



C.H.A.I.N. REPORT

Update Report #35

Assessing the Impact of the Ryan White CARE Act on Health Outcomes in New York City:

Executive Summary

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TABLE OF CONTENTS

Acknowledgments	1
Introduction	3
Research Questions	4
Key Findings	5
Data & Methods	7
Overall Strategy	7
Figure 1. Data Flow Schematic	9
Table 1. Comparison of Epidemiological Data with CHAIN Data	10
Client-level Data	10
Agency-level Data	11
Merging Data Sets	11
Table 2. Organizational type of provider sites	13
Variables	14
Table 3. Outcome variables	15
Table 4. Independent Variables	15
Analyses	16
Trend Analysis of Ryan white-funded Services Reported by CHAIN Respondents	16
Subgroup Analyses	16
Impact Analysis	17
Findings	17
Trend Analysis	17
Table 5. Distribution of reported Ryan White-funded providers	18
Subgroup Analysis	19
Table 6. Summary of Group Differences in Reported Use of RW-funded Services	20
Ryan White Impact Analysis	21
Table 7. Ryan White Impact: A Multivariate Analysis	21
Organizational Analysis	22
Table 8. Multivariate Analysis of Non-Ryan White Providers	23
Discussion	24

Introduction

Estimating the impact of Federal health policies on individuals affected by such policies has long been an objective of the policy and research communities. This report measures the impact of the Ryan White CARE Act on health care outcomes among a representative group of HIV-positive adults in New York City. The analysis capitalizes on three distinct data streams: client-level data from the longitudinal New York City CHAIN cohort, a representative sample of 967 HIV-positive adults in care; administrative contract data on Ryan White-funded services in the city, across all Ryan White titles, by site and type of service; and an agency database of over 2,800 service providers.

By mapping these data sets to one another we have been able, with reasonable accuracy, to identify when and where CHAIN cohort participants have received specific services funded through the Ryan White CARE Act. This has allowed us to establish three comparison groups – (1) individuals receiving specific services from a Ryan White-funded provider; (2) individuals receiving specific services from a non-Ryan White funded provider; and (3) individuals not receiving these services. We compared selected health outcomes among these three groups, controlling for the sociodemographic, health, and risk characteristics that might otherwise explain the differences in health outcomes. Using this approach we have explored a fundamental question: ***Does the Ryan White CARE Act make a difference in individual health outcomes?*** After conducting a series of analyses we have concluded that Ryan White CARE Act funding is statistically significantly associated with key health outcomes among HIV-positive adults in New York City.

Since its inception in 1990, Ryan White has fostered a number of local experiments in the design of comprehensive health and human service systems for individuals affected by HIV/AIDS. In New York City, the model has evolved as one of centralized planning, embodied in the HIV Health and Human Services Planning Council, built upon a health care system composed of loosely-integrated private, voluntary, and public agencies. Capitalizing on CARE Act funds and other public programs such as Medicaid, New York City has expanded its HIV care system over the past decade in an effort to address the needs of the country's largest HIV-positive population. Ryan White-funded services have been layered on top of a number of existing programs and funding streams, such as hospital-based Designated AIDS Centers (tertiary hospital centers which receive enhanced reimbursement for HIV services), enhanced Medicaid reimbursement rates through HIV Diagnosis Related Groups (DRGs) for high-volume HIV/AIDS providers, intensive case management services, and co-located substance use and primary care programs, among others. New York City, which accounts for 17.5% of all adults living with AIDS in the US as of December 2000 (CDC HIV/AIDS Surveillance Report, 2001, Volume 12, Number 2), received \$107.6 million in FY2000 under Title I (HRSA HAB), which in turn was distributed to over 130 community-based organizations, hospitals, clinics, and other service providers, who developed Title I-funded services at hundreds of sites throughout the city.

Aligning the Ryan White monies, across all Titles, with a specific client service in New York City is not easy. Multiple funding streams, including Medicaid, Medicare, private insurance, and private foundation grants, in addition to Ryan White, are blended at an administrative level within most agencies before being “expressed” as a specific service at a given location within an organization. Nonetheless, we did have access to data from the city’s master contractor for Title I funds, MHRA’s HIV Care Services, as well as from the state’s master contractor for Title II funds, the AIDS Institute. Both of these data sources, as will be described in detail later in this report, permitted us to align a specific funded service (such as case management or nutritional counseling, for example) with a site of service within a larger organization. We conducted similar alignments for the much smaller funding streams of Titles III, IV, SPNS, and dental reimbursement.

Research Questions

Given that there are two primary objectives in the Ryan White CARE Act – to provide HIV services to uninsured and under-insured individuals, and to develop comprehensive systems of health and social services HIV care – we have explored two hypotheses for this analysis:

Hypothesis 1: Since the Ryan White CARE Act is designed to provide high quality services to vulnerable populations who might otherwise suffer from poor quality medical care or no medical care, one would expect to find a “*leveling effect*” attributable to Ryan White. That is, the proportion of individuals receiving Ryan White-funded services with a good health outcome should be **equal** to the proportion of individuals receiving non Ryan White-funded services with a good health outcome. This can be expressed as the equation, $RW = non\ RW$.

Hypothesis 2: Since the Ryan White CARE Act is designed to develop and improve comprehensive systems of care for HIV-positive individuals, and coordinated systems of care are better suited to the delivery of complex medical and social care among vulnerable populations, one would expect to find a “*systems effect*” of Ryan White. In this case, the proportion of individuals receiving Ryan White-funded services with a good health outcome should be **greater** than the proportion of individuals receiving non Ryan White-funded services with a good health outcome. This can be expressed as the equation, $RW > non\ RW$.

Using the combined client- and agency-level data we have attempted to test these hypotheses by examining four research questions in this report: (1) What is the general distribution of Ryan White-funded services as reported by CHAIN participants? (2) Are there subgroup differences among the CHAIN cohort as to who reports a Ryan White-funded service compared to a non-Ryan White-funded service? (3) Among individuals reporting a specific service, does the receipt of a Ryan White-funded service result in better outcomes than receipt of a non-Ryan White service? (4) And, is there significant variation in health outcomes among the non Ryan White funded medical providers to suggest an organizational explanation for differential health outcomes, rather than a Ryan White explanation?

