

**A Double Digital Divide?**  
**Two-Sided Markets and HIV Incidence among the Digitally Disadvantaged**  
*PhD Student Research Paper*

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**Abstract**

Recent work has emphasized the substantial benefits offered by easily searchable, digitized, two sided matching platforms through decreased search costs and reduction of market frictions, but paid relatively limited attention to their negative social welfare implications. In this paper we investigate if the availability of such platforms for the solicitation of casual sex has influenced the incidence rate of HIV. We further examine to whom these negative effects accrue. Using a census of nearly 13 million patients who are subjected to a natural experiment in the state of Florida between 2002 and 2006, findings suggest that the largest negative effect accrues to historically at risk populations (i.e. African Americans, men, and the socio-economic lower class) that, ironically, are also on the disadvantaged side of the digital divide. Disturbingly, we find that populations generally considered at lower risk for HIV, who are also relatively digitally advantaged, are likewise penalized by the presence of the platform. Finally, results show a striking absence of learning and knowledge diffusion about the risks of platform use. These findings have important implications for policy makers and contribute to the literature on the digital divide and the role of the Internet in health.

*Key Words: public health, two sided matching, platforms, natural experiment, HIV, digital divide*

## **Introduction**

The promise of Internet related public health benefits has recently captured the attention of both policy and scholarly communities. Frequently discussed advantages of Internet-enabled connectivity for health range from support groups for chronic health conditions (Eysenbach et al. 2004, Goh et al. 2009), to the use of electronic health information exchange (Agarwal et al. 2010), to applications such as Google Flu Trends that assist public health officials in monitoring epidemics (Dugas et al. 2012). However, while substantial research documents the benefits of connectivity, the negative social welfare implications of increased connectivity remain understudied. In this paper, we examine how the introduction of Internet-based two sided matching platforms which can be used to solicit discreet and anonymous sexual partners affects the spread of the human immunodeficiency virus (HIV). We further investigate to whom these negative effects accrue based on ethnicity, gender, and socio-economic status.

Much like early C2C electronic commerce platforms (e.g. eBay or Amazon.com), websites such as eHarmony, Match.com, and Zoosk, have experienced success that is widely described in both popular media (Wortham 2012) and scholarly work (Bapna et al. 2012). Such platforms facilitate the partner matching process through two mechanisms: self-selection and decreased search costs (Brynjolfsson and Smith 2000). To the extent that these platforms position themselves as catering to the needs of specific demographics, ranging from eHarmony's more general goal of facilitating long term relationships to ChristianMingle's more segmented market approach based on theological beliefs, they are able to efficiently subdivide the market into prospective partners who satisfy each other's matching criteria. Moreover, the platforms typically gather extensive data about users to facilitate the matching process, resulting in drastically reduced search costs for users.

Together with sites such as eHarmony and Match.com that purportedly facilitate more

enduring relationships (Wortham 2012), the Internet has also given rise to platforms that enable the solicitation of casual sexual encounters with no long term relationship goal attached to them (e.g. AdultFriendFinder and AshleyMadison.com). While these platforms offer equivalent benefits in terms of market segmentation and reduced search cost, they offer the additional advantage of anonymity so users can utilize their services without fear of social stigma; thereby decreasing the social cost of engaging in risky sexual activity. Indeed, a range of negative outcomes have been associated with Internet-based partner solicitation for sexual activity, including the facilitation of human sex trafficking (Kristof 2012), the increased opportunity for violent crimes against partners (Goode 2012), and the proliferation of sexually transmitted diseases (Chan and Ghose 2012). Our specific focus is on HIV, a disease which has no known cure or vaccine, infects more than 4 million people every year (Gillespie 2006), and will cost \$35 billion annually to treat by 2031 (Hecht et al. 2009).

To quantify the effect these platforms have on the HIV incidence rate we exploit a natural experiment; the introduction of Craigslist into major cities in the state of Florida between January of 2002 and December of 2006. The claim that the introduction of Craigslist into a region is likely to increase the prevalence of sexually transmitted diseases (STDs) is not new. In related work (Chan and Ghose 2012) examine the state-level spread of many STDs after the introduction of two-sided matching platforms, finding a nearly 20% rise in case rate at an annual treatment cost of over \$100 million. However, as their analysis is conducted at the state level, the authors are unable to empirically isolate *who* is being affected by the availability of the platform. From a social welfare perspective, understanding who is vulnerable to platform availability is an important prerequisite for the design of policy interventions.

Our study, therefore, departs from prior work in several crucial aspects. First, we

conduct our analysis at the level of the patient by matching the introduction of Craigslist to a census of patients treated in Florida hospitals. Our dataset contains detailed information not only about the incidence rate of HIV, but also the socio-economic factors that attenuate or exacerbate a patient's risk. By matching these data we are thus able to identify specific populations who are disproportionately affected by platform introduction. Second, as the availability of Craigslist is staggered temporally and spatially, and search for sexual partners is highly localized (Zenilman et al. 1999), we are able to quantify the effect of platform introduction with more precision than previous investigations. Finally, our identification strategy exploits the exogeneity of platform introduction into different cities at different times. As the broader objective of Craigslist is not the facilitation of the solicitation of sexual partners (this section of the platform is non-revenue generating and is one of the many functionalities that Craigslist offers), we can reasonably assume that the introduction of the Craigslist forum into cities is driven by its primary revenue stream (the posting of classified ads for employment), and not by the sexual proclivities of individuals in the city.

Empirical analysis yields four important findings robust to multiple specifications. First, corroborating previous work (Chan and Ghose 2012), albeit at a more granular level, the introduction of Craigslist into a city significantly increases the diagnosis of HIV for patients admitted to local area hospitals. Second, the incidence rate for HIV patients increases the most for sub-segments of the population who are traditionally considered at risk for the disease, despite the documented lower level of access these groups have to online services as a result of the digital divide. Third, we find that socio-economic status (SES) attenuates the likelihood of HIV incidence, i.e. it negatively moderates the effect of the introduction of the Craigslist platform. Fourth, and finally, results suggest that there is an absence of learning by users of

Craigslist in that the incidence rate is unaffected by time.

Theoretically, this paper contributes to two significant streams of work in economics, public health, and information systems; research relating to the digital divide (Norris 2003, Warschauer 2004) and literature pertaining to the Internet and health. Discussions of the digital divide have typically been dominated by the economic and social penalties sub-populations suffer as a function of lower computer access and literacy (Norris 2003, Payton 2003). The finding that populations who are digitally disadvantaged (i.e., those less likely to utilize online resources) are affected to the greatest degree, is striking. It underscores the critical need for a more nuanced understanding of both sides of the digital divide and the adverse consequences it may create for different communities.

From the perspective of the Internet and health, we add to the small but highly consequential evidence base of the adverse effects of connectivity on public health (Bull et al. 2001, Kim et al. 2001, McFarlane et al. 2000). We find, in contrast to research that has highlighted the positive learning that occurs in Internet-based health communities as a result of pro-social motivations, that knowledge about the risks of partner solicitation on Craigslist does not appear to be widely disseminated among users. To the extent that the Craigslist platform has a large and diverse set of users, extant literature (Kittur and Kraut 2008) would suggest that knowledge of the HIV incidence rate would be disseminated across the community and the solicitation rate would decrease (Kozinets et al. 2008). Our results indicate that this is not occurring, raising the possibility that users are only learning that the platform is an effective means for the solicitation of casual sexual partners and not about its adverse consequences.

