# Child Labor in Ghana Cocoa Production: Focus upon Agricultural Tasks, Ergonomic Exposures, and Associated Injuries and Illnesses

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## SYNOPSIS

**Objectives.** The goal of this study was to determine the occupational hazards experienced by children harvesting cocoa in western Ghana in order to design a vocational literacy life skills curriculum and radio social messaging campaign with a safety component to decrease hazardous work exposures in child agricultural work.

**Methods.** An observational analysis was conducted of children aged 9 through 17 based upon personal interviews of agricultural workers, focus groups, and direct observation of work practices and activities. Job site analysis incorporated task mapping, job hazard review, and a review of equipment and use of protective gear.

**Results.** Children and young people aged 9 through 17 are exposed to hazardous occupational exposures including strenuous work, sharp tools, and pesticides. Lack of training in proper safety practices and inadequate personal protective equipment were commonly noted. Injuries and illnesses included musculoskeletal disorders, sprains, strains, lacerations to the head, fractures, eye injuries, rashes, and coughing.

**Conclusion.** Children working in cocoa harvesting are exposed to physical and chemical hazards without proper training or personal protective equipment. Unless safety interventions occur, there are potential long-term adverse health consequences.

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Work in cocoa harvesting has been identified as a hazardous occupation affecting children 17 years of age or younger. Various non-governmental agencies and organizations have targeted chocolate and cocoa producers and have highlighted concerns regarding hazardous practices. In response to these issues, a major review of the cocoa production practice in West Africa was undertaken by the International Institute of Tropical Agriculture (IITA) in 2001. IITA identified various hazardous practices through a randomized interview methodology focusing upon employer responses.[1] The current article reviews the hazards identified by lead author D.M. during the 2003 non-peak harvest season (i.e., August to September).[2] This report differs from the IITA report in that hazard assessment is based upon direct observation of work practices as well as interviews of adult and youth workers. This hazard review was conducted with funding by the United States Agency for International Development (USAID). The purpose of the activity was to undertake a brief observational study to map tasks and work-related activities performed by children and young people who grow and harvest cocoa and identify injuries and symptoms resulting from performing these activities. This information was used for setting project indicators related to the reduction of child labor in the cocoa sector and for the design of a vocational literacy life skills curriculum and radio social messaging campaign on child labor in cocoa production.


Photo: L. Diane Mull

This child has spent hours applying chemicals on the cocoa farm. Children begin learning how to mix, load, and apply pesticides as young as age 12, often with no personal protective equipment.

Agriculture is the mainstay of the rural economy in Ghana, employing 69% of the rural labor force. A recent Child Labour Survey carried out by the Ghana Statistical Service in 2003 highlights the importance of agricultural work and the differences between urban and rural child labor.[3] That survey serves as the source for the following information.

The largest proportion (62.5%) of working children of both sexes aged 5–17 is engaged in agricultural work to some degree; however, a greater proportion of rural children (73.6%) works in agriculture compared with urban children (21.5%). Overall, an estimated 21.7% of Ghana's children are engaged in economic activity, with a higher percentage in rural areas (39.7%) compared with urban areas (19.8%). Rural children and young people are also more economically active at younger ages than other children in Ghana, with the highest proportion of children in the age 5–9 category (70.0%) involved in some aspect of agricultural work. The proportion of older children working in the agricultural sector decreases with age, falling to 57.1% in the 15–17 age category, although they are involved more often in hazardous work. The proportion of child labor is greater than 30% in the western region where the present project was undertaken, and that percentage per region ranks as the highest category in Ghana. Other significant economic indicators of Ghana are (*1*) 40.6% of the rural population is age 5–19, with approximately 80% of those from age 5–14; (*2*) 47% of the western region is functionally illiterate compared with 51% nationally; (*3*) 63% of children in the western region are engaged in economic activity, higher than the national average of 57.5%; and (*4*) 84% of the children attend school, with more than 70% of the children attending school or training while working. Nearly 32% of rural children in Ghana or western Ghana are reported to have experienced a work-related injury or illness.[3] In contrast, an estimated 33,000 individuals younger than 20 years of age in the United States (2% of the population in the same age ranges) were injured on farms.[4]

