



## INTRODUCTION

Lead is a toxic metal that causes adverse effects on both human health and the environment. "Paint" includes varnishes, lacquers, stains, enamels, glazes, primers, or coatings used for any purpose. Paint is typically a mixture of resins, pigments, fillers, solvents, and other additives. "Lead paint" is a paint in which one or more lead compounds have been added.

While lead exposure is also harmful to adults, lead exposure harms children at much lower levels, and the health effects are generally irreversible and can have a lifelong impact.<sup>1</sup>

**The younger the child, the more harmful lead can be,** and children with nutritional deficiencies absorb ingested lead at an increased rate. The human fetus is the most vulnerable, and a pregnant woman can transfer lead that has accumulated in her body to her developing child.<sup>2</sup> Lead is also transferred through breast milk when lead is present in a nursing mother.<sup>3</sup>

Evidence of reduced intelligence caused by childhood exposure to lead has led the World Health Organization (WHO) to list "lead-caused mental retardation" as a recognized disease. WHO also lists it as one of the top ten diseases whose health burden among children is due to modifiable environmental factors.<sup>4</sup>

Lead paint is a major source of childhood lead exposure. High blood lead levels (BLL) in children

aged 6 to 36 months in Kathmandu Valley, Nepal was revealed from a cross-sectional study of associated factors, 2015. Of 312 children enrolled in the study, 64.4% had BLLs  $5\mu\text{g}/\text{dL}$ . A significant association was found between BLL and exposure to enamel paints in the household in the form of painting materials used in different parts of the house like walls, windows, and doors.<sup>5</sup>

The recent study report entitled "The Toxic Truth: Children Exposure to Lead Pollution Undermines a Generations of Future Potential" by UNICEF and PURE EARTH, 2020 revealed that 1 in every 3 children up to 8 million globally have blood lead levels at or above  $5\mu\text{g}/\text{dL}$ .<sup>6</sup> This study estimates that 6,719,235 Nepalese children (over 65% of the total child population of Nepal) have elevated BLL ( $>5\mu\text{g}/\text{dL}$ ) and some 3,512,007 children even had BLL over  $10\mu\text{g}/\text{dL}$  as per the upper bound estimates.<sup>6</sup> Nepalese children are under an astonishingly very high level of risk urgently needs to be addressed.

A study investigating the economic impact of childhood lead exposure on national economies in all low- and middle-income countries estimated a total cumulative cost burden of \$977 billion international dollars per year and estimated annual losses among Nepalese children were estimated at 1.5 billion dollars, the 4% of the GDP of Nepal.<sup>7</sup>

**The human fetus is the most vulnerable, and a pregnant woman can transfer lead that has accumulated in her body to her developing child.**



## STATUS OF LEAD IN PAINTS IN NEPAL

Series of lead paints studies carried out by CEPHED and LEADERS Nepal from the years 2010 to 2015 have shown varied and very high level of lead concentrations in the paints produced, imported, sold, distributed and used in Nepal.

These studies findings of high-level lead concentrations in paints produced, imported, sold, distributed, and used in Nepal and associated impacts on health and environment as well as huge annual economic losses called for urgent regulatory and institutional frameworks to be adopted and effectively implemented.



Organization (Years of Studies)	No. of Paints Samples	Minimum Lead (ppm)	Maximum Lead (ppm)	Times more than 90 ppm Standard
CEPHED (2010)	13	3.98	73966.44	822
CEPHED (2011)	27	60	212700	2363
CEPHED (2013)	49	9	130000	1444
LEADERS (2013)	64	60	200000	2222
CEPHED (2015)	87	10	125000	1389

## RESPONSES TOWARD LEAD PAINTS ELIMINATION

### 1. Government Initiatives

Responding to the research-based advocacy of the Center for Public Health and Environmental Development (CEPHED), the Government of Nepal gazette a mandatory lead paint standard to protect children’s health by eliminating the hazardous level of lead in paint. It was promulgated through a notification in **Nepal Gazette (Khand 64, Number 30, Part 5, Notice No.3 dated December 22, 2014)** by the Government of Nepal, Ministry of Forest and Environment-MOFE (the then Ministry of Science Technology and Environment- MOSTE) as per the Rule

15 of Environment Protection Regulation 1997. The standard took effect after 181 days (i.e. June 20, 2015) of the date of gazette notification.<sup>8</sup>

The promulgated lead paint standard has three important mandatory provisions: **(a) Maximum lead-in paints imported and domestically produced in Nepal to be not more than 90 ppm; (b) Each paint cans should be labeled with lead content in the paint it contained, and (c) Each paint cans should also be labeled with a protective precautionary message for occupational safety.**<sup>8</sup>

