

The Federal Centers for Disease Control and Prevention (CDC) has established guidelines to determine when children are in need of environmental assessments and medical evaluations. The NYC DOH LPPP has used these guidelines to define an “environmental intervention blood lead level” (EIBLL)<sup>27</sup>. Childhood blood lead levels at or above the EIBLL result in NYC DOH LPPP intervention activities in the form of environmental assessment of lead hazards and enforcement of lead hazard regulations (including safe work practices during lead abatement), and care coordination. These interventions generally continue until all outstanding lead-based paint violations are remediated and the child's blood lead level falls below the environmental intervention blood lead level.

High blood lead levels can cause coma, convulsions and even death. Children under 6 years of age who have a venous test result of  $\geq 45$   $\mu\text{g}/\text{dL}$  are in need of rapid medical treatment and environmental assessment. Because lead encephalopathy in a child can rapidly lead to death, a blood lead level of 70  $\mu\text{g}/\text{dL}$  or higher is considered an acute medical emergency.<sup>28</sup>

During the past thirty years, the NYC DOH LPPP EIBLL has been gradually lowered: in 1970, the EIBLL level was 60  $\mu\text{g}/\text{dL}$ . In November 1992, the EIBLL was defined as a venous blood lead level  $\geq 20$   $\mu\text{g}/\text{dL}$ . The EIBLL level remained at  $\geq 20$   $\mu\text{g}/\text{dL}$  until July 1999 at which point children with two blood lead levels of 15-19  $\mu\text{g}/\text{dL}$  (at least 3 months apart and the second test being a venous sample) were also added to the EIBLL criteria.

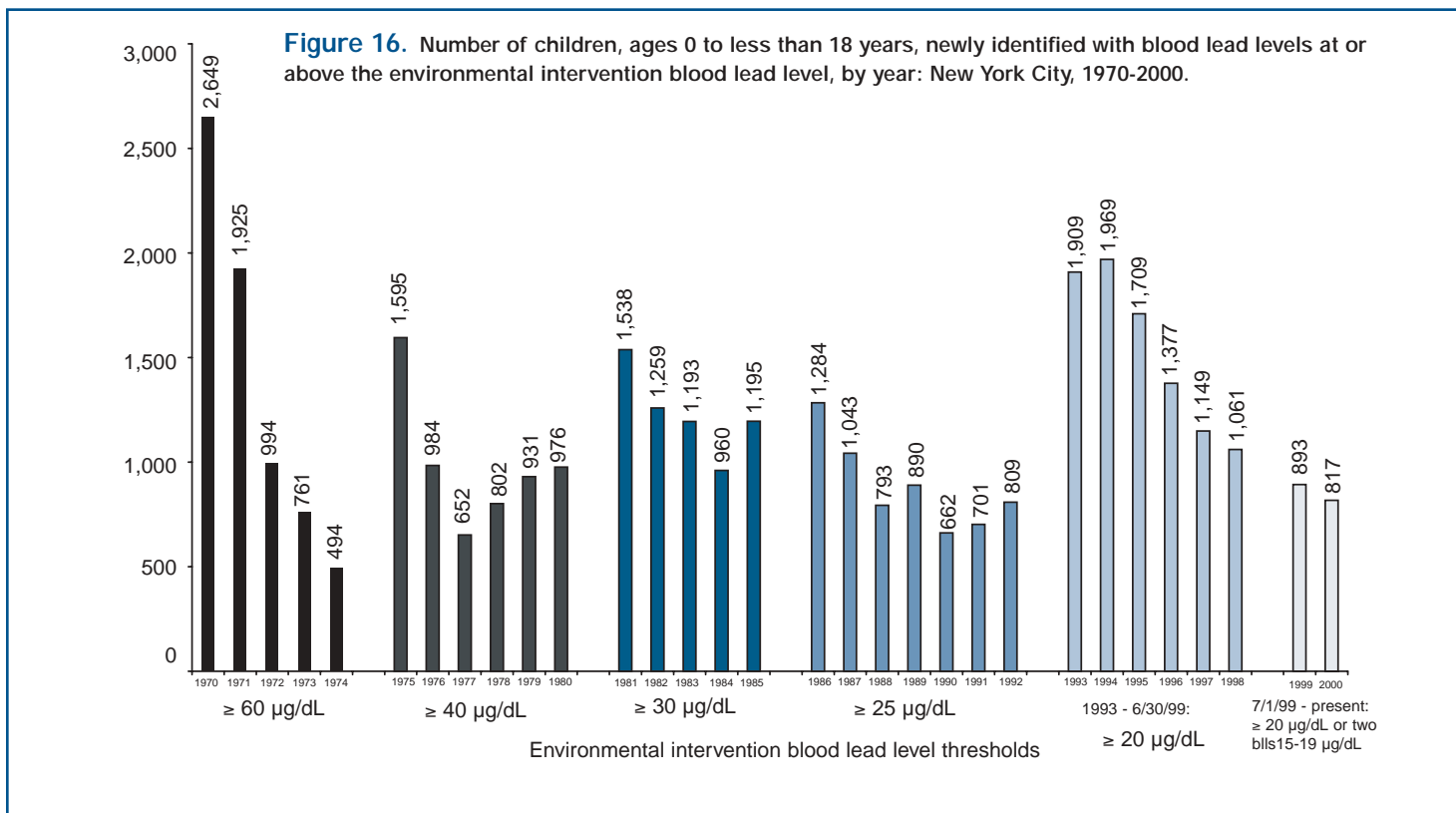
In this chapter, we use data for children with confirmed venous blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  to present case data over time. Unlike the previous chapters (Testing for Lead Poisoning, and Elevated Blood Lead Levels), children with capillary samples are not included in this section. For this reason, counts of children with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  differ between this chapter and previous chapters. (For more discussion of the EIBLL definition and criteria see Appendix, Table 5 and Technical Notes: Blood lead levels, environmental intervention blood lead level.)

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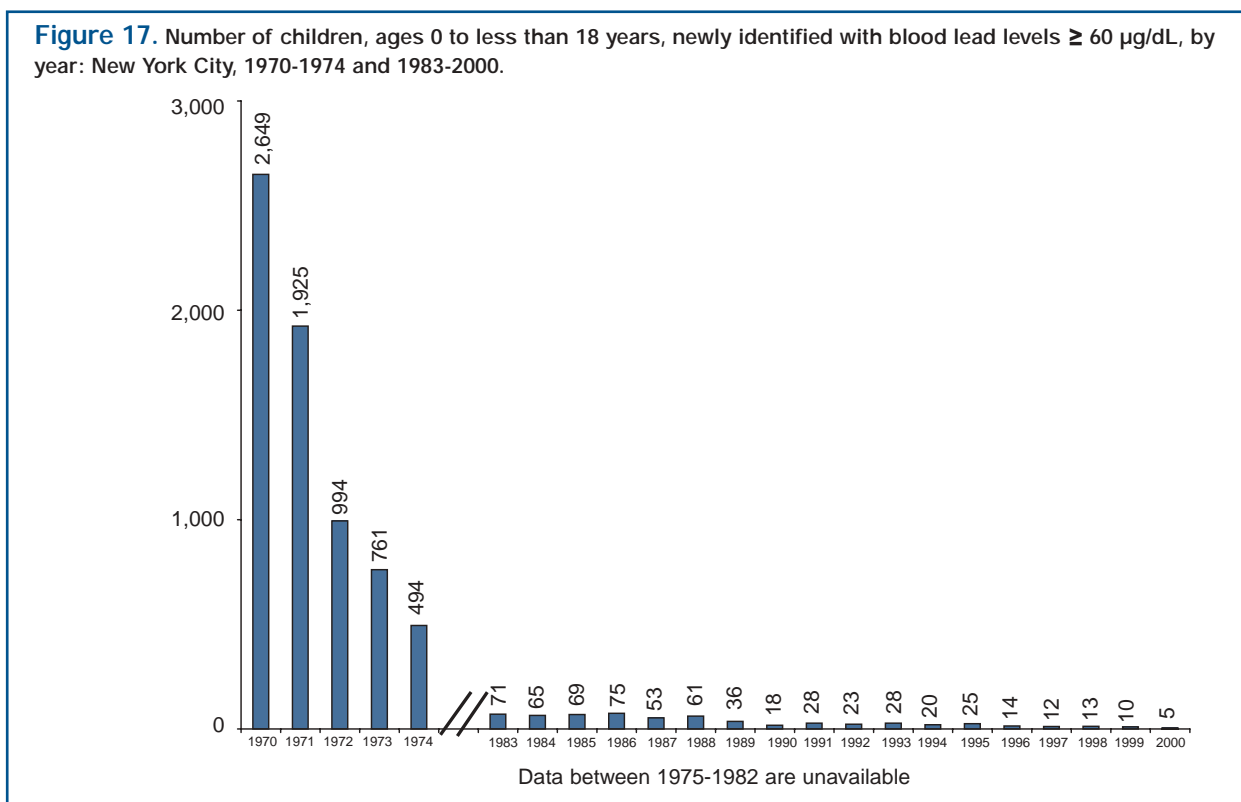
<sup>27</sup>Currently, the NYC EIBLL is a venous blood lead level of  $\geq 20$   $\mu\text{g}/\text{dL}$  or two blood lead levels of 15-19  $\mu\text{g}/\text{dL}$  at least 3 months apart where the second test is a venous sample.

