SWGDRUG Minimum Recommended Standards for Sampling Seized Drugs for Qualitative Analysis

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1. Introduction

This document addresses minimum recommendations for sampling of seized drugs for qualitative analysis; quantitative analyses will be addressed at a later time.

Note: For the purpose of this document the use of the term "statistical" refers to "probability-based."

1.1 The principal purpose of sampling in the context of this recommendation is to answer relevant questions about a population by examination of a portion of the population (e.g., What is the net weight of the population? What portion of the units of a population can be said to contain a given drug at a given level of confidence?)

1.2 By developing a sampling strategy and implementing appropriate sampling schemes,as illustrated in Figure 1, a laboratory will minimize the total number of required analytical determinations, while assuring that all relevant legal and scientific requirements are met.

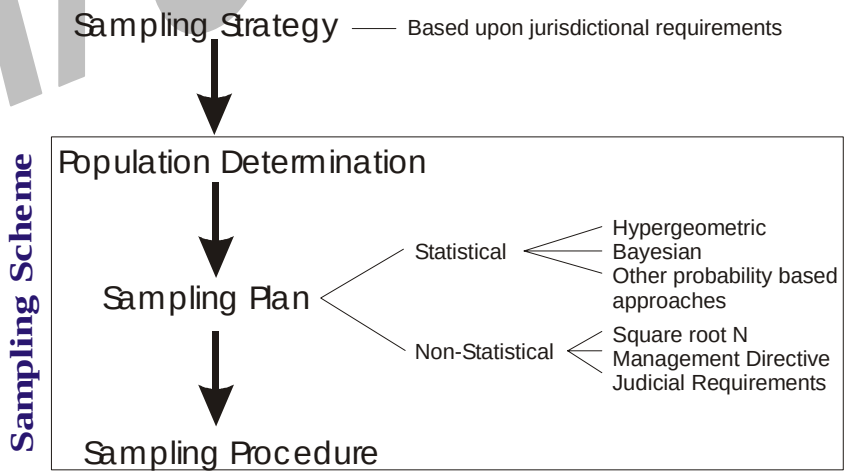

Figure 1: Relationship of the Various Levels Required in Sampling

2. Sampling Strategy

A sampling strategy is highly dependent on the purpose of the investigation, the original question, and the ultimate use of the results. Laws and legal practices form the foundation of most strategies and must be taken into account when

designing a sampling scheme. Therefore, specific sampling strategies are not defined in this document.

2.1 The laboratory has the responsibility to develop its own strategies consistent with these recommendations. SWGDRUG recommends attention to the following key points:

2.1.1 Sampling may be statistical or non-statistical.

a) In many cases, a non-statistical approach may suffice. The sampling plan must provide an adequate basis for answering questions of applicable law (e.g., Is there a drug present in the population? Are statutory enhancement levels satisfied by the analysis of a specified number of units?)

b) If an inference about the whole population is to be drawn from a sample, then the plan must be statistically based and limits of the inference must be documented (see Appendix A).

c) Statistically selected units must be analyzed to meet the SWGDRUG minimum recommendations (check for section number cross reference) for forensic drug identification if statistical inferences are to be made about the whole population.

3. Sampling Scheme

The sampling scheme is an overall approach which includes population determination, selection of the sampling plan and procedure and, when appropriate, sample reduction prior to analysis (Figure 2).