Key Findings

- We have successfully coded Ryan White funding characteristics to 477 provider agencies in our agency database. In the course of conducting this coding we have developed a number of “decision rules,” in consultation with program and contract managers at MHRA, the New York City Department of Health, and the New York State AIDS Institute, to guide this operation. The fully-coded agency database now provides a rich resource for estimating a “Ryan White effect” down to the level of specific service categories. The database also serves as a useful tool for geo-mapping analyses and other evaluation efforts being undertaken by Columbia University on behalf of the New York Title I Planning Council.
- The data illustrates the following distribution of Ryan White (RW) funded services among respondents who reported any receipt of service, for the period 1997 through 2000 (corresponding to Project Years 07 through 10 of the Ryan White CARE Act, and the fifth through seventh waves of the CHAIN longitudinal study):
 - Among respondents with a primary care provider, between 45% and 50% reported a provider funded by RW;
 - Among respondents reporting health services, between 57% and 63% reported using health services funded by RW;
 - Among respondents reporting housing services, between 32% and 56% reported using housing services funded by RW;
 - Among respondents reporting drug treatment services, between 22% and 33% reported using Alcohol or Drug (AOD) services funded by RW;
 - Among respondents reporting professional mental health services, between 11% and 20% reported using professional mental health services funded by RW;
 - Among respondents reporting supportive mental health services, between 15% and 19% reported using supportive mental health services funded by RW;

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- Among respondents reporting case management and/or client advocacy services, between 26% and 39% reported using case management and client advocacy services funded by RW;
 - Among respondents reporting food and nutrition services, between 26% and 39% reported using food and nutrition services funded by RW;
 - Among respondents reporting dental services, between 19% and 26% reported using dental services funded by RW.
- Subgroup analyses indicate that, generally, vulnerable populations (women, minorities, individuals with annual household income of less than \$10,000, people living in high poverty communities) are more likely to report Ryan White-funded health services than individuals without those characteristics. Furthermore, sicker individuals (those who have low self-reported health status or t-cell counts below 200) are more likely to report Ryan White-funded services than individuals not at advanced stages of the illness.
 - The analyses exploring a Ryan White effect revealed the following statistically significant differences:
 - CHAIN respondents who reported receiving primary medical care from a Ryan White-funded provider were 60 to 70 percent more likely to report appropriate medical care as were CHAIN respondents who received primary medical care from a non-Ryan White-funded provider.
 - Respondents who received primary medical care from a Ryan White-funded provider were 40 to 50 percent more likely to report being on HAART as were individuals who received primary medical care from a non-Ryan White-funded provider.
 - CHAIN respondents who received other health services (any hospital or clinical based services in addition to their primary medical care provider) from a Ryan White-funded provider were 60 to 80 percent more likely to report appropriate medical care as were CHAIN respondents who received other health services from a non-Ryan White-funded provider.
 - Respondents who reported receiving case management and/or client advocacy services from a Ryan White-funded provider were 80 to 90 percent more likely to report appropriate medical care as were CHAIN respondents who received case management and client advocacy services from a non-Ryan White-funded provider.
 - Finally, CHAIN respondents who reported receiving case management and/or client advocacy services from a Ryan White-funded provider were 70 percent more likely to report being on ARV therapy as were CHAIN respondents who

received case management and/or client advocacy services from a non-Ryan White-funded provider.

- Overall, clients of non-Ryan White medical providers were half as likely as clients of Ryan White medical providers to report care that met minimum HIV practice guidelines. There were no differences among different types of non-Ryan White medical care providers. When analyzed separately, clients of non-Ryan White funded medical providers at public hospitals, voluntary not-for-profit hospitals, and private doctors were all half as likely as clients of Ryan White medical providers to report care that met minimum HIV practice guidelines. This suggests that the difference is attributable to Ryan White funding, not organizational type.

Data & Methods

Overall Strategy

As will be described in greater detail later in this section, our general strategy was to map three distinct databases of varying hierarchical orders in an effort to create a synthesized data set organized at an individual-level unit of analysis (i.e., CHAIN respondents). The CHAIN data is a client-level data set composed of individuals who have been randomly selected from multiple health and human service agencies. These individual respondents report on the services they receive from multiple agencies in New York City; these services may or may not have been funded through a Ryan White CARE Act program. Furthermore, we cannot presume that any individual respondent will know whether the service he or she has received has been funded by Ryan White CARE Act monies. The fundamental premise in attributing an administrative data value (“Ryan White-funded service”) to a client-reported service is that it is reasonable to assign an ecological characteristic – in this case, “Ryan White funding,” much like “living in a high-poverty neighborhood” – to an individual. Since we cannot directly determine whether a service reported by an individual respondent in the CHAIN study was a Ryan White service, we assumed that if a client reported receiving a specific service (such as case management) at a service site that receives Ryan White funding to provide case management services, then it is likely that this client’s service was either directly or indirectly affected by Ryan White funding. Implicit in this model is the assumption that Ryan White-funded agencies establish or develop a particular organizational culture that is responsive to Ryan White funding requirements (e.g., more comprehensive services, greater depth of formal referral linkages, and more intensive quality assurance procedures, among others).

Figure 1 illustrates the Data Flow Schematic, representing the three major data streams we have mapped on to one another for this analysis. The mapping process involved first coding the Ryan White funding title and type of service to sites of services identified in the agency database, and then using this enhanced agency database as a “lookup table” for any agency reported by a CHAIN respondent.