## **Background**

Two sided matching platforms provide the infrastructure for distinct communities of users to transact with each other and have been examined in depth by both economists and information

systems researchers (Brynjolfsson and Smith 2000, Roth and Sotomayor 1992). In effect, these platforms reduce market inefficiencies (Brynjolfsson and Smith 2000) by lowering search cost and efficiently segmenting markets, both through self-selection or the delineation between users based on their characteristics (Jackson and Watts 2002, Roth and Sotomayor 1992). Much like early manifestations of digital two sided matching platforms, e.g. eBay (Dellarocas and Wood 2008, Li and Hitt 2008) and Amazon.com (Brynjolfsson et al. 2003, Brynjolfsson and Smith 2000), online dating services offer much the same benefits. By concentrating users with particular tastes or objectives on a digitized and easily searchable platform these services reduce the cost of search for acceptable matches, and increase the ease of sampling (i.e. dating).

Online forums for the solicitation of casual sexual partners operate similarly by concentrating users with similar objectives, i.e. the solicitation of a partner, and affording them the opportunity to search based on preference. Moreover, these forums often offer the added benefit of anonymity. Although not critical for the market to function, anonymity reduces the effect of social frictions that may constrain the two sided sexual matching process in offline settings (Cooper 2009, Kim et al. 2001). Such frictions, often a result of prevailing social norms, include social castigation as a result of promiscuity (Brown 1988), closeted sexual orientation (Floyd and Stein 2002), or even social contract (i.e. marriage or socially imposed monogamy) (MacDonald 1995). In addition to reducing the risk of being discovered engaging in deviant behavior, findings from psychology suggest that the security of anonymity can increase risky behavior, such as intensified aggression (Sia et al. 2002), deception (Kim et al. 2001), and criminal acts (Rogers 2010). With a guarantee of anonymity, to the extent that individuals no longer fear social castigation as a result of their actions, there is likely a decreased propensity to worry about social norms, and an increased tendency to engage in risky behavior.

However, extant work has yet to address how the negative effect of using these platforms accrues to different segments of the population. To address this question we juxtapose the characteristics of two populations: those identified as being “at risk” for HIV and those with limited access and training to online resources. It is well known that internet utilization rates vary widely within the population (Payton 2003); a phenomenon known as the digital divide (Norris 2003, Warschauer 2004). Research suggests that the likelihood of exploiting online resources is lower for populations with differential access, familiarity, and computer literacy (Stanley 2003, Warschauer 2004). Unsurprisingly, this divide usually falls along socio-economic lines, with the less educated, those with lower SES, and ethnic minorities suffering a disproportionate penalty as a result of their limited access to online services (Payton 2003). Moreover, the divide has been implicated in negative downstream impacts for both individuals (Payton 2003) and firms (Forman 2005), and a general recommendation is that policy makers should focus attention on interventions that help bridge the divide.

National estimates of HIV infection suggest that both people living below the poverty line, as well as ethnic minorities (specifically Latinos and African Americans), are far more likely to be carriers of the HIV virus (CDC 2011). Furthermore, HIV infection has an unequal effect on men (specifically bisexual or homosexual men) as well as individuals who engage in risky sexual behavior (CDC 2011). Thus, the question of to whom the negative effects of these platforms will accrue is unclear. On the one hand, the digitally disadvantaged are more likely, *ex ante*, to be HIV carriers. However, the digitally disadvantaged are also less likely to exploit online resources. On the other hand, as the use of the platform requires digital literacy and access, it is plausible that the platforms are used more extensively by populations who are not considered at risk for contracting the disease. In the absence of a clear *a priori* expectation of the

effect, we investigate the question of who is affected by the matching platform empirically.

## **Data and Methodology**

### ***Context: Craigslist***

To quantify the effect of the introduction of online platforms for the solicitation of casual sexual partners we exploit a natural experiment: the introduction of Craigslist into major cities in the State of Florida between January of 2002 and December of 2006 (Chan and Ghose 2012).

Craigslist is a community based online forum for the posting of classified ads which was launched in 1995 in San Francisco. Currently the site, which receives nearly 41 million visitors per month<sup>1</sup>, provides forums for the posting of resumes, items wanted, employment opportunities, housing, music shows, and personal ads. The personal ads section, which hosts many opportunities for couples to meet and interact, also contains a forum called “casual encounters” which can be used for the solicitation of sexual partners. Figure 1 contains a sample personal advertisement that has been selectively censored. As can be seen in this figure, the advertisement indicates the gender and age of the poster, preferred gender of respondents, a description of the poster’s preferences, and a method for response. This advertisement, and the platform itself, meets each of the criteria for two sided matching platforms. First, the community is populated with likeminded individuals seeking casual sexual encounters (as the title of the forum would imply). Second, the platform is easily searchable by user preferences (i.e. age, race, and sexual orientation). Third, and finally, the platform grants anonymity to users<sup>2</sup>.

### ***Data***

We construct a longitudinal dataset which contains a census of patients admitted to hospitals in the State of Florida from January of 2002 to December of 2006. The source of these data is the Florida Agency for Healthcare Administration (AHCA) which provides us with bed level

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<sup>1</sup> [www.atlantaclickadvisor.com](http://www.atlantaclickadvisor.com)

<sup>2</sup> While current versions of the website require posters to register a telephone number in order to submit an ad, these user protections had not been implemented during the timeframe of our study.



information about every patient admitted into a hospital in the state during that time. We constrain the empirical analysis to these dates as October of 2002 is the date of the first local implementation of Craigslist (Miami) and city level information regarding the implementation of Craigslist is unavailable after 2006<sup>3</sup>. A listing of the cities which Craigslist has been introduced into during the study time frame is available in Table 1 (as well as a comprehensive list of the cities where Craigslist was eventually installed). The AHCA dataset, used widely in prior research (Burke et al. 2003, Burke et al. 2007), offers the benefit of both observing when the patient is admitted to the hospital, i.e. before or after Craigslist implementation, as well as containing detailed information about the patient (sex / ethnicity / insurance provider) and what conditions the patient has been diagnosed with through their International Classification of Diseases Revision 9 (ICD-9) codes.

### ***Variable Definitions***

**Dependent Variable:** We use a dichotomous dependent variable that is set to 1 if the patient is an asymptomatic carrier of the HIV virus (as determined by the patient's ICD-9 diagnosis codes) and 0 otherwise. We use asymptomatic HIV, as opposed to symptomatic HIV, for several reasons. First, symptomatic HIV can take years, or even decades, to manifest after initial infection. The delay occurs because the body initially is capable of fighting the virus, resulting in the patient entering a clinical "latency period" 3-12 weeks after initial infection. However, during this 3-12 week period the patient will often experience nausea, flu like symptoms, and swelling of the lymph nodes. This initial period, as well as the latency period, are medically defined as asymptomatic HIV. A detailed explanation of disease progression from Pantaleo et al. (1993) is available in Figure 2. The choice of HIV as the focal medical condition offers significant advantages for identification. Since 1997 (Finzi et al. 1997) the standard treatment

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<sup>3</sup> <http://www.craigslist.org/about/expansion>

regimen for HIV management has been the use of highly active antiretroviral therapy, which can be administered in pill format and does not require the hospitalization for continued treatment. Econometrically, this mitigates significant identification problems by limiting re-hospitalization (because chronic management of the disease can be conducted in an outpatient setting). It is important to note that, medically, once a patient has been classified as a symptomatic carrier they can never be reclassified as an asymptomatic carrier.