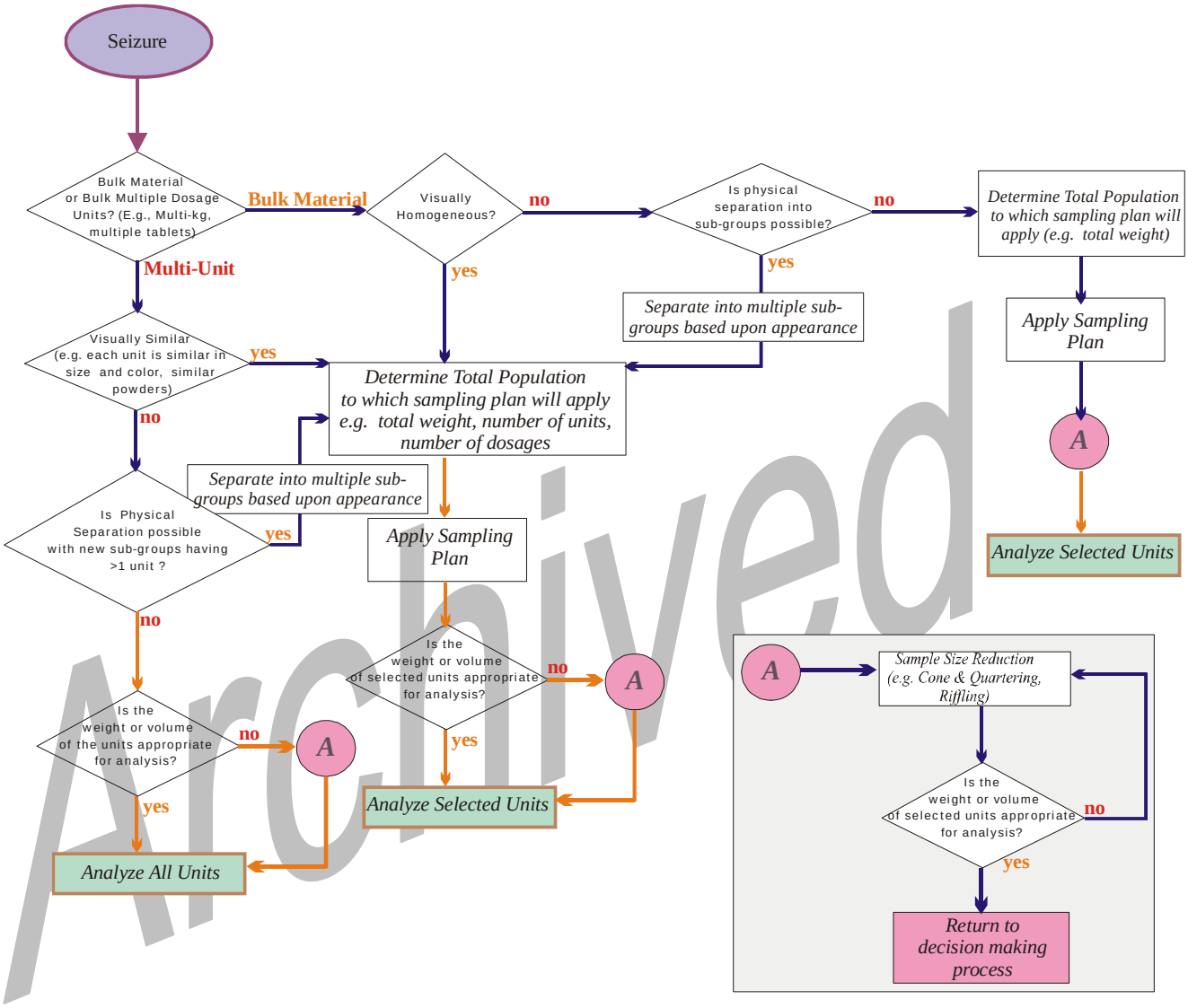

Figure 2: Example of a Sampling Scheme - A Decision Flowchart

3.1 Population Determination

a) The population determination must take into account all typical forms and quantities in which exhibits may appear.

b) A population can consist of a single unit or multiple units

c) A multiple unit population must consist of items which are similar in relevant visual characteristics.

3.2 Sampling Plan

There are numerous sampling plans used in the forensic analysis of drugs which are applicable to single and multiple unit populations.

3.2.1 When a single unit or bulk population is to be analyzed the issue of homogeneity must be addressed within the sampling plan.

a) One sample is sufficient if the bulk material is homogeneous, or if it is made so by the analyst.

b) If the bulk material is not homogeneous, several samples from different locations may be necessary to ensure that the test results are representative of the bulk material and to avoid false negative results.

