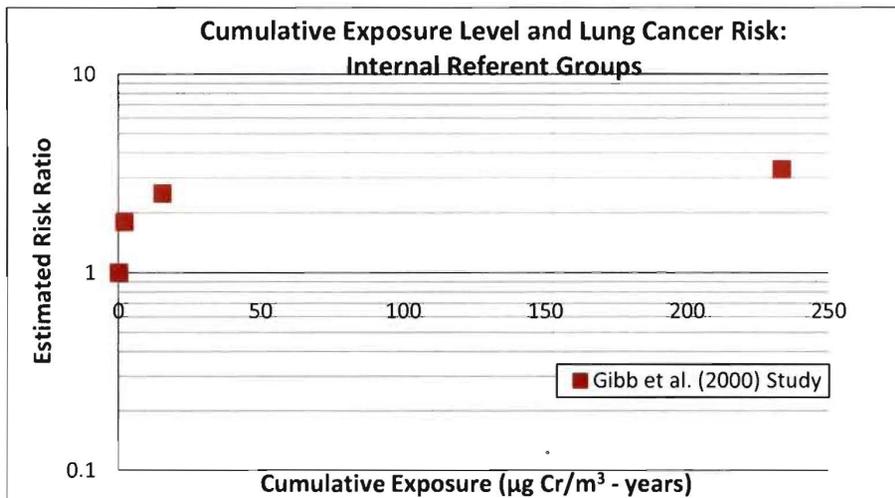
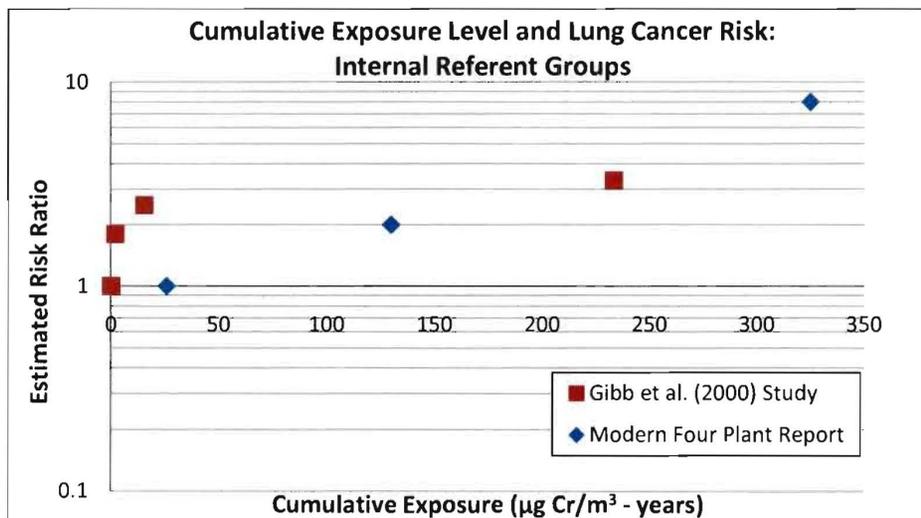


**Lung Cancer Mortality Risk in Relation to Cumulative Chromium Exposure  
 Using Internal Referent Groups:  
 Gibb and Modern Four Plant Report Studies**

An analysis using an internal referent group addresses some of the limitations of the approach based on standardized mortality ratios (SMRs) with an external referent group (CX 99; RX 32, 33). The internal referent (proportional hazards) analysis in the Gibb et al. (2000) study (CX 62) shows a two-to three-fold increased lung cancer mortality risk at cumulative exposures of less than 20 and at ~230  $\mu\text{g Cr/m}^3\text{-years}$ . The data pertaining to risk experienced at levels in between these exposure levels are relatively sparse.



The data from the analysis using an internal referent group in the Modern Four Plant Report (**October 2002** (CX 1) or **April 2003** (RX 14)) provide additional information about lung cancer mortality risk that was absent in the Gibb et al. (2000) study (CX 62). In the Modern Four Plant Report, workers who began work at age 35 or older experienced a two-fold increased risk of lung cancer at levels around 130  $\mu\text{g Cr/m}^3\text{-years}$ , the estimated exposure in the intermediate exposure group (CX 1/RX 14 (Table 18)). The Modern Four Plant Report provides additional information about substantial risk due to low exposures to hexavalent chromium.



<b>Gibb et al. (2000) Study</b>			
<u>Exposure Quartile</u>	<u>Cumulative Exposure<sup>a</sup> (<math>\mu\text{g Cr}/\text{m}^3\text{-years}</math>)</u>	<u>Relative Risk<sup>b</sup></u>	<u>(95% Confidence Interval)</u>
1	0.23	1.0	(referent group)
2	2.18	1.8	(not reported)
3	15.6	2.5	(not reported)
4	233.5	3.3	(not reported)

<b>Modern Four Plant Report (October 2002)</b>			
<u>Exposure Group</u>	<u>Cumulative Exposure<sup>c</sup> (<math>\mu\text{g Cr}/\text{m}^3\text{-years}</math>)</u>	<u>Relative Risk<sup>d</sup></u>	<u>(95% Confidence Interval)<sup>d</sup></u>
Low	0.26	1.0	(referent group)
Intermediate	130	2.0	(0.6, 6.9)
High	325	8.0	(2.4, 27.1)

<sup>a</sup> RX 32 and 33.  
<sup>b</sup> CX 62 at 8-9. Relative risk is based on the proportional hazards model, adjusting for smoking.  
<sup>c</sup> Cumulative exposure derived from RX 32 and 33.  
<sup>d</sup> CX 1 at 122 (Table 18), logistic regression, adjusted for ever smoked and age  $\geq$  35 years at first exposure; urinary exposure converted to air concentration by adjustment factor of 0.77.