Based on the 90 ppm standard, the Department of Education issued a public notice on lead paint on the 15th March 2015. According to notice, “all private and public schools must use non-lead paints or the paints that comply with government standard of

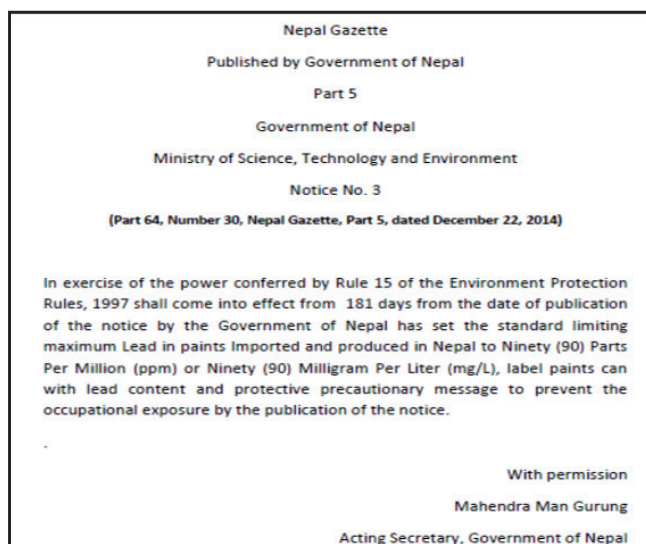


Figure 1: Gazette Standard of 90 ppm lead in paint

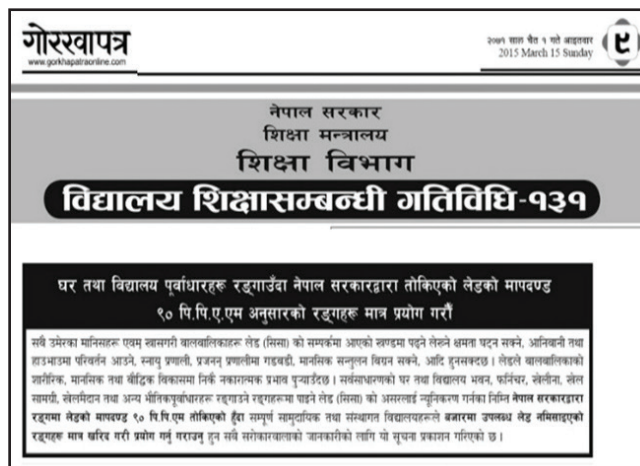


Figure 2: Public Notice from Department of Education, Ministry of Education, Government of Nepal.

90 ppm lead during their repainting and renovating activities on school furniture and buildings”.

This mandatory lead paint standard enacted by the Government of Nepal was challenged in the Supreme Court of Nepal by some paint industry and Nepal Paint Manufacturers Association (NPMA) on 17 June 2015, just three days ahead it was scheduled to become effective. This writ was sought to nullify a mandatory standard for lead in paint enacted by the Government of Nepal.

After several rounds of hearing, On 1st January 2018, Justice Om Prakash Mishra and Justice Bam Kumar Shrestha of the Supreme Court of Nepal dismissed the writ filled by NPMA and allied paint industries and reinstate the mandatory lead paint standard is the crucial steps taken by the Supreme Court of Nepal towards the protection of public health especially children health and environment.<sup>9</sup>

## 2. Paint Industry's Initiatives

Paint industries especially multinational companies have played a great role towards making fast shifting from leaded paints to no added lead- or lead-free paints. However, they need to be adhere with the standards all times and should ensure same quality paints throughout the country. Domestic national paints industries are also following the path of multinational and have improved their products to a greater extent as a number of paint samples from national paints industries have Non-Detectable (ND) level of lead. However still much needs to be done by all to achieve 100 percent full compliance of the lead paints standards in Nepal.

## 3. NGO & Development Partners Initiatives

Lead paint elimination campaign in Nepal is purely NGO such as CEPHED's initiative. NGOs have played a vital role from data generation to policy advocacy to fighting legal battle ensuring robust mandatory lead paint standard and follow up regular compliance monitoring towards achieving gradual improvement besides others regular public awareness and capacity buildings. NGO initiatives have been also well supported by the concerned government agencies as well as development partners and agencies working in Nepal. Development partners and agencies like WHO, EU, SSNC Sweden and IPEN has continuously supporting these endeavors.

## COMPLIANCE MONITORING OF LEAD PAINT STANDARD

From July to August 2021, the CEPHED with the support of WHO purchased a total of 62 cans of solvent-based enamel paints imported, produced, and sold from stores in more than 18 cities from all seven provinces of Nepal.



Figure 3: Enamel paint samples

The paints samples represent 41 different brands produced by 37 [30 National, 3 Multinational (Asian, Berger, and Kansai), and 4 International manufacturers companies from India, Thailand, and the USA].

