**SUPPLEMENTAL FILES**

**Appendix A. Core Local Health Department Questionnaire**

**Background Information**

1. What is the name of your agency?
2. What is your job title?

**Citizen Science Knowledge and Experiences**

The next several survey questions ask about your familiarity and experience with citizen science in general, and three different types of citizen science activities specifically.

Citizen science is a broad term that covers many different types of activities. It has also been called “public participation in scientific research,” “community science,” and “participatory research.” At its core, citizen science is the use of scientific methods by members of the public to perform research. Examples of citizen science could be community members providing data to the health department or a university for aggregation (crowdsourcing) or community members independently collecting and analyzing data on a public health issue.

1. How familiar are staff members in your agency with the concept of citizen science? If unsure, provide your best guess.
* Extremely familiar
* Moderately familiar
* Somewhat familiar
* Slightly familiar
* Not at all familiar

**Contributory citizen science**

The following section asks about your experiences with contributory citizen science. Contributory citizen science is just one of three types of citizen science we will ask you about in this survey. Contributory citizen science refers to activities initiated by the health department that involve the public as data gatherers only. *Examples include community members carrying air quality sensors that report readings to an online database or the health department crowdsourcing health or environmental observations from volunteers*.

1. In which programs has your agency engaged with contributory citizen science activities? Engaging in activities includes: initiating, implementing, or funding contributory citizen science projects or activities. If you are unsure about activities across programs, provide your best guess. Select all that apply.
* Air quality
* Chronic disease prevention and health promotion
* Drinking water supply & quality
* Emergency preparedness, response, and recovery
* Environmental health & environmental hazards
* Food safety & security
* Health care services
* Healthy aging/elder care
* Housing
* Infectious diseases
* Maternal & child health
* Occupational safety & health
* Public safety
* Recreational water safety
* None
* Don’t know
* Other, please describe:

**Collaborative citizen science**

The following section asks about your experiences with collaborative citizen science. Collaborative citizen science is the second of the three types of citizen science we ask about in this survey. Collaborative citizen science activities are typically initiated or led by health departments or academic experts in partnership with the public. Community members may be involved with problem definition and design, data collection, analysis, or interpretation. *An example of a collaborative citizen science activity is when a health department initiates a mosquito surveillance project and asks community members to help set up, monitor, and analyze data on community mosquito populations or habitats*.

1. In which programs has your agency engaged with collaborative citizen science activities? Engaging in activities includes: initiating, implementing, or funding collaborative citizen science projects or activities. If you are unsure about activities across programs, provide your best guess. Select all that apply.
* Air quality
* Chronic disease prevention and health promotion
* Drinking water supply & quality
* Emergency preparedness, response, and recovery
* Environmental health & environmental hazards
* Food safety & security
* Health care services
* Healthy aging/elder care
* Housing
* Infectious diseases
* Maternal & child health
* Occupational safety & health
* Public safety
* Recreational water safety
* None
* Don’t know
* Other, please describe:

**Community-led citizen science**

The following section asks about your experiences with community-led citizen science. Community-led citizen science is the third of the three types of citizen science we ask about in this survey. Community-led citizen science refers to research or data collection activities controlled and led by community members with little support or input from governmental agencies or academic institutions. Unlike collaborative citizen science, citizens in community-led citizen science retain control over scientific or data collection processes. *An example of a community-led citizen science activity is a mosquito surveillance project initiated, maintained, and controlled by community members*.

1. In which programs has your agency engaged with community-led citizen science activities? Engaging in activities includes: consulting on projects or providing technical support, funding activities, or working with data generated by community-led activities. If you are unsure about activities across programs, provide your best guess. Select all that apply.
* Air quality
* Chronic disease prevention and health promotion
* Drinking water supply & quality
* Emergency preparedness, response, and recovery
* Environmental health & environmental hazards
* Food safety & security
* Health care services
* Healthy aging/elder care
* Housing
* Infectious diseases
* Maternal & child health
* Occupational safety & health
* Public safety
* Recreational water safety
* None
* Don’t know
* Other, please describe:

**Citizen science and health department readiness**

The next several questions will ask about the readiness of your health department to engage with citizen science activities.

