

**INTOXICATION DEATHS ASSOCIATED WITH
DRUGS OF ABUSE OR ALCOHOL
BALTIMORE, MARYLAND**

**QUARTERLY REPORT: FOURTH QUARTER, 2008
AND 2008 SUMMARY**



A report from the
Office of Epidemiology and Planning
Baltimore City Health Department

July 1, 2009

GOAL

To monitor intoxication deaths associated with substance use in Baltimore.

HIGHLIGHTS

- **Intoxication deaths associated with drugs of abuse or alcohol increased in the fourth quarter of 2008 compared to the third quarter of the same year but remained substantially lower than the fourth quarter of 2007.** During the fourth quarter of 2008, the Maryland Office of the Chief Medical Examiner recorded 38 intoxication deaths associated with drugs of abuse or alcohol among Baltimore City residents, and 41 deaths resulting from drug of abuse- or alcohol-associated intoxications that occurred in Baltimore City regardless of residence. The comparable numbers for the third quarter of 2008 were 33 and 39 deaths, and for the fourth quarter of 2007, 67 and 79.
- **Considering the year as a whole, intoxication deaths associated with drugs of abuse or alcohol were more than a third lower in 2008 than in 2007.** There were 152 deaths among residents in 2008, compared to 236 in 2007; and there were 176 deaths resulting from intoxications occurring in Baltimore regardless of residence, compared to 281 in 2007. These numbers are the lowest since 1995, the earliest year for which data are available.
- **Deaths associated with all substances decreased in 2008 compared to 2007.** Decreases were most pronounced for cocaine-associated deaths, which decreased by 48% and for heroin-associated and methadone-associated deaths, which both decreased by approximately 40%. Alcohol-associated deaths decreased the least (by 20%). The decrease in methadone-associated deaths was the first since those deaths began increasing in 2000.

METHODOLOGY

The methodology used was identical to that used in our previous reports (http://baltimorehealth.org/info/2008_01_24.IntoxicationDeaths.pdf). Briefly, we used records from the Maryland Office of the Chief Medical Examiner (OCME). The OCME reviews all deaths in Maryland caused by violence, suicide, or injury; sudden deaths in apparently healthy individuals; and deaths that are suspicious or unusual. The OCME determines cause of death based on information from the death scene, police records, medical records, autopsy results, and toxicological results. Intoxication deaths were deaths where the OCME-determined cause of death included the word “intoxication” and the manner of death was categorized by the OCME as accidental or undetermined.

Based on recommendations from the OCME, we classified an intoxication death as being associated with a given *drug of abuse* if either of two criteria were met: (1) the drug was mentioned in the OCME-determined cause of death, or (2) the OCME-determined cause of death used non-specific terms such as “drug intoxication” or “narcotic intoxication” and the toxicological analysis indicated the presence of the drug. Drugs of abuse considered in this analysis include opioids (eg. heroin, methadone, fentanyl), cocaine,

benzodiazepines, and amphetamines among others. For a complete list, please refer to our previous report.

Alcohol-associated intoxication deaths were defined as deaths where “alcohol” or “ethanol” was mentioned in the OCME-determined cause of death, regardless of what was in the toxicological results. Substance-specific categories were not mutually exclusive: a death identified as associated with a given substance could have been associated with other substances as well.

Data presented here were obtained from the OCME on April 1, 2009. We present data for deaths that occurred between October 1, 2008 and December 31, 2008 as well as for the entire 2008 year and compare trends across years. While the quasi-totality of deaths occurring in each of the four quarters of 2008 will have been recorded by the OCME by April 1, 2009, it is possible that a few deaths that occurred in that period may be recorded subsequent to that date. Those deaths will be included in future quarterly reports based on updated data obtained from the OCME.

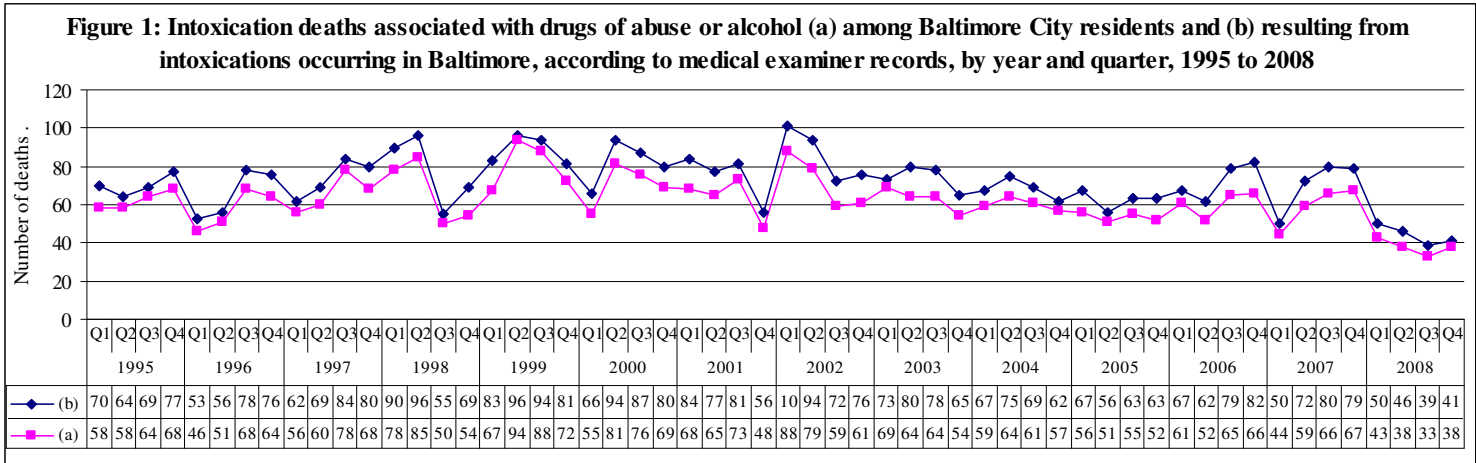
As in our previous report, we present results both for deaths among Baltimore City residents and for deaths resulting from intoxications that occurred in Baltimore regardless of residence.

