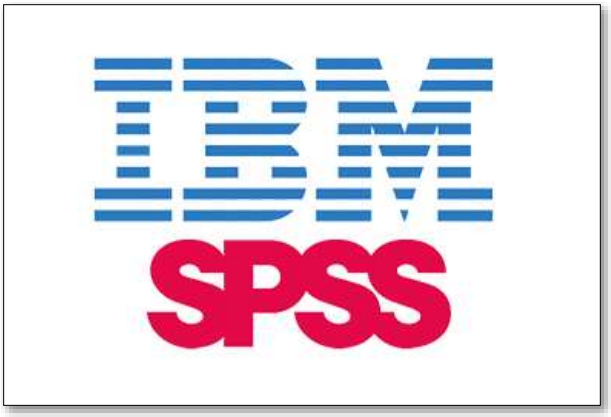
I.T. POST - IMPLEMENTATION BENEFITS AUDIT

OF THE

STATISTICS DEPARTMENT:

STATISTICAL PACKAGE FOR SOCIAL SCIENCES



Office of the Auditor General

March 2023

STATISTICAL PACKAGE FOR SOCIAL SCIENCES

This is a report of an Information Technology Post-Implementation Benefits audit conducted by the Office of the Auditor General.

Auditor-General
Office of the Auditor General
20 March 2023

TABLE OF CONTENTS


OFFICE OF THE AUDITOR GENERAL
MONTSERRAT

ABBREVIATIONS

CARICOM	Caribbean Community
CSO	Central Statistics Office
GoM	Government of Montserrat
IBM	International Business Machines
OAG	Office of the Auditor General
SDM	Statistics Department Montserrat
SPSS	Statistical Package for Social Sciences
WGITA-IDI	Working Group on IT Audit - INTOSAI Development Initiative

PREAMBLE

Vision Statement

"To be a proactive Supreme Audit Institution that helps the nation make good use of its resources."

Mission Statement

"The O.A.G is the national authority on public sector auditing issues and is focused on assessing performance and promoting accountability, transparency and improved stewardship in managing public resources by conducting independent and objective reviews of the accounts and operations of central government and statutory agencies; providing advice; and submitting timely Reports to Accounting Officers and the Legislative Assembly."

The Goal

"To promote staff development, enhance productivity, and maintain a high standard of auditing and accounting in the public sector, thereby contributing to the general efficiency and effectiveness of public finance management."

AUDITOR GENERAL'S OVERVIEW

As technology advances, the Government of Montserrat's Ministries, Departments and agencies have become increasingly dependent on computerized information systems to carry out their operations to process, maintain, and report essential information. In 1998, the Statistical Package for Social Sciences was acquired to facilitate and to expedite the processing of the collated raw data and the generation of the Statistical reports.

Our review revealed that the Statistics Department has benefitted significantly from the implementation of this software. Over the years, the software has been upgraded to reflect the changing requirements of the Department. The software is also used along with other types of software to perform various statistical tasks.

I wish to thank the management and the staff of the SDM for the courtesies extended to my staff during the audit.

Marsha V.E. Meade
Auditor-General (Ag)
20 March 2023

EXECUTIVE SUMMARY

Overview

1. In 1997, the Central Statistical Office (CSO) collaborated with the Department for International Development (DFID) [now known as the Foreign, Commonwealth & Development Office (FCDO)] on a population-count project. One of the issues that the CSO encountered, at the time, was the lack of data-processing software that could manipulate and analyse the collected census and/or survey data. Therefore, it was customary for the Statistics Department to seek assistance from overseas entities with the processing and analysis of the data, which would take several months, and, in some instances, years to complete.

2. The SPSS software was highly recommended by the former DFID to facilitate and expedite the processing and analysis of collated raw data, and the generation of the Statistical reports, within a few months of the census or survey exercises.

Observations and Findings

3. **Features.** The SPSS software is a very comprehensive, user-friendly, statistics processing tool, which enables the raw census and survey data to be manipulated and analysed. The windows contain highly visible Graphical User Interface (GUI) icons, such as contained and action buttons; navigation tabs; text fields for data input; simple drop-down menus and dialogue boxes for selection; error notification and informational messages. The software is compatible with Operating Systems such as Microsoft Windows, Macintosh, and Linux; and with data management programmes. The statistical data can therefore be imported to SPSS from other statistical analysis programmes, and in various files formats.

4. **Good governance.** Although all levels of the SDM's staff are trained to use the SPSS software, only five senior Statisticians actually use the SPSS software for analysing, validating, and cleaning of the quantitative data collated from census and survey interviews, questionnaires, and observations.

