Status and perspectives for the development of IAQ metrics in the US

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ABSTRACT

A scoring tool is being developed by the US DOE Building America program to allow for homes to get credit for better IAQ and to enable IAQ to be better recognized as an essential building feature. The development of this scoring tool is in its early stages of development and this paper summarizes the progress so far.

KEYWORDS

IAQ, Scoring Tool, Indoor Pollutants, ventilation, source control, DALY

1 INTRODUCTION

LBNL has recently begun work to create a scoring tool that produces an indoor air quality (IAQ) score similar to an energy score for a home. The score is intended to be a quantitative measure of a home's IAQ and will credit features that mitigate IAQ hazards and improve the likelihood of good IAQ. The goal is to develop an asset rating tool that can be used by the building industry to uniformly and consistently rate homes for IAQ. Because it is intended to rate the asset the behaviour of individual occupants is not included. This allows for home designers and builders to use the score at the design stage or at the end of construction and for different home designs, ventilation approaches, source control strategies, etc. to be compared. The scope of the score will, at first, be restricted to single-family homes and will apply to both new and existing construction. Multifamily issues with compartmentalization and shared ventilation systems are not included.

The score will have the following features:

- Have a single number – like an energy Score
- Develop a trusted third-party rating system
- Be based on observations about the home and possibly some diagnostics
- Include health, odor & moisture
- Must be simple enough to be reliably performed by home energy raters or contractors *not* researchers.

2 IDENTIFICATION AND DEFINITION OF HAZARDS

The hazards to be accounted for in the score include:

- Health-related airborne chemical, physical or biological agents, including irritants and allergens that negatively impact health,
- odour, and
- moisture – particularly at levels that can promote unwanted microbiological growth.

The health impact will be assessed using a Disability Adjusted Life Year calculations that allow for the effects of different pollutants at different concentrations to be combined into a

single metric for chronic impacts. For acute health effects exceedance of existing health guideline levels will be used. Odour and moisture are less amenable to a direct calculation (like DALY's) and so expert opinion will be elicited to assign hazard values and mitigation effectiveness to different home features. Because they have different effects there will be three separate sub-scores in addition to the overall score: health, odour, and moisture.

Some key hazards are not included. For example an occupant who smokes is not part of the asset. Another example is Radon where there are usually existing building codes and standards to account for Radon entry into homes.

3 USE OF AN ABSOLUTE OR RELATIVE SCORE

The score will be absolute with hazards and mitigation features adding or subtracting from the total. This is mainly because it is very difficult to define a reference home for IAQ that could be compared to the home being scored due to the large number of different potential hazards and mitigation strategies that could be employed. This is a key difference from energy scores that almost always compare to a reference home. For ease of understanding the target is a score that ranges from zero for a home with poor IAQ to 100 for a home with good IAQ – with most homes falling in this range. It will be possible to have negative scores for homes with many unaddressed hazards and a score in excess of 100 for an exceptionally good home.

4 SCORE METHODOLOGY

The score combines three factors:

1. Identify the hazards present in the home. Each hazard is assessed a hazard level – with more hazardous pollutants getting a higher number to make the score more sensitive to these important pollutants. For health impacts, the score focuses on key pollutants of concern that have known heath hazards, such as PM2.5, formaldehyde, NO2, acrolein and ozone as well as indirect contaminants such as excess moisture that can lead to mould.
2. Identify the mitigation strategies/features of the home and assign a value to the effectiveness of each feature in addressing a particular hazard
3. Identify how well each individual hazard mitigation strategy functions. This includes performance, automation, flow verification, durability and longevity factors.

For each hazard and mitigation strategy a value can be calculated that is summed to provide the score.

5 IMPLEMENTATION

A good question to ask is: "Who will be the "owner" of the scoring tool?". It is not going to be the researchers who develop the tool. Instead we think it needs to be maintained and administered by a consensus body – ideally one that promulgates standards and possibly already works in the field of energy scoring.

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