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**QUALITATIVE INSIGHTS ON THE MILITARY ENTRANCE PROCESSING
STATION (MEPS) OF EXCELLENCE PROGRAM**

THESIS

Brian T. Johnson, Captain, USA

AFIT-ENS-MS-22-M-141

**DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY**

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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QUALITATIVE INSIGHTS ON THE MILITARY ENTRANCE PROCESSING
STATION (MEPS) OF EXCELLENCE PROGRAM

THESIS

Presented to the Faculty

Department of Aeronautics and Astronautics

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Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the
Degree of Master of Science in Operations Research

Brian T. Johnson, B.S.

Captain, USA

March 25, 2022

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STATION (MEPS) OF EXCELLENCE PROGRAM

THESIS

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Abstract

The United States Military Entrance Processing Command (USMEPCOM) serves as the gateway for civilians to enter basic training of the respective military branches as they start their journey to becoming members of the Armed Forces. The Military Entrance Processing Station (MEPS) of Excellence Program (MOE) is a program to improve operations through recognition and motivation and to sustain excellence in MEPS's core services of medical, testing, processing and mission readiness. Quantitative MOE program data was studied using a hybrid approach of descriptive statistics, statistical process control, and logistic regression to gain relevant insights with respect to the program objectives of improvement, excellence, motivation, and recognition. Results indicate that performance at the Sector and Battalion levels largely falls within the bounds of statistical control; performance in newly-incorporated MOE metrics follows a predictable pattern, indicating that the program is an effective tool for process improvement; and a relatively small gap in raw performance can translate to a MEPS that either habitually wins MOE recognition or one that habitually falls short. Concerns that some MEPS have a systemic advantage over others in the MOE scoring due to the volume of applicants processed or other factors not completely within the control of MEPS leaders should be investigated on a case-by-case basis. Future work should employ information such as climate surveys, worker performance reports, and the civilian awards program for further insights into the MOE's effectiveness as a motivator.

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Brian T. Johnson

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QUALITATIVE INSIGHTS ON THE MILITARY ENTRANCE PROCESSING STATION (MEPS) OF EXCELLENCE PROGRAM

I. Introduction

Decision-makers want to ensure that programs they oversee are meeting their intended purpose, so they utilize program evaluations to periodically assess the processes, procedures and outcomes [1]. Program evaluations are established to determine merit or worth and can also assist in decision making [2]. By evaluating the program, valid, reliable, and credible data can be obtained to address questions about the program's performance [1].

1.1 Background – USMEPCOM and the MOE

The United States Military Entrance Processing Command (USMEPCOM) is the gateway for civilians to enter basic training of the respective military branches as they start their journey to becoming members of the Armed Forces. USMEPCOM is a Department of Defense joint service organization staffed with "Department of Defense Professional's committed to sustaining the quality of the All-Volunteer Force through state-of-the-art enlistment screening for applicants seeking to serve in our Nation's Armed Forces" [3]. All applicants who wish to enlist in the military need to process through the Military Entrance Processing Stations (MEPS) before reporting to their respective military basic training locations. MEPS personnel determine the applicants' physical qualifications, aptitude, and moral eligibility, based on standards set by each branch of military service. USMEPCOM serves as a disinterested party to execute the

functions of applicant processing throughout its 65 MEPS geographically distributed across the United States [3], shown in Figure 1.



Figure 1: MEPS Location [3]

The MEPS of Excellence Program (MOE) is an evaluation program to improve operations and sustain excellence in MEPS' core services of medical, testing, processing and mission readiness through motivation and recognition [4]. The MOE used 14 criteria in 2019 to determine the top three winners of quarterly and yearly awards in three different categories: Large, Medium, and Small. The breakdown of the scoring calculations, reclama process, timelines, award types and sections responsible is covered in the MOE as well as the four categories and their mission-related criteria [4].

Table 1: MEPS of Excellence Categories and Criteria

<u>Applicant Testing</u>	<u>Travel Card Delinquency Rates</u>
Test Loss Compromise	Central Billed Accounts
School Market Penetration	Individually Billed Accounts
<u>Medical Processing</u>	<u>Leadership and Training</u>
Drug Specimen Processing	Mandatory Training
HIV Specimen Processing	Mandatory Supervised Training
Clinical Laboratory Improvement Program	ARAAPS criterion
Accuracy of Fee-Basis Provider Work Hour Data	Timeliness of Civilian Performance Plans and Appraisals
Medical Referral Data	
Medical Prescreen	

1.2 Problem Statement

The MOE is designed to support command priorities and foster process improvement and sustained excellence [4]. While the MOE program has existed since FY 2006, there has not been a formal program evaluation conducted by an external party, to evaluate and gain insight on the qualitative data gathered. To ensure that the USMEPCOM Commander's priorities and intent are being met, this study seeks to understand the effectiveness of the MOE program. This study analyzes quantitative program data on MEPS performance to draw conclusions regarding the MOE program's strengths, weaknesses, opportunities, and threats with respect to the program objectives.

1.3 Significance of the Study

When properly conducted, evaluations have great potential in improving programs and organizations [2]. In order to meet mission requirements to serve and defend the United States, military commanders of all organizations seek the best tools in order to better understand the performance of the units under their command, recognize

excellence when achieved and sustain such excellence. By examining the strengths and weakness of the MOE Program the USMEPCOM Commander will have the opportunity to assess and improve performance of MEPS within the command.

1.4 Research Questions

This study employs quantitative program data on MEPS performance to gain relevant insights with respect to the program objectives. The desired outcome is to assess the qualitative concepts of performance, improvement, recognition, and motivation from the quantitative MOE performance data.

This core question can be decomposed into sub-questions that address each of the four major concepts contained in the program's objective: recognition, motivation, improvement and excellence.

1. *Do any MEPS display habitual, systemic overperformance or underperformance with any MOE metric?* This research question informs conclusions on the MOE program's influence on both excellence and motivation. Research ties performance and motivation to each other [5], and the habitual over or under performance of an individual MEPS is a first check in assessing whether the MOE is a truly equitable program.
2. *What is the year-to-year progression in MOE scores for newly-incorporated MOE metrics?* This research question may help quantify the degree to which the MOE program influences process improvement. The MOE program is a means for the USMEPCOM Commander to influence behavior; areas of particular focus can be added to MOE scoring for increased emphasis by unit Commanders.

3. *What is the distribution of MOE awards over time across the Command?* The answer to this question relates both to recognition and motivation and, to some degree, excellence. If a small subset of MEPS habitually earns MOE recognition, it may be an indicator of sustained excellence and likely a source of motivation for continued success and recognition. The converse is also true. This fact may also indicate program bias.

The most important objective from the USMEPCOM perspective is to see if the MOE fosters improvement and sustained excellence of the commander's priorities by recognition and motivation as extrapolated through the MOE.

1.5 Thesis Organization

The second chapter contains the literature review in this study which was used in conceptualizing the problem to be addressed. Chapter 3 explains the methodology and approach formulation for the study. The fourth chapter presents the research and findings. Discussion and proposed areas for further exploration are covered in Chapter 5.

II. Literature Review

From evasion techniques of sabre-tooths and design layouts of caves and huts to deciding on which family car would best suit my family and be within budget, understanding the history of the development of evaluations can be a daunting task due to the informality of the practical use by people since the dawn of time. As Scriven commented, evaluation is an old practice but a young discipline where the gaps between theory and practice are large [6]. Today a common use of evaluation is for program improvement [7]. Since 1815 when the United States Army developed a system of regulation and uniformity of the manufacturing of arms followed by their administrative, accounting and inspection practices, performance and evaluation to improve and achieve excellence has been a part of the United States Military [8].

USMEPCOM Commanders utilize the MOE in order to evaluate and measure performance of the 65 MEPS facilities under their command [3]. The purpose of the MOE program is to improve operations and services related to core MEPS processes by recognizing and motivating the workforce of the MEPS throughout the United States. The current MOE program is made up of 14 criteria separated into four categories to measure their facilities performance [4]. These criteria are graded and top performing MEPS are recognized for their overall performance, which is attributed to the personnel working there. The assumption is that work is a function of motivation, where motivation can come from positive reinforcement, treating people with dignity and respect, setting work goals, and recognizing and rewarding performance [9]. Understanding motivation and how the MOE is utilized gives insights on its effectiveness.

This literature review explores previous study conducted on MOE results and studies that looked into motivation and recognition. This research seeks to address if the MOE is an effective program in meeting the USMEPCOM Commander's intent and purpose of properly recognizing and motivating sustained excellence.

2.1 Prior MOE Studies

AFIT Students partially explored the MOE data as a classroom project for OPER 679: Empirical Modeling in the spring of 2021. Students created models using 2018 MOE data to predict 2019 MOE results with the implication that successful models would indicate favoritism of certain MEPS to the degree that success could be predetermined [10]. Student models did not perform well, with a comprehensive conclusion that the 2018 MOE data was not an effective predictor for results in 2019 [10]. Two limitations of the classroom project are that the algorithmic approach was constrained to empirical modeling techniques covered OPER 679 and the project only explored the qualitative dimension of motivation [10]

2.2 Motivation and Recognition

Lawler (2013) studies the design features that can potentially influence the effectiveness of a performance management system and its impact [2]. The study highlights the relationship between ongoing feedback, behavior-based measures on preset goals, employing trained raters, and the effectiveness of performance management, and it examines the relationship between the performance management system and the significant reward tied to the system, which led the system to be more effective with respect to motivation [2]. Lawler finds that when rewards are tied to performance

appraisals, leaders will be motivated because the outcome of the appraisal will have a significant impact on their ability to allocate rewards and motivate the individuals who work for them [6]. This study helps to examine these findings in relation to the workforce at USMEPCOM.

Akafo and Boateng (2016) examined the impact of reward and recognition on job satisfaction and motivation, finding a positive relationship between reward and work motivation but, interestingly enough, not with job satisfaction [12]. Other factors such as satisfaction with work attributes, coworkers, organizational context, and individual differences play a role [12].

Manzoor (2011) examines the relationship between employee motivation and organization effectiveness and determines that rewards and recognition are essential factors in enhancing work motivation, which directly impacts organizational achievements [12]. Organizational effectiveness is defined as how effective an organization is in accomplishing its aims [12]. As the MOE's purpose is to ensure the accomplishment of their criteria or the USMEPCOM aims while simultaneously recognizing and rewarding performance, this study has valuable insight into the use of the MOE and the relationship between MEPS employee motivation and the organization's effectiveness.

Ganta (2014) looks at the complexity of motivation and performance [14]. On the surface, the link between employee motivation and performance seems obvious but the motivation of someone's behavior can be complex [12]. Two motivation models, Maslow's Hierarchy of Needs and Herzberg's two-factor model, are examined to determine the conditions in which workers are motivated [14]. Both of these models

identify needs are the driving force for people to do something [14]. Herzberg's two-factor model highlights the importance of motivation [14].

2.3 Conclusion

This literature review looked into program evaluations, motivation and work performance and how those three things relate. The MOE is examined to see if it is effective in recognizing and motivating the MEPS workforce to improve and sustain excellence. This study seeks to understand and address the following: Is the MOE an effective tool for the USMEPCOM Commander in meeting his objective of improved and sustained excellence through motivation and recognition?

III. Methodology

The MEPS of Excellence Program (MOE) results were evaluated to gain insights on the program's effectiveness of the core Military Entrance Processing Stations (MEPS) process of medical, testing, and mission readiness through the four pillars of motivation, recognition, process improvement and sustained excellence. Results of the MOE are collected quarterly with a reclama process where MEPS are given the opportunity to review and correct the data before they are finalized. Data from fiscal year (FY) 2012 to FY 2019 were evaluated for this study. Data from FY2020 was not evaluated due to the program's suspension in FY2020 due to the coronavirus disease (COVID).

3.1 The MEPS of Excellence Program

The MOE divide MEPS into three categories (Large, Medium, Small) evaluated across 14 mission-related criteria in FY 2019. The category that a MEPS falls into is based on the annual Accessions and Delayed Entry Program (DEP) contracts and they remain in their designated category for the fiscal year. For FY 2019, 65 MEPS fell into the following categories shown in Table 2.

Table 2: MEPS Categories

Large		Medium		Small	
Atlanta	Montgomery	Boston	Louisville	Albany	Honolulu
Baltimore	New York	Charlotte	Milwaukee	Albuquerque	Jackson
Chicago	Phoenix	Cleveland	Minneapolis	Amarillo	Little Rock
Columbus	Raleigh	Denver	Nashville	Anchorage	Memphis
Dallas	Sacramento	Detroit	New Orleans	Beckley	Omaha
Fort Jackson	San Antonio	Fort Dix	Oklahoma	Boise	Pittsburgh
Fort Lee	San Diego	Harrisburg	Portland OR	Buffalo	Portland ME
Houston	San Jose	Indianapolis	Salt Lake	Butte	Shreveport
Jacksonville	St. Louis	Kansas City	San Juan	Des Moines	Sioux Falls
Los Angeles	Tampa	Knoxville	Seattle	El Paso	Spokane
Miami		Lansing	Springfield	Fargo	Syracuse

Table 3 contains the MOE mission-related criteria and the years of data that were available to be examined.

Table 3: FY 2019 MOE Criteria

Name	FY of Data Available
Check In / Check Out	FY15 to FY19
Test Loss Compromise	FY12 to FY19
Total Students Tested	FY12 to FY13, FY15 to FY19
Drug Specimen Processing	FY12 to FY19
HIV Sample Processing	FY12 to FY19
Clinical Laboratory Improvement Program (CLIP)	FY12 to FY19
Accuracy of Fee-Basis Provider Work Hour data	FY12 to FY19
Accuracy of Invoice Reconciliation Program	FY18 to FY19
Citibank CBA	FY12 to FY19
Citibank IBA	FY12 to FY19
Timeliness of Awards	FY12 to FY19
Timeliness of Evaluations	FY12 to FY19
Training	FY18 to FY19

MEPS are recognized by their category on a quarterly and yearly basis by the following three awards: MEPS of the Quarter (MOQ), MEPS of the Year (MOY) and the Unit Pennant. The title, frequency, criteria for award are outlined in Table 4.

Table 4: MOE Awards

Title	Frequency	Criteria	Award
MEPS of Quarter	Quarterly	Top 3 MEPS/category	Plaque
MEPS of the Year	Annual	Top MEPS/category	Golden Eagle Trophy
Unit Pennant	Quarterly	Scores 90% or higher	Unit Pennant (display)

3.2 Data Overview

The MOE quantitative data was reorganized and different methods were applied based on the domain to be examined, so models may be built to draw conclusions regarding the strengths and weaknesses of the MOE program's objectives. MEPS data is tabulated quarterly for each mission-related criteria and calculated as shown in Figure 2. If a criterion is not required, such as a submission of an award or evaluation or training

due for that period, then no score is applicable (N/A) for that quarter and points those criteria are not included in the overall calculation for a MEPS. To better analyze the information given, data is broken down for each mission-related criteria over FY12 to FY19 in order to see how well each MEPS performed. An example of this is given in Figure 3.

MEPS of EXCELLENCE 4th QTR FY19 Final Results														
	Check-In / Check-Out	Test Loss Compromis e	Total Student Tested	Drug Specimen Processin g	HIV Sample Processin g	CLIP	Accuracy of Fee-Basis Provider Work Hour Data	Citibank CBA	Citibank IBA	Timelines s of Awards	Timeliness of Eval s	Supervisor s Training	ATAAPS	Training
1	Atlanta	11.01	10	N/A	10.00	10.00	N/A	10.00	10	5	5	5	8	10
2	Baltimore	11.73	10	N/A	10.00	10.00	N/A	10.00	10	5	N/A	5	8	4.87
3	Chicago	11.37	10	N/A	8.94	5.04	N/A	10.00	10	5	N/A	5	8	0
4	Columbus	10.77	10	N/A	4.64	10.00	N/A	10.00	10	10	N/A	5	8	10
5	Dallas	6.06	0	N/A	10.00	0.00	N/A	10.00	5	5	N/A	5	10	7.96
6	Fort Jackson	11.22	10	N/A	10.00	0.00	N/A	10.00	5	10	5	N/A	5	8
7	Fort Lee	8.94	10	N/A	10.00	5.81	N/A	10.00	10	10	5	N/A	0	8
8	Houston	11.61	10	N/A	0.00	0.00	N/A	10.00	10	10	0	N/A	5	6
9	Jacksonville	12	10	N/A	10.00	10.00	N/A	10.00	10	10	5	5	5	8
10	Los Angeles	11.67	10	N/A	10.00	0.00	N/A	10.00	10	5	0	N/A	0	8
11	Miami	11.70	10	N/A	10.00	10.00	N/A	8.56	10	10	N/A	5	5	8
12	Montgomery	11.37	10	N/A	10.00	5.60	N/A	10.00	10	10	N/A	5	5	10
13	New York	11.73	10	N/A	10.00	10.00	N/A	10.00	10	10	0	N/A	5	8
14	Phoenix	11.73	10	N/A	10.00	1.66	N/A	10.00	10	5	5	N/A	0	10
15	Raleigh	9.45	10	N/A	10.00	10.00	N/A	10.00	10	5	N/A	N/A	0	8
16	Sacramento	9.99	10	N/A	10.00	10.00	N/A	10.00	10	5	5	5	0	10
17	San Antonio	11.52	10	N/A	10.00	10.00	N/A	10.00	10	10	5	5	5	2
18	San Diego	11.97	10	N/A	10.00	10.00	N/A	9.13	10	10	0	N/A	0	8
19	San Jose	11.94	10	N/A	8.86	10.00	N/A	10.00	10	5	N/A	N/A	0	6
20	St Louis	5.82	10	N/A	8.93	4.99	N/A	10.00	10	10	N/A	5	5	4

Figure 2: MEPS Quarterly Data

	Check-In/Check-Out													
	Atlanta	Baltimore	Chicago	Columbus	Dallas	Fort Jackson	Fort Lee	Houston	Jacksonville	Los Angeles	Miami	Montgomery	New York	Phoenix
FY15Q1	7.27	0	9.63	9.49	4.46	9.84	7.06	6.35	8.55	0.00	7.21	5.35	8.14	3.31
FY15Q2	7.89	0	9.97	9.92	6.82	9.92	9.07	7.74	9.97	0.00	6.37	6.88	8.6	9
FY15Q3	8.66	0.23	10	9.93	9.13	9.9	9.78	8.57	9.89	2.56	7.77	6.92	9.02	8.77
FY15Q4	9.28	3.27	9.95	10	9.56	9.97	9.67	8.16	9.85	9.50	9.7	5.32	7.76	9.63
FY16Q1	9.85	9.78	9.79	10	9.62	9.7	10	9.67	10	9.98	8.43	8.07	9.39	9.44
FY16Q2	9.6	7.18	10	9.96	9.68	9.93	9.78	8.11	10	9.76	9.34	5.25	9.03	9.83
FY16Q3	9.35	9.09	9.97	9.97	9.85	9.93	9.59	7.01	10	9.78	8.35	6.08	9.63	9.71
FY16Q4	9.67	9.6	10	10	9.96	9.97	9.86	8.61	10	9.94	2.95	7.65	8.84	8.5
FY17Q1	9.85	9.78	9.79	10	9.62	9.7	10	9.67	10	9.98	8.43	8.07	9.39	9.44
FY17Q2	9.85	9.82	9.97	10	9.52	9.97	9.94	9.79	10	8.82	9.55	8.34	0	9.47
FY17Q3	9.65	9.93	9.76	9.94	9.74	9.97	9.97	9.88	10	8.58	9.82	9.76	7.46	10
FY17Q4	9.9	9.88	9.41	9.85	9.66	7.51	9.89	9.79	9.96	9.65	9.66	9.79	9.53	9.71
FY18Q1	11.84	11.84	11.97	11.74	11.92	12	9.43	11.87	11.97	11.87	7.72	9.87	11.46	11.18
FY18Q2	6.57	11.48	11.94	11.58	9.51	12	11.55	10.44	11.7	11.91	10.62	9.21	7.95	10.95
FY18Q3	11.59	6.83	10.7	11.96	9.43	12	11.38	11.09	11.57	11.87	11.22	9.15	11.48	11.86
FY18Q4	11.46	11.67	11.94	11.55	3.12	11.37	10.95	11.79	11.88	10.02	11.73	7.23	11.91	11.46
FY19Q1	11.97	11.52	11.85	11.43	3.72	10.81	7.02	11.34	11.61	11.49	9.66	8.82	11.52	9.25
FY19Q2	12	11.4	11.88	10.98	3.93	12	7.29	11.19	11.85	11.49	10.74	11.88	11.64	5.76
FY19Q3	10.2	11.13	11.76	10.68	5.94	7.77	8.22	9.75	12	11.55	6.87	11.76	11.28	11.04
FY19Q4	11.01	11.73	11.37	10.77	6.06	11.22	8.94	11.61	12	11.67	11.70	11.37	11.73	11.73

Figure 3: MEPS Check-In/Check-Out FY15 to FY19

3.3 Model Selection

Model selection was influenced by the MOE data and the four pillars to be examined. When examining each pillar for insights different approaches were undertaken to obtain qualitative insights from the quantitative data.

3.3.1 Recognition and Motivation

By looking at how well a MEPS performs overall quarter-by-quarter and, year-by-year trends can be examined to see if MEPS perform well or badly on a consistent basis and we can infer if recognition and to an extent motivation is a factor of MEPS performance. Since the military is led by a command structure, it is also of value to measure performance of the 12 battalions that the 65 MEPS are incorporated in to see performance along the command and geographic lines. USMEPCOM divides command and control of the 65 MEPS by Western and Eastern Sectors with six battalions in each sector. Each battalion is made up of five to six MEPS as shown in Table 5.

Table 5: Breakdown of the Military Entrance Processing Stations

Western Sector					
1st Battalion		3rd Battalion		5th Battalion	
Des Moines	Fargo	Albuquerque	Boise	Anchorage	Honolulu
Minneapolis	Omaha	Butte	Denver	Portland OR	Seattle
Sioux Falls		Salt Lake		Spokane	
7th Battalion		9th Battalion		11th Battalion	
Los Angeles	Phoenix	Amarillo	Dallas	Little Rock	New Orleans
Sacramento	San Diego	El Paso	Houston	Oklahoma	Shreveport
San Jose		San Antonio		St. Louis	
Eastern Sector					
2nd Battalion		4th Battalion		6th Battalion	
Boston	Fort Dix	Albany	Buffalo	Chicago	Columbus
New York	Portland ME	Cleveland	Harrisburg	Detroit	Indianapolis
Springfield		Pittsburgh	Syracuse	Lansing	Milwaukee
8th Battalion		10th Battalion		12th Battalion	
Jackson	Knoxville	Atlanta	Jacksonville	Baltimore	Beckley
Louisville	Memphis	Miami	San Juan	Charlotte	Fort Jackson
Montgomery	Nashville	Tampa		Fort Lee	Raleigh

One approach is to analyze overall performance of MEPS from FY12 to FY19 to see the shape of the data distribution to help determine MEPS output overall and if there are any outliers. One approach to define performance is to use an indicator variable equal

to one if a MEPS places 1st, 2nd, or 3rd in a given fiscal year. These indicators can be aggregated to create metrics. The summation or averaging of the indicator variables can quantify recognition in a way that allows MEPS to be compared against each other or against some benchmark. If recognition leads to motivation to perform better, it would be expected to see MEPS that obtain a reward to improve to continuously achieve success in winning quarterly or yearly recognition.

