

BIRMINGHAM CITY COUNCIL

**REPORT OF THE ACTING DIRECTOR OF REGULATION AND ENFORCEMENT
TO THE LICENSING AND PUBLIC PROTECTION COMMITTEE**

17 FEBRUARY 2016
ALL WARDS

**RESEARCH FINDINGS ON THE EFFECTS OF SHISHA SMOKING ON CARBON
MONOXIDE AND PM_{2.5} CONCENTRATIONS IN THE INDOOR AND OUTDOOR
MICROENVIRONMENT OF SHISHA PREMISES**

1 Summary

- 1.1 This report and the scientific paper attached advises committee of the research undertaken by your officers and Birmingham University to determine that there is the potential to cause harm to employees and customers who frequent and work within Shisha premises. The research was published within the journal Science of the Total Environment in January 2016.
- 1.2 The Local Authority has a duty to ensure workplaces are compliant with the Smoke free Regulations 2007 enacted under the Health Act 2006. These regulations aim to ensure employees and members of the public are not exposed to harmful environmental tobacco smoke within enclosed workplaces and other enclosed public places.
- 1.3 Within Birmingham and around the country, shisha premises have grown in popularity and number. The main service offered is the sale of shisha pipes to customers who smoke the flavoured tobacco. Shisha premises are required to comply with the smoke free regulations and, therefore, cannot operate in an enclosed space.
- 1.4 The results of the research indicates that smoking shisha increases considerably the concentrations of Carbon Monoxide (CO) and PM_{2.5} (Particulate Matter less than 2.5 microns in size) inside shisha premises and that PM_{2.5} leaks from within shisha premises to the external environment and may cause public health concerns to local communities.

2 Recommendations

- 2.1 The report is directed to the Chair of Health and Wellbeing Committee and Chair for the Planning Committee for consideration and discussion.
- 2.2 That committee endorses action by Environmental Health to work with partners to provide a harm reduction package for shisha users, employees in

shisha businesses and shisha business owners to effectively reduce the potential harm from the activity of smoking shisha or secondary smoking.

- 2.3 That a further update report detailing potential harm reduction strategies is brought to Committee by June 2016

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3. Background

- 3.1 The Local Authority has a duty to ensure workplaces are compliant with the Smoke free Regulations 2007 enacted under the Health Act 2006. These regulations ensure employees and members of the public are not exposed to harmful environmental tobacco smoke within enclosed workplaces and enclosed public places.
- 3.2 The legislation places a duty on all owners and employers where more than one person works or where the premises is open to members of the public, to be smoke free where the premises are enclosed and not allow smoking within enclosed premises. Enclosed means that 50% or more of the premises or room is not open to the natural air.
- 3.3 Carbon monoxide (CO) is a product of combustion and has an affinity for red blood cells that carry oxygen to our body. Therefore, if CO levels are high this will lead to oxygen depletion within the haemoglobin in blood. Symptoms of CO poisoning include dizziness, shortness of breath and confusion through to loss of consciousness and death at high levels. The fire authority is particularly interested in CO as it can impair the ability of persons to react in fire situations.
- 3.4 Fine Particulate Matter 2.5 (PM_{2.5}) is also a product of combustion and an air pollutant that adversely affects people's health when levels in the air are high. They are tiny particles in the air that may reduce visibility and cause the air to appear hazy when levels are significantly elevated. The particles are of particular significance because they are able to travel deep into the respiratory tract, reaching the lower parts of the lungs where gas exchange occurs. Short term exposure health effects can include; eye, nose, throat and lung irritation, coughing, sneezing, runny nose and shortness of breath. Longer term they affect lung function such as chronic bronchitis, reduced lung function and increased mortality from lung cancer and heart disease.
- 3.5 Indoor sources of PM_{2.5} are tobacco smoke, cooking, burning candles, fuel-burning heaters and fireplaces, outdoor sources are mainly attributed to diesel engines and other sources of combustion.