<sup>28</sup>Lead encephalopathy is associated with blood lead levels as low as 70  $\mu\text{g}/\text{dL}$ . [MMWR (1991). Epidemiologic Notes and Reports Fatal Pediatric Poisoning from Leaded Paint -- Wisconsin, 1990. Morbidity and Mortality Weekly Report; 40:12, 193-195]

Over the last 30 years, substantial progress has been made in reducing the number of children with blood lead levels at or above the environmental intervention blood lead level (EIBLL) in NYC; this occurred even as the EIBLL threshold has been lowered. In 1970, the year that the New York City Department of Health's Lead Poisoning Prevention Program was established, there were 2,649 children (ages 0 to less than 18 years) identified at the EIBLL ( $\geq 60 \mu\text{g}/\text{dL}$ ). In 2000, there were 817 children newly identified at the EIBLL ( $20 \mu\text{g}/\text{dL}$  or two blood lead levels  $15\text{-}19 \mu\text{g}/\text{dL}$ ). (See discussion of limitations in the historic data in Appendix: Technical Notes: Blood lead levels: environmental intervention blood lead level (EIBLL).)



The number of children newly identified with blood lead levels  $\geq 60 \mu\text{g}/\text{dL}$  declined dramatically from 2,649 in 1970 to only 5 in 2000.

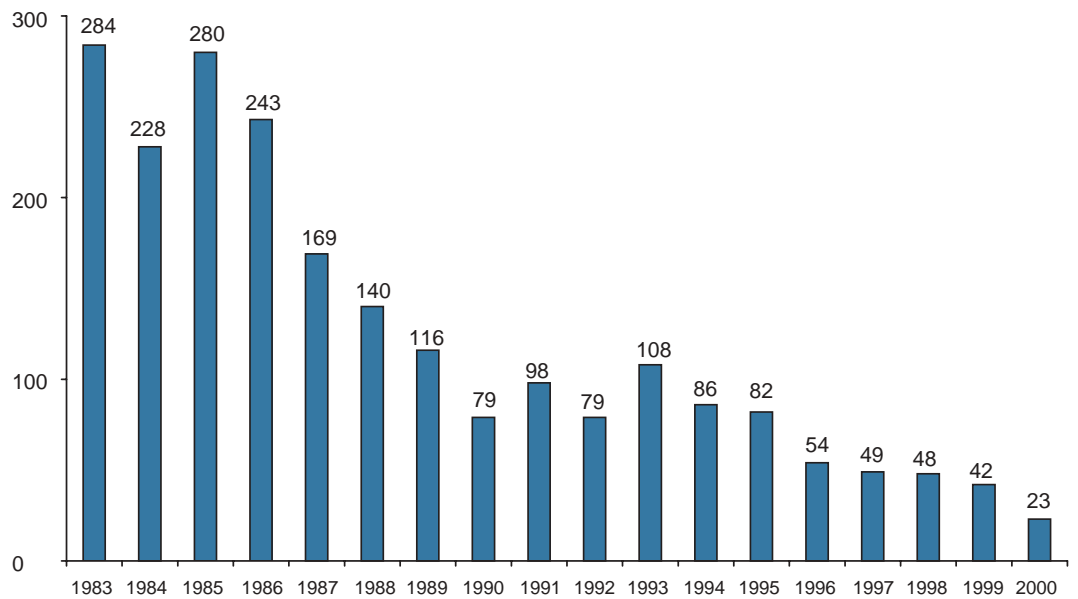


Environmental Intervention Blood Lead Levels

## TIME TRENDS

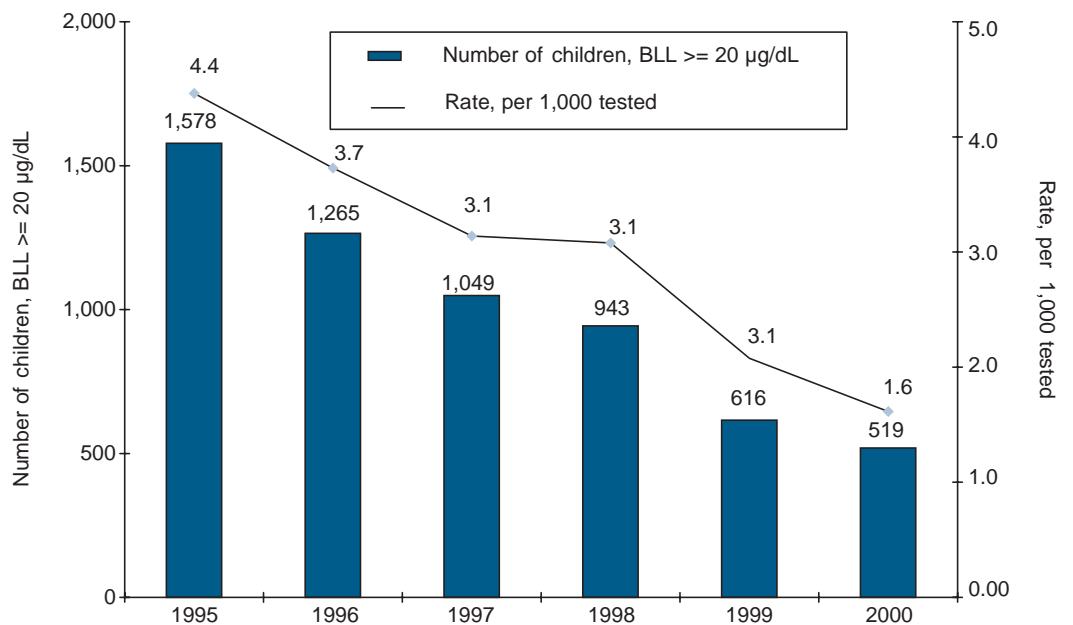
Children who have a venous test result of  $\geq 45 \mu\text{g/dL}$  are in need of rapid medical treatment and environmental assessment. The number of children newly identified with blood lead levels  $\geq 45 \mu\text{g/dL}$  declined 92% in the 16 years for which data are available; in 1983, there were 284 children newly identified with blood lead levels in this category and there were 23 children newly identified in 2000.

**Figure 18.** Number of children, ages 0 to less than 18 years, newly identified with blood lead levels  $\geq 45 \mu\text{g/dL}$ , by year: New York City, 1983-2000.



Between 1995 and 2000, the citywide rate of children ages 6 months to less than 6 years newly identified with blood lead levels  $\geq 20 \mu\text{g/dL}$  declined 64% (from 4.4 to 1.6 per 1,000 children tested, respectively). The average yearly decline between 1995 and 2000 was 19%.<sup>29</sup> This was approximately the same rate of decline that was seen for blood lead levels  $\geq 10 \mu\text{g/dL}$  (see Figure 10).

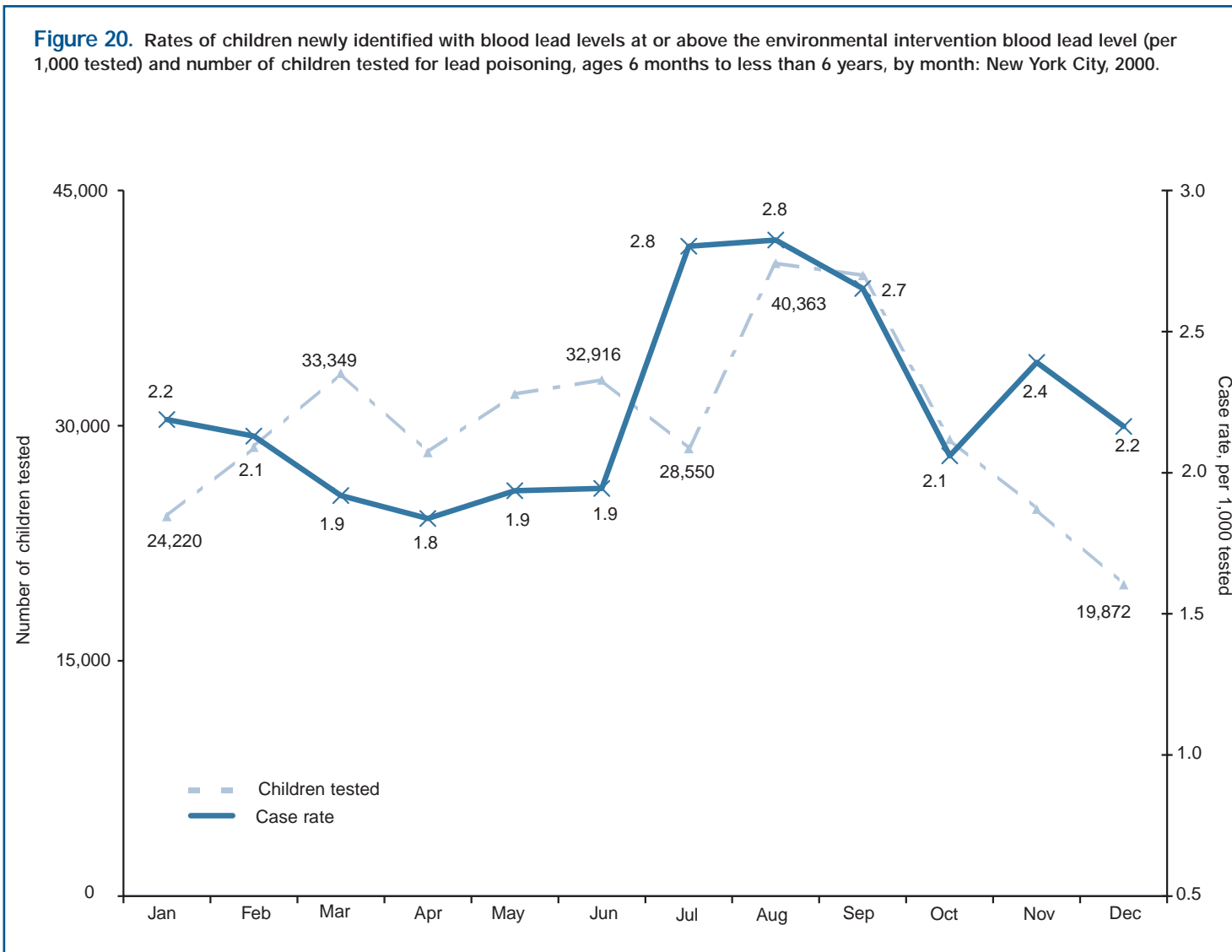
**Figure 19.** Children newly identified with blood lead levels  $\geq 20 \mu\text{g/dL}$  (number and rate per 1,000 tested), ages 6 months to less than 6 years, by year: New York City, 1995-2000.



