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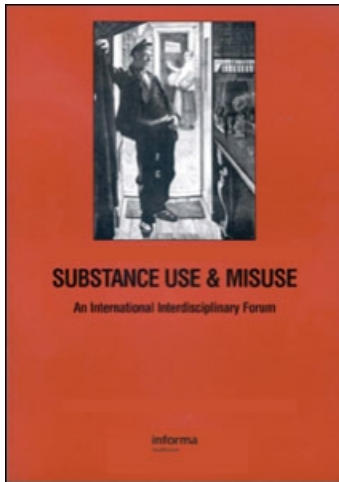
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Drug Users' Participation in a Free Hepatitis B Vaccination Program: Demographic, Behavioral, and Social-Cognitive Determinants

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Harm Reduction

Drug Users' Participation in a Free Hepatitis B Vaccination Program: Demographic, Behavioral, and Social-Cognitive Determinants

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The present study was conducted as an evaluation of a two-year pilot program started in 1998 in the Netherlands to provide free hepatitis B vaccination targeted at drug users (DUs). In order to identify which demographic and social-cognitive factors predict vaccination uptake, written questionnaires were distributed in three pilot regions (Amsterdam, Tiel, and Maastricht) amongst all DUs that were invited to participate in the program during a 2-month period. Vaccination behavior 2 years later was anonymously and prospectively linked to the questionnaire data, which allowed us to investigate which factors predict vaccination behavior. Of the 207 DUs eligible for vaccination (i.e., who were not immune and/or had no current infection with the virus), 93 DUs had obtained vaccination in the 2 years following the questionnaire. More than half of them (N = 50) had completed the full program (3 injections). As possible predictors of vaccination uptake, the questionnaire included constructs of the Theory of Planned Behavior as well as of the Health Belief Model. Our results show that attitude toward obtaining hepatitis B vaccination was positively associated with intention toward obtaining hepatitis B vaccination. However, perceived behavioral control was found to be the only construct related to actual vaccination uptake. None of the demographic variables were related to vaccination uptake. Our findings suggest that future interventions aimed at increasing

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uptake of vaccination against hepatitis B in DUs should address DUs (perceived) control concerning this behavior. The study's limitations are noted.

Keywords Drug users; vaccination; hepatitis B, social-cognitive determinants; health behavior; prevention

Introduction

Hepatitis B is an infectious disease of the liver caused by the hepatitis B virus. It is directly transmitted through unsafe sex and blood contact. The hepatitis B virus is 50 to 100 times more contagious than HIV (WHO, 2000). Approximately 90% of adult infections resolve completely, leaving life-long immunity; 10% remain chronically infected. These latter patients have an increased risk for developing liver cirrhosis and liver cancer (WHO, 2000). A safe and effective vaccine against hepatitis B is available since 1982 (CDC, 1982) and consists of three injections. Hepatitis B is a serious global health problem with 2 billion people who have been infected, and more than 350 million chronically infected (WHO, 2000).

Drug users (DUs) are at risk for hepatitis B through unsafe injecting drug use as well as through unsafe sexual behavior. In Europe, 20 to 60% of DUs show markers of previous infection (EMCDDA, 2003). Sharing needles, but also sharing injection equipment like cottons, rinse water, cookers, mixers, as well as the sharing of drug solutions between two syringes (front-loading and back-loading) may carry a risk of transmitting blood-borne viruses like the hepatitis B (Koester, Booth, and Zhang, 1996). In the Netherlands, the percentage of injecting DUs who share needles seems to be declining. For example in Rotterdam, a city with many facilities for needle exchange programs, the percentage of injecting DUs that recently shared needles decreased from 18% in 1994 to 8% in 2002 (De Boer et al., 2004). Risky sexual behavior among DUs, however, remains prevalent through inconsistent condom use with casual and primary sexual partners (EMCDDA, 2001; Booth, Kwiatkowski, and Chitwood, 2000).

After the Health Council of the Netherlands advised the Dutch Ministry of Health to vaccinate risk groups for hepatitis B, in 1998, a targeted vaccination approach was directed at men who have sex with men, heterosexuals with multiple sex partners (i.e., sex workers), and DUs (Van Steenberg, 2002). The goal of this 2-year pilot program was to evaluate strategies to enhance recruitment for hepatitis B vaccination and improve compliance (Van Steenberg, 2002). It was coordinated by the Dutch Centre for Infectious Disease Control and financed by the Dutch Ministry of Health. The present study evaluates this pilot program. After the pilot program ended, the vaccination campaign was continued by the Netherlands association for community health services in 2002, and developed into a national campaign. The results of our study were taken into account in the development of their policy toward the vaccination of DUs against hepatitis B.

During the pilot program the hepatitis B vaccination was offered free of charge according to the 6-months schedule: at 0, 1, and 6 months. When receiving their first vaccination, participants were serologically tested for markers of previous hepatitis B infection. Those who were not positive for hepatitis B virus received their first dose and were urged to get their second and third dose after the 1st and 6th month in order to comply with the vaccination procedure. Seven municipal health services within the Netherlands were selected for free distribution of hepatitis B vaccines to be implemented. In all participating municipal health services' areas hepatitis B vaccination was promoted through flyers that explained local vaccination procedures in different languages in order to reach those who do not speak or read Dutch. Moreover, enhanced outreach was undertaken in four of the seven intervention

regions: Amsterdam, Tiel, Heerlen, and Maastricht. For DUs, enhanced outreach meant that vaccination was performed mainly at onsite locations, such as sites for methadone outlet, needle exchange, and homeless shelters. Our study was directed at measuring the effect of this outreaching approach.

