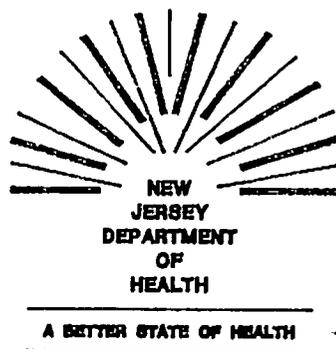


MEDICAL EVALUATION OF CHILDREN AND ADULTS
OF THE WHITNEY YOUNG JR. SCHOOL,
JERSEY CITY, NEW JERSEY

Environmental Health Service
Division of Occupational & Environmental Health
New Jersey Department of Health



December 1989

Thomas H. Kean
Governor

Molly Joel Coye, M.D., M.P.H.
Commissioner of Health

**MEDICAL EVALUATION OF CHILDREN AND ADULTS OF THE
WHITNEY YOUNG, JR. SCHOOL, JERSEY CITY, NEW JERSEY**

**Results of Skin, Nose, and Throat Examinations, and an
Assessment of Exposure to Chromium Using Urine Samples**

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SUMMARY

In June 1989, working with school and local officials, the New Jersey Department of Health (NJDOH) conducted a limited medical evaluation of children and adults of the Whitney Young, Jr. School in Jersey City, New Jersey. This evaluation was initiated in response to community concerns about potential exposure to hazardous amounts of chromium in the vicinity of the school building. This report provides a description and analysis of the results.

The purpose of the evaluation was to examine individuals for symptoms of chromium exposure and to attempt to measure exposure to chromium. Individuals were selected for participation on the basis of 1) residence in the neighborhood of the school in which several chromium contaminated lots exist, 2) referral by the school nurse, or 3) location of worksite in the school in which chromium contamination was suspected.

Over a three day period, three physicians examined 165 people. The limited evaluation of children and adults consisted of examinations of skin, nose and throat. Participants also supplied urine samples for measurements of chromium. The urine measurements were intended to provide an indication of potential recent exposure to chromium in the community. Since the school building was closed prior to the examinations, urine measurements are not indicative of potential chromium exposure, if any, in the school.

Findings of the medical evaluation were:

* Among the 97 children and 68 adults, 36% of children and 16% of adults showed levels of chromium in the urine above the detection limit of 0.3 micrograms per liter (ug/l). There is a limited basis in the medical literature for comparison of normal chromium levels in adults and no basis for children. For adults, levels of chromium in urine above approximately 0.3 ug/l may indicate exposure to chromium greater than that normally found in the diet. Levels up to 41 ug/l have been reported in occupationally-exposed workers outside the United States.

* The proportion of children having detectable levels of chromium in the urine was highest among children closest to the known chromium-contaminated sites. Among children living on blocks with contaminated sites, 54% had detectable chromium in the urine, compared to 39% of children living on nearby blocks, and 9% of children living on distant blocks. These findings suggest that exposure to chromium-contaminated soils or dusts from the sites are contributing to chromium exposure in children living near the sites.

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* There was no relationship between urine chromium levels among adults and location of residence relative to chromium-contaminated sites.

* Examinations of the children and adults by NJDOH and University of Medicine and Dentistry of New Jersey (UMDNJ) physicians revealed no abnormal skin conditions requiring referral to a specialist in 96% of children and 78% of adults. No abnormal nose or throat conditions requiring referral were observed in 96% of children and 96% of adults. The specialist physicians did not identify any conditions that could be specifically linked to chromium exposure.

* Incidental findings of medical problems during the evaluation resulted in referrals to private physicians for further examination and follow-up.

Recommendations based on these findings include:

* NJDOH will work with the New Jersey Department of Environmental Protection (NJDEP) and local officials to examine options for further medical or environmental evaluations as needed for the people examined in this medical evaluation and for those residing near other chromium-contaminated sites.

* Contingent on a source of funding, NJDOH will work with local officials and NJDEP to develop a plan for further health services and study of the chromium contamination problem. Included in this plan should be the development of a local capacity to carry out health screening, the development of a basis for comparison of urine levels to further evaluate its effectiveness as an exposure screening tool, and further medical study of individuals with documented or suspected exposure.

* NJDOH continues to support NJDEP efforts to identify the spread of chromium contamination and to pursue site remediation in order to reduce the potential for human exposure to chromium in Hudson County.

* Residents or persons working near sites with chromium contamination should continue to avoid contact with the sites until remediation is complete and should control dusts in their homes or workplaces. Appropriate measures include frequent damp mopping of floors, frequent replacement of air conditioner filters, and regular damp cleaning of window screens.

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1) BACKGROUND

From 1900 to 1970, three corporations extracted and produced chromate compounds from imported chromium ore at three locations in Jersey City and Kearny, New Jersey. An estimated 2 million tons of slag were produced that contained high concentrations of chromium and other metals. This slag was used as fill dirt at over 100 known locations in Hudson County, including sites in densely populated areas.

Human exposure to chromium in the fill dirt may occur in a variety of ways. Direct access to contaminated sites may result in human contact with chromium-contaminated soils. Crystals of chromium compounds may form on surfaces of contaminated fill and can be carried as dust into buildings by wind or foot traffic. Chromium compounds may also be leached by rain water and migrate through masonry into buildings.

a) Health Effects of Chromium

A small amount of chromium, obtained from food, is necessary for the body. Adverse health effects from exposure to high levels of various types of chromium have been reported from animal studies and from studies done in occupational settings where workers were exposed to chromium compounds.

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The two chemical types of chromium of most interest are trivalent and hexavalent, which occur in a variety of chemical compounds. Serious health effects are linked to exposure to hexavalent chromium compounds (12).

Some chromium compounds are strong irritants and can cause damage to skin and breathing passages. Damage may occur to the nasal membranes, eyes, and skin of persons exposed to high enough concentrations of chromium. Irritation may progress to sores and eventually cause perforation of the nasal septum (3).

Some persons develop allergic responses to chromium, particularly hexavalent compounds. These responses include skin rashes and asthma (3, 11, 12).

