



**NAVAL  
POSTGRADUATE  
SCHOOL**

**MONTEREY, CALIFORNIA**

**THESIS**

**AN ANALYSIS OF NAVY NURSE CORPS ACCESSION  
SOURCES**

by

Christopher L. Harvie

March 2014

Thesis Co-Advisors:

Simona Tick  
William Hatch

**Approved for public release; distribution is unlimited**

THIS PAGE INTENTIONALLY LEFT BLANK

<b>REPORT DOCUMENTATION PAGE</b>			<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.				
<b>1. AGENCY USE ONLY (Leave blank)</b>		<b>2. REPORT DATE</b> March 2014	<b>3. REPORT TYPE AND DATES COVERED</b> Master's Thesis	
<b>4. TITLE AND SUBTITLE</b> AN ANALYSIS OF NAVY NURSE CORPS ACCESSION SOURCES			<b>5. FUNDING NUMBERS</b>	
<b>6. AUTHOR(S)</b> Christopher L. Harvie				
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> Naval Postgraduate School Monterey, CA 93943-5000			<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>	
<b>9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b> N/A			<b>10. SPONSORING/MONITORING AGENCY REPORT NUMBER</b>	
<b>11. SUPPLEMENTARY NOTES</b> 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. IRB protocol number <u>NPS.2014.0005-IR-EP5-A</u> .				
<b>12a. DISTRIBUTION / AVAILABILITY STATEMENT</b> Approved for public release; distribution is unlimited			<b>12b. DISTRIBUTION CODE</b> A	
<b>13. ABSTRACT (maximum 200 words)</b> This study analyzes the various Navy Nurse Corps (NC) accession sources for associated costs and retention rates for cohorts accessed between FY00 and FY13. Individual NC accessions data were obtained from the Bureau of Medicine Information System. A logistical regression model was used to analyze six- and 11-year retention rates. The findings indicate that accessing through the Medical Enlisted Commissioning Program and the Seaman to Admiral-21 (STA-21) have higher rates of retention at six and 11 years while the Naval Reserve Officer Training Corps (NROTC) and the Nurse Candidate Program accessions had a lower overall likelihood of retention. The study finds that the most expensive accession source is the STA-21 program with a total cost of \$196,744. Further findings show the least expensive accession source is Direct Procurement with a total cost of \$25,000 per accession. However, the STA-21 program had the highest retention rate at six years at 91.23 percent. The NROTC program had the lowest retention rate at six years at 54.62 percent. The data analyzed in this research suggests that Bureau of Medicine should re-consider the NROTC NC program option due to high attrition.				
<b>14. SUBJECT TERMS</b> Nurse Corps manpower, manpower planning, Nurse Corps retention, Nurse Corps accession sources, nursing, retention, 2900, accession			<b>15. NUMBER OF PAGES</b> 83	
			<b>16. PRICE CODE</b>	
<b>17. SECURITY CLASSIFICATION OF REPORT</b> Unclassified	<b>18. SECURITY CLASSIFICATION OF THIS PAGE</b> Unclassified	<b>19. SECURITY CLASSIFICATION OF ABSTRACT</b> Unclassified	<b>20. LIMITATION OF ABSTRACT</b> UU	

THIS PAGE INTENTIONALLY LEFT BLANK

**Approved for public release; distribution is unlimited**

**AN ANALYSIS OF NAVY NURSE CORPS ACCESSION SOURCES**

Christopher L. Harvie  
Lieutenant, United States Navy  
B.S.N., Old Dominion University, 2008

Submitted in partial fulfillment of the  
requirements for the degree of

**MASTER OF SCIENCE IN MANAGEMENT**

from the

**NAVAL POSTGRADUATE SCHOOL  
March 2014**

Author: Christopher L. Harvie

Approved by: Simona Tick  
Thesis Co-Advisor

William Hatch  
Thesis Co-Advisor

William R. Gates  
Dean, Graduate School of Business and Public Policy

THIS PAGE INTENTIONALLY LEFT BLANK

## **ABSTRACT**

This study analyzes the various Navy Nurse Corps (NC) accession sources for associated costs and retention rates for cohorts accessed between FY00 and FY13. Individual NC accessions data were obtained from the Bureau of Medicine Information System. A logistical regression model was used to analyze six- and 11-year retention rates. The findings indicate that accessing through the Medical Enlisted Commissioning Program and the Seaman to Admiral-21 (STA-21) have higher rates of retention at six and 11 years while the Naval Reserve Officer Training Corps (NROTC) and the Nurse Candidate Program accessions had a lower overall likelihood of retention. The study finds that the most expensive accession source is the STA-21 program with a total cost of \$196,744. Further findings show the least expensive accession source is Direct Procurement with a total cost of \$25,000 per accession. However, the STA-21 program had the highest retention rate at six years at 91.23 percent. The NROTC program had the lowest retention rate at six years at 54.62 percent. The data analyzed in this research suggests that Bureau of Medicine should re-consider the NROTC NC program option due to high attrition.

THIS PAGE INTENTIONALLY LEFT BLANK

# TABLE OF CONTENTS

<b>I.</b>	<b>INTRODUCTION.....</b>	<b>1</b>
<b>A.</b>	<b>BACKGROUND .....</b>	<b>1</b>
<b>B.</b>	<b>PURPOSE.....</b>	<b>2</b>
	<b>1. Primary Research Question.....</b>	<b>2</b>
	<b>2. Secondary Research Questions.....</b>	<b>2</b>
<b>C.</b>	<b>ORGANIZATION OF STUDY .....</b>	<b>2</b>
<b>II.</b>	<b>BACKGROUND ON NURSES CORPS.....</b>	<b>3</b>
<b>A.</b>	<b>OVERVIEW.....</b>	<b>3</b>
<b>B.</b>	<b>CIVILIAN NURSING SHORTAGE .....</b>	<b>3</b>
	<b>1. Demand.....</b>	<b>3</b>
	<b>2. Supply.....</b>	<b>4</b>
<b>C.</b>	<b>NAVY NURSE CORPS.....</b>	<b>5</b>
	<b>1. Current State of the Navy Nurse Corps.....</b>	<b>6</b>
<b>D.</b>	<b>ACCESSION SOURCES .....</b>	<b>7</b>
	<b>1. NCP .....</b>	<b>8</b>
	<b>2. MECP.....</b>	<b>9</b>
	<b>3. NROTC .....</b>	<b>10</b>
	<b>4. STA-21 .....</b>	<b>10</b>
	<b>5. Direct Accession .....</b>	<b>11</b>
<b>III.</b>	<b>LITERATURE REVIEW .....</b>	<b>15</b>
<b>A.</b>	<b>OVERVIEW.....</b>	<b>15</b>
<b>B.</b>	<b>ACCESSION SOURCE AS A PREDICTOR OF SUCCESS.....</b>	<b>15</b>
<b>C.</b>	<b>COSTS AND BENEFITS OF NC ACCESSION SOURCES .....</b>	<b>17</b>
<b>D.</b>	<b>STEADY STATE MODEL FOR FORECASTING NC PERSONNEL.....</b>	<b>19</b>
<b>E.</b>	<b>AN ANALYSIS OF RETENTION AND AFFILIATION FACTORS AFFECTING THE NC.....</b>	<b>23</b>
<b>IV.</b>	<b>DATA AND METHODOLOGY .....</b>	<b>27</b>
<b>A.</b>	<b>DATA SOURCE.....</b>	<b>27</b>
	<b>1. Database Creation.....</b>	<b>27</b>
	<b>2. Data Selection .....</b>	<b>28</b>
<b>B.</b>	<b>VARIABLE DESCRIPTION.....</b>	<b>29</b>
<b>C.</b>	<b>DESCRIPTIVE VARIABLES.....</b>	<b>29</b>
	<b>1. Accession Source .....</b>	<b>29</b>
	<b>2. Fiscal Year .....</b>	<b>29</b>
	<b>3. Prior Military Service.....</b>	<b>29</b>
	<b>4. Rank at Commissioning .....</b>	<b>29</b>
	<b>5. Male.....</b>	<b>30</b>
<b>D.</b>	<b>DESCRIPTIVE STATISTICS.....</b>	<b>30</b>
	<b>1. FY00–FY02 Data Set .....</b>	<b>30</b>
	<b>2. FY04–FY07 Data Set .....</b>	<b>31</b>
	<b>3. Model Comparison.....</b>	<b>32</b>

E.	<b>METHODOLOGY .....</b>	<b>32</b>
V.	<b>COST ANALYSIS .....</b>	<b>37</b>
A.	<b>OVERVIEW .....</b>	<b>37</b>
B.	<b>BACKGROUND .....</b>	<b>37</b>
1.	<b>NROTC Cost Estimation.....</b>	<b>37</b>
2.	<b>NCP Cost Estimation.....</b>	<b>37</b>
3.	<b>MECP Cost Estimation .....</b>	<b>38</b>
4.	<b>Direct Procurement Cost Estimation .....</b>	<b>39</b>
5.	<b>STA-21 Cost Estimation.....</b>	<b>39</b>
C.	<b>COST ANALYSIS RESULTS .....</b>	<b>40</b>
VI.	<b>RETENTION RATE ANALYSIS .....</b>	<b>43</b>
A.	<b>OVERVIEW.....</b>	<b>43</b>
B.	<b>BIAVARIATE FINDINGS .....</b>	<b>43</b>
1.	<b>FY Retention Rates.....</b>	<b>43</b>
2.	<b>Accession Source Retention Rates.....</b>	<b>44</b>
a.	<i>Six-year Retention Rate by Accession Source .....</i>	<i>44</i>
b.	<i>Eleven-year Retention Rate by Accession Source .....</i>	<i>45</i>
3.	<b>Gender.....</b>	<b>46</b>
a.	<i>Six-year Retention Rates by Gender and Accession Source.....</i>	<i>46</i>
b.	<i>Eleven-year Retention Rates by Gender and Accession Source.....</i>	<i>47</i>
4.	<b>Entry Rank .....</b>	<b>48</b>
a.	<i>Six-year Retention Rate by Entry Rank .....</i>	<i>48</i>
b.	<i>Eleven-year Retention Rate by Entry Rank .....</i>	<i>49</i>
5.	<b>Prior Service.....</b>	<b>49</b>
C.	<b>REGRESSION ANALYSIS .....</b>	<b>49</b>
1.	<b>FY04–FY07 Data Set .....</b>	<b>49</b>
2.	<b>FY00–FY02 Data Set .....</b>	<b>51</b>
a.	<i>Logit Six-year Retention Model.....</i>	<i>51</i>
b.	<i>Logit 11-year Retention Model.....</i>	<i>53</i>
VII.	<b>SUMMARY, CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>55</b>
A.	<b>SUMMARY .....</b>	<b>55</b>
B.	<b>CONCLUSION AND RECOMMENDATIONS.....</b>	<b>55</b>
1.	<b>What are the Costs and Benefits for the Different Navy Nurse Corps Accession Sources? .....</b>	<b>55</b>
a.	<i>Conclusion.....</i>	<i>55</i>
b.	<i>Recommendation.....</i>	<i>56</i>
2.	<b>What Nurse Corps Accession Source has the Highest Initial Obligation Attrition? .....</b>	<b>56</b>
a.	<i>Conclusion.....</i>	<i>56</i>
b.	<i>Recommendation.....</i>	<i>56</i>
3.	<b>Does Prior Service Lead to Greater Retention?.....</b>	<b>56</b>
a.	<i>Conclusion.....</i>	<i>56</i>

<b><i>b.</i></b> <b><i>Recommendation</i></b> .....	57
<b>C.</b> <b>CONSIDERATION FOR FUTURE STUDIES</b> .....	57
<b>APPENDIX</b> <b>ENTRY GRADE CREDIT TABLE</b> .....	59
<b>LIST OF REFERENCES</b> .....	61
<b>INITIAL DISTRIBUTION LIST</b> .....	63

THIS PAGE INTENTIONALLY LEFT BLANK

## LIST OF FIGURES

Figure 1.	Increase in Population over the age of 65 (from Lund, 2013).....	4
Figure 2.	Increase in Average Age of Civilian Nurses (from Juraschek et al., 2012).....	5
Figure 3.	Cohort Retention Rates.....	44
Figure 4.	Six-year Retention by Accession Source.....	45
Figure 5.	Eleven-year Retention by Accession Source.....	46

THIS PAGE INTENTIONALLY LEFT BLANK

## LIST OF TABLES

Table 1.	Active NNC Billets Authorized by Subspecialty (from Levy & Morrison, 2013) .....	7
Table 2.	Active Navy Nurse Corps Accession Goals for FY2014–FY2018 (from Levy & Morrison, 2013) .....	8
Table 3.	Nurse Corps Accession Sources (from McNally, 2012) .....	13
Table 4.	Distribution and Percentages by FY and Gain Category (from Jonak & Paradis, 1998) .....	16
Table 5.	Logit Models (from Jonak & Paradis, 1998) .....	16
Table 6.	Gains by Cohort Year from the Various Accession Sources (from Maeder, 1999) .....	18
Table 7.	Accession Source Comparison (from Maeder, 1999) .....	19
Table 8.	Variable Description (from Deen & Buni, 2004) .....	21
Table 9.	FY 90–94 Retention Rates by Accession Sources (from Deen & Buni, 2004) .....	22
Table 10.	FY 96–98 Retention Rates by Accession Source (from Deen & Buni, 2004) .....	22
Table 11.	Partial Effects of Retention Regression Model (from Messmer & Pizanti, 2007) .....	25
Table 12.	Accession Source gains by FY, Navy Nurse Corps Monthly Report. ....	27
Table 13.	Descriptive Statistics for the 11-year Retention Model .....	30
Table 14.	Descriptive Statistics for the Six-year Retention Model .....	31
Table 15.	Variable Description .....	35
Table 16.	Accession Source Cost Comparison .....	41
Table 17.	FY Retention Rates .....	43
Table 18.	Six-year Accession Source Retention Rates .....	45
Table 19.	Eleven-year Accession Source Retention Rate .....	46
Table 20.	Six-year Retention and Distribution of Males by Accession Source .....	47
Table 21.	Six-year Retention and Distribution of Females by Accession Source .....	47
Table 22.	Eleven-year Retention and Distribution of Males by Accession Source .....	48
Table 23.	Eleven-year Retention and Distribution of Females by Accession Source .....	48
Table 24.	Six-year Rank Retention’s and Distributions .....	48
Table 25.	Eleven-year Rank Retention’s and Distributions .....	49
Table 26.	FY04–FY07 Six-year Logit Model Statistics .....	50
Table 27.	FY00–FY02 Six-year Logit Model Statistics .....	52
Table 28.	FY00–FY02 11-year Logit Model Statistics .....	53
Table 29.	Accession Source Comparison .....	56

THIS PAGE INTENTIONALLY LEFT BLANK

## LIST OF ACRONYMS AND ABBREVIATIONS

AACN	American Association of College Nursing
ACA	Affordable Care Act
BAH	basic allowance for housing
BAS	basic allowance for subsistence
BDCP	Baccalaureate Degree Completion Program
BLS	Bureau of Labor Statics
BSN	Bachelors of Science in Nursing
BUMIS	Bureau of Medicine Information System
CCNE	Commission of Collegiate Nursing Education
COMNAVCRUITCOM	Commander, Navy Recruiting Command
DMDC	Defense Manpower Data Center
DON	Department of the Navy
ENS	ensign
FTOST	full-time out-service training
FY	fiscal year
GCAT	gain category
GFY	gain of fiscal year
GPA	grade point average
GS	government service
HHS	Department of Health and Human Services
HSCP	Health Services Commissioning Program
IRR	individual ready reserves
LCDR	lieutenant commander
LTJG	lieutenant junior grade
LT	lieutenant
MECP	Medical Enlisted Commissioning Program
NCP	Nurse Candidate Program
NC	Nurse Corps
NCO	Nurse Corps officers
NLANAC	National League for Nursing Accrediting Commission

NMETC	Naval Medical Education and Training Command
NNC	Navy Nurse Corps
NPS	Naval Postgraduate School
NRC	Navy Recruiting Command
NROTC	Navy Reserve Officer Training Corps
NSI	Naval Science Institute
NSTC	Naval Service Training Command
ODS	Officer Development School
RN	registered nurse
SELRES	selective reserves
STA-21	Seamen to Admiral Program
TIS	time-in-service

## **ACKNOWLEDGMENTS**

I would like to extend my appreciation to those individuals who supported and contributed to this study. I would like to give a special thanks to my advisors Professor Simona Tick and Professor William Hatch for your patience and guidance throughout the thesis development process. I would also like to thank CDR Valeria Morrison who provided me with the data that made this thesis possible. Finally, I would like to thank my family for all their love and support during this entire process.

