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Innovations of Life Style Drugs and Some Socio-Economic Consequences[1]

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Abstract

This paper investigates whether the innovation in medication technology to orally treat erectile dysfunction (ED) with Sildenafil (commonly known as Viagra) can explain the recent rebounds of cases of sexually transmitted diseases (STD) and sexual related crimes among the elderly population. Preliminary evidence suggests that the launch of Viagra in April 1998 led to a historically unprecedented high usage of ED drugs and generated a new social climate where sexual activity among elderly is no longer a taboo. The contemporaneous changes in the disease and crime statistics may likely be associated with this fundamental change in sexual medicine and the public media attention ED obtained. Alternative hypothesis are investigated, including innovations in antiviral AIDS therapy causing changes in sexual behavior.

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Introduction

As Sexually Transmitted Diseases (STD) and AIDS/HIV have become major public health concerns imposing significant costs to the society, much of the research[2] and educational efforts have focused on the younger population. As a response, in the U.S. since the early nineties, most STD and AIDS cases are declining (UNAIDS, 2005). Despite this success, a closer look at the data shows that older people–who have not been the center of the education campaigns–first also experienced declining infection rates, but since the end nineties the older age groups show discerning increases in STD statistics. Simultaneously, also the cases of recorded sexual related crimes increased for the elderly generation. This paper intends to investigate whether these recent rebounds can be explained by differences in the sexual behavior prior and post the launching of the erectile dysfunction medication Viagra.

Before 1998, men suffering from erectile dysfunction (ED) had very limited treatment possibilities. In April 1998, however, the FDA approved the ED medication Viagra. Viagra was rapidly adopted. Sales soared and made the drug a tremendous commercial success for its producer–Pfizer. In this study we address the question of whether this innovation in medicine technology had any important socio-economic consequences. As Viagra is targeted to older men, we hypothesize that men in the age group of 45 and older might experience a revival of "desire" and in particular that this could lead to an

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[2] Research on attitudes towards condom use is limited to the younger population. The National Survey of Family Growth (CDC, 2006), for example, limits all condom related questions to the age below 25 (and in some instances below 45). For the purpose of our study, we however, define the treatment group as person with age above 45.

increased supply of older sexually active men. To achieve new equilibria, re-matching might result. Against this background, in this paper we ask the following questions: Does the sexual behavior of the older population change, leading i.e. to increases in coital frequency? Is the oral ED medication responsible for the recent re-surge in sexually transmitted diseases (STD)? And can it help to explain the recent re-surge in sexual crimes among the older population?

To preview the results, our preliminary evidence suggests that the launch of Viagra in April 1998 led to historically unprecedented high usage of ED drugs and generated a new social climate where sexual activity among elderly is no longer a taboo. In the USA, the prevalence of STDs increased until the early nineties and then declined. But recently, STD incidences are rebounding, particularly among older men. The contemporaneous changes in sexual crime statistics can also be associated with this fundamental change in sexual medicine. The crimes show age patterns over time, in that older individuals are more commonly charged with assaults in the time period post 1998 than prior to 1998, whereas for the younger population the opposite trend is true. These preliminary results are interpreted to be evidence that the increase in sexual functioning of older men (as well as the enormous public media attention surrounding this issue) revived sexual desires, leading to increases in risky behavior for the targeted age group. Alternative hypothesis are investigated.
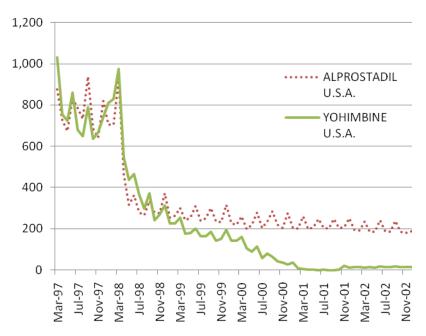

The remainder of the paper will be presented in the following order. After giving a brief historical background on ED medication, section 2 presents the analysis of aggregate sex offenses and forcible rape charges in the US as reported by the Federal Bureau of Investigation. Section three studies the trends of sexually transmitted diseases in the US, including: Gonorrhea, Chlamydia, and Syphilis as reported by the Centers for Disease Control. In section four alternative possible explanations for the data phenomena are discussed. Finally we conclude in section five.