Further details about our methodology can be found at http://baltimorehealth.org/info/2008_01_24.IntoxicationDeaths.pdf.

RESULTS

❖ *Deaths associated with drugs of abuse or alcohol*

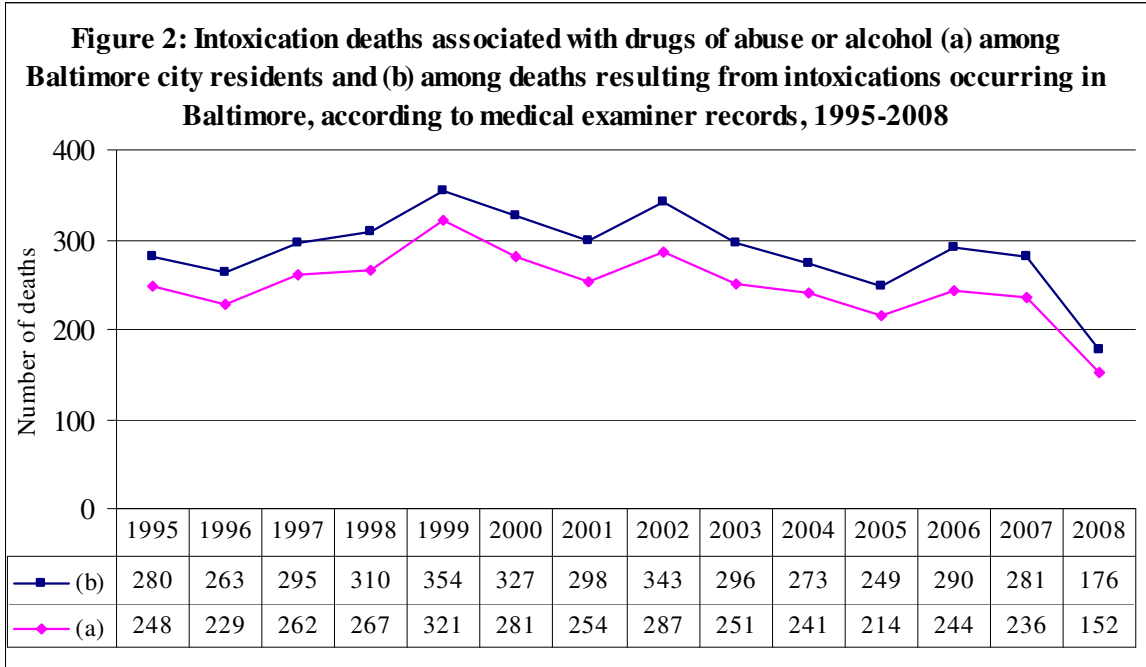
Figure 1 displays deaths among residents and resulting from intoxications in Baltimore by quarter from 1995 to 2008.



As of April 1, 2009, 38 intoxication deaths associated with drugs of abuse or alcohol had been recorded among Baltimore City residents during the fourth quarter of 2008. This represents five more deaths compared to the third quarter of 2008 and 29 fewer deaths compared to the fourth quarter of 2007. Considering deaths resulting from intoxications occurring in Baltimore regardless of residence, the OCME recorded 41 such deaths for

the fourth quarter of 2008. This is two more than in the third quarter of 2008 and 38 fewer than the fourth quarter of 2007.

Overall, between January 1st 2008 and December 31st 2008, the OCME recorded 152 drug of abuse- or alcohol-associated deaths among residents and 176 deaths resulting from drug of abuse- or alcohol-associated intoxications occurring in Baltimore City regardless of residence (Figure 2). This represents an 84 death (36%) drop in resident deaths compared to 2007 and a 105 death (37%) drop in deaths resulting from Baltimore intoxications.



❖ *Substances associated with drug of abuse- and alcohol-associated intoxication deaths*
 As in previous years, the quasi-totality of intoxication deaths during 2008 involved at least one drug of abuse, with heroin being the most common drug of abuse associated with these deaths, accounting for 59% of resident deaths and 60% of deaths resulting from intoxications occurring in Baltimore regardless of residence (Table 1). Deaths associated with multiple substances remained prevalent.

Deaths associated with all common substances of abuse decreased in 2008 compared to 2007 (Table 1 and Figures 3 and 4). Among the most common substances of abuse (heroin, cocaine, methadone and alcohol), cocaine-associated deaths decreased the most (by 48%). Heroin-associated and methadone-associated deaths decreased by approximately 40%. Alcohol-associated deaths decreased the least (by 20%).

Compared to 2007, the proportion of deaths associated with heroin decreased slightly in 2008 (by 8-9%), while the proportion of deaths associated with cocaine decreased by 16-21%. In contrast, the proportion of deaths associated with alcohol increased by 20-24%. The proportions of deaths associated with other substances remained relatively flat between 2007 and 2008.