THIS PAGE INTENTIONALLY LEFT BLANK

# I. INTRODUCTION

## A. BACKGROUND

Since 1998, the United States has experienced a nationwide nursing shortage (Juraschek, Zhang, Ranganathan, & Lin, 2012). This shortage is expected to increase as the Affordable Care Act (ACA) gets implemented and more of the baby boomers retire. A 2008 study by (Carlson) indicated that the baby boomer population makes up 40 percent of the entire registered nurse (RN) workforce. As the baby boomers retire, there will be a decrease in RN's and an increase in elderly population that could cause an even greater nurse shortage. With the approval of the ACA in October 2013, more individuals will have health insurance. This might lead to a higher demand for RN's nationwide, making it harder for the Navy Nurse Corps (NNC) to meet their recruiting quota.

In the past, the NNC has struggled to make recruiting goals. The NNC made quota in 2012 and 2013, but not without offering high value incentives through accession programs (Neimyer, 2012). The government sequester of year 2013 has caused the Department of the Navy (DON) to examine more ways to save money. These cuts could reduce funds required to attract and recruit new Nurse Corp officers (NCO). The DON currently uses five different accessions sources to obtain new NCO. Each of these sources has their own benefits and costs. If the NNC funding is reduced, it is in the best interest of the Navy, to know what accession sources are the most cost effective.

This thesis will conduct a cost-benefit analysis of NNC accession sources with the goal of supporting the NNC accession decisions. The thesis uses NCO data to conduct a systematic multivariate analysis of the NNC accession programs used by the DON: the Direct Procurement program, Navy Reserve Officer Training Corps (NROTC), Nurse Candidate Program (NCP), Medical Enlisted Commissioning Program (MECP), and Seaman to Admiral-21 (STA-21) graduates. The NROTC, NCP, MECP, and STA-21 programs all have school pipelines and produce a steady and predictable amount of Nurse Corps (NC) accessions each year.

## **B. PURPOSE**

The scope of this thesis is to conduct a systematic analysis of the NC accession sources during fiscal years (FY) 2000 through FY 2013. These accession sources include the NROTC, NCP, MECP, STA-21, and Direct Procurement. To estimate the benefit of each accession source, the thesis will use multivariate analysis to predict retention after completion of initial obligated service. Associated with each accession source will be an estimated cost.

### **1. Primary Research Question**

- What are the costs and benefits for the different Navy Nurse Corps accession sources?

### **2. Secondary Research Questions**

- What Nurse Corps accession source has the highest initial obligation attrition?
- Does prior service lead to greater retention?

## **C. ORGANIZATION OF STUDY**

Chapter II presents and discusses the trends in the supply and demand for the civilian nursing shortage, the current state of the NNC, and the NC accession sources. Chapter III presents a review of prior research that has been conducted on NNC accession programs. Chapter IV describes the data used in this thesis and the research methodology. Chapter V presents and discusses the cost estimation for each NC accession source. Chapter VI presents the analysis and findings from the multivariate regression analysis conducted in order to estimate cost and benefits for each NNC accession source. Chapter VII presents a summary, conclusions, recommendations and topics for future research.

## **II. BACKGROUND ON NURSES CORPS**

### **A. OVERVIEW**

This chapter presents and discusses the trends in the supply and demand for the civilian nursing shortage, the current state, and accession sources of the NC.

### **B. CIVILIAN NURSING SHORTAGE**

Since 1998, the demand for RNs and the growth in the healthcare sector has been exceeding the supply of RNs in the civilian workforce (Juraschek, Zhang, Ranganathan, & Lin, 2012). A study by Juraschek, Zhang, Ranganathan, & Lin (2012), projected a national nursing deficit of 918,232 nurses by the year 2030. The Bureau of Labor Statistics (BLS) (2012) predicts a 26 percent increase in the nursing workforce between 2010-2020, bringing up the number of job openings for nurses due to job growth and replacement to 1.2 million nursing jobs. The increase in demand and the shortage of supply is due to the increasing elderly population, the implementation of the ACA, age of the nursing workforce, and the decrease in nursing faculty (Juraschek et al., 2012). Work related issues such as working environment, stress, pay, etc. are additional causes for the civilian nursing shortage, but will not be discussed because they are outside the scope of this thesis.

#### **1. Demand**

Starting in 2011, the baby boomer generation began to retire, with an estimated 88.5 million by 2050 (Census Bureau, 2010). The U.S. Department of Health and Human Services predicts an increase in the population over the age 65 from 39.6 million in 2009 to 72.1 million individuals over 65 in 2030. The elderly population is not only growing but living longer as well. A person reaching the age of 65 today has an average life expectancy of an additional 19.2 years, an increase of 11.2 years since 1991. A reduction in the death rate in the population aged 65–84 has decreased by 41.6 percent in the period of 1990-2007 (HHS, 2012a). The elderly population undoubtedly is growing and living longer, but are still suffering from disabling medical conditions. In 2012, 35.6 percent of

the aged population 65 and older have some type of disability, and in 2011 3.6 percent lived in an institutional setting (HHS, 2012b). As the elderly population grows, so will the demand for nurses and the care they provide. See Figure 1.

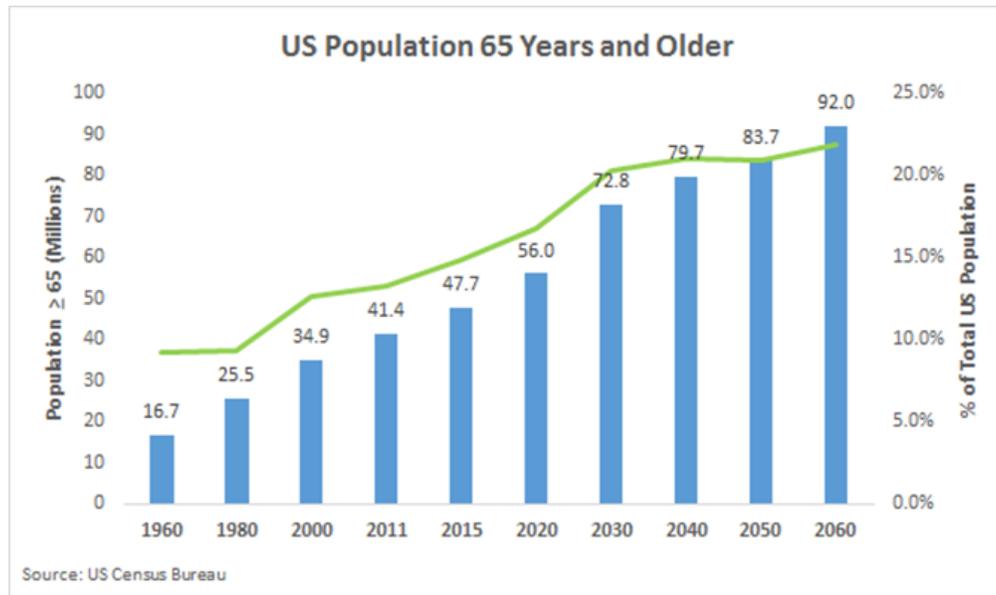


Figure 1. Increase in Population over the age of 65 (from Lund, 2013)

Another factor that is likely to cause the demand for nurses to increase is the ACA. The ACA will expand healthcare coverage to 31 million uninsured Americans. The increased coverage of uninsured Americans will create a higher demand for nurses. However, the ACA will limit the compensation to health care providers that could lead to a reduction in RN salaries. The reduction in pay could affect student interests in the nursing field, further compounding the growing nursing shortage (Juraschek et al., 2012).

## 2. Supply

The overall supply of nurses in the private sector is on the decline. This decline is due to the average age of the nursing population and the decline of available nursing instructors. In 2009, the average age of an RN was 45.4 years, up from 42.4 in the year 2000. According to the United States Department of Health and Human Services (2012b), over the next 10–15 years one-third of the nursing population will reach retirement age. See Figure 2.

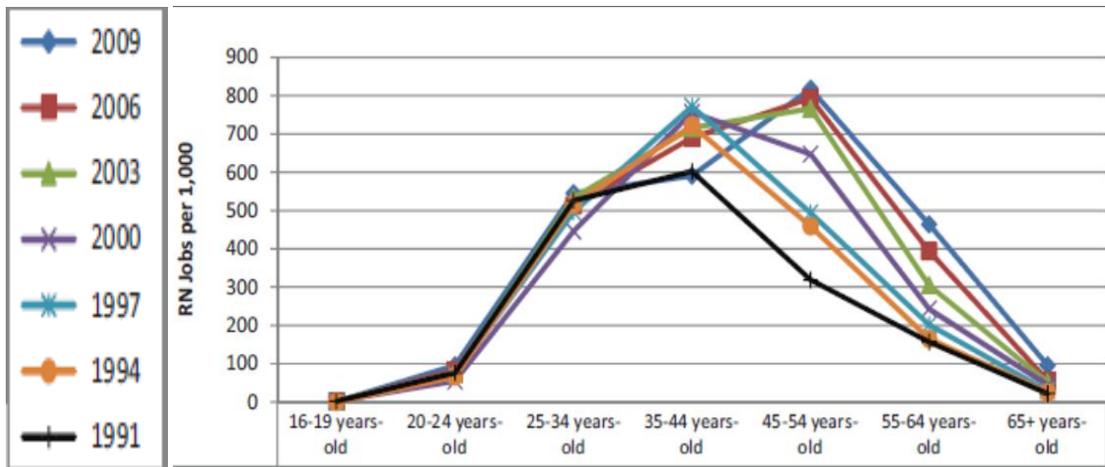


Figure 2. Increase in Average Age of Civilian Nurses (from Juraschek et al., 2012)

Another factor affecting the supply of nurses is the decline in nursing instructors. In 2011, 75,587 qualified nursing applicants were turned away (American Association of Colleges of Nursing, 2012). In an American Association of College Nursing (AACN) survey of 733 nursing schools, 62.5 percent of the schools indicated that “a lack of faculty” was their reason for turning away qualified candidates (AACN, 2012). A thesis by Messmer and Pizanti (2007) found the causes for a decrease in nursing faculty to be the average age of a nursing instructor, the average age of master’s degree attainment, and the relatively low salary compared to other specialized nursing positions that require a master’s degree.

### C. NAVY NURSE CORPS

The U.S. Navy Nurse Corps is a very dynamic staff officer community. The NC is comprised of 4,231 active and reserve component and 1,783 federal civilian registered nurses (Neimyer, 2012). Nurse Corps officers are highly trained and serve in a variety of different fields, including medical and surgical nursing, emergency/trauma nursing, critical care nursing, mental health nursing, pediatric nursing, perioperative nursing, nurse practitioners, certified nurse anesthetists, education and training nursing, manpower analysts, and many more important clinical and administrative fields.

Navy nurses currently serve in over 250 different medical facilities around the globe. In 2012, the NC had a presence of 223 active and 119 reserve component nurses serving in the Middle East in support of Operation Enduring Freedom (Neimyer, 2012). Navy nurses also serve on ships, such as the *USNS Comfort* (T-AH-20) and *USNS Mercy* (T-AH-19), to provide humanitarian assistance after natural disasters, and on aircraft carriers and amphibious ships, to support the war fighter. Even after all that, they continue to provide world class care to active duty, reserve, and retired Navy and Marine Corps personnel and their families.

### **1. Current State of the Navy Nurse Corps**

As of September 2013, the NC was manned at 100.4 percent, with 2966 authorized billets, and 2977 active duty officers. Of the 2966 authorized billets, 41 billets are “faired shared billets,” which is the NC’s fair share allocation of 2XXX billets distributed amongst Medical Corps, Dental Corps, Medical Service Corps, and Nurse Corps. The NC gained 71 nurses from Direct Procurement, 69 nurses from NROTC, 63 nurses from NCP, 38 nurses from MECP, 13 nurses from STA-21, and three nurses from recalls, for a total of 257 gains. The NC lost 117 nurses to retirement, 84 nurses to resignation, 12 nurses to either administrative discharge or lateral transfer, one nurse to death, and 11 nurses to other reasons not stated, for a total of 225 lost (Levy & Morrison, 2013). See Table 1.

					(1)	(2)		(3)	
		TOTAL			NET			NO.	
		INVEN-	#ASSIG		INVEN-	*F/S+AUTH	AUTH	OVER/	PERCENT
CODE#	SPECIALTY	TORY	- TRNG	=	TORY	BILLETS	BILLETS	UNDER	MANNED
1900	Professional Nursing	741	2		739	819	788	(80)	90%
1900D	Nursing PhD	13	7		6	8	8	(2)	75%
1903	Nursing Ed	34	0		34	34	32	0	100%
1910	Med/Sug	562	9		553	448	445	105	123%
1920	Maternal Infant	205	3		202	142	142	60	142%
1922	Pediatric Nursing	63	2		61	40	40	21	153%
1930	Psychiatric Nursing	72	1		71	48	48	23	148%
1940	Community Health	20	1		19	37	37	(18)	51%
1945	ER/Trauma Nursing Community	243	4		239	180	180	59	133%
1950	Perioperative Nursing Community	258	1		257	281	280	(24)	91%
1960	Critical Care Nursing	326	4		322	333	333	(11)	97%
1964	NICU Nursing	27	2		25	29	29	(4)	86%
1972D	CRNA PhD	15	3		12	4	4	8	300%
1972	Nurse Anesthesia	167	38		129	140	139	(11)	92%
1973	Psych/Mental Health NP	38	6		32	23	23	9	139%
1974	Pediatric NP	31	6		25	28	28	(3)	89%
1976	Family NP	92	14		78	89	88	(11)	88%
1980	Women's Health NP	8	0		8	1	0	7	800%
1981	Nurse Midwife	31	8		23	31	31	(8)	74%
3130	MPTA	9	2		7	9	9	(2)	78%
3150	E & T Management	22	1		21	32	31	(11)	66%
	TPPH					57	57		
	Authorized Training (ST) Billets					153	153		
	TOTAL	2,977	114		2,863	2,966	2,925	11	100.4%

Table 1. Active NNC Billets Authorized by Subspecialty (from Levy & Morrison, 2013)

#### D. ACCESSION SOURCES

The Navy has four primary methods of accession into the NC community, to include: the Nurse Candidate Program, Medical Enlisted Commissioning Program, Naval Reserve Officer Training Corps, and the Seaman to Admiral Program. When accession goals are not met through the training pipelines, the NC supplements their accessions through Direct Procurement. The purpose of this section is to introduce the different accession sources being compared in this study. Legacy accession sources, lateral transfers, and recalls, will not be discussed due to low number of observation, as shown in Table 2.