Animals experimentally exposed to high levels of chromium can develop certain forms of kidney damage (12). Studies have also suggested that this damage can occur among workers (5, 8).

Lung cancer has been reported for workers exposed to certain chromium compounds. Industries with workers at risk include chromate production, chrome pigment production, chrome plating, and ferrochrome processing (6, 11, 12).

Under laboratory conditions, chromium has been shown to

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For the purposes of this medical evaluation, NJDOH assumes that for both adults and children, a urine level of chromium above approximately 0.3 ug/l may suggest an elevated body burden of chromium and/or ongoing exposure to chromium. When urine tests reveal levels of chromium below 0.3 ug/l, NJDOH assumes that recent exposures have been low or that sufficient time has passed to permit clearance of chromium. The urine test does not indicate exposure to chromium more than a few days prior to the test or whether past exposures have injured the body.

Since urine flow can vary during the day, the concentration of chromium in the urine can also vary. Ideally, the concentration of chromium in urine would be determined from a composited urine sample through a day. To adjust a single (spot) urine sample for variations in urine flow, one approach has been to divide chromium concentration by the concentration of creatinine, a substance in the urine that is assumed to be excreted at a constant rate. This adjustment gives a chromium/creatinine ratio.

The amount of creatinine excreted in the urine can vary for each person depending on diet, activity, and time of day; also, creatinine excretion can vary between individuals depending on muscle mass, age, and gender. As a result, the impact of creatinine adjustment on the interpretation of chromium

cause mutations. Some studies of workers have found mutagenic changes among those exposed to chromium (9, 11, 12).

b) Measuring Exposure to Chromium

Chromium may be measured in a variety of body tissues and fluids, including the urine, red blood cells, and hair. There are advantages and disadvantages of each method. NJDOH evaluated these methods and concluded that urine measurements offer the best combination of reliability, convenience, lack of discomfort, and interpretability.

Chromium exposure can occur as a result of swallowing, breathing in, or skin contact with chromium-containing materials. Chromium is normally excreted into the urine with the level depending on total intake from food, air, water, and dusts. Generally, the level of chromium in the urine reflects the intake of chromium in the day or two prior to urine sample collection.

Urine chromium levels in adults are reported in the medical literature to normally range up to approximately 0.3 micrograms per liter (ug/l) in individuals not exposed to chromium in their workplace (1, 2, 7, 10). Reported urine levels in workers exposed to chromium range from 0.8 to 41 ug/l (8, 11). There is no information on normal chromium levels in children.

concentration is uncertain, particularly for children.

Use of the chromium/creatinine ratio for adults varies among researchers and is given in some but not all studies (4). In this medical evaluation, adjustment was not done for adults because of the large number of urine samples which were below the detection limit so that the ratio could not be developed.

c) The Whitney Young, Jr. School Medical Evaluation

In September 1988, NJDOH joined with NJDEP to establish the Executive Chromium Committee in order to coordinate efforts in the remediation and public health evaluation of the chromium contamination problem in Hudson County. A public health strategy was developed which included the production of informational materials for the public, workers, and physicians, and evaluations of worker and community exposures and health effects.

In April 1989, NJDOH began to plan a medical evaluation of children and adults of the Whitney Young, Jr. School. Community and school representatives' concerns about potential exposure to chromium and related health effects added urgency to the implementation of this effort. The Whitney Young, Jr. School, a central location for children living in the vicinity of known contaminated sites, was initially chosen as the location

for medical evaluation of the community children.

During May 13-17 1989, NJDOH collected a variety of samples from the Whitney Young, Jr. School to better characterize potential chromium contamination at the school.

Observations of suspected chromium-contaminated crystals on the basement walls of the school, however, prompted the Jersey City Board of Health on May 18, 1989, to order closure of the school pending further evaluation. Children and faculty were moved to the Fred Martin School in Jersey City. Consequently, the medical evaluation, described below, took place in mid-June at that location instead.

In June 1989, BCM Engineers was hired by NJDEP to collect samples in the Whitney Young, Jr. School to measure chromium in the air, dusts, wall crystals, and soils at the school. In July 1989, NJDOH evaluated BCM's environmental sampling data and concluded that there was evidence of elevated chromium contamination in certain air handling units of the school, which may be due to transport of dusts from chromium-contaminated sites in the neighborhood. Also, there appeared to be chromium in the carpets possibly due to tracking of dusts from the outside. There was no evidence of chromium contamination of the basement walls.

2) MEDICAL EVALUATION METHODS

The NJDOH medical evaluations were designed to provide selective biological monitoring on individuals most likely to be experiencing on-going exposure to chromium. The evaluation included physical examinations for potential chromium-related effects and tests for chromium in the body using urine samples.

Limited physical examinations focused on clinical outcomes known from occupational studies to be related to chromium exposure, and included dermatologic, nose and throat evaluations. Examinations were conducted by physicians from NJDOH and the University of Medicine and Dentistry of New Jersey (UMDNJ). Referrals were made to physician specialists for medical findings that the examining physicians judged to require further evaluation, and to personal physicians for other abnormal results.

a) Selection of Evaluation Participants

Children were selected for evaluation based on likelihood or potential of exposure as determined by 1) residence in the neighborhood blocks nearest the chromium contaminated sites, or 2) reporting of skin or nasal health problems by the school nurse. A variety of adults were selected for evaluation from

different job categories in the school (teacher/administrator, lunch aide, custodian).

NJDOH obtained prior written consent from the adult participants and from the parent or legal guardian of the children. Adult participants were asked to complete a brief health questionnaire that was reviewed by the NJDOH examining physician at the time of examination.

b) Evaluation Procedures

Physical examinations were conducted by three NJDOH and UMDNJ physicians on June 12, 13 and 14, 1989. The nasal passages, mouth and throat of each participant were examined for evidence of irritation, sores, ulcers, or other abnormal conditions. The skin on the head, chest, back, arms and legs of each participant was examined for evidence of irritation, rashes, sores, or other abnormal conditions. Findings were recorded by the examining physician.