**Independent Variables:** Our first independent variable of interest is the dichotomous indicator *Craigslist*, which indicates that the focal patient has been admitted to a hospital which is in the same county as a city in which *Craigslist* has been released (as determined by Table 1). As our data from AHCA is aggregated at the quarter level, this variable is set to 1 in the first *full* quarter during which the city has had access to Craigslist, as well as all subsequent quarters.

A second set of independent variables captures the race of the patient using two dichotomous indicators: *African American* and *Latino*, each of which are coded as 1 or 0 using the information from the AHCA patient records, *Caucasians* serve as the base case. All other patients are dropped from the sample. Our third independent variable of interest is the *Gender* of the patient. As casual sex seeking behavior is observed more often in men (Elford et al. 2001) we include this dichotomous indicator control to differentiate between the *ex ante* gender related propensity to engage in sexually risky behavior.

To estimate the socio-economic status of the patient we use three dichotomous indicators of the patient's insurance status as proxies: *Medicaid*, *Self-Insured*, and *Commercial Insurance*. Utilization of insurance provider is a well-established method for estimating household income in health services research (Cherkin et al. 1992). *Medicaid*, which is available only to people

with an income of \$1,869 a month or less in the state of Florida<sup>4</sup>, therefore serves as the proxy for low SES. *Self-Insured*, proxies for individuals whose income precludes them from receiving *Medicaid* benefits but do not receive third party insurance from their employer (i.e., middle SES). Finally, *Commercial Insurance*, indicates that the patient receives Insurance from their employer (either through traditional health insurance plans, a health maintenance organization (HMO), or a preferred provider organization (PPO))<sup>5</sup>. Finally, to control for unobserved heterogeneity we include fixed effects for the 261 hospitals in Florida and the 20 annual quarters of the investigation. The final sample is composed of 12,616,174 patients. Summary statistics and correlation are reported in Table 2.

### ***Empirical Strategy***

Given the size of the dataset, as well as the difficulties associated with interpreting nonlinear interactions (Ai and Norton 2003), we use a series of Linear Probability Models (LPM) to estimate the effect of *Craigslist* introduction on the spread of HIV in Florida. As the predicted value of the patient HIV/AIDS incidence rate remains consistently within the bounds of [0..1] the LPM provides an accurate proxy for the estimations of a logit or probit model. We first estimate the effect of our independent variables of interest using the following equation:

$$LPM (Asym HIV) = \beta_1 Craigslist + M_1 Patient Ethnicity + \beta_2 Gender + M_2 Insurance Provider + M_3 Hospital Controls + M_4 Time Controls + \varepsilon$$

where  $M_1$ ,  $M_2$ ,  $M_3$ , and  $M_4$  are the vectors of coefficients associated with the indicated variables. After estimating the *ex-ante* probability of HIV incidence we subsequently interact each of the patient level independent variables with the *Craigslist* treatment to determine the effect of patient ethnicity, gender, and SES. Results are available in Table 3.

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<sup>4</sup> <http://www.floridamedicaideligibility.com/asset.html>

<sup>5</sup> Patients covered by Medicare, Charity, the Veteran's Administration, Kidcare, or the Civilian Health and Medical Program for the Uniformed Services (CHAMPUS) are aggregated as the base group for comparison.

## **Results**

Empirical estimations yield several interesting findings. First, as seen in Table 3, there is a strong and significant increase in the HIV incidence rate after the introduction of *Craigslist*. Moreover, and as suggested by previous scholarly work, HIV has a disproportionately higher effect on the *African American* community. Finally, and as expected, results indicate that patients with low SES (*Medicaid*) are far more likely to be diagnosed with the HIV virus than patients of middle or upper SES (*Self Insured* and *Commercial Insurance*). Thus, overall results support an increase in the incidence of HIV after the introduction of the platform.

To determine the influence *Craigslist* introduction has on each of the different subgroups we next consider the interaction terms. Once again we see a disproportionately higher effect of *Craigslist* introduction on the *African American* community and men (*Gender*). Interestingly, the effect of *Craigslist* introduction on the HIV incidence is substantively lower for the *Latino* community, when compared with the *Caucasian* or *African American* communities. Moreover, we see that increases in SES attenuate the effect of *Craigslist*. To assist in interpretation of results we report numerical marginal effects (Table 4). Here we see, once again, that the absolute increase in the incidence rate for the *African American* community is by far the largest (6.5 times larger than the increase within the *Caucasian* community), however, the relative increases are very similar. Moreover, the only SES group where there is a significant increase in the HIV incidence rate is within *Medicaid* patients. These results provide further evidence that the effect of *Craigslist* is overwhelmingly associated with lower SES, men, and *African Americans*.

## **Empirical Extensions**

### ***Disproportionate Impact on the African American Community***

The first extension we conduct is to explore the disproportionate impact *Craigslist* introduction has on the *African American* community by splitting the sample based on ethnicity and replicating our analysis within the *African American* and *Caucasian* communities (see Table 6),

where we have several striking findings. First, corroborating previous analyses, we see by comparing Column 1 of Table 6 and Column 6 of Table 6 that the introduction of *Craigslist* has a disproportionately larger effect in the *African American* community. Moreover, and as expected, the *ex-ante* HIV incidence rate is far higher for low SES patients (*Medicaid*) and men, regardless of race. Interestingly, the gender gap in the effect of HIV, after *Craigslist* is introduced, is far larger for *Caucasians* than it is for *African Americans*. This suggests, all else equal, that HIV incidence is associated more strongly with heterosexual encounters within the *African American* community than the *Caucasian* community. Finally, we see that increasing SES once again has an attenuating effect for both communities. When exploring our results numerically (Table 7) we see that while the largest absolute increase in the incidence rate is within the *African American* community (for both genders), the largest relative increase is for *Caucasian* males. Interestingly, while SES attenuates the marginal effect of *Craigslist* introduction for both *Caucasians* and *African Americans* we also see that possession of *any* insurance decreases the likelihood an *African American* is diagnosed with HIV<sup>6</sup>.

### **Implications and Conclusion**

While digital two sided matching platforms offer robust benefits in regard to facilitating social contact, they may also yield connections that pose risks. We examined the effects of a platform for the solicitation of casual sexual partners on the incidence rate of Asymptomatic HIV. We asked: to whom do the negative effects of platform use accrue based on ethnicity, gender, and socio-economic status? Our work was motivated by the acknowledged presence of a digital divide among different populations and the growing role of the Internet in individual and public health. While the documented HIV incidence rate is highest among ethnic minorities and the

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<sup>6</sup> Further empirical extensions are available in Appendix A

socio-economic lower class (CDC 2011), internet usage among these groups is markedly lower as a result of limited access, training, and computer literacy, i.e. the digital divide (Norris 2003, Payton 2003, Warschauer 2004). Our empirical analysis on a census of nearly 13 million patients who are subjected to a natural experiment yields four striking results that are robust<sup>7</sup>. First, the entry of Craigslist significantly increases the asymptomatic HIV incidence rate for residents of treated cities. Second, the absolute increase in the HIV incidence rate is significantly larger for the digitally disadvantaged (*African Americans* and the socio-economic lower class). Third, populations considered to be at lower risk for HIV who are also digitally advantaged, i.e., Caucasians, experience a large relative penalty after the introduction of Craigslist across all socio-economic groups. Finally, our results are indicative of limited learning and knowledge dissemination among by users of the Craigslist site, post implementation (see Appendix A1).