3.2.2 Depending upon the inference to be drawn from the analysis for a multiple unit population the sampling plan may be statistical or non-statistical.

3.2.2.1 Statistical approaches are applicable when inferences are made about the whole population. For example:

- The probability that a given percentage of the population contains the drug of interest or is positive for a given characteristic.
- The total net weight of the population is to be extrapolated from the weight of a sample.

3.2.2.1.1 Published examples are provided below:

- Hypergeometric
  - Frank et al., J. Forensic. Sci., 1991, 36(2) 350-357
  - Guidelines on Representative Drug Sampling, European Network of Forensic Science Institutes (ENFSI), 2004, www.enfsi.org
  - ASTM E-2334-03
- Bayesian
  - Coulson et al., J. Forensic. Sci., 2001, 46(6) 1456-1461
  - Guidelines on Representative Drug Sampling, ENFSI, 2004, www.enfsi.org
- Other probability based approaches
  - American Society for Testing and Materials (ASTM) E105-58 “Standard Practice for Probability Sampling of Materials”
  - ASTM E 122-00 “Standard Practice for Calculating Sample Size to Estimate, With a Specified Tolerable Error, the Average for a Characteristic of a Lot or Process”

- Guidelines on Representative Drug Sampling, ENFSI, 2004. www.enfsi.org

3.2.2.2 Non-statistical approaches are appropriate if no inference is to be made about the whole population.

3.2.2.2.1 Examples are provided below:

- The "square root" method
  - Recommended Methods for testing Opium, Morphine and Heroin: Manual for use by National Drug Testing Laboratories, United Nations Office on Drugs and Crime, 1998

- Guidelines on Representative Drug Sampling, ENFSI, 2004, www.enfsi.org

- Selection of a single unit from a multiple unit population may be appropriate under certain circumstances (e.g., management directives, legislative and/or judicial requirements), however, statistical inferences cannot be made about the whole population from the subsequent analysis.

3.3 Sampling Procedure

3.3.1 Establish the procedure for selecting the number of units that will comprise the sample.

3.3.1.1 For non-statistical approaches select a sample appropriate for the analytical objectives.

3.3.1.2 For statistical approaches SWGDRUG recommends that a random sampling be conducted.

3.3.2 Selecting a random sample

3.3.2.1 A random sample is one selected without bias. Computer generated random numbers or random number tables are commonly employed for such tasks and these should be included in the sampling plan.

3.3.2.2 Random sampling of items using random number tables may not be practical in all cases. In these instances, an alternate sampling plan must be designed and documented to approach random selection. A practical solution involves a "black box" method, which refers to one that will prevent the sampler from consciously selecting a specific item from the population (e.g., all units are placed in a box and the samples for testing are selected without bias). Random sampling is discussed in the following references:

- ASTM E105-58 “Standard Practice for Probability Sampling of Materials”

- Guidelines on Representative Drug Sampling, ENFSI, “Chapter 3: Representative Sampling Techniques”, pages 10-11; www.enfsi.org

3.4 Sample Reduction

Sample reduction may be applied in cases where the weight or volume of the selected units is too large for laboratory analysis. (Figure 2, insert A)

4 Analysis

4.1 Statistically selected sample(s)

SWGDRUG recommends that each unit comprising the sample must be analyzed to meet the SWGDRUG minimum recommendations (check for section number cross reference) for forensic drug identification, if statistical inferences are to be made about the whole population.

4.2 Non-statistically selected sample(s)

SWGDRUG minimum recommendations for forensic drug identification must be applied to at least one unit of the sample.

5 Documentation

Inferences drawn from the sampling plan and analyses must be documented.

Appendix A

A Example of Statistical Inferences

A population of 2000 units is sampled using the hypergeometric approach. Twenty nine units are analyzed and are found to contain cocaine, therefore it can be said with 95% confidence at least 90% of all units contain cocaine.
A population is sampled using a statistical approach. The selected units are weighed and the inference of the total net weight is determined.