in some cases, dificits, but showed very much lower ratios.

Considering that lung cancer is increasing in recent years, the ratio between excess GI cancer to lung cancer would decrease, a value of 10 percent excess was chosen as a reasonable value. It's a relatively small additional contribution. I think it underestimates what the actual contribution would be [Tr. 6/19, p. I-115-116].

There was some objection to OSHA's quantification of the risk of gastrointestinal cancer (e.g. Ex. 328), the major issue being a lack of an observed dose-response for this type of cancer. Again Dr. Nicholson responded to this objection:

Well, we have limited dose-response data. And it's of two natures. One in terms of increased risk with increased exposure. It would appear that it's a very flat relationship. I've looked at it specifically for insulation workers, and it turns out that within about 10 years, there appears to be an elevated risk 50 percent above that which would be expected, approximately.

And that same elevated risk continues with time among insulators who continue working.

* * * There is a second dose-response relationship that is seen. . . . [I]f one takes those studies in which the number of gastrointestinal cancers either expected of observed exceeds 10, so we're looking at a study that has enough data that it could be—the results would not be simply statistical variability, and the study shows a statistically significant lung cancer risk so that we're looking at studies that have exposures that are of significance, one finds a fairly reasonable increasing relationship in the risk of, overall risk, of gastrointestinal cancer with the overall risk of access [excess] lung cancer. That is, access [excess] gastrointestinal cancer compared to access [excess] lung cancer correlates reasonable well [Tr. 6/19, p. I-113-114].

And, while Dr. Schneiderman noted "There is no adequate model of digestive cancers", he also stated that "OSHA's estimate [for gastrointestinal cancer risk] appears to be reasonable" [Ex. 116, p. 2]. Even Dr. Weill, who said he would have preferred OSHA not include quantitative estimates of GI cancer risk noted that "it doesn't make a lot of difference in my view in terms of the policy that emerges from such a risk assessment" [Tr. 6/19, p. I-193].

Thus, OSHA feels confident in including estimates of risk from gastrointestinal cancer in the final standard. Though this is still some controversy over the inclusion of these estimates in the risk assessment, OSHA believes there is sufficient evidence to support their inclusion and to suggest that their contribution to the overall estimates of risk may, in fact, be understated. The estimates of risk of gastrointestinal cancer are also given in Table 6 along with estimates of lung cancer and mesothelioma risks.

The incidence of cancers at sites other than the lung, mesothelium, and gastrointestinal tract have been shown to be elevated in some asbestos exposure studies, including laryngeal, kidney, pharyngeal and buccal cavity cancers. To OSHA, it appears that the excess risk for "other cancers" is about the same as for gastrointestinal cancers. OSHA recognizes many uncertainties in quantifying this risk, in view of the inconsistencies in findings among different epidemiologic studies. (Some studies have found excess risk from other cancers, while other studies have not). The sites showing excess risk have also varied among studies. Therefore, OSHA has not made numerical estimates of risks for these other cancers at this time. To the extent that estimates of these cancers are not included in the overall estimates of risk, OSHA has underestimated the total cancer risk posed by exposure to asbestos.

The data indicating gastrointestinal cancer excesses are stronger and more consistent than the data suggesting excesses at these other cancer sites. Thus, OSHA does not feel compelled to quantify the risk of cancer at these other sites at this time. The high quality and well-supported estimates of the excess risk of lung cancer, mesothelioma; gastrointestinal cancer, and asbestosis alone provide sufficient bases upon which to justify this regulatory action.

IV. Estimates of Cancer Mortality

The best estimates of K_L and K_M were utilized to estimate the mortality from exposures to varying concentrations of asbestos for different time periods. The calculations are age, intensity and duration specific. Table 6 shows the excess asbestos-related mortality rates from lung cancer, mesothelioma, and gastrointestinal cancer (gastrointestinal cancer excess is assumed to be 10% of the lung cancer excess). Table 6 gives the predicted excess lifetime risk of cancer for exposures of one year, 20 years, and 45 years, assuming first exposure at age 25. In these calculations, Equation 1 and Equation 3 were used with values of K_L equal to 0.01 and K_M equal to 1×10^{-4} and the 1977 U.S. male background lung cancer mortality rates. Because of age-specific increases in lung cancer rates in older men since 1977, estimates based on more recent background rates would be higher. Calculations were done for each 5-year age interval, and then summed to give a total lifetime risk. The calculations performed to give the results in Table 6 assumed that the relative risk increased following ten years after onset of exposure and continued to rise until ten years after cessation of exposure, after which it remained constant.