Section 1: Historical background on ED medication

Prior to the launch of Viagra in April 1998, erectile dysfunction (ED) could be treated with methods only that are often painful in its application as it involves injections, penile prosthesis, penis pump or vascular reconstructive surgery (Montague et al. 2005). The most common ED drug was Aprostadil. Aprostadil is a penile suppository applied either into the urethra or injected into the penis about ten minutes before the erection is needed. Figure 1 below shows that while in March 1998 more than 900,000 units of Aprodastil were prescribed, one month later, in April 1998 this figure dramatically declined to 462,000 units to then continually decline to insignificant numbers today. The aphrodisiac Yohimbine, a sexual stimulant, experienced even more drastic declines.
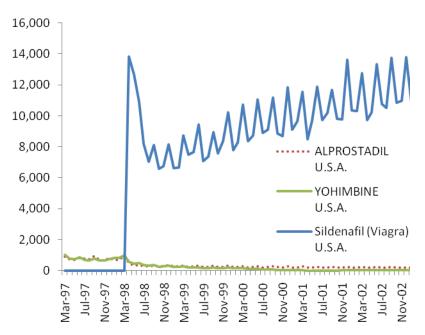
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Figure 1: Prescribed units (in thousands) sold of Aprodastil and Yohimbine March 1997 to February 2003 in the U.S.A.

This dramatic drop in medication sales can be clearly explained with the approval of Sildenafil by the Food and Drug Administration (FDA), becoming the first oral treatment approved to treat ED, sold under the brand name Viagra starting in April of 1998. The new drug was celebrated in the press and public media as revolutionizing the sexual behavior of the elderly population. The New York Times, for example, in the year 1998 featured over 193 articles on Viagra (with titles like: *The Nation: Thanks a Bunch, Viagra; The Pill That Revived Sex, Or at Least Talking About It*), and the hype continued as it was advertised directly to consumers on U.S. TV, famously being endorsed by sport stars, as soccer player Pelé, and former U.S. Senator Bob Dole. In addition, the presence of this topic in the public media (Viagra was voted the "word of the year" in both Germany and in the USA) created a new climate where sexual activity among elderly is no longer a taboo as it has been historically. It also altered the expectation of elderly people (and may have put pressure on older men) to stay sexual active longer. Hence,

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many of the former customers of the drugs Aprodastil or Yohimbine immediately started taking Viagra. Moreover, however, new patients must have adopted Viagra, as evidenced by Figure 2. Figure 2 displays the units sold of Viagra in the U.S. and clearly demonstrates that simultaneously with the drop of the former ED drugs, in April 1998 ED drugs experienced an unprecedented consumption level due to the launch of Viagra that was sold of over 14 million units. It is apparent that Aprodastil and Yohimbine now play an insignificant role, whereas Viagra, also informally known as "Vitamin V", "the Blue Pill", dominates the market.

Figure 2: Prescribed Units (in Thousands) sold of all ED related medications, Mar 1997 to Feb 2005, USA
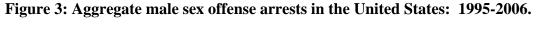
Section 2: Sexually Related Crime Arrests in the United States:

The first question we attempt to investigate is whether the publicity in the public media about Viagra and sex of elderly changed the sexual crime behavior of the elderly population. Hence, whether there has been an increase in such arrests in the United States since the release of Viagra, and if so amongst what age groups is this change most prevalent. The data we have collected is for aggregate rates in the United States by gender and age groups broken down into two categories (i) sex offenses arrests (that excludes forcible rapes) and (ii) forcible rapes. These aggregate data are reported annually by the Federal Bureau of Investigation (FBI). The category sex offenses include all sex offenses that led to arrests in the following crime subcategories: adultery/fornication, incest, buggery, indecent exposure, seduction and indecent liberties, sodomy or crimes against nature, statutory rape (no force), and any attempts of the stated categories.[3]

The graph below shows the sex offense arrests as stated above:

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[3] Sex solicitation rates are also not included in this category but in a "catch all" category that includes many other arrests not prevalent to this research. Solicitation rates may be of interest but are only recorded at the local level and time restraints do not allow us to acquire these rates.