No buprenorphine-associated deaths were observed during 2008, compared to one such death in 2007. However, it is important to note that samples are not routinely tested for buprenorphine, but instead are only tested when it is deemed indicated by the OCME.

Table 1: Number and percentage of intoxication deaths associated with drugs of abuse or alcohol according to medical examiner records, by substance(s) involved, comparing 2007 to 2008

Intoxication death involves: ¹	Baltimore City resident deaths				Deaths resulting from intoxications in Baltimore City			
	2007		2008		2007		2008	
	#	%	#	%	#	%	#	%
Alcohol or at least one drug of abuse	236	100%	152	100%	281	100%	176	100%
At least one drug of abuse	231	98%	147	97%	271	96%	171	97%
Opioids	214	91%	134	88%	253	90%	155	88%
Opioids and cocaine	73	31%	33	22%	88	31%	39	22%
Opioids and alcohol	36	15%	27	18%	43	15%	33	19%
Opioids without other drugs of abuse or alcohol	114	48%	80	53%	131	47%	89	51%
Heroin	150	64%	90	59%	185	66%	106	60%
Heroin and cocaine	57	24%	27	18%	71	25%	31	18%
Heroin and alcohol	27	11%	19	13%	34	12%	22	13%
Heroin without other drugs of abuse or alcohol	60	25%	38	25%	72	26%	45	26%
Methadone	76	32%	46	30%	85	30%	51	29%
Methadone and heroin	20	8%	9	6%	25	9%	12	7%
Methadone and cocaine	18	8%	4	3%	21	7%	7	4%
Methadone and alcohol	7	3%	7	5%	8	3%	8	5%
Methadone without other drugs of abuse or alcohol	36	15%	26	17%	38	14%	25	14%
Buprenorphine ²	1	0%	0	0%	1	0%	0	0%
Fentanyl	3	1%	3	2%	3	1%	2	1%
Codeine, Oxycodone or Hydrocodone	9	4%	8	5%	10	4%	8	5%
Cocaine	89	38%	46	30%	105	37%	55	31%
Cocaine and alcohol	11	5%	11	7%	13	5%	12	7%
Cocaine without other drugs of abuse or alcohol	15	6%	10	7%	16	6%	12	7%
Benzodiazepines	5	2%	2	1%	7	2%	2	1%
Alcohol	43	18%	35	23%	55	20%	42	24%
Alcohol without other drugs of abuse	5	2%	5	3%	10	4%	5	3%

¹ Except where noted, involvement of one substance does not preclude the possibility that other substances are involved as well.

² In contrast with the other substances in this table, samples are not routinely tested for buprenorphine, only when it is deemed indicated by the OCME.

Figures 3 and 4 present the number of deaths associated with specific substances for each year from 1995 to 2008 among resident deaths (Figure 3) and among deaths resulting from intoxications in Baltimore regardless of residence (Figure 4). These graphs show that deaths associated with all substances studied decreased in 2008 compared to the previous year, but that deaths associated with alcohol decreased the least. These graphs

also show that the decrease in methadone-associated deaths represents the first decrease observed since those deaths began increasing in frequency in the year 2000.

