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January 2014

DRINKING WATER

EPA Has Improved Its Unregulated Contaminant Monitoring Program, but Additional Action Is Needed

GAO-14-103

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GAO Highlights

Highlights of GAO-14-103, a report to congressional requesters

Why GAO Did This Study

EPA's UCMR program collects data on unregulated contaminants in the nation's drinking water. EPA uses these data and other information to make regulatory determinations—decisions on whether to regulate additional drinking water contaminants. It is currently in its third data collection cycle, UCMR3.

GAO was asked to examine the UCMR program. This report examines: (1) the extent to which EPA implemented GAO's prior recommendations to improve the program and opportunities, if any, to strengthen it further; (2) the factors EPA considered when it selected the UCMR3 contaminants and the limitations, if any, it faced in selecting them; and (3) the extent to which UCMR data support regulatory determinations.

GAO reviewed EPA documents, surveyed 48 subject matter experts, assessed the UCMR program against statutory requirements and other standards, and interviewed EPA officials.

What GAO Recommends

Congress should consider amending the Safe Drinking Water Act to allow EPA to monitor for more than 30 contaminants under certain circumstances, and to adjust statutory time frames so UCMR data can inform regulatory determinations in the same cycle. GAO, among other things, recommends that EPA vary the monitoring frequency based on contaminant type. In commenting on a draft of this report, EPA generally agreed with GAO's findings, conclusions, and recommendations.

View GAO-14-103. For more information, contact J. Alfredo Gómez (202) 512-3841 or gomezj@gao.gov.

What GAO Found

The Environmental Protection Agency (EPA) has implemented all of the recommendations GAO made in its May 2011 report to improve the Unregulated Contaminant Monitoring Rule (UCMR) program. In that report, GAO recommended that EPA (1) monitor for the full 30 contaminants allowed by statute, (2) monitor for most or all contaminants using a more robust monitoring approach, and (3) select sufficiently sensitive minimum reporting levels (MRL) for monitoring contaminants. EPA now requires public water systems to monitor for 30 contaminants in the UCMR3 program, using its most robust monitoring approach for a majority of these contaminants, and setting MRLs as low as can be reliably measured, according to EPA. The Safe Drinking Water Act (SDWA) requires EPA to vary the monitoring frequency based on the type of contaminant likely to be found, but EPA used a standard monitoring frequency for all contaminants. This may result in inaccurate estimates of the occurrence of sporadically occurring microbes (e.g., viruses) or pesticides, according to experts GAO surveyed and studies it reviewed. In such cases, the monitoring data may not provide reliable estimates of contaminant occurrence.

EPA used 10 factors to select the 30 contaminants for UCMR3, but its selection process faced some limitations. Officials told GAO that the contaminants did not have to meet all 10 of the selection factors to be chosen, but 3 were very important (1) the availability of an analytical method to detect contaminants, (2) the reliability of health effects information on the contaminants, and (3) the need for data to support regulatory determinations for priority contaminants. However, EPA is limited by a statutory cap of 30 contaminants every 5 years, which restricts its ability to collect data on additional contaminants that could have been monitored for little additional cost. SDWA's legislative history reflected concerns with the ability of public water systems to absorb such costs, but many of the analytical methods EPA is using for UCMR3 are able to test a single sample of drinking water for more than one contaminant at a time. However, because of the limit of 30, EPA cannot always take advantage of this efficiency and is unable to gain economies of scale using monitoring that is already under way.

EPA uses UCMR data to support regulatory determinations but faces a time lag when doing so. EPA has used UCMR data to support 10 out of 12 regulatory determinations it has made since 2008 and is currently using UCMR data to inform the determinations expected in 2015. However, a time lag between the statutory deadline for making regulatory determinations and when UCMR data are available delays determinations on given contaminants until the following cycle. The 2-year time frame SDWA originally established from the time EPA publishes the UCMR list to when it makes regulatory determinations has not provided enough time for the agency to incorporate the UCMR data into the determinations. The UCMR3 monitoring, data collection, and analysis overlap with the time when EPA will be making its regulatory determinations for contaminants from its most recent Contaminant Candidate List. Consequently, UCMR data are not available to support regulatory determinations for contaminants during the cycle in which they are monitored; rather, UCMR data typically are not used until the next cycle. EPA officials told GAO that most of the UCMR3 data, which are being collected from 2013 to 2015, will be used to support the regulatory determinations it expects to issue in 2020 instead of 2015.

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Abbreviations

CCL	Contaminant Candidate List
EPA	Environmental Protection Agency
GC-MS	gas chromatograph-mass spectrometer
MRL	minimum reporting level
MTBE	methyl tertiary-butyl ether
NAWQA	National Water-Quality Assessment Program
OMB	Office of Management and Budget
PFC	perfluorinated chemical
SDWA	Safe Drinking Water Act
UCMR	Unregulated Contaminant Monitoring Rule
USGS	United States Geological Survey
VOC	volatile organic compound

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U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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January 9, 2014

The Honorable Henry A. Waxman
Ranking Member
Committee on Energy and Commerce
House of Representatives

The Honorable Edward J. Markey
United States Senate

Most Americans receive their drinking water from the more than 160,000 public water systems in the United States, all of which are subject to key requirements of the Safe Drinking Water Act (SDWA).[1] Under SDWA, the Environmental Protection Agency (EPA) is authorized to regulate contaminants in public water systems.[2] Currently, EPA regulates more than 89 drinking water contaminants. In 1996, in the midst of concerns about the number and pace of regulations required under the act and the need to better focus limited resources on contaminants of greatest public health concern, Congress enacted significant amendments to SDWA. The 1996 amendments to SDWA also directed EPA, among other things, to identify unregulated contaminants that present the greatest public health concern, establish a program to monitor drinking water for unregulated contaminants, and decide whether or not to regulate at least 5 such contaminants every 5 years.[3] EPA decisions about whether or not to regulate these contaminants are called regulatory determinations. Since 1996, EPA has made 21 regulatory determinations and has decided to regulate one of the contaminants, perchlorate.[4] EPA has identified 116 unregulated contaminants, including perchlorate and others such as

[1]Pub. L. No. 93-523 (1974), codified as amended at 42 U.S.C. §§300f-300j-26 (2013).

[2]Under SDWA, a drinking water contaminant is defined as any physical, chemical, biological, or radiological substance or matter in water.

[3]In the 1996 amendments, Congress removed a previous requirement that EPA regulate 25 new contaminants every 3 years.

[4]EPA decided to regulate perchlorate in 2011 and is currently developing a regulatory proposal for it. Perchlorate is both a naturally occurring and man-made chemical that is used to produce rocket fuel, fireworks, flares and explosives. It can also be present in bleach and in some fertilizers. According to EPA, perchlorate may have adverse health effects because scientific research indicates that this contaminant can disrupt the thyroid's ability to produce hormones needed for normal growth and development.

formaldehyde and *Salmonella enterica*, that it believes may occur in public water systems and may also require regulation. Those unregulated contaminants are listed on EPA's current Contaminant Candidate List (CCL).[5]

In addition, EPA has established the Unregulated Contaminant Monitoring Rule (UCMR) program, to monitor drinking water for unregulated contaminants, under the 1996 amendments to SDWA. As part of the UCMR, the SDWA amendments require EPA to issue a list every 5 years identifying up to 30 contaminants to be monitored by public water systems. The UCMR program is currently in its third 5-year cycle, known as UCMR3. EPA estimates that UCMR3 will cost $87 million from 2012 to 2016, of which $21 million will be paid by EPA. EPA will pay for small water systems' costs for the UCMR; the remaining $66 million will be paid by large water systems.[6] The UCMR, CCL, and regulatory determinations are related to each other. First, the CCL identifies unregulated contaminants that may require regulation in the future. Through the UCMR program, public water systems monitor for some of the CCL contaminants to determine how often and at what level the contaminants occur in drinking water. EPA then makes regulatory determinations about contaminants on the CCL using UCMR data, information about the contaminants' health effects, and other information for support.

In May 2011, we reported that EPA's monitoring program under the UCMR did not use EPA's full statutory authority under SDWA, use sufficiently sensitive testing methods, or employ sufficiently robust monitoring approaches.[7] First, EPA did not use its full allotment of 30 contaminants as authorized by SDWA in either of the first two UCMR cycles (UCMR1 and UCMR2), which limited the agency's progress in obtaining data on drinking water contaminants. Second, in some cases, EPA required public water systems to use testing methods (i.e., analytical methods) that were not sufficiently sensitive to identify the presence of

[5]The current Contaminant Candidate List is referred to as CCL3.

[6]For purposes of the UCMR, EPA defines a small water system as one serving 10,000 or fewer people. EPA defines a large water system as one that serves more than 10,000 people.

[7]GAO, *Safe Drinking Water Act: EPA Should Improve Implementation of Requirements on Whether to Regulate Additional Contaminants,* GAO-11-254 (Washington, D.C.: May 27, 2011).

contaminants at EPA's health reference level—the health benchmark EPA uses in assessing whether to regulate specific contaminants. Third, EPA used a limited sample size of 300 public water systems for UCMR1 for one of the program's monitoring approaches, which resulted in occurrence data that, according to EPA documents, were not sufficient to make national estimates of contaminant occurrence. In the 2011 report, we also recommended that EPA use its full statutory authority to monitor for 30 unregulated contaminants, select minimum reporting levels that are sufficiently sensitive to detect the presence of contaminants in public water systems at levels of public health concern, and monitor for most or all contaminants using the program's most robust monitoring approach.

In this context, you asked us to examine the UCMR program. Specifically, our objectives for this report were to: (1) evaluate the extent to which EPA has implemented the recommendations we made in 2011 to improve the UCMR program and identify any opportunities to strengthen it further; (2) identify the factors that EPA considered when it selected the contaminants for monitoring under UCMR3 and the limitations, if any, that EPA faced in selecting the contaminants; and (3) examine the extent to which UCMR data support regulatory determinations.

To identify the steps EPA has taken in response to the recommendations we made in 2011, we reviewed EPA documents, including EPA's proposed and final rules for the UCMR program, assessed the UCMR sample design against statutory requirements and statistical standards, and interviewed EPA officials. To identify the factors EPA considers when selecting contaminants, we reviewed EPA documents, including EPA's proposed and final rules for the UCMR program and SDWA requirements, and interviewed EPA officials. To determine how EPA uses the UCMR data to support its regulatory determinations, we reviewed EPA and *Federal Register* documents and interviewed EPA officials. In addition, to obtain further information about the UCMR program and identify opportunities to strengthen it further, we conducted a two-round Delphi survey[8] of experts selected for their knowledge of one or more of the following areas: drinking water, contaminant monitoring, analytical methods, toxicology, risk assessment, and environmental regulation. In the first round of the survey, we selected 14 experts who demonstrated

[8]The Delphi method consists of surveying experts in two or more rounds to obtain group agreement or consensus on key topics.

familiarity with EPA's CCL, UCMR, and regulatory determination processes. We asked them 10 open-ended questions about how various aspects of the UCMR program helped or hindered EPA in (1) selecting priority contaminants, (2) monitoring for selected contaminants, and (3) using the data to support regulatory determinations. We analyzed the responses provided by the experts and developed closed-ended questions for the second round of the survey. To identify experts for the second round of the survey, we developed a preliminary list of experts, which included the 14 experts who completed the first round of the survey and others identified through interviews with stakeholders and our review of public comments provided on EPA's proposed rules. We contracted with the National Academy of Sciences to identify additional experts. We selected 48 experts for the second round of the survey based on their knowledge of one or more of the following topic areas: drinking water, contaminant monitoring, analytical methods, toxicology, risk assessment, and environmental regulation. For the first round of the survey, we received responses from 14 of the 14 experts we surveyed and, for the second round, we received responses from 40 of 48 experts we surveyed (83 percent response rate). The information that we obtained from the expert surveys is not generalizable to all experts that have an interest in or knowledge of drinking water contaminant monitoring but does provide several experts' views on the UCMR program. For more information on our objectives, scope, and methodology see appendix I. See appendix IV for a copy of the survey questions and responses for the second round of the survey and appendix V for a list of the experts who completed the surveys.

We conducted this performance audit from June 2012 to January 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

This section presents information on (1) regulated and unregulated contaminants in drinking water, (2) the UCMR program and SDWA requirements, and (3) laboratories and methods used to analyze drinking water.

Regulated and Unregulated Contaminants in Drinking Water

Drinking water contaminants include chemical and microbial substances, some of which can harm human health. For example, prolonged exposure to arsenic in drinking water can cause skin damage or circulatory problems and, over time, may increase cancer risks. Contaminants may be naturally occurring or introduced through other means. EPA has identified three ways that drinking water generally becomes contaminated. First, contaminants can find their way into drinking water sources from industrial waste releases, agricultural runoff, and other pollution sources. Second, contamination can occur during the treatment of water by forming what are known as "disinfection by-products."[9] Third, contaminants can "leach" or dissolve out of the materials used for treatment, storage, and distribution of water.

EPA regulates drinking water contaminants under SDWA by issuing legally enforceable standards, known as National Primary Drinking Water Regulations or "primary standards" that generally limit the levels of these contaminants in public water systems. EPA has issued primary standards addressing more than 89 contaminants. States generally enforce these standards through compliance monitoring. Under compliance monitoring, public water systems collect a sample of drinking water, analyze the sample for specific contaminants, and report the results to states. To analyze the samples, water systems and states use analytical methods developed by government agencies, universities, and other organizations. EPA evaluates analytical methods for drinking water and approves those it determines meet agency requirements for monitoring contaminants. Laboratories analyzing drinking water compliance samples must be certified by the state or EPA. EPA establishes schedules for how often water systems must monitor for regulated contaminants. The monitoring frequency generally depends on the contaminant, previous monitoring results, the type of source water, and the size of the population served by the water system.

Unregulated drinking water contaminants include chemical and microbial substances and are not currently subject to primary standards under

[9]To protect drinking water from disease-causing organisms, or pathogens, water suppliers may add a disinfectant, such as chlorine, to drinking water. However, disinfectants can react with naturally occurring materials in the water to form by-products, some of which may pose health risks.

SDWA.[10] Exposure to unregulated drinking water contaminants may pose a human health risk, particularly to vulnerable subpopulations such as pregnant women, infants, the elderly, and those with compromised immune systems.[11] Unregulated contaminants include industrial chemicals, military chemicals, pesticides, bacteria, and other microbes and chemicals. They also include contaminants of emerging concern—contaminants characterized by a perceived, potential or real threat to human health or the environment or by a lack of published health standards. Examples include pharmaceuticals, such as prescription and over-the-counter drugs, and ingredients in personal care products, such as cosmetics and soaps. A contaminant may also be considered to be emerging because a new source of public exposure has been discovered or a new detection method or treatment technology has been developed.

UCMR Program and SDWA Requirements

Under the UCMR program, EPA collects data about the occurrence of unregulated contaminants in drinking water. The UCMR program collects data on the extent of the occurrence of unregulated contaminants in all public water systems serving more than 10,000 people and in a nationally representative sample of smaller systems. These data inform EPA's decisions about whether to issue primary standards for unregulated contaminants. Under the UCMR, EPA is to identify up to 30 unregulated contaminants that may be present in drinking water and establishes a monitoring program to obtain data on the extent of their occurrence. These data help EPA determine whether drinking water contamination is occurring and estimate its level and frequency. EPA established a three-tiered approach for monitoring UCMR contaminants that includes (1) assessment monitoring, (2) screening survey, and (3) pre-screen testing. EPA's approach is based primarily on the availability of analytical methods to monitor the contaminants. Assessment monitoring is used to monitor contaminants that can be detected by well-established analytical methods that are widely used in drinking water laboratories. The screening survey is used to monitor contaminants that can be detected by more recently developed analytical methods that are used in fewer

[10]States may regulate some of these contaminants. Under state laws, some state environmental agencies have the authority to regulate additional contaminants or establish more stringent standards than federal regulations, while others do not have these authorities.

[11]GAO-11-254.

drinking water laboratories. Pre-screen testing is used to monitor contaminants that can be detected by very new or specialized analytical methods that are used in a small set of drinking water laboratories.

Approximately 6,000 public water systems are currently participating in the UCMR program. Participating public water systems are monitoring for contaminants under one or more of the three tiers. EPA varies the number of public water systems required to monitor under each tier. UCMR monitoring is conducted by all large community and nontransient, noncommunity public water systems serving more than 10,000 people.[12] Monitoring is also conducted by a nationally representative sample of other public water systems that EPA selects (see table 1). In addition, a sample of community and nontransient, noncommunity water systems, and transient water systems are required to allow EPA to conduct pre-screen testing under UCMR3.[13]

Table 1: Public Water Systems Required to Participate in the Third Unregulated Contaminant Monitoring Rule

Monitoring approach	Type of system	Size of system	Number of systems
Assessment monitoring using well-established analytical methods	Community water systems and nontransient, noncommunity water systems	Systems serving more than 10,000 people	All (~4,200)
		Systems serving 10,000 or fewer people	Representative sample of 800 systems
Screening survey using more recently developed analytical methods	Community water systems and nontransient, noncommunity water systems	Systems serving more than 100,000 people	All (~400)
		Systems serving 10,001 to 100,000 people	Representative sample of 320 systems
		Systems serving 10,000 or fewer people	Representative sample of 480 systems

[12]EPA defines a community water system as a public water system that has at least 15 service connections used by year-round residents or regularly serves an average of at least 25 year-round residents. EPA defines a nontransient, noncommunity water system as a public water system that is not a community water system and regularly serves at least 25 of the same people over 6 months per year. There are more than 52,000 community water systems and more than 19,000 nontransient, noncommunity water systems.

[13]EPA defines a transient noncommunity water system as a public water system that does not regularly serve at least 25 of the same people over 6 months per year. There are more than 87,000 transient, noncommunity water systems.

Monitoring approach	Type of system	Size of system	Number of systems
Pre-screen testing using specialized analytical methods	Nondisinfecting groundwater systems including community water systems, nontransient, noncommunity water systems, and transient, noncommunity water systems	Systems serving 1,000 or fewer people	Representative sample of 800 systems

Source: GAO analysis of EPA documents.

The UCMR program is part of a larger framework established by SDWA that also includes the CCL and requires EPA to make regulatory determinations for at least five of the contaminants on that list every 5 years. The CCL is a list of unregulated contaminants that are known or anticipated to occur in public water systems and that may require regulation. SDWA directs EPA to select contaminants that pose the greatest public health concern for consideration for the CCL and regulatory determinations.[14] A regulatory determination is a formal decision on whether EPA should initiate a rulemaking process to develop a primary standard for a specific drinking water contaminant. The UCMR, CCL, and regulatory determinations framework is implemented by three different branches within EPA's Office of Ground Water and Drinking Water's Standards and Risk Management Division: the Technical Support Center administers the UCMR program; the Targeting and Analysis Branch develops the CCL; and the Standards and Risk Reduction Branch leads the development of the regulatory determinations.

