Vision 20/20
National Strategies for Fire Loss Prevention

MODEL PERFORMANCE MEASURES FOR FIRE PREVENTION PROGRAMS

The purpose of this project is to outline potential model performance measures for local, state, and national fire prevention program managers. The goal is to begin reporting fire prevention efforts in a consistent enough fashion to allow for legitimate program comparison and the establishment of both baseline performance measures and benchmark standards. In other words, program managers can compare results to their own history, and to other jurisdictions to begin formulating management decisions based on evidence. The establishment of consistent and accepted performance measures will allow for demonstrated evidence that prevention programs are producing a desired result

However, there are some strong cautionary notes. The number of potential variables and the complexity involved in establishing model performance measures for fire prevention programs has often proved problematic.

Generally, the results we expect from fire prevention (and related life safety) programs include documenting educational gain (people actually learning something as opposed to just sitting in class); documenting risk reduction where increased safety behaviors or decreased hazard producing behaviors can be documented (e.g. hazards noted and abated during fire code compliance inspections); and finally documented reductions in losses. Losses in this context mean reductions in deaths, injuries, and both direct and indirect economic losses.

But there are often extraneous factors that can affect the data received and its perception. So while prevention programs exist to increase safety knowledge, reduce risks and losses – decision makers should be cautioned about abandoning efforts (as some have) due to inadequate data or study. For example, numbers for incident rates may rise, fall or remain constant because of prevention efforts, random chance, data entry errors or (in the case of wildland fires) because of the weather.

For that reason most of the model measures here have been described as changes – and the act of beginning to evaluate performance of prevention programs in common terms is the goal. With field experience over time, evaluation methods (and the measures ultimately recommended) will increase in sophistication – and program managers can begin to compare the results of their efforts in more scientific terms.

For comparative purposes – we have grouped these result-oriented performance measures into common evaluation terms used and taught at the National Fire Academy, the National Fire Protection Association and other organizations. They include (for post program evaluation) process, impact, and outcome evaluation measures.

Process, Impact and Outcome measures are the recommended terms for comparative analysis of the results our prevention programs achieve. This document contains examples of each for the basic functions of a fire prevention effort. That includes plan review for new construction, code compliance inspections for existing businesses, fire investigation and public safety education activities.

TERMINOLOGY

The difference between the following terms is actually driven by the stated goals of the particular program being evaluated. But generally, they are defined in the following fashion relative to fire prevention programs.

> Outcome Evaluation: the mechanism of determining how well a program achieves its ultimate goals (**like reduced losses**).
>
> Impact Evaluation: the mechanism of measuring changes in the target population that the program is intended to produce. These measures could be considered advanced indicators of successful outcomes (**like reduced risk**).
>
> Process Evaluation: the mechanism of testing whether a program is reaching its goals, like reaching target populations with quantifiable numbers expected. Process evaluation measures often include measures for workload (e.g. number of inspections done per inspector) and milestones in achievement of process objectives.
>
> Measuring workload does not indicate success of a program's results. But it can be important to decision makers when deciding how many resources are required to perform certain prevention tasks, like inspections, plan reviews, investigation or public education activities.

The following examples are intended to **stimulate** the concepet of common performance measures – so that comparisons between like organizations are possible in an "apples to apples" sense. *They are not intended to be a complete listing,* but rather provide a beginning methodology for comparative analysis of the **results** prevention programs achieve. Many of the measures have cautionary notes directly attached to help clarify the intent of the measure.

It should be noted that any comparison of data (e.g. incident numbers, death or injury rates) should be looked at over a period of time so that normal fluctuations or variances in the numbers may be taken into account. Examples and short explanations are provided in Attachment B.