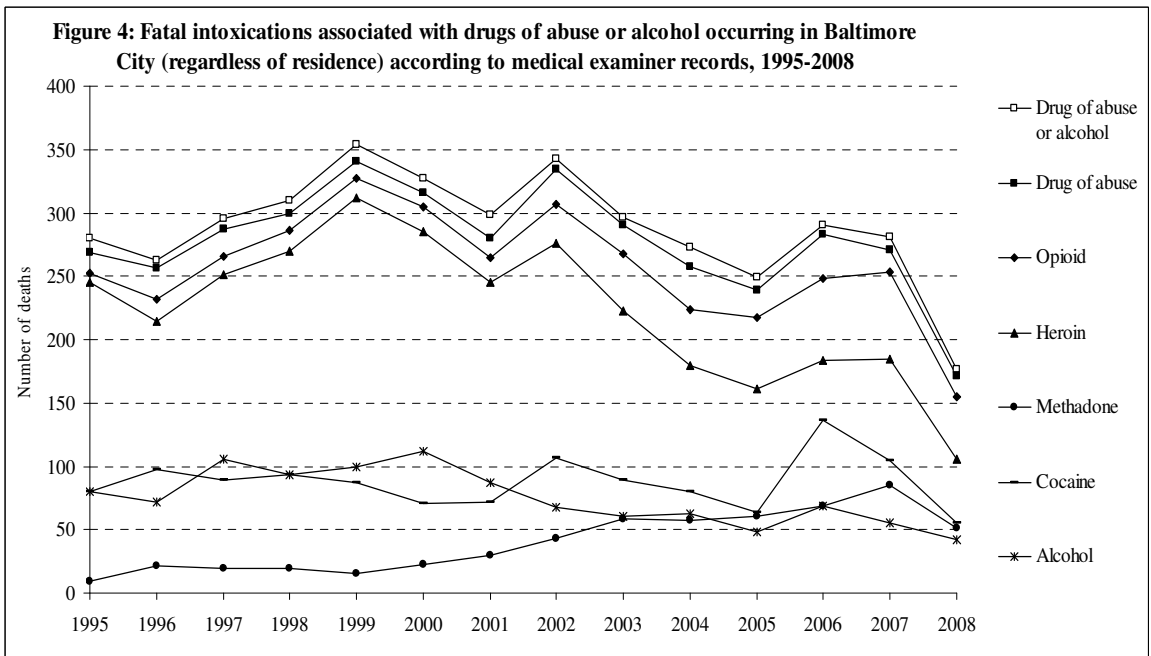
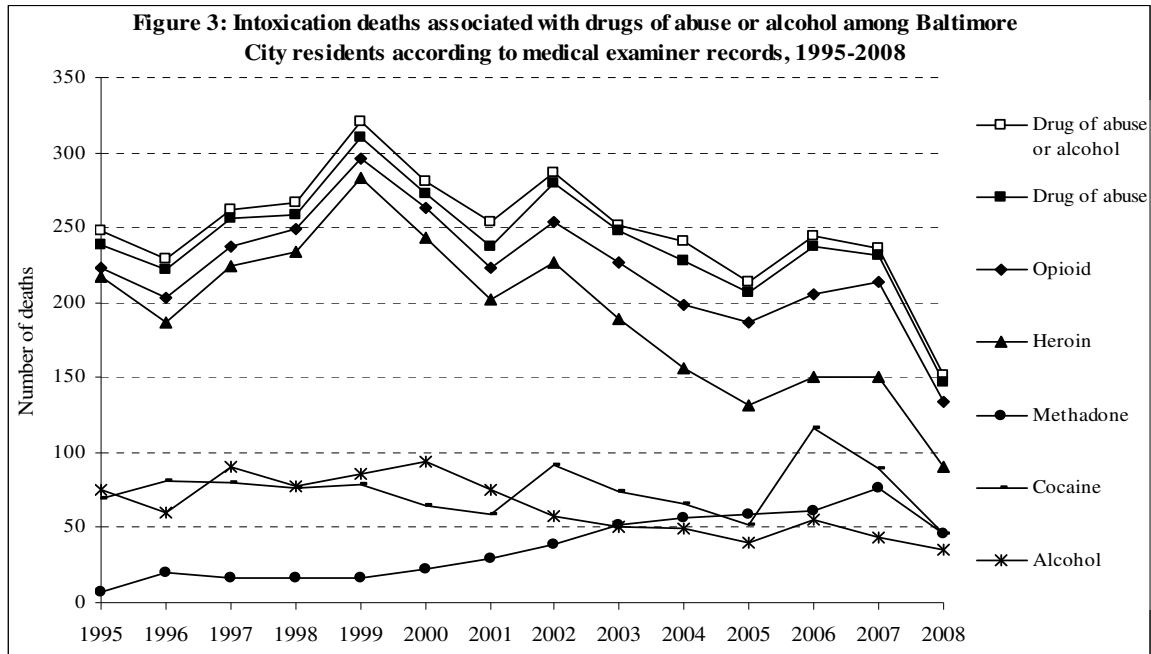


Figure 5 shows *rates*¹ of death due to drug of abuse- or alcohol-associated intoxication among Baltimore city residents from 1995 to 2008. Rates present the number of deaths per 10,000 city residents. The fact that the trends in the rates are identical to the trends in

¹ Population denominators for rates were intercensal population estimates for 1995-1999, Census 2000 for 2000, and Baltimore city's challenges to the postcensal estimates for 2001-2007. The 2007 challenge estimate was used for the 2008 denominator. Rates were not age adjusted, as age information was not available prior to 2003. However, crude rates were nearly identical to age-adjusted rates for 2003-2008.

the number of deaths (Figure 3) means that the observed trends in the number of deaths are not due simply to changes in the size of the city population.