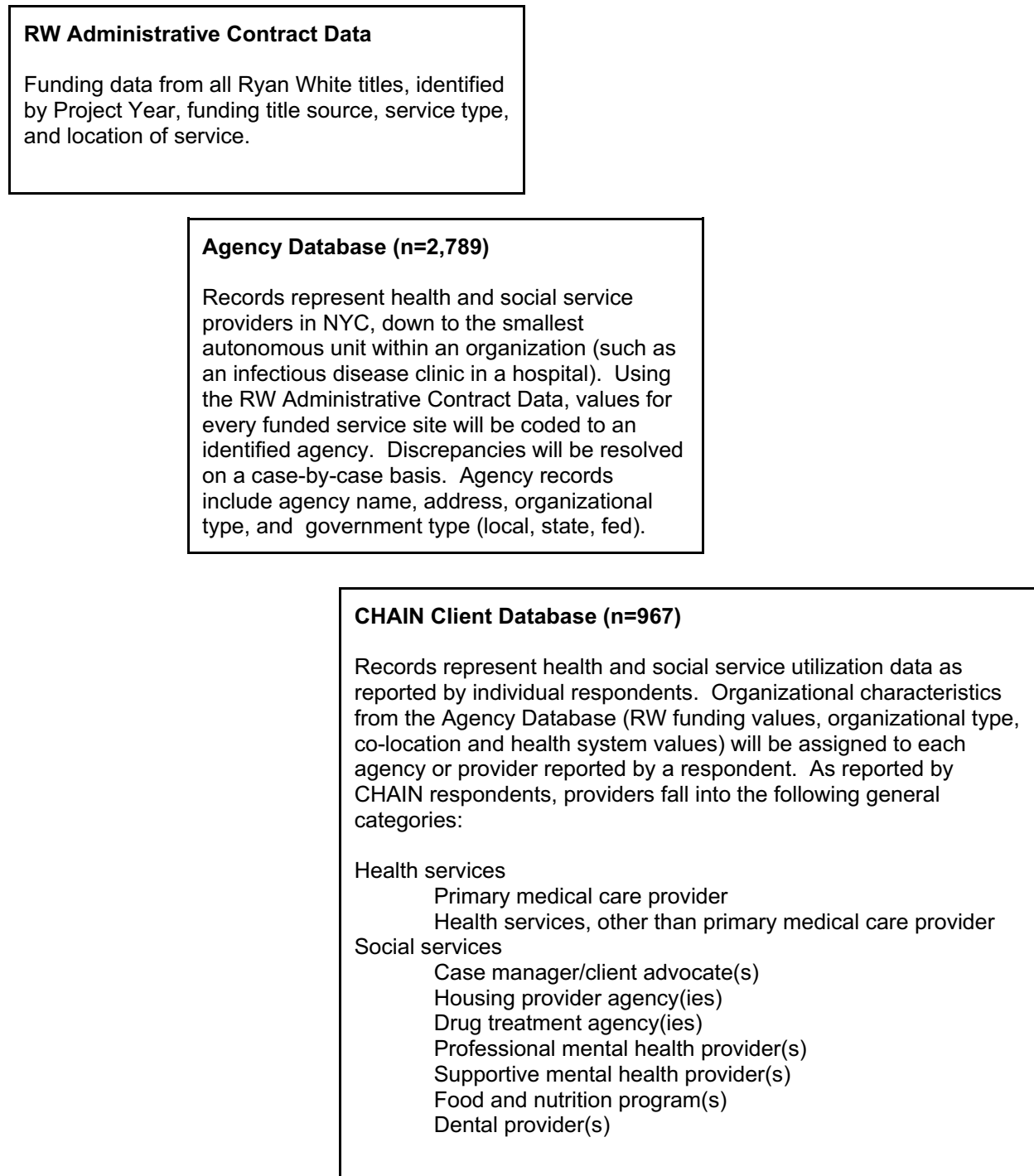
Figure 1. Data Flow Schematic

Table 1. Comparison of Epidemiological Data with CHAIN Data

	Surviving AIDS Cases, NYC†	CHAIN: Wave 6
	As of December, 1999	1999
n	43,150	508
MALE	32,012	291
<i>Non-Hispanic White</i>	27%	20%
<i>Non-Hispanic Black</i>	38%	54%
<i>Hispanic</i>	33%	24%
<i>Other</i>	2%	1%
FEMALE	11,138	217
<i>Non-Hispanic White</i>	12%	6%
<i>Non-Hispanic Black</i>	53%	67%
<i>Hispanic</i>	34%	27%
<i>Other</i>	1%	1%

† NYC DOH Office of AIDS Surveillance, "Estimates of Persons Living with AIDS in NYC, 1999 Edition"

Client-level Data

The CHAIN data set is composed of 967 individuals recruited through a multi-stage sampling strategy and targeted sampling techniques. The baseline cohort of 700 individuals was recruited in 1994-1995 and a refresher cohort of 267 individuals was recruited in 1998. The cohort is broadly representative of the city's estimated 80,000 HIV-positive population in care (see Table 1). The research team has conducted seven waves of interviews since the original recruitment, allowing for an interval of approximately six to twelve months between interviews. At each successive wave of interviews a small number of study participants were lost to follow-up. The research team has used a number of resources and strategies to recontact or confirm the status of individuals lost to follow-up, and occasionally an individual who has been lost to follow-up in an earlier wave is recontacted and interviewed at a subsequent wave.

In the two-hour long interviews, conducted in a face-to-face setting by community-based trained interviewers, participants are asked about: (1) their encounters with the health care delivery system, (2) their need for services, (3) their access, utilization and satisfaction with health and social services, (4) key sociodemographic characteristics, (5) informal caregiving from friends, family and volunteers, and (6) their quality of life with respect to health status, psychological and social functioning. A number of items have been added over the years related

to antiretroviral therapies, specific medical care services, viral load levels, and other topics of interest to policymakers, planners, providers, and clients on the Title I Planning Council.

Agency-level Data

The CHAIN agency database was initially developed in 1994 as the sampling frame for the original cohort. It was populated with agency data on approximately 400 health and human service agencies providing care to the city's HIV population, and included both Ryan white-funded and non-Ryan white-funded organizations. Agencies and providers were added to the database over the course of the longitudinal study as CHAIN respondents reported their service utilization. There is an ongoing mechanism and protocol for assigning a new agency code, operationalizing certain organizational measures (such as organizational type, government type, etc.), and resolving duplicates. Because clients report on services based on the site at which they received the service, the agency database has grown accordingly. A hierarchical ordering was implemented in 1998 in which each agency or provider was defined at the smallest autonomous organizational unit (the "agency"), and further attributed to a larger organization (the "parent") such as occurs with an infectious disease clinic (agency) within a hospital (parent). At the highest level, an agency belongs to a parent within a health care network (the "system"). There are presently 2,789 unduplicated agencies or providers identified in the agency database.