4 Research Project

- 4.1 Photographic evidence using flash photography taken by Environmental Health within shisha premises, showed the air contained particulates, resulting in the photographs being grainy and hazy looking. In addition, officers used personal CO monitors during visits and these indicated the presence of CO. From this, officers formed the hypothesis that there were elevated levels of PM_{2.5} and CO from environmental tobacco smoke from the shisha pipes, however, there was no previous evidence from specific shisha research to prove or disprove this theory.
- 4.2 Environmental Health works annually with the University of Birmingham's environmental health MSc course to assist with student dissertations. Your Officers hypothesis was put forward as the basis of a research project and accepted by the University. The students from the university and environmental health contacted a number of shisha businesses seeking their cooperation with the project.
- 4.3 Indoor concentrations of CO and PM_{2.5} were simultaneously collected through sensors for 60 minutes. This was repeated within twelve shisha premises during busy periods during March and June 2014. Samples were also taken outside usually by the fire assembly areas as a representative open space. The number of customers present and shisha pipes alight was recorded during sampling.
- 4.4 For a control, the same exercise was repeated for both pollutants inside five pubs/restaurants with cooking facilities. It was assumed that particulate matter and CO would be present in similar concentrations to shisha premises as gas cookers were in operation. There were no smoking issues within the control premises.
- 4.5 Owners and managers of shisha premises were interviewed using a structured questionnaire to determine the levels of knowledge about tobacco smoke and its associated health risks.
- 4.6 Data analysis of the air sample concentrations collected was undertaken by the university to determine the statistical difference/relationships of the concentrations:
 - inside and outside shisha premises;
 - the inside of shisha premises and inside of pub/restaurant premises;
 - inside shisha premises and urban monitoring background locations;
 - the relationship between the inside concentrations and number of alight shisha pipes.
- 4.7 The uniqueness of this research compared to other research is:
 - the finding that there is a strong suggestion that PM_{2.5} leaks out into the immediate environment surrounding shisha premises; and
 - this is the only research of its kind within the UK measuring PM_{2.5} and CO concentrations.

5 Results of the Research

5.1 PM_{2.5} and CO concentrations inside shisha premises:

On average concentrations are:

- 8 times greater for PM_{2.5} and 11 times greater for CO inside shisha premises than outdoor (outdoor fire assembly points) background levels.
- 13 times greater for PM_{2.5} and 9 times greater for CO inside shisha premises than inside control pub/restaurant.

5.2 The PM_{2.5} concentrations inside and immediately outside strongly correlate suggesting that indoor air is leaking outdoors and contributing to enhanced PM_{2.5} concentrations in nearby outdoor locations.

5.3 A comparison was made with the concentrations of PM_{2.5} measured at urban traffic locations and background level monitoring sites in the UK. PM_{2.5} concentrations were found to be considerably lower at the urban traffic and background level monitoring sites than those measured outside of the shisha premises during the same sample period.

5.4 Results showed a statistical significant difference between PM_{2.5} and CO concentrations measured inside shisha premises compared to inside pubs/restaurants with a similar number of customers and cooking facilities being used (in that the concentrations within shisha premises were higher for both pollutants). This suggests a strong linkage for shisha smoke leading to poor indoor air quality inside shisha premises.

5.5 With regard to the association between indoor air quality with the number of active shisha pipes:

On average a shisha smoking session lasts around 60 minutes with 1 shisha pipe being shared between 3 to 4 customers. The highest number of active shisha pipes and customers found in premises also featured the highest PM_{2.5} and CO concentrations. Analysis of this data suggests that the number of active shisha pipes is a strong predictor of the concentrations of PM_{2.5} inside shisha premises. There was less of a correlation with CO with only 30% of the variability of the CO concentration could be attributed to shisha pipes.

5.6 Business owner's awareness of environmental tobacco smoke:

Out of 12 shisha premises owners, only 3 owners/managers knew about the effects of secondhand smoke and its associated health risks. The remainder did not recognize secondhand smoke from shisha smoking as a hazard and were not aware of the need for ventilation to prevent the buildup of toxic and hazardous gasses.

6. Conclusions

- 6.1 The results of the study have revealed elevated concentrations of CO and PM_{2.5} inside shisha premises which are deemed to create a significant public health risk. This is consistent with results published around the world looking at indoor PM_{2.5} levels within shisha premises.
- 6.2 The leaking of indoor air with raised levels of PM_{2.5} from shisha premises to the outdoors could affect the health of local public causing potential harm to neighbourhood and environment. This in turn may raise environmental issues for local communities particularly where new developments are proposed near to residential or sensitive sites such as a school.
- 6.3 Smoking shisha inside shisha premises causes a detrimental impact to the indoor air quality. Shisha smoking is the main source emitting PM_{2.5} and the more shisha pipes are active the higher the concentration. CO concentrations within shisha premises is likely to arise from burning charcoal (lighted briquettes are placed on top of the tobacco instead of being lit in a traditional cigarette), though shisha smoke cannot be ruled out. There was no clear reason found why CO was not at its highest where there was more pipes being used. This may be affected by other factors such as ventilation and the fact CO is heavier than air and, therefore, the gas will lie at low level and maybe agitated by feet, people moving or dead zones caused by furniture.
- 6.4 Customers (including non-smokers) and employees within shisha premises are exposed to consistently elevated concentrations of PM_{2.5} and CO levels. These high levels pose a health risk for those working or socialising inside shisha premises and may increase the risk to employees and customers of serious illness and morbidity in later life.
- 6.5 The research concludes that even though this research was conducted in the UK, these results are likely to be representative of the situation experienced elsewhere due to the increased popularity of shisha smoking in countries around the world.