	<b>FY14 GOAL</b>	<b>FY14 KTD</b>	<b>FY15 GOAL</b>	<b>FY16 GOAL</b>	<b>FY17 GOAL</b>	<b>FY18 GOAL</b>
<b>Begin Strength:</b>	2977	2977	3009	3021	3029	3038
<b>Gains</b>						
<b>DIRECT^</b>	44		55	65	101	101
<b>(DA) HPLRP</b>	0		0	0	0	0
<b>RECALL</b>	2		2	2	2	2
<b>NROTC</b>	70		56	45	10	10
<b>NCP</b>	75		75	75	75	75
<b>MECP</b>	59		47	46	46	46
<b>STA 21</b>	8		3	1	1	1
<b>IST</b>	0		0	0	0	0
<b>Other (PERS)</b>	0		0	0	0	0
<b>Total Gains:</b>	<b>258</b>	<b>0</b>	<b>238</b>	<b>234</b>	<b>235</b>	<b>235</b>

Table 2. Active Navy Nurse Corps Accession Goals for FY2014–FY2018 (from Levy & Morrison, 2013)

## 1. NCP

The NCP program started in FY93 and is a financial assistance program for students enrolled in a baccalaureate nursing program. This program is managed by the Naval Medical Education and Training Command (NMETC), with quotas set by the Deputy Chief of Naval Operations (Manpower, Personnel, Training and Education). The Commander, Navy Recruiting Command (COMNAVRUITCOM) is responsible for recruiting and forwarding applications to the Nurse Corps Professional Review Board for evaluation after they have met all qualification requirements.

Applicants are civilian and enlisted personnel of the Navy Reserve not on active duty. They must be a citizen of the United States, be at least 18 years of age, and must complete 20 years of active service by age 62. Additionally, applicants must have completed their second year of a Bachelor of Science in Nursing (BSN) program, have at least six months of academic work remaining, be enrolled full-time to or accepted transfer to a college or university with a BSN program accredited by the National League for Nursing Accrediting Commission (NLNAC) or Commission of Collegiate Nursing Education (CCNE), maintain a 3.0 grade point average (GPA), and fulfill all BSN requirements within 24 months after enlistment.

Students are considered inactive reservist while attending school. They receive a \$10,000 accession bonus in which \$5000 will be paid upon program acceptance and \$5000 on their six-month anniversary. A \$1000 per month continuation bonus will be paid each month while the student is enrolled full-time. Upon completion, individuals are sent to Officer Development School (ODS) for military training. Candidates incur an active duty service obligation of four to five years, depending upon the length of time spent in the program. A total of eight years of military service is required (Manpower, Personnel, Training and Education Division (N13), 2007a).

## **2. MECP**

The MECP is an in-service commissioning program that provides outstanding career-motivated enlisted personnel of all ratings an advancement pathway to commissioned status in the NC. This program is managed by NMETC, with quotas set by the Deputy Chief of Naval Operations (Manpower, Personnel, Training and Education). MECP is available to all active duty U.S. Navy, Navy Reserve, and Marine Corps personnel. The MECP program currently authorizes 150 enlisted personnel for program participation.

Applicants must be United States citizens, be at least 20 years of age, and must complete 20 years of active commissioned service by age 62. Additionally, applicants must have completed 30 semester credit hours in undergraduate courses, have a cumulative collegiate GPA of 2.5 or higher on a 4.0 scale, be accepted by a NLNAC or CCNE accredited university and be able to complete a BSN program within 36 consecutive months from date of MECP enrollment. Applicants must remain at the university initially enrolled in and will not be permitted to extend beyond graduation date.

Students continue to receive full pay and allowances, while remaining eligible for promotion. The student must pay for tuition, books, and other school related expenses, but may use VA benefits for financial assistance. Upon completion, individuals receive a commission to ensign in the NC and must attend ODS. The selectee will incur an eight-

year obligation with four-years served on active duty and the rest in the selected reserve or Individual Ready Reserve (IRR) (Manpower, Personnel, Training and Education Division (N13), 2007b).

### **3. NROTC**

The NROTC program started in FY 92 and is a college scholarship program for students who are interested in a BSN. The NROTC program is managed by Naval Service Training Command (NSTC) with the quota set by the NC community manager. NRC (NAVRUITCOM) is responsible for recruiting and forwarding applications to the Nurse Corps Professional Review Board for evaluation after they have met all qualification requirements.

Applicants must be a U.S. citizen, be at least 17 years of age and commissioned before their twenty-seventh birthday. Unless the applicant has prior active duty service, then a waiver may be granted to up to age 30. Applicants with 30 semester hours or more are not eligible for the four years NROTC scholarship but may apply for two and three year scholarships.

If accepted, students will receive full tuition to an NROTC approved school along with a \$750 yearly book stipend and a subsistence allowance starting at \$250 for freshman that increases by \$50 for each following year. Students are considered midshipmen while attending school and must maintain a 2.5 GPA. They will be required to complete a four week summer cruise, during which time they receive E-5 pay. Students may not spend more than 40 academic months in the program. Upon graduation, students are commissioned as an ensign and have an eight-year service obligation, four years active duty service and four years in the selected reserve or IRR (Naval Reserve Officers Training Corps, 2013)

### **4. STA-21**

The STA-21 is an in-service commissioning program that provides outstanding career-motivated enlisted personnel of all ratings an advancement pathway to commissioned status in the NC. This program is managed by NSTC, with quotas set by

the Deputy Chief of Naval Operations (Manpower, Personnel, Training and Education). STA-21 is available to all active duty U.S. Navy and Navy Reserve.

Applicants must be United States citizens, be at least 18 years of age, and must complete 20 years of active commissioned service by age 62. Additionally, applicants must have completed 30 semester credit hours in undergraduate courses, have a cumulative collegiate GPA of 2.5 or higher on a 4.0 scale, be accepted by a NLNAC or CCNE accredited university, and be able to complete a BSN program within 36 consecutive months from date of MECP enrollment. Applicants must remain at the university initially enrolled in and will not be permitted to extend beyond graduation date.

If accepted, students will be required to attend the Naval Science Institute (NSI) for eight weeks at Newport, Rhode Island to complete their officer core requirements. While attending their selected college or university, STA-21 candidates will be required to join the college or university NROTC unit and drill but are only required to take two Naval Science leadership courses.

Students continue to receive full pay and allowances while remaining eligible for promotion. Students also receive an annual \$10,000 education voucher that is used to pay tuition, fees, and book cost only. Upon graduation, students are commissioned as an ensign and have an eight-year service obligation, five years active duty service and three years in the selected reserve or IRR (Military Personnel Plans and Policy Division (N13), 2011).

## **5. Direct Accession**

The Direct Accession program was once the primary accession source into the NC; however it is now used as a valve to supplement the training pipelines. This program allows individuals with no prior service experience that have an active nursing license to obtain a commission in the NC. This program is managed by the NMETC, with quotas set by the Deputy Chief of Naval Operations (Manpower, Personnel, Training and

Education). The NRC is responsible for recruiting and forwarding applications to the Nurse Corps Professional Review Board for evaluation after they have met all qualification requirements.

Applicants must be United States citizens, be at least 20 years of age, and must complete 20 years of active commissioned service by age 62. Applicants must have a BSN from an NLNAC or CCNE accredited university or college and possess an active nursing license from the National Council of State Boards of Nursing.

Applicants who are selected will receive a \$20,000 accession bonus for a three-year active duty service agreement and \$30,000 for a four-year active duty service agreement. Additionally, selectee's are given entry grade credit for nursing experience (see appendix) and may enter service an ensign, lieutenant junior grade, or lieutenant. All selectee's will have an eight-year total service obligation and must attend ODS upon commissioning (Manpower, Personnel, Training and Education Division (N13), 2007c). See Table 3.

SOURCE	EDUCATION	AGE	PROGRAM TIME	PAY	OBLIGATION
<b>Naval Reserve Officers Training Corps (NROTC)</b>	-Managed by Line (NSTC/NETC) -GPA 2.5 2, 3 & 4 yr Scholarships -Must attend NROTC affiliated universities with NLNAC or CCNE accreditation	Commission ENSIGN by age 27  -NROTC Midshipman while in school	48 months *5 <sup>th</sup> year benefits only if required by program	-Full Tuition, books fees, & uniforms -Graduated Subsistence \$250/mo Freshman \$300/mo Sophomore \$350/mo Junior \$400/mo Senior; 2 summer cruises	-4 yrs ACS -8 yr total service obligation Selective Reserve (SELRES) or IRR
<b>Seaman to Admiral 21 (STA-21) Nurse Option</b>	-Managed by Line (NSTC/NETC) -GPA 2.5 -Can not currently hold a bachelor's degree -Must attend NROTC affiliated universities with NLNAC or CCNE accreditation	Commission ENSIGN by age 42  -Attends NSI during program prior to enrollment at NROTC college or university	36 months max	-Pay & allowances at enlisted pay grade -Educational voucher paid for tuition/books/fees (\$10,000 annual maximum)	-5 year ACS -8 yr total service obligation (SELRES or IRR) -Must complete 10 years of ACS to be retirement eligible as an officer
<b>Nurse Candidate Program (NCP)</b>	-Managed by NMETC -GPA 3.0 -1 & 2 yr scholarships; must have more than 6 months until graduation from BSN program -Enrolled or accepted in NLNAC or CCNE accredited BSN program	Commission ENSIGN by age 42	24 months max	-\$1,000/mo stipend -\$10,000 accession bonus (\$5,000 at sign on & balance 6 months later) -No tuition fees	-4 yrs ACS for 1 <sup>st</sup> yr. -5 yrs ACS for 2 <sup>nd</sup> yr. -8 yr. total service obligation (SELRES or IRR)  -Inactive enlisted reserve end strength (OCUI2) while in school;  Not longevity pay eligible
<b>Medical Enlisted Commissioning Program (MECP)</b>	-Managed by NMETC -GPA 2.5 -Open to all ratings & Marine Corps -Enrolled/accepted in NLNAC or CCNE accredited BSN program	Commission ENSIGN by age 42	36 months max	-Pay and allowances of enlisted pay grade -No tuition, books, or fees	-4 yrs active duty -8 yr total service obligation (SELRES or IRR)  -Must complete 10 years of ACS to be retirement eligible as an officer
<b>Direct Procurement</b>	-Managed by CNRC -GPA: 3.0 -Hold BSN/MSN from NLNAC or CCNE accredited program	Commission by age 42  -Entry grade credit eligible	NA	NAB eligible: \$20K – 3 yr ACS \$30K – 4 yr ACS -O1/ENSIGN is entry level -Eligible for entry grade credit	-3 yr or-4 yr ACS based on NAB amount -8 yr total service obligation (SELRES or IRR)

Table 3. Nurse Corps Accession Sources (from McNally, 2012)

THIS PAGE INTENTIONALLY LEFT BLANK

### **III. LITERATURE REVIEW**

#### **A. OVERVIEW**

This chapter reviews prior research examining NC accession sources.

#### **B. ACCESSION SOURCE AS A PREDICTOR OF SUCCESS**

The 1998 Naval Postgraduate School (NPS) thesis by Jonak and Paradis titled *An Analysis of the Effects of Accession Source as a Predictor of Success of the Navy Nurse Corps Officer* is the first research that attempted to analyze NNC accession sources. This thesis analyzed the various NC accession sources ability to predict military career behavior. Military career behavior was defined as completing initial obligated service, retention beyond initial obligated service, and promotion to lieutenant commander.

The accession sources analyzed in the 1998 study were the NROTC, NCP, MECF, Direct Procurement, Health Services Commissioning Program (HSCP), Baccalaureate Degree Completion Program (BDCP), and the Full-time Out-service Training (FTOST). The FTOST accession source was phased out in 1993 and the HSCP and BDCP in 1995.

The 1998 thesis used data from Defense Manpower Data Center (DMDC) and Bureau of Medicine Information System (BUMIS) (Jonak & Paradis, 1998). The cohorts years used for this study were FY83, FY87, and FY90. Each cohort was followed till FY97 to allow sufficient time to determine military career behavior. FY83 was chosen to allow enough time to past to determine promotion to lieutenant commander, FY87 because there was a nursing shortage and accession bonuses were granted, and FY90 because it was the most recent FY with enough time lapsed that would allow the researchers to determine military career behavior. Because of the limitation in usable data, the 1998 NPS study was unable to analyze NROTC and NCP sources because these programs did not see entrants till FY92 and FY93. The gains from the various accession sources for given FY years can be seen in Table 4.

GAIN CATEGORY	FY83 N (%)	FY87 N (%)	FY90 N (%)
NROTC			1 ( 0.3)
MECP		14 ( 5.6)	24 ( 7.7)
DIRECT	207 (100)	235 (94.0)	46 (14.8)
NAB			156 (50.3)
HSCP			44 (14.2)
BDCP			26 ( 8.4)
FTOST		1 ( 0.4)	13 ( 4.2)
<b>TOTAL</b>	207 (100)	250 (100)	310 (100)

Table 4. Distribution and Percentages by FY and Gain Category  
(from Jonak & Paradis, 1998)

Additional variables used in the study were demographics (gender, marital status, dependent status, and race), rank, prior service, loss category, and education level.

The 1998 study used a logistical regression model to analyze the data. The formula for the model used was:

$$\Pr (Y_i = 1) = \beta X_i + \alpha Z_i + \epsilon_i$$

where  $Y_i$  is the probability of completing initial obligated service,  $X_i$  is the accession source, and  $Z_i$  are the other control variables as listed in Table 5..

<p>Logit Models:</p> <p>CIOS = f(DIRECT, MECP, NAB, STIPEND, MALE, FEMALE, WHITE, NON-WHITE)</p> <p>RIOS = f(DIRECT, MECP, NAB, STIPEND, MALE, FEMALE, WHITE, NON-WHITE)</p> <p>PROM = f(DIRECT, MECP, NAB, STIPEND, MALE, FEMALE, WHITE, NON-WHITE)</p>
--

Table 5. Logit Models (from Jonak & Paradis, 1998)

The CIOS variable represents the completion of the individuals initial obligated service. The RIOS variable represents retention of an individual beyond initial obligated service and the PROM variable represents and individual promotion to LCDR. The

DIRECT, MECP, NAB, and STIPEND (which is a combination of BDCP, NCP, HSCP, and FTOST) variables represent how an individual accessed into the NC. The MALE and FEMALE variable indicates the individual's gender and the WHITE and NON-WHITE variable indicates if an individual is Caucasian or another race. All variables are either given the value of "1" if that variable describes them or a value of "0" if it does not.

