OBJECTIVE
Provide recommendations for systematically evaluating and integrating evidence in cancer on National Ambient Air Quality Standards (NAAQS) reviews.

BACKGROUND
- The Clean Air Act mandates that the United States Environmental Protection Agency (US EPA) set primary and secondary NAAQS for six criteria air pollutants (i.e., particulate matter (PM), ground-level ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, and lead).
- Every 5 years, US EPA is required to review the available science and data to determine whether it should maintain or revise the NAAQS for each of these pollutants.
- As part of this process, US EPA generates Integrated Science Assessments (ISAs), in which causal relationships between criteria pollutants and health effects are assessed using a framework specifically developed for NAAQS reviews.
- The NAAQS causal framework includes a list of quality aspects for evaluating individual studies of health effects.
- However, it is not a complete list; there are no quality criteria for sub这么做,and sub- and meta-analyses.

METHODS/RESULTS
- Reviewed best practices for evaluating study and evidence integration.
- Served as a guide for the evaluation of 21 air pollution ISAs with NAAQS-related endpoints, including several that provided guidance for evaluating study quality (e.g., the National Toxicology Program Office of Health Assessment and Translation (NTP-OHT), Strengthening the Reporting of Observational Studies in Epidemiology (STROBE), Organisation for Economic Co-operation and Development (OECD) framework).
- Modified the NAAQS framework for evaluating the health effects of air pollutants using these best practices.
- Developed general quality criteria for epidemiology studies (Table 1) and demonstrated how to adapt these to address specific topics, using a case study of PM exposure and lung cancer (Table 2). Also, developed general quality criteria for experimental studies (i.e., controlled human-exposure and animal toxicity studies) and in vitro studies (available upon request).
- Proposed a conceptual framework for evidence integration.
- Studies of evidence are organized by an outcome and receive an initial confidence rating based on study design (Table 3). Each body of evidence is evaluated for additional domains that increase or decrease confidence (Figure 1). Causal conclusions are based on the levels of confidence in human, animal, and mechanistic data (Table 4).

Table 1 Quality Criteria for Epidemiology Studies of Air Pollutants and Health Effects

Table 2 Quality Criteria for Epidemiology Studies of PM and Lung Cancer

Table 3 Criteria for Higher Quality

Table 4 Causal Classification

CONCLUSIONS
Evaluating the quality of individual studies is an integral part of assessing causal relationships between air pollutants and health effects, including cancer. The relevance of mechanistic evidence to human must be determined. The results of the quality evaluation must inform evidence integration.

Figure 1 Confidence Assessment in Each Body of Evidence

All Studies with the Same Design with High/Moderate Initial Confidence Rating

Are There High Quality Studies?

CONCLUSIONS
Supporting An Effect

Supporting No Effect

No

Final Confidence Rating

Inadequate

For an Effect

High

Moderate

For no Effect

High

Moderate

Conclusion for Evidence Based on the Group of Studies with the Highest Confidence Rating

METHODS/RESULTS

TABLE 1 Initial Confidence Rating for Study Designs

TABLE 2 Causal Classification

TABLE 3 Criteria for Higher Quality

TABLE 4 Quality Criteria for Epidemiology Studies of Air Pollutants and Health Effects

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