| Capital (NYC-NYS)         | 78    |
| Rental (NYC)              | 3     |
| Total units               | 3,615 |

## Operating and service costs

Because of variations in housing layout and services offered, different housing configurations have varying levels of operating and service costs. Table B.2 shows the levels of service cost for the different types of housing. Service costs represent funding for social and related services provided to NY/NY tenants—services that are provided on-site, brokered by case management staff, or arranged with outside providers. Depending on the unit type, federal, state, and city funding can pay for these services. The community residence units have higher average service costs because of the greater intensity of the services provided.<sup>33</sup> For the supportive housing subheading, however, while tenants receive less intense services than their counterparts in the community residence housing, the differences in per unit funding reflect different levels and sources of money but not necessarily different intensities of service provision.

Operating costs, shown in table B.3, reflect costs needed for building upkeep, apartment maintenance, utilities, and so on and are most often provided in the form of rental subsidies to supplement the rent tenants

<sup>33</sup> Average service costs for community residence units are \$19,200 per unit. However, because Medicaid pays for the services in 128 of these units, at an average annual cost of \$17,478 per unit, and because those costs are accounted for in the services utilization analysis as client outpatient costs paid by Medicaid, they have been removed here. This reduces the average service cost per community residence unit to \$15,865, from *non-Medicaid* sources.

pay. In federally subsidized units (Section 8), all of which are operated by the city, tenants pay 30 percent of their income, here assumed to be the income for a person receiving SSI and living alone (\$617/month), toward rent. Thirty percent of this amount (\$185) has been deducted from the maximum fair market rent for an SRO allowed in NYC (\$500), and the difference is calculated as the federal Section 8 contribution (\$3,800).

*Table B.2. Service Costs for NY/NY Housing Type, by Funding Source*

| Housing                           | Units | State Funding* | City Funding* | Per Unit Subtotal* |
|-----------------------------------|-------|----------------|---------------|--------------------|
| Community residences              |       |                |               |                    |
| Community residences/SROs         | 713   | \$10,500       | \$0           | \$10,500           |
| Community residences <sup>3</sup> | 671   | \$15,865       | \$0           | \$15,865           |
| Supportive housing                |       |                |               |                    |
| Capital (state)                   | 285   | \$8,400        | \$0           | \$8,400            |
| Rental (state)                    | 520   | \$4,800        | \$0           | \$4,800            |
| Capital (NYC-HPD)                 | 1,087 | \$9,400        | \$900         | \$10,300           |
| Capital (NYC-HRA)                 | 258   | \$9,400        | \$900         | \$10,300           |
| Capital (NYC-NYS)                 | 78    | \$9,400        | \$900         | \$10,300           |
| Rental (NYC)                      | 3     | \$9,400        | \$900         | \$10,300           |

\*In 1999 dollars.

*Table B.3. Operating Costs for NY/NY Housing Type, by Funding Source*

| Housing                   | Units | Federal (Section 8) Funding* | State Funding* | City Funding* | Per Unit Subtotal* |
|---------------------------|-------|------------------------------|----------------|---------------|--------------------|
| Community residences      |       |                              |                |               |                    |
| Community residences/SROs | 713   | \$0                          | \$5,700        | \$0           | \$5,700            |
| Community residences      | 671   | \$0                          | \$4,200        | \$0           | \$4,200            |
| Supportive housing        |       |                              |                |               |                    |
| Capital (state)           | 285   | \$0                          | \$5,700        | \$0           | \$5,700            |
| Rental (state)            | 520   | \$0                          | \$5,000        | \$0           | \$5,000            |
| Capital (NYC-HPD)         | 1,087 | \$3,800                      | \$0            | \$0           | \$3,800            |
| Capital (NYC-HRA)         | 258   | \$3,800                      | \$0            | \$0           | \$3,800            |
| Capital (NYC-NYS)         | 78    | \$3,800                      | \$0            | \$0           | \$3,800            |
| Rental (NYC)              | 3     | \$3,800                      | \$0            | \$0           | \$3,800            |

\*In 1999 dollars.

Table B.4 combines the net unit operating and service costs and, in applicable categories, deducts tenant contributions from this cost. In the case of many NYS OMH-administered units—all community residence/SROs and Capital (state) units—the Section 8 standard for tenant rent contribution (one-third of income) is applied. However, tenant rent contributions are deducted from state operating and service contracts after providers report tenant rent collections. Thus, a separate column in table B.4, Less Tenant Contribution, shows the impact of deducting tenant contributions from the operating and service cost contracts of these state-administered units (again, assuming full, year-round occupancy, by persons receiving SSI income for an adult living alone). The deduction for community residences is higher (\$6,000 annually) because additional funds are deducted from tenant income to cover the costs of board. The Total Cost column reflects the per unit costs multiplied by the number of units for the particular type of housing, less tenant contributions, where applicable.