A second approach to analyze motivation is to create a predictive model employing Year n MOE data as the input and Year $n + 1$ result(s) as the output. One such approach would be a logistic regression model, not looking to predict successful MEPS but rather predict unsuccessful MEPS. If prior years' data can be used to predict which MEPS will perform poorly in the MOE competition, it could be a strong argument that the competition is not a truly fair.

When applying a logistic regression model, the form is taken as shown below.

$$\ln \frac{\pi}{1 - \pi} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + \epsilon \quad (1)$$

where $\pi = E(y)$ is the probability of success, y is the binary response variable, β_i are the regression coefficients, x values are the regressor variables, the subscript k is the number of regressor variables in the model, and ϵ is a random error component [14]. Logistic Regression is a statistical modeling technique looking into the relationship between a binary response variable and a set of predictor variables [14]. The model's β_i coefficients are transformed to produce a predicted probability associated with each possible outcome. With the concern that habitual or systemic over or underperformance

by a MEPS would impact motivation and hence performance, this approach may provide insight that a MEPS may not be motivated to excel.

3.3.2 Sustained Excellence

Statistical process control charts are a control tool used to determine quality management within a “band” of control [15]. Typically applied in the context of quality engineering, a control charts are a means to quantitatively assess the effects of different variables such as resource batch or supplier on the output of a manufacturing process. MEPS operations are not typically viewed as a manufacturing process; however, the MEPS does receive inputs (applicants), performs a predetermined set of actions, and produces an output (eligibility decision for each applicant). As such, control charts may be a useful approach to assess whether MEPS achieve a level of stability in a MOE criterion, particularly those that have been part of the program for an extended period of time. A control chart plots data over time which creates a graph with an upper line and lower line indicating a control limit for a process.

$$ULC = \text{Upper Control Line} = \bar{X} + 3\sigma \quad (2)$$

$$\text{Control Line} = \bar{X} \quad (3)$$

$$LUL = \text{Lower Control Line} = \bar{X} - 3\sigma \quad (4)$$

In those expressions, \bar{X} is the mean of a data set and σ is the standard deviation. Patterns in the data that are indicators of an out-of-control process include observations outside the 3σ bounds, too many consecutive increasing or decreasing observations, or too many consecutive observations above or below the mean. By applying this statistical

process, we can monitor a process over time and determine if a process over time is consistent or in control.

3.3.3 Process Improvement

As the MOE criteria have slight changes over time, a decision needs to be made on how best to study the data. The easiest approach would be to first see which data features stay the same over time and study performance after a criterion is introduced. This approach would shed light on whether the MOE is an effective tool in maintaining excellence over time. Possible relationships and correlation of data overtime need to be explored to examine if previous performance is an indicator of future performance and the effectiveness of the MOE in providing that information.

When the MOE introduces a new criterion, it is reasonable to expect high performing MEPS might score reasonably well while lower performing MEPS might score less well. However, over time it is reasonable to expect that high performing MEPS to continue to do well but lower performing MEPS to incrementally increase their performance as proficiency is developed. Analysis of the metric's variance can be used to test this hypothesis, with the expectation that initial variance of all MEPS scores would be highest in the first few fiscal quarters and then over time approach some "band" of excellence. This may indicate that the process of introducing and recognizing excellent performance on a criterion helps foster improvement and sustained excellence. It is expected for the variance to decrease over time as MEPS performance improves and scores are kept within a "band" of performance.

3.4 Conclusion

The chapter detailed the MOE program, the transformation of the MOE results, and the approaches to gain insight into the MOE to examine if it is effective in recognizing and motivating the MEPS workforce to improve and sustain excellence. The subsequent section will apply the methodology to the data set to see if the MOE objective of improved and sustained excellence through motivation and recognition can be determined through the MOE results.

IV. Analysis and Results

The MOE awards program recognizes performance by three categories; Large, Medium and Small. As commanders at the battalion level and higher will have their MEPS compete by categories and not directly sectors and battalion performance were also examined, as this aligns with the geographic and command structure of USMEPCOM and can provide further insights. The MOE results were reorganized and different approaches were applied to draw conclusions on the MOE's program objectives of recognition and motivation, sustained excellence, and process improvement. This chapter is organized into three parts: part one evaluates recognition from the MOE by tabulating how often a MEPS was awarded for performing 1st, 2nd, and 3rd by the MOE awards program. Logistic regression defined performance using an indicator variable for 1st, 2nd, and 3rd to aggregate and create metrics and logistic regression was applied to see if there is a relationship between the response variable and predictor variables. Motivation was defined based on the level of performance which ties to recognition. The second part applies control charts to determine quality management of performance of the MOE's criteria, and the final part examines new criterion introduced to the MOE expecting performance to improve over time.

4.1 Recognition and Motivation

The MOE results were reorganized to capture performance by fiscal year by the command structure in which MEPS are organized. The data was first divided by the Eastern and Western sector, then by battalions, which are made up of five to six MEPS, to evaluate their performance. Recognition is given in the form of the MEPS of the

Quarter (MOQ) and MEPS of the Year (MOY) by placing in the top three for their respective category of large, medium and small, placing 1st, 2nd, or 3rd so these placements were looked at. While there is no award or recognition by the MOE for placing 20th, 21st, and 22nd, these placements were analyzed to give some contrast. In the event of a tie score, both MEPS were considered to have received the same placing.

4.1.1 Performance by Sector

From FY12 to FY19, Eastern Sector outperformed Western Sector with 45 total 1st, 2nd, 3rd place for the MOY, while the Western Sector earned 27. While there is no official recognition for placing at the bottom, Eastern Sector did less “badly” with only 25 places of 20th, 21st, and 22nd while Western Sector did so 39 times.

	Eastern Sector			Western Sector		
	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)
FY12	8	2	87.35%	1	6	82.62%
FY13	4	3	83.65%	5	5	83.07%
FY14	6	4	83.77%	3	4	83.66%
FY15	6	2	86.77%	3	6	88.05%
FY16	2	5	85.89%	7	3	89.84%
FY17	6	4	89.04%	3	4	85.05%
FY18	5	4	82.77%	4	4	82.17%
FY19	8	1	86.15%	1	7	82.17%
Total	45	25	85.67%	27	39	84.58%

Figure 4: Sector Yearly Placing from FY12 to FY19

Examining Eastern Sector results in Figure 5, 2nd Battalion did the worst with two top three placements and 5 bottom three placements and an overall average score of 83%. The two top three placements did happen in the last two fiscal years (FY18 and FY19). 10th Battalion did the best with 12 top three placements, three bottom three placements

and an overall average score of 87.35%. With only 4.35% difference in overall score, the 10th battalion had 10 more top three placements with 12 total compared to 2nd Battalion's two.

	Eastern Sector								
	2nd Battalion			4th Battalion			6th Battalion		
	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)
FY12	0	0	86.44%	1	1	84.88%	0	0	84.67%
FY13	0	0	81.87%	0	2	79.26%	2	0	82.80%
FY14	0	1	79.62%	2	1	82.68%	1	0	85.03%
FY15	0	0	82.22%	2	1	87.01%	1	0	89.33%
FY16	0	1	84.38%	1	2	86.60%	0	1	87.30%
FY17	0	1	85.02%	0	1	89.28%	1	1	89.21%
FY18	1	2	80.27%	0	0	84.60%	2	0	84.71%
FY19	1	0	84.18%	0	0	85.78%	0	1	81.87%
Total	2	5	83.00%	6	8	85.01%	7	3	85.61%
	8th Battalion			10th Battalion			12th Battalion		
	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)
FY12	2	0	89.15%	2	1	88.97%	3	0	90.12%
FY13	0	1	81.31%	2	0	91.12%	0	0	86.50%
FY14	0	1	82.33%	2	0	87.77%	1	1	85.16%
FY15	1	1	86.49%	1	0	87.76%	1	0	87.22%
FY16	0	0	84.39%	1	1	86.03%	0	0	86.42%
FY17	1	1	91.03%	2	0	89.05%	2	0	89.96%
FY18	1	0	85.18%	0	1	79.71%	1	1	81.21%
FY19	5	0	93.44%	2	0	88.42%	0	0	83.26%
Total	10	4	86.67%	12	3	87.35%	8	2	86.23%

Figure 5: Eastern Sector Yearly Placing from FY12 to FY19

In Western Sector, Figure 6 identifies the 11th Battalion as performing poorly with three top three placements and 13 bottom three placements and an overall average score of 82.41%. 7th Battalion performed well with six top three placements, one bottom three placement and an average overall score of 85.35%. 11th Battalion only performed on average 3.14% worse but had 13 bottom three placements compared to one. 1st Battalion had the best overall average score of 87.64% with 5 top three placements but 3 bottom three placements.

	Western Sector								
	1st Battalion			3rd Battalion			5th Battalion		
	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)
FY12	0	1	83.59%	1	1	88.66%	0	1	85.43%
FY13	2	1	83.52%	1	1	83.24%	1	1	85.19%
FY14	0	0	85.41%	1	1	83.52%	1	2	81.64%
FY15	1	1	87.35%	0	2	83.02%	1	1	84.49%
FY16	0	0	90.06%	1	0	88.44%	1	1	87.12%
FY17	1	0	93.75%	0	0	90.37%	0	1	89.20%
FY18	1	0	90.05%	0	0	86.73%	0	2	83.79%
FY19	0	0	87.36%	0	2	82.73%	0	1	83.79%
Total	5	3	87.64%	4	7	85.84%	4	10	85.08%
	7th Battalion			9th Battalion			11th Battalion		
	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)	Total 1st, 2nd, and 3rd place	Total 22nd, 21st, and 20th place	Average Score (%)
FY12	0	0	84.88%	0	1	80.42%	0	2	81.53%
FY13	1	0	85.33%	0	1	77.37%	0	1	81.31%
FY14	1	0	86.27%	0	0	80.58%	0	1	81.33%
FY15	1	1	81.62%	0	1	81.45%	0	0	83.97%
FY16	1	0	89.18%	2	0	89.04%	2	2	85.08%
FY17	0	0	90.34%	1	0	88.83%	1	3	87.09%
FY18	2	0	84.21%	1	0	85.17%	0	2	81.13%
FY19	0	0	80.94%	1	2	81.19%	0	2	77.86%
Total	6	1	85.35%	5	5	83.00%	3	13	82.41%

Figure 6: Western Sector Yearly Placing from FY12 to FY19

4.1.2 Performance by Battalion

10th Battalion in Eastern Sector is made up of five MEPS (Atlanta, Jacksonville, Miami, Tampa, and San Juan), with results displayed in Figure 10. The best performing MEPS, Jacksonville had six top three placements with an overall yearly average score of 93.25%. The lowest performance was in FY18 with an overall score of 80.68%, which placed Jacksonville 10th that fiscal year. Miami did the worst with two placements in the bottom three placements with an overall yearly average score of 78.53%. Miami's best performance was in FY13 when it placed 9th and had an overall score of 83.95%. The difference in the overall yearly score between Jacksonville and Miami was 14.72%.

	10th Battalion									
	Atlanta		Jacksonville		Miami		Tampa		San Juan	
	Place	Score(%)	Place	Score(%)	Place	Score(%)	Place	Score(%)	Place	Score(%)
FY12	4	90.83%	1	97.65%	22	70.89%	2	94.98%	7	90.49%
FY13	7	86.68%	1	99.37%	9	83.95%	2	96.28%	5	89.29%
FY14	6	86.33%	3	93.13%	19	77.56%	1	96.81%	12	85.00%
FY15	8	85.96%	1	95.57%	19	79.14%	7	86.75%	7	91.40%
FY16	21	76.16%	6	89.74%	17	81.28%	2	94.38%	13	88.60%
FY17	18	82.91%	3	93.90%	16	83.61%	1	95.78%	18	89.06%
FY18	15	77.07%	10	80.68%	20	72.08%	13	78.99%	9	89.72%
FY19	2	91.64%	1	95.96%	15	79.72%	5	87.05%	13	87.73%
Average Score(%)		84.70%		93.25%		78.53%		91.38%		88.91%
Total 1st, 2nd, and 3rd place from FY12 to FY19	1		6		0		5		0	
Total 22nd, 21st, and 20th place from FY12 to FY19	1		0		2		0		0	

Figure 7: 10th Battalion Yearly Placing from FY12 to FY19

Figure 8 gives the results for 2nd Battalion, which performed the worst in Eastern Sector and is made up of five MEPS (New York, Boston, Fort Dix, Portland ME, and Springfield). Portland ME did the best with two top three placements and no placements in the bottom three with an overall average yearly score of 88.47%. The worst performing MEPS was New York, with three bottom three placements and an average overall score of 75.68%. New York best fiscal year was in FY19 with a placement of 12th and average score of 81.62%.

	2nd Battalion									
	New York		Boston		Fort Dix		Portland ME		Springfield	
	Place	Score(%)	Place	Score(%)	Place	Score(%)	Place	Score(%)	Place	Score(%)
FY12	17	78.03%	5	90.02%	6	89.92%	5	91.17%	18	83.03%
FY13	14	81.30%	19	77.54%	7	86.69%	13	81.89%	16	81.94%
FY14	21	71.99%	17	77.76%	7	87.95%	17	79.10%	15	81.32%
FY15	19	76.94%	18	79.94%	14	84.50%	12	88.29%	16	81.43%
FY16	20	76.19%	14	86.59%	16	85.54%	17	86.03%	12	87.53%
FY17	21	64.54%	17	87.10%	6	93.03%	14	91.97%	15	88.46%
FY18	18	74.85%	20	80.74%	22	68.28%	3	93.45%	14	84.05%
FY19	12	81.62%	11	82.21%	10	82.56%	1	95.87%	18	78.64%
Average Score(%)		75.68%		82.74%		84.81%		88.47%		83.30%
Total 1st, 2nd, and 3rd place from FY12 to FY19	0		0		0		2		0	
Total 22nd, 21st, and 20th place from FY12 to FY19	3		1		1		0		0	

Figure 8: 2nd Battalion Yearly Placing from FY12 to FY19

In Western Sector, 7th Battalion did the best and is made up of 5 MEPS (Los Angeles, Phoenix, Sacramento, San Diego, and San Jose). Figure 9 shows that Phoenix did the best with four yearly top three placements with an average score of 89.77%. San Jose had the most bottom three placements with one but had one top three yearly placements and had an overall average score of 84.27% which is only 5.5% under Phoenix.

	7th Battalion									
	Los Angeles		Phoenix		Sacramento		San Diego		San Jose	
	Place	Score(%)	Place	Score(%)	Place	Score(%)	Place	Score(%)	Place	Score(%)
FY12	12	84.55%	9	89.45%	10	85.70%	11	85.27%	16	79.45%
FY13	11	82.13%	3	93.60%	15	80.72%	6	88.19%	12	82.03%
FY14	11	83.53%	2	95.11%	9	84.85%	8	85.33%	12	82.51%
FY15	18	77.20%	2	92.37%	10	83.42%	15	79.57%	20	75.53%
FY16	1	95.29%	10	87.92%	15	82.83%	7	89.60%	4	90.24%
FY17	7	90.73%	4	91.05%	5	90.90%	9	89.60%	10	89.41%
FY18	11	79.82%	3	86.79%	16	76.32%	4	85.92%	1	92.20%
FY19	18	74.57%	11	81.88%	13	81.40%	8	84.03%	10	82.82%
Average Score(%)		83.48%		89.77%		83.27%		85.94%		84.27%
Total 1st, 2nd, and 3rd place from FY12	1		4		0		0		1	
Total 22nd, 21st, and 20th place from FY12 to FY19	0		0		0		0		1	

Figure 9: 7th Battalion Yearly Placing from FY12 to FY19

The 11th Battalion, results depicted in Figure 10, has six MEPS: St. Louis, Kansas City, New Orleans, Oklahoma City, Little Rock, and Shreveport. Kansas City and Oklahoma City did the best with one yearly top three placements and zero bottom three placements. Oklahoma City has an overall average score of 86.52% and Kansas City has 84.54%. Shreveport has one top three placement and one bottom three placement but the best overall average score of 87.42 within the battalion. Little Rock had the second worst overall score of 78.44% and 4 bottom three placements for the battalion. New Orleans did slightly better with their overall average score of 78.96 but had the most bottom three placements, five.

	11th Battalion											
	St Louis		Kansas City		New Orleans		Oklahoma City		Little Rock		Shereveport	
	Place	Score(%)	Place	Score(%)	Place	Score(%)	Place	Score(%)	Place	Score(%)	Place	Score(%)
FY12	20	75.21%	15	81.30%	15	83.77%	9	88.37%	18	80.97%	20	79.57%
FY13	9	82.95%	10	82.51%	22	71.19%	11	83.23%	15	81.36%	7	86.63%
FY14	5	86.91%	14	79.16%	20	75.41%	12	82.44%	19	76.84%	7	87.20%
FY15	13	82.19%	9	83.56%	17	80.82%	15	82.48%	16	85.34%	10	89.47%
FY16	16	82.78%	3	93.27%	21	77.01%	1	94.27%	22	76.79%	15	86.35%
FY17	20	74.72%	5	93.59%	21	80.91%	10	91.72%	20	85.01%	1	96.59%
FY18	21	71.29%	17	82.89%	13	84.30%	4	88.06%	22	70.49%	8	89.75%
FY19	19	72.79%	14	80.08%	21	78.27%	13	81.57%	22	70.68%	18	83.78%
Average Score(%)		78.60%		84.54%		78.96%		86.52%		78.44%		87.42%
Total 1st, 2nd, and 3rd place from FY12 to FY19	0		1		0		1		0		1	
Total 22nd, 21st, and 20th place from FY12 to FY19	3		0		5		0		4		1	

Figure 10: 11th Battalion Yearly Placing from FY12 to FY19

4.1.3 Discussion

Evaluating the performance data from the top of the command structure or sector, the average score difference isn't large but the number of placements is substantially better for Eastern Sector compared to Western Sector. Within the battalions, the difference in average score got larger as well as the number of top three and bottom three placements. MEPS performance viewed in this way is important as it parallels the command structure; however, the recognition system has MEPS competing based on their size category and not by geography, which is the basis for the battalion and sector groupings.

4.1.4 Performance by Size Category

In the Large category, results by MEPS are shown in Figure 11. Jacksonville had the most yearly top three placements with six, followed by Tampa with five and Phoenix with four. Jacksonville and Tampa belong to the 10th Battalion, the best performing

battalion in Eastern Sector. Phoenix belongs to 7th Battalion, which was the best battalion in Western Sector. Dallas, New York and St. Louis did the worst with three bottom three placements followed by Miami with two. St. Louis belongs to the 11th Battalion, the worst performing battalion in Western Sector. New York, which is in 2nd Battalion, belongs to worst performing battalion in Eastern Sector while Miami belongs to the best performing one, 10th Battalion. Dallas belongs to 9th Battalion, which has five top and bottom three placements.

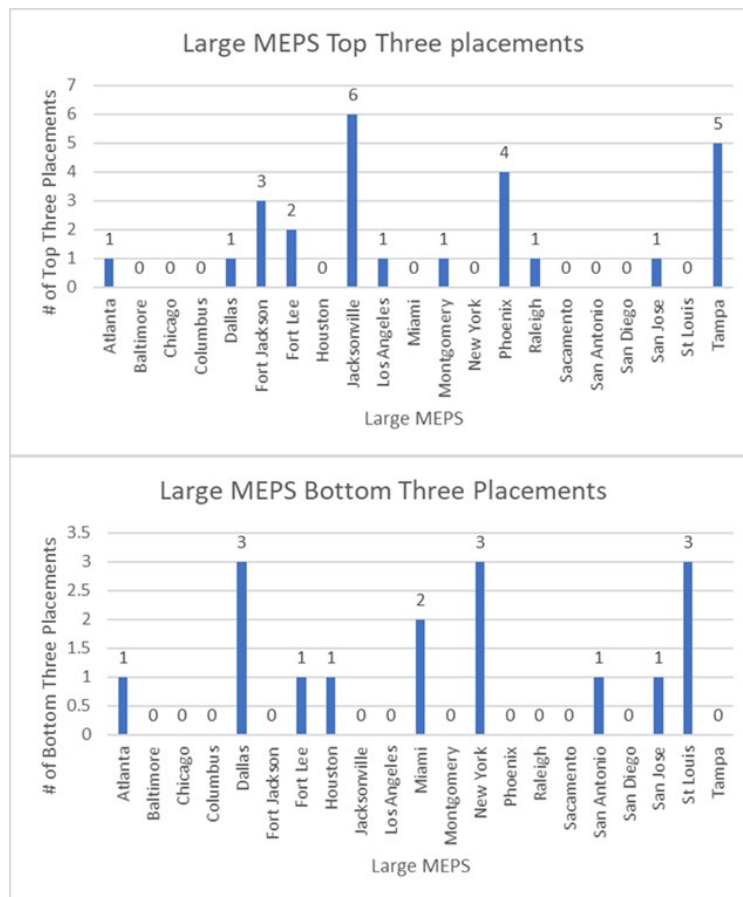


Figure 11: Large Category MEPS Placement from FY12 to FY19

Figure 12 contains similar information in the Medium category. Knoxville did the best with five top three yearly placements and belongs to the 2nd best performing battalion in Eastern Sector, 8th Battalion. Lansing, in 6th Battalion did the second best with four top three placements. Cleveland, belonging to 4th Battalion, did the third best with three placements. New Orleans did the worst with five top three bottom placements, belonging to the worst battalion in Western Sector, 11th Battalion. Indianapolis, Salt Lake City and Seattle did the next worst with three bottom three placements. Indianapolis is in 6th Battalion with Lansing, Seattle is in 5th Battalion, the second worst performing MEPS in the Western Sector and Salt Lake City is in the 3rd Battalion.