5. **Infrequent use of the SPSS software to conduct in-house departmental censuses and surveys**. The SPSS was at one time the sole statistical analysis tool at the Statistics Department for performing exploratory analysis, cleaning, and final analysis of statistical data. However, in recent times, the software was used infrequently, and, in the past decade, it was applied three times for in-house censuses and surveys performed by the SDM, which were: the 2011 *Population Housing Census*, the 2018 *Labour Force Census,* and the 2020 *Labour Force Survey*.

6. **Collaborations with external entities.** From time to time, the SDM collaborates with other governmental Ministries/Departments to provide support with the analysis and cleaning of the quantitative survey data; and to ensure that the results are accurate, and of high quality. The Statistics Department has teamed up on surveys with the Ministry of Finance, the Ministry of Health, and most recently the Ministry of Agriculture, Lands, Housing, and Environment (MALHE). Notably, the SDM is currently providing ongoing support to the Ministry of Communication, Works, Labour and Energy (MCWLE). The SDM has also worked closely with external organisations and individuals in 'one-off' projects; for example: the Office of the Opposition, the Montserrat National Trust, and assisting a local college student.

Audit Conclusion

7. The Office of the Auditor General has determined that the proprietary open source SPSS is very comprehensive, well-designed and user-friendly. The software has been successfully used by the organisation for two decades to manipulate, clean, and analyse Montserrat's raw statistical data; and to achieve the Statistics Department's work objectives as outlined in *CAP 6.02 Statistics Act* of 2013.

CHAPTER 1 INTRODUCTION

Background

1.1 The Statistics Department Montserrat (SDM) uses several statistical management and analysis software packages, to collect, process, compile, analyse, interpret, and to disseminate statistical data for use by local, regional and international organisations; that is data, census, and survey requests. The SDM has been utilising the Statistical Package for Social Sciences (SPSS) for two decades to manipulate, clean, and analyse Monserrat's social-science data.

Management Responsibility

1.2 Management is responsible for ensuring that the SDM's Statistical Package for Social Sciences (SPSS) project objectives were achieved. More specifically, management is to ensure that the project's outputs are advantageous to the users and beneficiaries of the SPSS.

Auditor's Responsibility

1.3 Our responsibility is to independently express a conclusion on the Post-Implementation Benefits of the SPSS, based on our audit. Our work was conducted in accordance with International Standards of Supreme Audit Institutions (ISSAI) 100 and International Standard on Assurance Engagements (ISAE) 3000. These principles require that we comply with ethical requirements and plan and perform the audit in order to obtain reasonable assurance about whether tried and true policies, plans, procedures, and internal controls exist and are functioning effectively; proper records have been, and are being, kept; and all the necessary information and explanations for the purpose of our audit have been obtained.

Audit Mandate

1.4 The Office of the Auditor General (OAG) is mandated through the Montserrat Constitution Order, 2010, to perform audits in the public sector. This mandate is supported by International Standards of Supreme Audit Institutions (ISSAI) 1, 200, 300, 400, and strengthened by the Public Finance (Management and Accountability) Act (PFMAA),

2008, and the Public Finance (Management and Accountability) Regulations (PFMAR), 2009.

Audit Standards and Guidelines

1.5 The standards and guidelines used to assess the SPSS web-based software included the use of International Standards of Supreme Audit Institutions (ISSAI) 3000, 4000, 5300, and the WGITA-IDI Handbook.

Audit Objectives

1.6 The aims of this Post-Implementation Benefits review were to:

- determine if the implementation of the SPSS software met the Statistical Department of Montserrat's work objectives.
- establish if any changes were made to the SPSS software since it was initially implemented.
- establish if there are any plans for future enhancements to the SPSS software.

Audit Scope and Methodology

1.7 The study covered the period 1997 to 2021, and focused on the examination of the Post-Implementation Benefits of the SPSS software. The Auditor monitored the audit in the field and may have amended any area of the audit scope in consultation with the Auditor General, so as to maximise the efficiency of the audit.

1.8 A combination of techniques was utilised to gather information and to validate the beneficial achievements for implementing the SPSS. These included, but were not limited to, interviewing the key stakeholders at SDM; inspection of documents; and observation of the software in order to gather in-depth information about the SPSS.

1.9 The findings of this study were discussed with the Chief Statistician, and senior Statisticians who are the main users of the SPSS software. Their views were taken into consideration when finalising the report.