The administrative contract data were initially obtained from the city's Title I master contractor, MHRA's HIV Care Services. MHRA supplied data on Title I direct contracts, as well as on Title I subcontracts administered by the New York State AIDS Institute and New York City's Human Resources Administration. Specific agencies were contacted directly when necessary to clarify specific service or site information. The state AIDS Institute, the New York State Title II contract administrator, supplied Title II contract data and supplemented information on their Title I subcontracts as well as Dental Care contracts. Additionally, we received information on Dental Care contracts generated by HRSA's HIV/AIDS Bureau. Because Title III, IV, and SPNS are self-administered contracts, contract data for these titles was more difficult to obtain. Two SPNS contract administrators were able to provide sufficient information on all New York City SPNS contracts. Agencies receiving Title III and IV contracts were contacted directly by telephone or in-person.

Merging Data Sets

In order to conduct the Ryan White Impact study, two substantial data merges were required. First, 1997-2000 Ryan White contract data for New York City was merged with CHAIN's agency database so that the database would reflect whether or not an agency received Ryan White funding through a Title I, II, III, IV, Dental Care or SPNS contract during these years. Second, once CHAIN's agency database was updated, it was merged with CHAIN's client database, which contained information on the agencies from which CHAIN respondents reported receiving social and/or medical care services. The end result was a synthesized data set

that indicated whether or not a CHAIN respondent received one of nine Ryan white-funded services during 1997-2000.

During the second data merge, there were two main considerations. (1) Because each Ryan White title classified the services it funded differently and these classifications did not exactly correspond to the service categories reported by CHAIN respondents, a method of mapping Ryan White to client-reported service categories was developed; (2) Because Ryan White Title I and Dental Care contract dates did not match CHAIN interview wave dates, a method of mapping contract years to interview dates was developed.

As expected, these data merges required a number of decision rules (see CHAIN Update Report #35a - Ryan White Impact Technical Appendix for greater detail). The guiding principal of the decision rules was to maximize specificity (that is, to identify “true negatives,” the agencies that don’t receive Ryan White funding), rather than sensitivity (finding “true positives,” agencies that do receive Ryan White funding). The consequence of this conservative approach is to maximize “false negatives” rather than “false positives.” The practical effect of such a decision rule is to raise the bar for establishing a Ryan White effect. This allows for greater confidence in any positive findings of a Ryan White effect since it is harder to achieve. In practice, then, we developed decision rules that underestimated the number of agencies, and thus CHAIN subjects, who received Ryan White-funded services.

Using information from the above data sources, each agency in the CHAIN agency database was assigned a code indicating whether they received Ryan White monies, further classified by a title and service category¹. (Service categories will be discussed in detail below.) In practice, this consisted of browsing the CHAIN agency database to identify the Ryan White-funded agencies. An agency in the CHAIN database was attributed with a Ryan White funding code if its name *and* address precisely matched an agency provided by one of the Ryan White data sources. Ryan White data sources often listed a lead contract agency as well as several additional sites that provided services under this contract. All sites, not just the lead contract agency, were attributed with the Ryan White code. Concomitantly, the CHAIN agency database links agencies to a “parent” agency if the agency is one site of a larger organization. Each site, not the parent agency, unless specified, was attributed with the appropriate Ryan White code.

While the agency database is a complete listing of all agencies utilized by CHAIN respondents, it is not comprehensive of all health care and social services agencies in New York City. If the name of a Ryan White-funded agency could not be matched to an existing agency in the database, it was automatically added and assigned the appropriate Ryan White code.

¹ Title I contracts were subdivided into project year 7, 8, 9, or 10 and Dental Care contracts were grouped as 1997/1998 or 1999/2000, due to changes in contracts over the time period of interest. Contracts under the other titles were assumed to be consistent over this time period unless otherwise noted.

In order to provide a detailed analysis of a Ryan White impact, we examined several service categories rather than specify a single overall Ryan White variable (e.g. Ryan White funding yes/no). Six service categories were initially selected based on MHRA's schema for aggregating Title I contracts up to a general "service area"²: health services, housing services, substance abuse services, mental health, social services, and dental services. However, following in-depth discussions on how these Title I classifications would be mapped to non-Title I contracts and the service categories reported by CHAIN respondents, they were substantially refined. Ultimately, nine service categories were chosen: primary medical care doctor, health

Table 2. Organizational type of provider sites¹, by Ryan White funding

Organizational type	No Ryan White-funded service provided at site	Ryan White-funded service provided at site
<i>TOTAL</i>	2312	477
<i>Social Service agencies</i>	489	224
<i>Drug treatment programs</i>	150	64
<i>Designated AIDS Centers⁴</i>	133	63
<i>Community health centers & neighborhood clinics</i>	80	42
<i>NYC Health & Hospitals Corporation²</i>	74	36
<i>Voluntary (not-for-profit) hospitals³</i>	90	28
<i>Nursing homes, hospices & home care</i>	56	12
<i>Prisons & correctional facilities</i>	61	8
<i>Other public hospitals (state and federal)</i>	14	0
<i>Solo practitioners & private providers</i>	1101	0
<i>Other</i>	64	0

Notes:

1. Provider sites are identified as the smallest autonomous organizational unit reported as a site of service by CHAIN respondents. A single institution, such as a hospital, may have numerous "sites of service," including services, departments, and hospital-based clinics.
2. New York City Health & Hospitals Corporation operates the city's public hospital system.
3. Voluntary (not-for-profit) hospitals constitute the private hospital sector in New York. There are no for-profit hospitals in the state.
4. Designated AIDS Centers are voluntary and public hospitals selected by the New York State AIDS Institute to provide comprehensive and tertiary care services to HIV-affected individuals. They receive enhanced Medicaid reimbursement rates for services delivered.