The findings of the 1998 NPS thesis were inconclusive. The possible problems they indicated for inconclusive results were small sample size, small gain category size, or omitted variables. Even if the study produced conclusive results, the information would have been of little use to the Nurse Corps for recruiting and policy change purposes. The reason for this is because the primary accession sources analyzed. HSCP, BDCP, and FTOST accession sources had already been discontinued when this study took place. NCP and NROTC did not produce entrants till after FY90 and MECP sample size was too small to produce quantifiable results (Jonak & Paradis, 1998).

The approach of this research is different from 1998 NPS thesis in several ways. First, this thesis will analyze active NC accession sources, determining individual replacement cost and six- and 11-year retention rates. This thesis will also use multiple cohort years to ensure an adequate study sample and gain sample size for each accession source. These differences will allow for the estimation of conclusive results that will be useful in driving recruiting and accession source policy changes.

### **C. COSTS AND BENEFITS OF NC ACCESSION SOURCES**

The 1999 NPS thesis by Tamera Maeder, titled *The Cost and Benefits of the Navy Nurse Corps Accession Sources*, built upon the NPS thesis by Jonak and Paradis (1998) research. The 1999 NPS thesis analyzed NNC accession sources ability to predict military career behavior but redefined success and added a cost element to their analysis. This thesis defined success as completing and continuing past initial obligated service.

The accession sources analyzed in this study were the NROTC, NCP, MECP, Direct Procurement, HSCP, BDCP and FTOST. The FTOST accession source was phased out in 1993 and the HSCP and BDCP in 1995.

The 1999 NPS thesis used data from DMDC and BUMIS. The cohorts years used for this study were FY92, FY93, and FY94 (Maeder, 1999). Each cohort was followed for 60 months with the exception of FY94, which was followed 59 months due to data availability. These FYs were chosen because they were the three most recent years that would allow enough time to determine military career behavior as defined above. The gains for the various accession sources for FY92–FY94 are shown in Table 6.

<b>Source</b>	<b>FY 1992</b>	<b>FY 1993</b>	<b>FY 1994</b>	<b>Total</b>
MECP	50	53	50	153
Direct no bonus	46	20	6	72
Direct with bonus	67	21	40	128
NROTC	7	9	20	36
BDCP	292	175	129	596
NCP	0	21	28	49
FTOST	16	6	0	22
*Recall	10	10	2	22
*Others	1	3	3	6
<b>Total</b>	<b>489</b>	<b>318</b>	<b>277</b>	<b>1084</b>

Table 6. Gains by Cohort Year from the Various Accession Sources (from Maeder, 1999)

Additional variables used in this study were demographics (gender, marital status, dependent status, and race), rank, initial duty station, prior service, and education level.

The 1999 study (Maeder) used a logistical regression model to analyze the data. The formula for the model use was:

$$\text{Retain} = f(\text{accession source, family status, entry age, race, gender, rank, first duty station, and prior service})$$

The 1999 NPS thesis developed cost estimations for each of the NC accession sources (Maeder, 1999). This was done by calculating the direct cost to train a replacement on the FY the service member was lost. For example, if a service member from the FY92 cohort left in FY97, FY97 pay and education cost were used. Cost estimations included pay and allowances, bonuses, program costs, and officer

indoctrination school. All costs are undiscounted current year costs that are averaged over the three cohort's years by rank for maximum allowed time in each program pipeline.

The 1999 NPS thesis found that NROTC program had the lowest retention rate at 41.7 percent but had the highest cost at \$86,000 (Maeder, 1999). MECP had the highest retention rate of 90.2 percent at a cost of \$74,781. Additionally, this study found that the five-year retention rate of males was 26 percent higher than females, and that married individuals with no children, prior service, and first duty station being a medium command, were more likely to be retained (Maeder, 1999). The costs of each accession source are shown in Table 7.

<b>Accession Source</b>	<b>Estimated Cost (dollars)</b>	<b>Retention Rate (percent)</b>
NROTC	\$ 86,000	41.7
FTOST	\$ 79,302	77.3
MECP	\$ 74,781	90.2
BDCP/HSCP	\$ 46,973	50.0
NCP	\$ 30,045	61.2
Direct with bonus	\$ 18,145	57.0
Direct without bonus	\$ 13,145	44.4

Table 7. Accession Source Comparison (from Maeder, 1999)

This thesis will use Tamara Maeder's thesis as foundation to examine today's environment for recruiting and policy analysis purposes (1999). First, this thesis will analyze the most recent cohort years that allow six- and 11-year retention rates to be determined. This thesis will also analyze the STA-21 program that started seeing entrants in FY04 and analyze how bonuses and program changes have affected each accession source. This new analysis will either confirm or detect a change in the costs and/or benefits for each NC accession source. This would allow the Navy to update accession source policies and refocus recruitment efforts.

#### **D. STEADY STATE MODEL FOR FORECASTING NC PERSONNEL**

The 2004 Naval Postgraduate School thesis by Deen and Buni, titled *Development of a Steady State Model for Forecasting U.S. Navy Nurse Corps Personnel*, developed a Markov model to determine a steady state representation of personnel progression in the

NC. One of the 2004 NPS thesis secondary goals were to figure out what number of nurses should come from each accession source program ((Deen & Buni). This is the part of their thesis that this literature review will focus on.

The accession sources analyzed in this study were the NROTC, NCP, MECP, Direct Procurement, HSCP, BDCP, and the FTOST. The FTOST accession source was phased out in 1993 and the HSCP and BDCP in 1995. STA-21 program was mentioned in their research but not used because it was only producing one to two accession candidates for 2004.

The 2004 NPS thesis received its data from BUMIS system provided by the NC Community Manager's Office (Deen & Buni). The cohort years used for this study were broken up into two groups, FY90–94 and FY96–98. Cohort FY90–94 was followed for 10 years and retention was measured at the four-, five-, seven- and 10-year mark to allow the completion of an initial obligation of four years and a follow-on assignment of three years. FY95–98 was chosen because it was the three most recent FY that would allow the service member enough time to finish their initial military obligation. The FY95–98 cohort was followed for five years. Additional variables used in this study were age, sex, initial education, and education at decision points.

The 2004 study used a logistical regression model to analyze the data (Deen & Buni). The formula for the model used was:

$$\text{Stay} = f(\text{Age, Agesq, DFY91, DFY92, DFY93, DFY94, Recall, BDCP\_HSCP, MECP, NCP, NROTC, DIRECTBON, FTOST, Male, Edchange})$$

The variables used in this model are shown in Table 8.

<b>VARIABLE NAMES</b>	<b>DEFINITION OF VARIABLES</b>
AGE	Age at entry into the Nurse Corps
AGESQ	Age at entry into the Nurse Corps squared
EDCHANGE	1 = Highest education level (EDLEV1) changed during the time of reference (STAY = 4, 5, 7, or 10 year mark); otherwise = 0
BDCP_HSCP	1 = Baccalaureate Degree Completion Program and Health Services Commissioning Program; otherwise = 0
DIRECT	1 = Direct accession without bonus; otherwise = 0
DIRECTBON	1 = Direct accession with sign-on bonus; otherwise = 0
FTOST	1 = Full Time Out Service Training; otherwise = 0
MECP	1 = Medical Enlisted Commissioning Program; otherwise = 0
NCP	1 = Nurse candidate Program; otherwise = 0
NROTC	1 = Naval Reserve Officer Training Corps; otherwise = 0
RECALL	1 = Recalled to active duty; otherwise = 0
PHD	1 = Doctorate degree; otherwise = 0
MS	1 = Masters degree; otherwise = 0
BSN	1 = Bachelors Science Nursing; otherwise = 0
DIP	1 = Diploma Graduate Nurse; otherwise = 0
ASSOC	1 = Associate Degree Nurse; otherwise = 0
DFY90	1 = Fiscal year 1990; otherwise = 0
DFY91	1 = Fiscal year 1991; otherwise = 0
DFY92	1 = Fiscal year 1992; otherwise = 0
DFY93	1 = Fiscal year 1993; otherwise = 0
DFY94	1 = Fiscal year 1994; otherwise = 0
DFY95	1 = Fiscal year 1995; otherwise = 0
DFY96	1 = Fiscal year 1996; otherwise = 0
DFY97	1 = Fiscal year 1997; otherwise = 0
DFY98	1 = Fiscal year 1998; otherwise = 0
DFY99	1 = Fiscal year 1999; otherwise = 0
DFY00	1 = Fiscal year 2000; otherwise = 0
DFY01	1 = Fiscal year 2001; otherwise = 0
DFY02	1 = Fiscal year 2002; otherwise = 0
DFY03	1 = Fiscal year 2003; otherwise = 0
STAY	1 = Nurse remained on active duty to a specified time (4, 5 7 or 10 years); otherwise = 0
MALE	1 if sex "M", otherwise = 0

Table 8. Variable Description (from Deen & Buni, 2004)

The STAY variable represents individuals that remained on active duty for a specified amount of time (four, five, seven or 10 years). The DFY variable represents FY and was created to capture any unobserved events during the given FY. The DIRECT, DIRECTBON, BDCP\_HSCP, FTOST, MECP, NCP, and RECALL variables indicate

how an individual enters into the NC. The PHD, MS, BSN, DIP, and ASSOC variable represents the individual's education level. The MALE variable represents if the individual is a male or not. The EDCHANGE variable indicates if an individual's education level changed while on active duty service. The AGE variable indicates the age an individual entered into the NC. The variables described, with the exception of AGE, are given a value of "1" if they describe the individual or a "0" if they do not.

The findings for the 2004 NPS thesis are shown in Tables 9 and 10.

<b>VARIABLE NAMES</b>	<b>STAY=4</b>	<b>STAY = 5</b>	<b>STAY = 7</b>	<b>STAY = 10</b>
<b>DIRECT</b>	<b>80.8%</b>	<b>70.9%</b>	<b>87.9%</b>	<b>93.1%</b>
<b>MECP</b>	<b>97.3%</b>	<b>92.1%</b>	<b>97.5%</b>	<b>96.5%**</b>
<b>RECALLS</b>	<b>96.7%</b>	<b>92.4%</b>	<b>95.5%**</b>	<b>96.8%**</b>
<b>Directbon</b>	<b>92.38%</b>	<b>n/s</b>	<b>n/s</b>	<b>n/s</b>
<b>NCP</b>	<b>n/s</b>	<b>89.3%**</b>	<b>68.9%**</b>	<b>n/s</b>
<b>EDCHANGE</b>	<b>3.7%</b>	<b>4.4%</b>	<b>5.5%</b>	<b>19.1%</b>

Unless specified, alpha = 0.01

Table 9. FY 90–94 Retention Rates by Accession Sources (from Deen & Buni, 2004)

<b>VARIABLES</b>	<b>STAY = 5 Years</b>
<b>Directbon</b>	<b>84.4%</b>
<b>NCP</b>	<b>97.4%</b>
<b>EDCHANGE</b>	<b>0.3%</b>

Table 10. FY 96–98 Retention Rates by Accession Source (from Deen & Buni, 2004)

The 2004 NPS thesis found in the FY90–94 model that MECP was a significant accession source for retention at the four-, five-, seven-, and 10-year decision point (Deen & Buni). Being male also had a positive significance at all decision points. NCP showed a decreased significance at the seven year decision point and a change in education showed a decreased significance at all decision points. The FY96–98 model found that being male and accessing through NCP was positively significant at all levels. A change in education at all levels decreased the probability of staying in the NC (Deen & Buni, 2004).

The 2004 NPS thesis primary focus was on determining steady states of the NC using Markov models with a minor focus on the effects of current and legacy NC accession sources on retention rates (Deen & Buni). The primary focus of this thesis will be the effects of NC accession sources on six- and 11-year retention rates, focusing on the most recent accession sources and their effects on retention in order to evaluate current accession source policies and recruiting efforts.

#### **E. AN ANALYSIS OF RETENTION AND AFFILIATION FACTORS AFFECTING THE NC**

The 2007 NPS thesis by Messmer and Pizanti, titled *Analysis of the Retention and Affiliation Factors Affecting the Active and Reserve Naval Nurse Corps*, analyzed demographic and organizational factors that affected retention in the NC. NC accession sources were among the organizational factors analyzed by this thesis and will be the focus of this literature review. The accession sources variables in this study were Direct, NROTC, HSCP, NCP, and MECP. As mentioned before, HSCP was phased out in FY95. STA-21 was not used because data was not available for the FY's chosen for analysis.

The 2007 thesis received data from DMDC and BUMIS. The cohorts years used for this study was FY90–FY05 (Messmer & Pizanti). Nurses who accessed in FY00 and beyond were dropped, in order to allow a minimum of six years to be evaluated. Stayers were classified as those that did not have leave dates and leavers would those with leave

dates due to resignation or release. NC officers that left service due to death, changed designator, administrative discharge, physical, or other reasons, were dropped from the data set.

Additional variables used in this study were demographics (gender, marital status, and race), prior service, education level, first duty station, and entry subspecialty code.

The 2007 study used a logistical regression model to analyze the data (Messmer & Pizanti). The formula for the model used was:

$$\ln \left( \frac{P_i}{1-P_i} \right) = \beta_0 + \beta_1(\text{MALE}) + \beta_2(\text{MWC}) + \beta_3(\text{MNC}) + \beta_4(\text{SWC}) + \beta_5(\text{COMM\_AGE}) + \beta_6(\text{PRIOR}) + \beta_7(\text{BLACK}) + \beta_8(\text{OTHER}) + \beta_9(\text{NROTC}) + \beta_{10}(\text{HSCP}) + \beta_{11}(\text{NCCP}) + \beta_{12}(\text{MECP}) + \beta_{13}(\text{DIRECT\_BONUS}) + \beta_{14}(\text{OTHER\_GCAT}) + \beta_{15}(\text{POST\_BA}) + \beta_{16}(\text{SANDOG}) + \beta_{17}(\text{PORT}) + \beta_{18}(\text{BETH}) + \beta_{19}(\text{MED\_SURG}) + \beta_{20}(\text{PSYCH}) + \beta_{21}(\text{ER}) + \beta_{22}(\text{OR}) + \beta_{23}(\text{ADMIN}) + \beta_{24}(\text{CRNA}) + \beta_{25}(\text{OB\_PEDS}) + \beta_{26}(\text{CC\_ICU}) + \beta_{27}(\text{YRGRP85\_89}) + \beta_{28}(\text{YRGRP90\_94}) + \beta_{29}(\text{YRGRP95\_99})$$

The STAY variable was the dependent variable and indicated if an individual was retained for six years or greater. The MALE variable indicates the gender of the individual. The MWC, MNC, SWC, and SNC variable indicates an individual's marital and dependent status. The COMM-AGE variable indicates the age at which an individual was commissioned into the NC. The PRIOR variable indicates if an individual has four or more years of prior military service. The WHITE, BLACK, and OTHER variable indicates the race of the individual. The NROTC, HSCP, NCCP, MECP, DIRECT\_BONUS, DIRECT, and OTHER\_GCAT variables indicate the accession source of entry into the NC. The SANDOG, PORT, and BETH are location variables and indicate the individual first duty station. The MED\_SURG, PSYCH, ER, OR ADMIN, CRNA, OB\_PEDS, GENERAL, and CC-ICU variables indicate the area of nursing an individual was qualified to or is working in. The YRGRP85\_89, YRGRP90\_94, and YRGRP95\_99 variable represents the year group of accession into the NC. The variables described, with the exception of COMM-AGE, are given a value of "1" if they describe the individual or a "0" if they do not.

