

***Update Report # 46***



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**Chronic Diseases  
and  
Clinical Comorbidities**

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**C.H.A.I.N. REPORT**

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## **INTRODUCTION**

The occurrence of disease conditions associated with HIV/AIDS has been evolving in recent years.<sup>1</sup> The various opportunistic infections and rare cancers that are closely associated with AIDS are declining in frequency, while other “Non-HIV” or “general medical” comorbid conditions, such as hepatitis, heart disease, and diabetes, are on the increase.<sup>2</sup> This shift in the profile of HIV comorbidities can be linked to HAART and other medical treatments. On the one hand, HAART and other medications have helped many people with HIV strengthen their immune system functioning against many common AIDS defining diseases. On the other hand, HIV infected individuals that benefit from HAART are becoming increasingly susceptible to chronic diseases such as hypertension and heart disease that are associated with aging in the general population. As HIV individuals live longer, they may also begin to manifest diseases associated with life styles or those that concentrate among individuals from a particular ethnic group or socioeconomic status. Lastly, new comorbidities may be associated with the toxicity of antiretroviral medications.

Previous CHAIN Update Reports have documented the decline in mortality and the associated decline in opportunistic infections (in particular, Update # 39). Meanwhile, gains in health functioning during the early interviews have stabilized or even declined in more recent interviews. The stagnation in health functioning suggests that participants may be experiencing other health problems, even as HIV defining conditions are becoming less frequent. This report investigates this possibility more directly. For each of 10 conditions we examine overall lifetime prevalence and the uneven burden of morbidity from these disease with respect to aging, social

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<sup>1</sup>A.M. Kilbourne, A.C. Justice et al. “General medical and psychiatric comorbidity among HIV-infected veterans in the post-HAART Era.” *Journal of Clinical Epidemiology*. 54(2001) S22-S28.

<sup>2</sup>Ibid., p. S22

factors, life style and long-term exposure to HIV. We also examine to what extent these conditions are associated with increased use of medical services.

## **KEY FINDINGS**

- Eight of every ten CHAIN participants reported being diagnosed with at least one of the 10 chronic conditions examined for this report.
- Lifetime prevalence was highest for hypertension (30%), asthma(26%), active tuberculosis infection(22%), and arthritis or rheumatism (22%).
- Aging is associated with increased risk for 6 of the 10 chronic diseases.
- Gender, ethnicity and education are associated with 3 conditions, but the relationships show no easily summarized pattern.
- Drug use and smoking are linked to Active TB and hepatitis, but they are associated with lower prevalence for diabetes.
- Length of exposure to HIV is associated with an increased risk of Active TB and hepatitis.
- Chronic condition are weakly associated with increased use of medical care service.

## **BACKGROUND AND METHODOLOGY**

### **A. The CHAIN survey and data**

The prevalence of “non-HIV” chronic diseases was examined through interview data obtained from a representative sample of HIV-infected individuals in New York City. The data were collected as part of the CHAIN Project, an ongoing longitudinal study funded since 1994 by the City’s Title I Health and Human Services Planning Council (the Planning Council). The CHAIN

Project tracks individuals' encounters with both medical care and ancillary services and links patterns of service delivery to a wealth of information on individual characteristics and health outcomes. The CHAIN Project has interviewed HIV-infected individuals in the cohort every 6-12 months since 1994, and data for this study are current as of 2001. Close to 1,000 individuals have been interviewed as part of the CHAIN project, and in addition to being HIV infected, a large majority come from minority populations or engage in behaviors associated with elevated morbidity from chronic disease conditions.

The CHAIN Project followed a recruitment procedure designed to yield a broadly representative sample of people living with HIV in New York City. Study recruitment was conducted in 43 agencies which were selected so that there would be an equal number of medical care and social service recruiting sites, and representation both from sites that were and were not Title I grant recipients. At 30 sites, staff contacted a random sample of clients. A sequential enrollment procedure was implemented at the remaining 13 agencies. All eligible clients present on a small number of recruitment days were invited by agency providers and CHAIN staff to participate in the CHAIN study. A total of 648 individuals recruited from participating agencies completed baseline interviews. The agency-based sample was supplemented with 52 interviews conducted with HIV+ individuals with little or no connection to medical and social services. These individuals were contacted at outreach sites and through nominations from CHAIN participants. More detailed information on sampling strategy and recruitment may be obtained upon request from MHRA (CHAIN Technical Report #1, 1995).