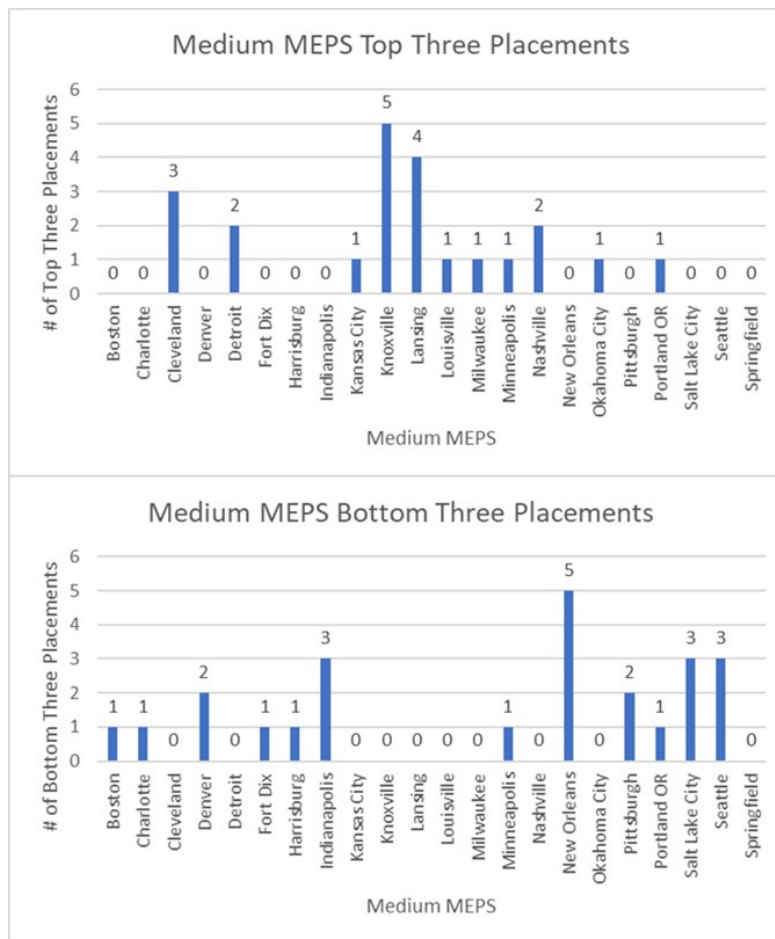


Figure 12: Medium Category MEPS Placement from FY12 to FY19

Finally, Figure 13 contains the consolidated numbers by MEPS in the Small category. Amarillo did the best representing 9th Battalion with four top three yearly placements. Boise and Spokane did the next best with three top three placements. Boise belongs to 3rd Battalion and Spokane belongs to 5th Battalion. 4th Battalion's MEPS, Buffalo, did the worst with four bottom three placements. Little Rock of 11th Battalion, the worst battalion in Western Sector, did the same as Buffalo with four. Anchorage and Honolulu of 3rd Battalion did the next worst with three bottom three placements.

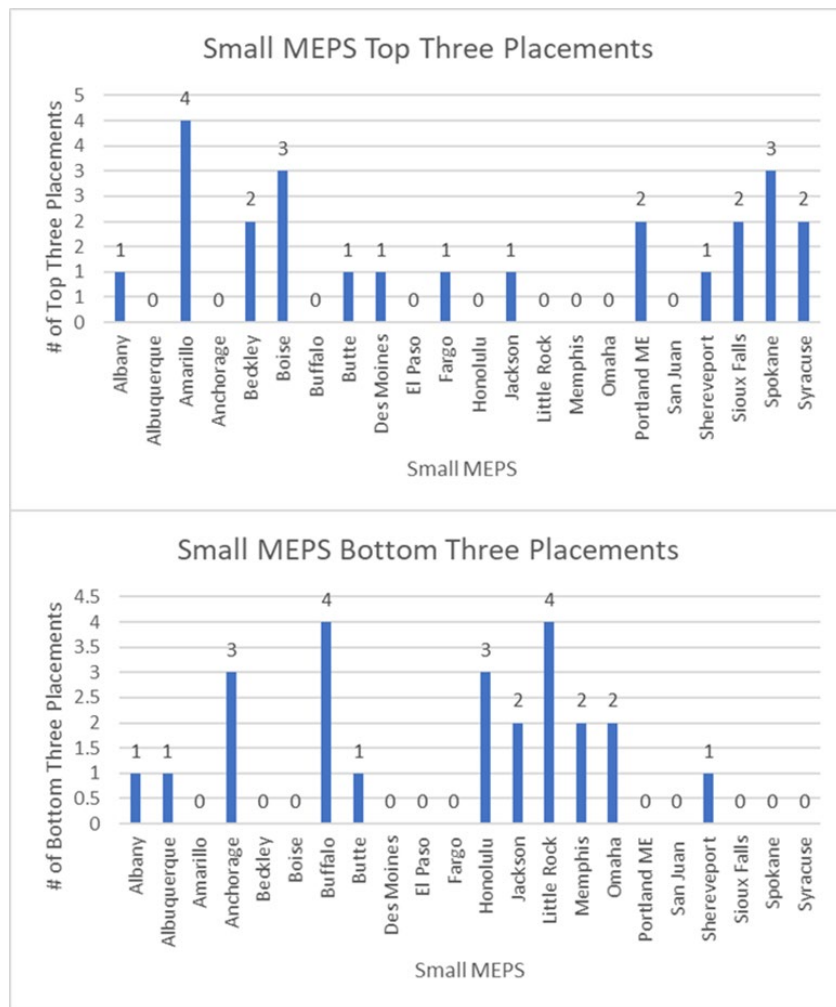


Figure 13: Small Category MEPS Placement from FY12 to FY19

Examining the MEPS by all three categories for the yearly top three placements in Figure 14, 10th Battalion has two MEPS, the top performing MEPS in the Eastern Sector and USMEPCOM. This is followed by one MEPS from 3rd to 9th Battalion.

MEPS	Jacksonville	Tampa	Phoenix	Knoxville	Lansing	Cleveland	Amarillo	Boise	Spokane
Battalion	10th Battalion	10th Battalion	7th Battalion	8th Battalion	6th Battalion	4th Battalion	9th Battalion	3rd Battalion	5th Battalion
Size Category	Large	Large	Large	Medium	Medium	Medium	Small	Small	Small
Total 1st, 2nd, and 3rd place from FY12 to FY19	6	5	4	5	4	3	4	3	3
Total 22nd, 21st, and 20th place from FY12 to FY19	0	0	0	0	0	0	0	0	0
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	97.65%	94.98%	89.45%	92.12%	85.92%	89.46%	91.26%	99.13%	90.35%
FY13	99.37%	96.28%	93.60%	88.10%	89.93%	83.33%	84.92%	92.06%	89.50%
FY14	93.13%	96.81%	95.11%	86.30%	92.72%	91.94%	86.67%	94.60%	91.97%
FY15	95.57%	86.75%	92.37%	94.48%	96.12%	94.38%	85.68%	92.76%	93.76%
FY16	89.74%	94.38%	87.92%	88.14%	91.83%	93.79%	92.82%	91.14%	92.26%
FY17	93.90%	95.78%	91.05%	96.84%	92.96%	92.04%	96.36%	94.50%	93.57%
FY18	80.68%	78.99%	86.79%	94.47%	90.80%	86.15%	97.14%	93.38%	92.44%
FY19	95.96%	87.05%	81.88%	97.07%	83.24%	78.55%	94.86%	92.70%	94.27%
Average Score (%) from FY12 to FY19	93.25%	91.38%	89.77%	92.19%	90.44%	88.70%	91.21%	93.78%	92.26%

Figure 14: Category Top Three MEPS Yearly Placing from FY12 to FY19

Looking at the MEPS by all three categories for the yearly bottom three placements in Figure 15, we see three MEPS from 11th Battalion, the worst performing battalion in the Western Sector and USMEPCOM with 13 bottom three placements from FY12 to FY19. 3rd Battalion follows 11th Battalion with three MEPS represented and is the third worst performing battalion in the Western Sector with seven bottom three placements from FY12 to FY19.

MEPS	Dallas	New York	St. Louis	New Orleans	Indianapolis	Salt Lake City	Seattle	Buffalo	Little Rock	Anchorage	Honolulu
Battalion	9th Battalion	2nd Battalion	11th Battalion	11th Battalion	6th Battalion	3rd Battalion	5th Battalion	4th Battalion	11th Battalion	3rd Battalion	3rd Battalion
Size Category	Large	Large	Large	Medium	Medium	Medium	Medium	Small	Small	Small	Small
Total 1st, 2nd, and 3rd place from FY12 to FY19	1	0	0	0	0	0	0	0	0	0	0
Total 22nd, 21st, and 20th place from FY12 to FY19	3	3	3	5	3	3	3	4	4	3	3
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	71.26%	78.03%	75.21%	83.77%	84.23%	76.94%	76.88%	71.08%	80.97%	83.39%	89.93%
FY13	73.19%	81.30%	82.95%	71.19%	80.44%	80.31%	89.74%	70.74%	81.36%	70.69%	85.80%
FY14	74.70%	71.99%	86.91%	75.41%	89.37%	73.74%	77.64%	78.53%	76.84%	76.09%	72.19%
FY15	78.32%	76.94%	82.19%	80.82%	83.02%	87.76%	75.56%	91.52%	85.34%	83.99%	82.54%
FY16	91.31%	76.19%	82.78%	77.01%	78.51%	88.33%	76.37%	78.96%	76.79%	89.49%	91.38%
FY17	83.22%	64.54%	74.72%	80.91%	79.23%	85.58%	85.89%	83.38%	85.01%	91.73%	92.99%
FY18	84.82%	74.85%	71.29%	84.30%	87.10%	87.78%	86.18%	85.34%	70.49%	77.33%	75.36%
FY19	66.93%	81.62%	72.79%	78.27%	78.48%	72.27%	79.53%	88.80%	70.68%	87.13%	79.26%
Average Score (%) from FY12 to FY19	77.97%	75.68%	78.60%	78.96%	82.55%	81.59%	80.97%	81.04%	78.44%	82.48%	83.68%

Figure 15: Category Bottom Three Yearly Placing from FY12 to FY19

4.1.4 Discussion

MEPS' ability to place yearly in the top three seems to be more evenly distributed among the battalions but the same observation is not clear for bottom three performance. While score for the MEPS among the top and bottom are not separated by much, the effect is that some MEPS consistently score in the top and other MEPS consistently score in the bottom. Eight out of 65 MEPS did not receive a placement at least once either in the top three or bottom three. Out of the eight MEPS, five were in the Large category (Baltimore, Chicago, Columbus, Sacramento, and San Diego), one in the Medium category (Springfield), and two in the Small category (El Paso and San Juan). When examining the command structure and size category performance, 11th Battalion seems to fare poorly compared to other battalions. When examining MEPS performance by Category, each category had some MEPS that placed in the Top 3 four or more times and had no placements in the Bottom 3. Also, there were a small subset of MEPS that had

three of more Bottom 3 placements and no Top 3. There seems to be a subset of MEPS that will place only in the Top 3 or Bottom 3.

4.2 Predictive Model

As per findings from previous student work on this topic [10], regression models were not effective in predicting top performance; however, given the disparities identified, it is worth examining a model that attempts to predict MEPS performance in the MOE competition. A logistic regression model was created in an attempt to predict MEPS performance by utilizing prior years' data to give insight to the how fair is competition in the MOE.

4.2.1 Prediction of 65 MEPS Performance

Logistic regression models of all 65 MEPS performance scores from FY12 to FY18 were leveraged to predict outcomes in FY19. Each model employed a binary response variable equal to 1 if the MEPS scored in the bin of interest in FY19 and 0 if it did not. Six bins of interest were identified and modeled: Top 3 finish (in category), Bottom 3 finish (in category), Top 25 finish (overall), Bottom 25 finish (overall), Top 8 finish (in category), and Bottom 8 finish (in category). The independent variables were the MEPS final percentage score for the fiscal year. Each model created used FY18, FY17, FY16, FY15, FY14, FY13, or FY12 as the single independent variable.

When attempting to predict the top three winners for each MEPS category in FY19, only FY12 overall average scores exhibited a significant relationship in the Whole Model Test with a p-value of 0.0021. The next two best performing models were FY15

(p-value 0.0735) and FY17 (p-value of 0.0834). Figure 16 contains JMP software output for the top-four performing models.

When the same models attempted to predict the top 25 MEPS overall instead of the top three in each size category, the Logistic Fits were better, with four of the seven models exhibiting a significant relationship in the whole Model Test: FY18 (p-value 0.0039), FY15 (p-value 0.0087), FY12 (p-value of 0.0119) and FY17 (p-value 0.0192).

Figure 17 contains the JMP outputs from these models.

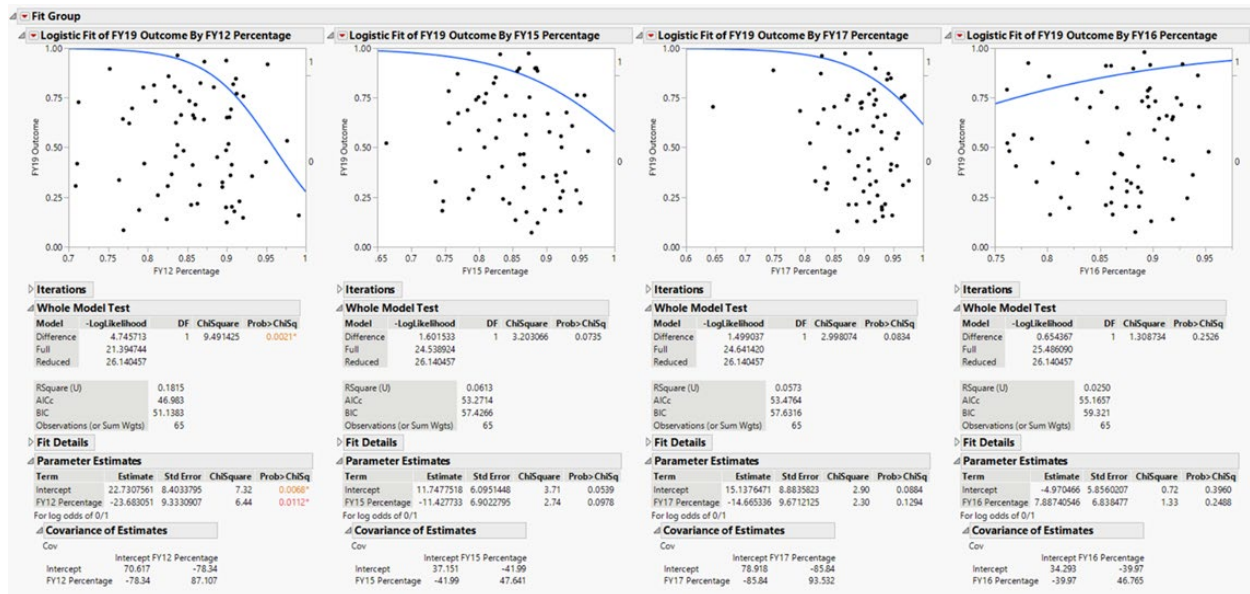


Figure 16: Logistic Fit of FY19 Outcomes for Top Three MEPS

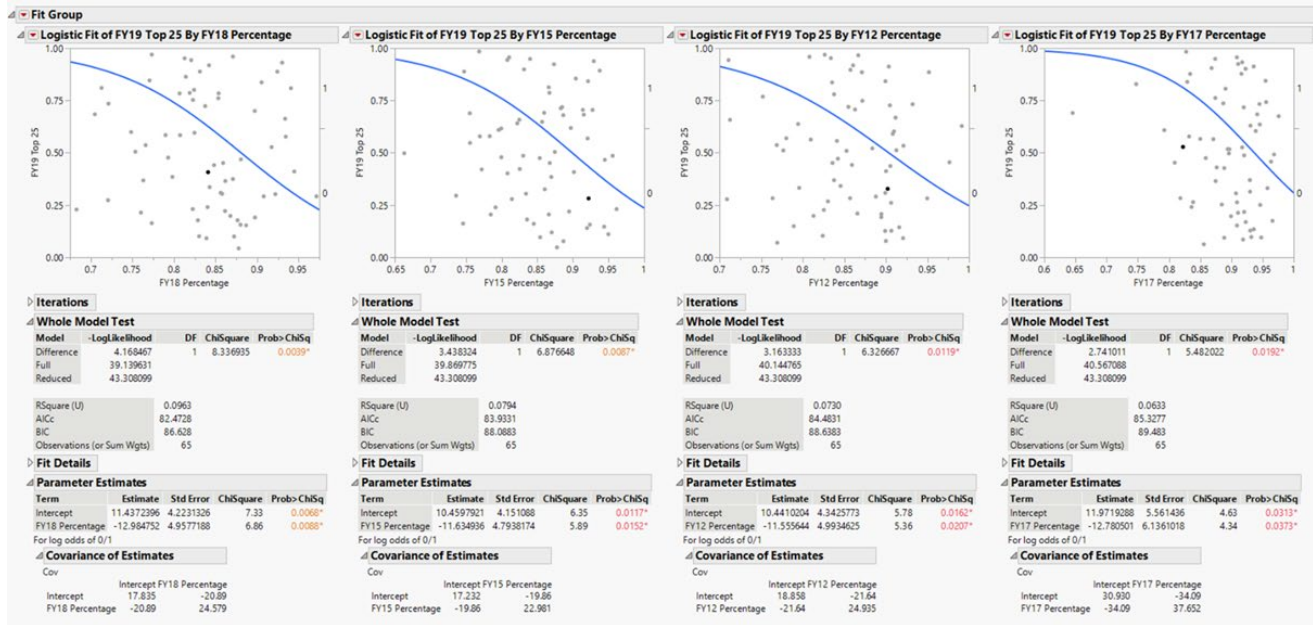


Figure 17: Logistic Fit of FY19 Outcomes for Top Twenty-Five MEPS

Similarly, the logistic regression models attempting to predict the FY19

Outcomes bottom three MEPS against FY12 to FY18 overall average scores displayed mixed results, indicated by the JMP output in Figure 18. The top four performing models in the Whole Model Test were, FY17 (p-value 0.0121), FY12 (p-value 0.0173), FY14 (p-value 0.0227) and FY18 (p-value 0.0736).

When predicting the bottom 25 MEPS, the models performed better, as per Figure 19, with FY17 having a p-value of 0.0011 followed by FY18 (p-value 0.0027), FY12 (p-value 0.0109), and FY14 with a p-value of 0.0255.

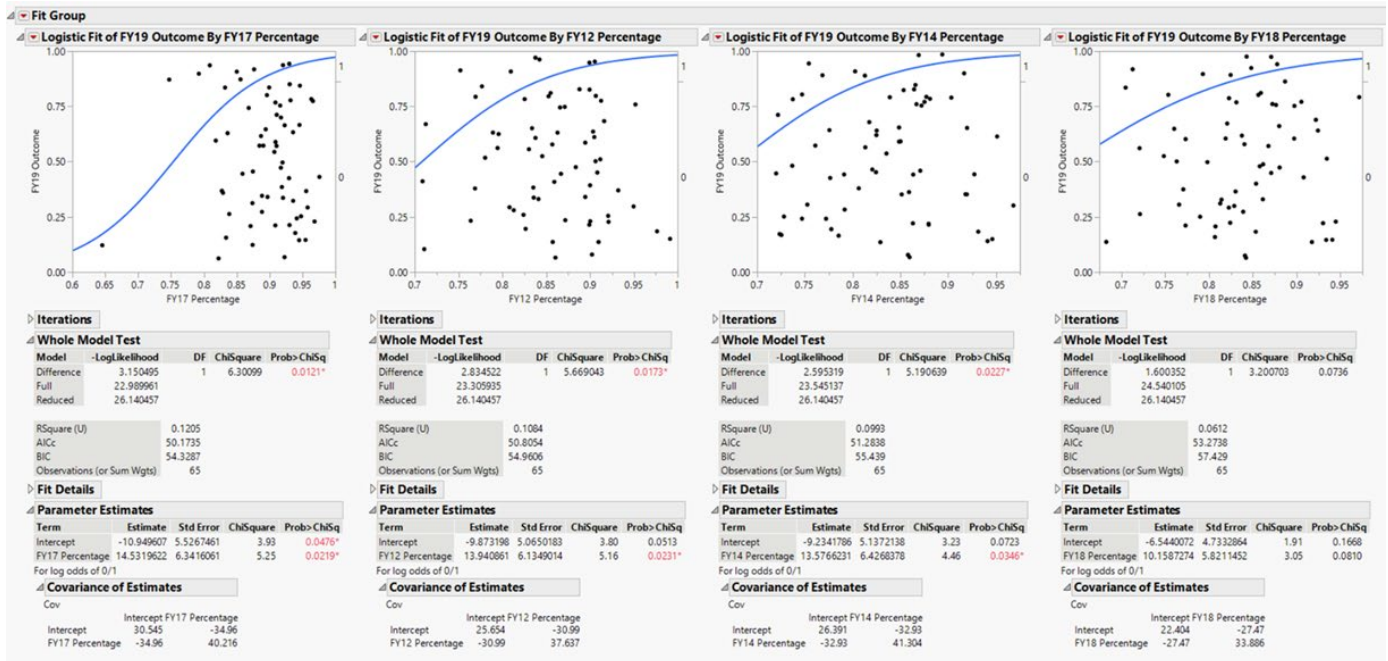


Figure 18: Logistic Fit of FY19 Outcomes for Bottom Three MEPS

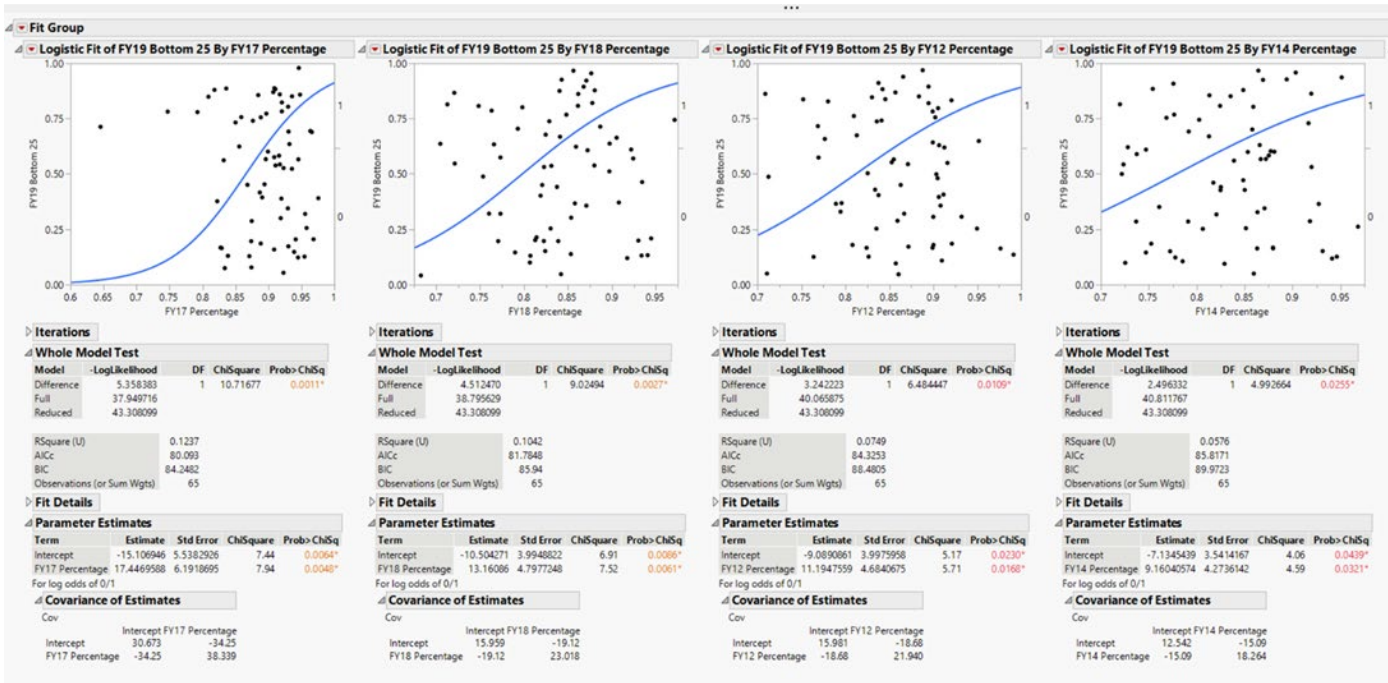


Figure 19: Logistic Fit of FY19 Outcomes for Bottom Twenty-Five MEPS

4.2.2 Discussion

The summarized results in Table 6 lend themselves to a number of immediate observations. The first observation is that, in the Top Three and Bottom Three models, there are clearly significant relationships that have been discovered among the set of independent variables. However, the set of variables that is significant does not necessarily conform to what might be expected. For example, in the Top Three models, FY17 percentage has a significant relationship with FY19 outcome, but FY18 percentage does not. Furthermore, FY12 percentage has the strongest relationship. There is no theoretical reason why this should be the case. The same phenomenon is observed with Bottom Three models, although for those models it makes intuitive sense for FY18 and FY17 each to be significant. But it is not clear why FY16 and FY15 would not be significant but FY14 would be.

