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Exposure to barbeque smoke in Vientiane, Lao PDR

Gendered disparities and unequal exposures for grillers

SEI policy brief
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Key messages

- **In Lao PDR, the grilled food sector is a growing part of the informal food economy; staff have limited access to workplace or social protections, including national health insurance and paid sick leave. Female workers are particularly disadvantaged.**
- **Emissions from grills from street vendors contribute very little to overall air pollution in Vientiane; however, localized exposure for individual workers is high, which can result in significant health impacts.**
- **More women than men work in the grilled food sector, and female grill workers are more likely to report respiratory symptoms than their male counterparts. Gender expectations affect who does what jobs and how much individuals are paid.**
- **To minimize localized air pollution and the health problems from exposure to grill smoke, the health, environment, social and business sectors should collaborate to raise awareness, reduce emissions, support workers' health, and support a sustainable clean air monitoring system.**

Air pollution and grilled food

In Lao PDR, a lower-middle income country in Southeast Asia, the urban population is growing, and with it, the demand for restaurants and grilled street food. Grilled food has become a growing part of the informal food economy.

Grilled foods are typically prepared in front of restaurants or on mobile street-carts, contributing to indoor and outdoor pollution. Cooking practices that use biomass fuels and require high temperatures, such as grilling, generate fine particulate matter smaller than 2.5 microns, PM2.5; these tiny particles can be airborne and can lead to health problems when inhaled (Kabir & Kim, 2011).

In Lao PDR, charcoal is used extensively in most grill shops because of its ease of usage and cost efficiency (Vicente et al., 2018). The combustion of charcoal creates a considerable amount of airborne toxic elements that have several adverse health effects, including carcinogenicity (Kabir et al., 2010; Huang et al, 2011). Exposure to PM2.5 from coal combustion is exacerbated by limited control of the source and lack of personal protection for grillers (Kim et al., 2011).

The Faculty of Public Health at the University of Health Sciences, Lao PDR, in cooperation with SEI, conducted a research project, "Air pollution among grill workers in Lao PDR: Issues of inequalities and gender". The team analysed the exposure of grill workers to PM2.5 and proposed risk reduction measures. Based on the research findings, this policy brief summarizes key issues related to unequal exposures to air pollution among grill workers in Vientiane, the capital of Lao PDR.

Grill workers' exposure

The research found that exposure to burning charcoal among grill workers depends on the grill shop setting and the worker's role. Assessment of the PM2.5 levels in and around 14 grill sites revealed the average concentrations of PM2.5 were 85 micrograms per cubic metre (µg/m3), with a minimum of nearly 22 µg/m3 and a maximum of 255 µg/m3. This is above the Lao air quality standard, which is 50 µg/m3 as the annual mean. The standard takes into account that PM2.5 levels in the range of 51–90 µg/m3 or above have negative implications for health, especially where the PM2.5 concentration level is higher than 251 µg/m3.

The wide variation in the PM2.5 concentration levels measured for this study is likely to be due to the different volume of food sold during a day, types of restaurant and location, and other environmental factors such as surrounding buildings, wind direction and wind speed. Higher concentrations of PM2.5 (average 143 µg/m3) were found in the grilling sites in markets compared to restaurant locations. Extremely high levels of PM2.5 were found in the Nongdouang Market, likely due to the high number of vendors with street food carts including grills, and food shops nearby.

Most grill workers interviewed (83% of a sample of 362 respondents) were exposed to smoke from a grill for at least eight hours per day, six to seven days per week, with charcoal as the primary fuel (10–50 kg per day). Workers using an indoor grill were around three times more likely to develop respiratory symptoms than outdoor grill workers.

Of the survey participants, 91% of the women in the study spend six to seven days a week grilling with charcoal, versus 82% of the men. Women were also more likely to be working at the grill without an assistant (48% vs 40%), or work in front of a grill stove without breaks for an entire shift (Sychareun et al., 2022).

Factors influencing the presence of self-reported respiratory symptoms among grill workers were the following: being female, having a low income, grilling inside, having more years of grilling work, experiencing sudden coughing due to inhaling smoke, and having a self-perception of being healthy. Regarding access to healthcare and sick leave, as part of the informal economy, grill workers did not have formal employment contracts or paid sick leave, nor did they have contributions to health insurance. They worked in an environment with limited occupational health and safety management systems.

Mitigation measures

Several mitigation measures can be taken to reduce the health risk of exposure to burning charcoal for grill food workers. These include use of personal protective equipment (PPE; e.g. gloves, long sleeves, face masks). Some preventive measures also include adequate maintenance of barbecue ventilation systems, regular cleaning of the grill areas, effective ventilation and fume extractors, and regular washing of workers' exposed skin. The present study found PPE usually is available but is not used consistently, especially face masks, which participants often found hot and uncomfortable to wear while grilling food or when serving customers.

Gender differences

According to the study results, nearly three-fourths of workers in the grilled food sector were women. The results also showed that female grill workers are almost three times more likely to develop respiratory symptoms than their male counterparts. These symptoms could be due to inhalation of grill smoke in their daily work. Possible reasons include longer hours worked by women, but another reason may be gender roles that mean that women also do more cooking at home with charcoal or other biomass fuels, thus prolonging their exposure to harmful pollutants.