Referrals were made by the examining physician if she judged that the observed condition required further evaluation regarding a possible relationship to chromium exposure. NJDOH made arrangements for participants requiring referral to physician specialists. Those referred for examination by a dermatologist

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were seen at the Fred Martin School on June 30, with the exception of one participant who was seen at the dermatologist's office on June 20. Those referred for examination by a nose and throat specialist were transported by NJDOH staff to the nose and throat specialist's office on June 26.

Urine samples were obtained at the time of examination from all participants. Adult assistance was supplied to children when needed. A portion of each sample was immediately tested on-site with a dipstick for pH, protein, glucose, ketone, bilirubin, and blood. These tests can indicate a variety of existing health problems. Individuals who could not produce a sufficient volume of urine on the examination day were asked to return on June 27. Also, individuals who showed an abnormal dipstick test were asked to return for re-testing on June 27.

On the days when urine samples were collected there were trip blanks (transported to the test site unopened) and field blanks (transported to the test site and opened during the test time). The blanks are used to indicate whether there are problems with sample collection and analysis. Samples were logged and transported under standard NJDOH chain-of-custody procedures.

Urine samples were tested by the NJDOH Division of Public

Health and Environmental Laboratories using standard analytical methods. Total chromium was measured with an atomic absorption spectrometer, furnace method. The method detection level (lowest detectable level) was 0.3 microgram per liter (ug/l).

c) Data Analysis

Urine chromium results were compiled for children and adults. The distributions of values were analyzed by several factors.

Among children, an analysis by age, gender, and location of residence relative to known chromium-contaminated sites was performed. The purpose of this analysis was to determine whether certain children were more likely to have detectable chromium levels than others; e.g. children who lived in a residence near the known chromium sites vs. those who lived farther from sites, boys vs. girls, and younger vs. older children were compared to determine if certain children were more likely to have detectable chromium in the urine.

Children were grouped into one of three categories for the residence analysis: those living on a city block with a known chromium-contaminated lot (on-block); those living on a block directly adjacent to the blocks with contaminated lots

(nearby-block); and those not living on or adjacent to a contaminated lot (distant). The boundary of the areas are found in Figure 1.

Since some children shared the same address, an analysis was also conducted of the proportion of households that contained at least one child with a detectable urine chromium level according to block location relative to chromium-contaminated sites.

Among adults, a similar analysis was conducted comparing adults living in the vicinity of chromium-contaminated lots, those living in Jersey City but not near a contaminated lot, and those residing outside Jersey City. Additionally, the proportions of those adults with detectable chromium levels were calculated by job category and gender.

The Fisher's exact statistical test, using the Epistat software package, was used to compare the differences among proportions. A significant difference was set at $p=0.05$ or less, standard procedure in statistical analysis.

3) RESULTS

a) Students

Urine Samples -- Dipstick Tests Urine samples were obtained from all 97 children examined. For 6 of the 97 children with urine samples, dip stick tests were not run because of insufficient urine sample volume on two occasions. Of the 91 remaining, 81 (89%) were entirely normal on the dip stick test. There were 3 children with unexplained blood in the urine, which may be a sign of kidney disease, injury, infection, or sickle cell disease. There was 1 student with elevated ketones in the urine, possibly a sign of not eating or of diabetes. There were 6 children with protein in the urine, which may be a sign of many conditions, including infection, kidney disease, or sample collection problems. Referrals were made to personal physicians for these findings.

Urine Samples -- Chromium Tests Of 97 children with urine samples, 62 (64%) had urine chromium levels below the testing method's detection limit (<0.3 ug/l). There were 35 children (36%) with urine chromium levels at or above the detection limit (≥ 0.3 ug/l). The distribution of urine chromium levels among children can be found in Table 1 and is pictured in Figure 2.

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Children who lived nearer to known chromium-contaminated lots were more likely to have detectable chromium levels than those children residing farther from the sites. On blocks with a contaminated lot, 14 (54%) of 26 children had detectable urine chromium, compared to 19 (39%) of 49 children living on blocks nearby, and 2 (9%) of 22 children living outside the vicinity of contaminated lots (Table 2 and Figure 3). The proportions of children having detectable urine chromium levels in the on-block and nearby-block residence categories were statistically different from the proportion in the distant blocks.

Within the on-block and nearby-block residence categories, boys were more likely than girls to have detectable chromium in the urine, but the differences were not statistically significant (Table 2). Within each residence category, there were no apparent differences in children divided by age group (Table 3).

When the data were analyzed according to household, 7 (70%) of 10 households on blocks with known contaminated sites had at least one child with detectable chromium, compared to 14 (58%) of 24 households on nearby blocks, and 2 (10%) of 19 households outside the vicinity of contaminated lots (Table 4). Again, the proportions of households on blocks and nearby blocks with chromium-contaminated sites were significantly different from the proportion on distant blocks.

In summary, compared to children living away from chromium-contaminated sites, a child living on a block with a known contaminated site was about 6 times (54% vs. 9%) as likely, and a child living on a nearby block was about 4 times (39% vs. 9%) as likely, to have detectable chromium in the urine (Table 2). Similarly, a household on a block with a chromium site was about 7 times (70% vs. 10%) as likely, and a household on a nearby block was almost 6 times (58% vs. 10%) as likely, to contain a child with detectable urine chromium than a household away from the sites (Table 4). These differences are unlikely to be attributable to chance variation, according to statistical tests.

Medical Examination The results of the skin, nose, and throat examinations of children are summarized in Table 5. Examinations by NJDOH and UMDNJ physicians identified no abnormal conditions of the skin requiring referral for 93 (96%) of the 97 children. In 1 case, a skin condition was observed on initial examination but the child was not available for re-examination. Three children were judged by the specialist to have a skin condition not reported to be associated with exposure to chromium.

No abnormal nose or throat conditions requiring referral were identified by NJDOH and UMDNJ physicians for 93 (96%) of the

97 children. In 2 children, nose or throat conditions were observed on initial examination but the children were not available for re-examination. For 2 children, a nose or throat condition was not present on re-examination by the specialist.

The referral physicians did not identify any specific skin, nose or throat conditions known to be associated with chromium exposure.