Table 6: Logistic Fit p-values for Top and Bottom MEPS

Top 4 Logistic Fit of FY19 Outcomes Top Three models p-values			
FY12 (0.0021)	FY15 (0.0735)	FY17 (0.0087)	FY16 (0.2526)
Logistic Fit of FY19 Outcomes Top Twenty-Five			
FY18 (0.0039)	FY15 (0.0087)	FY12 (0.0119)	FY17 (0.0192)
Logistic Fit of FY19 Outcomes Bottom Three			
FY17 (0.0121)	FY12 (0.0173)	FY14 (0.0227)	FY18 (0.0736)
Logistic Fit of FY19 Outcomes Bottom Twenty-Five			
FY17 (0.0011)	FY18 (0.0027)	FY12 (0.0109)	FY14 (0.0255)

The second immediate observation is that there appears to be consistency in the performance of the Top 25 and Bottom 25 models. Of the top four independent variables in each model, three in common were: FY18, FY17 and FY12. As with the Bottom 3 models, the recency effect can explain the significance of FY18 and FY17 percentage. However, it is not clear at all why FY14, FY15, and FY12 should be significant for these

models. One can hypothesize that the command climate at a MEPS can have a role in short-term patterns of performance. An excellent command team at a MEPS might result in sustained high performance for a two to three year period, whereas a poor command team might result in the opposite effect.

The likeliest explanation for the seemingly haphazard array of statistically significant independent variables is tied to the Sector, Battalion, and performance discussed in Chapter 4.1. Figures 11, 12, and 13 display the number of Top and Bottom 3 finishes by MEPS in each size category. The observation is that several MEPS that have placements in the Top 3 have none in the Bottom 3 and vice versa. Thus, the pool of possible MEPS that a model might classify in the Bottom 3 is not, in practice, the full 65 MEPS. Rather, there is a set of seven MEPS that habitually perform in the Bottom 3. The same phenomenon is observed for the Top 3. A possible explanation for this manifestation is that the logistic regression models are finding significance in the out-years' data not because it truly has predictive power but because the FY19 outcomes happened to align with the outcomes in those fiscal years and not in others.

The final observation is that the logistic regression models did better when attempting to predict the Top and Bottom 25 MEPS versus the Top and Bottom 3. Models attempting to predict the bottom MEPS performed better than the ones that tried to predict the top performers. However, MEPS compete against other MEPS in the same size category and not against all MEPS so models by category may perform better.

4.2.3 Prediction of MEPS Performance by Size Category

Similar models to those in Chapter 4.2.1 were created using only Small MEPS.

The difference is that, instead of modeling the Top 25 and Bottom 25 performers out of a total of 65 MEPS within USMEPCOM, the by-size models use Top 8 and Bottom 8 in their binary response variables since there are 21 to 22 MEPS within each size category.

Seven logistic regression models were made leveraging the 21 small MEPS FY12 to FY18 performance score against FY19 Outcomes to predict the top three MEPS performers. As indicated by Figure 20, the logistic fit of the seven models performed poorly, with none of the seven independent variables exhibiting a significant relationship in the Whole Model Test.

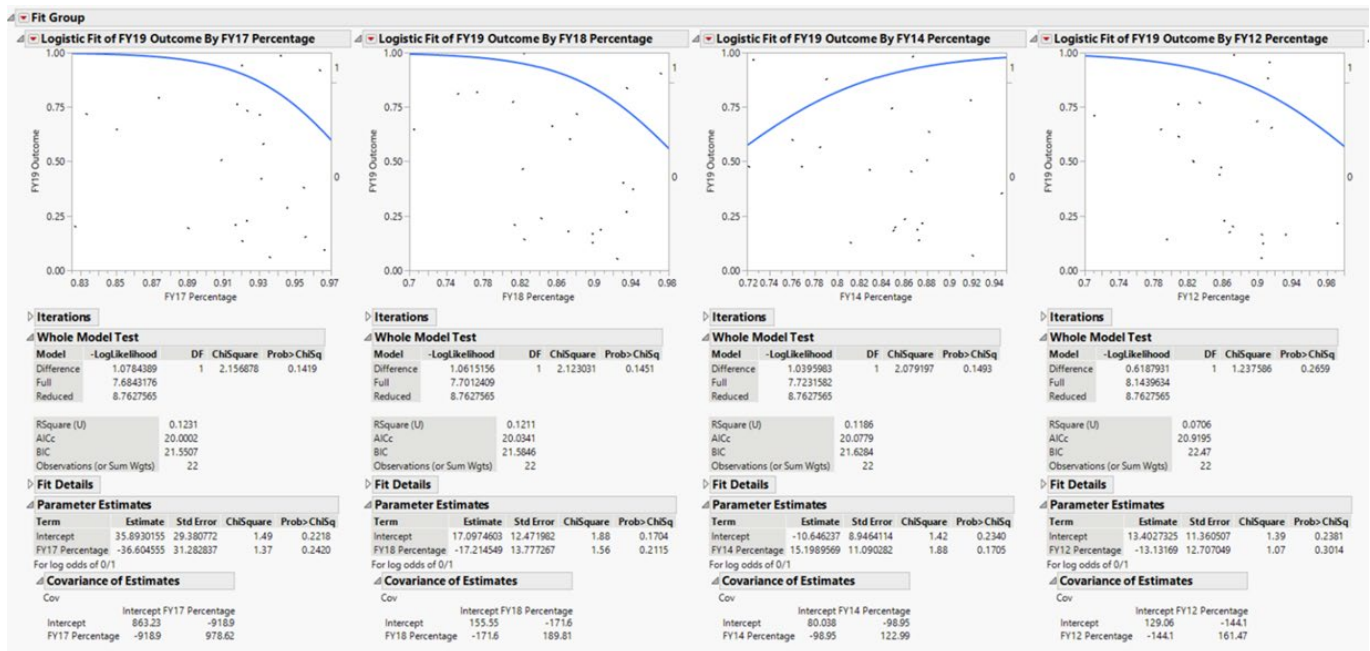


Figure 20: Logistic Fit of FY19 Outcomes for Top Three Small MEPS

When the same models attempted to predict the placement of the top eight instead of three, the output in Figure 21 shows only marginal improvement. Two models exhibited a significant relationship in the Whole Model Test (FY18 and FY14). Results

for predicting the outcomes of the Bottom 3 and Bottom 8 performers in Figures 22 and 23 are likewise unimpressive.

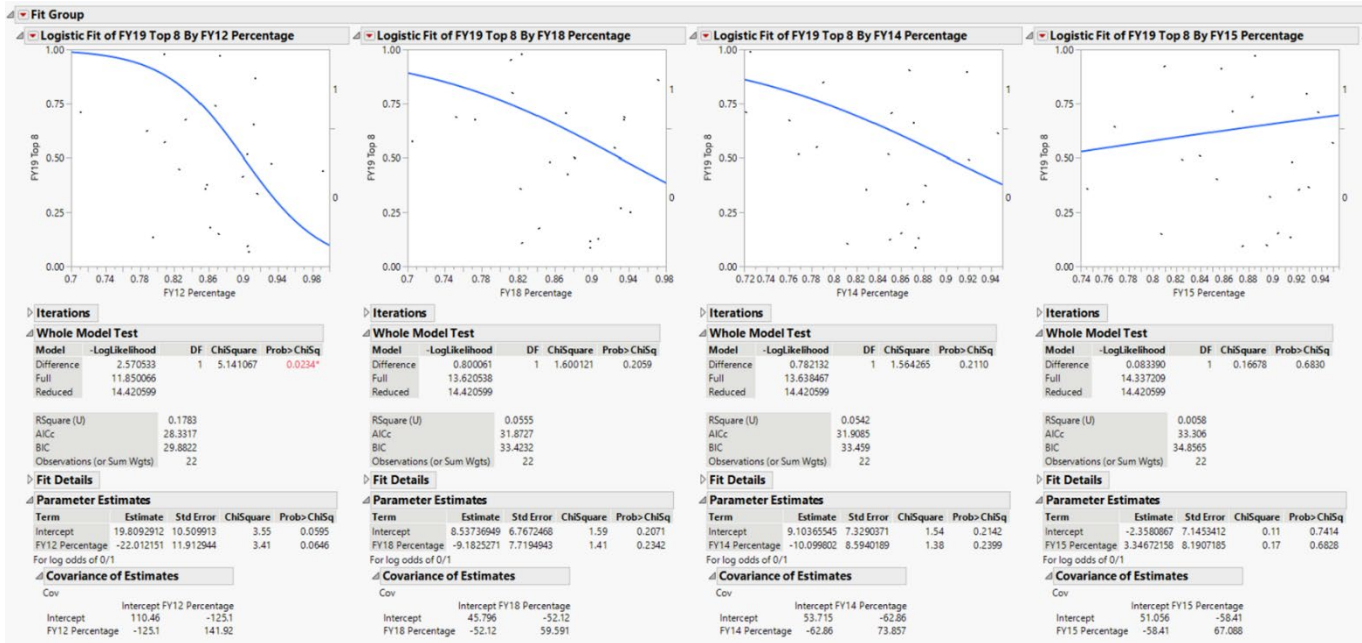


Figure 21: Logistic Fit of FY19 Outcomes for Top Eight Small MEPS

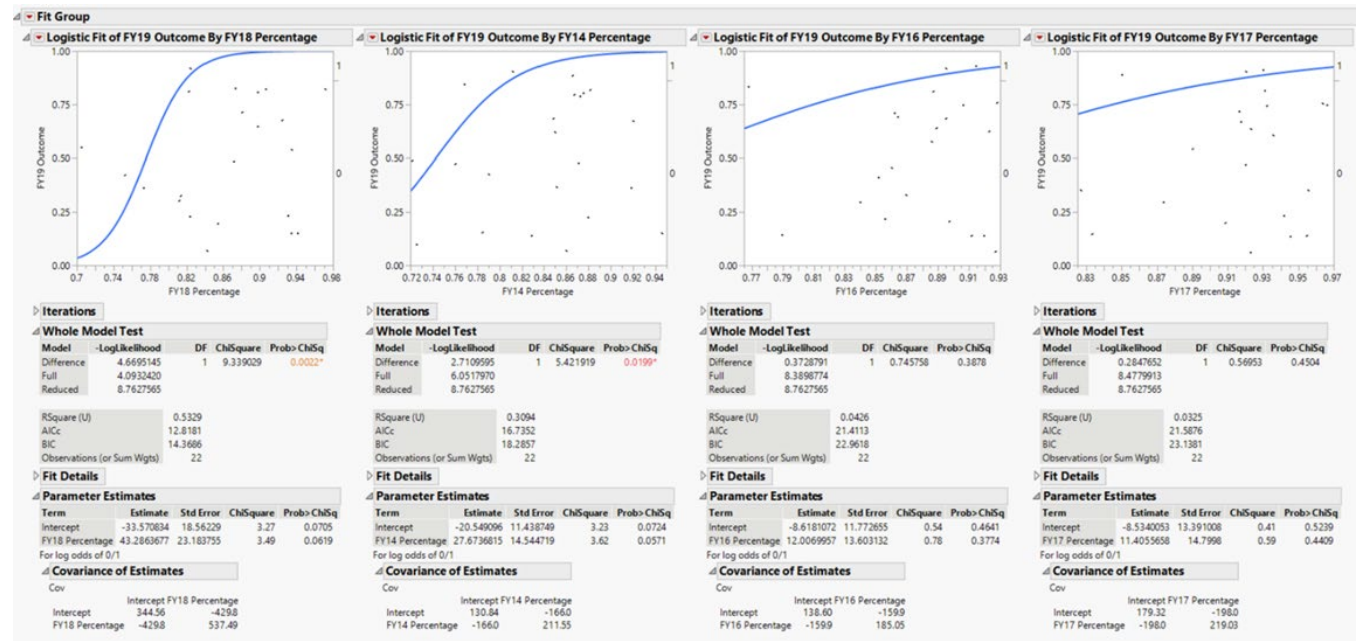


Figure 22: Logistic Fit of FY19 Outcomes for Bottom Three Small MEPS

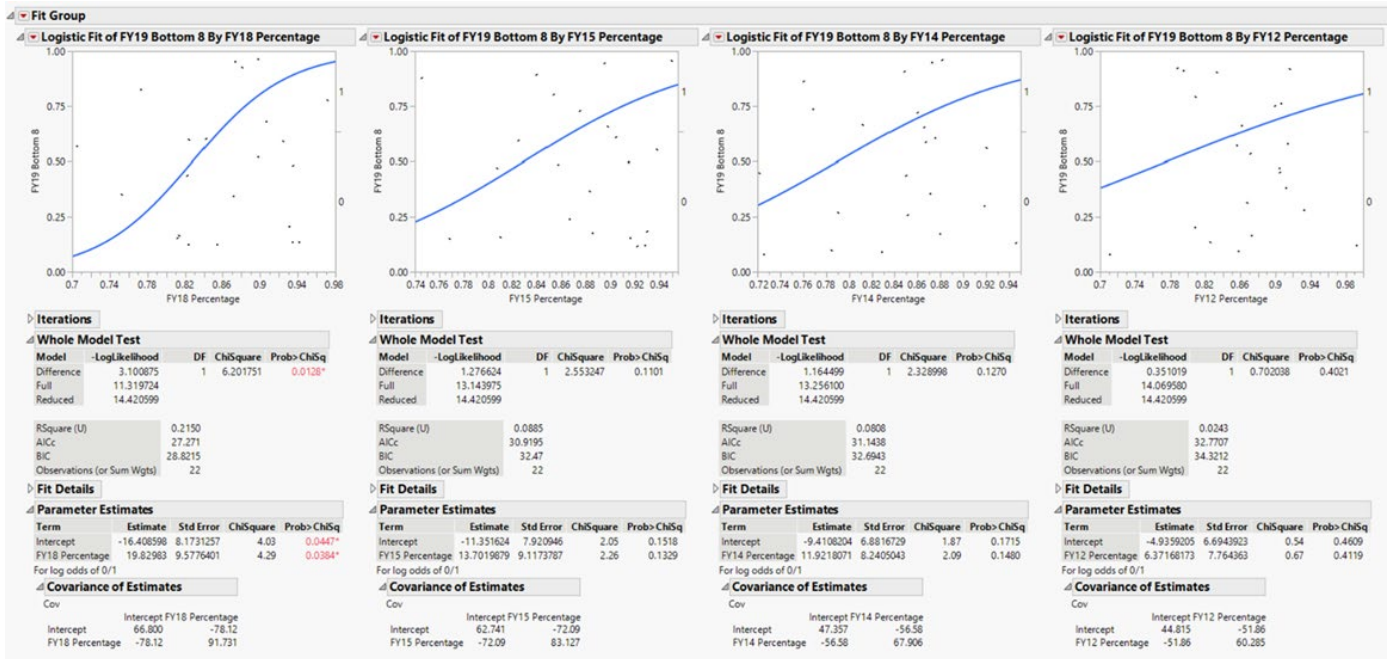


Figure 23: Logistic Fit of FY19 Outcomes for Bottom Eight Small MEPS

Seven logistic regression models leveraging FY12 to FY18 overall performance scores against FY 19 outcomes were created to predict the top and bottom three and eight placements of the 22 Medium MEPS performers. As shown in Figure 24, the models that attempted to predict the Top 3 Medium MEPS did not perform well except one using FY 17 performance scores which had a p-value of 0.0473. Models which attempted to predict the Top 8 did marginally better with FY17 p-value of 0.0465 as shown in Figure 25.

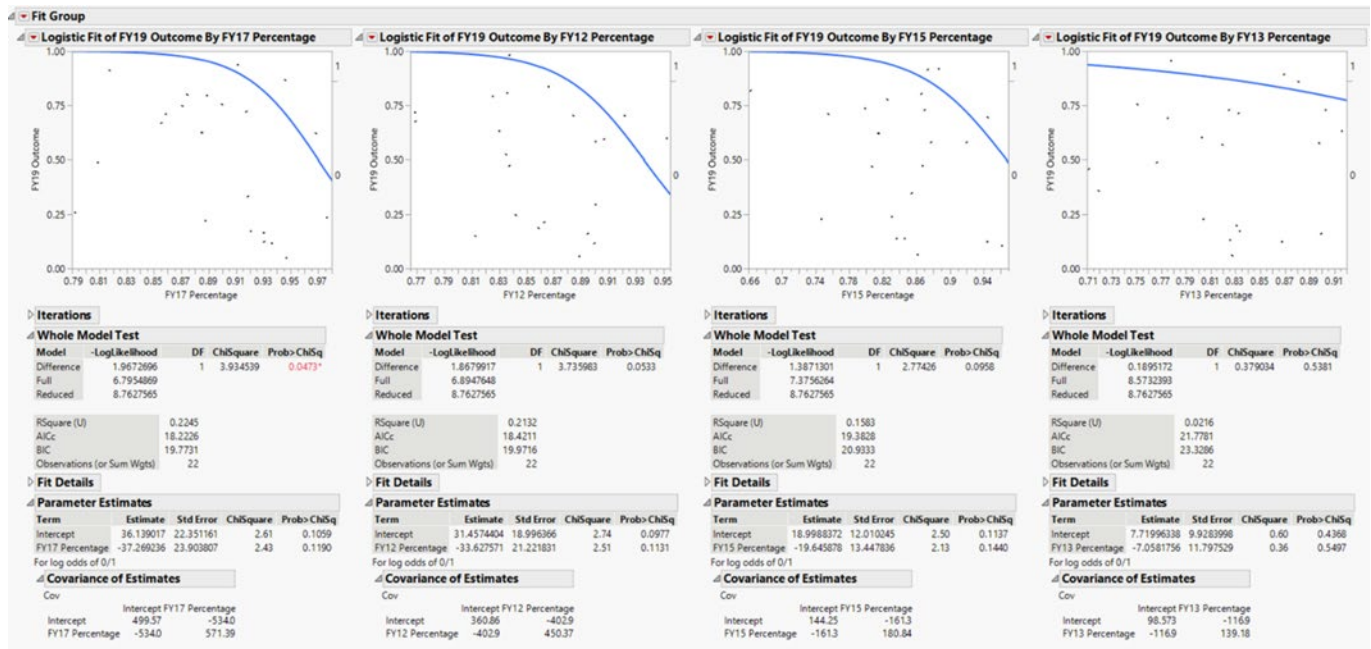


Figure 24: Logistic Fit of FY19 Outcomes for Top Three Medium MEPS

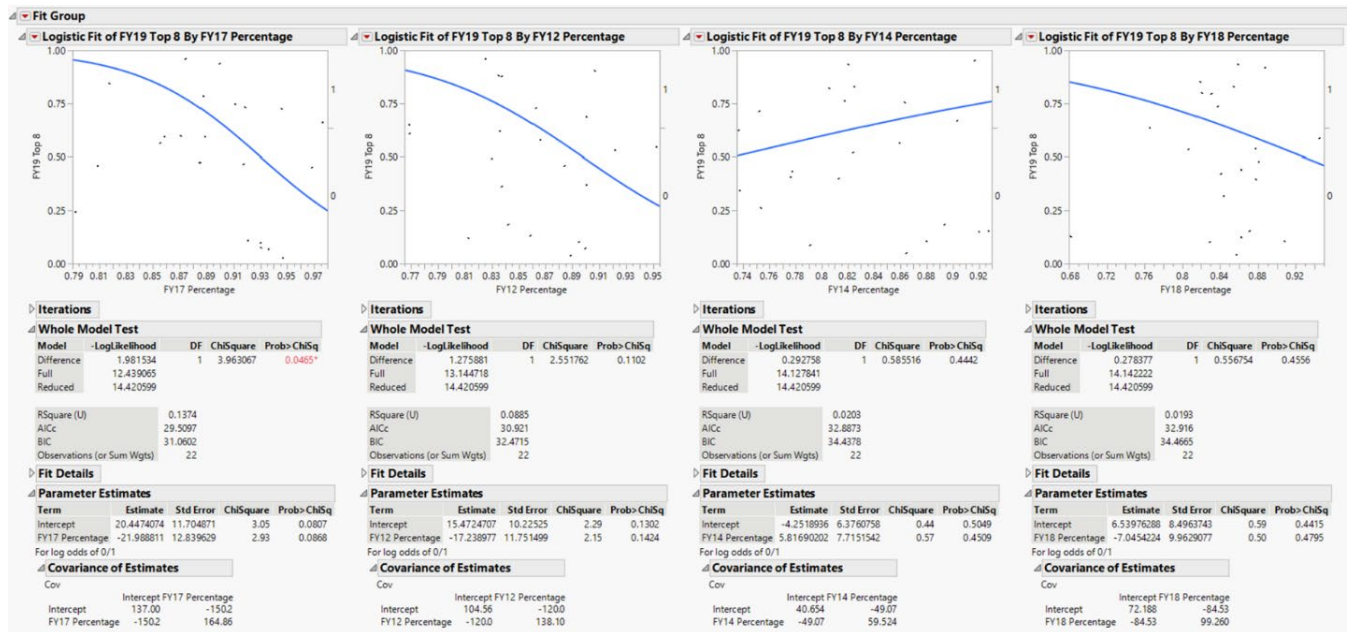


Figure 25: Logistic Fit of FY19 Outcome for Top Eight Medium MEPS

The same models attempted to predict outcomes for the Bottom 3 and Bottom 8 performers, as shown in Figures 26 and 27. These models did not perform well either,

but in both cases FY17 had a p-value that was significant and FY12 did well for Bottom 3 and was significant for Bottom 8.

