



NAVAL
POSTGRADUATE
SCHOOL

MONTEREY, CALIFORNIA

THESIS

**THE DETERRENCE EFFECT OF THE
IMPLEMENTATION OF THE DEPARTMENT OF
DEFENSE'S DRUG PREVENTION POLICY AMONG
MILITARY PERSONNEL**

by

Ananias Meletiadis

March 2004

Thesis Advisor:
Second Reader:

Stephen L. Mehay
Elda Pema

Approved for public release; distribution is unlimited.

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE March 2004	3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE: Title (Mix case letters) The Deterrence Effect of the Implementation of the Department of Defense's Drug Prevention Policy Among Military Personnel			5. FUNDING NUMBERS	
6. AUTHOR Meletiadiis, Ananias				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			12b. DISTRIBUTION CODE	
13. ABSTRACT (maximum 200 words) <p>This thesis examines the magnitude of the deterrence effect associated with the implementation of the "zero tolerance" policy in the U.S. military in the early 1980s. The estimation of the deterrence effect is based on the estimation of linear probability models (LPM). A difference-in-difference estimator is obtained by comparing pre- and post-policy differences in drug use rates in the military and civilian sectors.</p> <p>The thesis uses data on drug participation drawn from the National Household Survey of Drug Abuse and the DoD Worldwide Health Survey. The study investigates the deterrence effect for the military as a whole, for each branch, for various age groups, and two different measures of drug participation.</p> <p>The results show that a significant deterrence effect appears to have been associated with the implementation of the "zero tolerance" and drug testing policy, especially for the past year drug participation rates. Additionally, there is evidence that individuals above 25 years old who are more educated and married have smaller drug participation rates than the rest of the population.</p>				
14. SUBJECT TERMS Deterrence Effect, Zero Tolerance, Difference-in-Difference Estimators, Prevention Policy			15. NUMBER OF PAGES 131	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL	

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited

**THE DETERRENCE EFFECT OF THE IMPLEMENTATION OF THE
DEPARTMENT OF DEFENSE'S DRUG PREVENTION POLICY AMONG
MILITARY PERSONNEL**

Ananias Meletiadis
Lieutenant Commander, Hellenic Navy
B.A., Hellenic Naval Academy, 1989

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

**NAVAL POSTGRADUATE SCHOOL
March 2004**

Author: Ananias Meletiadis

Approved by: Stephen L. Mehay
Thesis Advisor

Elda Pema
Second Reader

Douglas A. Brook, Ph. D.,
Dean, Graduate School of Business and Public Policy

THIS PAGE INTENTIONALLY LEFT BLANK

ABSTRACT

This thesis examines the magnitude of the deterrence effect associated with the implementation of the “zero tolerance” policy in the U.S. military in the early 1980s. The estimation of the deterrence effect is based on the estimation of linear probability models (LPM). A difference-in-difference estimator is obtained by comparing pre- and post-policy differences in drug use rates in the military and civilian sectors.

The thesis uses data on drug participation drawn from the National Household Survey of Drug Abuse and the DoD Worldwide Health Survey. The study investigates the deterrence effect for the military as a whole, for each branch, for various age groups, and two different measures of drug participation.

The results show that a significant deterrence effect appears to have been associated with the implementation of the “zero tolerance” and drug testing policy, especially for the past year drug participation rates. Additionally, there is evidence that individuals above 25 years old who are more educated and married have smaller drug participation rates than the rest of the population.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	ENVIRONMENT.....	1
B.	OBJECTIVES.....	2
C.	THE RESEARCH QUESTION.....	2
D.	DISCUSSION.....	3
E.	ORGANIZATION OF THE STUDY.....	4
II.	BACKGROUND.....	5
A.	DEPARTMENT OF DEFENSE DRUG TESTING POLICY.....	5
B.	U.S. ARMY DRUG TESTING POLICY.....	6
C.	DEPARTMENT OF THE NAVY DRUG TESTING POLICY.....	8
1.	U.S. Navy Drug Testing Policy.....	8
2.	U.S. Marine Corps Drug Testing Policy.....	10
D.	U.S. AIR FORCE DRUG TESTING POLICY.....	11
E.	POLICY COMPARISON.....	13
III.	LITERATURE REVIEW.....	15
IV.	THE DATA.....	23
A.	INTRODUCTION.....	23
B.	ANALYSIS OF THE NHSDA DATA.....	24
C.	ANALYSIS OF THE DODWWS DATA.....	29
D.	LIMITATIONS OF THE DATA.....	35
V.	ESTIMATES OF THE DETERRENCE EFFECT.....	37
A.	THE MODELS.....	37
1.	The Age Variable.....	37
2.	The Marital Status Variable.....	37
3.	The Educational Background Variable.....	38
B.	DESCRIPTIVE STATISTICS.....	38
C.	DRUG PREVALENCE RATES BY AGE, MARITAL STATUS, AND EDUCATIONAL BACKGROUND.....	44
1.	DODWWS 1980.....	44
2.	DODWWS 1988.....	46
3.	DODWWS 1995.....	48
4.	NHSDA 1979.....	49
D.	DIFFERENCE-IN-DIFFERENCE ESTIMATES.....	52
E.	RESULTS.....	53
1.	Comparison 1979/80 with 1988.....	53
2.	Comparison of 1979/80 with 1995.....	56
F.	SUMMARY.....	58
VI.	CONCLUSIONS AND RECOMMENDATIONS.....	61
A.	CONCLUSIONS.....	61

B. RECOMMENDATIONS.....	64
APPENDIX A. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION FOR THE PERIOD 1979/80 TO 1988, AGES 17 TO 49.....	65
APPENDIX B. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO 49.....	67
APPENDIX C. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION FOR THE PERIOD 1979/80 TO 1988 IN THE NAVY, AGES 17 TO 49.....	69
APPENDIX D. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION FOR THE PERIOD 1979/80 TO 1988 IN THE NAVY, AGES 17 TO 49, MALES ONLY	71
APPENDIX E. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION FOR THE PERIOD 1979/80 TO 1988 IN THE ARMY, AGES 17 TO 49	73
APPENDIX F. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE ARMY FOR THE PERIOD 1979/80 TO 1988, AGES 17 TO 49, MALES ONLY	75
APPENDIX G. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE MARINES CORPS FOR THE PERIOD 1979/80 TO 1988, AGES 17 TO 49	77
APPENDIX H. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE MARINES CORPS FOR THE PERIOD 1979/80 TO 1988, AGES 17 TO 49, MALES ONLY	79
APPENDIX I. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE AIR FORCE FOR THE PERIOD 1979/80 TO 1988, AGES 17 TO 49.....	81
APPENDIX J. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE AIR FORCE FOR THE PERIOD 1979/80 TO 1988, AGES 17 TO 49, MALES ONLY	83
APPENDIX K. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE NAVY FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO 49, MALES ONLY	85
APPENDIX L. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE NAVY FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO 49.....	87
APPENDIX M. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE ARMY FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO 49, MALES ONLY.....	89

APPENDIX N. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE ARMY FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO 49.....	91
APPENDIX O. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE MARINE CORPS FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO 49, MALES ONLY	93
APPENDIX P. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE MARINE CORPS FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO 49	95
APPENDIX Q. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE AIR FORCE FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO 49, MALES ONLY	97
APPENDIX R. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION IN THE AIR FORCE FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO 49.....	99
APPENDIX S. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION FOR THE WHOLE POPULATION FROM 1979/80 TO 1988.....	101
APPENDIX T. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION FOR THE WHOLE POPULATION FROM 1979/80 TO 1995	103
APPENDIX U. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION FOR THE PERIOD 1979/80 TO 1988, AGES 17 TO 49, MALES ONLY	105
APPENDIX V. LPM ESTIMATES OF ANY ILLICIT DRUG PARTICIPATION FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO 49, MALES ONLY.....	107
LIST OF REFERENCES.....	109
INITIAL DISTRIBUTION LIST	113

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF FIGURES

Figure 1.	Past- month participation rates for military and civilian populations	41
Figure 2.	Past-year participation rates for military and civilian populations.....	41
Figure 3.	Percentages of married individuals for military and civilian populations.....	42
Figure 4.	Percentages of individuals who have attended some college	42
Figure 5.	Percentages of individuals aged 17 to 20	43
Figure 6.	Female population in the civilian and military samples.....	44
Figure 7.	Past-month drug participation rates for military personnel (1980) by characteristic	45
Figure 8.	Past-year drug participation rates for military personnel (1980) by characteristic	45
Figure 9.	Past-month drug participation rates for military personnel (1988) by characteristic	47
Figure 10.	Past-year drug participation rates for military personnel (1988) by characteristic	47
Figure 11.	Past-month drug participation rates for military personnel (1995) by characteristic	48
Figure 12.	Past-year drug participation rates for military personnel (1995) by characteristic	48
Figure 13.	Past-month drug participation rates for civilian personnel (1980) by characteristic	49
Figure 14.	Past-year drug participation rates for civilian personnel (1980) by characteristic	50
Figure 15.	Past-month drug participation rates for civilian personnel (1988) by characteristic	50
Figure 16.	Past-year drug participation rates for civilian personnel (1988) by characteristic	51
Figure 17.	Past-month drug participation rates for civilian personnel (1995) by characteristic	51
Figure 18.	Past-year drug participation rates for civilian personnel (1995) by characteristic	52

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

Table 1.	Logit Estimates of Military Coefficient in Drug Participation Models, Restricted Samples.....	16
Table 2.	Logit Estimates of Military Coefficient in Drug Participation Models, 1979/80 Data, Restricted Samples.	17
Table 3.	Marijuana Use Rates By Transition Status, NLSY Data.	19
Table 4.	Difference-in-Difference Estimators.	21
Table 5.	Number of completed questionnaires and response rates for NHSDA surveys. ...	28
Table 6.	Survey Respondents and Performance Rates for the DODWWS 1988.....	32
Table 7.	Sample sizes and Response rates for DODWWS.	35
Table 8.	Means from 1979 NHSDA and 1980 DODWWS files, restricted to Military Enlisted, Civilian Professionals.	38
Table 9.	Means from 1988 NHSDA and DODWWS files, restricted to Military Enlisted, Civilian Professionals.	39
Table 10.	Means from 1995 NHSDA and DODWWS files, restricted to Military Enlisted, Civilian Professionals.	40
Table 11.	LPM Difference-in-Difference estimators for the years 1979/80 and 1988.	54
Table 12.	LPM Difference-in-Difference estimators for the years 1979/80 and 1988.	54
Table 13.	LPM Difference-in-Difference estimators for the years 1979/80 and 1988.	55
Table 14.	LPM Difference-in-Difference estimators for the years 1979/80 and 1988.	55
Table 15.	LPM Difference-in-Difference estimators for the years 1979/80 and 1995.	56
Table 16.	LPM Difference-in-Difference estimators for the years 1979/80 and 1995.	57
Table 17.	LPM Difference-in-Difference estimators for the years 1979/80 and 1995.	57
Table 18.	LPM Difference-in-Difference estimators for the years 1979/80 and 1995.	58

THIS PAGE INTENTIONALLY LEFT BLANK

ACKNOWLEDGMENTS

First and foremost, I would like to thank my wife, Vaso, for her enduring patience and support during the last 14 years of my life. Without her by my side I could not have realized my goals in the Hellenic Navy. Therefore, both this thesis and my whole attempt of the last 21 months, from which I derived my dual degree, are dedicated to her.

Additionally, I would like to express my sincere appreciation to Dr. Stephen Mehay and Dr. Elda Pema for their significant contributions to the process of writing this thesis.

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

A. ENVIRONMENT

The term “substance abuse” covers a broad array of substances but usually includes alcohol, prescription drugs, and illegal drugs. Many people agree that a central cause of our social ills is the abuse of drugs and alcohol. Despite all the extensive public campaigns, people continue to engage in some form of illegal drug use. The Armed Forces are no exception to that rule.

In an attempt to convey clearly that drug abuse is completely incompatible with military duty, the Department of Defense (DoD) established a set of rules regarding drug use by its members. In 1980 the DoD formalized its rules when it implemented a “zero tolerance” drug policy, which remains the cornerstone of its prevention program today. [Ref. 1] The system is designed to deter drug use by service members while promoting readiness within the operational ranks. From that point of view, for the United States, drug use is a national security concern that not only affects the Department of Defense, but ultimately American society as a whole. The readiness of service members to defend their nation is likely to be negatively related to inappropriate drug use.

“Zero tolerance” recognizes that “drug and alcohol use is incompatible with the maintenance of high standards of performance, military discipline, and readiness and is destructive of DoD’s efforts to instill pride and promote professionalism”. [Ref. 1] In other words, the DoD simply does not tolerate any type of legal drug abuse or illicit drug use by its military members.

“Zero tolerance” implies immediate separation of service members who test positive for illegal drug use during random urinalysis testing. The military’s intangible output relies heavily on teams and units rather than individuals. No matter how severe or minor the effect drug use has on the individuals’ productivity, it can have a significant impact on the performance of a team/unit. The degradation of an individual caused by drug use can affect negatively the unit’s readiness. Decreased productivity due to illicit drug use also is likely to cause repair times to slow down, and thereby to hamper a unit’s ability to accomplish its mission. [Ref. 2] Additionally, military personnel work in ratings

or commands, where safety is extremely important. Even small accidents, resulting from drug use, are likely to increase the risk of injury or death not only to the individual but also to coworkers. An example of the safety effect is the tragic airplane crash that took place aboard USS Nimitz in 1981, in which 14 sailors were killed. The autopsy that took place after the incident revealed evidence of marijuana use among six of the 14 sailors and nonprescription antihistamine use by the pilot. [Ref. 3] Finally, military personnel often work with very expensive, high technology equipment and thus even a single serious accident, associated with drug use, may impose heavy costs on the military.

Of course, experienced users can try to cheat the system by using illicit drugs at certain low-risk times (like immediately after a drug test). It has been shown that these gaming users will generally avoid detection for longer periods. [Ref. 25]

Ideally, military leadership would prefer that its service members voluntarily choose not to use illicit drugs. However, the reality is that some percentage of soldiers, sailors and marines will choose to participate in this type of activity. The strict hierarchical rules and the authoritative style that dominate in the Armed Forces are conducive to the implementation of a policy with severe repercussions for inappropriate drug use.

B. OBJECTIVES

This thesis will evaluate the deterrence effect associated with the drug testing policy adopted by the DoD. Additionally, the thesis will evaluate is the magnitude of the deterrence effect of the military's drug prevention policies during the late 1980s, what was the change in drug use in civilian society during the same time frame, and what were the changes in demographics ("aging" of the Armed Forces, level of education of military personnel) that also probably influenced the deterrence effect during this period.

C. THE RESEARCH QUESTION

The primary question that this research will answer is:

- What is the impact of the US military's drug testing policies in deterring illicit drug use by military personnel?

Secondary questions are:

- What statistical methods are appropriate for estimating the effect of the military's drug prevention policies?
- What was the change in drug use in civilian society during the same time frame?
- What other factors occurred during the same period, such as the "aging" of the Armed Forces, and the increased level of education of military personnel, that also influenced the deterrence effect?

D. DISCUSSION

"Zero tolerance" is combined with aggressive random drug testing, and implies immediate military separation of service members who test positive for illicit drugs during random urinalysis testing. The system is designed to deter drug use by service members while promoting readiness within the operational ranks, because readiness is likely to be negatively related to illicit drug use.

In that context, it is worthwhile to evaluate the deterrence effect of the drug prevention policy. This thesis analyzes the deterrence effect of this "zero tolerance" policy by comparing differences in illegal drug use between military and civilian populations, using data from the National Household Survey of Drug Abuse (NHSDA) and the DoD's Worldwide Survey of Health Related Behaviors (DODWWS).

One method of estimating the deterrence effect would estimate the difference between actual illegal drug usage rates and what usage rates would be in the absence of the zero tolerance policy. At the same time one must take into account other changes of in the civilian population for the same period. Finally, one should examine if some other factors such as the aging of the force, and the increased level of the education among military personnel affected military drug usage and the measured deterrence effect.

E. ORGANIZATION OF THE STUDY

Chapter II describes the history of the DoD's drug testing program and those of the individual services as well. Chapter III presents a brief review of two relevant previous studies that influenced this research in terms of theory, models and results. Chapter IV provides information regarding the surveys used in this research, the 1979, 1988 and 1995 National Household Survey on Drug Abuse and the 1980, 1988 and 1995 Department of Defense Survey of Health Related Behaviors Among Military Personnel. Chapter V specifies the multivariate models that were constructed to detect the deterrence effect of drug testing. The results of these multivariate models are also discussed in this chapter. Finally, Chapter VI summarizes the conclusions of the analysis, addresses research limitations and provides recommendations for further research.

II. BACKGROUND

A. DEPARTMENT OF DEFENSE DRUG TESTING POLICY

The first initiative of DoD's drug testing policy took place in 1967, when a DoD was convened to investigate the observed increased illicit drug use within the military services. [Ref. 4] The findings of that investigation led the task force to formal procedure formulation and the summer of 1971, marked the birth of DoD's urinalysis drug testing program. The original intent of the new policy was to identify illicit drug users, rehabilitate them, and return them to full duty status. [Ref. 4] In other words, initially the DoD's urinalysis testing program was not envisioned as a tool for disciplinary or punitive actions. The expectation was that in the absence of negative consequences, illicit drug users would be more inclined to seek assistance and rehabilitation. [Ref. 5]

In 1974 DoD changed its approach and started using the results of drug tests as the basis for Uniform Code of Military Justice (UCMJ) actions. However, a Military Court of appeals decided later that the same year that the urinalysis results could not be used for disciplinary or administrative action. That decision virtually invalidated the deterrence effect of the program, because detected personnel could only be referred to a rehabilitation center. In that context for the following six years the drug urinalysis program was utilized solely to detect individual need for drug rehabilitation. In 1980, the Military Court of Appeals reversed its 1974 decision, and thus removed the only obstacle permitting DoD's desire to implement a drug testing program which could be used as both a deterrent and evidence-gathering device. [Ref. 6] As a result of this new attitude and legal position concerning drug testing, DoD issued a new directive updating its drug testing policy.

In 1980 DoD published Directive 1010.4 (DoD 1010.4). [Ref. 1] The goal of this directive was to free DoD from the ill effects of illicit drug use by promulgating the mandatory alcohol and drug abuse policy standards service members were obliged to adopt. Among other issues DoDD 1010.4 was published to address the following:

- Assess the alcohol and drug abuse influencing DoD

- Not induct persons into the military services who are alcohol or drug dependent
- Deter and detect alcohol and drug abuse within the Armed Forces
- Provide continuing education and training to alleviate problems associated with alcohol and drug abuse
- Threat or counsel alcohol and drug abusers and rehabilitate the maximum feasible number of them.

Additionally, DoDD 1010.4 required each service secretary to establish and manage urinalysis drug testing programs for her/his respective branch of service. In order to guide the secretaries in accomplishing this requirement, a second directive, DoDD 1010.1, was issued in 1980, and reissued in 1984 and 1994. DoD's intent in issuing DoDD 1010.1 was the achievement of two main goals: The first was to preserve the health of its military members by providing counseling, medical treatment, or rehabilitation to identified alcohol and drug abusers. The second goal was to provide commanders with a tool that would assist them in evaluating the good order and discipline, security, and military fitness of their commands. [Ref. 7]

Besides that, DoDD 1010.1 provided guidelines and limitations in using urinalysis test results. It clearly stated that drug testing results could be used in punitive or separation proceedings. In that context the Armed Forces had the opportunity to issue their own detailed policies about urinalysis testing.