The student's parent or guardian was referred to personal physicians for a variety of additional medical findings identified during the child's screening examination, and these findings were restated in letters sent to the individual's parent or guardian.

b) Adults

Urine Samples -- Dipstick Tests Urine samples were obtained from all 68 adults examined. Of 68 adults with urine samples, 55 (81%) were entirely normal on the dip stick test. There were 4 adults with glucose (sugar) and ketones in the urine, which may be a sign of diabetes. There were 4 adults with unexplained blood (or blood and protein) in the urine, which may be a sign of kidney disease, injury, infection, or sickle cell disease. There were 5 adults with protein in the urine which may

be a sign of infection, kidney disease, or sample collection problems. Referrals were made to personal physicians for these findings.

Urine Samples -- Chromium Tests Of 68 adults with urine samples, 57 (84%) had urine chromium levels below the testing method's detection limit. There were 11 adults (16%) with urine chromium levels at or above the detection limit (≥ 0.3 ug/l). The distribution of urine levels among adults can be found in Table 1 and is pictured in Figure 4.

Tables 6 and 7 present the analysis of adult urine levels by residence category, job category, and gender. In contrast to the results in children, none (0%) of the 7 adults living near the chromium contaminated lots had detectable chromium in the urine. Of 51 adults living in Jersey City but not near the contaminated sites, 10 (20%) had detectable urine chromium; of 10 adults living outside Jersey City, 1 (10%) had detectable chromium in the urine (Table 6). There were no statistical differences among the proportions by residence category.

All of the adults with detectable urine chromium are female (11 of 42, or 21%); no males had detectable chromium in the urine (0 of 15) (Table 7). This difference is statistically significant. Among all teachers and administrators, 10 (20%) of

50 had detectable chromium in the urine. Among lunch aides, 0 (0%) of 4 had detectable chromium in the urine, while 1 (7%) of 14 custodians had detectable chromium in the urine (Table 7). Since the adults were not in the Whitney Young, Jr. School in the days prior to urine sampling, these results do not reflect potential exposure at the school.

Medical Examination The results of the skin, nose, and throat examinations of adults are summarized in Table 8. Examinations by NJDOH and UMDNJ physicians identified no abnormal conditions of the skin requiring referral for 53 (78%) of the 68 adults. In 2 cases, skin conditions were observed on initial examination but the individuals were not available for re-examination. In 13 individuals, the specialist identified conditions not reported to be associated with chromium exposure.

No abnormal nose or throat conditions were identified by NJDOH and UMDNJ physicians for 65 (96%) of the 68 adults. In 1 case, a condition was identified on initial examination but was not present on re-examination by the specialist. In 2 cases, the specialist identified nose or throat conditions associated in scientific literature with chromium exposure and other causes, but chromium was judged an unlikely cause in these cases.

The referral physicians did not identify any specific skin,

nose or throat conditions known to be associated with chromium exposure.

Participants were referred to their personal physicians for a variety of additional medical findings identified during the screening examination, and these findings were restated in letters sent to the individual participants.

c) Quality Assurance

None of the trip or field blanks revealed detectable levels of chromium, indicating that procedures for collection and transportation of urine samples for chromium analysis were satisfactory.

4) CONCLUSIONS

This report includes descriptive data on and analyses of urine chromium levels and findings from the limited medical examinations of adults and children of the Whitney Young, Jr. School.

Medical examinations did not reveal clear evidence of skin, nose or throat conditions that could be attributed to chromium exposure. Incidental findings of a variety of medical conditions were identified in some participants who were encouraged to seek further evaluation by a personal physician. NJDOH hopes that these referrals will lead to beneficial medical attention for the affected individuals.

The findings from the urine chromium tests of children and adults indicate that there is variation in the amounts of chromium that individuals are excreting in the urine. The variation among children appears to be related to location of residence, with those living nearer to the chromium contaminated sites being more likely to have detectable levels of chromium in their urine samples.

Those children with urine chromium levels higher than their peers may be experiencing exposure to chromium from contaminated

sites in the neighborhood. Exposure to chromium may be occurring through direct contact with the sites, or contact with dusts blown off the sites into yards or houses. The pathways of exposure in the community cannot be determined from the information collected to date.

Among adults, no relationship of urine chromium content and residence area was observed. This may reflect differences in behavior or activities of adults that result in different patterns of exposure to chromium than occurred for children, such as time spent outside. The reason that females were more likely to have detectable chromium in the urine may be related to diet or other factors.

Whether exposure to chromium at the Whitney Young, Jr. School was occurring cannot be determined from the data collected in this medical evaluation, since children and adults were not present in the school for several weeks before urine samples were collected.

The full range of health implications of community exposure to chromium cannot be determined at this time. However, the possibility of exposure to potentially hazardous forms of chromium through inhalation of dusts during indoor or outdoor play indicates the need for aggressive pursuit of steps to reduce

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exposure to chromium.

The interpretation of the urine chromium findings is hampered by a lack of comparative data for children and a limited amount of comparative data for adults. This evaluation has identified the need for development of urine chromium data in all age groups to serve as a comparison for the data collected now and in the future.

NJDOH has sent letters to all participants in this medical evaluation with information on their individual results.

5) **RECOMMENDATIONS**

* NJDOH will work with local officials and NJDEP to examine options for further characterization of the environment of the participants in this medical evaluation, in order to determine the ways that exposure is occurring. Participants with detectable levels of urine will be asked to provide additional information to help determine whether urine chromium levels may be related to play activities near the sites, possible exposure to indoor dusts, or other factors. This additional information will be useful for designing appropriate public health interventions to reduce exposure.

* Contingent on a source of funding, NJDOH intends to develop a plan for further health services and study of the chromium contamination problem. Included in this plan should be the development of a local capacity to carry out health screening, the development of a basis for comparison of urine levels to evaluate its effectiveness as an exposure screening tool, and further medical study of individuals with documented or suspected exposure.

* Meanwhile, NJDOH strongly supports the efforts of NJDEP to continue identifying the spread of chromium contamination and to pursue site remediation in order to reduce the potential for

human exposure to chromium in Hudson County.