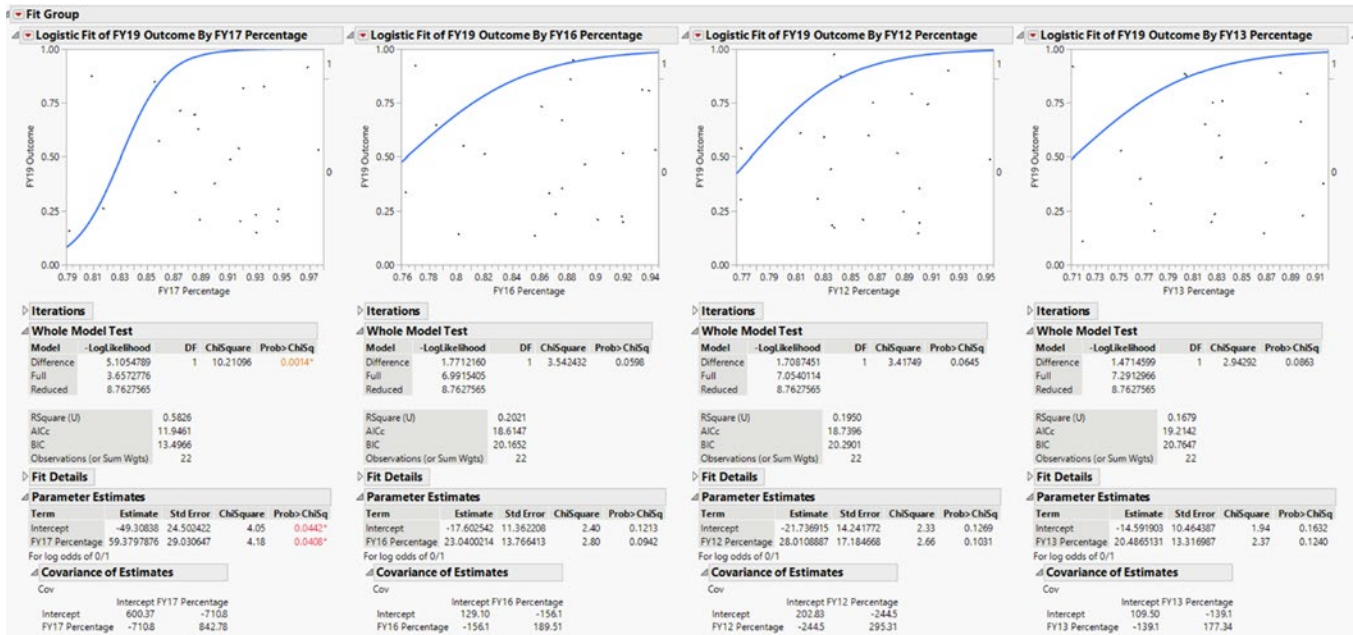


Figure 26: Logistic Fit of FY19 Outcomes for Bottom Three Medium MEPS

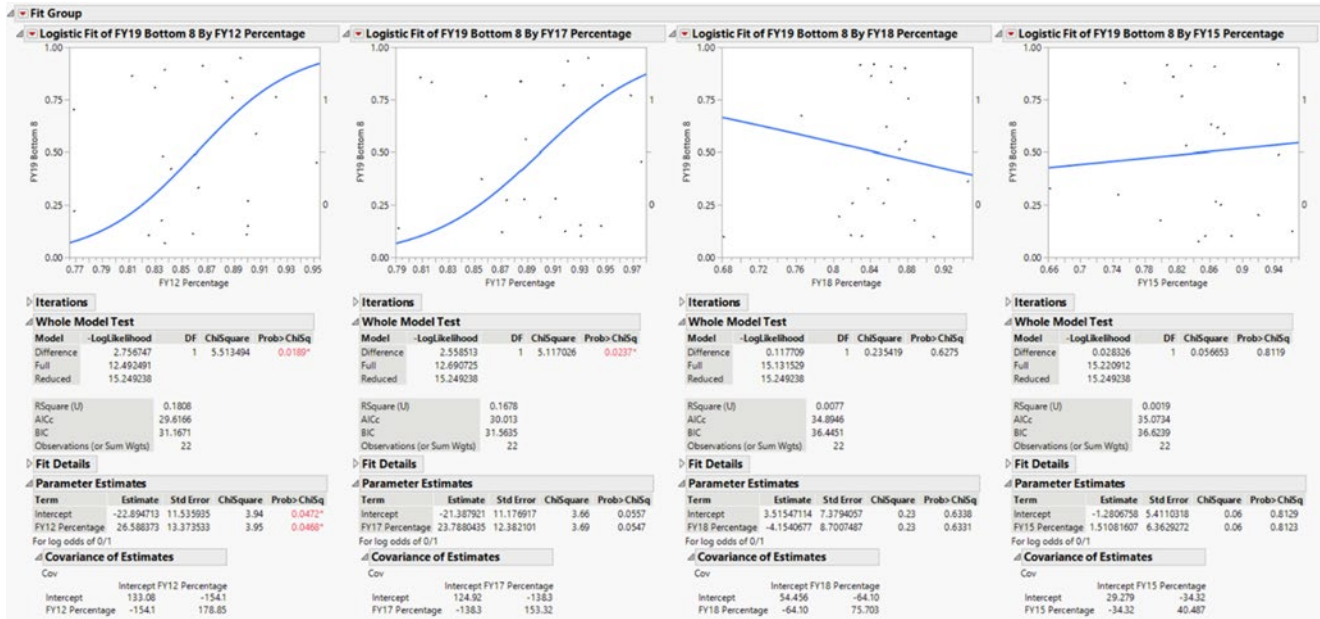


Figure 27: Logistic Fit of FY19 Outcomes for Bottom Eight Medium MEPS

Seven logistic models were made leveraging the 22 Large MEPS FY12 to FY18 performance score against FY19 Outcomes to predict the top and bottom three and eight performers. When examining the Top 3 and Top 8, FY 12 did well in both cases. Other models did not except for FY14 which did well in the Top 8 with a p-value of 0.0232.

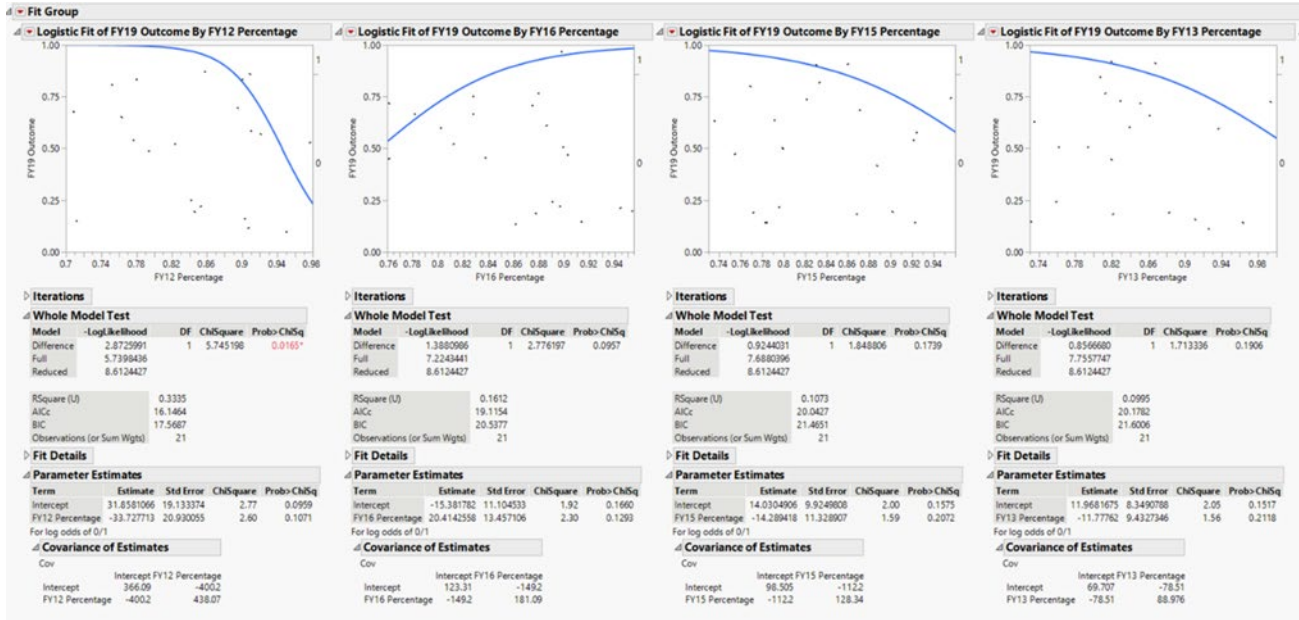


Figure 28: Logistic Fit of FY19 Outcomes for Top Three Large MEPS

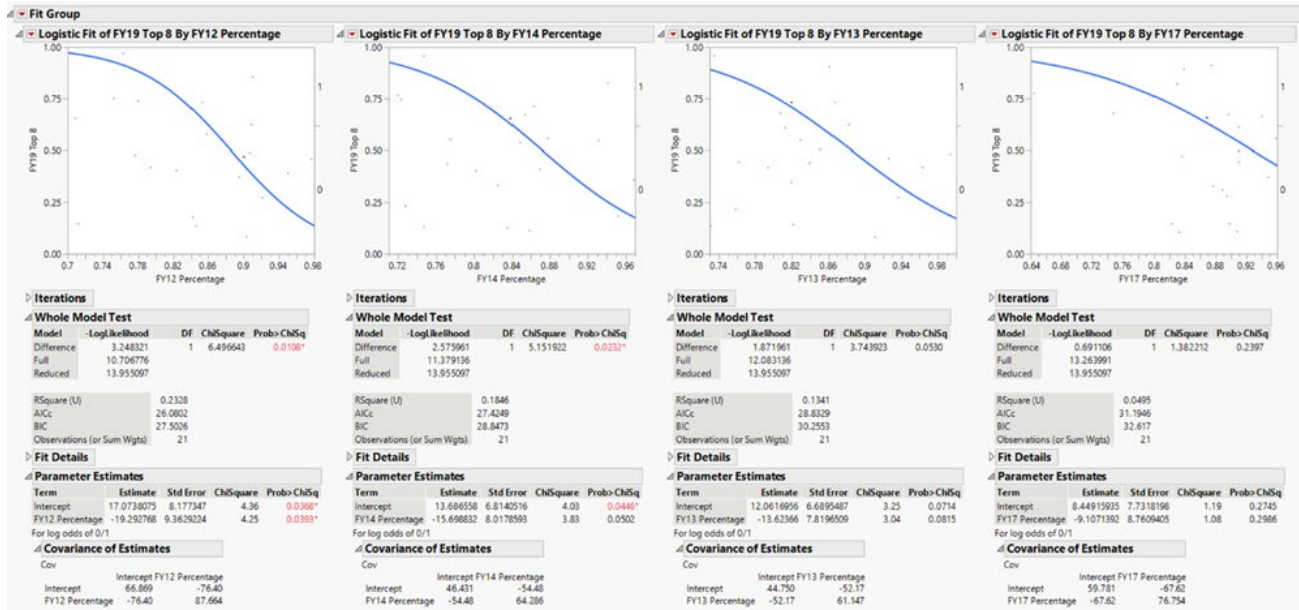


Figure 29: Logistic Fit of FY Outcomes for Top Eight Large MEPS

Models that attempted to predict the Bottom 3 and Bottom 8 performer for Large MEPS were not very impressive as shown in Figures 30 and 31. Surprisingly FY12 well did for Bottom Three performance and FY14 did well followed by FY12 for Bottom 8 performance.

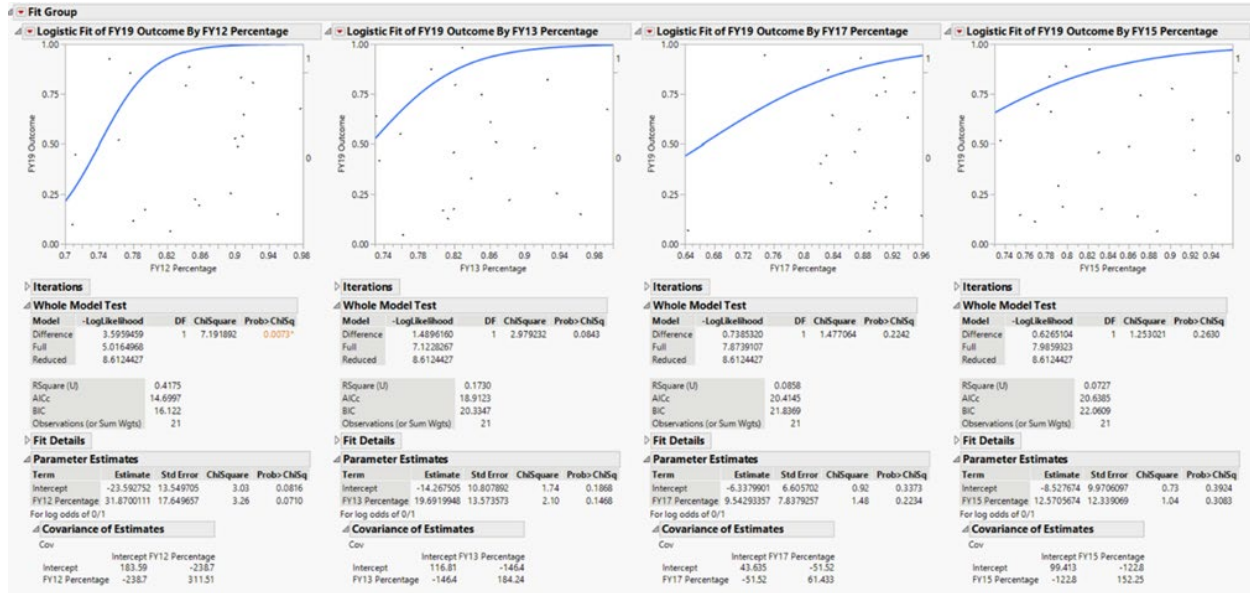


Figure 30: Logistic Fit of FY19 Outcomes for Bottom Three Large MEPS

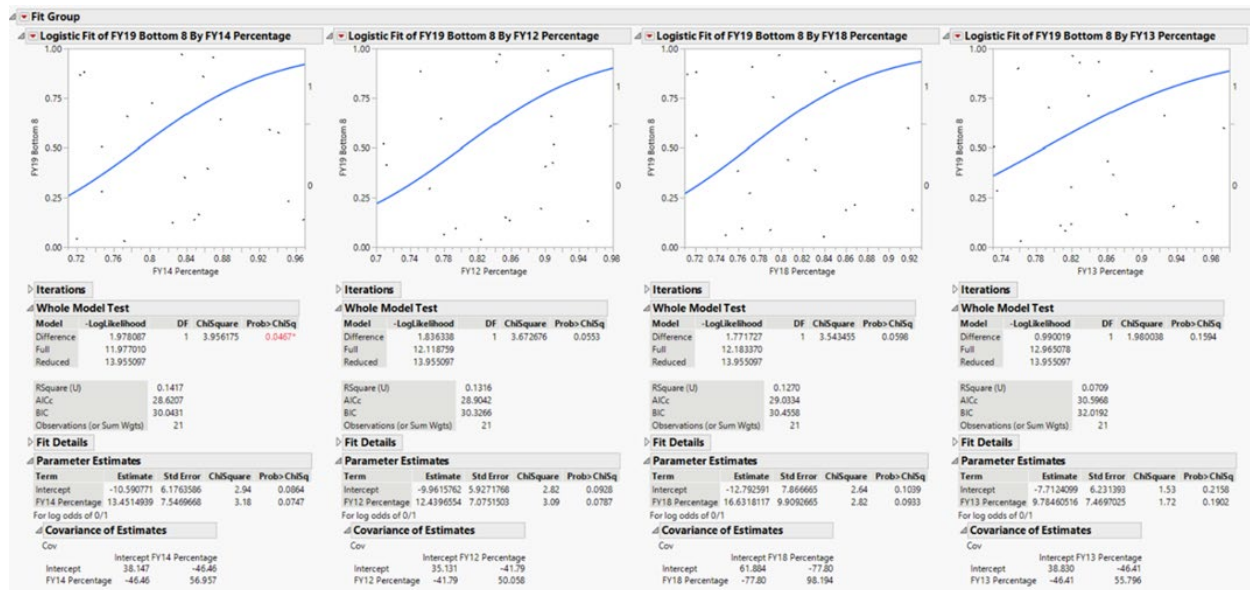


Figure 31: Logistic Fit of FY19 Outcomes for Bottom Eight Large MEPS

4.2.4 Discussion

Table 7 and Table 8 summarize the results of the models created by size category. Observations from the size category models are similar in theme to the observations in Chapter 4.2.2 but were worst in performance. Percentages from some fiscal years are significant while others are not, but there is not a clear, theoretical justification for why the results are what they are. The conclusion is that the size category models did not appreciably contribute to the analysis.

Table 7: Logistic Fit p-values for Top MEPS by Category

Logistic Fit of FY19 Outcomes Top Three Small MEPS			
FY17 (0.1419)	FY18 (0.1415)	FY14 (0.1493)	FY12 (0.2659)
Logistic Fit of FY19 Outcomes Top Eight Small MEPS			
FY12 (0.0234)	FY18 (0.2059)	FY14 (0.2110)	FY15 (0.6830)
Logistic Fit of FY19 Outcomes Top Three Medium MEPS			
FY17 (0.0473)	FY12 (0.0533)	FY15 (0.0958)	FY13 (0.5381)
Logistic Fit of FY19 Outcomes Top Eight Medium MEPS			
FY17 (0.0465)	FY12 (0.1102)	FY14 (0.4442)	FY18 (0.4556)
Logistic Fit of FY19 Outcomes Top Three Large MEPS			
FY12 (0.0165)	FY16 (0.0957)	FY15 (0.1739)	FY13 (0.1906)
Logistic Fit of FY19 Outcomes Top Eight Large MEPS			
FY12 (0.0108)	FY14 (0.0232)	FY13 (0.0530)	FY17 (0.2397)

There is no program to recognize MEPS that place in the bottom; however, identifying if MEPS consistently place at the bottom may be of interest to the USMEPCOM Commander. For models attempts to predict the bottom MEPS performers, FY17 data was important and FY18 data became more important especially for small MEPS and when attempting the Bottom 25 MEPS or for the Bottom 8 by size category.

Table 8: Logistic Fit p-values for Bottom MEPS by Category

Logistic Fit of FY19 Outcomes Bottom Three Small MEPS			
FY18 (0.0022)	FY14 (0.0199)	FY16 (0.3878)	FY17 (0.4504)
Logistic Fit of FY19 Outcomes Bottom Eight Small MEPS			
FY18 (0.0128)	FY15 (0.1101)	FY14 (0.1270)	FY12 (0.4021)
Logistic Fit of FY19 Outcomes Bottom Three Medium MEPS			
FY17 (0.0014)	FY16 (0.0598)	FY12 (0.0645)	FY13 (0.0863)
Logistic Fit of FY19 Outcomes Bottom Eight Medium MEPS			
FY12 (0.0189)	FY17 (0.0237)	FY18 (0.6275)	FY15 (0.8119)
Logistic Fit of FY19 Outcomes Bottom Three Large MEPS			
FY12 (0.0073)	FY13 (0.0843)	FY17 (0.2242)	FY15 (0.2630)
Logistic Fit of FY19 Outcomes Bottom Eight Large MEPS			
FY14 (0.0467)	FY12 (0.0553)	FY18 (0.0598)	FY13 (0.1594)

4.3 Sustained Excellence

The MOE results were reorganized to evaluate overall performance by fiscal year. Performance of MEPS are evaluated by their size category with the expectation that over time performance will “stabilize” within a band of excellence.

4.3.1 Sustained Excellence by Size Category

The Large Category had an overall average scored of 83.91% with a high score of 86.79% in FY17 and low score of 80.51% in FY18. This change from FY17 to FY18 is large compared to shifts in performance differences from other FY to FY performance. Despite this sudden change in the moving range from FY17 to FY18, overall, the performance remained within the upper and lower control lines. Performance improved from FY18 to FY19.

	Large										
	Atlanta	Baltimore	Chicago	Columbus	Dallas	Fort Jackson	Fort Lee	Houston	Jacksonville	Los Angeles	Miami
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	90.83%	90.66%	84.12%	82.41%	71.26%	90.98%	92.07%	77.67%	97.65%	84.55%	70.89%
FY13	86.68%	92.52%	75.97%	76.21%	73.19%	86.08%	85.12%	79.39%	99.37%	82.13%	83.95%
FY14	86.33%	87.71%	72.81%	77.21%	74.70%	94.11%	72.36%	80.25%	93.13%	83.53%	77.56%
FY15	85.96%	78.47%	90.14%	88.66%	78.32%	92.06%	87.01%	79.95%	95.57%	77.20%	79.14%
FY16	76.16%	86.06%	88.97%	89.84%	91.31%	87.45%	80.25%	83.79%	89.74%	95.29%	81.28%
FY17	82.91%	90.89%	89.68%	88.84%	83.22%	87.42%	94.78%	87.64%	93.90%	90.73%	83.61%
FY18	77.07%	76.03%	72.13%	83.91%	84.82%	91.75%	77.33%	79.31%	80.68%	79.82%	72.08%
FY19	91.64%	86.72%	80.45%	83.71%	66.93%	88.14%	79.18%	70.41%	95.96%	74.57%	79.72%
Average Score (%)	84.70%	86.13%	81.78%	83.85%	77.97%	89.75%	83.51%	79.80%	93.25%	83.48%	78.53%
	Montgomery	New York	Phoenix	Raleigh	Sacramento	San Antonio	San Diego	San Jose	St Louis	Tampa	Large
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	89.95%	78.03%	89.45%	90.22%	85.70%	76.39%	85.27%	79.45%	75.21%	94.98%	84.65%
FY13	81.98%	81.30%	93.60%	91.13%	80.72%	73.49%	88.19%	82.03%	82.95%	96.28%	84.39%
FY14	83.88%	71.99%	95.11%	85.79%	84.85%	74.70%	85.33%	82.51%	86.91%	96.81%	83.22%
FY15	83.14%	76.94%	92.37%	92.20%	83.42%	73.61%	79.57%	75.53%	82.19%	86.75%	83.72%
FY16	78.17%	76.19%	87.92%	87.73%	82.83%	88.59%	89.60%	90.24%	82.78%	94.38%	86.12%
FY17	86.82%	64.54%	91.05%	82.24%	90.90%	83.86%	89.60%	89.41%	74.72%	95.78%	86.79%
FY18	83.13%	74.85%	86.79%	84.11%	76.32%	82.27%	85.92%	92.20%	71.29%	78.99%	80.51%
FY19	88.73%	81.62%	81.88%	76.76%	81.40%	84.28%	84.03%	82.82%	72.79%	87.05%	81.85%
Average Score (%)	84.47%	75.68%	89.77%	86.27%	83.27%	79.65%	85.94%	84.27%	78.60%	91.38%	83.91%

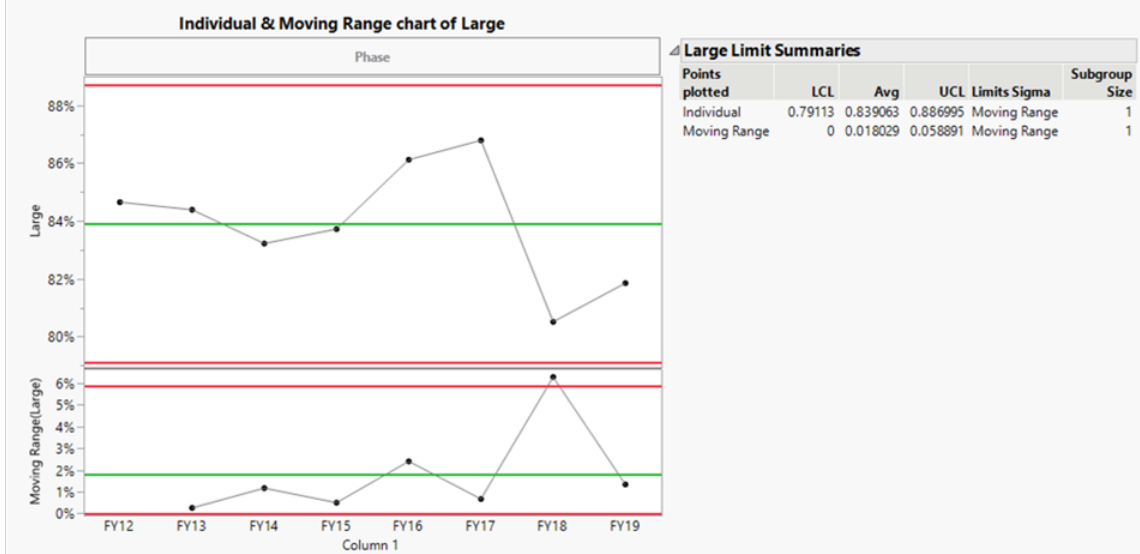


Figure 32: Large Category Performance and Control Chart

All 21 MEPS in the Large Category performed within statistical control, averaging four or five points out of eight above or below the control line. Figure 32 contains control charts for the top and bottom performing Large MEPS. Jacksonville did the best with an overall average score of 93.25% while New York did the worst with 75.68%. Jacksonville had five points above the control line and three points below with a

high score of 99.37% in FY13 and a low score of 80.68% in FY18. New York had drops in performance in FY15 and FY16 but maintained statistical control.

