TABLE 2-3 Symptoms Associated with COHb in Healthy Adult Humans and Susceptible Subpopulations

Healthy Adults		Susceptible Subpopulations	
COHb (%)	Symptoms	COHb (%)	Symptoms
~1	Physiologic background concentration	2	During physical exertion reduced time to onset of angina and electrocardiogram signs of myocardial ischemia in subjects with coronary artery disease
3-8	Background concentration in smokers	5-6	Increase in cardiac arrhythmias in subjects with coronary artery disease
		7	Headache, nausea in children
10	No appreciable effect, except shortness of breath on vigorous exertion, possible tightness across the forehead, dilation of cutaneous blood vessels	13	Cognitive development deficits in children
		15	Myocardial infarction in subjects with coronary artery disease
20	Shortness of breath on moderate exertion, occasional headache with throbbing in temples	25	Syncopes in children
		25	Stillbirths
30	Decided headache, irritable, easily fatigued, judgment disturbed, possible dizziness, dimness of vision		
40-50	Headache, confusion, collapse, fainting on exertion		
60-70	Unconsciousness, intermittent convulsion, respiratory failure, death if exposure is long continued		
80	Rapidly fatal		

Source: Adapted from WHO 1999a.

The susceptible subpopulations for lethal effects are subjects with coronary artery disease and the unborn fetus (see Section 2.3). The review on death causes by Balraj (1984) shows an association between coronary artery disease and relatively low COHb concentrations. A number of case studies are presented in which CO exposure contributed to myocardial infarction (all cases of infarction are presented in this section irrespective of whether the patients were rescued from death by intensive medical care).

The British Standards Institution (BSI 1989) published the following concentration–time combinations as lethal exposures to CO (used for hazard estimation in fires): 40,000 ppm × 2 min, 16,000 ppm × 5 min, 8,000 ppm × 10 min, 3,000 ppm × 30 min and 1,500 ppm × 60 min. The International Standard Organization (ISO) published lethal exposure concentrations of 12,000-16,000