The findings for the 2007 NPS thesis (Messmer & Pizanti) are shown in Table 11.

	Probability of Staying Active	Partial Effect	%Change in Probability
Base Case	48.44%		
Male ***	67.28%	0.1884	38.89%
Married With Children ***	62.25%	0.1381	28.51%
Single With Children ***	58.61%	0.1017	21.00%
Black ***	59.07%	0.1063	21.94%
Other ***	57.44%	0.09	18.58%
Age at Commissioning (28.3) *	48.77%	0.0033	0.68%
Prior Enlisted ***	79.23%	0.3079	63.56%
NROTC ***	28.77%	-0.1967	-40.61%
HSCP **	40.44%	-0.08	-16.52%
NCCP *	41.42%	-0.0702	-14.49%
MECP ***	70.71%	0.2227	45.97%
Direct with Bonus ***	35.93%	-0.1251	-25.83%
Other Gain Category ***	17.07%	-0.3137	-64.76%
Post Graduate Degree ***	94.19%	0.4575	94.45%
Did Attend NH Portsmouth ***	58.88%	0.1044	21.55%
Medical/Surgical ***	81.91%	0.3347	69.10%
Psychology *	61.85%	0.1341	27.68%
Emergency Room ***	75.13%	0.2669	55.10%
Operating Room ***	77.63%	0.2919	60.26%
Administration ***	87.09%	0.3865	79.79%
OB/Pediatrics ***	74.09%	0.2565	52.95%
Critical Care/ICU ***	57.11%	0.0867	17.90%
1985-1989 ***	8.33%	-0.4011	-82.80%
1990-1994 ***	10.35%	-0.3809	-78.63%
1995-1999 ***	32.32%	-0.1612	-33.28%

\*\*\* ChiSq significant at .01 level for comparison between stayers and leavers in retention model

\*\* ChiSq significant at .05 level

Table 11. Partial Effects of Retention Regression Model (from Messmer & Pizanti, 2007)

The 2007 thesis found that NROTC decreased retention rates by 19.67 percentage points, HSCP by 8.00 percentage points, NCP by 7.02 percentage points, Direct by 12.51 percentage points, and the other gain by 31.37 percentage points (Messmer & Pizanti). MECP accessions increased retention by 22.27 percentage points. A potential problem with the Active Retention Model pointed out by Messmer and Pizanti that could have affected results was multicollinearity. Multicollinearity was measured by calculating the Variance Inflation Factors for the model. After Variance Inflation Factors were calculated, the following variables had higher variance inflation factors than the model: Prior, NROTC, Direct with bonus, MECP, HSCP, and year group 1990 (Messmer & Pizanti, 2007).

The 2007 thesis main focus was factors affecting overall retention with the use of current and legacy accession sources up to FY00 (Messmer & Pizanti). This thesis will focus on six- and 11-year retention rates for the current individual accession sources for FY00–FY08. The information gained from this thesis will help guide recruiting efforts and accession source policy changes.

## IV. DATA AND METHODOLOGY

### A. DATA SOURCE

The Bureau of Medicine Information Systems provided NNC data for all active duty nurses from FY00 to FY13. BUMIS data was received in two Excel files. The first Excel file contained a snapshot of each NC officer’s accession into the Navy and the second file contained a snapshot, if applicable, of their loss from the Navy. The files contained demographic and professional data that included source of commission, report date, subspecialty codes, education level, rank, unit identification code (UIC), and gender.

#### 1. Database Creation

The two Excel files were combined to create the database for this thesis. The Excel files from BUMIS did not contain a unique identifier for each NC officer. The Excel files were first merged in STATA by the officer’s full name. The remaining unmerged entries were manually verified and merged by name, report date, accession source, and rank to ensure accuracy. After the files were merged, the database was broken into two data sets. The first data set contained nurses who entered the Navy in FY00, FY01, and FY02. The second data set comprised of NC officers entering in the Navy in FY04, FY05, FY06, and FY07. The NC officers that entered the Navy through recall, redesignation, or interservice transfer were deleted from the data sets. The number of accessions into the NC each FY by accession source are shown in Table 12.

	FY00	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08
<b>DIRECT^</b>	90	82	76	67	41	46	54	49	61
<b>NROTC</b>	49	54	52	44	38	40	34	57	38
<b>NCP</b>	38	58	62	50	61	38	48	61	56
<b>MECP</b>	47	65	41	52	63	47	42	39	53
<b>STA 21</b>					1	9	19	28	14
<b>Total Gains:</b>	<b>224</b>	<b>259</b>	<b>231</b>	<b>213</b>	<b>204</b>	<b>180</b>	<b>197</b>	<b>234</b>	<b>222</b>

Table 12. Accession Source gains by FY, Navy Nurse Corps Monthly Report.

## **2. Data Selection**

NC officers entering the Navy in cohort years FY00–FY02 were tracked for six and 11 years. NC officers enter the Navy in cohort year FY04–FY07 were tracked for six years. The six- and 11-year decision points were chosen because they represent two significant military career milestones. The six year decision point allows enough time for each service member from the various accession sources to finish their initial military service obligation and to decide either to stay or leave active service. The six-year decision point also allows enough time for service members who accessed through NCP and STA-21 enough time to transition out of the Navy if they have decided to leave active military service. The allowance for a one-year transition time is important because service members with five-year service obligations rarely leave service before or exactly on the end of their active duty service obligation. NC officer's on active duty at their six-year decision point are assumed to have completed their initial military service obligation and have decided to stay in the Navy.

The 11-year decision point was chosen because service members staying beyond the 10-year point are considered to be careerists (individuals that plan on staying in till retirement). The 11-year decision point was chosen to capture service members with prior military service whom have completed their 10-year minimum requirement to retire as an officer. This is especially important with MECF accessions because many of them have more than 10 years of active service prior to commissioning. The 11-year decision point also allows all NC officers the chance to complete two tours of duty. NC officers who are on active duty service at their 11-year decision point are assumed to be a careerist.

Cohort years FY00–FY02 was chosen because they are the most recent cohort years that have allowed enough time to pass to be tracked for 11 years. This cohort follows all accession sources with the exception of STA-21, which did not see accessions until FY04. Cohort years FY04–FY07 were chosen because they are the most recent cohort years that have passed that has allowed enough time for each FY to be tracked for six years. These cohort years contain the STA-21 accession source.

## **B. VARIABLE DESCRIPTION**

The variable RETAIN was chosen for the dependent variable and represents the six- and 11-year decision point for NC officer's. This variable was created in a two-step process. First, a time-in-service (TIS) variable was created by subtracting the service members report date (date reported to the NC) from their estimated loss data (last day of active military service). RETAIN6 is TIS greater than six years and RETAIN11 is TIS greater than 11 years.

## **C. DESCRIPTIVE VARIABLES**

### **1. Accession Source**

The accession variables (NROTC, MECP, NCP, STA-21, and Direct) were created by recoding the GCAT (Gain Category) and generating accession source variables by matching numerical codes. The GCAT of recall, redesignation, or intersevice transfer was dropped because they are not relevant.

### **2. Fiscal Year**

The GFY variable was obtained from the BUMIS system and indicates the FY that an individual accessed into the NC.

### **3. Prior Military Service**

The variable PRIOR is given the value of "1," if an individual has four or more years of prior military service. The four-year mark was chosen to avoid incorrectly classifying NROTC accessions as prior enlisted and because officers do not receive additional benefits until then. The PRIOR variable was created by subtracting the report date from the pay base entry date. A result of 48 months or greater was given the value of "1" and counted as having prior military service.

### **4. Rank at Commissioning**

The rank variables (ENS, LTJG, LT, and LCDR) were created by encoding the GRADGAIN variable and generating the rank variables. The rank variable indicates the rank an individual was given at commission.

**5. Male**

The male variable was created by encoding the SEX variable and generating the variable MALE and FEMALE. If the individual was male, they were given the value of “1” and “0” if they were female. This variable will analyze the effects of being a male or female has on retention.

**D. DESCRIPTIVE STATISTICS**

**1. FY00–FY02 Data Set**

The descriptive statistics for the 11-year retention model using data set FY00–FY02 is shown in Table 13

Model FY00–FY02 Summary Statistics				
Variable	Mean	Std. Dev.	Min	Max
RETAIN6	0.7244755	0.4470909	0	1
RETAIN11	0.5272727	0.4996051	0	1
GFY00	0.3090909	0.4624423	0	1
GFY01	0.3664336	0.4821673	0	1
GFY02	0.3244755	0.4685064	0	1
DIRECT	0.3482517	0.4767499	0	1
NROTC	0.2167832	0.4123423	0	1
NCP	0.220979	0.4151969	0	1
MECP	0.213986	0.4104043	0	1
MALE	0.3916084	0.4884517	0	1
FEMALE	0.6083916	0.4884517	0	1
PRIOR	0.2321678	0.4225112	0	1
ENS	0.9398601	0.2379123	0	1
LTJG	0.0461538	0.2099652	0	1
LT	0.013986	0.1175149	0	1
OBSERVATIONS	715			

Table 13. Descriptive Statistics for the 11-year Retention Model

The 11-year retention model has an average six-year retention rate of 72.45 percent and a 52.73 percent for the 11-year retention rate for individuals accessing in to the NC in FY00–FY02. GFY01 had the highest percentage of entrants at 36.64 percent and GFY00 with the lowest at 30.90 percent. The Direct Procurement program was the primary source of entry in this model, making up 34.83 percent of all accession. The

NROTC, NCP, and MECP accession sources made up an average of 21.77 percent each of the total accessions. Females made up 60.84 percent of all accession and ensigns comprised of 93.99 percent of all individuals joining the NC.

## 2. FY04–FY07 Data Set

The descriptive statistics for the six-year retention model using data set FY04–FY07 is shown in Table 14.

Model FY04–FY07 Summary Statistics				
Variable	Mean	Std. Dev.	Min	Max
<b>RETAIN6</b>	<b>0.6806527</b>	<b>0.4664957</b>	<b>0</b>	<b>1</b>
<b>GFY04</b>	<b>0.2377622</b>	<b>0.4259611</b>	<b>0</b>	<b>1</b>
<b>GFY05</b>	<b>0.2109557</b>	<b>0.408225</b>	<b>0</b>	<b>1</b>
<b>GFY06</b>	<b>0.2564103</b>	<b>0.4369056</b>	<b>0</b>	<b>1</b>
<b>GFY07</b>	<b>0.2948718</b>	<b>0.4562511</b>	<b>0</b>	<b>1</b>
<b>DIRECT</b>	<b>0.2715618</b>	<b>0.4450245</b>	<b>0</b>	<b>1</b>
<b>NROTC</b>	<b>0.1969697</b>	<b>0.3979412</b>	<b>0</b>	<b>1</b>
<b>NCP</b>	<b>0.2424242</b>	<b>0.4287995</b>	<b>0</b>	<b>1</b>
<b>MECP</b>	<b>0.2226107</b>	<b>0.4162417</b>	<b>0</b>	<b>1</b>
<b>STA21</b>	<b>0.0664336</b>	<b>0.2491837</b>	<b>0</b>	<b>1</b>
<b>MALE</b>	<b>0.3298368</b>	<b>0.4704279</b>	<b>0</b>	<b>1</b>
<b>FEMALE</b>	<b>0.6701632</b>	<b>0.4704279</b>	<b>0</b>	<b>1</b>
<b>PRIOR</b>	<b>0.3123543</b>	<b>0.4637238</b>	<b>0</b>	<b>1</b>
<b>ENS</b>	<b>0.9638695</b>	<b>0.1867237</b>	<b>0</b>	<b>1</b>
<b>LTJG</b>	<b>0.0244755</b>	<b>0.1546103</b>	<b>0</b>	<b>1</b>
<b>LT</b>	<b>0.011655</b>	<b>0.10739</b>	<b>0</b>	<b>1</b>
<b>OBSERVATIONS</b>	<b>858</b>			

Table 14. Descriptive Statistics for the Six-year Retention Model

The six-year retention model has an average six-year retention rate of 68.07 percent for individuals accessing in to the NC in FY04–FY07. GFY07 had the highest percentage of entrants at 29.49 percent and GFY05 with the lowest at 21.96 percent. The Direct Procurement program was the primary source of entry in this model making up 27.16 percent of all accession. The NROTC, NCP, and MECP accession sources made up an average of 22.07 percent each and STA-21 had the lowest percent of entrants at 6.64

percent of all accessions. Females made up 67.02 percent of all accession and ensigns comprised of 96.39 percent of all individuals joining the NC.

### **3. Model Comparison**

The FY04–FY07 retention model had a decrease in the direct accession entries and an increase in prior service entries, when compared to the FY00–FY02 retention model. The change between these models is mostly like due to the STA-21 accession source. The STA-21 accession source reduces the need to recruit nurses from the civilian population, causing direct accessions recruitment to be lower. The STA-21 accessions are obtained from the active duty military population, which would cause an increase in the average for prior service members in the model.

The male and female averages and the ensign averages for all models were very similar. Females averaged around 67 percent and males 33 percent for all models. The average entrant being an ensign was around 96 percent for all models.

## **E. METHODOLOGY**

A logistic regression model is used to analyze the probability that a NC officer will RETAIN at a six- and 11-year military career decision point for the FY00–FY02 model. The partial effects of the explanatory variables will be examined to determine their effects on retention at the above mentioned decision points.

The model used for the logistical regression on the FY00, FY01, and FY02 cohorts is presented below:

$$\text{RETAIN} = f(\text{GFY01 GFY02 NROTC NCP MECP MALE LTJG LT PRIOR})$$

The RETAIN variable is given the value of “1” if the service member is retained for six (RETAIN6) or 11 (RETAIN11) years otherwise a value of “0” given. The GFY variable represents the FY the individual entered the NC. The GFY variable is given the value of “1” for the FY entered and a value of “0” for other FY’s. The NROTC, Direct, NCP, and MECP variables represent the source of accession into the NC. The accession source variables are given a value of “1” for the accession source the individual entered into the NC and a value of “0” for the other accession sources. The MALE variable

represents males that entered in the NC. The MALE variable is given the value of “1” if the individual is a male and the value of “0” if they are not. The ENS, LTJG and LT variable represents the rank and individual was given at commission. The entry rank variable is given a value of “1” for the rank that an individual entered service and a value of “0” for all other ranks. The PRIOR variable represents an individual entering the NC with four or more years of prior military service. The PRIOR variable is given the value of “1” if the individual has four or more years of active duty service and a value of “0” if they do not.

The base for this model is a female ensign without prior military experience that entered the NC through Direct Procurement in FY00. Accession sources are in the model to determine how source of entry affects probability of staying in the NC. The MALE variable was added to determine retention differences between males and females.