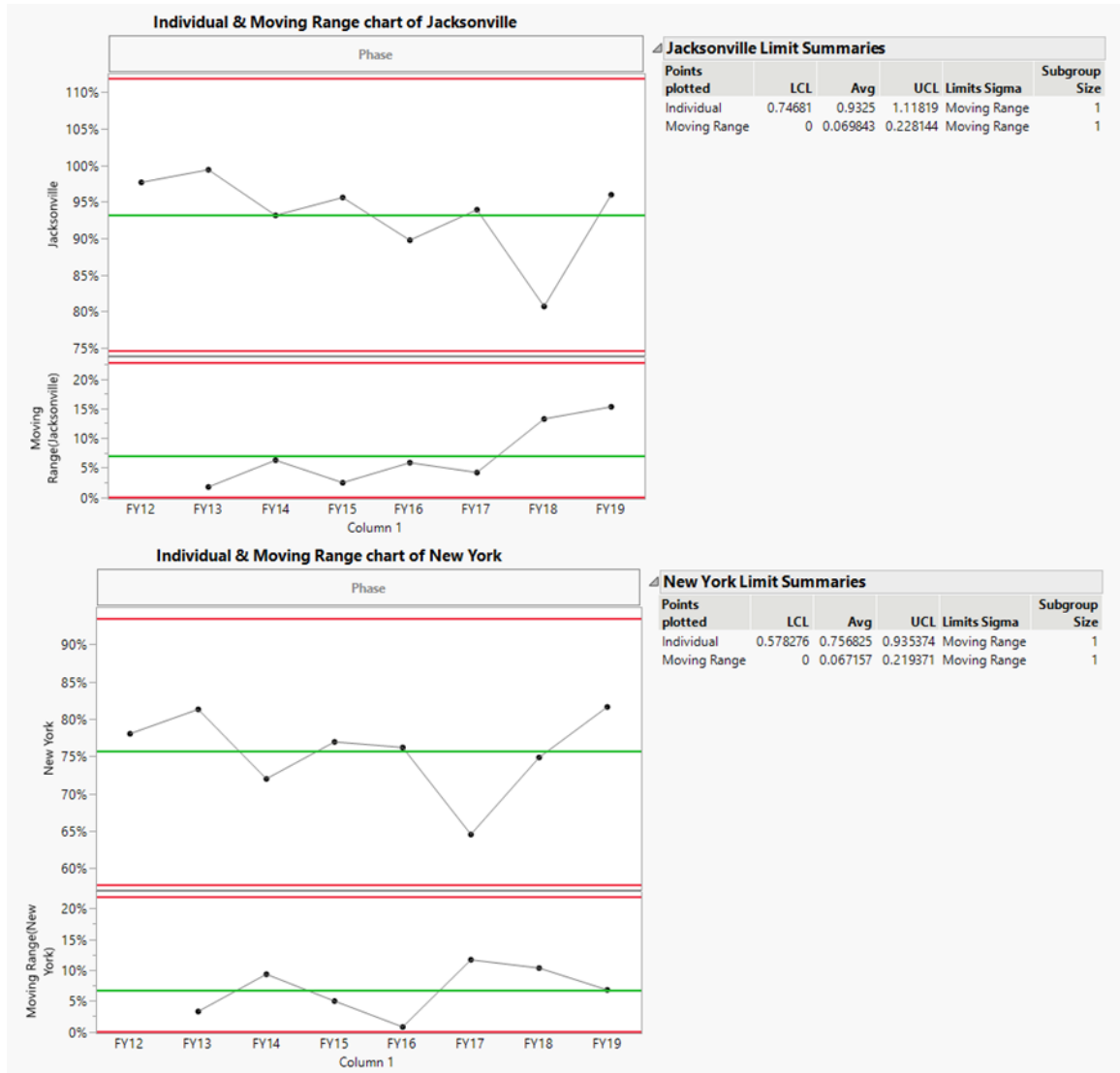


Figure 33: Jacksonville and New York Control Charts

The Medium category in Figure 33 had an overall average scored of 85.03% with a high score of 89.72% in FY17 and low score of 82.43% in FY13. As with Large MEPS, the performance is in statistical control.

	Medium											
	Boston	Charlotte	Cleveland	Denver	Detroit	Fort Dix	Harrisburg	Indianapolis	Kansas City	Knoxville	Lansing	
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	
FY12	90.02%	83.58%	89.46%	90.63%	82.54%	89.92%	90.01%	84.23%	81.30%	92.12%	85.92%	
FY13	77.54%	82.47%	83.33%	75.14%	91.57%	86.69%	72.01%	80.44%	82.51%	88.10%	89.93%	
FY14	77.76%	85.89%	91.94%	82.05%	91.66%	87.95%	75.26%	89.37%	79.16%	86.30%	92.72%	
FY15	79.94%	86.96%	94.38%	66.33%	91.98%	84.50%	85.40%	83.02%	83.56%	94.48%	96.12%	
FY16	86.59%	90.13%	93.79%	80.51%	87.54%	85.54%	91.89%	78.51%	93.27%	88.14%	91.83%	
FY17	87.10%	88.85%	92.04%	87.47%	89.93%	93.03%	91.87%	79.23%	93.59%	96.84%	92.96%	
FY18	80.74%	76.59%	86.15%	85.80%	88.68%	68.28%	83.03%	87.10%	82.89%	94.47%	90.80%	
FY19	82.21%	78.69%	78.55%	84.73%	83.59%	82.56%	83.96%	78.48%	80.08%	97.07%	83.24%	
Average Score (%)	82.74%	84.15%	88.70%	81.58%	88.43%	84.81%	84.18%	82.55%	84.54%	92.19%	90.44%	
	Louisville	Milwaukee	Minneapolis	Nashville	New Orleans	Oklahoma City	Pittsburgh	Portland OR	Salt Lake City	Seattle	Springfield	Medium
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	83.78%	88.80%	83.53%	95.18%	83.77%	88.37%	86.29%	86.58%	76.94%	76.88%	83.03%	86.04%
FY13	77.78%	82.68%	76.71%	86.91%	71.19%	83.23%	83.01%	90.22%	80.31%	89.74%	81.94%	82.43%
FY14	82.48%	86.42%	80.63%	81.73%	75.41%	82.44%	73.68%	90.32%	73.74%	77.64%	81.32%	83.00%
FY15	88.64%	86.06%	86.70%	87.34%	80.82%	82.48%	74.73%	86.61%	87.76%	75.56%	81.43%	84.76%
FY16	80.15%	87.09%	91.88%	89.20%	77.01%	94.27%	82.07%	86.10%	88.33%	76.37%	87.53%	86.72%
FY17	94.55%	94.61%	97.58%	91.08%	80.91%	91.72%	88.70%	81.81%	85.58%	85.89%	88.46%	89.72%
FY18	81.90%	85.63%	85.37%	82.08%	84.30%	88.06%	83.76%	87.66%	87.78%	86.18%	84.05%	84.60%
FY19	90.27%	81.74%	88.65%	95.08%	78.27%	81.57%	88.14%	78.76%	72.27%	79.53%	78.64%	83.00%
Average Score (%)	84.94%	86.63%	86.38%	88.57%	78.96%	86.52%	82.55%	86.01%	81.59%	80.97%	83.30%	85.03%

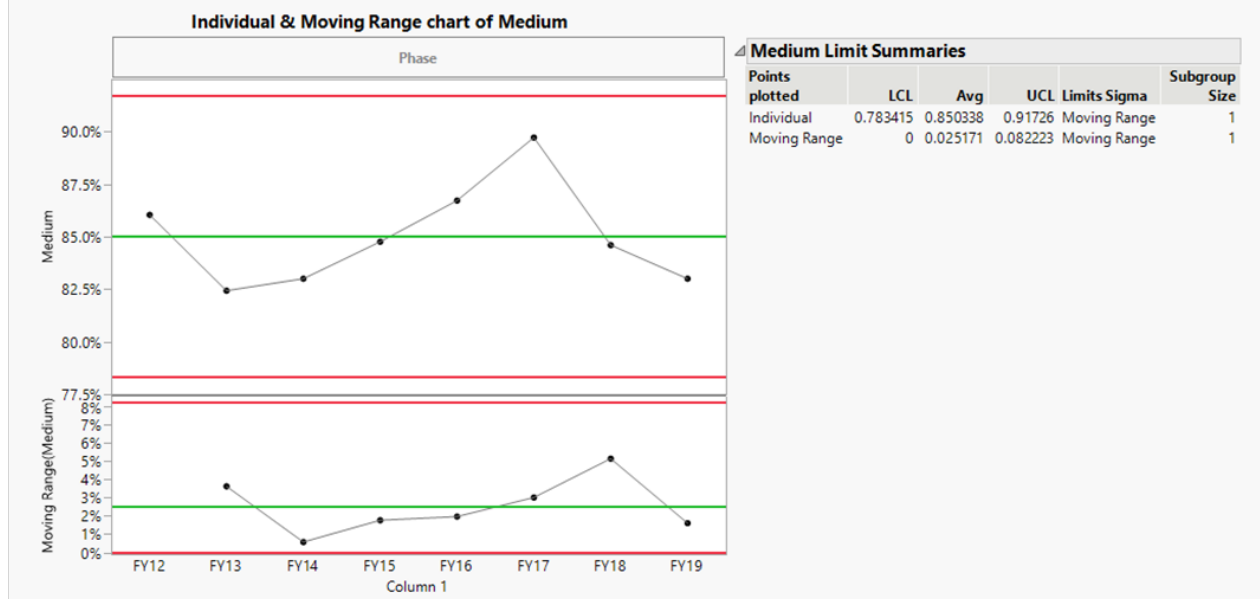


Figure 34: Medium Category Performance and Control Chart

All 22 MEPS in the Medium category perform within statistical control with most MEPS averaging four or five points out of eight above or below the control line. Fort Dix performs slightly below the Medium Category average with an overall average score of 84.81%. Fort Dix maintains statistical control despite the sudden shift from FY17 to

FY18. Kansas City is the fourth bottom performer with an overall average score of 80.08%. Despite the shift in FY17 to FY18, Kansas City did maintain statistical control of performance. Figure 34 contains control charts for Fort Dix and Kansas City.

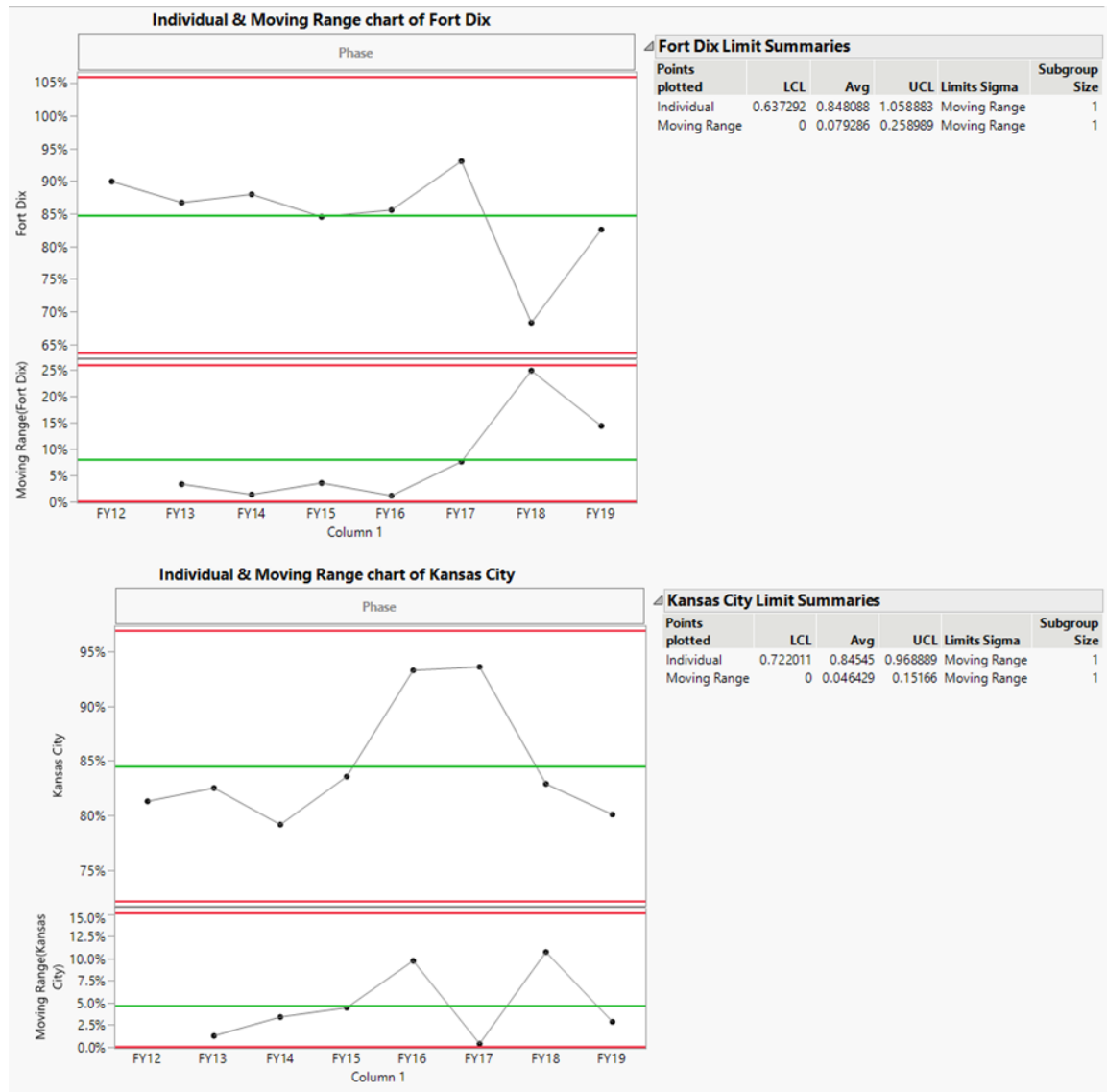


Figure 35: Fort Dix and Kansas City Control Charts

The Small category has an overall average score of 86.78%. with a high score of 91.63% in FY17 and low score of 82.71% in FY13. The control chart in Figure 35 shows

that the performance is within statistical control with four points above and below the control line.

	Small											
	Albany	Albuquerque	Amarillo	Anchorage	Beckley	Boise	Buffalo	Butte	Des Moines	El Paso	Fargo	
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	
FY12	80.81%	90.55%	91.26%	83.39%	93.22%	99.13%	71.08%	86.06%	87.11%	85.50%	82.65%	
FY13	78.31%	86.03%	84.92%	70.69%	81.72%	92.06%	70.74%	82.66%	89.78%	75.86%	78.09%	
FY14	91.80%	81.28%	86.67%	76.09%	85.13%	94.60%	78.53%	85.95%	87.51%	86.56%	87.94%	
FY15	81.05%	87.46%	85.68%	83.99%	86.61%	92.76%	91.52%	80.80%	90.40%	89.71%	92.93%	
FY16	84.03%	89.52%	92.82%	89.49%	86.94%	91.14%	78.96%	92.70%	90.59%	88.68%	89.71%	
FY17	87.39%	92.04%	96.36%	91.73%	95.57%	94.50%	83.38%	92.27%	91.61%	93.05%	90.87%	
FY18	81.29%	82.47%	97.14%	77.33%	81.43%	93.38%	85.34%	84.22%	90.55%	82.29%	93.02%	
FY19	90.91%	76.68%	94.86%	87.13%	90.05%	92.70%	88.80%	87.29%	88.11%	89.45%	87.61%	
Average Score (%)												
	84.45%	85.75%	91.21%	82.48%	87.58%	93.78%	81.04%	86.49%	89.46%	86.39%	87.85%	
	Honolulu	Jackson	Little Rock	Memphis	Omaha	Portland ME	San Juan	Shereveport	Sioux Falls	Spokane	Syracuse	Small
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	89.93%	87.18%	80.97%	86.69%	78.92%	91.17%	90.49%	79.57%	85.74%	90.35%	91.61%	86.52%
FY13	85.80%	70.78%	81.36%	82.31%	82.78%	81.89%	89.29%	86.63%	90.24%	89.50%	88.16%	82.71%
FY14	72.19%	72.54%	76.84%	87.07%	88.09%	79.10%	85.00%	87.20%	82.89%	91.97%	84.85%	84.08%
FY15	82.54%	88.47%	85.34%	76.85%	74.59%	88.29%	91.40%	89.47%	92.12%	93.76%	94.98%	87.30%
FY16	91.38%	85.55%	76.79%	85.12%	86.19%	86.03%	88.60%	86.35%	91.92%	92.26%	88.88%	87.89%
FY17	92.99%	94.14%	85.01%	82.75%	93.19%	91.97%	89.06%	96.59%	95.48%	93.57%	92.30%	91.63%
FY18	75.36%	82.42%	70.49%	87.10%	87.24%	93.45%	89.72%	89.75%	94.08%	92.44%	88.01%	86.30%
FY19	79.26%	95.44%	70.68%	94.07%	82.67%	95.87%	87.73%	83.78%	89.78%	94.27%	84.33%	87.79%
Average Score (%)												
	83.68%	84.57%	78.44%	85.24%	84.21%	88.47%	88.91%	87.42%	90.28%	92.26%	89.14%	86.78%

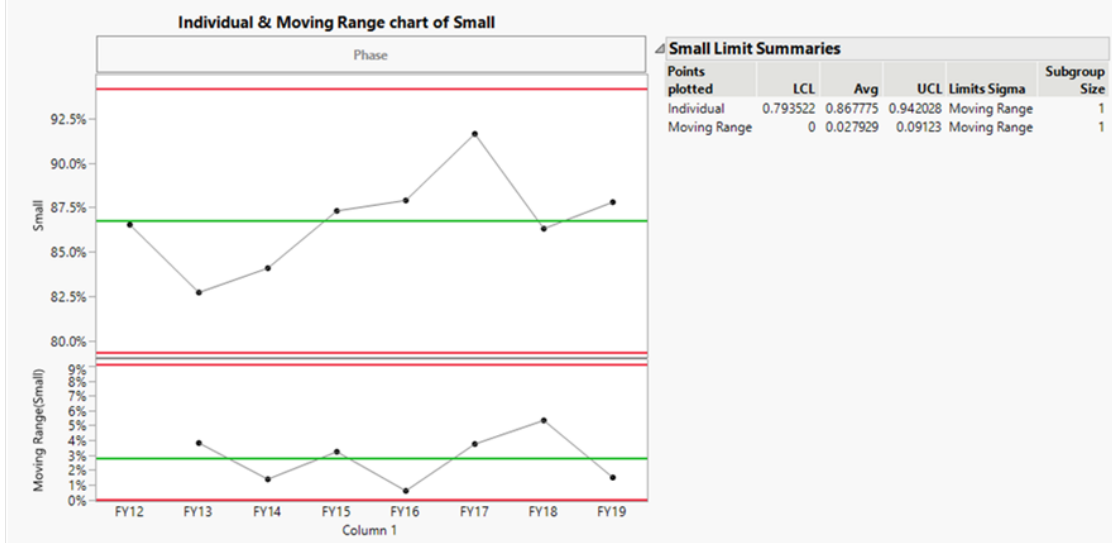


Figure 36: Small Category Performance and Control Chart

All 22 MEPS in the Small Category remain within a “band” of excellence or statistical control, with most MEPS averaging four or five points above the control line. Two MEPS, Shreveport and Syracuse have three points above the control line and five

points below. Although there are only three points above the control line, the average scores of Shreveport, 87.42% and Syracuse, 89.14% was above the overall score for Small Category, 86.78%. Shreveport had its highest score of 96.59% in FY17 and its lowest score of 79.57% in FY12. Syracuse had its highest score of 92.30% in FY17 and lowest score of 84.33% in FY19. Figure 36 contains control charts for Shreveport and Syracuse.