SDWA requires EPA to make regulatory determinations for at least five of the contaminants on the CCL every 5 years. Regulatory determinations can be positive (i.e., a primary standard is needed) or negative (i.e., no primary standard is needed). Under SDWA, EPA is to make a positive regulatory determination and subsequently issue a primary standard when (1) the contaminant may have an adverse effect on the health of persons; (2) the contaminant is known to occur or there is a substantial likelihood that the contaminant will occur in public water systems with a frequency and at levels of public health concern; and (3) in the sole judgment of the Administrator, regulation of such contaminant presents a meaningful opportunity for health risk reduction for persons served by public water systems. EPA can make a negative regulatory determination when the SDWA conditions are not met. SDWA set recurring 5-year deadlines for the CCL, UCMR, and regulatory determinations. The initial

[14]42 U.S.C. § 300g-1(b)(1)(C) (2013).

deadlines were staggered such that EPA was required to publish the CCL in the *Federal Register* first (February 1998), the UCMR list 18 months later (August 1999), and the regulatory determinations 2 years after that (August 2001). The cycle restarts with the next CCL, UCMR, and regulatory determinations due 5 years after the first set of deadlines. However, EPA has not always met the SDWA deadlines. Moreover, EPA has not issued the CCL, UCMR, and regulatory determinations separated by the 18-month and 2-year time frames that were originally established by statute.[15] The cycle is currently in its third iteration. EPA refers to the programs in the current cycle as CCL3, UCMR3, and the CCL3 regulatory determinations (see table 2).

Table 2: EPA Programs to Address Unregulated Contaminants in Drinking Water

Program	Contaminant Candidate List (CCL)	Unregulated Contaminant Monitoring Rule (UCMR)	Regulatory determinations
Purpose	Identify unregulated contaminants that are known or anticipated to occur in public water systems	Monitor unregulated contaminants to determine the extent of their occurrence in drinking water	Decide whether or not to regulate contaminants on the CCL using UCMR data, health effects information, and other information
SDWA requirement	Publish list every 5 years	Publish a list of up to 30 contaminants for monitoring, every 5 years	Decide whether or not to regulate at least 5 CCL contaminants, every 5 years
Outputs	1998 (60 contaminants on CCL1) 2005 (51 contaminants on CCL2) 2009 (116 contaminants on CCL3)	1999 (26 contaminants on UCMR1) 2007 (25 contaminants on UCMR2) 2012 (30 contaminants on UCMR3)	2003 (9 negative determinations for CCL1) 2008 (11 negative determinations for CCL2) 2011 (1 positive determination–out of cycle) 2015 (determinations for CCL3 expected)

Source: GAO analysis of EPA information.

The UCMR program's primary purpose is to inform regulatory determinations, but EPA can also use the UCMR data to develop health advisories for some of the contaminants it decides not to regulate. Health advisories provide information on contaminants that can harm human health and are known or anticipated to occur in drinking water. They provide technical guidance on health effects to assist EPA regional

[15]Under the time frames set out in the statute, EPA would have issued CCL3 in 2008, the list of UCMR3 contaminants in 2009, and the regulatory determinations for CCL3 in 2011.

offices, states, and other public health officials. EPA has issued new or updated health advisories for nine contaminants it decided not to regulate.[16] The advisories identify concentrations of contaminants at which adverse health effects are not anticipated to occur over specific exposure durations (1 day, 10 days, several years, and a lifetime). Drinking water health advisories are not legally enforceable standards and, according to EPA, are subject to change as new information becomes available.

Laboratories and Methods Used to Analyze Drinking Water

Private analytical laboratories and some water utilities' laboratories conduct the analytical testing for the UCMR contaminants. All laboratories conducting analyses for UCMR3 must be approved by EPA. In general, laboratories must first successfully complete the registration and application process, which includes testing for contaminants using EPA-specified analytical methods, before receiving EPA's approval.[17] Approved laboratories must adhere to the quality assurance and quality control procedures and criteria outlined in the methods and rule language to maintain their approval status and may be subject to on-site laboratory or paper audits. Laboratories also post occurrence data and required quality control data electronically in EPA's data system, the Safe Drinking Water Accession and Review System, within 120 days of the sample collection date.[18]

EPA specifies the analytical methods that laboratories participating in the UCMR program use to detect contaminants. Some methods can detect a single contaminant while others can detect a group of similar contaminants. Because the UCMR collects nationwide data, agency

[16]EPA has issued or updated health advisories for the following 9 contaminants: (1) 1,1,2,2-tetrachloroethane; (2) 2,4-dinitrotoluene; (3) 2,6-dinitrotoluene; (4) boron; (5) tetrachloroterephthalic acid; (6) monomethyl tetrachloroterephthalic acid; (7) manganese; (8) sodium; and (9) sulfate. EPA also developed consumer information for *Acanthamoeba*.

[17]Laboratories conducting the pre-screen testing analyses for viruses and pathogen indicators are under direct contracts with EPA and are subject to an analogous laboratory approval process.

[18]These data are included in EPA's National Contaminant Occurrence Database. EPA developed the database to satisfy the statutory requirements set by Congress in the 1996 amendments to SDWA to maintain a national drinking water contaminant occurrence database using sampling data for both regulated and unregulated contaminants in public water systems.

officials told us EPA's goal is to use analytical methods that yield consistently high-quality monitoring data from public water systems across the country. EPA officials told us that the agency develops or uses analytical methods for the UCMR program that enable it to meet this goal. In particular, agency officials told us these methods must (1) have sufficient "holding times";[19] (2) be able to be used successfully by a variety of labs with varying levels of expertise; and (3) be used effectively in different types of drinking water. EPA officials said it typically takes 1 or 2 years to develop a standard analytical method that meets these requirements and up to 3 years or longer to develop more complex methods. See appendix III for more information on analytical methods.

EPA Has Improved the UCMR Program by Implementing Our Recommendations, but Its Monitoring Frequency May Yield Some Inaccurate Estimates

EPA has implemented the three recommendations we made in our May 2011 report to improve the UCMR program.[20] The technical changes EPA has made to UCMR3 are significant improvements over prior UCMR cycles and have increased the program's productivity and statistical strength, among other things. However, the program's monitoring frequency may result in inaccurate estimates of the occurrence of some contaminants.

[19]Holding time is the time between the collection of a water sample by a public water system and the laboratory analysis of that water sample.

[20]Three of the 17 recommendations we made in GAO-11-254 applied to the UCMR program. Other recommendations concern regulatory determinations and could affect the UCMR program due to the relationship between the programs.

EPA Has Implemented All of GAO's 2011 Recommendations to Improve the UCMR Program

In UCMR3, EPA implemented our recommendations to (1) monitor for 30 contaminants; (2) monitor for most or all contaminants using the program's more robust monitoring approach; and (3) select minimum reporting levels (MRL) that are sufficiently sensitive to detect the presence of contaminants in public water systems at levels of public health concern as follows:[21]

Monitor for 30 contaminants. In our May 2011 report,[22] we reported that EPA did not use its full statutory authority to monitor for 30 contaminants in implementing the first two cycles of the UCMR program. Specifically, EPA required that 26 and 25 contaminants be monitored under UCMR1 and UCMR2, respectively. As a result, EPA did not obtain occurrence data for 9 additional contaminants, which in turn, limited the agency's productivity in obtaining critical information to support its regulatory determinations. In its response to our recommendation that it use its full statutory authority, EPA stated it supports a goal of including as many priority contaminants as possible in each 5-year monitoring cycle. Accordingly, in May 2012, EPA published its final rule for UCMR3 requiring public water systems to monitor for 30 contaminants (see app. II for a list of the 30 contaminants).[23]

Use more robust monitoring approach. In 2011, we reported that EPA officials described the assessment monitoring approach as "the gold standard" for obtaining sufficient data on national occurrence of drinking water contaminants to support regulatory determinations, but that it had used the more limited screening survey approach for a majority of the contaminants monitored under UCMR1 and UCMR2, as shown in table 3. The screening survey monitoring approach produces estimates of national occurrence with greater uncertainty than those provided by

[21]MRLs represent an estimate of the lowest concentration of a compound that can be quantitatively measured by members of a group of experienced drinking water laboratories. Under the UCMR, laboratories are to report all analyses of listed contaminants. Laboratories report values when they are equal to or greater than the established MRL, or report that the analysis was below the MRL.

[22]GAO-11-254.

[23]One of the 30 contaminants to be monitored under UCMR3 is total chromium, a regulated contaminant. EPA included total chromium in UCMR3 to collect data on it concurrent with data for chromium-6, an associated unregulated contaminant. EPA used a different statutory authority, section 1445(a)(1)(A) of SDWA, to require monitoring for total chromium.

assessment monitoring because it requires a smaller sample of public water systems to monitor. For example, under UCMR1, the screening survey required a sample of 300 public water systems to monitor. In contrast, approximately 3,800 systems were required to conduct assessment monitoring. In EPA's response to our recommendation that it conduct monitoring for most or all contaminants using the assessment monitoring approach, EPA stated that it supports a goal of using assessment monitoring for as many contaminants as is practical to obtain more robust occurrence data for and also to achieve higher confidence in the national estimates. EPA is requiring assessment monitoring for a majority of the contaminants under UCMR3. In addition, for UCMR2 and UCMR3, EPA expanded the sample size of the screening survey to increase the statistical strength of the monitoring results. We analyzed EPA's methodology for selecting the sample of systems for the screening survey under UCMR2 and UCMR3 against standard statistical criteria, and we determined that the larger sample size should allow EPA to make national estimates of contaminant occurrence with smaller margins of error and higher levels of confidence compared with the first UCMR. In addition, 26 of the 40 experts who participated in our survey thought the screening survey monitoring approach for UCMR3 is likely to provide EPA with sufficient data to determine whether contaminants occur with a frequency and at levels of public health concern. Further, EPA officials told us that the UCMR2 screening survey occurrence data are sufficient for supporting regulatory determinations, whereas, in its 2008 regulatory determinations notice, EPA stated that the occurrence data were insufficient to support regulatory determinations for 12 of the 14 contaminants monitored under the UCMR1 screening survey.

Table 3: Number of Public Water Systems Required to Participate in the First, Second, and Third Unregulated Contaminant Monitoring Rules (UCMR1, UCMR2, and UCMR3)

Monitoring approach	UCMR1	UCMR2	UCMR3
Number of contaminants to be monitored			
Assessment monitoring	12	10	21[a]
Screening survey	14	15	7
Pre-screen testing	0	0	2
Total number of contaminants	**26**	**25**	**30**
Number of public water systems required to participate			
Assessment monitoring	~3,800[b]	~4,200[b]	~5,000[b]
Screening survey	300[c]	~1,200[c]	~1,200[c]
Pre-screen testing	NA	NA	800

Source: GAO analysis of EPA information.

[a]UCMR3 assessment monitoring includes total chromium, a regulated contaminant being monitored under another authority.

[b]Assessment monitoring includes all public water systems serving over 10,000 people and a representative sample of 800 systems serving 10,000 or fewer people.

[c]EPA increased the sample size of the screening survey for UCMR2 and UCMR3. Specifically, under UCMR1, the screening survey included a sample of 300 systems (120 systems serving over 10,000 people and 180 systems serving 10,000 or fewer people). In contrast, under UCMR2 and UCMR3, the screening survey includes all systems serving over 100,000 people; a representative sample of 320 systems serving 10,001 to 100,000 people; and a representative sample of 480 systems serving 10,000 or fewer people.

Select sufficiently sensitive MRLs. In 2011, we reported that the utility of the UCMR occurrence data was reduced because EPA had not used sufficiently sensitive MRLs to detect the presence of contaminants at levels of public health concern. Specifically, for 9 of the 20 contaminants for which EPA made regulatory determinations in 2003 and 2008, the MRL exceeded EPA's health reference level—the health benchmark EPA uses to assess whether the detection of a specific contaminant may indicate a potential human health risk.[24] As a result, occurrence of these 9 contaminants at a level higher than the health reference level, but lower than the MRL, may not have been detected. In its response to our recommendation that EPA use MRLs that are sufficiently sensitive, EPA stated it supports a goal of establishing minimum reporting levels that are sufficiently sensitive to reliably detect the known and likely occurrence of contaminants in public water systems at levels of public health concern and provide useful and credible information on the occurrence of the contaminants in public drinking water systems.[25] EPA has since revised its approach for selecting MRLs for monitoring selected contaminants in an effort to increase the likelihood that the monitoring will be sufficiently sensitive to detect the presence of contaminants at levels of public health concern. Specifically, EPA officials told us that, for UCMR3, the agency set the MRLs based on how low the method could reliably measure

[24]The 9 contaminants include 4 monitored under, or in association with UCMR1, and 5 monitored under the program that preceded the UCMR. Under the earlier program, public water systems were required to monitor for up to 48 unregulated contaminants and to report monitoring results to the states or to EPA.

[25]GAO-11-254.

specific contaminants.[26] These levels are based on method sensitivity (i.e., not adjusted upward based on available health effects information). In some cases, the MRLs for UCMR3 are set well below EPA's current health reference levels, according to EPA's final rule for UCMR3. However, health effects research on some UCMR3 contaminants is still in progress, and the health reference levels are subject to change. EPA believes that its new approach will be more effective than its past approach because, by monitoring for contaminants at the lowest concentrations feasible, UCMR3 is more likely to detect contamination at levels of public health concern, even if new health effects data result in lower health reference levels in the future, as anticipated by its final rule for UCMR3.

UCMR Monitoring Frequency May Yield Inaccurate Estimates of Some Contaminant Occurrence

EPA has taken steps to improve the UCMR program, but the program's standard monitoring frequency may result in inaccurate estimates of the occurrence of certain contaminants. In particular, several experts we surveyed and studies on contaminant occurrence indicated that the UCMR3 standard monitoring frequency may result in inaccurate estimates of the occurrence of sporadically occurring microbes (e.g., viruses) and seasonally applied pesticides. SDWA calls for EPA to vary the monitoring frequency and schedule for public water systems based on three criteria (1) the number of persons served by the system, (2) the source of the system's water supply, and (3) the contaminants likely to be found. Under UCMR3, EPA varies the monitoring frequency for systems based on a system's size and water supply (e.g., surface water or groundwater), but it does not vary it based on the type of contaminant likely to be found. Specifically, under UCMR3, surface water systems and

[26] EPA set most of the MRLs for the UCMR3 contaminants at the level of micrograms per liter (µg/L), generally ranging from 0.0001 µg/L to 1 µg/L. Some contaminants are able to be detected at much lower concentrations than others, due to their chemical properties, among other factors. The levels set for the UCMR3 contaminants are generally more sensitive than the levels set for UCMR1 and UCMR2 contaminants, which generally ranged from 0.5 µg/L to 10 µg/L and from 0.002 µg/L to 2 µg/L, respectively.

groundwater systems under the direct influence of surface water[27] are required to conduct quarterly monitoring of selected chemical contaminants, while groundwater systems are required to monitor selected chemical contaminants twice a year. In addition, nondisinfecting groundwater systems that serve 1,000 or fewer people and are located in sensitive hydrogeological areas are required to allow EPA monitoring for two microbial contaminants (viruses) twice a year (see table 4). The virus monitoring in UCMR3 was designed in consideration of where these viruses may be more likely to be found—small groundwater systems that do not disinfect. Nonetheless, EPA used the standard monitoring frequency for viruses; it did not vary the frequency or schedule based on the contaminants likely to be found. Similarly, contaminant monitoring under UCMR2 occurred quarterly for surface water systems and twice a year for groundwater systems for all contaminants. EPA did not vary the monitoring frequency or schedule during the seasons when pesticides were applied and the likelihood of occurrence was highest.

Table 4: Monitoring Frequency by System Size and Water Supply Source for the Third Unregulated Contaminant Monitoring Rule

System size	Water supply source	Monitoring frequency
Assessment monitoring		
All systems serving more than 10,000 people and a representative sample of 800 systems serving 10,000 or fewer people	Surface water or groundwater under the direct influence of surface water	Quarterly during a 1-year period with sampling events 3 months apart
	Groundwater	Twice in a 1-year period with sampling events 5-7 months apart
Screening survey		
All systems serving more than 100,000 people, a representative sample of 320 systems serving 10,001 to 100,000 people, and a representative sample of 480 systems serving 10,000 or fewer people	Surface water or groundwater under the direct influence of surface water	Quarterly during a 1-year period with sampling events 3 months apart
	Groundwater	Twice in a 1-year period with sampling events 5-7 months apart

[27]Groundwater under the direct influence of surface water means any water beneath the surface of the ground with significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as *Giardia lamblia* or *Cryptosporidium,* or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH that closely correlate to climatological or surface water conditions. For example, a groundwater source located close enough to nearby surface water, such as a river or lake, to receive direct surface water recharge is considered at risk of contamination from pathogens that are not normally found in true groundwaters.

System size	Water supply source	Monitoring frequency
Pre-screen testing		
A representative sample of 800 nondisinfecting groundwater systems serving 1,000 or fewer people	Groundwater	Twice in a 1-year period with sampling events 5-7 months apart

Source: GAO analysis of EPA documents.

When EPA first established the UCMR program, it explained that the standard monitoring frequency for public water systems using surface water and groundwater under the direct influence of surface water will capture variability in contaminant occurrence because one of each public water system's quarterly sampling events must occur during what EPA considers to be the most vulnerable period for drinking water contamination, i.e., the period of peak contamination.[28] According to EPA's explanation in the *Federal Register* accompanying the final rule for UCMR1, studies show that the greatest risk of contaminant occurrence for much of the country is the late-spring/early-summer runoff period from May to July, particularly for contaminants such as pesticides and nitrate.[29] EPA designed the UCMR3 program to include sampling during this period, as designated by EPA or the state. Quarterly monitoring for systems using surface water or groundwater under the direct influence of surface water occurs during one of three possible time frames (1) January, April, July, and October; (2) February, May, August, and November; or (3) March, June, September, and December. EPA assigns one of these three time frames to each participating public water system using surface water or groundwater under the direct influence of surface water.[30] EPA did not specify a vulnerable period for public water systems using groundwater in UCMR2 and UCMR3, but it stated that samples will

[28]Environmental Protection Agency, "Revisions to the Unregulated Contaminant Monitoring Regulation for Public Water Systems," 64 Fed. Reg. 50,556, 50,570, 50,588 (Sept. 17, 1999).

[29]Id. at 50,571 ("For much of the United States, east of the Rocky Mountains, many studies have shown that the season of greatest vulnerability for contaminant occurrence is the late-spring, early-summer runoff-recharge period, particularly for contaminants such as pesticides and nitrate (e.g., Larson et al., 1997; Barbash and Resek, 1996; Hallberg, 1989a,b). For deeper, more confined ground water systems, defining vulnerable periods is much more difficult.").

[30]Systems that are unable to monitor within the assigned time frame must contact EPA to reschedule their monitoring.

be taken during all months and seasons of the year when all groundwater systems are considered together, according to agency documents.[31]

However, several experts we surveyed and studies on contaminant occurrence indicated that the UCMR standard monitoring frequency may not accurately characterize the presence of certain contaminants in public water systems. In particular, the monitoring frequency may result in inaccurate estimates of the occurrence of sporadically occurring microbes (e.g., viruses) and pesticides whose peak concentrations typically occur during and after the application season, primarily from April through July. For example, EPA's monitoring frequency may underestimate occurrence for compounds such as seasonally applied pesticides, according to one expert we surveyed.

As noted above, the UCMR3 standard monitoring frequency may result in inaccurate estimates of the occurrence of some microbes and pesticides.

