

**Title: Does Children Mining Gold Bother You?****Authors: Shilpi Misra, Afoma Mbanefo, Devarshi Jatin Pandya, and David F. Goldsmith****Affiliation: Milken Institute School of Public Health, George Washington University, and Workplace Health Without Borders US****Introduction**

Artisanal and small-scale gold mining (ASGM) accounts for ~15 to 25% of the world's gold production. This is ~330 tons of gold per year. Approximately 10-19 million people utilize mercury to mine for gold in over 70 countries, of which ~1.5 to 4 million are children aged 8 to 16 years. ASGM is also the largest source of mercury pollution and some countries are taking great lengths to address health effects on adult miners. Gold is not only used in jewelry production but also in electronic devices. The electronics industry is the third-largest consumer of gold. We know a smartphone contains ~30 mg of gold. Against a price of \$36,468.98 per kilogram, this modest amount of gold is worth about \$1.10 for each phone.

**Problem**

A significant number of people working in these ASGM are children, but the actual numbers are unknown due to the absence of any reliable census of those engaged in these operations. The International Labour Organization (ILO) states that there are about 4 to 5 million women and children working in ASGM. The two most serious concerns are the effects of mercury emissions on the environment as well as the impacts on the health of miners, especially child miners. As of October 2019, there are 113 countries that have ratified the Minamata Convention, an aggressive policy action designed to protect human and environmental health from adverse effects of mercury. There are ~1,400 tons of mercury emissions annually from ASGM in more than 70 countries. Most of these nations have ratified the Minamata Convention. We know that mercury vapor produced from heating mercury-gold amalgam can lead to tremors, memory loss, and respiratory dysfunction in adults. We are aware that children have been exposed to lead and silica dust hazards while engaged in ASGM. What is missing is a clear understanding of the health effects of mercury and ASGM among children who are engaged in mining activities.

Additionally, mercury run-off from mines has been detected in nearby rivers and has been found in fish and other wildlife, particularly if contaminated water is released from ASGM operations.

Enforcing stringent government regulations to prevent child labor in these mines, remains challenging. Families involved in ASGM often reside in low and middle-income countries and have limited means of sustainable employment. The ILO has identified nations with the greatest number of child miners. The list includes Mali, Burkina Faso, Bolivia, Peru, Philippines, Niger, Mongolia, Uganda, Ghana, and Tanzania. There are about 50,000 gold shops worldwide that serve small-scale gold miners, with each shop processing ~7 kg of gold per year. These shops are

where the raw gold from mines is sold for processing and refinement, and eventual sale to jewelry makers and international buyers. The families from ASGM view the opportunities as a means to earn a living even if the work is back breaking and dangerous, both in terms of mercury exposure and other workplace hazards. According to the ILO, the income coming from children working in ASGM in the Philippines contributes up to 30% of the family's total income. For these families, ASGM is a means of survival and preventing them from mining gold without providing a sustainable replacement is likely to push them further into poverty.

### **Methods**

We have reviewed the literature from the UN and ILO to estimate the children's population at risk for involvement in gold mining. Furthermore, we have sought information about programs similar to Brilliant Earth for diamonds (<https://www.brilliantearth.com>) designed to reduce the number of children engaged in mining gold. Lastly, we have attempted to estimate the health impacts, including gold mine injuries and health effects from mercury that might be correlated with pediatric exposure.

### **Conclusions**

Given the harsh economic conditions families face who engage in ASGM and the current price of gold worldwide, solutions will require leadership from national and local governments, the established gold mining industry, local worker communities, and NGOs to resolve this issue. From a public health perspective, we must look at policies that focus on the physical and mental health, and overall well-being of children who are employed in these mines. One larger question that should be explored is comparing the health outcomes of children who are working in gold mines to children that are not involved, to see if ASGM exposure is creating long-term adverse outcomes. At this time, there are no recent published studies focused solely on children mining gold.

Several organizations--such as Fairtrade International, Fairmined-Alliance for Responsible Mining, Responsible Jewelry Council, and OroVerde--claim to ensure that the gold they certify is adhering to child labor-free standards. These organizations offer services to ensure that the gold in commerce was not mined by children. It is difficult for organizations to monitor and measure what is happening when gold is being sold in each country. There is no way of knowing how effective these organizations have been in reducing the number of children in gold mines or reducing the amount of mercury that is being used in the mining process.

UNICEF has produced a toolkit that focuses on children as key stakeholders. The toolkit focuses on resettlement and alternative sources of employment to replace ASGM. Based on these recommendations, the next steps include collecting information from local communities to determine: 1) the driving factors for families to become involved in ASGM industries -- limited education opportunities, lack of employment opportunities, or generational norms; 2) other employment options such as agriculture or remediating prior mining activities.

As it stands in countries where ASGM exists, there are limited enforcement mechanisms to ensure that companies are abiding by national labor laws, including mandatory inspections of ASGM mines, and prosecuting companies using child labor. Additionally, countries should be responsible for creating vocational training programs or requiring children to enroll in schools. We know from the experience of children involved in coal mining in industrial nations that changing workplace norms about ASGM can be undertaken, although we recognize that this will require challenging policy changes.