B. U.S. ARMY DRUG TESTING POLICY

In 1981 the Department of the Army issued its directive specified as the "Alcohol and Drug Abuse Prevention and Control Programs." [Ref. 8] The revision of the original directive issued in 1988, included among other things that Army's general policy is that alcohol and drug abuse is: "...incompatible with military service..." [Ref. 9] The Army formulated the following objectives into its directive concerning its drug testing program:

- Early identification of alcohol and drug abuse.

- Deterrence of drug abuse.
- Monitoring of rehabilitation progress for those who require testing as part of their rehabilitation plan.
- Development of data on the prevalence of alcohol and drug abuse within the Army.

Army Regulation 600-85 empowered Army unit commanders by providing them with the flexibility to set their own drug testing rates for the members of their command: “Urine and alcohol tests will be conducted at the unit or elsewhere as the commander directs” [Ref. 9] Of course that flexibility was restricted by the limitation that commanders were authorized to test members of their commands only if they had a reasonable suspicion that an individual was using illicit drugs, as a component of a search and seizure action, as an element of unit’s inspection, or because of valid medical reasons. [Ref. 9]

The Department of the Army issued a revision to Army Regulation 600-85 in October of 1995. Among other issues the revision mandated that: “...Any soldier involved with the illicit trafficking, distribution, or selling of drugs will be processed for administrative separation for misconduct and, as appropriate, for disciplinary action under the UCMJ...” [Ref. 10] Additionally, the revision stated that, regardless of rank, any soldier with three or more years of military service, who would be identified as a drug abuser, would be considered for disciplinary action under the UCMJ as well as processed for separation. This did not necessarily guarantee the dismissal from active duty of those soldiers with more than three years of service who were identified as drug abusers. The one exception to that rule was a drug-positive soldier with less than three years of service. In this case, that soldier would be subject to disciplinary action but not processed for separation until a second incident of illicit drug abuse. In other words Army’s drug testing policy granted soldiers with less than three years of service a second chance. [Ref. 10]

C. DEPARTMENT OF THE NAVY DRUG TESTING POLICY

In accordance with the DoD mandates mentioned above, the Department of the Navy (DoN) issued in 1984 the Office of the Secretary of the Navy Instruction 5300.28A (SECNAVIST 5300.28A.) [Ref. 11] This publication promulgated the policies and regulations covering the alcohol and drug abuse within the DoN, and required that the Chief of the Naval Operations and the Commandant of the Marine Corps establish and conduct alcohol and drug abuse prevention programs for their respective services. Attention should be given in the areas of detection and deterrence, treatment and rehabilitation, education and training, and enforcement and discipline. [Ref. 6]

With regards to detection and deterrence, SECNAVIST 5300.28A mandated that a comprehensive random urinalysis-testing program should be enacted with the purpose of disclosing drug abuse among military members, regardless of rank. The use of positive test results would serve as the basis for appropriate disciplinary action, separation proceedings, and referrals of military members for treatment or rehabilitation programs. [Ref. 11]

1. U.S. Navy Drug Testing Policy

The DoN issued the Office of the Chief Naval Operations Instruction 5350.4 (OPNAVIST 5350.4) in 1980. This document had the title “Substance Abuse Prevention and Control” and basically included the drug testing policy for the members of the U.S. Navy. As stated in OPNAVIST 5350.4, “Zero tolerance recognizes that drug and alcohol use is incompatible with the maintenance of high standards of performance, military discipline, and readiness and is destructive of Navy efforts to instill pride and promote professionalism.” [Ref. 11] In that context the program required commanders to test between 10 and 20 percent of their commands on a monthly basis. The major priorities in the Navy’s drug testing program were the detection and deterrence at all levels. [Ref. 13] The Navy’s main purpose, with regard to drug testing was to:

Detect and deter abuse at a level that ensures the continued visibility of command drug abuse detection efforts, lessens the need to conduct broad scope random samples or unit sweeps, and does not impact negatively on Naval Regional Medical Center drug screening labs or other testing assets. [Ref. 13]

Despite the strict sounding nature, the Navy's zero tolerance drug abuse policy did not applied evenly to all personnel but was differentiated by rank. [Ref. 11] Naval Officers and Chief Petty Officers (senior enlisted) were the only personnel automatically processed for administrative discharges after punitive proceedings were completed. On the contrary, persons in the junior pay grades (Seaman through First Class Petty Officer) were to be screened and offered rehabilitation if their problems were considered treatable. This treatment would be offered after the completion of the punitive actions. After punitive and rehabilitative proceedings were completed, the individual would be allowed to return to active duty if considered worthy for retention. [Ref. 13] This double standard application of the zero tolerance drug abuse policy continued until 1990.

In 1990, a drug testing policy revision, OPNAVIST 5350.4B was issued. [Ref. 14] This new instruction applied the policy of "zero tolerance" to the entire Navy, regardless of rank. If illegal drugs were detected as a result of a random drug urinalysis, the individual would be processed for separation following punitive proceedings. However, processing individuals for administrative separation would still not necessarily result in discharge if they were considered worthy of retention. Additionally, to the shift in policy, OPNAVIST 5350.4B augmented the purpose of the Navy's drug testing program. Basically, there were four goals of the Navy's substance abuse policy:

- To establish a mean for assessment of command readiness.
- To deter drug use.
- To provide a tool for monitoring personnel in rehabilitation programs.
- To establish a historical record that could be utilized to track the demographic characteristics of Navy Drug use. [Ref. 14]

OPNAVIST 5350.4B mandated that commanding officers could use the urinalysis-testing program with no less than a 10 percent and no more than 20 percent monthly command test rate unless given special authorization. Besides that, Navy

Commanding Officers were authorized to test their commands only if they had a reasonable suspicion that an individual was using illicit drugs, as a component of a search and seizure action, as an element of a unit inspection, or because of valid medical reasons. [Ref. 14] After the issuance of Policy Memorandum, in 1996, commanding officers are authorized to test up to 30 percent of their command monthly without special authorization. [Ref. 15] This latest change allowed commanding officers some flexibility in setting command setting rates, while ensuring that the Navy retained some consistency throughout the fleet by setting minimum and maximum testing parameters.

2. U.S. Marine Corps Drug Testing Policy

In December 1996, the U.S. Marine Corps substantially revised and reissued the Marine Corps Order P5300.12A (MCO P5300.12A.) That publication, titled “The Marine Corps Substance Abuse Program, disclosed the policies, procedures and standards of the altered program, and established responsibility for its execution. The Marine Corps’ general policy toward illegal drug abuse is:

The Marine Corps will not tolerate the possession, use, sale, or distribution of illegal drugs and believes a drug free environment is essential to mission accomplishment. Accordingly, all Marines, regardless of pay grade, determined as having or possessed illegal drugs will be processed for administrative separation for misconduct, by reason of drug abuse. [Ref. 16]

The purpose of the Marine Corps urinalysis program is similar to that of Army and Navy with one exception. While its purpose included assessment of command readiness, deterrence, rehabilitation monitoring, and statistical data tracking, the substance abuse policy was also established to eliminate illegal drug use within the Marine Corps. [Ref. 16]

The Marine Corps Substance Abuse Program is divided into two major phases, proactive and reactive. The proactive phase consists of measures taken by commanding officers to preclude substance abuse. These actions primarily address the areas of prevention, education, and deterrence. The reactive phase occurs after an event or incident of substance abuse has taken place. Inclusive in this phase is identification, early

intervention, treatment and rehabilitation, discipline (if appropriate), and reinstatement to full duty or separation. [Ref. 16]

With regard to proactive deterrence, MCO P5300.12A mandates that all Marine Commanders conduct unit urinalysis testing programs in accordance with DoDD 1010.1. Additionally, Marine Corps Commanders are also bound by the test rates established in SECNAVINST 5300 series publications. However, the same limitations on frequency of testing that apply to the Navy and Army applies to the Marine Corps as well.

During the reactive phase, commanding officers have broad discretion in determining the consequences imposed on drug use policy offenders based on their assessment of the infraction. Despite the mandatory separation proceedings commander must initiate, Marines identified as illicit drug users can be retained in the Marine Corps if their commander determines that there is potential for future military service. Among other issues, commanding officers consider the severity of the specific incident, the Marines' attitude towards treatment and rehabilitation, and the investment the Marine Corps has made in the Marine to determine potential for future service. [Ref. 16]

It should be noted that the Marine Corps and Navy policies on substance abuse mirror each other in myriad ways. Among other issues, both essentially have the same zero tolerance stance on illicit drug use and legal drug abuse. Additionally, both policies require adherence to mandatory separation proceedings for violators of their respective drug abuse policies. However, regardless of the program, mandatory separation proceedings do not necessarily equate into mandatory separations for Navy and Marine Corps drug use violators.

D. U.S. AIR FORCE DRUG TESTING POLICY

As stated in Air Force Instruction (AFI) 44-121, issued in January 1998, the U.S. Air Force's general policy regarding substance abuse is that it does not tolerate the illegal or improper use of drugs. [Ref. 17] AFI 44-121 categorizes illicit drug use as a serious breach of discipline that is incompatible with Air Force service and automatically places the offender's continued service in jeopardy. Additionally, the publication states that such use can lead to criminal prosecution resulting in punitive charges or administrative

actions, to include separation or discharge under other than honorable conditions. [Ref. 17]

In devising their drug abuse testing policy, the Air Force set specific goals it wanted its program to achieve. These goals are:

- Deterrence of illicit drug use.
- Identification of personnel who need treatment or rehabilitation.
- Collect data on the prevalence of drug abuse.
- Provide rehabilitation support through monitoring.
- Develop evidence in support of administrative actions, rehabilitative services, separations, and UCMJ actions.
- Provide a tool for commander to maintain the morale, welfare, and health of their commands. [Ref.18]

The enforcement of the Air Force's drug abuse policy rests with local commands, where each commander is tasked with the responsibility of issuing their own drug abuse policy memorandum. These memoranda support the hard line stance taken by the Air Force as a whole, which, as previously mentioned, is "no tolerance." Each command memorandum ensures that Air Force personnel realize that frequent and random drug testing will be employed to deter abuse and enforce the zero tolerance policy. Furthermore, commanders are empowered to order spot testing anytime they feel there is reasonable suspicion of drug or alcohol abuse. [Ref. 18, 19 and 20]

In an effort to stop or reduce drug abuse or potential drug use, the Air Force also developed a well-planned and executed training and education strategy. Substance abuse prevention strategies were comprehensively structured to reduce individual and organizational risk factors while increasing resiliency factors in high-risk populations. [Ref. 17] Education programs were geared toward increasing organizational and

individual awareness of substance abuse issues, trends, and threat to mission readiness. Education also ensured that health care providers, commanders, and senior enlisted supervisors understood the impact of substance abuse on mission completion, understood how to identify the warning signs of substance abuse, and understood the referral process. To underscore the continued need for education on the subject, the policy directed that drug abuse education and training occur quarterly and immediately following any change of duty station. [Ref. 17]

Despite the various courses of action Air Force commanders had at their disposal to deter drug abuse, the options they were given after confirmed drug detection were limited. Commanding officers are required to establish programs to prevent drug abuse, identify drug abusers, and provide transitional counseling while pending separation. [Ref. 21] Specifically, if a commander obtained a confirmed positive drug test result, he or she was obligated to process the offender for administrative actions. Administrative actions included, if applicable, "...removal from flying status or sensitive duties; withdrawal of security access; letter of reprimand; separation from service; and other personnel actions such as denial of reenlistment or removal from duties involving firearms." [Ref. 22] This policy left the commander virtually no option to retain the service member once a confirmed positive test result was obtained. As a result of this strict stance, 95 percent of all confirmed positive drug tests ends in the separation of the member from the Air Force, regardless of rank, length of service, or investment. [Ref 23] Bray in his study characterized the Air Force policy, "Generally, Air Force commanders administratively discharge all identified drug abusers." [Ref. 23]

E. POLICY COMPARISON

An individual comparison of service policies shows that three of the four programs (Army, Navy, and Marine Corps) have very similar zero-tolerance policies for combating illicit drug use within their respective services. Some differences among the three service policies arise in testing procedures and policy execution. The main difference is that the Army allows soldiers with less than three years service a reprieve from separation proceedings for their first policy infraction; an option that the Navy and Marine Corps do not offer. Thus, enforcement in the Naval Services appears to be stricter

than in the Army. However, the underlying principle concept in all three programs is the same. While punitive proceedings are imposed on illicit drug users, their drug use does not necessarily lead to separation from their respective services.

The Air Force's zero tolerance illicit drug use policy also requires that all members testing positive begin separation proceedings. However, as opposed to the other services, it is almost certain that a member will be separated from the Air Force after a confirmed positive test result. Exceptions to this standard occur when the intent of the offending member cannot be established. For example, was it dosage amount, ignorance, or purposeful intent that caused an airman's wrongful use of prescription drugs? [Ref. 23]

If one were to rank the services' policies in terms of their punitive nature and the strength of the sanctions imposed, the Air Force would likely rank first followed by the Navy and Marine Corps, with the Army providing the least punishment of all. One of the addressed questions this thesis discusses is whether the deterrence effect is the result of the policy each service implemented and enforced.

III. LITERATURE REVIEW

In 1999, Mehay and Pacula conducted a study in an attempt to explore the deterrence effect of the implementation of zero tolerance in the Armed Forces since 1981. [Ref. 24] The authors point out that the military environment offers a unique natural experiment because it imposes a mandatory random drug testing on its employees. When random testing is administered to the entire work force it increases the deterrence effect, even if there are “gaming users” that generally avoid the detection for a long period of time. [Ref. 25] According to Mehay and Pacula, the goal of such aggressive policies is to impose high enough sanctions to deter drug use among current and potential users.

In that context, the authors used data from the National Household Survey of Drug Abuse (NHSDA) and the Department of Defense’s Worldwide Survey of Health Related Behaviors (DODWWS) studies for the year 1995. Those data revealed that those in the military were significantly less likely to report use of illicit drug use in the past year or in the past month. However, it was not clear if this difference could be entirely attributed to a deterrence effect of the drug-testing program, because people who decide to join the military know about the implementation of the program and may self-select into or away from this occupation. Besides that, drug use may be correlated with unobservable factors such as patriotism that affect an individual’s willingness to serve. Therefore, the authors examined data from surveys prior to the implementation of the military’s rigid program to assess whether significant differences were preexisted.

The restricted civilian sample from the NHSDA contained 12,012 individuals and its counterpart from the DODWWS, 16,067 individuals. The findings showed that individuals in the military are approximately 20% less likely to report use in the past year and 14% less likely to report use in the past 30 days than their civilian counterparts, holding all other factors constant at their mean values. From the authors’ perspective it was not clear if these differences could be attributed to the program. One of their major concerns was the possibility that military personnel are less willing to self-report illicit drug use, because of the enormous penalty imposed. Additionally, an alternative explanation for these differences could be the unobserved factors that as stated above may influence an individual’s willingness to use illicit drugs.

Therefore, the authors modified the sample to determine the sensitivity of the estimated program effect to an individual's willingness to report drug use. Specifically, the first step they took was to omit all officers and college graduates from the military sample, after they observed the low self-reported drug prevalence rates among officers. Then lower prevalence might be attributed either to the fact that officers indeed have significantly lower drug participation because they are more indoctrinated into the military environment, or it may reflect an increased unwillingness to report illicit drug use due to the enormous penalty imposed. If the latter hypothesis were correct, then restricting the sample should shrink the reported differences between the civilian and military population. To align the civilian population with its military modified counterpart, the civilian sample was restricted to non-college graduate workers in blue-collar occupations. The resulted restricted sample consisted of 22,374 observations.

Table 1. Logit Estimates of Military Coefficient in Drug Participation Models, Restricted Samples

	Ages 17-49	Ages 17-34	Ages 17-25
Past Year	-1.386	-1.301	-1.175
Participation	(0.56) ^a [19.35] ^b	-0.128 [18.89]	-0.073 [17.25]
Past Month	-1.537	-1.45	-1.329
Participation	-0.076 [13.33]	-0.08 [13.47]	-0.096 [14.97]
N	22,374	16,142	9,112

(Source: [Ref. 24])

The findings from the restricted sample are shown in Table 1, and are similar to the results that had been obtained from the unrestricted sample. The similarity of the results provided the authors with the evidence that the willingness of the individuals to underreport was not a major component of the observed differences in illicit drug use between the military and civilian populations.

^a Standard Errors are reported in parenthesis

^b Partial effects in brackets

The remaining question for the authors was whether the large estimated deterrence effect was upward biased due to selection bias. One way to assess that was to examine the difference in military and civilian drug participation in a period before the implementation of the military's drug program. If adjusted prevalence rates were also lower when no punitive programs were in place, one could infer that the estimated differences in drug use in 1995 are explained by unobserved differences between the two populations rather than by a true program effect. Alternatively, if military personnel used drugs at similar or higher rates than civilians prior to the implementation of the program, then one could infer that the prevention program was causally linked to lower drug participation among the military personnel.

Table 2. Logit Estimates of Military Coefficient in Drug Participation Models, 1979/80 Data, Restricted Samples

	Ages 17-49	Ages 17-34	Ages 17-25
Past Year Participation	0.0116 (.049) ^a [0.11] ^b	0.0662 -0.05 [1.53]	0.1911 -0.055 [4.38]
Past Month Participation	-0.5716 -0.053 [-2.79]	-0.5273 -0.054 [-8.38]	-0.4197 -0.059 [-10.12]
N	19,149	15,809	10,777

(Source: [Ref. 24])

The data used in that context were surveys that had been conducted by the DODWWS and NHSDA in the years 1980 and 1979, respectively. The authors chose these two surveys because they immediately preceded the implementation of the military program and, additionally, during those years the national trend in drug abuse remained unchanged. The results are shown in Table 2.

^a Standard Errors are reported in parenthesis

^b Partial effects in brackets

From the results the authors concluded that holding other variables constant at their means, military personnel were only 3% less likely to report illicit drug use in the previous thirty days than the civilian population. Regarding the past month model the coefficient estimate was negative and statistically insignificant. Thus, it was proved that the differences both in past year and past month participation were significantly smaller in the pre-program sample than they were in the post-program ones.

Although it appears that the differences in past year and past month participation were significantly smaller in the pre-program sample than they were in the post-program samples, the authors were not in position to evaluate the impact of the policy change on the behavior of those in the military. Additionally, the long time lag between the samples did not help to capture the results of the changes in the recruiting strategy that could make the military population more or less like the civilian population over time. Therefore, the authors used longitudinal data from the National Longitudinal Survey of Youth (NLSY) to explore if they could replicate their findings of the deterrence effect.

The advantages from the usage of the NLSY data in an attempt to evaluate the deterrence effect of the military's drug testing program, were:

- First, NLSY tracked the same individuals over time, and thus it was possible to separate people who chose to leave the military with those people who chose after the military's drug testing program went into place.
- The data offered the authors the opportunity to track how individuals who chose to stay in the military changed their drug use over time given the implementation of the military's drug testing program and compare this with changes in the civilian population during the same period.
- Finally, the richer set of demographic and background characteristics enabled the authors to obtain a better specification of the individual's demand function. Thus, the authors were in position to take into consideration variables that previously had been omitted, such as parental education, a measure of cognitive ability (AFQT scores), and mother's work status as the respondent was growing up.

The main disadvantage of the NLSY data was that drug use was not collected each year, and thus only the 1980 survey provided information on illicit drug use prior to

the implementation of the military's program. Additionally, the 1980 survey asked only about marijuana use, and that was used as the dependent variable for the evaluation of the deterrence effect.