* Additionally, residents or persons working near sites with chromium contamination should continue to avoid contact with the sites until remediation is complete and to practice measures to control dusts in their homes and workplaces. These measures include frequent damp mopping of floors, frequent replacement of air conditioner filters, and regular damp cleaning of window screens.

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Figure 1

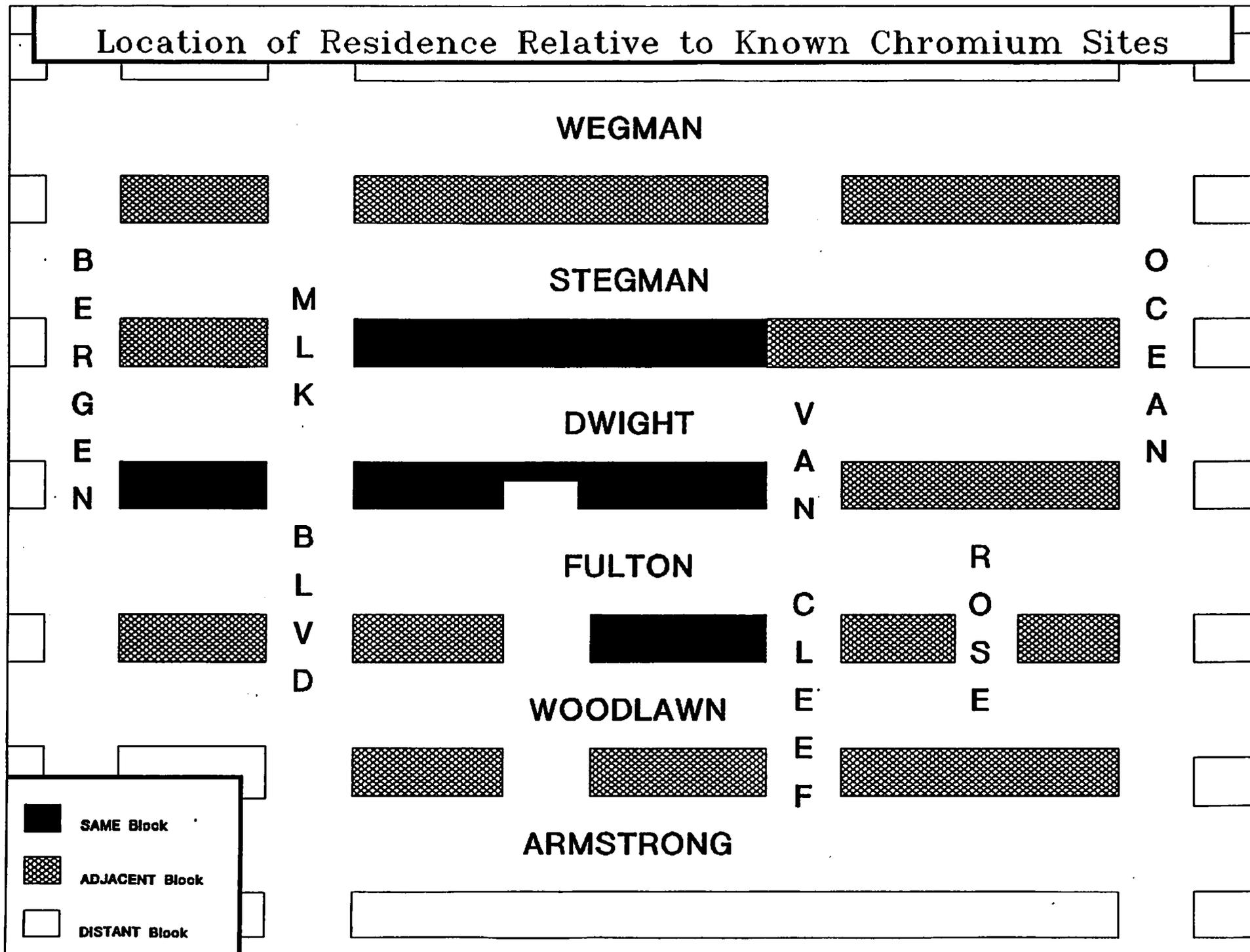
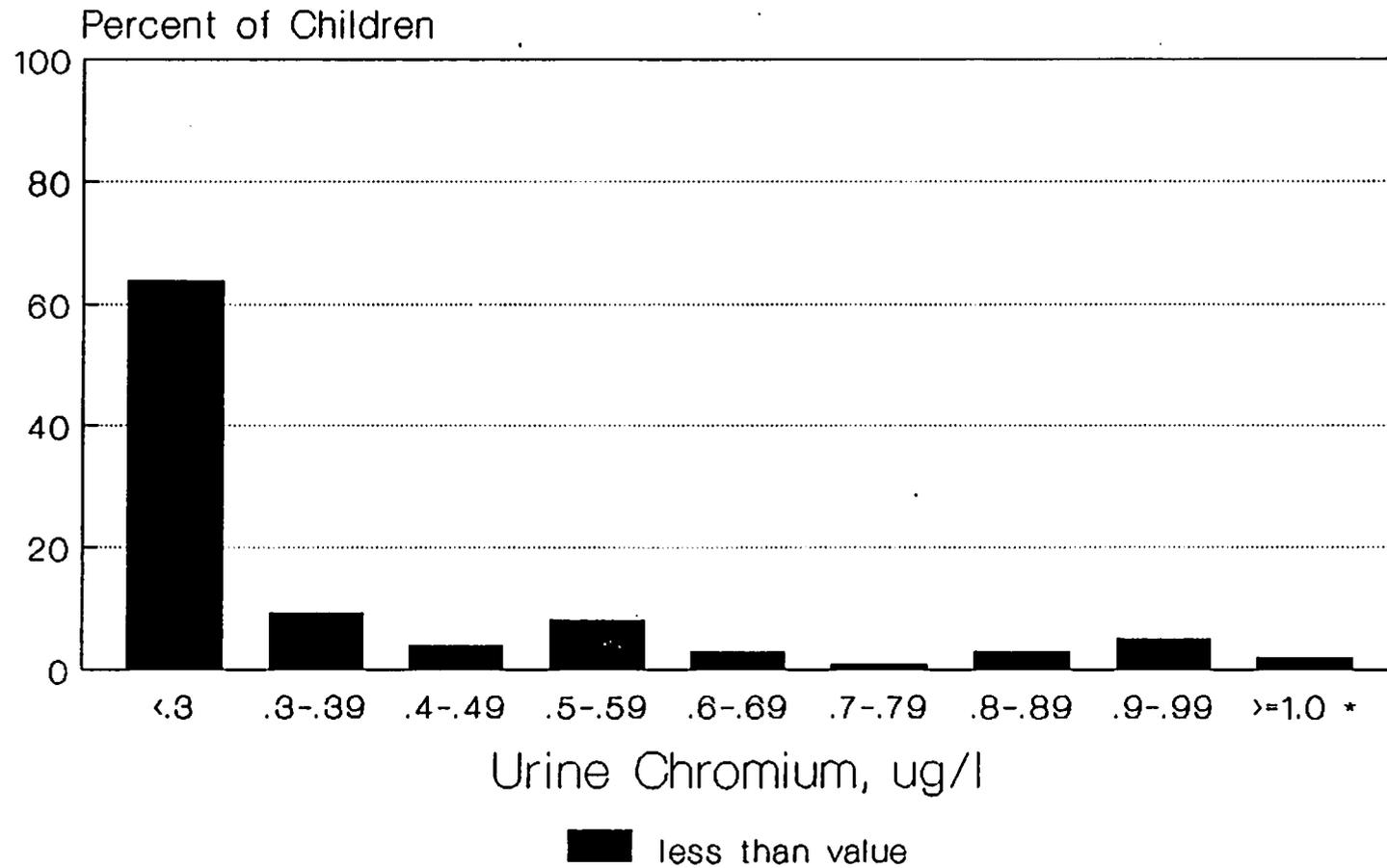