Subsequent interviews were conducted at approximately six to twelve month intervals. Round two interviews were completed with 568 participants, 92% of the cohort still alive and not known to have moved outside of New York City. Round three interviews were conducted with 480 of CHAIN participants, 88% of the cohort who were alive and still residing in New York City. Round four interviews were conducted with 420 CHAIN participants or 82% of the surviving cohort. In an effort to replenish the CHAIN sample which had lost a number of participants to death and

other factors, in 1998 an additional 268 individuals were added to the study, using the same agency and community sources. These individuals constituted the ‘refresher’ sample and joined the 383 CHAIN continuing participants who have been involved in the project since its inception in 1994, bringing the total number of people interviewed in round five to 651. In round six, 508 participants, in round seven, 444 participants were interviewed representing 80% of those eligible at each interview period (not known to be deceased or moved out of the NYC area). In Round 8, 388 interviews were completed during 2001 and 2002 representing over 80% of those eligible.

All CHAIN interviews are conducted in person by interviewers recruited from communities throughout New York City and trained specifically for the study. Interviewers are matched to respondents as much as possible with regard to gender and race/ethnicity. Interview topics include sociodemographic characteristics, the full range of experiences with access and use of medical and social services, and quality of life. At each round of interviews participants are asked about their current living situation, their recent history of housing instability, and whether or not they have had any housing problems or need for assistance with housing issues. Information was also obtained about rental assistance, housing placement or other housing services received.

Findings for this study are based on 388 CHAIN participants completing round 8 interviews and for whom cleaned data were available at this time for statistical analysis. The CHAIN data can be considered a fairly representative sample of the total population of persons living with HIV in New York City. Table 1 compares the distribution of surviving AIDS cases as of 1998 with round 5 interviews completed in that year and the interviews completed for the most recent round of interviews. The CHAIN cohort is somewhat over represented with African Americans, although the gender and ethnic distribution has changed little between rounds 5 and 8.

From the CHAIN interviews we gathered self-reported information on lifetime prevalence for 10 chronic disease or health conditions. Six of the conditions were asked for the first time at round

8 interviews. These were 1) asthma, 2) other breathing problems, 3) hypertension/high blood pressure, 4) heart problems, 5) diabetes, and 6) arthritis or rheumatism. To illicit information on the occurrence of each of these health conditions, participants were asked the following yes/no question: “Has a doctor ever told you that you have any of the following health conditions?”

**Table 1. CHAIN Study Participants Compared to NYC AIDS Cases**

	<b>AIDS Cases, NYC<sup>1</sup></b>	<b>CHAIN: Round 5</b>	<b>CHAIN: Round 8</b>
	1999	1998	2002
<b>n</b>	<b>(43150)</b>	<b>(652)</b>	<b>(388)</b>
<b>MALE</b>	<b>(32012)</b>	<b>(376)</b>	<b>(199)</b>
<i>Non-Latino White</i>	27%	19%	19%
<i>Non-Latino Black</i>	38%	54%	54%
<i>Latino</i>	33%	26%	26%
<i>Other</i>	2%	2%	2%
<b>FEMALE</b>	<b>(11138)</b>	<b>(276)</b>	<b>(189)</b>
<i>Non-Latina White</i>	12%	5%	4%
<i>Non-Latina Black</i>	53%	64%	68%
<i>Latina</i>	34%	30%	27%
<i>Other</i>	1%	1%	1%

<sup>1</sup> Source: NYC DOH Office of AIDS Surveillance, “Estimates of Persons Living with AIDS in NYC, 1999 Edition”

Information was also obtained for current prevalence at each round of interview for the following three conditions: 1) cervical disease (women only)<sup>3</sup>, 2) kidney disease, requiring dialysis and 3) tuberculosis (TB)-“active TB infection”. Starting with round 7 interviews we added hepatitis A, B, C or D (disease of the liver). For these conditions we asked participants whether “since [last interview] a doctor or other medical provider told you that you had ...”. At first interview, the question was worded to cover ever having such a diagnosis.

For the first group of conditions life time prevalence were based on positive responses to the round 8 questions. For the second group of conditions, lifetime prevalence was based on a positive responses at one or more rounds of interviews. No information from chart abstraction was available to verify the reliability of self reports of chronic conditions. Nor, from the available information, could we systematically determine to what extent CHAIN participants were receiving medical attention for these conditions.