Cocoa is the major cash crop and source of foreign exchange in Ghana. There are two primary harvest seasons: a small non-peak season from late July to early September and a peak season from November through January. Labor requirements on cocoa farms are seasonal and intensive at the time of land clearing and harvesting. Sharecropping is common and engaged in by community and migrant families.[5] Land is communally owned and leased, sold, or, most commonly, lent out under an abusa or abunu system—a formal land sharecropping strategy involving varied economic conditions and responsibilities.[6] The Ghana component of the IITA survey reported the family unit as the primary unit of labor supply, but there was a trend to hire day laborers, although no children younger than age 18 were reported as permanent workers.[5] The same survey reported that cocoa pod production was the most commonly reported practice for children and that less than 1% of the farms indicated employment of family children for applying pesticides. According to the 2002 IITA report, children and young people

are major contributors to the cocoa production work force, the majority of which are younger than age 14, and numerous children are involved in hazardous activities.[1]

In general, Ghana has progressive child labor laws and has ratified all but one of the major conventions related to labor and child rights. Under the 1998 Children's Act, children younger than 15 years of age are not authorized to be employed but can do light work if they are 13 years of age and older. The act stipulates the age of 18 years as the minimum age for engagement in hazardous work. However, enforcement mechanisms are weak or nonexistent, and communities are largely unaware of the requirements of the laws, especially in rural areas.[7]

Cocoa production is under threat from insect and fungal infestations and decreasing fertility of the land. Recently, there has been an increase in the more destructive variant of black pod disease and significant loss resulting from capsids that have affected at least 25% of the producers.[8] Due to economic factors, producers in Ghana apply pesticides at less than the recommended intervals. It is suspected that declining conditions in the rural economy, including deteriorating soil fertility, smaller land holdings, population growth, fluctuating commodity prices, and high rates of post-harvest losses have exacerbated the problem of children's early involvement in rural activity and the increased reliance on agricultural chemicals.[8]

## METHODS

The observation period took place over 11 days, during which task mapping and job risk/ergonomics analysis and interviews were conducted in 10 communities engaged in cocoa production within the Sefwi Wiawso district of the western region of Ghana. Meetings were held with community leaders to explain the purpose of the study and request permission to interview the children and young people. Once video and photographic recordings were made, focus groups of children of similar age, gender, and school participation were held. Questions addressed the types of injuries experienced by young workers, types of events leading to injuries, and steps in the work process that were considered by the young workers to be dangerous. A total of 61 individuals from age 9–32 years were interviewed, with 48 of the interviewees from age of 9–17. The selection criteria for children and youth were children between the ages of 9 and 17 who worked primarily in cocoa production and were available for interview. Adult workers also were interviewed to determine if the activities varied from children and youth workers and adults. Interviews were completed with a translator or through direct communication in English with those adults and children who spoke English.

Job site analysis incorporated task mapping, job hazard review, and a review of equipment and protective gear that was available and in use. Task mapping involved identifying the major job tasks, the activities performed in each task, and the tools or equipment and protective gear used. The process included recording the activities on standard forms developed by the primary author, collecting information through observations, conducting individual and group interviews, recording by videotape or camera, and verifying the accuracy of the assessments by members of the 10 communities visited. The task mapping, risk analysis, and questionnaires and survey instruments were not based upon a specific model but were designed by the lead author to fully understand the work processes, activities, practices, and perceptions of risk in order to develop a literacy lifeskills curriculum on cocoa production that included a worker safety component. As a result, a specific study design that would lead to formal analysis was not developed for the purposes intended.

## RESULTS

### Work-associated ergonomic exposures and injuries in cocoa production

Manual labor and material handling, the use of sharp tools, application of pesticides, and lack of personal protective equipment and clothing characterized cocoa production in western Ghana. Children of all ages participated in cocoa production, but usually adolescents aged 14 years and older who are migrant workers or members of sharecropper families did the most intensive work. Although there was a general pattern of delineation of work tasks based upon age and gender, children younger than age 17 were found performing tasks regardless of the degree of hazard associated with the job.

Key tasks identified included clearing virgin forest, planting cocoa seeds or seedlings, weeding and thinning, pruning, pesticide application, harvesting and carrying pods, opening pods with a cutlass (machete), extracting beans from pods, sorting and drying cocoa beans, and carrying beans in various stages for processing and storage.