CHAPTER 2 STATISTICS DEPARTMENT MONTSERRAT

3.1 [1,2]The Statistics Department Montserrat (SDM), formerly the Central Statistics Office (CSO), was established circa 1960's/1970's. It is Montserrat's national statistical office that processes and disseminates statistical data to be used by the Public and Private sectors of Montserrat, and also regional and international organisations. The department works as a team to produce timely, reliable, and relevant official statistics that are internationally comparable.

3.2 The department is empowered by the *CAP 6.02 Statistics Act* of 2013, to perform undertakings, such as:

- taking censuses in Montserrat;
- collecting, compiling, analysing, abstracting and publishing statistical information relating to the social, agricultural, mining, commercial, industrial, economic and general activities and conditions of the inhabitants of Montserrat;
- collaborating with other departments of the Government of Montserrat in the collection, compilation, analysis and publication of statistical records of administrations and departments; and
- generally organising a coordinated scheme of social and economic statistics relating to Montserrat.

3.1 The SDM utilises various types of software to perform the above tasks, including the Statistical Package for Social Sciences (SPSS).

[1] *https://www.gov.ms/government/ministries/ministry-of-finance-economic-management/statistics-department/*

[2] *Chapter 6.02 Statistics Act and Subsidiary Legislation Revised Edition showing the law as at 1 January, 2013.*

CHAPTER 3 STATISTICAL PACKAGE FOR SOCIAL SCIENCES

Project Summary

3.1 In 1997, the Central Statistical Office (CSO) collaborated with the Department for International Development (DFID) [now known as the Foreign, Commonwealth & Development Office (FCDO)] on a population count project. One of the issues that the CSO encountered at the time, was the lack of data processing software that could manipulate and analyse the collected census and/or survey data. Therefore, it was customary for the Statistics Department to seek the assistance from overseas entities with the processing and analysis of the data, which would take several months, and, in some instances, years to complete.

3.2 The SPSS software is a very popular commercial statistical package that was launched by SPSS Inc. in 1968, before being acquired by IBM Corporation in 2009. It performs highly complex data manipulation and analysis, to generate tabulated reports, charts and plots of distributions and trends, descriptive statistics, and conduct complex statistical analyses. Therefore, the software was highly recommended by DFID to facilitate and to expedite the processing of the collated raw data and the generation of the Statistical reports, within a few months of the census or survey exercises.

Project Schedule and Deliverables

3.3 The version 7.5 or 8 of the SPSS software was implemented during the height of the volcanic crisis, and when there was mass migration overseas by Montserrat's population, including a considerable number of the Statistics Department's staff. Consequently, the former Head Statistician was the sole user of the SPSS software for a number of years, until the Department began to re-establish its contingent of staff. She was also responsible for training the new recruits to use the software.

Project Cost

3.4 It was reported that the DFID acquired the necessary user-licences for the software for Montserrat and other British Overseas Territories, and has been responsible for the payment of annual fees and/or any other related charges. Therefore, the SDM has never made payments towards the software, since it was fully implemented circa 1997 or 1998.

Observations

3.5 [3,4]The SPSS software is a very comprehensive, user-friendly, statistical processing tool, which enables the raw census and survey data to be speedily manipulated, cleaned and analysed. The windows contain highly visible Graphical User Interface (GUI) icons, such as contained and action buttons; navigation tabs; text fields for data input; simple drop-down menus and dialogue boxes for selection; error-messages and dialogue boxes (*shown below in Figure I*) that alert users of any inconsistencies, and prompt them to review, to insert, and/or to correct the quantitative data.

Figure I – Dialogue Box

3.6 The software is compatible with Operating Systems such as Microsoft Windows, Macintosh, and Linux. It is also compatible with other data-management programmes; therefore, statistical data can be imported to SPSS from other statistical analysis programmes and in various file formats. For example:

- Microsoft Excel spreadsheet (**.xls, *.xlsx, *.xlsm*), or other spreadsheets from OpenOffice
- Plain Text (**.txt, *.dat, *.csv*)
- Relational Database (SQL)
- STATA (Statistical Data)
- SAS (Statistical Analysis System)

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[3] *https://medium.com/@writingneed/spss-statistics-is-a-software-package-used-for-logical-batched-and-non-batched-statistical-54a77e6f9eac*

[4] *https://scholar.valpo.edu/cgi/viewcontent.cgi?article=1000&context=psych_oer*

3.7 [5,6]This statistical analytic tool is composed of three main windows for the creation of data-files, analysis of the data, and viewing of the results of the analysed data as follows:

(a) **Data Editor Window:** The Data Editor is the main window that displays the contents of an active data file, and is similar to a Spreadsheet with rows and columns, in which the user can type in the data or enter from a stored file.