<sup>29</sup>Between 1997 and 1998, there was an 8% decline in numbers of children tested and a 10% decline in numbers of children with blood lead levels  $\geq 20 \mu\text{g/dL}$  - resulting in the case rate remaining stable at 3.1 children per 1,000 tested.

This figure shows case rates relative to testing numbers. There appears to be a seasonal pattern in the number of children tested and the rate of children newly identified with blood lead levels at or above the environmental intervention blood lead level (EIBLL). In 2000, the rate of children ages 6 months to less than 6 years newly identified with blood lead levels at or above the EIBLL (case rate) was highest from July through September (July 2.8, August 2.8, and September 2.7 per 1,000 tested) and lowest from March through June (about 1.9 per 1,000 tested). Testing numbers and case rates both appear to be higher in late summer/early fall; however, the association between testing rates and case rates was not consistent throughout the calendar year.

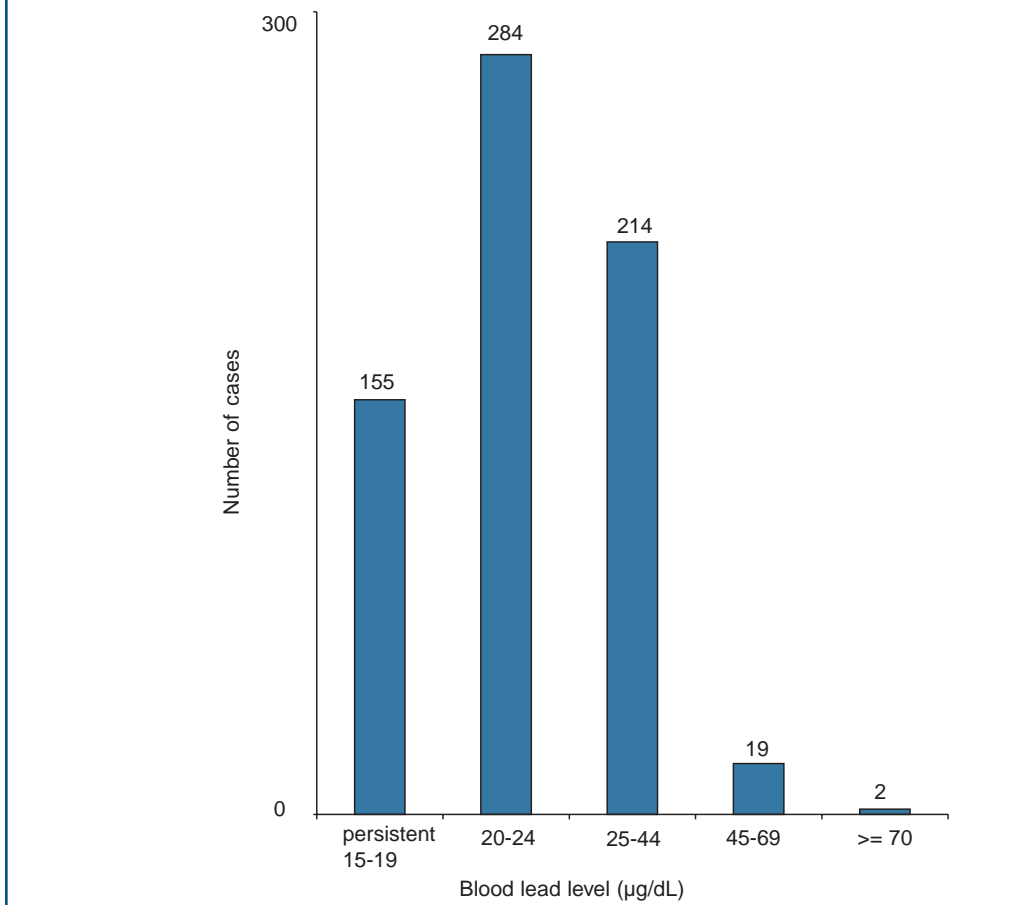
**Figure 20.** Rates of children newly identified with blood lead levels at or above the environmental intervention blood lead level (per 1,000 tested) and number of children tested for lead poisoning, ages 6 months to less than 6 years, by month: New York City, 2000.



Environmental Intervention Blood Lead Levels

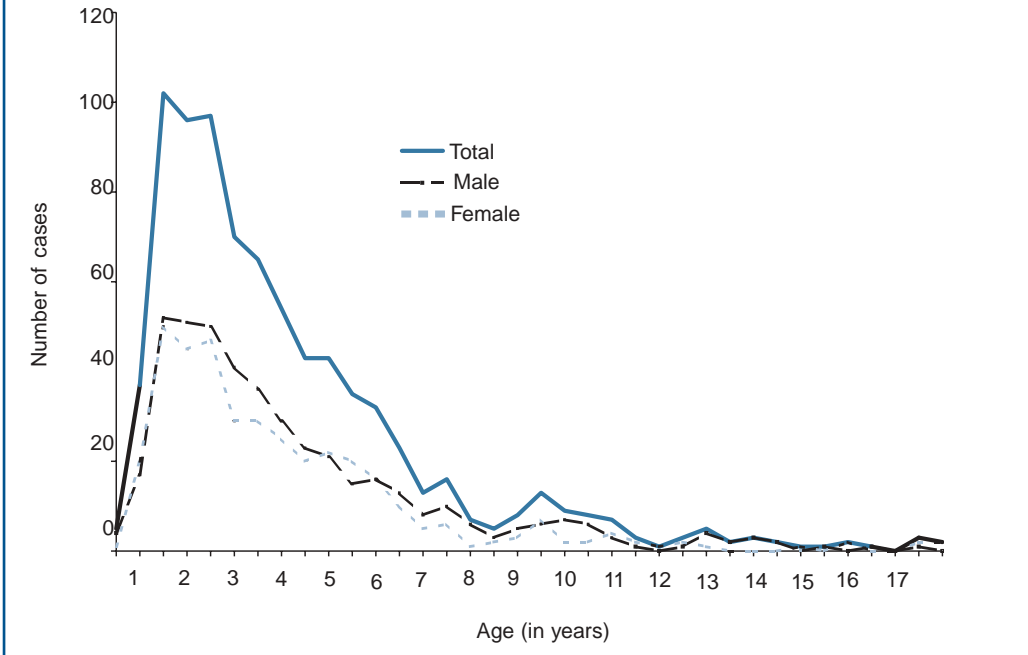
In 2000, only 2 children ages 6 months to less than 6 years were newly identified with blood lead levels of 70 µg/dL or greater. Most (74%, n=498) children newly identified with blood lead levels at or above the environmental intervention blood lead level had blood lead levels between 20 and 44 µg/dL. About one-quarter (23%, n=155) were identified as having persistent blood lead levels of 15-19 µg/dL.<sup>30</sup>

**Figure 21.** Distribution of children newly identified with blood lead levels at or above the environmental intervention blood lead level, ages 6 months to less than 6 years, by blood lead level: New York City, 2000. (Total=664)



Consistent with the data for children with blood lead levels ≥ 10 µg/dL (Figure 12), the number of children newly identified with blood lead levels at or above the environmental intervention blood lead level peaked between 12 and 29 months of age. There was only a very slight difference in the distribution of cases according to gender, 55% of cases were boys.

**Figure 22.** Number of children newly identified with blood lead levels at or above the environmental intervention blood lead level, ages 0 to less than 18 years, by age and gender: New York City, 2000. (Total = 817)