Total lead content was analyzed by an accredited laboratory Nepal Environmental and Scientific Services (NESS) Limited for their total lead content, based on the dry weight of the paint. The test method applied for lead concentration analysis was direct air acetylene AAS, AOAC, 974.02.

## 1. Compliance Monitoring of Lead Paint Standard in solvent-based Enamel paints.

**Every second (1 in 2) enamel paints you purchase is most likely to contain lead concentration more than the Government of Nepal's lead paint standard limit of 90 ppm.** 32 out of 62 solvent-based paints (52percent of paints) contained lead concentrations at or below 90 ppm, suggesting that the technology that produces paint without lead ingredients exists in Nepal. 18 out of 62 (29 percent of paints) contain a Non-Detectable (ND) level of lead including many Nepalese brands. Moreover, 18 out of 32 paints (56 percent) that comply with the standards contain a Non-Detectable (ND) level of lead is very good news for Nepalese consumers.

### Lead Standard Compliance Status in Enamel Paints

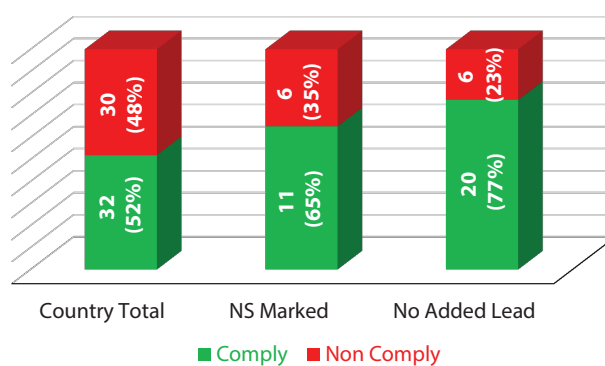


Figure 4: Compliance status of lead paint standard in Nepal

On the other hand, 30 out of 62 analyzed solvent-based paints (48 percent of paints) were not complying with the Government of Nepal’s lead paint standard, i.e., they contained lead concentrations above 90 parts per million (ppm, dry weight of paint). This is the regulatory limit for lead in paint in Nepal. Moreover, 7 paints (11 percent of paints) contained dangerously high lead concentrations above 10,000 ppm. The highest lead concentration detected was 22850.17 ppm (254 times more than the Government of Nepal lead paint standard of 90 ppm) in a Golden Yellow color paint and the second-highest lead concentration 15316.55 ppm (170 times more than the lead paint standard of Nepal) in a deep orange color of the SMART brand of Manjari Paints. Ithari, Sunsari.

In general, paint can label did not carry meaningful information about lead content or the hazards related precautionary message to avoid occupational exposure of lead as mandatory required by the Government of Nepal, lead paint standard.

Only 26 out of 62 paints (42 percent of paints) have lead-free or NO Added Lead..... labels. 6 out of 26 (24 percent) NO ADDED LEAD labeled paints contained lead concentration above 90 ppm. Moreover, paint cans labeled with lead-free or no added level are contained a very high level of lead ranked 3rd (15273.42 ppm) and 7th (11880.57 ppm) highest lead concentration among all in red and yellow color, **“Renew” brands of Tara Paints and chemical industry, Birgunj, Parsa, Nepal.**

Only 17 out of 62 paints (27 percent of paints) have **Nepal Standard (NS) Mark** labels. However, paint cans labeled with NS Mark have also contained a very high level of lead up to 2223.96 ppm (24.7 times more than GON Lead paint standard) in PO Red color, “Always” brand of Jasmin Paint Industry. Needs to be immediately and strictly regulated. 6 out of 17 NS Marked (35.29 percent) paints did not comply with the lead paint standard.

### Color-wise lead concentration distribution

All together 17 shades of 9 different colors (Red, Yellow, Black, Blue, Green, Brown, Phiroza, White, and Chocolate) paints were included in this study.

The good thing is that samples from red, yellow, blue, black, green, brown, and phiroza have at least one sample with a Non-Detectable (ND) level of lead. However, Yellow and Red color paints most frequently contained dangerously high lead concentrations above 10,000 ppm. 4 of all 14 yellow (28.57 percent), 2 of all 18 red (11.11 percent) and 1 of all 6 brown (16.67 percent) colored paints contained dangerously very high lead levels above 10,000 ppm. Even white color solvent-based enamel paints of the Manjari Industry were found to be contained a very high level of lead 2335.33 ppm (25.9 times more than standard).