1. Please select the box that indicates your agency’s readiness to engage in contributory, collaborative, and community-led forms of citizen science.
* **Contributory citizen science**:activities initiated by the health department or other academic or professional institutions that involve the public as data gatherers only.
* **Collaborative citizen science**: activities initiated or led by the health department or academic/professional experts in partnership with the public where all parties work together to design and implement projects.
* **Community-led citizen science**: research or data collection activities controlled and led by community members independent from governmental agencies or academic institutions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Citizen science activity** | **Not at all ready** | **Not very ready** | **Somewhat ready** | **Fully ready / already doing** |
| Contributory citizen science |  |  |  |  |
| Collaborative citizen science |  |  |  |  |
| Community-led citizen science |  |  |  |  |

1. What resources does your agency need to improve its readiness to engage in citizen science activities? Select all that apply.
* Additional staff
* Staff training/education
* Partnerships with relevant expertise or resources
* Equipment (e.g., software, hardware, mobile technologies, monitoring devices)
* Data infrastructure improvements (e.g., coordinated or interoperable systems, data collection systems or data repositories)
* Budget/money/funding
* Don’t know
* Other, please describe:
1. [If respondent selected “Staff training/education” in Q8] What kinds of trainings or education would help your agency to engage in citizen science activities? Select all that apply.
* Guidance on working with community citizen scientists
* Educational training/materials on working with crowdsourced data
* Software or programming applications
* Statistical analyses
* Community-based participatory research training
* Legal and privacy concerns
* Ethical issues
* Training community members to collect and handle data
* Cultural competence skills development
* Data quality assessment and evaluation
* Data governance (appropriate data use and administrative protocols)
* Volunteer management
* Intersectoral collaboration
* Partnership building
* Other, please describe:
1. Please select the barriers that limit your agency’s ability to implement citizen science activities generally.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Barriers** | **General public health** | **Emergency preparedness** | **Does not apply** | **Don’t know** |
| Short and long-term funding is uncertain. |  |  |  |  |
| We lack adequate LHD manpower/staffing. |  |  |  |  |
| We lack partners with relevant expertise, skills, or resources. |  |  |  |  |
| LHD staff require training  |  |  |  |  |
| Large changes to organizational policies required |  |  |  |  |
| Guidance needed on legal and ethical (e.g., IRB) procedures. |  |  |  |  |
| Activities may conflict with departmental procedures. |  |  |  |  |
| Data quality is a concern. |  |  |  |  |
| Departmental cultures are not receptive. |  |  |  |  |
| Value of citizen science is currently unclear. |  |  |  |  |
| Volunteers require vetting. |  |  |  |  |
| Protection of volunteers is necessary |  |  |  |  |
| Other |  |  |  |  |

1. If you selected Other in Q12 please describe the barriers to implementing citizen science. If you did not select Other, leave this question blank.
2. Please provide the names and a brief description of any citizen science activities your agency has been involved in. If you have heard of citizen science activities carried out in health departments in other jurisdictions please describe those projects as well. If you do not know of any citizen science projects, please write NA or skip this question.

**Citizen science perceptions**

The next several questions will ask about your perceptions of citizen science. Please indicate the extent to which you agree or disagree with each of the following statements.