Previous studies among DUs have reported completion rates of hepatitis B vaccination, varying from low completion rates (20%–31%; Des Jarlais et al., 2001; Christensen et al., 2004; Seal et al., 2003), to intermediate (41%–63%; Christensen et al., 2004; Lum et al., 2003; Ompad et al., 2004; McGregor, Marks, Hayward, Bell, and Slack, 2003; Van Houdt et al., 2006; Van Steenberghe, 2002), to high-compliance rates (66%–88%; Altice, Bruce, Walton, and Buitrago, 2005; Budd, Robertson, and Elton, 2004; Christensen et al., 2004; Des Jarlais et al., 2001; Lugoboni et al., 2004; Rogers and Lubman, 2005; Seal et al., 2003; Quaglio et al., 2002) depending on the use of different vaccination schedules, onsite vaccination possibilities, and the use of monetary incentives. However, only some of these studies identified social-demographic factors (age, ethnic background, and homelessness), and risk factors concerning drug use (i.e., injecting drug use) associated with vaccine completion (Altice et al., 2005; Lum et al., 2003; Ompad et al., 2004; Seal et al., 2003). Our study is the first to explain vaccination behavior of DUs in the light of constructs of the Theory of Planned Behavior (TPB), (Ajzen, 1991) and the Health Belief Model (HBM), (Rosenstock, 1965; Rosenstock, 1974). These theories have provided a useful theoretical framework to predict health behavior, such as self-breast examination, condom use, smoking cessation, and dietary change (Conner and Sparks, 1996; Sheeran and Abraham, 1996). Theory of Planned Behavior assumes that (health) behavior and health behavior change result from cognitive processes. The attitude toward a target behavior, combined with subjective norms regarding that behavior and perceived control with respect to conducting the behavior are expected to predict (motivation of) actual behavior. A person's attitude is defined as the subjective judgment of the target behavior: is it good, bad, sensible, or pleasant to obtain a hepatitis B vaccination? Subjective norms express the way the individual expects other important persons like family, friends, or partner to think about him performing the behavior. Perceived control is the conviction of the individual that he is or is not able to control his own behavior and that he can successfully perform this behavior.

The HBM is an eclectic model with perceived severity and perceived susceptibility of the health consequences that may result from not performing the target behavior, in this case obtaining vaccination, as key variables. According to the HBM a person who rates hepatitis B as a serious disease and assumes that his own chance of getting infected with this disease is high, is more likely to obtain hepatitis B vaccination, as compared to those who rate it as a less serious disease and/or those who assume that their own risk of getting infected with hepatitis B is low.

The results of our study can contribute to improve future campaigns directed at promoting vaccination (against hepatitis B) among DUs. Insight will be presented in the predictive value of social-demographic, risk-behavioral (sexual and drug-related), and social-cognitive determinants regarding hepatitis B vaccination behavior.

The main questions addressed in the present study are as follows:

1. Which percentage of the DUs that took part in this study had the intention to obtain hepatitis B vaccination, which part actually obtained vaccination, and which part shows vaccination completion?
2. Which (demographic, risk-behavioral, and social cognitive) determinants explain intention, vaccination uptake, and compliance with the full vaccination schedule among DUs?

Methods

Procedure

The present study was conducted as an evaluation of the hepatitis B vaccination pilot program. It took place in the regions in which the enhanced outreaching approach was used to invite DUs to participate in the vaccination program. A total of 379 DUs were recruited: 282 in Amsterdam, 13 in Tiel, and 64 in Maastricht; of 20 DUs information about the recruitment area is unavailable, because they did not fill in a zip code (those participants were later excluded from further analysis, see section “participants”).

Our recruitment procedure was equal to that in the pilot program. Drug Users were recruited by health professionals at drug-assistance agencies, at sites for methadone outlet (in Amsterdam, Maastricht, and Tiel), needle-exchange sites (in Maastricht), and homeless shelters (in Maastricht). Written questionnaires were distributed by health professionals among DUs who visited these locations. After administration of the questionnaire, DUs were informed about the possibility to obtain free vaccination against hepatitis B. This procedure ensured us that respondents had not yet been informed about the possibility of getting a free vaccination at the time of filling in the questionnaire, and had thus not (yet) been influenced by information about the free hepatitis B campaign (through flyers or outreach activities).

During the 2-year pilot program hepatitis B vaccination was administered free of charge and available at all the locations described above. In methadone clinics screening and vaccination against hepatitis B was integrated in the usual routine, with vaccine offered to all those who knew the Dutch or English language, could provide a zip code, and planned at least 6 months residence in the area. If the DUs showed up for vaccination, they were registered with a unique personal identification code (which was also noted on the questionnaire). This enabled us to prospectively link the determinants as measured in this study to actual vaccination behavior. Informed consent for this procedure was obtained. The implications of collecting data from individuals who are not likely to benefit directly from their participation in our study were taken into account (Kleinig and Einstein, 2006).

Measurement

The written questionnaire that was used in our study contained several social-demographic variables as well as variables related to risk behavior such as sexual behavior and drug intake, variables that measured vaccination uptake and infection, and social-cognitive constructs of the HBM and TPB.

Operationalisation of the Social-Demographic and Risk-Behavioral Factors. Table 1 shows the measurement of the social-demographic and risk-behavioral factors.