## Capital costs

Some 11 percent of the NY/NY units consist of existing, private rental housing, and the rest are located in buildings that have been specifically constructed or rehabilitated under the auspices of the NY/NY program. In the latter case, the city or the state provided the capital. Table B.5 provides the capital costs, both per unit and total, broken down by different subcategories of NY/NY housing. All of the capital costs per unit are budgeted at \$70,000, except for HPD-administered units, which are set at \$50,000 per unit. HPD unit costs were lower for several reasons: HPD began its property acquisition process earlier than the state did, and real estate values were relatively more depressed then; HPD also acquired some properties at essentially no cost (properties it owned through tax foreclosure—*in rem* buildings); and HPD's developments involved much larger buildings than the state's projects, so development costs per unit were lower (Timothy O'Hanlon, personal communication).<sup>34</sup>

<sup>34</sup> Approximately half (N = 508) of the HPD units received revenue from the sale of federal tax credits. For purposes of calculating the per unit per year cost, the tax credits are assumed to pay out over a 15-year period, amounting to a \$3,333 per unit per year cost. Although the cost of the tax credits is not included in the tabulation of debt service costs here, given that only 20 percent of the tax credit revenue was used for capital support, it is figured into the final costs per unit by source, in table B.7, combined with the debt service amounts.

Table B.4. Combined Service and Operating Costs, Less Tenant Contributions, for NY/NY Housing

| Housing                    | Units | Operating<br>per Unit<br>Subtotal* | Service<br>per Unit<br>Subtotal* | Less<br>Tenant<br>Contribution* | Per Unit<br>Cost* | Total<br>Cost* |
|----------------------------|-------|------------------------------------|----------------------------------|---------------------------------|-------------------|----------------|
| Community residences       |       |                                    |                                  |                                 |                   |                |
| Community residences /SROs | 713   | \$5,700                            | \$10,500                         | \$2,200                         | \$14,000          | \$9,982,000    |
| Community residences       | 671   | \$4,200                            | \$15,865                         | \$6,000                         | \$14,065          | \$9,437,615    |
| Supportive housing         |       |                                    |                                  |                                 |                   |                |
| Capital (state)            | 285   | \$5,700                            | \$8,400                          | \$2,200                         | \$11,900          | \$3,391,500    |
| Rental (state)             | 520   | \$5,000                            | \$4,800                          | \$0                             | \$9,800           | \$5,096,000    |
| Capital (NYC-HPD)          | 1,087 | \$3,800                            | \$10,300                         | \$0                             | \$14,100          | \$15,326,700   |
| Capital (NYC-HRA)          | 258   | \$3,800                            | \$10,300                         | \$0                             | \$14,100          | \$3,637,800    |
| Capital (NYC-NYS)          | 78    | \$3,800                            | \$10,300                         | \$0                             | \$14,100          | \$1,099,800    |
| Rental (NYC)               | 3     | \$3,800                            | \$10,300                         | \$0                             | \$14,100          | \$42,300       |
| Total                      | 3,615 |                                    |                                  |                                 |                   | \$48,013,715   |

\*In 1999 dollars.

*Table B.5. Capital Costs Allocated to Various Types of NY/NY-funded Housing*

| Housing                    | Units | Per Unit Costs* |          |          | Combined Costs* |              |               | Total |
|----------------------------|-------|-----------------|----------|----------|-----------------|--------------|---------------|-------|
|                            |       | State           | City     | Total    | State           | City         | Total         |       |
| Community residence        |       |                 |          |          |                 |              |               |       |
| Community residences /SROs | 713   | \$70,000        | \$0      | \$70,000 | \$49,910,000    | \$0          | \$49,910,000  |       |
| Community residences       | 671   | \$70,000        | \$0      | \$70,000 | \$46,970,000    | \$0          | \$46,970,000  |       |
| Supportive housing         |       |                 |          |          |                 |              |               |       |
| Capital (state)            | 285   | \$70,000        | \$0      | \$70,000 | \$19,950,000    | \$0          | \$19,950,000  |       |
| Rental (state)             | 520   | \$0             | \$0      | \$0      | \$0             | \$0          | \$0           |       |
| Capital (NYC-HPD)          | 1,087 | \$0             | \$50,000 | \$50,000 | \$0             | \$54,350,000 | \$54,350,000  |       |
| Capital (NYC-HRA)          | 258   | \$0             | \$70,000 | \$70,000 | \$0             | \$18,060,000 | \$18,060,000  |       |
| Capital (NYC-NYS)          | 78    | \$70,000        | \$0      | \$70,000 | \$5,460,000     | \$0          | \$5,460,000   |       |
| Rental (NYC)               | 3     | \$0             | \$0      | \$0      | \$0             | \$0          | \$0           |       |
| Total                      | 3,615 |                 |          |          | \$122,290,000   | \$72,410,000 | \$194,700,000 |       |

\*In 1999 dollars.