1. Carrying out scientific research requires formal training and education.
* Strongly Agree
* Agree
* Disagree
* Strongly Disagree
1. Our agency would trust data collected by citizen scientists just as much as data collected by professional scientists.
* Strongly Agree
* Agree
* Disagree
* Strongly Disagree

**Appendix B. Supplementary Local Health Department Module**

**Background Information**

1. Approximately what size population does your agency serve?
* < 25,000
* 25,000-49,999
* 50,000-99,999
* 100,000-249,999
* 250,000-499,999
* 500,000-999,999
* 1,000,000+
1. With respect to emergency planning and response, which of the following disasters has your agency dealt with in the past 5 years? Select all disasters that apply and indicate whether your agency engaged in planning for the disaster, responded to the disaster, or both.

|  |  |  |
| --- | --- | --- |
| **Disasters**  | **Planned for**  | **Responded to** |
| 1. Extreme temperature events
 |  |  |
| 1. Hurricanes
 |  |  |
| c. Tornadoes  |  |  |
| d. Droughts |  |  |
| e. Other severe storms/weather |  |  |
| f. Flooding |  |  |
| g. Earthquakes |  |  |
| h. Mud or landslides |  |  |
| i. Wildfires |  |  |
| j. Harmful algal blooms or other water quality issues |  |  |
| k. Disease outbreaks |  |  |
| l. Vector control (mosquitos, rodents, etc.)  |  |  |
| m. Food safety and defense (e.g. outbreaks)  |  |  |
| n. Water-borne disease |  |  |
| o. Accidental hazardous material / chemical releases or contamination  |  |  |
| p. Accidental nuclear/ radiation releases or contamination |  |  |
| q. Active shooter incidents  |  |  |
| r. Terrorism incidents  |  |  |
| s. All hazards  |  |  |
| t. Other |  |  |

1. If you chose Other in Q4 above, please describe the disaster.

**Citizen Science Knowledge and Experiences**

1. Prior to starting this survey, how familiar were you with the concept of citizen science?
* Extremely familiar
* Moderately familiar
* Somewhat familiar
* Slightly familiar
* Not at all familiar

**Contributory citizen science**

1. How many contributory citizen science activities or projects has your agency ever engaged in? Please provide your best estimate. If none, respond with zero (0).
2. [For respondents checking any program in **Core Question 4**] You indicated that your agency engaged with contributory citizen science activities for the following programs [list checked programs in Core Question 4]. Please select the factors that contributed to the initiation of your agency’s contributory citizen science efforts. Select all that apply.
* Community members indicated problem(s) were a priority
* Problem(s) were a priority of policymakers or other influential parties
* Our agency was interested in and wanted to explore using citizen science methods
* Citizen science methods were the best way to investigate the problem(s) (e.g., needed lots of observations)
* Citizen science methods were the best way to achieve public trust and buy-in of results
* Problem(s) had high visibility in the media
* Don’t know
* Other reasons for initiation, please describe:
1. [For respondents checking any program in **Core Question 4**] You indicated that your agency engaged with contributory citizen science activities for the following programs [list checked programs in Core Question 4]. How has your agency used information resulting from these activities?(If your agency did not end up using any information, check “Did not use.”)Select all that apply.
* Informing the public (public communications)
* Providing education and educational materials
* Supporting community health or needs assessments
* Building or strengthening partnerships
* Setting priorities / departmental planning
* Tracking and monitoring health or environmental conditions
* Research or scientific investigations
* Developing or improving programs, policies, or interventions
* Managing public health responses or interventions
* Regulatory or policy decision-making
* Enforcement actions and decisions
* Evaluation of health department activities and responses
* Too early/we have not used information yet
* Did not use
* Don’t know
* Other uses, please describe. Or use this space to provide comments about your answers.
1. [If respondent responded affirmatively to S7] You indicated that your agency’s engagement with contributory citizen science had resulted in use of the information collected. Please select all factors that contributed to the success of your agency’s contributory citizen science efforts.
* LHD staff were knowledgeable and trained appropriately
* Resources (e.g., time, money, labor) were adequate
* The right partnerships were developed or established
* Clear policies and procedures were established (e.g., administrative, legal, ethical guidelines)
* Efforts had organizational support (e.g., departmental leadership buy-in)
* The right technologies were available
* There was mutual trust between our agency and citizen scientists
* Efforts were led by committed and capable leaders (from our agency, partners, and/or the larger community)
* Citizen scientist volunteer participation was adequate
* Activities had clearly defined goals and approaches
* Results or findings were communicated appropriately
* Too early/we have not used information yet
* Don’t know
* Other contributors to success, please describe:
1. [For respondents checking any program in **Core Question 4**] You indicated that your agency engaged with contributory citizen science activities for the following programs [list checked programs in Core Question 4]. What impacts resulted from your agency’s engagement with contributory citizen science activities? Select all that apply.
* Changes to departmental policies
* New or improved public health programming
* Direct intervention by the health department
* Regulatory changes
* Enhanced agency communication or dissemination efforts
* Enhanced strength or quality of agency partnerships
* Helped secure agency research or program funding
* Increased awareness or knowledge among the public
* Prevented or mitigated adverse events
* No impacts
* Don’t know
* Other impacts, please describe:

**Collaborative citizen science**

1. How many collaborative citizen science activities or projects has your agency ever engaged in? Please provide your best estimate. If none, respond with zero (0).
2. [For respondents checking any program in **Core Question 5**] You indicated that your agency engaged with collaborative citizen science activities for the following programs [list checked programs in Core Question 5]. Please select the factors that contributed to the initiation of your agency’s collaborative citizen science efforts. Select all that apply.
* Community members indicated problem(s) were a priority
* Problem(s) were a priority of policymakers or other influential parties
* Our agency was interested in and wanted to explore using citizen science methods
* Citizen science methods were the best way to investigate the problem(s) (e.g., needed lots of observations)
* Citizen science methods were the best way to achieve public trust and buy-in of results
* Problem(s) had high visibility in the media
* Don’t know
* Other reasons for initiation, please describe:
1. [For respondents checking any program in **Core Question 5**] You indicated that your agency engaged with collaborative citizen science activities for the following programs [list checked programs in Core Question 5]. How has your agency used information resulting from these activities?(If your agency did not end up using any information, check “Did not use.”) Select all that apply.
* Informing the public (public communications)
* Providing education and educational materials
* Supporting community health or needs assessments
* Building or strengthening partnerships
* Setting priorities / departmental planning
* Tracking and monitoring health or environmental conditions
* Research or scientific investigations
* Developing or improving programs, policies, or interventions
* Managing public health responses or interventions
* Regulatory or policy decision-making
* Enforcement actions and decisions
* Evaluation of health department activities and responses
* Too early/we have not used information yet
* Did not use
* Don’t know
* Other uses, please describe. Or use this space to provide comments about your answers.
1. [If respondent responded affirmatively to S12] You indicated that your agency’s engagement with collaborative citizen science had resulted in use of the information collected. Please select all factors that contributed to the success of your agency’s collaborative citizen science efforts.
* LHD staff were knowledgeable and trained appropriately
* Resources (e.g., time, money, labor) were adequate
* The right partnerships were developed or established
* Clear policies and procedures were established (e.g., administrative, legal, ethical guidelines)
* Efforts had organizational support (e.g., departmental leadership buy-in)
* The right technologies were available
* There was mutual trust between our agency and citizen scientists
* Efforts were led by committed and capable leaders (from our agency, partners, and/or the larger community)
* Citizen scientist volunteer participation was adequate
* Activities had clearly defined goals and approaches
* Results or findings were communicated appropriately
* Too early/we have not used information yet
* Don’t know
* Other contributors to success, please describe:
1. [For respondents checking any program in **Core Question 5**] You indicated that your agency engaged with collaborative citizen science activities for the following programs [list checked programs in Core Question 5]. What impacts resulted from your agency’s engagement with collaborative citizen science activities? Select all that apply.
* Changes to departmental policies
* New or improved public health programming
* Direct intervention by the health department
* Regulatory changes
* Enhanced agency communication or dissemination efforts
* Enhanced strength or quality of agency partnerships
* Helped secure agency research or program funding
* Increased awareness or knowledge among the public
* Prevented or mitigated adverse events
* No impacts
* Don’t know
* Other impacts, please describe:

**Community-led citizen science**

1. How many community-led citizen science activities or projects has your agency ever engaged in? Please provide your best estimate. If none, respond with zero (0).
2. [For respondents checking any program in **Core Question 6**] You indicated that your agency engaged with community-led citizen science activities for the following programs [list checked programs in Core Question 6]. Please select the factors that contributed to the initiation of your agency’s community-led citizen science efforts. Select all that apply.
* Community-led activities required our agency to respond
* Our agency wanted to explore working with the community through citizen science
* Community-led citizen science was the best way to achieve public trust and buy-in of results
* Problem(s) were a priority of policymakers or other influential parties
* Problem(s) had high visibility in the media
* Don’t know
* Other reasons for initiation, please describe:
1. [For respondents checking any program in **Core Question 6**] You indicated that your agency engaged with community-led citizen science activities for the following programs [list checked programs in Core Question 6]. How has your agency used information resulting from these activities?(If your agency did not end up using any information, check “Did not use.”)Select all that apply.
* Informing the public (public communications)
* Providing education and educational materials
* Supporting community health or needs assessments
* Building or strengthening partnerships
* Setting priorities / departmental planning
* Tracking and monitoring health or environmental conditions
* Research or scientific investigations
* Developing or improving programs, policies, or interventions
* Managing public health responses or interventions
* Regulatory or policy decision-making
* Enforcement actions and decisions
* Evaluation of health department activities and responses
* Too early/we have not used information yet
* Did not use
* Don’t know
* Other uses, please describe. Or use this space to provide comments about your answers.
1. [If respondent responded affirmatively to S17] You indicated that your agency engaged with community-led citizen science that resulted in use of the information collected. Please select all factors that contributed to the success of your agency’s community-led citizen science efforts.
* LHD staff were knowledgeable and trained appropriately
* Resources (e.g., time, money, labor) were adequate
* The right partnerships were developed or established
* Clear policies and procedures were established (e.g., administrative, legal, ethical guidelines)
* Efforts had organizational support (e.g., departmental leadership buy-in)
* The right technologies were available
* There was mutual trust between our agency and citizen scientists
* Efforts were led by committed and capable leaders (from our agency, partners, and/or the larger community)
* Citizen scientist volunteer participation was adequate
* Activities had clearly defined goals and approaches
* Results or findings were communicated appropriately
* Too early/we have not used information yet
* Don’t know
* Other contributors to success, please describe:
1. [For respondents checking any program in **Core Question 6**] You indicated that your agency engaged with community-led citizen science activities for the following programs [list checked programs in Core Question 6]. What impacts resulted from your agency’s engagement with community-led citizen science activities? Select all that apply.
* Changes to departmental policies
* New or improved public health programming
* Direct intervention by the health department
* Regulatory changes
* Enhanced agency communication or dissemination efforts
* Enhanced strength or quality of agency partnerships
* Helped secure agency research or program funding
* Increased awareness or knowledge among the public
* Prevented or mitigated adverse events
* No impacts
* Don’t know
* Other impacts, please describe:

**Citizen science and health department readiness**

1. Please indicate the strength or quality of your agency's existing partnerships with each organization type. If the organization does not exist within your community service area, check NA. Select one box per row.
* **Very strong relationship**: includes formalized relationships (e.g., MOU, mutual agreement, contract) and/or frequent or regular interactions on an ongoing basis.
* **Moderately strong relationship**: includes periodic interactions on formal or informal levels.
* **Not strong or no relationship**: includes minimal to no interactions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Organizations** | **Very strong** | **Moderately strong** | **Not strong or none** | **NA** |
| Healthcare providers |  |  |  |  |
| Mental/behavioral health providers |  |  |  |  |
| Neighborhood groups/community leaders |  |  |  |  |
| Advocacy groups |  |  |  |  |
| Citizen science or data groups |  |  |  |  |
| Schools and childcare |  |  |  |  |
| Volunteer organizations |  |  |  |  |
| Private business, industry |  |  |  |  |
| Emergency management |  |  |  |  |
| Cultural and faith-based organizations |  |  |  |  |
| Housing and sheltering |  |  |  |  |
| Academic research institutions |  |  |  |  |
| Media |  |  |  |  |
| Social services |  |  |  |  |
| Senior services |  |  |  |  |