Operationalisation of Hepatitis B Infection and Vaccination. Infection with the hepatitis B virus was detected by self-report (Table 2). In addition, DUs who accepted the offer of vaccination had a blood sample taken for hepatitis B. If DUs were (ever) infected with the virus, the hepatitis B test showed markers of previous infection. The questions that are shown in Table 2 and the results of the blood sample were used in our study to select those participants that were eligible to obtain hepatitis B vaccination.

Table 1
Operationalization of social-demographic, drug use and sexual behavior factors

Variable	Question	Answer
Social-demographic factors		
Gender	“What is your gender?”	Male, female
Religion	“What is your religion?”
Education	“What is the highest educational degree that you have obtained?”	I have not finished any school (also not primary school), . . . , university
Ethnicity	“What is your place of birth?”
Age	“How old are you?”	. . . years
Drug use behavior		
Drug use	“In general, how many times did you use the following drugs: heroin, cocaine, speedballs, speed?”	Never; less than 1 time per month; a few times per month; a few times per week; (almost) daily
Injecting drug use	“Do you (occasionally) inject drugs?”	No, yes
Sexual behavior		
Steady partner	“Do you have a steady partner?”	No, yes
No. of sex partners	“How many different sex partners did you have in the past six months, do you think?”	About . . . sex partners
Being paid for sex	“Have you ever been paid for sex?”	Never, sometimes, regularly, often, always
Having paid for sex	“Have you ever paid for sex?”	Never, sometimes, regularly, often, always

Operationalisation of the Social-Cognitive Constructs. Table 3 shows how the social-cognitive factors were operationalised, the possible scores of the answers, and more information about their internal consistency.

Participants. Drug Users were defined as frequent users of illicit drugs (i.e., heroin, cocaine, and/or amphetamines). Although the use of other substances, such as ecstasy, is also related to unprotected sex (Choi et al., 2005), this study is limited to the goal population of the pilot program.

Table 2
Operationalization of variables concerning hepatitis B infection and vaccination

Infection with hepatitis B	“Did you ever get infected with hepatitis B?”	No, yes
Vaccination against hepatitis B	“Did you ever obtain hepatitis B vaccination?”	No, yes

Table 3
Operationalization of social-cognitive factors of hepatitis B vaccination behavior

Construct	Question	Answer	Internal consistency
Perceived severity	“How serious would you find it to be infected with hepatitis B?”	1–7 (not serious, very serious)	
Perceived susceptibility	“What is the probability of you getting infected with hepatitis B within the next 6 months?”	1–7 (very low, very high)	
Perceived behavioral control	“How hard is it for you to comply with the vaccination procedure (receiving 3 shots)?”	1–7 (difficult, easy)	Cronbach’s alpha for these three items was .66
	“Do you think you are capable of finishing the vaccination according to the procedure?”	1–7 (certainly, not certainly, yes)	
	“Are there any aspects of your lifestyle that make it harder for you to comply with the vaccination procedure?”	1–7 (certainly, not certainly, yes)	
Attitude	“What do you think about getting vaccinated against hepatitis B within the next 6 months?”	1–7 (unimportant, important)	Cronbach’s alpha for this scale was .83
		1–7 (bad, good) 1–7 (unwise, wise)	
Intention	“If it is free of charge, are you planning to get vaccinated against hepatitis B within the next 6 months?”	1–7 (certainly not, certainly yes)	The Pearson correlation between the items, $r = .60$
	“What is the probability that you will get vaccinated against hepatitis B in the next 6 months, if it is free of charge?”	1–7 (low, high)	

A total of 379 DUs returned the questionnaire (response rate 55.5%). Forty-seven respondents were omitted from the analyses because of insufficient data (19 had invalid information on drug use, and 28 did not fill in an identification code in the questionnaire). Analyses (*t*-tests) and Chi-square tests comparing participants who did not provide an identification code with those who did show that DUs who did not provide a code were more likely to describe themselves as religious (Chi-square (1) = 4.39, $p = .036$,

two-tailed) as compared to those who did provide the zip code, but that there was no significant difference in the other variables that are shown in Table 1 between the two groups.

Furthermore, 125 respondents were excluded as ineligible for vaccination on the following grounds: 29 reported previous vaccination, 76 reported previous infection, and 20 tested positive for hepatitis B markers. The remaining 207 respondents were included in the analyses.

Statistical Analyses. Associations between demographic and behavioral variables (such as drug use) and the dependent variables were analyzed using univariate statistics such as the Chi-square test and t-test. The demographic and behavioral variables with a *p*-value below .1 and all social-cognitive variables were included in multivariate regression analyses with intention to obtain vaccination, vaccination uptake, and compliance with the full vaccination schedule as the dependent variable. A *p*-value of .05 was considered significant.

Results

The majority of the 207 subjects in our sample were males (79.4%), with a mean age of 38.5 years ($SD = 7.2$). Participants had a low educational level, 31.8% having only finished primary school or no education at all. The majority lived in Amsterdam (83.2%) and had Dutch nationality (59.7%). Most DUs used heroin and/or cocaine. Daily heroin use was reported by 47.9%; 37.6% used cocaine every day; and 19.2% injected drugs. More than half of the DUs did not have a steady partner (64.5%). Of the female DUs, 25.0% had been working as a prostitute and got paid for sex, compared to 3.6% of male DUs. Of men, 22.9% had paid for sex themselves, but almost none on a regular basis (21.8% of DUs answered "sometimes"). Of the 39 men who report to have paid for sex, 18 did not have any sex partners in the preceding 4 months of entering the study. Modus of number of sex partners (for both male and female DUs) in the preceding 6 months is 0, the median is 1, the mean is 1.7, and the range is till 40. For further details, see Table 4.

