Table 1. Single-site studies.

Ref.	Study design	Study subjects	Exposure measure	Health outcomes studied	Reported findings
(*7*)	Geographical comparison	Love Canal census tract; comparison: New York State	Residence in Love Canal census tract	Cancer: liver, lymphomas, leukemia, other organ sites	No increased incidence
(*8*)	Cross-sectional	46 exposed residents; comparison: residents in adjacent census tract	Residence in houses where chemicals were detected	SCEs and CAs	No difference in frequency of chromosome changes
(*9*)	Cross-sectional	523 Love Canal children; 440 control children	Proximity to site; at least 5 months' residence in Love Canal area	Self-reported health problems: seizures, learning problems, hyperactivity, eye irritation, skin rashes, abdominal pain, and incontinence	Increased prevalence of all symptoms
(*10*)	Cross-sectional	428 Love Canal children; 493 control children	Born in Love Canal and more than 75% of life in Love Canal	Children's stature, weight, weight for stature	Shorter stature for Love Canal children. No difference in weight
(*11*)	Retrospective follow-up	174 births near site; 443 live births in rest of Love Canal area; all births in New York State	Residence in Love Canal area	LBW	Higher percentage of LBW in exposed area; excess in period of active dumping
(*12*)	Retrospective follow-up	239 exposed children; 707 unexposed	Residence in Love Canal area during pregnancy	LBW, birth defects	3-fold risk of LBW (homeowners only); increased risk for birth defects (homeowners and renters)
(*26*)	Retrospective follow-up	2,092 births in proximate area; 6,840 births in control area	Residence at birth in area closest to landfill	Average birth weight, LBW, preterm birth	Significantly lower average birth weight, higher proportion of LBW and prematurity during the time of heaviest pollution
(*14*)	Retrospective follow-up	25,216 births	Residence in census tract, proximate zone, and frequency of odor complaints	LBW, fetal mortality, infant mortality, prematurity	No difference over entire study period; moderate decrease in birth weight in high odor complaint zone in period of highest exposure
(*27*)	Case–control	7,977 LBW cases; 7,856 control births	Residence in areas adjacent to landfill and level of estimated exposure to landfill gas	LBW, very LBW, preterm birth, small for gestational age	Excess in LBW and small for gestational age births; no excess in very LBW or preterm birth
(*21*)	Geographical comparison	Residents of Montreal Island	Residence in areas adjacent to landfill and level of estimated exposure to landfill gas	Cancers of 17 organ sites for men; 20 organ sites for women.	Increase in incidence of stomach, liver, lung and prostate cancer for men, stomach and cervix–uteri cancer for women.
(*15*)	Cross-sectional	51 residents of exposed village incl. 11 children and 52 control persons	Residence in exposed village	SCEs	Higher frequency of SCEs in exposed population, particularly in children
(*28*)	Cross-sectional	47 children from exposed village; 45 unexposed children	Residence in exposed village and time of exposure	Chromosomal changes	Chromosome damage frequency returned to background levels after site remediation
(*29*)	Geographical comparison	Cancer deaths and birth defects compared to Pennsylvania and U.S.	Residence in counties surrounding waste site, incl. Clinton county, PA	Bladder cancer and cancers of other organ sites; birth defects	Increase in bladder cancer deaths in Clinton; increase in number of other cancers in Clinton and 3 surrounding counties; no excess in birth defects.
(*16*)	Cross-sectional	179 long-term exposed residents; 151 residents in comparison areas	Residence in area near waste site	14 self-reported diseases; 15 self-reported symptoms	Increased prevalence of skin problems and sleepiness
(*17*)	Cross-sectional	1,049 exposed; 948 unexposed residents	Residence in household close to site	36 self-reported health problems	Increased prevalence of minor respiratory symptoms (wheezing, cough, persistent cold), irregular heart beat, fatigue, bowel complaints
(*30*)	Retrospective follow-up	614 exposed households; 636 comparison households	Residence within 750 m of edge of site: long-/short-term residence	Self-reported health problems	Increased prevalence of mood disorders, narcotic symptoms, skin and respiratory disorders, eye problems, muscle weakness
(*31*)	Cross-sectional	403 exposed households; 203 comparison households	Residence in proximate area	19 self-reported diseases, 23 symptoms; mortality, cancer incidence, LBW, birth defects, spontaneous abortions	Increase in majority of self-reported diseases and symptoms. No significant association for mortality, cancer morbidity, reproductive effects
(*32*)	Cross-sectional	257 residents in exposed zones; 105 in comparison area	Distance based zones: zone 1: < 300 m zone 2: 300–1,000 m	Self-reported diseases and symptoms, miscarriages, stress levels	Increased reporting of majority of symptoms, miscarriages, stress
(*18*)	Follow-up survey	57 high-, 66 low-, 70 unexposed residents	Exposure zones based on odor zones	22 self-reported health problems	2-fold increase in 64% of reported symptoms
(*33*)	Cross-sectional	321 high-exposed persons; 351 persons with low/minimal exposure	Cumulative exposure index based on distance from sites and amount of chemicals present at sites	29 self-reported health problems	Excess in reporting of 11 of 29 symptoms: mainly neurologic symptoms