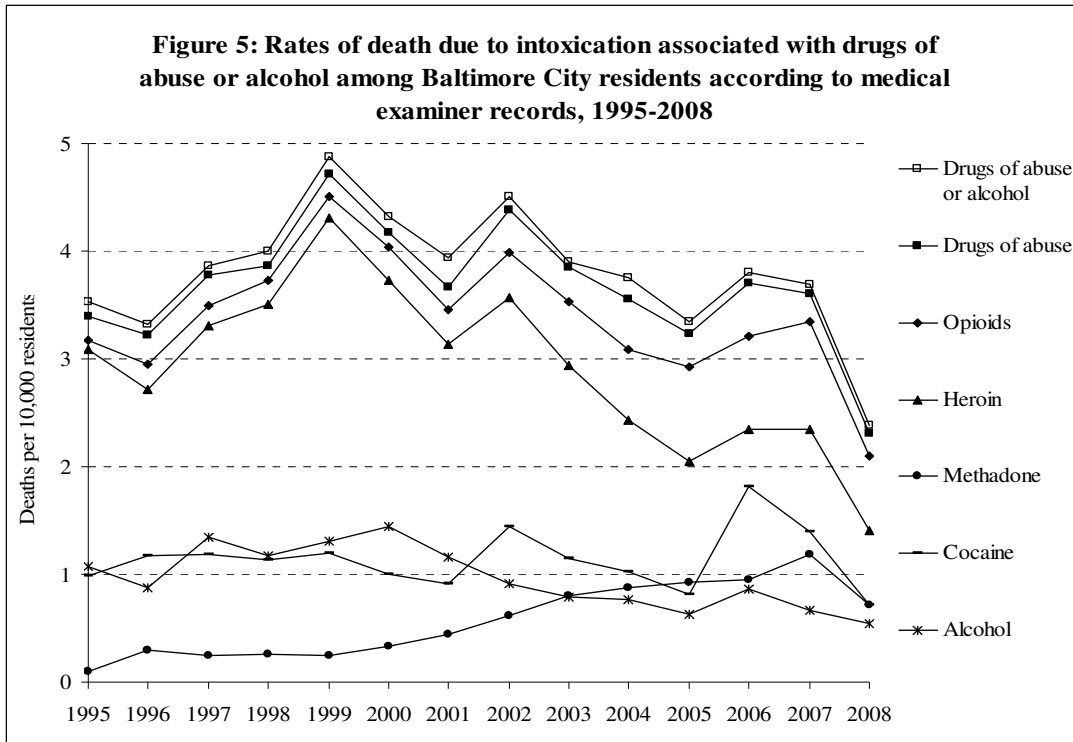
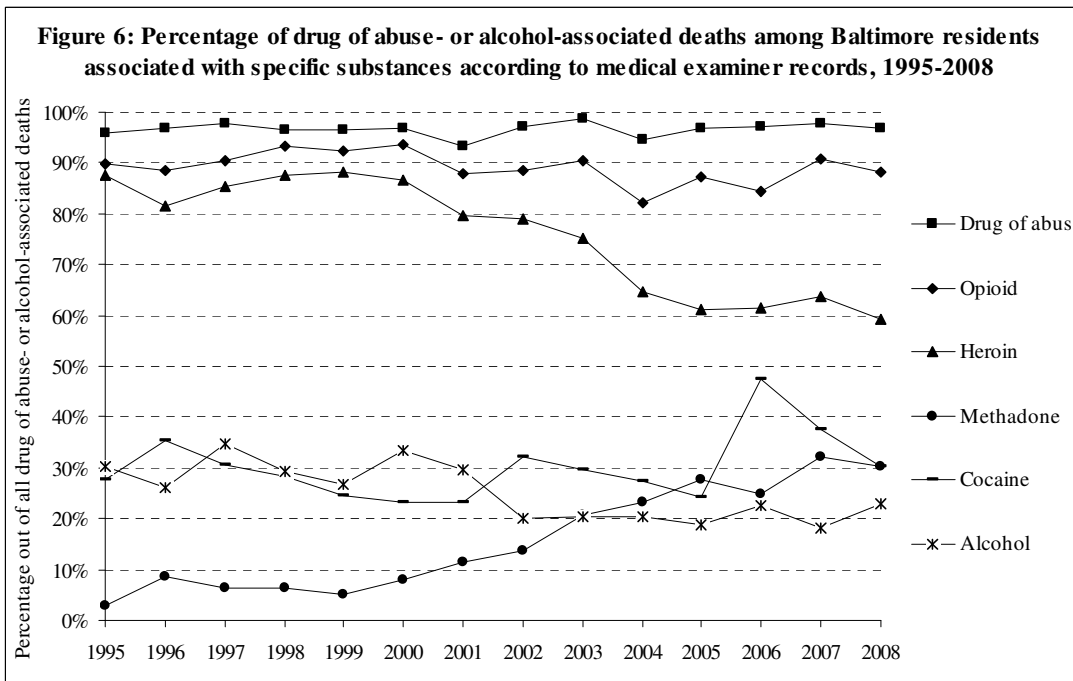


Figure 6 displays the *percentage* of intoxications deaths among city residents associated with specific substances. Figure 6 shows that the percent of intoxication deaths associated with heroin decreased substantially between 2000 and 2004, going from nearly 90% of deaths to slightly over 60%. That percentage has held steady since 2004. In contrast, methadone deaths have increased as a percentage of intoxication deaths regularly since 1999, going from less than 10% in 1999 to over 30% in 2008.



❖ *Demographic characteristics of victims*

As in 2007, victims of fatal drug of abuse- or alcohol-associated intoxications in 2008 were predominantly male, African American and were on average in their mid-forties (Table 2). In 2008, there was one death in a minor, compared to none in 2007.² The death was associated with methadone and occurred in a two year old.

Table 2: Sex, race, and age of victims of fatal intoxications associated with drugs of abuse or alcohol according to medical examiner records, 2007 and 2008

	Baltimore City resident deaths		Deaths resulting from intoxications in Baltimore City	
	2007	2008	2007	2008
	%	%	%	%
Sex				
% Male	67%	67%	71%	69%
Race				
% African American	66.5%	64%	61%	59%
% White	33.5%	36%	39%	40%
Age				
Mean (SD)	45.7 (8.7)	45.3 (11.3)	44.9 (9.3)	44.8 (11)
Min-Max	18.3-76.7	1.9-74.2	17.8-76.7	1.9-74.2

❖ *Geographic distribution of deaths*

Figure 7 (next page) shows that, in 2008, intoxication deaths associated with drugs of abuse or alcohol among Baltimore residents clustered in zip codes 21201, 21202, 21223, 21216, 21217, and 21211 in the downtown and western side of the city, zip code 21224 on the eastern side, and zip codes 21225 and 21226 in the south of the city. Rates of death are highest in zip code 21226, although this may partly be due to unstable rates because the population in that zip code is small (<4000).