On average, DUs who were eligible for vaccination had a high intention to obtain hepatitis B vaccination at the start of the pilot program (DUs scored at a scale from 1 to 7 a mean of 5.32, $SD = 1.86$, $N = 207$, see Table 5). By the end of the program in late 2000, 93 (44.9%) of 207 DUs had been vaccinated. More than half of them ($N = 50$) completed the full program and received three injections; 14 DUs had received two injections (14%); and 29 DUs had received only one injection (31%). More than half of the DUs ($N = 114$) obtained no vaccination.

To understand DUs' motivation for obtaining vaccination, mean scores and standard deviations for factors of the TPB and HBM were calculated (Table 5). Mean scores show that DUs think that their chances of becoming infected with the hepatitis B virus is low, but that they would find it very serious if they got infected with the virus. Attitude, perceived behavioral control, and intention toward vaccination are high.

Predicting Intention to Obtain Vaccination

Next we examined the association between social-demographic, behavioral, and social-cognitive determinants of intention to obtain a hepatitis B vaccination (Table 6). Those who identified with a religion had a higher intention to obtain vaccination. Attitude was positively associated with the intention to obtain vaccination. This means that DUs who have

Table 4
Selected background characteristics of participants ($N = 207$)

Background characteristics	Percentage/mean score (<i>SD</i>)
Social demographic	
Gender	
Men	79.4
Religion	
Yes	62.1
Education	
< / = Primary school	31.8
Ethnicity	
Dutch	59.7
Age	
Mean	38.5 (7.2)
Drug use behavior	
Heroin use	
Daily	47.9
Cocaine use	
Daily	37.6
Amphetamine use	
> / = Sometimes	7.1
Speedballs	
> / = Sometimes	13.2
Injecting drug use	
Yes	19.2
Sexual behavior	
Steady partner	
Yes	35.5
No. of sex partners	
Mean	1.7 (4.0)
Being paid for sex	
Yes	8.0
Having paid for sex	
Yes	18.7

Table 5
Mean scores (*SD*) and range for social-cognitive factors of vaccination behavior ($N = 206$)

	Mean (<i>SD</i>)	Range
Perceived severity	6.27 (1.45)	1–7
Perceived susceptibility	2.23 (1.76)	1–7
Perceived behavioral control	5.66 (1.37)	1–7
Attitude	6.31 (1.25)	1–7
Intention	5.32 (1.86)	1–7

Table 6
Summary of linear regression analysis for variables predicting intention to obtain hepatitis B vaccination ($N = 206$)¹

	<i>B</i>	<i>SE B</i>	β	<i>P</i> -value
Step 1				
Ethnicity	-0.06	0.31	-0.02	0.85
Religion	0.93	0.31	0.24	0.003
Amphetamine use	-0.85	0.54	-.12	0.12
Step 2				
Ethnicity	-0.32	0.28	-0.08	0.26
Religion	0.68	0.28	0.18	0.02
Amphetamine use	-0.25	0.50	-0.03	0.61
Attitude	0.66	0.10	0.43	0.000
Perceived behavioral control	0.07	0.09	0.05	0.45
Step 3				
Ethnicity	-0.27	0.28	-0.07	0.34
Religion	0.65	0.28	0.17	0.02
Amphetamine use	-0.19	0.49	-0.03	0.70
Attitude	0.60	0.10	0.39	0.000
Perceived behavioral control	0.09	0.09	0.07	0.31
Perceived susceptibility	0.13	0.07	0.12	0.07
Perceived severity	0.15	0.09	0.11	0.09

¹Note: $R^2 = .08$ for step 1, $.27$ for step 2 ($p = .000$), and $.29$ for step 3 ($p = .07$).

a positive attitude toward vaccination have a higher intention to obtain vaccination against hepatitis B. Perceived severity and perceived susceptibility were marginally significant predictors of intention to obtain vaccination.

Predicting Uptake of Vaccination (None versus 1, 2, 3 Vaccinations)

Univariate analyses show no significant differences between vaccinated and unvaccinated DUs for the variables that are shown in Table 4.

Our results show that only perceived behavioral control was a significant predictor of vaccination uptake in a logistic regression analyses with vaccination (1, 2, or 3) versus no vaccination as a dependent variable. Attitude, intention, perceived susceptibility, and perceived severity were not. In our model, 7% of the variance in vaccination uptake is explained (Table 7).

Predicting Compliance with Full Vaccination (1, 2 versus 3 Vaccinations)

Drug Users who complied with the full vaccination schedule did not differ from those who did not with regard to gender, age, having a steady partner, or number of sex partners. Neither were behavioral determinants concerning drug use, i.e., the frequency of using heroin, speedballs, or speed significantly different between DUs who did comply and those

Table 7
Summary of logistic regression analysis for variables predicting vaccination uptake ($N = 206$)¹

	OR	95% CI
Step 1		
Attitude	0.97	0.76–1.23
Perceived behavioral control	1.34	1.07–1.67
Step 2		
Attitude	0.92	0.70–1.20
Perceived behavioral control	1.33	1.07–1.67
Intention	1.07	0.91–1.28
Step 3		
Attitude	0.91	0.69–1.19
Perceived behavioral control	1.34	1.06–1.67
Intention	1.08	0.91–1.29
Perceived susceptibility	0.91	0.79–1.08
Perceived severity	1.16	0.93–1.44

¹Note: Nagelkerke R-square = .05 for step 1; Nagelkerke R-square = .05 for step 2 ($p = .40$); Nagelkerke R-square = .07 for step 3 ($p = .17$). Hosmer Lemeshow Chi-square = 9.95, $p = .27$.