- *Microbes*. Under UCMR3, EPA selected a representative sample of 800 nondisinfecting groundwater systems located in sensitive hydrogeological areas[32] to monitor for two viruses—enterovirus and norovirus—using the pre-screen testing monitoring approach.[33] In the notice for its proposed rule for UCMR3, EPA states that the agency limited its selection to those systems serving 1,000 or fewer persons because these smaller systems are the least likely to disinfect the water and, therefore, the most vulnerable to contamination with viruses. Monitoring and analyses are organized and paid for by EPA through direct contracts with laboratories. Under UCMR3, each of the selected systems will be monitored for the viruses twice during a 12-month period from January 2013 to December 2015. The systems'

[31]Environmental Protection Agency, *UCMR2 Categorized Public Comments* (Washington, D.C.: June 2006); and Environmental Protection Agency, *Response to Comments Document for the Unregulated Contaminant Monitoring Regulations (UCMR3)* (Washington, D.C.: January 2012).

[32]The 800 systems use groundwater wells that do not treat the water and are located in areas of vulnerable geology, such as karst aquifers.

[33]According to an EPA fact sheet, the primary means of virus-related disease transmission is exposure to fecally contaminated water or consumption of food exposed to the contaminated water. Exposure to enterovirus-contaminated drinking water can cause fever, respiratory illness, rash, conjunctivitis, hand-foot-mouth disease, and meningitis, among other things. Exposure to norovirus-contaminated drinking water can cause mild fever, vomiting, diarrhea, and cramps.

sampling events will be 5 to 7 months apart. However, more than half of the experts who completed our survey (23 of 40) said the twice-yearly monitoring requirement for viruses is not likely to provide EPA sufficient data to determine whether the contaminants occur with a frequency and at levels of public health concern. In addition, 15 experts who completed our survey stated that more frequent monitoring may be warranted to capture the occurrence of viruses in public water systems, which many characterized as variable. Similarly, a technical presentation that EPA used to support its rationale for including the viruses in UCMR3 shows that virus occurrence in groundwater systems is highly variable and that groundwater recharge events, like heavy precipitation, increase virus contamination levels.[34] The technical presentation concludes that more frequent sampling is necessary to characterize virus occurrence in public water systems. Moreover, in the past, EPA varied the monitoring frequency for a microbe that public comments on EPA's proposed rule for UCMR1 characterized as sporadically occurring.[35] Specifically, under UCMR1, surface water systems and groundwater systems monitoring for the microbial contaminant, *Aeromonas*, were required to take samples quarterly, with additional samples taken, so that samples generally were collected each month during the warmest months of the year (July, August, and September) because EPA officials told us that this is when they expected to find contaminant occurrence.[36] Systems monitored during one of three possible time frames (1) January, April, July, August, September, and October; (2) February, May, July, August, September, and November; or (3) March, June, July, August, September, and December. In contrast, UCMR3 does not require any additional monitoring for viruses. As a result, the data obtained under UCMR3 may not provide reliable estimates of the occurrence of viruses in drinking water.

[34]*Wisconsin Water and Health Trial for Enteric Risks (WAHTER Study)—Part 1: Risk of Illness from Municipal Groundwater Consumption.* EPA Office of Water Symposium on Groundwater-Borne Infectious Disease, Etiologic Agents and Indicators (Washington, D.C.: December 2–4, 2008).

[35]Environmental Protection Agency, *Public Comment and Response Summary for the Unregulated Contaminant Monitoring Regulation* (Washington, D.C.: August 1999).

[36]According to EPA's website, *Aeromonas* is a genus of bacteria with the potential to contaminate drinking water by evading treatment (e.g., chlorine disinfection) and to cause human disease such as gastroenteritis and bacterial septicemia, which are typically acquired through ingestion or though exposure of open wounds.

- *Pesticides*. Under UCMR2, all public water systems serving 100,000 or more people and a representative sample of 800 systems serving fewer than 100,000 people were required to monitor for nine pesticides using the screening survey monitoring approach. These pesticides included three widely used herbicides applied for weed control on crops such as corn, cotton, and soybeans, and six degradates.[37] Contaminant monitoring occurred quarterly for surface water systems and biannually for groundwater systems. No additional monitoring was conducted during the seasons when pesticides were applied and the likelihood of occurrence was highest. Two of the 14 experts who participated in the first round of our survey said that the UCMR standard monitoring frequency may result in inaccurate estimates of the occurrence of such pesticides in public water systems. For example, one expert said that, following application, pesticides can occur at relatively high concentrations but for short periods of time, and that, because the UCMR's timing and frequency of monitoring are not based on this consideration, the program could completely miss that occurrence. Data from a United States Geological Survey (USGS) report also show that concentrations of herbicides are usually highest during and after the application season, primarily from April through July.[38] For example, at four stream sites studied, USGS found that the presence of atrazine, the dominant herbicide used in the Corn Belt during the study period, typically peaked after applications in the spring and gradually declined through the summer and winter. According to the USGS report, such seasonal patterns of pesticide concentrations are generally consistent each

[37]Specifically, the three herbicides included in UCMR2 are acetochlor, alachlor, and metolachlor. Such pesticides have the potential to contaminate drinking water by making their way into surface water or groundwater systems that feed drinking water supplies, for example, through runoff or drainage resulting from rainfall or irrigation. EPA classified all three contaminants as "possible" or "probable" carcinogens. The six degradates included in UCMR2 are acetochlor ethane sulfonic acid; acetochlor oxanilic acid; alachlor ethane sulfonic acid; alachlor oxanilic acid; metolachlor ethane sulfonic acid; and metolachlor oxanilic acid. Degradates are the result of pesticides breaking down in the environment as they interact with water, soil, air, sunlight, or microorganisms.

[38]The USGS National Water-Quality Assessment Program (NAWQA) conducted a national-scale assessment of pesticide occurrence and concentrations in streams and groundwater during 1992–2001. The assessment's findings were published in a March 2006 report entitled, *The Quality of Our Nation's Waters—Pesticides in the Nation's Streams and Ground Water, 1992–2001*. The report notes that "although NAWQA did not measure pesticide concentrations at drinking-water intakes, NAWQA results for the wide range of streams sampled indicate that seasonal pulses of pesticide concentrations probably occur in some streams that are used as sources of drinking water."

year, as long as the pesticides are still in use. Pesticide occurrence in groundwater also generally coincides with pesticide use patterns. Sampling was conducted throughout the year, including intensive sampling during the times of highest pesticide use and runoff. This sampling approach enabled USGS to conclude that concentrations of pesticides in streams and groundwater were typically below water-quality benchmarks for human health. Thus, seasonal monitoring of pesticides is important to assess whether pesticides occur at concentrations that may affect human health. Also, high-frequency sampling during seasons when intense pesticide use coincides with periods of high runoff may be needed to ensure that the highest pesticide concentrations are detected. In contrast, EPA's standard monitoring frequency requires most public water systems to monitor for contaminants only once per season or once over two seasons. As a result, some of the data collected under UCMR2 may not yield accurate estimates of pesticide occurrence in public water systems.

EPA Considered 10 Factors to Select Contaminants for Monitoring, but Its Selection Process Faced Limitations

EPA used 10 selection factors, as well as a working group, and internal and external reviews, among other steps, to select contaminants for UCMR3. However, the process was lengthy due primarily to the reviews and the time required to develop analytical methods. The selection process was also limited by a statutory cap of 30 contaminants, which restricted EPA's ability to collect data on additional contaminants that could have been monitored for very little additional cost. The selection process also excluded contaminants previously monitored in earlier UCMR cycles, which has some limitations.

UCMR3 Contaminant Selection Considered Multiple Factors, but the Process Was Lengthy

To select contaminants for UCMR3, EPA considered 10 factors and used a prioritization process to identify potential contaminants, but took over 30 months, or 2 ½ years, to develop and publish the final list in the *Federal Register* after the CCL was published. Had EPA consistently met the initial and recurring statutory deadlines for CCL and UCMR, they would have been separated by 18 months.

Contaminant Selection Factors

EPA used 10 factors to select contaminants for UCMR3 (see fig. 1). Officials told us that a contaminant does not have to meet all of the selection factors to be chosen; however, three are very important to consider as follows:

- *Analytical method availability*. Because analytical methods are the means by which laboratories test for contaminants, EPA officials told us they could not include a contaminant on the UCMR list without also

having an analytical method available that is sensitive and precise enough to provide the data quality and accuracy that EPA needs for the UCMR program. See appendix III for more information on analytical methods.

- *Health effects information*. Because of the importance of monitoring for UCMR contaminants that may pose a public health risk and, therefore, may need to be regulated, EPA officials told us they placed a high priority on contaminants for which they have reliable health effects data.

- *Need for data to support regulatory determinations on priority contaminants*. Because the goal of the UCMR program is to provide occurrence data on unregulated contaminants for informing regulatory determinations, the Standards and Risk Reduction Branch's priorities for data to support a regulatory determination are heavily considered.

Figure 1: EPA Selection Factors for Identifying Contaminants for Monitoring under the Third Unregulated Contaminant Monitoring Rule (UCMR3)

1. Whether an analytical method was available and sensitive enough to detect contaminants at the desired level;[a]
2. Whether information on the health effects of exposure to a contaminant was available and reliable;
3. Whether EPA's Standards and Risk Reduction Branch identified the contaminant as a priority for obtaining occurrence data in order to support a regulatory determination;
4. Whether the contaminant had already been monitored under a prior Unregulated Contaminant Monitoring Rule (UCMR); if so, it was eliminated from further consideration;[a]
5. Whether the contaminant is listed on the Contaminant Candidate List, which serves as the primary basis for developing the UCMR list;[a]
6. Whether EPA identified it as a contaminant of emerging concern;[a]
7. Whether industry trends show an increase or decrease in the use of certain chemicals that could be contaminants;
8. Whether stakeholders' input through EPA's public meetings, UCMR3 working group, and public comments on the proposed UCMR rule identify a contaminant as a priority;
9. Whether a contaminant could be monitored using the same analytical method being used for contaminants already chosen for the UCMR, which would make monitoring it cost-effective; and
10. Whether monitoring data from other organizations, such as USGS and states, indicate that the contaminant is likely to be present in drinking water.

Source: GAO analysis of EPA information.

[a]EPA identified these selection factors in the *Federal Register*. EPA officials identified the other factors during interviews with us.

Contaminant Selection Process

According to EPA documents and officials, EPA used a prioritization process to select potential UCMR3 contaminants. First, EPA considered the contaminants listed on CCL3 and identified contaminants of emerging concern[39] to establish an initial list of about 150 contaminants. Contaminants for which analytical methods were not available were then eliminated from consideration for UCMR3, however EPA officials told us that those contaminants may be monitored under a future UCMR if an analytical method can be developed. Contaminants that were monitored under UCMR1 or UCMR2 were also eliminated from further consideration early in the UCMR3 selection process, as reported in the *Federal Register* and agency records.[40] These two selection factors reduced the list to fewer than 35 contaminants, according to EPA documentation. In addition, officials told us they met regularly with representatives from the Standards and Risk Reduction Branch to ensure the list of UCMR contaminants would meet their needs for data to support regulatory determinations.

EPA finalized the UCMR3 list through deliberations with other EPA staff and stakeholders and by holding internal and external reviews, among other steps (see fig. 2). In November 2009, a UCMR3 working group led by EPA's Technical Support Center and composed of EPA national and regional staff, as well as representatives from states, began to select the final 30 contaminants. The EPA Office of Science and Technology[41] conducted health effects evaluations for possible UCMR3 contaminants, according to EPA documents and agency officials. The UCMR3 working group, whose members included experts from the Office of Science and Technology, reviewed this health effects information. For each UCMR3 chemical contaminant, EPA developed an information sheet that listed known health effects information and the sources of that information, among other things. EPA used these contaminant information sheets for internal considerations and published them in the EPA docket for

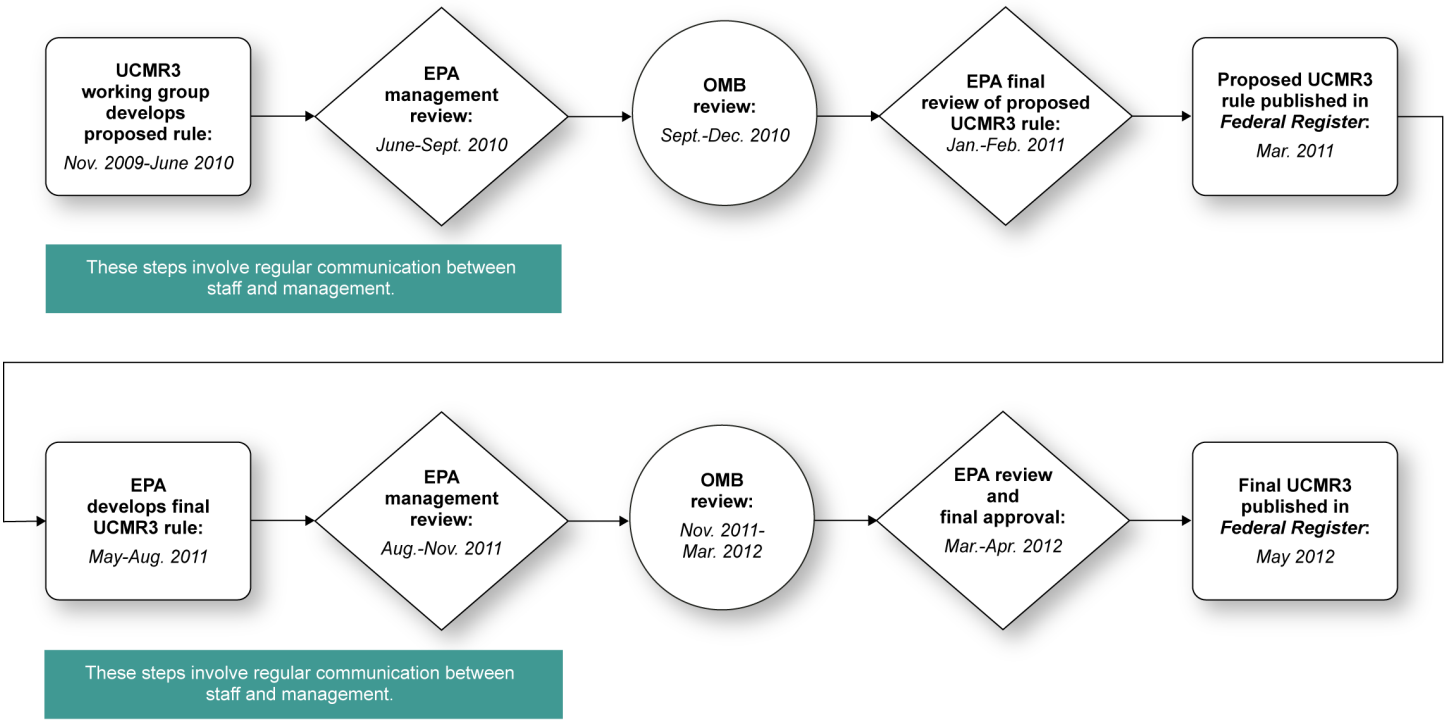
[39]A contaminant of emerging concern is a contaminant characterized by a perceived, potential or real threat to human health or the environment or by lack of published health standards.

[40]Environmental Protection Agency, "Revisions to the Unregulated Contaminant Monitoring Regulation (UCMR 3) for Public Water Systems," Proposed Rule, 76 Fed. Reg. 11,713 (Mar. 3, 2011).

[41]EPA's Office of Science and Technology, part of the Office of Water, provides scientific support for drinking water regulatory determinations, information for drinking water health advisories, and other human health risk assessments, among other duties.

UCMR3. After the working group discussed the list of contaminants, the Technical Support Center submitted the proposed and final UCMR contaminant lists and associated rules to EPA management for their review. The EPA internal reviews involved different offices within EPA, including the Office of the EPA Administrator. EPA also submitted the proposed and final UCMR lists and rules to the Office of Management and Budget (OMB) for its review. On March 3, 2011, EPA published a proposed list of 30 contaminants and the associated rule in the *Federal Register*. EPA published the final UCMR3 contaminant list and associated rule on May 2, 2012 (see app. II for list of UCMR3 contaminants).

Figure 2: Contaminant Selection and Rule Development Process for the Third Unregulated Contaminant Monitoring Rule



UCMR = Unregulated Contaminant Monitoring Rule

Source: GAO analysis of EPA information.

The UCMR3 selection process led EPA to select many contaminants from the CCL, EPA's list of the unregulated drinking water contaminants that may require regulation because they are known or anticipated to occur in public water systems. Specifically, 22 of the UCMR3 contaminants were

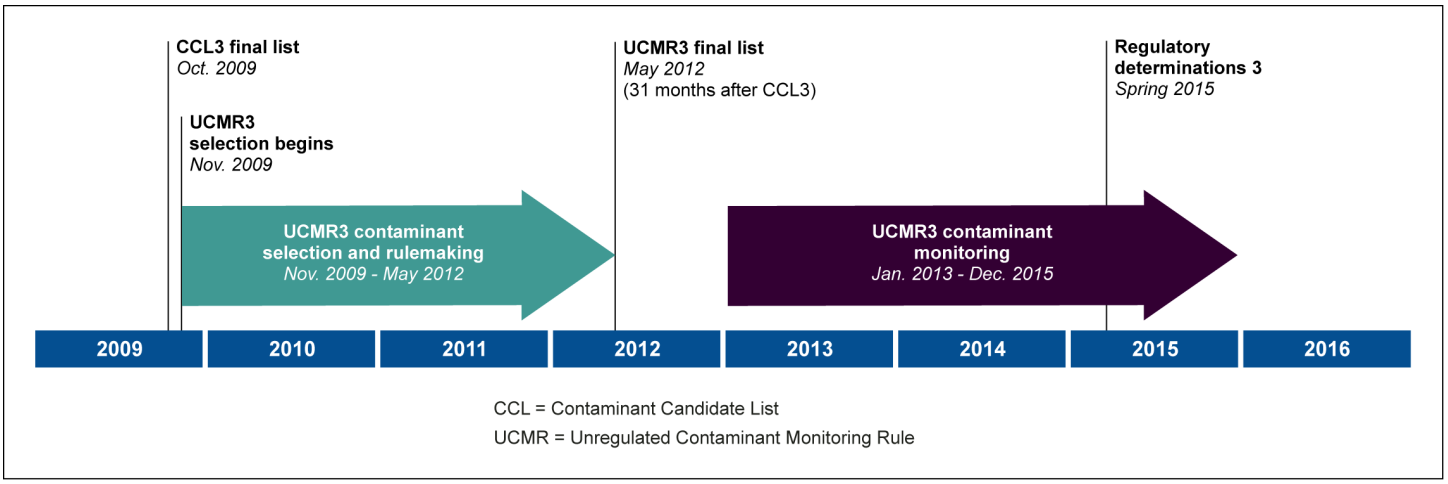
also listed on CCL3. The CCL3 process was developed using substantial expert input and recommendations from various groups, including the National Academy of Science's National Research Council, the National Drinking Water Advisory Council, and EPA's Science Advisory Board, according to EPA documents. In addition, 37 of the 40 experts who participated in our survey said that CCL3 was a reasonable source for EPA to use when it began identifying contaminants for UCMR3. UCMR3 also included 7 contaminants of emerging concern that were not on CCL3, and total chromium.[42] Further, 33 of the 40 experts said it was worthwhile for EPA to select contaminants for the UCMR that are not on the CCL. For example, one expert in our survey told us that including such contaminants is the best way to identify emerging contaminants that come to light between the publication of the CCL and UCMR list. Overall, 30 of the 40 experts who participated in our survey reported that the contaminants EPA selected for UCMR3 warrant monitoring.