Table 2 shows the sample distributions for various subgroups that are the basis for a more detailed analysis of the distribution in the burden of chronic disease morbidity. To examine the impact these chronic diseases on health care utilization, we compared means for individuals with and without a diagnosis for the 10 conditions on 1) days hospitalized, 2) visits to the emergency room, and 3) visits for outpatient physician visits for the six month period prior to the 8<sup>th</sup> round of interviews.

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<sup>3</sup> Although we asked respondents whether they were diagnosed with cervical cancer, there is good reason to believe that patients as well as providers confuse all stages of cervical disease. For a study of invasive cervical cancer in HIV infected women in New York City, only 44 percent of possible invasive cervical cancer cases reported in hospital discharge data, were confirmed (Chiasson, personal communications). For this reason we use the term cervical disease in preference to cervical cancer, since it is likely that most patients reporting cervical cancer are reporting a condition other than invasive cervical cancer.

**Table 2: Subgroup Analysis Variables (N=388)**

Variable & Subgroups	Sample Proportions
<b>Gender</b> <i>Female</i> <i>Male</i>	 49% 51%
<b>Race/Ethnicity</b> <i>Non-Latino White</i> <i>Non-Latino Black</i> <i>Latino</i>	 12% 61% 27%
<b>Age</b>  <i>&lt;35</i> <i>35-50</i> <i>50+</i>	 10% 60% 31%
<b>Education</b> <i>High school or more</i> <i>Less than high school</i>	 52% 48%
<b>Substance Use</b>  <i>Never used</i> <i>Used before initial interview</i> <i>Used after initial interview</i>	 16% 35% 49%
<b>Smokes Cigarettes</b>  <i>Current</i> <i>Former</i> <i>No</i>	 58% 28% 14%
<b>Duration since Initial HIV Diagnosis</b>  <i>1-5 yrs</i> <i>6-10 yrs</i> <i>11+ yrs</i>	 16% 51% 33%
<b>Minimum T-Cell Count since start of CHAIN study</b>  <i>0-100</i> <i>101-200</i> <i>201-300</i> <i>301-500</i> <i>501+</i>	 24% 24% 22% 20% 10%

Source: Round 8 CHAIN Interviews

## **FINDINGS**

### LIFETIME PREVALENCE OF CHRONIC DISEASE CONDITIONS

Eight of every 10 CHAIN participants reported being diagnosed with at least one of the 10 chronic conditions examined for this report. Half the CHAIN cohort interviewed at Round 8 reported a diagnosis for at least 2 of the 10 conditions. Lifetime prevalence was highest for hypertension (30%), asthma (26%), active tuberculosis (22%), and arthritis or rheumatism (22%).

Table 3 and 4 examine possible factors associated with increased prevalence for each condition. The variables examine the extent to which these chronic conditions are associated with aging, social demographic risk factors, life style behaviors, and exposure to HIV infection. For the latter factor we included measures of the length of time since first tested positive for HIV and also the lowest CD4 count reported at any round of interview – a measure of the extent to which an individual’s immune system functioning has been compromised. Table 5 presents a more succinct summary of findings. Multiple regression models were estimated, which included all the row variables in Table 3 and 4 as independent variables and each of the chronic conditions was treated as the dependent variable. We also ran a parallel regression equation for the number of chronic conditions. Based on the results of the regression analysis we have checked off each domain in which one or more of the variable in that domain were statistically significant.

Aging is the most common factor associated with prevalence of comorbid chronic diseases. With the exception of asthma, kidney disease and cervical disease older age is associated with increasing risk of experiencing a chronic health condition as well as the number of chronic conditions.

**Table 3. Lifetime Prevalence of Chronic Diseases by Sociodemographic Characteristics**

	(N)	Asthma	Other breathing problems	Hypertension	Heart Problems	Diabetes	Arthritis or Rheumatism	Kidney Disease	Hepatitis	Active TB infection	Cervical disease (women)
<b>All</b>	<b>(388)</b>	<b>26</b>	<b>20</b>	<b>30</b>	<b>15</b>	<b>14</b>	<b>22</b>	<b>6</b>	<b>21</b>	<b>22</b>	<b>13</b>
<b>Age</b>											
<35	(37)	33	8	6	3	8	11	8	8	16	9
35-50	(231)	27	17	26	14	11	18	6	22	23	16
50+	(120)	27	28**	46**	22**	22**	32**	6	23	23	10
<b>Gender</b>											
Female	(189)	36	21	29	16	13	26	4	25	19	13
Male	(199)	20**	19	31	15	15	17**	8	18	26	-
<b>Ethnicity</b>											
White	(46)	21	31	21	14	14	33	2	22	24	25
Black	(235)	24	15	36	13	15	19	6	20	23	12
Latino	(103)	38**	27**	21**	20	13	21	6	25	18	15
<b>Education</b>											
High school +	(201)	21	20	32	14	15	24	7	19	21	12
Less than HS	(187)	35**	20	28	16	13	19	4	24	23	14

All numbers represent the percentages, except the category sample sizes in parentheses.