Figure 2

DISTRIBUTION OF URINE CHROMIUM LEVELS Children Screened June 1989



n = 97 children

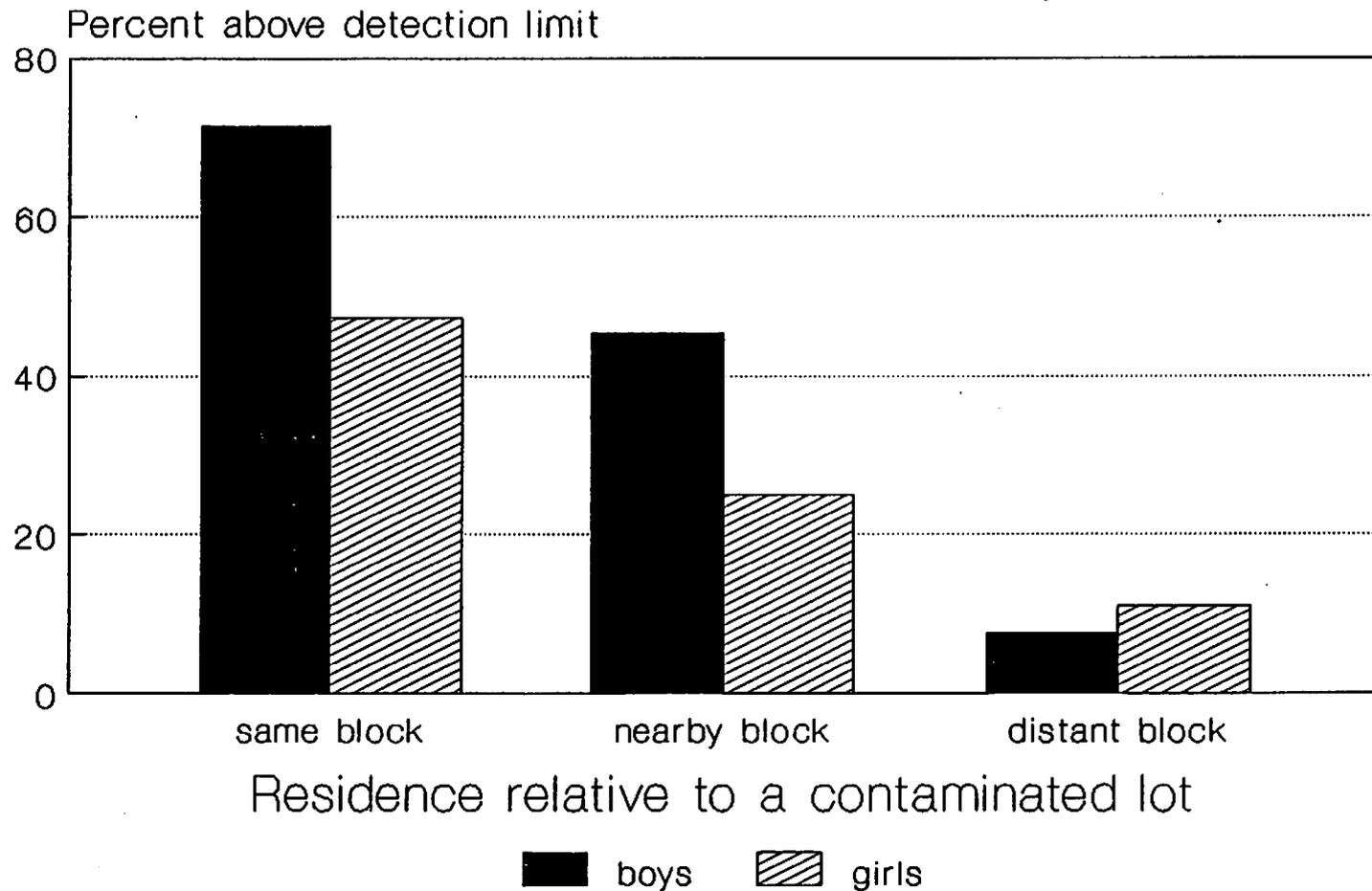
Method detection Limit = 0.3 ug/l

* Maximum value = 1.8 ug/l

Figure 3

URINE CHROMIUM LEVELS BY RESIDENCE

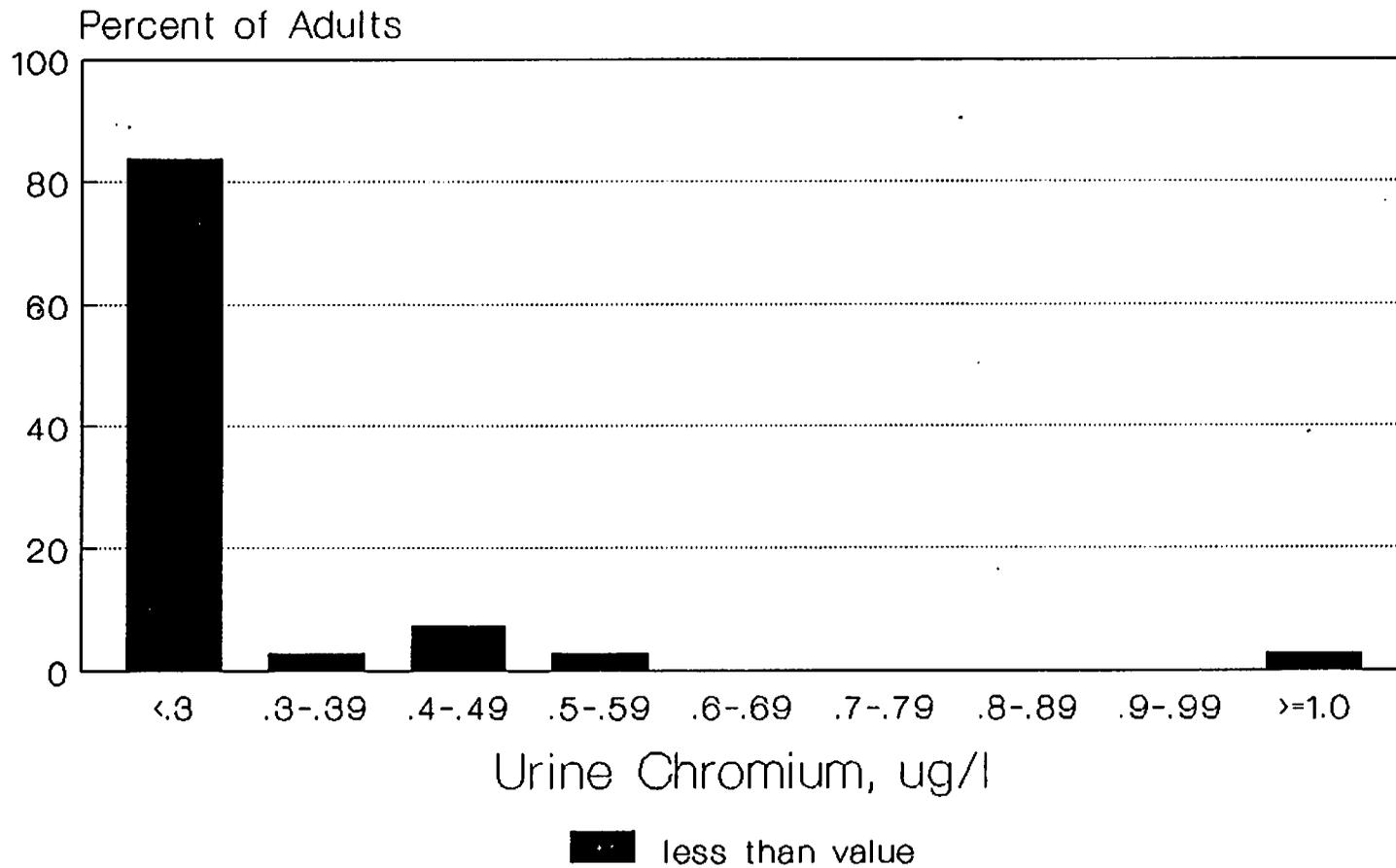
Children Screened June 1989



n = 97 children
Method detection limit = 0.3 ug/l

Figure 4

DISTRIBUTION OF URINE CHROMIUM LEVELS Adults Screened June 1989



n = 68 adults

Method detection limit = 0.3 ug/l

Maximum value = 2.7 ug/l

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TABLE 1 DISTRIBUTION OF URINE CHROMIUM LEVELS FROM THE MEDICAL EVALUATION OF CHILDREN AND ADULTS AT A SCHOOL IN JERSEY CITY, NEW JERSEY

CHROMIUM CONCENTRATION IN URINE (ug/l) *	CHILDREN		ADULTS	
	#	%	#	%
<0.30	62	(64%)	57	(84%)
≥0.30 a	35	(36%)	11	(16%)
TOTAL	97	(100%)	68	(100%)

* Micrograms of chromium per liter of urine (ug/l)