Contaminant Selection Process Was Lengthy

EPA's UCMR3 contaminant selection and rule development process took more than 2 ½ years to complete. EPA started the formal UCMR3 selection process in November 2009 but did not publish the final UCMR3 list until May 2012. SDWA specifies that EPA publish a new UCMR list every 5 years. Whereas EPA's previous list was issued in 2007, it met the 5-year time frame required by SDWA. However, the UCMR program is no longer staggered 18 months after the CCL, as SDWA intended. Rather, UCMR3 was issued 31 months after CCL3. Based on the length of its process, EPA would have had to begin selecting contaminants in September 2008 to have issued UCMR3 within 18 months of CCL3. Further, EPA cannot implement the UCMR program until it publishes the final UCMR list and rule in the *Federal Register*, which delays the onset of the data collection period. This delay, in turn, delays the availability of the UCMR data for making regulatory determinations (see fig. 3).

[42] Total chromium, while already regulated in drinking water, was included in conjunction with UCMR3 monitoring to determine its relationship with chromium-6, a contaminant of emerging concern.

Figure 3: UCMR3 Timeline



Source: GAO.

The UCMR3 contaminant selection and rulemaking process concluded 31 months after the CCL was issued primarily because EPA waited to initiate its working group until CCL3 was finalized, and the EPA and OMB reviews were lengthy. First, EPA's UCMR3 working group did not begin its work until November 2009, after the final CCL3 had been published in October 2009. EPA officials told us that discussions about potential contaminants for UCMR3 and analytical methods that were likely to be available to detect them began earlier, but they waited until November 2009 to begin the formal selection process, in part, because of staffing needs. The staff who developed UCMR3 were also coordinating and providing technical support to the public water systems that were monitoring for contaminants under UCMR2, which took place between January 2008 and December 2010. In addition, CCL staff serve on the UCMR working group, and UCMR staff also serve on the CCL working group, which EPA officials told us limits their availability. Second, EPA internal reviews, OMB reviews, and the revisions to the UCMR3 proposed and final rules prompted by the reviewers' comments added 16 months in total to the process. However, these reviews are not always required for this type of activity, according to agency guidance. Specifically, EPA's UCMR is conducted under the agency's Action Development Process, a process used for developing rules. The agency incorporated EPA management and OMB reviews into their process; however, these

reviews are not always required for a program like the UCMR, according to agency guidance, as stated earlier.[43]

In addition, the EPA analytical method development process is complex, technically challenging and lengthy, which agency officials also told us presents a challenge for EPA to meet its deadline. EPA officials said it typically takes 1 to 2 years to develop a standard method that meets the requirements needed for the UCMR program and up to 3 years or longer for more complex methods. In addition, EPA generally has not used a specific analytical method in more than one UCMR cycle, although some of those older methods could be used to monitor unregulated contaminants for which EPA does not yet have UCMR occurrence data. For example, an analytical method used under UCMR1 could have detected seven CCL3 contaminants, but this method was not included in UCMR3. According to industry organizations and EPA officials, EPA did not formally reach out to stakeholders when developing analytical methods for UCMR 1, 2, or 3. However, EPA is formally reaching out to stakeholders to get their input on the development of analytical methods that may be used for UCMR4. In May 2013, EPA held a public meeting and webinar to provide stakeholders with an update on analytical methods that EPA has completed or has under development for potential use in the UCMR program and requested input from attendees to help address some of the technical challenges it faces.

Statutory Cap of 30 Contaminants Limits EPA's Ability to Obtain Additional Data at Little Extra Cost

The statutory cap limiting the UCMR program to 30 unregulated contaminants every 5 years (i.e., each UCMR cycle) impedes EPA's ability to obtain occurrence data on additional contaminants that could be monitored for little additional effort or cost. Many of the analytical methods that EPA is using for UCMR3 are able to test a single sample of drinking water for more than one contaminant at a time. Therefore, data on additional contaminants could be obtained without additional sampling by the public water systems. EPA is allowing laboratories to use eight EPA-developed analytical methods to test for UCMR3 contaminants and four methods developed by others. These methods can detect a total of 67 unregulated contaminants, including 4 listed on CCL3 and 8 contaminants of emerging concern, according to our analysis of EPA data. There is

[43]EPA classified the UCMR program as a Tier 3 action under its Action Development Process. Tier 3 actions allow the lead office to design their own review processes and do not require formal EPA management reviews or OMB reviews.

broad recognition throughout the federal government that agencies need to operate programs efficiently and maximize efficiencies when possible.[44] In addition, EPA officials who use the UCMR data to make regulatory determinations, while sensitive to the practical limitations of monitoring for additional contaminants, said that it would be helpful to have additional UCMR data if a method already in use for UCMR could detect the occurrence of additional contaminants. However, because of the SDWA limit of 30 contaminants, EPA cannot always take advantage of this efficiency and is unable to gain economies of scale by monitoring for additional contaminants using monitoring that is already under way.

Specifically, our analysis indicates that four CCL3 chemicals—1,1,1,2-Tetrachloroethane; n-propylbenzene; sec-butylbenzene; and methyl tertiary-butyl ether (MTBE)—could have been detected using one of the UCMR3 analytical methods. As noted earlier, CCL3 represents EPA's list of the unregulated drinking water contaminants that may require regulation because they are known or anticipated to occur in public water systems. EPA had included n-propylbenzene and sec-butylbenzene in the proposed list of UCMR3 contaminants, but it did not include them on the final UCMR3. Instead, EPA included chromium-6, as well as total chromium, which EPA stated became higher priorities for monitoring for the agency. Public comments on the draft UCMR3 list also supported monitoring these two contaminants. EPA's Standards and Risk Reduction Branch, which develops the regulatory determinations, supported the inclusion of the two chromiums, as did a majority of the experts who participated in our survey (35 of 40 supported adding chromium-6 and 28 of 40 supported adding total chromium). However, by including these two higher priority contaminants, EPA removed two others in light of the cap of 30 contaminants and could not take advantage of economies of scale by using a method already selected for UCMR3 to obtain additional data. In addition, MTBE could also have been monitored using the same method. However, EPA officials told us they decided not to include MTBE, which was monitored under UCMR1, because they did not need

[44]Given continuing budget pressures combined with the focus on performance envisioned in the GPRA Modernization Act of 2010, we have reported that federal agencies need to identify ways to operate more efficiently. We have defined efficiency as maintaining federal government services or outcomes using fewer resources (such as time and money) or improving or increasing the quality or quantity of services or outcomes while maintaining (or reducing) resources. See GAO, *Streamlining Government: Key Practices from Select Efficiency Initiatives Should be Shared Governmentwide*, GAO-11-908 (Washington, D.C.: Sept. 30, 2011).

additional information about it. As noted earlier, the priorities of EPA's Standards and Risk Reduction Branch are a key selection factor for which contaminants to include on the UCMR. In the absence of the limit of 30, EPA would have had an opportunity to monitor for these CCL3 chemicals, as well as 1,1,1,2-Tetrachloroethane, as part of UCMR3 at nominal extra cost. EPA officials told us that adding a contaminant to an ongoing analysis typically costs about $5 to $10.

Similarly, our analysis indicates that eight contaminants of emerging concern known as perfluorinated chemicals, or PFCs, could also have been detected by the same analytical method that EPA is using to monitor six other PFCs (see table 5).[45] In 2009, EPA published an action plan to address some of these chemicals, which the agency describes as persistent in the environment and in people.[46] This action plan also states that it can reasonably be anticipated that continued exposure to PFCs could harm human health. Due to industry's increasing use of various PFCs, EPA included six of the chemicals identified in this plan in UCMR3, according to EPA officials. However, according to our analysis, five additional PFCs from the plan are among the eight that could have been detected using the same analytical method but are not on UCMR3. EPA selected the six PFCs it thought most important, but the statutory limit of 30 contaminants curtailed EPA's opportunity to gather occurrence data on eight additional contaminants of emerging concern at little additional cost or effort. EPA could have included the additional PFCs in UCMR3 but doing so would have reduced the number of contaminants selected from CCL3, EPA's list of the unregulated drinking water contaminants that may require regulation because they are known or anticipated to occur in public water systems. Nonetheless, the agency will not have UCMR data on whether or not those eight contaminants are present in the nation's drinking water until the next UCMR cycle at the very earliest; UCMR4 data collection is expected to be completed in 2021. However, EPA has not decided which contaminants will be monitored under UCMR4, and so it remains to be seen if they are included.

[45]PFCs are man-made chemicals that are used in a wide variety of industrial and commercial products. EPA has reported that PFCs have significant adverse effects on laboratory animals and wildlife and anticipates that continued exposure to PFCs could result in adverse effects on humans.

[46]Environmental Protection Agency, *Long-Chain Perfluorinated Chemical's (PFCs) Action Plan* (Washington, D.C.: Dec. 30, 2009).

Table 5: Contaminants of Emerging Concern Detectable with an Analytical Method Already in Use

Contaminants of emerging concern
N-Ethyl perfluorooctanesulfonamido acetic acid
N-Methyl perfluorooctanesulfonamido acetic acid
Perfluorodecanoic acid
Perfluorododecanoic acid
Perfluorohexanoic acid
Perfluorotetradecanoic acid
Perfluorotridecanoic acid
Perfluoroundecanoic acid

Source: GAO analysis of EPA data.

Note: All of the contaminants of emerging concern listed in this table are perfluorinated chemicals, or PFCs. PFCs are man-made chemicals that are used in a wide variety of industrial and commercial products. EPA has reported that PFCs have significant adverse effects on laboratory animals and wildlife and anticipates that continued exposure to PFCs could result in adverse effects on humans.

The legislative history of the SDWA Amendments of 1996 generally noted concerns with the financial limitations of public water systems and their abilities to absorb costs for activities such as monitoring. While the number of contaminants being monitored is a factor, costs related to analytical methods, such as laboratory equipment and labor, are key cost drivers for UCMR monitoring, according to EPA officials. EPA officials told us that they carefully consider the cost on public water systems when selecting analytical methods for the UCMR program. In addition, EPA pays for some of the small public water systems' monitoring and must stay within its budget for those costs.[47] EPA documentation indicates that UCMR3 will generally cost public water systems $50 to $470 per water sample, per analytical method. EPA officials told us that the cost to detect additional contaminants for an analytical method already in use was nominal—typically about $5 to $10 per water sample, per contaminant. Thus, the cost of adding contaminants to an analytical method that is already being used would likely pose only a modest cost increase for public water systems.

[47]EPA has funded the small public water system's UCMR monitoring from EPA's State Revolving Fund appropriation.

UCMR3 Excludes Previously Monitored Contaminants

One of EPA's key selection factors for UCMR3 involved generally eliminating contaminants that were monitored under a prior UCMR round,[48] but by eliminating those contaminants, EPA may encounter data limitations because (1) the sampling methodology was not sufficient, (2) the health information has been updated, or (3) the data have become outdated.

Sampling methodology. One of the sampling methodologies EPA used in a prior UCMR did not provide sufficient occurrence data to make regulatory determinations for some contaminants, according to EPA's regulatory determinations for the CCL2 contaminants.[49] Specifically, UCMR1 used a limited sample size of 300 public water systems for the 14 contaminants it monitored using the screening survey approach. This resulted in occurrence data for some contaminants that, according to EPA documents, were not sufficient to make a national estimate. In its July 2008 Regulatory Determination notice, EPA found that a total of 12 contaminants monitored under UCMR1 had insufficient occurrence data for making national estimates. Three of those contaminants are also listed on CCL3—the pesticides disulfoton, diuron, and terbufos. By applying the UCMR selection factor to eliminate contaminants monitored under previous UCMR rounds, EPA did not consider remonitoring these contaminants in UCMR3, even though EPA previously found the existing data were not sufficient to make national estimates of contaminant occurrence. However, 31 of the 40 experts who participated in our survey said it would be worthwhile to monitor UCMR contaminants again if they had insufficient data due to the sampling size.

According to EPA's notice in the *Federal Register* for UCMR1, EPA's original intent was to use the screening survey as a first indicator of potential contamination and then to remonitor the contaminants again using assessment monitoring to obtain nationally representative results if the contaminants occurred frequently enough in drinking water to warrant

[48]EPA has only once remonitored for a contaminant: namely, the pesticide acetochlor, which was monitored under UCMR1 and UCMR2. MTBE was monitored under UCMR1 and was considered for, but not included, in UCMR3. EPA's practice when selecting contaminants for UCMR3 was to exclude those monitored under a prior UCMR, as stated in the *Federal Register*.

[49]Environmental Protection Agency, "Drinking Water: Regulatory Determinations Regarding Contaminants on the Second Drinking Water Contaminant Candidate List," Final Rule, 73 Fed. Reg. 44,251 (July 30, 2008).

doing so.[50] However, EPA officials told us they later determined that this approach was not feasible because of the time it required and did not follow through with its plan to remonitor the UCMR1 contaminants. For the UCMR2 and UCMR3 cycles, EPA revised its approach and increased the screening survey sample size from 300 to 800. Specifically, under UCMR1, the screening survey included a sample of 300 public water systems.[51] Under UCMR2 and UCMR3, the screening survey included a sample of 800 public water systems and all of the systems serving more than 100,000 people, for a total of approximately 1,200 systems.[52] This increase allowed EPA to make nationally representative estimates based on the occurrence data.

Health effects information. According to EPA officials, health effects information for unregulated contaminants is often uncertain and in flux because research is often being conducted at the same time UCMR monitoring is occurring. Those officials said the new research sometimes indicates that health effects occur at lower levels of exposure than previously thought. In recognition of this, EPA set the monitoring levels, or MRLs, for UCMR3 based on how low the analytical method could reliably measure specific contaminants, as reported earlier. However, EPA previously set the MRLs for UCMR1 and UCMR2 with consideration of the levels of public health concern that were known at the time. In May 2011, we reported that EPA set the MRLs for some of the UCMR1 and UCMR2 contaminants before it had developed the health reference levels for those contaminants. EPA subsequently determined that those MRLs exceeded the health reference levels. As a result, occurrence of those contaminants at a level higher than the health reference level but lower than the MRL might not have been detected, and UCMR1 and UCMR2 occurrence data might not accurately capture the risk these contaminants pose to public health. Similarly, if the health effects information about the UCMR1 and UCMR2 contaminants changes in the future, EPA may not

[50]Environmental Protection Agency, "Revisions to the Unregulated Contaminant Monitoring Regulation for Public Water Systems," Final Rule, 64 Fed. Reg. 50,556, 50,568 (Sept. 17, 1999).

[51]The 300 public water systems included 120 systems serving more than 10,000 people and 180 systems serving 10,000 or fewer people.

[52]The 800 public water systems included 320 systems serving 10,001 to 100,000 people; and a representative sample of 480 systems serving 10,000 or fewer people. Approximately 400 systems serve more than 100,000 people.

have the data it needs to support regulatory determinations. Thirty-two of the 40 experts who participated in our survey said it would be worthwhile to monitor again for UCMR1 and UCMR2 contaminants if new health effects information becomes available.

Age of data. The UCMR data estimated contaminant occurrence at the time that they were collected. Due to changing industrial and agricultural chemical use and environmental conditions, UCMR data may not present an accurate picture of current contaminant occurrence after several years. In particular, the UCMR1 data, which were collected from 2001 to 2003, are now over 10 years old. Nineteen of the 40 experts who participated in our survey said that UCMR data this old are not likely to be a reliable indicator of the frequency and level of drinking water contamination, and 18 said they did not have enough information to judge how long the UCMR data are likely to be a reliable indicator. EPA officials and experts told us the shelf life of the UCMR data generally depends on the type of contaminant and whether its use is likely to have changed over time. According to the officials, concentrations of naturally occurring contaminants remain relatively constant in drinking water over time but concentrations of pesticides and industrial chemicals are subject to change. While some of the UCMR1 data may still be a reliable indicator of contaminant occurrence, several of the UCMR1 contaminants are pesticides and industrial chemicals and the extent of their use has changed since the UCMR data were collected. For example, use of the pesticides disulfoton and molinate effectively ended following EPA actions in 2009 and 2004, respectively.[53] Use of the pesticides terbufos and diuron also decreased significantly from 2003 to 2009, according to USGS data. In addition, use of two industrial chemicals, MTBE and nitrobenzene, decreased over time, according to EPA data. MTBE, a former gasoline additive, has not been used in significant quantities since 2005. Nitrobenzene use has fluctuated over time but decreased sharply from 1998 to 2005.[54] Because the UCMR1 data estimate contamination at a point in time prior to these changes, they likely overestimate current levels of contaminant occurrence.

[53]In 2009, EPA cancelled the registration for disulfoton. In 2004, EPA cancelled certain uses of molinate. Molinate is still registered but, as of 2012, there were no active uses, according to EPA documents.

[54]EPA's data do not indicate whether the decrease in nitrobenzene use occurred before, during, or after the UCMR1 data were collected.

EPA might choose not to make regulatory determinations on some contaminants if it concludes that the available occurrence data do not provide sufficient support, as it did for several contaminants in 2008. As we reported in May 2011, EPA did not make regulatory determinations for some contaminants monitored under a prior UCMR round because the occurrence data were not sufficient to do so.[55] SDWA requires EPA to use the best available data,[56] but by not remonitoring contaminants when appropriate, such as when the data collected in an earlier cycle have become outdated, EPA may not have sufficient data to support its regulatory determinations. SDWA does not prohibit EPA from remonitoring UCMR contaminants; therefore, the agency has the option to do so, for example when it believes that remonitoring would provide better support for its regulatory determinations. EPA officials told us that when developing future UCMRs, they will consider whether adequate occurrence data for a contaminant had already been collected under a prior UCMR, rather than generally eliminating all previously monitored contaminants as part of its contaminants selection process. They also said that if the officials who make the regulatory determinations asked for a contaminant to be remonitored, they would consider doing so.

[55] In May 2011, we reported that EPA had not defined what data are adequate to support a regulatory determination. In that report, we also recommended that EPA develop guidance for making regulatory determinations that included factors for determining when data provide adequate support. In its response to the recommendation, EPA stated that it did not believe establishing such guidance was practicable, given the many combinations of health effects factors and potential ranges of frequencies and levels of contaminants measured in drinking water.

[56] SDWA requires EPA, in carrying out the provisions concerning listing, selecting, and regulating contaminants, to the degree that an action is based on science, to use the best available peer-reviewed science and data collected by accepted or best available methods.