\*\* p <0.05

Chronic Disease Comorbidity

**Table 4. Lifetime Prevalence of Chronic Diseases by Life Style Behaviors and HIV Exposure**

	(N)	Asthma	Other breathing problems	Hypertension	Heart Problems	Diabetes	Arthritis or Rheumatism	Kidney Disease	Hepatitis	Active TB infection	Cervical disease (women)
<b>All</b>	<b>(388)</b>	<b>26</b>	<b>20</b>	<b>30</b>	<b>15</b>	<b>14</b>	<b>22</b>	<b>6</b>	<b>21</b>	<b>22</b>	<b>13</b>
<b>Substance Use</b>											
<i>Never Use</i>	(63)	17	14	37	15	30	27	5	8	8	3
<i>Use before Int</i>	(134)	29	23	26	14	13	21	7	24	22	16
<i>Use after Int</i>	(191)	30	19	30	16	10	20	6	24	27	15
<b>Smoke Use</b>											
<i>Never</i>	(54)	25	22	34	15	23	19	2	13	13	4
<i>Past</i>	(108)	26	19	31	15	14	23	9	21	28	11
<i>Current</i>	(226)	29	19	29	15	13	21	5	23	22	16
<b>HIV Dx</b>											
<i>1-5 yr</i>	(62)	33	10	33	17	15	20	6	16	15	12
<i>6-10 yr</i>	(196)	27	22	30	14	14	20	5	19	22	12
<i>11+ yr</i>	(130)	25	20	29	16	14	24	7	27	26	16
<b>Lowest Tcell</b>											
<i>0-100</i>	(93)	27	21	28	18	12	22	11	22	32	12
<i>101-200</i>	(92)	26	23	25	18	16	19	4	30	18	17
<i>201-300</i>	(87)	27	21	38	13	13	22	5	15	16	14
<i>301-500</i>	(79)	26	12	30	12	17	21	6	19	23	11
<i>500+</i>	(37)	37	18	31	11	11	26	0	16	19	8

All numbers are percentages, except the category sample sizes in parentheses.

\*\* <0.05

**Table 5. Factors Associated with Chronic Disease Conditions**

	<b>Aging</b>	<b>Social Factors</b>	<b>Life Style Behaviors</b>	<b>HIV Exposure</b>
<b>Asthma</b>		✓		
<b>Other Breathing Problems</b>	✓	✓		
<b>Hypertension</b>	✓			
<b>Heart Problems</b>	✓			
<b>Diabetes</b>	✓		✓	
<b>Arthritis or Rheumatism</b>	✓	✓		
<b>Kidney Disease</b>				
<b>Hepatitis</b>	✓		✓	✓
<b>Active TB Infection</b>			✓	✓
<b>Cervical disease</b>				
<b>Total Number of Chronic Disease Conditions</b>	✓	✓		

Notes

1. Social factors include sex, race/ethnicity and education. Life style behavior factors include drug use and smoking history. HIV exposure factors include number of years after HIV diagnosis and the lowest t-cell count during the study.
2. Results of a regression analysis in which the factors in tables 3 and 4 were independent variable in a multiple regression analysis.
3. ✓ = One or more independent variables under each domain were statistically significant at the p<.05 level

upper respiratory problems and arthritis or rheumatism. These ethnic differences persists even after adjusting for age differences. The data suggest that Latinos may have higher rates of asthma than other ethnic groups, but these differences were not statistically significant.

Our two life style measures, smoking and use of illicit substances are only weakly lined to chronic conditions. Active TB is associated with substance use and smoking. Although the differences for the latter are not statistically significant. In contrast the risk for diabetes is greatest among the small minority of CHAIN participants who did not use either illicit substance or smoked cigarettes. Finally only the risk of contracting TB or hepatitis are associated with length of exposure to HIV as measured by years since initial diagnosis or lowest t-cell count.