Gendered expectations of certain work tasks were also evident. For example, men were perceived to be better at handling the more "skilled" work of being a griller, especially in shops selling beef or goat, while women were often seen as more suited to carry out "easier" and lower paid tasks such as serving and cleaning up. Women also tended to be paid less than men.

Policy recommendations

Several actions could reduce the emission of air pollutants from grilling activities and protect grill workers' health from exposure to barbeque smoke and its negative consequences. Based on the findings from the study, the table below summarizes suggestions for policy and implementation, with a focus on multi-sectoral collaboration.

Table 1. Recommended actions

Action	Implementation	Possible challenge	Possible facilitator
1. Raise awareness of the adverse short-term and long-term health impacts of regular exposure to all forms of particulate matters, especially PM2.5 for the grill workers and shop owners	Public health education about the contribution of grilling with combustible fuels to air pollution Raise awareness of gender disparities around certain tasks, and creating targeted interventions accordingly Disseminate information to grill workers about health risks of exposure to the smoke from grill fires and risk mitigation measures such as PPE	Difficulty in getting participation of grill shop owners and workers due to time constraints	Lao Women's Union social media channels; print, television and radio media outlets Ministry of Information and Culture; television and radio stations
2. Ensure workers have appropriate labour contracts that guarantee paid time off and basic labour rights as outlined in legislation	Provide information to workers and shop owners about the legal obligations of employers and the need to provide employment contracts that formalize their employees' work	Understanding and participation of the shop owners Additional cost to employers in providing contracts and paid time off Does not address needs of self-employed vendors	Ministry of Labour and Social Welfare, Lao Federation of Trade Unions
3. Increase enrolment of informal workers in health insurance schemes, to allow for better access to healthcare	Provide information about health insurance to owners and to informal workers, and clarify the benefits in order to promote enrolment into health insurance schemes Increase public awareness of health insurance schemes via social media, arts and storytelling, puppet shows and folk drama to broadcast information on the benefits of health insurance Include information about the national social security website and employers' responsibilities towards workers A longer-term strategy should be to move informal workers into the formal sector, providing more tax revenue and more protections for workers	Language barrier for ethnic minority groups Owners and workers unwilling to voluntarily enrol in health insurance scheme due to cost	Lao Social Security Organization, Ministry of Labour and Social Welfare, Lao Youth Union and Lao Women's Union, Small and Medium Enterprise Promotion Department
4. Increase "clean cooking" practices, burning control, grilling food with cleaner fuel	Provide information on "clean fuels" – electricity, natural gas, liquefied petroleum gas (LPG), and advanced biomass cooking and heating stoves in rural areas; use low-emissions briquettes as fuel Encourage grill shops to properly install high-efficiency range hoods over stoves or to use vent hoods or wall or ceiling exhaust fans during cooking Provide subsidies or other financial incentives for improved cookstoves and ventilation systems Run campaigns or award certificates for the "Best Clean Air Restaurant or Shop" in the district or city, for example	Difficulty getting participation of grill shop owners Lack of funds (from both government and owners) to improve cooking practices Not a priority for government or owner investment	Link up with Vientiane municipality and Ministry of Natural Resources and Environment to inspect the quality and cleanliness of restaurants Provide subsidies or other financial incentives for owners to make changes

Action	Implementation	Possible challenge	Possible facilitator
5. Increase PPE use by grill workers	Promote the appropriate use of PPE, including use of face masks, improved ventilation and monitoring of smoke, but also be transparent about the limitations of face masks based on current evidence, to avoid a false sense of security Acknowledge gendered disparities in high-exposure work tasks and ensure relevant protection accordingly Require owners of shops to provide workers with PPE	Participation of grill shop owners due to time constraints Cost of providing PPE to workers	Ministry of Health, Small and Medium Enterprise Promotion Department, Ministry of Natural Resources and Environment
6. Recognize grill restaurants that use cleaner cooking fuels or ventilation systems	Establish campaigns for monitoring and approval and award certificate handling for the "Best Clean Air Restaurant or Shop" in the city, for example	Participation of grill shop owners due to time constraints Cost of purchasing cleaner cooking fuels and ventilation systems Shop owners are not sufficiently motivated by clean recognition rewards	Health, Environment, Social Welfare and Business Groups of Vientiane Capital City
7. Inspection and maintenance programmes for air pollution in congested areas of grill shops or carts	The environmental sector, especially the Department of Pollution Control and Monitoring, should set up a clean air inventory and monitoring system Introduce environmental management plans and monitoring of smoke emissions for grill shops	Participation of grill shop owners Capacity of environmental sector to set up a clean air inventory and monitoring system	Health, environment, social welfare and business groups of Vientiane Capital City

In order to implement the above recommendations, a technical working group could be established to agree on and prioritize policy actions to reduce the PM2.5 exposure of grill workers. The implementation options can be facilitated by the Laos Ministry of Health, Ministry of Natural Resources and Environment, and the Department of Small and Medium Enterprise Promotion to discuss challenges and facilitators.

In the short- to medium-term, owners should be encouraged to enrol their staff in the national health insurance scheme and to provide labour contracts for employed staff. In the longer term, informal businesses should be supported to transition to the formal economy. Air monitoring and other measures should be subsidized and mandated.

Improving air quality and protection for workers in the grilled food sector means addressing the various dimensions of the impacts of grill smoke, including occupational health, labour rights and social equity. Achieving these ends will require strong cross-sectoral collaboration between health, environment, social and business sectors.

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