OUTCOME MEASUREMENT EXAMPLES

CODE COMPLIANCE EFFECTIVENESS

- Total value of property lost in inspectable occupancies to fire in relation to assessed value (factored for inflation)
- Changes in the percentage of total fire losses occurring in inspectable occupancies (factored for inflation)
- Changes in fire deaths/100,000 residents in inspectable occupancies
- Changes in number of structural fires/1,000 residents in inspectable occupancies

PUBLIC EDUCATION PROGRAMS

- Changes in fire incidents in target population
  - Assumes the target population has been identified (e.g. elderly, young, etc.) and is quantifiable
- Changes in fire-related deaths in target population
- Changes in fire-related injuries in target population
- Changes in property damage costs in target population (factored for inflation)

PLAN REVIEW PROGRAMS

- Changes in fire incidents in "reviewed" occupancies
  - Assumes a time frame between recent construction – and older properties that fall under a regular code compliance inspection cycle. In this context "reviewed" would be a building or portion that is approved for occupancy, and the time before it falls under a regular code compliance inspection cycle.

FIRE INVESTIGATION PROGRAMS

- Changes in percentage of fires where cause is determined
  - Assumes the outcome expected of investigation is to determine cause – but quality control is important and can be affected by the quality (or lack thereof) of the investigation

IMPACT MEASUREMENT EXAMPLES

CODE COMPLIANCE PROGRAMS

- Percentage of code violations noted that were corrected/abated
  - Decision makers should take into account that minor violations are easier to correct quickly and more difficult/expensive violations may take years to correct
- Percentage of fires that were preventable or could have been mitigated by inspection or by the educational and motivational elements of inspection
- Percentage of fires where there were pending, uncorrected violations present at the time of the fire.

PUBLIC EDUCATION PROGRAMS

- Changes in participants' safety knowledge, attitudes, and beliefs
- Observed and documented changes in behavior (e.g., safe storage of flammables, planned and practiced escape plans) and safety devices used (e.g., smoke alarms)

PLAN REVIEW PROGRAMS

- Changes in percentage of errors on plans reviewed
  - Assumes an audit/quality control system to measure errors

FIRE INVESTIGATION PROGRAMS

- Changes in percentage of fire reports "cleared" without a determination of cause
  - Assumes an improved capability to successfully determine causes through training, equipment – but caution and an audit system needed to prevent erroneous reporting

PROCESS MEASUREMENT EXAMPLES

CODE COMPLIANCE PROGRAMS

- Percentage of fires in properties subject to inspection that were not listed in inspection files
- Percentage of inspections for which time since last inspection is greater than the department's target cycle time.
- Number of building systems and features, from defined list, for which inspection and approval were not completed, per new construction project

PUBLIC EDUCATION PROGRAMS

- Percentage of people reached in target population
- Number of fire safety programs delivered
  - A workload indicator

PLAN REVIEW PROGRAMS

- Percentage of time turn-a-round goals for plan review are achieved
- Average time (days) from permit application to permit "decision"
- Number of plans reviewed

FIRE INVESTIGATION PROGRAMS

- Number of fires investigated
  - A workload indicator
- Number of interviews conducted
  - A workload indicator

ATTACHMENT A

Other notable industry efforts

A recently released report by the National Fire Protection Association (NFPA), authored by John Hall, includes a comprehensive discussion of performance measures and contains several key performance measures that should be considered when establishing performance measures. The *NFPA Handbook* also includes a comprehensive chapter on performance measures for fire prevention programs.

OUTCOME-TYPE MEASURES FOR CODE COMPLIANCE EFFECTIVENESS

1. **Structure fire rate** per 1,000 inspectable properties
   Use five-year averages to compensate for small numbers of fires per year. May exclude intentional fires. Designed for routine inspections.
2. **List inspectable-property structure fires with at least $25,000 in loss**; with presence and importance to fire severity of standard list of major hazards.
   Work with insurance companies to get best loss estimates. Consider including indirect loss, such as business interruption costs. Link to measure #4, which identifies major classes of hazards to be tracked separately. Distinguish hazards associated with new construction versus routine inspections.
3. **Estimated monetary value per additional inspection**, by major property use group.
   Calculate using the formula: Value of one annual inspection = (Fire loss per year) x (% loss preventable by inspection) / (# occupancies) Link to measure #5, which sets up formula for what is preventable. For routine inspections.