#### CHRONIC DISEASES AND MEDICAL UTILIZATION

The second part of the analysis for this report explored whether the burden of these chronic diseases increased medical care utilization for this group of individuals, who were already heavy users of medical services because of their HIV infection. Table 6 presents differences in inpatient days, emergency room and ambulatory care visits associated with each diagnosed condition, adjusted for t-cell count. Although the pattern is not completely consistent and the differences did not reach levels of statistical significance, chronic disease conditions were associated with small increases in use of medical care services. Heart problems were associated with an increase of a little 1.15 extra days in the hospital during the six months prior to round three interviews. None of these conditions were with increased emergency room visits. Moreover the chronic disease were generally associated with small but generally not significant increases in outpatient visits.

**Table 6. Impact of Chronic Disease on Medical Care Utilization during the six month period preceding round 8 interviews.**

	<b>(N) with condition</b>	<b>Mean days of Hospitalized</b>	<b>Mean ER visits</b>	<b>Mean Visits to MD</b>
<b>Asthma</b>	(102)	0.16	0.01	0.73
<b>Other Breathing Problems</b>	(74)	0.04	0.01	0.67
<b>Hypertension</b>	(112)	0.51	-0.05	-0.85
<b>Heart Problems</b>	(56)	1.15	-0.07	0.34
<b>Diabetes</b>	(53)	-0.36	-0.06	0.18
<b>Arthritis or Rheumatism</b>	(80)	0.55	-0.04	0.47
<b>Kidney Disease</b>	(23)	0.26	-0.03	0.60
<b>Hepatitis</b>	(82)	0.30	0.03	-0.04
<b>Active TB Infection</b>	(86)	0.34	-0.07	0.00
<b>Cervical disease</b>	(25)	-0.37	-0.06	0.16

Values are differences in group means between in utilization adjusting for t-cell counts for individuals with and without each chronic condition.

## **DISCUSSION**

CHAIN participants report being diagnosed with a broad range of chronic disease conditions not directly associated with HIV infection. Approximately 8 of 10 CHAIN respondents report at some point being told by a physician that they had at least one of the 10 health conditions examined for this study. The prevalence of these diseases are sufficiently high that they underscore that physicians managing patient with HIV need to be attentive to the complications arising from other chronic disease conditions. Unfortunately, we do not have good comparative data that would be needed to draw more confidence conclusions as whether these prevalences were atypical when compared to a general population of similar age. As a very rough point of comparison the 1997 National Health Interview Survey found that 7 percent of individuals aged 18 to 44, 17 percent of those aged 45-64 reported limitations due to 1 or more chronic conditions. Although chronic conditions may not necessarily limit activities, these numbers suggest that the occurrence of chronic conditions is likely to be very much higher than national norms. The study previously cited for a cohort of HIV infected VA patients found that 53 percent of their sample had chemical hepatitis, a much higher rate than reported by our sample. The occurrence in the VA sample of hypertension ( 24 %), diabetes (11%) and kidney disease (6%) more closely approximated the prevalences for these conditions reported by the CHAIN cohort. It is possible that the CHAIN data underestimate lifetime of hepatitis. Among the ten conditions, hepatitis is the only one, for which we did not ask about lifetime prevalence. The estimate reported here is restricted to a physician diagnosis in the six months preceding either the seventh or eight interviews. Diagnosis at an earlier date would not be captured.

Aging appears to be the most important process associated with an increased risk for a chronic disease among CHAIN participants. To a lesser extent factors such as gender, ethnicity, education and drug use were related to a narrower range of chronic diseases. There was much less evidence to suggest that HIV disease progression precipitated increased susceptibility to these conditions. The absence of links between smoking and health conditions may be surprising given the very high

prevalence of smoking in the CHAIN cohort. One explanation is that the impact of smoking is masked because the practice is so widespread and the nonsmokers are atypical individuals for this cohort. It is also possible that effects of smoking are still in the future for this cohort. In any event, the high level of smoking is a matter of concern. Further discussion as to the importance of promoting cessation among HIV positive individuals is recommended.

The evidence was much weaker for a link between these chronic disease conditions and greater utilization of medical care. A limitation of this analysis was that we could not reliably determine current prevalence. Although most of these conditions are assumed to be life long afflictions, which require continuing management by physicians, the level of physician intervention may be reduced either if active infection has been treated, the case of TB, or the individual is able to manage their condition as in the case of hypertension. Nonetheless it does seem prudent that the occurrence of general medical conditions among HIV infection should be more carefully monitored with a particular attention paid to improved knowledge about possible complications that may arise in managing HIV in the presence of other chronic conditions.