UCMR Data Support Regulatory Determinations, but Time Lag Results in Delays and Reliance on Older Data

EPA uses the UCMR data to support regulatory determinations but faces a time lag when doing so. Agency officials told us UCMR data are EPA's primary source of data on the occurrence of unregulated contaminants in drinking water and are a key input for regulatory determinations. However, by the time the complete set of UCMR data is available, the recurring 5-year deadline SDWA established for making at least 5 regulatory determinations has passed, leading EPA, in some cases, to rely on older data that may no longer accurately reflect current contaminant occurrence in drinking water.[57]

UCMR Data Are EPA's Primary Occurrence Data Source and a Key Input for Regulatory Determinations

EPA uses the UCMR data, along with information about the contaminants' health effects and other information, to make regulatory determinations—that is, decisions on whether or not new primary drinking water standards are needed for particular unregulated contaminants. Regulatory determinations can be positive (i.e., a new primary standard is needed) or negative (i.e., no new primary standard is needed).[58] While SDWA requires EPA to make regulatory determinations for at least five CCL contaminants every 5 years, EPA officials told us their goal is to make as many regulatory determinations as possible, given the available data.[59] EPA used UCMR1 data to support 9 of the 11 regulatory determinations it made in 2008 for the CCL2 contaminants and another regulatory determination in 2011. It is currently using UCMR1 and UCMR2 data to inform its regulatory determinations for the CCL3 contaminants, which EPA expects to issue in 2015. The complete UCMR3 data set will not be available until after those regulatory determinations have been issued. However, if the timing allows, EPA officials told us they may have an opportunity to use a partial UCMR3 data set to corroborate other data they have on contaminant occurrence when making the final regulatory determinations.

[57]SDWA requires EPA to make at least 5 regulatory determinations every 5 years, and hence we refer to the 5-year mark as a "deadline." See 42 U.S.C. § 300g-1(b)(1)(B)(ii)(I) (2013).

[58]EPA has made 20 negative regulatory determinations and 1 positive regulatory determination (perchlorate) since the SDWA Amendments of 1996 established the UCMR program.

[59]EPA also needs information on a contaminant's health effects to make a regulatory determination. In 2011, GAO reported that EPA did not have health effects information for many of the contaminants on the CCL, which limited EPA's ability to make regulatory determinations. See GAO-11-254.

EPA officials told us that, when they are available, UCMR data are EPA's primary data source on unregulated contaminants in drinking water because they allow EPA to make national estimates of drinking water contamination, as discussed earlier in this report. EPA also has data on unregulated contaminants from other sources, such as USGS and some states, but those data do not provide nationally representative estimates of drinking water contamination. For example, the USGS data estimate contamination in source water (i.e., untreated water from rivers, lakes, and groundwater aquifers). Since source water can become public drinking water, the USGS data can indicate potential drinking water contamination. However, these data do not provide conclusive information on whether contamination is occurring in public water systems. EPA officials told us they use the other data to provide additional support for regulatory determinations, but they generally do not provide sufficient support on their own. In contrast, the UCMR data are generally sufficient for estimating nationwide occurrence of drinking water contamination, with the exceptions noted earlier in this report. In addition, 35 of the 40 experts who participated in our survey said that the UCMR program has been an effective way to collect sufficient data to determine whether contamination is occurring frequently and at levels of public health concern in drinking water. Several experts provided additional comments on the overall effectiveness of the UCMR program. For example, one expert said that considering the great need for data and EPA's limited resources, the UCMR program has been one of the more effective tools in the agency's rule development process. Another expert said that, given statutory requirements, resources, and data availability, EPA has done an admirable job with the UCMR program. Finally, one expert said that the UCMR program has been an effective way to remove contaminants from the radar screen when they did not warrant regulation.

Time Lag Delays Regulatory Determinations by a Full 5-Year Cycle and Results in the Use of Older Data

A time lag between the SDWA deadline for regulatory determinations and the UCMR data's availability typically delays determinations on given contaminants by a full 5-year cycle. SDWA sets deadlines for publishing the CCL and UCMR contaminant list and making regulatory determinations, but it does not set a deadline for monitoring the UCMR contaminants. SDWA established recurring 5-year deadlines for making regulatory determinations and for publishing the UCMR list. EPA has established a 3-year monitoring period for the UCMR, but this overlaps with the time frame during which EPA makes its regulatory

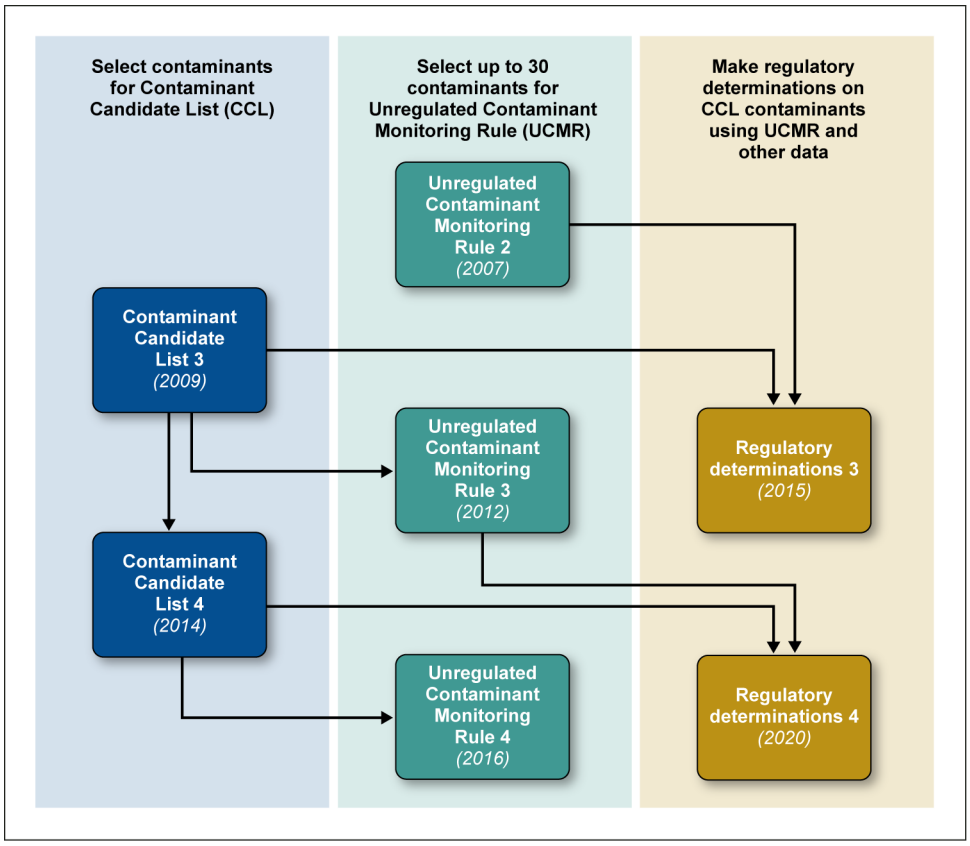
determinations. EPA also uses some older data that may no longer accurately reflect current contaminant occurrence in drinking water when it is making regulatory determinations.[60]

Time Lag Typically Delays Regulatory Determinations for Contaminants by a Full 5-Year Cycle

A time lag between the statutory deadline for regulatory determinations and the UCMR data's availability typically delays regulatory determinations on given contaminants until the following cycle. SDWA directs EPA to publish a new CCL, UCMR, and set of regulatory determinations every 5 years, as described earlier in this report. The initial timeline staggered the deadlines such that EPA was required to publish the UCMR list 18 months after the CCL and issue the regulatory determinations 2 years after that. However, in practice, the 2-year window SDWA set from the time EPA publishes the UCMR list to when it makes regulatory determinations has not provided enough time for the agency to monitor the contaminants and incorporate the UCMR data into the determinations. Consequently, UCMR data are not available for EPA to make regulatory determinations for contaminants during the cycle in which they are monitored; rather, UCMR data for contaminants in one cycle typically are not used until the next cycle or later (see fig. 4).

[60]In its comments on a draft of this report, EPA noted that the agency makes judgments on a case by case basis to determine whether data are too old.

Figure 4: UCMR Data Do Not Inform Regulatory Determinations in the Same Cycle



Source: GAO analysis of EPA data.

EPA officials told us that the timing of the UCMR program is a key challenge, particularly in relation to the timing of the CCL and regulatory determination deadlines. Since the UCMR program began, the full UCMR data set has not been available until a year or more after EPA made its regulatory determinations for the same 5-year cycle. The time lag is influenced by the recurring 5-year deadlines for the CCL, UCMR, and regulatory determinations and increased when EPA missed the deadlines for CCL2 and UCMR2. As a result, UCMR2 data were not available until nearly 3 years after EPA made the regulatory determinations for the CCL2 contaminants. When EPA missed the UCMR2 deadline, subsequent deadlines were moved to a later date, consistent with the 5-

year cycle established by SDWA.[61] Accordingly, the UCMR3 data will lag behind the regulatory determinations for the CCL3 contaminants by over a year. Based on EPA's current schedules for the three programs, the UCMR4 data will likewise lag behind the regulatory determinations for the CCL4 contaminants. EPA's schedule indicates that the agency plans to make regulatory determinations for the CCL4 contaminants in spring 2020 and complete UCMR4 monitoring in December 2020, with the full UCMR4 data set available in 2021. Without congressional action to make the time frames more realistic, the time lag and resultant delays are expected to continue in subsequent cycles.

Three-Year Monitoring Period Contributes to Time Lag

EPA has established a 3-year monitoring period for the UCMR, which contributes to the time lag between the SDWA deadline for regulatory determinations and the UCMR data's availability. Before the monitoring period begins, EPA spends about 1 year preparing for the monitoring that public water systems will conduct. During this time, EPA finalizes the monitoring schedules for systems that will be participating in the program and approves the laboratories that will conduct the analyses, among other things. Each public water system monitors for contaminants during a 12-month window throughout the 3-year period that follows. EPA officials told us they spend up to 1 year finalizing the data collection and analysis, which includes about 6 months for public water systems and laboratories to report, review, and approve their data.[62] The UCMR3 monitoring, data collection, and analysis overlap with the time frame during which EPA will be making its regulatory determinations for contaminants on CCL3. UCMR3 monitoring is occurring from January 2013 through December 2015. Regulatory determinations for the CCL3 contaminants are expected in spring 2015, according to agency officials.[63] Officials who make the regulatory determinations told us that it is helpful to have the UCMR data

[61]SDWA limits EPA to listing no more than 30 contaminants every 5 years and, as a result, EPA cannot accelerate the UCMR schedule by issuing the next list earlier–that is, before 5 years from the last one–under current law. Each time EPA publishes a UCMR list or set of regulatory determinations, the agency adds 5 years to determine its next deadline.

[62]EPA had considered shortening the time to report, review, and approve the data by about half (90 days total) but decided not to, based on public comments on the proposed UCMR3 rule and OMB's review of the final rule.

[63]Final regulatory determinations for the CCL3 contaminants were originally expected to be published in 2013, according to EPA documents. However, EPA officials told us they have been delayed until 2015 for reasons unrelated to the UCMR program.

about 2 years before publishing the final regulatory determinations. They also told us they start using the data once about 70 percent of the data set is available, approximately 2 years into the 3-year monitoring period. For example, EPA began using the UCMR1 data set to inform its internal deliberations on the regulatory determinations for CCL2 after about 70 percent of the data were available, according to agency officials. The officials said that by this time in the data collection period they saw very little variation in contaminant occurrence (i.e., the data were relatively stable).

EPA officials told us they selected the 3-year monitoring period mainly for logistical reasons impacting the agency and the public water systems. They told us that the 3-year monitoring period spreads the agency's work out over a more manageable period of time. EPA staff provide technical support to the public water systems conducting the monitoring, and many also have other responsibilities, according to EPA officials. The 3-year monitoring period also provides public water systems with more flexibility to decide when they will start monitoring. EPA officials told us that, after the agency publishes the final UCMR in the *Federal Register*, they assign each system a month and year to start monitoring. However, some systems request a later start date to incorporate the monitoring into their budgets and operations, according to agency officials. EPA officials also said laboratory capacity is sufficient under the 3-year period and has approved 53 laboratories to participate in UCMR3. EPA officials had told us that about 15 laboratories could probably handle the analytical work for UCMR3, therefore, laboratory capacity may be sufficient under a shorter monitoring period. Officials also told us that the 3-year monitoring period is not a given. For example, officials told us that a 2-year monitoring period, while challenging, may be possible for future cycles, but they would have to evaluate the shorter time frame in detail to determine its feasibility.

UCMR program officials also told us that monitoring over 3 years is intended to allow them to account for the effects that extreme weather in a given season could have on the data. They told us they did not know whether a shorter monitoring period, such as a 2-year period, would also allow them to do this because the extent of seasonal variability in the UCMR program is unknown. However, they did not expect that a shorter monitoring period would address variability to the same extent that the current 3-year monitoring period would because the longer period of time provides greater opportunity to detect it. Nonetheless, as reported earlier, EPA officials who make the regulatory determinations observed very few changes in occurrence trends after about 70 percent of the UCMR data

had been collected, about 2 years into the 3-year monitoring period. When asked, experts who participated in our survey had mixed views on whether a 2-year monitoring period would be likely to provide EPA with sufficient information on seasonal fluctuations.[64] Specifically, 19 of 40 respondents thought that it was likely to, 11 thought it was not likely to, and 9 said they did not have enough information to judge. The UCMR3 data set may provide EPA with information that it can use to assess the extent of seasonal variability, according to agency officials. Because UCMR3 is monitoring for contaminants at low MRLs, it will likely have a higher rate of detections than prior UCMRs and, therefore, more data points that EPA can use to detect seasonal variability that it would have missed in the past. EPA could use this information to help it understand the extent of seasonal variability and the feasibility of a shorter monitoring period.

EPA Uses Occurrence Data from Previous UCMR Cycles When Current Data Are Not Available

EPA has adapted to the time lag by using UCMR data from previous cycles to make regulatory determinations. For example, EPA is using UCMR1 and UCMR2 data to make regulatory determinations for the CCL3 contaminants.[65] Similarly, EPA used UCMR1 data to make regulatory determinations for the CCL2 contaminants. Because EPA has carried over many contaminants from one CCL to the next, officials told us this is a workable approach.[66] However, more than half of the experts (25 of 40) who participated in our survey did not think using data from a prior UCMR cycle was an effective strategy for making regulatory determinations. Many of those experts were concerned because the time lag delays regulatory determinations on given contaminants and leads EPA to use older data that may not reflect current contaminant occurrence in some cases. The time lag delays regulatory determinations on contaminants by at least one 5-year cycle, and sometimes longer. EPA officials told us that most of the UCMR3 data will be used to support regulatory determinations for the CCL4 contaminants, which are expected

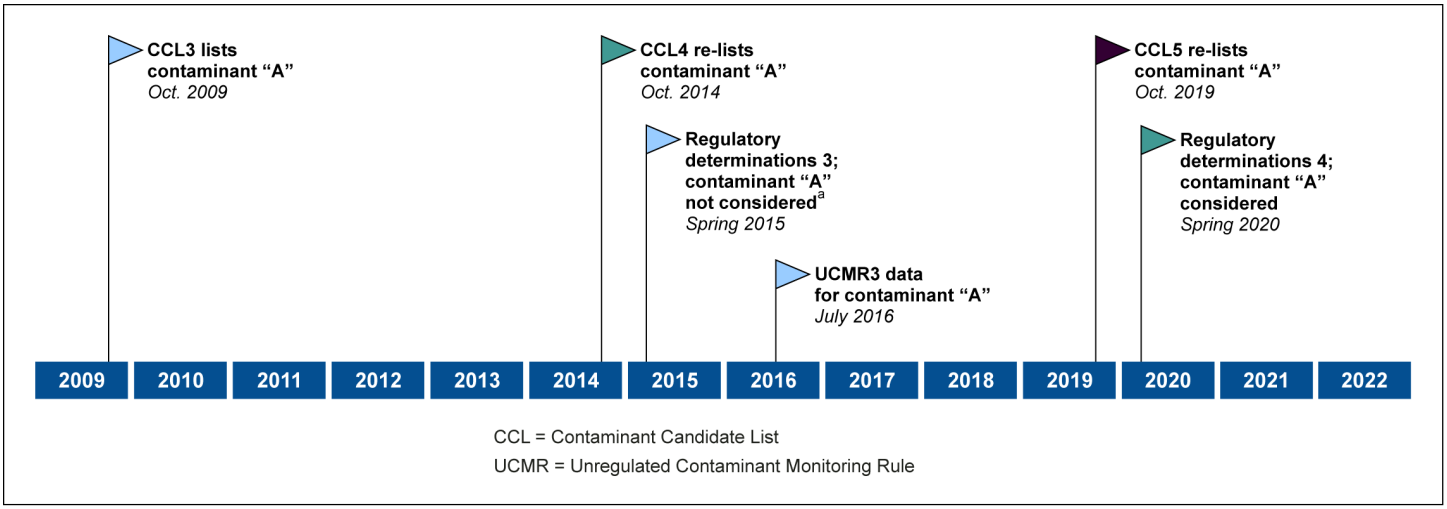
[64]Survey on EPA's Unregulated Contaminant Monitoring Program, Question 19B: For the 30 contaminants being monitored under UCMR-3, would a 2-year monitoring timeframe instead of the 3-year timeframe be likely to provide EPA sufficient information on seasonal fluctuations in contaminant occurrence? (See app. IV for full survey.)

[65]As noted earlier, EPA may have an opportunity to use partial UCMR3 data to inform its CCL3 regulatory determinations, but not enough UCMR3 data will be available to serve as a primary source.

[66]Eighteen of the contaminants on CCL3 were carried over from CCL1 and CCL2.

to be issued in 2020. Those UCMR3 contaminants that are carried over to CCL4 will wait about 10 years for regulatory determinations unless EPA uses data from another source or makes an out-of-cycle regulatory determination (see fig. 5).[67]

Figure 5: About 10 Years Typically Pass before Regulatory Determinations Are Made for Contaminants on the CCL



Source: GAO analysis of EPA data.

[a]Contaminant "A" not considered because UCMR data are not yet available.

Regulatory determinations on given contaminants can also take longer to make. For example, 11 of the contaminants EPA included on a short list of potential regulatory determinations for CCL3[68] were first listed on CCL1 in March 1998.[69] By the time EPA makes its regulatory determinations, about 17 years will have passed since they were identified as contaminants known or anticipated to occur in public water systems. In addition, there are six contaminants that EPA carried over from CCL1 to

[67]EPA can make regulatory determinations outside of the 5-year cycle but has done so only once. In 2011, EPA made an out of cycle determination to regulate perchlorate.

[68]Environmental Protection Agency, "Regulatory Determinations for the Third Drinking Water Contaminant Candidate List, Presentation for Stakeholder Meeting" (Washington, D.C.: June 16, 2011).

[69]EPA first listed these contaminants on CCL1 and carried them over to CCL2 and CCL3. They are (1) acetochlor, (2) alachlor ESA, (3) disulfoton, (4) diuron, (5) MTBE, (6) metolachlor, (7) molinate, (8) nitrobenzene, (9) RDX, (10) terbufos, and (11) vanadium.

CCL3 that it has not yet included in a regulatory determinations cycle. UCMR data are not yet available for any of them, although two—methyl bromide and 1,1-dichloroethane—are currently being monitored under UCMR3.[70] Methyl bromide is a pesticide that was phased out of use in 2005; 1,1,-dichloroethane is an industrial chemical. Due to the time lag, EPA's first use of the UCMR3 data for these CCL1 contaminants will likely be when it makes the regulatory determinations for CCL4.[71] This is about 22 years after they were first identified on the CCL as unregulated contaminants that are known or anticipated to occur in public water systems and may require regulation.