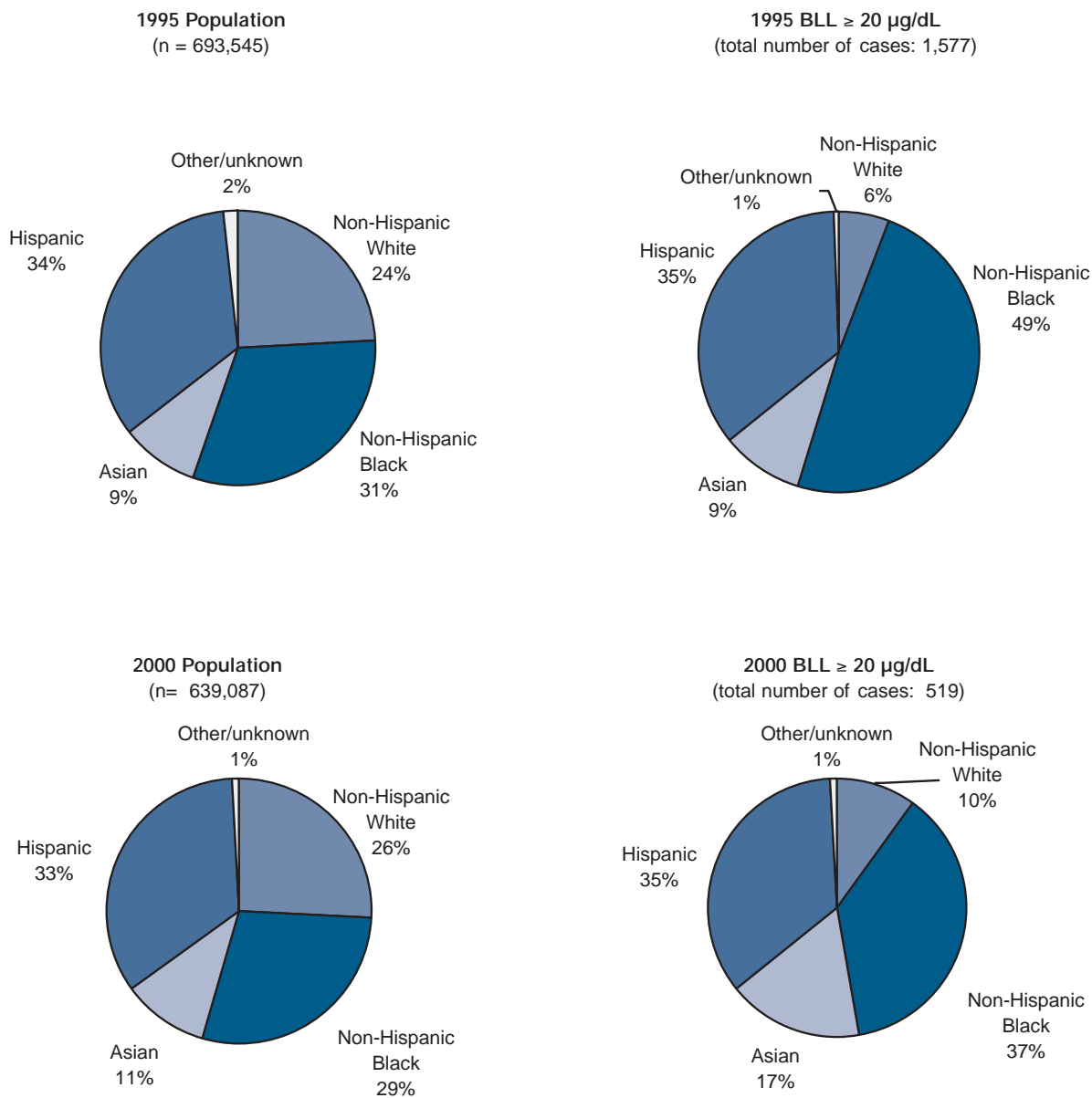


<sup>30</sup> Persistent blood lead levels of 15-19 µg/dL are defined as two blood lead levels of 15-19 µg/dL at least 3 months apart.

Non-Hispanic black children represented a disproportionate share of the percent of children newly identified with blood lead levels  $\geq 20 \mu\text{g/dL}$ . In 1995, non-Hispanic black children (ages 6 months to less than 6 years) accounted for almost half (49%) of children newly identified with blood lead levels  $\geq 20 \mu\text{g/dL}$  while only one-third (31%) of children in the population were non-Hispanic black. By 2000, the disparity remained, though it was slightly less (37% of cases versus 29% in the population).

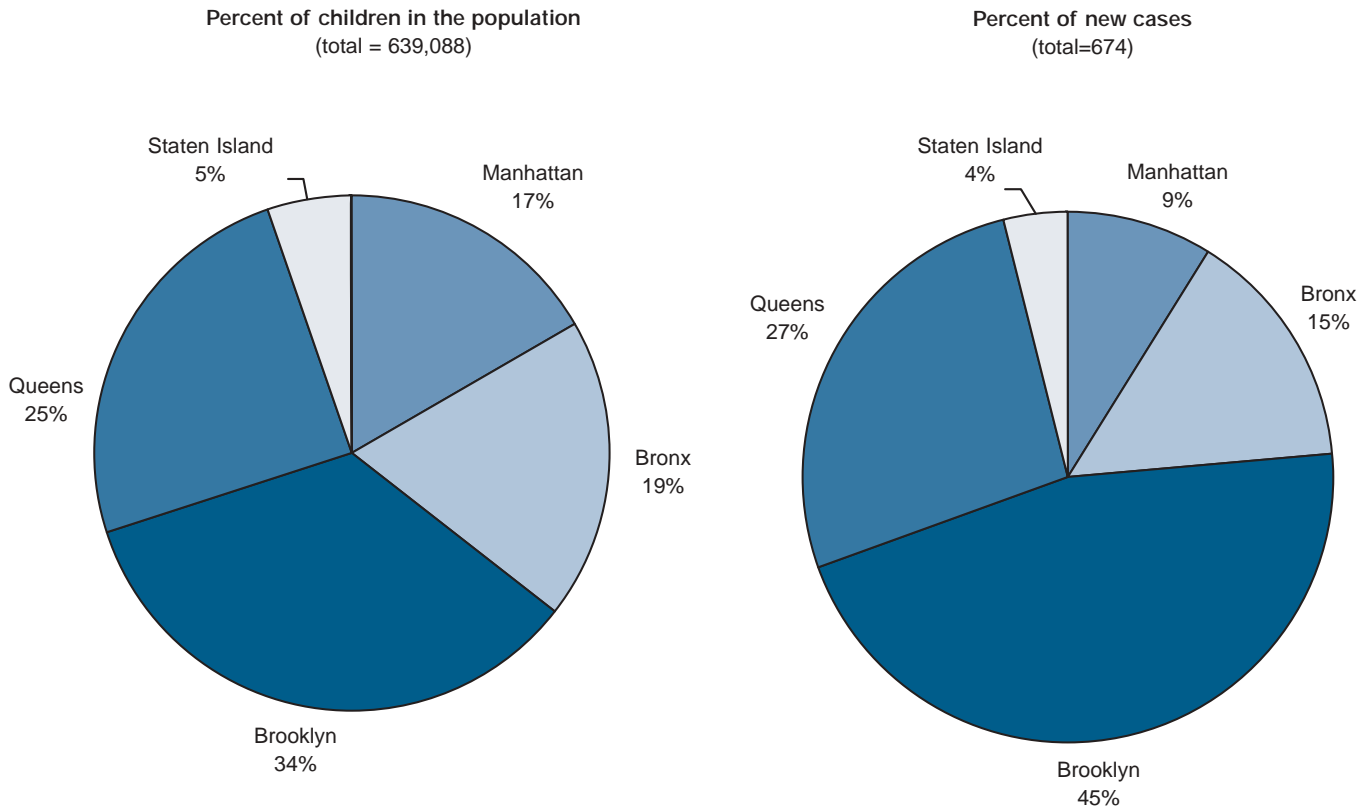
Comparing 1995 to 2000, among children newly identified with blood lead levels  $\geq 20 \mu\text{g/dL}$ , the proportion of white children increased slightly (from 6% to 10%), and the proportion of Hispanic children remained the same (35%). By 2000, Asian children represented a disproportionate share of the cases. Between 1995 and 2000, the citywide proportion of Asian children in the population remained about 10%, but the proportion of children newly identified with blood levels  $\geq 20 \mu\text{g/dL}$  who were Asian increased from 9% to 17%.

**Figure 23.** Distribution of children in the population and children newly identified with blood lead levels (BLL)  $\geq 20 \mu\text{g/dL}$ , ages 6 months to less than 6 years, by race/ethnicity: New York City, 1995 and 2000. (Sources: NYC DOH Bureau of Vital Statistics, and NYC DOH LPPP)



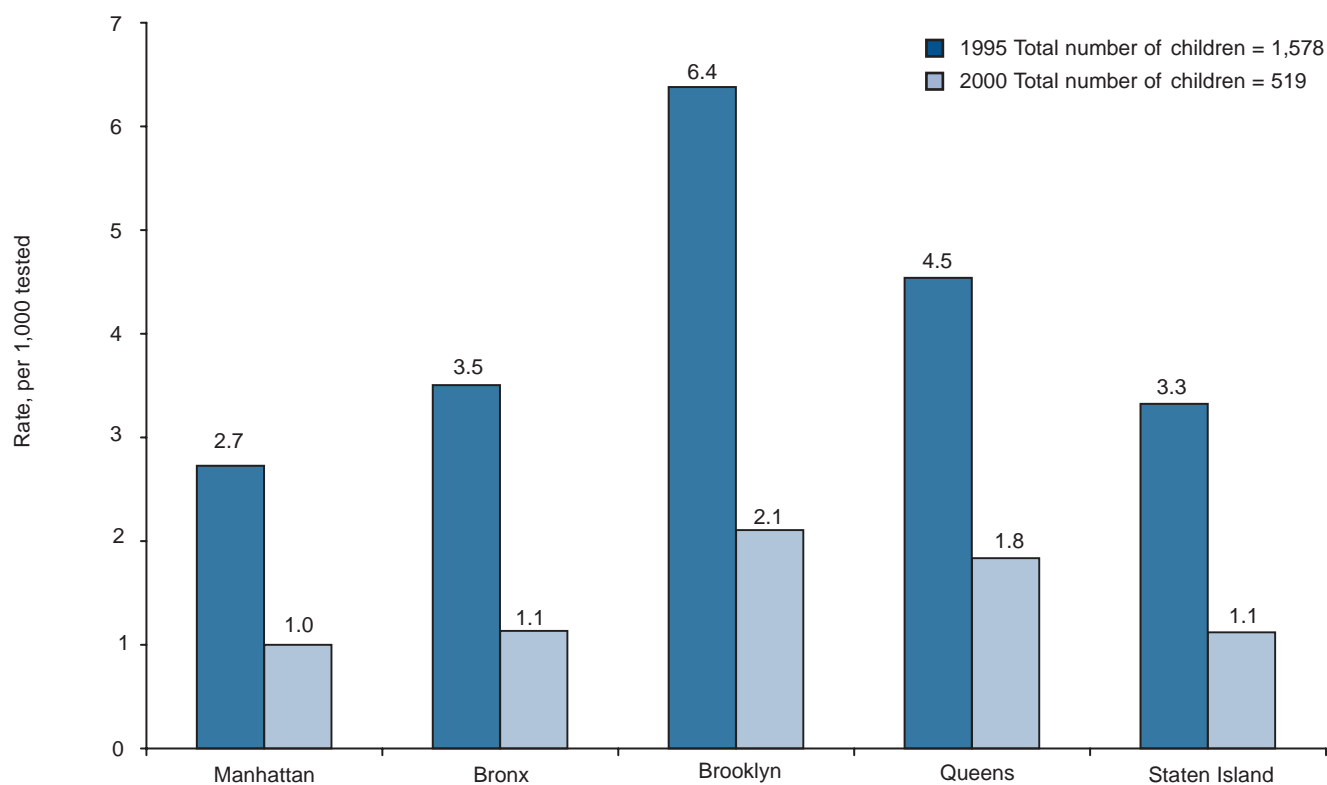
Brooklyn has a disproportionate share of the percent of children with blood lead levels at or above the environmental intervention blood lead level (EIBLL). In 2000, Brooklyn accounted for 45% of the EIBLL children but only 34% of children in this age group resided in Brooklyn. Conversely, Manhattan accounted for only 9% of lead poisoning cases, while 17% of children resided in the borough. (These results are consistent with data from 1995, not shown, see Appendix, Table 3).

