Sampling and Error Rates

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Instructional Objectives:

• Understand the terms and concepts of sampling
• Discern between different sampling scenarios
• Understand organizational guidelines used in choosing a representative sample
• Identify when and how to apply error rates
• Ability to expand test samples to give equal treatment to affected jurisdictions and identify other potential sampling errors
• Document sampling approach for both jurisdictional audit reports and the licensee/registrant
Sampling

Introduction:

The sampling process involves the review of samples of groups of items to determine the quality of the entire group. Merriam Webster’s Deluxe Dictionary defines a sample as a “representative part or single item from a larger whole or group especially when presented for inspection or shown as evidence of quality”.

Both IFTA and IRP recommend sampling vs. full audits. However sampling and other types of tests introduce an element of risk into auditing. The auditor must consider the effectiveness of internal control systems, the number and size of items to be tested, and the probabilities that groups of items, numbers of vehicles, total distance, total fuel and resulting percentages or tax will be misstated in significant amount. As with materiality, judgment plays an important role in determining the acceptable risk.

Many people refer to a sampling plan as statistical sampling. This is usually not the case when discussing IFTA and IRP sampling methods. Statistical sampling is the mathematical method of sampling risk from a sample to the entire population. All samples have risks that the sample is not representative of the population (sampling error). Statistical sampling involves the mathematical method of measuring that risk. Additionally, based on the measurable risk the audit takes, an optimum sample size can be statistically determined.

Non-statistical sampling is the standard approach used by IFTA/IRP auditors. The auditor determines a sample size and evaluates the results of the sample based on the sound reasoning and judgment of the auditor. This differs from statistical sampling in that sampling risk is not measured. Although IFTA and IRP primarily use judgmental sampling, it is important that auditors understand the concepts of statistical sampling, since these concepts will be utilized for an effective judgmental sampling plan.

- **Non-Statistical Sampling:** When auditing a licensee with multiple qualified and registered vehicles, both IFTA and IRP recommend non-statistical sampling as the standard approach. Types of non-statistical sampling are:

  1. **Haphazard sampling** – units have been selected without regard to size, source or other attributes. Using this method the auditor is trying to select a sample without any bias. This is the most commonly used method by both IFTA and IRP auditors.
  2. **Random sampling** – generally, this method is useful for larger licensees. A vehicle is assigned a number, one to whatever, and a random table or computer program is used to choose the sample vehicles.
  3. **Systematic sampling** – again, this method may be used when dealing with larger licensees. The auditor simply selects every “nth” unit. This method is convenient for an auditor in the field, provided the population is in random order.
  4. **Judgmental sampling** – here, the sample is selected based on the sound reasoning and judgment of the auditor.
5. **Block sampling** – items are selected in sequence. This is generally used when choosing a “time” sample. The sequence is usually three consecutive months.

- **Regarding sampling distance**, IFTA (A-520) suggests, but does not require three representative quarters for total distance sampling while IRP (APM-703) recommends three representative months of the registration year for total distance sampling. For jurisdictional sampling, IFTA recommends not less than three representative months.

- **Representative**: When choosing sample periods, keep in mind they must be representative of the licensee’s operations and you want to include as many jurisdictions as possible through which the licensee travels. You should be aware a licensee’s activities, for various reasons, might be seasonal.

- **Sampling Agreement**: Both IFTA and IRP state the licensee should have some say in the selection of the sample and the licensee as well as the auditor should sign an agreement concerning the sample periods. There are jurisdictions resistant to using the sampling agreement. The argument is that the sampling agreement locks the auditor into one sample period. Some think if the auditor finds it necessary to expand the sample, the licensee has the right to say “no”.

- **Sample Size**: As far as sample size is concerned, there have been a number of IFTA and IRP ballots, each of which has failed, trying to dictate the size of the sample under specific guidelines.

The rule of thumb (IFTA-R1310 and IRP) is the author should make every effort to choose a sample period in which all jurisdictions, through which a licensee travels, is represented. When selecting vehicles from the sample quarter, try to get a cross-section. If an auditor feels the sample is valid, but a jurisdiction(s) is not represented, the auditor may go back and audit a vehicle in another quarter that traveled in the non-represented jurisdiction(s), provided the licensee agrees, if a sampling agreement has been signed.

There are probably as many valid ways to sample as there are licensees to be sampled. If the licensee’s records are good and he keeps recaps by vehicle for both distance and fuel, at least by quarter, the sampling and the audit itself can be relatively easy.

**Discussion:**

- **Distance Records by Vehicle but No Vehicle Specific Fuel Records**: There are those instances when the licensee keeps distance records by vehicle but the fuel is recapped at the end of the week, month or quarter, with no regard to the vehicle using the fuel. A real problem arises if the licensee includes non-qualified vehicles in his fuel recap. (How would you sample in this case?) (Sample the vehicles for distance and do a full fuel audit. Other suggestions?)