- **Data View** - Contains the actual data in columns that represent variables, and in rows that represent cases (observations); for example:
  - **Columns:** gender, educ, bdate, jobcat
  - **Rows**: Female, 07/26/1929, 12, Clerical

- **Variable View** - Each row is a variable and each column is an attribute that is associated with that variable. Variables represent the different types of collected data; that is, the response to each question of a census or survey, such as numbers, strings, currency, and dates; for example:
  - **Columns:** Name, Type, Width, Label
  - **Rows:** Salary, Dollar, 8, Current Salary

  Census or survey data can be entered manually into SPSS either in Data View, or imported from external data files (as shown below on *page 7*).

(b) **Syntax Editor Window:** SPSS procedures and analyses can be run from this window by writing instructions in the SPSS Syntax control language, as some SPSS routines are available only through Syntax. Specific analyses can also be saved as a Syntax file for later use.

(c) **Output (or Variable) Viewer Window:** This window displays statistical data, resulting from variables chosen in the Frequencies dialogue box, or specified by Syntax command language. The results from running a statistical procedure are displayed in the Output Viewer Window, as either tables, charts, or texts. The frequency tables automatically indicate which variables need to be reviewed.

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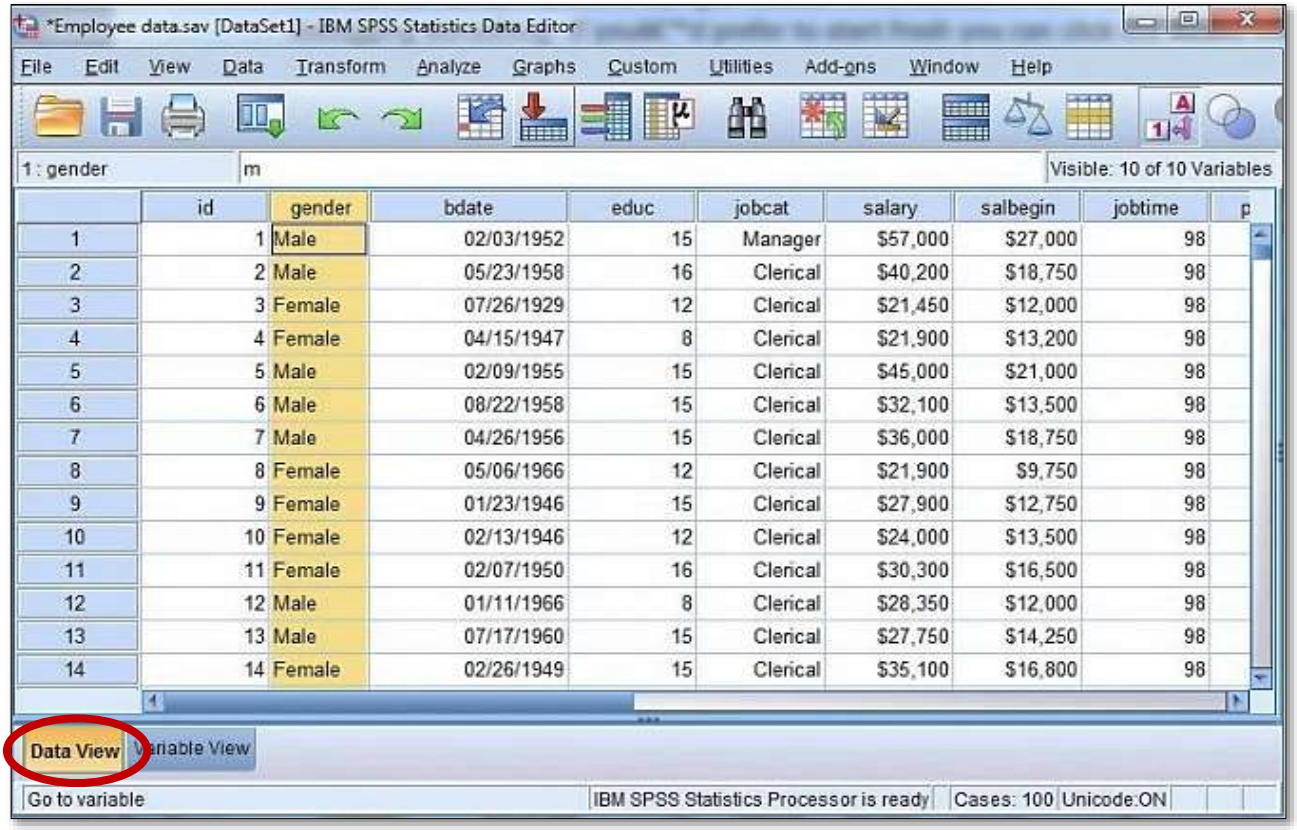
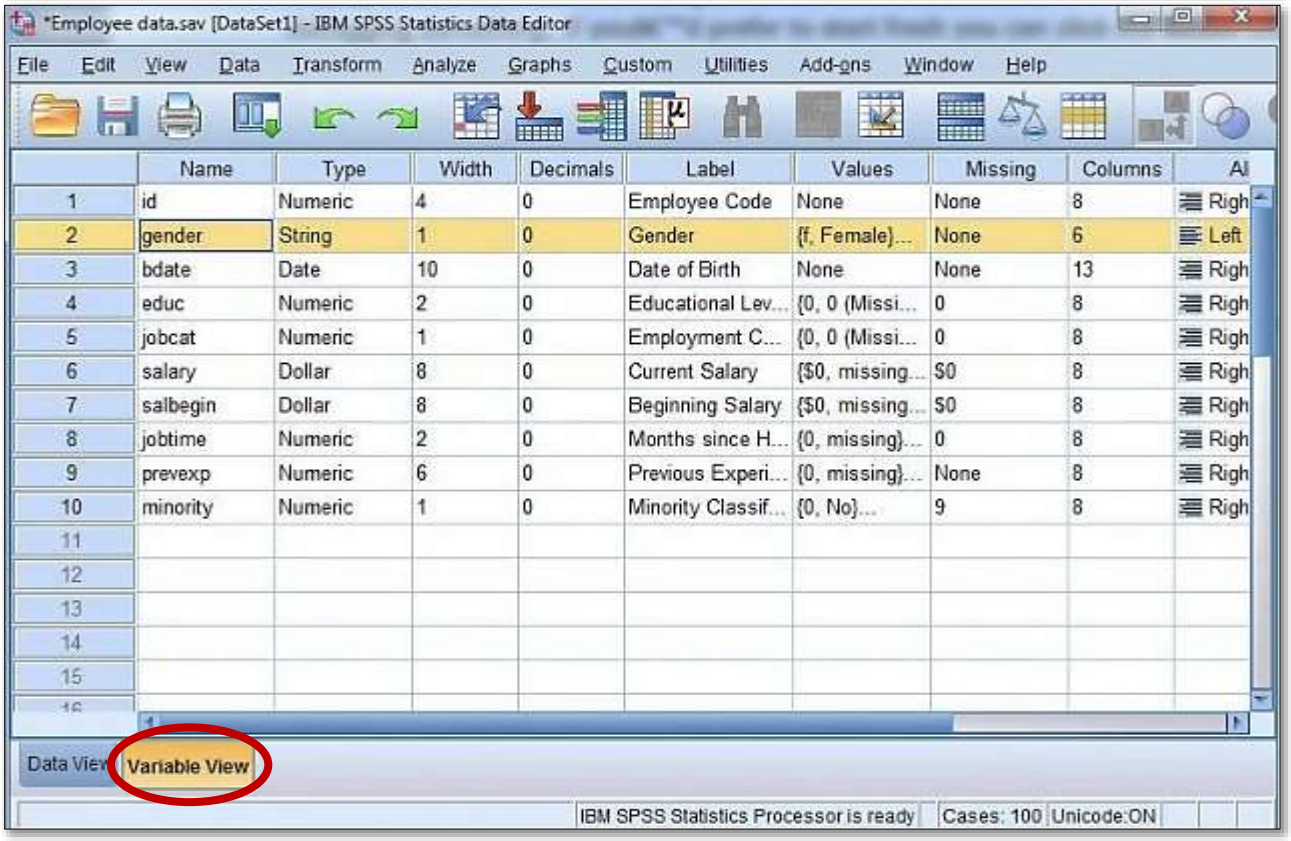
[5] *https://www.ssc.wisc.edu/sscc/pubs/spss/classintro/spss_students1.html#data-editor-.sav-files*