² See MHRA's 1998 Service Directory (p.ix-x) and PY 07 directory

services (other than primary medical care), housing services, substance abuse services, professional mental health services, supportive mental health services, case management and client advocacy services, food and nutrition services, and dental care services.

A “mapping schema” was developed and reviewed by program and contract managers at the New York City Department of Health, MHRA HIV Care Services, and the New York State AIDS Institute (see the Ryan White Impact Technical Appendix). The schema mapped service categories funded by the different Ryan White titles to the client-reported service categories. Title I contracts were easily mapped to the more refined categories by separating out individual contracts from the aggregate service areas (e.g. case management and supportive counseling contracts were split out from the social services area and mapped to the case management/advocacy and supportive mental health categories, respectively.) Except for Dental Care contracts, mapping services funded by non-Title I contracts posed greater difficulty, as these contracts were not service-specific as were Title I, but rather grouped many services together. In addition, each title had its own definition of services. (Please see the Ryan White Impact Technical Appendix notes for details on obtaining service information for Title II, III, IV, and SPNS.)

Given that the time period of interest was from 1997-2000, individuals from three waves of CHAIN interviews (Waves 5-7), which covered these years, were selected for analysis. Wave 5 through 7 interviews were conducted from October 1, 1997 to April 15, 2001, but effectively covered the period April 1, 1997 to April 15, 2001, since the CHAIN interview asks information about health services received up to six months prior to the interview date. As mentioned above, Title II, III, IV, and SPNS contracts were consistent over this time period and thus applied to data from all three waves. That is, an individual who reported receiving a service from an agency in Waves 5, 6, or 7 was considered to have received a Ryan white-funded service if that agency was funded for that service under any of these titles. As mentioned in a footnote above, Title I and Dental Care contracts were year-specific. Because the contract fiscal years did not precisely correspond to CHAIN wave dates, decision rules were required to determine which contract year should apply to which interview wave (see Ryan White Impact Technical Appendix).

Table 2 illustrates the distribution of Ryan White funding in the agency database, summing across all funding titles.

Variables

Table 3 lists the outcome variables, all of which are dichotomous (that is, yes/no) except for length of hospitalization, which is continuous. Table 4 lists the independent variables used in the analyses. Most of the listed variables are scored dichotomously. Among those that are categorical (such as race/ethnicity, with multiple categories), a series of dummy variables were created for the purposes of the multivariate analyses.

Table 3. Outcome variables

Indicator	Measurement
<i>Appropriate medical care</i>	Based on number of medical care visits in prior 6 months, self-reported complete physical and blood work, and use of antiretroviral therapy. See Technical Appendix for detailed criteria
<i>ARV</i>	On any antiretroviral therapy at time of interview
<i>HAART</i>	DHHS approved therapy at time of interview
<i>Hospitalizations</i>	Any self-reported in-patient use in prior six months
<i>Length of hospitalization</i>	Self-reported number of days of in-patient use in prior six months
<i>Adherence</i>	Self-reported adherence to HIV medication + no missed pills in prior two days

Table 4. Independent Variables

Ryan White funding service categories	
<i>Current primary medical provider</i>	Respondent identified a provider in charge of overall HIV care
<i>Health services</i>	Respondent reported any ambulatory health services (at a hospital, clinic, or private office)
<i>Housing services</i>	Includes housing assistance (primarily referrals) and housing placements and subsidies (for waves 6 and 7 only)
<i>AOD services</i>	Respondent reports drug rx (inpatient, methadone, out-pt, residential, etc)
<i>Professional mental health</i>	Respondent reports MH treatment from psychiatrist/psychologist
<i>Supportive mental health</i>	Respondent reports MH counseling from soc worker, case mgr, clergy, etc
<i>Case management/client advocacy</i>	Any “case manager, case worker, or any other paid employee of a social or medical service agency [who] helped you arrange for services”
<i>Food and nutrition</i>	Expressed need in wave 5, for waves 6 & 7 includes all agencies providing congregate meals, nutritional counseling, food pantry, and delivered meals
<i>Dental</i>	Respondent reported any dental service
Covariates and Vulnerable/Underserved Subgroups	
<i>Gender</i>	Respondent’s self-report of gender
<i>Race/Ethnicity</i>	Black, non-Hispanic; White, non-Hispanic; Hispanic
<i>Age group</i>	Respondent’s age at interview (20-34, 35-49, 50+)
<i>Educational Level</i>	Respondents report less than a high school diploma
<i>Annual Household Income</i>	Self-reported annual household income (<\$10,000, >\$10,000)

<i>High Poverty Community</i>	Residential zip code > 40% population under federal poverty line
<i>T-cell count</i>	Self-reported CD4 count (<200, 201-500, >501)
<i>Opportunistic infection</i>	Reported OI in prior 6 month period
<i>Antiretroviral therapy</i>	Respondent on any antiretroviral therapy
<i>HAART</i>	Therapy follows DHHS guidelines, amongst respondents on therapy
<i>Adherence</i>	Self-reported adherence to HIV medication plus no reported missed pills in prior 2 days
<i>Self-reported health status</i>	Scored on MOS Physical Component Summary Scale (PCS<45.0 is low)
<i>Self-reported mental health status</i>	Scored on MOS Mental Component Summary Scale (PCS<37.0 is low)
<i>Type of Medical Service</i>	Organizational type of primary medical care provider (HHC, Voluntary hospital, CHC/clinic, drug treatment/social service, private physician)
<i>HIV risk behavior</i>	Self reported as MSM; MSM + IDU; IDU; Other
<i>Drug Use</i>	Self reported as current user; former user; never used
<i>Unstably housed</i>	Respondents report any episode of living in street, shelter, single-room occupancy, or doubled-up with a friend or relative in past 6 months

Analyses

Trend Analysis of Ryan white-funded Services Reported by CHAIN Respondents

For each of the three waves of CHAIN interview data we ran a series of univariate frequencies for each reported service area. We restricted the analysis to respondents who indicated they had received a service within one of the nine service categories.