Each of these findings poses significant challenges for policy makers. While recent efforts have focused on reducing the HIV incidence rate in inner cities, where the disease is most prevalent (O'Donnell et al. 1994), this work underscores the fact that HIV is having an increasing effect on both the socio-economic lower and upper class. The lack of change in incidence rate over time when platforms for two sided sexual matching are introduced underscores the importance of appropriate education for people on both sides of the digital divide. Furthermore, the contraction of HIV by older patients, i.e. the middle aged, underscores this concern.

We compute the economic implications of the availability of sites which facilitate such behavior. Assuming similarity in the incidence rates between cities which have and have not been treated by the introduction of Craigslist, results suggest that roughly 2334 patients have been admitted to Florida hospitals for the treatment which otherwise would not have been

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<sup>7</sup> See Appendix B for robustness tests.

admitted. At a cost of \$618k over the patient's lifetime (Schackman et al. 2006), this translates to an additional financial burden of \$1.44 Billion in the State of Florida alone. As Craigslist currently operates in over 700 cities across 70 countries<sup>8</sup> the total costs easily reach tens of billions of dollars. We note that these estimates are conservative as our results only capture a small part of the effect as the diagnosis rate during the asymptomatic phase of the disease is not 100% (Janssen et al. 1992). The recent proliferation of these online matching platforms only highlights the need for aggressive education regarding the danger of engaging in risky behavior, as well as the need to ensure that people engage in safe sex should they use these services.

Our research contributes to scholarly work on the digital divide (Norris 2003, Warschauer 2004) that has historically focused on the negative downstream implications of decreased information access and connectivity, with limited attention to the negative implications of internet access and literacy. Even within the health policy literature discussions have been confined to the undesirable effect of limited internet access on the dissemination of health information (Brodie et al. 2000). Our results suggest that despite the decreased access which traditionally at risk groups have to online resources, penalties continue to accrue to them disproportionately. We also find that Internet advantages impose a penalty on those who are on the "right" side of the traditional digital divide. These findings suggest a need for potentially re-conceptualizing what the digital divide represents. While limited access to the resources of the Internet may reduce social welfare in most instances, there are perhaps situations where increased access can diminish welfare by promoting risky behavior. This work underscores the need for further investigation into the differential effects of the digital divide for both the digitally disadvantaged as well as the digitally advantaged; and when the beneficial and punitive

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<sup>8</sup> <http://www.craigslist.org/about/factsheet>

effects of increased internet access accrue to both groups.

Our finding that knowledge about the risks posed by Craigslist is not being diffused through the user community is also cause for concern. Online communities across a variety of domains have been widely heralded as forums for the exchange of information where users contribute freely driven by both pro-social and self-interested motivations. In our setting individuals who acquire the HIV virus as a result of Craigslist appear not to exhibit altruistic behavior in regard to warning others about the risks. While we cannot empirically verify this mechanism, one plausible explanation for the lack of learning is simply that the social stigma and embarrassment associated with HIV inhibits individuals from sharing information about how the disease was contracted. One possible policy remedy for this is anonymous forums where users can share any adverse effects, such as the capability offered at [www.sotheycanknow.com](http://www.sotheycanknow.com).

We acknowledge the limitations of this work which future research can address. First, we cannot observe the Craigslist utilization rates for visitors to treated cities (from either inside or outside the state of Florida). Econometrically this is of limited concern as it will bias results downward and make estimates more conservative. However, from the perspective of epidemiological research, further work investigating the effect of platforms which facilitate the transmission of disease across geographical regions is needed. Second, our data does not allow us to observe patient re-admittance. Although Florida is experiencing a decreased HIV incidence rate during the study period, and advances in medical treatment are causing patient re-admittance to slow, this is clearly a data limitation. Finally, the data do not allow us to observe the socio-demographic characteristics of the individual who passed the HIV virus to the patient. One future, important, extension of this work will be to investigate how the focal individual's selection of sexual partner on matching platforms influences the spread of STDs.



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Table 1: Florida Cities and Craigslist Implementation Date

| City              | County            | Implementation Date |
|-------------------|-------------------|---------------------|
| Fort Lauderdale   | Broward           | Jun-06              |
| Daytona Beach     | Volusia           | Jun-06              |
| Florida Keys      | Monroe            | -                   |
| Fort Meyers       | Lee               | Jun-05              |
| Gainesville       | Alachua           | Jan-06              |
| Jacksonville      | Duval             | Jan-05              |
| Lakeland          | Polk              | -                   |
| Miami             | Miami-Dade        | Oct-02              |
| Ocala             | Marion            | -                   |
| Okaloosa / Walton | Okaloosa / Walton | -                   |
| Orlando           | Orange            | Feb-04              |
| Palm Beach        | Palm Beach        | Apr-05              |
| Panama City       | Bay               | -                   |
| Pensacola         | Escambia          | Sep-05              |
| Sarasota          | Sarasota          | Jun-06              |
| Space Coast       | Brevard           | -                   |
| St Augustine      | St Johns          | -                   |
| Tallahassee       | Leon              | Jun-05              |
| Tampa Bay         | Hillsborough      | Nov-03              |
| Treasure Coast    | Indian River      | -                   |

Table 2: Summary Statistics

| Variable               | Mean   | Std. Dev. | 1       | 2       | 3       | 4       | 5      | 6       | 7       |
|------------------------|--------|-----------|---------|---------|---------|---------|--------|---------|---------|
| 1 Asym HIV             | 0.0038 | 0.0613    |         |         |         |         |        |         |         |
| 2 Craigslist           | 0.2353 | 0.4242    | 0.0169  |         |         |         |        |         |         |
| 3 African American     | 0.1586 | 0.3653    | 0.067   | 0.0554  |         |         |        |         |         |
| 4 Latino               | 0.1495 | 0.3566    | -0.0047 | 0.2574  | -0.182  |         |        |         |         |
| 5 Gender               | 0.4331 | 0.4955    | 0.0176  | -0.0004 | -0.0323 | -0.0196 |        |         |         |
| 6 Medicaid             | 0.1672 | 0.3731    | 0.0287  | 0.0651  | 0.1918  | 0.1437  | -0.075 |         |         |
| 7 Self-Insured         | 0.0552 | 0.2283    | 0.0087  | -0.0013 | 0.0264  | 0.054   | 0.0433 | -0.1083 |         |
| 8 Commercial Insurance | 0.2967 | 0.4568    | -0.0182 | 0.0151  | -0.0437 | -0.0211 | -0.034 | -0.291  | -0.1569 |