Table 8
Summary of logistic regression analysis for variables predicting compliance with the vaccination schedule (obtaining 3 hepatitis B vaccinations) ($N = 92$)¹

	OR	95% CI
Step 1		
Injecting drug use	0.33	0.12–0.91
Step 2		
Injecting drug use	0.31	0.11–0.88
Attitude	1.23	0.86–1.78
Perceived behavioral control	0.80	0.55–1.15
Step 3		
Injecting drug use	0.30	0.11–0.86
Attitude	1.31	0.83–2.04
Perceived behavioral control	0.80	0.55–1.16
Intention	0.94	0.71–1.24
Step 4		
Injecting drug use	0.34	0.12–0.98
Attitude	1.20	0.74–1.95
Perceived behavioral control	0.79	0.54–1.16
Intention	0.93	0.70–1.24
Perceived susceptibility	0.91	0.68–1.21
Perceived severity	1.37	0.91–2.06

¹Note: Nagelkerke R-square = .07 for step 1; Nagelkerke R-square = .10 for step 2 ($p = .27$); Nagelkerke R-square = .11 for step 3 ($p = .66$); Nagelkerke R-square = .15 for step 4 ($p = .21$). Hosmer Lemeshow Chi-square = 8.80, $p = .36$.

who did not. However, injecting drug use was found to be univariately (Chi-square (1) = 4.55, $p = .03$) as well as multivariately related to vaccine completion. None of the following social-cognitive factors such as attitude, intention, perceived susceptibility, and perceived severity could predict compliance with the vaccination procedure (Table 8).

Discussion

Our prospective study shows that most DUs who participated in the survey had not yet been vaccinated against hepatitis B and had not been infected with hepatitis B. The participants in our study had a high intention to obtain vaccination at the start of the pilot program. After 2 years, 93 of the 207 DUs who were eligible for vaccination had been vaccinated. By receiving three injections, more than half of them completed the program.

Our results showed that DUs described themselves as being religious had a higher intention to obtain vaccination within the next 6 months. In addition, those who had a positive attitude toward obtaining vaccination had a higher intention to obtain vaccination against hepatitis B. Perceived severity and perceived susceptibility to be infected with hepatitis B were marginally related to intention to obtain hepatitis B vaccination. Perceived behavioral control was the only social-cognitive construct that was related to vaccination uptake, illustrating that DUs who found themselves more capable of receiving a vaccination were more likely to obtain vaccination later in time. Injecting drug use was the only variable significantly related to vaccine completion in the multivariate logistic regression analysis.

Among men who have sex with men more is known about social-cognitive factors that influence vaccination behavior. De Wit, Vet, Schutten, and Van Steenberg (2005) reported that in this heterogeneous group perceived threat of hepatitis B infection was related to vaccination behavior against hepatitis B. Rhodes, Grimley, and Hergenrather (2003) showed that men with increased readiness to complete the 3-dose series of the hepatitis B vaccine perceived lower practical barriers and greater benefits to vaccination, perceived higher severity of infection, and had a higher self-efficacy to complete the vaccine series. Although our study found that social-demographic variables, perceived severity, perceived susceptibility, and attitude were not significantly related to vaccination behavior, the latter was associated with intention. We did not find a relation between intention and behavior. Others have paid attention to the great discrepancy between behavioral intentions and actual behavior in social-cognitive models (Orbell and Sheeran, 1998; Abraham et al., 1999; Sheeran and Abraham, 2003). The weak relationship between intention and behavior is largely due to people having good intentions, but failing to act on them (Orbell and Sheeran, 1998; Gollwitzer, 1999). This discrepancy has been labeled as the "intention-behavior gap." Sheeran (2002) showed in a meta-analysis that 47% of the participants with positive behavioral intentions failed to perform the goal behavior. Contrary to the general population, most DUs live in an environment in which the primary necessities of life play a more important role than obtaining a hepatitis B vaccination. Although DUs have a positive attitude and intention toward obtaining vaccination, different barriers may play a role in their ability to obtain vaccination. Such barriers may include finding a place to sleep, craving for drugs, or a period spent in jail; such activities are urgent and time consuming, leaving little room for planning to obtain a hepatitis B vaccination. The vaccination behavior of DUs should be explored further by investigating the benefits and barriers to obtain vaccination—two constructs of the HBM. Benefits and barriers may also influence compliance, since none of the demographic and social-cognitive factors as described in the present study were able to predict compliance with the vaccination schedule. Des Jarlais et al. (2001) and Seal et al. (2003) showed that among DUs, financial incentives and convenient location greatly increased adherence to hepatitis B vaccination.

Although Quaglio et al. (2002) showed among injecting DUs who participated in a large cohort study, suboptimal vaccine responses when short-vaccine protocols are used (0, 1, 2 months), different studies have indicated the use of accelerated vaccination schedules (3-week or 2-month schedule) to be an acceptable alternative of the routine 6-month schedule, because of a high and fast vaccine completion (Budd et al., 2004; Christensen et al., 2004; Wright, Campbell, and Tompkins, 2002). It should however be kept in mind that booster vaccinations are recommended after 12 months to ensure long-lasting immunity if accelerated vaccination schedules are being used (Bock, 2003; Budd et al., 2004; Nothdurft et al., 2002). The same barriers that influence vaccination completion rates at the 6-month schedule could influence the uptake of the booster vaccination.