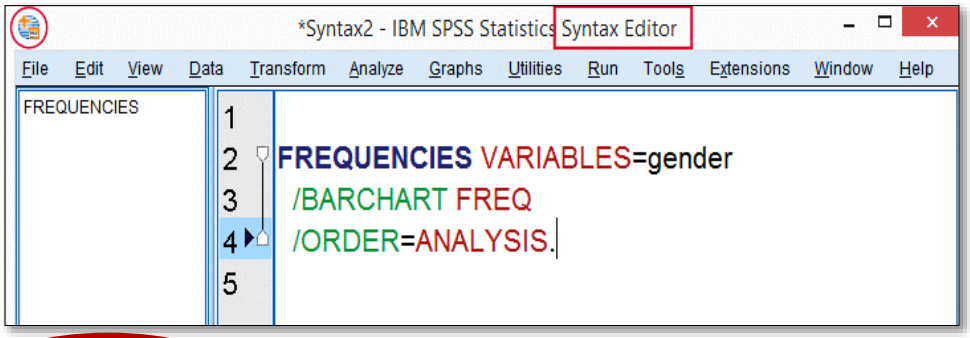
[6] *Colin D. Gray & Paul R. Kinnear (2012), IBM SPSS STATISTICS 19 Made Simple, School of Psychology, University of Aberdeen, ISBN: 978-1-84872-069-5*

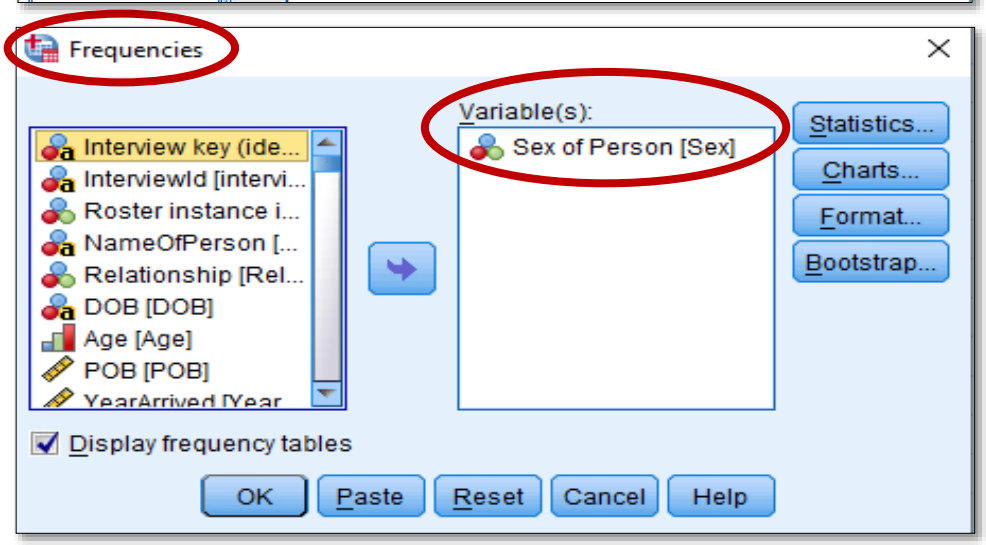
Figures II & III – Data Editor Windows: Data & Variable views