The authors chose the years 1980 and 1984 for their analysis focusing on those individuals who remained in the military, or if they were included originally in the civilian population, who did not join the military during the intervening period. The results concerning marijuana use rates by transition status are shown in Table 3 and show that in 1984 a statistically significant difference existed between the military and civilian populations in illicit drug use. The respective use rates for the year 1980, the year before the military's drug policy was introduced, did not show any significant difference in self-reported annual marijuana prevalence between the civilian and military sectors. Additionally, the drop in illicit drug use for continuous military personnel was 35.2 points (from 48.5% to 13.3%), compared to that of 7.1 points, for the civilian population.

Table 3. Marijuana Use Rates By Transition Status, NLSY Data

Status	Marijuana Use 1980 (1)	Marijuana Use 1984 (2)	Difference (1)-(2)
Stayed Military	.485 (.500)	.132 (.340)	-0.353
Stayed Civilian	.458 (.498)	.320 (.466)	-0.138
Entered Military	.504 (.500)	.234 (.424)	-0.27
Left Military	.618 (.486)	.406 (.491)	-0.212
Military 1984		.179 (.383)	
Civilian 1984		.325 (.468)	

(Source: [Ref. 24]) (Standard errors in parentheses)

Thus, the authors finally concluded that the US military's policy of random and drug-testing policy provided a highly effective mean of deterring illicit drug use both among currents and potential users.

Another study was conducted in 2001 by Hey and McCrea. [Ref. 26] The authors attempted to estimate not only the direct effect of the policy, but also to estimate if and how the deterrence effect changed over time. In that context they used data from the military and civilian surveys that were conducted in the years 1979/80, 1985, and 1995.

The 1979/80 NHSDA/DoD data files respectively, served as the base (pre-policy) year. Although the constructed models were applicable to all services, Hey and McCrea focused on the results for the Navy population.

One of the limitations that was identified in the Hey-McCrea study was a possible bias because the DODWWS questionnaires, due to long time lag, did not take into consideration that respondents might or might not have used drugs prior to their entry into the service. [Ref. 26] For example, a respondent who answered the past-year participation question in October might have joined the military in June. In that case, drug use for the five months the individual was a civilian (January to June) would be attributed to the “zero tolerance” policy although the respondent had been in the military for only five months. One solution to avoid that possible bias would be to eliminate from the analysis past-year participation individuals with less than one year of service.

The authors detected a number of demographic trends such as in educational level, race/ethnicity, age, and marital status. These demographic trends and differences between the civilian and military population suggested the necessity of multivariate regression analysis and the implementation of the difference-in-difference estimator. The models used by the authors were similar to those that previously had been used by Mehay and Pacula. All findings clearly indicated that both past-year as well as past-month drug participation decreased after the implementation of the policy. Moreover, all findings showed that the policy had the greatest impact on the youngest individuals, especially those who are 17 to 25 years old. Additionally, after they compared the findings from the surveyed years 1985 and 1995, the authors concluded that the deterrence effect decreased over time, and that the decrease was due to possible uncertainty among military members about the consequences of the policy. [Ref. 26]

More analytically, focusing on the comparison between the years 1979/80 and 1995 the findings from the models showed two main results: (a) the higher deterrence effect of the policy on past-year participation was observed for Navy, males only, ages 17-25 (-23.58 percentage points), while the lowest was for the all services sample, males only, ages 17-49 (-11.88 percentage points); and (b) for the past-month participation the findings ranged from a positive deterrence effect of -1 percentage points (all military combined, males only, ages 17 to 25) to the maximum value of -4 percentage points

(Navy, males only, ages 17 to 25). The combined sample (males and females) broken down by services showed an insignificant decrease of -0.78 percentage points, which led the authors to conclude that the deterrence effect had remained relatively constant over time.

Table 4. Difference-in-Difference Estimators

	<u>Difference-in-Difference (1979/80 - 1995)</u>	
	MIN	MAX
Past Year Participation	[-11.88%] Males 17-49 All Service sample	[-23.58%] Ages 17-25 Navy
Past Month Participation	[-1%] Males 17-25 All Service sample	[-4%] Ages 17-25 Navy

(Source: Ref. 26)

THIS PAGE INTENTIONALLY LEFT BLANK

IV. THE DATA

A. INTRODUCTION

As mentioned above the services started the implementation of the “zero tolerance” policy in 1981. The critical question is: Did the policy help to decrease the drug participation rate in the DoD environment, and if so, to what degree? In order to evaluate the existence and magnitude of the deterrence effect that can be attributed to the military’s drug policy we need data on drug use in the military and in the civilian sector in a period prior to the implementation of the policy, and in the military and civilian sector in a period after implementation. This allows us to compare the difference in drug use between military members and civilians before and after the policy’s introduction. This design has not been done in the past in previous studies of the deterrence effect. The new element this thesis introduces is the inclusion of two surveyed years in the regression model, pre- and post-policy years, an approach that offers direct estimation of difference-in-difference estimators. [Ref. 38]

In this context we chose the Department of Defense Worldwide Survey of Health Related Behaviors Among Military Personnel (DODWWS) 1980 survey, which is the first in a series of surveys that were conducted by Burt Associates. This year, 1980, served as the base (pre-policy) year for the military population. The purpose of the DODWWS is to determine the nature, causes and effects of illicit substance use and health behavior. It also allows an evaluation of the impact not only of the current policy, but also of potential future program policies targeting substance use and health decisions in this population [Ref. 24].

To assess drug use in the civilian population we used the NHSDA 1979 survey to represent the pre-policy year. The reason we used different surveyed years during the pre-implementation period (1979 and 1980 for the civilian and military population, respectively) is because there was no single year prior to 1981 when both surveys were fielded. This is what Mehay and Pacula also did in their study, when they merged the data from the 1979 NHSDA and the 1980 DODWWS [Ref. 24]. Additionally, they “chose these two years because they immediately preceded the implementation of the military’s

program and they were two survey years in which the national trend in drug use remained unchanged.” [Ref. 24]

As in prior studies, we used a multiple regression analysis for two dependent variables, DRUG12 and DRUG30, which represent drug participation rates in the previous year and in the previous month, respectively. The studies of Antonio Martinez [Ref. 12] and Mehay and Pacula [Ref.24] had covered a rather long period of fifteen years, from 1979/80 to 1995. Mehay and Pacula pointed out that: “There may have been changes in the recruiting strategy employed by the military that would make the military population more or less like the civilian population over time in ways that have not measured.” [Ref. 24] In 2001 Hey and McCrea tried to correct this potential weakness by including another year, 1985, in their study. Thus, they tried to determine whether differences in drug use rates could be attributed to other reasons rather than to the implementation of the drug prevention program. [Ref. 26]

These are two new contributions of this thesis. First, this thesis analyses data from 1988 as well as from 1979/80 and 1995. Second, models are estimated as linear probability models (LPM) by OLS techniques rather than as logistic (Logit) models by maximum likelihood techniques. This change is necessary to implement the difference-in-difference analysis. Additionally, use of data from 1988 is especially significant not only because this pinpoints the middle point of this time interval, but also because the Federal Drug-Free Workplace Act was introduced in 1988. This law may have decreased drug participation rates in the civilian sector after 1988.

B. ANALYSIS OF THE NHSDA DATA

The NHSDA is the only study that regularly produces estimates of drug use among civilian members of the non-institutionalized population in the United States. These surveys provide an appropriate technique for estimating prevalence rates for use of different drugs because much drug use would not ordinarily come to the attention of administrative, medical, or correctional authorities and therefore would not be included in official statistics. In-person interviews with a large national probability sample seem to be the best way to estimate drug use in virtually the entire population of the United States [Ref. 27]

The basic sample of the NHSDA surveys involved five selection stages:

- (1) The selection of the primary sampling units (e.g. counties);
- (2) The selection of sub areas (blocks or block groups) within Primary Sample Units (PSU);
- (3) The selections of listing units (housing units or civilian no institutionalized group quarters' units) within these sub areas;
- (4) The selection of age-group-smoking classes within sampled listing units;
- (5) The selection of eligible individuals within the sampled age-group-smoking classes.

Throughout the course of the NHSDA surveys, separating identifying information from survey responses protected the respondent's anonymity and the privacy of his or her responses. Respondents were assured that their identities and responses would be handled in the strictest compliance with Federal law. The questionnaire itself and the interviewing procedures were designed to enhance the privacy of responses, especially during segments of the interview in which questions of a sensitive nature were posed. Respondents were asked to mark answer sheets to record their responses to questions read aloud by the interviewer. The interviewer was not in position to see the completed answer sheets. [Ref. 27]

Because respondents were not identified on the questionnaires, a special procedure was developed to facilitate interview verification. At the end of an interview, the respondent was asked to fill out a postcard giving her/his name, address, and telephone number. The postcard was mailed directly to an independent verification service rather than being included in the envelope with the questionnaire and other materials. The independent verification service telephoned at least 15% of the people each staff member interviewed. If no telephone number could be found for the

respondent, the verification service tried to verify the interview by mail. The verification included determining how long each interviewer had spent with the respondent, a check on how well the interviewer adhered to procedures that assured respondent's anonymity, and a general question on the topic of the interview. If a discrepancy was found or the procedures were not followed, all of that particular interviewer's work was verified or unacceptable work was reassigned to another interviewer. The postcards were destroyed after the verification procedure was completed. [Ref. 27]

The surveys provide information on time-based use categories: ever used, used in past year, and used in past month. They include questions concerning the usage of 14 illicit drugs such as marijuana, hashish, cocaine, crack, inhalants, hallucinogens, PCP, heroin, nonmedical use of any psychotherapeutic, and others. Finally, they provide information concerning the past-year frequency of use categories: used at least once, used once a week, used more than once a week. [Ref. 28]

The 1979 NHSDA is the sixth in a series of studies that began in 1971 and that aimed to measure the prevalence and correlates of drug use in the United States. The National Institute on Drug Abuse (NIDA) sponsored it, and the Response Analysis Corporation, Princeton, NJ, collected the data. The Research Triangle Institute prepared the data and codebook for public release. The survey includes US householders of ages 12 years and older of the coterminous United States (Alaska and Hawaii were excluded.) The sample design used to survey this population was a national area probability sample. Analyses used white and Black/other races as the two racial groups. There were five age divisions that usually classified into three groups: youth, age 12 to 17; young adult, age 18 to 21 and 22 to 25; and older adult, age 26 to 34 and 35 and older. Youth were selected at higher rates than adults and, generally, the younger the potential eligible person the more likely s/he was to be chosen. Because younger persons are more likely to use drugs, they were selected at higher rates to provide a large base for multivariate analysis. In this survey respondents from rural areas were oversampled. In the first stage 103 districts or PSU were screened. Originally 13,578 households were listed, 12,334 were found to be occupied and 8,718 were eligible for interview. Finally, 7,224 questionnaires were completed yielding a response rate of 82.9%. [Ref. 27]

The 1988 National Household Survey is the ninth survey. In 1979, respondents from rural areas were oversampled, and in 1985 and 1988, Blacks and Hispanics were oversampled to increase the reliability of estimates of drug use of these important groups. [Ref. 28] In 1982, considerable attention was devoted to medical as well as nonmedical use of stimulants, sedatives, tranquilizers, and analgesics. In the 1979 and 1982 surveys, supplementary information was obtained about the prevalence of cigarettes and other tobacco products, such as smokeless tobacco, and cocaine. In 1988 additional information was also gathered about the form of cocaine known as “crack” as well as information about sharing needles for injection of drugs. Also, in 1985 and 1988, the consequences of use of various drugs were given considerable attention.

The target population for the 1988 NHSDA, as for the previous surveys, was the household population aged 12 and older of the coterminous United States. The sample design used to survey this population was a multi-stage probability sample. The 1988 sample design used a composite site measure methodology and a specially designed within-household selection procedure to meet specified precision constraints for subgroups defined by age and minority group membership. Differential sampling rates were used based on race/ethnicity and age groups. To reduce survey costs, the design sampled Hispanics at higher rates in geographic areas where they were most concentrated. Additionally, persons aged 12-17 were sampled at higher rates than persons in other age groups. [Ref. 28] The basic design plan involved the five selection stages described above.

Again senior staff at Research Triangle Institute directed the fieldwork for the 1988 NHSDA. A total of 8,814 completed interviews were obtained between September 13, 1988 and February 28, 1989. Eighty seven percent of the interviews were conducted by December 31, 1988, and the median completion date for the survey was November 5, 1988. A completed interview had to contain at a minimum, data on use of marijuana, cocaine, alcohol, and cigarettes in the respondent’s lifetime. [Ref. 28]

Strategies for ensuring high rates of participation resulted in a response rate of 77% and a total of 8,243 completed interviews for the original selection of cases. In an attempt to increase the count of non-Hispanic, non-Black interviews to the target sample size, 1,104 cases that were originally screened out were re-fielded, resulting in 571

additional interviews. Of the 8,814 completed interviews, 4,551 were with whites (non-Hispanics), 1,888 were with Blacks, and 2,193 were with Hispanics. About 5% (413) of the interviews were conducted using the Spanish version of the questionnaire. The completed interviews represented 93.3% completion rate for screened sample households, and 74.3% for the screened sample individuals. If someone takes into account the original and the re-fielded samples combined, the response rates for these racial/ethnic groups were 73% for whites, 75% for Blacks, and 78% for Hispanics. [Ref. 28]

Before 1991, the NHSDA sample was drawn from the household population of the contiguous 48 states. Alaska, Hawaii, and residents of non-institutional group quarters were not included in the sampled population. The 1995 NHSDA is the fifteenth in that sequence of surveys. The target population in this survey is the same as defined for the 1991, 1992, 1993, and 1994 NHSDAs: the civilian, no institutionalized population of the 50 states (including civilians living on military bases) who are 12 years of age and older. In the 1994 survey, a revised questionnaire and editing methodology was introduced for first time. In that context, a split sample design was implemented with a sample of 4,732 persons using the old questionnaire (1994-A) and 17,809 persons using the new questionnaire (1994-B). The questionnaire that was used in the 1995 survey was similar to 1994-B type. Besides that, the 1995 NHSDA questionnaire retains the new questions on mental health and access to care which were introduced in the 1994-B. Furthermore, questions on the need for treatment for drug or alcohol use were included for first time. [Ref. 29]

Table 5. Number of completed questionnaires and response rates for NHSDA surveys

Year of Survey	Completed Questionnaires	Response rate
1979	7,224	82.90%
1988	8,814	74.30%
1995	17,747	80.60%

(Source: Ref. 27, 28, 29)

The 1995 survey used basically the same multistage area probability sample design that has been employed since the 1988 NHSDA. This design uses a composite size measure methodology and a specially designed within-dwelling selection procedure to ensure that desired sample sizes would be achieved for sub-populations defined by age and race/ethnicity.

Over sampling was used to meet specified precision constraints for these sub-populations. Following precedents established in the 1993 and 1994 NHSDAs, the 1995 NHSDA oversampled Hispanics in areas of high Hispanic concentration to reduce survey costs and also oversampled cigarette smokers of age 18 to 34 to increase the precision of drug use estimates for recent years. In that context 115 PSU were originally included in the survey. The completed questionnaires reached 17,747 out of 22,000 households that were initially screened, yielding a response rate of 80.6%. [Ref. 29]

C. ANALYSIS OF THE DODWWS DATA

A systematic effort to obtain data that can be used to guide and evaluate health and substance abuse programs and policies began in 1980 under the direction of the Office of Assistant Secretary of Defense (Health Affairs) (OASD (HA)). The DoD initiated a series of recurrent surveys to: (a) improve understanding of the nature, causes, and consequences of substance use and health in the Military; (b) determine the appropriateness of the emphasis placed on program elements; and (c) examine the impact of current and future program policies. The 1980 survey was conducted by Burt Associates, Incorporated, of Bethesda, Maryland. The 1982, 1985, 1988, 1992, and 1995 surveys were conducted by Research Triangle Institute of Research Triangle Park, North Carolina. All six surveys assessed the extent and consequences of alcohol and other drug use. Beginning in 1985, the surveys broadened their focus to include an assessment of health promotion efforts. [Ref. 32]

All DODWWS surveys contain active duty personnel only, excluding recruits, service academy students, persons without leave, and persons who were in a state of change of station (PCS). To reduce reporting bias, the DODWWS use self-reported questionnaires rather than interviewer-administered data collection techniques. [Ref. 31]

As it is stated above, the 1980 Worldwide Survey was conducted by Burt Associates, Incorporated, of Bethesda, Maryland (Burt and Biegel, 1980). This survey was intended to provide a “comprehensive, detailed and accurate estimate of the prevalence of nonmedical drug use and alcohol use among the active duty military population worldwide and to provide information on the physical, social and work-related consequences of substance use in the population.” [Ref. 30] Thus, the study concentrated on medical drug use and alcohol use and associated consequences and provided a benchmark for the analysis of change over time. The survey was conducted during February, March and April 1980, and a total of 19,582 military personnel in pay grades E1- O6 stationed at 81 installations completed self-administered questionnaires. More analytically, the survey consisted of 6,239 Army, 5,202 Navy, 2,861 Marine Corps, and 5,280 Air Force members. [Ref. 30]

The 1988 Worldwide Survey of Substance Abuse and Health Behaviors Among Military Personnel was conducted by the Research Triangle Institute (RTI) under the sponsorship and guidance of the Assistant Secretary of Defense (Health Affairs). The survey is the fourth in a series that began in 1980, and provides comprehensive and detailed estimates of the prevalence of use of drugs, alcohol, and tobacco and the negative consequences of drug and alcohol abuse among active-duty military personnel. Additionally, the 1988 survey examines attitudes and knowledge AIDS transmission and prevention. This survey is guided by five major objectives: [Ref. 36]

- To describe the prevalence of substance abuse (alcohol use, non-medical drug use) among military personnel.
- To describe the physical, social and work consequences of this use.
- To identify the demographic and behavioral characteristics of substance abusers including age, rank, service, social and family climate, and reported reasons for using, not using, or discontinuing use.

- To compare reported drug and alcohol abuse and smoking habits to prior Worldwide Surveys.
- To assess the health behaviors of service members with regard to smoking, fitness, and other health behaviors.

The sampling design for the 1988 Worldwide Survey was a deeply stratified, two-stage, two-phase probability sample. The first stage sample consisted of military installations (and the associated to these installations based on geographical proximity) for each service located in four broad regions of the world (America, North Pacific, Other Pacific, and Europe). The second-stage sample consisted of military personnel stationed at the selected first-stage installations who were randomly selected within pay grades (E1- E3, E4-E6, E7-E9, W1-W4, O1-O3, and O4-O10).

During Phase 1, questionnaires were administered in group settings at selected installations around the world under the supervision of Research Triangle Institute field teams. Team members explained the purpose of the survey, encouraged cooperation and honest responses, and answered the questions of the potential respondents. Questionnaires were distributed and completed and then were sent to a scoring contractor for optical scan processing. The identity of the participants was anonymous. A military liaison officer surveyed the selected Naval personnel for the sample that were aboard the ships and thus were inaccessible to field teams. To ensure the confidential treatment of these questionnaires, a clerk from the ships' mailroom collected the completed questionnaires in a mailbag after the group sessions, and shipped them to U.S. for processing.

During phase 2, questionnaires were mailed to a selected sub sample of personnel who did not participate in phase 1 with instructions to complete the questionnaires and mail it in a business reply envelope to U.S. for processing. Again the identity of the respondents was anonymous. As shown in Table 5, usable questionnaires were obtained from 18,673 military personnel and the overall response rate among eligibles for the study was 81.4 percent.

Table 6. Survey Respondents and Performance Rates for the DODWWS 1988

<u>Survey Respondents (n)</u>	<u>Service</u>				Total DoD
	Army	Navy	Marine Corps	Air Force	
Enlisted Personnel	4,791	3,777	1,519	4,302	14,389
Officers	1,679	1,020	451	1,134	4,284
Total	6,470	4,797	1,970	5,436	18,673
<u>Performance Rates (%)</u>					
Availability rate*	83.4	78.2	75.1	84.3	81.3
Response rate among eligibles**	82.9	76.1	76.8	86.2	81.4

* Rate at which eligible persons were available to participate in phase 1. Some persons were unavailable due to illness, temporary duty assignments, and leave.