Impact-Type Measures for Code Compliance Effectiveness

4. **Number of violations found per inspection**, overall and separately for (a) sprinkler-related and (b) safe evacuation related. For new construction, also identify number of conditions that could not be inspected because they were not inspected while still exposed.
   The focus on sprinkler status and evacuation-related violations is one way of singling out problems that are frequently cited as major reasons for multiple-death fires in inspectable properties. Hazardous-material-related violations, compartmentation-related violations, and detection/alarm-related violations are other major groups that could be

given their own focus. .Link to measure #2, which can use the same major-hazard groups selected for focus here. Designed for new construction and routine inspections.

5. **Percentage of fires that were preventable or could have been mitigated by inspection or by the educational and motivational elements of inspection**.
   Link to measure #3 on estimated value of an additional inspection, which will use the same framework for judging fires preventable or amenable to mitigation. Designed for routine inspections.
6. **Percentage of fires where there were pending, uncorrected violations present at the time of the fire.**
   Designed for routine inspections and designed primarily to focus on problems post-inspection in achieving removal of hazards and code compliance.

Process-Type Measures for Code Compliance Effectiveness

7. **Percentage of fires in properties subject to inspection that were not listed in inspection files.**
   (Existing buildings) Code by reason not listed.
8. **Percentage of inspections for which time since last inspection is greater than the department's target cycle time.**
   (Existing buildings) This measure should be analyzed separately for different major occupancy groups.
9. **Number of building systems and features, from defined list, for which inspection and approval were not completed, per new construction project**
   A building system or feature would go on this list if no **timely** inspection had occurred.
10. **Percentage of inspections conducted by inspectors with all necessary certifications for their assignment.**
    This measure should be analyzed separately for different major occupancy groups. It may be appropriate to analyze initial inspections and follow-up inspections separately or to separate assignments in other ways that relate to differences in required certifications. A list of necessary certifications needs to be developed to support the measure.
11. **Percentage of inspections conducted by full-time inspectors**.
    This measure should be analyzed separately for different major occupancy groups.

ATTACHMENT B

Additional Performance Measure Examples and Illustrations

The following illustrations provide some additional insight into model outcome, impact and process performance measures.

Why Evaluate Fire Safety Programs?

- To understand how to improve service
- To learn whether programs have any unexpected benefits or problems
- To monitor whether program is having desired results

Why Evaluate Fire Safety Programs? (cont.)

- To monitor progress toward program's goals
- To produce data on which to base future programs
- To demonstrate effectiveness to target population, to public, to other who want to conduct similar programs, to those who want to fund future programs

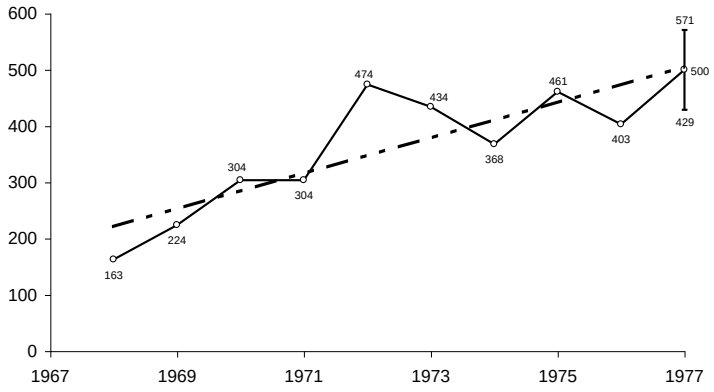
Note: trend analysis can help prevent misconceptions about normal variation of numbers from one year to the next. A 50% reduction in fire deaths sounds impressive – until the hard data is examined and the numbers actually amount to a reduction from two fire deaths to one. And looking at the numbers over time (trending) could indicate the numbers fluctuating between three and none over many years without benefit of specific prevention programs. In short, the numbers can be misleading if misrepresented or not examined over time.