Hazardous tools included long and short cutlasses, sosa (long bamboo poles with attached cutting knives), chain saws, and pesticide backpack spray devices. The most hazardous activities that children and young people engaged in were the following: clearing virgin forests and weeds using chainsaws; pruning trees while climbing heights greater than nine feet; mixing, loading, and applying pesticides; harvesting pods using short and long cutlasses; opening pods using short cutlasses; and transporting heavy baskets and/or bags of pods and beans for long distances. Non-hazardous activities, although associated with repetition and force, included gathering individual pods from the ground, extracting beans by hand from open pods, and spreading and sorting beans on the drying mats.

Common ergonomic problems included frequent bending, twisting, and lifting heavy objects. Additional hazards included climbing trees and maneuvering among branches, cutting overhead pods with sharp blades, and carrying heavy loads. A full bag of dried cocoa beans may weigh 60–65 kg. Cuts, deep lacerations, and severed fingers may occur when clearing land, cutting grass and weeds, and cutting open cocoa pods to extract the beans. Other hazards included slips and falls when climbing or carrying heavy loads on uneven ground obscured by thick ground cover.

### Pesticide exposures

Due to the extent of crop infestation, pesticides were widely used and encouraged. Most community members were unaware of the hazards associated with pesticides and took little or no precautions with respect to mixing, loading,

application, storage, or disposal of the agricultural chemicals. Training for workers and community members on pesticide safety was weak or nonexistent.

During cocoa production, children came into direct contact with pesticides when they served as applicators and/or acted as assistants or helpers. Pesticide containers were commonly carried on top of the head. Adolescents as young as 14 years of age worked as pesticide applicators, and children as young as 10 years assisted applicators during the mixing, loading, and application processes, resulting in pesticide exposure. Children were observed carrying backpack sprayers containing liquid pesticides supported on their heads without personal protective equipment to prevent exposure from spilling and leaking. More than 95% of children in rural areas did not use protective equipment.[3] Boys usually worked in short pants, short sleeve or sleeveless tee shirts, and flip-flops. Their female counterparts wore skirts or dresses, short-sleeve or sleeveless tee shirts, and flip-flops. Protective clothing reported as being worn largely by adults included spraying coats (usually cotton without chemical resistance properties), soft cotton masks, and rubber sandals. Adult and older-youth male workers shared mid-calf rubber boots. Pesticide exposure was found to be significant and occurring in the presence of inadequate personal protective equipment and clothing, which is critical but rarely, if ever, available. We also noted that restricted entry intervals (REIs) were not observed.

Pesticides identified and reported were fungicides and insecticides including Ridomil (metalaxyl + cuprous oxide), Champion, Cocostar (pirimiphosmethyl), Nordox Super 75 (cuprous oxide or copper oxide), Unden 20 (propoxur), and Thionex (lindane). The active ingredients of primary concern contained in most pesticides identified in the production of cocoa include the following: inorganic copper compound fungicides; pirimiphosmethyl, an organophosphate insecticide; propoxure and carbamate insecticide; and lindane, an organochlorine insecticide. Due to varying trade names that often change and multiple formulations for variations on the same trade name, identifying the specific compounds and active ingredients is difficult unless the actual labels can be obtained.

### Reported physical symptoms and injuries

Symptoms most commonly reported following physical work activities were pain in the neck, back, shoulders, and arms. The types of injuries reported were strains and sprains of the back and upper and lower extremities. These are symptoms consistent with work-related musculoskeletal disorders that are distinguished from acute musculoskeletal injuries.

Major injuries included lacerations to the head, fractures of the wrists and arms, and dislocated shoulders. Separating beans was associated with pain in the hands and wrists, while hand and finger cuts and severed fingers occurred while cutting open the tough pods with a cutlass. Eye injuries were commonly reported from debris falling into the eyes while harvesting. Symptoms associated with pesticide application included headaches, burning eyes and skin, dermal rashes, coughing, nausea, and dizziness. Heat-related syndromes and dehydration were associated with very strenuous activities. Children performed strenuous work activity in the same manner as adults without taking frequent breaks and fluid replacement. Fears expressed by the interviewees included snake bites and bee stings that occur while clearing fields and harvesting, pruning, climbing trees to cut pods, and removing the raw beans from pods.

## DISCUSSION

### Ergonomic issues

Children and young people engaged in cocoa production are involved in activities that place them at risk of acetylcholinesterase inhibitor and organochlorine poisoning, acute major and minor injuries, and musculoskeletal disorders.