** Overall rate at which eligible persons from both phases took part in the survey

The items included in the 1988 Worldwide Survey questionnaire allow the comparisons with prior Worldwide Surveys to examine trends in substance abuse and health behaviors among military personnel. From the completed questionnaires it became evident that the urinalysis program appeared to be an especially effective component of the drug abuse prevention program. Additionally, from the answers of the surveyed individuals became obvious that although the personnel were generally aware of the health risks of alcohol and drug abuse, were moderately aware of the potential effects on job performance and combat readiness.

The 1995 DODWWS survey is the sixth in the series of DoD surveys of active duty military personnel. Again, it was conducted by the Research triangle Institute under the sponsorship of the Office of the Assistant Secretary of Defense (Health Affairs). In addition to the purposes described earlier, the 1995 survey had two broad goals: to continue the survey of substance use among active-duty military personnel, and to establish baseline data to assess progress toward selected DoD health objectives for active-duty military personnel. In that context, the 1995 DODWWS provides comprehensive and detailed estimates of the prevalence of alcohol, illicit drug, and tobacco use within the military services. [Ref. 32]

During the 1995 DODWWS survey a two-stage design was implemented again to ensure the sample was representative of the worldwide active-duty force. Within the contexts of the entire survey series and the health promotion focus of the surveys in recent years, the 1995 has two broad aims: [Ref. 32] (1) To continue the survey of substance use among military personnel; and (2) to establish baseline data to assess progress toward selected “Healthy People 2000” objectives.

In keeping with these two aims, major objectives of the 1995 survey are as follows: [Ref. 32]

- To continue the analysis of trends in use of alcohol, illicit drugs, and cigarettes, and consequences associated with substance use.
- To describe important correlates of substance use among military personnel in 1995.
- To compare rates of alcohol, illicit drug, and cigarette use among military personnel in 1995 with rates from comparable civilian populations.
- To provide estimates for health behaviors pertaining to fitness and cardiovascular disease risk reduction, injuries and injury prevention, cervical cancer screening, and maternal and infant health.
- To identify important correlates of these health behaviors.
- To compare health behavior data between 1992 and 1995, where appropriate.

The 1995 survey also included more detailed questions about the mental health and quality of life of military personnel. Specifically, the questionnaire contained questions about stress experienced at work and in family life, specific sources of stress, and approaches to dealing with stress. It also contained questions about the global mental health status and symptoms of depression. [Ref. 32]

Finally, the content of the 1995 survey reflected the increasingly important role of women in the Military and special considerations were given to their health needs. In that context for the first time in the survey series, a set of questions was included on health issues that apply particularly to military women. Some of these questions provide information for “Healthy People 2000” objectives that apply to women but not men (i.e., Pap tests and substance use during pregnancy.)

The first-stage of the sampling procedure was consisted of information by military installation separated by service and geographic location. The second-stage was comprised of randomly selected military personnel, stationed at the same military installations identified in the first stage, stratified by rank and gender. The reasoning behind the decision for the implementation of that two-stage procedure was to “... achieve cost efficiency while preserving the inferential capability of the sample.” [Ref. 32]

However, some groups were not included in the sampling. As it was stated earlier, from the sampling were excluded recruits, service academy students, those absent without official leave, and service members who at the time of the survey were in the midst of a permanent change. In other words the eligible population for the DODWWS was limited to all active-duty members. The eligible personnel that took part in the survey completed a questionnaire during one of two phases. During phase one, from April through August of 1995, civilian field survey teams administered the test in group settings at 59 military installations. In phase two, the teams mailed the questionnaires to those members that although were eligible for participation were not available during phase one. The used methodology for the completion of the questionnaires was again the self-administered procedure. The final sample consisted of 16,193 military personnel (3,638 Army, 4,265 Navy, 3,960 Marine Corps, and 4,330 Air Force) who completed self-administered questionnaires anonymously. Data were collected primarily from participants in group sessions at military installations or by mail. The overall response rate was 69.6%. [Ref. 32]

Table 7. Sample sizes and Response rates for DODWWS

Survey Year	Survey	Sample Size	Response rate
1980	DODWWS	19,582	93%
	Army	6,239	
	Navy	5,202	
	Marine Corps	2,861	
	Air Force	5,280	
1988	DODWWS	18,673	81.4%
	Army	6,470	
	Navy	4,797	
	Marine Corps	1,970	
	Air Force	5,436	
1995	DODWWS	16,193	69.60%
	Army	3,638	
	Navy	4,265	
	Marine Corps	3,960	
	Air Force	4,330	

(Source: [Ref. 30, 32,38])

D. LIMITATIONS OF THE DATA

Although both surveys provide useful data for the estimation of the prevalence of drug use in their respective populations, both the NHSDA and the DODWWS have some limitations.

First of all the surveys are self-reported. Hence, the value of the data highly depends on the respondents' truthfulness and memory. Although NHSDA and DODWWS procedures were designed to encourage honesty and recall, undoubtedly some respondents underreport and others over-report. At the same time, self-responding clues reduce the possibility of reporting bias, and increase respondents' cooperation and willingness to report honestly about their illicit drug use behavior. Of course we have to admit that especially in case of military respondents some of the responses could lead to job separation if they could be revealed. This respondents' fear could be the cause of under-reporting actual drug use, something that could result in faulty estimates. "A

conclusion drawn from studies done by Rouse, Kozel, and Richards is that self reported data can be trusted if the individual feels that his or her privacy will be protected and that there is a valid reason for the study.” [Ref. 33] Therefore confidentiality is stressed in all written and oral communications with potential respondents and respondents’ names are not collected with the data. [Ref. 27]

Additionally, the surveys are neither cross-sectional nor longitudinal. That is, each time the surveys are conducted a fresh sample of respondents is pursued. This means that the data provide a snapshot in a single year rather than measure changes in the same group of individuals overtime. [Ref. 28]

Finally, because the target population for most NHSDAs (years 1979, 1988) is defined as the household population of the continental United States, a small proportion (less than 2%) of the population is excluded. The subpopulations excluded are those in no institutional group quarters (e.g. military installations, college dormitories, group homes), those in institutional quarters (e.g., prisons nursing homes, treatment centers), and those who had no permanent residence (the homeless and residents in single rooms in hotels.) If the drug use of these groups differs from that of the household population, the NHSDAs may provide slightly inaccurate estimates of drug use in the total population. This may be particularly true for prevalence estimates of rarely used drugs such as heroin. [Ref. 28]

V. ESTIMATES OF THE DETERRENCE EFFECT

A. THE MODELS

The models used in this thesis are similar to those in previous studies by Antonio Martinez [Ref. 12], Mehay and Pacula [Ref. 24], and Hey and McCrea. [Ref. 26] More specifically, two dependent variables are used to describe the drug use during the recent past (past-month) and in the more distant past (past-year). The independent variables are gender, race, marital status, age, and educational background. In order to estimate potential differences in drug participation rates between civilians and military personnel, we included in the model a dummy variable for individuals who served in the Armed Forces. Furthermore in an attempt to estimate the difference of drug use rates across the different services, we subdivided the sample by branch of service. The generic model is shown below:

$$\text{DRUG30 (DRUG12)} = f(\text{GENDER, RACE, MARITAL STATUS, AGE, MILITARY, EDUC})$$

1. The Age Variable

The findings from the previous studies (Antonio Martinez [Ref. 12], Mehay and Pacula [Ref. 24], and Hey and McCrea [Ref. 26]), have shown that as a person ages the probability of that person engaging in drug participation decreases. To measure the effect of age we categorized the “age” variable in four groups: (a) age1: from 17 to 20 years; (b) age2: from 21 to 25 years; (c) age3: from 26 to 34 years; and (d) age4: from 35 to 49 years. From the civilian population we omitted the ages below the 17 years old, to ensure a fair comparison between civilians and military members, as the latter are always 17 years and older.

2. The Marital Status Variable

Again, from the findings of previous studies we have evidence that drug participation rates are lower for married persons. Additionally, from studies conducted by the US Department of Health and Human Services [Ref. 34] and the National Council on Alcoholism and Drug Dependence [Ref. 35] it has been estimated that unmarried workers have about twice the rate of illicit drug use as married workers. On the other hand, family

members of alcoholics and substance abusers use ten times as much sick leave and have higher than average medical care claims than family members of non-alcoholic and substance using families.

3. The Educational Background Variable

The surveyed individuals both in the civilian and in military population differ in terms of their educational background. Thus, we have a spectrum from those who have not graduated from the high school to those who have graduated from college. Hey and McCrea [Ref. 26] examined samples from the years 1979/80, 1985, and 1995. Their findings demonstrated statistically significant lower drug participation rates for both past-month and past-year categories for individuals who graduated from college. This trend remained stable over time.

B. DESCRIPTIVE STATISTICS

The means values of the variables that are used in the estimated models are given in Tables 8, 9 and 10.

Table 8. Means from 1979 NHSDA and 1980 DODWWS files, restricted to Military Enlisted, Civilian Professionals

Variables	Variable Definitions	Military Means	Civilian Means
Past-month Drug Participation	=1 if respondents reports using any Illicit drug in the past month	0.196 (0.397)	0.199 (0.400)
Past-year Drug Participation	=1 if respondents reports using any Illicit drug in the past year	0.392 (0.488)	0.279 (0.449)
Female	=1 if respondent is female	0.086 (0.281)	0.570 (0.495)
Married	=1 if respondent is married	0.473 (0.499)	0.480 (0.500)
Black	=1 if respondent is Black, Negro or African American	0.181 (0.385)	0.113 (0.317)
Hispanic	=1 if respondent is Hispanic	0.050 (0.218)	0.049 (0.217)
Other Minority	=1 if respondent is other racial/ Ethnic minority	0.067 (0.249)	0.029 (0.168)
Age 17-20	=1 if respondent's age falls in category	0.279 (0.448)	0.239 (0.426)
Age 21-25	=1 if respondent's age falls in category	0.339	0.239

		(0.474)	(0.426)
Age 26-34	=1 if respondent's age falls in category	0.190	0.179
		(0.392)	(0.383)
Age 35-49	=1 if respondent's age falls in category	0.192	0.189
		(0.394)	(0.391)
High School Diploma	=1 if respondent has high school diploma	0.450	0.357
		(0.498)	(0.479)
Some College	=1 if respondent attended college but did not attain diploma	0.309	0.223
		(0.462)	(0.416)
College Graduate	=1 if respondent has college degree	0.086	0.073
		(0.280)	(0.260)
Sample size		11,337	4,594

Note:

Restricted to ages 17-49

Military sample deletes officers; Civilian sample deletes professionals

Standard Deviation in parenthesis

Table 9. Means from 1988 NHSDA and DODWWS files, restricted to
Military Enlisted, Civilian Professionals

Variables	Variable Definitions	Military Means	Civilian Means
Past-month Drug Participation	=1 if respondents reports using any Illicit drug in the past month	0.034 (0.180)	0.103 (0.304)
Past-year Drug Participation	=1 if respondents reports using any Illicit drug in the past year	0.061 (0.239)	0.187 (0.390)
Female	=1 if respondent is female	0.096 (0.295)	0.584 (0.493)
Married	=1 if respondent is married	0.708 (0.455)	0.453 (0.498)
Black	=1 if respondent is Black, Negro or African American	0.212 (0.409)	0.212 (0.409)
Hispanic	=1 if respondent is Hispanic	0.045 (0.206)	0.039 (0.194)
Other Minority	=1 if respondent is other racial/ Ethnic minority	0.055 (0.229)	0.020 (0.141)
Age 17-20	=1 if respondent's age falls in category	0.073 (0.260)	0.187 (0.390)
Age 21-25	=1 if respondent's age falls in category	0.202 (0.402)	0.143 (0.351)
Age 26-34	=1 if respondent's age falls in category	0.360 (0.480)	0.314 (0.464)
Age 35-49	=1 if respondent's age falls in category	0.362 (0.481)	0.163 (0.369)
High School Diploma	=1 if respondent has high school diploma	0.355 (0.479)	0.336 (0.472)
Some College	=1 if respondent attended college but	0.513	0.166

	did not attain diploma	(0.500)	(0.372)
College Graduate	=1 if respondent has college degree	0.067	0.122
		(0.249)	(0.328)
Sample size		14,389	6,182

Note: Restricted to ages 17-49
Military sample deletes officers; Civilian sample deletes professionals
Standard Deviation in parenthesis

Table 10. Means from 1995 NHSDA and DODWWS files, restricted to
Military Enlisted, Civilian Professionals

Variables	Variable Definitions	Military Means	Civilian Means
Past-month Drug Participation	=1 if respondents reports using any Illicit drug in the past month	0.026 (0.159)	0.099 (0.298)
Past-year Drug Participation	=1 if respondents reports using any Illicit drug in the past year	0.056 (0.230)	0.167 (0.373)
Female	=1 if respondent is female	0.188 (0.391)	0.614 (0.487)
Married	=1 if respondent is married	0.624 (0.484)	0.402 (0.490)
Black	=1 if respondent is Black, Negro or African American	0.194 (0.395)	0.250 (0.433)
Hispanic	=1 if respondent is Hispanic	0.093 (0.290)	0.295 (0.456)
Other Minority	=1 if respondent is other racial/ethnic minority	0.071 (0.257)	0.026 (0.158)
Age 17-20	=1 if respondent's age falls in category	0.128 (0.334)	0.195 (0.396)
Age 21-25	=1 if respondent's age falls in category	0.273 (0.445)	0.191 (0.393)
Age 26-34	=1 if respondent's age falls in category	0.257 (0.437)	0.359 (0.480)
Age 35-49	=1 if respondent's age falls in category	0.340 (0.474)	0.231 (0.421)
High School Diploma	=1 if respondent has high school diploma	0.368 (0.482)	0.356 (0.479)
Some College	=1 if respondent attended college but did not attain diploma	0.527 (0.499)	0.217 (0.412)
College Graduate	=1 if respondent has college degree	0.074 (0.262)	0.084 (0.277)
Sample size		12,531	10,608

Note: Restricted to ages 17-49
Military sample deletes officers; Civilian sample deletes professionals
Standard Deviation in parenthesis

Figure 1. Past- month participation rates for military and civilian populations

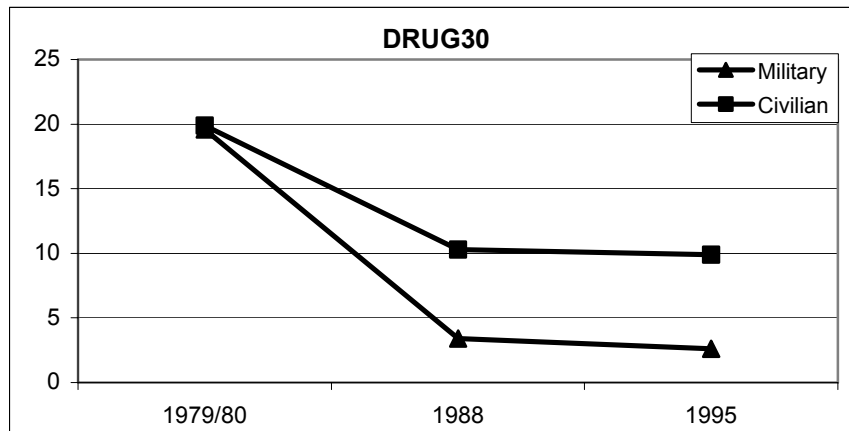
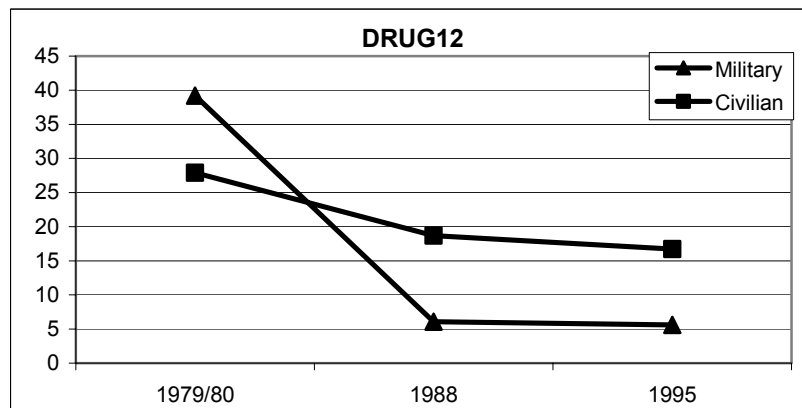


Figure 1 shows that for 1979/80 the civilian and military population appeared to have similar past-month participation rates (19.9% vs 19.6%). During the first period, from 1980 to 1988, both the civilian and military population demonstrated a decrease in past-month participation rate, but the decrease was bigger for the military sector. Thus, in 1988 the difference between the two was 6.9%. For the period 1988 to 1995, the civilian population demonstrated an almost stable trend (from 10.3% to 9.9%) while the military population showed a rather significant decrease from 3.4% to 2.6%, which represents a decrease of about 25%.

Figure 2. Past-year participation rates for military and civilian populations



The 1980's past-month participation rate for the military personnel was 39.2%, while the civilian population had a rate of only 27.9%. During the next 8 years both the military and civilian population showed a considerable decrease, but this decrease was

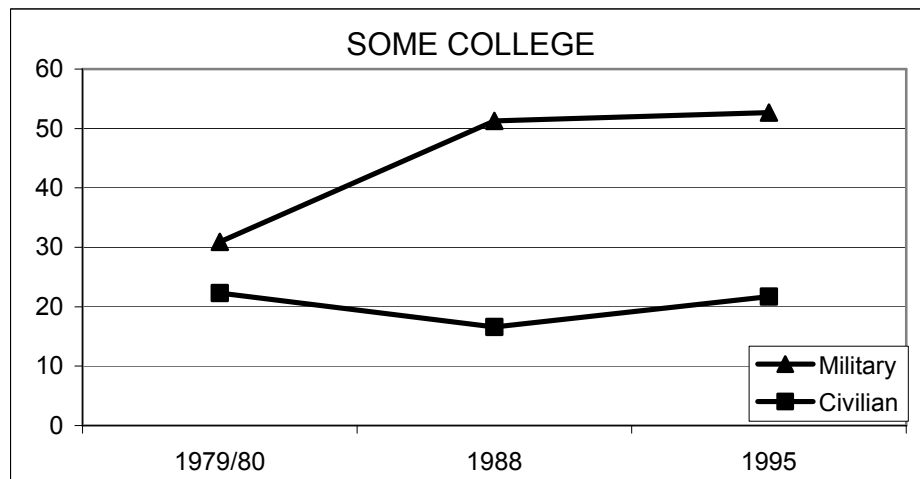
larger for the military part (33.1% vs 9.2%). For the next seven years (until 1995) these rates still continued to decline, but at a decreasing rate.

From Figure 3 one can observe that the difference in married individuals between military and civilian population took its highest value during the surveyed year 1988 (25.5%). Another critical observation someone can derive from Figure 3, is that there is a slight decreasing trend in marriage rates.

Figure 3. Percentages of married individuals for military and civilian populations



Figure 4. Percentages of individuals who have attended some college



There are some critical points one could derive from Figure 4. First of all, the majority of the enlisted personnel have attended some college (because we have to take into account also the individuals who have graduated from college). There is a big

difference in “some college” between military respondents and their counterparts in the civilian sector (the lowest percentage is for the latter one). This difference took its maximum value during the surveyed year 1988.