a Range of detectable urine chromium concentrations:

Children -- 0.30 to 1.80 ug/l
Adults -- 0.30 to 2.70 ug/l

TABLE 2 CHILDREN: PROPORTION OF CHILDREN WITH DETECTABLE CHROMIUM IN THE URINE, BY LOCATION OF RESIDENCE RELATIVE TO KNOWN CHROMIUM SITES AND GENDER

	LOCATION OF RESIDENCE			TOTAL
	ON A BLOCK W/CHROMIUM SITE	ON A NEARBY BLOCK	ON A DISTANT BLOCK	
<u>BOYS</u>				
Total	7	33	13	53
# $\geq 0.30^*$	5	15	1	21
% ≥ 0.30	71% a	46% a	8%	40%
<u>GIRLS</u>				
Total	19	16	9	44
# ≥ 0.30	9	4	1	14
% ≥ 0.30	47% a	25%	11%	32%
<u>TOTAL</u>				
Total	26	49	22	97
# ≥ 0.30	14	19	2	35
% ≥ 0.30	54% a	39% a	9%	36%

* Urine chromium concentration in micrograms per liter

a Proportion is statistically different ($p < 0.05$, one-tailed Fisher's exact test) from proportion "On a Distant Block"

Note: There are no statistical differences in the proportions of children with detectable chromium in the urine between boys and girls in the same residence classification.