Table 3: LPM Estimates of Effect of Craigslist Introduction on Patient Likelihood of Asymptomatic HIV/AIDS Incidence – 2002 - 2006  
Time and Hospital Fixed Effects Omitted

| Dependent Variable                   | (1)<br>Asym HIV           | (2)<br>Asym HIV            | (3)<br>Asym HIV            | (4)<br>Asym HIV            | (5)<br>Asym HIV            | (6)<br>Asym HIV            |
|--------------------------------------|---------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| Craigslist                           | 0.000482***<br>(6.51e-05) | 0.000472***<br>(6.50e-05)  | 3.40e-05<br>(7.52e-05)     | -9.73e-05<br>(7.40e-05)    | 0.000926***<br>(8.05e-05)  | -9.03e-05<br>(9.56e-05)    |
| African American                     |                           | 0.00902***<br>(5.23e-05)   | 0.00825***<br>(5.97e-05)   | 0.00902***<br>(5.23e-05)   | 0.00902***<br>(5.23e-05)   | 0.00823***<br>(6.01e-05)   |
| Latino                               |                           | -0.000717***<br>(6.02e-05) | -0.000319***<br>(7.28e-05) | -0.000712***<br>(6.02e-05) | -0.000724***<br>(6.02e-05) | -0.000347***<br>(7.32e-05) |
| Gender                               |                           | 0.00231***<br>(3.50e-05)   | 0.00231***<br>(3.50e-05)   | 0.00200***<br>(3.99e-05)   | 0.00231***<br>(3.50e-05)   | 0.00199***<br>(4.00e-05)   |
| Medicaid                             |                           | 0.00246***<br>(5.28e-05)   | 0.00245***<br>(5.28e-05)   | 0.00246***<br>(5.28e-05)   | 0.00248***<br>(6.10e-05)   | 0.00255***<br>(6.15e-05)   |
| Self-Insured                         |                           | 0.00145***<br>(7.91e-05)   | 0.00144***<br>(7.92e-05)   | 0.00145***<br>(7.91e-05)   | 0.00166***<br>(9.02e-05)   | 0.00169***<br>(9.03e-05)   |
| Commercial Insurance                 |                           | -0.000887***<br>(4.16e-05) | -0.000885***<br>(4.16e-05) | -0.000888***<br>(4.16e-05) | -0.000626***<br>(4.71e-05) | -0.000644***<br>(4.71e-05) |
| African American<br>* Craigslist     |                           |                            | 0.00293***<br>(0.000114)   |                            |                            | 0.00302***<br>(0.000116)   |
| Latino<br>* Craigslist               |                           |                            | -0.000588***<br>(0.000111) |                            |                            | -0.000508***<br>(0.000113) |
| Gender<br>* Craigslist               |                           |                            |                            | 0.00132***<br>(8.19e-05)   |                            | 0.00135***<br>(8.23e-05)   |
| Medicaid<br>* Craigslist             |                           |                            |                            |                            | -0.000188<br>(0.000113)    | -0.000466***<br>(0.000116) |
| Self-Insured<br>* Craigslist         |                           |                            |                            |                            | -0.000907***<br>(0.000185) | -0.00110***<br>(0.000185)  |
| Commercial Insurance<br>* Craigslist |                           |                            |                            |                            | -0.00114***<br>(9.68e-05)  | -0.00106***<br>(9.69e-05)  |
| Constant                             | 0.00930***<br>(0.000180)  | 0.00311***<br>(0.000183)   | 0.00315***<br>(0.000183)   | 0.00325***<br>(0.000183)   | 0.00299***<br>(0.000184)   | 0.00316***<br>(0.000184)   |
| Hospital Fixed Effects               | Yes                       | Yes                        | Yes                        | Yes                        | Yes                        | Yes                        |
| Quarter Fixed Effects                | Yes                       | Yes                        | Yes                        | Yes                        | Yes                        | Yes                        |
| Observations                         | 12,616,174                | 12,616,174                 | 12,616,174                 | 12,616,174                 | 12,616,174                 | 12,616,174                 |
| R-squared                            | 0.005                     | 0.009                      | 0.009                      | 0.009                      | 0.009                      | 0.009                      |

Standard errors in parentheses  
\*\*\* p<0.0001, \*\* p<0.001, \* p<0.01

Table 4: Marginal Impact of *Craigslist* Introduction on Different Patient Classes  
 Untreated – Absence of *Craigslist* / Treated – *Craigslist* Introduced

| Group                          | Incidence Rate | Absolute $\Delta$ | Relative $\Delta$ |
|--------------------------------|----------------|-------------------|-------------------|
| African American Untreated     | 0.0128         | 0.0013            | 10.16%            |
| African American Treated       | 0.0141         |                   |                   |
| Caucasian Untreated            | 0.0017         | 0.0002            | 11.76%            |
| Caucasian Treated              | 0.0019         |                   |                   |
| Woman Untreated                | 0.0028         | -0.0002           | -7.14%            |
| Woman Treated                  | 0.0026         |                   |                   |
| Man Untreated                  | 0.0047         | 0.0013            | 27.66%            |
| Man Treated                    | 0.006          |                   |                   |
| Medicaid Untreated             | 0.0057         | 0.00014           | 2.46%             |
| Medicaid Treated               | 0.00584        |                   |                   |
| Self-Insured Untreated         | 0.0052         | -0.0006           | -11.54%           |
| Self-Insured Treated           | 0.0046         |                   |                   |
| Commercial Insurance Untreated | 0.0032         | -0.0003           | -9.38%            |
| Commercial Insurance Treated   | 0.0029         |                   |                   |

Table 5: Marginal Impact of *Craigslist* Introduction on African American and Caucasian Communities  
 Untreated – Absence of *Craigslist* / Treated – *Craigslist* Introduced

| Group   | Incidence Rate | Absolute $\Delta$ | Relative $\Delta$ |
|---|----------------|-------------------|-------------------|
| African American Woman Untreated                | 0.0118         | 0.0011            | 9.32%             |
| African American Woman Treated                  | 0.0129         |                   |                   |
| African American Man Untreated                  | 0.0143         | 0.0018            | 12.59%            |
| African American Man Treated                    | 0.0161         |                   |                   |
| Caucasian Woman Untreated                       | 0.0009         | -0.0004           | -44.44%           |
| Caucasian Woman Treated                         | 0.0005         |                   |                   |
| Caucasian Man Untreated                         | 0.0027         | 0.0009            | 33.33%            |
| Caucasian Man Treated                           | 0.0036         |                   |                   |
| African American Medicaid Untreated             | 0.0144         | -0.0005           | -3.47%            |
| African American Medicaid Treated               | 0.0139         |                   |                   |
| African American Self Insured Untreated         | 0.0146         | -0.0013           | -8.90%            |
| African American Self Insured Treated           | 0.0133         |                   |                   |
| African American Commercial Insurance Untreated | 0.0082         | -0.0016           | -19.51%           |
| African American Commercial Insurance Treated   | 0.0066         |                   |                   |
| Caucasian Medicaid Untreated                    | 0.0038         | 0.0006            | 15.79%            |
| Caucasian Medicaid Treated                      | 0.0044         |                   |                   |
| Caucasian Self Insured Untreated                | 0.0032         | 0.0004            | 12.50%            |
| Caucasian Self Insured Treated                  | 0.0036         |                   |                   |
| Caucasian Commercial Insurance Untreated        | 0.0018         | 0.0001            | 5.56%             |
| Caucasian Commercial Insurance Treated          | 0.0019         |                   |                   |