The chronic musculoskeletal stress typified by manual material handling of heavy objects and carrying the objects on the head can have adverse effects upon the developing musculoskeletal system. Studies looking at long-term consequences of early exposure to repetitive musculoskeletal forces in children are lacking. In order to assess potential long-term consequences of agricultural labor among children, a review of studies assessing musculoskeletal disorders among older farm workers is helpful. A study of arthritis in Swedish farmers linked heavy physical exertion before the age of 16 with an increased risk of hip arthritis.[9] A number of studies have linked the development of back pain and hip and knee arthritis with agricultural and other physically strenuous work.[10–13]

Work-related musculoskeletal disorders result from excessive physical work demands involving both forceful activities and repetition without an adequate recovery time and generally involve pain and discomfort in the lower back, neck, hands, arms, shoulders, or legs.[14] The adverse effects resulting from these exposures can interfere with activities of daily living and may have negative long-term economic consequences for the individual and community.

Children working in cocoa production in Ghana are exposed to significant ergonomic hazards at a critical time in their physical development. The survey in Ghana identified the neck, back, shoulders, legs, hands, and fingers as the body parts most often affected, while the National Institute for Occupational Safety and Health (NIOSH) Childhood Agricultural Injury Survey identified hands, wrists and fingers, head, and legs as the most commonly injured areas of the body among young U.S. farm workers.[14] Injuries to those younger than 20 years working on U.S. agricultural operations most commonly occur from falls, off-road transportation injuries, and being struck by objects.[4] The U.S. survey of youth agricultural workers did not address symptoms consistent with heat stress or pesticide exposure. Also, the overall prevalence of musculoskeletal disorders in agriculture is unknown in the U.S.[14]

Adolescents from age 11–15 are more susceptible to sprains and strains secondary to decreased flexibility occurring during the onset of puberty and growth spurts. According to recommendations made in the North American Guidelines for Agricultural Tasks (NAGCAT),[15] lifting should be limited to 10% to 15% of body weight; carrying weights at these levels should occur for no more than 10 to 15 yards; slippery uneven surfaces leading to slips, trips, and falls should be avoided; and repetitive motion leading to muscle strain, chronic back pain, and injuries should be limited.[15] Other NAGCAT recommendations that would apply to chil-

dren working in cocoa production include the following: incorporate 10 minute breaks each hour; limit repetitive and strenuous activities in children aged 11 or younger to 20 minutes consecutively; allow no use of cutting tools for children aged 11 or younger; ensure drinking a quart of water each hour by scheduling breaks to do so to prevent heat stress; provide bite-proof protective boots with non-skid soles to prevent snake bites and slips and falls; and stop children younger than age 18 from working with pesticides, even with proper protective equipment and clothing.

**Pesticide issues**

Children are much more susceptible to pesticide poisoning than adults due to a larger relative surface area of exposure. Table 1 lists the summary of toxicity and health effects of the identified pesticides. The fungicides include inorganic copper compounds, primarily cupric hydroxide and cuprous oxide. The copper compounds are respiratory and dermal irritants, particularly irritating to the eyes, and are considered moderately hazardous, with a World Health Organization (WHO) Acute Hazard rating of III.[16] The Environmental Protection Agency (EPA) toxicity rating for Ridomil Plus, which contains 60% cuprous oxides, is Class I, or dangerous, due to the corrosive effect upon the eyes secondary to copper compounds.[16]

Propoxur, a carbamate insecticide, and pirimiphosmethyl, an organophosphate insecticide, are both acetycholinesterase inhibitors and cause similar clinical effects. They have been identified as being hazardous during mixer/loader/applicator usages. Cholinesterase inhibition in humans occurs with excessive exposure resulting in overstimulation of the nervous system. Symptoms include nausea, dizziness, and confusion, and at very high concentrations, respiratory paralysis and even death.[17] The EPA recommends protective clothing such as long sleeved shirts and trousers, chemical resistant footwear, socks, and chemical resistant gloves. A chemical resistant apron is required during mixing and loading. Toxicity ratings vary from Class II for eye irritation to Class III for dermal and oral exposure. The risk is considered acceptable if protective clothing is used but not acceptable with only baseline clothing.[18]

Thionex contains lindane, an organochlorine insecticide. Organochlorines are mainstays to control capsid infestation. Exposures can occur through skin absorption, inhalation, and ingestion. The compound is rated as a moderately to highly toxic Class I agent by the EPA and as a moderately hazardous compound by WHO, with a Class II acute hazard rating.[16] Overexposure may result in central nervous system toxicity with mental and motor impairment, headache, dizziness, vomiting, convulsions, and hyperirritability. It also