Completion rates were similar to those in earlier studies focusing on hepatitis B adherence rates using the 6-month schedule among DUs, varying from 41% to 83% (Altice et al., 2005; Des Jarlais et al., 2001; Lum et al., 2003; Ompad et al., 2004; Seal et al., 2003; Van Houdt et al., 2006; Van Steenberg, 2002), and in concordance with the fact that within the Dutch pilot program nearly all vaccinations were received onsite, and no monetary incentive was given. Lugoboni et al. (2004) showed that in Italy 88% of 320 DUs had received three or more vaccinations; however, in that cohort study, participants were studied over 15 years, and were followed up every 4 months. The extensive screening and the longer period that free vaccination was available in that study may explain the higher compliance among Italian DUs.

Study's Limitations

Our study has several limitations that may influence the results. First, although the registration of the codes in order to be able to connect the questionnaire data to the vaccination behavior was done with great care, it is possible that in some cases the registration system failed. Consequently, the number of DUs that obtained vaccination may actually be greater than the 93 (44.9%) that were reported here. A second limitation is that some of the respondents did not provide an identification code. Those who did not provide the code were more likely to be religious. It is not clear whether or how this selection bias influenced our results. Third, compliance was not associated with any of the demographic, behavioral, and social-cognitive determinants as measured in this study. This could be partly due to insufficient power, since only 50 participants finished the full vaccination schedule. Fourth, since DUs are a so-called hidden population (Watters and Biernacki, 1989) it is extremely difficult to recruit a representative sample. Our study is a convenience sample, which is most likely not fully representative of the total DU population. However, the sample does reflect the population that was targeted in the pilot project, because the same recruitment procedures were used for both the study and the pilot program. Additional study limitations include an inadequate description of the sample and their adaptation skills and abilities. In our study endogenous factors that influence vaccination behavior, i.e., social-cognitive factors, are explored. Since exogenous factors, i.e., the frequency of visiting drug-assistance agencies are not collected as part of this study we can not draw conclusions about their interaction with social-cognitive factors.

Conclusion

Our findings indicate that targeted free hepatitis B vaccination will increase the uptake of vaccination against hepatitis B for DUs. Almost half of the 207 DUs who were eligible for vaccination (i.e., who were not immune and/or had no current infection with the virus) got vaccinated against hepatitis B as a result of the pilot program, and over half of them

completed the full vaccination schedule. Our study is the first in which social-cognitive determinants were used to explain vaccination behavior against hepatitis B among DUs. Our advice for future health interventions directed at increasing uptake of vaccination against hepatitis B among DUs is to address perceived behavioral control, which we have demonstrated to have a significant effect on vaccination uptake. Our research findings might be useful for other vaccinations among DUs, for example vaccination against pneumococcus, the influenza vaccine, or a possible future HIV vaccination.

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RÉSUMÉ

La présente étude a été menée pour évaluer un programme pilote de deux années qui a commencé aux Pays-Bas en 1998, visant à vacciner gratuitement des toxicomanes contre l'hépatite B. Pour cerner les déterminants démographiques et sociocognitifs de la vaccination, des questionnaires par écrit ont été distribués dans trois régions pilotes (Amsterdam, Tiel et Maastricht) parmi tous les toxicomanes qui étaient invités à participer au programme pendant deux mois. Au bout de deux ans, le comportement en matière de vaccination a été comparé de manière anonyme et hypothétique aux résultats des questionnaires, ce qui nous a permis d'étudier les facteurs influençant le comportement en matière de vaccination. Sur les 207 toxicomanes éventuellement candidats à une vaccination (c'est-à-dire n'étant pas immunisés et/ou n'ayant pas été contaminés par le virus), 93 toxicomanes s'étaient fait vacciner dans les deux ans qui ont suivi le questionnaire. Plus de la moitié d'entre eux ($N = 50$) avait suivi le programme entier (3 injections). Le questionnaire comprenait des éléments de la Theory of Planned Behavior (*Théorie du comportement prévu*), ainsi que du Health Belief Model (*Modèle des croyances liées à la santé*) comme déterminants éventuels de la vaccination. Nos résultats montrent que l'attitude face à la vaccination contre l'hépatite B est associée positivement à l'intention de se faire vacciner contre l'hépatite B. Toutefois, la perception du contrôle comportemental s'est avéré être le seul élément lié à une vaccination effective. Aucun lien n'a pu être établi entre les facteurs démographiques et la vaccination. Nos résultats suggèrent que les actions futures visant à augmenter le taux de vaccination contre l'hépatite B parmi les toxicomanes doivent se concentrer sur le contrôle comportemental perçu chez les toxicomanes. Les limites de cette étude sont prises en considération.

Mots clés Toxicomanes, Vaccination, Hépatite B, éléments sociocognitifs; Comportement sanitaire, Prévention.