1. [For respondents who checked emergency preparedness in **Core Questions 4, 5, or 6** a table will populate with only relevant forms appearing.] You indicated that your agency used either contributory, collaborative, or community-led citizen science for emergency preparedness, response, and recovery actions. We would like to know how health departments use citizen science across the disaster lifecycle (including pre-, during, and post-disaster). For each form of citizen science, what did your agency use resulting information for? If your agency did not use the information, indicate what the information was intended to be used for. Select all that apply.
* **Contributory citizen science**:activities initiated by the health department or other academic or professional institutions that involve the public as data gatherers only.
* **Collaborative citizen science**: activities initiated or led by the health department or academic/professional experts in partnership with the public where all parties work together to design and implement projects.
* **Community-led citizen science**: research or data collection activities controlled and led by community members independent from governmental agencies or academic institutions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Citizen science form** | **Help prepare for a future event**  | **Aid in response efforts during an event** | **Support recovery efforts post-disaster** | **Other, specify below** |
| Contributory citizen science |  |  |  |  |
| Collaborative citizen science |  |  |  |  |
| Community-led citizen science |  |  |  |  |

1. If you selected *Other* in Q30 above, please describe how your agency used citizen science activities for preparedness, response, or recovery efforts.

**Citizen science perceptions**

1. Citizen science is no different from other types of community engagement conducted by our agency.
* Strongly Agree
* Agree
* Disagree
* Strongly Disagree
1. Please select the box that indicates how beneficial the different forms of citizen science could be for your agency in the future. Select one box per row.
* **Contributory citizen science**:activities initiated by the health department or other academic or professional institutions that involve the public as data gatherers only.
* **Collaborative citizen science**: activities initiated or led by the health department or academic/professional experts in partnership with the public where all parties work together to design and implement projects.
* **Community-led citizen science**: research or data collection activities controlled and led by community members independent from governmental agencies or academic institutions.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Citizen science form** | **Not at all beneficial**  | **Slightly beneficial** | **Moderately beneficial** | **Very beneficial** |
| Contributory citizen science |  |  |  |  |
| Collaborative citizen science |  |  |  |  |
| Community-led citizen science |  |  |  |  |

1. Below is a list of potential benefits that could result from citizen science activities. Please choose up to 3 benefits that you believe your agency would consider the most important.
* Improved health department visibility and reputation
* Improved agency responses in terms of programs, policies, and interventions
* Improved agency understanding of the community
* Improved partnerships or collaborative community relationships
* Ability to leverage community resources for public health activities
* Better tracking of new or emerging threats
* Better community understanding of public health messages or risk communications
* Enhanced public scientific literacy and knowledge of public health
* Enhance community resilience and community preparedness for disaster events
* There are no benefits
* Other benefits, please describe:
1. Below is a list of potential concerns with citizen science activities. Please choose up to 3 concerns you believe your agency would consider the most important.
* Agency funding may be reduced as a result of volunteer citizen science activities
* Citizen science may distract from other more important priorities
* Citizen science data may not be high enough quality for use in departmental activities or decisions
* Citizen science data may be falsified
* Unverified citizen science data may be used inappropriately for advocacy or political purposes
* Small-scale technological developments used by citizen scientists may pose new threats (e.g., bioengineering)
* There are no concerns
* Other concerns, please describe:
1. Imagine that you had the resources to start a citizen science project related to emergency preparedness, response, or recovery. What kinds of data could the public collect that would be useful for your agency? Please list your ideas.