EPA is also using some older UCMR data that may not accurately reflect current contaminant occurrence in drinking water to make regulatory determinations, according to agency documents. Specifically, 6 of the 32 contaminants EPA included on its short list of potential regulatory determinations for CCL3 were monitored from 2001 to 2003 under UCMR1.[72] EPA officials told us that one of the reasons the UCMR1 data were not used for the regulatory determinations it issued in 2008 was because health effects information on some of the contaminants was not available.[73] EPA's July 2008 regulatory determinations indicate that there were health effects information gaps for 3 of the 6 contaminants.[74] As noted earlier in the report, the UCMR1 data are now over 10 years old and may not accurately reflect current levels of drinking water contamination in some cases. In particular, the 6 UCMR1 contaminants on EPA's short list are industrial chemicals and pesticides, and the extent

[70]The other four contaminants are microbes and have not been monitored yet because EPA does not have analytical methods available for them. Methyl bromide is listed by the name bromomethane in UCMR3.

[71]While EPA is authorized to make regulatory determinations outside of the 5-year cycle, in practice, it has done so only once.

[72]These contaminants are (1) disulfoton, (2) diuron, (3) MTBE, (4) molinate, (5) nitrobenzene, and (6) terbufos.

[73]We have previously reported that gaps in health effects data limit EPA's ability to make regulatory determinations and recommended that EPA develop a coordinated process for obtaining the necessary health effects and occurrence data. EPA's response to our recommendation did not acknowledge that any further steps are needed. See GAO-11-254.

[74]Environmental Protection Agency, "Drinking Water: Regulatory Determinations Regarding Contaminants on the Second Drinking Water Contaminant Candidate List," 73 Fed. Reg. 44,251 (July 30, 2008).

of their use has changed since the UCMR data were collected, as described earlier. Four of the 6 contaminants are pesticides: disulfoton, molinate, terbufos, and diuron. The other 2 contaminants are industrial chemicals: MTBE and nitrobenzene. Further, in its July 2008 Regulatory Determination notice, EPA stated that it had insufficient occurrence data for making national estimates of disulfoton, diuron, and terbufos contamination. Occurrence data had been collected on those contaminants under UCMR1 but, as discussed earlier in this report, the sampling methodology used was not sufficient. EPA has not collected new occurrence data on the contaminants since then. As a result, the older data may not provide an accurate basis for EPA to use when making regulatory determinations.

Conclusions

The overall goal of SDWA is to ensure that public drinking water is safe. The UCMR program is an important component of EPA's implementation of the act. As EPA's primary data source for assessing the nation's potential exposure to unregulated contaminants and the levels of that exposure, the UCMR plays a key role in EPA's regulatory development process. As a result, the accuracy and timeliness of the data it provides are important to support informed decision making. The technical changes EPA has made to UCMR3 in response to our 2011 recommendations are significant improvements over prior UCMR cycles. First, by more fully utilizing its statutory authority and monitoring for 30 contaminants under UCMR3, EPA has increased the productivity of the UCMR program. As a result, more data will be available to inform regulatory determinations in the future. Second, by increasing the sample size of the public water systems monitoring under the screening survey approach, EPA has also increased the statistical strength of its monitoring results. The larger sample size should allow EPA to make better estimates of exposure to drinking water contaminants. Third, by monitoring for contaminants at lower detection levels, or MRLs, the UCMR3 data are more likely to remain useful even in light of new information about the contaminants' health effects in the future.

However, some statutory provisions pose limitations for obtaining additional and more timely data. First, because SDWA caps the number of UCMR contaminants in each 5-year cycle at 30, the agency is not able to take advantage of economies of scale by collecting occurrence data on additional contaminants. As a result, EPA does not have the opportunity to collect data on additional unregulated contaminants at little additional effort and cost to the agency or the public water systems. The cost to detect additional contaminants with analytical methods already being

used by the UCMR program can be nominal. Second, the 2-year window SDWA initially established from the time EPA publishes the UCMR list to when it publishes the regulatory determinations does not provide adequate time for the UCMR data to support regulatory determinations in the same cycle. As a practical matter, the time frames SDWA initially established are not adequate to provide enough time for UCMR's data collection period and EPA's subsequent use of the data. As a result, regulatory determinations on given contaminants are typically delayed by a full 5-year cycle, meaning that about 10 years pass from when EPA identifies them on the CCL as potential problems and decides whether they need to be regulated. Two contaminants—methyl bromide and 1,1-dichloroethane—will likely wait 22 years after their initial listing for regulatory determinations. Without congressional action to make the statutory time frames more realistic, the time lag and resultant delays are expected to continue in subsequent cycles.

The UCMR program faces other limitations that may cause EPA to base its regulatory determinations on inaccurate or outdated information. In particular, EPA's standard monitoring frequency may not be accurately estimating the occurrence of certain contaminants in the public's drinking water, particularly those that occur sporadically like viruses or seasonally like pesticides. By not varying the monitoring frequency for contaminants when appropriate, for example by increasing the frequency during the months when EPA expects viruses to be present, the UCMR data may not provide reliable estimates of contaminant occurrence. Similarly, by not remonitoring contaminants from prior UCMR cycles when appropriate, EPA may not have sufficient data to support its regulatory determinations. EPA continues to use data from past UCMR cycles to inform its regulatory determinations, but those data sets have potential limitations. For example, EPA previously determined that some of the data collected under UCMR1 were not sufficient to make national estimates of contaminant occurrence. Because EPA has not remonitored those contaminants, the agency still does not have sufficient UCMR data about them. Similarly, some of the UCMR1 data may be outdated due to changing industrial and agricultural chemical use and environmental conditions. As a result, the existing UCMR data for certain contaminants may no longer accurately reflect current drinking water conditions. We are encouraged by recent statements from EPA officials indicating that they will consider whether adequate occurrence data for a contaminant had already been collected under a prior UCMR when selecting contaminants in the future. Finally, the timing of the UCMR program significantly reduces the availability of the data to support regulatory determinations. Specifically, the time lines for the contaminant selection process and

monitoring period do not get the UCMR data into the hands of EPA officials in time to support regulatory determinations in the same cycle. The UCMR data are EPA's preferred source of information on contaminant occurrence because the program has been specifically designed to yield nationally representative estimates of drinking water contamination. However, if the UCMR data are not available, EPA either must use data from another source, or delay making regulatory determinations on specific contaminants. For most of the UCMR3 contaminants, over 10 years are likely to pass between the time that EPA first listed contaminants on CCL3 in 2009 and the time that regulatory determinations are made for those contaminants, expected in 2020. The SDWA deadlines, EPA's lengthy contaminant selection process, and its 3-year monitoring period all contribute to the time lag. As stated earlier, to change the statutory deadlines and adjust the time frames requires congressional action, and shortening the selection process and monitoring period requires EPA action. UCMR program officials coordinate closely with the other two EPA offices that make regulatory determinations and develop the CCL and are sensitive to the impact that timeliness has on each of these processes. We recognize that EPA officials must consider a variety of data quality objectives, logistical needs, and the burden on public water systems in managing the UCMR program, regulatory determinations, and CCL. But, since EPA officials consider the UCMR data to be their primary source of occurrence data for the regulatory determinations, it is important that these data also be timely. However, without a coordinated effort to address the time lag, most contaminants on the CCL will continue to wait 10 years or longer for a regulatory determination.

Matters for Congressional Consideration

- To take advantage of opportunities to collect UCMR data on additional unregulated contaminants, Congress should consider amending SDWA to give EPA the flexibility to select more than 30 contaminants for monitoring under the UCMR program if high-priority contaminants, such as those on the CCL or contaminants of emerging concern, can be included at minimal cost, with minimal additional burden on public water systems, and while using analytical methods that EPA is already employing.

- To optimize the ability of the UCMR data to support regulatory determinations, Congress should consider adjusting the statutory time frames for the UCMR and regulatory determinations cycles so that EPA can use the UCMR data to support regulatory determinations in the same cycle.

Recommendations for Executive Action

We recommend that the Administrator of the Environmental Protection Agency direct the Assistant Administrator of the Office of Water to take the following three actions:

- To help ensure that the UCMR data accurately reflect contaminant occurrence, vary the monitoring frequency for public water systems when the standard UCMR monitoring frequency is not expected to accurately detect the presence of contaminants, such as sporadically occurring viruses or pesticides that fluctuate seasonally.

- To help address potential limitations with the UCMR data, when considering if adequate data had been collected under a prior UCMR during the contaminant selection process, take into account whether:
  - the sampling methodology EPA used in a prior UCMR for a particular contaminant provided sufficient occurrence data to make a regulatory determination,
  - the contaminant's health information is in flux or has been updated and now indicates that adverse health effects occur at a lower level than that at which UCMR data were originally collected, or
  - the data collected in an earlier cycle have become outdated and no longer present an accurate picture of contaminant occurrence, for example, because industrial or agricultural chemical use has changed.

- To optimize the ability of the UCMR program to support regulatory determinations, convene an internal working group of officials responsible for the UCMR, regulatory determinations, and CCL to fully examine opportunities to improve the timeliness of the UCMR program. Among other things, the working group should consider:
  - whether a shorter process for selecting contaminants would yield a high-quality list, or whether the existing process can be started sooner, and
  - whether monitoring for contaminants over a shorter period, instead of the current 3-year period, is feasible, given data quality, logistical needs, and the burden on public water systems.

Agency Comments

We provided EPA with a draft of this report for its review and comment. In written comments, reproduced in appendix VI, EPA generally agreed with our findings and conclusions and is committed to implementing our recommendations when it develops the next UCMR.

EPA also provided technical comments, which we incorporated as appropriate.

As agreed with your offices, unless you publically announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to the Administrator of EPA and the appropriate congressional committees. In addition, this report will be available at no charge on the GAO website at http://www.gao.gov.

If you or your staff members have any questions about this report, please contact me at (202) 512-3841or gomezj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to the report are listed in appendix VII.

J. Alfredo Gómez
Director, Natural Resources and Environment

Appendix I: Objectives, Scope, and Methodology

This report addressed the following objectives (1) evaluate the extent to which the Environmental Protection Agency (EPA) implemented the recommendations GAO made in 2011 to improve the Unregulated Contaminant Monitoring Rule (UCMR) program and any opportunities that may exist to strengthen it further; (2) identify the factors EPA considered when it selected the contaminants for monitoring under UCMR3 and the limitations, if any, that EPA faced in selecting the contaminants; and (3) examine the extent to which UCMR data support EPA's regulatory determinations.

To obtain information for each of our objectives on issues related to monitoring unregulated drinking water contaminants, we surveyed a broad range of experts in two rounds using the Delphi method. The Delphi method consists of surveying experts in two or more rounds to obtain group agreement or consensus on key topics. For this report, the first round of the survey was comprised of open-ended questions that asked experts to provide their views on the strengths and weaknesses of EPA's UCMR program, as well as suggestions for improving the program. The second round included primarily closed-ended questions developed from our content analysis of the first round survey responses. To identify experts for the first round of the survey, we reviewed public comments provided on EPA's proposed rules for its Contaminant Candidate Lists (CCL), UCMR, and preliminary regulatory determinations. We also reviewed public nominations of drinking water contaminants submitted to EPA and EPA documentation on two expert panels it convened to provide input and review of chemical and microbial contaminants for CCL3. We identified 14 experts from academia, an analytical laboratory, environmental advocacy organizations, professional associations, water utilities, and federal and state government agencies. These experts were selected based on their demonstrated familiarity with EPA's CCL, UCMR, and regulatory determination processes. The first round of the survey—which ran from December 12, 2012 to January 4, 2013—asked these experts to respond to 10 open-ended questions. These questions asked about various aspects of the UCMR program that helped or hindered EPA in (1) selecting priority contaminants, (2) monitoring for selected contaminants, and (3) using the data to support regulatory determinations. We also asked the experts whether programmatic or statutory changes were needed to address any challenges identified. We received responses from 14 of the 14 experts we surveyed in the first round of the survey.

We performed a content analysis of the responses from the first round of the survey to identify the most important issues raised by the experts. We

used the results of the content analysis to develop questions for the second round of the survey. Because this was not a sample survey, it had no sampling errors. However, the practical difficulties of conducting any survey can introduce nonsampling errors, such as difficulties interpreting a particular question, which can introduce unwanted variability into the survey results. We took steps to minimize nonsampling errors by pretesting the questionnaire with five experts. This helped ensure that the questions were clear and unbiased, and that the questionnaire did not place an undue burden on respondents. An independent reviewer within GAO also reviewed a draft of the questionnaire prior to its administration. We made appropriate revisions to the content and format of the second round survey questionnaire based on the pretests and independent review.

To identify experts for the second round of the survey, we developed a preliminary list of experts, which included the 14 experts who completed the first round of the survey and others identified through interviews with stakeholders and our review of public comments provided on EPA's proposed rules. We contracted with the National Academy of Sciences to identify additional experts. We selected 48 experts for the second round of the survey based on their knowledge of one or more of the following topic areas: drinking water, contaminant monitoring, analytical methods, toxicology, risk assessment, and environmental regulation. Similar to the first round of the survey, the selected experts were from academia, analytical laboratories, environmental advocacy organizations, industry, water utilities, and federal and state government agencies. The second round of the survey was administered on the Internet from May 10, 2013 to June 7, 2013. Experts were sent an e-mail invitation to complete the survey on a GAO web server using a unique username and password. To increase the response rate, we followed up with e-mails and personal phone calls to the experts to encourage participation in our survey. The second round of the survey had an 83 percent response rate. We received responses from 40 of 48 experts, including 12 who had also completed round one of the survey. The information that we obtained from the expert survey is not generalizable to all experts that have an interest in or knowledge of drinking water contaminant monitoring issues. The full survey and responses are available in appendix IV. The survey participants are listed in appendix V.

To evaluate the extent to which EPA implemented GAO's May 2011 recommendations to improve the UCMR program, we reviewed EPA's proposed and final rules for the UCMR program and interviewed the relevant EPA officials who are responsible for designing and

implementing the UCMR program to identify specific actions the agency had taken. To identify any opportunities that may exist to strengthen the UCMR program further, we interviewed stakeholders to obtain their perspectives on the UCMR program and related issues. In addition, we assessed EPA's sampling methodology against standard statistical criteria to determine whether the resulting sample sizes are likely to provide EPA with sufficient data for making national estimates of contaminant occurrence and exposure within an acceptable margin of error.

To identify the factors EPA considered when it selected the contaminants for monitoring under UCMR3, we reviewed EPA documentation describing the steps the agency took to select the contaminants, including UCMR3 working group meeting minutes and EPA's proposed and final rules for the UCMR program and the CCL, which serves as EPA's primary basis for selecting UCMR contaminants. We also interviewed EPA officials who are responsible for designing and implementing the UCMR program, including selecting the UCMR contaminants; as well as those responsible for developing the CCL and making regulatory determinations. To identify the limitations, if any, EPA faced in selecting the contaminants, we interviewed stakeholders to obtain their perspectives on the UCMR contaminant selection process and related issues. In addition, we assessed the UCMR contaminant selection process against statutory requirements.

To examine the extent to which UCMR data support EPA's regulatory determinations, we reviewed EPA and Federal Register documents about the use of the data for making the CCL2 and CCL3 regulatory determinations. In addition, we interviewed EPA officials who are responsible for designing and implementing the UCMR program and for making regulatory determinations. We also considered the time frames for implementing the UCMR program and using UCMR data for making regulatory determinations and assessed them against statutory requirements and GAO criteria for program timeliness. There is broad recognition throughout the federal government that, in addition to being effective in producing desired outcomes and other important dimensions of performance, agencies need to operate programs and provide information about them in a timely and efficient manner. For example, the GPRA Modernization Act calls on agencies to set goals and measure their progress toward meeting them. Timeliness is an important dimension of program performance. In addition, EPA initiated a new drinking water strategy in 2010 that recognizes the need to improve the timeliness of its efforts to address unregulated contaminants.

We conducted this performance audit from June 2012 to January 2014 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: UCMR3 Contaminants

Assessment monitoring	
1,4-dioxane	vanadium
molybdenum	strontium
cobalt	chromium 6 (hexavalent chromium)
1,2,3-trichloropropane	total chromium[a]
1,3-butadiene	chlorate
chloromethane (methyl chloride)	perfluorooctanesulfonic acid
1,1-dichloroethane	perfluorooctanoic acid
bromochloromethane (Halon 1011)	perfluorononanoic acid
bromomethane (methyl bromide)	perfluorohexanesulfonic acid
chlorodifluoromethane (HCFC-22)	perfluoroheptanoic acid
	perfluorobutanesulfonic acid
Screening survey	
17-β-estradiol	estriol
17-α-ethynylestradiol (ethinyl estradiol)	equilin
estrone	testosterone
4-androstrene-3,17-dione	
Pre-screen testing	
enteroviruses	noroviruses

Source: UCMR3 final rule.

[a]Total chromium is a regulated contaminant. EPA used a different statutory authority, section 1445(a)(1)(A) of the Safe Water Drinking Act, to require monitoring for total chromium.

Appendix III: Information on Analytical Methods

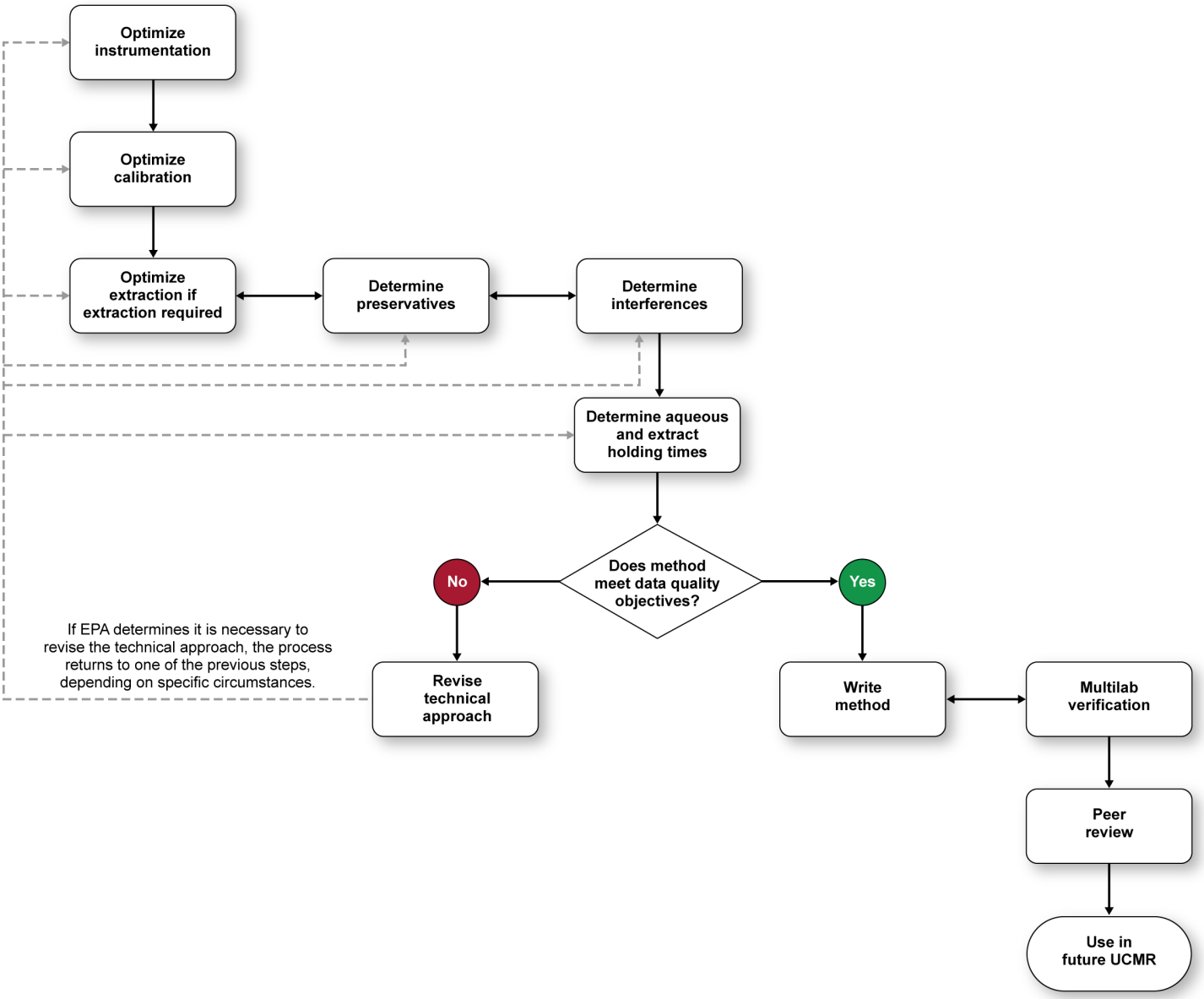
Analytical methods are laboratory tests that measure the level of chemical and microbial contamination in a sample of drinking water. Analytical methods specify the volume of the sample to be tested, laboratory equipment and procedure used to test the sample, and quality control procedures to ensure the test is run correctly. Analytical methods vary based on the type of contaminant; different equipment and techniques are required for analyzing chemicals versus microbes. For example, laboratories use specialized scientific equipment such as gas chromatograph-mass spectrometers (GC-MS) to detect the presence of some chemicals in drinking water.