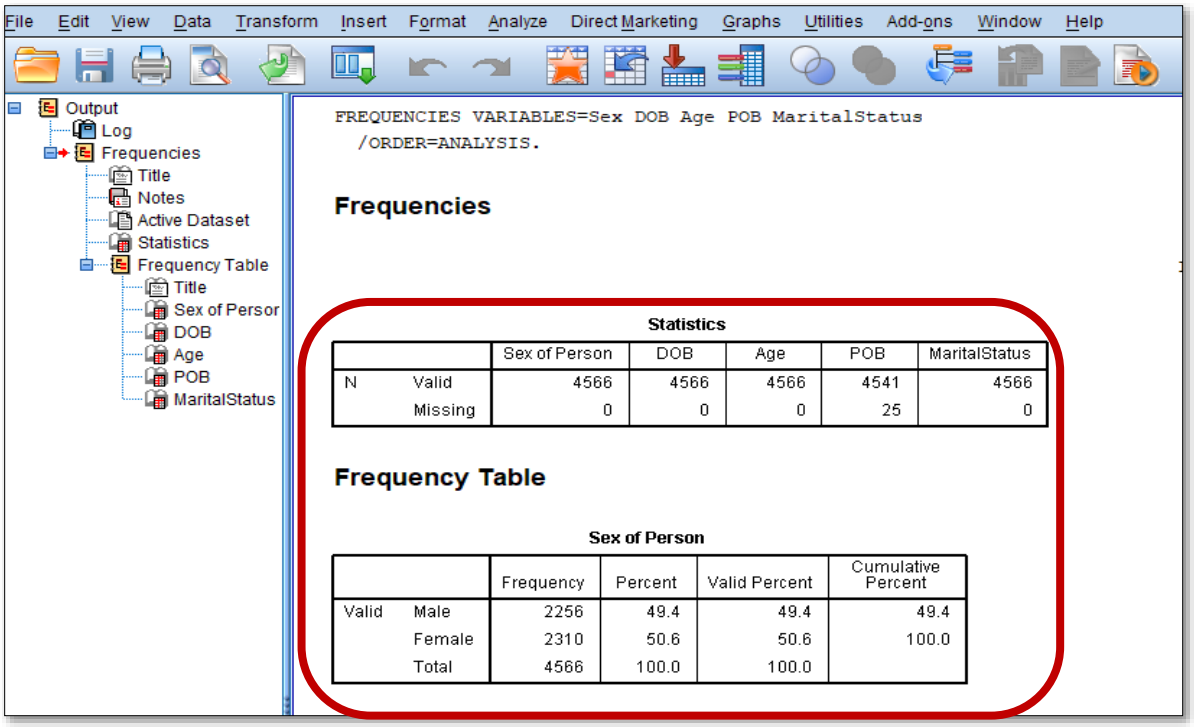




Figures IV, V & VI - Syntax Editor Window, and Output (or Variable) Viewer Windows of Frequencies Variables







3.9 The statisticians at the SDM use the Data View, Variable View, and Output Viewer windows and quite a few (not all) of the sub-options' features for the processing, cleaning, and analysing collected census/survey data.

3.10 When the collated quantitative census or survey data are inputted, or imported to SPSS, the data are checked to ensure that all variables are defined, and that there are no errors. Variables represent the different types of collated data; i.e., the response to each question of a census or survey such as: numbers, strings, currency, and dates.

3.11 The next step is to analyse the data by selecting all the variables and by validating them in a table format; i.e., in higher-level Frequencies and Cross Tab Table. The Frequency Tables automatically indicate which variables need to be scrutinised; anything listed as 'missing' in these tables is later defined by the Statisticians (in most instances) as "not stated". This means that the question was not answered, or that a response was not recorded, in the census/survey questionnaire.

3.12 The Frequency and Cross Tab Tables are exported to Excel where further validation is conducted; the data are cross-referenced to ensure that the data in the tables correspond, and that any discrepancies found are adjusted. When the process is complete, the Excel spreadsheet is then converted into a Microsoft Word report, with associated graphical representation and analysis, to be disseminated to the general public.

CHAPTER 4 FINDINGS

4.1 **Frequency of SPSS training received by the SDM's staff.** At present, the SDM's contingent of ten employees (permanent and temporary) receive refresher in-house training for SPSS once a year, or when necessary. The in-house and refresher trainings were facilitated by the Department's former CSO; in-house trainings on SPSS are now being conducted by senior Statisticians.

4.2 Comprehensive face-to-face training on SPSS was also provided by CARICOM in 2014 and 2017; and virtually in 2021.

4.3 **Good governance.** Although all levels of the Statistics Department Montserrat (SDM) staff are trained to use the SPSS software, only five (5) senior Statisticians actually use the SPSS software for validating, cleaning and analysing of the quantitative data collated from census and survey interviews, questionnaires, and observations.

4.4 **Ownership and storage of statistical data.** The quantitative data that are processed using the SPSS are owned by the SDM. Notably, the statistical data cannot be stored in the software, the data has to be saved as data files on the SDM's H: drive on the Government of Montserrat's (GoM) network.

4.5 **SPSS user-access security.** There are no user access security accounts created for the SPSS. The software is downloaded onto the SDM's individual work computers that are connected to the GoM's network; each employee in the SDM has a user account to log-in to the computers, using his/her unique user ID and password.

4.6 **Syntax Editor Window.** This component of the software is not utilised by any of the Statisticians to manipulate, to clean, and/or to analyse the data, because it entails using command syntax language. Therefore, the Syntax Editor Window was only used by a former Computer Systems Officer (CSO), who was very proficient in the SPSS command syntax language.

4.7 **Infrequent use of the SPSS software to conduct in-house departmental censuses and surveys.** The SPSS was, at one time, the sole statistical analysis tool at the Statistics Department for performing exploratory analysis, cleaning, and final analysis of statistical data. However, in recent times, the SPSS software is used infrequently because the department utilises other statistical analysis software that are more flexible than SPSS. The software is used by SDM mainly for cleaning the raw statistical data.

