

Biomonitoring

Phthalates

Table B9: Phthalate metabolites in women ages 16 to 49 years: Median concentrations in urine, 1999-2014

	Median concentration of phthalate metabolites in urine ($\mu\text{g}/\text{L}$)							
	1999- 2000	2001- 2002	2003- 2004	2005- 2006	2007- 2008	2009- 2010	2011- 2012	2013- 2014
DEHP metabolites	Ø	41.9	44.5	40.6	50.6	22.5	13.6	13.7
DBP metabolites¹	32.6	26.7	32.1	32.2	36.3	30.2	16.4	20.0
BBzP metabolite	13.8	13.6	12.3	9.9	12.4	7.3	4.7	5.5

DATA: Centers for Disease Control and Prevention, National Center for Health Statistics and National Center for Environmental Health, National Health and Nutrition Examination Survey

NOTES:

- DEHP = di-2-ethylhexyl phthalate, DBP = dibutyl phthalate (di-n-butyl phthalate and di-isobutyl phthalate), and BBzP = butyl benzyl phthalate.
- Values below the limit of detection are assumed equal to the limit of detection divided by the square root of 2.
- To reflect exposures to women who are pregnant or may become pregnant, the estimates are adjusted for the probability (by age and race/ethnicity) that a woman gives birth. The intent of this adjustment is to approximate the distribution of exposure to pregnant women. Results will therefore differ from a characterization of exposure to adult women without consideration of birth rates.

Ø The estimate is not reported because the DEHP metabolites MEOHP and MEHHP were not measured in 1999-2000.

Table B9a: Phthalate metabolites in women ages 16 to 49 years: 95th percentile concentrations in urine, 1999-2014

	95 th percentile concentration of phthalate metabolites in urine ($\mu\text{g}/\text{L}$)							
	1999- 2000	2001- 2002	2003- 2004	2005- 2006	2007- 2008	2009- 2010	2011- 2012	2013- 2014
DEHP metabolites	Ø	577.9*	462.2	521.3*	567.2	118.5*	87.2	56.9
DBP metabolites¹	NA**	128.2	139.6	144.9	160.2	127.8	101.8	99.7
BBzP metabolite	73.9	99.7	67.8	67.5	70.5	43.2	41.4	43.4

DATA: Centers for Disease Control and Prevention, National Center for Health Statistics and National Center for Environmental Health, National Health and Nutrition Examination Survey

NOTES:

¹ The primary urinary metabolites of DBP (di-n-butyl phthalate and di-isobutyl phthalate) are mono-n-butyl phthalate (MnBP) and mono-isobutyl phthalate (MiBP). The urinary levels of MnBP and MiBP were measured together for the NHANES 1999–2000 survey cycle, but for the following years were measured separately. Indicators B9 and B10 present the combined urinary levels of MnBP and MiBP for each survey cycle.

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- DEHP = di-2-ethylhexyl phthalate, DBP = dibutyl phthalate (di-n-butyl phthalate and di-isobutyl phthalate), and BBzP = butyl benzyl phthalate.
- Values below the limit of detection are assumed equal to the limit of detection divided by the square root of 2.
- To reflect exposures to women who are pregnant or may become pregnant, the estimates are adjusted for the probability (by age and race/ethnicity) that a woman gives birth. The intent of this adjustment is to approximate the distribution of exposure to pregnant women. Results will therefore differ from a characterization of exposure to adult women without consideration of birth rates.
- Phthalates do not accumulate in bodily tissues; thus, the distribution of NHANES urinary phthalate metabolite levels may overestimate high-end exposures as a result of collecting one-time urine samples rather than collecting urine for a longer time period.⁵⁻⁷

*The estimate should be interpreted with caution because the standard error of the estimate is relatively large: the relative standard error, RSE, is at least 30% but is less than 40% (RSE = standard error divided by the estimate), or the RSE may be underestimated.

** Not available. The estimate is not reported because it has large uncertainty: the relative standard error, RSE, is 40% or greater (RSE = standard error divided by the estimate), or the RSE cannot be reliably estimated.

Ø The estimate is not reported because the DEHP metabolites MEOHP and MEHHP were not measured in 1999-2000.