Table 6: LPM Estimates of Effect of Craigslist Introduction on Patient Likelihood of Asymptomatic HIV/AIDS Incidence  
Comparison of *African American* and *Caucasian* Communities - Time and Hospital Fixed Effects Omitted

| Dependent Variable                   | (1)                        | (2)                       | (3)                       | (4)                       | (5)                       | (6)                      | (7)                       | (8)                       | (9)                        | (10)                       |
|--------------------------------------|----------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------|---------------------------|---------------------------|----------------------------|----------------------------|
|                                      | Asym HIV                   | Asym HIV                  | Asym HIV                  | Asym HIV                  | Asym HIV                  | Asym HIV                 | Asym HIV                  | Asym HIV                  | Asym HIV                   | Asym HIV                   |
|                                      | African American Community |                           |                           |                           |                           | Caucasian Community      |                           |                           |                            |                            |
| Craigslist                           | 0.00136***<br>(0.000293)   | 0.00134***<br>(0.000293)  | 0.00353***<br>(0.000385)  | 0.000956*<br>(0.000326)   | 0.00320***<br>(0.000420)  | 0.000182*<br>(5.67e-05)  | 0.000174*<br>(5.67e-05)   | 0.000245**<br>(6.91e-05)  | -0.000428***<br>(6.63e-05) | -0.000392***<br>(7.81e-05) |
| Gender                               |                            | 0.00281***<br>(0.000167)  | 0.00280***<br>(0.000167)  | 0.00252***<br>(0.000197)  | 0.00259***<br>(0.000198)  |                          | 0.00199***<br>(2.86e-05)  | 0.00199***<br>(2.86e-05)  | 0.00176***<br>(3.13e-05)   | 0.00176***<br>(3.14e-05)   |
| Medicaid                             |                            | 0.00172***<br>(0.000204)  | 0.00252***<br>(0.000242)  | 0.00172***<br>(0.000204)  | 0.00250***<br>(0.000243)  |                          | 0.00243***<br>(4.99e-05)  | 0.00238***<br>(5.47e-05)  | 0.00243***<br>(4.99e-05)   | 0.00235***<br>(5.47e-05)   |
| Self-Insured                         |                            | 0.000844<br>(0.000341)    | 0.00176***<br>(0.000395)  | 0.000849<br>(0.000341)    | 0.00177***<br>(0.000395)  |                          | 0.00162***<br>(7.03e-05)  | 0.00158***<br>(7.70e-05)  | 0.00161***<br>(7.03e-05)   | 0.00160***<br>(7.70e-05)   |
| Commercial Insurance                 |                            | -0.00731***<br>(0.000219) | -0.00615***<br>(0.000256) | -0.00731***<br>(0.000219) | -0.00617***<br>(0.000256) |                          | 0.000133***<br>(3.30e-05) | 0.000188***<br>(3.61e-05) | 0.000132***<br>(3.30e-05)  | 0.000176***<br>(3.61e-05)  |
| Medicaid<br>* Craigslist             |                            |                           | -0.00271***<br>(0.000433) |                           | -0.00263***<br>(0.000435) |                          |                           | 0.000294<br>(0.000129)    |                            | 0.000432**<br>(0.000129)   |
| Self-Insured<br>* Craigslist         |                            |                           | -0.00334***<br>(0.000772) |                           | -0.00338***<br>(0.000772) |                          |                           | 0.000205<br>(0.000186)    |                            | 0.000102<br>(0.000187)     |
| Commercial Insurance<br>* Craigslist |                            |                           | -0.00411***<br>(0.000475) |                           | -0.00404***<br>(0.000477) |                          |                           | -0.000305**<br>(8.48e-05) |                            | -0.000242*<br>(8.49e-05)   |
| Gender<br>* Craigslist               |                            |                           |                           | 0.000964*<br>(0.000363)   | 0.000706<br>(0.000365)    |                          |                           |                           | 0.00134***<br>(7.63e-05)   | 0.00134***<br>(7.66e-05)   |
| Constant                             | 0.0144***<br>(0.000565)    | 0.0136***<br>(0.000578)   | 0.0129***<br>(0.000583)   | 0.0137***<br>(0.000579)   | 0.0130***<br>(0.000585)   | 0.00333***<br>(0.000176) | 0.00172***<br>(0.000177)  | 0.00169***<br>(0.000177)  | 0.00182***<br>(0.000177)   | 0.00179***<br>(0.000177)   |
| Hospital Fixed Effects               | Yes                        | Yes                       | Yes                       | Yes                       | Yes                       | Yes                      | Yes                       | Yes                       | Yes                        | Yes                        |
| Quarter Fixed Effects                | Yes                        | Yes                       | Yes                       | Yes                       | Yes                       | Yes                      | Yes                       | Yes                       | Yes                        | Yes                        |
| Observations                         | 2,000,391                  | 2,000,391                 | 2,000,391                 | 2,000,391                 | 2,000,391                 | 8,729,512                | 8,729,512                 | 8,729,512                 | 8,729,512                  | 8,729,512                  |
| R-squared                            | 0.007                      | 0.009                     | 0.009                     | 0.009                     | 0.009                     | 0.003                    | 0.004                     | 0.004                     | 0.004                      | 0.004                      |

Standard errors in parentheses

\*\*\* p<0.0001, \*\* p<0.001, \* p<0.01

Table 7: LPM Estimates of Learning after the Introduction of Craigslist – 2002 - 2006  
Time and Hospital Fixed Effects Omitted

| Dependent Variable     | (1)<br>Asym HIV           | (2)<br>Asym HIV          | (3)<br>Asym HIV          | (4)<br>Asym HIV            | (5)<br>Asym HIV            | (6)<br>Asym HIV            |
|------------------------|---------------------------|--------------------------|--------------------------|----------------------------|----------------------------|----------------------------|
| Craigslist             | 0.000538***<br>(6.69e-05) | 0.000285*<br>(8.99e-05)  | 0.000265+<br>(0.000108)  | 0.000521***<br>(6.68e-05)  | 0.000357***<br>(8.98e-05)  | 0.000287*<br>(0.000108)    |
| Length Treated         |                           | 2.02e-05<br>(1.28e-05)   | 3.00e-05<br>(3.25e-05)   |                            | 1.63e-05<br>(1.28e-05)     | 5.15e-05<br>(3.24e-05)     |
| Length Treated^2       |                           |                          | -7.62e-07<br>(2.33e-06)  |                            |                            | -2.75e-06<br>(2.33e-06)    |
| African American       |                           |                          |                          | 0.00900***<br>(5.36e-05)   | 0.00989***<br>(7.18e-05)   | 0.00989***<br>(7.18e-05)   |
| Latino                 |                           |                          |                          | -0.000759***<br>(6.18e-05) | -0.000980***<br>(8.04e-05) | -0.000984***<br>(8.04e-05) |
| Gender                 |                           |                          |                          | 0.00230***<br>(3.58e-05)   | 0.00273***<br>(5.11e-05)   | 0.00273***<br>(5.11e-05)   |
| Medicaid               |                           |                          |                          | 0.00250***<br>(5.41e-05)   | 0.00261***<br>(7.60e-05)   | 0.00261***<br>(7.60e-05)   |
| Self-Insured           |                           |                          |                          | 0.00145***<br>(8.13e-05)   | 0.00129***<br>(0.000115)   | 0.00129***<br>(0.000115)   |
| Commercial Insurance   |                           |                          |                          | -0.000893***<br>(4.26e-05) | -0.00121***<br>(6.02e-05)  | -0.00121***<br>(6.02e-05)  |
| Constant               | 0.00922***<br>(0.000184)  | 0.00909***<br>(0.000218) | 0.00909***<br>(0.000218) | 0.00301***<br>(0.000187)   | 0.00232***<br>(0.000223)   | 0.00232***<br>(0.000223)   |
| Hospital Fixed Effects | Yes                       | Yes                      | Yes                      | Yes                        | Yes                        | Yes                        |
| Quarter Fixed Effects  | Yes                       | Yes                      | Yes                      | Yes                        | Yes                        | Yes                        |
| Observations           | 12,616,174                | 7,507,075                | 7,507,075                | 12,616,174                 | 7,507,075                  | 7,507,075                  |
| R-squared              | 0.005                     | 0.005                    | 0.005                    | 0.009                      | 0.009                      | 0.009                      |