- **Multiple Facilities in Multiple Jurisdictions**: Another scenario is when you have a licensee based in your jurisdiction, but he has facilities in other jurisdictions, what happens?
• **Record Quality Variance by Facility for Distance:** What if one of the facilities has recaps by vehicle for distance, but not for fuel assuming only IFTA qualified and registered vehicles are owned?

• **Record Quality Variance by Facility for Fuel:** Conversely, what do you do if the licensee keeps recaps by vehicle for fuel, but only keeps beginning and ending odometer records, per quarter for vehicles?

• **No Vehicle Specific Records:** Then you have the licensee whose only recap is the IFTA Schedule 101 or the IFTA Return. What else should you request?

**Guidelines:**

1. Sample periods should be chosen to prevent biased results.

2. Samples may be adjusted to accommodate the licensee’s reporting system or records retention method provided the results are representative, valid and reliable.

3. Chosen sample sizes are generally acceptable provided the auditor documents his/her procedures.

4. If the licensee has more than one fleet, long haul and short haul or vehicles that are at both ends of the weight spectrum, the auditor should sample vehicles from each group.

5. The auditor is to consider the effects of multiple bases (facilities) as well as fleets. The different facilities may have differing vehicle types and reporting systems.

6. Sampling periods may be changed, modified and deleted at the auditor’s discretion based on documentation and the licensee’s tax reporting environment (internal controls, record retention, reporting system).

7. The licensee may ask that a sample period be changed due to some extraordinary event. (One hopes the licensee would bring this fact to light during the opening conference.) The request may be allowed, but IFTA states that the auditor would have to audit the exception period as well as the new period. This statement presumes that the extraordinary event wasn’t a fire or flood during which records were destroyed.

8. Any sampling procedure that deviates from all items in a sample period must be documented as to the reason for the deviation and for the new sampling procedure.

9. The auditor should use solid, professional judgment and common sense.

**Problems:**

1. ABC Trucking, for calendar year 2002 and 2003 is registered in your home base jurisdiction. Total distance per quarter ranges from 18,500 miles to 23,000 miles. The
jurisdictions in which distance is reported are consistent. MPGs range from 4.97 to 5.32.

In calendar year 2004, the total mileage per quarter ranges from 200,000 miles to 227,000 miles. The jurisdictions range from Canada south with no consistency. MPGs are roughly the same as the previous calendar years.

There were five registered vehicles in 2002/2003. There are 120 registered vehicles in 2004. Records are good for the most part and recaps are per vehicle, but one block of facilities does not recap fuel by vehicle, only by month. The records are located in three other jurisdictions as well as your own.

There is no bulk fuel involved.

The company has not changed hands nor has it merged. Management simply decided to opt for one home jurisdiction (yours) rather than declare a home jurisdiction in each of the other three jurisdictions where fleets are garaged with offices.

How do you choose a time sample? Why?

What criteria do you use to choose vehicle samples and why?

Will auditing fuel be a problem and why?

2. A Supervisor was reviewing a particular case that was completed by an auditor and noticed that the sample selected by the auditor involved units that operated in only three of the twenty jurisdictions for which the licensee reported miles. After calling the auditor in to discuss the case, the following is the conversation between the Supervisor and the auditor:

**Supervisor:** The sample units you selected are not representative and therefore would not be in compliance with IFTA and IRP agreements.

**Auditor:** I selected my sample from the three different months all of which are representative months of operation for the entire audit period. The licensee agreed with the test sample and results of the audit.

**Supervisor:** I agree that the sample months you used to select your test sample vehicles appear to be representative months, but the actual test sample itself is not representative and therefore we will be in violation of the IFTA and IRP agreements.

**Auditor:** Not every return included twenty jurisdictions and the majority of miles traveled by the licensee were within the three jurisdictions included in my test sample. Since the sample periods were representative and since the
majority of miles accrued by this licensee were tested, I believe that we are in compliance with the IFTA and IRP agreements.

Do you agree or disagree with the auditor’s statement?

Why or why not?

3. A common carrier (400 vehicles) declared your jurisdiction as its home base. This licensee has facilities in four other jurisdictions each with its own designated fleet. Some facilities have bulk fuel and some are primarily OTR. The facilities with bulk fuel storage will fuel vehicles from other locations when necessary. During the course of the audit, you find that two of the bulk fuel facilities are dispensing fuel tax-free. Though vehicles are facility-specific, one location will “lease” a vehicle, sometimes with the driver, to another location to replace a vehicle being repaired. Miles and fuel are recapped on a facility basis on a weekly time frame. Generally, the jurisdictions traveled through are the same with a variation of miles. There are, however, some seasonal differences in the reported jurisdictions from one facility.

How do you choose a time sample? Why?

What criteria do you use to choose vehicle samples and why?

Will auditing fuel be a problem and if so why?
Error Rates

Ok, so now you’ve chosen your sample period(s) and vehicles and you’ve completed your audit.

- **No Change Audit** There are a few questions to consider. The first one is closely related to sampling. If you selected fourteen vehicles for testing and have completed testing eight units for distance and fuel with no errors, think about discontinuing the review and designate the audit as a “no change”.

But, what if, lo and behold, your figures are different from the licensee’s recaps! What to do?

