Both fetal and adolescent period are critical time periods for development of lungs. Any adverse environmental exposures during these critical periods of lung growth is a form of programming which can have long term effects on pulmonary function. The purpose of this dissertation was to examine the association between different environmental exposures and pulmonary function in children and late adolescents. The first objective was to investigate the association between reactivity on skin prick test (SPT) to house dust mites (HDM) allergen and pulmonary function during late adolescence (18 years of age) within the birth cohort of Isle of Wight (IOW). The second objective was to assess the combined effects of maternal smoking during pregnancy and adolescent smoking on pulmonary function in late adolescence. This association was also tested in the birth cohort of IOW at 18 years of age. The third objective was to examine relationship between body burden of dichlorodiphenyl dichloroethene (DDE) and pulmonary function in pre-adolescent children (8-10 years of age) from federal state of Hesse, Germany.

The results from the first objective suggested that there exists an inverse dose response relationship between weal diameter (immunological response obtained on SPT to HDM) allergen and pulmonary function parameters- forced expiratory volume in one second (FEV₁), ratio of forced expiratory volume in one second over forced vital capacity (FEV₁/FVC) and forced expiratory flow at 25%-75% (FEF₂₅%-₇₅%). Stratified analysis by history of asthmatic wheezing attacks showed reduced FEV₁ and FVC in individuals with no history of asthmatic wheezing attacks.

For the second objective girls who were exposed to both maternal smoking in fetal period and adolescent smoking had lower FEV₁/FVC ratio and FEF₂₅%-₇₅% when compared to girls with no exposure. Additionally, girls exposed to only maternal smoking in fetal period also had lower FEV₁/FVC ratio and FEF₂₅%-₇₅%. We also found that girls with history of exposure maternal
smoking during fetal period are more likely to smoke and which in turn decreased their FEV$_1$. These findings were not seen in boys.

Results from the third objective demonstrated that DDE exposure do not affect the pulmonary function in children. However, through path analysis or structural equation modelling we showed that DDE exposure has indirect inverse effects on pulmonary function, particularly FEV$_1$ and FVC, mediated through its inverse effects on childhood height and weight.

Children are particularly susceptible to adverse environmental exposures and lungs are a common site of environmentally induced diseases. All three environmental exposures studied in this research showed adverse effects on pulmonary function during childhood and late adolescence. These findings indicated that the weal diameter on SPT which is mostly used to determine sensitivity to HDM allergen could also serve has an indicator of underlying abnormal pulmonary function even in individuals without asthma symptoms. Second objective showed that girls are more vulnerable to smoking effects than boys and the joint effects of maternal smoking during pregnancy and adolescent smoking may be responsible for larger deficit in pulmonary function than the independent effect of either exposure. Finally, the use of path analysis improved the understanding of underlying directional or non-directional relationships between height, weight and DDE exposure on pulmonary function. These findings have implications in the areas of environmental epidemiology, respiratory epidemiology and child health epidemiology.