

# Correcting a Poorly Designed Sampling Frame that Renders Poor Precision and Unreliable Results

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## Basic Rule from Yesterday

- As the error rate increases, the precision amount gets worse (larger).
- As the error rate increases, the relative precision gets better (smaller).

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## Precision

- In the discussion to follow, we will focus on the relative precision.
- The relative precision is only meaningful if the population values have the same sign (all positive or all negative).
- If the population (and sample) contain positives and negatives, the point estimate may be near zero, whereby the relative precision is terrible yet the precision amount can be very good.

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## Developing a Tax Relevant Sampling Frame

- A lower relative precision (better precision) can be obtained when the frame contains a high frequency of taxable items.
- However, it is important to remember that if nearly all the taxable items were taxed properly, then a large number of zero errors are encountered.
- This will likely result in a small precision amount (the confidence interval will be narrow) but a large relative precision.

Good

Bad

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## Working with a Full Download

- If a full download exists, then the taxpayer and auditor can develop a sampling frame which excludes both obviously taxed and obviously exempt items.
- The number of zeros will likely be reduced, and the relative precision will be improved (decreased), because more errors will result since more tax deficient or tax overpaid items will comprise the pull list.

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## Developing a Tax Relevant Sampling Frame

- Restricting the sampling frame to the items of interest, and limiting the number of zeros that enter into the sample, is the best approach in assuring a better (lower) relative precision.
- This does not introduce a bias since the sample frame is also restricted to items with a higher error rate.
- To avoid bias, it is important to develop a sampling frame that is not merely focused on the discovery of underpayment errors.

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## Improving Precision After the Pull List is Drawn

- After a pull list is drawn and the usage of items has been researched, there are very few alternatives for improving precision when it becomes evident that a poorly designed sampling frame exists.
- Quite often, it will be necessary to redraw the pull list or increase the sample size.

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## Improving Precision After the Pull List is Drawn

- It is important to remember that "better precision" generally means that the lower confidence limit will likely be increased since the resulting confidence interval will be narrower.
- As a result, in the case of tax underpayment, "better precision" would likely result in a higher tax assessment if the lower limit is used.

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## Improving Precision After the Pull List is Drawn

- If not already done, precision can be improved by:
  - detailing the higher invoice amounts,
  - defining a low dollar cutoff,
  - excluding items known to have very low error rates.
- In the last two cases, these items must be removed from the pull list and the population.

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## Negotiation

- Up front, the audit staff and taxpayer should negotiate:
  - the sample size,
  - who does what work, and
  - what items are in the sample frame.

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## A Possible Scenario

- After the pull list was drawn and the taxability of each item was determined, it was clear that a utility account dominated the sample.
- However, the only taxable item in the utility account was brokered natural gas that comprised a minor portion of the listings.
- Can the utility account be completely removed from the pull list and sampling frame and replaced with additional randomly drawn items?

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## The Hard Line on Replacement

- It is OK to expand a sample but once drawn into the sample, each item should be valued for error.
- Or the items can be removed from the sample (and frame) and taxed on an individual basis.

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## The Hard Line on Replacement

- Replacing the utility account transactions with newly drawn sample items is simply a bad idea because it invites having the taxpayer request removal of other errors for a variety of reasons.
- Bottom line: It is safe to say that such a replacement policy introduces too much chaos into the audit procedure.

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## Avoiding Trouble

- Difficult situations arise when a sample has already been selected and then the state or taxpayer wants to remove a particular group.
- Often this problem could have been avoided if the audit team had done some better population analysis during the planning phase.

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## Avoiding Trouble

- One way to avoid this situation is for the audit team to obtain some pilot studies during the planning phase where a few transactions are tested to see what data is available.
- If the field auditors and taxpayers are under severe time pressure and headcount reduction, they too often begin the sampling plan without an adequate understanding of the population and data availability.

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