Entry rank was included to assess if a nurse with prior commissioned service or civilian nursing experience affects retention at career decision points. Entry grade credit is granted to qualifying individuals with prior commissioned service, advanced education, or civilian nursing experience. Entry grade credit determination can be found in the appendix.

The PRIOR variable is included in the model to determine if prior military experience affects an individual’s decision to stay or leave military service. It is hypothesized that prior military service has a positive effect on retention rates. The PRIOR variable is defined as an individual entering the NC with four or more years of prior military service.

The model used for the logistical regression on the FY04, FY05, FY06, and FY07 cohorts:

$$\text{RETAIN} = f(\text{GFY05 GFY06 GFY07 NROTC NCP MECP STA-21 MALE LTJG LT PRIOR})$$

The RETAIN variable is given the value of “1” if the service member is retained for six (RETAIN6) years otherwise a value of “0” given. The GFY variable represents the FY the individual entered the NC. The GFY variable is given the value of “1” for the FY entered and a value of “0” for other FY’s. The NROTC, Direct, STA-21, NCP, and

MECP variables represent the source of accession into the NC. The accession source variables are given a value of “1” for the accession source the individual entered into the NC and a value of “0” for the other accession sources. The MALE variable represents males that entered in the NC. The MALE variable is given the value of “1” if the individual is a male and the value of “0” if they are not. The ENS, LTJG and LT variable represents the rank and individual was given at commission. The entry rank variable is given a value of “1” for the rank that an individual entered service and a value of “0” for all other ranks. The PRIOR variable represents an individual entering the NC with four or more years of prior military service. The PRIOR variable is given the value of “1” if the individual has four or more years of active duty service and a value of “0” if they do not.

The base for this model is a female ensign without prior military experience that entered the NC through Direct Procurement in FY04. See Table 15.

<b>Variable Name</b>	<b>Definition of Variables</b>
<b>DIRECT</b>	<b>1 = Direct Accession; otherwise = 0</b>
<b>NROTC</b>	<b>1 = Navy Reserve Officer Training Corps; otherwise = 0</b>
<b>NCP</b>	<b>1 = Nurse Candidate Program; otherwise = 0</b>
<b>MECP</b>	<b>1 = Medical Enlisted Commissioning Program; otherwise = 0</b>
<b>STA21</b>	<b>1 = Seamen-to-Admiral Program; otherwise = 0</b>
<b>MALE</b>	<b>1 = Male; otherwise = 0</b>
<b>ENS</b>	<b>1 = Commissioned as an Ensign; otherwise = 0</b>
<b>LTJG</b>	<b>1 = Commissioned as an Lieutenant Junior Grade; otherwise = 0</b>
<b>LT</b>	<b>1 = Commissioned as an Lieutenant; otherwise = 0</b>
<b>LCDR</b>	<b>1 = Commissioned as an Lieutenant Commander; otherwise = 0</b>
<b>PRIOR</b>	<b>1 = Indicates the completion of four years of enlisted service; otherwise = 0</b>
<b>GFY00</b>	<b>1 = Commissioned Fiscal Year 2000; otherwise = 0</b>
<b>GFY01</b>	<b>1 = Commissioned Fiscal Year 2001; otherwise = 0</b>
<b>GFY02</b>	<b>1 = Commissioned Fiscal Year 2002; otherwise = 0</b>
<b>GFY03</b>	<b>1 = Commissioned Fiscal Year 2003; otherwise = 0</b>
<b>GFY04</b>	<b>1 = Commissioned Fiscal Year 2004; otherwise = 0</b>
<b>GFY05</b>	<b>1 = Commissioned Fiscal Year 2005; otherwise = 0</b>
<b>GFY06</b>	<b>1 = Commissioned Fiscal Year 2006; otherwise = 0</b>
<b>GFY07</b>	<b>1 = Commissioned Fiscal Year 2007; otherwise = 0</b>
<b>GFY08</b>	<b>1 = Commissioned Fiscal Year 2008; otherwise = 0</b>
<b>RETAIN5</b>	<b>1 = Nurse retained at five years; otherwise = 0</b>
<b>RETAIN6</b>	<b>1 = Nurse retained at six years; otherwise = 0</b>
<b>RETAIN10</b>	<b>1 = Nurse retained at ten years; otherwise = 0</b>
<b>RETAIN11</b>	<b>1 = Nurse retained at eleven years; otherwise = 0</b>

Table 15. Variable Description

THIS PAGE INTENTIONALLY LEFT BLANK

## **V. COST ANALYSIS**

### **A. OVERVIEW**

This chapter identifies and compares the costs of the different NC accession sources.

### **B. BACKGROUND**

The NNC has five different sources for entry. Knowing which accession source is the most effective for its cost is important to the NC Community Manager, to determine accession source quotas and direct recruiting efforts. The cost used for this determination will be a FY12 direct replacement cost. Replacement cost is defined as the amount of money the Navy would have to spend to replace a NC officer in FY12. Direct cost includes base pay, allowances, and accession source cost. Indirect costs such as advertising, recruiting, and support personnel will not be used in the cost estimation. FY12 was chosen because it provided the most recent NROTC average yearly cost and access to FY13 and FY14 pay tables for a more accurate estimation.

#### **1. NROTC Cost Estimation**

The NROTC program cost was obtained from Mr. Robert Turpin the Deputy of Student Operation (OD41). The average program cost for FY12 was \$23,758 per student, which included tuition, book stipend, and monthly stipend (Turpin, 2013). Individuals are assumed to be in the program for the maximum time of 48 months. The total four-year cost for the NROTC program was \$95,032.

#### **2. NCP Cost Estimation**

Individuals in the NCP program are paid a monthly stipend of \$1000 and they receive a \$10,000 bonus. The maximum allowed time in the NCP program is 24 months. The NCP program one-year cost is \$22,000 and two-year cost is \$34,000. The simple and weighted average was then calculated to obtain the total program cost. The simple average was calculated by adding one-year program cost and two-year program cost and dividing the sum by two. The simple average cost for the NCP program was \$28,000. The

weighted average cost was determined by reviewing all NCP program participants from FY04 to FY13. Out of the 433 individuals reviewed, 97 individuals used the program for one-year and 336 for two-years. The weighted average cost for the NCP program is \$31,312.

### **3. MECP Cost Estimation**

In the MECP program, the service member covers all the cost for education, but receives full pay and benefits while in the program. To calculate the average cost of the MECP program, individuals are assumed to be an E-4, E-5, or E-6 and do not promote while in the program. Individuals are also assumed to spend the maximum amount of time in the program, which is 36 months.

Cost estimations for the rank of E-4, E-5, and E-6 was determined by using military FY12, FY13, and FY14 military pay tables, Department of Defense FY12 and FY13 Green Books, and from the Defense Travel website. An E-4 is assumed to enter the program with three years of TIS. Their base pay is calculated as over three years of TIS for the first year in the program, and over four years TIS for the remaining two years in the program. An E-5 is assumed to enter the program with five years of TIS and their base pay is calculated as over four years of TIS for the first year in the program, and over six years of TIS for the remaining two years in the program. An E-6 is assumed to enter the program with eight years of TIS, with base pay calculated as over eight years of TIS for the first two years and over 10 years of TIS for the remaining year in the program. The average single basic allowance for housing (BAH) in the continental United States for E-4, E-5, and E-6 is used for FY12, FY13, and FY14 and enlisted basic allowance for subsistence (BAS) for each FY. Individuals are assumed to receive no other pay or allowances and be single.

The total cost for the MECP program is \$131,529 for an E-4, \$151,873 for an E-5, and \$176,659 for an E-6. The simple average cost was calculated by adding the total cost for an E-4, E-5, and E-6 and dividing the sum by three. The simple average cost for the MECP program was \$153,354. The weighted average cost was determined by reviewing

the MECP selection board results for FY11, FY12, FY13, and FY14. Out of the 177 individuals reviewed, 25 were E-4, 86 were E-5, and 66 were E-6. The weighted average cost for the MECP program was \$156,704.

#### **4. Direct Procurement Cost Estimation**

Individuals entering the NC through the Direct Procurement program receive a \$20,000 bonus for three years of active service and \$30,000 bonus for four years of active service. There is no other direct cost associated with Direct Procurement program. No information was obtained for how many individuals signed up for three or four years of service. A simple average was calculated by adding the three-year obligation cost and the four-year obligation cost, then dividing the sum by two. The simple average cost for the Direct Procurement program was \$25,000.

#### **5. STA-21 Cost Estimation**

The service member receives a \$10,000 yearly stipend to cover educational expenses and they receive full pay and benefits, while in the STA-21 program. To calculate the average cost of the STA-21 program, individuals are assumed to be an E-4, E-5, or E-6 and do not promote while in the program. Individuals are also assumed to spend the maximum amount of time in the program, which is 36 months.

Cost estimations for the rank of E-4, E-5, and E-6 was determined by using military FY12, FY13, and FY14 military pay tables, Department of Defense FY12 and FY13 Green Books, and from the Defense Travel website. An E-4 is assumed to enter the program with three years of TIS, and base pay is calculated as over three years of TIS for the first year in the program and over four years of TIS for the remaining two years in the program. An E-5 is assumed to enter the program with five years of TIS, and base pay is calculated as over four years of TIS for the first year in the program and over six years of TIS for the remaining two years in the program. An E-6 is assumed to enter the program with eight years of TIS, and base pay is calculated as over eight years of TIS for the first two years and over 10 years of TIS for the remaining year in the program. The average

single BAH in the continental United States for E-4, E-5, and E-6 is used for FY12, FY13, and FY14 and enlisted BAS for each FY. Individuals are assumed to receive no other pay or allowances and be single.

The total cost for the STA-21 program is \$161,529 for an E-4, \$181,873 for an E-5, and \$206,659 for an E-6. The simple average cost was calculated by adding the total cost for an E-4, E-5, and E-6 and dividing the sum by three. The simple average cost for the STA-21 program was \$183,354. The weighted average cost was determined by reviewing the STA-21 selection board results for FY11, FY12, FY13, and FY14. Out of the 15 individuals reviewed, zero were E-4, six were E-5, and nine were E-6. The weighted average cost for the STA-21 program was \$196,744. The total cost for E-4's was not excluded because it is possible to be selected for the STA-21 and be an E-4.

### **C. COST ANALYSIS RESULTS**

The analysis showed the most expensive accession source is the STA-21 program at \$196,744 and the least expensive is the Direct Procurement at \$25,000. The MECP and NROTC are the second and third most expensive accession source programs at \$156,704 and \$95,302, respectively. The NCP was the second cheapest accession source program at \$31,312. Comparisons of the different accession source cost are shown in Table 16.

Source	Pay & Allowances	Bonus	Education Voucher	Total Cost	Simple Average Cost	Weighted Average Cost		
<b>NROTC</b> 4 Years	N/A	N/A	N/A	95,032	\$95,032	\$95,032.00*		
<b>NCP</b> 1 Year 2 Years	12,000 24,000	10,000 10,000	N/A N/A	22,000 34,000	\$28,000	\$31,312.00		
<b>MECP</b> 1 Year E-4 2 Years E-4 3 Years E-4	42,000 44,292 45,237	N/A N/A N/A	N/A N/A N/A	131,529	\$153,354	\$156,704.00*		
1 Year E-5 2 Years E-5 3 Years E-5	48,012 51,372 52,489	N/A N/A N/A	N/A N/A N/A	151,873				
1 Year E-6 2 Years E-6 3 Years E-6	57,306 58,440 60,913	N/A N/A N/A	N/A N/A N/A	176,659				
<b>Direct</b> 3 Years 4 Years	N/A N/A	20,000 30,000	N/A N/A	20,000 30,000			\$25,000	\$25,000.00
<b>STA-21</b> 1 Year E-4 2 Years E-4 3 Years E-4	42,000 44,292 45,237	N/A N/A N/A	10,000 10,000 10,000	161,529				
1 Year E-5 2 Years E-5 3 Years E-5	48,012 51,372 52,489	N/A N/A N/A	10,000 10,000 10,000	181,873				
1 Year E-6 2 Years E-6 3 Years E-6	57,306 58,440 60,913	N/A N/A N/A	10,000 10,000 10,000	206,659	\$183,354	\$196,744.00**		
* Average is not weighted								
**Weighted Average includes E-5 & E-6 Only								

Table 16. Accession Source Cost Comparison

PAGE INTENTIONALLY LEFT BLANK

## VI. RETENTION RATE ANALYSIS

### A. OVERVIEW

This chapter presents first the findings of bivariate analysis of retention by several characteristics for all individuals entering the NC in FY00–FY07. It will then present the results of the logistical regressions for the six- and 11-year retention models to test what variables best explain variation in retention rates.

### B. BIAVARIATE FINDINGS

#### 1. FY Retention Rates

FY00 had the highest six-year retention rate of 84.16 percent while FY03 had the lowest at 57.48 percent. The average six-year retention rate for cohorts FY00–FY07 was 68.39 percent.

FY00 had the highest 11-year retention rate of 64.25 percent while FY02 had the lowest at 46.12 percent. The average 11-year retention rate for cohorts FY00–FY02 was 53.07 percent. The six- and 11-year retention rates by FY of accession are presented in Table 17 and Figure 3.

<b>FY</b>	<b>6-Year Retention Rates (Percent)</b>	<b>11-Year Retention Rates (Percent)</b>
<b>2000</b>	<b>84.16</b>	<b>64.25</b>
<b>2001</b>	<b>69.47</b>	<b>48.85</b>
<b>2002</b>	<b>64.46</b>	<b>46.12</b>
<b>2003</b>	<b>57.48</b>	
<b>2004</b>	<b>63.73</b>	
<b>2005</b>	<b>66.3</b>	
<b>2006</b>	<b>72.73</b>	
<b>2007</b>	<b>68.77</b>	
<b>Average</b>	<b>68.39</b>	<b>53.07</b>

Table 17. FY Retention Rates

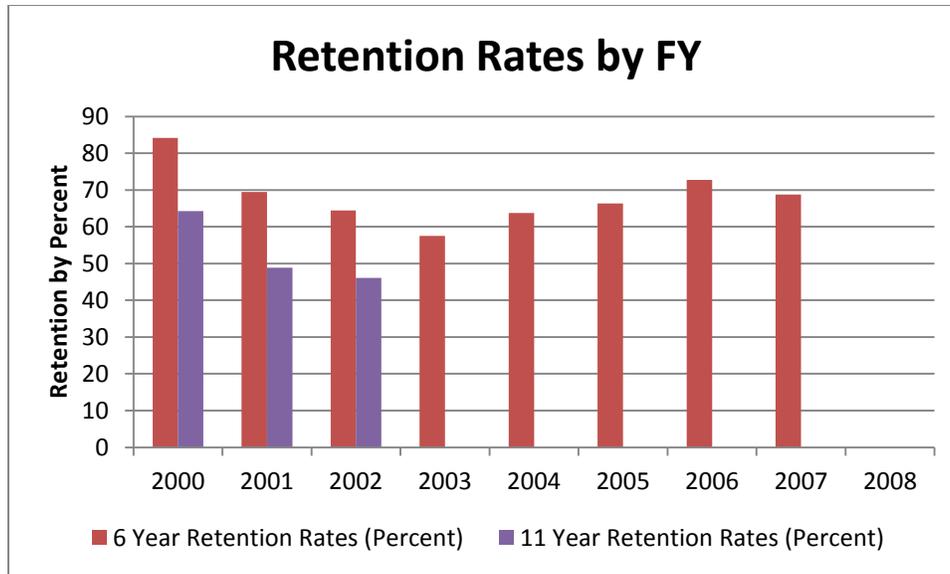


Figure 3. Cohort Retention Rates

## 2. Accession Source Retention Rates

### a. Six-year Retention Rate by Accession Source

STA-21 program had the highest retention rate of 91.23 percent and NROTC program had the lowest retention rate of 54.62 percent. The MECP program had the second highest retention rate of 89.65 percent. STA-21 and MECP programs higher retention rate is likely due to the career investment of the individuals entering in these programs. STA-21 and MECP accessions are obtained from the active duty military population. A majority of those accessions have close to 10 years of military service at the time of their commission.