Figure 3: Aggregate male sex offense arrests in the United States: 1995-2006.
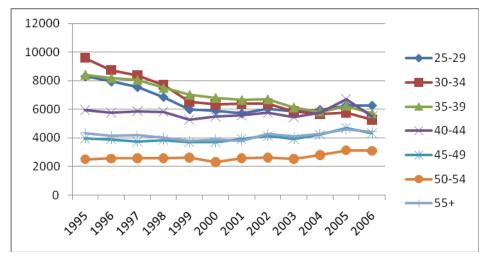

Figure 3 shows that beginning in 1995 there has been a decrease in arrests for younger age groups that continues to 2006. The graph is not as effective at providing a visible representation of the older age groups because of their smaller numerical values, but there does appear to be an increase in their values beginning somewhere between 1998-2000. Hence in the following we provide percentage change calculations for all age groups for the two time periods, the first prior to the launch of Viagra in 1998 and the second period from 1998 until 2006. This percentage change offers a better representation of the changes among age groups given the large quantity differences in values. Below is a list of these percentage changes:
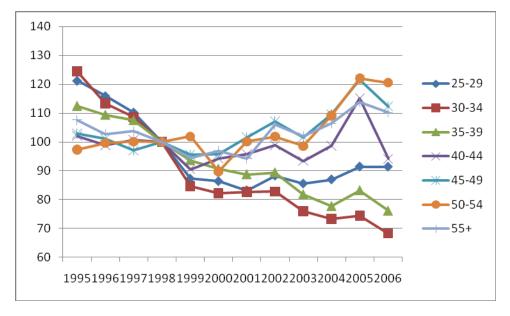
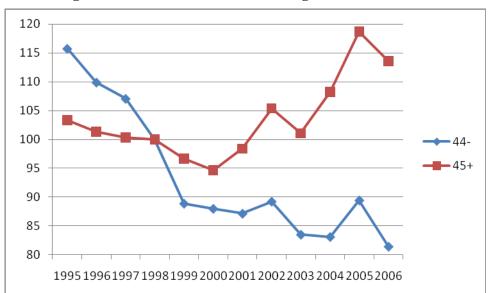**Percentage change by age groups of male sex offense arrests in the USA**

Age group	%change 95-98	%change 98-06
25-29	-17.52%	-8.61%
30-34	-19.62%	-31.72%
35-39	-11.03%	-23.90%
40-44	-2.03%	-5.86%
45-49	-2.85%	12.32%
50-54	2.67%	20.57%
55-69	-0.61%	17.25%
60-64	-6.74%	8.78%
65+	-13.80%	2.98%
Total	**-8.94%**	**-5.62%**
44 and below	**-13.60%**	**-18.54%**
45 and above	**-3.25%**	**+13.53%**

The total data show that in general sex offense arrests are decreasing (in the time period from 1995 to 1998 by 9% and from 1998 to 2006 by 6%). From 1995-1998, before Viagra, we see the largest changes being made in the 30-34 and 65+ age groups, both decreases of 19% and 13%. The 45-64 age groups all remained fairly constant with minor fluctuations. However, the largest changes between 1998-2006 occur in the 30-34 and 35-39 age groups, with decreases of 31% and 23%. These decreases in sex offenses arrests, however, are coupled with surprising increases among older age groups. We see that from ages 25-44, there are decreases in arrests, and in age groups 45+, there is an increase in every single age group. There is an increase of 20% by age group 50-54 and a 17% increase in age group 55-59. The 60+ age group also reveals an undeniable increase.

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The most striking evidence of an abnormality may not be the increases of older age groups themselves, but the fact that all the younger age groups show a decrease in sex offense arrests after the release of Viagra and all older age groups show an increase, representing opposite trends. We also observe that aggregate percentage changes remain negative among both time series and the only significant percentage change increases come in the latter time frame among older age groups. Figure 4 below reinforce the above table in visual terms.