**Table. Categories and toxicity of pesticides reported in cocoa production**

| *Compound (exposure route)* | *Class rating* | *Toxicity effects* | *Physiologic effects* | *Carcinogen potential* |
|---|---|---|---|---|
| Pirimiphosmethyl (dermal, inhalation) | Organophosphate insecticide | EPA-II (eye); moderately toxic warning EPA III (dermal) | Acetylcholinesterase inhibitor; cholinesterase poisonings; copius secretions; fasciculations; respiratory arrest; coma; death | Not listed |
| Lindane (dermal, inhalation) | Organochlorine insecticide | EPA-II; WHO-not listed | CNS toxicity; hyperstimulation; dermal irritant; toxic effects to liver, kidney, pancreas, testes; endocrine disruption | 2B possible[a] |
| Ridomil Plus (dermal, inhalation) | Cuprous oxide fungicide | EPA-I (eye) highly toxic danger poison; WHO-II moderately hazardous | Highly corrosive effect (eyes); dermal irritant; cough; sore throat | Not listed |
| Propoxur (dermal, inhalation) | Carbamate insecticide | EPA I highly toxic; WHO-II | Acetylcholinesterase inhibitor; cholinesterase poisonings; copius secretions; fasciculations; respiratory arrest; coma; death | Not listed |

NOTE: The World Health Organization and Environmental Protection Agency assign acute pesticide toxicity ratings to compounds. The WHO categories range from Ia and Ib (extremely and highly hazardous), II (moderately hazardous), and III (slightly hazardous). EPA classes range from 1 (highly toxic), 2 (moderately toxic), 3 (slightly toxic), to 4 (not acutely toxic). The warning labels of danger, warning, and caution are assigned to the first three categories.[21]

[a]2B is a carcinogenicity category of the International Agency for Research on Cancer that indicates the compound is possibly carcinogenic to humans due to degrees of evidence in humans and animals.[22]

EPA = United States Environmental Protection Agency

WHO = World Health Organization

CNS = central nervous system

may result in dermal hypersensitivity. Absorption occurs through the skin. Animal studies have shown an association between lindane and damage to the liver, kidneys, and pancreas. Although lindane is not considered to be a carcinogen, it does have mutagenic effects in animal studies.[19,20]

Engineering controls are not suited to backpack application, which is the type of pesticide application most often used in cocoa production. There may be endocrine disrupter effects resulting from organochlorine applications, and cholinesterase inhibition from organophosphates can cause severe poisoning with marked morbidity and even fatalities. Based upon reported agricultural work practices in the IITA study, pesticide use is lower in Ghana than the other cocoa producing countries in West Africa, with approximately half of producers reporting no use of fungicides or pesticides.[5] This can change, however, depending upon the economic impact of evolving pest and insect infestations. Exposures to an increasing variety of pesticides will likely occur as it is anticipated that other pesticides will be utilized in the future and will include organophosphates, carbamates, organochlorines, and pyrethrins.[8] Although only 1% of cocoa producers reported family children applying pesticides, pesticide exposure, even within the limited evaluation of this study, was observed in children younger than 14 years—and with inadequate personal protective equipment.

Limitations of this observational study include a small, non-randomized study population, limited observation period during the non-peak season, and limited time period of the observation period. The primary strength of the study is the linkage of interviews of cocoa workers, both adults and children, with careful observation of the actual work practices to clarify the ergonomic hazards and the establishment of a baseline for hazard assessment in children and youth workers engaged in harvesting cocoa.

## CONCLUSIONS

This case study provides a picture of the hazards found during cocoa production in the western region of Ghana. The observations establish a clear baseline for comparison of pre-intervention/post-intervention safety training implementation. This article points to the need to examine the potential for similar hazards in other forms of agricultural production and other regions. Labor inspectors can use the methods identified by the lead author to identify and control chemical and physical hazards to laborers of any age. The increased risk of chemical toxicity to children makes the identification and elimination of pesticide exposure particularly important but difficult to attain when such usage is possibly underreported. Further formal studies to assess work practices during the peak season and in other regions are recommended. Future evaluations would benefit from standardizing an ergonomic tool to assess cocoa production at strategically selected sites. By combining this field assessment with randomized villages selected from the IITA "Child Labour in the Cocoa Sector" report,[1] and performing a systematic qualitative and quantitative data analysis of the physical and chemical hazards, instruction manuals to promote safer work practices could be developed. The final goal is to use these tools to provide modifications of work practices and improved personal protective equipment to decrease hazardous acute and long-term occupational exposures.