4.8 In the past decade, it has been applied only three times by the department for their in-house censuses and survey namely the 2011 Population Housing Census, the 2018 Labour Force Census, and the 2020 Labour Force Survey.

4.9 **Collaborations with external entities.** From time to time, the SDM collaborates with other governmental Ministries/Departments to provide support with the analysis and the cleaning of the quantitative survey-data; and to ensure that the results are accurate, and of high quality. Persons are trained to use the SPSS software when it is shared with entities or individuals.

4.10 The Statistics Department has teamed up on surveys with the Ministry of Finance; the Ministry of Health's *Breastfeeding Study* conducted by two local doctors circa 2016/2017; and, most recently, in 2021 with the Ministry of Agriculture, Lands, Housing, and Environment (MALHE) on *Employee Satisfaction*. Notably, the SDM is currently providing the Ministry of Communication, Works, Labour and Energy (MCWLE), with ongoing support regarding the survey on Montserrat's *Minimum Wage*.

4.11 The SDM has also worked closely with external organisations and individuals in 'one-off' projects; for example: the Office of the Opposition (*COVID-19 Assessment Survey*), the Montserrat National Trust, and to assist a local college student.

CHAPTER 5 CHANGES AND FUTURE INITIATIVES

5.1 The Statistical Package for Social Sciences is a proprietary open-source software; therefore, the Statistics Department of Montserrat cannot make changes to the software, as the vendor IBM owns SPSS and performs all enhancements to the software. However, since version 7.5 or 8 was implemented at the Statistics Department circa 1997/1998, the SDM has downloaded updated versions of the software from the IBM website, up to version 19. A few statisticians have versions 20, 21, or 22 on their work laptop computers.

CHAPTER 6 AUDIT CONCLUSION

6.1 The Office of the Auditor General has determined that the proprietary open-source Statistical Package for Social Sciences, is a comprehensive, well-designed, and very user-friendly software. The software has been successfully used by the Statistics Department for two decades to process Montserrat's raw census and survey data (i.e., manipulate, clean, and analyse), and to achieve the SDM's work objectives as outlined in the *CAP 6.02 Statistics Act* of 2013.

CHAPTER 7 MANAGEMENT RESPONSE

7.1 The SDM's Management provided the following comments throughout the document:

OBSERVATIONS & FINDINGS	COMMENTS
Chapter 3 3.6 The statisticians at SDM do not use a lot of the features when processing, cleaning, and analysing collected census/survey data. They use only the Data View, the Variable View, and the Output Viewer windows.	These are the only options for viewing. All three must be used.
Chapter 3 3.8 The next step is to analyse the data by selecting all the variables, and to validate them in table-format, i.e. in Frequencies Table. The Frequency Tables automatically indicate which variables need to be scrutinised; anything listed as 'missing' in these tables is later defined by the Statisticians (in most instances) as "not stated". This means that the question was not answered, or a response was not recorded, in the census/survey questionnaire.	Higher level frequencies and cross tab tables at the lower level.
Chapter 3 3.9 The Frequency Tables are exported to Excel where further validation is conducted; the data are cross-referenced to ensure that the data in the tables correspond, and any discrepancies found are adjusted. When the process is complete, the Excel spreadsheet is then converted into a Microsoft Word document to be disseminated to the general public.	And cross tab tables. Report with associated graphical representation and analysis.

Chapter 4 4.5 **Ownership of statistical data.** The quantitative data that are processed using the SPSS are owned by the SDM. Notably, the statistical data cannot be stored in the software. The data have to be saved as data files on the SDM's H: drive, on the Government of Montserrat's (GoM) network, or on other storage devices. **EXECUTIVE SUMMARY** Paragraph #5	Files are only kept on the H-Drive.
Chapter 4 4.7 **Infrequent use of the SPSS software to conduct in-house departmental censuses and surveys.** SPSS was at one time the sole statistical analysis tool at the Statistics Department for performing exploratory analysis, cleaning, and final analysis of statistical data. However, in recent times, the SPSS software is used infrequently because the Department utilises other statistical analysis software which are more flexible than SPSS. The software is used by the SDM mainly for cleaning the raw statistical data. Therefore, in the past decade, it has been applied only three times for in-house censuses and surveys performed by the SDM, which were: the 2011 Population Housing Census, the 2018 Labour Force Census, and the 2020 Labour Force Survey.	Will be more than 3 times if we include surveys for other MDAs