The NROTC and NCP programs lower retention rates is likely due to the motivation of the individuals accessing in these programs. The NROTC and NCP programs are scholarship and stipend programs, which individuals use to pay for their college education. The motivation for entry in these programs may not be military service but instead education costs.

Direct accessions had a 67.21 percent six-year retention rate. The overall six-year retention rate for this sample is 72.44 percent. The six-year retention rates of the NC accession sources are presented in Table 18 and Figure 4.

Accession Source	Commissioned	Percentage of Total Accessions	Retained after 6 Years	Retained after 6 Years (Percent)
MECP	396	22.2	355	89.65
NCP	417	23.3	248	59.47
NROTC	368	20.1	201	54.62
Direct	549	31	369	67.21
STA-21	57	3.4	52	91.23

Table 18. Six-year Accession Source Retention Rates

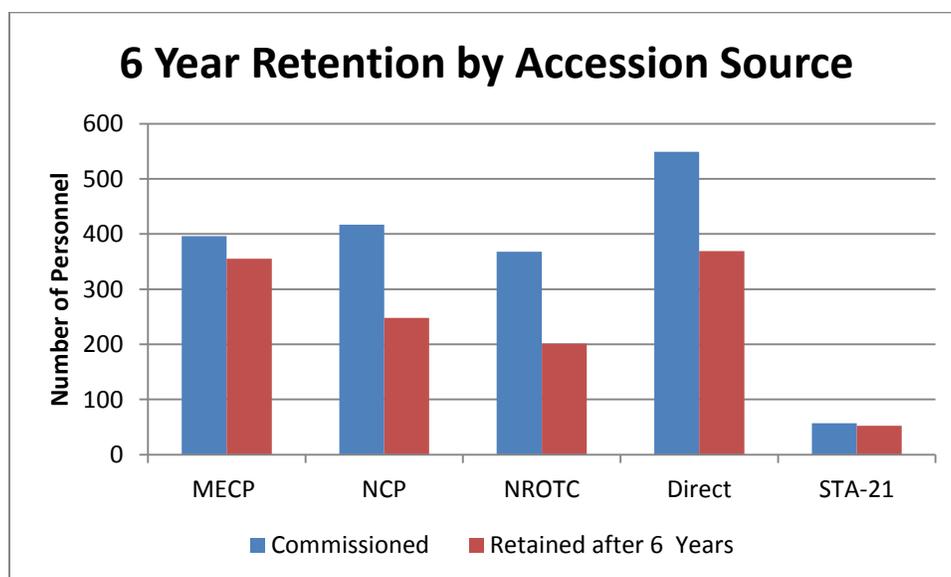


Figure 4. Six-year Retention by Accession Source

***b. Eleven-year Retention Rate by Accession Source***

The MECP program had the highest retention rate of 71.9 percent and NCP program had the lowest retention rate of 37.34 percent. The reason for the difference in accession source retention rates are the same as presented in the six-year retention model. The overall 11-year retention rate for this sample is 52.88 percent. The 11-year retention rates of the various NC accession sources are presented in Table 19 and Figure 5

Accession Source	Commissioned	Percentage of Total Accessions	Retained after 11 Years	Retained after 11 Years (Percent)
MECP	153	21.4	110	71.9
NCP	158	22.1	59	37.34
NROTC	155	21.7	77	49.68
Direct	249	34.8	131	52.61

Table 19. Eleven-year Accession Source Retention Rate

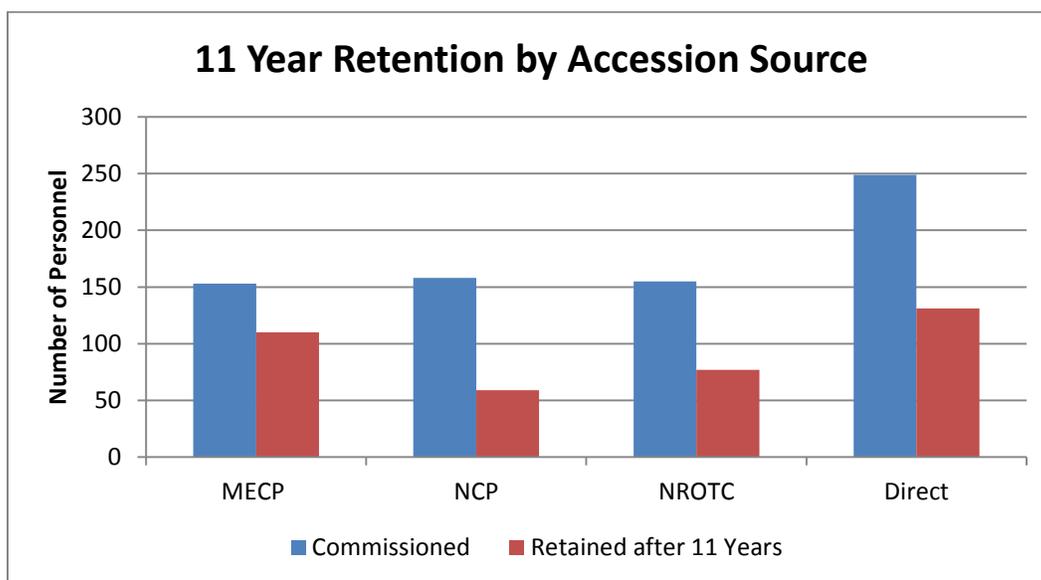


Figure 5. Eleven-year Retention by Accession Source

### 3. Gender

#### a. Six-year Retention Rates by Gender and Accession Source

Females made up approximately 65 percent of the total sample and males 35 percent. The MECP and STA-21 programs are the only two accession sources that males exceeded females. The reason for the increased number of males in the MECP and STA-21 programs is because those programs obtain accessions from the active duty military population, which is predominately male. Males had the highest six-year retention rate in all accession sources. This is likely due to the female giving up their military career to

take on a domestic role. The distribution of males and females and their six-year retention rates by accession source are presented in Table 20 and Table 21.

<b>Accession Source</b>	<b>Male</b>	<b>Percentage of Total Accessions</b>	<b>Retained after 6 Years</b>	<b>Retained after 6 Years</b>
<b>MECP</b>	<b>237</b>	<b>13.26%</b>	<b>216</b>	<b>91.14%</b>
<b>NCP</b>	<b>109</b>	<b>6.10%</b>	<b>79</b>	<b>72.48%</b>
<b>NROTC</b>	<b>84</b>	<b>4.70%</b>	<b>56</b>	<b>66.67%</b>
<b>Direct</b>	<b>164</b>	<b>9.20%</b>	<b>125</b>	<b>76.22%</b>
<b>STA-21</b>	<b>31</b>	<b>1.73%</b>	<b>29</b>	<b>93.55%</b>

Table 20. Six-year Retention and Distribution of Males by Accession Source

<b>Accession Source</b>	<b>Female</b>	<b>Percentage of Total Accessions</b>	<b>Retained after 6 Years</b>	<b>Retained after 6 Years</b>
<b>MECP</b>	<b>159</b>	<b>8.90%</b>	<b>139</b>	<b>87.42%</b>
<b>NCP</b>	<b>308</b>	<b>17.24%</b>	<b>169</b>	<b>54.87%</b>
<b>NROTC</b>	<b>284</b>	<b>15.89%</b>	<b>145</b>	<b>51.06%</b>
<b>Direct</b>	<b>385</b>	<b>21.54%</b>	<b>244</b>	<b>63.38%</b>
<b>STA-21</b>	<b>26</b>	<b>1.45%</b>	<b>23</b>	<b>88.46%</b>

Table 21. Six-year Retention and Distribution of Females by Accession Source

***b. Eleven-year Retention Rates by Gender and Accession Source***

Females made up approximately 74 percent of the total sample and males 26 percent. Males had the highest 11-year retention rate in all accession sources with the exception of NCP. Males and females have the same NCP 11-year retention rate of 48 percent. The distribution of males and females and their 11-year retention rates by accession source are presented in Table 22 and Table 23.

Accession Source	Male	Percentage of Total Accessions	Retained after 11 Years	Retained after 11 Years
MECP	98	13.70%	74	75.51%
NCP	50	7%	24	48.00%
NROTC	45	6.30%	24	53.33%
Direct	87	12.17%	51	58.62%

Table 22. Eleven-year Retention and Distribution of Males by Accession Source

Accession Source	Female	Percentage of Total Accessions	Retained after 11 Years	Retained after 11 Years
MECP	55	21.40%	36	65.45%
NCP	108	15%	35	48.00%
NROTC	110	15.38%	53	48.18%
Direct	162	22.66%	80	49.38%

Table 23. Eleven-year Retention and Distribution of Females by Accession Source

#### 4. Entry Rank

##### a. Six-year Retention Rate by Entry Rank

ENSs comprised of 95.19 percent of the sample and had a 68.61 percent six year retention rate. LTs had the highest retention rate at 80.00 percent and LTJGs the lowest with 76.08 percent. Rank distribution and retention rates are presented in Table 24.

Rank at Commissioning	Commissioned	Percent of Total Commissioned	6 Year Retention	6 Year Retention Rate
ENS	1701	95.19%	1167	68.61%
LTJG	65	3.69%	41	63.08%
LT	20	1.12%	16	80.00%

Table 24. Six-year Rank Retention's and Distributions

**b. *Eleven-year Retention Rate by Entry Rank***

ENSs comprised of 93.98 percent of the sample and had the lowest 11-year retention rate of 52.38 percent LTs had the highest retention rate at 70 percent and LTJGs had an 11 year retention rate of 54.55 percent. Rank distribution and retention rates are presented in Table 25.

<b>Rank at Commissioning</b>	<b>Commissioned</b>	<b>Percent of Total Commissioned</b>	<b>11 Year Retention</b>	<b>11 Year Retention Rate</b>
<b>ENS</b>	<b>672</b>	<b>93.98%</b>	<b>352</b>	<b>52.38%</b>
<b>LTJG</b>	<b>33</b>	<b>4.62%</b>	<b>18</b>	<b>54.55%</b>
<b>LT</b>	<b>10</b>	<b>1.40%</b>	<b>7</b>	<b>70.00%</b>

Table 25. Eleven-year Rank Retention's and Distributions

**5. Prior Service**

The six-year retention rate of those with prior service in this study was 82.23 percent; those without prior service had a 63.47 percent retention rate. The 11-year retention rate for individuals with prior service was 64.46 percent and 49.18 percent for individuals without prior service. Prior service higher retention rate is likely due to the individual's career investment in the military.

**C. REGRESSION ANALYSIS**

**1. FY04–FY07 Data Set**

The results of the six-year logistical regression model are shown in Table 26.

<b>VARIABLES</b>	<b>RETAIN6 Model Parameter Est.</b>	<b>RETAIN6 Model Partial Effects</b>
<b>GFY05</b>	<b>0.148 (0.230)</b>	<b>0.0299 (0.0455)</b>
<b>GFY06</b>	<b>0.447** (0.226)</b>	<b>0.0874** (0.0417)</b>
<b>GFY07</b>	<b>0.327 (0.216)</b>	<b>0.0652 (0.0416)</b>
<b>NROTC</b>	<b>-0.574*** (0.219)</b>	<b>-0.125** (0.0504)</b>
<b>NCP</b>	<b>-0.151 (0.211)</b>	<b>-0.0316 (0.0447)</b>
<b>MECP</b>	<b>1.027*** (0.293)</b>	<b>0.183*** (0.0435)</b>
<b>STA21</b>	<b>1.256** (0.521)</b>	<b>0.195*** (0.0546)</b>
<b>MALE</b>	<b>0.630*** (0.189)</b>	<b>0.123*** (0.0346)</b>
<b>PRIOR</b>	<b>0.276 (0.234)</b>	<b>0.0555 (0.0458)</b>
<b>LTJG</b>	<b>-0.466 (0.477)</b>	<b>-0.104 (0.113)</b>
<b>LT</b>	<b>-0.0694 (0.722)</b>	<b>-0.0145 (0.152)</b>
<b>Constant</b>	<b>0.215 (0.216)</b>	
<b>Observations</b>	<b>858</b>	<b>858</b>
<b>Standard errors in parentheses *** p&lt;0.01, ** p&lt;0.05, * p&lt;0.1</b>		

Table 26. FY04–FY07 Six-year Logit Model Statistics

The base for this model is a female ensign without prior military experience that entered the NC through Direct Procurement in FY04. The base case in this model had a predicted probability of staying in the NC of 71.1 percent.

The MECP and STA-21 accession sources were significant at a one percent confidence level and NROTC was significant at the five percent confidence level. STA-21 accession source showed a 19.5 percentage point increase in the probability of staying in the NC to the six-year mark while the NROTC accession source showed a 12.5

percentage point decrease in the probability of staying to the six-year mark. MECP accessions had a higher probability of staying in the NC by 18.3 points.

The variable MALE was significant at the one percent confidence level and showed a 12.3 percentage point increase in probability of staying to the six-year mark compared to females.

An accession entering in the NC in FY06 was significant at the five percent confidence level and had 8.6 point higher probability of staying in.

**2. FY00–FY02 Data Set**

***a. Logit Six-year Retention Model***

The results of the six-year logistical regression model are provided in Table 27.

<b>VARIABLES</b>	<b>RETAIN6 Model Parameter est.</b>	<b>RETAIN6 Model Partial Effects</b>
<b>GFY01</b>	<b>-0.948*** (0.237)</b>	<b>-0.181*** (0.0466)</b>
<b>GFY02</b>	<b>-1.051*** (0.240)</b>	<b>-0.205*** (0.0489)</b>
<b>NROTC</b>	<b>-0.374 (0.233)</b>	<b>-0.0709 (0.0465)</b>
<b>NCP</b>	<b>-0.302 (0.233)</b>	<b>-0.0566 (0.0456)</b>
<b>MECP</b>	<b>1.596*** (0.358)</b>	<b>0.221*** (0.0341)</b>
<b>MALE</b>	<b>0.416** (0.202)</b>	<b>0.0729** (0.0345)</b>
<b>PRIOR</b>	<b>0.282 (0.241)</b>	<b>0.0487 (0.0398)</b>
<b>LTJG</b>	<b>0.105 (0.434)</b>	<b>0.0184 (0.0740)</b>
<b>LT</b>	<b>1.312 (1.077)</b>	<b>0.161** (0.0788)</b>
<b>Constant</b>	<b>1.423*** (0.234)</b>	
<b>Observations</b>	<b>715</b>	<b>715</b>
<b>Standard errors in parentheses *** p&lt;0.01, ** p&lt;0.05, * p&lt;0.1</b>		

Table 27. FY00–FY02 Six-year Logit Model Statistics

The base for this model is a female ensign without prior military experience that entered the NC through direct procurement in FY00. The base case in this model had a predicted probability of staying in the NC of 76.49 percent.