**Figure 24.** Distribution of children in the population and children newly identified with blood lead levels at or above the environmental intervention blood lead level, ages 6 months to less than 6 years, by borough: New York City, 2000. (Sources: NYC DOH Office of Vital Statistics, and NYC DOH LPPP)



By 2000, the rate of children with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  declined to approximately one-third of the 1995 rate. The change did not vary much by borough (a 60% to 68% change). Consistent with results presented for blood lead levels  $\geq 10$   $\mu\text{g}/\text{dL}$  (see Figure 13), in both 1995 and 2000, Brooklyn had the highest rate of children ages 6 months to less than 6 years newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  (6.4 and 2.1 cases per 1,000 children tested, respectively).

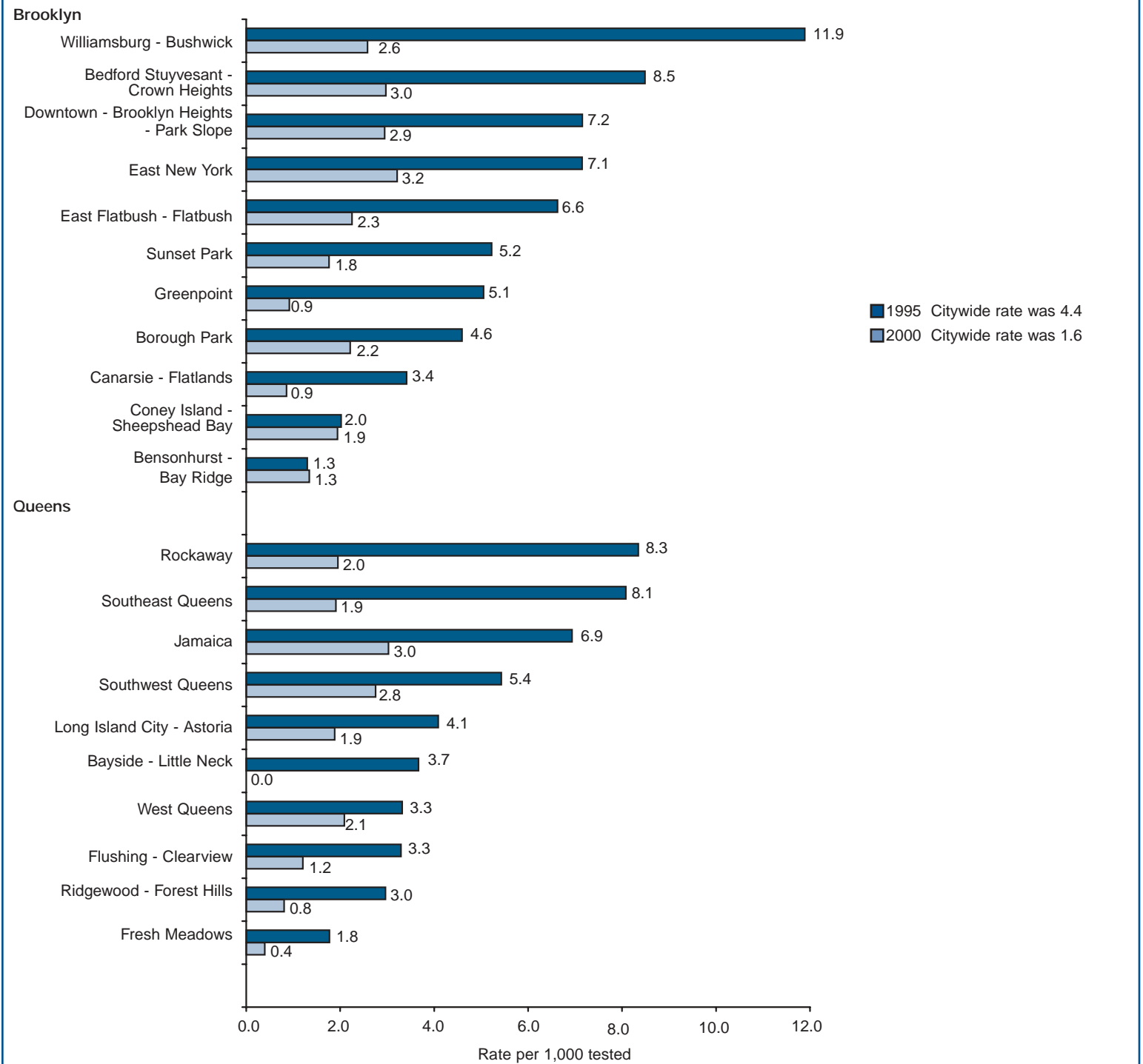
**Figure 25.** Rates of children newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  (per 1,000 tested), ages 6 months to less than 6 years, by borough: New York City, 1995 and 2000.



## NEIGHBORHOOD

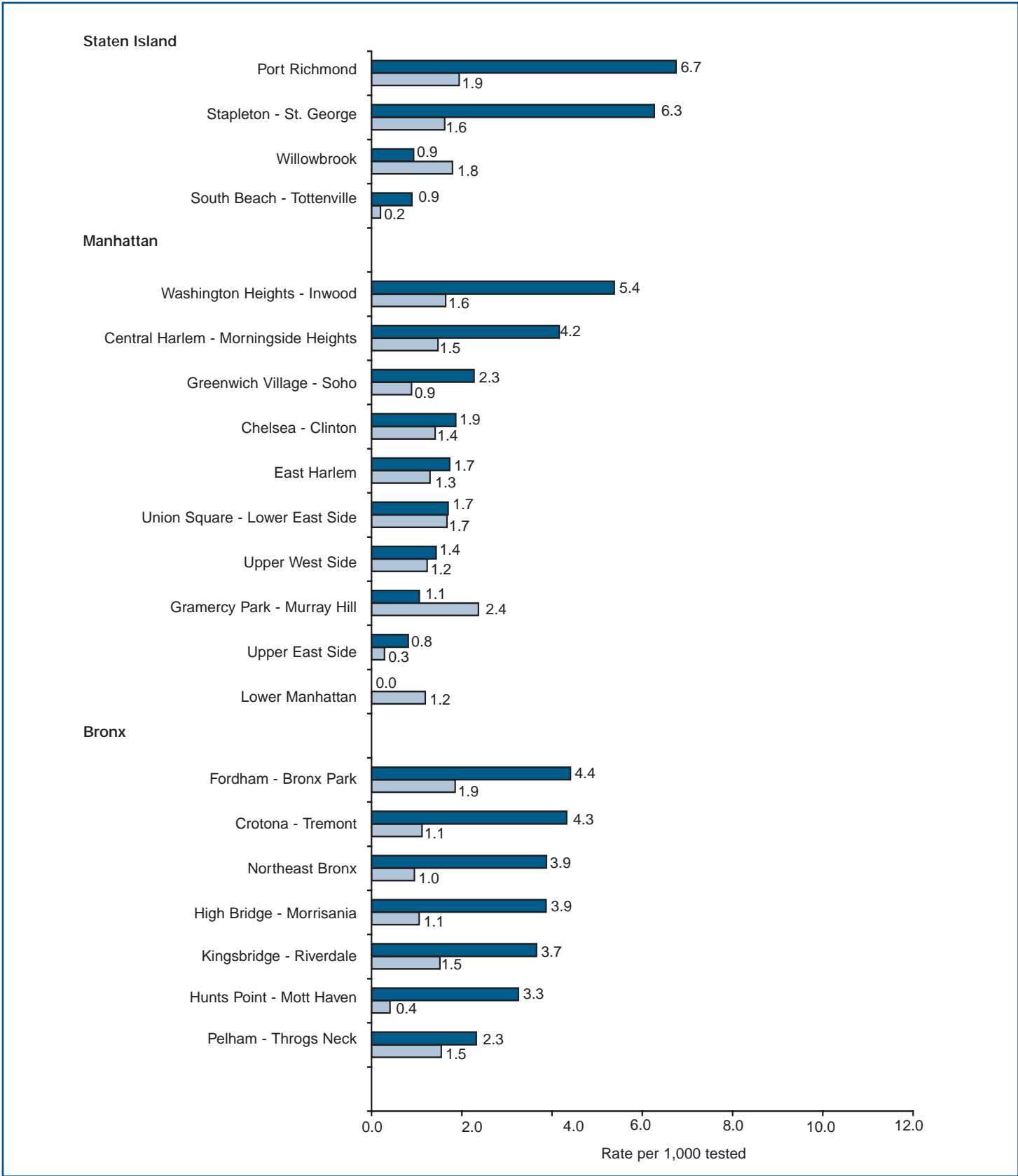
The rates of children newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  varied between NYC neighborhoods. In 2000, the rates (per 1,000 children tested) ranged from 0.0 in Bayside-Little Neck (Queens) to 3.2 in East New York (Brooklyn). By the year 2000, rates of children newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  had sharply declined in neighborhoods that had the highest rates in 1995 (Williamsburg-Bushwick, Rockaway, Southeast Queens, Bedford-Stuyvesant-Crown Heights declined 78%, 77%, 76%, 65%, respectively). Nevertheless, some neighborhoods persisted in having the highest rates. Between 1995 and 2000, seven communities in Brooklyn and Queens persisted in