Because the Unregulated Contaminant Monitoring Rule (UCMR) collects nationwide data, the Environmental Protection Agency's (EPA) goal is to use analytical methods that offer consistent application across the country. To get the data quality and accuracy that EPA needs, the agency uses analytical methods for UCMR that, among other requirements (1) have sufficient "holding times" for shipment of water samples from water utilities to laboratories; (2) can be used by a variety of laboratories with varying levels of expertise; and (3) can be used equally effectively under different drinking water conditions and types.[1] EPA often develops analytical methods for the UCMR program that meet these specific requirements. When EPA develops an analytical method, there are many key steps it follows. EPA begins with optimizing instrumentation and determining the best calibration, which involves setting up the equipment to measure a contaminant at the desired level. Next, EPA staff optimize the solid phase extraction—a process that involves separating compounds that are dissolved or suspended in water from other compounds in the water sample according to their physical and chemical properties in order to isolate the contaminant for analysis. Then, EPA staff determine which preservatives to use that will allow the chemical to be preserved in the water sample. They also determine any interferences– if there are other chemicals or substances in the water sample that may have similar physical and chemical properties and thus interfere with the chemical to be analyzed—and how to address such interferences, if any. Then, EPA staff determine the holding times for the contaminant and the water sample; as noted earlier, EPA must have sufficient "holding times" for shipment of water samples from water utilities to laboratories. These

[1]Drinking water types in the United States include groundwater sources, such as underground aquifers, and surface water sources, such as streams, rivers, and lakes.

holding times must not have any negative impact in quality on the contaminant to be analyzed in the water sample. After following all these steps, if the analytical method meets EPA's data quality objectives, then EPA writes the method so that laboratories across the country can use and follow the EPA instructions to measure the level of contamination in drinking water. EPA then sends the written analytical method to several laboratories to ensure the method works as written; this process is known as a multilab verification process. If the method passes this verification process, then EPA publishes and uses the analytical method in a future UCMR. On the other hand, if the analytical method does not meet the data quality objectives that EPA has set, EPA revises the technical approach in order for the earlier steps in the analysis to lead to a method that meets the data quality objectives. See figure 6.

Figure 6: EPA's Process for Analytical Method Development



UCMR = Unregulated Contaminant Monitoring Rule

Source: GAO analysis of EPA information.

Developing an analytical method can be a complex, technically challenging, and time-consuming process. For example, EPA officials cited challenges for developing methods for some CCL3 contaminants such as the high water solubility of some contaminants, as well as some

contaminants' instability in water. In such cases, EPA cannot keep these contaminants stable in the water samples for the minimum holding times that are required between the collection of samples by public water systems and sending the samples to the laboratories for analysis. For these contaminants, EPA is still working on techniques that will allow the agency to develop an analytical method that works effectively under all the conditions noted above that UCMR analytical methods must meet. EPA officials said it can take 1 to 2 years to develop a standard method that meets their data quality requirements and 2 to 3 years for more complex methods.

Most often, the UCMR program uses EPA analytical methods, but it also allowed some methods developed by others as alternatives for UCMR3. EPA is also using compliance methods in the UCMR3 program. Compliance methods are analytical methods that laboratories are required to use when monitoring for regulated drinking water contaminants. For example, the analytical method for volatile organic compounds that EPA is using for UCMR3 is a compliance method.[2] In addition, EPA involves stakeholders in its development of analytical methods. In May 2013, EPA held a public meeting and webinar to provide stakeholders with an update on analytical methods completed or under development for potential use in the UCMR program. Several external stakeholders participated in the meeting, both in person and via webinar. Some of them provided suggestions to address challenges EPA was facing with certain methods.

[2]Volatile organic compounds, or VOCs, may occur naturally in the environment or occur only as a result of manmade activities; some VOCs have both origins. VOC contamination of drinking water supplies is a human-health concern because many are toxic and are known or suspected human carcinogens. EPA has issued drinking water regulations for eight VOCs.

Appendix IV: Round 2 Survey Questionnaire and Results

The questions we asked experts in Round 2 of our survey are shown below. Our survey was composed of closed- and open-ended questions. In this appendix, we include all the survey questions and aggregate results of responses to the closed-ended questions; we do not provide information on responses provided to the open-ended questions. For a more detailed discussion of our survey methodology, see appendix I. For a list of the experts who completed our survey, see appendix V.

Survey on EPA's Unregulated Contaminant Monitoring Program

U.S. Government Accountability Office

EPA uses the Unregulated Contaminant Monitoring Rule (UCMR) program to collect data for some contaminants that are suspected to be present in drinking water, but do not have health-based standards set under the Safe Drinking Water Act. Under the Safe Drinking Water Act, EPA is responsible for identifying and regulating drinking water contaminants that may pose a public health risk. Specifically, the act directs EPA to:

1. Publish a list every 5 years of contaminants that are a) not currently regulated b) known or anticipated to occur in public water systems and c) may require regulation. EPA has implemented this provision as the Contaminant Candidate List.

2. Establish a program to monitor unregulated contaminants and publish a list every 5 years of up to 30 contaminants to be monitored by public water systems. EPA has implemented this provision as the Unregulated Contaminant Monitoring Rule (UCMR) program.

3. Determine whether or not to regulate at least 5 contaminants included on the list of unregulated contaminants every 5 years. EPA has implemented this provision as the regulatory determination process. The act specifies that EPA shall regulate a drinking water contaminant under certain conditions. To see these conditions, click here. [In the online-version of the survey, this was a live link to the Safe Drinking Water Act requirements for making a regulatory determination.]

Some of the contaminants on the Contaminant Candidate List are monitored under the UCMR. EPA uses the monitoring data, along with information about the contaminants' health effects, to determine whether or not to regulate the contaminants. EPA is currently in its third round of the UCMR program (UCMR-3).

EPA is monitoring 30 contaminants under UCMR-3. Click here to review the list. [In the online-version of the survey this was a live link. See appendix II of this report for a list of the 30 contaminants.]

Section 1: UCMR Program Requirements and Considerations

The Safe Drinking Water Act requires that EPA publish a list of unregulated contaminants that pose the greatest public health concern, are known or anticipated to occur in public water systems, and may require regulation. This is known as the Contaminant Candidate List (CCL).

1. EPA uses the Unregulated Contaminant Monitoring Rule (UCMR) program to collect monitoring data for informing its regulatory determinations about some of the contaminants on the CCL. The Safe Drinking Water Act requires EPA to select contaminants that pose the greatest public health concern for its CCL and for regulatory determinations.

When selecting contaminants for monitoring under the UCMR, should EPA select contaminants that potentially pose the greatest public health concern?

Q1	Frequency	Cumulative Frequency
1-Definitely yes	24	24
2-Probably yes	13	37
3-Probably no	1	38
5-Not enough information to judge	2	40

2. EPA identified the contaminants for its third UCMR list (UCMR-3) largely from contaminants identified in its third Contaminant Candidate List (CCL-3). To create CCL-3, EPA identified about 7,500 contaminants and then analyzed the contaminants' potential to occur in public water systems and to be a public health concern. Based on those criteria, EPA selected 116 contaminants for CCL-3 which it determined pose the greatest public health concern.

Was CCL-3 a reasonable source for EPA to use when it began identifying contaminants for the UCMR-3?

Q2	Frequency	Cumulative Frequency
1-Definitely yes	17	17
2-Probably yes	20	37
3-Probably no	2	39
5-Not enough information to judge	1	40

Please explain your answer to question 2:

[Open ended]

3. The UCMR and CCL are created through separate processes. EPA finalized CCL-3 in 2009, and finalized UCMR-3 in 2012. UCMR-3 includes 22 contaminants from CCL-3 and 8 other contaminants.

If EPA combined the CCL and UCMR contaminant selection processes, would the resulting UCMR list likely be of similar or better quality when compared to the UCMR list created under the current separate processes?

Q3	Frequency	Cumulative Frequency
1-Definitely yes	5	5
2-Probably yes	15	20
3-Probably no	10	30
5-Not enough information to judge	10	40

Please explain your answer to question 3:

[Open ended]

4. The Safe Drinking Water Act requires EPA to issue a new list of contaminants for monitoring under the UCMR every 5 years. Is 5 years enough time to select contaminants and implement a new round of the UCMR program?

Q4	Frequency	Cumulative Frequency
1-Definitely yes	10	10
2-Probably yes	18	28
3-Probably no	10	38
4-Definitely no	2	40

5. For UCMR-3, EPA selected 8 contaminants that were not on CCL-3. Some of these 8 contaminants became priorities between the publication of the CCL-3 and UCMR-3 lists.

Is it worthwhile for EPA to select contaminants for the UCMR when they are not on the CCL?

Q5	Frequency	Cumulative Frequency
1-Definitely yes	20	20
2-Probably yes	13	33
3-Probably no	7	40

6. The UCMR list of contaminants is based largely on the CCL, and UCMR supports regulatory determinations.

Do the 30 contaminants EPA selected warrant being included in UCMR-3? Click here to review the list. [In the online-version of the survey this was a live link. See appendix II of this report for a list of the 30 contaminants.]

Q6	Frequency	Cumulative Frequency
1-Definitely yes	11	11
2-Probably yes	19	30
3-Probably no	3	33
4-Definitely no	3	36
5-Not enough information to judge	1	37
6-No answer	3	40

7. EPA added chromium-6 and total chromium to the UCMR-3 list based largely on the strength of public comments supporting these additions.

7A. Did chromium-6 warrant being included on the UCMR-3 list?

Q7A	Frequency	Cumulative Frequency
1-Definitely yes	19	19
2-Probably yes	16	35
3-Probably no	3	38
5-Not enough information to judge	2	40

7B. Did total chromium warrant being included on the UCMR-3 list?

Q7B	Frequency	Cumulative Frequency
1-Definitely yes	11	11
2-Probably yes	17	28
3-Probably no	8	36
5-Not enough information to judge	4	40

Section 2: Factors EPA Considers when Selecting Contaminants for UCMR

8. One factor EPA considers when selecting contaminants for UCMR is what health effects information is available for the universe of unregulated contaminants.

In general, was enough health effects information available when EPA began selecting contaminants in 2009 to identify contaminants that potentially pose the greatest public health concern?

Q8	Frequency	Cumulative Frequency
1-Definitely yes	2	2
2-Probably yes	14	16
3-Probably no	15	31
4-Definitely no	2	33
5-Not enough information to judge	4	37
6-No answer	3	40

9. EPA also needs health effects information when determining whether or not to regulate a contaminant monitored under UCMR. However, health effects information is often being developed for contaminants at the same time that the UCMR program is collecting data about contaminant occurrence.

Given this situation, is it worthwhile for EPA to select contaminants for UCMR when the health effects information needed to make regulatory determinations is not yet available?

Q9	Frequency	Cumulative Frequency
1-Definitely yes	8	8
2-Probably yes	21	29
3-Probably no	8	37
4-Definitely no	2	39
6-No answer	3	40

10. Another factor EPA considers when selecting contaminants for UCMR is whether or not the contaminant was included in a prior round of UCMR. EPA typically does not select contaminants that were previously included. While this policy reduces the burden on public water systems, there have been situations in which monitoring again could enable EPA to collect better data. The following questions ask about such situations.

10A. In the first round of the UCMR program, the sampling methodology that EPA used to select water systems had limitations, and therefore the program did not provide sufficient data for making decisions about whether or not to regulate some of the contaminants.

Given the tradeoff between burden on water systems and data quality, would it be worthwhile for EPA to consider selecting some of those contaminants again for monitoring under UCMR?

Q10A	Frequency	Cumulative Frequency
1-Definitely yes	15	15
2-Probably yes	16	31
3-Probably no	7	38
4-Definitely no	1	39
5-Not enough information to judge	1	40

10B. In prior rounds of the UCMR program, some of the analytical methods used were not sensitive enough to detect contaminants at EPA's health effects benchmark. More sensitive analytical methods have since become available for some of these contaminants.

Given the tradeoff between burden on water systems and data quality, would it be worthwhile for EPA to consider selecting some of those contaminants again for monitoring under UCMR?

Q10B	Frequency	Cumulative Frequency
1-Definitely yes	18	18
2-Probably yes	16	34
3-Probably no	3	37
5-Not enough information to judge	3	40

10C. New or updated health effects information is now available for some contaminants monitored in prior rounds of the UCMR. The new information indicates that health effects occur at lower concentrations than those previously monitored for.

Given the tradeoff between burden on water systems and data quality, would it be worthwhile for EPA to consider selecting some of those contaminants again for monitoring under UCMR?

Q10C	Frequency	Cumulative Frequency
1-Definitely yes	19	19
2-Probably yes	13	32
3-Probably no	4	36
5-Not enough information to judge	4	40

11. Another factor EPA considers when selecting contaminants for UCMR is whether analytical methods will be available to detect these contaminants in drinking water. EPA typically develops analytical methods for the contaminants it plans to monitor. For UCMR-3, EPA also considered analytical methods that had been developed by Standard Methods and the American Society for Testing and Materials.

For future rounds of UCMR, will it be worthwhile for EPA to reach out to organizations that develop such analytical methods before it selects contaminants?

Q11	Frequency	Cumulative Frequency
1-Definitely yes	32	32
2-Probably yes	8	40

12. Another factor EPA considers when selecting contaminants for UCMR is whether the contaminants are similar to others it will be monitoring. EPA selected 6 contaminants for UCMR-3 primarily because they could be detected by an analytical method that will be used for another UCMR-3 contaminant. These 6 were not on the CCL-3, EPA's primary source for selecting UCMR-3 contaminants.

Is it worthwhile for EPA to select contaminants for the UCMR primarily because they can be detected by an analytical method that will be used for another UCMR contaminant?

Q12	Frequency	Cumulative Frequency
1-Definitely yes	10	10
2-Probably yes	17	27
3-Probably no	12	39
4-Definitely no	1	40

13. Another factor EPA considers when selecting contaminants is stakeholder input. For UCMR-3, EPA convened a State working group, held a public stakeholder meeting, and collected public comments on the proposed rule published in the Federal Register.

Did these means of communication give stakeholders enough opportunity to provide input on the contaminants that EPA selected for UCMR-3?

Q13	Frequency	Cumulative Frequency
1-Definitely yes	10	10
2-Probably yes	23	33
3-Probably no	5	38
4-Definitely no	1	39
5-Not enough information to judge	1	40

14. When EPA develops the CCL it is reviewed by EPA's Science Advisory Board. In addition, EPA solicited additional expert input from the National Drinking Water Advisory Board and from other outside experts when it selected contaminants for the CCL-3.

Should EPA use similar means to obtain additional expert input when it selects contaminants for the UCMR?

Q14	Frequency	Cumulative Frequency
1-Definitely yes	24	24
2-Probably yes	15	39
3-Probably no	1	40

15. In addition to EPA, the US Geological Survey, some states, and other groups generate contaminant occurrence data. EPA reviews some of this other data when selecting the UCMR contaminants.

Is it worthwhile for EPA to consider this other data on contaminant occurrence when it selects contaminants for UCMR?

Q15	Frequency	Cumulative Frequency
1-Definitely yes	32	32
2-Probably yes	7	39
3-Probably no	1	40

Section 3: Collection of Contaminant Occurrence Data through the UCMR Program

16. EPA varies the frequency for monitoring based primarily on the source water type. Under UCMR-3**,** **surface water systems** must monitor for **4** consecutive quarters with sampling events 3 months apart.

Is the requirement that **surface water systems** monitor for **4** consecutive quarters likely to provide EPA sufficient data to determine whether contaminants occur with a frequency and at levels of public health concern?

Q16	Frequency	Cumulative Frequency
1-Definitely yes	1	1
2-Probably yes	26	27
3-Probably no	7	34
4-Definitely no	5	39
5-Not enough information to judge	1	40

Please explain your answer to question 16:

[Open ended]

17. Under UCMR-3, **ground water systems** must monitor **twice** in a 12-month period with sampling events 5-7 months apart.

Is the requirement that **ground water systems** monitor **twice** in a 12-month period likely to provide EPA sufficient data to determine whether contaminants occur with a frequency and at levels of public health concern?

Q17	Frequency	Cumulative Frequency
1-Definitely yes	3	3
2-Probably yes	25	28
3-Probably no	10	38
4-Definitely no	2	40

Please explain your answer to question 17:

[Open ended]

18. Under UCMR-3, **non-disinfecting ground water systems** located in sensitive hydrogeological areas (i.e., karst or fractured bedrock) must monitor **twice** in a 12-month period with sampling events 5-7 months apart for 2 viruses.

Is the requirement that these **non-disinfecting ground water systems** monitor **twice** in a 12-month period likely to provide EPA sufficient data to determine whether the contaminants occur with a frequency and at levels of public health concern?

Q18	Frequency	Cumulative Frequency
2-Probably yes	9	9
3-Probably no	16	25
4-Definitely no	7	32
5-Not enough information to judge	4	36
6-No answer	4	40

Please explain your answer to question 18:

[Open ended]

19. UCMR-3 is a national study with samples taken over 3 years (January 2013 through December 2015) and across all months and seasons to capture seasonal fluctuations in contaminant occurrence.

19A. For the 30 contaminants being monitored under UCMR-3, is this **3-year** monitoring timeframe likely to provide EPA sufficient information on seasonal fluctuations in contaminant occurrence? Click here to review the list of 30 contaminants. [In the online-version of the survey this was a live link. See appendix II of this report for a list of the 30 contaminants.]