Table B9b. Phthalate metabolites in women ages 16 to 49 years: Median concentrations in urine by race/ethnicity and family income, 2011-2014

	Race / Ethnicity	Median concentration of phthalate metabolites in urine ($\mu\text{g/L}$)		
		All Incomes‡ (n=1,135)	< Poverty Level (n=325)	\geq Poverty Level (n=723)
DEHP metabolites	All Races/Ethnicities (n=1,135)	13.6	16.2	12.6
	White non-Hispanic (n=386)	12.2	13.6	11.7
	Black non-Hispanic (n=268)	19.8	24.6*	17.9
	Mexican-American (n=143)	15.6	16.2*	NA**
	All Other Races/Ethnicities† (n=338)	13.5	15.7*	12.1
	All Races/Ethnicities (n=1,135)	17.9	22.8	16.7
DBP metabolites	White non-Hispanic (n=386)	16.4	20.0	15.3
	Black non-Hispanic (n=268)	26.2	31.4*	25.6
	Mexican-American (n=143)	17.2	26.8*	15.2*
	All Other Races/Ethnicities† (n=338)	17.1	22.6*	17.0
	All Races/Ethnicities (n=1,135)	5.1	7.6	4.5
	White non-Hispanic (n=386)	4.7	8.7	4.5
BBzP metabolites	Black non-Hispanic (n=268)	8.5	10.8*	7.5
	Mexican-American (n=143)	4.8	6.7*	3.0*
	All Other Races/Ethnicities† (n=338)	4.4	6.1*	3.5

DATA: Centers for Disease Control and Prevention, National Center for Health Statistics and National Center for Environmental Health, National Health and Nutrition Examination Survey

NOTES:

- DEHP = di-2-ethylhexyl phthalate, DBP = dibutyl phthalate (di-n-butyl phthalate and di-isobutyl phthalate), and BBzP = butyl benzyl phthalate.
- Values below the limit of detection are assumed equal to the limit of detection divided by the square root of 2.
- To reflect exposures to women who are pregnant or may become pregnant, the estimates are adjusted for the probability (by age and race/ethnicity) that a woman gives birth. The intent of this adjustment is to approximate the distribution of exposure to pregnant women. Results will therefore differ from a characterization of exposure to adult women without consideration of birth rates.

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† The “All Other Races/Ethnicities” category includes all other races or ethnicities not specified, together with those individuals who report more than one race.

‡ Includes sampled individuals for whom income information is missing.

*The estimate should be interpreted with caution because the standard error of the estimate is relatively large: the relative standard error, RSE, is at least 30% but is less than 40% (RSE = standard error divided by the estimate), or the RSE may be underestimated.

** Not available. The estimate is not reported because it has large uncertainty: the relative standard error, RSE, is 40% or greater (RSE = standard error divided by the estimate), or the RSE cannot be reliably estimated.

Table B10: Phthalate metabolites in children ages 6 to 17 years: Median concentrations in urine, 1999-2014

Median concentration of phthalate metabolites in urine ($\mu\text{g}/\text{L}$)								
	1999-2000	2001-2002	2003-2004	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014
DEHP metabolites	Ø	56.9	59.5	62.4	45.2	29.3	19.4	15.5
DBP metabolites¹	37.9	36.3	39.7	41.8	41.3	36.5	24.8	24.7
BBzP metabolite	24.8	22.4	22.1	18.5	16.3	12.2	8.7	7.8

DATA: Centers for Disease Control and Prevention, National Center for Health Statistics and National Center for Environmental Health, National Health and Nutrition Examination Survey

NOTES:

- DEHP = di-2-ethylhexyl phthalate, DBP = dibutyl phthalate (di-n-butyl phthalate and di-isobutyl phthalate), and BBzP = butyl benzyl phthalate.
- Values below the limit of detection are assumed equal to the limit of detection divided by the square root of 2.

Ø The estimate is not reported because the DEHP metabolites MEOHP and MEHHP were not measured in 1999-2000.