**Figure 26.** Rates of children newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  (per 1,000 tested), ages 6 months to less than 6 years, by United Hospital Fund neighborhood (sorted highest to lowest within each borough for 1995): New York City, 1995 and 2000.



<sup>31</sup>Between 1995 and 2000, three neighborhoods experienced an increase in the rate of children newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$ : Lower Manhattan (from 0.0 to 1.2), Willowbrook (from 0.9 to 1.8), and Gramercy Park-Murray Hill (1.1 to 2.4). In 2000, both Lower Manhattan and Willowbrook had a rate of children newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  that approximated the citywide rate of 1.6 (per 1,000 children tested), but Gramercy Park's rate was higher than the citywide rate. Gramercy Park's testing rate of children 6 months to less than 6 years was lower than the citywide testing rate (35% versus 54%) so there is a possibility that the testing sample was not representative of the neighborhood and over estimated the risk.

being among the top-ten neighborhoods that had the highest rates of children (ages 6 months to less than 6 years) newly identified with blood lead levels  $\geq 20 \mu\text{g}/\text{dL}$ : East New York, Bedford Stuyvesant-Crown Heights, Downtown-Brooklyn Heights-Park Slope, Williamsburg-Bushwick, East Flatbush-Flatbush, Jamaica, and Southwest Queens.<sup>31</sup> Based on the actual numbers, in 2000, 45% percent of all cases resided in these seven neighborhoods (231 children out of a total of 519).



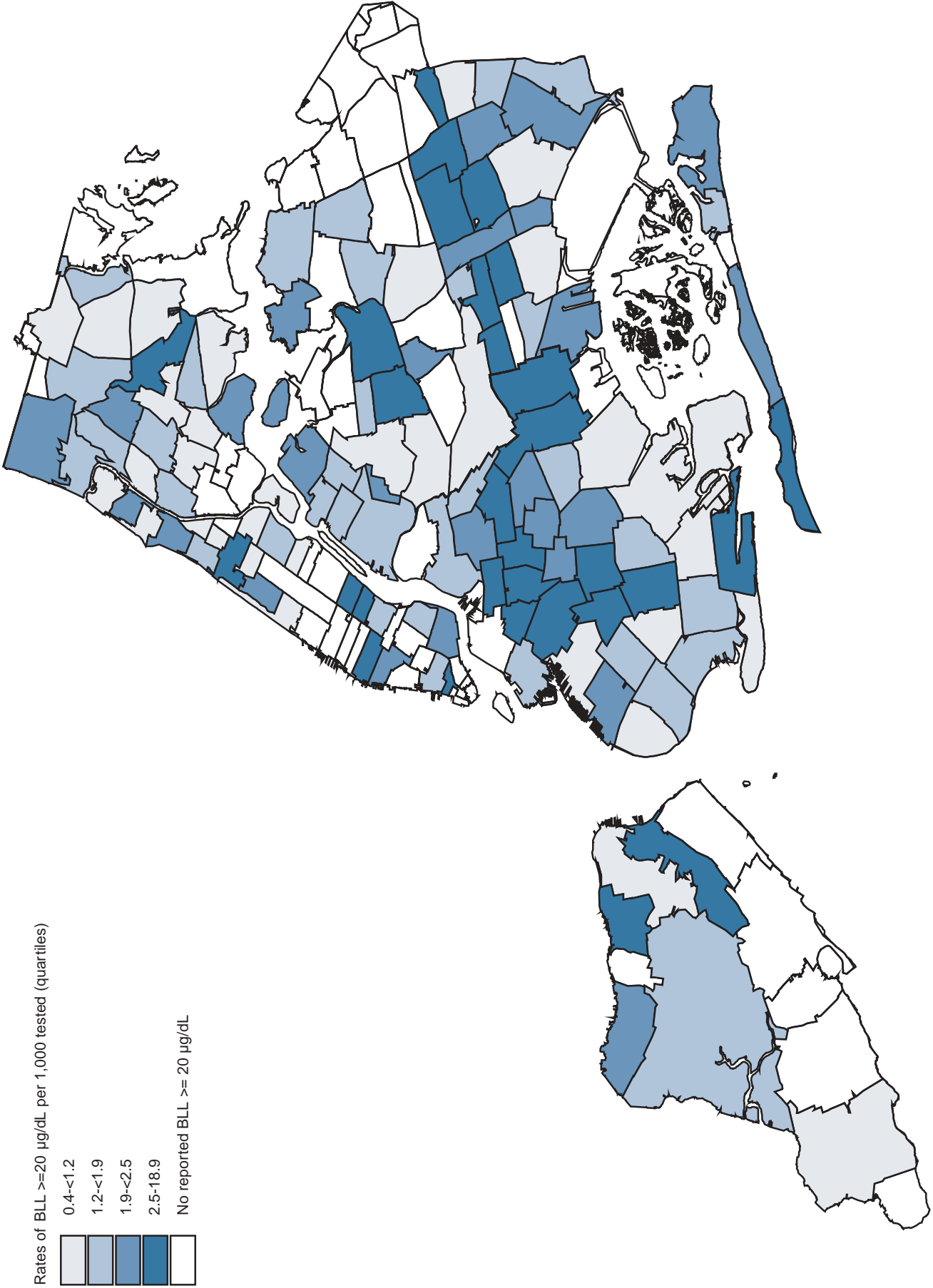
In 2000, the citywide rate of children ages 6 months to less than 6 years newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  was 1.6<sup>32</sup> per 1,000 children tested. By ZIP code, these rates varied from 0 to 8.0 per 1,000 children tested. ZIP codes with the highest rates were located in Queens and Brooklyn: 11418 in Southwest Queens (8.0), 11428 in Southeast Queens (6.7), and 11238 in Bedford-Stuyvesant-Crown Heights (5.7), 11433 and 11432 in Jamaica (5.5 and 5.0, respectively), 11205 and 11215 in Downtown-Brooklyn Heights-Park Slope (4.6 and 4.1, respectively), and 11235 in Coney Island-Sheepshead Bay (4.1).

Four of the top-ten ZIP codes with the highest rates (blood lead level  $\geq 20$   $\mu\text{g}/\text{dL}$ ) in 1995 remained among the top-ten for 2000 (11238 and 11216 in Bedford-Stuyvesant-Crown Heights, 11428 in Southeast Queens, and 11205 in Downtown-Slope-Brooklyn Heights). (Data for 1995 not shown in map, see Appendix, Table 4d. Also see Appendix, Technical Notes: Calculation of rates, elevated blood lead level rates and EIBLL rates, denominator issues.)

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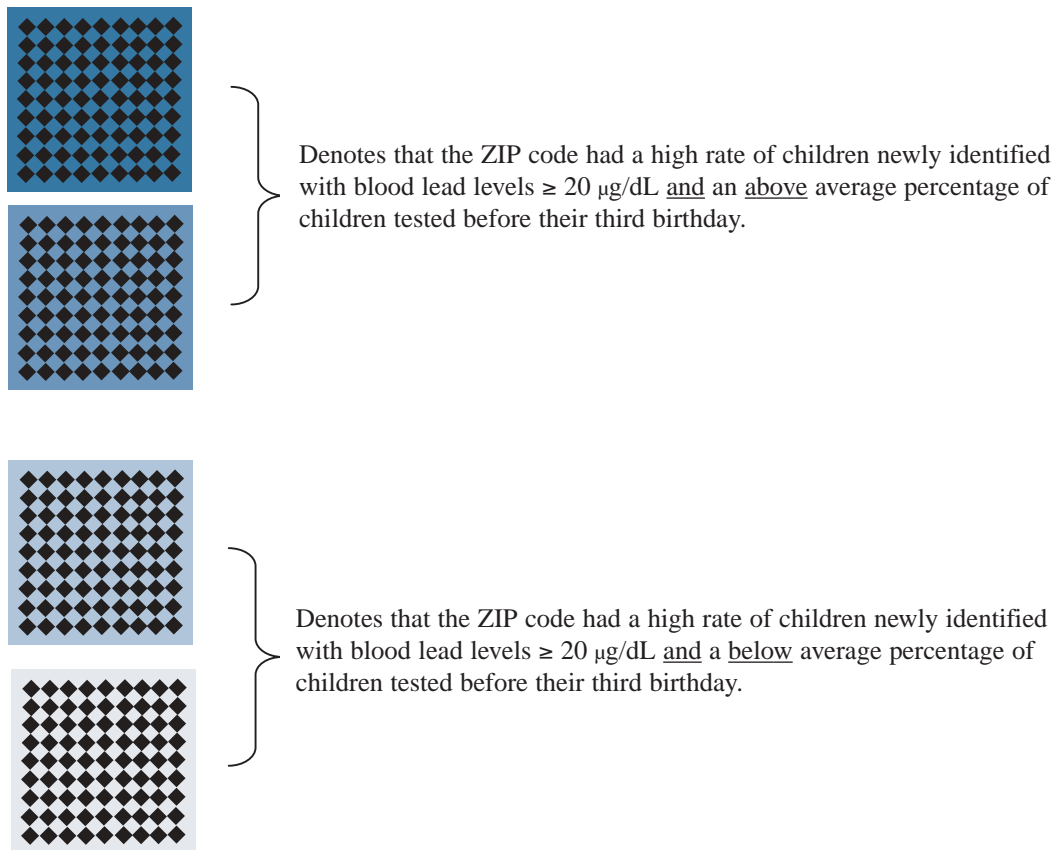
<sup>32</sup> Median ZIP code level case rate was 1.9 per 1,000 children tested.