Lead concentrations across the sample color (%)

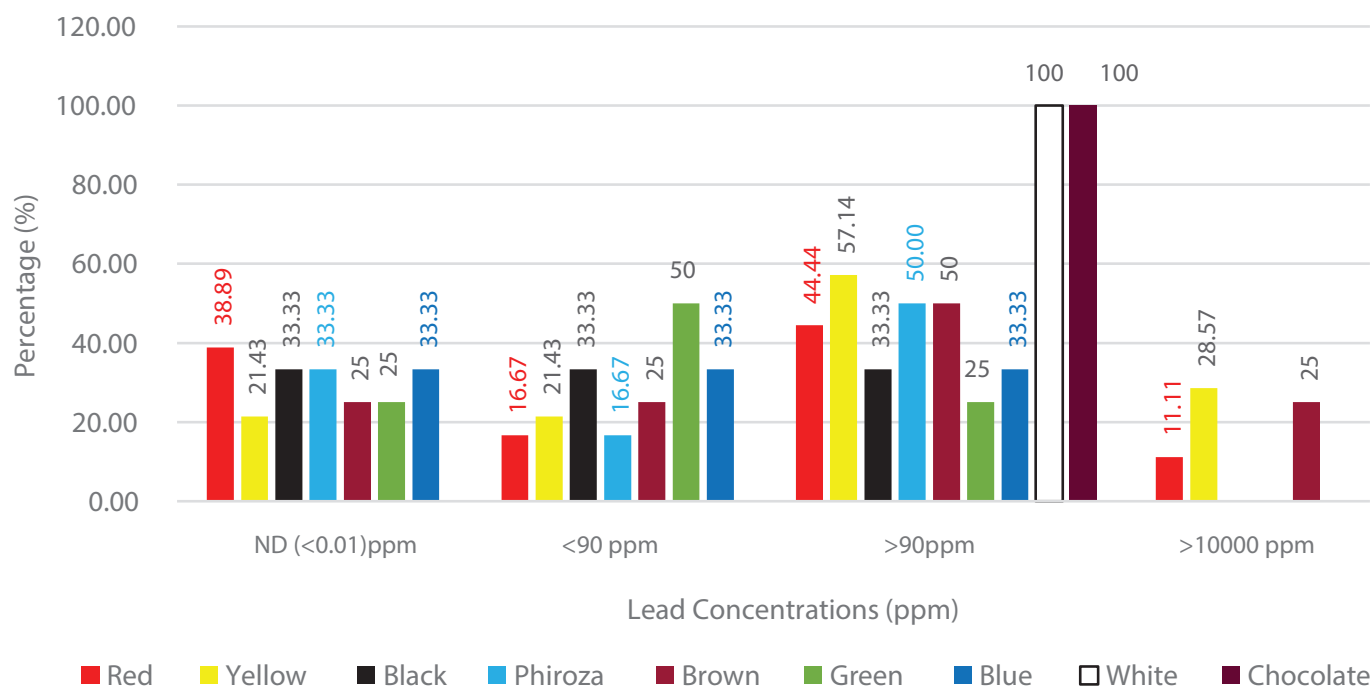
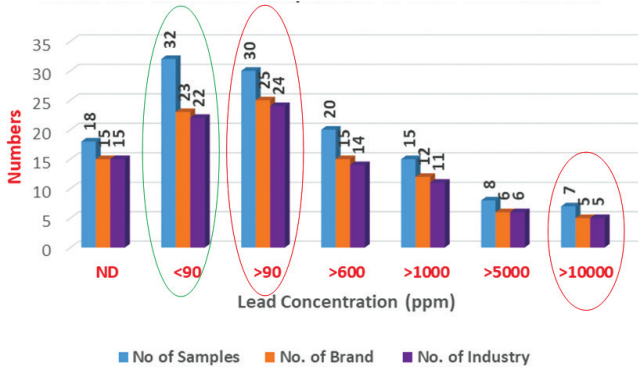


Figure 5: Color wise lead distribution

**Brand and industries comparison of Lead concentration**



**Figure 6: Brand and Industries’ wise lead concentration distribution**

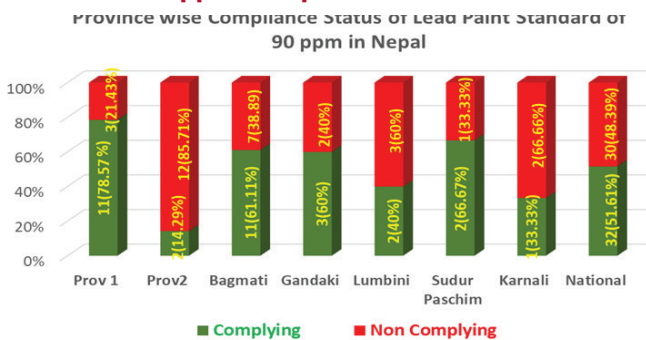
**Industry and Brandwise lead concentration distribution**

- 7 paints of 62 (11.29 percent of all) sold paint with a dangerously high lead concentration above 10,000 ppm.
- 24 out of 37 different industries` produced paints (64.86 percent of paint industries) sold at least one lead paint, i.e., paint with a lead concentration above 90 ppm.
- 5 out of 37 different industries` produced paint analyzed (13.51 percent of paints companies) sold at least one lead paint with dangerously high lead concentrations above 10,000 ppm.
- 5 brands of 41 analyzed brands (12.19 percent of paint brands) sold at least one paint with a dangerously high lead concentration above 10,000 ppm.