Figure 4a: % by age groups of male sex offense arrests in the USA, normalized to 1998

Panel b: % change of sex offense arrests in the USA, normalized to 1998 for all males of age below 44 and all males above age 45

Finally, we perform the same analysis with a simple statistical Difference-in-Difference methology of the following form. Let G be the dummy variable defined for male in the group of age 45 and older. Let T be defined as a dummy of the years post Viagra introduction, hence 1999 to 2006. Then, regressing

$$\ln(sex\ offense)_{it} = a + b*G_{it} + g*T_{it} + d(T*G)_{it} + e_{it}$$

via OLS with robust standard errors leads to the result that the treatment coefficient g equals to 0.25. This implies that in the years 1999 to 2006 the sex offenses increased by 25% in the age group of 45 and older, relative to the younger male and relative to the pre-Viagra years being here defined as 1996 to 1998. This result is significant at the 1% significance level with a standard error of g of stderr(g)=0.04. This result is entirely robust of whether we define the treatment years starting from 1999 or starting from 1998. Both regressions are displayed in the Table below.

Result of Difference-in-Difference Regression of Equation (1)

Panel (a): Treatment years defined from 1999 to 2006

```
    Source |    SS      df     MS              Number of obs =    24
-------------+------------------------------         F( 3,   20) = 477.83
     Model | 4.74987734   3 1.58329245            Prob > F    = 0.0000
  Residual | .06627069   20 .003313535            R-squared   = 0.9862
-------------+------------------------------         Adj R-squared = 0.9842
     Total | 4.81614803   23 .209397741            Root MSE    = .05756
```

```
-----------------------------------------------------------------------------
     lna |    Coef.  Std. Err.    t   P>|t|   [95% Conf. Interval]
-------------+---------------------------------------------------------------
       T |  -.224242  .0352502   -6.36  0.000   -.2977726  -.1507114
       G | -1.045976  .0407034  -25.70  0.000   -1.130882  -.9610699
   treat |  .253648   .0498513    5.09  0.000   .1496601   .357636
   _cons | 10.31332   .0287817  358.33  0.000   10.25329   10.37336
```
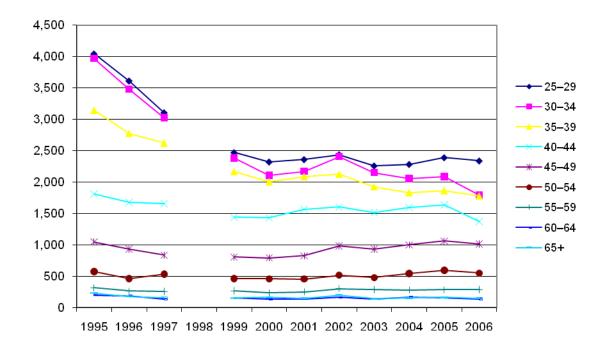
Panel (b): Treatment years defined from 1998 to 2006

```
Linear regression                       Number of obs =    24
                                        F( 3,   20) = 1151.88
                                        Prob > F    = 0.0000
                                        R-squared   = 0.9836
                                        Root MSE    = .06281
```

```
-----------------------------------------------------------------------------
          |          Robust
     lna |    Coef.  Std. Err.    t   P>|t|   [95% Conf. Interval]
-------------+---------------------------------------------------------------
      T1 | -.2336338  .029075   -8.04  0.000   -.2942831  -.1729844
       G | -1.067536  .0218703  -48.81  0.000   -1.113157  -1.021915
  treat1 |  .2542121  .0399256    6.37  0.000   .1709287   .3374954
   _cons | 10.33905   .0204585  505.37  0.000   10.29638   10.38173
-----------------------------------------------------------------------------
```

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Forcible Rape Arrests in the US