7. Legislation governing indoor air quality

- 7.1 There are currently no UK indoor air quality standards for PM_{2.5}. Only outdoor air quality standards are available within the UK for comparison. The range of concentrations of PM_{2.5} found within this study within shisha premises was between 37µg/m³ and 3332µg/m³ (average = 287µg/m³ +/- 330µg/m³ (1hr)). Tyburn roadside, an urban traffic reference site in Birmingham measured and average of 5.9µg/m³ +/-1.9µg/m³ (1hr) for the same time period. The national air quality objective and European directive limit and target values for the protection of human health in the outdoors is 25µg/m³ PM_{2.5} (average for the year) for the UK.
- 7.2 The average concentration of CO within shisha premises was found to be 7.3mg/m³ (15mins). The workplace exposure limits set up by the Health and

Safety executive recommends 232mg/m³ (15mins). Therefore, the level was found below the legislative limit.

8. Further use for the published evidence

- 8.1 Current interventions to reduce the harm from secondhand smoking within shisha premises are education and advice to shisha owners/managers and compliance interventions. Compliance with UK legislation only requires that 50% of the area in which smoking occurs is open to the air. The experience of your officers and from speaking to other local authorities, we have found that within some premises, interpretation of the 50% opening by designers and businesses owners has created smoking shelters that may technically adhere to the legislation but do not follow the spirit of the law in that they do not allow for the free movement of smoke out of the premises. Prosecution of the smoke free legislation for allowing smoking within enclosed premises has not found to have been effective in that some premises pay the fine and subsequently, continue to operate non-compliantly. Currently other avenues need to be investigated to ensure sustainable improvements are achieved.
- 8.2 Environmental Health continues to work with West Midlands Fire Service, the Black Country Tobacco Control Alliance, Birmingham City Council Public Health and Public Health England to consider a package of interventions to work towards reducing the potential harm from shisha smoking. This will include both smoking in shisha premises and within a domestic setting.

9. Awards

- 9.1 This research received the 2015 CIEH president's award from the Chartered Institute of Environmental Health in recognition for their services to the field of environmental Health which as presented to Birmingham City Council at the House of Commons on 14th July 2015.
- 9.2 In March 2015 Birmingham City Council and the MSc Environmental Health student won the Environmental Protection UK – 'best research project for indoor air quality'.
- 9.3. The MSc student who conducted this research was awarded the University of Birmingham Sir Oliver Lodge Student Prize 2014, which is awarded to high achieving students whose work has contributed to the field of environmental protection.

10. Implications for Resources

- 10.1 The resources employed in carrying out the research detailed in this report were partly delivered by the University of Birmingham, whilst officer time will be contained within this Committee's budget.

10.2 Resources to undertaken the Regulation and Enforcements compliance measures of shisha premises are contained within this committees budget.

10.3 Future harm reduction measures will be borne through partnership working with Public Health England, Black Country Tobacco Control Alliance, Birmingham City University and West Midlands Fire Authority.

11 Implications for Policy Priorities

11.1 The work undertaken by Environmental Health also supports the Regulation and Enforcement Division's mission statement to provide 'fair regulation for all - achieving a safe, clean, green and fair trading city for residents, business and visitors'.

11.2 A link between poor outdoor air quality and social deprivation has been established with the more inner city wards suffering the greatest amount of pollution.

12. Public Sector Equality Duty

12.1 Air pollution has the potential to affect all members of society but can have specific impacts on pregnant women and the unborn child. The concerns about such are widely known and health advice is issued accordingly by relevant medical professionals.

12.2 The smoking of shisha in the UK within shisha premises is virtually universal. The approach taken to address air quality is such as to protect all members of society and does not discriminate against any group.

ACTING DIRECTOR OF REGULATION AND ENFORCEMENT

Background Papers:

~~Appendix 1 Gurung, G, Bradley, J, Delgado-Saborit, J.M, 2016. *Effects of shisha smoking on carbon monoxide and PM_{2.5} concentrations in the indoor and outdoor microenvironment of shisha premises.* Science of the Total Environment 548-549, 340-346.~~