Figure 27. Rates of children newly identified with blood lead levels (BLL)  $\geq 20 \mu\text{g/dL}$ , aged 6 months to less than 6 years, by ZIP code: New York City, 2000.



This map shows case rates relative to children tested for lead poisoning. In the majority of neighborhoods with high case rates, the rate of children tested for lead poisoning was above the median citywide testing rate. Two-thirds of the ZIP codes highlighted as areas with high case rates in Figure 27, also had high testing rates. The ZIP codes that had the highest case rates and highest proportion of children tested were in Brooklyn [11216, 11238, and 11233 (all in Bedford Stuyvesant-Crown Heights), 11221 (in Williamsburg-Bushwick), 11207 and 11208 (both in East New York) and 11208 (in East Flatbush-Flatbush)].

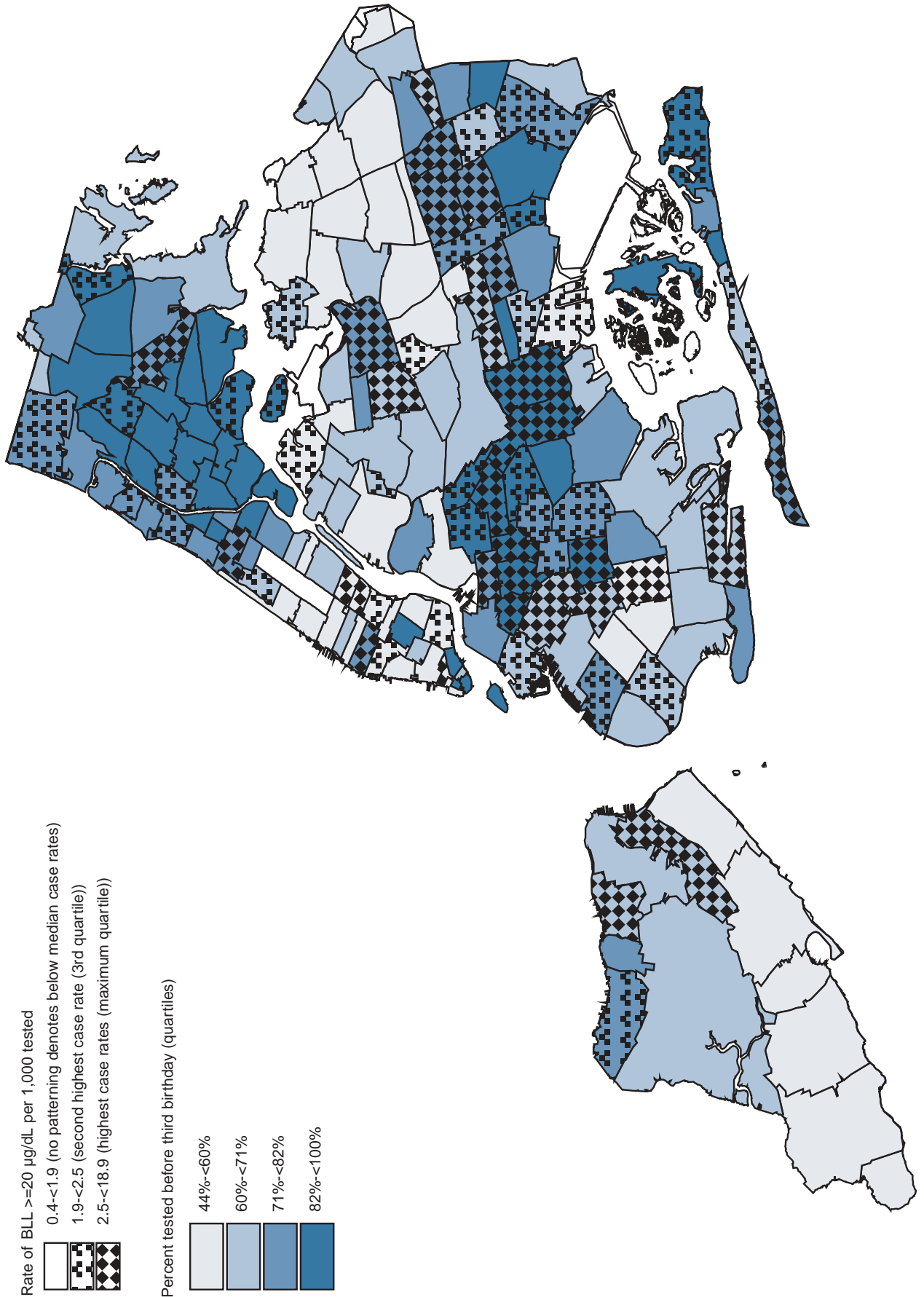
The map also reveals that some ZIP codes in Brooklyn, Queens, and Staten Island had high case rates ( $\geq 2.5$  per 1,000 tested) but had testing rates that were below the median.<sup>33</sup> ZIP codes that fell into this category were: 11428 (Southeast Queens), 11418 and 11421 (Southwest Queens), 11373 (West Queens), 11235 (Coney Island Sheepshead Bay), 11215 (Downtown-Brooklyn Heights-Slope), 11218 and 11230 (both in Borough Park), and 10304 (Stapleton-St. George) and 10310 (Port Richmond).<sup>34</sup>



<sup>33</sup> The median rate of children tested before their third birthday for ZIP codes was 71%.

<sup>34</sup> ZIP codes in Gramercy Park-Murray Hill (10017 and 10022) and Lower Manhattan (10007) have high case rates and low testing rates. However, generally, the rates are influenced by small population numbers: a relatively small number of children resided in the ZIP codes and there were relatively small numbers of births in the ZIP codes. In Lower Manhattan ZIP code 10007, there were 811 children in the population and 41 births in 1997. In Gramercy Park-Murray Hill ZIP code 10017, there were 755 children in the population and 142 births in 1997 and in ZIP code 10022 there were 1,574 children in the population and 294 children born in 1997.

**Figure 28.** Rates of children (aged 6 months to less than 6 years) newly identified with blood lead levels (BLL)  $\geq 20$   $\mu\text{g}/\text{dL}$  in 2000, overlaid on the percent of children born in 1997 who were tested for lead poisoning before their third birthday, by ZIP code. (Sources: NYC DOH Bureau of Biometrics, and NYC DOH LPPP)



This ZIP code level map further highlights the disparity in high blood lead levels for different racial/ethnic groups. On average within each NYC ZIP code, about half (46%) of the population was non-white and/or Hispanic.<sup>35</sup> In ZIP codes with an above-average concentration of non-white and/or Hispanic persons, there was a clustering of children with high blood lead levels.

In 2000, among children ages 6 months to less than 6 years newly identified with blood lead levels  $\geq 20$   $\mu\text{g/dL}$  ("cases"), almost half (48%) resided in ZIP codes with a very high (84%-100%) concentration of non-white and/or Hispanic persons; in contrast 8% of cases resided in ZIP codes with a low (1%-22%) concentration of non-white and/or Hispanic persons. (See Appendix Table 7).