The sex offense statistics do not reflect forcible rape arrests. Rape is considered much more heinous and is reported by the FBI in a separate category. We can analyze this data in the same fashion to account for phenomena amongst age groups over the same time series. According to the FBI, forcible rape, as defined in the Uniform Crime Reporting (UCR) Program, is the "carnal knowledge of a female forcibly and against her will. Assaults and attempts to commit rape by force or threat of force are also included; however, statutory rape (without force) and other sex offenses are excluded." Below is a figure of the arrests for forcible rape distributed by age group, and over a time series (note: data for 1998 were not reported by the FBI):

forcible rape arrests US, males by age group. source: FBI

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The pattern we see is similar to the distribution viewed in the sex offense graph. There appears to be a drop in arrests up until the late 90's, especially among the younger age groups, and then a flattening out afterward. Again we can show the percentage changes among different age groups:

Percentage change by age groups of forcible rape arrests in the USA

Age Group	%change 95-97	%change 99-2006
25–29	-23.15%	-5.38%
30–34	-23.82%	-24.85%
35–39	-16.53%	-18.05%
40–44	-8.39%	-4.51%
45–49	-20.10%	25.34%
50–54	-6.96%	18.49%
55–59	-18.87%	8.21%
60–64	-34.16%	-10.46%
65+	-30.90%	-3.87%
45-	-19.69%	-13.96%
45+	-19.01%	15.73%

From the percentage changes shown, we see a similar story to the one we saw with "sex offense arrests". From 1995-1997 there were decreases in arrests rates for every age group, not one having an increase. The largest decreases were among the oldest males, a 34% decrease from 60-64 year old men and a 31% decrease for men 65+. The average decrease among all men 45 and over was 19.7% and all men under 45 was a very similar decrease of 19.0%. From 1999-2006 the trends change, however. Men under 45 continue to show declining arrests, at 14% for the group as a whole. Men above 45 display a different trend, they actually show an increase for the group as a whole of 15.7%. The oldest age groups still show a decline but of much reduced strength compared to that seen from 95-97. Men 45-54 demonstrate a substantial increase in arrests. The only percentage increases are in the 45+ age groups; none being shown in the younger groups for this later time series.

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Applying the Difference in Difference method to this data set of forced rapes leads to qualitatively similar results.
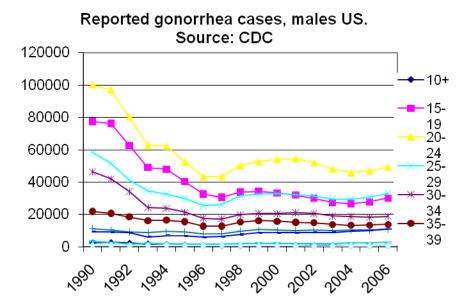
Section 3

Aggregate STD reported cases in the US (Gonorrhea, Chlamydia, and Syphilis.)

Up until the mid to late 90s there had been a significant decrease in reported cases of Gonorrhea and Syphilis. For whatever reason or combination of reasons, this decrease in STD rates leveled off and Gonorrhea and Syphilis rates began to increase. Chlamydia too, shows an increase in aggregate reported cases occurring in the mid to late 90's. The following data are aggregate reported cases in the US as reported by the Center for Disease Control (CDC).

Gonorrhea

According to the CDC, "Gonorrhea is a sexually transmitted disease (STD). Gonorrhea is caused by *Neisseria gonorrhoeae*, a bacterium that can grow and multiply easily in the warm, moist areas of the reproductive tract, including the cervix (opening to the womb), uterus (womb), and fallopian tubes (egg canals) in women, and in the urethra (urine canal) in women and men. The bacterium can also grow in the mouth, throat, eyes, and anus." The following graph depicts aggregate reported cases of Gonorrhea in the US from 1990-2006:

Reported gonorrhea cases, males US.
Source: CDC

We clearly see the dramatic decrease in reported cases beginning in 1990 and ending around 1997, followed by an increase among specific age groups. Once again we calculate the percentage changes to obtain a more detailed depiction of changes after normalizing for differences in quantity:

Percentage change of Gonorrhea of male by age groups in the USA

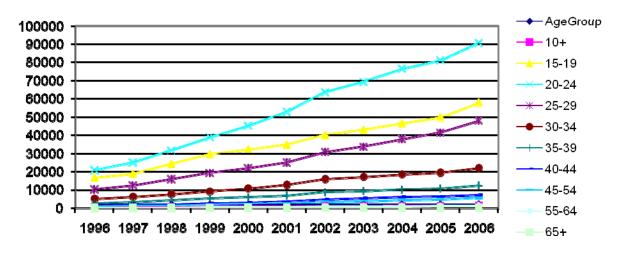| Age	%change 90-98	%change 98-06
14-	-67.01%	-15.96%
15-19	-56.45%	-10.83%
20-24	-49.76%	-1.94%
25-29	-46.45%	4.99%
30-34	-57.28%	-4.74%
35-39	-30.54%	-9.38%
40-44	-14.55%	10.20%
45-54	-18.39%	45.79%
55-64	-44.10%	41.94%
65+	-16.44%	-24.00%
total	**-48.35%**	**-0.43%**
44-	**-49.43%**	**-2.85%**
45+	**-24.59%**	**39.32%**

When we investigate the percentage changes from 1990-1998 we find the obvious decrease that we visibly see in the graphs. In the 1998-2006 time series we find some, but small changes in all age groups under 40. The 45-54 and 55-64 age groups, however, show significant changes. These age groups showed staggering percentage increases of 45.7% and 41.9%. The 55-64 age groups, in particular, had a 45% decrease in reported cases from 1990-1998, following the trend of the aggregate. However, this age group had an abnormally large increase in the years following, from 1998-2006.

Chlamydia

According to the CDC, Chlamydia is, "is a common sexually transmitted disease (STD) caused by the bacterium, *Chlamydia trachomatis*, which can damage a woman's reproductive organs. Even though symptoms of chlamydia are usually mild or absent, serious complications that cause irreversible damage, including infertility, can occur "silently" before a woman ever recognizes a problem. Chlamydia also can cause

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discharge from the penis of an infected man. The graph below depicts aggregate newly reported cases from 1996-2006:

Reported Chlamydia cases, males US. source: CDC

The graph above shows a steady increase for all age groups beginning at the first available data set in 1996. Again, we can show percentage changes from 1998-2006 as shown below:
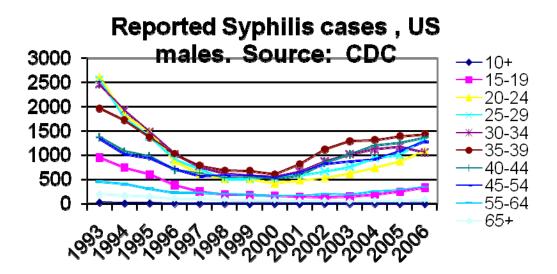
Percentage change of Chlamydia of male by age groups in the USA

Age Group	%change 96-98	%change 98-06
10+	35.01%	99.19%
15-19	44.32%	138.10%
20-24	51.04%	186.57%
25-29	53.28%	201.11%
30-34	48.98%	185.44%
35-39	66.62%	184.27%
40-44	59.64%	256.33%
45-54	43.01%	322.39%
55-64	28.69%	320.33%
65+	115.79%	62.60%
Total	49.36%	177.63%
44-	50.06%	176.44%
45+	46.82%	288.26%

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The percentage changes from 98-06 are positive for all age groups. Once again, however, we see the largest increase among three of the oldest age groups. Age group 40-44 shows an increase of 256%, age group 45-54 shows an increase of 322% and age group 55-64 shows an increase of 320%.

Syphilis

The last STD we consider is Syphilis. It should be noted that the values for newly reported Syphilis cases are relatively small and could make any sort of economic/statistical analysis unreliable. According to the CDC, "Syphilis is a sexually transmitted disease (STD) caused by the bacterium *Treponema pallidum*. It has often been called "the great imitator" because so many of the signs and symptoms are indistinguishable from those of other diseases. Syphilis is passed from person to person through direct contact with a syphilis sore. Sores occur mainly on the external genitals, vagina, anus, or in the rectum. Sores also can occur on the lips and in the mouth. Transmission of the organism occurs during vaginal, anal, or oral sex..." The graph below depicts aggregate newly reported cases in the US from 1993-2006:

Reported Syphilis cases, US males. Source: CDC

This graph again shows the dramatic drop in reported cases followed by a substantial increase. Again, we can show the percentage changes, here from 1993-1998 and 1998-2006.