(*Continued*)

Table 1. *Continued.*

Ref.	Study design	Study subjects	Exposure measure	Health outcomes studied	Reported findings
(*34*)	Cross-sectional	456 exposed residents; 481 comparison persons	Residence near site	14 self-reported health problems	Increased reporting of 11 of 14 symptoms.
(*19*)	Retrospective follow-up	694 residents	Individual exposure index based on concentration of pollutants and daily activity of study subjects	Amount of prescribed medication for selected diseases (respiratory, ophthalmologic, dermatologic, gastrointestinal, neurologic)	No relationship between individual exposure index and drug consumption
(*20*)	Case–control	432 cases; 384 controls	Individual exposure index based on concentration of pollutants and daily activity of study subjects	Dermatologic, respiratory, eye, gastrointestinal diseases, psychologic disorders and other conditions	Relationship between exposure level and existing cases of respiratory and psychologic conditions
(*38*)	Geographical comparison	Three counties adjacent to waste dump compared to whole region	Communities near dump; distance of community to dump	Leukemia, multiple myeloma, malignant lymphoma	Excess in leukemia incidence
(*39*)	Geographical comparison	Ward surrounding landfill compared to whole region	Residence in landfill ward, surrounding wards, area downwind from landfill	All childhood cancers	No excess of childhood cancer
(*40*)	Geographical comparison	5 wards near landfill compared to 22 wards elsewhere	Wards near landfill	Mortality rates, hospital admissions for asthma, cancer, and other conditions, spontaneous abortions, birth defects, drug prescriptions	No consistent differences in mortality rates, hospital admissions, spontaneous abortions. Excess in birth defects before and after start of the landfill. Increase in prescriptions for certain medications
(*41*)	Geographical comparison	Cancer rates in 8 counties in Illinois compared to national rates	Residence in town with contaminated wells	Bladder cancer	Excess in bladder cancer in town with contaminated wells
(*44*)	Geographical comparison	Woburn cancer rates compared to national rates	Residence in Woburn	Childhood leukemia	More than 2-fold excess in childhood leukemia
(*45*)	Case–control	20 leukemia cases; 164 control children	Exposure index based on fraction of water supply in household from contaminated wells	Childhood leukemia	Significant association with exposure index
(*45*)	Retrospective follow-up	4,396 pregnancies; 5,018 children under 18	Exposure index based on fraction of water supply in household from contaminated wells	Childhood disorders; adverse pregnancy outcomes: spontaneous abortions, perinatal death, LBW, birth defects	Increase in eye/ear anomalies, CNS/chromosomal/cleft anomalies; perinatal deaths; kidney/urinary tract disorders, lung/respiratory disorders
(*46*)	Cross-sectional	28 family members of leukemia cases; 30 healthy controls	Being a family member of a Woburn leukemia case	Immunologic abnormalities, medical examination	Immunologic abnormalities in family members
(*47*)	Retrospective follow-up	Births in exposed census tracts compared to births in the entire county	Residence in census tract served by contaminated water supply	Congenital heart defects	2-fold excess in cardiac anomalies
(*48*)	Retrospective follow-up	Pregnancies in exposed census tract; pregnancies in unexposed census tract	Residence in census tract served by contaminated water supply	Spontaneous abortions, birth defects, LBW	Increase in spontaneous abortions and birth defects; no excess in LBW
(*49*)	Retrospective follow-up	Pregnancies in 2 exposed census tracts; pregnancies in 2 unexposed census tracts	Residence in 2 census tracts served by contaminated water supply	Spontaneous abortions, birth defects, LBW	No excess in spontaneous abortions or malformations in new exposed study area
(*50*)	Retrospective follow-up	Pregnancies in 2 exposed census tracts	% water in census tract from contaminated well; estimated concentration of solvents	Spontaneous abortions, birth defects	No relation between abortion or malformation rate and estimated exposure
(*51*)	Case–control	145 cases with cardiac malformations; 176 nonmalformed control births	Mother's consumption of home tap water	Congenital heart defects	Elevated risk for consumption of more than 4 glasses of tap water compared to none
(*52*)	Retrospective follow-up	349 pregnancies in 1 exposed and 1 unexposed census tract	Mother's consumption of home tap water	Spontaneous abortions, birth defects	Spontaneous abortions: significant trend with number of glasses tap water per day. Birth defects: no trend
(*53*)	Retrospective follow-up	1,016 pregnancies in exposed and unexposed areas	Mother's consumption of home tap water	Spontaneous abortions, birth defects, LBW	Spontaneous abortions: 7-fold risk for any versus no tap water. Birth defects: nonsignificant increase. No association with LBW
(*13*)	Cross-sectional and follow-up	49 exposed residents; 57 unexposed residents	Use of contaminated well water	Liver function	Abnormalities in liver function in exposed residents. Returned to normal 2 months later.
(*54*)	Cross-sectional	676 exposed residents; 778 unexposed residents	Residence in high-exposure area based on groundwater flow	Self-reported disease: cancer, liver disease, respiratory illness, skin disease, seizures	Statistically significant increase in respiratory disease and seizures, not significant after accounting for smoking
(*55*)	Cross-sectional	65 exposed residents; 66 residents from control households	Residence in households with contaminated well water	15 self-reported health symptoms; 14 self-reported diseases	Increased reporting of eye irritation, diarrhea, sleepiness.