CONCLUSIONS

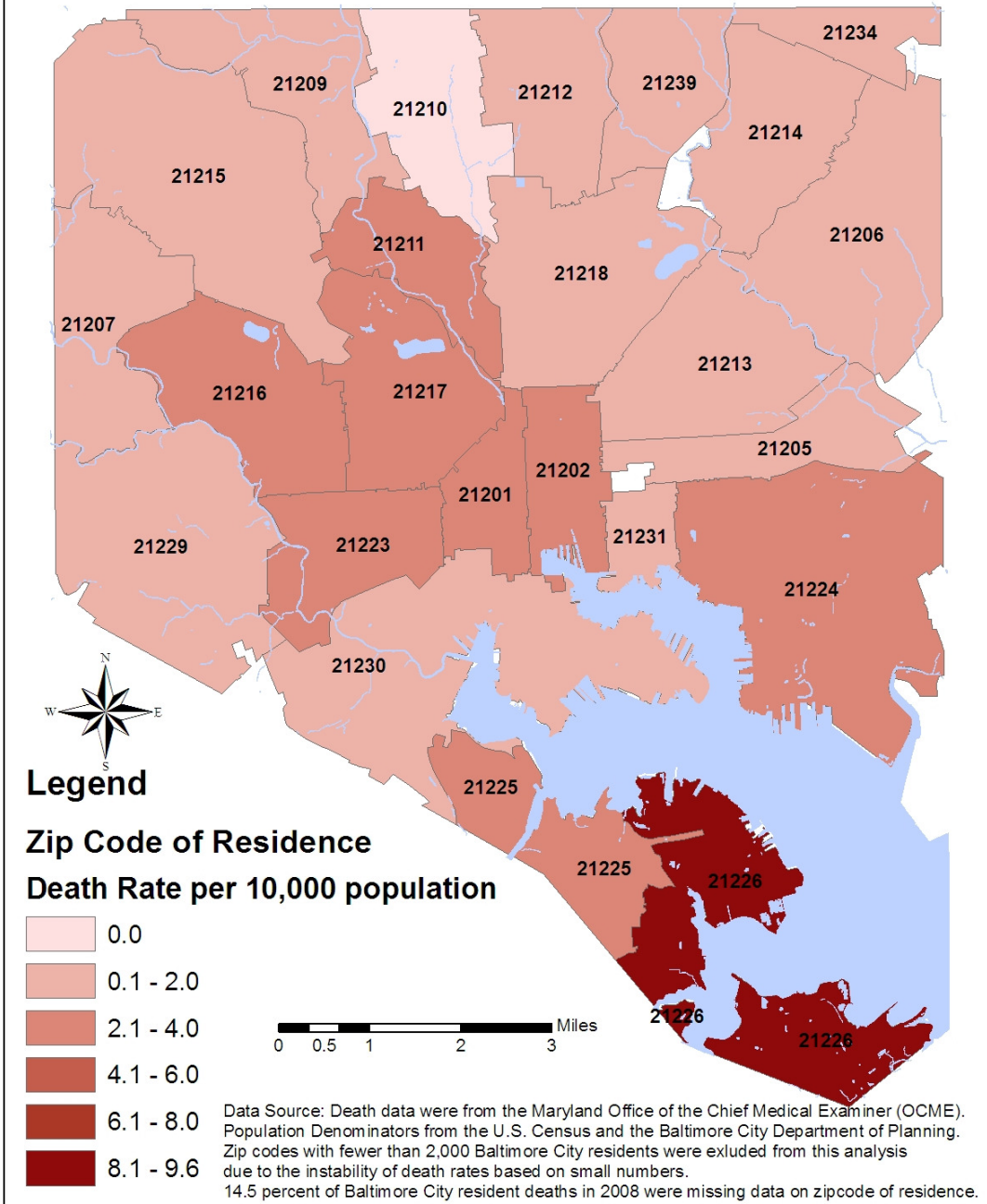
Despite a slight increase in deaths in the fourth quarter of 2008 compared to the third quarter, intoxication deaths associated with drugs of abuse or alcohol were more than a third lower in 2008 than 2007, resulting in the lowest number of deaths since 1995, the earliest year for which data are available.

Deaths associated with all substances decreased. Decreases were most pronounced for cocaine-associated, heroin-associated and methadone-associated deaths. Alcohol-associated deaths decreased the least. Of note, the decrease in methadone-associated deaths was the first decrease seen since those deaths began increasing in the year 2000.

² The highly publicized death of 2-year old Bryanna Harris in 2007 was ruled a homicide and was therefore not included in these counts since this analysis focuses only on deaths that are accidental or of undetermined manner.

Figure 7

Rate of Intoxication Deaths Associated with Drugs of Abuse or Alcohol among Baltimore City Residents, by Zip Code of Residence, 2008



APPENDIX 1: DATA TABLES

Table A1: Number of drug of abuse- or alcohol-associated intoxication deaths among Baltimore City residents