Standard errors in parentheses  
\*\*\* p<0.0001, \*\* p<0.001, \* p<0.01, + p<0.05

Table 8: OLS Estimates of Total Number of Asymptomatic HIV Cases By Group  
Time and Hospital Fixed Effects Omitted

| Dependent Variable     | (1)<br>Total Asym   | (2)<br>Caucasian    | (3)<br>African American | (4)<br>Latino        | (5)<br>Commercial Insurance | (6)<br>Self-Insured | (7)<br>Medicaid     | (8)<br>Male         | (9)<br>Female       |
|------------------------|---------------------|---------------------|-------------------------|----------------------|-----------------------------|---------------------|---------------------|---------------------|---------------------|
| Craigslist             | 2.526***<br>(0.264) | 0.479***<br>(0.125) | 1.474***<br>(0.189)     | 0.548***<br>(0.0746) | 0.222***<br>(0.0839)        | 0.179**<br>(0.0702) | 0.891***<br>(0.135) | 1.450***<br>(0.181) | 1.076***<br>(0.148) |
| Constant               | 65.98***<br>(1.035) | 10.82***<br>(0.489) | 53.72***<br>(0.742)     | 0.660**<br>(0.292)   | 4.858***<br>(0.329)         | 3.233***<br>(0.275) | 30.65***<br>(0.531) | 27.54***<br>(0.710) | 38.45***<br>(0.581) |
| Hospital Fixed Effects | Yes                 | Yes                 | Yes                     | Yes                  | Yes                         | Yes                 | Yes                 | Yes                 | Yes                 |
| Quarter Fixed Effects  | Yes                 | Yes                 | Yes                     | Yes                  | Yes                         | Yes                 | Yes                 | Yes                 | Yes                 |
| Observations           | 5,124               | 5,124               | 5,124                   | 5,124                | 5,124                       | 5,124               | 5,124               | 5,124               | 5,124               |
| R-squared              | 0.959               | 0.854               | 0.953                   | 0.896                | 0.767                       | 0.725               | 0.940               | 0.936               | 0.945               |

Table 9: LPM Placebo Estimates of Effect of Craigslist Introduction on Patient Likelihood of Being Affected by Other Conditions – 2002 – 2006  
Time and Hospital Fixed Effects Omitted

| Dependent Variable     | (1)<br>AMI              | (2)<br>Stroke           | (3)<br>Melanoma           | (4)<br>Lung Cancer      | (5)<br>Alzheimer's       | (6)<br>Diabetes        |
|------------------------|-------------------------|-------------------------|---------------------------|-------------------------|--------------------------|------------------------|
| Craigslist             | 0.000427<br>(0.000171)  | -0.000236<br>(0.000114) | 6.91e-06<br>(2.18e-05)    | -1.67e-05<br>(0.000112) | -0.000411*<br>(0.000147) | 0.00110*<br>(0.000397) |
| Constant               | 0.0239***<br>(0.000472) | 0.0165***<br>(0.000315) | 0.000366***<br>(6.02e-05) | 0.0114***<br>(0.000310) | 0.0114***<br>(0.000405)  | 0.179***<br>(0.00110)  |
| Hospital Fixed Effects | Yes                     | Yes                     | Yes                       | Yes                     | Yes                      | Yes                    |
| Quarter Fixed Effects  | Yes                     | Yes                     | Yes                       | Yes                     | Yes                      | Yes                    |
| Observations           | 12,616,174              | 12,616,174              | 12,616,174                | 12,616,174              | 12,616,174               | 12,616,174             |
| R-squared              | 0.008                   | 0.002                   | 0.003                     | 0.004                   | 0.006                    | 0.021                  |

Table 10: Marginal Impact of *Craigslist* Introduction on Different Age Groups  
Untreated – Absence of *Craigslist* / Treated – *Craigslist* Introduced

| Age Group | Untreated | Treated | Absolute $\Delta$ | Relative $\Delta$ |
|-----------|-----------|---------|-------------------|-------------------|
| 15-19     | 0.0046    | 0.0051  | 0.0004            | 9.01%             |
| 20-24     | 0.0063    | 0.0071  | 0.0007            | 11.83%            |
| 25-29     | 0.0079    | 0.0101  | 0.0023            | 28.76%            |
| 30-34     | 0.0100    | 0.0119  | 0.0019            | 18.79%            |
| 35-39     | 0.0140    | 0.0181  | 0.0040            | 28.72%            |
| 40-44     | 0.0155    | 0.0229  | 0.0074            | 47.91%            |
| 45-49     | 0.0132    | 0.0206  | 0.0074            | 55.97%            |
| 50-54     | 0.0099    | 0.0151  | 0.0053            | 53.27%            |
| 55-59     | 0.0070    | 0.0103  | 0.0033            | 47.26%            |
| 60-64     | 0.0057    | 0.0073  | 0.0016            | 28.62%            |
| 65-69     | 0.0048    | 0.0058  | 0.0010            | 20.75%            |
| 70-74     | 0.0043    | 0.0048  | 0.0005            | 11.21%            |
| 75-80     | 0.0041    | 0.0045  | 0.0005            | 11.26%            |



Figure 1: Sample Craigslist Ad

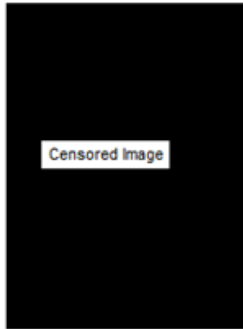
CL > [City] > All Personal > Casual Encounters

Reply [omitted]@pers.craigslist.org

flag [?] : [miscategorized](#) [prohibited spam](#) [best of](#)

[Title] - w4m - 29 ([City])

[description of user preferences]



- Location: [City]
- it's NOT ok to contact this poster with services or other commercial interests