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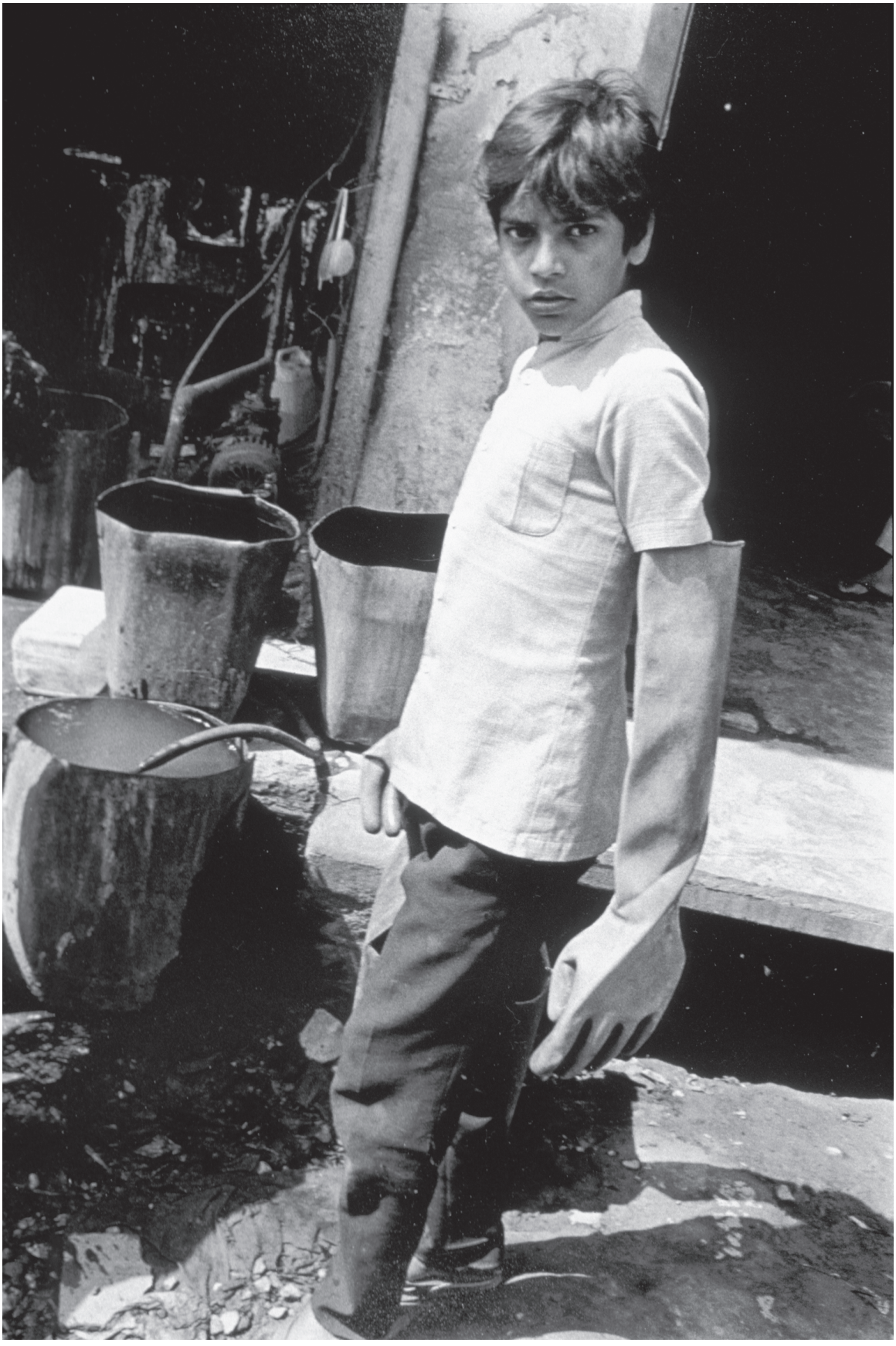

Worker in an electroplate factory (India 1993)

*Photo: David L. Parker*