Intoxication death involves¹	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Alcohol or at least one drug of abuse	248	229	262	267	321	281	254	287	251	241	214	244	236	152
At least one drug of abuse	238	222	256	258	310	272	237	279	248	228	207	237	231	147
Opioids	223	203	237	249	296	263	223	254	227	198	187	206	214	134
Opioids and cocaine	57	62	64	68	65	56	46	67	56	38	32	86	73	33
Opioids and alcohol	59	50	81	66	75	83	57	49	44	32	33	39	36	27
Opioids without other drugs of abuse or alcohol	120	104	114	131	165	138	130	148	138	133	121	93	114	80
Heroin	217	187	224	234	283	243	202	227	189	156	131	150	150	90
Heroin and cocaine	57	59	63	64	60	50	44	63	51	32	24	67	57	27
Heroin and alcohol	56	47	79	64	75	80	55	48	37	27	26	31	27	19
Heroin without other drugs of abuse or alcohol	111	87	99	120	150	120	104	111	96	86	67	53	60	38
Methadone	7	20	17	17	16	22	29	39	52	56	59	61	76	46
Methadone and heroin	5	9	8	11	10	10	15	18	22	21	16	20	20	9
Methadone and cocaine	0	1	3	7	3	6	3	6	9	10	6	27	18	4
Methadone and alcohol	2	3	2	2	0	4	4	1	5	8	4	3	7	7
Methadone without other drugs of abuse or alcohol	0	8	7	4	4	6	12	18	23	23	28	19	36	26
Buprenorphine ²									0	0	0	0	1	0
Fentanyl	0	0	0	0	1	1	0	1	3	2	3	10	3	3
Codeine, Oxycodone or Hydrocodone	1	1	3	4	2	5	5	2	5	2	11	8	9	8
Cocaine	69	81	80	76	79	65	59	92	74	66	52	116	89	46
Cocaine and alcohol	18	18	25	21	11	16	13	11	14	8	3	22	11	11
Cocaine without other drugs of abuse or alcohol	8	16	13	5	14	7	12	24	16	25	20	22	15	10
Benzodiazepines	2	3	2	4	1	2	3	0	2	1	2	2	5	2
Alcohol	75	60	91	78	86	94	75	58	51	49	40	55	43	35
Alcohol without other drugs of abuse	10	7	6	9	11	9	17	8	3	13	7	7	5	5

¹ Except where noted, involvement of one substance does not preclude the possibility that other substances are involved as well.

² In contrast with the other substances in this table, samples are not routinely tested for buprenorphine, only when it is deemed indicated by the OCME.

Table A2: Number of deaths resulting from intoxications occurring in Baltimore City regardless of residence

Intoxication death involves¹	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Alcohol or at least one drug of abuse	280	263	295	310	354	327	298	343	296	273	249	290	281	176
At least one drug of abuse	269	256	287	299	341	316	280	334	290	257	239	283	271	171
Opioids	252	232	266	286	327	305	265	307	268	224	217	248	253	155
Opioids and cocaine	66	75	71	81	73	60	59	81	69	49	42	102	88	39
Opioids and alcohol	63	61	93	79	86	99	68	58	52	43	37	52	43	33
Opioids without other drugs of abuse or alcohol	136	112	126	149	183	159	152	179	161	140	138	110	131	89
Heroin	245	214	251	270	312	285	245	276	223	179	161	184	185	106
Heroin and cocaine	66	71	70	76	68	54	58	77	63	42	34	81	71	31
Heroin and alcohol	60	57	90	77	86	96	66	57	46	36	30	42	34	22
Heroin without other drugs of abuse or alcohol	125	95	110	137	165	141	125	136	111	94	83	62	72	45
Methadone	9	22	19	20	15	23	30	43	58	57	61	69	85	51
Methadone and heroin	6	9	9	12	10	11	16	20	23	23	17	22	25	12
Methadone and cocaine	0	2	4	8	3	6	3	5	9	13	6	29	21	7
Methadone and alcohol	2	4	3	2	0	4	4	2	5	8	4	3	8	8
Methadone without other drugs of abuse or alcohol	1	8	7	5	4	6	11	20	28	21	28	23	38	25
Buprenorphine ²									0	0	0	0	1	0
Fentanyl	0	0	0	0	1	1	0	1	3	2	3	12	3	2
Codeine, Oxycodone or Hydrocodone	1	2	3	4	2	5	6	3	6	4	12	12	10	8
Cocaine	80	97	89	93	87	71	72	107	89	80	64	136	105	55
Cocaine and alcohol	19	23	28	28	16	17	18	12	17	12	5	27	13	12
Cocaine without other drugs of abuse or alcohol	9	19	14	9	14	9	12	25	18	28	21	25	16	12
Benzodiazepines	2	7	2	5	0	4	3	1	1	2	2	2	7	2
Alcohol	80	72	106	93	99	112	87	68	61	63	48	69	55	42
Alcohol without other drugs of abuse	11	7	8	11	13	11	18	9	6	16	10	7	10	5

¹ Except where noted, involvement of one substance does not preclude the possibility that other substances are involved as well.

² In contrast with the other substances in this table, samples are not routinely tested for buprenorphine, only when it is deemed indicated by the OCME.

Table A3: Rates¹ of drug of abuse- or alcohol-associated intoxication deaths among Baltimore City residents (deaths/10,000)

Intoxication death involves²	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Alcohol or at least one drug of abuse	3.53	3.33	3.87	4.00	4.88	4.32	3.94	4.51	3.90	3.75	3.34	3.81	3.69	2.38
At least one drug of abuse	3.39	3.22	3.78	3.87	4.72	4.18	3.67	4.38	3.86	3.55	3.23	3.70	3.61	2.31
Opioids	3.18	2.95	3.50	3.73	4.50	4.04	3.46	3.99	3.53	3.08	2.92	3.21	3.34	2.10
Heroin	3.09	2.72	3.31	3.51	4.30	3.73	3.13	3.57	2.94	2.43	2.05	2.34	2.34	1.41
Methadone	0.10	0.29	0.25	0.25	0.24	0.34	0.45	0.61	0.81	0.87	0.92	0.95	1.19	0.72
Cocaine	0.98	1.18	1.18	1.14	1.20	1.00	0.91	1.44	1.15	1.03	0.81	1.81	1.39	0.72
Alcohol	1.07	0.87	1.34	1.17	1.31	1.44	1.16	0.91	0.79	0.76	0.62	0.86	0.67	0.55

¹ Population denominators for rates were intercensal population estimates for 1995-1999, Census 2000 for 2000, and Baltimore city's challenges to the postcensal estimates for 2001-2007. The 2007 challenge estimate was used for the 2008 denominator. Rates were not age adjusted, as age information was not available prior to 2003. However, crude rates were nearly identical to age-adjusted rates for 2003-2008.