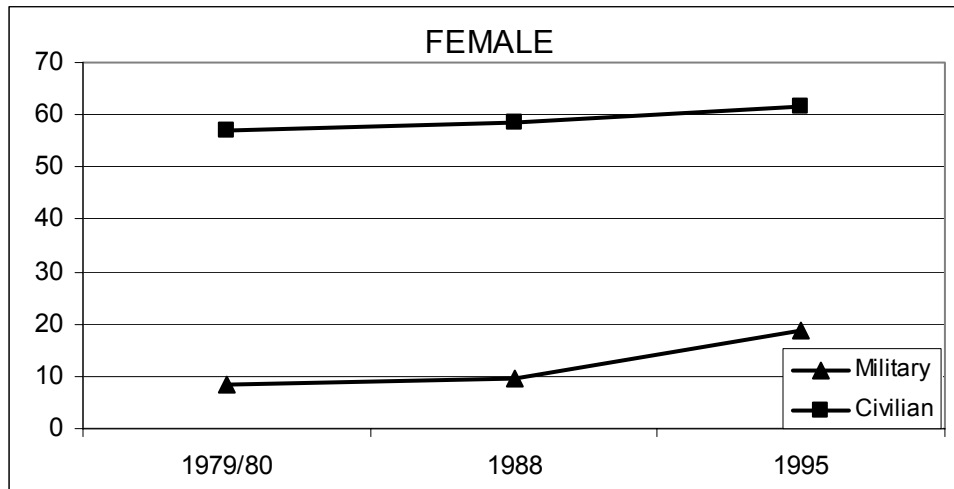
Figure 5 exhibits that the percentage of the younger population in the Armed Forces is decreasing over time, and especially of those who are contained in the 17 to 21 age-group. The potential consequences of aging the services’ enlisted force go beyond the drug participation rates, and exert significant influence on issues such as professionalism, productivity, and readiness. [Ref. 37]

From Figure 6 it becomes apparent that females occupy a significant lower fraction of the military population than their counterparts in the civilian sector. On the other hand, one could argue that the percentage of the females in the military increased drastically in these 15 years, from 1980 to 1995, rising from 8.6% to 18.8%, which is a more than double-increase (roughly 120%).

Figure 5. Percentages of individuals aged 17 to 20



Figure 6. Female population in the civilian and military samples



C. DRUG PREVALENCE RATES BY AGE, MARITAL STATUS, AND EDUCATIONAL BACKGROUND

In this section we investigate how drug prevalence rates differ by demographic characteristics. In that context we examine the drug participation rates by age, married and singles, and educational background.

1. DODWWS 1980

Figures 7 and 8 demonstrate past-month and past-year drug participation rates, respectively, for military members with different age, marital status and educational background for survey year 1980.

The figures show that military members with lower drug participation rates are: (a) aged from 26 to 49; (b) college graduates; (c) married; or (d) have attended some college. Some respondents will be only in one category (i.e., those who have age from 35 to 49 cannot be at the same time in the group of people with age from 26 to 34). Respondents also can be included to multiple categories (i.e., college graduates who are married and have age 26 to 34). It is remarkable that not only the same groups demonstrate lower drug use rates for both categories, but also that their ranking, based on the values of the respective percentages, is the same for both groups. The percentage of the respondents that belong at least to one of the above categories is 65.33%.

Figure 7. Past-month drug participation rates for military personnel (1980) by characteristic

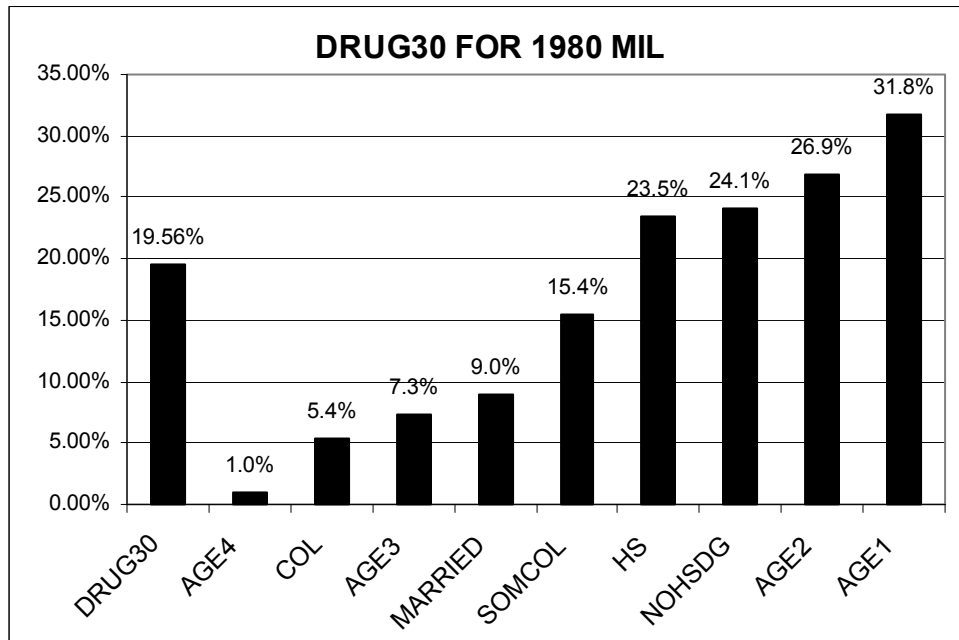
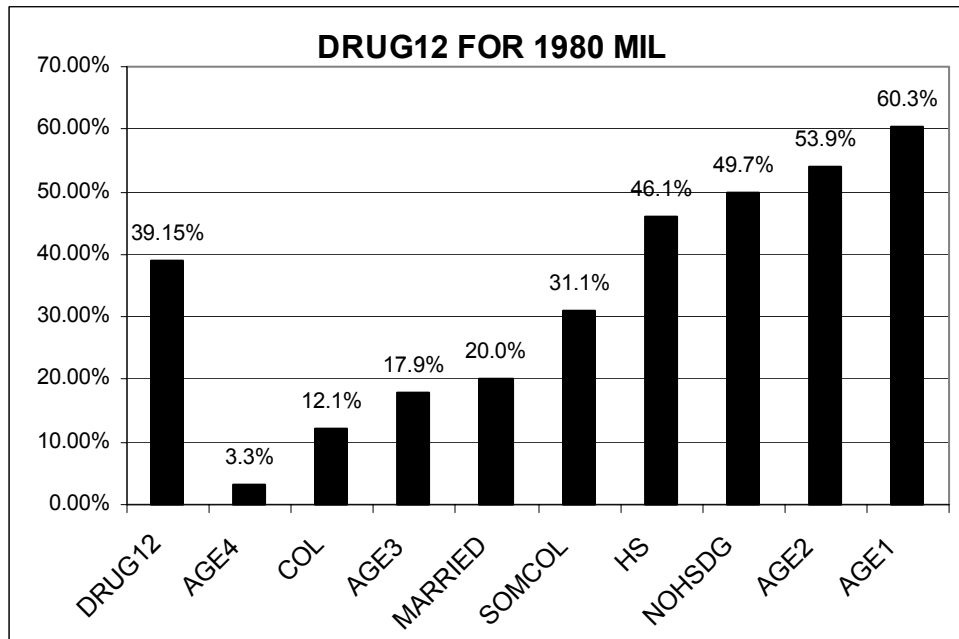


Figure 8. Past-year drug participation rates for military personnel (1980) by characteristic



If one is to attempt a comparison between overall values of drug participation rates and the rates of each group, we find that the biggest difference is observed for past-

month drug participation rates and for military members aged 35 to 49 (35.85%). The lowest difference is observed for past-month participation rates for those who have attended some college (4.16%).

On the other hand, the following respondents demonstrate higher drug participation rates than the mean: (a) have a high school degree; (b) do not have a high school degree; (c) aged 21 to 25; or (d) are aged 17 to age 21. Following the same procedure we estimate the above-the-mean difference, which takes its maximum value (+21.15%) for respondents aged 17 to 21 (past-year drug participation), and its minimum value (+3.94%) for those who have a high school degree (past-month drug participation).

2. DODWWS 1988

Figures 9 and 10 demonstrate past-month and past-year drug participation rates, respectively, for military members with different age, marital status and educational background, for the survey year 1988. Following the same methodology one could mention that the previously mentioned groups still demonstrate lower drug participation rates than the mean for the group. This time the below-the-mean difference is maximized (4.1%) for respondents aged 35 to 49 (past-year drug participation), while it is minimized (0.4%) for respondents aged 26 to 34 (past-month drug participation).

On the other hand, the same groups mentioned for the 1980 survey still have above-the-mean values. The maximum difference (+9.4%) is observed for respondents aged 17 to 20 (past-year drug participation), while the minimum (+0.8%) for those who have not a high school degree (past-month drug participation).

In 1988 there is a significant increase in the number of respondents that belong to “below-the-mean” groups, as they represent 89.5% of the sampled military members. This is equivalent to 24.2% increase (absolute values), and thus one could argue that in a period of 8 years a significant result attained toward the “quality” improvement of the personnel.

Figure 9. Past-month drug participation rates for military personnel (1988) by characteristic

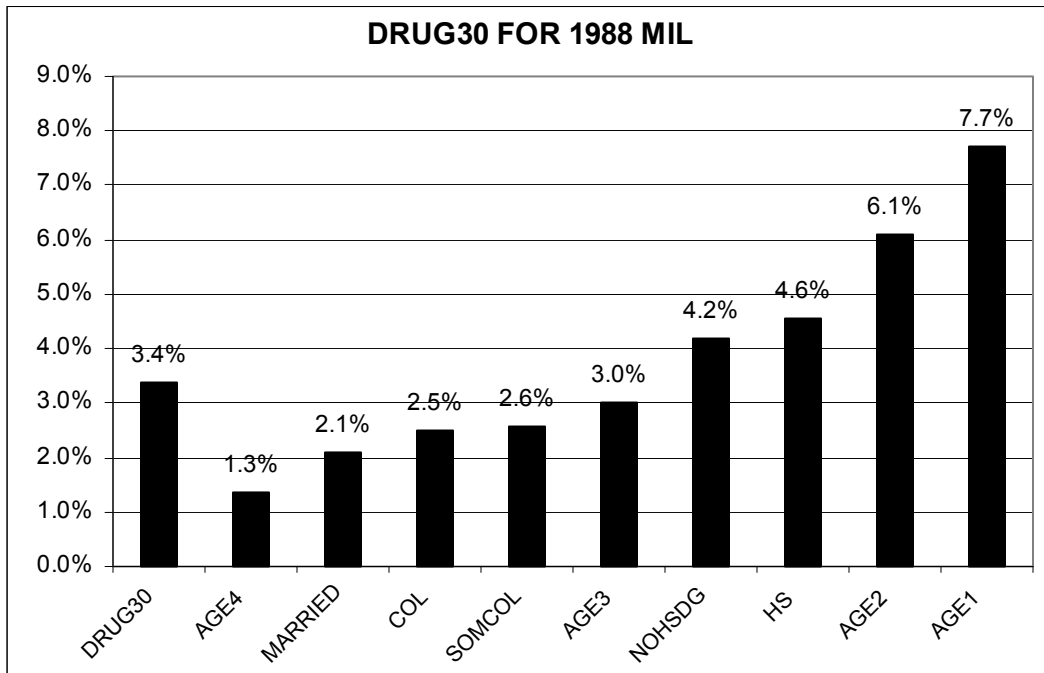
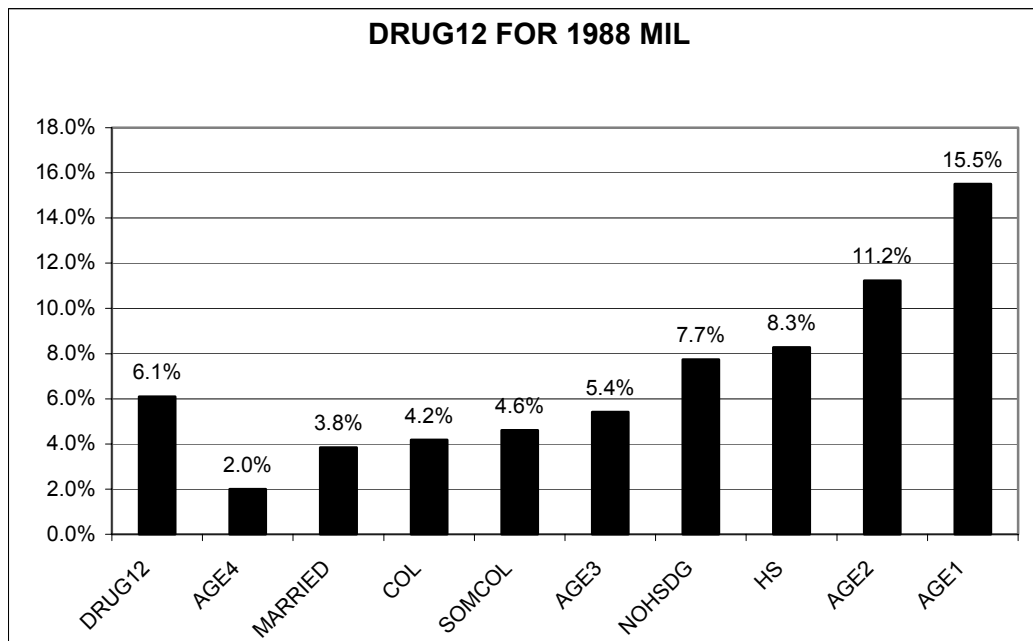


Figure 10. Past-year drug participation rates for military personnel (1988) by characteristic



3. DODWWS 1995

Figures 11 and 12 indicate that the drug use picture is identical to what was observed in the 1988 survey. The percentage of the respondents that belong to “below-the-mean” groups is slightly less than it was in 1988 survey (84.4%).

Figure 11. Past-month drug participation rates for military personnel (1995) by characteristic

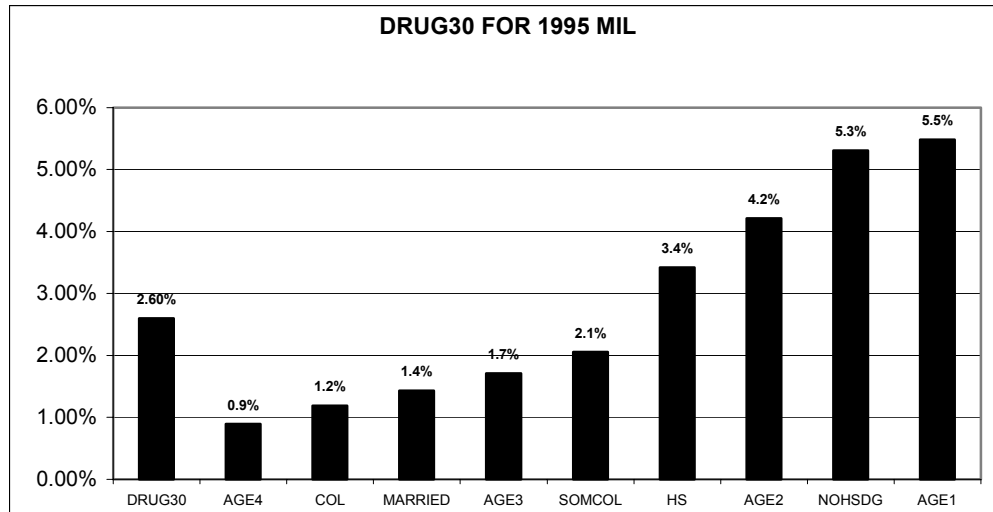
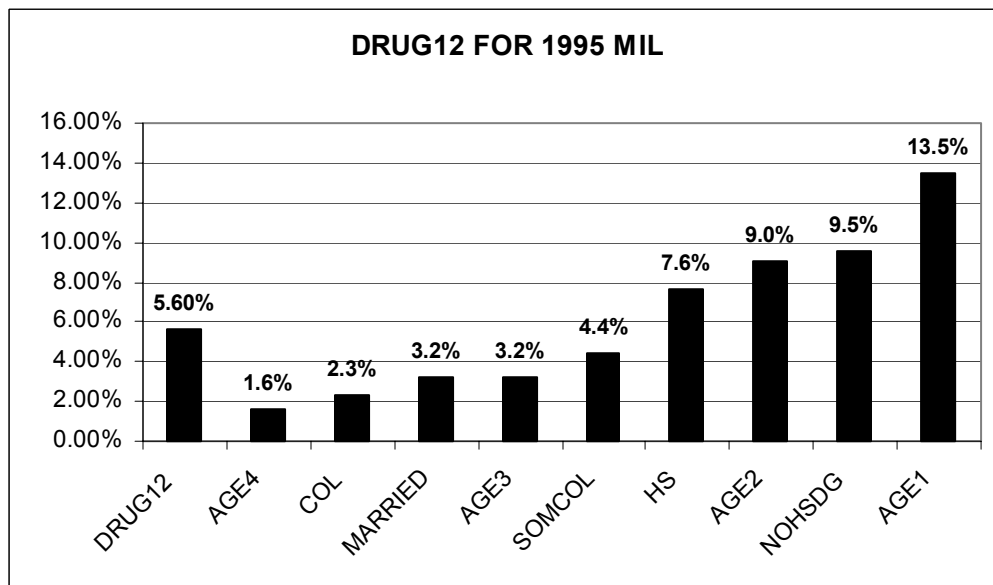


Figure 12. Past-year drug participation rates for military personnel (1995) by characteristic



4. NHSDA 1979

Drug use rates for the civilian population are shown in Figures 13 – 18. First of all, it seems that there are two groups of respondents that demonstrate drug participation rates below the mean value of the sample: (a) respondents aged from 35 to 49, and (b) married individuals. From a comparison between these two groups it becomes apparent that: (a) the drug participation rates for the “age” group remain virtually stable over time; and (b) the married individuals demonstrate a decreasing trend in drug participation rates for both past-month (-4.1%) and past-year (-4%) categories.

On the other hand, there are two groups that steadily demonstrate significantly higher drug participation rates than the mean: (a) respondents aged from 17 to 20; and (b) respondents aged from 21 to 25. The percentage of surveyed individuals who were included in one of these two groups decreased significantly overtime, from 47.7% (1980) to 29.1% (1995).