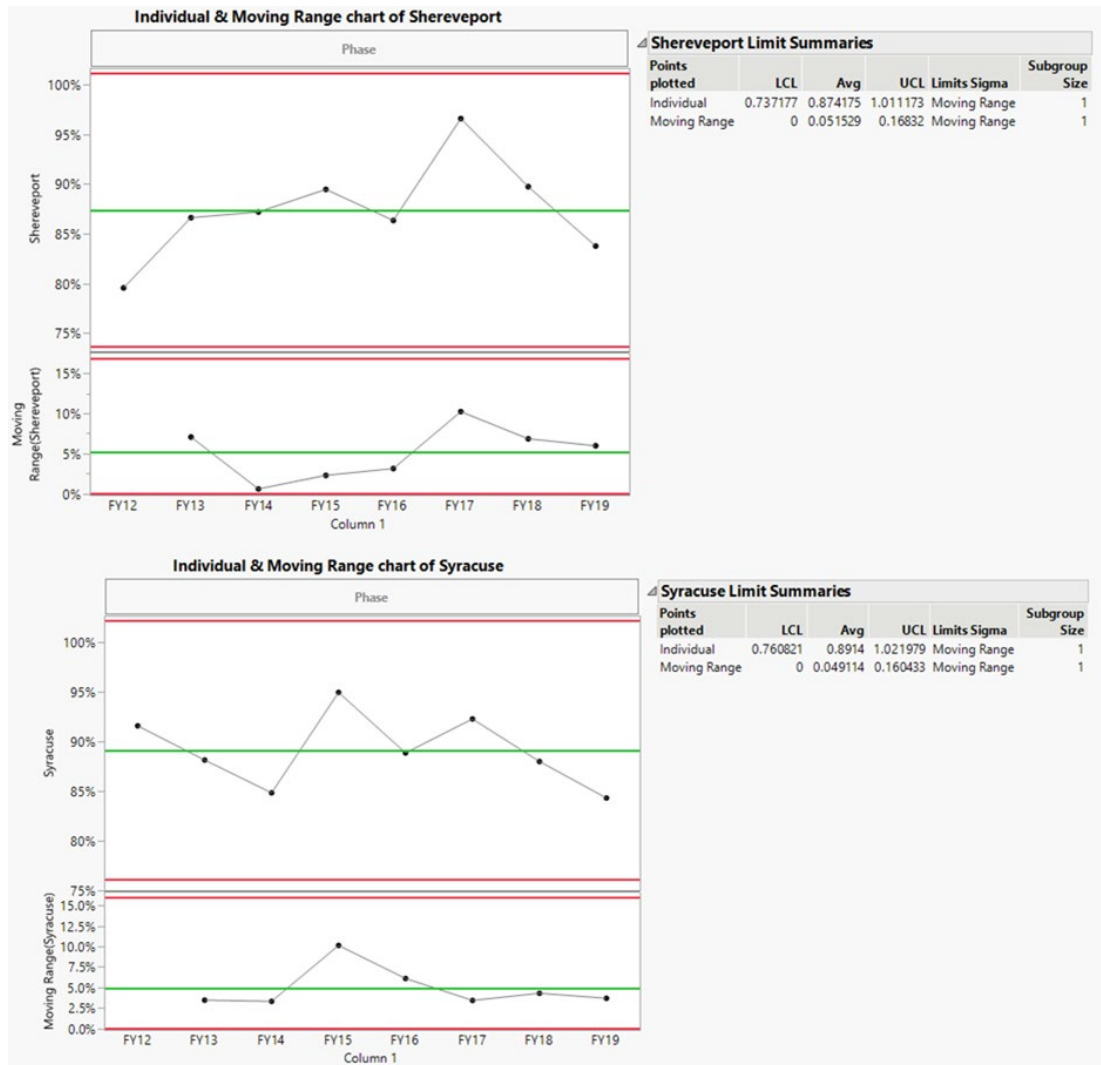


Figure 37: Shreveport and Syracuse Control Charts

4.3.2 Discussion

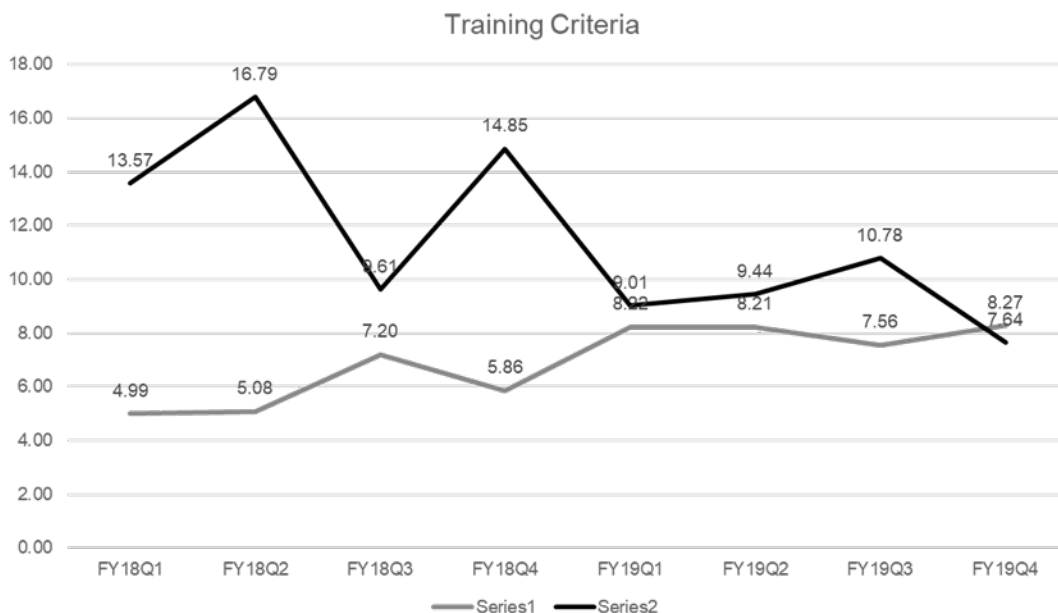
MEPS performance in all Categories remained within the upper and lower control lines. Even though overall MEPS are performing within statistical control, a few MEPS noticeable score changes. While MEPS scores did fluctuate and some MEPS are performing better or worse than others, each MEPS may be within a control “band” of performance. Each band is calculated based on each of the MEPS performance so each MEPS had different upper and lower control lines to indicate if performance was within statistical control. While MEPS performed within the control line upper and lower bounds, the moving range which shows the level of change from time point to time point did have some large changes as we saw in the overall performance of Large MEPS from FY17 to FY18. Overall performance is being sustained but there are some cases big shifts in performances from FY to FY. The implication is that the MOE program is successful over time in at least the first part of its goal of sustained excellence. There is sustained performance, although whether that performance constitutes excellence is a value judgement to be made by the USMEPCOM leadership and not by this research.

4.4 Process Improvement

The MOE data results were organized to evaluate performance over time. Performance is expected to improve after a new criterion is introduced and to stabilize over time. Check-in / Check-out criteria was introduced in FY15 and was evaluated once every fiscal year, and Training was introduced in FY18 and was evaluated every quarter.

4.4.1 Training Criteria

Training criteria to evaluate the completion of required training by employees was introduced to the MOE in FY18 and was evaluated every quarter, resulting in eight points to evaluate. Scores for each quarter ranges from 0 -10 calculated by (Total Employees – Employees failed to complete) / Total Employees. When this criterion was introduced, the variance of performance scores between each MEPS was high, 13.57 but over time the variance decreased to a value of 7.64 in FY19Q4 as can be seen in Figure 37.



Series 1: Average Performance Score

Series 2: Variance of scores

Figure 38: MEPS Overall Training Scores from FY18Q1 to FY19Q4

Most MEPS have an average score higher than their FY18Q1 score. Some MEPS did not perform well with this criterion in the last two fiscal year. St. Louis, New York and Albuquerque had overall average scores of 2.58, 2.86 and 3.12 with a variance of 11.02, 17.63 and 19.19. Each of these MEPS did score a 10 at least once so they do have the potential to get the maximum score, but they also got a few zero scores. Des Moines,

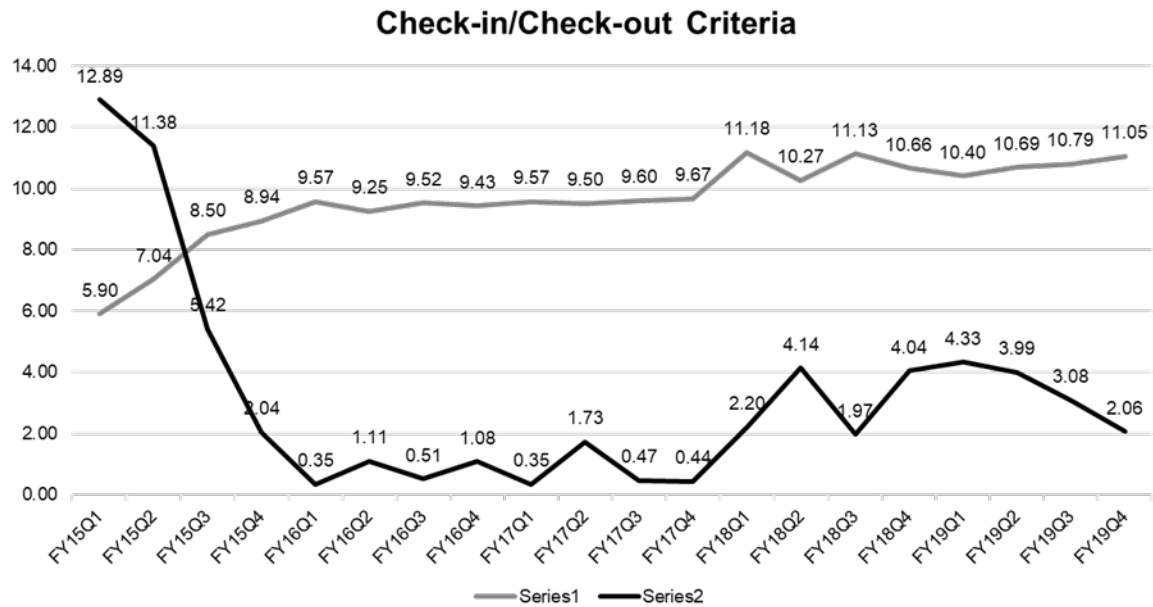
Knoxville and Amarillo got the top overall scores with 9.79, 9.62 and 9.27 with variances of 0.35, 1.15 and 2.08. Des Moines had the least variance followed by Knoxville and Fargo which had an overall score of 9.19 and variance of 1.25. The MEPS with the highest variance was Louisville, with 23.00, Baltimore with 21.69 and El Paso with 20.69. One reason for a high variance is that scoring can range from zero, if no employee completed mandatory training for that quarter, to 10 points for all employees completing training.

	Baltimore	New York	St Louis	Charlotte	Knoxville	Louisville	Albuquerque	Amarillo	Des Moines	El Paso	Fargo
FY18Q1	0.00	0.00	3.42	8.48	10.00	0.00	0.00	6.15	8.33	10.00	8.08
FY18Q2	10.00	0.00	0.00	10.00	10.00	0.00	0.00	10.00	10.00	0.00	10.00
FY18Q3	0.00	0.00	0.00	8.53	6.97	2.59	7.62	10.00	10.00	5.65	10.00
FY18Q4	0.00	0.00	0.00	8.44	10.00	10.00	7.37	10.00	10.00	0.00	10.00
FY19Q1	6.43	0.00	1.46	0.00	10.00	10.00	10.00	10.00	10.00	10.00	7.73
FY19Q2	10.00	10.00	2.86	7.06	10.00	10.00	0.00	8.00	10.00	10.00	10.00
FY19Q3	10.00	8.15	2.86	10.00	10.00	10.00	0.00	10.00	10.00	10.00	7.73
FY19Q4	4.87	4.74	10.00	10.00	10.00	10.00	0.00	10.00	10.00	10.00	10.00
Average	5.16	2.86	2.58	7.81	9.62	6.57	3.12	9.27	9.79	6.96	9.19
Variance	21.69	17.63	11.02	11.04	1.15	23.00	19.19	2.08	0.35	20.69	1.25

Figure 39: MEPS Training Performance from FY18Q1 to FY19Q4

4.4.2 Check-in / Check-out Criteria

Check-in / Check-out Criteria was introduced to the MOE in FY15 and was evaluated every quarter with scores range of 0 to 12. When this criterion was introduced, the average overall score for all 65 MEPS was 5.90 in FY15Q1 and the variance was 12.89. Over the next few quarters, the average score improved to 9.57 with a variance of 0.35 in FY16Q1. The overall score improved over time and variances did fluctuate but less than in the first three quarters from when the criteria was first introduced as indicated in Figure 39.



Series 1: Average Performance Score

Series 2: Variance of scores

Figure 40: MEPS Overall Check-In/Out Scores from FY15 to FY19

All MEPS but one has an average overall score higher than it earned the first fiscal quarter that this criterion was introduced. St. Louis has an average of 6.69 points and got 6.85 in the first quarter. This MEPS also has the lowest average points followed by Harrisburg with an average of 8.02 points and Dallas with 8.06 points. The top performing MEPS were Sioux Falls with an overall average of 10.77 and variance of 1.06, San Juan with 10.70 and 1.11, followed by Jacksonville with 10.64 and 1.09 and Detroit with 10.64 and 1.02. Baltimore had the highest variance average of 16.82 but an overall average score of 8.31. San Diego had the second highest variance with 13.79 and average score of 8.77, and third highest variance MEPS was Oklahoma with an average variance of 12.31 and average overall score of 9.07. Chicago had the lowest variance average of 0.93 and average score of 10.58. Detroit, and Spokane had the next lowest variance of 1.02 and average score of 10.64 and 10.31.

	Baltimore	Chicago	Dallas	Jacksonville	St Louis	San Diego	Detroit	Harrisburg	Okahoma City	Boise	San Juan	Sioux Falls	Spokane
FY15Q1	0.00	9.63	4.46	8.55	6.85	0.00	9.90	0.00	0.00	9.29	8.93	9.64	7.92
FY15Q2	0.00	9.97	6.82	9.97	10.00	0.00	9.89	3.99	0.00	9.87	9.82	9.81	9.88
FY15Q3	0.23	10.00	9.13	9.89	8.48	2.56	10.00	9.89	9.24	10.00	9.96	10.00	9.70
FY15Q4	3.27	9.95	9.56	9.85	8.21	7.18	9.26	6.47	9.67	9.88	9.96	10.00	9.90
FY16Q1	9.78	9.79	9.62	10.00	6.59	9.97	10.00	10.00	9.27	9.87	10.00	10.00	10.00
FY16Q2	7.18	10.00	9.68	10.00	8.76	10.00	9.96	5.34	9.72	10.00	9.95	10.00	10.00
FY16Q3	9.09	9.97	9.85	10.00	8.66	10.00	9.81	7.15	9.84	10.00	10.00	10.00	9.89
FY16Q4	9.60	10.00	9.96	10.00	8.42	9.97	9.95	6.04	9.18	9.43	10.00	10.00	10.00
FY17Q1	9.78	9.79	9.62	10.00	6.59	9.97	10.00	10.00	9.27	9.87	10.00	10.00	10.00
FY17Q2	9.82	9.97	9.52	10.00	7.14	9.93	9.95	9.61	9.72	10.00	10.00	10.00	9.90
FY17Q3	9.93	9.76	9.74	10.00	6.51	9.95	9.91	8.50	9.89	10.00	10.00	10.00	10.00
FY17Q4	9.88	9.41	9.66	9.96	5.90	10.00	10.00	9.83	9.89	10.00	10.00	10.00	10.00
FY18Q1	11.84	11.97	11.92	11.97	5.31	10.93	11.94	10.20	4.98	10.88	12.00	12.00	11.52
FY18Q2	11.48	11.94	9.51	11.70	4.65	6.99	12.00	7.59	9.18	12.00	12.00	12.00	10.41
FY18Q3	6.83	10.70	9.43	11.57	5.38	8.66	12.00	11.87	11.93	12.00	11.96	12.00	11.09
FY18Q4	11.67	11.94	3.12	11.88	5.31	12.00	12.00	10.80	11.70	11.55	12.00	12.00	9.00
FY19Q1	11.52	11.85	3.72	11.61	4.14	11.64	12.00	5.43	12.00	9.15	12.00	12.00	11.43
FY19Q2	11.40	11.88	3.93	11.85	5.07	11.64	11.88	7.02	12.00	11.79	12.00	12.00	12.00
FY19Q3	11.13	11.76	5.94	12.00	5.91	12.00	11.85	9.18	12.00	12.00	12.00	12.00	11.73
FY19Q4	11.73	11.37	6.06	12.00	5.82	11.97	10.59	11.52	12.00	12.00	11.34	12.00	11.73
Average	8.31	10.58	8.06	10.64	6.69	8.77	10.64	8.02	9.07	10.48	10.70	10.77	10.31
Variance	16.82	0.93	6.70	1.09	2.56	13.79	1.02	8.47	12.31	1.02	1.11	1.06	1.02

Figure 41: MEPS Overall Check-In/Out Performance from FY15Q1 to FY19Q4

4.4.3 Discussion

Looking at Training and Check-in/Check-out criteria over time, the observation is that scores improve over time and the variance across the Command generally decreases over time. These are consistent with what one might expect of an improving organization. Considering variance, one might expect that, for a new scoring criterion, there to be a wide range of scores earned by the 65 MEPS. Generally high-performing units may score highly but lower-performing units would be expected to score lower. This phenomenon would be observed in higher variance across the MEPS. However, as time passes, the lower-performing MEPS would adapt to the new criterion and raise their scores, thus reducing the variance of scores across the Command. Performance for Check-in/Check-out improved more than Training but there were 16 more fiscal quarters of data available. It's very likely that the Training criteria will follow the same trend as Check-in/Check-out.

4.5 Summary

Performance overall scores between the MEPS are close at the top and bottom. Overall performance scores for MEPS at the top and bottom were separated by only a few percentage points but there is a trend of MEPS to place over others. A small group of MEPS like Jacksonville, Phoenix, Tampa, Knoxville, Lansing and Amarillo had four or more Top 3 placements and no placements in the Bottom 3. Also, for the unofficial Bottom 3, a subgroup of MEPS (New Orleans, Buffalo, and Little Rock) had 3 or more placements and no placements in the Top 3. When applying control charts to MEPS performance scores, the scores are in statistical control. Each MEPS has a different control line, as the control line is based on their individual performance. Two criteria that were introduced in FY15 and FY18 were analyzed to see if performance in newly-incorporated metrics follows an observable pattern. In both cases, the scores exhibited the same behavior of increasing average scores and decreasing variance over time suggesting that the MOE was effective in process improvement of new incorporated criteria

V. Conclusions and Recommendations

The USMEPCOM Commander's tool in evaluating mission objectives and MEPS performance within the command is the MOE. MOE quantitative data was examined to see its relation to recognition and motivation, performance and improvement. The following were examined in this study: Distribution of MOE awards over time across the Command, habitual overperformance or underperformance by any MEPS, and Year-to-year progression in MOE scores for newly-incorporated MOE metrics. The intent is to gain relevant insights to the MOE's program objectives.

5.1 Conclusions on Recognition and Motivation

A challenge of interest to leadership at the battalion level is understanding the MEPS that are awarded through the MOE for placing in the Top 3 for their size category. It was also explored in the study MEPS that would place in the Bottom 3. Differences in performance scores for placing in the Top 3 or Bottom 3 are small, but there are large differences in being able to place in the top three. Eleven out of the twenty-one MEPS in the Large category placed in the top three at least once while nine MEPS have placed in the bottom.

The same pattern is observed in Medium and Small MEPS. Out of 22 MEPS in the Medium Category, 11 MEPS had at least one top three placements, and 12 MEPS had at least one bottom three placement. Thirteen of the twenty-two MEPS in the Small Category from FY12 to FY19 have placed at least once in the top three and eleven MEPS placed in the bottom three at least once.

In general, the observation is that there are two classes of MEPS, one that is consistently among the finalists for being a top finisher and one that is not. Logistic regression models that tried to predict FY19 Outcomes based on previous year performance were largely unsuccessful. This is likely due to the relatively small subgroup of MEPS that consistently perform at the top or bottom for the models to make predictions on. It could be reasoned that a nontrivial number of MEPS might reasonably believe, year in and year out, that their prospects of earning an MOE award are minimal. A small subset of MEPS habitually earning MOE recognition may be an indicator of sustained excellence and may indicate that the MOE's awards program is a source of motivation. For the subset of MEPS performing at a consistently lower level of performance compared to other MEPS, the lack of recognition may have the opposite motivational effect.

5.2 Conclusions on Sustained Excellence

Examining performance scores over time from the sector, battalion, and MEPS level, it can be concluded that MOE scores fluctuate a lot initially, but over time the differences reduce and stay largely consistent, with all analyzed units remaining within statistical control. Each MEPS had their performance values average out to different scores. As identified when looking at recognition and motivation, there are a subset of MEPS at the top and bottom with scores in those subsets close to each other. This sustained consistency may or may not be deemed *excellence*; that is a judgment to be made by the USMEPCOM leadership. The MOE does recognize a MEPS having quarterly performance scores of 90% or greater, very few MEPS achieve this.

5.3 Conclusions on Process Improvement

Based on the two criteria evaluated, the MOE appears to be an effective tool in raising standards of performance across USMEPCOM. Both criteria, Training (introduced in FY18) and Check-in / Check-out (introduced in FY15) exhibited similar behavior, with scores improving and differences of scores between the MEPS decreasing in the first eight fiscal quarters of the metric's use.

5.4 Recommendations

It is possible that some MEPS may have a systemic advantage over others in the MOE scoring due to the volume of applicants processed, staffing, facilities or other factors not completely within the control of MEPS leaders and should be investigated on a MEPS-by-MEPS basis. Augmented information such as climate surveys, worker performance reports and the civilian awards program could be utilized for further insights that could provide better insights into why some of the MEPS appear to overperform or underperform. Target lower-performing MEPS for targeted data collection to identify root causes of systematic underperformance as a systemic advantage perceived or factual would jeopardize the MOE's effectiveness as a motivator. Examine recognizing MEPS on a Unit-based awards system versus size-based as this may control possible subtle advantages or disadvantages due to geography. An Improvement Award category to recognize and reward lower-performing units may help those MEPS to improve their performance scores.

While MEPS have remained within statistical control, the control line for each MEPS is based on the performance of each individual MEPS. Findings from applying

control charts to MEPS performance scores helped to reinforce the analysis that MEPS are performing at a certain level over time. It may be of benefit to the command to establish a performance target for their MEPS and then examine if MEPS are reaching that target. While the definition of *excellence* has been formally established through the Unit Pennant threshold there has been no definition for what constitutes *acceptable but not excellent* performance.