**Province wise standard compliance and lead concentration distribution**

Province-wise compliance status varies greatly among the provinces. The lead concentration varies immeasurably among the samples taken from different provinces. Compliance of lead paint standards highest in Province No. 1 (78.57%), Sudur Paschim (66.67%), Bagmati (61/11%), Gandaki (60%), Lumbini (40%) Karnali (33.33%), and Province No. 2 (14.29%) only. Worst Province concerning compliance status. 6 out of 7 highest lead concentrations exceedingly more than 10000 ppm were found in Province No. 2. The other one with the highest lead was from Bagmati province.

**Province wise Compliance Status of Lead Paint Standard of 90 ppm in Nepal**



**Figure 7: Province wise lead paint standard compliance status**

Paints industries are also suspected to adopted the double standard concerning the quality of the paints with lead contents.

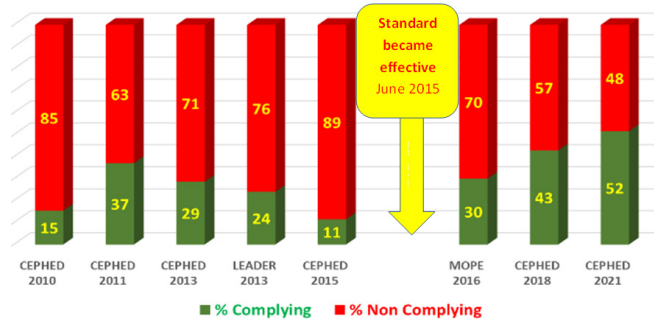
The Lead content of the same company products found in Province No. 2 is highly leaded than their products found in another province like in Gandaki. A separate exclusive study for verifying double standards adoption by the larger company needs to be carried out.

**Implementation of lead paint standard is not so effective.**

This is the first-ever largest compliance monitoring of lead paint standard in Nepal since the date of its promulgation on 22 December 2014 and became effective on 20th June 2015 and tried to extract the situation whether it’s improving or need the intervention after this study findings. Despite this study clearly shows a slightly increasing trend of compliance of lead paint standards over the years, much more needed to be done to achieve 100 percent and full compliance with all the three provisions of a standard of a maximum of 90 ppm of lead, exact labeling of lead content and precautionary message to avoid occupational exposure.

This compliance monitoring of 62 samples from 37 different industries revealed the least effective in the implementation of the lead paint standard. As 30 out of 62 analyzed solvent-based canned paints (48.39 percent of paints) were not complying with the Government of Nepal`s lead paint standard, i.e., they contained lead concentrations above 90 ppm. Moreover, 7 paints (11.29 percent of paints) contained

**Compliance Status of Lead Paint Standard in Nepal**



**Figure 8: Week Compliance status over the years but still more needs to be done to achieve 100% compliance**

dangerously high lead concentrations above 10,000 ppm. The highest lead concentration detected was 22850.17 ppm (254 times more than the Government of Nepal lead paint standard of 90 ppm). There is a substantial reduction of the highest lead concentration of 75046 ppm (CEPHED 2018) to 22850.17 ppm (CEPHED 2021), still very high, required immediate regulatory actions gainst such highly leaded paint producing companies even after 6 years of standards in place and effective.

## 2. Study of Lead in Spray Paints in Nepal

This is the first-ever study of lead in aerosol-based Spray Paints conducted in Nepal after lead paint standards took effect in June 2015. From July to August 2021, the CEPHED with the support of WHO purchased a total of 21 imported and produced spray paints paint of 8 different(7 International and 1 National) industries, and 8 different brands were sampled for the study of lead in spray paints imported, produced, marketed and available for use in Nepal.



Figure 9: Spray Paints samples studied.

The majority of purchased paints (19 samples) were from 7 International paint manufacturing companies from India, China, Thailand, and 2 Samples were purchased from a national industry called National Auto and Spray Udhyog Hetauda, Nepal. The only

known spray paint producing paint company in Nepal. 7 different color spray paints were included in the study. The total lead concentration in spray paints was analyzed in a government-accredited laboratory named NESS Pvt Ltd using AAS.