- **Isolated or Recurring Errors:** Think about whether the errors are isolated or recurring. Is the error due to a clerk picking up an incorrect figure once or maybe twice during the testing period?

Or is it recurring in that the figure reported is an incorrect calculation on the part of the driver(s) and these calculations are not verified before they become part of the reported figures?

Don’t include the isolated errors in your error rate projection. IFTA states, “In a situation where isolated errors are found, discontinue sampling and audit in detail for the isolated error”. What do you think?

There are a few commonly occurring errors to look for during the audit process.

1. **Unusual clerical error:** Do not include it in the error adjustment factor, but correct it as a separate, stand alone adjustment. It may be corrected on the audited return for the sample period, only.

2. **Error Corrected in Subsequent Quarters:** If an error is found (distance) and is corrected in a subsequent period by the licensee, this would have an effect on the periods in which the error adjustment factor would be applied. Is this therefore, an isolated error?

3. **Error Problem Determined:** If the reason for an error is known and the error can easily be calculated, the sample should not be used for error projection purposes. For example, if the licensee’s missed local distance can be calculated or “backed into”, a separate error rate/adjustment is needed.

Now, you create and examine error rates for total and taxable distance and total and tax-paid fuel or any single entity or combination of the above.

- **Error Rate Formula:** Basically, the formula for error rates is audited figures divided by reported figures. So if the audited and reported figures are the same,
the error rate is 1.00. If you audit more than was reported, the error rate will be “1.” plus additional digits or 1.152. Conversely, if you audit less than was reported, the “1.” is replaced by “0” and additional digits, or 0.853.

**Communication Essential with Licensee:** During the audit, the auditor should be communicating with the licensee. The licensee should be made aware of any non-compliance with IFTA and/or IRP as soon as possible.

He/she should also be made aware of any mistakes made by his staff. Consistent calculation errors by drivers, clerical staff not verifying drivers’ calculations, drivers missing seemingly inconsequential jurisdictional miles, NH between MA and ME, NY between CT and NJ, PA between NY and Ohio.

If the licensee ignores the driver’s odometer readings and reported jurisdictional miles and uses the PC Miler, for example to run the trips to obtain reported mileage, you may end up with differences large enough to generate error rates.

The licensee may have included mileage and/or fuel from non-qualified vehicles.

Then there are the obvious problems of no odometer readings, no readings at jurisdictional borders, etc. The sooner a licensee knows about those types of problems, the sooner he/she can rectify them.

**Both IFTA and IRP suggest several courses of action when errors are found.**

1. The auditor can isolate the reason for the error and using the circumstances, estimate an error. For example, if the reason for the error is that the base jurisdiction distance isn’t reported, you can determine the interjurisdictional distance per day, week or trip, determine the applicable number of days, weeks or trips and multiply to arrive at a total error. More ideas?

2. If sample results are representative of the population, project the error rate based on your sampling results.

3. If you find that the sample is not representative, expand your sample. However, if your errors are relatively minor or are isolated events, it may not be necessary to expand your sample. In this case, you may want to restrict your error rate only to the sample period. You can make the required adjustments to the reported figures on the licensee’s IFTA Schedule 101. You would use the actual error amount to make the adjustments.

4. If the type of error that’s occurring can’t be determined, expand the audit in that particular area. For example, if the reporting quarter/month is not quite the calendar quarter/month, but well within reason, adjust your sample to accommodate the aberration. Suggest to the licensee that he/she should adhere more closely to calendar months and quarters.
5. If the sample error rate is representative of the population, project it over the entire audit period.

6. If errors are truly minor, if the error rate is 1.019 or 0.987, for example, you may want to consider them immaterial and accept the miles and/or fuel as reported.

- **Denying Credits**: Theoretically, if errors are occurring due to lack of internal controls or source documents do not give sufficient proof of where vehicles traveled or the auditor finds it necessary to create distances, giving the licensee a refund from any jurisdiction should be discouraged. In other words, at the bottom line of the audit, any jurisdiction showing a credit should have that figure raised to zero. Any jurisdiction showing a liability should be left alone. There would be no offsetting credits allowed.

- **Auditor Discretion**: The auditor has fairly wide discretionary powers when it comes to error rates. He/she may decide that the error rate is minor enough to be disregarded. This decision may be made on a total or jurisdictional distance basis, total fuel or tax-paid fuel basis. If adjustments are made to total fuel but not to tax-paid fuel, or conversely to tax-paid fuel but not to total fuel, care must be taken to insure that total fuel remains at least equal to or more than tax-paid fuel, per quarter.

- **Applying Error Rates to Total Population**: An auditor may decide to adjust distance only in the sample quarter, but extend the error rate for total and tax-paid fuel to all periods under audit or the other way around. An auditor may decide to apply error rates only to the sample quarter or to each quarter under audit.

- **Documentation is Essential**: Whatever action an auditor takes should be documented and explained in his narrative or equivalent report. The licensee should be apprised of the auditor’s findings as they occur if possible, not just at the closing conference.