Percentage change of Syphilis of male by age groups in the USA

Age group	%change 93-98	%change 98-06
10+	-79.17%	-60.00%
15-19	-79.79%	72.02%
20-24	-80.45%	112.57%
25-29	-80.16%	162.60%
30-34	-74.58%	69.01%
35-39	-65.24%	108.93%
40-44	-61.21%	155.91%
45-54	-56.78%	121.66%
55-64	-57.55%	75.26%
65+	-56.12%	-8.14%
Total	-71.90%	111.77%
40-	-76.12%	107.41%
40+	-58.66%	120.29%

The percentage decrease and following increase for Syphilis appears to be more even spread throughout age groups than the other age groups.

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Section 4: Reasons for data phenomena:

In the USA, the prevalence of STDs increased until the early nineties and then declined. But recently, STD incidences are rebounding, particularly among older men. Similarly, since the end nineties, the U.S. experienced an over-proportional increase in sexual related crimes among older male. What is the cause or are the causes for these findings? The answer to this question is not as easy as it may seem as many other explanations could be thought off.

One explanation might be alterations in reporting frequencies. This meaning the idea that, when concerning STD's, reported cases fluctuate depending on certain social circumstances. One being that people were more comfortable in certain years to report sexual problems than they were in others. Or perhaps that doctors were more prone to diagnosing STD's in certain years than in others. This is a valid argument. The question, however, is, that if certain social norms were prevalent preventing STD reporting or diagnosing, shouldn't both of these occurrences take place between all age groups? The dramatic decrease (in the early nineties) and following increase in aggregate Gonorrhea and Syphilis rates may account for these diagnosing or reporting hypothesis; but they fail when we differentiate by age groups. Another hypothesis is that older men requiring Viagra more freely and frequently talk to their doctor about sexual transmitted diseases then in the pre-Viagra regime. However, given the steady continuous increase in STDs for the elderly (and not a kink in the data), the hypothesis that the same rate of STDs existed prior to the 1998 launch (as compared to after the launch, only that after the launch it got reported) cannot be strongly concluded either.

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Another factor that may have played a role in the changes in reported STD cases, is the release of HIV antiviral treatments. In 1987, the first effective AIDS/HIV treatment, Retrovir, was approved by the FDA and released for treatment. From 1991-1994 three additional HIV/AIDS treatments were approved and released but prescription drug use for the HIV/AIDS treatments actually decreased over this time period, showing the ineffectiveness of the treatment. Then, from 1995-1998, Epivir and three protease inhibitors (PI) were approved by the FDA. These drugs would prove to be the most successful treatment thus far. There have been other releases since but the most drastic effect on treatment levels and mortality rates have come from the release of Epivir and the three PI's (Duggan and Evans, 2005). The release of Epivir/PI spawned the use of highly active antiretroviral therapy (HAART), which is the simultaneous use of two or more Antiretrovirals (ARVs) to treat HIV. According to the CDC, the mortality rate for individuals with AIDS fell by seventy percent between 1995-1998.

This release of the more efficient antiviral HIV/AIDS treatment does not exactly coincide with the surge in STD rates observed in the above data. It could be argued, however, that this treatment eased peoples concerns about HIV contraction and increased unsafe sex practices. This train of thought could account for some or all of the increase in reported cases of STD's. Once again, however, this explanation alone does not offer reasons for the specific increase in older male age groups if sexual practices (i.e. condom use) do not differ between age groups. Condom usage rates play a role in the number of reported STD cases. If, compared to younger male age groups, older people use condoms less frequently as a direct reaction to the HAART option, then the antiviral treatment can

partially explain the uptake of the STD cases.[4] Unfortunately, as of today, no reliable data could be found that condom usage rates differ among age groups over time (all studies I am aware of investigate condom usage by the youth and adolescents, but not for the elderly). Elderly men also may not have the extensive sexual education that has been propagated over the last few decades.