**Every Third (1 of 3) Spray Paints you purchase is likely to contain lead concentration more than the Government of Nepal Lead Paint Standard limit of 90 ppm.**

As 14 out of 21 analyzed aerosol spray paints (67 percent of paints) were complying with the Government of Nepal’s lead paint standard, i.e., they contained lead concentrations less than 90 parts per million (ppm, dry weight of paint). 13 out of 21 (62 percent) of total and 13 out 14 (93 percent) of all complying paints has a lead concentration of non-detectable (ND) level. This demonstrates that the spray paints that only comply with the lead paint standard of Nepal can be produced and imported into Nepal to protect its population especially children and the environment.

7 out of 21 analyzed spray paints (33 percent) were non complying with the lead paint standard. This is the regulatory limit for lead in paint in Nepal for all kinds of paints being imported, produced, marketed, and used.

Moreover, 2 spray paints (9.52 percent of paints) contained dangerously high lead concentrations above 10,000 ppm. The highest lead concentration detected was 15618.62 ppm (173 times more than the Government of Nepal lead paint standard of 90 ppm) in a yellow color spray paint, LAZER brand of Nippon Paints, China. The other paint sample of the same industry of green color contained the second-highest lead concentration 15070.49 ppm (167 times

### Compliance Status of Lead Paint Standard in Spray Paints, Nepal, CEPHED, 2021

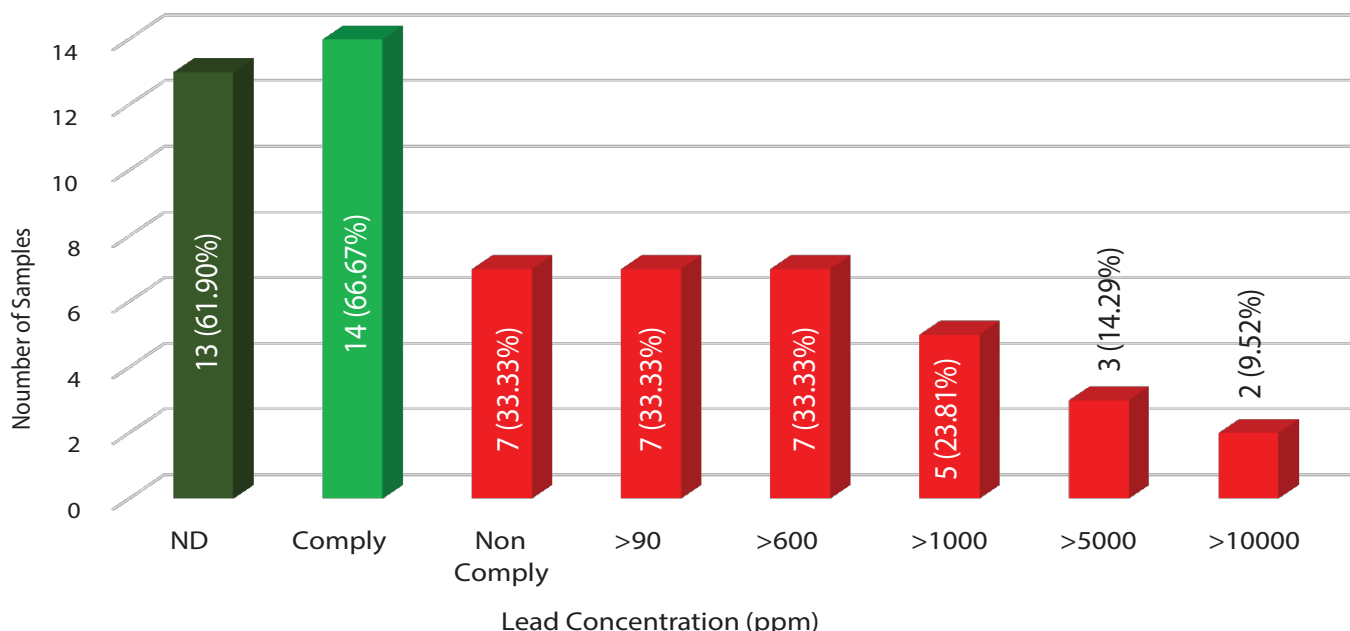
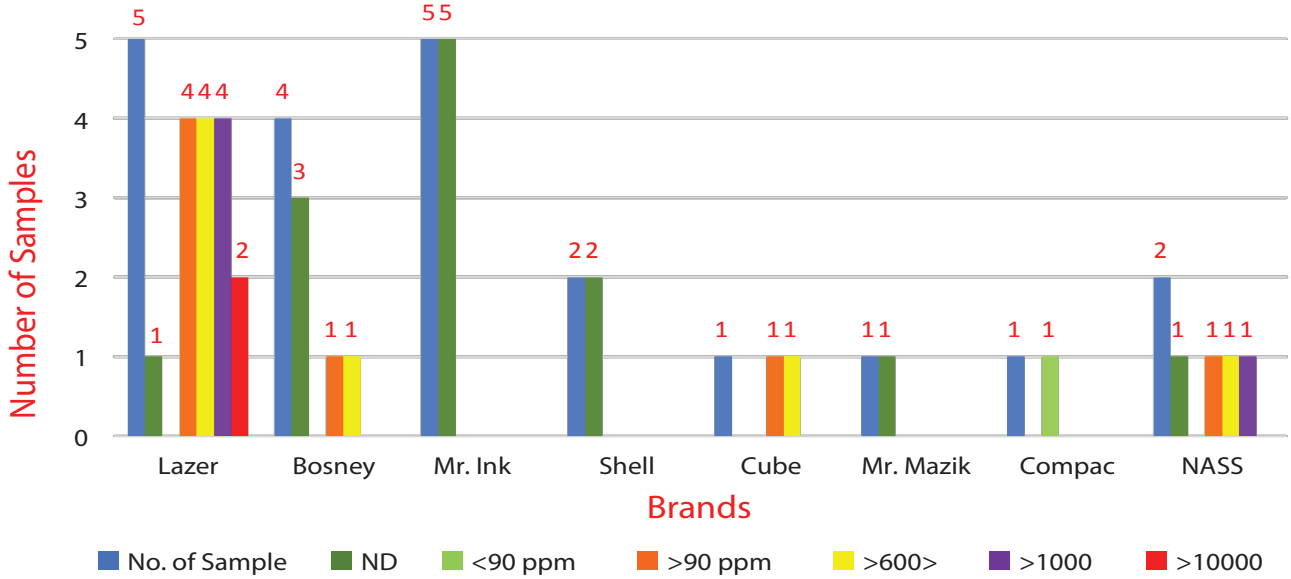