Figure 13. Past-month drug participation rates for civilian personnel (1980) by characteristic

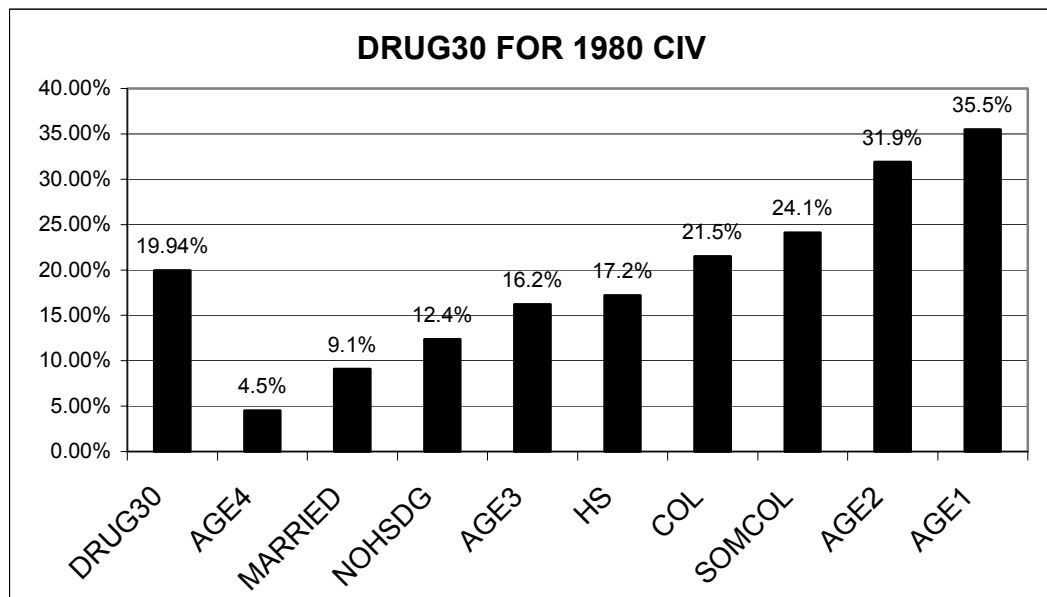


Figure 14 Past-year drug participation rates for civilian personnel (1980) by characteristic

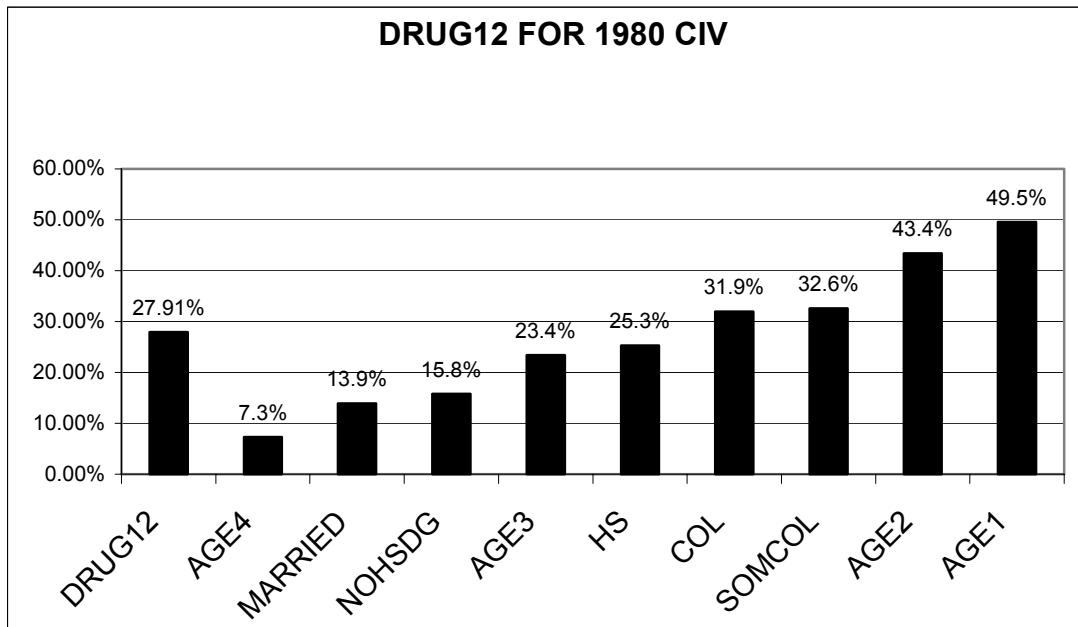


Figure 15. Past-month drug participation rates for civilian personnel (1988) by characteristic

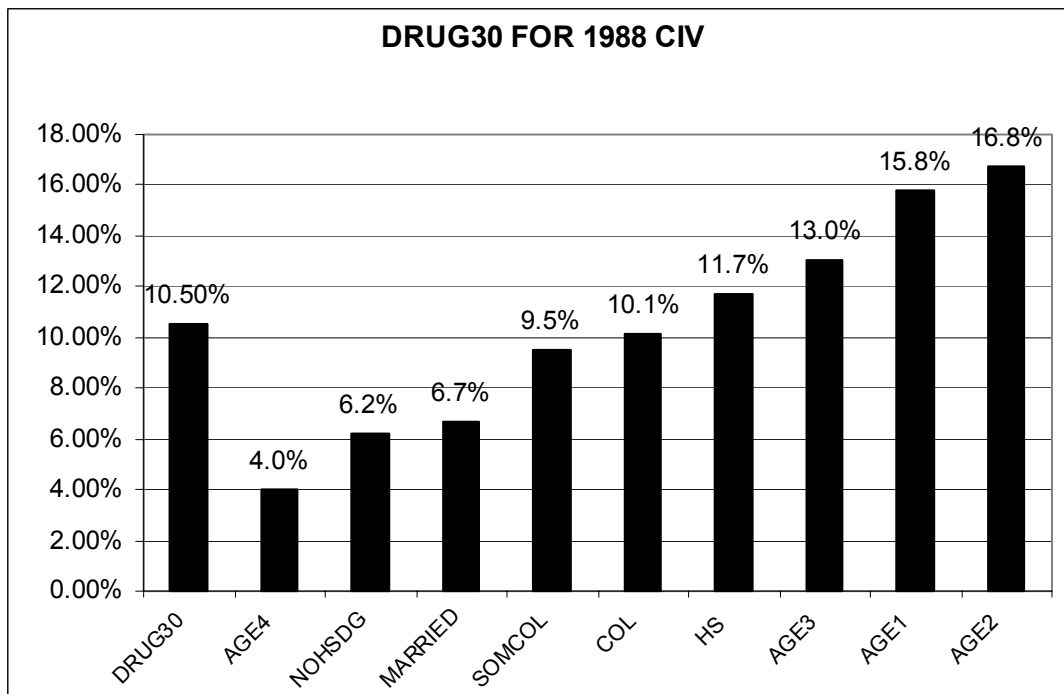


Figure 16. Past-year drug participation rates for civilian personnel (1988) by characteristic

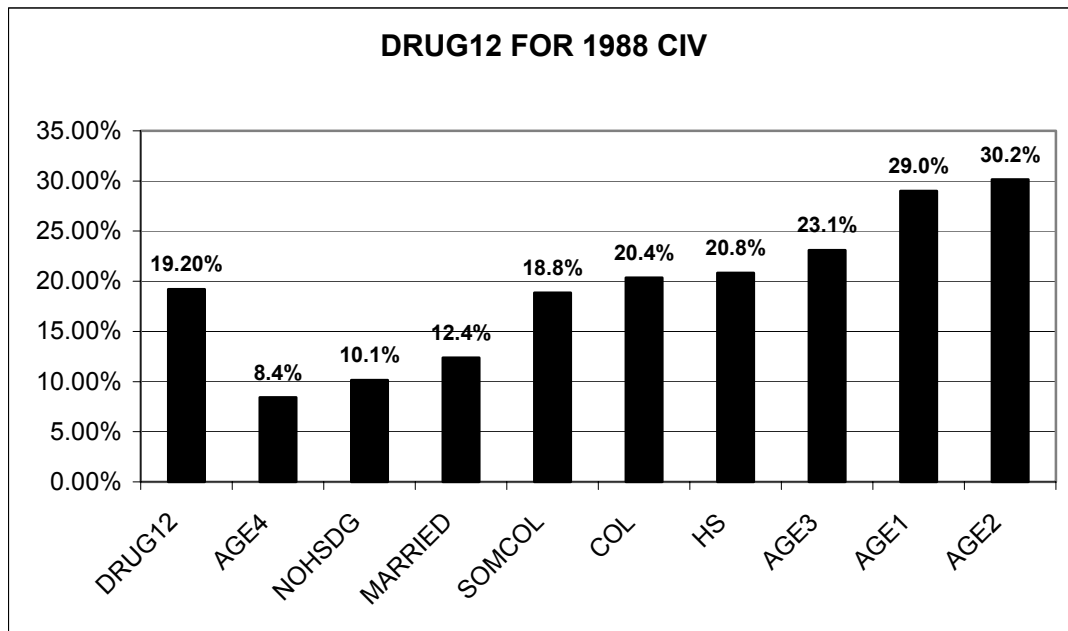


Figure 17. Past-month drug participation rates for civilian personnel (1995) by characteristic

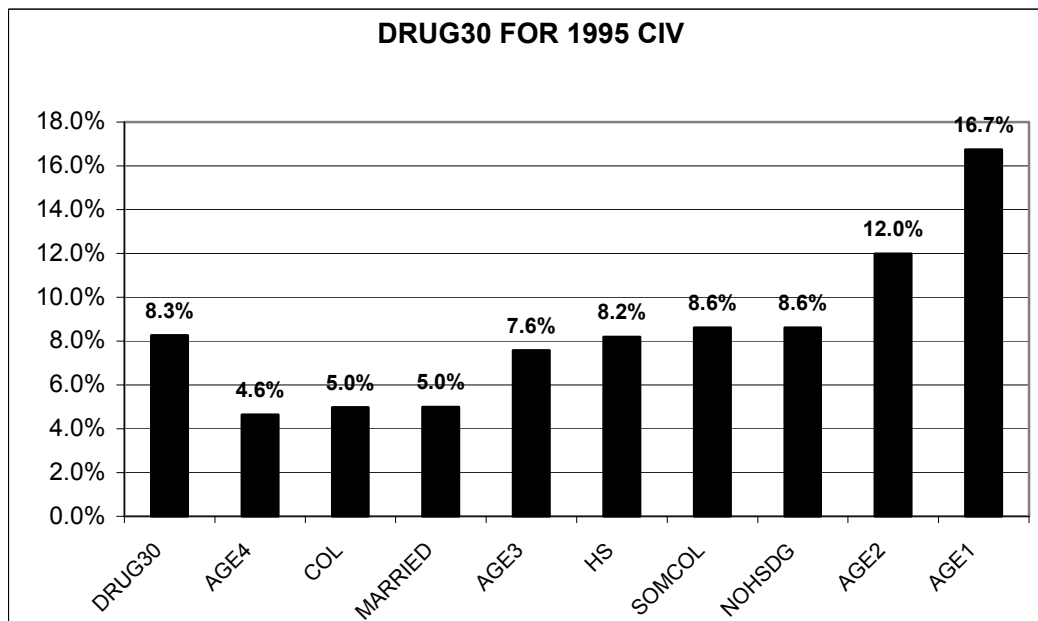
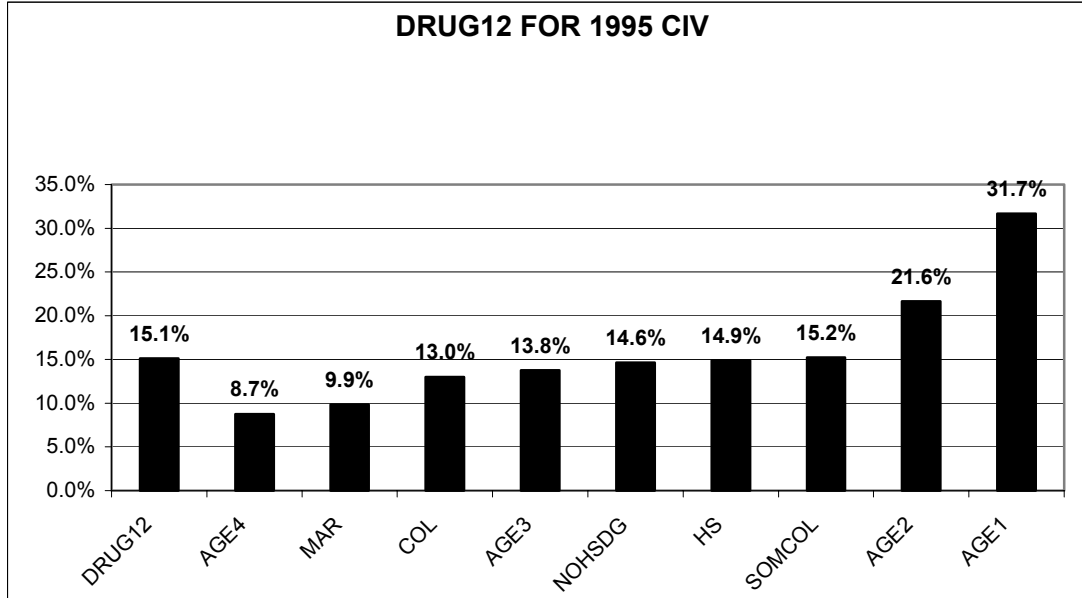


Figure 18. Past-year drug participation rates for civilian personnel (1995) by characteristic



D. DIFFERENCE-IN-DIFFERENCE ESTIMATES

To obtain the difference-in-difference estimator we followed the methodology described in Wooldridge [Ref. 38]. In that context the estimated model is the following:

$$y_i = \beta_0 + \delta_0 d2_i + \delta_1 dM_i + \delta_1 d2 dM_i + \beta_1 X_i + e_i$$

where, y is the dependent variable (either the DRUG30 or DRUG12 variable),

dM is a dummy variable for a military member,

$d2$ denotes a dummy variable for the second time period (post-policy change year, either 1988 or 1995),

i is the i individual, and

e_i represents the random error term.

The control group does not appear in the model as it represents the base group, which in our case is the civilian population.

In the above model $\hat{\delta}_1$ is the difference-in-difference estimator, and in our case measures the difference in drug participation rates (both past-month and past-year) due to introduction of the new drug policy (“zero tolerance”).

The steps we took for the construction of the respective models were: (a) we merged the data from the 1979/80 surveys, which served as the pre-policy year; (b) we merged the data from the 1988 surveys (both NHSDA and DODWWS); (c) we used 1988 as the first post-policy year; (d) we replicated the procedure substituting 1995 data for 1988 data (i.e., 1995 because the post-policy year); and (e) we estimated the $\hat{\delta}_1$ for both DRUG30 and DRUG12 dependent variables. Thus, we created four sets of estimates ($DRUG30_{79/80-88}$, $DRUG12_{79/80-88}$, $DRUG30_{79/80-95}$, and $DRUG12_{79/80-95}$), which are shown in the Appendixes A and B.

This is the new element this thesis introduces, as previous studies (Martinez, [Ref. 12], and Hey and McCrea, [Ref. 26]) estimated the policy change based solely on the coefficient of a military dummy variable (dM), with no interaction effects included. The coefficient of the military variables in the previous captures only on the effect of the military sector, but does not capture the true policy effect, which requires the difference-in-difference estimator.

E. RESULTS

1. Comparison 1979/80 with 1988

In the Table 11 are shown the estimated difference-in-difference estimators for both past month and past year participation. From the sign of these values (negative) we conclude that a definite deterrence effect resulted from the implementation of the “zero tolerance” policy. Additionally, it is noteworthy that the magnitude of the deterrence effect was larger for the past year drug participation. One could explain this by taking into consideration that past month drug participation was lower for the military sector for the year 1980 (pre-policy period). Additionally, both the military and civilian sectors demonstrated a significant decrease in past month participation over this 8-year (16.19% and 9.66%, respectively).

The total set of the involved variables with the associated coefficients is shown in Appendix A. The base group for that model is a male white civilian with no high school degree. The most significant decrease in illicit drug participation is observed for married individuals (-20.69%), while the less significant decrease is for those who have high school degree (-0.84%).

Table 11. LPM Difference-in-Difference estimators for the years 1979/80 and 1988

	Diff-in-Diff 1979/80 vs. 1988	Means (military)		Means (civilians)	
		1980	1988	1979	1988
Past Year Participation	-17.24%	39.16%	6.08%	27.91%	18.73%
Past Month Participation	-1.94%	19.56%	3.37%	19.93%	10.27%
N	34,546				

Note: Sample includes all respondents

Table 12 shows the results of restricting the analysis to males. The magnitudes of the deterrence effect for drug participation rate are smaller for the male sub-sample. The means show that males demonstrate lower past month and past year drug participation in both the military and civilian sector.

Table 12. LPM Difference-in-Difference estimators for the years 1979/80 and 1988

	Diff-in-Diff 1979/80 vs. 1988	Means (military)		Means (civilians)	
		1980	1988	1979	1988
Past Year Participation	-12.78%	35.09%	5.35%	15.82%	9.45%
Past Month Participation	2.65%	17.58%	2.95%	12.04%	5.53%
N	26,968				

Note: Sample includes males only

Appendix T exhibits the total set of variables with their coefficients. Again the married persons demonstrate lower drug participation rates by -21.54%, followed by college graduates with a respective value of -12.75%.

The difference-in-difference estimators for each service separately are shown in the Table 13, and Table 14. Table 13 includes females, while Table 14 excludes females.

If one ranked the services based on the magnitude of the deterrence effect, the

Marines Corps would occupy the first place followed by the Navy, Army and Air Force. This ranking remains unchanged for both past month and past year participation, and regardless of whether the males are included in the sample. Another interesting point is that the magnitude of the deterrence effect is smaller for the male population. This difference is greatest for the Army (-4.98%, past year drug participation) and smallest the Marines Corps (-4.13%, past year drug participation).

Table 13. LPM Difference-in-Difference estimators for the years 1979/80 and 1988

		Difference-in-Difference 1979/80 vs. 1988			
		Navy	Army	Marines	Air Force
Past Year Participation		-21.33%	-16.83%	-28.43%	-10.20%
Past Month Participation		-5.27%	0.16%	-7.62%	1.90%
N		16,213	16,988	11,839	16,107

Note: Sample includes all respondents by service

Appendixes C, E, G, and I illustrate the total set of the variables and their coefficients, for Navy, Army, Marine Corps, and Air Force respectively. The married individuals demonstrate lower drug participation regardless of the service. The maximum value of this lower rate is observed for the Navy (-22.18%), while the minimum for the Air Force (-18.36%).

Table 14. LPM Difference-in-Difference estimators for the years 1979/80 and 1988

		Difference-in-Difference 1979/80 vs. 1988			
		Navy	Army	Marines	Air Force
Past Year Participation		-16.90%	-11.85%	-24.30%	-5.44%
Past Month Participation		-1.00%	4.90%	-3.14%	6.60%
N		10,371	11,124	6,577	10,278

Note: Sample includes only males by service

The total set of the variables with their coefficients are shown in Appendixes D, F, H and J for Navy, Army, Marine Corps and Air Force, respectively. Once again the married persons demonstrate lower drug participation rates, and the respective values are very close to those that observed for the whole population. The Navy married males show

lower drug participation rates by –23.79%, while the respective value for the Air Force is –17.49%.

2. Comparison of 1979/80 with 1995

The Difference-in-Difference LPM estimators for both past year and past month drug participation models for the years 1979/80 and 1995 are displayed in Tables 15, 16, and 17. Each table follows the same pattern as in Tables 11-14. If we compare these results with those for the years 1979/80 and 1988, we observe that the findings are very similar. The observed deterrence effects are slightly smaller for these periods. This implies that although there is still a statistically significant difference in drug participation between the military and the civilian sector in 1995, this difference is decreasing overtime.

Table 15. LPM Difference-in-Difference estimators for the years 1979/80 and 1995

	Diff-in-Diff	Means (military)		Means (civilians)	
	1979/80 vs. 1995	1980	1995	1979	1995
Past Year Participation	-14.47%	39.16%	5.59%	27.91%	16.67%
Past Month Participation	-1.88%	19.56%	2.60%	19.93%	9.80%
N	37,592				

Note: Sample includes all respondents

The full set of the variables and their coefficients is shown in Appendix B. Male individuals demonstrate lower drug participation by –19.27%, which is very close to what was observed for the period 1979/80 to 1988. Drug participation for college graduates has further decreased and reached the value –12.63%.

Table 16 shows that when females are excluded from the sample the observed differences decrease in a similar way to what previously observed in Tables 11 and 13 (1979/80 vs. 1988).

Appendix V exhibits the total set of variables with their coefficients. This time married persons demonstrate lower drug participation rates by -21.46%, followed by college graduates with a respective value of –15.67%. Thus, we have evidence that as the

period interval between pre-and post-implementation increases, the lower drug participation rates for college graduates increases.