Table B10a: Phthalate metabolites in children ages 6 to 17 years: 95th percentile concentrations in urine, 1999-2014

95 th percentile concentration of phthalate metabolites in urine ($\mu\text{g}/\text{L}$)								
	1999-2000	2001-2002	2003-2004	2005-2006	2007-2008	2009-2010	2011-2012	2013-2014
DEHP metabolites	Ø	387.4	455.6	524.5	563.9	178.1	107.0	68.8
DBP metabolites	165.7	175.1	191.4	166.2	190.9	145.4	124.3	102.9
BBzP metabolite	122.3	143.1	151.1	104.0	107.1	76.3	63.0	55.9

DATA: Centers for Disease Control and Prevention, National Center for Health Statistics and National Center for Environmental Health, National Health and Nutrition Examination Survey

NOTES:

- DEHP = di-2-ethylhexyl phthalate, DBP = dibutyl phthalate (di-n-butyl phthalate and di-isobutyl phthalate), and BBzP = butyl benzyl phthalate.
- Values below the limit of detection are assumed equal to the limit of detection divided by the square root of 2.
- Phthalates do not accumulate in bodily tissues; thus, the distribution of NHANES urinary phthalate metabolite levels may overestimate high-end exposures as a result of collecting one-time urine samples rather than collecting urine for a longer time period.⁵⁻⁷

Ø The estimate is not reported because the DEHP metabolites MEOHP and MEHHP were not measured in 1999-2000.

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Table B10b. Phthalate metabolites in children ages 6 to 17 years: Median concentrations in urine, by race/ethnicity and family income, 2011-2014

		Median concentration of phthalate metabolites in urine ($\mu\text{g}/\text{L}$)		
		All Incomes‡ (n=1,439)	< Poverty Level (n=471)	\geq Poverty Level (n=863)
Race / Ethnicity				
DEHP metabolites	All Races/Ethnicities (n=1,439)	17.4	19.2	16.6
	White non-Hispanic (n=359)	14.6	17.3	14.5
	Black non-Hispanic (n=386)	23.1	27.4	20.6
	Mexican-American (n=326)	18.8	16.4	19.3
	All Other Races/Ethnicities† (n=368)	16.3	14.7	16.3
DBP metabolites	All Races/Ethnicities (n=1,439)	24.8	25.8	24.6
	White non-Hispanic (n=359)	24.6	22.8	24.7
	Black non-Hispanic (n=386)	32.2	41.3	29.2
	Mexican-American (n=326)	23.0	25.7	21.9
	All Other Races/Ethnicities† (n=368)	21.1	21.1	21.0
BBzP metabolite	All Races/Ethnicities (n=1,439)	7.9	10.3	7.3
	White non-Hispanic (n=359)	7.9	11.8	7.6
	Black non-Hispanic (n=386)	12.0	15.3	9.8
	Mexican-American (n=326)	7.2	7.3	7.0
	All Other Races/Ethnicities† (n=368)	6.2	8.4	4.9

DATA: Centers for Disease Control and Prevention, National Center for Health Statistics and National Center for Environmental Health, National Health and Nutrition Examination Survey

NOTES:

- DEHP = di-2-ethylhexyl phthalate, DBP = dibutyl phthalate (di-n-butyl phthalate and di-isobutyl phthalate), and BBzP = butyl benzyl phthalate.
- Values below the limit of detection are assumed equal to the limit of detection divided by the square root of 2.

† The “All Other Races/Ethnicities” category includes all other races or ethnicities not specified, together with those individuals who report more than one race.

‡ Includes sampled individuals for whom income information is missing.

Table B10c: Phthalate metabolites in children ages 6 to 17 years: Median concentrations in urine by age group, 2011-2014

		Median concentration of phthalate metabolites in urine ($\mu\text{g}/\text{L}$)			
		All ages	Ages 6 to 10 years	Ages 11 to 15 years	Ages 16 to 17 years
DEHP metabolites		17.4	19.3	16.2	15.3
DBP metabolites		24.8	24.5	26.8	22.3
BBzP metabolite		7.9	8.6	8.1	7.2

DATA: Centers for Disease Control and Prevention, National Center for Health Statistics and National Center for Environmental Health, National Health and Nutrition Examination Survey

NOTES:

- DEHP = di-2-ethylhexyl phthalate, DBP = dibutyl phthalate (di-n-butyl phthalate and di-isobutyl phthalate), and BBzP = butyl benzyl phthalate.
- Values below the limit of detection are assumed equal to the limit of detection divided by the square root of 2.