Subgroup Analyses

For this analysis we used the pooled cross-sectional observations of respondents who participated in the fifth through seventh waves, for a total of 1,604 observations. Since the intent of this analysis was to identify statistically significant differences that would prove useful for later regression analyses, we decided to err upon the side of increased power (i.e., capitalizing on the pooled observations) versus the possibilities of biasing the findings because of a skewed intra-individual effect. CHAIN Update Report #35a - Ryan White Impact Technical Appendix includes the first of three subgroup analyses. The first was a chi-square analysis of each funding service category by specific client characteristics. We identified sociodemographic characteristics (gender, race/ethnicity, age group, educational attainment, annual household income, neighborhood poverty characteristics), health characteristics (t-cell count, recent opportunistic infection, antiretroviral therapy, HAART, adherence to medication, physical and mental health status), and risk characteristics (HIV risk behaviors, drug use, and unstable housing). In this analysis we included all categories of the Ryan White funding service variables – no service reported, non-Ryan white-funded service, or Ryan white-funded service. The two subsequent chi-square analyses [data not shown here] involved comparing individuals who

reported any service with those who reported no service within the above characteristics, and then comparing individuals who received Ryan white-funded services with those receiving non-Ryan White-funded services, using the same characteristics as above. This permitted us to generalize about subgroup differences along two domains: service versus no service, and Ryan White versus no Ryan White.

Impact Analysis

To measure the association between the Ryan White service variables and the dichotomous health outcome measures, we estimated a series of logistic regression equations using a version of the generalized estimation equation (GEE) procedure implemented in Stata version 7.0, using the random effects option. GEE adjusts standard errors of the estimates of the regression coefficients to account for the dependency among multiple observations contributed by the same individual. We estimated a series of equations, first bivariate and then multivariate (incorporating all of the covariates) of the following form:

$$\text{logit [health outcome]} = \text{RW funding} + \text{covariates} + \text{error.}$$

This series of regression analyses, conducted separately for each of the Ryan White service categories, was restricted to respondents receiving a service. The Ryan White dummy variable thus tested the Ryan White contribution toward the health outcome.

Findings

Trend Analysis

As illustrated in Table 5, the trend analysis of Ryan White-funded services illustrates a very stable and consistent proportion within each service category from 1997 through 2000. Overall, across all service categories, respondents reported between 11% and 63% of the services they received was from providers with Ryan White contracts. The largest proportion of Ryan White-funded services was among clients reporting health-related services (primary medical care provider or other health services) and housing services, in which approximately half of the providers mentioned by respondents were Ryan White-funded.³ In order, the next most commonly-cited Ryan White provider services were case management and client advocacy, food and nutrition services, and substance abuse services, which were mentioned by one-quarter to over one-third of clients receiving those services. Finally, approximately one-sixth to one-quarter of clients reporting mental health (professional or supportive) or dental services referenced Ryan White-funded providers.

³Excluding housing services in Wave 5 in which only one-third reported Ryan White-funded services. This is because the Wave 5 CHAIN questionnaire captured reported need only while Wave 6 on captured reported need plus agencies assisting with housing subsidy and placement.

Table 5. Distribution of reported Ryan White-funded providers, by service category

	Wave 5		Wave 6		Wave 7	
Service reported	n=652	%	n=508	%	n=444	%
Primary medical care provider						
Total reporting service	619		495		425	
<i>RW-funded service</i>	309	50%	242	49%	192	45%
<i>Non RW-funded service</i>	310	50%	253	51%	233	55%
Health services - other than primary medical care provider						
Total reporting service	532		436		372	
<i>RW-funded service</i>	333	63%	213	57%	213	57%
<i>Non RW-funded service</i>	199	37%	159	43%	159	43%
Housing						
Total reporting service	123		227		129	
<i>RW-funded service</i>	39	32%	127	56%	61	47%
<i>Non RW-funded service</i>	84	68%	100	44%	68	53%
Substance Abuse Treatment						
Total reporting service	184		126		85	
<i>RW-funded service</i>	40	22%	42	33%	26	31%
<i>Non RW-funded service</i>	144	78%	84	67%	59	69%
Mental Health - professional services						
Total reporting service	195		137		104	
<i>RW-funded service</i>	39	20%	15	11%	12	12%
<i>Non RW-funded service</i>	156	80%	122	89%	92	88%
Mental Health -supportive services						
Total reporting service	231		178		111	
<i>RW-funded service</i>	35	15%	33	19%	21	19%
<i>Non RW-funded service</i>	196	85%	145	81%	90	81%
Case management and Client advocacy						
Total reporting service	486		372		267	
<i>RW-funded service</i>	189	39%	164	44%	115	43%
<i>Non RW-funded service</i>	297	61%	208	56%	152	57%

Service reported	Wave 5		Wave 6		Wave 7	
	n=652	%	n=508	%	n=444	%
Food and nutrition						
Total reporting service	31		249		203	
<i>RW-funded service</i>	8	26%	97	39%	70	34%
<i>Non RW-funded service</i>	23	74%	152	61%	133	66%
Dental						
Total reporting service	254		204		165	
<i>RW-funded service</i>	67	26%	47	23%	31	19%
<i>Non RW-funded service</i>	187	74%	157	77%	135	81%

Subgroup Analysis

Table 6 illustrates summary differences among CHAIN respondents with different individual characteristics in their reported use of Ryan White-funded services, amongst individuals who reported a service. Overall, respondents whose characteristics represent more vulnerable populations (women, minorities, low-income, residents of high-poverty neighborhoods) were generally more likely to report Ryan White-funded health services such as primary medical care, health, and dental services. Results, however, are not as clear regarding vulnerable population's use of social or supportive services. Sicker individuals appear more likely to report Ryan White-funded services.