Table 16. LPM Difference-in-Difference estimators for the years 1979/80 and 1995

	Diff-in-Diff	Means (military)		Means (civilians)	
	1979/80 vs. 1995	1980	1995	1979	1995
Past Year Participation	-10.07%	35.09%	4.55%	15.82%	8.74%
Past Month Participation	2.33%	17.58%	2.09%	12.04%	5.50%
N	25,988				

Note: Sample includes males only

From the comparison of the Tables 17 and 18 becomes apparent that the previous ranking of the services based on relative drug participation rates (Marines Corps, Navy, Army and Air Force) remained unchanged. Once again, the differences decrease when we deal only with males. As previously, the largest decrease is for the Army (-5.27%, past year drug participation), while the smallest is for the Marine Corps (-3%, past year participation). In Appendixes R and S, are shown the LPM estimates for other segments of the population (females) as well as for subgroups broken by age.

Table 17. LPM Difference-in-Difference estimators for the years 1979/80 and 1995

	Difference-in-Difference 1979/80 vs. 1995			
	Navy	Army	Marines	Air Force
Past Year Participation	-17.59%	-14.67%	-24.61%	-8.49%
Past Month Participation	-4.19%	-0.70%	-6.28%	1.47%
N	20,731	19,720	18,217	20,207

Note: Sample includes all respondents by service

Appendixes K, M, O, and Q show the coefficients of the used variables for Navy, Army, Marine Corps and Air Force, respectively. It is observed that the coefficients for married persons and college graduates assume lower values than their counterparts for the male population only. Married individuals show lower drug participation up to -19.68% (Navy), while college graduates up to -9.30% (Army).

Table 18. LPM Difference-in-Difference estimators for the years 1979/80 and 1995

	Difference-in-Difference 1979/80 vs. 1995			
	Navy	Army	Marines	Air Force
Past Year Participation	-13.35%	-9.40%	-21.61%	-4.04%
Past Month Participation	-0.02%	3.05%	-2.64%	5.50%
N	11,579	10,716	9,503	11,093

Note: Sample includes males only by service

The full set of the variables with their coefficients are shown in Appendixes J, L, N, and P for Navy, Army, Marine Corps and Air Force, respectively. Once again the married persons demonstrate lower drug participation rates with a maximum value of -23.05% (Navy), followed by college graduates with a respective value of -12.68% (Army).

F. SUMMARY

This chapter discussed the new contributions of this thesis: (a) the implementation of LPM models; (b) the estimations of the policy effect via an explicit difference-in-difference estimates; and (c) the usage of data for the year 1988 for the NHSDA and DODWWS surveys. The chapter also discussed the NHSDA and DODWWS surveys. In that context the survey techniques are briefly mentioned, together with the established goals each survey. The chapter also discussed the limitations of the data, as these weaknesses help to evaluate the accuracy and the validity of the findings.

In the next step the description of the model was presented together with a brief explanation of the explanatory variables of this model. This serves as the starting point for the exploration of the data and the meaningful interpretation of model results. Potential correlations between drug participation rates and demographic characteristics such as age, marital status and educational background are examined. The data show that military personnel in 1995, on average, were more likely to be older, married, and to have more education than in 1980. Additionally, we find that these elements are associated with lower drug participation rates.

Finally, difference-in-difference estimators are presented in the last section of this chapter. Different estimators are obtained by gender and service. The findings illustrate an impressive decrease in drug participation for the Marines Corps, followed by smaller decreases for the Navy, Army, and Air Force. This decrease is especially significant during the first period (1979/80 to 1988). For the period from 1988 to 1995 the deterrence effect slightly decreased, as the percentage of drug users in the military environment continued to drop, but at the same time a comparable decrease took place in the civilian population.

THIS PAGE INTENTIONALLY LEFT BLANK

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The primary issue addressed by this thesis was the evaluation of the deterrence effect associated with the drug testing policy adopted by the DoD. Data gathered for the years 1979, 1980, 1988, from the NHSDA and DODWWS surveys were used to analyze the deterrence effect. The models were estimated as linear probability models (LPM) by OLS techniques. A simple difference-in-difference estimator was used to represent the impact of the military's drug policy.

First, we examined the difference-in-difference estimator for both past year and past month drug participation in the time period from 1979/80 to 1988. The findings show clearly a significant decrease in any illicit drug participation, and support the conclusion that a definite deterrence effect resulted from the implementation of the "zero tolerance" policy. More specifically, taking into consideration the military population as a whole (all services), the difference-in-difference estimator for past year drug participation is found to be -17.24%, and -1.94% for past month usage. In the next stage we focused only on males, as males represent the majority of the military personnel (over 90%). The values for the difference-in-difference estimators were -12.78% (past year) and +2.65% (past month). The magnitude of the deterrence effect for past year drug participation rate appears to be smaller for males.

In the next step we examined the difference-in-difference estimator for each service separately, again for both males and females and separately for males. The results show that the magnitude of the deterrence effect for any illicit drug participation is largest for the Marine Corps (-28.43%, past year) and smallest for the Air Force (1.90%, past month). Restricting our examination to males only we found that the largest deterrence effect occurred in the Marines Corps (-24.30%, past year) while again the smallest was observed in the Air Force (6.60%, past month). At this point we have to remember that the Air Force had the lowest illicit drug participation of all services during the pre-

implementation era (based on the 1980 DODWWS survey,) and thus the probability of an impressive further decrease was limited.

One of the secondary questions of this thesis was to examine if other factors such as marriage, education, and age influenced the deterrence effect. The percentage of the military personnel that was married in the 1980 sample was 47.3%. These married individuals usually demonstrate significant lower drug participation rates (up to -50% lower). During the 1988 survey the married individuals represented 70.8% of the surveyed military personnel, and thus one could expect that the increase in marriage rates would contribute to the decrease in illicit drug participation. Indeed, from the statistical models we found that married persons were less likely to have participated in illicit drug use by -20.69% (past year) and -12.48% (past month). Excluding the female population we find the values to be -21.54% and -12.75%, respectively. Furthermore, examining each service separately, we find the largest deterrence effect for the Navy (-23.79%, past year) while the smallest difference is observed for the Air Force (-11.18%, past month). Additionally, the Air Force is the only service where married males are not associated with lower drug participation rates.

Age was another effect we examined for its effect on drug use. Generally, as military members age they are promoted to higher levels in the hierarchy. Thus, the imposed penalties for senior military members who engage in illegal drug participation are associated with larger losses. Therefore, one could expect that “aging of the Force” over time and illicit drug participation are negatively correlated. This is verified by the 1980 DODWWS survey, where the percentage of drug abusers among service members aged above 25 years old is -35% smaller than young ages (past year drug participation for individuals aged 36 to 49). The percent of the military population in 1975 above 25 was 35%, while in the 1988 DODWWS survey this percentage had almost doubled to 72.4%, a considerable “aging of the Force”. Naturally, this force aging contributed to the deterrence effect. Again from the models we find that the probability of drug participation for a military member aged 36 to 49 is -25.62% (past year use) lower than for younger age groups.

Finally, educational background was examined to determine the potential relationship between education and drug participation. It is generally accepted that more educated persons (college graduates and those with some college attendance) consider the long run consequences of their decisions. In that context, it is expected that more educated persons realize the negative consequences associated with drug participation, and thus, will avoid engaging in such activity. Military members with some college attendance or college graduates represented 39.5% of the surveyed military population in 1980, while this percentage increased to 58% in the 1988 DODWWS survey. Additionally, college graduates showed lower (-27%) illicit drug participation in the 1980 DODWWS survey. Therefore, one could argue that in the period from 1980 to 1988, military members became more educated, which lead to lower drug participation rates. Indeed, from the results we find that the probability of a military college graduate participating in illicit past year drug participation is -5.79% (Navy, males only) lower than non-college graduates.

At this point it is considered critical to recall that the self-administered questionnaires may impose a bias in the estimation of the deterrence effect, as those who participate in the surveys may attempt to hide the truth. Thus, one could argue that the severity of the imposed penalty for detected drug abusers in the military may contribute to the large magnitude of the deterrent effect. Besides that, a bias may be imposed in the estimation of the past year drug participation because respondents who had been in military for less than one year were included in the survey. Their drug usage may have been occurred while they were civilians.

In the next stage we examined if the deterrence effect changed over time, using data from the 1995 surveys (both for military and civilian population). Although estimated deterrence effects were lower than estimated in 1988, the deterrence effect of the “zero tolerance” and aggressive random drug testing was still significant. These lower deterrence effects could be attributed to the fact that illicit drug participation decreased in the civilian sector after Federal Drug-Free Workplace Act was adopted in 1988.

In conclusion, the results provide evidence that certain characteristics of the population such as being married, and college educated are associated with lower illicit

drug participation. Additionally, there is evidence that the military population in 1995 was older, more married and more educated than it was in 1980. Thus, these characteristics contributed, together with the “zero tolerance” and aggressive random drug testing policy, to the decline in illicit drug participation. Finally, for the period from 1980 to 1995, a significant drop in illicit drug participation also occurred in the civilian sector.

B. RECOMMENDATIONS

Illicit drug participation is associated with potential losses not only for the Armed Forces as a whole (productivity, professionalism, unit readiness), but also for individual drug abusers. The larger the penalties for engaging in drug use the lower the probability of participation. From the findings there is evidence that the probability of any illicit drug participation for individuals who have a family is lower than it is for single persons. To put it simply, individuals who have a family know that they are taking a bigger risk when they engage in illicit drug participation, because they have more to lose. Therefore, the temporal trend toward married service members and toward families can be viewed in a positive light from the standpoint of drug usage.

Education of military personnel is associated with certain costs. On the other hand, the Armed Forces derive certain advantages from increased education, including lower illicit drug participation. As mentioned earlier, lower drug participation means fewer accidents, greater efficiency, greater productivity, and higher level of readiness. In that context, a cost-benefit analysis that would calculate the costs associated with providing additional education to military personnel, and the derived benefits, would help to determine the appropriate amount to allocate to voluntary educational programs for military personnel.

**APPENDIX A. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION FOR THE PERIOD 1979/80 TO 1988,
AGES 17 TO 49**

	Past Month Participation	Past Year Participation
Intercept	33.72% (50.350)*	48.18% (59.770)
FEMALE	-5.22% (10.970)	-5.93% (10.360)
MARRIED	-12.48% (35.320)	-20.69% (48.640)
BLACK	-2.66% (6.100)	-2.05% (3.910)
HISPANIC	-1.66% (2.090)	0.58% 0.600
OTHRACE	-2.25% (2.940)	-2.44% (2.650)
HSDG	-0.39% (0.750)	-0.84% (1.370)
SOMCOLL	-2.39% (4.490)	-4.89% (7.630)
COLLGRAD	-5.26% (7.220)	-9.99% (11.400)
MILITARY	-5.73% (9.110)	4.53% 5.980
YEAR88	-10.86% (16.260)	-10.14% (12.600)
MIL_88	-1.94% (2.470)	-17.24% (18.270)
N	34,546	

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses.

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX B. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION FOR THE PERIOD 1979/80 TO 1995,
AGES 17 TO 49.**

	Past Month Participation	Past Year Participation
Intercept	34.53% (54.110)*	49.43% (63.920)
FEMALE	-4.96% (-12.560)	-5.96% (-12.470)
MARRIED	-11.67% (-35.620)	-19.27% (-48.540)
BLACK	-2.98% (- 7.120)	-2.97% (- 5.850)
HISPANIC	-4.12% (- 7.930)	-5.43% (- 8.630)
OTHRACE	-2.44% (- 3.410)	-3.25% (- 3.750)
HSDG	-2.33% (- 4.880)	-3.18% (- 5.500)
SOMCOLL	-3.42% (- 6.790)	-6.35% (-10.390)
COLLGRAD	-7.63% (-10.990)	-12.63% (-15.010)
MILITARY	-5.36% (- 8.790)	4.86% (6.580)
YEAR95	-12.13% (-20.140)	-14.33% (-19.640)
MIL_95	-1.88% (- 2.600)	-14.47% (-16.470)
N	37,592	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX C. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION FOR THE PERIOD 1979/80 TO 1988 IN THE
NAVY, AGES 17 TO 49.**

	Past Month Participation	Past Year Participation
Intercept	35.19% (42.12)*	48.51% (49.69)
FEMALE	-7.07% -(10.87)	-7.91% -(10.40)
MARRIED	-14.30% -(25.49)	-22.18% -(33.83)
BLACK	-3.26% -(4.11)	-4.32% -(4.66)
HISPANIC	-2.31% -(1.70)	-1.42% -(.89)
OTHRACE	-2.48% -(1.99)	-3.67% -(2.51)
HSDG	-0.39% -(.54)	0.55% (.65)
SOMCOLL	-0.94% -(1.18)	-1.13% -(1.22)
COLLGRAD	-2.89% -(2.65)	-3.91% -(3.08)
MIL_88	-5.28% -(4.74)	-21.33% -(16.39)
MILITARY	-3.83% -(4.41)	6.34% (6.25)
YEAR88	-10.85% -(14.60)	-9.99% -(11.50)
N	16,213	

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX D. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION FOR THE PERIOD 1979/80 TO 1988 IN THE
NAVY, AGES 17 TO 49, MALES ONLY**

	Past Month Participation	Past Year Participation
Intercept	39.38% (36.49)*	52.98% (43.05)
MARRIED	-15.12% (-20.69)	-23.79% (-28.53)
BLACK	-3.55% (- 3.27)	-2.19% (- 1.77)
HISPANIC	-1.82% (- 1.02)	-0.67% (- .33)
OTHRACE	-3.90% (- 2.73)	-5.61% (- 3.44)
HSDG	-0.95% (- .99)	-0.27% (- .24)
SOMCOLL	-1.35% (- 1.31)	-2.94% (- 2.49)
COLLGRAD	-3.73% (- 2.61)	-5.79% (- 3.56)
MIL_88	-0.96% (- .65)	-16.90% (-10.09)
MILITARY	-7.46% (- 6.97)	3.12% (2.56)
YEAR88	-15.33% (-13.22)	-14.13% (-10.69)
N	10,372	

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX E. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION FOR THE PERIOD 1979/80 TO 1988 IN THE
ARMY, AGES 17 TO 49**

	Past Month Participation	Past Year Participation
Intercept	34.30% (42.97)*	47.72% (49.89)
FEMALE	-7.44% (-11.84)	-8.20% (-10.89)
MARRIED	-12.91% (-24.19)	-20.56% (-32.14)
BLACK	-2.46% (- 3.91)	-2.76% (- 3.65)
HISPANIC	-2.82% (- 2.45)	-0.97% (- .70)
OTHRACE	-1.34% (- 1.02)	0.30% (.19)
HSDG	0.63% (.92)	1.19% (1.45)
SOMCOLL	-1.08% (- 1.45)	-2.42% (- 2.72)
COLLGRAD	-2.80% (- 2.72)	-4.57% (- 3.70)
MIL_88	0.16% (.15)	-16.83% (-13.30)
MILITARY	-7.19% (- 8.36)	5.22% (5.07)
YEAR88	-10.87% (-15.13)	-10.09% (-11.71)
N	16,989	

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX F. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE ARMY FOR THE PERIOD 1979/80 TO
1988, AGES 17 TO 49, MALES ONLY**

	Past Month Participation	Past Year Participation
Intercept	37.77% (37.23)*	51.62% (43.08)
MARRIED	-12.90% -(18.79)	-20.76% -(25.62)
BLACK	-2.60% -(3.35)	-1.17% -(1.28)
HISPANIC	-2.67% -(1.90)	-0.06% -(.03)
OTHRACE	-2.38% -(1.54)	-1.41% -(.77)
HSDG	1.10% (1.23)	1.15% (1.09)
SOMCOLL	-1.37% -(1.46)	-4.44% -(4.01)
COLLGRAD	-3.59% -(2.70)	-7.35% -(4.69)
MIL_88	4.91% (3.54)	-11.85% -(7.24)
MILITARY	-11.15% -(10.63)	1.02% (.83)
YEAR88	-15.47% -(13.97)	-14.29% -(10.92)
N	11,125	

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX G. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE MARINES CORPS FOR THE PERIOD
1979/80 TO 1988, AGES 17 TO 49**

	Past Month Participation	Past Year Participation
Intercept	34.74% (38.30)*	47.48% (44.84)
FEMALE	-8.35% -(11.31)	-9.48% -(10.99)
MARRIED	-13.38% -(19.88)	-20.57% -(26.17)
BLACK	-2.71% -(3.10)	-4.95% -(4.85)
HISPANIC	-2.42% -(1.65)	-1.10% -(.65)
OTHRACE	0.08% (.04)	-0.29% -(.13)
HSDG	0.29% (.36)	1.63% (1.70)
SOMCOLL	0.12% (.12)	1.09% (.99)
COLLGRAD	-1.47% -(1.17)	-1.26% -(.85)
MIL_88	-7.62% -(4.97)	-28.43% -(15.89)
MILITARY	-4.05% -(3.48)	9.57% (7.03)
YEAR88	-10.83% -(14.13)	-9.81% -(10.97)
N	11,840	

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX H. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE MARINES CORPS FOR THE PERIOD
1979/80 TO 1988, AGES 17 TO 49, MALES ONLY**

	Past Month Participation	Past Year Participation
Intercept	37.66% (30.82)*	50.19% (36.32)
MARRIED	-13.93% -(14.42)	-21.16% -(19.37)
BLACK	-2.68% -(2.13)	-3.05% -(2.14)
HISPANIC	-2.51% -(1.25)	-0.75% -(.33)
OTHRACE	-2.85% -(1.09)	-4.24% -(1.44)
HSDG	0.75% (.62)	2.27% (1.67)
SOMCOLL	0.48% (.35)	0.17% (.11)
COLLGRAD	-1.60% -(.87)	-2.66% -(1.27)
MIL_88	-3.14% -(1.64)	-24.26% -(11.19)
MILITARY	-7.24% -(5.25)	6.74% (4.32)
YEAR88	-15.41% -(12.48)	-14.07% -(10.08)
N		

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX I. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE AIR FORCE FOR THE PERIOD 1979/80
TO 1988, AGES 17 TO 49**

	Past Month Participation	Past Month Participation
Intercept	33.04% (42.09)*	45.22% (47.72)
FEMALE	-7.04% -(11.94)	-7.47% -(10.49)
MARRIED	-11.81% -(22.60)	-18.36% -(29.09)
BLACK	-1.86% -(2.75)	-3.79% -(4.64)
HISPANIC	-1.57% -(1.29)	-0.01% -(.01)
OTHRACE	0.62% (.47)	1.55% (.97)
HSDG	0.51% (.71)	1.81% (2.07)
SOMCOLL	0.24% (.31)	0.83% (.89)
COLLGRAD	-1.92% -(1.97)	-3.11% -(2.64)
MIL_88	1.88% (1.84)	-10.22% -(8.28)
MILITARY	-12.42% -(14.91)	-7.36% -(7.32)
YEAR88	-10.85% -(16.11)	-9.80% -(12.05)
N	16,108	

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX J. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE AIR FORCE FOR THE PERIOD 1979/80
TO 1988, AGES 17 TO 49, MALES ONLY**

	Past Month Participation	Past Year Participation
Intercept	36.16% (36.15)*	48.65% (40.94)
MARRIED	-11.18% -(16.77)	-17.49% -(22.08)
BLACK	-1.51% -(1.77)	-1.49% -(1.47)
HISPANIC	-1.49% -(.98)	1.02% (.56)
OTHRACE	-0.58% -(.38)	-0.09% -(.05)
HSDG	1.28% (1.28)	2.20% (1.85)
SOMCOLL	0.81% (.79)	0.04% (.04)
COLLGRAD	-1.97% -(1.57)	-4.74% -(3.18)
MIL_88	6.58% (5.09)	-5.44% -(3.54)
MILITARY	-17.25% -(17.22)	-12.38% -(10.40)
YEAR88	-15.50% -(15.41)	-14.12% -(11.81)
N	10,278	