Figure 10: Compliance Status lead paint standard in Spray Paints imported, produced and used in Nepal

**Brandwise Lead Concentration among total samples**



**Figure 11: Brand wise lead distribution in Spray paints in Nepal**

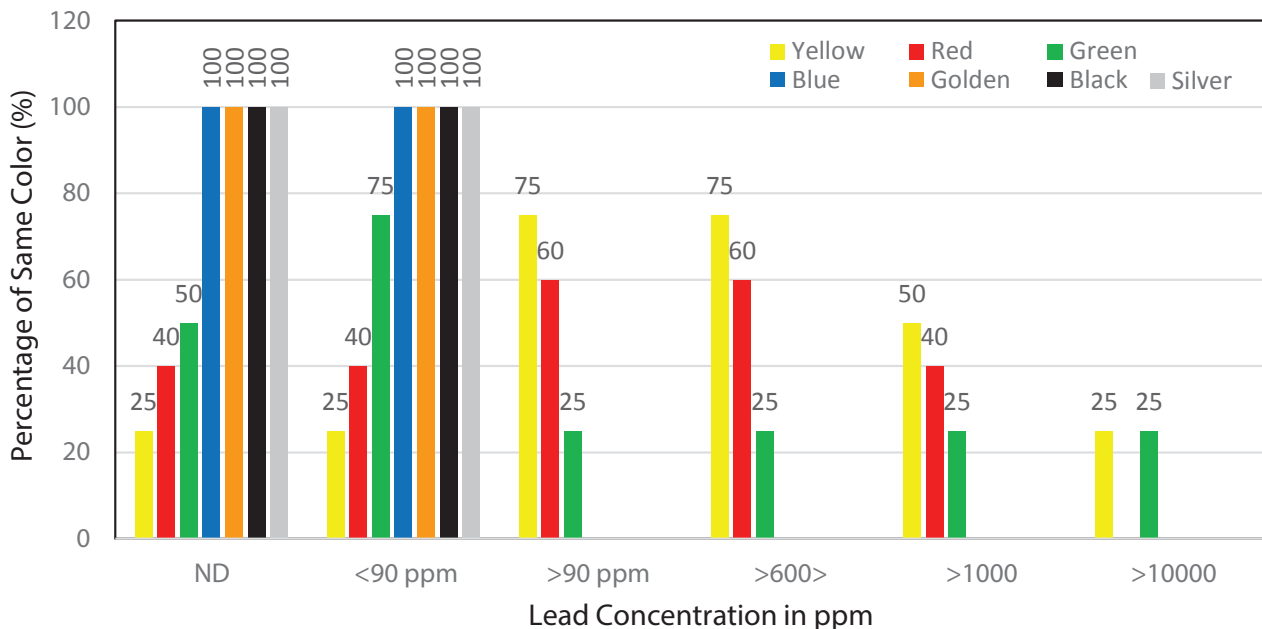
more than lead paint standard of Nepal) paint sold. Another yellow color sample of the same Lazer brand of Nippon paints company contained the 4th highest lead concentration of 2549.81 ppm (28 times more than standard). The third highest lead concentration of 5357.14ppm (59 times more than the standard limit) was found in red color spray paints samples of nationally produced paints by National Auto and Spray Udhog, Hetauda, Nepal.