Table 6. Summary of Group Differences in Reported Use of RW-funded Services

Client Characteristics	
<i>Sociodemographic</i>	<p>Blacks and Latinos are more likely than white respondents to report Ryan White-funded primary medical providers or health services. Black respondents are less likely than white or Latinos to report Ryan White-funded food and nutrition services;</p> <p>Respondents with an annual household income of less than \$10,000 are more likely than those with an income of greater than \$10,000 to report a Ryan White-funded primary medical care provider, health service, or dental service, but less likely to report a Ryan White-funded housing service;</p> <p>Respondents aged 35-49 years old are more likely than younger or older clients to report Ryan White-funded alcohol or drug treatment;</p> <p>Women are more likely than men to report Ryan White-funded professional mental health services;</p> <p>Respondents with a high school education are more likely than those with less than a high school education to report Ryan White-funded supportive mental health services;</p> <p>Respondents in high-poverty areas are more likely than those in low poverty areas to report Ryan White-funded dental services, but less likely to report Ryan White-funded drug and alcohol or case management and client advocacy services.</p>
<i>Health</i>	<p>Respondents on HAART are more likely to report Ryan White primary medical provider than respondents on non-combination antiretroviral therapy; but are less likely to report Ryan White-funded supportive mental health services;</p> <p>Individuals with low self-reported health status are more likely than those with high self-reported health status to report Ryan White-funded food and nutrition services;</p> <p>Respondents with t-cell counts below 200 are more likely than those with higher t-cell counts to report Ryan White-funded dental services.</p>
<i>Risk</i>	<p>Men who have sex with men (MSM) are less likely than others to report a Ryan White-funded medical provider or dental service;</p> <p>Former drug users are less likely than current or never drug users to report a Ryan White-funded medical provider;</p> <p>Respondents with IDU + MSM risk behaviors as well as those with heterosexual risk behaviors are more likely to report Ryan White-funded mental health services than MSM or IDU alone, although MSM alone are more likely to report a Ryan White-funded supportive mental health service;</p> <p>Never drug users are more likely than former or current drug users to report a Ryan White-funded supportive mental health or case management and advocacy services;</p> <p>MSM are more likely than respondents in other risk categories to report a Ryan White-funded food and nutrition service.</p>

Ryan White Impact Analysis

Table 7 illustrates the results of the series of logit regression equations run using a generalized estimation equation model. The unadjusted odds ratios (OR) represent the relationship between receipt of a Ryan White-funded service and the specific outcome, notwithstanding any other client characteristic which might explain the relationship. The adjusted odds ratios take into account a number of additional characteristics which could account for a statistically significant difference in health outcomes. The other explanatory variables added to the equations include gender, race/ethnicity, age, education, substance abuse history, t-cell count, unstable housing, and low mental health.

As highlighted in the table, individuals reporting a Ryan White-funded primary medical provider are 1.7 times as likely to also report medical care that meets minimum practice guidelines and 1.5 times as likely to report being on HAART than are individuals who had a non-Ryan White-funded primary medical provider. Similarly, individuals who report health services (such as clinical or ambulatory care visits) at a Ryan White-funded provider are 1.8 times as likely to report appropriate medical care (which may also be characterized as 80% more likely) than individuals who receive the same services from non-Ryan White-funded providers. Finally, respondents who reported receiving case management and client advocacy services from Ryan

Table 7. Ryan White Impact: A Multivariate Analysis

Ryan White-funded service	Odds of Reporting Appropriate Medical Care		Odds of Being on Any Antiretroviral Therapy		Odds of Being on HAART	
	Unadjusted OR	Adjusted OR	Unadjusted OR	Adjusted OR	Unadjusted OR	Adjusted OR
Primary medical care provider	1.6***	1.7***	0.8	0.8	1.4	1.5*
Health care- other than 1 ^o medical	1.6**	1.8***	1.0	1.0	1.0	1.0
Housing services	0.8	0.7	1.6	1.7	1.1	1.1
AOD services	0.9	1.1	1.2	1.4	0.9	0.8
Professional mental health	1.0	0.9	1.2	1.2	0.8	0.8
Supportive mental health services	1.1	1.1	1.0	0.9	0.1***	0.00***
Case mgmt and client advocacy	1.9***	1.8***	1.7*	1.7*	1.5	1.5
Food and nutrition	1.1	1.2	2.0	1.7	0.7	0.7
Dental services	0.9	0.8	1.1	1.2	1.4	1.7

* p=<.05

**p=<.01

***p=<.001

Note: Adjusted Odds Ratio have been controlled for the following explanatory factors: gender, race/ethnicity, age, education, substance abuse history, tcell count, unstable housing, and low mental health.

White-funded providers are nearly twice as likely to also report appropriate medical care and 1.7 times more likely to be on ARV therapy as are individuals who received non-Ryan White-funded case management and client advocacy services.

Organizational Analysis

Because it could be argued that the above findings are due to the organizational type of agencies that do not receive Ryan White funding, rather than the Ryan White funding characteristic itself, impact analysis was re-run stratifying non-Ryan White-funded agencies by their organizational type. Table 8 presents the results of this analysis for the primary medical care provider category, using Ryan White-funded agencies as the referent category. Primary medical care provider is the only service category that could be analyzed because it is the only one for which CHAIN respondents are limited to reporting only one agency. Therefore, a client's reported agency could be distinctly assigned to one of five organizational types: New York City Health and Hospital Corporation (HHC), Voluntary hospitals, Community Health Centers (CHC) or clinics, drug treatment or social service programs, or private physicians.

The results from the organizational analysis indicate that the two principle findings from the impact analysis above – individuals reporting Ryan White-funded primary medical care providers are significantly more likely than those who do not report a Ryan White-funded medical care provider to receive appropriate medical care and be on HAART – is generally consistent across all non-Ryan White organizational types. For example, an individual who reports a non-Ryan White-funded primary medical care provider of any type, except CHC/clinic, is only 50 to 60 percent as likely to receive appropriate medical care as an individual who reports a Ryan White-funded primary medical care provider of any type. Individuals reporting providers of the CHC/clinic type are also less likely to receive appropriate medical care, although it is not a significant difference. For all organizational types, respondents reporting non-Ryan White-funded providers are less likely to be on HAART than those who have a Ryan White-funded provider, although it is only significant for the providers of the CHC/clinics and drug treatment/social service types. These results suggest that the Ryan White characteristic of an agency, more than the organizational type of non-Ryan White-funded agencies, contributes to the associations found above.