NYC and NYS both financed capital costs through a separate series of bond issues. On the basis of available information, on \$81 million of the \$130.5 million in state capital costs, the aggregated interest rate on state bond issues was 6.339 percent. Similarly, interest rates on bonds issued by the city were between 6 percent and 7 percent; the higher rate was the basis for these calculations.<sup>35</sup> A 25-year amortization schedule and these interest rates were used to estimate annual debt service costs and allocate them across the different types of housing based on the number of units and the capital costs (see table B.6). Both the city and state incur these debt service costs on behalf of the housing provider as part of their assistance to NY/NY.

### **Calculating average total costs per NY/NY housing unit and per housing placement**

The debt service, social service, and operating costs are combined and averaged across housing types in table B.7 to come up with more complete cost estimates. Each of these estimates, which aggregate two or more subtypes of housing, represents a weighted mean as determined by the number of housing units and specific costs associated with each subtype. Federal tax credit costs have been added, along with the debt service costs in this table, although only 20 percent of federal tax credit revenue was applied to capital expenses. The remaining 80 percent was used to fund operating reserves. Tax credit costs are assumed to pay out over the first 15 years of the project but are assumed as a constant annual cost here (see also footnote 34).

The total combined cost per unit per year, for all NY/NY units, is estimated at \$18,190.<sup>36</sup> Breaking down this estimate, community residence housing costs more per unit than supportive housing (\$19,662 versus \$17,277, respectively). Social services and operating costs account for 73 percent of the total estimated per unit cost, and NYS provides, on average, 78 percent of the estimated per unit cost.

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<sup>35</sup> Information on the state's NY/NY bond issues was provided through personal communication with Michael Newman at the NYS OMH; information on the interest rates for bond issues was provided by the city.

<sup>36</sup> This number excludes Medicaid-paid services for the 128 community residence units mentioned earlier.

Table B.6. Estimated Debt Service on State and City Bond Issues to Fund Capital Costs for NY/NY Housing

| Housing                   | Units | Per Unit Costs* |         |         | Total Costs* |             |              |
|---------------------------|-------|-----------------|---------|---------|--------------|-------------|--------------|
|                           |       | State           | City    | Total   | State        | City        | Total        |
| Community residences      |       |                 |         |         |              |             |              |
| Community residences/SROs | 713   | \$5,630         | \$0     | \$5,630 | \$4,013,976  | \$0         | \$4,013,976  |
| Community residences      | 671   | \$5,630         | \$0     | \$5,630 | \$3,777,730  | \$0         | \$3,777,730  |
| Supportive Housing        |       |                 |         |         |              |             |              |
| Capital (state)           | 285   | \$5,630         | \$0     | \$5,630 | \$1,604,550  | \$0         | \$1,604,550  |
| Rental (state)            | 520   | \$0             | \$0     | \$0     | \$0          | \$0         | \$0          |
| Capital (NYC-HPD)         | 1,087 | \$0             | \$4,293 | \$4,293 | \$0          | \$4,666,369 | \$4,666,369  |
| Capital (NYC-HRA)         | 258   | \$0             | \$5,997 | \$5,997 | \$0          | \$1,547,171 | \$1,547,171  |
| Capital (NYC-NYS)         | 78    | \$5,630         | \$0     | \$5,630 | \$439,117    | \$0         | \$439,117    |
| Rental (NYC)              | 3     | \$0             | \$0     | \$0     | \$0          | \$0         | \$0          |
| Total                     | 3,615 |                 |         |         | \$9,835,373  | \$6,213,540 | \$16,048,913 |

\*In 1999 dollars.

**Table B.7. Estimated Unit Costs to Federal, State and City Sources for NY/NY Housing Averaged over Housing Types**

| Housing Type        | Units | Net Service and Operating Costs <sup>a</sup> |          |       | Subtotal |
|---------------------|-------|--|----------|-------|----------|
|                     |       | Federal                                      | State    | City  |          |
| Community residence | 1,384 | \$0  | \$14,032 | \$0   | \$14,032 |
| Supportive housing  | 2,231 | \$2,429                                      | \$9,813  | \$575 | \$12,817 |
| Total               | 3,615 | \$1,499                                      | \$11,428 | \$355 | \$13,282 |

  

| Housing Type        | Units | Debt Service Costs <sup>a</sup> |         |         | Subtotal |
|---------------------|-------|---------------------------------|---------|---------|----------|
|                     |       | Federal                         | State   | City    |          |
| Community residence | 1,384 | \$0                             | \$5,630 | \$0     | \$5,630  |
| Supportive housing  | 2,231 | \$759 <sup>b</sup>              | \$916   | \$2,785 | \$4,460  |
| Total               | 3,615 | \$468                           | \$2,721 | \$1,719 | \$4,908  |