7 spray paint coming from 4 out of 8 analyzed brands (50% percent of paint brands) sold at least one paint with a high lead concentration above 90 ppm. 2 paints of 1 brand sold paint with a dangerously high lead concentration above 10,000 ppm.

The good news for Nepalese consumers is that 13 out of 21 (62%) from most coming at least one from each studied color samples have no detectable level (<0.01 ppm) of lead and an additional 14 out of total samples 21 (67%) have lead content below government of Nepal lead regulatory limit of 90 ppm.

Color-wise, 60% (3 of 5) red, 75% (3 of 4) yellow, and 25% (1 of 4) green contained lead concentrations above 90 ppm. Samples from Yellow, Red, and Green contained lead concentrations above 90 ppm to over 1000 ppm and even yellow and green color paints have a dangerously high level of lead exceeding over 10000 ppm.

**Color wise Lead Concentration Distribution**



**Figure 12: Color wise lead distribution in Spray Paints**

## CONCLUSION

This study demonstrates that solvent-based Enamel Paints and Spray Paints with high concentrations of lead have been still produced, imported, and available to be sold in Nepal even after 6 years of standard been effective. 32 out of 62 solvent-based enamel paints (52percent) contained lead concentrations at or below 90 ppm. 6 out of 17 NS Marked (35.29 percent) paints and 6 out of 26 (24 percent) NO ADDED LEAD labeled paints did not comply with the lead paint standard limit of 90 ppm. The highest lead concentration detected in solvent based Enamel paint was 22850.17 ppm (254 times more than the standard of 90 ppm. Maximum lead concentration also reduced from 75046 ppm (CEPHED 2018) to 22850 ppm (CEPHED 2021), however, it is still very higher than the standard limit.

In the case of Spray paints, only 14 of 21 ( 67 percent of spray paints) contained lead concentration below 90 ppm. 7 out of 21 (33 percent) of spray paints still contained lead above 90 ppm. The highest lead concentration detected was 15618.62 ppm (173 times more than the Government of Nepal lead paint standard of 90 ppm).

None of the paints cans of enamel paints and spray paints have complied with the mandatory provision of

labelings. Even NS marked paints and NO added Lead ....Marked paint did not give you any guarantee that it does contain lead level always less than the standard limit. Therefore, this research finding urgently call for the effective implementation and strict labeling, market and industries monitoring to enhance effective implementation of lead paint standard in Nepal.

## WAY FORWARD FOR FULL COMPLIANCE & PROTECTION OF PUBLIC HEALTH

More stringent and effective implementation of standard is urgently needed through regular market and industry monitoring by three tiers of concerned government authorities; ban the manufacture, import, export, distribution, sale and use of all paints (enamel and spray paints) with total lead concentrations greater than 90 ppm; ban the import and use of leaded pigments, leaded drier and leaded fillers etc. as the known source of excess lead contamination into the paints in Nepal; promotion of non leaded paint ingredients; mandatory provision of maximum 90 ppm limit as NS award criteria; envision and immediately implement the Green Public Procurement Policy (GPPP); uniform labeling provision and mandatory labeling about lead content and precautionary messaging; envision National Blood Lead Level (BLL) screening program through developing suitable BLL testing laboratory facilities in each province; inclusion of chemical safety in school & college curricula; declare schools, playgrounds, day-care centers and health care facilities as lead free zones; paint companies, dealers and retailers should only produce and/or import & sale paints that fully comply with all the three provision of standard and should not adopt the double standards; consumers should demand paints with no added lead from paint manufacturers, dealers and retailers, as well as full disclosure of a paint product's content ; larger and periodical compliance monitoring studies and mass awareness about lead toxicity and other chemical safety issues should be given due priorities at all three level of governance structures etc.

### The summary finding of Lead Paint in Enamel and Spray Paints in Nepal



**Every Second (1 of 2) Enamel Paints you purchase is likely to contain lead concentration more than the Government of Nepal Lead Paint Standard limit of 90 ppm.**



**Every Third (1 of 3) NS Marked Paints you purchase is likely to contain lead concentration more than the Government of Nepal Lead Paint Standard limit of 90 ppm.**



**Every Fourth (1 of 4) No Added Lead .....Paints you purchase are likely to contain lead concentration more than the Government of Nepal Lead Paint Standard limit of 90 ppm.**



**Every Third (1 of 3) Spray Paints you purchase is likely to contain lead concentration more than the Government of Nepal Lead Paint Standard limit of 90 ppm.**

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"Brief on Lead in Paints and its Compliance Status in Nepal" prepared by CEPHED with the Support from WHO



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