Table 8. Ryan White Impact: A Multivariate Analysis of Non-Ryan White Primary Medical Care Providers^{1,2}

	Odds of Reporting Appropriate Medical Care	Odds of Reporting Inpatient Stay	Coefficient of Length of Stay as an inpatient	Odds of Being on any ARV ³	Odds of Being on HAART ⁴	Odds of Being Adherent to Medication
Non-Ryan White Primary Medical Care Funded Providers	Adj. OR	Adj. OR	Adj. Coeff.	Adj. OR	Adj. OR	Adj. OR
Ryan White Providers	1.0	1.0	1.0	1.0	1.0	1.0
Non-Ryan White Providers	0.6***	0.9	-0.1	1.3	0.7 *	1.2
Non-Ryan White Providers by provider type						
Non-Ryan White HHC Providers	0.5*	2.0	2.5*	2.8 †	0.5	1.2
Non-Ryan White Voluntary Hospital Providers	0.6**	1.1	0.2	1.1	0.9	1.1
Non-Ryan White CHC/Clinic Providers	0.9	1.1	-0.9	0.4	0.3*	1.3
Non-Ryan White Drug treatment/Social Service Providers	0.6*	0.8	0.2	3.0**	0.5*	1.9*
Non-Ryan White Private Doctor Providers	0.5**	0.4*	-1.3	0.8	0.9	0.9
†p<.10	* p<.05		** p<.01		***p<.001	

Notes on Table:

- Adjusted Odds Ratio and coefficients have been controlled for the following explanatory factors: gender, race/ethnicity, age, education, substance abuse history, tcell count, unstable housing, and low mental health.
- These Odds Ratios are interpreted as an individual's odds of having a particular health outcome if at a specific type of non-funded Ryan White provider, in comparison to a Ryan White funded provider. For example, an individual whose primary medical care provider is *not* Ryan White funded and of the HHC type is 50% as likely to report appropriate medical care as an individual whose primary medical care provider is Ryan White funded and of any type.
- Antiretroviral therapy
- Highly active antiretroviral therapy

Discussion

The most formidable task facing the research team on this study was operationalizing a “Ryan White effect.” This is particularly daunting given the near-impossibility of assigning a specific service or provider to a specific client since New York City agencies fund their HIV services and providers using a mix of revenue streams. The strategy of assigning an ecological characteristic of “Ryan White funding” to clients reporting a service or provider at a given location – particularly since the funding can be identified to this level of site of service – appears to be a reasonable approximation for precisely measuring a Ryan White effect. A great deal of effort has gone into fine-tuning the mapping of administrative contract data down to the level of a client-level database, and the methodology should prove useful in other analyses as well.

The findings clearly suggest certain outcomes which appear to match the intent of the Ryan White CARE Act. To begin with, individuals from the most vulnerable populations are more likely to report Ryan White-funded services, which is in keeping with the policy’s intent to serve as a fallback when no other funding is available. Furthermore, it appears that Ryan White funding may be causally related to certain improved outcomes, such as self-reported appropriate medical care or use of HAART. We anticipated that if Ryan White funding provided a “leveling effect,” effectively showing no statistical differences between Ryan White and non-Ryan White-funded providers, that would demonstrate a policy effect of exerting a “rising tide” on providers serving the most vulnerable. Finding a statistically positive difference suggests an even more robust effect of Ryan White funding. As such, we conclude that we have found compelling evidence for both our first hypothesis – that Ryan White provides a leveling effect – and our second hypothesis – that Ryan White has a systems effect which promotes better health outcomes than individuals receiving care outside of the Ryan White system..

These findings raise very important questions. What is it about Ryan White funding that is associated with better health outcomes, and why is that only certain health outcomes exhibit such robust improvement from a Ryan White effect? In fact, the finding highlights the questions of causal relationship between Ryan White funding and organizational behavior change. Which is the causal order? Does Ryan White funding promote organizational behavior change, such that agencies with more formal referral linkages and a more evolved quality assurance and reporting system tend to exhibit better health outcomes among their clients? Or is it equally plausible that more highly organized agencies, and those agencies that a priori deliver higher quality care to their clients, are more likely to apply for and receive Ryan White funding? Both of these explanations are viable, and the question demands further research and analysis. More detailed information on the agencies, both those receiving and those not receiving Ryan White funding, as well as temporal data to indicate an agency’s change over time, would permit for more refined analyses. In the absence of such data, it is still reasonable to assert that there is an association between Ryan White funding and better health outcomes, and it may be regarded as an impact of such funding regardless of the causal order.

Another question that has been raised is whether the Ryan White effect is confounded by the Medicaid effect. That is, wouldn’t the presence of Medicaid better explain the variation in health outcomes, since it is the primary payer for HIV health services. As it happens, over 80%

of the CHAIN cohort reports Medicaid as a primary insurance carrier between waves 5 and 7, so the Ryan White impact demonstrated in our analyses is present notwithstanding the presence of Medicaid. In other words, Ryan White appeared to exert an independent effect on increasing certain health outcomes regardless as to the presence of Medicaid.

Clearly, the study has a number of limitations. It is based on client self-report of a number of key health issues, and would benefit from clinical exams and medical chart reviews to validate some of the survey measures. Also, we cannot justify generalizing about such a Ryan White effect beyond New York City, since the local “effect” is a product of both the national Ryan White variable as well as a number of unmeasured local variables. Another limitation relates to the funding database, since there may be errors in administrative and contract data beyond the validation of the research team. Even though an agency reports to its funder that certain funds are being used to provide specific services at a specific site, the exigencies of clinic or agency operations might dictate transferring those funds or providers to another site. Furthermore, we cannot be completely assured that the service was provided in a timely fashion after the funding was made available. The start-up times at certain agencies might have varied greatly, and in systematic ways to have produced unmeasured error in our analyses.

Notwithstanding the limitations of the study, the analysis still offers a reasonable strategy for conducting policy analyses, as well as a provocative finding that Ryan White has a considerable and sustained impact on improving certain health outcomes at an individual level.