The MECP accession source was significant at a one percent confidence level and NCP at a five percent confidence level. The MECP accession source showed a 22.1 percentage point increase in the probability of staying in the NC to the six-year mark.

The variable MALE was significant at the one percent confidence level and showed a 7.29 percentage point increase in probability of staying to the six-year mark compared to females

Accessions entering the NC in FY01 and FY02 were significant at the one percent confidence level and had 18.1 and 20.5 point lower probability of staying in, respectively.

The PRIOR variable was significant at the one percent confidence level and had a 12.3 point higher probability of staying in the NC.

**b. *Logit 11-year Retention Model***

The results of the 11-year logistical regression model are provided in Table 28.

<b>VARIABLES</b>	<b>RETAIN11 Model Parameter est.</b>	<b>RETAIN11 Model Partial Effects</b>
<b>GFY01</b>	<b>-0.664*** (0.196)</b>	<b>-0.164*** (0.0477)</b>
<b>GFY02</b>	<b>-0.663*** (0.202)</b>	<b>-0.164*** (0.0491)</b>
<b>NROTC</b>	<b>0.0171 (0.217)</b>	<b>0.00426 (0.0541)</b>
<b>NCP</b>	<b>-0.516** (0.221)</b>	<b>-0.128** (0.0543)</b>
<b>MECP</b>	<b>0.832*** (0.237)</b>	<b>0.199*** (0.0527)</b>
<b>MALE</b>	<b>0.344** (0.171)</b>	<b>0.0852** (0.0420)</b>
<b>PRIOR</b>	<b>0.404** (0.199)</b>	<b>0.0993** (0.0480)</b>
<b>LTJG</b>	<b>0.138 (0.387)</b>	<b>0.0342 (0.0952)</b>
<b>LT</b>	<b>0.774 (0.715)</b>	<b>0.180 (0.148)</b>
<b>Constant</b>	<b>0.274 (0.193)</b>	
<b>Observations</b>	<b>715</b>	<b>715</b>
<b>Standard errors in parentheses *** p&lt;0.01, ** p&lt;0.05, * p&lt;0.1</b>		

Table 28. FY00–FY02 11-year Logit Model Statistics

The base for this model is a female ensign without prior military experience that entered the NC through Direct Procurement in FY00. The base case in this model had a predicted probability of staying in the NC of 59.5 percent.

The MECP accession source was significant at a one percent confidence level and NCP at a five percent confidence level. The MECP accession source showed a 19.9 percentage point increase in the probability of staying in the NC to the 11-year mark while the NCP accession source showed a 12.8 point lower probability of staying in.

The variable MALE was significant at the five percent confidence level and had a 8.52 percentage point increase in probability of staying to the 11-year mark, compared to females

Accessions entering the NC in FY01 and FY02 were significant at the one percent confidence level and both had a 16.4 point lower probability of staying in.

The PRIOR variable was significant at the five percent confidence level had a 9.9 point higher probability of staying in the NC

## **VII. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

### **A. SUMMARY**

This study analyzed the costs and benefits of the various NC accession sources. The study compared the 2012 direct replacement cost for NC accession sources and associated six- and 11-year retention rates. The study concluded that STA-21 program had the highest six-year retention rate and MECP program had the highest 11-year retention rate while NROTC had the lowest six-year retention rate and NCP the lowest 11-year retention rate. The STA-21 program was the most expensive program while Direct Procurement program was the least expensive.

This study also used logistical regression models to determine factors that affect retention and to compare the various NC accession sources. The FY04–FY07 data set compared six-year retention rates.

The FY00–FY02 data set compared the six- and 11-year retention rates of the various NC accession sources. The six-year model concluded that being a male, LT, and entering the NC through the MECP program increased the probability of being retained. The 11-year model concluded that being a male, having prior service, and entering the NC through the MECP program increased the probability of being retained while entering the NC through the NCP program decreased the probability of being retained.

### **B. CONCLUSION AND RECOMMENDATIONS**

#### **1. What are the Costs and Benefits for the Different Navy Nurse Corps Accession Sources?**

##### ***a. Conclusion***

The analysis showed the most expensive accession source is the STA-21 program at \$196,744 and the least expensive is the Direct Procurement at \$25,000. The estimated costs and the six- and 11-year retention rates for the various NC accession sources are shown in Table 29.

<b>Accession Source</b>	<b>Estimated Cost</b>	<b>6 Year Retention Rate</b>	<b>11 Year Retention Rate</b>
<b>STA-21</b>	<b>\$ 196,744.00</b>	<b>91.23%</b>	<b>N/A</b>
<b>MECP</b>	<b>\$ 156,704.00</b>	<b>89.65%</b>	<b>71.90%</b>
<b>NROTC</b>	<b>\$ 95,032.00</b>	<b>54.62%</b>	<b>49.68%</b>
<b>NCP</b>	<b>\$ 31,312.00</b>	<b>59.47%</b>	<b>37.34%</b>
<b>DIRECT</b>	<b>\$ 25,000.00</b>	<b>67.21%</b>	<b>52.61%</b>

Table 29. Accession Source Comparison

***b. Recommendation***

The NC community manger should increase the number of accessions into the NC through Direct Procurement and NCP programs and reduce the number of NROTC and STA-21 accessions.

**2. What Nurse Corps Accession Source has the Highest Initial Obligation Attrition?**

***a. Conclusion***

The findings in this study concluded that the NROTC program had the highest initial obligation attrition rate of 54.62 percent. The model concluded that being male and entering the NC through the STA-21 program or the MECP program increased the probability of being retained while individuals entering the NC through the NROTC program were less likely to be retained.

***b. Recommendation***

It is recommended that BUMED discontinue the NROTC program NC option.

**3. Does Prior Service Lead to Greater Retention?**

***a. Conclusion***

The research confirms an individual with prior service is more likely to be retained when compared to an individual with no prior service. The six-year retention rate of those with prior service in this study was 82.23 percent; those without prior service

had a 63.47 percent retention rate. The 11-year retention rate for individuals with prior service was 64.46 percent and 49.18 percent for individuals without prior service

***b. Recommendation***

It is recommended that the NC community manager continue to support and utilize the MECF accession source, to obtain highly qualified and motivated individuals with prior military service.

**C. CONSIDERATION FOR FUTURE STUDIES**

An expansion of the model used in the study would improve the predicting powers and accuracy of the model. This model lacked demographic characteristics such as race, date-of-birth, marital status, dependence status, education, and duty station, all which could help predict an individual's choice to be retained. Additionally, a more in-depth look into how the number of deployments, primary SSC's, and bonuses affects an individual's decision to be retained.

A current assessment of the civilian military pay gap is needed to improve recruiting and retention efforts for the NC. The BLS (2012) reported that the average yearly income for an RN in the United States was \$67,930. The yearly income for a NC officer, who is an ensign with less than two years of experience considering all pay and allowances, is \$50, 571.

An assessment of the reimplementation of the Technical Nurse Warrant Officer Program (TNWO) to bring in associate level nurses as warrant officers to fill future shortages should be conducted. If this program is cost effective, it will open another resource pool for the NNC to recruit from.

A study that compares NC accession programs from all service branches should be conducted. This study would include educational and monetary benefits, along with short and long term retention rates.

THIS PAGE INTENTIONALLY LEFT BLANK

## APPENDIX      ENTRY GRADE CREDIT TABLE

	<b>QUALIFICATION</b>	<b>CREDIT</b>
1.	Commissioned service on active duty or in an active status as an NC officer in any of the Uniformed Services.	1 year for each year.
2.	Commissioned service on active duty or in an active status in any of the Uniformed Services other than as an NC officer.	½ year for each year.
3.	<p>Successful completion of advanced degrees in nursing or related fields that contribute to fulfilling the requirements for assignment to the nursing specialty authorized by DCNO (MPTE) (N1) and identified by a specialty classification code in reference (o), part B to which the applicant will be appointed. Advanced degrees normally qualifying for entry grade credit are in the following fields: Clinical Nursing Specialty, NP/CNM, Nurse Anesthetist, Education and Nursing, Healthcare or Business Administration. Advanced degrees in fields not listed above may be credited when the degree contributes directly toward meeting a requirement approved by DCNO (MPTE) (N1) and identified by a nursing specialty classification code in reference (o), part E based on the recommendations of DCNO (MPTE) (N1), when approved on a case-by-case basis by ASN (M&amp;RA). Credit may be given for only one degree in a single non-nursing field. Credit for the degree shall be based on full-time equivalent education but not more than two years for a master's degree or 4 years for a doctorate degree. Credit shall not be awarded for a degree earned concurrently with the Baccalaureate degree and shall not be awarded for the qualifying degree for entry into the NC.</p>	1 year for each year or 1 month for each month limited by level of degree earned.

4.	Credit may be granted for nurse experience gained as a fully licensed Baccalaureate prepared nurse.	½ year for each year of experience up to a maximum of 3 years. (If 6 months or less, no credit will be granted).
5.	In unusual cases, additional credit may be granted for special professional nursing experience in the specialty or subspecialty in which appointed when that experience is accrued after obtaining the qualifying degree. This additional credit applies only to individuals who have experience level needed by the NC that uniquely distinguishes them from the normal qualifications required for appointment as a commissioned officer. To be credited, the experience must be associated with the advanced education credited under qualification 3 above and contribute directly to performance in a nursing specialty or subspecialty authorized by DCNO (MPTE) (N1) and identified by a specialty classification code or subspecialty code in reference (o), part B.	1 year for each year of special professional nursing experience up to a maximum of 3 years credit. (If total creditable experience is 6 months or less, no credit will be granted).

## LIST OF REFERENCES

- American Association of College Nursing. (2012). Nursing shortage. Retrieved from <https://www.aacn.nche.edu/media-relations/fact-sheets/nursing-shortage>
- Bureau of Labor Statistics. (2012). Employment projections 2010–2020. Retrieved from <http://www.bls.gov/news.release/ecopro.t06.htm>
- Census Bureau. (2010). The older population in the United States: 2010 to 2050. Retrieved from <https://www.census.gov/prod/2010pubs/p25-1138.pdf>
- Carlson, J. (2009). Nursing shortage eases...but only while the recession lasts, experts warn. *Modern Healthcare*. Retrieved from <http://www.modernhealthcare.com/article/20090518/MAGAZINE/905159977/?template=printpicart>
- Deen, G. & Buni, G. G. (2004). *Development of a steady state model for forecasting U.S. Navy Nurse Corps personnel* (Master's thesis). Naval Postgraduate School, Monterey, CA. Retrieved from [https://calhoun.nps.edu/public/bitstream/handle/10945/1699/04Mar\\_Buni.pdf?sequence=1](https://calhoun.nps.edu/public/bitstream/handle/10945/1699/04Mar_Buni.pdf?sequence=1)
- Department of Health and Human Services. (2012a). Administration on aging: aging statistics. Retrieved from [http://www.aoa.gov/AoARoot/\(S\(2ch3qw55k1qylo45dbihar2u\)\)/Aging\\_Statistics/index.aspx](http://www.aoa.gov/AoARoot/(S(2ch3qw55k1qylo45dbihar2u))/Aging_Statistics/index.aspx)
- Department of Health and Human Services. (2012b). A profile of older American: 2012. Retrieved from [http://www.aoa.gov/AoARoot/\(S\(2ch3qw55k1qylo45dbihar2u\)\)/Aging\\_Statistics/Profile/2012/docs/2012profile.pdf](http://www.aoa.gov/AoARoot/(S(2ch3qw55k1qylo45dbihar2u))/Aging_Statistics/Profile/2012/docs/2012profile.pdf)
- Jonak, P.M. & Paradis, R. J. (1998). *An analysis of the effects of accession source as a predictor of success of Navy Nurse Corps officers*. (Master's thesis). Naval Postgraduate School, Monterey, CA. Retrieved from [www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA344570](http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA344570)
- Juraschek, S. P., Zhang, X., Ranganathan, V. K., & Lin, V. W. (2012). United States registered nurse workforce report card and shortage forecast. *American Journal of Medical Quality*, 27, 241–249.
- Levy, M & Morrison, V. (2013). *Nurse Corps monthly report as of September 2013*. Retrieved from <https://www.nko.navy.mil/group/nurse-corps/force-structure-and-promotion-statistics>

- Mader, T. K. (1999). *The cost and benefits of the Navy Nurse Corps accession sources*. (Master's thesis). Naval Postgraduate School, Monterey, CA. Retrieved from [www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA374063](http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA374063)
- Manpower, Personnel, Training and Education Division (N13). (2007a). Program Authorization 116C: Nurse Candidate Program. Retrieved from [http://www.cnrc.navy.mil/publications/PAs/NCP\\_PA\\_116C\\_Mar07.pdf](http://www.cnrc.navy.mil/publications/PAs/NCP_PA_116C_Mar07.pdf)
- Manpower, Personnel, Training and Education Division (N13). (2007b). Program authorization 116A: Medical Enlisted Commissioning Program. Retrieved from [http://www.cnrc.navy.mil/publications/PAs/NC\\_MECP\\_116A\\_Mar07.pdf](http://www.cnrc.navy.mil/publications/PAs/NC_MECP_116A_Mar07.pdf)
- Manpower, Personnel, Training and Education Division (N13). (2007c). Program authorization 116: Appointment as officer in the Nurse Corp of the United States Navy for immediate active duty. Retrieved from <http://www.public.navy.mil/bupers-npc/officer/communitymanagers/staffcorps/documents/nurse%20active%20and%20reserve%20pa116%20%20mar%2007.pdf>
- Messmer, S. J. & Pizanti, K. A. (2007). *Analysis of the retention and affiliation factors affecting the active and reserve Naval Nurse Corps*. (Master's thesis). Naval Postgraduate School, Monterey, CA. Retrieved from [www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA467232](http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA467232)
- Military Personnel Plans and Policy Division (N13). (2011). Program authorization 150H: Seaman to Admiral-21 Nurse Corp Option commissioning program. Retrieved from [http://www.sta-21.navy.mil/pdfs/pa150h\\_10\\_11\\_2011\\_10\\_43\\_41.pdf](http://www.sta-21.navy.mil/pdfs/pa150h_10_11_2011_10_43_41.pdf)
- Naval Reserve Officer Training Corps. (2013). NROTC. Retrieved from [http://www.nrotc.navy.mil/entrance\\_requirements.aspx](http://www.nrotc.navy.mil/entrance_requirements.aspx)
- The Navy Nurse Corps: Hearing before the Subcommittee on Defense of the Senate Committee on Appropriations, 112<sup>th</sup> Cong., 1 (2012) (testimony of Elizabeth S. Niemyer).*

## **INITIAL DISTRIBUTION LIST**

1. Defense Technical Information Center  
Ft. Belvoir, Virginia
2. Dudley Knox Library  
Naval Postgraduate School  
Monterey, California