How does this discussion apply to the sex offense and forcible rape arrests data, which had substantial increases in rates among older male age groups after 1998? Plausible reasons as stated above for offering alternative answers for the increase in STD's do not hold for these sex offenses as condom usage and HIV/AIDS treatment do not have any clear correlation from initial intuition. The concept that STD cases may fluctuate depending on the socially acceptable environment at the time, does not hold relevance for the supply of sex crimes. Surely, men are not turning themselves in for indecent exposure, adultery or forcible rape because they feel their community is more accepting of the circumstances. Could there be a crackdown on sex offense arrests and forcible rape among the law enforcement community? This is plausible. But once again, an increase in law enforcement efforts into sex crimes does not account for the phenomena in our findings unless that increase was specifically targeted at a cohort of older men, which seems unlikely at best. On the other hand, since sexual activity of older people became less of a taboo, the feelings of shame by the victims could have declined, leading to increase filings of reports and finally to arrests of actually committed sex crimes. In this sense the launch of Viagra may have reduced the psychological costs of the victims

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[4] See also Palmer (2003).

to sue against the offender. On the other hand, the increased public media report about sexually active elderly men, may have spurred an increase in desire and sexual thoughts, which (when not naturally satisfied) may have led to the increase of sexual related crimes. Which of these two factors (increase of the number of accusations vs. actual increase in crimes committed) is responsible to explain the change in the crime reports (and in what proportion) cannot finally be answered here, but in either case, it stands that for both of the hypothesis the public media attention about Viagra did seem to play a key role here.

Mechanism of increased desire:

As Viagra is targeted to older men we hypothesize that men in the age group of 45 and older might experience a revival of "desire" and in particular that this could lead to an increased supply of older sexually active men. First, Viagra is increasing the sexual functioning, but the active component of Viagra (Sildenafil) does not by itself stimulate sexual desire. The increased desire to become sexual active might have come more due to the effect that the men know that they can still be functioning. (NYT article cite reborn). Furthermore the public media attention of almost daily articles in the newspapers and the small talk about it could have lead to an atmosphere generating more active sexual thoughts and desire.

Section 5: Conclusion:

Lifestyle drugs play an increasing role in modern society; yet their socio-economic consequences are not well understood quantitatively. This paper attempts to shed light on some of the potential risky behaviors associated with the consumption of life style drugs. As health related costs have increased dramatically and the USA and Europe are rapidly aging societies, the well-being of older people is of recent public and economic concern (for example see Vaupel, 1998).

In this paper we focus on the release of Viagra in April of 1998 if it could potentially have had socio-economic impacts on society. With increased sexual drive come numerous effects, both desirable and undesirable. STD's may actually not be a deterrent for men who want to become sexually active again. These "side effects" may be worth for many men debating the use of erectile dysfunction treatment. For others, they may not take this possibility into account and find themselves in a situation they wish they would not have been.

The increase in sex offense and forcible rape arrests are more serious "side effects" that we hypothesized may be a result of the release of Viagra. Giving men back the ability to act on their sexual impulses may be harmful. It is difficult to make direct causal statements between the blue pill and increased sex offense and forcible rape arrests. But: What other explanation could there be? This paper discusses some alternative hypothesis, including the changes in medicine treatments for HIV.

Future Research

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Further research include the questions: Do family age structures change? Do reproduction rates increase among older men? Does the enhanced sexual functioning of older men lead to increased marriages or divorce rates? Does the Viagra boom affect tourism, in particular to areas where prostitution is relatively inexpensive? To statistically identify the effects, in the future we plan to make use of the (a) differences in health insurance policies between US States and (b) cross-country variation in launching dates of Viagra. For example, whereas Viagra was available in the USA in April 1998, the launching date in Japan and Canada was Spring 1999 and in China Viagra was not launched until Summer 2000. For the time period of 1990 to 2005, data was collected for the US and 25 additional countries tracking sales of ED medication, STD and sexual assaults, stratified by socio-economic characteristics depending on availability.

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