

## STUDY CONCLUSIONS AND RECOMMENDATIONS

Based on the data available to us from state, hospital association, and healthcare provider sources, the health of people in Garfield County is not different from the health of residents of other Western Slope counties. However, citizen perception, as evidenced by focus group and interview data and the household survey, indicates that at least some individuals in impacted areas of Garfield County believe otherwise. Citizens express concern and experience frustration and stress over activities that they fear could have negative impacts on their health and environment. Such stress, frustration and the fear of the unknown can, of itself, lead to health problems. Paul Slovic's research (Slovic P. Science 1987;236:280-285) on risk perception documents that individuals tend to fear and react most negatively to situations for which there are considerable unknowns regarding the outcomes, both current and future, and over which they feel they have little control. Energy-related activities in Western Colorado present such a situation for many individuals.

As described in this report, there are numerous gaps and uncertainties in our understanding of pollution from natural gas operations in Garfield County. The motivation for the following recommendations is to reduce these uncertainties and fill data gaps. Better information is needed in order to make a complete and accurate evaluation of threats to human health.

### **RECOMMENDATIONS.**

- Establish a medical monitoring system – especially through primary care networks – to identify any changes in baseline data or trends and/or anomalies in medical practices.
- Conduct a thorough study of air emissions during drilling, including enough sites to cover the range of drilling approaches.
  - Collect 24-hour samples daily around the perimeter of the drill pad to achieve continuous monitoring during several cycles of well installation.
  - Monitor meteorological conditions.
- Identify the components of hydraulic fracturing fluids.
  - Would allow open evaluation of degree of threat.
  - Would improve public acceptance of natural gas operations.
- Inspect surface soils at completion of drilling operations.
  - Minimize possible exposure of landowners to residual soil contamination.
  - Sample and analyze areas suspected to be contaminated.
  - Clean up areas exceeding action levels.

- Use “green completions” and applicable best management practices, including locating drilling and production facility operations far enough from public buildings and residences to reduce the risk of exposure to air toxics, such as benzene, toluene, and xylenes.
- Establish a monitoring program for private wells
  - Provides the most direct way to assess contamination of drinking water resources
  - Analyze for methane, benzene and other volatile organic compounds, and selected components of hydraulic fracturing fluids having the greatest potential to affect human health

### **STUDY LIMITATIONS**

In addition to limitations and data gaps discussed in the body of this report, the following study limitations are worth pointing out:

- “RARE CANCERS” – Cancers that occur very rarely within a population cannot be identified through the state’s Tumor Registry, because of requirement to protect individual identity. Thus, the occurrence of rare cancers in persons living in Garfield County, whether or not those cancers could have some relationship to environmental exposures, were not likely to have been picked up through this study. Those incidences could be identified through a county-based medical monitoring system.
- PRIMARY CARE DATA – As noted earlier, we were not able to acquire primary care data directly, despite an attempt to survey local primary care practices. Primary care practice data are the most reliable source of information on unusual occurrences of diseases or symptoms, especially if the data from all local practices can be combined for analysis. This requires, however, that local care providers are networked electronically or have some other means of sharing patient data in a de-identified (to protect individual identities), but nearly real-time manner.
- AVAILABLE DATA SETS -- Because the health data used for this study (other than the Household Survey data) were not collected specifically for research purposes, they are limited in scope, have significant gaps, and may not be comparable with other datasets. This is a common limitation for studies of this type. However, the datasets used for this study are often the only data available, and thus, are often used to describe community health with the qualifications noted.