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TABLE 3 CHILDREN: PROPORTION OF CHILDREN WITH DETECTABLE CHROMIUM IN THE URINE, BY LOCATION OF RESIDENCE RELATIVE TO KNOWN CHROMIUM SITES AND AGE

	LOCATION OF RESIDENCE			
	ON A BLOCK W/CHROMIUM SITE	ON A NEARBY BLOCK	ON A DISTANT BLOCK	TOTAL
<u>AGE 6-8</u>				
Total	7	12	7	26
# $\geq 0.30^*$	3	5	1	9
% ≥ 0.30	43%	42%	14%	35%
<u>AGE 9-11</u>				
Total	6	18	8	32
# ≥ 0.30	3	6	1	10
% ≥ 0.30	50%	33%	12%	31%
<u>AGE 12+</u>				
Total	13	19	7	39
# ≥ 0.30	8	8	0	16
% ≥ 0.30	62%	42%	0%	41%
<u>TOTAL</u>				
Total	26	49	22	97
# ≥ 0.30	14	19	2	35
% ≥ 0.30	54%	39%	9%	36%

* Urine chromium concentration in micrograms per liter

Note: There are no statistical differences (using the Fisher's one-tailed exact test, $p < 0.05$) in the proportions of children with detectable chromium in the urine among age groups in the same residence classification.

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TABLE 4 CHILDREN: PROPORTION OF HOUSEHOLDS WITH AT LEAST ONE CHILD WITH DETECTABLE CHROMIUM IN THE URINE, BY LOCATION OF HOUSEHOLD RELATIVE TO KNOWN CHROMIUM SITES

	LOCATION OF HOUSEHOLD			TOTAL
	ON A BLOCK W/ CHROMIUM SITE	ON A NEARBY BLOCK	ON A DISTANT BLOCK	
# Households	10	24	19	53
# With At Least One Child $\geq 0.30^*$	7	14	2	23
% With At Least One Child ≥ 0.30	70% ^a	58% ^a	10%	43%

* Urine chromium concentration in micrograms per liter

^a Proportion is statistically different (one-tailed Fisher's exact test $p < 0.05$) from proportion "On a Distant Block"

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TABLE 5 RESULTS OF SKIN, NOSE AND THROAT EXAMINATIONS FOR CHILDREN

<u>NUMBER OF INDIVIDUALS:</u>	<u>SKIN</u>	<u>NOSE/THROAT</u>
<u>Screening Examinations</u>	97 (100%)	97 (100%)
No condition requiring referral	93 (96%)	93 (96%)
Referred for further evaluation	4 (4%)	4 (4%)
Referred but not available for re-examination	1 (1%)	2 (2%)
<u>Referral examinations</u>	3 (3%)	2 (2%)
Others seen by specialist	1 (1%)	1 (1%)
Condition not present on re-examination	0 (0%)	3 (3%)
Condition not reported to be chromium-related	4 (4%)	0 (0%)
Condition associated with chromium but other causes more likely in this case	0 (0%)	0 (0%)
Condition definitely chromium-related	0 (0%)	0 (0%)

TABLE 6 ADULTS: PROPORTION OF ADULTS WITH DETECTABLE CHROMIUM IN THE URINE, BY LOCATION OF RESIDENCE RELATIVE TO KNOWN CHROMIUM SITES

	LOCATION OF RESIDENCE			TOTAL
	<u>ON/NEAR A BLOCK W/CHROMIUM SITE</u>	<u>ON DISTANT BLOCK IN JERSEY CITY</u>	<u>ON DISTANT BLOCK NOT IN JERSEY CITY</u>	
Total	7	51	10	68
# $\geq 0.30^*$	0	10	1	11
% ≥ 0.30	0%	20%	10%	16%

* Urine chromium concentration in micrograms per liter

Note: There are no statistical differences (one-tailed Fisher's exact test $p < 0.05$) in the proportions of adults with detectable chromium in the urine among residential classifications.

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TABLE 7 ADULTS: PROPORTION OF ADULTS WITH DETECTABLE CHROMIUM IN THE URINE, BY JOB CLASSIFICATION AND GENDER

	<u>FEMALES</u>	<u>MALES</u>	<u>TOTAL</u>
<u>TEACHERS, ADMINISTRATORS</u>			
Total	37	13	50
# ≥ 0.30	10	0	10
% ≥ 0.30	27% a,b	0%	20%
<u>LUNCH AIDES</u>			
Total	4	0	4
# ≥ 0.30	0	0	0
% ≥ 0.30	0%	-	0%
<u>CUSTODIANS</u>			
Total	12	2	14
# ≥ 0.30	1	0	1
% ≥ 0.30	8%	0%	7%
<u>ALL JOB CATEGORIES</u>			
Total	53	15	68
# ≥ 0.30	11	0	11
% ≥ 0.30	21% a	0%	16%

a Proportion among females is statistically different ($p < 0.05$, two-tailed Fisher's exact test) from proportion among males.

b Proportion among female teachers approaches statistical difference ($p = 0.08$, two-tailed Fisher's exact test) relative to other females.

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TABLE 8 RESULTS OF SKIN, NOSE AND THROAT EXAMINATIONS FOR ADULTS

<u>NUMBER OF INDIVIDUALS:</u>	<u>SKIN</u>	<u>NOSE/THROAT</u>
<u>Screening Examinations</u>	68 (100%)	68 (100%)
No condition requiring referral	53 (78%)	65 (96%)
Referred for further evaluation	15 (22%)	3 (4%)
Referred but not available for re-examination	2 (3%)	0 (0%)
<u>Referral examinations</u>	13 (19%)	3 (4%)
Others seen by specialist	0 (0%)	0 (0%)
Condition not present on re-examination	0 (0%)	1 (1%)
Condition not reported to be chromium-related	13 (19%)	0 (0%)
Condition associated with chromium but other causes more likely in this case	0 (0%)	2 (3%)
Condition definitely chromium-related	0 (0%)	0 (0%)