1) Based on the evidence presented below, and considering that the international energy code will require mechanical ventilation in new housing, I would propose that the Massachusetts building code be amended to require MERV 13 or higher filtration in housing that is within 500 feet of highways (>50,000 vehicles/day) or within 100 feet of major roadways (>10,000 vehicles/day).

2) Long- and short-term exposures to air pollution, especially particulate matter <2.5 µm in aerodynamic diameter (PM$_{2.5}$), have been associated with cardiovascular morbidity and mortality worldwide (1–5). Evidence suggests that pollution exposures associated with traffic may be particularly harmful (6–21), which is a key issue as the US EPA estimates that 30 million Americans live within 300 m of a major roadway (22). In fact, living near major roadways and highways is a risk factor for many adverse health outcomes, including respiratory and cardiovascular disease. In 2008, for the California South Coast Air Basin, an estimated 1,300 coronary heart disease deaths were attributable to traffic density and 430 deaths due to residential proximity to a major road. Numbers of deaths are anticipated to increase due to population aging (23).

3) Ultrafine particles (UFP) are a component of PM that have an aerodynamic diameter of less than 0.1 micrometer. UFP is known to vary substantially within about 200 meters of busy roads (24-27). Short-term exposure to UFP is associated with changes in cardiovascular biomarkers of IHD risk (28-32). A longitudinal study of the association between long-term exposure to neighborhood-scale (1x1 km resolution) UFP and inflammatory and coagulation markers was recently reported (33). Urban scale (4x4 km resolution) UFP was also recently reported to be associated with cardiovascular mortality in another longitudinal study (34). Very recently, we have reported that UFP exposure near Interstate-93 in and near Boston is associated with higher levels of several blood biomarkers that indicate elevated inflammation and that predict greater risk of future cardiovascular disease (35, attached).

4) High-efficiency particulate air (HEPA) filtration has been shown to reduce PM concentrations as much as 70-80% (depending on particle size) using free standing filters in homes (36-37) and over 95% with filtration in mechanical systems in schools (38-41). In-home HEPA filtration has been found to improve asthma in children (42-43) and reduce a few, but not most, markers of cardiovascular risk in adults (44-45). We have recently completed two studies of HEPA filtration to reduce traffic-related UFP near interstate-93 in Boston. We showed that we could reduce UFP levels in near highway homes (46-47) and obtained some preliminary evidence for short term improvements in blood biomarkers of inflammation (not published).

5) The State of California has restricted the siting of schools within 500 feet of freeways (48), although there have been reports that schools continue to be built close to freeways (49). The City of Los Angeles has more recently approved a modification to their building code that requires MERV 13 filtration in mechanically ventilated buildings within 1000 feet of freeways (50). There has also been a program to install air filtration in schools in the South Coast Air Quality Management District in Southern California (51). Further, in our direct experience, it is possible to reduce UFP levels indoor relative to outdoors substantially by having MERV rated filters in mechanical ventilation systems combined with recirculation of air.
References