Abbreviations: CAs, chromosomal aberrations; CNS, central nervous system; LBW, low birth weight; SCEs, sister chromatid exchanges.

Table 2. Multisite studies.

Ref	Study design	Study sties	Study subjects	Exposure measure	Health outcomes studied	Reported findings
(*56*)	Geographical comparison	593 NPL waste sites in U.S.	339 counties with waste site, more than 3,000 without	County with site	Cancer mortality	Increased rates of cancer of the lung, bladder, stomach, and rectum
(*57*)	Case–control	12 sites in New York State	339 deceased lung-cancer cases; 676 deceased controls	Residence in census tract with site; duration of residence	Lung cancer	No association
(*58*)	Case–control	38 sites with likely landfill gas migration in New York State	9,020 cancer cases; 9,169 deceased controls	Residence within 250 ft	Cancer of liver, lung, bladder, kidney and brain; non-Hodgkin lymphoma, leukemia	Excess of female bladder cancer and female leukemia
(*59*)	Case–control	300 sites in 1,072 census tracts in California	5,046 birth defects cases and 28,085 control births. 1,904,000 births for birth weight analysis	Residence in census tract with site and potential for human exposure	Birth defects, LBW	1.5-fold increase in risk of heart defects. Other malformations and birth weight not associated
(*60*)	Case–control	1,281 NPL sites in U.S.	17,407 births	Residence within 1 mile	Birth weight, birth defects, fetal deaths, infant deaths	No association between adverse pregnancy outcomes and living near a NPL site
(*61*)	Case–control	590 waste sites in New York State	9,313 live births with birth defects; 17,802 normal control births	Residence within 1 mile and hazard score of site	Birth defects	Increased risk for all malformations (12%), integument system, nervous system, musculoskeletal. Indications for dose–response relation with exposure risk
(*62*)	Case–control	643 waste sites in New York State	473 cases with central nervous system defects; 3,305 musculoskeletal cases; 12,436 control births	Ratings of exposure probability within 1 mile of each site	Central nervous system defects and musculo-skeletal defects	No association between two types of and proximity to waste sites
(*64*)	Case–control	317 waste sites in New York State	259 cases of end-stage renal disease and 259 controls	Residence within 1 mile, exposure probability; years of residence within 1 mile	End-stage renal disease	Nonstatistically significant increase in risk of renal disease for ever living within 1 mile, having lived within 1 mile for more than 12 years, and a medium/high probability of exposure
(*65*)	Case–control	105 NPL and 659 non-NPL sites in California	507 neural tube defects, 517 controls; 210 heart defects, 439 oral clefts, and 455 controls	Census tracts: no site, non-NPL site, NPL site; residence within 1 mile and residence within 1/4 mile	Birth defects: neural tube defects, heart defects, and oral clefts	No increased risks relating to residence in census tract with site. Small, nonsignificant increase in risk of NTD and heart defects for living within 1/4 mile
(*66*)	Case–control	21 sites in 5 European countries	1,089 cases with non-chromosomal birth defects; 2,366 control births	Residence within 3 km	Birth defects	Increased risk for all malformations (33%), NTD, cardiac defects

NTD, neural tube defect.