APPENDIX A. MEPS OF EXCELLENCE FINAL RESULTS 4th QTR FY19

MEPS of EXCELLENCE 4th QTR FY19 Final Results																				
		Check-In / Check-Out	Test Loss Compromise	Total Student Tested	Drug Specimen Processing	HIV Sample Processing	CLIP	Accuracy of Fee-Basis Provider Work Hour Data	Citibank CBA	Citibank IBA	Timeliness of Awards	Timeliness of Evals	Supervisors Training	ATAAPS	Training	Total Possible Points	Total Points Earned	Percentage	Rank	
1	Atlanta	11.01	10	N/A	10.00	10.00	N/A	10.00	10	10	5	5	5	8	10	107.0	104.01	97.206%	2	
2	Baltimore	11.73	10	N/A	10.00	10.00	N/A	10.00	10	5	N/A	5	5	8	4.87	102.0	89.60	87.843%	8	
3	Chicago	11.37	10	N/A	8.94	5.04	N/A	10.00	10	5	N/A	N/A	5	8	0	97.0	73.35	75.619%	18	
4	Columbus	10.77	10	N/A	4.64	10.00	N/A	10.00	10	10	N/A	N/A	5	8	10	97.0	88.41	91.144%	5	
5	Dallas	6.06	0	N/A	10.00	0.00	N/A	10.00	5	5	N/A	5	5	10	7.96	102.0	64.02	62.765%	21	
6	Fort Jackson	11.22	10	N/A	10.00	0.00	N/A	10.00	5	10	5	N/A	5	8	10	102.0	84.22	82.569%	13	
7	Fort Lee	8.94	10	N/A	10.00	5.81	N/A	10.00	10	10	5	N/A	0	8	8.61	102.0	86.36	84.667%	12	
8	Houston	11.61	10	N/A	0.00	0.00	N/A	10.00	10	10	0	N/A	5	6	7.56	102.0	70.17	68.794%	20	
9	Jacksonville	12	10	N/A	10.00	10.00	N/A	10.00	10	10	5	5	5	8	10	107.0	105.00	98.131%	1	
10	Los Angeles	11.67	10	N/A	10.00	0.00	N/A	10.00	10	5	0	N/A	0	8	9.12	102.0	73.79	72.343%	19	
11	Miami	11.70	10	N/A	10.00	10.00	N/A	8.56	10	10	N/A	5	5	8	6.05	102.0	94.31	92.461%	4	
12	Montgomery	11.37	10	N/A	10.00	5.60	N/A	10.00	10	10	N/A	5	5	10	10	102.0	96.97	95.069%	3	
13	New York	11.73	10	N/A	10.00	10.00	N/A	10.00	10	10	0	N/A	5	8	4.74	102.0	89.47	87.716%	9	
14	Phoenix	11.73	10	N/A	10.00	1.66	N/A	10.00	10	5	5	N/A	0	10	10	102.0	83.39	81.755%	15	
15	Raleigh	9.45	10	N/A	10.00	10.00	N/A	10.00	10	5	N/A	N/A	0	8	10	97.0	82.45	85.000%	11	
16	Sacramento	9.99	10	N/A	10.00	10.00	N/A	10.00	10	5	5	5	0	10	8.53	107.0	93.52	87.402%	10	
17	San Antonio	11.52	10	N/A	10.00	10.00	N/A	10.00	10	10	5	5	5	2	5.56	107.0	94.08	87.925%	7	
18	San Diego	11.97	10	N/A	10.00	10.00	N/A	9.13	10	10	0	N/A	0	8	0	102.0	79.10	77.549%	17	
19	San Jose	11.94	10	N/A	8.86	10.00	N/A	10.00	10	5	N/A	N/A	0	6	6.67	97.0	78.47	80.897%	16	
20	St Louis	5.82	10	N/A	8.93	4.99	N/A	10.00	10	10	N/A	5	5	4	10	102.0	83.74	82.098%	14	
21	Tampa	11.91	10	N/A	10.00	6.27	N/A	10.00	10	5	5	5	5	8	8.84	107.0	95.02	88.804%	6	
22	Boston	11.85	10	N/A	10.00	10.00	N/A	10.00	10	10	5	N/A	5	4	8.53	102.0	94.38	92.529%	5	
23	Charlotte	11.91	10	N/A	10.00	10.00	N/A	10.00	10	5	5	5	5	6	10	107.0	97.91	91.505%	6	
24	Cleveland	9.03	5	N/A	10.00	0.00	N/A	8.13	10	5	5	N/A	0	10	5.83	102.0	67.99	66.657%	21	
25	Denver	12	10	N/A	10.00	10.00	N/A	5.74	10	10	N/A	5	0	8	10	102.0	90.74	88.961%	11	
26	Detroit	10.59	10	N/A	10.00	2.80	N/A	10.00	10	10	N/A	N/A	5	10	10	97.0	88.39	91.124%	8	
27	Fort Dix	11.22	10	N/A	10.00	10.00	N/A	10.00	5	10	N/A	5	0	10	10	102.0	91.22	89.431%	10	
28	Harrisburg	11.52	10	N/A	10.00	4.60	N/A	10.00	5	10	0	5	5	10	8.53	107.0	89.65	83.785%	14	
29	Indianapolis	11.79	10	N/A	10.00	0.00	N/A	10.00	0	10	5	N/A	0	2	7.22	102.0	66.01	64.716%	22	
30	Kansas City	10.44	0	N/A	10.00	10.00	N/A	10.00	10	5	N/A	5	0	10	10	102.0	80.44	78.863%	18	
31	Knoxville	11.28	10	N/A	10.00	0.00	N/A	10.00	10	10	N/A	5	5	10	10	102.0	91.28	89.490%	9	
32	Lansing	12	10	N/A	10.00	10.00	N/A	10.00	10	5	5	N/A	5	6	10	102.0	93.00	91.176%	7	
33	Louisville	12	10	N/A	10.00	10.00	N/A	10.00	10	5	5	5	5	10	10	107.0	102.00	95.327%	2	
34	Milwaukee	12	10	N/A	10.00	10.00	N/A	10.00	10	5	5	N/A	5	6	5.59	102.0	88.59	86.853%	13	
35	Minneapolis	11.82	10	N/A	10.00	10.00	N/A	10.00	10	10	5	5	5	4	10	107.0	100.82	94.224%	3	
36	Nashville	9.57	10	N/A	10.00	10.00	N/A	10.00	10	10	N/A	5.00	0	6	10.00	102.0	90.57	88.794%	12	
37	New Orleans	9.36	10	N/A	10.00	3.51	N/A	8.39	5	5	N/A	5	5	8	4.83	102.0	74.09	72.637%	20	
38	Oklahoma City	12	10	N/A	10.00	4.10	N/A	10.00	10	10	N/A	N/A	5	10	10	97.0	91.10	93.918%	4	
39	Pittsburgh	9.99	10	N/A	10.00	10.00	N/A	10.00	10	10	N/A	N/A	5	10	10	97.0	94.99	97.928%	1	
40	Portland OR	11.1	10	N/A	10.00	0.00	N/A	10.00	10	5	N/A	N/A	5	10	8.44	97.0	79.54	82.000%	15	
41	Salt Lake City	12	10	N/A	10.00	0.00	N/A	10.00	10	10	N/A	N/A	0	8	5	97.0	75.00	77.320%	19	
42	Seattle	10.56	10	N/A	10.00	1.67	N/A	10.00	10	10	N/A	N/A	0	8	7.22	97.0	77.45	79.845%	17	
43	Springfield	12	10	N/A	10.00	10.00	N/A	10.00	10	5	N/A	N/A	0	6	5.45	97.0	78.45	80.876%	16	
44	Albany	11.52	10	N/A	10.00	10.00	N/A	10.00	5	10	5	5	5	8	10	107.0	99.52	93.009%	10	
45	Albuquerque	10.95	10	N/A	10.00	0.00	N/A	10.00	10	10	5	N/A	5	8	0	102.0	78.95	77.402%	19	
46	Amarillo	12	10	N/A	10.00	10.00	N/A	10.00	10	5	N/A	N/A	5	10	10	97.0	92.00	94.845%	8	
47	Anchorage	8.46	10	N/A	10.00	10.00	N/A	10.00	10	10	N/A	N/A	0	10	10	97.0	88.46	91.196%	11	
48	Beckley	5.94	10	N/A	10.00	10.00	N/A	10.00	5	10	N/A	5	5	10	10	102.0	90.94	89.157%	14	
49	Boise	12	10	N/A	10.00	10.00	N/A	10.00	10	10	N/A	N/A	5	10	10	97.0	97.00	100.000%	1	
50	Buffalo	12	10	N/A	10.00	10.00	N/A	10.00	10	5	5	N/A	5	10	8	102.0	95.00	93.137%	9	
51	Butte	10.41	10	N/A	10.00	0.00	N/A	10.00	5	10	5	N/A	0	8	10	102.0	78.41	76.873%	20	
52	Des Moines	12	10	N/A	10.00	0.00	N/A	10.00	10	10	3.33	N/A	5	8	10	102.0	88.33	86.598%	17	
53	El Paso	10.62	10	N/A	10.00	10.00	N/A	10.00	5	10	N/A	5	5	0	10	102.0	85.62	83.941%	18	
54	Fargo	12	10	N/A	10.00	10.00	N/A	10.00	10	10	N/A	5	5	10	10	102.0	102.00	100.000%	1	
55	Honolulu	12	10	N/A	10.00	10.00	N/A	10.00	10	5	N/A	5	0	6	0	102.0	78.00	76.471%	21	
56	Jackson	12	10	N/A	10.00	10.00	N/A	10.00	10	10	5	N/A	5	10	10	102.0	102.00	100.000%	1	
57	Little Rock	10.83	10	N/A	10.00	0.00	N/A	10.00	10	10	0	5	0	4	4.44	107.0	74.27	69.411%	22	
58	Memphis	11.88	10	N/A	10.00	10.00	N/A	10.00	10	10	5	N/A	5	8	10	102.0	99.88	97.922%	5	
59	Omaha	11.49	0	N/A	10.00	10.00	N/A	10.00	10	10	N/A	5.00	5	8	10.00	102.0	89.49	87.735%	15	
60	Portland ME	12	10	N/A	10.00	0.00	N/A	10.00	10	10	5	5	5	10	10	107.0	97.00	90.654%	12	
61	San Juan	11.34	10	N/A	10.00	10.00	N/A	7.50	10	10	5	5	5	10	10	107.0	103.84	97.047%	7	
62	Shreveport	12	10	N/A	10.00	10.00	N/A	10.00	5	10	N/A	5	5	2	10	102.0	89.00	87.255%	16	
63	Sioux Falls	12.00	10	N/A	10.00	10.00	N/A	10.00	10	10	N/A	N/A	5	10	10.00	97.0	97.00	100.000%	1	
64	Spokane	11.73	10	N/A	10.00	10.00	N/A	10.00	10	10	5	N/A	5	8	10	102.0	99.73	97.775%	6	
65	Syracuse	11.76	10	N/A	6.83	10.00	N/A	10.00	10	5	5	N/A	5	8	10	102.0	91.59	89.794%	13	
Totals		718.47	615.00	0.00	628.20	446.05	0.00	637.45	590.00	540.00	133.33	150.00	225.00	510.00	537.59	6620.00	5731.09	86.572%		
POC Correction J-5 CORRECTION																				

Blue: Large MEPS | Red: Medium MEPS | Black: Small MEPS

APPENDIX B. MEPS PLACE AND OVERALL SCORES FROM FY12 TO FY19

Small Category MEPS

	Small										
	Albany	Albuquerque	Amarillo	Anchorage	Beckley	Boise	Buffalo	Butte	Des Moines	El Paso	Fargo
	Place	Place	Place	Place	Place	Place	Place	Place	Place	Place	Place
FY12	19	6	4	16	2	1	22	12	11	14	17
FY13	16	8	10	22	14	1	21	12	3	19	17
FY14	3	16	8	20	11	1	18	10	6	9	5
FY15	19	13	15	17	14	4	6	20	8	9	3
FY16	20	9	1	10	14	6	21	2	7	12	8
FY17	19	13	2	15	3	5	21	12	16	9	17
FY18	19	15	1	20	18	4	13	14	7	17	5
FY19	7	21	3	16	8	6	11	15	12	10	14
Total 1st, 2nd, and 3rd place from FY12 to FY19	1	0	4	0	2	3	0	1	1	0	1
Total 22nd, 21st, and 20th place from FY12 to FY19	1	1	0	3	0	0	4	1	0	0	0
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	80.81%	90.55%	91.26%	83.39%	93.22%	99.13%	71.08%	86.06%	87.11%	85.50%	82.65%
FY13	78.31%	86.03%	84.92%	70.69%	81.72%	92.06%	70.74%	82.66%	89.78%	75.86%	78.09%
FY14	91.80%	81.28%	86.67%	76.09%	85.13%	94.60%	78.53%	85.95%	87.51%	86.56%	87.94%
FY15	81.05%	87.46%	85.68%	83.99%	86.61%	92.76%	91.52%	80.80%	90.40%	89.71%	92.93%
FY16	84.03%	89.52%	92.82%	89.49%	86.94%	91.14%	78.96%	92.70%	90.59%	88.68%	89.71%
FY17	87.39%	92.04%	96.36%	91.73%	95.57%	94.50%	83.38%	92.27%	91.61%	93.05%	90.87%
FY18	81.29%	82.47%	97.14%	77.33%	81.43%	93.38%	85.34%	84.22%	90.55%	82.29%	93.02%
FY19	90.91%	76.68%	94.86%	87.13%	90.05%	92.70%	88.80%	87.29%	88.11%	89.45%	87.61%
Average Score (%)	84.45%	85.75%	91.21%	82.48%	87.58%	93.78%	81.04%	86.49%	89.46%	86.39%	87.85%
	Honolulu	Jackson	Little Rock	Memphis	Omaha	Portland ME	San Juan	Shereveport	Sioux Falls	Spokane	Syracuse
	Place	Place	Place	Place	Place	Place	Place	Place	Place	Place	Place
FY12	9	10	18	10	21	5	7	20	13	8	3
FY13	9	20	15	15	11	13	5	7	2	4	6
FY14	22	21	19	8	4	17	12	7	14	2	13
FY15	18	11	16	21	22	12	7	10	5	2	1
FY16	5	18	22	19	16	17	13	15	4	3	11
FY17	10	6	20	22	8	14	18	1	4	7	11
FY18	21	16	22	12	11	3	9	8	2	6	10
FY19	20	2	22	5	19	1	13	18	9	4	17
Total 1st, 2nd, and 3rd place from FY12 to FY19	0	1	0	0	0	2	0	1	2	3	2
Total 22nd, 21st, and 20th place from FY12 to FY19	3	2	4	2	2	0	0	1	0	0	0
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	89.93%	87.18%	80.97%	86.69%	78.92%	91.17%	90.49%	79.57%	85.74%	90.35%	91.61%
FY13	85.80%	70.78%	81.36%	82.31%	82.78%	81.89%	89.29%	86.63%	90.24%	89.50%	88.16%
FY14	72.19%	72.54%	76.84%	87.07%	88.09%	79.10%	85.00%	87.20%	82.89%	91.97%	84.85%
FY15	82.54%	88.47%	85.34%	76.85%	74.59%	88.29%	91.40%	89.47%	92.12%	93.76%	94.98%
FY16	91.38%	85.55%	76.79%	85.12%	86.19%	86.03%	88.60%	86.35%	91.92%	92.26%	88.88%
FY17	92.99%	94.14%	85.01%	82.75%	93.19%	91.97%	89.06%	96.59%	95.48%	93.57%	92.30%
FY18	75.36%	82.42%	70.49%	87.10%	87.24%	93.45%	89.72%	89.75%	94.08%	92.44%	88.01%
FY19	79.26%	95.44%	70.68%	94.07%	82.67%	95.87%	87.73%	83.78%	89.78%	94.27%	84.33%
Average Score (%)	83.68%	84.57%	78.44%	85.24%	84.21%	88.47%	88.91%	87.42%	90.28%	92.26%	89.14%

Medium Category MEPS

	Medium										
	Boston Place	Charlotte Place	Cleveland Place	Denver Place	Detroit Place	Fort Dix Place	Harrisburg Place	Indianapolis Place	Kansas City Place	Knoxville Place	Lansing Place
FY12	5	16	7	4	19	6	7	14	15	2	13
FY13	19	14	10	21	1	7	21	17	10	5	3
FY14	17	11	3	13	4	7	16	6	14	10	2
FY15	18	9	3	22	4	14	13	12	9	2	1
FY16	14	7	2	18	11	16	4	20	3	10	6
FY17	17	13	8	16	12	6	9	22	5	2	7
FY18	20	21	9	10	3	22	16	7	17	1	2
FY19	11	17	19	6	8	10	7	20	14	1	9
Total 1st, 2nd, and 3rd place from FY12 to FY19	0	0	3	0	2	0	0	0	1	5	4
Total 22nd, 21st, and 20th place from FY12 to FY19	1	1	0	2	0	1	1	3	0	0	0
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	90.02%	83.58%	89.46%	90.63%	82.54%	89.92%	90.01%	84.23%	81.30%	92.12%	85.92%
FY13	77.54%	82.47%	83.33%	75.14%	91.57%	86.69%	72.01%	80.44%	82.51%	88.10%	89.93%
FY14	77.76%	85.89%	91.94%	82.05%	91.66%	87.95%	75.26%	89.37%	79.16%	86.30%	92.72%
FY15	79.94%	86.96%	94.38%	66.33%	91.98%	84.50%	85.40%	83.02%	83.56%	94.48%	96.12%
FY16	86.59%	90.13%	93.79%	80.51%	87.54%	85.54%	91.89%	78.51%	93.27%	88.14%	91.83%
FY17	87.10%	88.85%	92.04%	87.47%	89.93%	93.03%	91.87%	79.23%	93.59%	96.84%	92.96%
FY18	80.74%	76.59%	86.15%	85.80%	88.68%	68.28%	83.03%	87.10%	82.89%	94.47%	90.80%
FY19	82.21%	78.69%	78.55%	84.73%	83.59%	82.56%	83.96%	78.48%	80.08%	97.07%	83.24%
Average Score (%)	82.74%	84.15%	88.70%	81.58%	88.43%	84.81%	84.18%	82.55%	84.54%	92.19%	90.44%
	Louisville Place	Milwaukee Place	Minneapolis Place	Nashville Place	New Orleans Place	Okahoma City Place	Pittsburgh Place	Portland OR Place	Salt Lake City Place	Seattle Place	Springfield Place
FY12	15	8	17	1	15	9	12	11	20	21	18
FY13	18	13	20	6	22	11	12	2	18	4	16
FY14	15	9	16	14	20	12	22	5	21	18	15
FY15	6	12	10	8	17	15	21	11	7	20	16
FY16	19	13	5	8	21	1	17	15	9	22	12
FY17	4	3	1	11	21	10	14	20	19	18	15
FY18	19	11	12	18	13	4	15	6	5	8	14
FY19	3	12	4	2	21	13	5	16	22	15	18
Total 1st, 2nd, and 3rd place from FY12 to FY19	1	1	1	2	0	1	0	1	0	0	0
Total 22nd, 21st, and 20th place from FY12 to FY19	0	0	1	0	5	0	2	1	3	3	0
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	83.78%	88.80%	83.53%	95.18%	83.77%	88.37%	86.29%	86.58%	76.94%	76.88%	83.03%
FY13	77.78%	82.68%	76.71%	86.91%	71.19%	83.23%	83.01%	90.22%	80.31%	89.74%	81.94%
FY14	82.48%	86.42%	80.63%	81.73%	75.41%	82.44%	73.68%	90.32%	73.74%	77.64%	81.32%
FY15	88.64%	86.06%	86.70%	87.34%	80.82%	82.48%	74.73%	86.61%	87.76%	75.56%	81.43%
FY16	80.15%	87.09%	91.88%	89.20%	77.01%	94.27%	82.07%	86.10%	88.33%	76.37%	87.53%
FY17	94.55%	94.61%	97.58%	91.08%	80.91%	91.72%	88.70%	81.81%	85.58%	85.89%	88.46%
FY18	81.90%	85.63%	85.37%	82.08%	84.30%	88.06%	83.76%	87.66%	87.78%	86.18%	84.05%
FY19	90.27%	81.74%	88.65%	95.08%	78.27%	81.57%	88.14%	78.76%	72.27%	79.53%	78.64%
Average Score (%)	84.94%	86.63%	86.38%	88.57%	78.96%	86.52%	82.55%	86.01%	81.59%	80.97%	83.30%

Large Category MEPS

	Large										
	Atlanta	Baltimore	Chicago	Columbus	Dallas	Fort Jackson	Fort Lee	Houston	Jacksonville	Los Angeles	Miami
	Place	Place	Place	Place	Place	Place	Place	Place	Place	Place	Place
FY12	4	5	13	14	21	3	3	18	1	12	22
FY13	7	4	18	17	20	8	8	16	1	11	9
FY14	6	4	19	15	17	1	20	13	3	11	19
FY15	8	16	5	5	17	4	6	14	1	18	19
FY16	21	13	8	5	3	12	18	14	6	1	17
FY17	18	6	8	11	17	13	2	12	3	7	16
FY18	15	17	19	7	5	2	14	12	10	11	20
FY19	2	6	14	9	21	4	16	20	1	18	15
Total 1st, 2nd, and 3rd place from FY12 to FY19	1	0	0	0	1	3	2	0	6	1	0
Total 22nd, 21st, and 20th place from FY12 to FY19	1	0	0	0	3	0	1	1	0	0	2
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)
FY12	90.83%	90.66%	84.12%	82.41%	71.26%	90.98%	92.07%	77.67%	97.65%	84.55%	70.89%
FY13	86.68%	92.52%	75.97%	76.21%	73.19%	86.08%	85.12%	79.39%	99.37%	82.13%	83.95%
FY14	86.33%	87.71%	72.81%	77.21%	74.70%	94.11%	72.36%	80.25%	93.13%	83.53%	77.56%
FY15	85.96%	78.47%	90.14%	88.66%	78.32%	92.06%	87.01%	79.95%	95.57%	77.20%	79.14%
FY16	76.16%	86.06%	88.97%	89.84%	91.31%	87.45%	80.25%	83.79%	89.74%	95.29%	81.28%
FY17	82.91%	90.89%	89.68%	88.84%	83.22%	87.42%	94.78%	87.64%	93.90%	90.73%	83.61%
FY18	77.07%	76.03%	72.13%	83.91%	84.82%	91.75%	77.33%	79.31%	80.68%	79.82%	72.08%
FY19	91.64%	86.72%	80.45%	83.71%	66.93%	88.14%	79.18%	70.41%	95.96%	74.57%	79.72%
Average Score (%)	84.70%	86.13%	81.78%	83.85%	77.97%	89.75%	83.51%	79.80%	93.25%	83.48%	78.53%
	Montgomery	New York	Phoenix	Raleigh	Sacramento	San Antonio	San Diego	San Jose	St Louis	Tampa	
	Place	Place	Place	Place	Place	Place	Place	Place	Place	Place	
FY12	8	17	9	6	10	19	11	16	20	2	
FY13	13	14	3	5	15	19	6	12	9	2	
FY14	10	21	2	7	9	18	8	12	5	1	
FY15	11	19	2	3	10	21	15	20	13	7	
FY16	19	20	10	11	15	9	7	4	16	2	
FY17	14	21	4	19	5	15	9	10	20	1	
FY18	8	18	3	6	16	9	4	1	21	13	
FY19	3	12	11	17	13	7	8	10	19	5	
Total 1st, 2nd, and 3rd place from FY12 to FY19	1	0	4	1	0	0	0	1	0	5	
Total 22nd, 21st, and 20th place from FY12 to FY19	0	3	0	0	0	1	0	1	3	0	
	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	Score(%)	
FY12	89.95%	78.03%	89.45%	90.22%	85.70%	76.39%	85.27%	79.45%	75.21%	94.98%	
FY13	81.98%	81.30%	93.60%	91.13%	80.72%	73.49%	88.19%	82.03%	82.95%	96.28%	
FY14	83.88%	71.99%	95.11%	85.79%	84.85%	74.70%	85.33%	82.51%	86.91%	96.81%	
FY15	83.14%	76.94%	92.37%	92.20%	83.42%	73.61%	79.57%	75.53%	82.19%	86.75%	
FY16	78.17%	76.19%	87.92%	87.73%	82.83%	88.59%	89.60%	90.24%	82.78%	94.38%	
FY17	86.82%	64.54%	91.05%	82.24%	90.90%	83.86%	89.60%	89.41%	74.72%	95.78%	
FY18	83.13%	74.85%	86.79%	84.11%	76.32%	82.27%	85.92%	92.20%	71.29%	78.99%	
FY19	88.73%	81.62%	81.88%	76.76%	81.40%	84.28%	84.03%	82.82%	72.79%	87.05%	
Average Score (%)	84.47%	75.68%	89.77%	86.27%	83.27%	79.65%	85.94%	84.27%	78.60%	91.38%	

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14. ABSTRACT The Military Entrance Processing Station (MEPS) of Excellence Program (MOE) is a program to improve operations through recognition and motivation and to sustain excellence in MEPS's core services of medical, testing, processing and mission readiness. Quantitative MOE program data was studied using a hybrid approach of descriptive statistics, statistical process control, and logistic regression to gain relevant insights with respect to the program objectives of improvement, excellence, motivation, and recognition. Results indicate that performance at the Sector and Battalion levels largely falls within the bounds of statistical control; performance in newly-incorporated MOE metrics follows a predictable pattern, indicating that the program is an effective tool for process improvement; and a relatively small gap in raw performance can translate to a MEPS that either habitually wins MOE recognition or one that habitually falls short. Concerns that some MEPS have a systemic advantage over others in the MOE scoring due to the volume of applicants processed or other factors not completely within the control of MEPS leaders should be investigated on a case-by-case basis.					
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