RESUMEN

El presente estudio se desarrolló como la evaluación de un programa piloto de dos años de duración, que comenzó en 1998 en los Países Bajos con el objetivo de vacunar gratis a drogadictos contra la hepatitis B. Para identificar los factores demográficos y socio-cognitivos que preceden a la puesta de la vacuna se entregaron cuestionarios durante dos meses en tres regiones piloto (Amsterdam, Tiel y Maastricht) a todos los drogadictos elegidos para

participar en este programa. Dos años después el comportamiento con respecto a la vacuna se relacionaba de manera anónima y hipotética con los datos del cuestionario, permitiéndonos investigar los factores previos al comportamiento con respecto a la vacuna. De los 207 drogadictos a los que se les administró la vacuna (es decir, que no eran inmunes y no estaban infectados por el virus), 93 consiguieron vacunarse dos años después del cuestionario. Más de la mitad de ellos ($N = 50$) finalizaron el programa completo (3 inyecciones). Como posibles elementos vaticinadores de la puesta de la vacuna, el cuestionario incluía constructos de la Theory of Planned Behavior (*Teoría del comportamiento planificado*), así como del Health Belief Model (*Modelo de creencias de salud*). Nuestros resultados demostraron que la actitud frente a la obtención de la vacuna contra la hepatitis B estaba positivamente asociada a la intención de obtener la vacuna contra la hepatitis B; sin embargo, la percepción de comportamiento controlado se descubrió como el único constructo relacionado con la puesta efectiva de la vacuna. Ninguna variable demográfica se relacionaba con ella. Nuestros descubrimientos sugieren que las intervenciones futuras enfocadas a aumentar la cobertura vacunal contra la hepatitis B en drogadictos deberían enfocarse al control del comportamiento percibido de los drogadictos. Se apuntan, pues, las limitaciones del estudio.

Palabras claves: drogadictos, vacuna, hepatitis B, determinantes socio-cognitivos, comportamiento médico, prevención.

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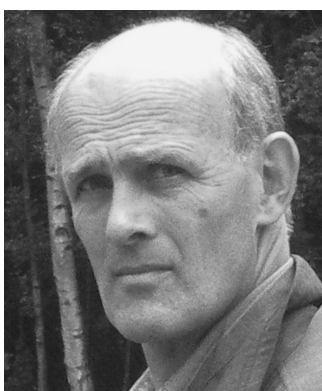


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Merel Schutten, M.Sc., is currently working as epidemiologist at the Municipal Health Service in Dordrecht, The Netherlands. She has worked on different health issues such as obtaining hepatitis B virus vaccine for risk groups, alcohol use at the workplace and in youth, and several projects to protect small children (0–4 years old), adolescents and the general population from all sorts of injuries. Her current research focuses on health issues among adolescents in the Dordrecht area.



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Glossary

Compliance. Finishing the hepatitis B vaccination schedule by receiving three or more vaccinations within 6 months.

Eligible for vaccination. In this study by eligible for vaccination we mean people who are not immune to hepatitis B (those who have not been infected with the virus nor have been fully vaccinated). They are qualified for hepatitis B vaccination.

Hepatitis B. It is a disease of the liver caused by the hepatitis B virus. The virus can cause lifelong infection, cirrhosis of the liver, liver cancer, liver failure, and death.

References

- Abraham, C., Sheeran, P., Norman, N., Conner, P., de Vries, N., Otten, W. (1999). When good intentions are not enough: modeling post-intention cognitive correlates of condom use. *Journal of Applied Social Psychology* 29:2591–2612.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes* 50:179–211.
- Altice, F. L., Bruce, R. D., Walton, M. R., Buitrago, M. I. (2005). Adherence to hepatitis B virus vaccination at syringe exchange sites. *Journal of Urban Health* 82(1):151–161. E pub March 3.
- Bock, H. L. (2003). Rapid hepatitis B immunization for the traveler: comparison of two accelerated schedules with a 2-month schedule. *BioDrugs* 17(Suppl 1):11–13.
- Booth, R. E., Kwiatkowski, C. F., Chitwood, D. D. (2000). Sex related HIV risk behaviors: differential risks among injection drug users, crack smokers, and injection drug users who smoke crack. *Drug and Alcohol Dependence* 58:219–226.