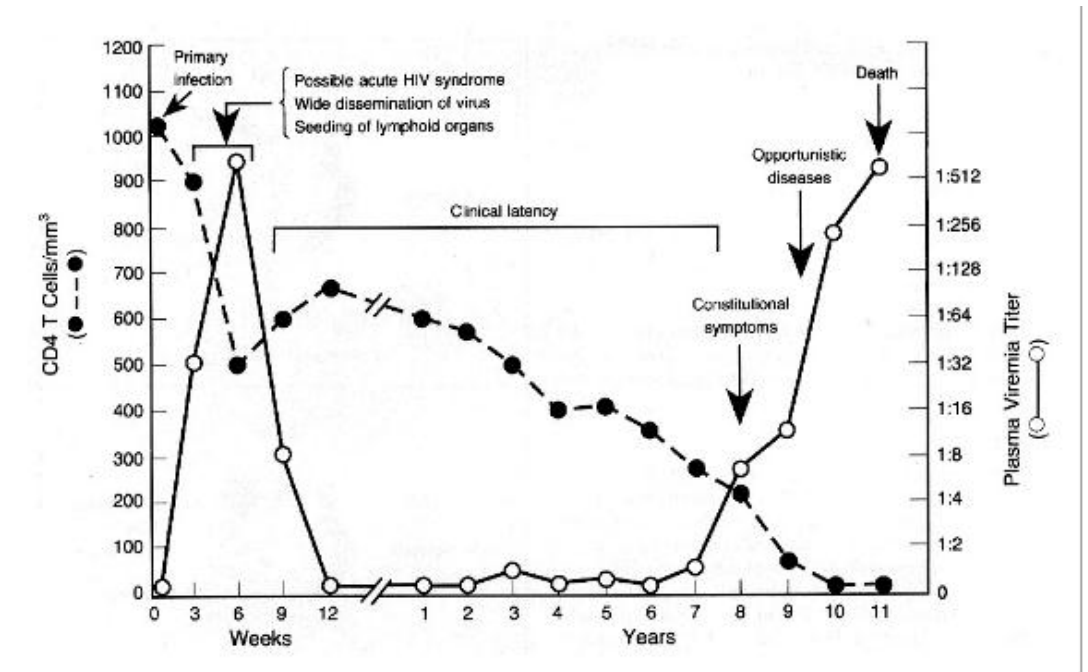
PostingID: [omitted]

Posted: [omitted]

[email to a friend](#)

[Please report suspected exploitation of minors to the appropriate authorities](#)

Figure 2: Detailed HIV Progression Timeline



“During the early period after primary infection there is widespread dissemination of virus and a sharp decrease in the number of CD4 T cells in peripheral blood. An immune response to HIV ensues, with a decrease in detectable viremia followed by a prolonged period of clinical latency. The CD4 T-cell count continues to decrease during the following years, until it reaches a critical level below which there is a substantial risk of opportunistic diseases.” (Pantaleo et al. 1993)

## Appendix A: Empirical Extensions

We report two additional empirical extensions: those related to learning and the relationship between age, the presence of Craigslist, and HIV incidence.

### *Learning*

If indeed the consummation of casual encounters through partners found on Craigslist is resulting in greater HIV incidence, one would expect such information to be disseminated among platform users (Kittur and Kraut 2008, Kozinets et al. 2008, Schultz 2000). Therefore, one further question we ask is: is there learning behavior exhibited by users of the *Craigslist* forum, i.e. are users aware of the increased HIV incidence rate and do they subsequently alter their behavior? The answer to this question is not clear, *ex ante*. On one hand, if the users of the forum identify the proliferation of HIV as a result of the risky behavior it enables this information should be disseminated throughout the social network. Conversely, if users only identify the forum as an effective platform for the solicitation of sexual partners, while not recognizing the increased risk, then the utilization rates will rise. We therefore investigate the effect of *Craigslist* introduction on the community over time. To conduct this analysis we include a linear spline and a quadratic spline (Wooldridge 2009) which indicates the number of quarters the *Craigslist* website has been active in the focal county<sup>9</sup>. Results are available in Table 7.

As shown by the coefficient for the *Length Treated* variable, the change in the HIV incidence rate in the presence (Column 5 and 6 of Table 7) and absence (Column 2 and 3 of Table 7) of patient and demographic controls is negligible. These results suggest that while users have identified *Craigslist* as an effective forum for the solicitation of sexual partners, the fact that this risky sexual behavior significantly increases the probability of HIV infection is not influencing the utilization either negatively or positively over time.

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<sup>9</sup> The spline captures the relative change in the *Craigslist* penalty over time (Wooldridge, 2009)

### *User Age*

Our further empirical extension is to consider the age of patients who are impacted by the introduction of *Craigslist*. Once again, no clear *a priori* expectation regarding whom will be influenced to a greater or lesser extent is apparent. On one hand, younger people are far more likely to engage in risky sexual behavior (Cooper 2002) for many reasons: lower likelihood of having children, lower likelihood of marriage, and an increased propensity for behavior which results in casual sexual encounters (i.e. binge drinking and drug use). However, by virtue of these behaviors younger people also have more avenues available to them for the solicitation of sexual partners, resulting in their *ex ante* search costs being significantly lower. We break the patient population down by 5 year increments (ages 15 – 80) and re-execute our analysis<sup>10</sup>.

Results (Table 10) indicate that, while there is a significant increase in the asymptomatic HIV rate across all ages (from adolescents to septuagenarians) the largest relative and absolute increases are in the middle aged (aged 40-55). Interestingly, these are individuals who, while most likely to be carriers of HIV in general (regardless of progression) (CDC 2011), are *not* people who habitually engage in risky sexual behavior (Cooper 2002). A possible explanation for this finding, and one of some concern, is simply a lack of education on safe sex. As this age group attended high school, where the majority of formal sex education takes place, in the late 1960s and early 1970s, and most common STDs were not seen in the US on a large scale until much later (e.g. HIV in 1981 the human papilloma virus in 1985), it is plausible that this population is underestimating the risk of HIV contraction due to limited awareness.

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<sup>10</sup> Due to space constraints, detailed regression results are not reported.

## **Appendix B: Robustness Checks**

### ***Absolute Counts***

One concern with our initial estimations is that, because we are operationalizing the dependent variable as a percent probability instead of an absolute count, our results may come from an aberrant decrease in the number of patients which are coming into *Craigslis*t adjacent hospitals. To ensure the robustness of results we therefore re-operationalize the dependent variable as a count of the number of asymptotically infected HIV patients which are admitted to each hospital *in the focal quarter*. Although this methodology reduces the power of the estimations, and precludes the inclusion of moderating effects of patient characteristics, it does allow us to eliminate this possible alternate explanation. We regress the number of patients admitted for each of the above investigated groups on the treated variables (along with hospital and quarter fixed effects). Results are available in Table 8. Estimations with Poisson, Negative Binomial, and Quasi Maximum Likelihood Poisson are consistent. These findings, once again, confirm previous results that the introduction of *Craigslis*t into a county significantly increases the HIV incidence rate. Moreover, we see confirmatory evidence that the negative effect is significantly larger for *African Americans* than *Caucasians* or *Latinos*. Similarly, the effect of *Craigslis*t is much larger for men and people with low SES.

### ***Placebo Test***

An alternate explanation of our results is that there are structural changes occurring at *Craigslis*t hospitals that are causing an increased visitation rate by the general public. For example, if cities like Miami, Tampa Bay, and Orlando have been making large scale capital investments in their local area hospitals then patients with more severe conditions (such as HIV) would be treated at these hospitals (because of their increased ability to treat these patients).

To mitigate this possible alternate explanation we estimate our model using patient affliction with other medical conditions (e.g. Heart Attacks (AMI), Stroke, Melanoma, Lung

Cancer, Alzheimer's disease, and Diabetes Mellitus) as the dependent variable. These conditions are not only the leading causes of death in the United States (CDC 2013), they offer a mix of different conditions which are both emergent and chronic (thereby ensuring the robustness of the result). Results are available in Table 9 and suggest that the introduction of *Craigslist* into a city has no effect on the incidence rate of the majority of these conditions. While the incidence rate for *Alzheimer's* is negative and significant, and *Diabetes* is positive and significant, we note that the significance level of each of these conditions (t-stat of 2.80 and 2.77) is small compared to asymptomatic HIV (t-stat of 8.04). As the sample size for the investigation is so large it is arguable that these correlations are spurious and contain little information at the ( $p < 0.01$ ) level.