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX K. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE NAVY FOR THE PERIOD 1979/80 TO
1995, AGES 17 TO 49, MALES ONLY**

	Past Month Participation	Past Year Participation
Intercept	40.68% (38.28)*	54.83% (45.06)
MARRIED	-14.98% (-21.56)	-23.05% (-28.99)
BLACK	-2.57% (- 2.65)	-1.85% (- 1.67)
HISPANIC	-4.68% (- 4.41)	-6.02% (- 4.96)
OTHRACE	-3.59% (- 2.61)	-5.80% (- 3.68)
HSDG	-3.15% (- 3.53)	-3.77% (- 3.70)
SOMCOLL	-2.45% (- 2.52)	-4.43% (- 3.97)
COLLGRAD	-7.64% (- 5.43)	-9.82% (- 6.09)
MIL_95	-0.03% (- .02)	-13.35% (- 8.15)
MILITARY	-7.22% (- 6.70)	3.55% (2.88)
YEAR95	-16.27% (-15.11)	-17.66% (-14.32)
N	11,579	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX L. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE NAVY FOR THE PERIOD 1979/80 TO
1995, AGES 17 TO 49**

	Past Month Participation	Past Year Participation
Intercept	36.17% (48.69)*	50.24% (57.43)
FEMALE	-6.77% -(13.12)	-8.03% -(13.22)
MARRIED	-12.94% -(27.18)	-19.68% -(35.10)
BLACK	-3.39% -(5.31)	-5.09% -(6.77)
HISPANIC	-5.45% -(7.90)	-8.36% -(10.29)
OTHRACE	-2.90% -(2.69)	-5.07% -(3.98)
HSDG	-2.80% -(4.63)	-3.04% -(4.26)
SOMCOLL	-2.66% -(4.00)	-3.89% -(4.96)
COLLGRAD	-6.39% -(6.64)	-7.85% -(6.93)
MIL_95	-4.19% -(4.05)	-17.59% -(14.40)
MILITARY	-3.32% -(4.09)	6.90% (7.21)
YEAR95	-11.77% -(17.83)	-13.30% -(17.11)
N	20,733	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX M. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE ARMY FOR THE PERIOD 1979/80 TO
1995, AGES 17 TO 49, MALES ONLY.**

	Past Month Participation	Past Year Participation
Intercept	39.65% (37.30)*	54.14% (43.21)
MARRIED	-13.07% -(18.25)	-21.17% -(25.09)
BLACK	-2.38% -(2.74)	-1.33% -(1.30)
HISPANIC	-5.34% -(5.11)	-5.70% -(4.63)
OTHRACE	-3.46% -(2.10)	-4.08% -(2.10)
HSDG	-2.13% -(2.33)	-2.28% -(2.12)
SOMCOLL	-2.35% -(2.37)	-6.07% -(5.18)
COLLGRAD	-8.15% -(5.83)	-12.68% -(7.70)
MIL_95	3.54% (2.38)	-9.39% -(5.36)
MILITARY	-10.79% -(9.80)	1.60% (1.23)
YEAR95	-16.11% -(15.09)	-17.84% -(14.18)
N	10,718	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX N. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE ARMY FOR THE PERIOD 1979/80 TO
1995, AGES 17 TO 49**

	Past Month Participation	Past Month Participation
Intercept	35.71% (48.27)*	50.04% (56.27)
FEMALE	-7.13% -(13.72)	-8.42% -(13.47)
MARRIED	-11.77% -(24.45)	-18.83% -(32.53)
BLACK	-3.06% -(5.15)	-4.24% -(5.94)
HISPANIC	-5.75% -(8.42)	-8.08% -(9.84)
OTHRACE	-2.41% -(1.96)	-2.41% -(1.63)
HSDG	-2.50% -(4.08)	-2.52% -(3.43)
SOMCOLL	-2.66% -(3.97)	-4.92% -(6.11)
COLLGRAD	-6.72% -(7.06)	-9.30% -(8.13)
MIL_95	-0.72% -(.67)	-14.67% -(11.24)
MILITARY	-6.68% -(8.07)	5.78% (5.80)
YEAR95	-11.64% -(17.82)	-13.40% -(17.05)
N	19,720	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX O. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE MARINE CORPS FOR THE PERIOD
1979/80 TO 1995, AGES 17 TO 49, MALES ONLY**

	Past Month Participation	Past Year Participation
Intercept	38.50% (35.72)*	51.73% (41.83)
MARRIED	-12.17% -(16.27)	-17.91% -(20.88)
BLACK	-1.18% -(1.21)	-2.63% -(2.37)
HISPANIC	-4.11% -(3.97)	-6.22% -(5.24)
OTHRACE	-2.24% -(1.16)	-5.27% -(2.38)
HSDG	-2.07% -(2.15)	-2.15% -(1.94)
SOMCOLL	-0.33% -(.31)	-1.87% -(1.52)
COLLGRAD	-7.44% -(4.73)	-8.80% -(4.88)
MIL_95	-2.64% -(1.66)	-21.61% -(11.82)
MILITARY	-6.90% -(5.39)	7.52% (5.11)
YEAR95	-16.44% -(15.56)	-17.37% -(14.33)
N	9,503	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX P. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE MARINE CORPS FOR THE PERIOD
1979/80 TO 1995, AGES 17 TO 49**

	Past Month Participation	Past Year Participation
Intercept	35.07% (47.26)*	48.70% (55.54)
FEMALE	-7.26% -(13.80)	-8.74% -(14.05)
MARRIED	-11.26% -(22.75)	-16.85% -(28.81)
BLACK	-2.47% -(3.89)	-5.14% -(6.85)
HISPANIC	-4.76% -(7.06)	-7.95% -(9.97)
OTHRACE	-0.95% -(.70)	-3.48% -(2.18)
HSDG	-2.53% -(4.05)	-2.70% -(3.66)
SOMCOLL	-1.55% -(2.23)	-2.38% -(2.89)
COLLGRAD	-5.89% -(5.81)	-6.64% -(5.54)
MIL_95	-6.28% -(5.12)	-24.61% -(17.01)
MILITARY	-2.88% -(2.78)	11.05% (9.03)
YEAR95	-11.92% -(18.46)	-13.17% -(17.26)
N	18,213	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX Q. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE AIR FORCE FOR THE PERIOD 1979/80
TO 1995, AGES 17 TO 49, MALES ONLY**

	Past Month Participation	Past Year Participation
Intercept	38.28% (38.39)*	51.72% (43.67)
MARRIED	-11.31% -(17.60)	-17.53% -(22.97)
BLACK	-0.77% -(.89)	-1.20% -(1.16)
HISPANIC	-4.52% -(4.66)	-5.77% -(5.01)
OTHRACE	-1.08% -(.72)	-2.30% -(1.29)
HSDG	-2.16% -(2.36)	-2.40% -(2.20)
SOMCOLL	-0.97% -(1.00)	-2.81% -(2.44)
COLLGRAD	-6.90% -(5.56)	-9.78% -(6.63)
MIL_95	5.52% (4.23)	-4.04% -(2.61)
MILITARY	-16.45% -(15.88)	-11.37% -(9.24)
YEAR95	-16.41% -(16.97)	-17.66% -(15.37)
N	11,093	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX R. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION IN THE AIR FORCE FOR THE PERIOD 1979/80
TO 1995, AGES 17 TO 49**

	Past Month Participation	Past Year Participation
Intercept	34.67% (49.23)*	48.16% (56.52)
FEMALE	-6.72% -(14.03)	-7.81% -(13.48)
MARRIED	-10.84% -(24.19)	-16.59% -(30.61)
BLACK	-2.24% -(3.81)	-4.50% -(6.32)
HISPANIC	-5.13% -(7.91)	-8.07% -(10.29)
OTHRACE	-0.79% -(.69)	-1.64% -(1.18)
HSDG	-2.61% -(4.33)	-2.73% -(3.75)
SOMCOLL	-1.79% -(2.75)	-2.78% -(3.55)
COLLGRAD	-6.18% -(7.08)	-8.09% -(7.66)
MIL_95	1.47% (1.50)	-8.49% -(7.13)
MILITARY	-11.74% -(14.70)	-6.76% -(6.99)
YEAR95	-11.85% -(19.35)	-13.23% -(17.86)
N	20,207	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX S. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION FOR THE WHOLE POPULATION
FROM 1979/80 TO 1988.**

	Past Month Participation	Past Year Participation
Intercept	37.00% (52.79)*	53.89% (64.76)
FEMALE	-5.80% -(12.32)	-6.99% -(12.50)
MARRIED	-7.68% -(19.47)	-12.16% -(25.98)
BLACK	-2.53% -(5.88)	-1.83% -(3.57)
HISPANIC	-2.26% -(2.87)	-0.49% -(.53)
OTHRACE	-1.70% -(2.24)	-1.45% -(1.62)
AGE2	-2.04% -(3.86)	-3.25% -(5.17)
AGE3	-10.00% -(17.46)	-17.58% -(25.85)
AGE4	-14.47% -(23.90)	-25.62% -(35.65)
HSDG	-0.44% -(.87)	-0.99% -(1.64)
SOMCOLL	-0.47% -(.86)	-1.52% -(2.38)
COLLGRAD	-0.90% -(1.21)	-2.27% -(2.59)
MIL_88	-0.73% -(.94)	-15.10% -(16.36)
MILITARY	-6.84% -(10.98)	2.54% (3.43)
YEAR88	-9.60% -(14.43)	-7.88% -(9.98)
N	34,546	

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX T. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION FOR THE WHOLE POPULATION FROM 1979/80
TO 1995**

	Past Month Participation	Past Year Participation
Intercept	36.64% (55.50)*	53.08% (67.07)
FEMALE	-5.25% -(13.39)	-6.52% -(13.87)
MARRIED	-7.71% -(21.13)	-12.02% -(27.48)
BLACK	-2.36% -(5.67)	-1.83% -(3.66)
HISPANIC	-4.11% -(7.98)	-5.43% -(8.80)
OTHRACE	-2.14% -(3.01)	-2.69% -(3.16)
AGE2	-1.42% -(3.05)	-1.93% -(3.47)
AGE3	-7.62% -(15.39)	-13.66% -(23.03)
AGE4	-10.90% -(21.14)	-19.81% -(32.06)
HSDG	-2.28% -(4.79)	-3.17% -(5.56)
SOMCOLL	-2.08% -(4.07)	-3.99% -(6.53)
COLLGRAD	-4.17% -(5.91)	-6.34% -(7.50)
MILITARY	-6.16% -(10.18)	3.36% (4.63)
YEAR95	-10.48% -(17.37)	-11.31% -(15.64)
MIL_95	-2.31% -(3.19)	-15.23% -(17.59)
N	37,587	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX U. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION FOR THE PERIOD 1979/80 TO 1988, AGES 17 TO
49, MALES ONLY**

	Past Month Participation	Past Year Participation
Intercept	38.85% (45.88)*	53.84% (53.29)
MARRIED	-12.67% -(31.34)	-21.54% -(44.64)
BLACK	-2.64% -(5.36)	-0.69% -(1.18)
HISPANIC	-1.15% -(1.29)	1.47% (1.39)
OTHRACE	-3.00% -(3.66)	-3.33% -(3.40)
HSDG	-0.69% -(1.17)	-1.91% -(2.70)
SOMCOLL	-3.01% -(4.94)	-6.74% -(9.27)
COLLGRAD	-6.39% -(7.66)	-12.75% -(12.80)
MILITARY	-10.62% -(13.05)	-0.07% -(.07)
YEAR88	-15.43% -(15.34)	-14.15% -(11.78)
MIL_88	2.66% (2.43)	-12.78% -(9.79)
N	26,968	

Notes: Merged 1979/80 and 1988 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

**APPENDIX V. LPM ESTIMATES OF ANY ILLICIT DRUG
PARTICIPATION FOR THE PERIOD 1979/80 TO 1995, AGES 17 TO
49, MALES ONLY.**

	Past Month Participation	Past Year Participation
Intercept	39.87% (45.58)*	55.38% (52.90)
MARRIED	-12.64% -(30.72)	-21.46% -(43.58)
BLACK	-2.71% -(5.13)	-0.83% -(1.31)
HISPANIC	-3.24% -(4.74)	-3.05% -(3.73)
OTHRACE	-3.25% -(3.90)	-4.11% -(4.13)
HSDG	-2.44% -(3.95)	-4.19% -(5.69)
SOMCOLL	-3.63% -(5.64)	-7.94% -(10.30)
COLLGRAD	-8.67% -(9.92)	-15.67% -(14.99)
MILITARY	-10.36% -(12.37)	0.30% (.29)
YEAR95	-16.64% -(17.75)	-18.57% -(16.55)
MIL_95	2.33% (2.24)	-10.07% -(8.08)
N	25,989	

Notes: Merged 1979/80 and 1995 data.

*T-values in parentheses

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF REFERENCES

1. U.S. Department of Defense, Directive 1010.4, 1980, "Alcohol and Drug Abuse by DoD Personnel," Washington D.C.
2. Pindyck, Roberts S. and Rubinfeld, Daniel L. "Econometric Models and Economic Forecasts," McGraw Hill, 3rd edition, 1991.
3. Bray, M. Robert, Mary Ellen Marsden, John R. Herbold, and Michael R. Peterson, "Progress Toward Eliminating Drug and Alcohol Abuse among U.S. Military Personnel. Armed Forces and Society Vol 18.
4. Bray, M. Robert, Mary Ellen Marsden, John R. Herbold, and Michael R. Peterson, "Progress Toward Eliminating Drug and Alcohol Abuse among U.S. Military Personnel. Armed Forces and Society Vol 18.
5. Doster, T.R., and H.A. Ross, "An Analysis of the Effectiveness of the Air Force Drug Testing Program and Four Potential Modifications." Master's Thesis, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio, 1993.
6. Lieb, M. Patricia "An Evaluation of the Department of Defense Drug testing Program." Master's Thesis, Naval Postgraduate School, Monterey, California, 1986.
7. U.S. Department of Defense, Directive 1010.1, 1994, "Military Personnel Drug Abuse Testing Program," Washington D.C.
8. Department of the Army, Headquarters, Regulation 600-85, 1981, "Alcohol and Drug Abuse Prevention and Control Programs," Washington D.C.
9. Department of the Army, Headquarters, Regulation 600-85, Change 1, 1988, "Alcohol and Drug Abuse Prevention and Control Programs," Washington D.C.
10. Department of the Army, Headquarters, Regulation 600-85, Change 2, 1995, "Alcohol and Drug Abuse Prevention and Control Programs," Washington D.C.
11. Department of the Navy, Office of the Secretary of the Navy Instruction 5300.28A, 1984, "Alcohol and Drug Abuse Prevention and Control," Washington D.C.
12. Martinez, Antonio "A Statistical Analysis of the Deterrence Effects of the Military Services' Drug Testing Policies." Master's Thesis, Naval Postgraduate School, Monterey, California, 1998.
13. Department of the Navy, Office of the Chief of Naval Operations Instruction 5350.4, 1984, "Substance Abuse Prevention and Control," Washington D.C.

14. Department of the Navy, Office of the Chief of Naval Operations Instruction 5350.4B, 1990, "Substance Abuse Prevention and Control," Washington D.C.
15. Department of the Navy, Bureau of Navy Personnel, 1996, Policy Memorandum: "Navy Urinalysis Program," Washington D.C.
16. Department of the Navy, Headquarters United States Marine Corps Order P5300.12A, 1996, "The Marine Corps Substance Abuse Program," Washington D.C.
17. Department of the Air Force, Secretary of the Air Force, Air Force Instruction 44-121, 1998. "Alcohol and Drug Abuse Prevention and Treatment (ADAPT) Program. Washington D.C.
18. Department of the Air Force, Secretary of the Air Force, Air Force Instruction 44-120, 1997. "Drug Abuse Testing Program." Washington D.C.
19. Department of the Air Force, Air Education and Training Command, Memorandum for Distribution J. 1994. "Random Inspection Urine Drug Testing Program." Washington D.C.
20. Department of the Air Force, Air Education and Training Command, Memorandum for Distribution J. 1996. "Drug Testing Policy." Washington D.C.
21. Department of the Air Force, Secretary of the Air Force, Air Force Instruction 36-27, 1993. "Social Actions." Washington D.C.
22. Department of the Air Force, Secretary of the Air Force, Air Force Instruction 36-2701, 1994. "Social Actions Program." Washington D.C.
23. Bray, Robert M., et al. 1992. "1992 Worldwide Survey of Substance and Health Behaviors Among Military Personnel." Research Triangle Park, NC: Research Triangle Institute.
24. Mehay, Stephen L. and Pacula Rosalie Liccardo. "The Effectiveness of Workplace Drug Prevention Policies: Does 'Zero Tolerance' Work?" Working Paper 7383, National Bureau of Economic Research, INC October 1999.
25. Borack, Jules I., 1995. "A Technique for Estimating the Probability of Detecting a Nongaming Drug User." San Diego, CA: Navy Personnel Research and Development Center.
26. Osmena McCrea, Mary Jane and Hey, Markus. "An Evaluation of Costs and Benefits of the Navy's Drug Prevention Policies" Master's Thesis, Naval Postgraduate School, Monterey, California, 2001.

27. "National Household Survey of Drug Abuse: Public Release Codebook," 1979. Rockville, MD: Substance Abuse and Mental Health Service Administration, 1980.
28. "National Household Survey of Drug Abuse: Public Release Codebook," 1988. Rockville, MD: Substance Abuse and Mental Health Service Administration, 1990
29. "National Household Survey of Drug Abuse: Public Release Codebook," 1995. Rockville, MD: Substance Abuse and Mental Health Service Administration, 1997.
30. Burt, M., M. Biegel, Y. Carnes, and E. Farley, 1980. "Worldwide Survey of Nonmedical Drug Use and Alcohol Use Among Military Personnel." Bethesda, MD: Burt Associates.
31. Turner, C., J. Lessler, and J. Devore, 1992. "Effects of Mode of Administration and Wording on Reporting of Drug Use," in *Survey, Measurement of Drug Use: Methodological Studies*. Washington, DC: National Institute of Drug Abuse.
32. Bray, Robert M., et al. 1997. "Highlights 1995 Department of Defense Survey of Health Related Behaviors Among Military Personnel." Research Triangle Park, NC: Research Triangle Institute.
33. Bray, Robert M., Larry A. Kroutil, and Mary Ellen Marsden, 1995. "Trends in Alcohol, Illicit Drug, and Cigarette Use among U.S. Military Personnel: 1980-1992." *Armed Forces and Society*.
34. *Drug Use Among U.S. Workers: Prevalence and Trends by Occupation and Industry Categories*, U.S. Department of Health and Human Services, 1996.
35. *Alcohol and Other Drugs in the Workplace*, National Council on Alcoholism and Drug Dependence, 1999.
36. Bray, Robert M., et al. 1989. "Highlights 1988 Department of Defense Survey of Health Related Behaviors Among Military Personnel." Research Triangle Park, NC: Research Triangle Institute.
37. Henry S. Griffis et al. "Costs and Benefits of Aging the Navy's Enlisted Force." Center for Naval Analyses, 1997.
38. Jeffrey M. Wooldridge (2002) "Introductory to Econometrics: A Modern Approach", South-Western.

THIS PAGE INTENTIONALLY LEFT BLANK

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
Ft. Belvoir, Virginia
2. Dudley Knox Library
Naval Postgraduate School
Monterey, California
3. Professor Stephen L. Mehay
Naval Postgraduate School
Monterey, California
4. Professor Elda Pema
Naval Postgraduate School
Monterey, California
5. Lieutenant Commander Ananias Meletiadis
13th Oktovriou 45, Amfiali, Piraeus,
187 58 Greece