  

| Housing Type        | Units | Total Costs <sup>a</sup> |          |         | Subtotal |
|---------------------|-------|--------------------------|----------|---------|----------|
|                     |       | Federal                  | State    | City    |          |
| Community residence | 1,384 | \$0                      | \$19,662 | \$0     | \$19,662 |
| Supportive housing  | 2,231 | \$3,188                  | \$10,729 | \$3,360 | \$17,277 |
| Total               | 3,615 | \$1,967                  | \$14,149 | \$2,074 | \$18,190 |

<sup>a</sup>In 1999 dollars.

<sup>b</sup>This per unit cost reflects the cost associated with the federal tax credit, paid over the first 15 years of each project. Overall, 20 percent went for debt service, and the remainder went for operating reserves, to be used in the event that Section 8 support stopped on units after the initial five-year commitment.

To facilitate comparisons of the housing costs reported here and reductions in the use of collateral services reported in the article, housing costs have been converted into annualized costs per placement in table B.8. The annualized per unit costs (from table B.7) were converted into per diem costs by multiplying them by 0.746, the average annualized length of tenure over the first two years following placement (Lipton 1996). This yields an *annualized per placement* cost of \$13,570. (This approach is consistent with the one used in the service utilization analysis.)

**Table B.8. Estimated per Annum, per Diem, and per Placement per Year Costs**

| Housing                    | Units | Annual per Unit Cost | Annualized per Placement Cost |
|----------------------------|-------|----------------------|-------------------------------|
| Community residence (mean) | 1,384 | \$19,662             | \$14,668                      |
| Supportive housing (mean)  | 2,231 | \$17,277             | \$12,889                      |
| Weighted mean              | 3,615 | \$18,190             | \$13,570                      |

Alternatively, one could also compare housing costs and service system cost reductions by converting the *per placement per year* service utilization reductions reported in the article into *per housing unit per year* numbers, by applying the same set of assumptions. As shown in table B.9, the utilization reductions by service type, adjusted for case-control differences, can be expressed in terms of the annualized cost reductions per placement (also shown in the last column of table 18). These annualized per placement reductions can be expressed in terms of annualized cost reductions *per unit* by adjusting for the housing retention rate (multiplying the annualized per placement reductions by 1.34—the annualized number of tenants per average housing unit). This procedure yields turnover adjusted and annualized cost reductions attributable to the full-year housing placement of \$16,281 per unit per year. This figure can then be compared with the estimated costs of the housing units presented in this appendix, which have already been calculated in terms of the per unit per year costs and (with the exception of table B.8) have also assumed year-round occupancy.

*Table B.9. Annualized Cost Reductions Adjusted for Housing Turnover: Per Unit and for Total NY/NY Housing Units (N = 3,615), by Type*

| Service Provider                  | Annualized Cost Reductions* | Annualized Turnover/Adjusted Cost Reductions* |
|-----------------------------------|-----------------------------|---|
| DHS                               | \$2,819                     | \$3,779                                       |
| OMH                               | \$6,162                     | \$8,260                                       |
| HHC                               | \$1,321                     | \$1,771                                       |
| Medicaid (inpatient)              | \$2,825                     | \$3,787                                       |
| Medicaid (outpatient stays)       | -\$1,982                    | -\$2,657                                      |
| VA                                | \$444                       | \$595   |
| Department of Corrections (state) | \$312                       | \$418   |
| Department of Corrections (city)  | \$245                       | \$328   |
| Total                             | \$12,146                    | \$16,281                                      |

\*In 1999 dollars.

## Conclusion

This article has presented estimates of costs borne by NYC, NYS, and the federal government for the construction, operation, and service provision associated with NY/NY housing. City and state program administrators served as sources for the cost information, and costs are assessed in 1999 dollars. It must also be reiterated that these cost estimates are not comprehensive, but rather reflect the assistance provided by the federal, state, and city governments to nonprofit housing and service providers to administer this housing. Additional funding

may come from the nonprofit agencies themselves and from tenant rent contributions that are otherwise not deducted here.<sup>37</sup>

NY/NY housing reflects diverse housing and service configurations, which correspond to a wide range of expenses. In the process of combining the different types of housing, average costs also become less representative of individual types of housing. While the average figures are useful for comparing NY/NY housing costs with potentially offsetting cost reductions brought on by reductions in the use of collateral services such as psychiatric hospitals, other public and private hospitals, homeless shelters, and corrections programs, future research should be refined by breaking down cost calculations by specific programs and by specific tenancy histories.

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<sup>37</sup> Medicaid-paid services to tenants, delivered in 128 of the community residence units, are excluded.

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