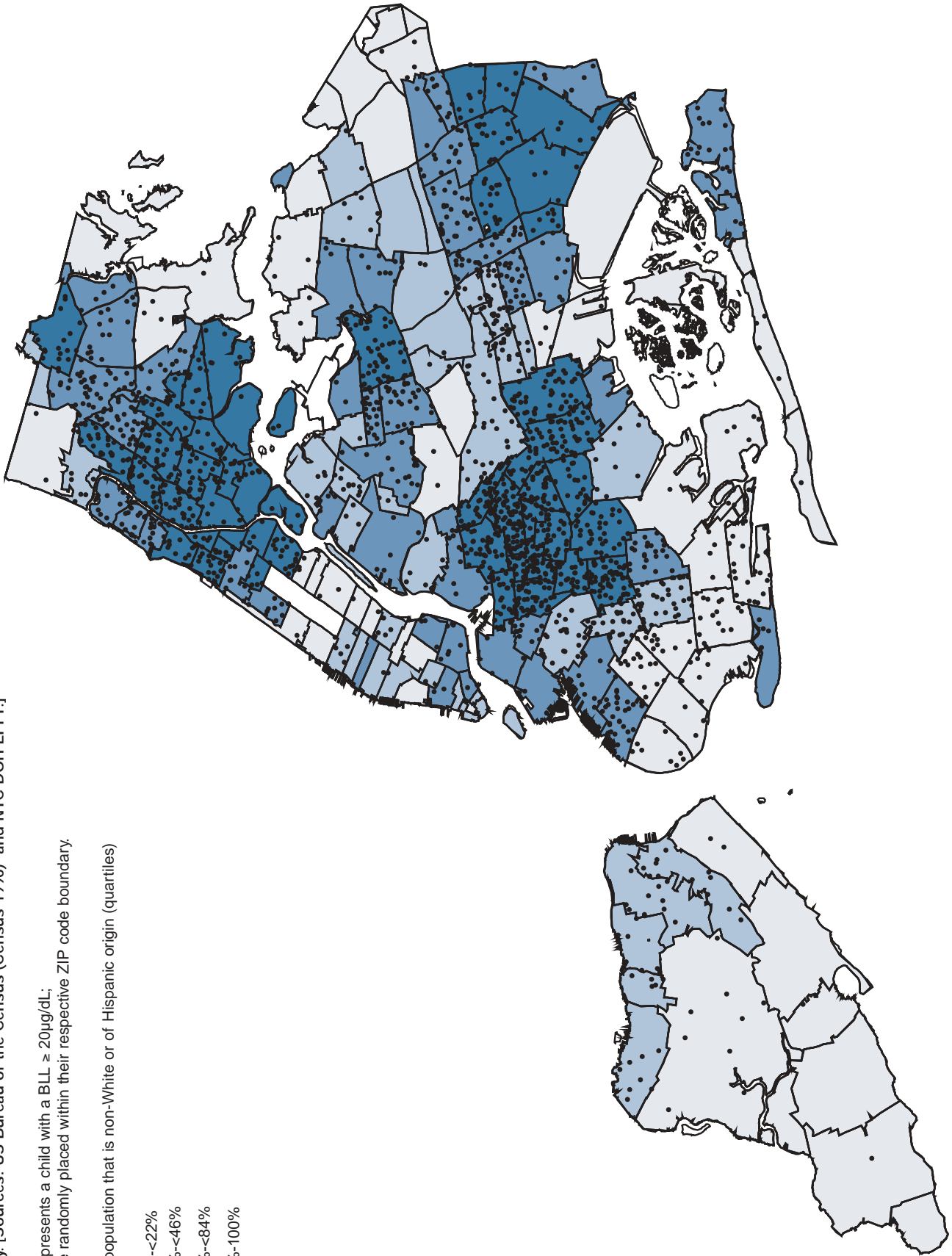
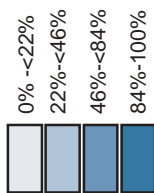
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<sup>35</sup>Data from 1990 Census, the latest year for which Census socio-demographic data by ZIP codes are currently available.

**Figure 29** Children (ages 6 months to less than 6 years) newly identified with blood lead levels (BLL)  $\geq 20 \mu\text{g}/\text{dL}$  in 1998-2000, overlaid on the percent of the population reporting non-White race or Hispanic origin, by ZIP code: New York City. [Sources: US Bureau of the Census (Census 1990) and NYC DOH LPPP]

Each dot represents a child with a  $\text{BLL} \geq 20\mu\text{g}/\text{dL}$ ; the dots are randomly placed within their respective ZIP code boundary.

Percent of population that is non-White or of Hispanic origin (quartiles)



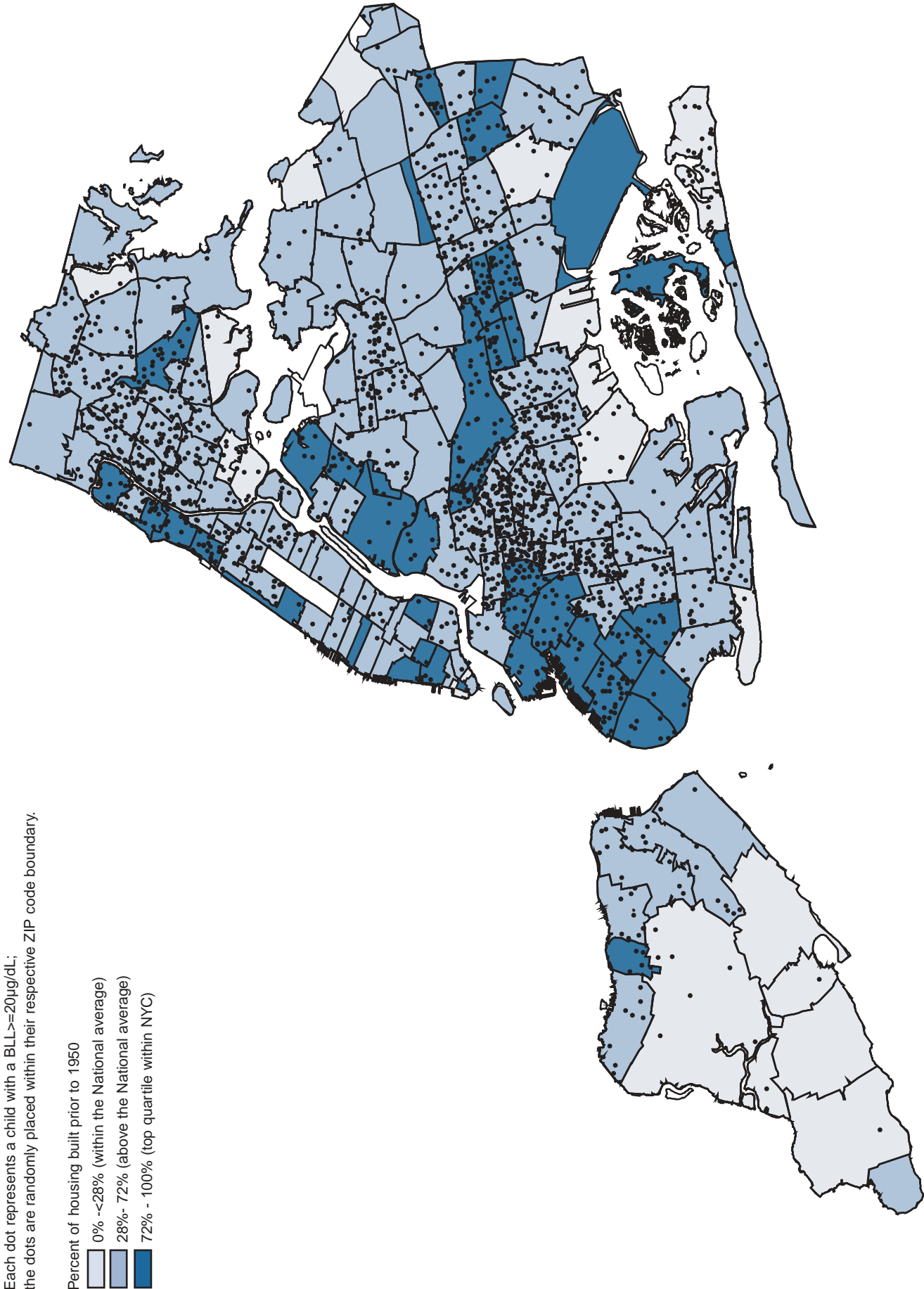
Nationwide, 27% of United States housing units were built before 1950. In NYC, 55% of housing units were built before 1950. Only 19<sup>36</sup> NYC ZIP codes had a lower percent old housing than the national average. Most of these ZIP codes were located in Queens and Staten Island (particularly in the neighborhoods of South Beach-Tottenville and Willowbrook on Staten Island). As the map suggests, few children ages 6 months to less than 6 years newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  were located in these newer housing ZIP codes.

Among children ages 6 months to less than 6 years newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$  in 2000 (“cases”), only 4% resided in ZIP codes with a concentration of old housing (prior to 1950) that were at or below the national average (0-27%). Twenty-six percent of cases resided in ZIP codes with an extremely high (72%-100%) density of old housing. (See Appendix, Table 7, and Technical Notes: Age of housing.)

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<sup>36</sup>Nineteen out of the 173 ZIP codes that had 1990 Census data.

**Figure 30.** Children (ages 6 months to less than 6 years) newly identified with blood lead levels (BLL)  $\geq 20\mu\text{g/dL}$  in 1998-2000, overlaid on the percentage of housing built prior to 1950, by ZIP Code: New York, City. [Sources: US Bureau of the Census (Census 1990) and NYC DOH LPPR]



Consistent with national data, NYC children with high blood lead levels were concentrated in areas that were poor. In ZIP codes with an above-average concentration of poor children<sup>37</sup>, there was a clustering of children with high blood lead levels. This pattern was particularly evident in parts of Brooklyn, Upper Manhattan, and the Bronx; and the pattern was less evident in Queens.

In 2000, among children ages 6 months to less than 6 years newly identified with blood lead levels  $\geq 20$   $\mu\text{g}/\text{dL}$ , 38% resided in ZIP codes with high concentrations of poor children (38%-67%) and 5% resided in ZIP codes with low concentrations of poor children (0%-<8%). (See Appendix, Technical Notes: Percent of children living in poverty.)

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<sup>37</sup>On average within each NYC ZIP code, about one-fifth (17%) of the population less than 6 years old were considered poor as recorded in Census 1990.

**Figure 31.** Children (ages 6 months to less than 6 years) newly identified with blood lead levels (BLL)  $\geq 20\mu\text{g}/\text{dL}$  in 1998-2000, overlaid on the percentage of children less than 6 years old living in households that are poor, by ZIP Code: New York, City. [Sources: US Bureau of the Census (Census 1990) and NYC DOH LPPP.]