Trending

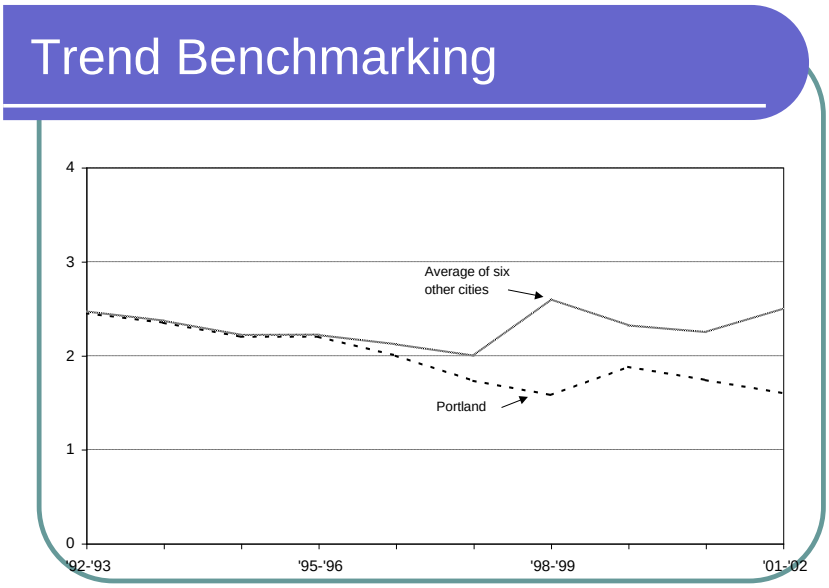
- Be careful to make claims
  - 50% reduction in one year?
- Trending important for outcome measurement

A simple trend can illustrate what direction the numbers are headed without any intervention – and a reasonable variance range that would occur to random chance.

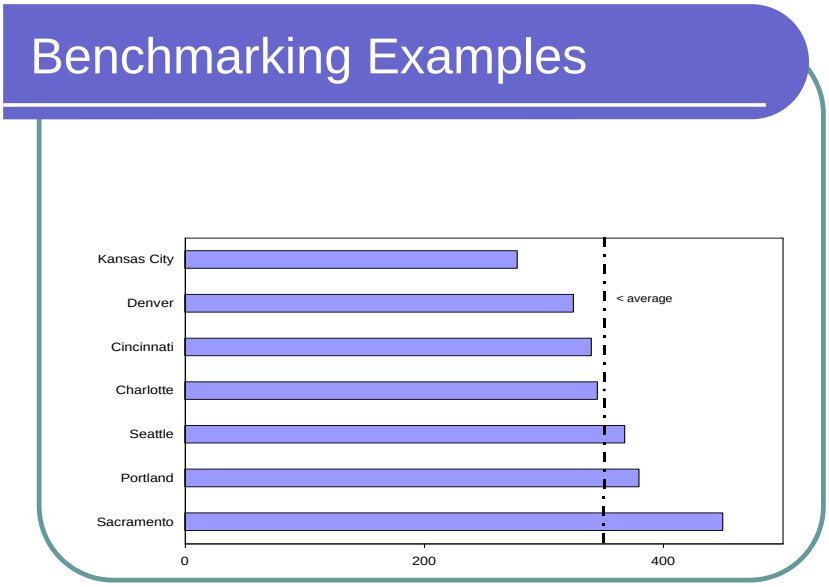
Trend Analysis



Trends can also be compared (benchmarked) to previous experience (as in the case of the illustration above) or to other like jurisdictions to provide additional evidence of program results.



Benchmarking can also be used to illustrate any number of comparisons from one jurisdiction to another. In this case it produces a mean average for comparison to see if one jurisdiction is above or below the mean.



There are many challenges to adequate evaluation – not the least of which is that it takes resources to conduct properly. Inadequate resources can provide limited or even faulty analysis of data. Poor data entry can always be a factor in the accuracy of evaluation measures. Small numbers are always more difficult to measure because changes do occur by random chance. And impacts or outcomes are most likely not seen immediately – but over longer periods (years) of time.