² Involvement of one substance does not preclude the possibility that other substances are involved as well.

Table A4: Percent of drug of abuse- or alcohol-associated intoxication deaths among Baltimore City residents by substance

Intoxication death involves¹	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Alcohol or at least one drug of abuse	100	100	100	100	100	100	100	100	100	100	100	100	100	100
At least one drug of abuse	96	97	98	97	97	97	93	97	99	95	97	97	98	97
Opioids	90	89	90	93	92	94	88	89	90	82	87	84	91	88
Heroin	88	82	85	88	88	86	80	79	75	65	61	61	64	59
Methadone	3	9	6	6	5	8	11	14	21	23	28	25	32	30
Cocaine	28	35	31	28	25	23	23	32	29	27	24	48	38	30
Alcohol	30	26	35	29	27	33	30	20	20	20	19	23	18	23

¹ Involvement of one substance does not preclude the possibility that other substances are involved as well.

Table A5: Percent of deaths resulting from intoxications occurring in Baltimore City regardless of residence by substance

Intoxication death involves¹	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Alcohol or at least one drug of abuse	100	100	100	100	100	100	100	100	100	100	100	100	100	100
At least one drug of abuse	96	97	97	96	96	97	94	97	98	94	96	98	96	97
Opioids	90	88	90	92	92	93	89	90	91	82	87	86	90	88
Heroin	88	81	85	87	88	87	82	80	75	66	65	63	66	60
Methadone	3	8	6	6	4	7	10	13	20	21	24	24	30	29
Cocaine	29	37	30	30	25	22	24	31	30	29	26	47	37	31
Alcohol	29	27	36	30	28	34	29	20	21	23	19	24	20	24

¹ Involvement of one substance does not preclude the possibility that other substances are involved as well.

APPENDIX 2: LIST OF DRUGS IDENTIFIED IN MEDICAL EXAMINER RECORDS OF BALTIMORE CITY INTOXICATION DEATHS, JANUARY 1995-DECEMBER 2008

Drugs of Abuse

(* indicates drugs of abuse that are included in the medical examiner's routine toxicological analysis)

<u>Opioids</u>	<u>Non-opioids</u>	
Buprenorphine	Alprazolam*	Methylenedioxyamphetamine (MDA)*
Codeine*	Amobarbital*	Methylenedioxyamphetamine (MDMA)*
Fentanyl*	Amphetamine*	Meprobamate*
Heroin (and metabolite 6-monoacetylmorphine*)	Butalbital*	Midazolam
Hydrocodone*	Chloral hydrate (metabolized to trichloroethanol)	Nordiazepam*
Hydromorphone	Chlordiazepoxide*	Pentobarbital*
Meperidine*	Clonazepam	Pentothal
Methadone*	Cocaine* (and metabolite benzoylecgonine*)	Phencyclidine (PCP)*
Morphine*	Dextromethorphan*	Phenobarbital*
Oxycodone*	Diazepam*	Phentermine*
Pentazocine*	Ethanol*	Secobarbital*
Propoxyphene*	Flurazepam*	Sodium Thiopental/Sodium
Tramadol*	Ketamine*	Triazolam
	Lorazepam	Zopiclone
	Methamphetamine*	Zolpidem*

Not Drugs of Abuse

Acetaminophen	Hydrochlorothiazide	Procaine
Amitriptyline	Hydroxyzine	Promethazine
Amoxapine	Imipramine	Propanol
Atenolol	Isopropanol	Propofol
Atropine	Isopropyl alcohol	Propranolol
Bupropion	Lamotrigine	Pseudoephedrine
Carbamazepine	Lidocaine	Quetiapine
Carbon monoxide (CO)	Lithium	Quinine
Cardizem	Methane	Rocuronium Bromide
Carisoprodol	Methanol	Salicylic acid
Chlorodifluoromethane	Metoclopramide	Salicylate
Chlorpheniramine	Metoprolol	Sertraline
Citalopram	Mirtazapine	Sodium Penthanol
Cyclobenzaprine	Nifedipine	Theophylline
Cyproheptadine	Norfluoxetine	Thioridazine
Desipramine	Nortriptyline	Toluene
Desmethylvenlafaxine	Olanzapine	Topiramate
Diltiazem	Pancuronium Bromide (Pavulon)	Trazodone
Diphenhydramine	Paroxetine	Tricyclate
Doxepin	Perphenazine	Trimethoprim
Doxylamine	Pheniramine	Tricycline
Duloxetine	Phenytoin	Venlafaxine
Ethylene Glycol	Potassium chloride	Verapamil
Fluoxetine	Primidone	
Gasoline		