- Budd, J., Robertson, R., Elton, R. (2004). Hepatitis B vaccination and injecting drug users. *British Journal of General Practice* 54:444–447.
- Centers for Diseases Control and Prevention (1982). Inactivated hepatitis B vaccine. *Morbidity and Mortality Weekly Report* 31:317–318.
- Christensen, P. B., Fisker, N., Krarup, H. B., Liebert, E., Jaroslavtsev, N., Christensen, K., Gorgsen, J. (2004). Hepatitis B vaccination in prison with a 3-week schedule is more efficient than the standard 6-month schedule. *Vaccine* 44:3897–3901.
- Choi, K. H., Operario, D., Gregorich, S. E., McFarland, W., MacKellar, D., Valleroy, L. (2005). Substance use, substance choice, and unprotected anal intercourse among young Asian American and Pacific Islander men who have sex with men. *AIDS Education and Prevention* 17(5):418–429.
- Connor, M., Sparks, P. (1996). The theory of planned behavior. In M. Conner & P. Norman (Eds.), *Predicting health behavior* (pp. 121–162). Buckingham, UK: Open University Press.
- De Boer, I. M., Op de Coul, E. L. M., Beuker, R. J., De Zwart, O., Al Taqatqa, W., Van de Laar, M. J. W. (2004). Trends in HIV prevalence and risk behaviour among injecting drug users in Rotterdam, 1994–2002. *Nederlands Tijdschrift voor Geneeskunde* 148(47):2325–2330.
- De Wit, J. B., Vet, R., Schutten, M., Van Steenberghe, J. (2005). Social-cognitive determinants of vaccination behavior against hepatitis B: an assessment among men who have sex with men. *Preventive Medicine* 40(6):795–802.
- Des Jarlais, D. C., Fisher, D. G., Newman, J. C., Trubatch, B. N., Yancovitz, M., Paone, D., Perlman, D. (2001). Providing hepatitis B vaccination to injection drug users: referral to health clinics vs on-site vaccination at a syringe exchange program. *American Journal of Public Health* 91(11):1791–1792.
- EMCDDA (2001). Workgroup review of qualitative research on the health risk associated with injecting drug use. Lisbon, Portugal: European Monitoring Centre for Drugs and Drug Addiction. Accessed March 11, 2004 from <http://qed.emcdda.eu.int>.
- EMCDDA (2003). The state of the drugs problem in the European Union and Norway. Lisbon, Portugal: European Monitoring Centre for Drugs and Drug Addiction. Retrieved January 19, 2006, from <http://www.emcdda.eu.int>.
- Gollwitzer, P. M. (1999). Implementation intentions. Strong effects of simple plans. *American Psychologist* 54:493–503.
- Kleinig, J., Einstein, S. (Eds.). (2006). Ethical challenges for intervening in drug use: policy, research and treatment issues. Huntsville, TX: OICJ.
- Koester, S., Booth, R., Zhang, E. (1996). The prevalence of additional injection-related HIV risk behaviors among injection drug users. *Journal of Acquired Immunodeficiency Syndrome and Human Retrovirology* 12:202–207.
- Lugoboni, F., Migliozi, S., Mezzelani, P., Pajusco, B., Ceravolo, R., Quaglio, G. (2004). Progressive decrease of hepatitis B in a cohort of drug users followed over a period of 15 years: the impact of anti-HBV vaccination. *Scandinavian Journal of Infectious Diseases* 36(2):131–133.
- Lum, P. J., Ochoa, K. C., Hahn, J. A., Page Shafer, K., Evans, J. L., Moss, A. R. (2003). Hepatitis B virus immunization among young injection drug users in San Francisco, Calif: the UFO Study. *American Journal of Public Health* 93(6):919–923.
- McGregor, J., Marks, P. J., Hayward, A., Bell, Y., Slack, R. C. B. (2003). Factors influencing hepatitis B vaccine uptake in injecting drug users. *Journal of Public Health* 25(2):165–170.
- Nothdurft, H. D., Dietrich, M., Zuckerman, J. N., Knobloch, J., Kern, P., Vollmar, J., Sanger, R. (2002). A new accelerated vaccination schedule for rapid protection against hepatitis A and B. *Vaccine* 20(7–8):1157–1162.
- Ompad, D. C., Galea, S., Wu, Y., Fuller, C. M., Latka, M., Koblin, B., Vlahov, D. (2004) Acceptance and completion of hepatitis B vaccination among drug users in New York City. *Communicable Disease and Public Health* 7(4):294–300.
- Orbell, S., Sheeran, P. (1998). 'Inclined abstainers': a problem for predicting health-related behaviour. *British Journal of Social Psychology* 37:151–165.

- Quaglio, G. L., Tamini, G., Lugoboni, F., Lechi, A., Venturini, L., Des Jarlais, D. C., Mezzelani, P. (2002). Compliance with hepatitis B vaccination in 1175 heroin users and risk factors associated with lack of vaccine response. *Addiction* 97:985–992.
- Rhodes, S. D., Grimley, D. M., Hergenrather, K. C. (2003). Integrating behavioral theory to understand hepatitis B vaccination among men who have sex with men. *American Journal of Health Behavior* 27(4):291–300.
- Rogers, N., Lubman, D. I. (2005). An accelerated hepatitis B vaccination schedule for young drug users. *Australian and New Zealand Journal of Public Health* 29:305–307.
- Rosenstock, I. M. (1965). Why people use health services. *Milbank Quarterly* 44:94–127.
- Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs* 2:1–8.
- Seal, K. H., Kral, A. H., Lorvick, J., McNeese, A., Gee, L., Edlin, B. R. (2003). A randomized controlled trial of monetary incentives vs. outreach to enhance adherence to the hepatitis B vaccine series among injection drug users. *Drug and Alcohol Dependence* 71(2):127–131.
- Sheeran, P., Abraham, C. (1996). The health belief model. In M. Conner & P. Norman (Eds.), *Predicting health behavior* (pp. 23–61). Buckingham, UK: Open University Press.
- Sheeran, P. (2002). Intention-behavior relations: a conceptual and empirical review. In W. Stroebe & M. Hewstone (Eds.), *European Review of Social Psychology* 12: (1–36).
- Sheeran, P., Abraham, C. (2003). Mediator of moderators: temporal stability of intention and the intention-behavior relation. *Personality and Social Psychology Bulletin* 12:1–30. Chichester, UK: Wiley.
- Van Houdt, R., Sonder, G. J. B., Dukers, N. H. T. M., Bovee, L. P. M. J., Van den Hoek, A., Coutinho, R. A., Bruisten, S. M. (2006). Impact of a targeted hepatitis B vaccination program in Amsterdam, The Netherlands. *Vaccine* 25(14):2698–2705.
- Van Steenberghe, J. E. (2002). Results of an enhanced-outreach programme of hepatitis B vaccination in the Netherlands (1998–2000) among men who have sex with men, hard drug users, sex workers and heterosexual persons with multiple partners. *Journal of Hepatology* 37(4):507–513.
- Watters, J. K., Biernacki, P. (1989). Targeted sampling: Options for the study of hidden populations. *Social Problems* 36:416–430.
- WHO (2000). *Hepatitis B fact sheet N° 204*. Geneva: World Health Organization. Retrieved February 15, 2006, from <http://www.who.int>.
- Wright, N. M. J., Campbell, T. L., Tompkins, C. N. E. (2002). Comparison of conventional and accelerated hepatitis B schedules for homeless drug users. *Communicable diseases and public health* 5(4):324–326.