Q19A	Frequency	Cumulative Frequency
1-Definitely yes	5	5
2-Probably yes	27	32
3-Probably no	4	36
4-Definitely no	1	37
5-Not enough information to judge	3	40

19B. For the 30 contaminants being monitored under UCMR-3, would a **2-year** monitoring timeframe instead of the **3-year** timeframe be likely to provide EPA sufficient information on seasonal fluctuations in contaminant occurrence?

Q19B	Frequency	Cumulative Frequency
1-Definitely yes	3	3
2-Probably yes	16	19
3-Probably no	9	28
4-Definitely no	2	30
5-Not enough information to judge	9	39
6 – No answer	10	40

20. EPA established a three-tiered strategy for monitoring UCMR contaminants based primarily on the availability of analytical methods. UCMR's Tier I monitoring requires all water systems serving more than 10,000 people and a random sample of 800 water systems serving 10,000 or fewer people to monitor those contaminants that can be detected by analytical methods that are widely used in drinking water laboratories.

Is Tier I monitoring likely to provide EPA sufficient data to determine whether contaminants occur with a frequency and at levels of public health concern?

Q20	Frequency	Cumulative Frequency
1-Definitely yes	4	4
2-Probably yes	27	31
3-Probably no	3	34
5-Not enough information to judge	4	38
6-No answer	2	40

21. UCMR's Tier II monitoring requires all water systems serving more than 100,000 people, 320 randomly selected water systems serving 10,001 to 100,000 people, and 480 randomly selected water systems serving 10,000 or fewer people to monitor those contaminants that can be detected by newly developed analytical methods that are used in fewer drinking water laboratories.

Is Tier II monitoring likely to provide EPA sufficient data to determine whether contaminants occur with a frequency and at levels of public health concern?

Q21	Frequency	Cumulative Frequency
1-Definitely yes	1	1
2-Probably yes	25	26
3-Probably no	8	34
5-Not enough information to judge	4	38
6-No answer	2	40

22. UCMR's Tier III monitoring requires a random sample of 800 non-disinfecting ground water systems located in sensitive hydrogeological areas (i.e., karst or fractured bedrock) to monitor those contaminants that can be detected by very new or specialized analytical methods that are used in a small set of drinking water laboratories.

Is Tier III monitoring likely to provide EPA sufficient data to determine whether contaminants occur with a frequency and at levels of public health concern?

Q22	Frequency	Cumulative Frequency
1-Definitely yes	1	1
2-Probably yes	17	18
3-Probably no	11	29
4-Definitely no	2	31
5-Not enough information to judge	8	39
6-No answer	1	40

23. Overall, is the three-tiered monitoring strategy described in questions 20-22, which varies the number and size of water systems based on the availability of analytical methods, likely to provide EPA sufficient data to determine whether contaminants occur with a frequency and at levels of public health concern?

Q23	Frequency	Cumulative Frequency
2-Probably yes	26	26
3-Probably no	5	31
4-Definitely no	1	32
5-Not enough information to judge	6	38
6-No answer	2	40

Please explain your answer to question 23:

[Open ended]

24. Under UCMR-3, systems must monitor for 5 pathogen indicators. This monitoring will be conducted in conjunction with virus monitoring of enterovirus and norovirus.

The pathogen indicators are: Total coliforms, *E. coli*, *Enterococci,* Bacteriophage, and Aerobic spores.

Is this type of monitoring likely to help EPA better understand the co-occurrence of pathogen indicators and viruses?

Q24	Frequency	Cumulative Frequency
1-Definitely yes	9	9
2-Probably yes	21	30
3-Probably no	3	33
4-Definitely no	1	34
5-Not enough information to judge	3	37
6-No answer	3	40

25. Under UCMR-3, systems must monitor for total chromium in conjunction with chromium-6.

25A. Is this type of monitoring likely to provide EPA with valuable information on the co-occurrence of total chromium and chromium-6?

Q25A	Frequency	Cumulative Frequency
1-Definitely yes	14	14
2-Probably yes	20	34
3-Probably no	2	36
5-Not enough information to judge	3	39
6-No answer	1	40

25B. Is this type of monitoring likely to provide EPA with valuable information on the usefulness of monitoring for total chromium as an indicator for chromium-6?

Q25B	Frequency	Cumulative Frequency
1-Definitely yes	7	7
2-Probably yes	19	26
3-Probably no	8	34
4-Definitely no	2	36
5-Not enough information to judge	3	39
6-No answer	1	40

Section 4: Use of the UCMR Contaminant Occurrence Data

26. EPA uses UCMR data to make regulatory determinations for some of the contaminants listed on the CCL. Due to a time lag, the UCMR-3 occurrence data will not be available to inform the regulatory determinations about the contaminants on CCL-3. As a result, EPA is using occurrence data from prior UCMRs to inform these regulatory determinations. CCL-3 includes 28 contaminants monitored under prior UCMRs.

Is this likely to be an effective strategy for making regulatory determinations, given the time lag?

Q26	Frequency	Cumulative Frequency
1-Definitely yes	1	1
2-Probably yes	9	10
3-Probably no	18	28
4-Definitely no	7	35
5-Not enough information to judge	4	39
6-No answer	1	40

Please explain your answer to question 26:

[Open ended]

27. Sometimes EPA waits several years before it uses the UCMR occurrence data to inform its regulatory determinations.

After the UCMR occurrence data has been collected, about how long is it likely to be a reliable indicator of the frequency and level of drinking water contamination?

Q27	Frequency	Cumulative Frequency
b.-Less than 5 years	11	11
c.-5 to less than 11 years	8	19
d.-11 to less than 16 years	2	21
e.-16 to less than 20 years	1	22
g.-Not enough information to judge	18	40

28. The primary purpose of the UCMR program is to collect contaminant occurrence data for informing regulatory determinations which are based, in part, on the frequency and level of drinking water contamination.

Overall, how effective has the UCMR program been at collecting sufficient data to determine whether contaminants occur with a frequency and at levels of public health concern?

Q28	Frequency	Cumulative Frequency
1-Very effective	9	9
2-Somewhat effective	26	35
3-Not effective	1	36
4-Not enough information to judge	3	39
5-No answer	1	40

29. Another purpose of the UCMR program is to inform EPA's development of future CCLs. EPA expects to complete its data collection and analysis for UCMR-3 in 2016; it expects to finalize its next CCL in 2014.

Given the tradeoff between data completeness and timeliness, would it be worthwhile for EPA to use partial UCMR data to inform its next CCL?

Q29	Frequency	Cumulative Frequency
1-Definitely yes	11	11
2-Probably yes	24	35
3-Probably no	5	40

30. An additional purpose of the UCMR program is to inform EPA's health research planning. For example, EPA might prioritize the completion of health effects information for a specific contaminant over others if it believes the contaminant is likely to be found in drinking water. EPA expects to complete its data collection and analysis for UCMR-3 in 2016; its health research planning is on-going.

Given the tradeoff between data completeness and timeliness, would it be worthwhile for EPA to use partial UCMR data to inform its health research planning?

Q30	Frequency	Cumulative Frequency
1-Definitely yes	16	16
2-Probably yes	20	36
3-Probably no	2	38
5-Not enough information to judge	2	40

IMPORTANT: Please continue to the next screen to submit your final responses to GAO.

Submit Your Final Responses to GAO

31. Are you ready to submit your final completed survey to GAO?

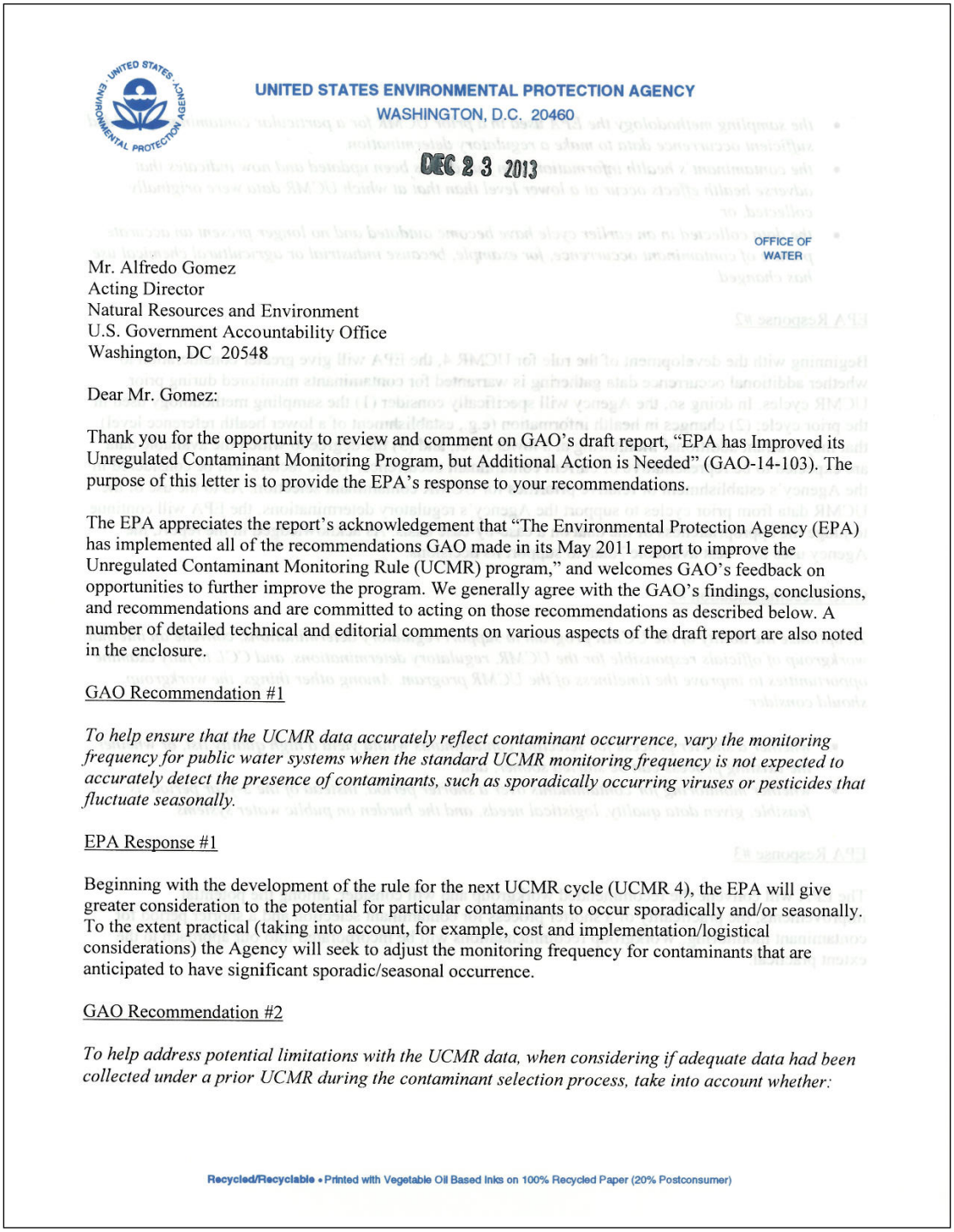
(This is equivalent to mailing a completed paper survey to us. It tells us that your answers are official and final.)

- ☐ Yes, my survey is complete - To submit your final responses, please click on "Exit" below
- ☐ No, my survey is not yet complete - To save your responses for later, please click on "Exit" below

Appendix V: List of Experts Who Completed the Surveys

Scott Biernat, Association of Metropolitan Water Agencies
Melissa Billman, Fairfax Water Utility
Danielle Blacet, Association of California Water Agencies
Mark Borchardt, Ph.D., U.S. Department of Agriculture
Bryan Brooks, Ph.D., Baylor University
Gary Burlingame, Philadelphia Water Department
Peter L. deFur, Ph.D., Environmental Stewardship Concepts
Gregory Delzer, U.S. Geological Survey
Andy Eaton, Ph.D., Eurofins Eaton Analytical, Inc.
Stephen Estes-Smargiassi, Massachusetts Water Resources Authority
Mike Focazio, Ph.D., U.S. Geological Survey
David Fischer, American Chemistry Council
Ann Marie Gebhart, Ph.D., ToxServices LLC
Will Gonzalez, Coachella Valley Water District
Annette Guiseppi-Elie, Ph.D., DuPont
George Hallberg, Ph.D., The Cadmus Group, Inc.
Charles Hertz, Ph.D.,Aqua America, Inc.
Michael Hutcheson, Ph.D., Massachusetts Department of Environmental Protection
Elston Johnson, Texas Commission on Environmental Quality
Todd Johnson, Minnesota Department of Health
Nancy Kim, Ph.D., State University of New York at Albany
Rebecca D. Klaper, Ph.D., University of Wisconsin-Milwaukee
Dana Kolpin, U.S. Geological Survey
John H. Koon, Ph.D., Georgia Technical Institute
Mark LeChevallier, Ph.D., American Water
Gary R. Lynch, Park Water Company
Charles Maddox, Austin Water Utility
David Mazzera, Ph.D., California Department of Public Health
Erik Olson, Pew Charitable Trusts
Darrell Osterhoudt, Association of State Drinking Water Administrators
Rebecca Parkin, Ph.D., George Washington University
Gloria Post, Ph.D., New Jersey Department of Environmental Protection
Alan Roberson, American Water Works Association
Renee Sharp, Environmental Working Group
Mary Skopec, Ph.D., Iowa Department of Natural Resources
Shane Snyder, Ph.D., University of Arizona
Mark D. Sobsey, Ph.D., University of North Carolina at Chapel Hill
Lynn Thorp, Clean Water Action
Patricia Toccalino, Ph.D., U.S. Geological Survey
Lloyd Wilson, Ph.D., New York State Department of Health
Mae Wu, Natural Resources Defense Council
Nira Yamachika, Orange County Water District

Appendix VI: Comments from the Environmental Protection Agency



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

DEC 2 3 2013

OFFICE OF WATER

Mr. Alfredo Gomez
Acting Director
Natural Resources and Environment
U.S. Government Accountability Office
Washington, DC 20548

Dear Mr. Gomez:

Thank you for the opportunity to review and comment on GAO's draft report, "EPA has Improved its Unregulated Contaminant Monitoring Program, but Additional Action is Needed" (GAO-14-103). The purpose of this letter is to provide the EPA's response to your recommendations.

The EPA appreciates the report's acknowledgement that "The Environmental Protection Agency (EPA) has implemented all of the recommendations GAO made in its May 2011 report to improve the Unregulated Contaminant Monitoring Rule (UCMR) program," and welcomes GAO's feedback on opportunities to further improve the program. We generally agree with the GAO's findings, conclusions, and recommendations and are committed to acting on those recommendations as described below. A number of detailed technical and editorial comments on various aspects of the draft report are also noted in the enclosure.

GAO Recommendation #1

To help ensure that the UCMR data accurately reflect contaminant occurrence, vary the monitoring frequency for public water systems when the standard UCMR monitoring frequency is not expected to accurately detect the presence of contaminants, such as sporadically occurring viruses or pesticides that fluctuate seasonally.

EPA Response #1

Beginning with the development of the rule for the next UCMR cycle (UCMR 4), the EPA will give greater consideration to the potential for particular contaminants to occur sporadically and/or seasonally. To the extent practical (taking into account, for example, cost and implementation/logistical considerations) the Agency will seek to adjust the monitoring frequency for contaminants that are anticipated to have significant sporadic/seasonal occurrence.

GAO Recommendation #2

To help address potential limitations with the UCMR data, when considering if adequate data had been collected under a prior UCMR during the contaminant selection process, take into account whether:

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- *the sampling methodology the EPA used in a prior UCMR for a particular contaminant provided sufficient occurrence data to make a regulatory determination,*
- *the contaminant's health information is in flux or has been updated and now indicates that adverse health effects occur at a lower level than that at which UCMR data were originally collected, or*
- *the data collected in an earlier cycle have become outdated and no longer present an accurate picture of contaminant occurrence, for example, because industrial or agricultural chemical use has changed.*

EPA Response #2

Beginning with the development of the rule for UCMR 4, the EPA will give greater consideration to whether additional occurrence data gathering is warranted for contaminants monitored during prior UCMR cycles. In doing so, the Agency will specifically consider (1) the sampling methodology used in the prior cycle; (2) changes in health information (e.g., establishment of a lower health reference level) that may warrant additional monitoring at a lower level; and (3) the degree to which the available data are expected to be representative of current contaminant occurrence. These factors will be considered in the Agency's establishment of relative priorities for UCMR contaminant selection. As to the use of the UCMR data from prior cycles to support the Agency's regulatory determinations, the EPA will continue to judge the appropriateness of the data on a case-by-case basis. As acknowledged in the report, the Agency uses the "best available" data to support its decisions.

GAO Recommendation #3

To optimize the ability of the UCMR program to support regulatory determinations, convene an internal workgroup of officials responsible for the UCMR, regulatory determinations, and CCL to fully examine opportunities to improve the timeliness of the UCMR program. Among other things, the workgroup should consider:

- *whether a shorter process for selecting contaminants would yield a high quality list, or whether the existing process can be started sooner, and*
- *whether monitoring for contaminants over a shorter period, instead of the 3-year period, is feasible, given data quality, logistical needs, and the burden on public water systems.*

EPA Response #3

The EPA will convene the recommended workgroup and will consider, among the potential improvements, the practicality of a shorter process for contaminant selection and a shorter period for contaminant monitoring. Workgroup recommendations will be incorporated into our approach to the extent practical.

Again, we appreciate the opportunity to review the draft report. We also appreciate the constructive recommendations and the professionalism with which the review was conducted. Please direct questions regarding this response to Greg Carroll, carroll.gregory@epa.gov or (513) 569-7948.

Sincerely,

Nancy K. Stoner
Acting Assistant Administrator

Enclosure

Appendix VII: GAO Contact and Staff Acknowledgments

GAO Contact

J. Alfredo Gómez, (202) 512-3841 or gomezj@gao.gov

Staff Acknowledgments

In addition to the individual named above, Diane B. Raynes (Assistant Director), Elizabeth Beardsley, Mark Braza, Justin Fisher, Annamarie Lopata, Rebecca Makar, Christopher Murray, Alison O'Neill, Dan Royer, Kelly Rubin, and Esther Toledo made significant contributions to this report.

Related GAO Products

Chemical Assessments: An Agencywide Strategy May Help EPA Address Unmet Needs for Integrated Risk Information System Assessments. GAO-13-369. Washington, D.C.: May 10, 2013.

Environmental Health: Action Needed to Sustain Agencies' Collaboration on Pharmaceuticals in Drinking Water. GAO-11-346. Washington, D.C.: August 8, 2011.

Safe Drinking Water Act: Improvements in Implementation Are Needed to Better Assure the Public of Safe Drinking Water. GAO-11-803T. Washington, D.C.: July 12, 2011.

Safe Drinking Water Act: EPA Should Improve Implementation of Requirements on Whether to Regulate Additional Contaminants. GAO-11-254. Washington, D.C.: May, 27, 2011.

Perchlorate: Occurrence is Widespread but at Varying Levels; Federal Agencies Have Taken Some Actions to Respond to and Lessen Releases. GAO-10-769. Washington, D.C.: August 12, 2010.

Safe Drinking Water Act: Progress and Future Challenges in Implementing the 1996 Amendments. GAO/RCED-99-31. Washington, D.C.: January 14, 1999.

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